ESV Workstation

2.0 Release Notes

Part Number

517970-109

EVANS & SUTHERLAND COMPUTER CORPORATION
Salt Lake City, Utah

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Table of Contents

1. Introduction

Overview

This document describes the 2.0 Release of the ESV Workstation software.

- Chapter 1, "Introduction," (this chapter) describes the functionality added in the 2.0 Release.
- Chapter 2, "Known Bugs in the System," describes the system, ES/os, ES/PSX, ES/PEX, X Window System, and OSF/Motif bugs that are known to be in the 2.0 Release.
- Chapter 3, "Bugs Fixed in the Release," describes bugs that have been fixed in the 2.0 Release.
- Chapter 4, "Documentation Corrections," describes additions and corrections to the ESV Workstation documentation.
- Chapter 5, "Installation Instructions," describes the installation procedure for the tapes included in the 2.0 Release.
- Appendix A, "1.3 to 2.0 C Binding Conversion," contains information to assist you in the process of converting source code from the 1.3 C binding to the 2.0 C binding.
- Appendix B, "Change Pages," contains change pages for the ESV Workstation documentation.

Additional information will be found in the following documents which are distributed with the 2.0 Release:

- *MIPS Software Binary Release Notes, RISCos 4.50 Release*
- *MIPS Software Binary Release Notes, RISCos 4.51 Release*

On-line release notes for the operating system, compilers, and OSF/Motif are found in the **/usr/pkg/rn** directory.

2.0 Release

The 2.0 Release includes the following tapes:

- ES/os 2.0
- ES/PEX-Server 2.0
- ES/PEX-Library 2.0
- ES/PSX 2.0
- ES/Dnet 2.0
- LAT Host Services
- Diskless Node 2.0
- Kodak Printer 2.0
- ES/AVS 2.0
- Pascal RISCompiler 2.11
- Fortran RISCompiler 2.11
- Ada RISCompiler 3.0
- Documenter's Workbench

ES/os 2.0

The ES/os 2.0 Release is based on the 4.5.1 Release of RISC/os.

ES/PEX 2.0

The ES/PEX-Server 2.0 Release is based on the PEX-SI release, which supports the 5.0P protocol specification of PEX. Hence, PEX programs which run on releases prior to the 2.0 release will not run on the 2.0 release. Please see pages 1-27 and 1-28 of the *ESV Workstation Reference Manual*, and also appendix A, "1.3 to 2.0 C Conversion," of these *Release Notes* for information about how to make the necessary changes in your programs.

The ES/PEX-Motif 2.0 Release is based on the OSF/Motif 1.1.1 Release. This Motif revision uses Version 11, Release 4 of the X window system, including the X11R4 X Toolkit Intrinsics. 1.1.1 Motif implements many enhancements and new features, including enhancements to the window manager, **mwm**. For complete information, refer to the *OSF/Motif Release Notes, Revision 1.1.1.*

Application Status Report

This section notifies customers of any impact the 2.0 Release may have on the third-party applications they use. The applications are placed into one of the following categories:

ENHANCED	The 2.0 Release improves performance and/or fixes known bugs in the application.
COMPATIBLE	No known problems with the 2.0 Release.
TESTING IN PROGRESS	Testing in progress at time of printing. Contact the vendor or Evans & Sutherland Technical Support for more information.
IRREGULAR	Application may experience minor side effects with the 2.0 Release. Contact the vendor or Evans & Sutherland Technical Support for more information.
NOT COMPATIBLE	Contact the vendor before upgrading to the 2.0 Release.
UPGRADE AVAILABLE	Not compatible with the 2.0 Release. An upgrade for the 2.0 Release is available from the vendor.

Application Name	Category
AVS	ENHANCED/UPGRADE AVAILABLE
BIOGRAF/POLYGRAPH/NMRGRAF	UPGRADE AVAILABLE
CDRS	NOT COMPATIBLE
FELIX	NOT COMPATIBLE
FRODO	UPGRADE AVAILABLE
INSIGHT/DISCOVER	UPGRADE AVAILABLE
MARC/MENTAT	UPGRADE AVAILABLE
MEDCHEM	COMPATIBLE
MOVIESTAR.BYU	NOT COMPATIBLE
"O"	NOT COMPATIBLE
PARA-SERIES	NOT COMPATIBLE
SYBYL	NOT COMPATIBLE

Added Functionality in the 2.0 Release

PHIGS Functionality

Added PHIGS Functions

The following PHIGS functions have been added in the 2.0 Release:

ARCHIVE ALL STRUCTURES
ARCHIVE STRUCTURE NETWORKS
ARCHIVE STRUCTURES
CHANGE STRUCTURE IDENTIFIER
CHANGE STRUCTURE IDENTIFIER AND REFERENCES
CHANGE STRUCTURE REFERENCES
CLOSE ARCHIVE FILE
DELETE ALL STRUCTURES FROM ARCHIVE
DELETE STRUCTURE NETWORKS FROM ARCHIVE
DELETE STRUCTURES FROM ARCHIVE
GENERALIZED DRAWING PRIMITIVE
GENERALIZED DRAWING PRIMITIVE 3
GENERALIZED STRUCTURE ELEMENT
GET CHOICE
GET LOCATOR
GET LOCATOR 3
GET PICK
GET STRING
GET VALUATOR
INITIALIZE CHOICE
INITIALIZE CHOICE 3
INITIALIZE LOCATOR
INITIALIZE LOCATOR 3
INITIALIZE PICK
INITIALIZE PICK 3
INITIALIZE STRING
INITIALIZE STRING 3
INITIALIZE VALUATOR
INITIALIZE VALUATOR 3
INQUIRE ALL CONFLICTING STRUCTURES
INQUIRE ARCHIVE FILES
INQUIRE ARCHIVE STATE VALUE
INQUIRE CHOICE DEVICE STATE
INQUIRE CHOICE DEVICE STATE 3
INQUIRE CONFLICT RESOLUTION
INQUIRE CONFLICTING STRUCTURES IN NETWORK
INQUIRE DEFAULT CHOICE DEVICE DATA
INQUIRE DEFAULT CHOICE DEVICE DATA 3
INQUIRE DEFAULT LOCATOR DEVICE DATA
INQUIRE DEFAULT LOCATOR DEVICE DATA 3
INQUIRE DEFAULT PICK DEVICE DATA
INQUIRE DEFAULT PICK DEVICE DATA 3
INQUIRE DEFAULT STRING DEVICE DATA
INQUIRE DEFAULT STRING DEVICE DATA 3
INQUIRE DEFAULT VALUATOR DEVICE DATA

INQUIRE DEFAULT VALUATOR DEVICE DATA 3
INQUIRE LOCATOR DEVICE STATE
INQUIRE LOCATOR DEVICE STATE 3
INQUIRE MODELLING CLIPPING FACILITIES
INQUIRE MORE SIMULTANEOUS EVENTS
INQUIRE NUMBER OF AVAILABLE LOGICAL INPUT DEVICES
INQUIRE PICK DEVICE STATE
INQUIRE PICK DEVICE STATE 3
INQUIRE STRING DEVICE STATE
INQUIRE STRING DEVICE STATE 3
INQUIRE VALUATOR DEVICE STATE
INQUIRE VALUATOR DEVICE STATE 3
OPEN ARCHIVE FILE
REQUEST CHOICE
REQUEST LOCATOR
REQUEST LOCATOR 3
REQUEST PICK
REQUEST STRING
REQUEST VALUATOR
RETRIEVE ALL STRUCTURES
RETRIEVE ANCESTORS OF STRUCTURE
RETRIEVE DESCENDANTS OF STRUCTURE
RETRIEVE STRUCTURE IDENTIFIERS
RETRIEVE STRUCTURE NETWORKS
RETRIEVE STRUCTURES
SAMPLE CHOICE
SAMPLE LOCATOR
SAMPLE LOCATOR 3
SAMPLE PICK
SAMPLE STRING
SAMPLE VALUATOR
SET CHOICE MODE
SET LOCATOR MODE
SET PICK MODE
SET STRING MODE
SET VALUATOR MODE

Unsupported PHIGS Functions

Following is a complete list of all PHIGS functions that are not supported in the 2.0 Release. **FILL AREA 3 WITH DATA** is not supported under the 2.0 server, but it is supported if the thin layer is used.

CELL ARRAY
CELL ARRAY 3
EXTENDED CELL ARRAY 3+
GET ITEM TYPE FROM METAFILE
GET STROKE
GET STROKE 3
INCREMENTAL SPATIAL SEARCH
INCREMENTAL SPATIAL SEARCH 3
INITIALIZE STROKE
INITIALIZE STROKE 3

INQUIRE COLOUR MAPPING FACILITIES +
INQUIRE COLOUR MAPPING METHOD FACILITIES +
INQUIRE COLOUR MAPPING REPRESENTATION +
INQUIRE COLOUR MAPPING STATE +
INQUIRE DEFAULT STROKE DEVICE DATA
INQUIRE DEFAULT STROKE DEVICE DATA 3
INQUIRE LIST OF COLOUR MAPPING INDICES +
INQUIRE PREDEFINED COLOUR MAPPING REPRESENTATION +
INQUIRE STROKE DEVICE STATE
INQUIRE STROKE DEVICE STATE 3
INQUIRE TEXT EXTENT
INTERPRET ITEM
NON-UNIFORM B-SPLINE CURVE +
NON-UNIFORM B-SPLINE SURFACE +
READ ITEM FROM METAFILE
REQUEST STROKE
REQUEST STROKE 3
RESTORE MODELLING CLIPPING VOLUME
SAMPLE STROKE
SAMPLE STROKE 3
SET BACK PARAMETRIC SURFACE CHARACTERISTICS +
SET COLOUR MAPPING INDEX +
SET COLOUR MAPPING REPRESENTATION +
SET CURVE APPROXIMATION CRITERIA +
SET EXTENDED PATTERN REPRESENTATION +
SET MODELLING CLIPPING INDICATOR
SET MODELLING CLIPPING VOLUME
SET MODELLING CLIPPING VOLUME 3
SET OF FILL AREA SET 3 WITH DATA +
SET PARAMETRIC SURFACE CHARACTERISTICS +
SET PATTERN REFERENCE POINT
SET PATTERN REFERENCE POINT AND VECTORS
SET PATTERN REPRESENTATION
SET PATTERN SIZE
SET STROKE MODE
SET SURFACE APPROXIMATION CRITERIA +
SET TRIMMING CURVE APPROXIMATION CRITERIA +
WRITE ITEM TO METAFILE

NIS (Yellow Pages)

ES/os supports the MIPS Virtual Information Service (VIS) which provides the capability to use multiple information services on a single host. In the 2.0 Release, this includes support for Sun's Network Information Service (NIS, formerly known as Yellow Pages, or YP) and the DARPA Domain Name service, as well as the standard UNIX information files.

This is implemented by modifying the library routines which provide interfaces to these information data bases. This significantly eases the task of application development because the application itself does not need to know about the different information sources. The following commands are supported:

ypcat	**yppasswd**	**ypbind**
ypmake	**yppoll**	**ypserv**
ypupdated	**ypxfr**	**ypmatch**
ypwhich	**ypinit**	**yppasswdd**
yppush	**ypset**	**ypwhich**

It is very important that **ypbind** has correctly run before you reboot your machine, as an improperly configured system could cause the console to hang when booted.

By default, the OS distribution does not come with NIS enabled. Refer to the *MIPS Software Binary Release Notes, RISCos 4.51 Release* for a complete explanation of how to configure NIS.

Users should note the following about NIS:

- On-line manual pages are available for all NIS commands. These commands start with the string **yp**. The command **man -k yp** will give you a list of the NIS commands along with a few other unrelated commands (disregard the unrelated commands).
- **/usr/bin/domainname** can be used to set your domain name interactively. This must be done before you build a database or start any of the servers.
- **/etc/local_domainname** must contain your domain name in order for NIS to come up automatically when booting your system.
- The file **/etc/rc2.d/S38nis_local** needs to be added in order for NIS to come up automatically when booting your system. Its contents should be:

```
echo startup ypbind
nohup /etc/ypbind
/usr/bin/ypwhich
```

A sample **vis.conf** file, **/etc/vis.conf.sample**, can be moved to **/etc/vis.conf**.

- In order to take advantage of NIS **passwd** and **group** facilities you must add "**+::0:0:::**" as the last entry in your **/etc/passwd** file and "**+:**" as the last entry to your **/etc/group** file.
- For Diskless Node and Local Server systems, **bootparamd** does not use **/etc/bootparams** if NIS is enabled. If you are running a Diskless Node server, you need to have added your system's **/etc/bootparamd** entries to your NIS server's **bootparamd** database.

  For Local Server systems, if you are running a diskless GCPU system, the above note is very important. Without this change you cannot boot the GCPU of the Local Server system and there is no way (other than the network) to access a booted SCPU.

  For Local Server systems, if you have more than one diskless GCPU Local Server system, you do not need to include multiple **/etc/bootparams** entries on the NIS server for the GCPU. Multiple systems may use the same entry provided they have the same **root**, **usr**, and **swap** paths on the SCPU. If the GCPUs of multiple Local Server systems have differing **root**, **usr**, and **swap** paths, you will have to change the Local Server network names and add more than one entry to your NIS server's **bootparams** database. You are strongly urged to use the default Local Server configuration and naming conventions.
- NIS will not work with old executables. Programs need to be relinked with 2.0 libraries.
- To test NIS on a network where an NIS server is already running, execute the following commands as **root**:

  ```
  /usr/bin/domainname <your-domainname>
  mv /etc/vis.conf.sample /etc/vis.conf
  /etc/ypbind
  /usr/bin/ypwhich
  ```

  If everything is correct, the following command will cause a password file to be output:

  ```
  ypcat passwd | more
  ```

  Be sure to apply the above required changes if you want your system to use NIS when it is rebooted.

xdm

The display manager, **xdm**, is a new client with 2.0 which is started automatically when the ESV is booted. This starts the X server and allows users to log in and out without having to explicitly start and stop the X server. See chapter 3, "Getting Started," in the *ESV Workstation User's Manual* for a full description.

If you do not want to run under **xdm**, then you can abort **xdm** by typing ALT-F4. This brings you back to the console in which you must start X explicitly, as was required in previous releases. If you later want to restart **xdm**, you can do so by logging in as user **xdm**. There is no password required. This will cause **xdm** to start again.

New Default Startup Files

The 2.0 release has modified the files which provide the default X environment. See chapter 3, "Getting Started" in the *ESV Workstation User's Manual* for a full description

PHIGS Stereo

The 2.0 Release includes stereo implementation through PHIGS. For information, refer to the following document which is shipped with the Stereo Option: *Stereo User's Manual [2.0].*

Multiple Screens

Multiple screens (provided by the X Multiscreen Extension) allow you to effectively expand your working surface. The term "screen" means a logical screen, not a physical one. When displayed, a logical screen takes up the entire surface of a monitor, and when not displayed, it is not seen.

With multiple screens, you can configure the windows you would like on each screen and then not have to rearrange them (as you do now) if you need to look at a window that is buried in a stack or iconified. With the **csm** multiscreen manager, you can switch between screens, or optionally, with the mouse you can switch screens to an entirely new screen of different windows. This general interface handles multiple logical screens, including normal screens, stereo screens, *etc.*

For additional information, refer to the "X Extensions" chapter in the *ESV Workstation Reference Manual [2.0].*

Overlay Planes

The X Overlay functionality provides access to the ESV Workstation overlay hardware. On the ESV Workstation, the total number of overlay planes is 4. These planes are shared with planes that identify PHIGS workstations. Each plane allocated for overlay reduces the total number of PHIGS workstations by one-half. If all 4 are allocated for overlay, a maximum number of 12 PHIGS workstations will be available. The planes can be allocated for overlay from 1 to 4.

For additional information about the X Overlay functionality, refer to the "X Extensions" chapter in the *ESV Workstation Reference Manual [2.0]*. An example program demonstrating the use of overlay planes on the ESV Workstation is found in **/usr/people/fstest/demo/overlay.c**.

High Quality Spheres

Both 2.0 ES/PEX and ES/PSX provide options for the static renderings of spheres and cylinders which are created using sphere and cylinder equations rather than polygonal approximations. The spheres and cylinders produced are smooth, and the edges and intersections are clear.

Fast Spheres

GDP3 spheres that are drawn with a precision value less than 40 are automatically replaced with spheres that are tessellated in the software instead of the DSPs. This results in faster drawing of spheres for spheres of low precision.

PHIGS Monitor

The PHIGS monitor enables the use of the PHIGS input model. It starts automatically when a PHIGS application is started. This process does three things: it monitors X events, generates PHIGS input, and redraws structures on exposure.

The PHIGS monitor can be enabled or disabled by setting an environment variable. For information on how to enable or disable the PHIGS monitor, refer to the *ESV Workstation Reference Manual [2.0]*, chapter 1, "ES/PEX," description of **OPEN XPHIGS,** or the manual page for **popen_xphigs**.

To set the path from which the PHIGS monitor is obtained, enter the following command:

setenv PEXAPIDIR *directory_path*

where ***directory_path*** is the directory in which the PHIGS monitor is located. It is **/usr/lib/x11/PEX** by default.

A client application cannot use both X input and PHIGS input.

PEX Line Features

The 2.0 Release includes the capability to design and program an unlimited number of line patterns. Unlike previous releases, in which polyline patterns were limited to a predetermined type and number, a newly implemented **GSE** called **Pgse_linepattern_mask** allows you to create your own polyline types. For more information about **Pgse_linepattern_mask**, refer to the "ES/PEX" chapter in the *ESV Workstation Reference Manual [2.0]*.

/usr/man/make.xman.sections

This utility enables the manual browser client, **xman**, to find all of the manual pages on the system. It allows you to cleanup invocations of **make.xman.sections** from prior releases, or to back out completely and remove all of the links and the **mandesc** file previously created.

Running **make.xman.sections** adds approximately 900 Kbytes to the **/usr/man** area.

To execute the utility, follow the steps below:

- Login as **root**
- Type **`su bin`**
- Type **`cd /usr/man`**

  (If Local Server, type **`cd /usr/diskless/usr/man`**)
- Type **`./make.xman.sections`**
- Answer the prompts appropriately

sysadm

The system administration utility, **sysadm**, has been revised and enhanced to match the ESV system configuration and characteristics.

sysadm is a menu driven utility that greatly eases several system administration tasks. The following five areas are involved:

- file management,
- machine management,
- system setup,
- tty management,
- user management.

Items such as backing up and restoring file systems, setting system time zone and date, and adding users are easily accomplished using **sysadm**. For a complete description of this utility, consult the manual page for **sysadm**.

XtSetDefaultAppContext

A new routine called **XtSetDefaultAppContext** was added by Evans & Sutherland to the Xt toolkit library. There is a manual page for this routine which contains a complete description of its functionality.

The Motif widget set supplied by OSF relies on X11R3 compatibility routines provided in the R4 Intrinsics. The release of the R4 Toolkit Intrinsics included the idea of application contexts, which did not exist in the R3 Intrinsics. The R3 compatibility routines in R4 use the idea of a default application context to allow R3-style Intrinsics routines to be used in a backward compatible fashion.

However, a program that is written to use the R4 Intrinsics may want to use a widget set (*e.g.*, Motif) that uses R3 compatibility routines which require the default application context to be initialized. The R4 Intrinsics, as released by MIT, do not contain a function that explicitly initializes this default application context. It is initialized only within the R3-style initialization routine **XtInitialize**.

The **XtSetDefaultAppContext** routine is provided for native R4 applications that wish to use R3-oriented widget sets. Users should note that this routine is not yet a part of the official MIT distribution and is non-portable at the source-code level.

PEXt Toolkit

The PEXt (PEX Toolkit) library is new with the 2.0 Release, and it contains several convenience routines for X toolkit based PEX applications as well as providing a PHIGS workstation widget that can automate some of the tedium of handling exposure and resize events on a PHIGS workstation's window. The following manual pages describe the routines in the library:

- Matrix convenience routines:

  PEXtBuildTran
  PEXtNonUniformScale
  PEXtRotate
  PEXtTranslate

- Primitive convenience routines:

  PEXtCircle
  PEXtCube
  PEXtCylinder
  PEXtEllipse2
  PEXtSphere

- Utility routines:

  PEXtInitialize
  PEXtOpenPEX
  PEXtRegisterConverters
  PEXtSanityCheck

- Widgets:

  PEXtWorkstation

The PEXt library developed from the observation that certain operations become common when writing PEX application code. For instance, the PEX API provides convenience routines for creating transformation matrices (*e.g.*, **BUILD TRANSFORMATION MATRIX 3**, **ROTATE**, **TRANSLATE**, **SCALE**, etc.) and a routine for setting transformation matrices in the PHIGS viewing pipeline model (*e.g.*, **SET LOCAL TRANSFORMATION**, **SET GLOBAL TRANSFORMATION**, etc.). A frequently encountered operation is to create a matrix using one of the convenience routines and immediately insert the matrix as a local transformation matrix:

```
[...]
{
        Pvec3 translation;
        Pint PEXtError;
        Pmatrix3 m;
```

```
        translation.delta_x = 1.;
        translation.delta_y = 1.;
        translation.delta_z = 1.;
        ptranslate3(&translation, &PEXtError, m);

        if (PEXtError)
            {
            fprintf(stderr, "?unexpected PEX error %d!\n",
            PEXtError);
            exit(1);
            }

        pset_local_tran3(m, PTYPE_POSTCONCAT);
}
[...]
```

PEXt provides convenience routines to perform this common operation with a single procedure call:

```
PEXtTranslate3(1., 1., 1., PTYPE_POSTCONCAT);
```

The error code returned by the PEX API routines called by the PEXt library is kept in the global variable ***PEXtError*** (described in the **PEXtSanityCheck** manual page). A "sanity check" is performed after this variable is passed to any PEX API routine, and the library prints a message and exits when it encounters a non-zero value for the error code. These convenience routines provide simple mechanisms for performing common PEX operations.

The second portion of PEXt is the PHIGS workstation widget, which is described fully in the manual page for **PEXtWorkstation**. The widget provides the basic mechanisms of a PHIGS workstation and provides callbacks for expose and resize events. Simple management of exposure and resize events can also be performed without callbacks, providing commonly occurring behavior for these events. Refer to the manual for a description of the behaviors supported.

The third portion of PEXt is a set of resource conversion routines that allow PEX applications to specify resources having PEX data types (*e.g.*, ***Ppoint3, Pvec3***, etc.). The resource conversions and the valid string values are described in the manual page for **PEXtRegisterConverters**.

This library evolved (and is evolving) out of common operations in real PEX programs, and suggestions for improvement and/or bugs should be submitted to Evans & Sutherland. This is the first public release of this library, and it will be submitted to the X Consortium for inclusion in the contributed software distribution.

PAttach

A change has been made in the parameter sent to **PAttach** which allows ES/PSX to be used more effectively with the Local Server option. When running on a Local Server machine, it may be desirable to have the GSR application running on the SCPU while ES/PSX is running on the GCPU. The change to the **PAttach** parameter makes this possible.

Prior to this change, the **PAttach** call accepted a string that was the name of the ES/PSX process to which it was attached. An optional comma (,) is now permitted in that string parameter. The comma is placed after the ES/PSX name, and is followed by the hostname on which the ES/PSX process is running.

For example, to attach to an ES/PSX process named **foo** which is running on the ESV Workstation named **graph**, the **PAttach** call would be:

```
PAttach("foo,graph")
```

To attach to an unnamed ES/PSX process on **graph**, the **PAttach** call would be:

```
PAttach(",graph")
```

Note: The **PAttach** command identifies the port on the server host by issuing an **rcp** command to copy a file from the server to the local host. The **rcp** command requires that the local host be identified as a trusted host to the remote server. This is accomplished by updating the user's **.rhosts** file, or the system **hosts.equiv** file (see the volume 4 manual pages for more information). The `Permission denied` message is received if the **rcp** command fails.

CPK Renderings

ES/PSX now can render CPK images with the same quality as is available on the PS390. This functionality is triggered by setting the sphere precision to zero with the following command:

```
SEND FIX(0) TO <24>SHADINGENVIRONMENT;
```

This is now the default sphere precision.

With this sphere precision, CPK ignores the cylinder precision value given on input <25> of **SHADINGENVIRONMENT**. Cylinder radius and two-tone control can still be manipulated by input <21> of **SHADINGENVIRONMENT**.

PSXENV

A new initial function instance was added: **PSXENV**. It works much like the **PS390ENV** function in that all of its inputs are constant inputs except for input <1>, which is used only to trigger the function.

Inputs:

<1> - trigger which accepts any data type to cause the function to run.

<2> - constant which accepts an integer to specify the ES/PEX Marker type used in ES/PSX to display dots.

The following ES/PEX marker types are currently supported:

-6 : Octagon
-5 : Inverted Triangle
-4 : Square
-3 : Triangle
-2 : Dot (Faster than 1) This is the default
-1 : Diamond
0 : Asterisk
1 : Dot (Higher Quality than -2)
2 : Plus Sign
3 : Asterisk
4 : Circle
5 : X

The application developer may want to change the marker type in order to make ES/PSX dots appear brighter, to give them a certain desired shape, or to get better performance.

<3> - constant which accepts a real number to specify the scale factor for ES/PSX dots. The default is 0.25.

When changing the dot type or the dot scale factor, the change effects all of the dots used in the ES/PSX display structure.

ES/PSX Function Keys and Dial Labels

The ES/PSX Function Keys and Dial Labels Soft Devices are now outlined slightly differently than in previously releases, and the default background color of the top window has been changed from white to black. Almost all of these appearance attributes can be changed in the user's **.Xdefaults** file. See appendix G of the ES/PSX documentation for details on how to do this.

ES/PSX Full Screen Monoscopic Mode

A new screen mode format is available in which ES/PSX will take over the entire ESV screen. This could be useful when wanting to get a photograph of the ES/PSX window but not the other windows on the screen. This is enabled with the commands:

```
SEND FIX(-2) to <5>PS390ENV;
SEND TRUE TO <1>PS390ENV;
```

Another command was added which allows you to change back to the previous screen mode (either Monoscopic or one of the Stereo Modes). After this mode has been entered once, it is possible to toggle in and out of this mode by typing the following:

```
SEND FIX(-1) to <5>PS390ENV;
SEND TRUE TO <1>PS390ENV;
```

Alternately, you can toggle in and out of this mode with a special hot-key sequence; press the CONTROL and SHIFT keys simultaneously, then press all three mouse buttons simultaneously.

Physical I/O

The Physical I/O capability is now supported, and change pages that describe and define it are contained in appendix B.

AVS Functionality

Product Overview

The Application Visualization System (AVS) is an interactive environment which gives users the ability to use advanced computer graphics and imaging techniques without graphics programming. It allows users to construct applications that transform their computational code into meaningful graphics. AVS models the iterative, exploratory approach of scientists, and provides interactive visual feedback. With AVS, users can:

- Quickly visualize geometric, image, and volume data sets;
- Interactively construct and execute a processing network using a visual network editor;
- Easily connect user computational programs to the processing network for realtime, interactive processing and visualization; and
- Build discipline-specific visualization applications.

Features Added in the 2.0 Release

Transparency

Transparency is now supported through the Edit Property menu.

"Multi-pass" Traversal Mode

To support the added functionality of transparency and antialiased lines on top of polygons, another Z-buffering mode was added to the ZBUFFER button in the Cameras menu. The ZBUFFER radio button is now a tri-state button which supports the following modes:

- Gray Ball – No Z-buffering

  Indicates that Z-buffering is turned off. Used for scenes containing only lines and no polygons.

- Dark Blue Ball – Z-buffering

  Indicates that Z-buffering is turned on. Used for scenes containing shaded polygons, spheres, and transparency. If you use transparency in this mode, you should read all transparent objects into the Geometry Viewer after all the opaque objects have been read. This will allow for the correct transparency calculation and for optimum performance.

- Light Blue Ball - Multi-pass Traversal Z-buffering

  Indicates that multi-pass traversal Z-buffering is turned on. This mode will create the best possible picture but with some sacrifice in performance. This mode will create a picture with nice transparency and antialiased lines on top of shaded polygons, regardless of the order in which objects have been loaded into the Geometry Viewer.

Unsupported Features

The following is a list of the unsupported or not-yet ported features and functions of AVS.

Unsupported Peripherals

- Control dials
- Spaceball

Unsupported Modules

- Transform pixmap
- Alpha blend

Unsupported Functionality

- Texture mapping
- Phong shading

New AVS Usage

A command line option to choose the type of sphere primitive is available by using the **-sphere** option when starting AVS.

The default sphere primitive (without the **-sphere** option) is a triangle strip generated by AVS. This primitive is best used when more interactive updates are desired.

The sphere primitive generated with the **-sphere** option will use the PHIGS **GDP** primitive in the hardware. This primitive is best used when the creation time is important; *i.e.*, the time it takes to create and delete the sphere primitive is less than when using the triangle strip primitive. For example, a co-routine module that would create spheres would perform better by using the **-sphere** option. The second advantage using this primitive is the amount of memory it requires. Since the application stores these primitives as single spheres (as opposed to triangle strips, as is the case for the default sphere), considerably less memory is consumed.

Documentation Corrections

This is a list of the unsupported items and the pages on which they are found in the *AVS User's Guide* provided by Stardent.

Chapter 4

- Pg. 4-1 — under "Geometric Techniques," bubble viz is not supported.
- Pg. 4-1 through 2 — under "Volume Rendering," alpha blend and shaded alpha blend are not supported.

Chapter 5

- Pg. 5-7 — under "Function Key Usage," F4 - Transform Map is not supported.
- Pg. 5-7 — Transform textures are not supported.
- Pg. 5-8 — Dial box and Spaceball are not supported.
- Pg. 5-9 — under "Geometric Viewer," edit texture, lines, and Phong are not supported.
- Pg. 5-14 — Edit texture is not supported.
- Pg. 5-15 — Lines and Phong shading are not supported.
- Pg. 5-20 — "Depthcue Lines" should be just "Depthcue." This depth cues all objects in the camera, not just lines.
- Pg. 5-20 — "Z-Buffer Lines" should be just "Z-Buffer." This Z buffers all objects in the camera, not just lines.
- Pg. 5-23 — Font Selection Submenu has only Font1 and Font2. It does not have Courier, Helvetica, Schoolbook, Times, Charter, and Symbol fonts. Also there are no bold or italic fonts.
- Pg. 5-24 — Dropshadow is not supported.
- Pg. 5-24 — Add "Stroke" under Label Attributes Submenu. Stroke is 3D text and can be scaled just as any object. Annotation text is used when Stroke is turned off.

Chapter 7

- Pg. 7-8 through 10 — Alpha blend is not supported.
- Pg. 101 — Transform pixmap is not supported.

Appendix A

- Pg. A-6 — Item 20 should say **mandril.x** instead of **stardent.x**.
- Pg. A-7 — Stardent image should be replaced by Mandril image.
- Pg. A-25 through 28 — Items 73 through 79 are not supported.

Appendix B

- Pg. B-5 through 6 — Any references to Lines are not supported.
- Pg. B-10 through 11 — Any references to Lines or Phong are not supported.

New Options in the 2.0 Release

Local Server

The Local Server consists of the following two cards:

- Server CPU Card
- DPR Card

The Local Server provides the ESV Workstation user with a second, fully-functional CPU Card called the *Server CPU*. The Server CPU supports all ESV Workstation hardware and software products supported by the standard CPU (called the *Graphics CPU*), with the exception of products that require the CPU to be directly connected to the ESV Workstation graphics hardware. The Local Server offers the ESV Workstation user a way to purchase an inexpensive network compute/file server.

The Local Server software is included in the 2.0 Release. For additional information, refer to chapter 9, "Local Server," in the *ESV Workstation User's Manual [2.0]*.

Spaceball

Spaceball is an optional interactive device, consisting of a stationary ball which senses applied force and torque. Eight programmable buttons are located on the upper face, which can be used as function keys, and another programmable button is located on the front of the ball, which can be used as a pick button.

Spaceball has six degrees of freedom. By pushing and twisting the stationary ball, Spaceball simultaneously senses the forces along, and the torques around, the *x,y,z* axes of its coordinate system. These six parameters are processed by Spaceball and output as numeric vectors and matrices. They can be used to control any function you specify.

Spaceball can be implemented through ES/PSX or X. For additional information refer to the following document, which is shipped with the option: *Spaceball User's Manual [2.0]* (E&S # 517941-201).

Button Box

The Function Button Box unit is an optional interactive device that gives an expanded capability for program selection by providing 32 programmable function buttons in addition to the 12 function keys on the keyboard.

Data Shuttle

The Data Shuttle facilitates the removal of two disk drives without disconnecting any wires or cables. The Data Shuttle provides shock protection and electrostatic discharge protection (ESD) for the disk drives. The disk drives are mounted in individual canisters which slide easily in and out of the chassis. The E&S part number for this option is 220050-100.

2. Known Bugs in the 2.0 Release

This chapter describes bugs known to be in the 2.0 Release.

Note: For additional information about operating system and compiler bugs, refer to the *MIPS Release Notes*, which will be found on-line in the **/usr/pkg/rn** directory.

Bugs are organized into six categories within this chapter as follows:

- System bugs
- ES/os bugs
- ES/PSX bugs
- ES/PEX bugs
- X Window System bugs
- OSF/Motif bugs

System Bugs

1.3 X Server

If you type **xinit** on a machine where an X server is already running, the initial X server hangs. The CTRL-ALT-BREAK key sequence will not kill it.

1.4 Bad Broadcast Address

On the ESV Workstation, the variable portion of the default broadcast address contains 0s (zeros). If the default broadcast address is used, it may result in **portmap** generating an **mfree** panic. To prevent this from happening, you should set the broadcast address explicitly in **/etc/local_hostname**.

1.7 ES/Dnet Remote DCL/Shell Command

Remote DCL/shell commands won't allow you to specify a file without an extension. You must rename files to a name with an extension before copying.

ES/os Bugs

2.3 Line Editing

There is a bug in the MIPS documentation regarding line editing. After starting and killing the X server, the parent session is automatically logged off. The problem disappears when line editing is not set in the C-shell.

