PEX Protocol Specification

Version 5.1P - **X PUBLIC REVIEW DRAFT**

11-May-1992

PEX Document Editor

Paula Womack	*Digital Equipment Corp.*	*December,1991 to present*
Jeffrey Friedberg	*Digital Equipment Corp.*	*September,1990 to December,1991*
Sally C. Barry	*Digital Equipment Corp.*	*April,1990 to September,1990*
Randi J. Rost	*Digital Equipment Corp.*	*June,1987 to April,1990*

PEX Chief Architect

Cheryl Huntington	*Sun Microsystems*	*September,1991 to present*

PEX Issues Librarian

Karl Schultz	*IBM*	*September,1991 to present*

PEX Secretary

Jeff Stevenson	*Hewlett-Packard Company*	*September,1991 to present*

Copyright © 1988, 1989, 1990, 1991, 1992 Massachusetts Institute of Technology
All rights reserved.

Permission to use, copy, modify, and distribute this document for any purpose and without fee is hereby granted, provided that the above copyright notice appear in all copies and that both that copyright notice and this permission notice are retained, and that the name of M.I.T. not be used in advertising or publicity pertaining to this document without specific, written prior permission. M.I.T. makes no representations about the suitability of this document or the protocol defined in this document for any purpose. It is provided "as is" without express or implied warranty.

PEX Protocol Specification

1. Acknowledgements

2. PEX Protocol Specification

2.1. Request Processing 2

2.2. Protocol Format 2

2.2.1. Request Format 2
2.2.2. Reply Format 2
2.2.3. Error Format 2
2.2.4. Event Format 3

2.3. Syntax 4

2.4. Naming Conventions 4

2.5. Common Types 5

2.5.1. LISTofFOO 5
2.5.2. BITMASK and LISTofVALUE 5
2.5.3. Floating Point Format - FLOAT 5
2.5.4. Colors 5
2.5.5. Element Types 5
2.5.6. Types 6
2.5.7. Errors 11

2.6. Events 11

2.7. Padding 12

2.8. Extension Information 13

2.8.1. Get Extension Information 13
2.8.2. Get Enumerated Type Information 14
2.8.3. Get Implementation-Dependent Constants 28
2.8.4. Match Renderer Targets 31
2.8.5. Escape 31
2.8.6. Escape With Reply 32

3. Output Commands

3.1. Data Formats 33

3.2. Errors 33

3.2.1. FloatingPointFormat Errors 33

3.2.2. ColorType Errors 34
3.2.3. Length Errors 34
3.2.4. OutputCommand Errors 34

3.3. Output Command Descriptions 34

Marker type 35
Marker scale 35
Marker color index 35
Marker color 35
Marker bundle index 35
Text font index 35
Text precision 35
Character expansion 36
Character spacing 36
Text color index 36
Text color 36
Character height 36
Character up vector 36
Text path 36
Text alignment 36
Annotation text height 37
Annotation text up vector 37
Annotation text path 37
Annotation text alignment 37
Annotation text style 37
Text bundle index 37
Line type 37
Line width 38
Line color index 38
Line color 38
Curve approximation 38
Polyline interpolation method 38
Line bundle index 38
Surface interior style 38
Surface interior style index 38
Surface color index 39
Surface color 39
Surface reflection attributes 39
Surface reflection model 39
Surface interpolation method 39
Backface surface interior style 39
Backface surface interior style index 39
Backface surface color index 40
Backface surface color 40
Backface surface reflection attributes 40
Backface surface reflection model 40
Backface surface interpolation method 40
Surface approximation 40

Facet culling mode 40
Facet distinguish flag 41
Pattern size 41
Pattern reference point 41
Pattern reference point and vectors 41
Interior bundle index 41
Surface edge flag 41
Surface edge type 41
Surface edge width 42
Surface edge color index 42
Surface edge color 42
Edge bundle index 42
Set individual ASF 42
Local transform 3D 43
Local transform 2D 43
Global transform 3D 43
Global transform 2D 43
Model clip 44
Set model clip volume 3D 44
Set model clip volume 2D 44
Restore model clip volume 44
View index 44
Light source state 44
Depth cue index 45
Pick ID 45
HLHSR identifier 45
Color approximation index 45
Rendering color model 45
Parametric surface characteristics 45
Add names to name set 45
Remove names from name set 46
Execute structure 46
Label 46
Application data 46
GSE 46
Marker 3D 46
Marker 2D 47
Text 3D 47
Text 2D 48
Annotation text 3D 48
Annotation text 2D 48
Polyline 3D 49
Polyline 2D 49
Polyline set 3D with data 49
Non-uniform B-spline curve 50
Fill area 3D 50
Fill area 2D 51
Fill area 3D with data 51

Fill area set 3D 52
Fill area set 2D 53
Fill area set 3D with data 53
Triangle strip 54
Quadrilateral mesh 55
Set of fill area sets 56
Non-uniform B-spline surface 58
Cell array 3D 59
Cell array 2D 60
Extended cell array 3D 60
GDP 3D 60
GDP 2D 60
Noop 61

4. Lookup Tables

4.1. Lookup Table Resource Management 68

4.1.1. Create Lookup Table 68
4.1.2. Copy Lookup Table 68
4.1.3. Free Lookup Table 69

4.2. Lookup Table Inquiry 70

4.2.1. Get Table Info 70
4.2.2. Get Predefined Entries 71
4.2.3. Get Defined Indices 71
4.2.4. Get Table Entry 72
4.2.5. Get Table Entries 72

