Contents

About This Manual xiii
Customer Support xvi

Chapter 1 Introduction 1

1.1 Overview 1
1.2 The Look and Feel of Prism 2
1.3 Loading and Executing Programs 3
1.4 Debugging 4
1.5 Visualizing Data 4
1.6 Analyzing Program Performance 4
1.7 Editing and Compiling 5
1.8 Obtaining On-Line Help and Documentation 5
1.9 Customizing Prism 6

Chapter 2 Using Prism 7

2.1 Before Entering Prism 8
2.1.1 Supported Languages and Compilers 8
2.1.2 Compiling and Linking Your Program 8
2.1.3 Setting Up Your Environment 9
2.2 Entering Prism 10
2.2.1 Invoking Prism 10
2.2.2 Command-Line Options 10
Loading a Program 10
Specifying Commands-Only Prism 11
Specifying Node Prism (CM-5 Only) 11
Specifying Remote Execution (Node Prism Only) 11
Specifying X Toolkit Options 12
Specifying Input and Output Files 12
2.3 Within Prism 12
2.3.1 Using the Mouse 13
2.3.2 Using Keyboard Alternatives to the Mouse 13

Copyright © 1991–1994 Thinking Machines Corporation

2.3.3 Issuing Commands 15
2.4 Using the Menu Bar 16
2.4.1 With a Mouse 16
2.4.2 From the Keyboard 17
Mnemonics 17
Keyboard Accelerators 18
2.4.3 What Happens When You Choose an Item 18
2.5 Using Windows, Dialog Boxes, and Lists 19
2.5.1 Windows 19
2.5.2 Dialog Boxes 20
2.5.3 Lists 21
2.6 Using the Source Window and Line-Number Region 21
2.6.1 The Source Window 21
Moving through the Source Code 22
Selecting Text 22
Splitting the Source Window 23
2.6.2 The Line-Number Region 24
2.7 Using the Command Window 26
2.7.1 Using the Command Line 26
2.7.2 Using the History Region 27
2.7.3 Redirecting Output 28
2.7.4 Logging Commands and Output 29
2.7.5 Executing Commands from a File 29
2.8 Using Prism with Paris Programs 30
2.9 Writing Expressions in Prism 31
2.9.1 How Prism Chooses the Correct Variable or Procedure 31
Using Qualified Names 32
2.9.2 Using Fortran Intrinsic Functions in Expressions 33
2.9.3 Writing C* Expressions 34
Using C* Reduction Operators 34
Passing Parallel Variables to Functions 35
Using Array-Section Syntax in C* Left Indexes 35
2.9.4 Using C and C* Arrays in Expressions 36
2.9.5 Hints for Detecting NaNs and Infinities 36
2.10 Issuing UNIX Commands 37
2.10.1 Changing the Current Working Directory 37
2.10.2 Setting and Displaying Environment Variables 38
2.11 Leaving Prism 39

Version 2.0, April 1994
Copyright © 1991–1994 Thinking Machines Corporation

Chapter 3 Loading and Executing a Program 41

3.1 Loading a Program 41
3.1.1 From the Menu Bar 42
3.1.2 From the Command Window 43
3.1.3 What Happens When You Load a Program 43
3.1.4 Loading Subsequent Programs 44

3.2 Associating a Core File with a Loaded Program 44

3.3 Attaching to and Detaching from a Running Process 44

3.4 Attaching to and Detaching from a CM-2 or CM-200 45
3.4.1 Attaching from within Prism 46
Auto-Attaching in Prism 48
3.4.2 Detaching from within Prism 48
3.4.3 Cold Booting 48
3.4.4 Turning Safety On and Off 49
3.4.5 Obtaining Information about CM Users 49

3.5 Executing a Program 49
3.5.1 Running a Program 50
3.5.2 Program I/O 51
3.5.3 Stepping through a Program 51
3.5.4 Interrupting and Continuing Execution 52
3.5.5 Status Messages 52

3.6 Choosing the Current File and Function 53

3.7 Creating a Directory List for Source Files 55

Chapter 4 Debugging a Program 57

4.1 Overview of Events 57

4.2 Using the Event Table 59
4.2.1 Description of the Event Table 59
4.2.2 Adding an Event 62
4.2.3 Deleting an Existing Event 63
4.2.4 Editing an Existing Event 63
4.2.5 Saving Events 64
4.2.6 Enabling and Disabling Events 64

4.3 Setting Breakpoints 65
4.3.1 Using the Line-Number Region 66
Deleting Breakpoints via the Line-Number Region 67
What Happens in a Split Source Window 67
4.3.2 Using the Event Table and the **Events** Menu 67
Deleting Breakpoints via the Event Table 68

