Contents

About This Manual vii
Customer Support ix

Chapter 1 Introduction 1

1.1 Partitions 2
1.1.1 CM-5 Vector Units 2
1.2 Software Versions Documented 3
1.3 Using a CM-5 System 3
1.3.1 The User's View 4
1.3.2 Keeping Up with System Status 5
1.4 Why Use This Manual? 8
1.4.1 Software to Know About 8
1.4.2 Organization of the Manual 9

Chapter 2 Creating Message-Passing Programs 11

2.1 Basic Components of a Message-Passing Program 11
2.2 Hostless Programs 12
2.2.1 Computation and Communication 12
2.2.2 I/O 13
2.2.3 Termination 13
2.3 Host/Node Programs 14
2.4 A Few Caveats 15
2.5 Fortran I/O Issues 16
2.5.1 CMMD I/O Mode Restrictions 16
Synchronous I/O Modes 16
Global Independent I/O Mode 17
Local I/O Mode 18
2.5.2 Other Fortran I/O Considerations 18
Initializing Standard I/O 18
Using the `-f` Option in Fortran 77 18
Don't Mix F77 I/O and CMF I/O 18

Copyright © 1993 Thinking Machines Corporation

Chapter 3 Compiling and Linking CMMD Programs 19

3.1 Include Files 19

3.2 Hostless Programs 20
3.2.1 Compiling and Linking Hostless Programs 20
Compile as Usual 20
Link with **cmmd-ld** 21
3.2.2 Important Note for VU CM-5 Sites: 22

3.3 Host/Node Programs 22
3.3.1 Executing Host/Node Programs 22
Starting the Programs 22
The I/O Server 23
Terminating the Programs 23

3.4 Compiling CM Fortran and C* Programs 24

3.5 Fortran 77 Programs 24
3.5.1 Use **-Nx** Option to Increase Symbol Table Limit 24
3.5.2 Use **-f** Option to Align Double Precision Data Correctly 25

3.6 Writing Version-Independent CMMD Code 25
3.6.1 Important Differences Between Versions 2.0 and 3.0 25
3.6.2 **CMMD_VERSION** Preprocessor Symbol 25

3.7 Sample Programs 26
3.7.1 Hostless Examples 26
3.7.2 Host/Node Examples 26

Chapter 4 Executing Programs 27

4.1 The Execution Environment 27

4.2 Gaining Access 28

4.3 Checking System Status 28

4.4 Executing a Program 29

4.5 Executing a Batch Job with NQS 30
4.5.1 Submitting a Batch Job 30
4.5.2 Checking on NQS 31

4.6 Timing a Program 31
4.6.1 Using CMOST Timers 32

Copyright © 1993 Thinking Machines Corporation

Chapter 5 Error Handling and Error Diagnosis 33

5.1 Error Handling 33
5.1.1 Default Error Handling 34
5.1.2 Customized Error Handling 35
5.2 CMMD Safety Routine 35
5.3 When Your Program Is Terminated 36
5.3.1 Using **printf** 36
5.3.2 The Errors File 36
5.3.3 Core Files 37
5.3.4 CMTSD Files 37
5.4 Fortran Tracebacks:
A Warning about Synchronization 37

Chapter 6 Debugging Your Program 39

6.1 Introduction 39
6.2 High-Level **dbx** Features Supported 40
6.2.1 The Essential Commands 40
6.2.2 Other Commands 41
6.2.3 Commands Not Supported 41
6.3 Summary of Extensions 41
6.4 Commands for Low-Level Debugging 42
6.5 Compiling and Linking 44
6.6 Starting Up **pndbx** 44
6.6.1 Using Prism 44
6.6.2 Using **dbx** 45
6.7 Monitoring the Nodes 45
6.7.1 Asynchronous Monitoring 46
6.8 Exiting from **pndbx** 46
6.9 Using **pndbx** 46
6.9.1 **pnstatus** 47
6.9.2 Interrupting Nodes 48
6.9.3 Waiting for Breakpoints and Errors 48
6.9.4 Using pndbx to Debug Core Files 49
6.9.5 Debugging CM Fortran Programs with pndbx 49
6.10 Submitting a Bug Report 51
6.11 A Sample **pndbx** Session 52

Copyright © 1993 Thinking Machines Corporation

Appendix A Sample Programs **59**

A.1 C Examples 61
A.1.1 **round_trip** 61
Round-trip message (host program) 61
Round-trip message (node program) 62
A.1.2 **ring** 63
One-dimensional ring 63
A.1.3 **redist_block** 64
A.1.4 **redist_nonblock** 65
A.1.5 **redist_nonblk_hndlr** 66
A.1.6 **sort** 68
A.2 Fortran 77 Examples 71

Appendix B Non–RTS Parallel Memory Allocation **75**

B.1 The Parallel Stack and Parallel Heap 75
B.2 VU Regions 76
B.3 Expanding the Stack or Heap 76
B.4 Translating Stack and Heap Addresses 78
B.5 Using **pmalloc** to Allocate Memory 79

Copyright © 1993 Thinking Machines Corporation