Contents

Contents .......................................................................................................................................................... 3
Figures ........................................................................................................................................................... 12
Tables ............................................................................................................................................................ 20
1. Preface ..................................................................................................................................................... 21
   1.1 Edition information ......................................................................................................................... 21
   1.2 What this book is about ................................................................................................................. 21
   1.3 Who should read this book ........................................................................................................... 21
   1.4 What you need to know to understand this book .......................................................................... 21
   1.5 How to use this book ...................................................................................................................... 21
   1.6 Revision Notice .............................................................................................................................. 21
   1.7 Readers Comments ......................................................................................................................... 22
   1.8 Legal Advice ................................................................................................................................... 22
   1.9 Trademarks ..................................................................................................................................... 22
   1.10 Acknowledgements ....................................................................................................................... 23
2. Related Publications ............................................................................................................................ 24
   2.1 Hercules – General Information .................................................................................................. 24
   2.2 Hercules – Installation Guide ....................................................................................................... 24
   2.3 Hercules – User Reference Guide ............................................................................................... 24
   2.4 Hercules – Operations and Utilities Guide .................................................................................. 24
   2.5 Hercules – Messages and Codes .................................................................................................. 24
   2.6 Hercules – Reference Summary ................................................................................................... 24
3. Summary of changes ............................................................................................................................ 25
   3.1 Version 4, First Edition (HEUR040000-00) ................................................................................ 25
4. Hercules Configuration File .................................................................................................................. 28
   4.1 The Configuration File ................................................................................................................... 28
   4.2 System Parameters ........................................................................................................................ 28
   4.3 Device Definitions ........................................................................................................................ 31
   4.4 Coding Rules ................................................................................................................................ 33
   4.5 Record Format ............................................................................................................................... 33
   4.6 Sample Configuration File ............................................................................................................ 34
   4.7 Symbol Substitution ...................................................................................................................... 36
5. System Parameter Descriptions ......................................................................................................... 40
   5.1 # (Comment line) ......................................................................................................................... 40
   5.2 * (Comment line) .......................................................................................................................... 41
   5.3 ARCHLVL (Set architecture level) ............................................................................................... 42
   5.4 ARCHMODE (Initial architecture mode) ....................................................................................... 45
   5.5 ASN_AND_LX_REUSE / ALRF (ESAME ASN and LX REUSE feature) ................................... 46
   5.6 AUTO_SCSI_MOUNT (Automatic SCSI tape mounts) ................................................................. 47
   5.7 AUTOINIT (Automatic creation of empty tape files) .................................................................. 48
   5.8 AUTOMOUNT (Tape automount root directory) ......................................................................... 49
   5.9 CAPPING (CPU capping feature) ................................................................................................. 51
   5.10 CCKD (Compressed CKD DASD options) .................................................................................. 52
   5.11 CMDLEVEL (Set current command group) ................................................................................. 57
   5.12 CMDLVL (Set current command group) ...................................................................................... 59
5.13 CMDSEP (Command line separator) ................................................................................................................. 60
5.14 CNSLPORT (Console port) ........................................................................................................................................ 61
5.15 CODEPAGE (Codepage conversion table) ............................................................................................................... 62
5.16 CONKPALV (Console and telnet clients keep-alive option) ...................................................................................... 64
5.17 CP_UPDT (User character conversion table) ........................................................................................................... 66
5.18 CPUIDFMT (Set format BASIC / 0 / 1 STIDP generation) ......................................................................................... 69
5.19 CPUMODEL (CPU model number) .......................................................................................................................... 71