2.6 Server Cleanup

If the PEX server crashes, you may have to clean up the system shared memory, and semaphores. To clean up the active shared memory and semaphores, if attempting to start the Xserver fails, do the following:

1) Login as **root.**
2) Execute the shell command: **ipcs.**
3) Remove them with the shell command:

   ipcrm -s {Semaphore ID} **-m** {Shared Memory ID}

4) The **/tmp** directory should also be cleaned out by removing all the files with the shell command: **rm /tmp/***.

2.9 find Command Stops on /usr/lib/cron/FIFO|

The BSD version of the **find** command will search a periodically updated database for a requested file instead of searching the directory hierarchy directly. This can result in a much improved response time when you are looking for a specific file.

In order to periodically update this database, an entry in the **cron** table is made to run the **sh(1)** script **/usr/lib/find/updatedb** once a week. This file looks in a set of search paths (excluding NFS mounted directories) and creates the appropriate database.

However, this database is incomplete because it doesn't contain files local to the machine. The **find** command gets an error on the file **/usr/lib/cron/FIFO|.** The error reported is:

```
Couldn't find mount point for FIFO
```

To avoid the problem, use the explicit path name form of the **find** command.

2.11 Pascal Compiler Initialization Crash

A Pascal compiler bug causes a crash during initialization due to incorrectly generated code attempting to clear a local variable.

If a local variable is defined which is a record consisting of a 255-byte array and a two-byte integer, the compiler generates incorrect code to clear the array. A bus error occurs.

The following is C code which calls the offending Pascal code:

```
 */
main()
{
    printf("if there is no following message, it crashed\n");
    bug();
    printf("didn't crash\n");
}
```

The following is the offending Pascal code:

```
*/
TYPE
    Int16 = -32768..32767;  { 16-bit integer }
    Bytespell = ARRAY [ 1..255 ] OF char;
stringtype = RECORD  { the offending record description }
        chars : Bytespell;
        len   : Int16;
        END;
PROCEDURE bug;
VAR
    temp    : Stringtype;

    PROCEDURE copy_str ( stri : Bytespell; VAR stro : Stringtype;
              len : Integer);
    VAR
             i      : Integer;
    BEGIN
        FOR i := 1 TO len DO
            stro.chars[i] := stri[i];
    END;

BEGIN
    copy_str('so far so good', temp, 14);
    writeln(temp.chars);
END;
```

2.13 FORTRAN Parameter Declaration

The FORTRAN **PARAMETER** (epsilon = '3cb0000000000000'x) fails. Declaring an epsilon variable using a literal hex value such as **PARAMETER** (epsilon = '3cb0000000000000'x) fails to produce valid results when multiplied by a floating point number. This problem does not occur if the variable assignment is not made as **PARAMETER**.

Try to avoid using **PARAMETER** declaration for this type of variable.

2.14 xdm Log File

The X display manager **xdm** creates a log file **/usr/tmp/xdm-errors**.This file grows each time you log in and out of the system via **xdm**.The only way to safely remove this file is to reboot the system. At this time, the old file will be removed and a new one will be opened. It is recommended that you reboot the system periodically so as to not allow the file to grow too large.

ES/PSX Bugs

3.2 Unsupported GSRs

The following GSRs are not supported in ES/PSX (in addition to those already noted in the "Porting from the PS 390" chapter in the *ES/PSX User's Manual*): **PPutGX**, **PSndRStr**, **PDelim**, **PLoad**, **PSavBeg**, and **PSavEnd**.

3.14 Dial Box Label Characters

The = (equals) character cannot be set into the dial box label.

3.23 Missing Pixels in Stereo

The two pixels in the left-most boundary of the low-resolution and mixed resolution stereo screen are not seen. The two pixels in the right-most boundary are not seen in mixed resolution stereo. If a line is drawn vertically at these extremities, it is not seen.

3.24 Gap at Top of ES/PSX Window

A border drawn around an ES/PSX window from -1:1 in *x,y* will leave a small (approximately 1 to 2 pixels) gap at the top of the X window between the stroked box and the X window border.

3.25 PSX Warning Messages

The warning initial function is not set the same in PSX and the PS390. On the PS390, warning messages are turned off at bootup. In PSX, the warning messages are on by default. To avoid getting warning messages, enter the following command at the keyboard:

```
Send false to <1>warning;
```

or from your **site.dat** file:

```
Send false to <1>warning1;
```

ES/PEX Bugs

4.5 PHIGS Functions Without Errors

The PHIGS and PHIGS PLUS functions that are not supported in this release do not produce error messages. For a list of the supported and unsupported functions, refer to the "ES/PEX" chapter of the *ESV Workstation Reference Manual.*

4.8 pinqdynstruct

Page 462 of the *SunPHIGS 1.1 Reference Manual* lists the function **pinqdynstruct**. It uses as a reference the structure **Pmodstruct**. The element priority is listed for the C structure, but not for the FORTRAN parameters. The priority element is not in the **phigs.h** file and should be ignored.

4.10 ddpex

Errors returned from **ddpex** are not consistent. They have just recently been defined by the PEX SI project, and this release does not incorporate these definitions.

4.17 Invalid Color Type

Elements with invalid color types produce errors. Currently, the system checks all elements that contain colors for unsupported color types. If an element with an unsupported color type is found, the element is rejected and an error is issued. This is different from the proposed PHIGS PLUS standard, which states that the correct action is to build the element, detect the bad color type during traversal, then use the default color.

4.18 RGB Values

RGB values need to be clamped to reasonable ranges (0.0 to 1.0) when the client program supplies out-of-range data. This is not done currently, and RGB values outside the range 0.0 to 1.0 have unpredictable results.

4.20 Workstations on Multiple Servers

You cannot open workstations on multiple servers. When **OPEN WORKSTATION** is called, and the server to which the connection is being made is not the same as the default server sent to **OPEN PEX**, an X error occurs, and the workstation is not opened.

To work around this problem, you can call **XGetWindowAttributes** on the workstation window before calling **OPEN WORKSTATION**. This allows the **OPEN WORKSTATION** to complete.

4.25 Black Polygons Visible With Black Background

With a black background color set, black lines, markers and text are all indiscernible. Black polygons, however, are more a charcoal gray color and are still visible.

4.26 DeleteStructures Fails

Under certain conditions a PEX bug using labels and delete structure causes **DeleteStructures** to fail.

4.27 Quad Meshes With Vertex and Facet Normals

Certain sizes of quad meshes with vertex and facet normals are not displayed correctly. The last row is incorrect. If the facet normals are not set for the mesh, it is displayed correctly.

4.28 PEX Structure ID Size

Unpredictable results occur if the PEX structure ID is larger than 64K.

4.29 RETRIEVE STRUCTURES

The archive retrieval function **RETRIEVE STRUCTURES** can hang. When the routine is called, and the list of structures to retrieve is not in sequence, the routine may not return.

4.30 INQUIRE PICK DEVICE STATE 3

The value in the **Init_pick.depth** field which is returned when **INQUIRE PICK DEVICE STATE 3** is called is not correct. Also, if you are using the 1.3 thin layer, this procedure should not be used at all, because the buffer size which is returned is incorrect and may cause unpredictable behavior.

4.31 INQUIRE DEFAULT LOCATOR DEVICE DATA 3

INQUIRE DEFAULT LOCATOR DEVICE DATA 3 returns an error. A call to this routine may generate a bad device error (error 250) even though a valid locater device is given.

4.32 1.3 Thin Layer pinqelemcontent

The 1.3 thin layer **pinqelemcontent** routine does not work. It produces a segmentation fault. There is a workaround for this bug. If no structure is open, substitute the call to **pinqelemcontent** with the following:

```
popenstruct (struct);
psetelemptr (elem);
pinqcurelemcontent (size, error, buffer, total_size, data);
```

If another structure is open, you must first close that structure before calling the above routines.

4.33 INQUIRE HLHSR MODE

This inquiry routine may incorrectly return an error, even when no error occured. If the error indicator is 0, the data is correct. Otherwise, the returned values may be incorrect.

4.34 Cylinder GDP

If a Cylinder **GDP** with indexed colors contains a cylinder list that is too large, the server will hang. To prevent this, make sure that no cylinder list which uses indexed colors contains more than 33 endpoints.

4.35 Opening Multiple Server Connections

The PHIGS libraries supplied with the 2.0 release contain a fundamental bug that prohibits PHIGS clients from having more than one connection to a server, including multiple connections to different servers. Attempts to establish more than one connection will result in one of the X servers aborting whenever an execute structure element is created.

Multiple connections can be established in several ways, some of which are subtle. Here are a couple of examples.

- If you call **popen_phigs**, then open a workstation of type **phigs_ws_type_x_drawable**, two connections are created. Since **popen_phigs** was used instead of **popen_xphigs**, a connection was created while opening PHIGS and another is established by the **XOpenDisplay** call that is required prior to opening the workstation.
- If you call **popen_phigs** and then open a workstation of type **phigs_ws_type_x_tool** with a connection id string that is not the same as the one used to set the **DISPLAY** environment variable, two connections are created. The best approach to opening **phigs_ws_type_x_tool** workstations is to always pass a NULL string for the connection id. This will cause **popen_ws** to use the connection established by the **popen_phigs** call.

4.36 SET EDGETYPE

Setting the edgetype to something other than solid in **SET EDGETYPE** will cause unpredictable visual effects.

4.37 SET FACE DISTINGUISHING MODE

If you set the back face distinguishing mode to **yes** in **SET FACE DISTINGUISHING MODE**, and you shade a back facing polygon, the polygon will appear black.

X Window System Bugs

5.8 DeviceMotion Extension Events

DeviceMotion extension events for dials do not propagate through the window hierarchy as documented in the *X11 Input Extension Library Specification*. For a finite number of subwindows, you can request the event for each of the windows.

5.9 XgetImage

Calls to **XGetImage** with large portions of the screen take a long time to complete.

5.10 XSync

When the device focus is set to the tablet, calls to **XSync** may cause a bus error. When the device focus is set to the dials, calls to **XSync** may cause the X Server to crash.

5.11 XGrabDeviceButton

XGrabDeviceButton returns a **NOMATCH** error ("device does not support input class **BUTTONS**") when you try to grab a tablet button.

5.12 XQueryDeviceState

XQueryDeviceState kills the server when you ask for information about the dials.

5.13 Running a Large Number of Clients

If you run a large number of clients (> 4,000), some of the clients may fail.

5.14 Dials

When constantly sending dial labels, and turning 3 or more knobs at the same time, the dial box may get confused and blank out labels and make other mistakes. Avoid sending a large number of label updates when simultaneous rotation of dials is needed.

5.16 XAllowEvents

XAllowEvents does not allow events to be sent to the client that has grabbed the keyboard or the mouse.

5.18 XFreePC

XFreePC returns **Colour Type** error when it is called:

```
X Error of failed request:  Colour Type Error -- device does
not support the specified color typ
Major opcode of failed request:  135 (ESPickExtension)
```

```
Minor opcode of failed request:  4 (X_FreePC)
Value 0x1c00001
```

5.20 Keyclick Doesn't Work

Turning keyclick on and off through **xset** never produces a key click noise, even though the keyboard supports it.

5.21 Cut Buffer Drops Characters

When several lines (more than 10) are put into the X server's cut buffer, then are pasted into another Emacs window, characters are frequently dropped if Emacs is performing an autosave.

5.22 xsetroot -cursor Fails

If a bitmap greater than 64 x 64 pixels is used as the root window cursor using **xsetroot -cursor bitmap** bitmap, the bottom and right segments of the cursor > pixel 64 are truncated in the display.

5.23 XGetDeviceDontPropagateList and XChangeDeviceDontPropagateList

XGetDeviceDontPropagateList always returns a count of 0 events not to propagate, and **XChangeDeviceDontPropagateList** doesn't appear to change this.

Also, selecting events for the window in which you are attempting to use **XChangeDeviceDontPropagateList** creates an error.

5.24 XtUnmapWidget Fails

XtUnmapWidget fails if it is called immediately after **XtMapWidget.**

In the following sequence of calls:

```
XtMapWidget(topLevel);
XFlush ( XtDisplay (topLevel ) );
XtUnmapWidget(topLevel);
XFlush ( XtDisplay (topLevel ) );
```

the **unmap** does not work. If a **sleep(1)** is placed before the **unmap**, it works.

5.25 lco Leaves Trails

When you run **lco** with the flags **-obj octa -lw 10**, which draws an octahedron with a 10-pixel linewidth, the moving object leaves trails behind.

5.26 XI_KEYBOARD

XI_KEYBOARD is not declared in **XI.h** for **XListInputDevices**. Compilation returns the error `XI_KEYBOARD` undefined.

5.27 Picking in Perspective Projection

With the projection specified as perspective, a picking program gets zeroes for the model coordinates when a primitive is picked. If the projection is changed to parallel, the model coordinates are returned correctly.

This occurs because the perspective matrix is non-invertible, making it impossible to compute a 3D pick point. There is a flag for this condition which can be checked.

The typical cause for the perspective matrix to be non-invertible is putting the projection reference point on the front clipping plane. This creates a matrix with zeroes in the column. That matrix is non-invertible making it impossible to return a model space pick point.

5.28 xterm

xterm won't work with VMS TDMS. When TDMS queries as to the terminal type, **xterm** does not reply.

5.29 XGrabServer

The combination of a client program calling **XGrabServer** and a bus error, locks up the server. Here is a sample program:

```
main(){
     Display *dpy;
  unsigned long used[2], i=0xff1100;
  dpy=XOpenDisplay("");
  XGrabServer(dpy);
  XSync(dpy, 1);     /*freezes with an X call*/
  used[i]=1;         /*force bus error*/
          XUngrabServer(dpy);
  XCloseDisplay(dpy);
}
```

5.31 Turning the Bell on/off

Using **xset** to turn on/off the bell (**xset b off**, **xset b on**) has no effect; the bell always rings.

5.35 Overlay Planes

XGetImage and **XPutImage** do not work with overlay planes under all conditions.

5.36 xman Crashes in XCreateWindow

xman will crash with the error 'cannot do bold and italics' on manual pages that attempt to do bold and italics at the same time. One example of this is the

XCreateWindow manual page. If you scroll down through it, **xman** will die at the certain point that it tries to do both bold and italics.

5.37 xman Segmentation Faults

xman has segmentation faults with **^m** or **^d** in the help screen. Under **xman**, in a manual-page or directory window, the key presses CONTROL-d and CONTROL-m will display the directory or the manual page, respectively. However, if you press one of these key combinations while the cursor is in the help window, **xman** will produce a segmentation fault.

OSF/Motif Bugs

With the ES/os 2.0 release comes the OSF/Motif Revision 1.1.1 which uses Version 11, Release 4 of the X Windows System, including the X11R4 X Toolkit Intrinsics.

On-line release notes for OSF/Motif 1.1.1 can be found in **/usr/pkg/rm/motif**.

6.2 *OSF/Motif Reference Manual*

On page 38 (and many other pages), the constant named **XmNinsertPosition** does not exist. This is a software bug, but, until it is fixed, applications can use the string **"insertPosition"** (quotes included) in its place.

On page 404, in the middle of the page, there is a constant referred to as **XmText**. The name of this constant should be **XmTextWidget**.

On page 407, in the middle of the page, there is a constant referred to as **XmNinsertionPointVisible**. The name of this constant should be **XmNcursorPositionVisible**.

On page 410, near the bottom of the page, there is a constant referred to as **XmCR_MOVING_TEXT_CURSOR**. The name of this constant should be **XmCR_MOVING_INSERT_CURSOR**.

6.27 PushButtonGadgets

When the height and width attributes of **PushButtonGadgets** (with bulletin board parent) are set at creation of the gadgets, they are not maintained if the gadget is later moved to a new position.

For example, if **PushButtonGadgets** are positioned at 0,0 on creation and subsequently moved to new *x,y* positions by means of **XtSetArg** and **XtSetValues**, they position correctly but their height and width are no longer correct.

This can be worked around by creating the gadget with no arguments set, then setting all arguments (including size, position etc.) for the gadget after creation using **XtSetArg** and **XtSetValues**. Then don't reposition them again. Another possible workaround is to re-parent the gadget.

6.28 Motif Doesn't Pass Pointer to Event

When a resize callback is added for a drawing area widget, no pointer to the event is passed into the callback in the callback structure. The third parameter passed to the callback routine should be a structure defined the following way:

```
typedef struct {
int reason;
XEvent *event;
```

```
    Window window;
    } XmDrawingAreaCallbackStruct;
```

The window and reason are there, but the pointer to the event is NIL. To get the information contained in the event, you can call **XGetWindowAttributes.**

6.29 Popup Menu Causes Fault

Popup menu as a child of top-level shell causes a fault. When creating a pop-up menu as a child of the widget returned by **XtAppInitialize** (*i.e.,* as a top-level shell widget), an application gets a segmentation fault when attempting to manage the popup menu.

If the popup menu is created as a child of a manager widget (or any widget that inherits behavior from the manager widget class, such as a row column) then it works fine.

6.30 Motif XmStringCompare

In some cases, **XmStringCompare** does not return a correct comparison result. To avoid this problem, use **XmStringByteCompare** to compare strings.

6.31 Button State Info Problem

During testing, a check on the valid state info for a button window sometimes returns non-expected data, failing the test.

6.32 Bitmap Failures

A number of Motif tests are designed to bring up bitmaps, but fail to do so. The bitmaps will come up in certain sections of the tests, but not others. Some functions will allow bitmaps to work, others won't.

3. Bugs Fixed in the 2.0 Release

This chapter lists bugs reported in previous releases that have been fixed in the 2.0 Release, as well as bugs not previously reported but fixed for this release.

Bugs are organized into six categories within this chapter as follows:

- System bugs
- ES/os bugs
- ES/PSX bugs
- ES/PEX bugs
- X Window System bugs
- OSF/Motif bugs

System Bugs Fixed

Structure Memory

If a process exhausts structure memory, the PEX server may crash without notification. Structure memory should be set to be one-half of the total system memory. For more information, refer to the "Customizing the System" chapter in the *ESV Workstation User's Manual.*

Yellow Pages

Yellow Pages does not work properly in ES/os.

18 x 25 Data Tablet Mapping

When the large data tablet is set to be the core pointer the cursor/screen mapping is incorrect. The **x_root** element in the event structure is mapped correctly, but the **y_root** element is wrong. The range in *y* seems to be from 0 to 740, when it should be 0 to 1023

6x9 Data Tablet

The 6x9 data tablet doesn't generate button change events unless the puck position changes as well. You only get an event when you move the increment amount, regardless of button changes.

ES/Dnet Can't Read Password

When logging onto the ESV from a VAX, after entering your login name the system returns:

```
Sorry, can't read your password.
```

This occurs immediately after installing the operating system, occasionally after rebooting ESV, and when ES/Dnet has been running a long time. You should stop and restart ES/Dnet. This may or may not be a permanent fix.

ES/Dnet

When ES/Dnet runs, it can get into a state in which it uses 80-90% of the CPU. This makes everything else run very slowly. It is reported that you can temporarily correct the problem by bringing down ES/Dnet and restarting it. This condition occurs mainly when the system has been sitting idle for a long time.

ES/os Bugs Fixed

Help Facility /usr/lib/help/glossary

The help facility **/usr/lib/help/glossary** is not found. If you type in

```
$ help
```

then follow the menu option to get the glossary, the following error message comes up:

```
sh: /usr/lib/help/glossary: not found
```

Indent

When you run **Indent** you get a core dump and an empty file.

ld Crash

ld crashes and dies under certain conditions. When compiling the test suite for **mwm** an error occurs on the first compilation.

usleep()

The system function **usleep()** is listed in the on-line manual pages, but it is not in any of the system libraries. An equivalent function can be implemented using **setitimer()**.

nm Command

The **nm** command doesn't work with some libraries.

bcopy has System V Semantics

The **bcopy** provided in the BSD library has System V semantics. It does not allow for overlapping copies.

dbx Dies

When using **dbx** via an **rlogin** session from a non-ESV Workstation, the debugger causes the **rlogin** session to terminate abnormally.

rlogin and recall Incompatible

When a process has made an **rlogin** to an ESV Workstation from a Sun Workstation, and you type the **!!** command, the process immediately terminates and the **login** session closes.

vmstat and iostat

In the ES/os, **vmstat** and **iostat** don't work correctly.

vmstat produces the following message:

```
nscsi undefined in system
```

iostat produces the following message:

```
scsiiotime not found in /unix namelist
```

export

The **manual page** for **exports** indicates that directories, subdirectories and even files may be **exported** via NFS. If **/etc/exports** contains an entry for something other than a file system, the receiving machine gets the message `access denied` when trying to mount the imported directory or file.

yacc Doesn't Allocate Enough States

You get an error when you have more than 750 states because **yacc** was made without -**Dmips** defined. This keeps -**DEXTRA_HUGE** undefined which forces **yacc** to only allocate 750 states.

stty Command Does Not Work on Redirect

The **stty** command should be able to redirect requested **tty** settings to a line other than the currently logged in **tty** when used as follows:

```
- /bin/stty [setting] < /dev/tty3
-/bsd43/bin/stty [setting] > /dev/tty3
```

The above commands should set the requested default(s) for **tty3**. This is important if the **tty** line goes to a "dumb" device that requires certain defaults, like -**Ixany**, but is not able to set them interactively.

The 1.3 **stty** commands do modify the defaults for the specified **tty**, but the original defaults are restored as soon as the **stty** command exits.

sendmail.nis Fails

sendmail.nis fails with large alias lists due to small buffers in the send mail process. These buffers have been increased dramatically.

ES/PSX Bugs Fixed

Hostnames Longer than 14 Characters

In previous releases, ES/PSX would crash if it were run on hosts with a local hostname longer than 14 characters. This problem has been fixed in the 2.0 release. ES/PSX applications must be relinked with Release 2.0 GSR libraries if they are to be run on hosts with names longer than 14 characters.

Abort of psxcommand

When running **psxcommand**, aborting with **^C** or by other methods may leave the terminal in a state that it may not echo. Users should exit **psxcommand** as via the escape sequence, which is "@." by default.

Rendering Spheres in CPK

If you run dynamic CPK with low precision spheres, rotate the spheres with their poles parallel to the monitor screen, and move the spheres a short distance, horizontal lines may flash out of the spheres.

CPK Specular Highlights

When displaying a CPK model in ES/PSX with a high precision value and the terminal emulator turned on, movement of the cursor across the screen may cause the specular highlights to blink.

CPK Spheres Clipped

In ES/PSX, spheres and lines with *z* positions that cause them to reside in the back half of the CPK window are clipped and not seen.

CPK Renderings Inverted in *z*

In ES/PSX, some CPK renderings may be inverted in *z*.

Turning Off the Display When Rendering

When a rendering is done on the PS 390, the display is turned off by sending the equivalent of a fix(1) to **TURNONDISPLAY**, which turns the wireframe display off. This prevents stenciling over the static image on the PS 390. This feature has been implemented in ES/PSX.

READASCII May Crash ES/PSX

Sending a filename to input <1> of a **F:READDISK** function can occasionally cause ES/PSX to immediately abort with an `Exit 11` error message. Thus, sending to the initial function instances **READASCII** and **READBINARY** may cause an immediate abort of ES/PSX.

DELETE STRUCTURE May Crash ES/PSX

Using the **DELETE STRUCTURE** command may crash ES/PSX. The problem occurs when a Set node in the structure that is being deleted is empty.

Multiple CPK Processes

If you are running multiple ES/PSX processes, do not run CPK in more than one. Doing so may cause unpredictable behavior, including the possibility of crashing the X server.

Set Nodes in a Structure

If you have a Set node under another Set node, which was created in **OPTIMIZE STRUCTURE** mode and which does not require the state to be saved, the X server will hang.

ES/PSX xmenu

When the **xmenu** window has **root** as its parent (that is, it is not under the 'top' window), it has a few problems:

1) Doesn't display the word **Shell** upon bootup, but does if you move the pointer to the **xmenu** window.
2) Doesn't display any of the current states until the pointer is in the **xmenu** window.
3) Can't use the keyboard to get into **Shell** mode. You can click on the **xmenu** to get into this mode.
4) Clicking on **Keyboard** lags one click behind.
5) **Term** and **Graph** seem to lag one mouse click behind, slightly differently than **Keyboard**.

SET DISPLAY

Sending **TRUE** or **FALSE** to the code created by the **SET DISPLAY** command does not make changes to what is displayed.

Clock Functions

The clock functions, namely the **CLFRAMES** and **CLTICKS** functions, could be triggered to run in 1 tick or frame, but might actually run immediately instead of waiting for that time.

Keyboard/Term/Graph Data

If the parent of the **xmenu** window was the root window, the display of the Keyboard/Term/Graph data was delayed.

Clipped Items Still Pickable

Molecular structures which are clipped out in *z* and are not visible can still be picked in ES/PSX-FRODO. This has been fixed.

ES/PEX Bugs Fixed

Back/Front Area Properties

With **FACE DISTINGUISH MODE** on and different properties set for the back and front area properties, the image will have the same properties for both.

ES/PEX Polygon Rendering with ES/PSX

When you bring up an ES/PEX window running the "sponge" program in ES/PSX, any dynamics applied to the ES/PEX model cause the specular highlights to "wink" or vary in diameter on the object.

pset_edgetype

Calls to **pset_edgetype** with any types other than **PSOLID** still cause solid edges to be drawn.

Broken pdel_elems_labels

If **pdel_elems_labels** is called to delete elements between labels, and there are no elements, an attempt is made to immediately insert elements, and the pointer gets lost.

pfill_area_set3

pfill_area_set3 that has edge data does not draw the edges as expected. It draws the edges assuming the first edge ends at vertex 1 (the edge between the last vertex and the first vertex).

Clipping Causes Bad Model and Screen Points

Clipping causes bad model and screen points on a pick. The points that are returned on a pick are incorrect.

PHIGS Traversal State

According to the ANSI standard, colors for PHIGS PLUS attributes should be initialized to type **INDEXED** and value **1**. These attributes are initialized to type **RGB** and value **WHITE**. This will effect the behavior of programs that change the value of color LUT entry 1 and expect to see their default colors change. This affects the following attributes: **polyline colour, polymarker colour, text colour, interior colour, back interior colour, specular colourback, specular colour**, and **edge colour**.

InquireWksInfo

InquireWksInfo returns spurious information for the current values of HLHSR mode, NPC subvolume, and workstation viewport.

EMPTY STRUCTURE and DELETE STRUCTURE

Calling **EMPTY STRUCTURE** or **DELETE STRUCTURE** to delete the contents of a structure results in the structure being emptied, but structure memory is not completely reclaimed.

REDRAW ALL STRUCTURES

Sometimes the screen is not redrawn after a **REDRAW ALL STRUCTURES** call. After an expose event, a **REDRAW ALL STRUCTURES** call is issued by the user's program. If the window has been moved before the expose event is generated, the window may not actually refresh.

PWAIT

The **PWAIT** definition conflicts with **sys/param.h**. **PWAIT** is also defined in **<sys/param.h>**. If this file is included after **phigs.h**, an X error occurs when **PWAIT** is used in **pset_disp_upd_st**. To work around this, include **phigs.h** after **sys/param.h.**

INQUIRE ELEMENT CONTENT

Inquiring the element content on an edge flag element does not return valid values. The returned element should be an enumerated type of **PEDGE_ON** or **PEDGE_OFF**.

INQUIRE ELEMENT CONTENT gives bad data for the following PEX elements:

- **POLYLINE SET 3 WITH DATA**
- **TRIANGLE STRIP 3 WITH DATA**
- **QUADRILATERAL MESH 3 WITH DATA**
- **FILL AREA 3 WITH DATA**
- **FILL AREA SET 3 WITH DATA**

Primitives with No Data

Because the graphics pipeline always assumes that there is at least the minimum amount of data needed to render a primitive, **ppolymarker3** (or any primitive) with no data will cause the system to hang. When this happens, the system must be rebooted to restore the DSPs to a known state. You can try the following if you encounter this problem:

- If you are in a network, **rlogin** and kill the stalled process, or
- Use the key sequence CTRL-ALT-BREAK.

To avoid this problem, make sure all primitives have data.

Picking After Moving a PEX Window

The first time a structure is traversed after a PEX window is moved, the structure is drawn in the window's new position.

If you move a **PEX** window and don't immediately redraw the structure, the window stays black. If you then do a pick and hold down the button, the structure is displayed on its old location, and whatever item is picked is highlighted. A subsequent **REDRAW ALL STRUCTURES** call puts the model in its correct place in the window, and a subsequent pick at the exact same location returns the same screen coordinates, but picks the object currently under the pointer.

EXECUTE STRUCTURE

When structures are terminated with **EXECUTE STRUCTURE** elements, problems occur when that terminating **EXECUTE STRUCTURE** element is deleted. To avoid this possibility, you should terminate with something other than an **EXECUTE STRUCTURE**.

peval_view_map_matrix3

Under certain conditions, **peval_view_map_matrix3** returns an incorrect mapping matrix. The conditions under which this occurs are as follows:

- The identity is the orientation matrix.
- Projection is oblique orthographic (with the PRP raised 5.0 vrc units in *y* off the VPN).
- The view plane is not at vrc 0.0.

If, for example, the vrc is -10.0, the matrix produced does not generate a view volume raised somewhat in *y* as one would expect; rather the view volume is still centered at vrc 0.0 and the image is rendered as such. If the projection type switched to **PPERSPECTIVE**, but all other parameters remain the same, suddenly the view volume is raised in *y* and the image is rendered as such.

polymarker3

ppolymarker3 with no data (0 vertices) can cause the DSPs to hang because the graphics pipe assumes at least the minimum amount of data needed to render a primitive. When this happens, the system must be rebooted to restore the DSPs to a known state.

The primitives that can have no data are: **polyline, polyline2d, marker, marker2d, polyline set**. The **gdp**s (sphere and cylinders) work with no data.

pset_ws_win3

pset_ws_win3 doesn't work correctly. Setting clip limits in the view rep causes a change in the portion of NPC space you chose to display on the workstation.

pset_ws_vp

pset_ws_vp doesn't work correctly. This routine is influenced by any clip limits that are defined in **pset_view_rep**. It does not map the workstation window to the lower left hand corner of the window.

pset_int_rep X Error

When **pset_int_rep** is called, the following is returned before the program exits:

```
X Error of failed request:  128
Major opcode of failed request:  129 (X3D-PEX)
Minor opcode of failed request:  12
(PEX_SetTableEntries)
Value in failed request:  0x0
Serial number of failed request:  447
Current serial number in output stream:  448
```

To avoid this problem, use individual elements instead of the bundle table.

PHIGS Routine pset_elem_ptr_label

When the label between the current pointer position and the end of the structure does not exist, the PHIGS routine **pset_elem_ptr_label** should report an error to the screen or to a designated error file (depending on how **popen_pex** was set up). No error is reported.

Pempty_struct

The **pempty_struct** call does not remove references to previous structures. If you post a structure, then empty and reuse the structure, the system displays data from the previous reference. If the previous structure is deleted, the server generates the following error:

```
X Error of failed request: Internal Graphics Error-
- check error log in /tmp
```

Lack of Swap Space Crashes Server

Shuffling lots of images "leaks" memory and crashes the server. When this occurs, you appear to have no swap space when you should. Creating this problem often may crash the server with a segmentation fault.

X Window System Bugs Fixed

XAllowEvents

XAllowEvents doesn't allow events to be sent to the client that has grabbed the keyboard or the mouse. This bug is caused by a subtle interaction between the X input extension and the core X server. A bug report has been sent to the X consortium.

xman Errors

When you bring up the **mwm** manual page in **xman**, and scroll down to about the middle of page 5, the program exits and gives the following error:

```
Error: SBLW: cannot be both bold and italic.
```

XGetImage Returns Incorrect Depth of Image

Doing an **XGetImage** using **XYPixmap** format (**ZPixmap** format does not suffer this bug) returns an **XImage** structure with a depth field value of zero. Using this **XImage** structure in a subsequent call to **XPutImage** results in a **BadMatch** error because the image depth (0) doesn't match the drawable's depth (32).

Assigning the **XImage**'s depth field a value of 32 after it returns from **XGetImage** allows the image to be accessed successfully to **XPutImage**; however, the image is not displayed correctly.

Default Picking Behavior

With no nameset specified, or inclusion or exclusion filters set, a pick traversal tries to pick all primitives. With no names added to the nameset, nothing should be picked. If both the picking inclusion and exclusion filters are empty, then no primitive is pickable.

xterm

In **vi**, if you type to the end of a line in an **xterm**, that line gets shifted to the right by about one character on the whole screen.

XQueryColor

XQueryColor does not return correct colors. If you load a set of 256 colors with **XStoreColors**, then query a color value with **XQueryColor**, you get incorrect values for red and green. If you store a single color, using **XStoreColor**, then read with **XQueryColor**, you get correct values.

Picking Extension

The Picking Extension returns the incorrect item number for cylinders in a single call.

bitmap Line Quality Irregularities

Line drawing irregularities occur when using the X client **bitmap**. The line quality is variable. The initial line quality may be poor but may improve after a **resize** event. It will also improve after a refresh of the screen but only if several bits have been filled in first. The invert image is also irregular until after a refresh.

The problem can be seen by starting the **bitmap** client with any filename.

The change in quality is less noticeable when the **-nodashed** option is used when running **bitmap.**

Oval Buttons Draw Incorrectly

When an expose event is generated by a 3D window on a non-rectangular window (the oval buttons in **xman**, for instance), the borders of the windows are drawn incorrectly. This was verified as a property of **editres** (which also uses oval buttons), but not of **xeyes**.

Graphics Manager Error File

The error file used by the graphics manager (**/tmp/X_gmerrorlog**) grows without bound when the structure walker encounters a segmentation fault. It seems to get stuck in a loop where it encounters the error, traps it, prints a message and continues execution only to encounter the error again.

XChangePointerDevice

If you change the core pointer to the tablet with **XChangePointerDevice**, **mwm**'s pull-down menus don't respond correctly, *i.e.*, the choice you are on often won't be highlighted. When you switch the core pointer back to the mouse, the problem still exists. Changing the focus window for the new pointer to **PointerRootWin** may solve the problem.

OSF/Motif Bugs Fixed

R3/R4 Compatibility

The Motif libraries and include files are in release 1.0. Since the Motif widgets depend upon an R3-compatible Toolkit Intrinsics library, developers creating a Motif application must follow these rules:

1) Always use the BSD environment. The options **-systype bsd43** should always be specified when compiling any part of a Motif application.