Copyright © 1991–1994 Thinking Machines Corporation

4.3.3 Using Commands 68
Examples 70
For Machine Instructions 71
Deleting Breakpoints via the Command Window 71
4.4 Tracing Program Execution 71
4.4.1 Using the Event Table and the **Events** Menu 72
Deleting Traces via the Event Table 72
4.4.2 Using Commands 73
For Machine Instructions 73
Deleting Traces via the Command Window 73
4.5 Displaying and Moving through the Call Stack 74
4.5.1 Displaying the Call Stack 74
4.5.2 Moving through the Call Stack 75
4.6 Examining the Contents of Memory and Registers 75
4.6.1 Displaying Memory 76
4.6.2 Displaying the Contents of Registers 77
4.7 Debugging Message-Passing Programs on a CM-5 78

Chapter 5 Visualizing Data 79

5.1 Overview 79
5.1.1 Printing and Displaying 80
5.1.2 Methods 80
5.1.3 Notes 81
5.2 Choosing the Data to Visualize 82
5.2.1 Printing and Displaying from the **Debug** Menu 82
5.2.2 Printing and Displaying from the Source Window 83
5.2.3 Printing and Displaying from the Event Table and the **Events** Menu 83
From the **Events** Menu 83
From the Event Table 84
5.2.4 Printing and Displaying from the Command Window 85
Setting the Context 86
5.3 Working with Visualizers 86
5.3.1 Using the Data Navigator in a Visualizer 88
Changing the Axes 88
5.3.2 Using the Display Window in a Visualizer 88
5.3.3 Using the **File** Menu 89
5.3.4 Using the **Options** Menu 89
Choosing the Representation 90
Setting Parameters 94

Copyright © 1991–1994 Thinking Machines Corporation

Displaying a Ruler 96
Displaying Statistics 97
Using the **Set Context** Dialog Box 97
5.3.5 Updating and Closing the Visualizer 99
5.4 Visualizing Structures 99
5.4.1 Expanding Pointers 100
5.4.2 Panning and Zooming 102
5.4.3 Deleting Nodes 103
5.4.4 More about Pointers in Structures 103
5.4.5 Updating and Closing a Structure Visualizer 103
5.4.6 Visualizing Dynamic Arrays and Union Members 103
Calling the Functions 104
An Example 105
5.5 Printing the Type of a Variable 106
5.5.1 What Is Displayed 107
5.6 Modifying Data 107
5.7 Changing the Radix of Data 108

Chapter 6 Obtaining Performance Data 109
6.1 Overview 109
6.2 Writing and Compiling Your Program 110
6.2.1 Including Timers within Your Program 111
6.3 Obtaining the Most Accurate Performance Data 111
6.4 Collecting Performance Data 112
6.4.1 Collecting Performance Data Outside of Prism 113
6.5 Displaying Performance Data 113
6.5.1 The **Resources** Pane 116
On a CM-2 or CM-200 116
On a CM-5 117
6.5.2 The **Procedures** Pane 119
6.5.3 The **Source-Lines** Pane 121
6.5.4 Displaying Performance Data in the Command Window 121
6.6 Interpreting the Data 122
6.6.1 Making Sense of the Times 122
6.6.2 Isolating Bottlenecks 122
6.6.3 Anomalous Performance Data 124
6.7 Saving and Loading Performance Data Files 124