5.20 CPUPRIO (CPU thread process priority) .................................................................................................................. 72
5.21 CPUSERIAL (CPU serial number) .......................................................................................................................... 73
5.22 CPUVERID (CPU version code) .................................................................................................................................. 74
5.23 DEFSYM (Define a symbol) ........................................................................................................................................... 79
5.24 DEFTMAX (Maximum number of device threads) .................................................................................................... 81
5.25 DEVSYM (Define a symbol) ........................................................................................................................................... 79
5.26 DEVTPRIO (Device threads process priority) ........................................................................................................ 80
5.27 DIAG8CMD (DIAGNOSE 8 command option) ........................................................................................................ 83
5.28 ECPSVM (ECPS:VM support status (VM)) ................................................................................................................ 85
5.29 ENGINES (Processor engines type) ...................................................................................................................... 87
5.30 HAO (Hercules Automatic Operator) ...................................................................................................................... 89
5.31 HERCLOGO (Hercules logo file) ............................................................................................................................ 91
5.32 HERCPRIO (Hercules process priority) ................................................................................................................... 92
5.33 HTTP (HTTP server configuration) ....................................................................................................................... 93
5.34 HTTPPORT (HTTP server port) .................................................................................................................................. 95
5.35 HTTPROOT (HTTP server root directory) ................................................................................................................ 96
5.36 IGNORE (Ignore subsequent INCLUDE errors) ......................................................................................................... 97
5.37 INCLUDE (Include configuration file) .................................................................................................................... 98
5.38 IODELAY (I/O interrupt wait time (LINUX)) ........................................................................................................... 99
5.39 LMOD (Additional dynamic load modules) ............................................................................................................ 101
5.40 LEGACYSENSEID (SENSE ID CCW (x'E4') feature) .............................................................................................. 102
5.41 LOADPARM (IPL parameter) ....................................................................................................................................... 104
5.42 LOGOPT (Logging options) ......................................................................................................................................... 105
5.43 LPARNAME (LPAR name returned by DIAG x'204') .............................................................................................. 106
5.44 LPARNUM (LPAR identification number) ............................................................................................................. 107
5.45 MAINSIZE (Main storage size) .................................................................................................................................. 109
5.46 MANUFACTURER (STSI manufacturer code) .......................................................................................................... 112
5.47 MAXCPU (Maximum number of CPUs) ................................................................................................................ 113
5.48 MAXRATES (MIPS/SIO rate reporting interval) ......................................................................................................... 115
5.49 MEMLOCK (Lock Hercules memory) ...................................................................................................................... 117
5.50 MODEL (STSI model code) .......................................................................................................................................... 118
5.51 MODPATH (Dynamic load module path) ................................................................................................................ 120
5.52 MOUNTED_TAPE_REINIT (Control tape initialization) .......................................................................................... 121
5.53 MSGHLD (Timeout value of held messages) ............................................................................................................ 123
5.54 MSGLEVEL (Message display output) ................................................................................................................... 124
5.55 MSGLEVEL (Message display output) ................................................................................................................... 127
5.56 NUMCPU (Number of emulated CPUs) ................................................................................................................ 128
5.57 NUMVEP (Number of vector facilities) .................................................................................................................. 130
5.58 OSTAILOR (Tailor trace information for specific operating system) .................................................................... 131
5.59 PANRATE (Console refresh rate) ................................................................. 133
5.60 PANTITLE (Console window title) .............................................................. 135
5.61 PGMPRDS (LPP license setting) ................................................................. 137
5.62 PLANT (STSI plant code) ........................................................................ 138
5.63 QUITMOUT (Quit timeout value) ............................................................... 139
5.64 REXX (REXX interpreter settings) ............................................................. 140
5.65 SCLPROOT (SCLP base directory) ............................................................. 145
5.66 SCPECHO (Echo to console and history of SCP replies) .......................... 146
5.67 SCPIMPLY (Pass non-Hercules commands to the SCP) ............................ 147
5.68 SCSIMOUNT (Automatic SCSI tape mounts) ........................................... 148
5.69 SHCMDOPT (Shell command option) ....................................................... 149
5.70 SHOWDVOL1 (Enable showing of DASD volsers in device list) ............... 151
5.71 SHRDPRT (Shared device server port) ....................................................... 152