2) Link with the R3-compatible Toolkit Intrinsics. The file **/bsd43/usr/lib/libXtR3.a** is the library that the application should be linked with. Use **-lXtR3** instead of **-lXt** when linking.

3) Use the Toolkit Intrinsics header files from **/bsd43/usr/include/X11R3**. To make this a bit easier, there is a symbolic link named **X11** in that directory. You can, for example, use

```
#include <X11/Composite.h>
```

in your source files if you add **-I/bsd43/usr/include/X11R3** to your compilation lines. This flag must precede any other include directory that may have a subdirectory named **X11**.

XmDrawingArea

The **XmDrawingArea** widget ignores the **XmNheight**, **XmNwidth** resources when it is created. It is sizing itself based on the sizes of child widgets that are created under it, or defaulting to twice the child margins (**XmNmarginWidth**, **XmNmarginHeight**) if no children are specified. To work around this bug, set the resources **XmNmarginHeight** and **XmNmarginWidth** to be half of the desired height and width, respectively.

XmText Widget Default Value

The value of **XmText** widget does not default to an empty string. Do not depend on default values.

XmNdirSpec Resource

Attempts to change the setting of the **XmNdirSpec** resource of the **XmFileSelectionBox** widget fails. An attempt to set it to * results in a setting of **Filter**.

XmNlistLabelString Resource

Attempts to change the setting of the **XmNlistLabelString** resource of the **XmSelectionBox** widget are not performed correctly. It may be that setting other label string resources for the widget are interfering with the list label string.

XmNcursorPosition of XmText Widget

There is a possibility of setting **XmNcursorPosition** of the **XmText** widget incorrectly when setting both the **XmNcursorPosition** and the **XmNtopPosition** resources.

XmGetImageFromFile

The function **XmGetImageFromFile()** does not work correctly.

XmArrowButton Highlight

A single **XmArrowButton** widget as the child of an **ApplicationShell** does not highlight correctly.

XmPushButtonGadget Label

The label for an **XmPushButtonGadget** as a child of an **XmBulletinBoard** does not shift with the button as the button is moved around by the bulletin board.

XmFileSelection Widget

An **XmFileSelection** widget is almost completely inoperative.

XmForm Widget

An **XmForm** widget does not shrink when a child **XmPushButton**'s top widget constraint is set to **NULL**.

XmGetPixmap

Attempts to retrieve nonexistent pixmaps using **XmGetPixmap** may corrupt the image cache.

XmList

The anchored **XmList** item does not unselect properly when SHIFT-CTRL dragged.

XmNmargin* Not Inquirable

XmNmarginWidth and **XmNmarginHeight** for an **XmPushButtonGadget** are reported incorrectly by **XtGetValues()**.

XmScale Widget Label

Rightmost labels for an **XmScale** widget are missing when 10 are drawn horizontally. A different number of them will be missing for each redraw attempt.

XmScrollBar Slider

The XmScrollBar slider does not appear at the bottom of the scale with the following non-default settings:

XmNvalue: 60

XmNsliderSize: 50

XmNprocessingDirection: XmMAX_ON_TOP

XmScrollBar Click Movement

A small horizontal **XmScrollBar** may appear to move the slider in the wrong direction in response to a click on one of the end arrows after the slider has been positioned by dragging.

Callbacks from Mouse Click

Callbacks are not called when clicking mouse button 1 in the scrollbar region with the CTRL or SHIFT keys pressed.

XmText Widget

The text in an **XmText** widget may disappear after some selection and insertion operations.

XmPanedWindow

An **XmPanedWindow** does not manage the geometry of three **XmPushButton** children correctly when interactively modifying the placement of the separators.

mwm - Window Drag Blinking

Sometimes the window outline during moves blinks very rapidly and may be mostly invisible.

mwm - Window Icons Blank

When many windows (more than 8) are iconified, some of the icons are blank. They do not display the pixmap that should be associated with the icon for that type of client.

mwm - Illegal configFile Resource

When a **configFile** resource is specified which does not exist, **mwm** has no menus at all. It should read the system configuration file to determine the default behavior if the file specified by the **configFile** resource does not exist.

mwm - Binding to ALT-F11

Bindings for ALT-F11 do not work.

XmNmwmDecorations

A program cannot set its decorations for a Vendor Shell using **XmNmwmDecorations**. OSF/Motif bug # 999 states that the **MWM_HINTS** property in a window does not get set up. However, the work around says that it can be set up after the shell is created using **XtSetValues**.

On the ESV Workstation, the **MWM_HINTS** property does get created and the values for the decorations get set, but the window does not reflect the correct values set for decorations. The code below reflects the OSF/Motif work around:

```
XtToolkitInitialize();
d = XtOpenDisplay(NULL,NULL,argv[0],"go",NULL,0,&argc,argv);
n=0;
wid
=XtAppCreateShell("go","go",topLevelShellWidgetClass,d,args,n);
n=0;

XtSetArg(args[n],XmNheight,500); n++;
XtSetArg(args[n],XmNwidth,500); n++;
XtSetArg(args[n],XmNmwmDecorations,MWM_DECOR_BORDER); n++;
XtSetValues(wid,args,n);
n=0;
XtSetArg(args[n],XmNheight,500); n++;
XtSetArg(args[n],XmNwidth,500); n++;
txt = XmCreateText(wid,"txt",args,n);
XtManageChild(txt);

XtRealizeWidget(wid);
XtMainLoop();
```

The decorations can be set up in the **.Xdefaults** file.

stty Commands Hang mwm

When **stty** calls are made from a **.cshrc**, when **mwm** opens an **xterm** the **mwm** process is hung. The **mwm** process must be killed and restarted to get back control of the display. **mwm** version 1.1.1 fixes this.

Rowcolumn Widget Causes Bus Error When Destroyed

When a widget tree containing a Motif Rowcolumn widget is destroyed using **XtDestroyWidget** a bus error is generated. If a different widget (such as form or bulletin board) is substituted no bus error occurs.

4. Documentation Corrections

The following corrections and additions should be made in the appropriate documents.

ESV Workstation Reference Manual [2.0], "1. ES/PEX"

The syntax for the FORTRAN **OPEN PHIGS**, **OPEN XPHIGS**, and **OPEN WORKSTATION** calls should be added to this chapter.

OPEN PHIGS FORTRAN Call

Syntax

POPPH(*ERRFIL*, *BUFA*)
INTEGER *ERRFIL*
INTEGER *BUFA*

FORTRAN Input Parameters

ERRFIL	Error file number
BUFA	Amount of memory units (ignored)

OPEN XPHIGS FORTRAN Call

Syntax

POPXP(*ERRFIL*, *BUFA*, *MASK*, *INFO*)
INTEGER *ERRFIL*
INTEGER *BUFA*
INTEGER *MASK*
INTEGER *INFO(2)*

FORTRAN Input Parameters

ERRFIL	Error file number.
BUFA	Amount of memory units (ignored).
MASK	Bitmask to indicate which parts of ***INFO*** are valid. ***MASK*** can have either of the values **PXPIDI** and **PXPINM** or the sum of the values. **PXPIDI** indicates that the **Display *** is present in ***INFO(1)***. **PXPINM** indicates that the **no_monitor** flag is present in ***INFO(2)***.
INFO(2)	Information about the type of **OPEN** that is to be done.

OPEN WORKSTATION FORTRAN Call

Syntax

POPWK(*WSID, CONID, WTYPE*)
INTEGER *WSID*
INTEGER *CONID*
INTEGER *WTYPE*

FORTRAN Input Parameters

WSID Workstation ID.

CONID Connection identifier. If ***WTYPE*** is **phigswstypextool**, then ***CONID*** can be either a 0 or 1. If ***CONID*** is 0, the default server is used for the connection. If ***CONID*** is 1, the common variable **dispname** is used as the connection ID in the call to **popen_ws**.

WTYPE Workstation type. ***WTYPE*** can be **phigswstypexdrawable** or **phigswstypextool**.

If ***WTYPE*** is **phigswstypexdrawable**, the common variables **phigsdisplay** and **phigswindow** will be used in the **Pconnid_x_drawable** structure in a call to **popen_ws**. ***CONID*** is ignored in this case.

If ***WTYPE*** is **phigswstypextool**, ***CONID*** is examined.

phigs77.h

The following common areas and variables are defined at the end of the **phigs77.h** file:

```
C     The default workstation types.
        COMMON /phigs77wstypes/ phigswstypexdrawable, phigswstypextool
        INTEGER                 phigswstypexdrawable
        INTEGER                 phigswstypextool

C     The connection id for drawable workstations
        COMMON /phigs77connid/  phigsdisplay, phigswindow
        INTEGER                 phigsdisplay
        INTEGER                 phigswindow

C     The display name for tool workstations
        COMMON /phigs77dispname/ dispname
        CHARACTER*80             dispname

C     The info mask values.
        PARAMETER(PXPIDI=1,      PXPINM=16)
```

SunPHIGS Document Set

Known Size Limitations on Structure Elements

Since structure elements are communicated to the central structure store via the connection to the X server(s), structure elements are limited in size by the request buffer size of the server. The request buffer size can be found using the **xdpyinfo(1)** command. Currently, the buffer size is 64 K long words, or 256 Kbytes.

For polygon (**FILL AREA**, **FILL AREA SET**, *etc.*) structure elements, there is a further restriction of no more than 128 vertices (64 if the primitive includes colors or normals, 42 if the element includes colors and normals for each vertex) per element. This limitation is imposed by the size of the processing buffer in the DSPs.

5. Installation Instructions

This chapter contains information on ESV Workstation tape drives and provides installation instructions for release tapes. This chapter is organized as follows:

Caution: You should carefully read the "Installation Notes" section before you begin the software installation

Installation Notes

The 2.0 release supports multiple software configurations. ESV machines come from the factory with software installed in the basic configuration. Additional software may be installed by the ESV's system manager.

As new software is released, each ESV system manager must decide the particular configuration desired, and install the appropriate updates. The choices involve:

- Which optional tapes should be installed. This is usually determined by what was purchased with the ESV. For example, some of the options are the Developer's Kit Option, the FORTRAN compiler, ES/Dnet, PSX, etc.
- Which OS kernel to install. This generally depends on whether or not the Developer's Kit is to be installed on the system. See "OS Kernel Information" below.
- Which subpackages of the OS, Server and Development Kit tapes to install. This generally depends on whether or not the Development Kit is to be installed. See the "Configuration Information" below.

OS Kernel Information

There are two kernels available on the tape. The "non-development" kernel provides smaller resource allocations and can be used when systems mainly run existing applications. Beginning with the 2.0 release, this kernel is installed on the ESV when it is shipped from the factory. For systems in which large application compiles and builds are done, the "development" kernel, which provides larger resource allocations, should be used.

To determine which type of kernel has previously been loaded on the system, you can boot the system and type the following command:

```
uname -A
```

This command will print the following system information:

sysname, nodename, release, version, machine, m_type, and base_rel.

The m_type will be one of the following:

- m120-1 if the non-development kernel was installed
- m120-2 if the development kernel was installed

Note that all releases prior to 2.0 had only the development kernel.

If you need to install a kernel other than the one on the system, you can do so by following the Operating System Update Installation Instructions, but only installing the root and m-120x subpackages.

Configuration Information

The OS tape, the Server tape, and the Library tape (Developer's kit tape) include various optional subpackages. Since each subpackage requires space on the ESV disk, only those which will be used should be installed. The "2.0 Release Subpackage Sizes" section in this chapter provides information about disk space utilization of the various subpackages and options.

Beginning with the 2.0 Software Release, the following are the subpackages installed on the ESV before it is shipped from the factory. See the definitions for non-development and development systems below before deciding which subpackages to choose.

The following contains recommendations for which subpackages to install:

Non-Development Systems

All non-development systems (Standard Media Kit with/without PSX, ES/Dnet, LAT Host Services Options) should only install the following tape subpackages:

ES/os Tape (Domestic or Foreign)

root	-	installed automatically on SCRATCH install
m120-x	-	installed automatically on SCRATCH install
usr	-	installed automatically on SCRATCH install
cmplrs	-	you must type '**y**' when prompted
man	-	you must type '**y**' when prompted
bsd43	-	you must type '**y**' when prompted

ES/PEX Server Tape

executables_s	-	you must type '**y**' when prompted
library_s	-	you must type '**y**' when prompted
pexs_man	-	you must type '**y**' when prompted
fstest	-	you must type '**y**' when prompted

PSX, ES/Dnet and LAT Host Services Options

All Subpackages

Development Systems

All development systems (Development Kit with/without Ada, AVS, Pascal, Fortran, PSX, ES/Dnet, LAT Host Services Options) should install the tape subpackages as follows:

ES/os (Domestic or Foreign)

All Subpackages

ES/PEX Server

All Subpackages

ES/PEX Library (Development Kit)

library_1

pexl-man

pexl-man-unformat

All other Options

All Subpackages

LS Systems

All LS systems should install the tape subpackages as follows:

ES/os (Domestic or Foreign)

Up to your system manager. You may install the non-development or development configuration for CPUS and CPUG.

ES/PEX Server

The CPUS only needs the following subpackages:

executables_s

library_s

pexs-man

The CPUG should at least have the non-development configuration mentioned above. You may install more subpackages.

ES/PEX Library (Development Kit)

Both CPU's should have at least the following:

library_1

pexl-man

All other Options

Graphics Options should be installed on the CPUG (Graphics CPU, *i.e.*, PSX, AVS etc). Other options can go on either CPU depending on how much disk space you have available.

CDRS Systems

All CDRS Systems should install the tape subpackages as follows:

ES/os (Domestic or Foreign)

All Subpackages

ES/PEX Server

All Subpackages

ES/PEX Library (Development Kit)

All Subpackages

All other Options

All Subpackages

xman Setup Script

To set up directories for the **xman** client, follow these steps:

1) Login as root.
2) `cd /usr/man`
3) `su bin`
4) `./make.xman.sections`
5) Answer prompts appropriately. **xman** will work when invoked after running this script.
6) Type `exit` to return to root prompt.

Remove Package/Subpackage Utility

With Release 2.0, a new feature is provided to remove packages or subpackages to free up needed disk space. It is called **rmpkg**. Instructions on how to use this tool are located on page 5-11.

Tape Drive Data Cartridge Information

The Evans & Sutherland ESV Graphics Workstation currently uses the TANDBERG DATA (SIEMENS) 3660 Series Tape Drive.

Data Cartridges that have proven to work on this drive:

Vendor	Product	Tape Length	Mbyte Capacity	Notes
3M	DC600A	620 ft.	120 meg	Used prior to 2.0**
3M	DC615A	150 ft.	30 meg	Used prior to 2.0**
BASF	DC600H	620 ft.	120 meg	Used prior to 2.0**
3M	DC6037	150 ft.	37 meg	Used for Software Distribution
3M	DC6150	600 ft.	150 meg	Used for Software Distribution

** We have found that these tapes cause pre-mature head wear and are not recommended on the ESV anymore. They may be used if the new tapes are not available.

2.0 Release Subpackage Sizes

These sizes are provided to help you configure your system based on how much disk space you have available. The Kbyte value is the one you need to determine what will fit on your disk. Type df /usr to see how many Kbytes you have available and use chart below to determine any additional sub-packages you wish to install. (see "Configuration Information" for listing of sub-packages installed at the factory).

ES/os Domestic

Subpackage	Bytes	Kbytes	Meg	
root*	10975284	10718	10.47	
m120-1*	5372173	5246	5.12	← Install one only
m120-2	5372215	5246	5.12	← Install one only
usr*	37562740	36682	35.82	
usr_help	774766	757	0.74	
usr_dvlp	11370262	11104	10.84	
usr_terms	1823098	1780	1.74	
cmplrs*	11015953	10758	10.51	
cmplrs-bsd43	1665432	1626	1.59	
man*	4103341	4007	3.91	
man_misc	81082	79	0.08	
bsd43*	12315535	12027	11.75	
bsd43_troff	96862	95	0.09	
bsd43_dvlp	4656482	4547	4.44	
reconfig	12125063	11841	11.56	
emacs	10143932	9906	9.67	
posix	3269801	3193	3.12	
uucp	2718805	2655	2.59	
sccs	195155	191	0.19	
news_readers	864159	844	0.82	
games	3779744	3691	3.60	
mh	17461336	17052	16.65	
Non-Dvlp Config*	81345024	79439	77.58	
Dvlp Config	134463400	131312	128.23	

* Installed at Factory for Non-Dvlp Systems

ES/os Foreign

Subpackage	Bytes	Kbytes	Meg	
root*	10903709	10648	10.40	
m120-1*	5372173	5246	5.12	← Install one only
m120-2	5372215	5246	5.12	← Install one only
usr*	37508060	36629	35.77	
usr_help	774766	757	0.74	
usr_dvlp	11370262	11104	10.84	
usr_terms	1823098	1780	1.74	
cmplrs*	11015953	10758	10.51	
cmplrs-bsd43	1665432	1626	1.59	
man*	4103341	4007	3.91	
man_misc	81082	79	0.08	
bsd43*	12315535	12027	11.75	
bsd43_troff	96862	95	0.09	
bsd43_dvlp	4648734	4540	4.43	
reconfig	12125063	11841	11.56	
emacs	10143932	9906	9.67	
posix	3269801	3193	3.12	
uucp	2718805	2655	2.59	
sccs	195155	191	0.19	
news_readers	864159	844	0.82	
games	3779744	3691	3.60	
mh	17461336	17052	16.65	
Non-Dvlp Config	81218776	79315	77.46	
Dvlp Config	134337100	131189	128.11	

* Installed at Factory for Non-Dvlp Systems

ES/PEX Server 2.0

Subpackage	Bytes	Kbytes	Meg
executables_s*	12308787	12020	11.74
library_s*	9160771	8946	8.74
pexs-man*	1238284	1209	1.18
fstest*	9920400	9688	9.46
xclients_s	17937647	17517	17.11
pexs-man-unformat	1055019	1030	1.01
demo_s	6952381	6789	6.63
Non-Dvlp Config*	32628242	31864	31.12
Dvlp Config	58573289	57200	55.86

* Installed at Factory for Non-Dvlp Systems

ES/PEX Library 2.0

Subpackage	Bytes	Kbytes	Meg
library_l	23927799	23367	22.82
cdrs_library	19876032	19410	18.96
pexl-man	4924721	4809	4.70
pexl-man-unformat	6397531	6248	6.10
Non-CDRS Config	35250051	34424	33.62
CDRS Config	55126083	53834	52.57

ES/PSX 2.0

Subpackage	Bytes	Kbytes	Meg
psx	6560772	6407	6.26

MIPS Pascal 2.11

Subpackage	Bytes	Kbytes	Meg
pascal	596420	582	0.57
pascal-bsd43	111917	109	0.11
pascal-man	31796	31	0.03
Total	740133	723	0.71

MIPS Fortran 2.11b

Subpackage	Bytes	Kbytes	Meg
f77	2184804	2134	2.08
f77-bsd43	1716043	1676	1.64
f77-man	64327	63	0.06
Total	3965174	3872	3.78

MIPS Ada 3.0

Subpackage	Bytes	Kbytes	Meg
ada	16822633	16428	16.04
ada-man	92908	91	0.09
Total	16922633	16519	16.13

MIPS C 2.11.4ada (Goes with Ada Compiler)

Subpackage	Bytes	Kbytes	Meg
cmplrs	10017899	9783	9.55

ES/AVS 2.0

Subpackage	Bytes	Kbytes	Meg
avs	22786337	22252	21.73

ES/Dnet

Subpackage	Bytes	Kbytes	Meg
esdnet	8744413	8539	8.34

ES/LAT Host Services

Subpackage	Bytes	Kbytes	Meg
eslat	434818	425	0.41

ES/Diskless Node

Subpackage	Bytes	Kbytes	Meg
droot	2654198	2592	2.53
dusr	37711	37	0.04
dvar	512	0	0.00
Total	2692421	2629	2.56

ES/Kodak Printer

Subpackage	Bytes	Kbytes	Meg
kodak	489406	477	0.47

rmpgk Tool

This tool is provided to remove installed packages/subpackages from your ESV. This allows you to free up needed disk space should you choose to do so.

Login as **root.**

```
cd /usr/pkg/bin
```

Type **./rmpkg <package>** (possible packages to remove are found in **/usr/pkg/lib**)

You will be prompted for each subpackage to remove from the given package.

Note: This program prompts all subpackages available from a package even though it may/may not be installed. If you type '**y**' to a subpackage that is not installed, nothing happens.

Example: Removing man pages from ES/PEX Server release

```
./rmpkg pexs2.0
Pkgroot=/, Pkg=/usr/pkg/lib/pexs2.0 (package pexs 2.0)
Remove pexs.executables_s 2.0 (y n) [n]? n
Remove pexs.library_s 2.0 (y n) [n]? n
Remove pexs.pexs-man 2.0 (y n) [n]? y
Remove pexs.fstest 2.0 (y n) [n]? n
Remove pexs.xclients_s 2.0 (y n) [n]? n
Remove pexs.pexs-man-unformat 2.0 (y n) [n]? n
Remove pexs.demo_s 2.0 (y n) [n]? n

The following subpackages have been selected for removal:  pexs-man
Ok (y n) [y]? y

removing pexs.pexs-man 2.0...
rm ./usr/man/catman/P_man/man7/colour.7
rm ./usr/man/catman/P_man/man7/phigs_description_table.7
rm ./usr/man/catman/P_man/man7/phigs_workstation_description_table.7
            .
            .
            .
rm ./usr/man/x_man/man1/xwud.1
rm ./usr/man/x_man/man5/gm_config.5
rm ./usr/man/x_man/man5/pex_config.5
Some of the boms for subpackages in this package remain in the packaging
information tree, so the packaging information tree will not be removed.
#
```

ES/os Domestic/Foreign Tape 2.0 – Update Installation

Things to Check PRIOR to an Update Installation

Before beginning this installation, you should verify that your system has enough disk space available. For successful installation of all packages on this tape there must be at least 4000 additional Kbytes available on **/dev/usr**. Use the **df** command to get a listing of the bytes available on your machine.

If your machine does not have enough space on **/dev/usr**, you may be able to reclaim a large amount of space by removing unneeded system-crash core files. This can be done as follows:

```
cd /usr/adm/crash
ls -l
```

If the listing shows any files named **core.#** or **unix.#**, remove them.

```
rm ./core.*
rm ./unix.*
```

If you still do not have enough room, you will need to do further file cleanup, *i.e.*, transfer some of your users accounts to another disk and/or elect not to install all the subpackages.

Furthermore, when this script asks you if you want to clean up old versions of subpackages, always type **y**, to free up needed disk space.

Installation Begins Here

In the following procedure, system output is shown in `typewriter normal` font, and user responses are shown in **`typewriter bold`** font. All user responses should be typed as shown and entered with a carriage return.

To install this tape, insert the ES/os Domestic or Foreign Tape into the tapedrive, and proceed as follows:

1) Power up the machine and let it run its power-on diagnostics. Make sure they all PASS.

OR...

1) Login as **root**.
2) Clean up filesystems by typing **`fsck.ffs`**.
3) Maker sure everyone else is off the machine (includes rlogins).
4) Remove mouse from mousepad.
5) Pay attention to the case-sensitivity of entries.
6) Type **`sync; sync`**
7) Type **`telinit 0`**

```
E&S CPU Board MIPS Monitor Version 4.10 MIPS OPT Mon Feb 18 15:00:28 MST
1991
```

```
Copyright 1988, MIPS Computer Systems Inc., All Rights Reserved
Memory size: 33554432 (0x2000000) bytes
Icache size: 65536 (0x10000) bytes
Dcache size: 65536 (0x10000) bytes

>> boot -f tqis(,,2)sash.std
120544+23088+170432 entry: 0xa0300000
MIPS Standalone Shell Version 5.00 MIPS OPT Mon Feb 18 08:39:23 MDT 1991
sash: cp -b 16k tqis(,,4) dkis(,,1)
----------Note: @5 minutes till next user response----------

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
13824000 (0xd2f000) bytes copied
```

Note: The next input determines the OS kernel you will be installing. There are two to choose from. See "OS Kernel Information" located at the beginning of these installation notes before typing the next command.

sash: boot -f tqis(,,6)unix.std root=isc0d0s1 (non-development systems)

OR

sash: boot -f tqis(,,7)unix.dvlp_std root=isc0d0s1 (development systems)

```
846208+101360+789520 entry: 0x80021000
CPU: MIPS R3000 Processor Chip Revision: 2.0
FPU: MIPS R3010 VLSI Floating Point Chip Revision: 2.0

ES/os Release 2.0 ESV Version R_100
Total real memory  = 33554432
Available memory   = 31170560
abminit: ARS/HIC not present.
arsinit: ARS/HIC not present.
installing VME vector: addr 0x8007FFA4 ipl 2, vec 0xE0 unit 0
Root on dev 0x1001, Swap on dev 0x1001
```

```
installing VME vector: addr 0x8007FFA4 ipl 2, vec 0xE0 unit 0
Root fstype ffs
New swplo: 26992  swap size: 19272K bytes
Available memory   = 29478912

Miniroot run level 1

Making miniroot device files for m120-1 system...
erase = ^H, kill = ^U, interrupt = ^C
# set -a
# Install=update
# inst

Software package installation

This is an update install.
Packages will be read in from the local Q24 tape drive.
Machine type: m120-1

Is the information above correct? (y n) [y]? <CR>

Note: It is not necessary to install a kernel on the miniroot. The process
will take a few minutes.
Would you like to install the kernel to the miniroot (y n) [n]? <CR>

========== checking subpackages ==========

The following subpackages may be installed:

root          -- ES/os Standard Root Filesystem
m120-1        -- ES/os m/120, RC3240 Kernel and Devices
usr           -- ES/os Standard /usr Filesystem
usr_help      -- ES/os Standard /usr help facilities
usr_dvlp      -- ES/os Standard /usr Development files (header files &
                 libraries)
usr_terms     -- ES/os Standard /usr Miscellaneous Terminal descriptions
cmplrs        -- MIPS-C Compiler
cmplrs-bsd43  -- MIPS-C 4.3 BSD Include Files and Libraries
man           -- ES/os Manual Pages
bsd43         -- ES/os 4.3 BSD Utilities, Include Files and Libraries
bsd43_troff   -- ES/os 4.3 BSD Troff Utilities and Libraries
bsd43_dvlp    -- ES/os 4.3 BSD Include Files and Libraries
reconfig      -- Kernel Binary Reconfiguration Components
emacs         -- emacs
posix         -- ES/os POSIX P1003.1 Include Files, Commands and Libraries
uucp          -- UUCP
sccs          -- SCCS
news_readers  -- News Readers
```

```
games           -- Games
mh              -- mh

========== selecting subpackages ==========
```

Note : This OS release contains more subpackages than the 1.3 release. Some existing 1.3 subpackages were broken out into smaller subpackages to allow you tailor the install to your needs and requirements. If you are unsure if you need a particular subpackage or not, type '**n**' at the next prompt and follow instructions to list the contents of a subpackage. If you installed ALL the subpackages of the 1.3 OS release, you may want ALL of the subpackages on this tape.

```
You may select all of the above subpackages by answering y to the following
question. If you answer n, you will be asked to select the optional
subpackages you would like to have installed.

Install ALL subpackages (y n) [n]? y

========== setting system clock/calendar ==========

The current value of the clock is: Thu Aug 30 16:32:55 PDT 1990
Is the clock correct (y n) [y]? <CR>

========== verifying single-user mode ==========

The system is in a single-user run level.

Please answer y to the following question unless you really understand the
consequences.

Do you want to install sash to the volume header (y n) [y]? <CR>

========== installing sash to volume header ==========

========== mounting filesystems ==========

Note: If your get a "dirty filesystem" error here, type the following:

# fsck.ffs <filesystem path> (i.e. /dev/dsk/isc0d0s1)

Otherwise, this should appear:

/dev/root mounted on /mnt
/dev/usr mounted on /mnt/usr
------------------------------------------------------------------------
Partition Megs Mounted File System or Partition Usage
------------------------------------------------------------------------
0 /dev/dsk/isc0d0s0 23 /dev/root
```

```
1 /dev/dsk/isc0d0s1 33 /
6 /dev/dsk/isc0d0s6 564 /dev/usr
7 /dev/dsk/isc0d0s7 14 -**** Available Partition ****-
------------------------------------------------------------------------
Disk Device /dev/dsk/isc0d0s2 632 Megabytes Total Size
------------------------------------------------------------------------
Do you wish to change swap partition configuration (y n) [n]? n

========== preserving local files ==========

Running preserve -s for subpackage root... 55 files preserved.
No preserve list or findmods list for m120- preserve not executed.
Running preserve -s for subpackage usr... 25 files preserved.
No preserve list or findmods list for usr_help- preserve not executed.
No preserve list or findmods list for usr_dvlp- preserve not executed.
No preserve list or findmods list for usr_terms- preserve not executed.
No preserve list or findmods list for cmplrs- preserve not executed.
No preserve list or findmods list for cmplrs-bsd43- preserve not executed.
No preserve list or findmods list for man- preserve not executed.
No preserve list or findmods list for bsd43- preserve not executed.
No preserve list or findmods list for bsd43_troff- preserve not executed.
No preserve list or findmods list for bsd43_dvlp- preserve not executed.
No preserve list or findmods list for reconfig- preserve not executed.
No preserve list or findmods list for emacs- preserve not executed.
No preserve list or findmods list for posix- preserve not executed.
No preserve list or findmods list for uucp- preserve not executed.
No preserve list or findmods list for sccs- preserve not executed.
No preserve list or findmods list for news_readers- preserve not executed.
No preserve list or findmods list for games- preserve not executed.
No preserve list or findmods list for mh- preserve not executed.

========== verifying disk space ==========

Do you want to check for space (please do so unless you really understand
the consequences) (y n) [y]? <CR>

The system will now be checked to verify that there is enough disk space
with the current configuration to successfully install the package (and any
selected optional subpackages). For large packages (especially operating
system packages), this can be time consuming...

You will see either this:

device     bfree      ifree      breq       ireq       bcred      icred
/dev/root  7873       8858       15146      440        9221       320
/dev/usr   61418      109649     108483     7264       50649      5788
```

```
        WARNING! This package will fit on the disk, but it will
        cause more than 90% of the disk to be used. This may cause
        problems for non-root users. It is recommended that you
        abort the installation now.
```