4.3. Lookup Table Modification 74

4.3.1. Set Table Entries 74
4.3.2. Delete Table Entries 74

5. Pipeline Contexts

5.1. Pipeline Context Resource Management 83

5.1.1. Create Pipeline Context 83
5.1.2. Copy Pipeline Context 83
5.1.3. Free Pipeline Context 84

5.2. Pipeline Context Inquiry 85

5.2.1. Get Pipeline Context 85

5.3. Pipeline Context Modification 85

5.3.1. Change Pipeline Context 85

6. Renderers

6.1. Renderer Resource Management 90

6.1.1. Create Renderer 90
6.1.2. Free Renderer 90

6.2. Renderer Modification 91

6.2.1. Change Renderer 91

6.3. Renderer Inquiry 91

6.3.1. Get Renderer Attributes 91
6.3.2. Get Renderer Dynamics 92

6.4. Client-Side Traversal Support 93

6.4.1. Begin Rendering 93
6.4.2. End Rendering 93
6.4.3. Begin Structure 94
6.4.4. End Structure 94

6.5. Rendering Commands 95

6.5.1. Render Output Commands 95
6.5.2. Render Elements 95
6.5.3. Accumulate State 96
6.5.4. Render Network 96

7. Renderer Picking

7.1. Pick One 99

7.1.1. Begin Pick One 99
7.1.2. End Pick One 100
7.1.3. Pick One 100

7.2. Pick All 101

7.2.1. Begin Pick All 101
7.2.2. End Pick All 102
7.2.3. Pick All 102

8. Structures

8.1. Structure Resource Management 104

8.1.1. Create Structure 104
8.1.2. Copy Structure 105
8.1.3. Destroy Structures 105

8.2. Structure Inquiry 106

8.2.1. Get Structure Info 106
8.2.2. Get Element Info 107
8.2.3. Get Structures In Network 107
8.2.4. Get Ancestors 108
8.2.5. Get Descendants 109
8.2.6. Fetch Elements 110

8.3. Structure Resource Attribute Modification 111

8.3.1. Set Editing Mode 111
8.3.2. Set Element Pointer 111
8.3.3. Set Element Pointer At Label 112
8.3.4. Element Search 113

8.4. Structure Editing 114

8.4.1. Store Elements 114
8.4.2. Delete Elements 115
8.4.3. Delete Elements To Label 116
8.4.4. Delete Elements Between Labels 116
8.4.5. Copy Elements 117
8.4.6. Change Structure References 118

9. Name Sets

9.1. Name Set Resource Management 119

9.1.1. Create Name Set 119
9.1.2. Copy Name Set 119
9.1.3. Free Name Set 120

9.2. Name Set Inquiry 121

9.2.1. Get Name Set 121

9.3. Name Set Modification 121

9.3.1. Change Name Set 121

10. Search Contexts

10.1. Search Context Resource Management 124

10.1.1. Create Search Context 124
10.1.2. Copy Search Context 124
10.1.3. Free Search Context 125

10.2. Search Context Inquiry 126

10.2.1. Get Search Context 126

10.3. Search Context Modification 126

10.3.1. Change Search Context 126

10.4. Structure Network Searching 127

10.4.1. Search Network 127

11. PHIGS Workstations

11.1. PHIGS Workstation Resource Management 129

11.1.1. Create PHIGS Workstation 129
11.1.2. Free PHIGS Workstation 130

11.2. PHIGS Workstation Inquiry 131

11.2.1. Get PHIGS Workstation Info 131
11.2.2. Get Dynamics 135
11.2.3. Get View Representation 137

11.3. PHIGS Workstation Manipulation 138

11.3.1. Redraw All Structures 138
11.3.2. Update Workstation 138
11.3.3. Redraw Clip Region 139
11.3.4. Execute Deferred Actions 139
11.3.5. Set View Priority 140
11.3.6. Set Display Update Mode 140
11.3.7. Map DC to WC 141
11.3.8. Map WC to DC 141

11.4. PHIGS Workstation Update 143

11.4.1. Set View Representation 143
11.4.2. Set Workstation Window 143
11.4.3. Set Workstation Viewport 144
11.4.4. Set HLHSR Mode 144
11.4.5. Set Buffer Mode 145

11.5. Posting/Unposting Structures 146

11.5.1. Post Structure 146
11.5.2. Unpost Structure 146
11.5.3. Unpost All Structures 147
11.5.4. Get PHIGS Workstation Postings 147

12. Workstation Picking

12.1. Pick Device Descriptors 148

12.1.1. Get Pick Device Descriptor 150
12.1.2. Change Pick Device Descriptor 150

12.2. Pick Measure 151
12.2.1. Create Pick Measure 152
12.2.2. Free Pick Measure 152
12.2.3. Get Pick Measure Attributes 152
12.2.4. Update Pick Measure 153

13. PEX Fonts

13.1. PEX Font Resource Management 155
13.1.1. Open PEX Font 155
13.1.2. Close PEX Font 155

13.2. PEX Font Inquiry 156
13.2.1. Query PEX Font 157
13.2.2. List PEX Fonts 157
13.2.3. List PEX Fonts with Info 158
13.2.4. Query PEX Text Extents 159

Appendix A: Definition of Standard PEX Subsets

Appendix B: Minimum Support for PHIGS/PHIGS-PLUS

Appendix C: Definition of PEX Errors

Appendix D: Definition of Table Default Values

Appendix E: Registered PEX Escapes