5.72 SRVPRI0 (Server threads priority) ............................................................ 154
5.73 SYMPTOM (Instruction trace display option) .......................................... 155
5.74 SYSEPOCH (Base date for TOD clock) ....................................................... 156
5.75 TIMERINT (Internal timer update interval) ............................................. 158
5.76 TODDRAG (TOD clock drag factor) .......................................................... 160
5.77 TODPRI0 (Timer thread process priority) .................................................. 161
5.78 TRACEOPT (Instruction trace display option) ......................................... 162
5.79 TZOFFSET (TOD clock offset from GMT) .............................................. 163
5.80 XPNSIZE (Expanded storage size) ............................................................ 164
5.81 YROFFSET (TOD clock offset from actual date) ...................................... 167
5.82 Process and Thread Priorities ................................................................. 168

6. Device Definition Descriptions ................................................................. 170
   6.1 Local non-SNA 3270 Devices ................................................................. 170
   6.2 Integrated 3270 (SYSG) Console ........................................................... 173
   6.3 Console Printer-Keyboard Devices ......................................................... 176
   6.4 Integrated Console Printer-Keyboard Devices ....................................... 179
   6.5 Card Reader Devices ........................................................................... 180
   6.6 Card Punch Devices ............................................................................ 183
   6.7 Line Printer Devices ............................................................................ 185
   6.8 Emulated Tape Devices ...................................................................... 189
   6.9 Channel-to-Channel Adapters .............................................................. 208
   6.10 FBA DASD Devices ........................................................................... 222
   6.11 CKD DASD Devices ........................................................................... 224
   6.12 Communication Lines ....................................................................... 228

7. Hercules Console ...................................................................................... 232
   7.1 Hercules Hardware Console ................................................................. 232
   7.2 Web browser interface ........................................................................ 234
   7.3 Using the keyboard ............................................................................ 235
   7.4 Log formats ....................................................................................... 238
   7.5 Programmed Function Key (PF Key) Support ..................................... 240
   7.6 Hercules Console Commands (sorted alphabetically) ....................... 243
   7.7 Hercules Console Commands (grouped by functionality) ................. 250

8. Console Command Descriptions .............................................................. 259
8.1 !message (SCP priority message) ................................................................. 259
8.2 # (Silent comment) ...................................................................................... 260
8.3 $LOCATE (Display and verify Hercules control blocks) ............................ 261
8.4 $TEST (Custom test command) ................................................................. 264
8.5 $ZAPCMD (Enable or disable system parameters and console commands) ................................................................................................................................. 266
8.6 * (Loud comment) .................................................................................... 268
8.7 .reply (SCP command) ........................................................................... 269
8.8 ? (List all commands / command specific help) ........................................ 270
8.9 ABS (Display or alter absolute storage) .................................................. 273
8.10 AEA (Display AEA absolute-effective-address tables) ......................... 275
8.11 AIA (List AIA absolute-instruction-address fields) ................................. 277
8.12 AR (Display access registers) ................................................................. 278
8.13 ARCHLVL (Set architecture level) ............................................................ 279
8.14 ARCHMODE (Set architecture mode) ....................................................... 283
8.15 ATTACH (Configure device) ................................................................. 284
8.16 AUTO_SCSI_MOUNT (Automatic SCSI tape mounts) .............................. 286
8.17 AUTOINIT (Display or set the automatic creation of empty tape files) ...... 287
8.18 AUTOMOUNT (Display or update allowable tape automount directories) ................................................................................................................................. 289
8.19 B (Set breakpoint) .................................................................................. 291
8.20 B+ (Set breakpoint) ............................................................................... 292
8.21 B- (Delete breakpoint) ........................................................................... 293
8.22 CACHE (Execute cache related commands) ............................................ 294
8.23 CACHESTATS (Display cache statistics) .................................................. 296
8.24 CAPPING (Display or set CPU capping value) ......................................... 298
8.25 CCKD (CCKD command) ....................................................................... 300
8.26 CD (Change directory) ........................................................................ 306
8.27 CF (Configure current CPU online or offline) ......................................... 307
8.28 CFALL (Configure all CPUs online or offline) .......................................... 309
8.29 CLOCKS (Display TOD clock and CPU timer) ......................................... 311
8.30 CMDLEVEL (Display or set current command group) ............................ 312
8.31 CMDLVL (Display or set current command group) .................................. 314
8.32 CMDSEP (Display or set current command line separator) ................. 315
8.33 CMDTGT (Specify the command target) ................................................ 317
8.34 CNSLPORT (Display or set console port) ................................................ 319
8.35 CODEPAGE (Display or set codepage conversion table) ....................... 321
8.36 CONKPALV (Display / alter console TCP/IP keep-alive settings) .......... 323
8.37 CP_UPDT (Create or modify user character conversion table) .............. 325
8.38 CPU (Define target CPU for console displays and commands) ............. 331
8.39 CPUIDFMT (Display or set format BASIC / 0 / 1 STIDP generation) ... 333
8.40 CPUMODEL (Display or set CPU model number) .................................. 335
8.41 CPUPRIO (Display or set CPU thread process priority) ......................... 336
8.42 CPU SERIAL (Display or set CPU serial number) ................................... 337