OR this:

```
The package (and any selected optional subpackages) cannot be installed at
this time due to the shortage(s) of disk space and/or inodes shown above.
Please make the required space available and then retry the installation
procedure.

(Press return to continue...)

The script now restores the -preserve files and returns to the following
prompt:

# <-At this prompt, SEE SYSTEM MANAGER.

OR this:

There is enough space.

========== stripping old links ==========

Stripping links for subpackage root...
Stripping links for subpackage m120-1...
Stripping links for subpackage usr...
Stripping links for subpackage usr_help...
Stripping links for subpackage usr_dvlp...
Stripping links for subpackage usr_terms...
Stripping links for subpackage cmplrs...
Stripping links for subpackage cmplrs-bsd43...
Stripping links for subpackage man...
Stripping links for subpackage bsd43...
Stripping links for subpackage bsd43_troff...
Stripping links for subpackage bsd43_dvlp...
Stripping links for subpackage reconfig...
Stripping links for subpackage emacs...
Stripping links for subpackage posix...
Stripping links for subpackage uucp...
Stripping links for subpackage sccs...
Stripping links for subpackage news_readers...
Stripping links for subpackage games...
Stripping links for subpackage mh...

========== extracting files from subpackage archives ==========

rewinding the tape...
Verifying tape id... ok
```

```
Forward spacing the tape...

Loading subpackage: root...
Forward spacing the tape...
Loading subpackage: m120-1...
Forward spacing the tape...
Loading subpackage: usr...
Forward spacing the tape...
Loading subpackage: usr_help...
Forward spacing the tape...
Loading subpackage: usr_dvlp...
Forward spacing the tape...
Loading subpackage: usr_terms...
Forward spacing the tape...
Loading subpackage: cmplrs...
Forward spacing the tape...
Loading subpackage: cmplrs-bsd43...
Forward spacing the tape...
Loading subpackage: man...
Forward spacing the tape...
Loading subpackage: bsd43...
Forward spacing the tape...
Loading subpackage: bsd43_troff...
Forward spacing the tape...
Loading subpackage: bsd43_dvlp...
Forward spacing the tape...
Loading subpackage: reconfig...
Forward spacing the tape...
Loading subpackage: emacs...
Forward spacing the tape...
Loading subpackage: posix...
Forward spacing the tape...
Loading subpackage: uucp...
Forward spacing the tape...
Loading subpackage: sccs...
Forward spacing the tape...
Loading subpackage: news_readers...
Forward spacing the tape...
Loading subpackage: games...
Forward spacing the tape...
Loading subpackage: mh...
Forward spacing the tape...
rewinding the tape...

========== making device special files ==========
```

```
running MKDEV...
done.

========== running comply ==========

running first comply pass...
running second comply pass...
There were no comply messages from the second pass.

========== doing uncompress Thu Apr 04 17:17:24 PST 1991 ==========

uncompress usr/bin/admin.Z
uncompress usr/bin/at.Z
uncompress usr/bin/chkey.Z

(Un-compresses occur here...)

uncompress usr/new/mh/vmh.Z
uncompress usr/new/mh/whatnow.Z
uncompress usr/new/mh/whom.Z

========== cleaning up old versions ==========

An attempt will now be made to clean up any files left over from previous
versions of the software which has just been installed.

Searching for old versions to remove...

At this point, you may be asked to "Cleanup" old software from the system.

It is recommended that you type 'y' to these inquiries.

========== restoring preserved user files ==========

Running preserve -r for subpackage root...
No preserve list or findmods list for m120-1- no files restored.
Running preserve -r for subpackage usr...
No preserve list or findmods list for usr_help- no files restored.
No preserve list or findmods list for usr_dvlp- no files restored.
No preserve list or findmods list for usr_terms- no files restored.
No preserve list or findmods list for cmplrs- no files restored.
No preserve list or findmods list for cmplrs-bsd43- no files restored.
No preserve list or findmods list for man- no files restored.
No preserve list or findmods list for bsd43- no files restored.
No preserve list or findmods list for bsd43_troff- no files restored.
No preserve list or findmods list for bsd43_dvlp- no files restored.
No preserve list or findmods list for reconfig- no files restored.
No preserve list or findmods list for emacs- no files restored.
No preserve list or findmods list for posix- no files restored.
No preserve list or findmods list for uucp- no files restored.
```

```
No preserve list or findmods list for sccs- no files restored.
No preserve list or findmods list for news_readers- no files restored.
No preserve list or findmods list for games- no files restored.
No preserve list or findmods list for mh- no files restored.

========== running conversion scripts ==========

========== root.fstab Thu Apr 04 17:24:49 PST 1991 ==========

No ips devices found in /etc/fstab.

To take advantage of the improved parallel fsck, /etc/fstab will now be
modified to allow the root partition to be fsck'd on the first pass.All
other local filesystems will be fsck'd on the second pass.

A copy of /etc/fstab will be saved as /etc/fstab.save.1.
No changes made.

Press return to continue: <CR>

========== cleaning up ==========

Copying packaging information directory to /mnt/usr/pkg/lib/ESos1.3...

Removing Duplicate File /mnt/etc/TZ:1.3+
Removing Duplicate File /mnt/etc/exports:1.3+
Removing Duplicate File /mnt/etc/fstab:1.3+
Removing Duplicate File /mnt/etc/group:1.3+
Removing Duplicate File /mnt/etc/inittab:1.3+
Removing Duplicate File /mnt/etc/motd:1.3+
Removing Duplicate File /mnt/etc/networks:1.3+
Removing Duplicate File /mnt/etc/passwd:1.3+
Removing Duplicate File /mnt/usr/etc/exports:1.3+
Removing Duplicate File /mnt/usr/etc/bootptab:1.3+
Removing Duplicate File /mnt/usr/etc/timed.conf:1.3+
Removing Duplicate File /mnt/usr/lib/aliases:1.3+
Removing Duplicate File /mnt/usr/lib/sendmail.cf:1.3+
Removing Duplicate File /mnt/usr/lib/me/local.me:1.3+

Unmounting filesystems...
/mnt/usr: Unmounted
/mnt: Unmounted

========== installation complete ==========

# sync; sync
# telinit 0
#
INIT: New run level: 0
```

```
Miniroot shutdown

E&S CPU Board MIPS Monitor Version 5.00 MIPS OPT Mon Feb 18 15:00:28 MST
1991
Copyright 1988, MIPS Computer Systems Inc., All Rights Reserved
Memory size: 33554432 (0x2000000) bytes
Icache size: 65536 (0x10000) bytes
Dcache size: 65536 (0x10000) bytes
>> auto

Autoboot: Waiting to load dkis(0,0,8)sash (CTRL-C to abort, RETURN
to expedite) <CR>

loading
120544+23088+170432 entry: 0xa0300000
MIPS Standalone Shell Version 5.00 MIPS OPT Mon Feb 18 08:39:23 MDT 1991

Loading dkis(0,0,0)/unix
846208+101360+789520 entry: 0x80021000
CPU: MIPS R3000 Processor Chip Revision: 2.0
FPU: MIPS R3010 VLSI Floating Point Chip Revision: 2.0

ES/os Release 1.3.10 ESV Version R_100
Total real memory = 33554432
Available memory = 31170560
abminit: ARS/HIC not present.
arsinit: ARS/HIC not present.
installing VME vector: addr 0x8007FFA4 ipl 2, vec 0xE0 unit 0
installing VME vector: addr 0x8007FFA4 ipl 2, vec 0xE0 unit 0
Root fstype ffs
Available memory = 29478912

Checking root file system () if necessary.
The system is coming up. Please wait.

***** Normally all file systems are fscked.
***** To fsck only dirty ones, type 'yes' within 5 seconds:
***** All file systems will be fscked.
/dev/usr: 6199 files, 109289 used, 431746 free (2882 frags, 53608 blocks,
0.5% fragmentation)
/dev/usr mounted on /usr
No process accounting on this system
Aug 31 07:19:19 tonto unix: CPU: MIPS R3000 Processor Chip Revision: 2.0
Aug 31 07:19:19 tonto unix: FPU: MIPS R3010 VLSI Floating Point Chip
Revision: 2.0
Aug 31 07:19:20 tonto unix:
Aug 31 07:19:20 tonto unix: Total real memory = 33554432
```

```
Aug 31 07:19:20 tonto unix: Available memory = 31170560
Aug 31 07:19:20 tonto unix: abminit: ARS/HIC not present.
Aug 31 07:19:20 tonto unix: arsinit: ARS/HIC not present.
Aug 31 07:19:21 tonto unix: installing VME vector: addr 0x8007FFA4 ipl 2,
vec 0xE0 unit 0
Aug 31 07:19:21 tonto unix: installing VME vector: addr 0x8007FFA4 ipl 2,
vec 0xE0 unit 0
Aug 31 07:19:21 tonto unix: Root fstype ffs
Aug 31 07:19:21 tonto unix: Available memory = 29478912
checking for system core dump...
Internet daemons: routed snmpd snmptrapd portmap inetd timed(slave).
Export file systems
NFS daemons: nfsd biod lockd statd.
Aug 31 07:19:32 tonto rpc.statd[139]: enter statd_init
Aug 31 07:19:32 tonto rpc.statd[139]: 1
Aug 31 07:19:32 tonto rpc.statd[139]: local state = 1
Starting lpd
The system is ready.

tonto Console login:
```

You now need to modify the **/etc/passwd** file to set up some accounts properly.

1) Login as **root**. Modify **/etc/passwd** file and REPLACE the line:

```
xdm:L..SxyBb0ydh.:21:250:X windowing systems startup:/usr2/X:/usr/bin/X11/xdmshell
```

with

```
xdm::21:250:X windowing systems startup:/usr/bin/X11:/usr/bin/X11/xdmrestart
```

2) Add the following line to the end of **/etc/passwd** file.

```
esdemo::102:102:ESV Demo Account:/usr/esdemo:/bin/csh
```

End of installation.

ES/os Domestic/Foreign Tape 2.0 – Scratch Installation

****

WARNING: This software installation is a scratch install. Data on the **root** and **/usr** partitions on disk 0 will be lost. Back-up any files that you don't want destroyed. A list of systems files you might want to backup are located in Appendix A of the 2.0 Release Notes.

****

CAUTION: It is recommended that you be the only user logged onto the machine while loading this software.

****

Get the following from your system manager. Will need later during installation.

1) System Hostname (found in **/etc/local_hostname** file)

2) Netmask

3) Net address (found in **/etc/hosts** file)

4) Domain name for your site

In the following procedure, system output is shown in `typewriter normal` font, and user responses are shown in **`typewriter bold`** font. All user responses should be typed as shown and entered with a carriage return.

This installation requires approximately 1.5 hours. There are many places where a time is indicated to you can walk away and come back later during the installation.

To begin installation, insert the ES/os Domestic or Foreign Tape 2.0 into the tape drive, and proceed as follows:

Login as **root** and make sure everyone else is off the machine.

Type **`cd /`**.

Shutdown your ESV by typing **`shutdown -y -g0 -i0`**.

```
E&S CPU Board MIPS Monitor Version 4.10 MIPS OPT Mon Feb 18 15:00:28 MST
1991
Copyright 1988, MIPS Computer Systems Inc., All Rights Reserved
Memory size: 33554432 (0x2000000) bytes
Icache size: 65536 (0x10000) bytes
Dcache size: 65536 (0x10000) bytes
>> boot -f tqis(,,2)format.std
128896+31552+206928 entry: 0x80020000

 ********** NOTE: The following sequence formats DISK 0 ********

MIPS Format Utility
Version 5.00 Mon Feb 18 15:47:23 MST 1991
name of device? dkis
LUN number? 0
```

```
target id? 0
vendor: CDC
product: 94191-15
Disk has block caching enabled

device parameters from disk don't match table entries!
choose new device parameters (y if yes)? y
Drive has 5061 cylinders
256 sectors per cylinder
234 sectors left over

dump device parameters (y if yes)? <CR>
modify device parameters (y if yes)? <CR>

dump partition table (y if yes)? <CR>
modify partition table (y if yes)? <CR>

formatting destroys ALL SCSI disk data, perform format (y if yes)? <CR>

formatting wasn't done, perform scan anyway (y if yes)? <CR>

SCSI defect list manipulation, when prompted
choose one of (list, add, delete, quit)
command? q
writing volume header...
exit(0) called
```

Note: The following sequence formats DISK 1. Skip this section if you are not formatting DISK 1

****

WARNING: Only perform this sequence at the factory, or if you really want to re-format and destroy data on DISK 1.

****

```
E&S CPU Board MIPS Monitor Version 5.00 MIPS OPT Mon Feb 18 15:00:28 MST
1991
Copyright 1988, MIPS Computer Systems Inc., All Rights Reserved
Memory size: 33554432 (0x2000000) bytes
Icache size: 65536 (0x10000) bytes
Dcache size: 65536 (0x10000) bytes
>> go

MIPS Format Utility
Version 5.00 Mon Feb 18 15:47:23 MST 1991

name of device? dkis
LUN number? 0
```

```
target id? 1
vendor: CDC
product: 94161-9

device parameters from disk don't match table entries!
choose new device parameters (y if yes)? y

dump device parameters (y if yes)? <CR>
modify device parameters (y if yes)? <CR>

dump partition table (y if yes)? <CR>
modify partition table (y if yes)? <CR>

formatting destroys ALL SCSI disk data, perform format (y if yes)? <CR>

formatting wasn't done, perform scan anyway (y if yes)? <CR>

SCSI defect list manipulation, when prompted
choose one of (list, add, delete, quit)
command? q

writing volume header...
exit(0) called

------------------ End of DISK 1 Formatting Sequence --------------------

E&S CPU Board MIPS Monitor Version 5.00 MIPS OPT Mon Feb 18 15:00:28 MST
1991
Copyright 1988, MIPS Computer Systems Inc., All Rights Reserved
Memory size: 33554432 (0x2000000) bytes
Icache size: 65536 (0x10000) bytes
Dcache size: 65536 (0x10000) bytes
>> boot -f tqis(,,2)sash.std
120544+23088+170432 entry: 0xa0300000
MIPS Standalone Shell Version 5.00 MIPS OPT Mon Feb 18 08:39:23 MDT 1991
sash: cp -b 16k tqis(,,4) dkis(,,1)

---------- Note : Takes @5 minutes till next user response ----------

.............................................................
.............................................................
.............................................................
.............................................................
.............................................................
.............................................................
.............................................................
.............................................................
.............................................................
.............................................................
```

```
.....................................................................
.....................................................................
.....................................................................
...........
13824000 (0xd2f000) bytes copied
```

Note: The next input determines the OS Kernel you will be installing. There are two to choose from. See "OS Kernel Information" located at the beginning of these installation notes before typing the next command.

```
sash: boot -f tqis(,,6)unix.std root=isc0d0s1 (non-development systems)
```

OR

```
sash: boot -f tqis(,,7)unix.dvlp_std root=isc0d0s1 (development systems)

---------- Note: Takes @8 minutes till next user response ----------

46208+101360+789520 entry: 0x80021000
CPU: MIPS R3000 Processor Chip Revision: 3.0
FPU: MIPS R3010 VLSI Floating Point Chip Revision: 4.0

ES/os Release 2.0 ESV Version R_100
Total real memory = 33554432
Available memory = 31170560
abminit: ARS/HIC not present.
arsinit: ARS/HIC not present.
installing VME vector: addr 0x8007FFA4 ipl 2, vec 0xE0 unit 0
Root on dev 0x1001, Swap on dev 0x1001
Root fstype ffs
New swplo: 26992 swap size: 19272K bytes
Available memory = 29478912

Miniroot run level 1

Making miniroot device files for m120-1 system... (takes 5 minutes)
erase = ^H, kill = ^U, interrupt = ^C
# inst

Software package installation

Installation Information:

This is a SCRATCH install. Data on the root and /usr disks will be lost.
Packages will be read in from the local Q24 tape drive.
Machine type: m120-1

Is the information above correct? (y n) [y]? y

Note: It is not necessary to install a kernel on the miniroot
The process will take a few minutes.
```

```
Would you like to install the kernel to the miniroot (y n) [n]? <CR>

========== checking subpackages ==========

The following subpackages may be installed:

root          -- ES/os Standard Root Filesystem
m120-1        -- ES/os m/120, RC3240 Kernel and Devices
usr           -- ES/os Standard /usr Filesystem
usr_help      -- ES/os Standard /usr help facilities
usr_dvlp      -- ES/os Standard /usr Development files (header
                 files&libraries)
usr_terms     -- ES/os Standard /usr Miscellaneous Terminal descriptions
cmplrs        -- MIPS-C Compiler
cmplrs-bsd43  -- MIPS-C 4.3 BSD Include Files and Libraries
man           -- ES/os Manual Pages
bsd43         -- ES/os 4.3 BSD Utilities, Include Files and Libraries
bsd43_troff   -- ES/os 4.3 BSD Troff Utilities and Libraries
bsd43_dvlp    -- ES/os 4.3 BSD Include Files and Libraries
reconfig      -- Kernel Binary Reconfiguration Components
emacs         -- emacs
posix         -- ES/os POSIX P1003.1 Include Files, Commands and Libraries
uucp          -- UUCP
sccs          -- SCCS
news_readers  -- News Readers
games         -- Games
mh            -- mh

========== selecting subpackages ==========
```

Note : At the factory, only the following subpackages will be installed: root, m120-1, usr, cmplrs, man, and bsd43. These subpackages are REQUIRED. You may choose to install any or all of the remaining subpackages depending on your needs and how much disk space you have. At this printing the "default" installation uses @80000 Kbytes. If you install everything available on this tape, you will need @131000 Kbytes.

```
You may select all of the above subpackages by answering "y" to the
following question. If you answer "n" then you will be asked to select the
optional subpackages you would like to have installed.

Install ALL subpackages (y n) [n]? n -> See CONFIGURATION INFORMATION

When asked if you want to install a subpackage, please answer with one of
the following:

 y - Yes, you want to install the subpackage
 n - No, you do NOT want to install the subpackage
 l - List the contents of the subpackage and ask me again
```

```
Subpackage root will be installed
Subpackage m120-1 will be installed
Subpackage usr will be installed

Install subpackage usr_help (l y n) [n]? n
Install subpackage usr_dvlp (l y n) [n]? n
Install subpackage usr_terms (l y n) [n]? n
Install subpackage cmplrs (l y n) [n]? y
Install subpackage cmplrs-bsd43 (l y n) [n]? n
Install subpackage man (l y n) [n]? y
Install subpackage bsd43 (l y n) [n]? y
Install subpackage bsd43_troff (l y n) [n]? n
Install subpackage bsd43_dvlp (l y n) [n]? n
Install subpackage reconfig (l y n) [n]? n
Install subpackage emacs (l y n) [n]? n
Install subpackage posix (l y n) [n]? n
Install subpackage uucp (l y n) [n]? n
Install subpackage sccs (l y n) [n]? n
Install subpackage news_readers (l y n) [n]? n
Install subpackage games (l y n) [n]? n
Install subpackage mh (l y n) [n]? n

Selected subpackages:
root m120-1 usr cmplrs man bsd43
Is this what you want (y n) [y]? y

========== setting system clock/calendar ==========

The current value of the clock is: Thu Aug 30 14:10:44 PDT 1990
Is the clock correct (y n) [y]? <CR>

========== verifying single-user mode ==========

The system is in a single-user run level.

Please answer "y" to the following question unless you really understand
the consequences.

Do you want to install sash to the volume header (y n) [y]? <CR>

========== installing sash to volume header ==========

========== determining /usr partition ==========
```

```
------------------------------------------------------------------------
Partition Megs Mounted File System or Partition Usage
------------------------------------------------------------------------
3 /dev/dsk/isc0d0s3 578 -**** Available Partition ****-
4 /dev/dsk/isc0d0s4 376 -**** Available Partition ****-
5 /dev/dsk/isc0d0s5 188 -**** Available Partition ****-
6 /dev/dsk/isc0d0s6 564 -**** Available Partition ****-
------------------------------------------------------------------------
Disk Device /dev/dsk/isc0d0s2 632 Megabytes Total Size
------------------------------------------------------------------------

Possible partitions to use are marked by -**** Available Partition ****-
 select either partition 3, 4, 5 or 6
Which partition should /usr be installed on [6]? <CR>
/usr partition will be installed on partition 6

========== initializing filesystems ==========

A scratch install of an operating system package is being performed from
the miniroot. Normally in this case the filesystems are initialized. When
a filesystem is initialized, any existing data will be lost. You will be
given a chance to override initialization of each individual filesystem
below.

Initialize filesystems (y n) [y]? <CR>
Disk type for controller 0 drive 0 [94171]? <CR>
Initialize filesystem on /dev/root (y n) [y]? <CR>
Initialize filesystem on /dev/usr (y n) [y]? <CR>

---------- Note: Takes @12 minutes until next user response ----------

Initializing the filesystem on /dev/root...
/dev/root: 46080 sectors in 180 cylinders of 1 tracks, 256 sectors
 23.6Mb in 12 cyl groups (16 c/g, 2.10Mb/g, 832 i/g)
super-block backups (for fsck -b#) at:
 32, 4128, 8224, 12320, 16416, 20512, 24608, 28704, 32800, 36896,
 40992, 45088,
rotational delay between contiguous blocks changes from 7ms to 0ms

Checking the filesystem on /dev/root...
** /dev/root
** Last Mounted on
** Phase 1 - Check Blocks and Sizes
** Phase 2 - Check Pathnames
** Phase 3 - Check Connectivity
** Phase 4 - Check Reference Counts
** Phase 5 - Check Cyl groups
2 files, 9 used, 21574 free (14 frags, 2695 blocks, 0.1% fragmentation)
```

```
Initializing the filesystem on /dev/usr...

/dev/usr: 1154304 sectors in 4509 cylinders of 1 tracks, 256 sectors
 591.0Mb in 282 cyl groups (16 c/g, 2.10Mb/g, 896 i/g)
super-block backups (for fsck -b#) at:
 32, 4128, 8224, 12320, 16416, 20512, 24608, 28704, 32800, 36896,
 40992, 45088, 49184, 53280, 57376, 61472, 65568, 69664, 73760, 77856,
 81952, 86048, 90144, 94240, 98336, 102432, 106528, 110624, 114720, 118816,
 122912, 127008, 131104, 135200, 139296, 143392, 147488, 151584, 155680,
159776,
 163872, 167968, 172064, 176160, 180256, 184352, 188448, 192544, 196640,
200736,
 204832, 208928, 213024, 217120, 221216, 225312, 229408, 233504, 237600,
241696,
 245792, 249888, 253984, 258080, 262176, 266272, 270368, 274464, 278560,
282656,
 286752, 290848, 294944, 299040, 303136, 307232, 311328, 315424, 319520,
323616,
 327712, 331808, 335904, 340000, 344096, 348192, 352288, 356384, 360480,
364576,
 368672, 372768, 376864, 380960, 385056, 389152, 393248, 397344, 401440,
405536,
 409632, 413728, 417824, 421920, 426016, 430112, 434208, 438304, 442400,
446496,
 450592, 454688, 458784, 462880, 466976, 471072, 475168, 479264, 483360,
487456,
rotational delay between contiguous blocks changes from 7ms to 0ms

Checking the filesystem on /dev/usr...
** /dev/usr
** Last Mounted on
** Phase 1 - Check Blocks and Sizes
** Phase 2 - Check Pathnames
** Phase 3 - Check Connectivity
** Phase 4 - Check Reference Counts
** Phase 5 - Check Cyl groups
2 files, 9 used, 541026 free (10 frags, 67627 blocks, 0.0% fragmentation)

========== mounting filesystems ==========

/dev/root mounted on /mnt
/dev/usr mounted on /mnt/usr

--------------------------------------------------------------------------
Partition Megs Mounted File System or Partition Usage
--------------------------------------------------------------------------
0 /dev/dsk/isc0d0s0 23 /dev/root
1 /dev/dsk/isc0d0s1 33 /
```

```
6 /dev/dsk/isc0d0s6 564 /dev/usr
7 /dev/dsk/isc0d0s7 14 -**** Available Partition ****-
------------------------------------------------------------------------
Disk Device /dev/dsk/isc0d0s2 632 Megabytes Total Size
------------------------------------------------------------------------

Do you wish to change swap partition configuration (y n) [n]? <CR>

========== verifying disk space ==========

Do you want to check for space (please do so unless you really understand
the consequences) (y n) [y]? y

---------- Note: Takes @30 minutes til next user response ----------
The system will now be checked to verify that there is enough disk space
with the current configuration to successfully install the package (and any
selected optional subpackages). For large packages (especially operating
system packages), this can be time consuming...

There is enough space.

========== extracting files from subpackage archives ==========

rewinding the tape...
Verifying tape id... ok
Forward spacing the tape...

Loading subpackage: root...
Forward spacing the tape...
Loading subpackage: m120-1...
Forward spacing the tape...
Loading subpackage: usr...
Forward spacing the tape...
Loading subpackage: cmplrs...
Forward spacing the tape...
Loading subpackage: man...
Forward spacing the tape...
Loading subpackage: bsd43...
Forward spacing the tape...
rewinding the tape...

========== making device special files ==========

running MKDEV...
done.

========== running comply ==========

running first comply pass...
running second comply pass...
```

```
There were no comply messages from the second pass.

========== doing uncompress Thu Aug 30 15:27:31 PDT 1990 ==========

uncompress usr/bin/admin.Z
uncompress usr/bin/at.Z

(Uncompresses Occur Here)

uncompress usr/bin/chkey.Z
uncompress usr/new/mh/whatnow.Z
uncompress usr/new/mh/whom.Z

Once again, before you can type 'y' to the next questions, your system
administrator must provide you with the following info:

1) System hostname.
2) Netmask.
3) Broadcast address.
4) Net address.
5) Domain name for your site.

The following entries are given for example ONLY!

Do you wish to configure the network (y n) [n]? y

========== making special network files ==========

Set hostname [no_ho stname]? tonto

Set netmask [0xffff0000]? 0xffffff00
Set broadcast address [255.255.255.0]? 130.187.85.0
Set net address [127.1.0.0]? 130.187.85.156
Should we create the /etc/local_hostname file (y n) [y]? y

tonto 130.187.85.156
Should we add the above entry to the /etc/hosts file (y n) [y]? y

Set domain name [mips.com]? sauria
Should we create the /etc/local_domainname file (y n) [y]? y

========== cleaning up ==========

Copying packaging information directory to /mnt/usr/pkg/lib/ESos2.0...
Copying miniroot fstab to installed system...
Unmounting filesystems...
/mnt/usr: Unmounted
/mnt: Unmounted

========== installation complete ==========
```

****

WARNING: If this is an LS or Diskless Node Install - **STOP**, do not proceed further using these instructions. Instead, go to the Diskless Node 2.0 Installation Instructions and continue with the **#sync; sync** command found in those instructions.

****

```
# sync; sync
# telinit 0
#
INIT: New run level: 0

Miniroot shutdown

E&S CPU Board MIPS Monitor Version 5.00 MIPS OPT Mon Feb 18 15:00:28 MST
1991
Copyright 1988, MIPS Computer Systems Inc., All Rights Reserved
Memory size: 33554432 (0x2000000) bytes
Icache size: 65536 (0x10000) bytes
Dcache size: 65536 (0x10000) bytes
>> auto

Autoboot: Waiting to load dkis(0,0,8)sash (CTRL-C to abort, RETURN to
expedite)<CR>
loading
120544+23088+170432 entry: 0xa0300000
MIPS Standalone Shell Version 5.00 MIPS OPT Mon Feb 18 08:39:23 MDT 1991

Loading dkis(0,0,0)/unix
846208+101360+789520 entry: 0x80021000
CPU: MIPS R3000 Processor Chip Revision: 2.0
FPU: MIPS R3010 VLSI Floating Point Chip Revision: 2.0

ES/os Release 2.0 ESV Version R_100
Total real memory = 33554432
Available memory = 31170560
abminit: ARS/HIC not present.
arsinit: ARS/HIC not present.
installing VME vector: addr 0x8007FFA4 ipl 2, vec 0xE0 unit 0

installing VME vector: addr 0x8007FFA4 ipl 2, vec 0xE0 unit 0
Root fstype ffs
Available memory = 29478912

Checking root file system () if necessary.
The system is coming up. Please wait.

***** Normally all file systems are fscked.
```

```
***** To fsck only dirty ones, type 'yes' within 5 seconds:
***** All file systems will be fscked.
/dev/usr: 6199 files, 109289 used, 431746 free (2882 frags, 53608 blocks,
0.5% fragmentation)
/dev/usr mounted on /usr
No process accounting on this system
Aug 31 07:19:19 tonto unix: CPU: MIPS R3000 Processor Chip Revision: 2.0
Aug 31 07:19:19 tonto unix: FPU: MIPS R3010 VLSI Floating Point Chip
Revision: 2.0
Aug 31 07:19:20 tonto unix:
Aug 31 07:19:20 tonto unix: Total real memory = 33554432
Aug 31 07:19:20 tonto unix: Available memory = 31170560
Aug 31 07:19:20 tonto unix: abminit: ARS/HIC not present.
Aug 31 07:19:20 tonto unix: arsinit: ARS/HIC not present.
Aug 31 07:19:21 tonto unix: installing VME vector: addr 0x8007FFA4 ipl 2,
vec 0xE0 unit 0
Aug 31 07:19:21 tonto unix: installing VME vector: addr 0x8007FFA4 ipl 2,
vec 0xE0 unit 0
Aug 31 07:19:21 tonto unix: Root fstype ffs
Aug 31 07:19:21 tonto unix: Available memory = 29478912
checking for system core dump...
Internet daemons: routed snmpd snmptrapd portmap inetd timed(slave).
Export file systems
NFS daemons: nfsd biod lockd statd.
Aug 31 07:19:32 tonto rpc.statd[139]: enter statd_init
Aug 31 07:19:32 tonto rpc.statd[139]: 1
Aug 31 07:19:32 tonto rpc.statd[139]: local state = 1
Starting lpd
The system is ready.

tonto Console login:
```

You now need to modify the **/etc/passwd** file to set up some accounts properly.

1) Login as **root**. Modify **/etc/passwd** file and REPLACE the line:

```
xdm:L..SxyBbOydh.:21:250:X windowing systems startup:/usr2/X:/usr/bin/X11/xdmshell
```

with

```
xdm::21:250:X windowing systems startup:/usr/bin/X11:/usr/bin/X11/xdmrestart
```

2) Add the following line to the end of **/etc/passwd** file.

```
esdemo::102:102:ESV Demo Account:/usr/esdemo:/bin/csh
```

End of installation.

Installation Instructions - ES/PEX Server Tape 2.0

In the following procedure, system output is shown in `typewriter normal` font, and user responses are shown in **`typewriter bold`** font. All user responses should be typed as shown and entered with a carriage return.

****

CAUTION: It is recommended that YOU be the only user logged onto the machine while loading this software.

****

To install this tape, insert the ES/PEX Server Tape 2.0 into the tape drive, login as **root**, and proceed as follows:

Type **cd /**

Type **/usr/pkg/bin/inst**

```
Software package installation

Install package relative to where [/]? <CR>
Please mount the (first, if multiple tapes) distribution
tape, then press return... <CR>
Rewinding the tape...
Verifying tape id... ok

Extracting packaging information tree... pexs2.0

Installation Information:

Packages will be read in from the local Q24 tape drive.
Machine type: m120

Is the information above correct? (y n) [y]? <CR>

========== checking subpackages ==========

The following subpackages may be installed:
executables_s       -- PEX 2.0 Executable Release
library_s           -- PEX 2.0 Library Release
pexs-man            -- PEX 2.0 Man Page Release
fstest              -- fstest Release
xclients_s          -- PEX 2.0 XClients Release
pexs-man-unformat   -- Unformatted Man Page Release
demo_s              -- Demo_s Release

========== selecting subpackages ==========

You may select all of the above subpackages by answering "y" to the
following question. If you answer "n" then you will be asked to select the
optional subpackages you would like to have installed.
```

```
Install ALL subpackages (y n) [n]? SEE CONFIGURATION INFORMATION

========== setting system clock/calendar ==========

The current value of the clock is: Fri Mar 22 16:37:04 MST 1991
Is the clock correct (y n) [y]? <CR>

========== verifying single-user mode ==========
This system is not presently in a single-user run level. Installation of a
package can fail if performed at this run level. We recommend that the
system be brought to a single user run level (using "init S") prior to
performing the installation.

Are you absolutely sure you wish to continue (y n) [n]? y

========== preserving local files ==========

Running preserve -s for subpackage executables_s... 2 files preserved.
No preserve list or findmods list for library_s- preserve not executed.
No preserve list or findmods list for pexs-man- preserve not executed.
No preserve list or findmods list for fstest- preserve not executed.
No preserve list or findmods list for xclients_s- preserve not executed.
No preserve list or findmods list for pexs-man-unformat- preserve not
executed.
No preserve list or findmods list for demo_s- preserve not executed.
========== verifying disk space ==========

Do you want to check for space (please do so unless you really understand
the consequences) (y n) [y]? y

The system will now be checked to verify that there is enough disk space
with the current configuration to successfully install the package (and any
selected optional subpackages). For large packages (especially operating
system packages), this can be time consuming...

There is enough space.

========== stripping old links ==========

Stripping links for subpackage executables_s...
Stripping links for subpackage library_s...
Stripping links for subpackage pexs-man...
Stripping links for subpackage fstest...
Stripping links for subpackage xclients_s...
Stripping links for subpackage pexs-man-unformat...
Stripping links for subpackage demo_s...

========== extracting files from subpackage archives ==========

rewinding the tape...
Verifying tape id... ok
```

```
Forward spacing the tape...

Loading subpackage: executables_s...
Forward spacing the tape...
Loading subpackage: library_s...
Forward spacing the tape...
Loading subpackage: pexs-man...
Forward spacing the tape...
Loading subpackage: fstest...
Forward spacing the tape...
Loading subpackage: xclients_s...
Forward spacing the tape...
Loading subpackage: pexs-man-unformat...
Forward spacing the tape...
Loading subpackage: demo_s...
Forward spacing the tape...
rewinding the tape...

========== running comply ==========

running first comply pass...
running second comply pass...
There were no comply messages from the second pass.

========== doing uncompress Fri Mar 22 16:54:41 MST 1991 ==========

========== cleaning up old versions ==========

An attempt will now be made to clean up any files left over from previous
versions of the software which has just been installed.

Searching for old versions to remove...

NOTE: These messages appear if you have a previous version of ES/PEX Server
installed on your system.

Clean up pexs.executables_s 1.3 (y n) [n]? y
Removing leftover files from pexs.executables 1.3...
rm ./usr/bin/X11/imake
rm ./usr/bin/X11/sw
rm ./usr/bin/X11/swstart
Clean up pexs.library_s 1.3 (y n) [n]? y
Removing leftover files from pexs.library_s 1.3...
rm ./usr/lib/X11/dsp_ucode
rm ./usr/lib/X11/fonts/misc/roman.esf
Clean up pexs.pexs-man 1.3 (y n) [n]? y
Removing leftover files from pexs.pexs-man 1.3...
rm ./usr/man/catman/x_man/man1/imake.1
```

```
Clean up pexs.fstest 1.3 (y n) [n]? y
Removing leftover files from pexs.fstest 1.3...
rm ./usr/people/fstest/diag/esv_sysdiag

There are no longer any boms present for any subpackages from
//usr/pkg/lib/pexs1.3 version 1.3. This probably indicates that no
subpackages installed from this package are still present on the system.


Remove the packaging information tree for this package (y n) [y]? y

========== restoring preserved user files ==========

Running preserve -r for subpackage executables_s...
No preserve list or findmods list for library_s- no files restored.
No preserve list or findmods list for pexs-man- no files restored.
No preserve list or findmods list for fstest- no files restored.
No preserve list or findmods list for xclients_s- no files restored.
No preserve list or findmods list for pexs-man-unformat- no files restored.
No preserve list or findmods list for demo_s- no files restored.

========== running conversion scripts ==========

========== pexs-man.conversion Fri Mar 22 16:55:30 MST 1991 ==========

Manpage Conversion...

x_man exists
Making P_man -> catman/P_man softlink...
Done.

========== cleaning up ==========

Remove install tools (y n) [n]? y

========== installation complete ==========
```

Your file **/usr/lib/X11/pex_config.dat** from prior releases has been preserved. However, without modification it will not work with the 2.0 Release.

Before PEX clients can be run, the file **/usr/lib/X11/pex_config.dat** must be modified to update the **MAX_TABLE_ENTRIES** in the **COLOUR_APPROXIMATION_TABLE** from 0 to 256. To do this, find the following lines in the file **/usr/lib/pex_config.dat**:

```
COLOUR_APPROXIMATION_TABLE
        START_INDEX 0
        MAX_TABLE_ENTRIES 0
        NUMBER_PREDEFINED 0
        FIRST_PREDEFINED_INDEX 0
        LAST_PREDEFINED_INDEX 0
```

Change the following line,

```
MAX_TABLE_ENTRIES 0
```

to read,

```
MAX_TABLE_ENTRIES 256
```

Alternately, a default **pex_config.dat** file has been included in the 2.0 Release. It is called **pex_config.dat:2.0+** and is located in the same directory. You can rename this file to be **pex_config.dat**. However, you should not do this if your original **pex_config.dat** file has been modified for your specific needs. In this case, you should edit your original **pex_config.dat** file as described above.

Installation Instructions - ES/PEX Library Tape 2.0

In the following procedure, system output is shown in `typewriter normal` font, and user responses are shown in **`typewriter bold`** font. All user responses should be typed as shown and entered with a carriage return.

****

CAUTION: It is recommended that YOU be the only user logged onto the machine while loading this software.