Copyright © 1991–1994 Thinking Machines Corporation

Chapter 7 Editing and Compiling Programs 127

7.1 Editing Source Code 127

7.2 Using the **make** Utility 128

7.2.1 Creating the Makefile 128

7.2.2 Using the Makefile 128

Chapter 8 Getting Help 131

8.1 Getting Help 131

8.1.1 Using the Help System 132

8.1.2 Choosing Selections from the **Help** Menu 132

8.1.3 Getting Help on Using the Mouse 133

8.1.4 Obtaining Help from the Command Window 133

8.2 Obtaining On-Line Documentation 134

8.2.1 Viewing CM Documents 134

8.2.2 Viewing Manual Pages 135

8.2.3 Viewing Release Notes and Bug-Update Files 136

8.3 Sending Electronic Mail about Prism 136

8.4 The Prism Mailing List 137

Chapter 9 Customizing Prism 139

9.1 Using the Tear-Off Region 139

9.1.1 Adding Menu Selections to the Tear-Off Region 140

9.1.2 Adding Prism Commands to the Tear-Off Region 141

9.2 Setting Up Alternative Names for Commands and Variables 141

9.3 Using the C**ustomize** Utility 142

9.3.1 How to Change a Setting 143

9.3.2 The Resources 144

9.3.3 Where Prism Stores Your Changes 146

9.4 Changing Prism Defaults in Your X Resource Database 147

9.4.1 Adding Prism Resources to the Resource Database 148

9.4.2 Specifying the Editor and Its Placement 149

9.4.3 Specifying the Window for Error Messages 149

9.4.4 Changing the Text Fonts 150

9.4.5 Changing Colors 150

Changing the Colors Used for Colormap Visualizers 150

Changing Prism's Standard Colors 151

9.4.6 Changing Keyboard Translations 151

Changing Keyboard Translations in Text Widgets 152

Version 2.0, April 1994

Copyright © 1991–1994 Thinking Machines Corporation

Changing General Motif Keyboard Translations 153
9.4.7 Changing the Xterm to Use for I/O 154
9.4.8 Changing the Way Prism Signals an Error 154
9.4.9 Changing the `make` Utility to Use 154
9.4.10 Changing the Way Prism Treats Stale Data in Visualizers 154
9.4.11 Specifying Mappings between Paths for Remote Execution . . 154
9.5 Initializing Prism 155

Chapter 10 Node Prism 157
10.1 Overview 157
10.2 Entering Node Prism 159
10.2.1 From the Command Line 159
10.2.2 From Global Prism 160
10.2.3 From a Remote Computer 160
Opening the Connection 160
Closing the Connection 162
Mapping Paths 162
10.3 Using PN Sets 163
10.3.1 Using the PN Sets Window 164
10.3.2 Predefined PN Sets 166
10.3.3 Defining Your Own PN Sets 166
The Syntax for Defining a PN Set 166
Naming PN Sets 169
Evaluating Variable PN Sets 170
10.3.4 Viewing the Contents of PN Sets 172
From the **PN Sets** Window 172
From the Command Line 173
10.3.5 Deleting PN Sets 174
10.3.6 The Current PN Set 174
Finding Out the Current PN Set 175
The Current PN Set and Dynamic PN Sets 176
The Current PN Set and Variable PN Sets 177
10.3.7 The Current PN 177
10.3.8 The `Cycle` PN Set 178
The Cycle Visualizer Window 180
10.3.9 Using PN Sets in Commands 180
10.4 Executing a Program in Node Prism 181
10.4.1 The Structure of a Message-Passing Program 182
10.4.2 Running 183
10.4.3 Attaching 184

Copyright © 1991–1994 Thinking Machines Corporation

10.4.4 Detaching 185
10.4.5 Quitting 185
10.4.6 Using Prism with Global/Local CM Fortran Programs 185
Example 186
10.4.7 Stepping and Continuing through a Program 187
10.4.8 Interrupting and Waiting for Nodes 187
10.4.9 The Execution Pointer 189
10.4.10 Finding Out Execution Status 189
10.4.11 Executing a Program in Commands-Only Node Prism 189
10.5 Debugging in Node Prism 190
10.5.1 Events in Node Prism 190
Events and Dynamic PN Sets 191
Events and Variable PN Sets 192
Actions in Events 192
Displaying Events by Node 193
Events and Deleted PN Sets 193
Using the Line-Number Region 194
10.5.2 The **Where** Graph 194
Panning and Zooming in the **Where** Graph 196
Shrinking Selected Portions of the **Where** Graph 198
Moving through the **Where** Graph 198
Making a Function the Current PN Set 198
Issuing the **`where`** Command in Node Prism 199
10.5.3 Scope in Node Prism 199
10.5.4 Examining the Contents of Vector-Unit Registers 200
The Data Registers 200
The Control Registers 202
10.5.5 Examining Node Core Files 203
Description of Node Core Files and Associated Files 203
How to Look at a Node Core File 205
An Example 205
10.6 Visualizing Data in Node Prism 207
10.7 Performance Analysis in Node Prism 210
10.7.1 Interpreting the Data 213
10.7.2 Saving and Loading Performance Data 213
10.8 Customizing Node Prism 214

Appendix A Commands-Only Prism 215

A.1 Specifying the Commands-Only Option 215
A.2 Issuing Commands 216

Version 2.0, April 1994
Copyright © 1991–1994 Thinking Machines Corporation

A.3 Useful Commands 217
A.4 Obtaining On-Line Documentation 218
A.5 Leaving Commands-Only Prism 218
A.6 Running Commands-Only Prism from an Xterm: The **-cx** Option 219

Appendix B Using Prism with CMAX 221
B.1 How Prism Can Display Both Source Files 221
B.2 Splitting the Source Window 222
B.2.1 From the Command Line 223
B.3 Using the Master Pane 224
B.3.1 From the Command Line 225
B.4 Displaying Corresponding Source Lines 225
B.5 Debugging 225
B.6 Analyzing Performance 226
B.7 Using Commands-Only Prism 226

Appendix C Glossary 227

Index 233

Copyright © 1991–1994 Thinking Machines Corporation