****

To install this tape, insert the ES/PEX Library Tape 2.0 into the tape drive, login as **root**, and proceed as follows:

Type **cd /**

Type **/usr/pkg/bin/inst**

```
Software package installation

Install package relative to where [/]? <CR>
Please mount the (first, if multiple tapes) distribution
tape, then press return... <CR>
Rewinding the tape...
Verifying tape id... ok

Extracting packaging information tree... pexl2.0

Installation Information:

Packages will be read in from the local Q24 tape drive.
Machine type: m120-1

Is the information above correct? (y n) [y]? <CR>

========== checking subpackages ==========

The following subpackages may be installed:

library_1              -- PEX 2.0 Library Release
cdrs_library_1         -- PEX 2.0 CDRS Library Release
pexl-man               -- PEX 2.0 Man Pages
pexl-man-unformat -- PEX 2.0 Unformatted Man Pages

========== selecting subpackages ==========

You may select all of the above subpackages by answering "y" to the
following question. If you answer "n" then you will be asked to select the
optional subpackages you would like to have installed.

Install ALL subpackages (y n) [n]? --> SEE CONFIGURATION INFORMATION
```

```
========== setting system clock/calendar ==========

The current value of the clock is: Fri Mar 22 16:51:09 MST 1991
Is the clock correct (y n) [y]? y

===========verifying single-user mode ==========

This system is not presently in a single-user run level. Installation of a
package can fail if performed at this run level. We recommend that the
system be brought to a single user run level (using "init S") prior to
performing the installation.

Are you absolutely sure you wish to continue (y n) [n]? y

========== preserving local files ==========

No preserve list or findmods list for library_1- preserve not executed.
No preserve list or findmods list for cdrs_library_1- preserve not
executed.
No preserve list or findmods list for pexl-man- preserve not executed.
No preserve list or findmods list for pexl-man-unformat- preserve not
executed.

========== verifying disk space ==========

Do you want to check for space (please do so unless you really understand
the consequences) (y n) [y]? y

The system will now be checked to verify that there is enough disk space
with the current configuration to successfully install the package (and any
selected optional subpackages). For large packages (especially operating
system packages), this can be time consuming...

There is enough space.

========== stripping old links ==========

Stripping links for subpackage library_1...
Stripping links for subpackage cdrs_library_1...
Stripping links for subpackage pexl-man...
Stripping links for subpackage pexl-man-unformat...

========== extracting files from subpackage archives ==========

rewinding the tape...
Verifying tape id... ok
Forward spacing the tape...

Loading subpackage: library_1...
Forward spacing the tape...
Loading subpackage: cdrs_library_1...
Forward spacing the tape...
```

```
Loading subpackage: pexl-man...
Forward spacing the tape...
Loading subpackage: pexl-man-unformat...
Forward spacing the tape...
rewinding the tape...
========== running comply ==========

running first comply pass...
running second comply pass...
There were no comply messages from the second pass.

========== doing uncompress Fri Mar 22 17:11:36 MST 1991 ==========

========== cleaning up old versions ==========

An attempt will now be made to clean up any files left over from previous
versions of the software which has just been installed.

Searching for old versions to remove...

========== restoring preserved user files ==========

No preserve list or findmods list for library_1- no files restored.
No preserve list or findmods list for cdrs_library_1- no files restored.
No preserve list or findmods list for pexl-man- no files restored.
No preserve list or findmods list for pexl-man-unformat- no files restored.

========== running conversion scripts ==========

========== pexl-man.conversion Fri Mar 22 17:11:54 MST 1991 ==========

Manpage Conversion...

x_man exists
P_man exists
m_man exists

Done.

========== cleaning up ==========

Remove install tools (y n) [n]? y

========== installation complete ==========
```

Installation Instructions - ES/PSX Tape 2.0

In the following procedure, system output is shown in `typewriter normal` font, and user responses are shown in **`typewriter bold`** font. All user responses should be typed as shown and entered with a carriage return.

****

CAUTION: It is recommended that you be the only user logged onto the machine while loading this software.

****

To install this tape, insert the ES/PSX Tape 2.0 into the tape drive, login as **root**, and proceed as follows:

Type **`cd /`**

Type **`/usr/pkg/bin/inst`**

```
Software package installation

Install package relative to where [/]? <CR>
Please mount the (first, if multiple tapes) distribution
tape, then press return... <CR>
Rewinding the tape...
Verifying tape id... ok

Extracting packaging information tree... psx2.0

Installation Information:

Packages will be read in from the local Q24 tape drive.
Machine type: m120

Is the information above correct? (y n) [y]? <CR>

========== checking subpackages ==========

The following subpackages may be installed:

psx                    -- PSX 2.0 Release

========== selecting subpackages ==========

You may select all of the above subpackages by answering "y" to the
following question. If you answer "n" then you will be asked to select the
optional subpackages you would like to have installed.

Install ALL subpackages (y n) [n]? y

========== setting system clock/calendar ==========

The current value of the clock is: Wed Sep 26 09:58:24 PDT 1990
Is the clock correct (y n) [y]? <CR>
```

```
========== verifying single-user mode ==========

This system is not presently in a single-user run level. Installation of a
package can fail if performed at this run level. We recommend that the
system be brought to a single user run level (using "init S") prior to
performing the installation.

Are you absolutely sure you wish to continue (y n) [n]? y

========== preserving local files ==========

No preserve list or findmods list for psx- preserve not executed.

========== verifying disk space ==========

Do you want to check for space (please do so unless you really
understand the consequences) (y n) [y]? <CR>

The system will now be checked to verify that there is enough disk space
with the current configuration to successfully install the package (and any
selected optional subpackages). For large packages (especially operating
system packages), this can be time consuming...

There is enough space.

If you see this type of error message:

space: error: fstabind(): couldn't find device file for dev=0x1439

there is a filesystem linked through NFS to another system which must be
removed before the installation can be performed.

========== stripping old links ==========

Stripping links for subpackage psx...

========== extracting files from subpackage archives ==========

rewinding the tape...
Verifying tape id... ok
Forward spacing the tape...

Loading subpackage: psx...
Forward spacing the tape...
rewinding the tape...

========== running comply ==========

running first comply pass...
running second comply pass...
There were no comply messages from the second pass.

========== doing uncompress Wed Sep 26 10:01:10 PDT 1990 ==========
```

```
========== cleaning up old versions ==========

An attempt will now be made to clean up any files left over from previous
versions of the software which has just been installed.
Searching for old versions to remove...

========== restoring preserved user files ==========

No preserve list or findmods list for psx- no files restored.

========== cleaning up ==========

Remove install tools (y n) [n]? y

========== installation complete ==========
```

Installation Instructions - ES/Dnet Tape 2.0

In the following procedure, system output is shown in `typewriter normal` font, and user responses are shown in **`typewriter bold`** font. All user responses should be typed as shown and entered with a carriage return.

****

CAUTION: It is recommended that YOU be the only user logged onto the machine while loading this software.

****

To install this tape, insert the ES/Dnet Tape 2.0 into the tape drive, login as **root**, and proceed as follows:

Type **cd /**

Type **/usr/pkg/bin/inst**

```
Software package installation

Install package relative to where [/]? <CR>
Please mount the (first, if multiple tapes) distribution
tape, then press return... <CR>
Rewinding the tape...
Verifying tape id... ok

Extracting packaging information tree... esdnet2.0

Installation Information:

Packages will be read in from the local Q24 tape drive.
Machine type: m120

Is the information above correct? (y n) [y]? <CR>

========== checking subpackages ==========

The following subpackages may be installed:
esdnet                -- ES/Dnet Release
========== selecting subpackages ==========

You may select all of the above subpackages by answering "y" to the
following question. If you answer "n" then you will be asked to select the
optional subpackages you would like to have installed.

Install ALL subpackages (y n) [n]? y

========== setting system clock/calendar ==========

The current value of the clock is: Thu Oct 4 09:43:52 MDT 1990
Is the clock correct (y n) [y]? <CR>

========== verifying single-user mode ==========
```

```
This system is not presently in a single-user run level. Installation of a
package can fail if performed at this run level. We recommend that the
system be brought to a single user run level (using "init S") prior to
performing the installation.

Are you absolutely sure you wish to continue (y n) [n]? y

========== preserving local files ==========

No preserve list or findmods list for esdnet- preserve not executed.

========== verifying disk space ==========

Do you want to check for space (please do so unless you really understand
the consequences) (y n) [y]? y

The system will now be checked to verify that there is enough disk space
with the current configuration to successfully install the package (and any
selected optional subpackages). For large packages (especially operating
system packages), this can be time consuming...

There is enough space.

========== stripping old links ==========

Stripping links for subpackage esdnet...

========== extracting files from subpackage archives ==========

rewinding the tape...
Verifying tape id... ok
Forward spacing the tape...

Loading subpackage: esdnet...
Forward spacing the tape...
rewinding the tape...

========== running comply ==========

running first comply pass...
running second comply pass...
There were no comply messages from the second pass.

========== doing uncompress Thu Oct 4 09:47:18 MDT 1990 ==========

========== cleaning up old versions ==========

An attempt will now be made to clean up any files left over from previous
versions of the software which has just been installed.

Searching for old versions to remove...
Clean up esdnet.esdnet 1.3 (y n) [n]? y
Removing leftover files from esdnet.esdnet 1.3...
```

```
There are no longer any boms present for any subpackages from
//usr/pkg/lib/esdnet1.3 version 1.3.
This probably indicates that no subpackages installed from this package are
still present on this system.

Remove the packaging information tree for this package (y n) [y]? <CR>

========== restoring preserved user files ==========

No preserve list or findmods list for esdnet- no files restored.

========== cleaning up ==========

Remove install tools (y n) [n]? y

========== installation complete ==========
```

Installation Instructions - AVS Tape 2.0

In the following procedure, system output is shown in `typewriter normal` font, and user responses are shown in **`typewriter bold`** font. All user responses should be typed as shown and entered with a carriage return.

****

CAUTION: It is recommended that you be the only user logged onto the machine while loading this software.

****

To install this tape, insert the AVS Tape 2.0 into the tape drive, login as **root**, and proceed as follows:

Type **`cd /`**

Type **`/usr/pkg/bin/inst`**

```
Software package installation

Install package relative to where [/]? <CR>

Please mount the (first, if multiple tapes) distribution tape, then press
return... <CR>
Rewinding the tape...
Verifying tape id... ok

Extracting packaging information tree... avs2.0

Installation Information:

Packages will be read in from the local Q24 tape drive.
Machine type: m120

Is the information above correct? (y n) [y]? y

========== checking subpackages ==========

The following subpackages may be installed:

avs                    -- AVS2 2.0 Release

========== selecting subpackages ==========

You may select all of the above subpackages by answering "y" to the
following question. If you answer "n" then you will be asked to select the
optional subpackages you would like to have installed.

Install ALL subpackages (y n) [n]? y

========== setting system clock/calendar ==========

The current value of the clock is: Tue Apr 2 13:23:28 MST 1991
Is the clock correct (y n) [y]? y
```

```
========== verifying single-user mode ==========

This system is not presently in a single-user run level. Installation of a
package can fail if performed at this run level. We recommend that the
system be brought to a single user run level (using "init S") prior to
performing the installation.

Are you absolutely sure you wish to continue (y n) [n]? y

========== preserving local files ==========

No preserve list or findmods list for avs- preserve not executed.

========== verifying disk space ==========

Do you want to check for space (please do so unless you really understand
the consequences) (y n) [y]? y

The system will now be checked to verify that there is enough disk space
with the current configuration to successfully install the package (and any
selected optional subpackages). For large packages (especially operating
system packages), this can be time consuming...

There is enough space.

========== stripping old links ==========

Stripping links for subpackage avs...

========== extracting files from subpackage archives ==========

rewinding the tape...
Verifying tape id... ok
Forward spacing the tape...

Loading subpackage: avs...
Forward spacing the tape...
rewinding the tape...

========== running comply ==========

running first comply pass...
running second comply pass...
There were no comply messages from the second pass.

========== doing uncompress Tue Apr 2 13:32:23 MST 1991 ==========

========== cleaning up old versions ==========

An attempt will now be made to clean up any files left over from previous
versions of the software which has just been installed.

Searching for old versions to remove...
```

```
========== restoring preserved user files ==========

No preserve list or findmods list for avs- no files restored.

========== cleaning up ==========

Remove install tools (y n) [n]? y

========== installation complete ==========
```

Installation Instructions - ES/Diskless Node Tape 2.0

The following instructions should be used for either a "Diskless Node" installation or an "LS - Local Server" installation.

****

CAUTION: It is recommended that you be the only user logged onto the machine while loading this software.

Before this installation is attempted, make sure you have already installed the ES/os 2.0, and ES/PEX Server 2.0 tapes on the "Serving" machine. (See installation instructions for these particular tapes.

****

General Notes

Diskless Node and Local Server (LS) machines have very similar installation procedures. For the LS installation, a "SCPU" prefix will appear at all user prompts in the instructions that follow.

Diskless Node Notes

The "ES/Diskless Node" tape should be installed on an ESV that will be the "Serving" machine for other ESV Diskless Workstations. This "Serving" machine should already have had the ES/os 2.0 and ES/PEX Server 2.0 tapes and any other software options installed prior to attempting this install.

LS - Local Server Machine Notes

The "ES/Diskless Node" tape should be installed on the "SCPU" which is the "Serving" CPU. This "Serving" CPU should already have had the ES/os 2.0 and ES/PEX Server 2.0 tapes and any other software options installed prior to attempting this install.

Disk Space Requirements

The files on tapes used will require approximately 400 megabytes of disk space. This is do to the fact that the ES/os 2.0 tape and the ES/PEX Server 2.0 tapes will be installed again during this procedure (but in a different location on the disk).

Items needed for Diskless Node/Local Server Installation

- ES/Diskless Node 2.0 tape
- ES/os 2.0 tape
- ES/PEX Server 2.0 tape

In the following procedure, system output is shown in `typewriter normal` font, and user responses are shown in **`typewriter bold`** font. All user responses should be typed as shown and entered with a carriage return.

To install this software, follow these instructions:

1) Log on as **root.**

2) Insert the "ES/Diskless Node" distribution tape into the ESV "Serving" OR the LS machine.

3) Type **cd /.**

```
# sync; sync
# telinit 0
#
INIT: New run level: 0

Miniroot shutdown

E&S CPU Board MIPS Monitor Version 4.10 MIPS OPT Mon Feb 18 15:00:28 MST
1991
Copyright 1988, MIPS Computer Systems Inc., All Rights Reserved
Memory size: 33554432 (0x2000000) bytes
Icache size: 65536 (0x10000) bytes
Dcache size: 65536 (0x10000) bytes
>> boot -f dkis(,,8)sash
138896+27152+175024 entry: 0xa0480000
MIPS Standalone shell Version 5.00 MIPS OPT Mon Feb 18 10:49:00 MST 1991
sash>> boot -f dkis()/unix initarg=s
869264+103616+894624 entry: 0x80021000
CPU: MIPS R3000 Processor Chip Revision: 3.0
FPU: MIPS R3010 VLSI Floating Point Chip Revision: 4.0

ES/os Release 2.0 ESV Version R_100
Total real memory = 33554432
Available memory = 31170560
abminit: ARS/HIC not present.
arsinit: ARS/HIC not present.
installing VME vector: addr 0x8007FB1C ipl 1, vec 0x1 unit 0
Root fstype ffs
Available memory = 62386176

Checking root file system () if necessary.

INIT: SINGLE USER MODE
TERM: (esconsole) <CR>
# fsck.ffs /dev/usr
** /dev/usr
** Last Mounted on /usr
** Phase 1 - Check Blocks and sizes
** Phase 2 - Check Pathnames
** Phase 3 - Check Connectivity
```

```
** Phase 4 - Check Reference Counts
** Phase 5 - Check Cyl Group
6201 files, 109993 used, 431042 free (1946 frags, 53637 blocks, 0.4% frag)
```

4) Type the following:

```
# mount -a
# mkdir -p /usr/diskless/dl_root
# /usr/pkg/bin/inst

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
Software package installation

Install package relative to where [/]? /usr/diskless/dl_root

Please mount the (first, if multiple tapes) distribution
tape, then press return... <CR>
Rewinding the tape...
Verifying tape id... ok

Extracting packaging information tree... umips-diskless2.0

Installation Information:

Packages will be read in from the local Q24 tape drive.
Machine type: m120

Is the information above correct? (y n) [y]? y

========== checking subpackages ==========

The following subpackages may be installed:

droot -- Diskless root files
dusr -- Diskless usr files
dvar -- Diskless var files

========== selecting subpackages ==========

You may select all of the above subpackages by answering "y" to the
following question. If you answer "n" then you will be asked to select the
optional subpackages you would like to have installed.

Install ALL subpackages (y n) [n]? y

========== setting system clock/calendar ==========

The current value of the clock is: Thu Dec 6 11:13:03 MST 1990
Is the clock correct (y n) [y]? y

========== verifying single-user mode ==========
```

```
This system is not presently in a single-user run level. Installation of a
package can fail if performed at this run level. We recommend that the
system be brought to a single user run level (using "init S") prior to
performing the installation.

Are you absolutely sure you wish to continue (y n) [n]? y

========== preserving local files ==========

No preserve list or findmods list for droot- preserve not executed.
No preserve list or findmods list for dusr- preserve not executed.
No preserve list or findmods list for dvar- preserve not executed.

========== verifying disk space ==========

Do you want to check for space (please do so unless you really understand
the consequences) (y n) [y]? y

The system will now be checked to verify that there is enough disk space
with the current configuration to successfully install the package (and any
selected optional subpackages). For large packages (especially operating
system packages), this can be time consuming...

There is enough space.

========== stripping old links ==========

Stripping links for subpackage droot...
Stripping links for subpackage dusr...
Stripping links for subpackage dvar...

========== extracting files from subpackage archives ==========

rewinding the tape...
Verifying tape id... ok
Forward spacing the tape...

Loading subpackage: droot...
Forward spacing the tape...
Loading subpackage: dusr...
Forward spacing the tape...
Loading subpackage: dvar...
Forward spacing the tape...
rewinding the tape...

========== running comply ==========

running first comply pass...
running second comply pass...
There were no comply messages from the second pass.
```

```
========== doing uncompress Thu Apr 6 11:15:25 MST 1991 ==========

========== cleaning up old versions ==========

An attempt will now be made to clean up any files left over from previous
versions of the software which has just been installed.

Searching for old versions to remove...

========== restoring preserved user files ==========

No preserve list or findmods list for droot- no files restored.
No preserve list or findmods list for dusr- no files restored.
No preserve list or findmods list for dvar- no files restored.

========== running conversion scripts ==========

========== droot.conversion Thu Apr 6 11:15:30 MST 1991 ==========

Diskless Conversion...

Filesystem      Type      kbytes    use       avail     %use      Mounted on
/dev/usr        ffs       541035    293802    247233    54%       /usr

Kbytes free on the server disk: 247233

WARNING! When asked whether or not you want to perform the space check
please answer "yes"

Press [RETURN] to continue: <CR>

You should now install ES/os 2.0. Put ES/os tape 1 in the drive.

Software package installation

Please mount the (first, if multiple tapes) distribution
tape, then press return... <CR>
Rewinding the tape...
Verifying tape id... ok

Extracting packaging information tree... ESos2.0

========== checking subpackages ==========

The following subpackages may be installed:

root          -- ES/os Standard Root Filesystem
m120-1        -- ES/os m/120, RC3240 Kernel and Devices
usr           -- ES/os Standard /usr Filesystem
usr_help      -- ES/os Standard /usr help facilities
usr_dvlp      -- ES/os Standard /usr Development files (header
                 files&libraries)
```

```
usr_terms      -- ES/os Standard /usr Miscellaneous Terminal descriptions
cmplrs         -- MIPS-C Compiler
cmplrs-bsd43   -- MIPS-C 4.3 BSD Include Files and Libraries
man            -- ES/os Manual Pages
bsd43          -- ES/os 4.3 BSD Utilities, Include Files and Libraries
bsd43_troff    -- ES/os 4.3 BSD Troff Utilities and Libraries
bsd43_dvlp     -- ES/os 4.3 BSD Include Files and Libraries
reconfig       -- Kernel Binary Reconfiguration Components
emacs          -- emacs
posix          -- ES/os POSIX P1003.1 Include Files, Commands and Libraries
uucp           -- UUCP
sccs           -- SCCS
news_readers   -- News Readers
games          -- Games
mh             -- mh

========== selecting subpackages ==========
```

Note: At the factory, only the following subpackages will be installed: root, m120-1, usr, cmplrs, man, and bsd43. These subpackages are REQUIRED. You may choose to install any or all of the remaining subpackages depending on your needs and how much disk space you have. At this printing the "default" installation uses @80000 Kbytes. If you install everything available on this tape, you will need @131000 Kbytes.

```
You may select all of the above subpackages by answering "y" to the
following question. If you answer "n" then you will be asked to select the
optional subpackages you would like to have installed.

Install ALL subpackages (y n) [n]? n -> SEE CONFIGURATION INFORMATION

When asked if you want to install a subpackage, please answer with one of
the following:

 y - Yes, you want to install the subpackage
 n - No, you do NOT want to install the subpackage
 l - List the contents of the subpackage and ask me again

Subpackage root will be installed
Subpackage m120-1 will be installed
Subpackage usr will be installed

Install subpackage usr_help (l y n) [n]? n
Install subpackage usr_dvlp (l y n) [n]? n
Install subpackage usr_terms (l y n) [n]? n
Install subpackage cmplrs (l y n) [n]? y
```

```
Install subpackage cmplrs-bsd43 (1 y n) [n]? n
Install subpackage man (1 y n) [n]? y
Install subpackage bsd43 (1 y n) [n]? y
Install subpackage bsd43_troff (1 y n) [n]? n
Install subpackage bsd43_dvlp (1 y n) [n]? n
Install subpackage reconfig (1 y n) [n]? n
Install subpackage emacs (1 y n) [n]? n
Install subpackage posix (1 y n) [n]? n
Install subpackage uucp (1 y n) [n]? n
Install subpackage sccs (1 y n) [n]? n
Install subpackage news_readers (1 y n) [n]? n
Install subpackage games (1 y n) [n]? n
Install subpackage mh (1 y n) [n]? n


Selected subpackages:
root m120-1 usr cmplrs man bsd43
Is this what you want (y n) [y]? y

========== preserving local files ==========

Running preserve -s for subpackage root... 0 files preserved.
No preserve list or findmods list for m120-1- preserve not executed.
Running preserve -s for subpackage usr... 0 files preserved.
No preserve list or findmods list for cmplrs- preserve not executed.
No preserve list or findmods list for man- preserve not executed.
No preserve list or findmods list for bsd43- preserve not executed.

========== verifying disk space ==========

Do you want to check for space (please do so unless you really understand
the consequences) (y n) [y]? y

The system will now be checked to verify that there is enough disk space
with the current configuration to successfully install the package (and any
selected optional subpackages). For large packages (especially operating
system packages), this can be time consuming...

There is enough space.

========== stripping old links ==========

Stripping links for subpackage root...
Stripping links for subpackage usr...
Stripping links for subpackage cmplrs...
Stripping links for subpackage man...
Stripping links for subpackage bsd43...

========== extracting files from subpackage archives ==========
```

```
rewinding the tape...
Verifying tape id... ok
Forward spacing the tape...

Loading subpackage: root...
Forward spacing the tape...
Forward spacing the tape...
Loading subpackage: usr...
Forward spacing the tape...
Loading subpackage: cmplrs...
Forward spacing the tape...
Loading subpackage: man...
Forward spacing the tape...
Loading subpackage: bsd43...
Forward spacing the tape...
rewinding the tape...

========== running comply ==========

running first comply pass...
running second comply pass...
There were no comply messages from the second pass.

========== doing uncompress Thu Dec 6 12:24:25 MST 1990 ==========

uncompress usr/bin/acctcom.Z
uncompress usr/bin/admin.Z
uncompress usr/bin/at.Z
.
. (Uncompresses Occur Here)
.
uncompress usr/new/mh/rmm.Z
uncompress usr/new/mh/scan.Z
uncompress usr/new/mh/send.Z
uncompress usr/new/mh/sortm.Z
uncompress usr/new/mh/vmh.Z
uncompress usr/new/mh/whatnow.Z
uncompress usr/new/mh/whom.Z

========== cleaning up old versions ==========

An attempt will now be made to clean up any files left over from previous
versions of the software which has just been installed.

Searching for old versions to remove...

========== restoring preserved user files ==========

Running preserve -r for subpackage root...
```

```
Running preserve -r for subpackage usr...
No preserve list or findmods list for cmplrs- no files restored.
No preserve list or findmods list for man- no files restored.
No preserve list or findmods list for bsd43- no files restored.

========== running conversion scripts ==========

========== root.fstab Thu Apr 4 12:33:27 MST 1991 ==========

========== cleaning up ==========

Remove install tools (y n) [n]? y

========== installation complete ==========

Are you going to use ES/PEX on any of the clients? (y n) [y]? y

You should now install ES/PEX Server 2.0. Put the ES/PEX Server tape in the
drive.

Software package installation

Please mount the (first, if multiple tapes) distribution
tape, then press return... <CR>
rewinding the tape...
Verifying tape id... ok

Extracting packaging information tree... pexs2.0

========== checking subpackages ==========

The following subpackages may be installed:

executables_s       -- PEX 2.0 Executable Release
library_s           -- PEX 2.0 Library Release
pexs-man            -- PEX 2.0 Man Page Release
fstest              -- fstest Release
xclients_s          -- PEX 2.0 XClients Release
pexs-man-unformat   -- Unformatted Man Page Release
demo_s              -- Demo_s Release

========== selecting subpackages ==========

You may select all of the above subpackages by answering "y" to the
following question. If you answer "n" then you will be asked to select the
optional subpackages you would like to have installed.

Install ALL subpackages (y n) [n]? --> SEE CONFIGURATION INFORMATION

========== setting system clock/calendar ==========

The current value of the clock is: Fri Mar 22 16:37:04 MST 1991
```

```
Is the clock correct (y n) [y]? y

========== verifying single-user mode ==========

This system is not presently in a single-user run level. Installation of a
package can fail if performed at this run level. We recommend that the
system be brought to a single user run level (using "init S") prior to
performing the installation.

Are you absolutely sure you wish to continue (y n) [n]? y

========== preserving local files ==========

Running preserve -s for subpackage executables_s... 2 files preserved.
No preserve list or findmods list for library_s- preserve not executed.
No preserve list or findmods list for pexs-man- preserve not executed.
No preserve list or findmods list for fstest- preserve not executed.
No preserve list or findmods list for xclients_s- preserve not executed.
No preserve list or findmods list for pexs-man-unformat- preserve not
executed.
No preserve list or findmods list for demo_s- preserve not executed.

========== verifying disk space ==========

Do you want to check for space (please do so unless you really understand
the consequences) (y n) [y]? y

The system will now be checked to verify that there is enough disk space
with the current configuration to successfully install the package (and any
selected optional subpackages). For large packages (especially operating
system packages), this can be time consuming...

There is enough space.

========== stripping old links ==========

Stripping links for subpackage executables_s...
Stripping links for subpackage library_s...
Stripping links for subpackage pexs-man...
Stripping links for subpackage fstest...
Stripping links for subpackage xclients_s...
Stripping links for subpackage pexs-man-unformat...
Stripping links for subpackage demo_s...

========== extracting files from subpackage archives ==========

rewinding the tape...
Verifying tape id... ok
Forward spacing the tape...

Loading subpackage: executables_s...
```

```
Forward spacing the tape...
Loading subpackage: library_s...
Forward spacing the tape...
Loading subpackage: pexs-man...
Forward spacing the tape...
Loading subpackage: fstest...
Forward spacing the tape...
Loading subpackage: xclients_s...
Forward spacing the tape...
Loading subpackage: pexs-man-unformat...
Forward spacing the tape...
Loading subpackage: demo_s...

Forward spacing the tape...
rewinding the tape...

========== running comply ==========
running first comply pass...
running second comply pass...
There were no comply messages from the second pass.

========== doing uncompress Fri Mar 22 16:54:41 MST 1991 ==========

========== cleaning up old versions ==========

An attempt will now be made to clean up any files left over from previous
versions of the software which has just been installed.

Searching for old versions to remove...

NOTE:    These messages appear if you have a previous version of ES/PEX
         Server installed on your system.

Clean up pexs.executables_s 1.3 (y n) [n]? y
Removing leftover files from pexs.executables 1.3...
rm ./usr/bin/X11/imake
rm ./usr/bin/X11/sw
rm ./usr/bin/X11/swstart
Clean up pexs.library_s 1.3 (y n) [n]? y
Removing leftover files from pexs.library_s 1.3...
rm ./usr/lib/X11/dsp_ucode
rm ./usr/lib/X11/fonts/misc/roman.esf
Clean up pexs.pexs-man 1.3 (y n) [n]? y
Removing leftover files from pexs.pexs-man 1.3...
rm ./usr/man/catman/x_man/man1/imake.1
Clean up pexs.fstest 1.3 (y n) [n]? y
Removing leftover files from pexs.fstest 1.3...
rm ./usr/people/fstest/diag/esv_sysdiag
```

```
There are no longer any boms present for any subpackages from
//usr/pkg/lib/pexs1.3 version 1.3.
This probably indicates that no subpackages installed from this package are
still present on the system.

Remove the packaging information tree for this package (y n) [y]? y

========== restoring preserved user files ==========

Running preserve -r for subpackage executables_s...
No preserve list or findmods list for library_s- no files restored.
No preserve list or findmods list for pexs-man- no files restored.
No preserve list or findmods list for fstest- no files restored.
No preserve list or findmods list for xclients_s- no files restored.
No preserve list or findmods list for pexs-man-unformat- no files restored.
No preserve list or findmods list for demo_s- no files restored.

========== running conversion scripts ==========

========== pexs-man.conversion Fri Mar 22 16:55:30 MST 1991 ==========

Manpage Conversion...

x_man exists
Making P_man -> catman/P_man softlink...
Done.
========== cleaning up ==========

Remove install tools (y n) [n]? y

========== installation complete ==========

Fixing up all the directories and links...
mv: usr/X11/etc: No such file or directory
ln: Symbolic link ../../var/X11_etc to usr/X11/etc: No such file or
directory
Doing comply for ES/os 2.0 files and directories...

Comply Pass 1... done.
Comply Pass 2... done.

Doing comply for ES/PEX 2.0 files and directories...

Comply Pass 1... done.
Comply Pass 2... done.

No comply errors.

Building diskless database directory and files...
Done.
```

```
========== cleaning up ==========

Remove install tools (y n) [n]? y

========== installation complete ==========

# cd /usr/disklessDB
# ./client.setup

MIPS diskless client installation

The following user entries are for example ONLY!
Operation (add clone modify move del) [add]? add
New Client Machine Name? []? toddler

Is this client the gcpu of an LS system (y n) [n]? y

Enter toddler's inet address [130.62.10.xx] 130.62.10.35
Adding toddler to /etc/hosts.
Mode (master slave client none) [none]? none

Note: Your swap space size should be twice the physical memory of the
Client.

Swap Space Size [32M]? 32M
Client Root Directory [/usr/diskless/clients/toddler]? <CR>
Client Swap File Directory [/usr/diskless/clients/toddler]? <CR>
Client Dump File Directory [/usr/diskless/clients/toddler]?
Read Only usr Directory [/usr/diskless/dl_usr]? <CR>
Building environment for toddler.
Copying root directory... done.
Copying var directory... done.
Creating swap file... done.
Building devices... done.
Copying /etc/hosts for toddler
Creating etc/fstab for toddler
Creating etc/local_hostname for toddler
Adding toddler to /etc/bootparams
Adding toddler to /usr/etc/exports

running /usr/etc/exportfs...
exported /usr/diskless/dl_usr
exported /usr/diskless/clients/toddler
done.

Creating link in /tftpboot for toddler

Starting /etc/rpc.bootparamd... done.

# sync; sync
```

```
# telinit 0

>> auto (follow normal boot procedure at this point)

Autoboot: waiting to load lcs()tftboot/gcpu (CTRL-C to abort, RETURN to
expedite) <CR>

For LS Systems, you will need to boot the second CPU the same as above.

-----------------------------------------------------------------------
```

You now need to modify the **/etc/passwd** file to set up some accounts properly.

1) Login as **root**. Modify **/etc/passwd** file and REPLACE the line:

```
xdm:L..SxyBb0ydh.:21:250:X windowing systems
startup:/usr2/X:/usr/bin/X11/xdmshell
```

with

```
xdm::21:250:X windowing systems
startup:/usr/bin/X11:/usr/bin/X11/xdmrestart
```

2) Add the following line to the end of **/etc/passwd** file.

```
esdemo::102:102:ESV Demo Account:/usr/esdemo:/bin/csh
```

End of installation.

Installation Instructions - ES/Kodak Printer Tape 2.0

In the following procedure, system output is shown in `typewriter normal` font, and user responses are shown in **`typewriter bold`** font. All user responses should be typed as shown and entered with a carriage return.

****

CAUTION: It is recommended that YOU be the only user logged onto the machine while loading this software.

****

To install this tape, insert the ES/Kodak Printer Tape 2.0 into the tape drive, login as **root**, and proceed as follows:

Type **cd /**

Type **/usr/pkg/bin/inst**

```
Software package installation

Install package relative to where [/]? <CR>
Please mount the (first, if multiple tapes) distribution
tape, then press return... <CR>
Rewinding the tape...
Verifying tape id... ok

Extracting packaging information tree... kodak2.0

Installation Information:

Packages will be read in from the local Q24 tape drive.
Machine type: m120-1

Is the information above correct? (y n) [y]? <CR>

========== checking subpackages ==========

The following subpackages may be installed:
kodak                --Kodak 2.0 Release
========== selecting subpackages ==========

You may select all of the above subpackages by answering "y" to the
following question. If you answer "n" then you will be asked to select the
optional subpackages you would like to have installed.

Install ALL subpackages (y n) [n]? y

========== setting system clock/calendar ==========

The current value of the clock is: Wed Apr 10 13:25:26 MDT 1991
Is the clock correct (y n) [y]? <CR>

========== verifying single-user mode ==========
```

```
This system is not presently in a single-user run level. Installation of a
package can fail if performed at this run level. We recommend that the
system be brought to a single user run level (using "init S") prior to
performing the installation.

Are you absolutely sure you wish to continue (y n) [n]? y

========== preserving local files ==========

No preserve list or findmods list for kodak- preserve not executed.

========== verifying disk space ==========

Do you want to check for space (please do so unless you really understand
the consequences) (y n) [y]? y

The system will now be checked to verify that there is enough disk space
with the current configuration to successfully install the package (and any
selected optional subpackages). For large packages (especially operating
system packages), this can be time consuming...

There is enough space.

========== stripping old links ==========

Stripping links for subpackage kodak...

========== extracting files from subpackage archives ==========

rewinding the tape...
Verifying tape id... ok
Forward spacing the tape...

Loading subpackage: kodak...
Forward spacing the tape...
rewinding the tape...

========== running comply ==========

running first comply pass...
running second comply pass...
There were no comply messages from the second pass.

========== doing uncompress Wed Apr 10 13:25:26 MDT 1991 ==========

========== cleaning up old versions ==========

An attempt will now be made to clean up any files left over from previous
versions of the software which has just been installed.

Searching for old versions to remove...

========== restoring preserved user files ==========
```

```
No preserve list or findmods list for kodak- no files restored.

========== cleaning up ==========

Remove install tools (y n) [n]? y

========== installation complete ==========
```

To configure the SCSI printer device for the Kodak printer, type the following while logged on as **root**:

```
mknod /dev/scsi/printer c 16 80; chmod 666 /dev/scsi/printer
```

A. 1.3 to 2.0 C Binding Conversion

Introduction

There have been extensive changes in the PHIGS C binding between the 1.3 Release and the 2.0 Release. These changes have been made to keep the ESV Workstation 2.0 Release current with the PEX-SI releases. The C binding to PHIGS will continue to change until the binding is adopted as a formal standard; therefore, these kinds of changes will continue to occur with future releases of the PEX-SI.

If you want to run PHIGS programs written with the1.3 C binding, you have two options:

- If you choose not to convert your 1.3 C code, the 2.0 Release provides a "thin layer" 1.3 C binding which allows you to rebuild existing 1.3 PHIGS programs with minimal effort. The thin layer will increase the size of the executable image. Currently, Evans & Sutherland will continue support for the thin layer; but if support is terminated, customers will be informed of this decision at least six months in advance.
- If you choose to convert your 1.3 C code, the information in this appendix will assist you in the process of converting source code from the 1.3 C binding to the 2.0 C binding. Some of the hints provided will require you to manually change the source code. Shell scripts are provided which will replace old function names with the new function names.

You should read through this appendix before converting any code to the 2.0 C binding or using the thin layer. On-line 2.0 PHIGS manual pages are provided with the 2.0 Release. These new manual pages will assist you in solving problems that the compiler will identify when your source code is rebuilt. A list of the PHIGS/PHIGS PLUS function names together with the 1.3 and 2.0 C binding names will be found at the end of this appendix.

Running the 1.3 C Thin Layer

1) Change all **include** references from **<X11/extensions/phigs.h>** to **<X11/phigs1.3/phigs.h>**

2) All parts of the **PopenpexInfo** structure need to be defined before the **popenpex** call is made. Most of the sample programs only defined part of the elements.

```
PopenpexInfo   xinfo;

xinfo.display = dpy (or NULL);
xinfo.rdb = NULL;
xinfo.name = "";
xinfo.classname = "";
xinfo.argc_p = NULL;
xinfo.flags.no_monitor = True (or False);
xinfo.flags.force_client_SS = False;
popenpex((Pchar *)NULL, PDEFAULT_MEM_SIZE, &xinfo);
```

If you don't define everything, you will get a bus error. All of these fields may be used by the application, but if they're not, they need to be set as above.

3) In the **Makefile**, add **libPEXapi1.3.a (-lPEXapi1.3)** in front of **libPEXapi.a(-lPEXapi)**.

4) Change **Makefile** references from **libXtR3.a** to **libXt.a**.

5) If necessary, adjust text positions to make them correct. The 2.0 API fixes a bug in the 1.3 server which always reported string length to be one greater than the correct value. This slightly affects the position of centered text.

Converting to the 2.0 C Binding

1) Most routine names have changed.

2) Most enumerated types have changed.

3) Change **Makefile** references from **libXtR3.a** to **libXt.a**.

4) The number of parameters has changed for **ppolyline3**, **ppolymarker3**, **fillarea3**, and **gdp3**. They used to have two parameters (number of points and list of points), but now have one parameter:

```
typedef struct {
        Pint   num_points;
        Ppoint3 *points;
                } Ppoint_list3;
```

The same holds true for the 2D calls.

5) The **Plimit(3)** structure was:

```
typedef struct {
        Pfloat xmin;
        Pfloat xmax;
        Pfloat ymin;
        Pfloat ymax;
        Pfloat zmin;
        Pfloat zmax;
                } Plimit3
```

It is now:

```
typedef struct {
        Pfloat x_min;
        Pfloat x_max;
        Pfloat y_min;
        Pfloat y_max;
        Pfloat z_min;
        Pfloat z_max;
                } Plimit3
```

6) Names of elements of structures have changed for **set_view_representation(3)**, **evaluate_view_orientation_matrix(3)**, and **evaluate_view_mapping_matrix(3)**.

7) **Pcolr_bundl** is now **Pcolr_rep**, and **Pcolr_rep** is a different structure:

```
typedef union {
        Prgb   rgb;
        Pcieluv cieluv;
        Phls   hls;
        Phsv   hsv;
        Pdata  unsupp;
              } Pcolr_rep
```

All of the types inside are new and different from 1.3.

8) **Pvector3** is now **Pvec3**:

```
typedef struct {
        Pfloat  delta_x;
        Pfloat  delta_y;
        Pfloat  delta_z;
              } Pvec3;
```

9) **fillarea3withdata** doesn't exist in 2.0. You should now use **fill_area_set3_data**.

10) **PWAIT** has been changed to **PDEFER_WAIT**. There is also a system variable called ***PWAIT***. If the PHIGS **PWAIT** is not changed you will get very interesting errors when the routine is run. If your PHIGS program was using the **PWAIT** system type, then you need to make sure that doesn't get changed to **PDEFER_WAIT** by running the script.

11) **pinqhlhsrfacll** is now two routines: **pinq_hlhsr_id_facs** and **pinq_hlhsr_mode_facs**.

12) If necessary, adjust text positions to make them correct. The 2.0 API fixes a bug in the 1.3 server which always reported string length to be one greater than the correct value. This slightly affects the position of centered text.

13) This list is not exhaustive, but it contains some of the changes in the 2.0 Release. Most of the remaining changes will be flagged by the compiler.

2.0 Conversion Script

A script is available to assist you in converting from the 1.3 C binding to the 2.0 C binding. The script is located in the **/usr/src/samples/tools** directory, and it will do the following:

- Change the 1.3 routine names to the 2.0 routine names
- Change 1.3 enumerated types to 2.0 enumerated types
- Change 1.3 **#defines** to 2.0 **#defines**
- Flag all routines that had a parameter list change with a **####** at the end of the line

To run the script, enter the following command:

conv2.0 *PATH*/1.3file

where ***PATH*** is the path to the file **1.3file**. The converted program will be put into the file **1.3file.out**. If you move the program from the **/usr/src/samples/tools** directory where it is currently located, you need to move the following four files with it: **conv2.0.list1**, **conv2.0.list2**, **conv2.0.list3**, and **conv2.0.list4**.

Caution: Do not delete your 1.3 program until you are absolutely sure that the 2.0 conversion is complete and the program is running correctly.

List of #defines with Changes

1.3 Binding	2.0 Binding
PRGB	PMODEL_RGB
PCIE	PMODEL_CIELUV
PHSV	PMODEL_HSV
PHLS	PMODEL_HLS
PLN_DOTDASH	PLINE_DOT_DASH
PMK_POINT	PMARKER_DOT
PMK_PLUS	PMARKER_PLUS
PMK_STAR	PMARKER_ASTERISK
PMK_O	PMARKER_CIRCLE
PMK_X	PMARKER_CROSS
PAN_UNCON	PANNO_STYLE_UNCONNECTED
PAN_LEADLINE	PANNO_STYLE_LEAD_LINE

Enumerated Types with Changes

PWORKSTATION_INDEPENDENT	PWS_INDEP
PWORKSTATION_DEPENDENT	PWS_DEP
PPHCL	PSYS_ST_PHCL
PPHOP	PSYS_ST_PHOP
PWSCL	PWS_ST_WSCL
PWSOP	PWS_ST_WSOP
PSTCL	PSTRUCT_ST_STCL
PSTOP	PSTRUCT_ST_STOP
PSTAT_NON_EXISTENT	PSTRUCT_STATUS_NON_EXISTENT
PSTAT_EMPTY	PSTRUCT_STATUS_EMPTY
PSTAT_NON_EMPTY	PSTRUCT_STATUS_NON_EMPTY
PARCL	PST_ARCL
PAROP	PST_AROP
PVECTOR	PCLASS_VEC
PRASTER	PCLASS_RASTER
POTHER	PCLASS_OTHER
POUTPUT	PCAT_OUT
PINPUT	PCAT_IN
POUTIN	PCAT_OUTIN
PMO	PCAT_MO
PMI	PCAT_MI
PCONDITIONALLY	PFLAG_COND
PALWAYS	PFLAG_ALWAYS
PPOSTPONE	PUPD_POSTPONE
PPERFORM	PUPD_PERFORM
PASAP	PDEFER_ASAP
PBNIG	PDEFER_BNIG
PBNIL	PDEFER_BNIL
PASTI	PDEFER_ASTI
PWAIT	PDEFER_WAIT
PDISTG_NO	PDISTING_NO
PDISTG_YES	PDISTING_YES
PCULL_NONE	PCULL_NONE
PCULL_BACKFACE	PCULL_BACKFACE
PCULL_FRONTFACE	PCULL_FRONTFACE
PNIVE	PMODE_NIVE
PUWOR	PMODE_UWOR
PUQUM	PMODE_UQUM
PNOMORE	PSIMULT_NO_MORE
PMORE	PSIMULT_MORE
PCSS	PNET_CSS
PARCHIVE	PNET_ARCHIVE
PDS_EMPTY	PSURF_EMPTY
PDS_NOTEMPTY	PSURF_NOT_EMPTY
PCORRECT	PVISUAL_ST_CORRECT
PDEFERRED	PVISUAL_ST_DEFER

PSIMULATED	PVISUAL_ST_SIMULATED
PPSTRING	PPREC_STRING
PPCHAR	PPREC_CHAR
PPSTROKE	PPREC_STROKE
PTP_RIGHT	PPATH_RIGHT
PTP_LEFT	PPATH_LEFT
PTP_UP	PPATH_UP
PTP_DOWN	PPATH_DOWN
PAH_NORMAL	PHOR_NORM
PAH_LEFT	PHOR_LEFT
PAH_CENTRE	PHOR_CTR
PAH_RIGHT	PHOR_RIGHT
PAV_NORMAL	PVERT_NORM
PAV_TOP	PVERT_TOP
PAV_CAP	PVERT_CAP
PAV_BASE	PVERT_BASE
PAV_BOTTOM	PVERT_BOTTOM
PAV_HALF	PVERT_HALF
PHOLLOW	PSTYLE_HOLLOW
PSOLID	PSTYLE_SOLID
PPATTERN	PSTYLE_PAT
PHATCH	PSTYLE_HATCH
PEMPTY	PSTYLE_EMPTY
PEDGE_OFF	PEDGE_OFF
PEDGE_ON	PEDGE_ON
PLINETYPE	PASPECT_LINETYPE
PLINEWIDTH_SCALE_FACTOR	PASPECT_LINEWIDTH
PPOLYLINE_COLOUR_INDEX	PASPECT_LINE_COLR_IND
PMARKERTYPE	PASPECT_MARKERTYPE
PMARKERSIZE_SCALE_FACTOR	PASPECT_MARKERSIZE
PPOLYMARKER_COLOUR_INDEX	PASPECT_MARKER_COLR_IND
PTEXT_FONT	PASPECT_TEXT_FONT
PTEXT_PRECISION	PASPECT_TEXT_PREC
PCHARACTER_EXPANSION_FACTOR	PASPECT_CHAR_EXPAN
PCHARACTER_SPACING	PASPECT_CHAR_SPACE
PTEXT_COLOUR_INDEX	PASPECT_TEXT_COLR_IND
PINTERIOR_STYLE	PASPECT_INT_STYLE
PINTERIOR_STYLE_INDEX	PASPECT_INT_STYLE_IND
PINTERIOR_COLOUR_INDEX	PASPECT_INT_COLR_IND
PEDGE_FLAG	PASPECT_EDGE_FLAG
PEDGETYPE	PASPECT_EDGETYPE
PEDGEWIDTH_SCALE_FACTOR	PASPECT_EDGEWIDTH
PEDGE_COLOUR_INDEX	PASPECT_EDGE_COLR_IND
PPOLYLINE_SHADING_METHOD	PASPECT_LINE_SHAD_METH
PAREA_PROPERTIES	PASPECT_REFL_PROPS
PINTERIOR_REFLECTANCE_EQUATION	PASPECT_INT_REFL_EQN
PINTERIOR_SHADING_METHOD	PASPECT_INT_SHAD_METH
PBACK_INTERIOR_STYLE	PASPECT_BACK_INT_STYLE

PBACK_INTERIOR_STYLE_INDEX	PASPECT_BACK_INT_STYLE_IND
PBACK_INTERIOR_COLOUR	PASPECT_BACK_INT_COLR
PBACK_AREA_PROPERTIES	PASPECT_BACK_REFL_PROPS
PBACK_INTERIOR_REFLECTANCE_EQUATION	PASPECT_BACK_INT_REFL_EQN
PBACK_INTERIOR_SHADING_METHOD	PASPECT_BACK_INT_SHAD_METH
PCURVE_APPROXIMATION_CRITERIA	PASPECT_CURVE_APPROX_CRIT
PSURFACE_APPROXIMATION_CRITERIA	PASPECT_SURF_APPROX_CRIT
PBUNDLED	PASF_BUNDLED
PINDIVIDUAL	PASF_INDIV
PCOLOUR	PAVAIL_COLR
PMONOCHROME	PAVAIL_MONOCHR
PPRECONCATENATE	PTYPE_PRECONCAT
PPOSTCONCATENATE	PTYPE_POSTCONCAT
PREPLACE	PTYPE_REPLACE
PPARALLEL	PTYPE_PARAL
PPERSPECTIVE	PTYPE_PERSPECT
PCLIP	PIND_CLIP
PNOCLIP	PIND_NO_CLIP
PHIGHER	PPRI_HIGHER
PLOWER	PPRI_LOWER
PMAINTAIN	PRES_MAINTAIN
PABANDON	PRES_ABANDON
PUPDATE	PRES_UPD
PPF_POLYLINE	PFLAG_LINE
PPF_FILLAREA	PFLAG_FILL
PPF_FILLAREA_SET	PFLAG_FILL_SET
PTOP_FIRST	PORDER_TOP_FIRST
PBOTTOM_FIRST	PORDER_BOTTOM_FIRST
PREQUEST	POP_REQ
PSAMPLE	POP_SAMPLE
PEVENT	POP_EVENT
PES_ECHO	PSWITCH_ECHO
PES_NOECHO	PSWITCH_NO_ECHO
PSTAT_OK	PIN_STATUS_OK
PSTAT_NONE	PIN_STATUS_NONE
PSTRUCT_NONE	PSTRUCT_NONE
PSTRUCT_OPEN	PSTRUCT_OPEN
PI_NONE	PIN_NONE
PI_LOCATOR	PIN_LOC
PI_STROKE	PIN_STROKE
PI_VALUATOR	PIN_VAL
PI_CHOICE	PIN_CHOICE
PI_PICK	PIN_PICK
PI_STRING	PIN_STRING
PPR_OFF	PPR_OFF
PPR_ON	PPR_ON
PSET	PINQ_SET
PREALIZED	PINQ_REALIZED

PNOTPENDING	PUPD_NOT_PENDING
PPENDING	PUPD_PENDING
PDC_METERS	PDC_METRES
PDC_OTHER	PDC_OTHER
PIRG	PDYN_IRG
PIMM	PDYN_IMM
PCBS	PDYN_CBS
PPOLYLINE	PATTR_LINE
PPOLYMARKER	PATTR_MARKER
PTEXT	PATTR_TEXT
PINTERIOR	PATTR_INT
PEDGE	PATTR_EDGE
PEL_NIL	PELEM_NIL
PEL_POLYLINE3	PELEM_POLYLINE3
PEL_POLYLINE	PELEM_POLYLINE
PEL_POLYMARKER3	PELEM_POLYMARKER3
PEL_POLYMARKER	PELEM_POLYMARKER
PEL_TEXT3	PELEM_TEXT3
PEL_TEXT	PELEM_TEXT
PEL_ANNOTATION_TEXT_RELATIVE3	PELEM_ANNO_TEXT_REL3
PEL_ANNOTATION_TEXT_RELATIVE	PELEM_ANNO_TEXT_REL
PEL_FILL_AREA3	PELEM_FILL_AREA3
PEL_FILL_AREA	PELEM_FILL_AREA
PEL_FILL_AREA_SET3	PELEM_FILL_AREA_SET3
PEL_FILL_AREA_SET	PELEM_FILL_AREA_SET
PEL_CELL_ARRAY3	PELEM_CELL_ARRAY3
PEL_CELL_ARRAY	PELEM_CELL_ARRAY
PEL_GDP3	PELEM_GDP3
PEL_GDP	PELEM_GDP
PEL_POLYLINE_INDEX	PELEM_LINE_IND
PEL_POLYMARKER_INDEX	PELEM_MARKER_IND
PEL_TEXT_INDEX	PELEM_TEXT_IND
PEL_INTERIOR_INDEX	PELEM_INT_IND
PEL_EDGE_INDEX	PELEM_EDGE_IND
PEL_LINETYPE	PELEM_LINETYPE
PEL_LINEWIDTH_SCALE_FACTOR	PELEM_LINEWIDTH
PEL_POLYLINE_COLOUR_INDEX	PELEM_LINE_COLR_IND
PEL_MARKER_TYPE	PELEM_MARKER_TYPE
PEL_MARKER_SIZE_SCALE_FACTOR	PELEM_MARKER_SIZE
PEL_MARKER_COLOUR_INDEX	PELEM_MARKER_COLR_IND
PEL_TEXT_FONT	PELEM_TEXT_FONT
PEL_TEXT_PRECISION	PELEM_TEXT_PREC
PEL_CHARACTER_EXPANSION_FACTOR	PELEM_CHAR_EXPAN
PEL_CHARACTER_SPACING	PELEM_CHAR_SPACE
PEL_TEXT_COLOUR_INDEX	PELEM_TEXT_COLR_IND
PEL_CHARACTER_HEIGHT	PELEM_CHAR_HT
PEL_CHARACTER_UP_VECTOR	PELEM_ANNO_CHAR_UP_VEC
PEL_TEXT_PATH	PELEM_TEXT_PATH

PEL_TEXT_ALIGNMENT	PELEM_TEXT_ALIGN
PEL_ANNOTATION_TEXT_CHARACTER_HEIGHT	PELEM_ANNO_CHAR_HT
PEL_ANNOTATION_TEXT_CHARACTER_UP_VECTOR	PELEM_ANNO_CHAR_UP_VEC
PEL_ANNOTATION_TEXT_PATH	PELEM_ANNO_PATH
PEL_ANNOTATION_TEXT_ALIGNMENT	PELEM_ANNO_ALIGN
PEL_ANNOTATION_STYLE	PELEM_ANNO_STYLE
PEL_INTERIOR_STYLE	PELEM_INT_STYLE
PEL_INTERIOR_STYLE_INDEX	PELEM_INT_STYLE_IND
PEL_INTERIOR_COLOUR_INDEX	PELEM_INT_COLR_IND
PEL_EDGE_FLAG	PELEM_EDGE_FLAG
PEL_EDGETYPE	PELEM_EDGETYPE
PEL_EDGEWIDTH_SCALE_FACTOR	PELEM_EDGEWIDTH
PEL_EDGE_COLOUR_INDEX	PELEM_EDGE_COLR_IND
PEL_PATTERN_SIZE	PELEM_PAT_SIZE
PEL_PATTERN_REFERENCE_POINT_AND_VECTORS	PELEM_PAT_REF_POINT_VECS
PEL_PATTERN_REFERENCE_POINT	PELEM_PAT_REF_POINT
PEL_ADD_NAMES_TO_SET	PELEM_ADD_NAMES_SET
PEL_REMOVE_NAMES_FROM_SET	PELEM_REMOVE_NAMES_SET
PEL_INDIVIDUAL_ASF	PELEM_INDIV_ASF
PEL_HLHSR_IDENTIFIER	PELEM_HLHSR_ID
PEL_LOCAL_MODELLING_TRANSFORMATION3	PELEM_LOCAL_MODEL_TRAN3
PEL_LOCAL_MODELLING_TRANSFORMATION	PELEM_LOCAL_MODEL_TRAN
PEL_GLOBAL_MODELLING_TRANSFORMATION3	PELEM_GLOBAL_MODEL_TRAN3
PEL_GLOBAL_MODELLING_TRANSFORMATION	PELEM_GLOBAL_MODEL_TRAN
PEL_MODELLING_CLIPPING_VOLUME3	PELEM_MODEL_CLIP_VOL3
PEL_MODELLING_CLIPPING_VOLUME	PELEM_MODEL_CLIP_VOL
PEL_MODELLING_CLIPPING_INDICATOR	PELEM_MODEL_CLIP_IND
PEL_RESTORE_MODELLING_CLIPPING_VOLUME	PELEM_RESTORE_MODEL_CLIP_VOL
PEL_VIEW_INDEX	PELEM_VIEW_IND
PEL_EXECUTE_STRUCTURE	PELEM_EXEC_STRUCT
PEL_LABEL	PELEM_LABEL
PEL_APPLICATION_DATA	PELEM_APPL_DATA
PEL_GSE	PELEM_GSE
PEL_PICK_ID	PELEM_PICK_ID
PEL_POLYLINE_SET3_DATA	PELEM_POLYLINE_SET3_DATA
PEL_FILL_AREA_SET3_DATA	PELEM_FILL_AREA_SET3_DATA
PEL_TRIANGLE_STRIP3_DATA	PELEM_TRI_STRIP3_DATA
PEL_QUADRILATERAL_MESH3_DATA	PELEM_QUAD_MESH3_DATA
PEL_POLYHEDRON3_DATA	PELEM_SET_OF_FILL_AREA_SET3_DATA
PEL_NON_UNIFORM_B_SPLINE_CURVE	PELEM_NUNI_BSP_CURVE
PEL_NON_UNIFORM_B_SPLINE_SURFACE	PELEM_NUNI_BSP_SURF
PEL_EXTENDED_CELL_ARRAY3	PELEM_CELL_ARRAY3_PLUS
PEL_TEXT_COLOUR	PELEM_TEXT_COLR
PEL_POLYMARKER_COLOUR	PELEM_MARKER_COLR
PEL_EDGE_COLOUR	PELEM_EDGE_COLR
PEL_POLYLINE_COLOUR	PELEM_LINE_COLR
PEL_CURVE_APPROXIMATION_CRITERIA	PELEM_CURVE_APPROX_CRIT
PEL_POLYLINE_SHADING_METHOD	PELEM_LINE_SHAD_METH

PEL_INTERIOR_COLOUR	PELEM_INT_COLR
PEL_BACK_INTERIOR_COLOUR	PELEM_BACK_INT_COLR
PEL_BACK_INTERIOR_STYLE	PELEM_BACK_INT_STYLE
PEL_BACK_INTERIOR_STYLE_INDEX	PELEM_BACK_INT_STYLE_IND
PEL_AREA_PROPERTIES	PELEM_REFL_PROPS
PEL_BACK_AREA_PROPERTIES	PELEM_BACK_REFL_PROPS
PEL_INTERIOR_SHADING_METHOD	PELEM_INT_SHAD_METH
PEL_BACK_INTERIOR_SHADING_METHOD	PELEM_BACK_INT_SHAD_METH
PEL_INTERIOR_REFLECTANCE_EQUATION	PELEM_INT_REFL_EQN
PEL_BACK_INTERIOR_REFLECTANCE_EQUATION	PELEM_BACK_INT_REFL_EQN
PEL_SURFACE_APPROXIMATION_CRITERIA	PELEM_SURF_APPROX_CRIT
PEL_TRIM_CURVE_APPROXIMATION_CRITERIA	PELEM_PARA_SURF_CHARACS
PEL_FACE_DISTINGUISHING_MODE	PELEM_FACE_DISTING_MODE
PEL_FACE_CULLING_MODE	PELEM_FACE_CULL_MODE
PEL_LIGHT_SOURCE_STATE	PELEM_LIGHT_SRC_STATE
PEL_DEPTH_CUE_INDEX	PELEM_DCUE_IND
PEL_COLOUR_MAPPING_INDEX	PELEM_COLR_MAP_IND
PEL_RENDERING_COLOUR_MODEL	PELEM_RENDERING_COLR_MODEL
PEL_NUM_EL_TYPES	PELEM_NUM_EL_TYPES
PEDIT_INSERT	PEDIT_INSERT
PEDIT_REPLACE	PEDIT_REPLACE
PDELETE	PFLAG_DELETE
PKEEP	PFLAG_KEEP
PERROR_OFF	PERR_OFF
PERROR_ON	PERR_ON
PBACKWARD	PDIR_BACKWARD
PFORWARD	PDIR_FORWARD
PFAILURE	PSEARCH_STATUS_FAILURE
PSUCCESS	PSEARCH_STATUS_SUCCESS

Routines with Parameter Changes

pawaitevent
pcellarray3
pfillarea
pfillarea3data
pgdp3
pgetloc
pgetpick
pgetstroke3
pincrspasrch3
pinitloc3
pinitstroke3
pinqannotationfacil
pinqchoicest
pinqcolourmodelfacil
pinqcurvsurffacil
pinqdefchoicedata3
pinqdeflocdata
pinqdefpickdata
pinqdefstringdata
pinqdefstrokedata
pinqdefvaldata
pinqdescstruct
pinqextpatrep
pinqgdp3
pinqhlhsrfacil
pinqinvisfilter
pinqlocst3
pinqpatrep
pinqpickst
pinqpredextpatrep
pinqstringst
pinqstrokest
pinqtextfacil
pinqvalst3
pinqwstran
pinqwstypes
ppolyhedron3data
ppolyline3
ppolymarker3
preqloc
preqpick
preqstroke
preqval
pretrievedescstruct
psampleloc
psamplepick
psamplestroke3
psetinvisfilter
psetpatsize
pcellarray
pextcellarray3
pfillarea3
pgdp
pgetchoice
pgetloc3
pgetstroke
pincrspasrch
pinitloc
pinitstroke
pinqancesstruct
pinqarfiles
pinqchoicest3
pinqcurelemcontent
pinqdefchoicedata
pinqdefdisplayupdatest
pinqdeflocdata3
pinqdefpickdata3
pinqdefstringdata3
pinqdefstrokedata3
pinqdefvaldata3
pinqelemcontent
pinqgdp
pinqhilightfilter
pinqintfacil
pinqlocst
pinqmarkerfacil
pinqphigsfacil
pinqpickst3
pinqpredpatrep
pinqstringst3
pinqstrokest3
pinqvalst
pinqwsconntype
pinqwstran3
popenpex
ppolyline
ppolymarker
preqchoice
preqloc3
preqstring
preqstroke3
pretrieveancesstruct
psamplechoice
psampleloc3
psamplestroke
psethilightfilter
psetpatrefptvectors
psetpickfilter

PHIGS Function	1.3 C Binding	2.0 C Binding
ADD NAMES TO SET	paddnameset	padd_names_set
ANNOTATION TEXT RELATIVE	pannotationtextrelative	panno_text_rel
ANNOTATION TEXT RELATIVE 3	pannotationtextrelative3	panno_text_rel3
APPLICATION DATA	papplicationdata	pappl_data
ARCHIVE ALL STRUCTURES	parallstruct	par_all_structs
ARCHIVE STRUCTURE NETWORKS	parstructnet	par_struct_nets
ARCHIVE STRUCTURES	parstruct	par_structs
AWAIT EVENT	pawaitevent	pawait_event
BUILD TRANSFORMATION MATRIX	pbuildtran	pbuild_tran_matrix
BUILD TRANSFORMATION MATRIX 3	pbuildtran3	pbuild_tran_matrix3
CELL ARRAY	pcellarray	pcell_array
CELL ARRAY 3	pcellarray3	pcell_array3
CHANGE STRUCTURE IDENTIFIER	pchangestructid	pchange_struct_id
CHANGE STRUCTURE IDENTIFIER AND REFERENCES	pchangestructidref	pchange_struct_id_refs
CHANGE STRUCTURE REFERENCES	pchangestructref	pchange_struct_refs
CLOSE ARCHIVE FILE	pclosearfile	pclose_ar_file
CLOSE PHIGS	pclosephigs	pclose_phigs
CLOSE STRUCTURE	pclosestruct	pclose_struct
CLOSE WORKSTATION	pclosews	pclose_ws
COMPOSE MATRIX	pcomposematrix	pcompose_matrix
COMPOSE MATRIX 3	pcomposematrix3	pcompose_matrix3
COMPOSE TRANSFORMATION MATRIX	pcomposetran	pcompose_tran_matrix
COMPOSE TRANSFORMATION MATRIX 3	pcomposetran3	pcompose_tran_matrix3
COPY ALL ELEMENTS FROM STRUCTURE	pcopyallelemsstruct	pcopy_all_elems_struct
CREATE STORE	N/A	pcreate_store
DELETE ALL STRUCTURES	pdelallstruct	pdel_all_structs
DELETE ALL STRUCTURES FROM ARCHIVE	pdelallstructar	pdel_all_structs_ar
DELETE ELEMENT	pdelelem	pdel_elem
DELETE ELEMENT RANGE	pdelelemrange	pdel_elem_range
DELETE ELEMENTS BETWEEN LABELS	pdelelemslabels	pdel_elems_labels
DELETE STORE	N/A	pdel_store
DELETE STRUCTURE	pdelstruct	pdel_struct
DELETE STRUCTURE NETWORK	pdelstructnet	pdel_struct_net
DELETE STRUCTURE NETWORKS FROM ARCHIVE	pdelstructnetar	pdel_struct_nets_ar
DELETE STRUCTURES FROM ARCHIVE	pdelstructar	pdel_structs_ar
ELEMENT SEARCH	pelemsrch	pelem_search
EMERGENCY CLOSE PHIGS	pemergencyclosephigs	pemergency_close_phigs
EMPTY STRUCTURE	pemptystruct	pempty_struct

PHIGS Function	1.3 C Binding	2.0 C Binding
ERROR HANDLING	perrorhand	perr_hand
ERROR LOGGING	perrorlog	perr_log
ESCAPE	pescape	pescape
EVALUATE VIEW MAPPING MATRIX	pevalviewmappingmatrix	peval_view_map_matrix
EVALUATE VIEW MAPPING MATRIX 3	pevalviewmappingmatrix3	peval_view_map_matrix3
EVALUATE VIEW ORIENTATION MATRIX	pevalvieworientationmatrix	peval_view_ori_matrix
EVALUATE VIEW ORIENTATION MATRIX 3	pevalvieworientationmatrix3	peval_view_ori_matrix3
EXECUTE STRUCTURE	pexecutestruct	pexecute_struct
FILL AREA	pfillarea	pfill_area
FILL AREA 3	pfillarea3	pfill_area3
FILL AREA SET	pfillareaset	pfill_area_set
FILL AREA SET 3	pfillareaset3	pfill_area_set3
FLUSH DEVICE EVENTS	pflushevents	pflush_events
GENERALIZED DRAWING PRIMITIVE	pgdp	pgdp
GENERALIZED DRAWING PRIMITIVE 3	pgdp3	pgdp3
GENERALIZED STRUCTURE ELEMENT	pgse	pgse
GET CHOICE	pgetchoice	pget_choice
GET ITEM TYPE FROM METAFILE	pgettypemf	pget_item_type
GET LOCATOR	pgetloc	pget_loc
GET LOCATOR 3	pgetloc3	pget_loc3
GET PICK	pgetpick	pget_pick
GET STRING	pgetstring	pget_string
GET STROKE	pgetstroke	pget_stroke
GET STROKE 3	pgetstroke3	pget_stroke3
GET VALUATOR	pgetval	pget_val
INCREMENTAL SPATIAL SEARCH	pincrspasrch	pincr_spa_search
INCREMENTAL SPATIAL SEARCH 3	pincrspasrch3	pincr_spa_search3
INITIALIZE CHOICE	pinitchoice	pinit_choice
INITIALIZE CHOICE 3	pinitchoice3	pinit_choice3
INITIALIZE LOCATOR	pinitloc	pinit_loc
INITIALIZE LOCATOR 3	pinitloc3	pinit_loc3
INITIALIZE PICK	pinitpick	pinit_pick
INITIALIZE PICK 3	pinitpick3	pinit_pick3
INITIALIZE STRING	pinitstring	pinit_string
INITIALIZE STRING 3	pinitstring3	pinit_string3
INITIALIZE STROKE	pinitstroke	pinit_stroke
INITIALIZE STROKE 3	pinitstroke 3	pinit_stroke3

PHIGS Function	1.3 C Binding	2.0 C Binding
INITIALIZE VALUATOR	pinitval	pinit_val
INITIALIZE VALUATOR 3	pinitval3	pinit_val3
INQUIRE ALL CONFLICTING STRUCTURES	pinqallconfstruct	pinq_all_conf_structs
INQUIRE ANNOTATION FACILITIES	pinqannotationfacil	pinq_anno_facs
INQUIRE ARCHIVE FILES	pinqarfiles	pinq_ar_files
INQUIRE ARCHIVE STATE VALUE	pinqarst	pinq_ar_st
INQUIRE CHOICE DEVICE STATE	pinqchoicest	pinq_choice_st
INQUIRE CHOICE DEVICE STATE 3	pinqchoicest3	pinq_choice_st3
INQUIRE COLOUR FACILITIES	pinqcolourfacil	pinq_colr_facs
INQUIRE COLOUR MODEL	pinqcolourmodel	pinq_colr_model
INQUIRE COLOUR MODEL FACILITIES	pinqcolourmodelfacil	pinq_colr_model_facs
INQUIRE COLOUR REPRESENTATION	pinqcolourrep	pinq_colr_rep
INQUIRE CONFLICT RESOLUTION	pinqconfres	pinq_conf_res
INQUIRE CONFLICTING STRUCTURES IN NETWORK	pinqconfstructinnet	pinq_conf_structs_net
INQUIRE CURRENT ELEMENT CONTENT	pinqcurelemcontent	pinq_cur_elem_content
INQUIRE CURRENT ELEMENT TYPE AND SIZE	pinqcurelemtypesize	pinq_cur_elem_type_size
INQUIRE DEFAULT CHOICE DEVICE DATA	pinqdefchoicedata	pinq_def_choice_data
INQUIRE DEFAULT CHOICE DEVICE DATA 3	pinqdefchoicedata3	pinq_def_choice_data3
INQUIRE DEFAULT DISPLAY UPDATE STATE	pinqdefdisplayupdatest	pinq_def_disp_upd_st
INQUIRE DEFAULT LOCATOR DEVICE DATA	pinqdeflocdata	pinq_def_loc_data
INQUIRE DEFAULT LOCATOR DEVICE DATA 3	pinqdeflocdata3	pinq_def_loc_data3
INQUIRE DEFAULT PICK DEVICE DATA	pinqdefpickdata	pinq_def_pick_data
INQUIRE DEFAULT PICK DEVICE DATA 3	pinqdefpickdata3	pinq_def_pick_data3
INQUIRE DEFAULT STRING DEVICE DATA	pinqdefstringdata	pinq_def_string_data
INQUIRE DEFAULT STRING DEVICE DATA 3	pinqdefstringdata3	pinq_def_string_data3
INQUIRE DEFAULT STROKE DEVICE DATA	pinqdefstrokedata	pinq_def_stroke_data
INQUIRE DEFAULT STROKE DEVICE DATA 3	pinqdefstrokedata3	pinq_def_stroke_data3
INQUIRE DEFAULT VALUATOR DEVICE DATA	pinqdefvaldata	pinq_def_val_data
INQUIRE DEFAULT VALUATOR DEVICE DATA 3	pinqdefvaldata3	pinq_def_val_data3
INQUIRE DISPLAY SPACE SIZE	pinqdisplayspacesize	pinq_disp_space_size
INQUIRE DISPLAY SPACE SIZE 3	pinqdisplayspacesize3	pinq_disp_space_size3
INQUIRE DISPLAY UPDATE STATE	pinqdisplayupdatest	pinq_disp_upd_st
INQUIRE DYNAMICS OF STRUCTURES	pinqdynstruct	pinq_dyns_structs
INQUIRE DYNAMICS OF WORKSTATION ATTRIBUTES	pinqdynwsattr	pinq_dyns_ws_attrs
INQUIRE EDGE FACILITIES	pinqedgefacil	pinq_edge_facs
INQUIRE EDGE REPRESENTATION	pinqedgerep	pinq_edge_rep
INQUIRE EDIT MODE	pinqeditmode	pinq_edit_mode
INQUIRE ELEMENT CONTENT	pinqelemcontent	pinq_elem_content

PHIGS Function	1.3 C Binding	2.0 C Binding
INQUIRE ELEMENT POINTER	pinqelemptr	pinq_elem_ptr
INQUIRE ELEMENT TYPE AND SIZE	pinqelemtypesize	pinq_elem_type_size
INQUIRE ERROR HANDLING MODE	pinqerrorhandmode	pinq_err_hand_mod
INQUIRE GENERALIZED DRAWING PRIMITIVE	pinqgdp	pinq_gdp
INQUIRE GENERALIZED DRAWING PRIMITIVE 3	pinqgdp3	pinq_gdp3
INQUIRE GENERALIZED STRUCTURE ELEMENT FACILITIES	pinqgsefacil	pinq_gse_facs
INQUIRE HIGHLIGHTING FILTER	pinqhilightfilter	pinq_highl_filter
INQUIRE HLHSR FACILITIES	pinqhlhsrfacil	N/S
INQUIRE HLHSR IDENTIFIER FACILITIES	N/S	pinq_hlhsr_id_facs
INQUIRE HLHSR MODE	pinqhlhsrmode	pinq_hlhsr_mode
INQUIRE HLHSR MODE FACILITIES	N/S	pinq_hlhsr_mode_facs
INQUIRE INPUT QUEUE OVERFLOW	pinqinputoverflow	pinq_in_overf
INQUIRE INTERIOR FACILITIES	pinqintfacil	pinq_int_facs
INQUIRE INTERIOR REPRESENTATION	pinqintrep	pinq_int_rep
INQUIRE INVISIBILITY FILTER	pinqinvisfilter	pinq_invis_filter
INQUIRE LIST OF AVAILABLE GENERALIZED DRAWING PRIMITIVES	pinqavailgdp	pinq_list_avail_gdp
INQUIRE LIST OF AVAILABLE GENERALIZED DRAWING PRIMITIVES 3	pinqavailgdp3	pinq_list_avail_gdp3
INQUIRE LIST OF AVAILABLE GENERALIZED STRUCTURE ELEMENTS	pinqgse	pinq_list_avail_gse
INQUIRE LIST OF AVAILABLE WORKSTATION TYPES	pinqwstypes	pinq_list_avail_ws_types
INQUIRE LIST OF COLOUR INDICES	pinqcolourind	pinq_list_colr_inds
INQUIRE LIST OF EDGE INDICES	pinqedgeind	pinq_list_edge_inds
INQUIRE LIST OF INTERIOR INDICES	pinqintind	pinq_list_int_inds
INQUIRE LIST OF PATTERN INDICES	pinqpatind	pinq_list_pat_inds
INQUIRE LIST OF POLYLINE INDICES	pinqlineind	pinq_list_line_inds
INQUIRE LIST OF POLYMARKER INDICES	pinqmarkerind	pinq_list_marker_inds
INQUIRE LIST OF TEXT INDICES	pinqtextind	pinq_list_text_inds
INQUIRE LIST OF VIEW INDICES	pinqviewind	pinq_list_view_inds
INQUIRE LOCATOR DEVICE STATE	pinqlocst	pinq_loc_st
INQUIRE LOCATOR DEVICE STATE 3	pinqlocst3	pinq_loc_st3
INQUIRE MODELLING CLIPPING FACILITIES	pinqmodelclipfacil	pinq_model_clip_facs
INQUIRE MORE SIMULTANEOUS EVENTS	pinqmoreevents	pinq_more_simult_events
INQUIRE NUMBER OF AVAILABLE LOGICAL INPUT DEVICES	pinqnuminput	pinq_num_avail_in
INQUIRE NUMBER OF DISPLAY PROIRITIES SUPPORTED	pinqnumdisplaypri	pinq_num_disp_pris
INQUIRE OPEN STRUCTURE	pinqopenstruct	pinq_open_struct
INQUIRE PATHS TO ANCESTORS	pinqancesstruct	pinq_paths_ances
INQUIRE PATHS TO DESCENDANTS	pinqdescstruct	pinq_paths_descs
INQUIRE PATTERN FACILITIES	pinqpatfacil	pinq_pat_facs
INQUIRE PATTERN REPRESENTATION	pinqpatrep	pinq_pat_rep

PHIGS Function	1.3 C Binding	2.0 C Binding
NQUIRE PHIGS FACILITIES	pinqphigsfacil	pinq_phigs_facs
IINQUIRE PICK DEVICE STATE	pinqpickst	pinq_pick_st
INQUIRE PICK DEVICE STATE 3	pinqpickst3	pinq_pick_st3
INQUIRE POLYLINE FACILITIES	pinqlinefacil	pinq_line_facs
INQUIRE POLYLINE REPRESENTATION	pinqlinerep	pinq_line_rep
INQUIRE POLYMARKER FACILITIES	pinqmarkerfacil	pinq_marker_facs
INQUIRE POLYMARKER REPRESENTATION	pinqmarkerrep	pinq_marker_rep
INQUIRE POSTED STRUCTURES	pinqpostedstruct	pinq_posted_structs
INQUIRE PREDEFINED COLOUR REPRESENTATION	pinqpredcolourrep	pinq_pred_colr_rep
INQUIRE PREDEFINED EDGE REPRESENTATION	pinqprededgerep	pinq_pred_edge_rep
INQUIRE PREDEFINED INTERIOR REPRESENTATION	pinqpredintrep	pinq_pred_int_rep
INQUIRE PREDEFINED PATTERN REPRESENTATION	pinqpredpatrep	pinq_pred_pat_rep
INQUIRE PREDEFINED POLYLINE REPRESENTATION	pinqpredlinerep	pinq_pred_line_rep
INQUIRE PREDEFINED POLYMARKER REPRESENTATION	pinqpredmarkerrep	pinq_pred_marker_rep
INQUIRE PREDEFINED TEXT REPRESENTATION	pinqpredtextrep	pinq_pred_text_rep
INQUIRE PREDEFINED VIEW REPRESENTATION	pinqpredviewrep	pinq_pred_view_rep
INQUIRE SET OF OPEN WORKSTATIONS	pinqsetopenws	pinq_set_open_ws
INQUIRE SET OF WORKSTATIONS TO WHICH POSTED	pinqsetwsposted	pinq_wss_posted
INQUIRE STRING DEVICE STATE	pinqstringst	pinq_string_st
INQUIRE STRING DEVICE STATE 3	pinqstringst3	pinq_string_st3
INQUIRE STROKE DEVICE STATE	pinqstrokest	pinq_stroke_st
INQUIRE STROKE DEVICE STATE 3	pinqstrokest3	pinq_stroke_st3
INQUIRE STRUCTURE IDENTIFIERS	pinqstructids	pinq_struct_ids
INQUIRE STRUCTURE STATE VALUE	pinqstructst	pinq_struct_st
INQUIRE STRUCTURE STATUS	pinqstructstatus	pinq_struct_status
INQUIRE SYSTEM STATE VALUE	pinqsystemst	pinq_sys_st
INQUIRE TEXT EXTENT	pinqtextextent	pinq_text_extent
INQUIRE TEXT FACILITIES	pinqtextfacil	pinq_text_facs
INQUIRE TEXT REPRESENTATION	pinqtextrep	pinq_text_rep
INQUIRE VALUATOR DEVICE STATE	pinqvalst	pinq_val_st
INQUIRE VALUATOR DEVICE STATE 3	pinqvalst3	pinq_val_st3
INQUIRE VIEW FACILITIES	pinqviewfacil	pinq_view_facs
INQUIRE VIEW REPRESENTATION	pinqviewrep	pinq_view_rep
INQUIRE WORKSTATION CATEGORY	pinqwscategory	pinq_ws_cat
INQUIRE WORKSTATION CLASSIFICATION	pinqwsclass	pinq_ws_class
INQUIRE WORKSTATION CONNECTION AND TYPE	pinqwsconntype	pinq_ws_conn_type
INQUIRE WORKSTATION STATE TABLE LENGTHS	pinqwsstlable	pinq_ws_st_table
INQUIRE WORKSTATION STATE VALUE	pinqwsst	pinq_ws_st

PHIGS Function	1.3 C Binding	2.0 C Binding
INQUIRE WORKSTATION TRANSFORMATION	pinqwstran	pinq_ws_tran
INQUIRE WORKSTATION TRANSFORMATION 3	pinqwstran3	pinq_ws_tran3
INTERPRET ITEM	pinterpret	pinterpret_item
LABEL	plabel	plabel
MESSAGE	pmessage	pmessage
OFFSET ELEMENT POINTER	poffsetelemptr	poffset_elem_ptr
OPEN ARCHIVE FILE	popenarfile	popen_ar_file
OPEN PEX	popenpex	popen_xphigs
OPEN PHIGS	popenphigs	popen_phigs
OPEN STRUCTURE	popenstruct	popen_struct
OPEN WORKSTATION	popenws	popen_ws
POLYLINE	ppolyline	ppolyline
POLYLINE 3	ppolyline3	ppolyline3
POLYMARKER	ppolymarker	ppolymarker
POLYMARKER 3	ppolymarker3	ppolymarker3
POST STRUCTURE	ppoststruct	ppost_struct
READ ITEM FROM METAFILE	preadmf	pread_item
REDRAW ALL STRUCTURES	predrawallstruct	predraw_all_structs
REMOVE NAMES FROM SET	premovenameset	premove_names_set
REQUEST CHOICE	preqchoice	preq_choice
REQUEST LOCATOR	preqloc	preq_loc
REQUEST LOCATOR 3	preqloc3	preq_loc3
REQUEST PICK	preqpick	preq_pick
REQUEST STRING	preqstring	preq_string
REQUEST STROKE	preqstroke	preq_stroke
REQUEST STROKE 3	preqstroke3	preq_stroke3
REQUEST VALUATOR	preqval	preq_val
RESTORE MODELLING CLIPPING VOLUME	prestoremodelclipvolume	prestore_model_clip_vol
RETRIEVE ALL STRUCTURES	pretrieveallstruct	pret_all_structs
RETRIEVE PATHS TO ANCESTORS	pretrieveancesstruct	pret_paths_ances
RETRIEVE PATHS TO DESCENDANTS	pretrievedescstruct	pret_paths_descs
RETRIEVE STRUCTURE IDENTIFIERS	pretrievestructids	pret_struct_ids
RETRIEVE STRUCTURE NETWORKS	pretrievestructnet	pret_struct_nets
RETRIEVE STRUCTURES	pretrievestruct	pret_structs
ROTATE	protate	protate
ROTATE X	protatex	protate_x
ROTATE Y	protatey	protate_y
ROTATE Z	protatez	protate_z

PHIGS Function	1.3 C Binding	2.0 C Binding
SAMPLE CHOICE	psamplechoice	psample_choice
SAMPLE LOCATOR	psampleloc	psample_loc
SAMPLE LOCATOR 3	psampleloc3	psample_loc3
SAMPLE PICK	psamplepick	psample_pick
SAMPLE STRING	psamplestring	psample_string
SAMPLE STROKE	psamplestroke	psample_stroke
SAMPLE STROKE 3	psamplestroke3	psample_stroke3
SAMPLE VALUATOR	psampleval	psample_val
SCALE	pscale	pscale
SCALE 3	pscale3	pscale3
SET ANNOTATION STYLE	psetannotationstyle	pset_anno_style
SET ANNOTATION TEXT ALIGNMENT	psetannotationalign	pset_anno_align
SET ANNOTATION TEXT CHARACTER HEIGHT	psetannotationcharheight	pset_anno_char_ht
SET ANNOTATION TEXT CHARACTER UP VECTOR	psetannotationcharup	pset_anno_char_up_vec
SET ANNOTATION TEXT PATH	psetannotationpath	pset_anno_path
SET CHARACTER EXPANSION FACTOR	psetcharexpan	pset_char_expan
SET CHARACTER HEIGHT	psetcharheight	pset_char_ht
SET CHARACTER SPACING	psetcharspace	pset_char_space
SET CHARACTER UP VECTOR	psetcharup	pset_char_up_vec
SET CHOICE MODE	psetchoicemode	pset_choice_mode
SET COLOUR MODEL	psetcolourmodel	pset_colr_model
SET COLOUR REPRESENTATION	psetcolourrep	pset_colr_rep
SET CONFLICT RESOLUTION	psetconfres	pset_conf_res
SET DISPLAY UPDATE STATE	psetdisplayupdatest	pset_disp_upd_st
SET EDGE COLOUR INDEX	psetedgecolourind	pset_edge_colr_ind
SET EDGE FLAG	psetedgeflag	pset_edge-flag
SET EDGE INDEX	psetedgeind	pset_edge_ind
SET EDGE REPRESENTATION	psetedgerep	pset_edge_rep
SET EDGETYPE	psetedgetype	pset_edgetype
SET EDGEWIDTH SCALE FACTOR	psetedgewidth	pset_edgewidth
SET EDIT MODE	peteditmode	pset_edit_mode
SET ELEMENT POINTER	psetelemptr	pset_elem_ptr
SET ELEMENT POINTER AT LABEL	psetelemptrlabel	pset_elem_ptr_label
SET ERROR HANDLING	N/A	pset_err_hand
SET ERROR HANDLING MODE	pseterrorhandmode	pset_err_hand_mode
SET GLOBAL TRANSFORMATION	psetglobaltran	pset_global_tran
SET GLOBAL TRANSFORMATION 3	psetglobaltran3	pset_global_tran3
SET HIGHLIGHTING FILTER	psethilightfilter	pset_highl_filter

PHIGS Function	1.3 C Binding	2.0 C Binding
SET HLHSR IDENTIFIER	psethlhsrid	pset_hlhsr_id
SET HLHSR MODE	psethlhsrmode	pset_hlhsr_mode
SET INDIVIDUAL ASF	psetindivasf	pset_indiv_asf
SET INTERIOR COLOUR INDEX	psetintcolourind	pset_int_colr_ind
SET INTERIOR INDEX	psetintind	pset_int_ind
SET INTERIOR REPRESENTATION	psetintrep	pset_int_rep
SET INTERIOR STYLE	psetintstyle	pset_int_style
SET INTERIOR STYLE INDEX	psetintstyleind	pset_int_style_ind
SET INVISIBILITY FILTER	psetinvisfilter	pset_invis_filter
SET LINETYPE	psetlinetype	pset_linetype
SET LINEWIDTH SCALE FACTOR	psetlinewidth	pset_linewidth
SET LOCAL TRANSFORMATION	psetlocaltran	pset_local_tran
SET LOCAL TRANSFORMATION 3	psetlocaltran3	pset_local_tran3
SET LOCATOR MODE	psetlocmode	pset_loc_mode
SET MARKER SIZE SCALE FACTOR	psetmarkersize	pset_marker_size
SET MARKER TYPE	psetmarkertype	pset_marker_type
SET MODELLING CLIPPING INDICATOR	psetmodelclipindicator	pset_model_clip_ind
SET MODELLING CLIPPING VOLUME	psetmodelclipvolume	pset_model_clip_vol
SET MODELLING CLIPPING VOLUME 3	psetmodelclipvolume3	pset_model_clip_vol3
SET PATTERN REFERENCE POINT	psetpatrefpt	pset_pat_ref_point
SET PATTERN REFERENCE POINT AND VECTORS	psetpatrefptvectors	pset_pat_ref_point_vecs
SET PATTERN REPRESENTATION	psetpatrep	pset_pat_rep
SET PATTERN SIZE	psetpatsize	pset_pat_size
SET PICK FILTER	psetpickfilter	pset_pick_filter
SET PICK IDENTIFIER	psetpickid	pset_pick_id
SET PICK MODE	psetpickmode	pset_pick_mode
SET POLYLINE COLOUR INDEX	psetlinecolourind	pset_line_colr_ind
SET POLYLINE INDEX	psetlineind	pset_line_ind
SET POLYLINE REPRESENTATION	psetlinerep	pset_line_rep
SET POLYMARKER COLOUR INDEX	psetmarkercolourind	pset_marker_colr_ind
SET POLYMARKER INDEX	psetmarkerind	pset_marker_ind
SET POLYMARKER REPRESENTATION	psetmarkerrep	pset_marker_rep
SET STRING MODE	psetstringmode	pset_string_mode
SET STROKE MODE	psetstrokemode	pset_stroke_mode
SET TEXT ALIGNMENT	psettextalign	pset_text_align
SET TEXT COLOUR INDEX	psettextcolourind	pset_text_colr_ind
SET TEXT FONT	psettextfont	pset_text_font
SET TEXT INDEX	psettextind	pset_text_ind

PHIGS Function	1.3 C Binding	2.0 C Binding
SET TEXT PATH	psettextpath	pset_text_path
SET TEXT PRECISION	psettextprec	pset_text_prec
SET TEXT REPRESENTATION	psettextrep	pset_text_rep
SET VALUATOR MODE	psetvalmode	pset_val_mode
SET VIEW INDEX	psetviewind	pset_view_ind
SET VIEW REPRESENTATION	psetviewrep	pset_view_rep
SET VIEW REPRESENTATION 3	psetviewrep3	pset_view_rep3
SET VIEW TRANSFORMATION INPUT PRIORITY	psetviewtraninputpri	pset_view_tran_in_pri
SET WORKSTATION VIEWPORT	psetwsviewport	pset_ws_vp
SET WORKSTATION VIEWPORT 3	psetwsviewport3	pset_ws_vp3
SET WORKSTATION WINDOW	psetwswindow	pset_ws_win
SET WORKSTATION WINDOW 3	psetwswindow3	pset_ws_win3
TEXT	ptext	ptext
TEXT 3	ptext3	ptext3
TRANSFORM POINT	ptranpt	ptran_point
TRANSFORM POINT 3	ptranpt3	ptran_point3
TRANSLATE	ptranslate	ptranslate
TRANSLATE 3	ptranslate3	ptranslate3
UNPOST ALL STRUCTURES	punpostallstruct	punpost_all_structs
UNPOST STRUCTURE	punpoststruct	punpost_struct
UPDATE WORKSTATION	pupdatews	pupd_ws
WRITE ITEM TO METAFILE	pwritemf	pwrite_item

PHIGS PLUS/PEX Function	1.3 C Binding	2.0 C Binding
CELL ARRAY 3 PLUS	pextcellarray3	pcell_array3_plus
COMPUTE FILL AREA SET GEOMETRIC NORMAL	pcompfillareasetgnorm	pcomp_fill_area_set_gnorm
FILL AREA SET 3 WITH DATA	pfillarea3data / pfillareaset3data	pfill_area_set3_data
INQUIRE CURVE AND SURFACE FACILITIES	pinqcurvsurffacil	pinq_curv_surf_facs
INQUIRE DEPTH CUE FACILITIES	pinqdcuefacil	pinq_dcue_facs
INQUIRE DEPTH CUE REPRESENTATION	pinqdcuerep	pinq_dcue_rep
INQUIRE DIRECT COLOUR MODEL FACILITIES	pinqdirectcolourmodelfacil	pinq_direct_colr_model_facs
INQUIRE DYNAMICS OF WORKSTATION PLUS	pinqdynwsattr	pinq_dyns_ws_attrs_plus
INQUIRE EDGE REPRESENTATION PLUS	pinqextedgerep	pinq_edge_rep_plus
INQUIRE INTERIOR FACILITIES PLUS	pinqextintfacil	pinq_int_facs_plus
INQUIRE INTERIOR REPRESENTATION PLUS	pinqextintrep	pinq_int_rep_plus
INQUIRE LIGHT SOURCE FACILITIES	pinqlightsrcfacil	pinq_light_src_facs
INQUIRE LIGHT SOURCE REPRESENTATION	pinqlightsrcrep	pinq_light_src_rep
INQUIRE LIST OF DEPTH CUE INDICES	pinqdcueind	pinq_list_dcue_inds
INQUIRE LIST OF LIGHT SOURCE INDICES	pinqlightsrcind	pinq_list_light_src_inds
INQUIRE PATTERN REPRESENTATION PLUS	pinqextpatrep	pinq_pat_rep_plus
INQUIRE POLYLINE FACILITIES PLUS	pinqextlinefacil	pinq_line_facs_plus
INQUIRE POLYLINE REPRESENTATION PLUS	pinqextlinerep	pinq_line_rep_plus
INQUIRE POLYMARKER REPRESENTATION PLUS	pinqextmarkerrep	pinq_marker_rep_plus
INQUIRE PREDEFINED DEPTH CUE REPRESENTATION	pinqpreddcuerep	pinq_pred_dcue_rep
INQUIRE PREDEFINED EDGE REPRESENTATION PLUS	pinqpredextedgerep	pinq_pred_edge_rep_plus
INQUIRE PREDEFINED INTERIOR REPRESENTATION PLUS	pinqpredextintrep	pinq_pred_int_rep_plus
INQUIRE PREDEFINED LIGHT SOURCE REPRESENTATION	pinqpredlightsrcrep	pinq_pred_light_src_rep
INQUIRE PREDEFINED PATTERN REPRESENTATION PLUS	pinqpredextpatrep	pinq_pred_pat_rep_plus
INQUIRE PREDEFINED POLYLINE REPRESENTATION PLUS	pinqpredextlinerep	pinq_pred_line_rep_plus
INQUIRE PREDEFINED POLYMARKER REPRESENTATION PLUS	pinqpredextmarkerrep	pinq_pred_marker_rep_plus
INQUIRE PREDEFINED TEXT REPRESENTATION PLUS	pinqpredexttextrep	pinq_pred_text_rep_plus
INQUIRE RENDERING COLOUR MODEL FACILITIES	N/A	pinq_rendering_colr_model_facs
INQUIRE TEXT REPRESENTATION PLUS	pinqexttextrep	pinq_text_rep_plus
INQUIRE WORKSTATION STATE TABLE LENGTHS PLUS	pinqextwsstlable	pinq_ws_st_table_plus
NON-UNIFORM B-SPLINE CURVE	N/A	pnuni_bsp_curv
NON-UNIFORM B-SPLINE SURFACE	N/A	pnuni_bsp_surf
POLYLINE SET 3 WITH DATA	ppolylineset3data	ppolyline_set3_data
QUADRILATERAL MESH 3 WITH DATA	pquad3data	pquad_mesh3_data
SET REFLECTANCE PROPERTIES	psetareaprop	pset_refl_props
SET BACK REFLECTANCE PROPERTIES	psetbackareaprop	pset_back_refl_prop
SET BACK INTERIOR COLOUR	psetbackintcolour	pset_back_int_colr
SET BACK INTERIOR REFLECTANCE EQUATION	psetbackintreflecteq	pset_back_refl_eqn

PHIGS PLUS/PEX Function	1.3 C Binding	2.0 C Binding
SET BACK INTERIOR SHADING METHOD	psetbackintshadmethod	pset_back_int_shad_meth
SET BACK INTERIOR STYLE	psetbackintstyle	pset_back_int_style
SET BACK INTERIOR STYLE INDEX	psetbackintstyleInd	pset_back_int_style_Ind
SET CURVE APPROXIMATION CRITERIA	psetcurvapprox	pset_curve_approx
SET DEPTH CUE INDEX	psetdcueind	pset_dcue_Ind
SET DEPTH CUE REPRESENTATION	psetdcuerep	pset_dcue_rep
SET EDGE COLOUR	psetedgecolour	pset_edge_colr
SET EDGE REPRESENTATION PLUS	psetextedgerep	pset_edge_rep_plus
SET FACE CULLING MODE	psetfaceculimode	pset_face_cull_mode
SET FACE DISTINGUISHING MODE	psetfacedistgmode	pset_face_disting_mode
SET INTERIOR COLOUR	psetintcolour	pset_int_colr
SET INTERIOR REFLECTANCE EQUATION	psetintreflecteq	pset_refl_eqn
SET INTERIOR REPRESENTATION PLUS	psetextintrep	pset_int_rep_plus
SET INTERIOR SHADING METHOD	psetintshadmethod	pset_int_shad_meth
SET LIGHT SOURCE REPRESENTATION	psetlightsrcrep	pset_light_src_rep
SET LIGHT SOURCE STATE	psetlightsrcstate	pset_light_src_state
SET OF FILL AREA SET 3 WITH DATA	N/A	pset_of_fill_area_set3_data
SET PARAMETRIC SURFACE CHARACTERISTICS	N/A	pset_para_surf_characs
SET PATTERN REPRESENTATION PLUS	psetextpatrep	pset_pat_rep_plus
SET POLYLINE COLOUR	psetlinecolour	pset_line_colr
SET POLYLINE REPRESENTATION PLUS	psetextlinerep	pset_line_rep_plus
SET POLYLINE SHADING METHOD	psetlineshadmethod	pset_line_shad_meth
SET POLYMARKER COLOUR	psetmarkercolour	pset_marker_colr
SET POLYMARKER REPRESENTATION PLUS	psetextmarkerrep	pset_marker_rep_plus
SET RENDERING COLOUR MODEL	N/A	pset_rendering_colr_model
SET SURFACE APPROXIMATION CRITERIA	psetsurfapprox	pset_surf_approx
SET TEXT COLOUR	psettextcolour	pset_text_colr
SET TEXT REPRESENTATION PLUS	psetextfontrep	pset_text_rep_plus
TRIANGLE STRIP 3 WITH DATA	ptri3data	ptri_strip3_data

B. Change Pages

The following change pages for the ESV Workstation documentation are attached.

ESV Workstation Applications and Options [2.0]

"Helpful Hints"

Add these pages to the "Helpful Hints" section in this volume.

"Application Notes"

Add these pages to the "Application Notes" section in this volume.

ES/PSX Document Set II

Table of Contents

Substitute these pages for the Table of Contents in the appendices of the *ES/PSX Document Set II*

Appendix I "Physical I/O"

Add these pages to the appendices of the *ES/PSX Document Set II*.

Appendix H "Release Distribution"

Substitute these pages for appendix H, "Release Distribution" in the *ES/PSX Document Set II*.

Helpful Hints

For convenience, the helpful hints are divided into the following three categories:

- System,
- ES/PSX,
- ES/PEX.

System

Porting From BSD-Derived Systems

ES/os compiles programs under System V or BSD depending on the following:

- The setting of the ***PATH*** variable in your environment,
- Use of the **-systype** option to the compile command.

In order to successfully compile programs for BSD functionality, you must do one of two things:

1) Use the compile time switch **-systype bsd43** which prepends **/bsd43** to the path for include files and libraries:

```
% cc -systype bsd43 -g -o sample sample.c
```

2) Place **/bsd43/bin** before **/bin** in the ***PATH*** variable in your **.cshrc**, **.profile**, or **.login** file. When you compile, your system goes to the **/bsd43** command directory and uses the BSD **cc** command which contains the switch **-systype bsd43**.

If you want to compile a program for System V functionality and you have placed **/bsd43** in your path prior to **/bin**, you must use the **-systype sysv** switch, as in:

```
% cc -systype sysv -g -o sample sample.c
```

The default compile time switch for **/bin/cc** is **-systype sysv** and the default compile time switch for **/bsd43/bin/cc** is **-systype bsd43**.

Path

The path is a list of directories. It traces a sequential route through the file structure for the system to follow to locate a particular command or executable program. The first occurrence of a command found along the path is executed.

BSD Extensions

The ESV Workstation is UNIX System V with BSD extensions. Commands on the ESV Workstation default to System V commands, unless the directory specification **/bsd43/bin** is placed in the path. Placing **/bsd43/ bin** properly in the path allows the operating system to execute the BSD extension commands.

Because some System V commands have the same name as BSD extensions, the position of **/bsd43/bin** in the path determines which is executed.

C-Shell and BSD Extensions

The default path is determined at login by the system. An example of the default path for the csh is set as follows:

```
set path = (~/bin /usr/net /bsd43/bin /usr/ucb /usr/bin /
   bin /usr/new /usr/bin/X11)
```

Generally, everything in this path except the home directory specification is necessary for the proper functioning of your account on the ESV Workstation.

The command **env** shows what is in your current path.

Users of the C-shell will probably prefer to use the BSD extensions. Many of these extensions have more options than corresponding System V commands.

The directory **/bsd43/bin** should appear before **/usr/bin** in the path.

You can set the path from the command line. Note that setting the path on the command line is temporary: the effect of variables set on the command line is cancelled by logging out. Use the command **set path** to put in a new command directory at the front of the command line in the C-shell.

```
set path = (newcommanddir $path)
```

To put a new command directory at the end of the current path enter

```
set path = ($path newcommanddir)
```

Bourne Shell and BSD Extensions

The default path for the Bourne shell is as follows:

```
PATH=$HOME/bin:/usr/net:/usr/bin:/bin:/usr/ucb:/usr/new::/
     usr/bin/X11:/bsd43
```

Users of the Bourne shell may not want the operating system to default to the BSD extensions when duplicate command names exist. As long as the **/usr/bin** appears before **/bsd43/bin** in the path, the operating system defaults to System V commands.

You can set the path from the command line. Note that setting the path on the command line is temporary: the effect of variables set on the command

line is cancelled by logging out. Use the command **PATH** to put in a new command directory at the front of the command line in the Bourne shell.

```
PATH=newcommanddir:$PATH;export PATH
```

To put a new command directory at the end of the current path enter

```
PATH=$PATH:newcommanddir;export PATH
```

Notes

- If you login as **root**, you get System V by default.
- For additional information, refer to the "ES/os Considerations" section in the "Porting Guide" chapter of the *ESV Workstation User's Manual [2.0]*.

Linking Libraries

The ESV's X, PEX, and Motif libraries are compiled and linked using UNIX Berkeley (BSD) 4.3. Any applications linking to these libraries must also be compiled and linked using BSD 4.3 with the **-systype bsd34** option to the compiler.

The ESV 2.0 software release changes some of the libraries to which programs must be linked. If you have programs that include PHIGS graphics and Motif, and are written to the new PEX binding specifications the following is the recommended linking order:

```
-lXm -lXt -lPEXapi -lXEandSext -lXinput -lXpick -lXext -lX11 \
        -lXdmcp -lsysv -lm
```

where:

`-lXm` is the Motif library.

`-lXt` is the Xtoolkit.

`-lPEXapi` is the PEX library.

`-lXEandSext` is the Evans & Sutherland extensions.

`-lXinput` is the X input extensions.

`-lXpick` is the X picking extensions.

`-lXext` is the X extensions.

`-lX11` is X11R4.

`-lsysv` is a subset of the System V library.

`-lm` is the math library.

If your programs are written to the ES/os 1.3 PEX binding, the following is the recommended linking order:

```
-lXm -lXt -lPEXapi1.3 -lPEXapi -lXEandSext -lXinput -lXpick \
    -lXext -lX11 -lXdmcp -lsysv -lm
```

where:

`-lPEXapi1.3` is a thin layer translation of the old 1.3 PEX binding to the new 2.0 PEX binding.

Include File Declarations

The include header files required for a Motif, PEX program should be declared in the program source code using the following formats:

```
#include <X11/Xlib.h>
#include <X11/Intrinsics.h>
#include <Xm/Xm.h>
#include <X11/extensions/XInput.h>
#include <X11/extensions/XPick.h>
#include <X11/extensions/Xext.h>
#include <X11/extensions/phigs/phigs.h> etc.
```

Sample Makefile

The following is a sample makefile showing compilation and linking for ESV programs using Motif and PEX.

```
#
# Optional include files can be listed as:
#

BitMapINCL = /bsd43/usr/include/X11/bitmaps
INCLFLAGS = -I$(BitMapINCL)

#
# Flags:
# DFLAGS are optional depending on use of #ifdef in source
# code.The -g in LDFLAGS can be changed to -O if debugging is
# not required. The CC_ENVIRON is needed to increase the size
# of internal compiler tables.
#

DFLAGS = -DPHIGS_PEX_API -DPEX
LDFLAGS = -systype bsd43 -g
CC_ENVIRON = -Wf,-XNp8400 -Wf,-XNd9000

CFLAGS = $(LDFLAGS) $(CC_ENVIRON) $(DFLAGS) $(INCLFLAGS)

#
# Libraries
#
```

```
MOTIFLIBS = -lXm -lXt
PEXLIBS = -lPEXapi -lsysv
XINPUTLIB = -lXinput
XPICKLIB = -lXpick
XEXTLIB = -lXext
XESLIB = -lEandSext
XLIB = -lX11

#
# Be sure that $(XLIB) follows any others that you use.
#
LIBS = $(MOTIFLIBS) $(PEXLIBS) $(XINPUTLIB) $(XPICKLIB) \
         $(XEXTLIB) $(XESLIB) $(XLIB)

#
# Object files
#

MOTIF_PEX_OBJS = sample.o

#
# Compilation and ld instructions. The following order is
# important. $(LIBS) must be last. Note: the $(CC) causes the
# CFLAGS to be used on compilation.

sampleprog:   $(MOTIF_PEX_OBJS)
              $(CC) -o $@ $(LDFLAGS) $(MOTIF_PEX_OBJS) $(LIBS)
```

man -k Command

The command **man -k** uses a special database file to look up its information. This database file doesn't exist automatically for all man pages. If you want to use **man -k** for all man pages (including PEX, Motif, *etc.*) you have to build the database by running **/usr/lib/makewhatis**. After installing a package with man pages, you should enter **/usr/lib/makewhatis** while logged in as **root**. This remakes the database to include the new man pages.

UNIX Sockets

The UNIX domain sockets should be used whenever possible because they can be up to 57% faster than Ethernet sockets for certain applications. Specify UNIX domain sockets by setting the ***DISPLAY*** environment variable to **unix:0.0.** The client must be running on the same ESV as the server.

Unlock Keyboard on CTRL-ALT-BREAK

Sometimes, the key sequence CTRL-ALT-BREAK locks up the keyboard. This happens when the keyboard is connected to the RDC and you use CTRL-ALT-BREAK to exit the X server. The symptoms are that all three LEDs remain lit, and the keyboard will not respond to any further typing.

To unlock the keyboard, cycle the power on the RDC. This leaves the keys in a state where the CAPS LOCK key is actually the CONTROL key, and the DELETE key emits garbage and back-quotes. Restart the X Server to restore the keyboard to its proper operation.

ES/PSX

screen_oriented Text

The purpose of ES/PSX **screen_oriented** text is to rotate the character string so as to make it readable, while maintaining the other attributes (*i.e.*, size and position) of its relationship to the object being annotated. This means that such text, while always appearing right-side-up, will change size as the associated object is moved toward or away from the user in a perspective view. (It will not, however, change size as the associated object is simply scaled in modeling space.)

The above is in contrast to **screen_oriented/fixed** text, whose size is permanently fixed to the value specified in the applicable **CHARACTER SCALE** or **TEXT SIZE** commands.

screen_oriented/fixed text is designed to appear the same size as **screen_oriented** text would be when placed a distance equal to one-half the viewport width from the eye for a 90-degree **FIELD_OF_VIEW** angle. For a **FIELD_OF_VIEW** angle less than 90 degrees, if it is desired to have a string of **screen_oriented** text appear the same size when at screen depth as a corresponding **screen_oriented/fixed** string, the **CHARACTER SCALE** value should be multiplied by the cotangent of one-half the **FIELD_OF_VIEW** angle. For example, for a **FIELD_OF_VIEW** angle of 30 degrees, multiply the desired **CHARACTER SCALE** argument by 3.7321, which is the cotangent of 15 degrees.

TE Colors

The color of the ES/PSX terminal emulator characters and cursor can be modified by the following command, which can be included in the **site.dat** file.

```
Send v3d(r,g,b) to <1>tecolor0;
```

Note that ***r,g,b*** are integers specifying the red, green and blue components of the color desired (blue = 0, red=120, green=240).

The color can also be modified while running ES/PSX by typing the following commands from command mode:

```
Configure a;
Send v3d(r,g,b) to <1>tecolor0;
Finish Configuration;
```

ES/PSX and PEX Libraries

The ES/PSX and PEX libraries provided in the 2.0 Release were all compiled using the **bsd43** libraries. Modules that are to be linked with these libraries should also be compiled as **bsd43** modules by using the **-systype bsd43** option in the compile command. If you want to use specific System V routines in your programs, you should do so with caution and with explicit knowledge as to which libraries are used to resolve external references.

malloc Fails Even With Swap Space

Sometimes when attempting to **malloc** a chunk of memory, the **malloc** call returns a NULL pointer, as if it cannot **malloc** the space even though **vsar** shows plenty of swap space. This occurs because **vsar** shows memory that is not currently being used, not necessarily that which is free and available.

In one case, we attempted to **malloc** a 4*1280*1024 chunk of memory. We had **vsar** running which showed more that 40 meg of swap available (although free memory had been nearly exhausted). The **malloc** call returned a NULL pointer.

ES/PEX

z-buffering Objects in Depth

There is an inherent conflict with *z*-buffering as objects approach each other in depth. Polygon edges are at the same *z* value as the corresponding polygons. The system moves the edges forward to make them appear in front of the corresponding polygons. This can make them appear in front of other polygons.

Anti-Aliased Line Anomalies

If you turn on **HLHSR** mode for anti-aliased lines, it may result in a decrease in picture quality. The problem is especially evident near the joins of segments of curves. If you are only dealing with lines, don't turn on the **HLHSR** mode. If you are mixing lines and polygons, and always want your lines to show up, turn off the **HLHSR** ID when drawing lines.

Lines Over Polygons

When drawing lines and polygons, there are some anti-aliasing anomalies when the lines are drawn over polygons. You will see fringes that are the background color, and the lines look jagged. Refer to the description of **SET HLHSR MODE** in the *ES/PHIGS Reference Manual [2.0]* for ways to avoid this.

Non-*z*-Buffered Polygons

When polygons are not *z*-buffered, it is inherently unpredictable which of two or more overlapping polygons will appear on the screen. It is also possible that parts of several polygons may appear in stripes.

Always *z*-buffer polygons by turning on the **HLHSR** mode.

Inquiry Routines

After executing a function to open something like PHIGS, a PHIGS workstation, or a structure, programmers should call inquiry routines to make sure that the intended action occurred. Making sure that a request really occurred is the application's responsibility.

EVALUATE VIEW MAPPING MATRIX 3

If the projection reference point (PRP) in the **EVALUATE VIEW MAPPING MATRIX 3** function is set on the *front plane*, all values of *z* are the same upon transformation. This causes polygon priority to be lost and halts depth cueing. If the *z*-value is constant for all items, there can be no visibility resolution, so polygons interleave with other polygons, and lines pop in and out.

FILL AREA SET

A **FILL AREA SET** can be clipped in *z* such that degenerate edges are introduced into the polygon description. This causes some pixels to "leak through" the two degenerate edges that are introduced. Programmers should reduce the number of **FILL AREA SET**s with holes in order to separate polygons.

Controlling Line Quality with Hidden-Surface Removal

There are inherent problems drawing anti-aliased lines with hidden-surface removal. The ESV minimizes these as much as possible, and following these guidelines will help produce the best possible pictures.

Disable hidden-surface removal (by setting either the **HLHSR** mode or **HLHSR** ID to off) when drawing lines over the picture background. With hidden-surface removal disabled, lines blend properly where they cross, even when many lines converge (although in this case, there may be a color shift towards a saturated color). Disabling hidden-surface removal when drawing lines over an object causes the line's color to wash into the color of the object. If the background is not black, it can cause fringing of the background color on the sides of lines.

Enable hidden-surface removal (by setting both the **HLHSR** mode and **HLHSR** ID to on) when drawing only polygons, or when drawing lines over a non-constant background, or when drawing polygons and lines freely intermixed on the screen or in the structure. While there may be some fringing on the sides of lines with hidden-surface removal enabled, there will be no color shift as lines appear over other objects. Drawing the lines after drawing the polygons will reduce the fringing.

It can also be advantageous to change the **HLHSR** ID during traversal when the **HLHSR** mode is on, enabling or disabling hidden-surface removal for different parts of the image. For example, a guideline grid of lines may appear generally over the background and behind the polygons. In this case, a good picture may be obtained by turning the **HLHSR** mode on, then drawing the grid with the **HLHSR** ID off and the object with the **HLHSR** ID on. Drawing the grid first produces a different effect than drawing the object first.

Avoid Intensity Values Near 0

Because of the limits of the ESV DACs, colors near 0 in intensity vary dramatically in appearance. For example, a triangle with intensity 0 at one vertex and 1 at the other two vertices appears as two bands, one black and the other colored. This happens when any of the red, green, or blue components of color reaches the bottom of the intensity range, regardless of the values of the other components. To avoid these problems, avoid using colors near 0 in intensity. This problem frequently happens when depth cueing to black or when shading without any ambient light; therefore, these should be avoided.

Clipping Indicators

Images are always clipped to the view volume. The clipping indicators control whether to clip to the clip bounds within the viewing space. This is self-evident in the *x*- and *y*-dimensions where the image cannot extend beyond the limits of the window. Because of limits on number ranges, this must also be so in the *z*-dimension. Images cannot extend indefinitely in the *z*-direction, but are always clipped at the front and back planes. The clipping indicators only control whether to clip to a sub-range defined by the clipping minimum and maximum.

Lines and Polygon Edges Over Solid Polygons

Because they share the same *z*-values, lines drawn on the surface of a polygon or polygon edges drawn with solid polygons conflict with the polygon interiors. To increase their likelihood to appear, lines and polygon edges are moved forward in the image. For best results, keep the clipping planes as close to the object as possible. Extensions to allow user control of this capability are planned in future releases.

WAIT and ASAP Workstation Deferral Modes

Two different workstation deferral modes supported by ES/PEX:

- **WAIT**
- **ASAP**

Under **WAIT** deferral mode, any PEX routines that can change the visible state of the display (modifying table entries, editing a posted structure, *etc.*) are not reflected until the application calls either **UPDATE WORKSTATION** or **REDRAW ALL STRUCTURES.**

Under **ASAP** deferral mode, any PEX routines that can change the visible state of the display cause an immediate traversal of all posted structures.

ASAP mode should be used with caution as it can result in many more traversals than are necessary. If you are building a large structure network, or doing a lot of structure editing, the system finishes the work more quickly if it is not continually traversing. The following code fragment demonstrates this:

```
psetdisplayupdatest(ws, PWAIT, PNIVE);
/* ... initialize color table, view reps, create structures ... */
psetdisplayupdatest(ws, PASAP, PUQUM); /* change to ASAP mode */
/* ... generate primitives from simulation, etc. ... */
psetdisplayupdatest(ws, PWAIT, PNIVE); /* change back to WAIT mode */
```

The default workstation deferral mode is **ASAP**.

BSD Version ps Command

The BSD version of the **ps** command is included in the 2.0 release. The options to the two commands are not the same. For example, if you were previously using **ps -ef** to get a full listing, the BSD equivalent is **ps -aux**. If your path defaults to the BSD commands, you can still access the System V version of **ps** command as **/bin/ps**.

Expose Event for PEX Windows

When selecting expose events on PEX windows, either through the mechanism provided by Xlib or the X toolkit (Xt), you should examine the count field in the event before causing a structure traversal for the window.

The X server sends expose events as contiguous groups in the event stream, each with a count field indicating how many more expose events are in the group. This is done because a single exposure action, such as cycling a group of windows via a window manager, can cause multiple regions of a single window to be exposed. Each action that generates such a set of regions will generate a set of contiguous expose events in the event stream.

Since PEX (3D) windows are double-buffered, a portion of the window cannot be redrawn without causing a buffer swap. Therefore, as you take events off the event queue, you should examine the count field in the expose event. When this count is zero, this is the last expose event in its contiguous group. At this point, the application can cause a structure traversal and update its window.

Implementing this method can eliminate many unnecessary structure traversals and improve performance when interacting with window managers and other X clients.

Round Trip Requests to X Server

Calling a PHIGS routine that returns information about structures to the caller (*e.g.*, current element pointer value or structure element content) requires a round-trip to the server through network connections.

The current element pointer value can be maintained by the client while building a structure; *i.e.*, the client may know how many structure elements it has inserted into the currently open structure. Maintaining this information in the client program can result in performance increases since the time required for obtaining the current element pointer value can be expensive for a very large structure. Obtaining this value typically requires a linear traversal of the structure from the beginning until the current element is reached.

Client-side optimizations that result in fewer round-trip messages are the smart thing to do.

Resizing of PEX Windows

X and PHIGS have slightly different ideas about the dynamics of a display surface. Under X, display windows can be resized by the user or another program, and the client receives a **ConfigureNotify** event. Under PHIGS, the usable portion of a window is determined by the workstation transformation matrix.

The workstation transformation matrix is controlled by **SET WORKSTATION VIEWPORT, SET WORKSTATION VIEWPORT 3, SET WORKSTATION WINDOW**, and **SET WORKSTATION WINDOW 3.** Using the 2D versions of the routines, you can examine your new window size from the **ConfigureNotify** event and adjust the size of your PHIGS display surface accordingly.

PHIGS specifies that when a workstation is opened, it uses the largest square in the upper-left portion of the workstation, unless the workstation transformation is explicitly changed. The workstation window and viewport, which together define the workstation transformation, must be set to the same aspect ratio when they are changed.

When a **PEX** window is resized, the client application has several choices to make regarding the workstation transformation. It can render the entire NPC space to any square portion of the window's new size, preserving aspect ratio. Another option is to limit the portion of **NPC** space shown in the resized window, making the window a "porthole" into **NPC** space. This requires a considerable amount of programming.

The following code fragment is an example of resizing the **PHIGS** display surface to be the largest (centered) square in the resized window:

```
XNextEvent(&event);
if (event.type == ConfigureNotify)
            {
            Plimit viewport;
            int width, height;

            width = event.xconfigure.width;
            height = event.xconfigure.height;
if (height > width)/* window is taller than wide */
            {
            viewport.xmin = 0;
            viewport.xmax = width-1; /* use entire width */
            viewport.ymin = (height-width)/2;
            viewport.ymax = viewport.ymin + width-1;
            /* center vertically */
            }
else        /* window is wider than tall */
```

```
                {
                viewport.ymin = 0;
                viewport.ymax = height-1; /* use entire height */
                viewport.xmin = (width-height)/2;
                viewport.xmax = viewport.xmin + height-1;
                /* center horizontally */
                }
                psetwsviewport(ws, &viewport);
                predrawallstruct(ws, PALWAYS);
                }
        else /* other events */
                ...
```

Remember that device coordinate space is in pixels and relative to the origin of the X window. Also, X coordinate structures have a *y*-axis that increases down the screen, while the PHIGS *y*-axis increases up the screen.

Pick Highlighting

When the prepick control is set to **highlight picked commands**, the color of markers within the boundary of the pick box is changed. Optionally, the color changes for markers in the same node as the one within the pick box. When this happens, markers within the node that preceded the one picked have already been drawn. Their color is a combination of the highlight color and their normal color.

Known Size Limitations on Structure Elements

Since structure elements are communicated to the central structure store via the connection to the X server(s), structure elements are limited in size by the request buffer size of the server. The request buffer size can be found from the **xdpyinfo(1)** command. Currently, the buffer size is 64 K long words, or 256 Kbytes.

For polygon (**FILL AREA, FILL AREA SET**, *etc.*) structure elements, there is a further restriction of no more than 128 vertices (64 if the primitive includes colors or normals, 42 if the element includes colors and normals for each vertex) per element. This limitation is imposed by the size of the processing buffer in the DSPs.

Optimization of Structure Element Size for Performance

When writing PHIGS/PEX clients, it is important to remember that the ESV Workstation contains between 4 and 44 DSPs that render the set of posted structures. Splitting large structure elements into a group of smaller, equivalent structure elements can improve rendering performance. The overhead for an extra element on a low-end system is negligible and results in approximately the same rendering time. However, on a high-end system, the result is

a greater degree of data parallelism. This means more efficient use of the DSPs and higher rendering throughput. This throughput is limited by communication speeds and other basic architectural trade-offs, but a performance gain can be usually achieved by splitting large structure elements into smaller ones.

For optimum performance, a match must be obtained between the size of rendering primitives within a structure, their relationship to one another and the number of output primitives in the structure. A structure that contains a high ratio of execution (via **EXECUTE STRUCTURE**) to drawing (via output primitives, *i.e.*, lines, polygons) can cause excessive overhead on the host CPU in structure traversal. Conversely, a structure with a high drawing to execution ratio (*i.e.*, flat) can consume large amounts of host structure memory and may be adversely effected by system paging. The best approach is to attempt to balance these effects.

Some output primitives are broken up by the system to increase available parallelism in rendering these primitives. Since the rendering pipeline of the ESV consists of parallel processors combining their results into the frame buffer, performance gains can also be achieved by judiciously adjusting the size and number of output primitives. For increased performance, the following guidelines should be followed, keeping in mind they are only guidelines, not guarantees.

Text

Text functions include **TEXT**, **TEXT 3**, **ANNOTATION TEXT RELATIVE**, and **ANNOTATION TEXT RELATIVE 3**. Longer character strings perform better than short character strings. Single character strings used as markers are less efficient than marker elements.

Polygons

Polygonal structure element functions include **FILL AREA**, **FILL AREA 3**, **FILL AREA SET**, **FILL AREA SET 3**, **FILL AREA 3 WITH DATA**, and **FILL AREA SET 3 WITH DATA**. Polygonal structure elements with less than 14 vertices require less complicated processing during scan conversion. Processing of convex primitives is optimized.

Quadrilateral Mesh and Triangle Strip

Quadrilateral mesh and triangle strip functions include **QUADRILATERAL MESH 3 WITH DATA** and **TRIANGLE STRIP 3 WITH DATA**, and they have unique performance characteristics. For optimum performance, a match must be obtained between the number of meshes and their size. A few small meshes that can be rendered in parallel will be faster than a single large mesh, since the primitive level is the lowest level at which parallelism is applied.

The system breaks up meshes and strips that are larger than 500 words. This overhead can be avoided if the primitives are kept below 500 words. This translates into the following guidelines (these numbers are derived from the packet sizes defined in the PEX V4.0 Protocol Encoding document). There are about four words of header for each of these primitives, and the remaining space is left for vertices and optional vertex data. That leaves 496 words for this data:

- 165 vertices with no colors and no normals
- 82 vertices with colors or normals
- 55 vertices with colors and normals

These numbers calculated by dividing 496 by 3, 6, and 9, respectively.

Setting Size of Socket Buffer Length Can Degrade Performance

Using **setsockopt(fd, SOL_SOCKET, SO_SNDBUF, ...)** can kill network I/O performance if the buffer size is less than the system default of 4096. It took 7 1/2 hours to move 16Mb with 1/4M packets of 64 bytes each when the kernel buffer size was set down to 256 bytes. Use the default kernel buffer size.

pfillareaset3

pfillareaset3 does not draw the polygon if the length of one of the sides is below a certain value. The side in question in the example below is the length between <vertex 4> and <vertex 5>.

Example code:

```
ploss()
{
/* Define polyline cube vectors */
    Ppointlst3  side;
    static Ppoint3  points[]=
   {{  0.8768756, 0.1534203, 0.0} , { 0.8772517, 0.1693954, 0.0} ,
   {  0.8563184, 0.1754968, 0.0} , { 0.8558692, 0.1591864, 0.0} ,
    {  0.8559113, 0.1589217, 0.0}};

   side.number = 5;
   side.points = points;

   popenstruct(FILLBOX);
     psetintstyle(PSOLID);
      psetintcolourind(7);
      pfillareaset3(1, &side);
   pclosestruct();
```

```
    popenstruct(DISPLAY_STRUCT);
       psetviewind(VIEW);
       pexecutestruct(FILLBOX);
    pclosestruct();

    ppoststruct(WS, DISPLAY_STRUCT, 1);

    pupdatews(WS,PPERFORM);

}
```

PHIGS requires the first three vertices to determine front or back facing. If the first three vertices are colinear, then use the next point. But the colinearity test depends on the precision. If the tolerance is too low (the present case), it mislabels polygons. If the tolerance is too high, it may miss pertinent data (for example, presume all the sides of the above polygon were as short as the offending vertex). So, do not define the first two sides of a polygon to be abnormally short.

Multiple Connections to the Same X Server

There are certain situations that can cause multiple connections to the same X server when using both X and ES/PEX calls. These situations can cause some undesirable visual effects.

- If you are using **XOpenDisplay** to get a **Display ***, that pointer should be used in a **popen_xphigs** call in order to prevent multiple connections. If **XOpenDisplay** is used, **popen_phigs** should not be used to open PHIGS.
- If you are using **XOpenDisplay** and opening workstations of type **phigs_ws_type_x_tool**, and if a value is specified for connection ID, the value should be the same as a the value given to **XOpenDisplay** for connection to that display.

Correct Usage Example

```
Display  *display;
Pxphigs_info   xinfo;

display = XOpenDisplay("");

xinfo.display = display;
popen_xphigs(PDEF_ERR_FILE, PDEF_MEM_SIZE,
      PXPHIGS_INFO_DISPLAY, &xinfo);

popen_ws(1, "", phigs_ws_type_x_tool);
```

or

```
popen_phigs(PDEF_ERR_FILE, PDEF_MEM_SIZE);

popen_ws(1, NULL, phigs_ws_type_x_tool);
```

Incorrect Usage Example

```
Display  *display;
Pconnid_x_drawable  xdraw;
Window  win;

display = XOpenDisplay("");

popen_phigs(PDEF_ERR_FILE, PDEF_MEM_SIZE);

win = XCreateSimpleWindow(...);
xdraw.display = display;
xdraw.drawable_id = (XID)win;

popen_ws(1, &xdraw, phigs_ws_type_x_drawable);
```

Faster PHIGS Text

Text performance can be improved by setting the text path to **PTP_RIGHT**, the horizontal alignment to **PAH_NORMAL**, the vertical alignment to **PAV_NORMAL**, and the text spacing to a non-negative value. If these criteria are met, text speed is improved.

editres

The **editres** client message protocol provides the capability to allow one client to perform an **XtSetValues/XtGetValues** operation on another client's widget tree. This is the fundamental mechanism behind the program editres, which allows interactive editing of an application's resources while the application is executing. See the manual page on **editres(1)** for more details.

Developers wishing to take advantage of the **EditRes** client message protocol need to make sure that the **editres** protocol message handler is initialized and that the **editres** message event handler is added to their application. The Athena widget set's **VendorShell** widget does this when it is initialized. This makes the **editres** protocol available to all applications based on the Athena widget set. For applications using the **VendorShell** in the Motif widget set, the application should call the following procedure:

```
XtAddEventHandler(topLevel, (EventMask) 0, TRUE,
  _EditResCheckMessages, NULL);
```

where **topLevel** is the widget ID returned by **XtAppInitialize**.

The application will need to be linked with the Xmu library, which contains the **editres** client message protocol handling routines.

Facet Normals

If facet normals are not specified, they are calculated from the last vertices instead of from the first vertices.

AN1. Exabyte

Functional Characteristics

Exabyte is a proprietary cartridge tape subsystem. The Exabyte 8200 transfers data at the rate of 246 Kbytes per second and uses standard 8 mm tape cartridges. Tape cartridges are available in five user-selectable sizes which support data capacities from 291 Mbytes to 2.332 Gbytes.

Product Details

The model we tested is an Exabyte "8200" with a manufacture date of July 29, 1989. The part number is 110060-A01. An SCSI cable is required and an SCSI terminator might also be required.

Supplemental Information

Always shutdown the ESV Workstation and turn off the power when installing or removing SCSI devices. It is suggested that the SCSI ID be set to 4 or 5. This allows the use of tape devices **/dev/rmt/hc0** or **/dev/rmt/h0**, which are preconfigured device names. Logical block sizes of 512 bytes and 1024 bytes were used for testing.

Suggested Vendors

The Exabyte 8200 can be purchased from:

R Squared
11211 E. Arapahoe Road, Suite 200
Englewood, CO 80112
Telephone: 800-777-2478
FAX: 303-799-9297

An SCSI cable and terminator can be purchased from Evans & Sutherland. The actual SCSI connection equipment required will depend on the number and type of other devices that are connected to the SCSI bus and the model or revision level of the Exabyte drive.

AN2. Trackball

Product Details

The trackball is an alternate input device that is a direct replacement for the mouse. The ESV trackball is a true 3-button device which allows the user to roll the ball with the thumb while the fingers are free to operate the buttons. The trackball requires a space of about 5.4 by 4.25 inches and has a default DPI of 300. A trackball is often preferred for plotting points in CAD-type operations or just selecting menu choices. A mouse is generally preferred for freehand drawing applications. The trackball comes with a 9 foot cable. The case and buttons are "mist/fieldstone" in color and the ball and the cable are grey.

Supplemental Information

The trackball requires minor modification for ESV compatibility and cannot, therefore, be purchased directly from dealers for use with the ESV Workstation. The effective DPI of the trackball (and mice) can be adjusted with the **xset** command. The E & S part number for the trackball is 220725-100. The trackball is purchased from Logitech, Inc. (OEM Division).

AN3. Serial-to-Parallel Converter

Functional Characteristics

The serial-to-parallel converter can be used to interface the ESV Workstation to a parallel centronics device such as the IBM Proprinter. Baud rate, character length, parity, handshake mode, and conversion direction can be set with dip switches. The handshake mode can be set to either the X- ON/OFF or the DTR mode. This converter can convert data in either direction and has a 64 Kbyte buffer.

Product Details

The parallel port on the converter has a centronics type 36-pin female connector. The serial port has a DB25 male connector. An AC-to-DC adapter comes with the converter, but cables must be purchased seperately. A null-modem adapter is also required for use with the ESV Workstation.

Supplemental Information

The converter was tested with an IBM Proprinter using the X- ON/OFF handshake mode. The DTR handshake mode has not yet been successfully tested. All parts can be purchased from:

Dalco Electronics
223 Pioneer Blvd.
Springboro, Ohio, 45066
Telephone: (800) 445-5342
FAX: (513) 743-9251

Parts List

- BIDIRECTIONAL CONVERTER
  Cost: $138.50
  Part number: 78870
- CABLE, Centronics 36 Pin male to 36 pin male, 6 feet.
  Cost: $8.95
  Part number: 38680
- CABLE, DB25 male to DB25 female, 6 feet.
  Cost: $7.95
  Part number: 38630
- NULL MODEM, DB25 male to female.
  Cost: $6.95
  Part number: 78610

AN4. Video Extension Cables

Functional Characteristics

These video extension cables allow the ESV cabinet to be placed 150 feet away from the work area.

Product Details

The cable assembly consists of 150 feet of large, RG11, low-loss cables and smaller, RG59, 6 foot cables which are attached to both ends of the large O.D. cable. The smaller cables are provided to facilitate attachment to the ESV and the display monitor. Suitable connectors are provided for coupling the cables together. All cables are color coded to simplify assembly.

Supplemental Information

These cables have not been tested by E&S for electromagnetic emissions. "Teflon" cables are also available if the cables are to be routed through plenum areas. Use of these cables requires configuration with the Reprogrammable Data Concentrator (RDC).

Vendor

Network Technologies, Incorporated
7322 Pettibone Road
Chagrin Falls, Ohio 44022
Telephone: (216) 543-1646 & 1-800-RGB-TECH
FAX: (216) 543-5423

Parts List

- 3 RG11 Coax + BNC-N adapters + RG59 cables

  Cost: $295.00
  Part Number: 3C-RG11-150

AN5. Distribution Amplifiers

Functional Characteristics

Distribution amplifiers allow the ESV workstation to simultaneously drive as many as 12 monitors or additional video equipment, such as a video printer.

Product Details

These distribution amplifiers are attractively packaged and are suitable for desk-top placement. Rack-mount units are also available. Model numbers are designated as VOPEX-3ANH with the "N" in the model number indicating the number of outputs. The VOPEX-3A2H, for example, has three input connectors, one each for red, green and blue and two output connectors for each color (six total output connectors). Installation is straight forward and interface cables are included. Inputs and outputs are via female BNC connectors. No termination is required for unused outputs. The size of the VOPEX-3A2H model is approximately 3 5/16 x 7 x 4 1/8 inches. NTI products do not have UL or EMI certifications which is not uncommon with this type of product.

Supplemental Information

The proper cable must be used to insure that display clarity is not compromised (see application note(s) on video extension cables).

Vendor

Network Technologies, Incorporated
7322 Pettibone Road
Chagrin Falls, Ohio 44022
Telephone: (216) 543-1646 & 1-800-RGB-TECH
FAX: (216) 543-5423

Price List

- Two output RGB

  Cost: $500.00
  Part Number: VOPEX-3A2H

- Four output RGB

  Cost: $840.00
  Part Number: VOPEX-3A4H

- Six output RGB

  Cost: $950.00
  Part Number: VOPEX-3A6H

- Eight output RGB

  Cost: $1220.00
  Part Number: VOPEX-3A8H

- Ten output RGB

  Cost: $1920.00
  Part Number: VOPEX-3A10H

- Twelve output RGB

  Cost: $2100.00
  Part Number: VOPEX-3A12H

AN6. CIPHER Tape Drive

Functional Characteristics

This tape drive utilizes Group Code Recording (GCR) formatting, 9-track data interchange and recording densities of 1,600 bits per inch or 6250 bits per inch. Unformatted capacity is 270 Mbytes with 3600 foot reels at 6,250 bits per inch. Read and write tape speed is 100 in/sec. There is 1 Mbyte of cache memory.

Product Details

The M995S measures 8 3/4 inches high by 17 inches wide by 25 inches long. The weight is 68 pounds. Mounting options are rack mounting, standard 19-inch EIN/RETMA and desktop enclosure. The M995S has an autoranging power supply that automatically adjusts to 110 and 220 VAC power sources and it has UL, CSA, TUV, and FCC certification. Additional product information can be obtained by calling Cipher sales at 1-800-4CIPHER. European customers may telephone 07341/775757.

Supplemental Information

Always shutdown the ESV Workstation and turn off the power when installing or removing SCSI devices. It is suggested that the SCSI ID be set to 4 or 5. This allows the use of tape devices **/dev/rmt/hc0** or **/dev/rmt/h0**, which are preconfigured device names. Logical block sizes of 512 bytes and 1024 bytes were used for testing.

Suggested Vendor

Vincent Simmons, Field Sales Manager
Arrow Electronics, Inc.
1946 West Parkway Boulevard
Salt Lake City, Ut 84119
Telephone: (801) 973-6913

Parts List

Qty.	Description	Cipher P/N	E&S P/N	Est. Cost
1	Cipher 1/2" Tape Drive	M995S		$7400.00
1	Desk-Top Enclosure	ENVENM-995S		$ 400.00
1	*SCSI Cable		423203-006	
1	SCSI Terminator		401258-050	
1	Tape Path Cleaning Kit	960855-001		$ 30.00

*This is the correct cable if the M995S is the only device connected to the external SCSI bus. A different cable might be required if additional equipment is connected to the external SCSI bus.

AN7. External SCSI Cables and Terminators

Overview

The nature of SCSI will occasionally require custom configurations for individual customers. In addition, some forethought may be required to insure that the customer receives the correct cables in a timely fashion. This application note, then, describes the available external SCSI connection equipment and the pertinent SCSI operating parameters.

Operating Parameters

A total of seven SCSI devices can be connected to the SCSI bus, in addition to the CPU. This means, for example, that four devices can be connected via external cables if the ESV Workstation has one tape drive and two disk drives installed inside the cabinet.

There is an input and output connector provided on each external SCSI device. The input connector accommodates the cable from the host or previous device. The output connector is provided to allow for daisy chain configurations to the next device or the placement of a terminator. A resistive network (terminator) must be attached to the last device in the daisy chain. Some devices have internal terminators which may be installed or removed. In most cases, however, the terminator will be installed on the output connector.

The total length of the external cable(s) cannot exceed 10 feet. This limitation includes SCSI cables that are often found inside external SCSI equipment such as disk-drive enclosures. Failure to properly install a terminator, the presence of more than one external terminator or the use of cable exceeding 10 feet may cause a system crash.

Terminators

SCSI connectors have not been standardized. The DS-2000 Data Shuttle, for example, has a male "subminiature-D" (Sub-D) output connector. The KODAK XL7700 printer has a female "alternate 2" (Alt-2) output connector. The ESV Workstation has a female Sub-D output connector. There are, therefore, three terminators available:

1) E&S P/N 401258-050 (Alt-2 male connector). This type of terminator is also called "Amp Champ" or the "Centronics" type. The KODAK printer is an example of a device that uses this type of terminator.

2) E&S P/N 401272-050 (Sub-D male connector). The ESV Workstation uses this terminator.

3) E&S P/N 401294-050 (Sub-D female connector). This is an uncommon terminator that will probably be used only with the DS2000 Data Shuttle.

Cables

It is recommended that only ESV Workstation cables be used with SCSI devices in order to avoid impedance discontinuity and EMI problems. There are eight cables available. Cables (1) and (2) will probably be used most often. Cables (3) and (4) can be used to help create custom configurations. Cables (5), (6), (7), and (8) are for use with the MDB Data Shuttle or other devices that have uncommon connectors:

1) E&S P/N 423203-006 (Male Alt-2/Male Sub-D, 6 Feet). This cable has a Centronics connector on one end and a Sub-D on the other. It is currently being used to connect the ESV Workstation to the Kodak printer and to other devices that have a Centronics input connector.

2) E&S P/N 401013-002. (Male Alt-2/Male Alt-2, 2 Feet). This cable has a Centronics connector on both ends. This is probably the most common cable for daisy chaining SCSI devices. The Kodak printer and CDROM drive could, for example, be connected together using this cable.

3) E&S P/N 423203-002. Two-foot version of 423203-006.

4) E&S P/N 401013-006. Six-foot version of 401013-002.

5) E&S P/N 401010-006 (Male Sub-D/Male Sub-D, 6 Feet). This cable has a Sub-D connector on both ends. It is currently used to connect the ESV Workstation to the DS2000 Data Shuttle.

6) E&S P/N 401010-002. Two-foot version of 401010-006.

7) E&S P/N 401012-002. (Male Alt-2/Female Sub-D, 2 Feet). This cable can be used to daisy chain devices such as the Kodak printer to the DS2000 Data Shuttle.

8) E&S P/N 401011-002. (Male Sub-D/Female Sub-D, 2 Feet). This cable can be used to daisy chain DS2000 Data Shuttles.