8.43 CPUVERID (CPU version code) ............................................................. 338
8.44 CR (Display or alter control registers) ..................................................... 339
8.45 CSCRIPT (Cancel a running script thread) ............................................ 341
8.46 CTC (Enable / disable CTC debugging) ................................................ 343
8.47 DEFINE (Rename device) ................................................................. 345
8.48 DEFSSTORE (Display or define main and expanded storage values) ........................................ 346
8.49 DEFSYM (Define a symbol) ............................................................. 350
8.50 DELSYM (Delete a symbol) .............................................................. 352
8.51 DETACH (Remove device) ................................................................. 353
8.52 DEVINIT (Reinitialize device) ........................................................... 354
8.53 DEVLIST (List device, device class or all devices) ......................... 355
8.54 DEVPRIO (Display or set device threads process priority) .................. 358
8.55 DEVTMAX (Display or set maximum device threads) ......................... 359
8.56 DIAG8CMD (Display or set DIAGNOSE 8 command option) .............. 361
8.57 DIR (Display file and directory listing) ............................................... 363
8.58 DS (Display subchannel) ................................................................. 365
8.59 ECPSVM (ECPS:VM commands) ...................................................... 369
8.60 ENGINES (Set processor engines type) .............................................. 373
8.61 EXEC (Execute a REXX script) ......................................................... 375
8.62 EXIT (Terminate the emulator) ......................................................... 378
8.63 EXT (Generate external interrupt) ....................................................... 380
8.64 F(+/-) (Mark frames usable or unusable) ........................................... 381
8.65 FCB (Display current FCB or load new FCB image) ......................... 382
8.66 FPC (Display or alter floating point control register) ......................... 384
8.67 FPR (Display or alter floating point registers) .................................... 385
8.68 G (Turn off instruction stepping and start all CPUs) ......................... 387
8.69 GPR (Display or alter general purpose registers) .............................. 388
8.70 HAO (Hercules Automatic Operator) ............................................... 390
8.71 HELP (List all commands / command specific help) ......................... 393
8.72 HERC (Send Hercules command) ..................................................... 396
8.73 HERCLOG (Read new Hercules logo file) ............................................ 397
8.74 HERCPRIO (Display or set Hercules process priority) ....................... 398
8.75 HST (History of commands) ............................................................ 399
8.76 HTTP (Start, stop, modify and display HTTP server) ......................... 401
8.77 I (Generate I/O attention interrupt for device) ...................................... 404
8.78 ICOUNT (Display individual instruction counts) ............................... 405
8.79 IODELAY (Display or set I/O delay value) ......................................... 408
8.80 IPENDING (Display pending interrupts) ............................................ 410
8.81 IPL (IPL Normal from device xxxx) .................................................. 412
8.82 IPLC (IPL Clear from device xxxx) .................................................... 414
8.83 K (Display CCKD internal trace) ....................................................... 415
8.84 KD (Clear held messages) ............................................................... 417
8.85 LDMOD (Load a module) ............................................................... 418
8.86 LEGACYSENSEID (Display or set SENSE ID CCW (x'E4') feature) .......... 419
8.87 LOADCORE (Load a core image from a file) ...................................... 421
8.88 LOADPARM (Set IPL parameter) ..................................................... 422
8.89 LOADTEXT (Load a text deck file) ..................................................... 424
8.90 LOG (Direct logger output) ............................................................. 425
8.91 LOGOPT (Display or set logging options) ........................................... 426
8.92 LPARNAME (Display or set LPAR name) ........................................... 427
8.93 LPARNUM (Display or set LPAR identification number) .......................................................... 428
8.94 LS (Display file and directory listing) .................................................................................. 430
8.95 LSDEP (List module dependencies) ...................................................................................... 432
8.96 LSMOD (List dynamic modules) ........................................................................................... 433
8.97 MAINSIZE (Display or set main storage size) ..................................................................... 435
8.98 MANUFACTURER (Display or set STSI manufacturer code) ............................................. 439
8.99 MAXCPU (Display or set maximum number of CPUs) ...................................................... 440
8.100 MAXRATES (Display highest MIPS/SIO rate or set new reporting interval) ......................... 442
8.101 MEMLOCK (Lock Hercules memory) .................................................................................. 444
8.102 MESSAGE (Display message on console like VM) .......................................................... 445
8.103 MODEL (Display or set STSI model code) ....................................................................... 446
8.104 MODPATH (Display or set dynamic load module path) ..................................................... 448
8.105 MOUNTED_TAPE_REINIT (Control tape initialization) ..................................................... 450
8.106 MSG (Display message on console like VM) .................................................................... 452
8.107 MSGHLD (Display or set timeout of held messages) ........................................................ 453
8.108 MSGLEVEL (Display or set the current message display output) ...................................... 455
8.109 MSG_LVL (Display or set the current message display output) ........................................ 458
8.110 MSGNOH (Display message on console like VM, but without header) ............................... 459
8.111 MT (Control magnetic tape operation) .............................................................................. 460
8.112 NUMCPU (Display or set number of emulated CPUs) ...................................................... 464
8.113 NUMVEC (Display or set number of vector facilities) ...................................................... 466
8.114 OSTAILOR (Tailor trace information for specific operating system) ................................. 467
8.115 PANRATE (Display or set console refresh rate) ................................................................. 470
8.116 PANTITLE (Display or set console window title) ................................................................. 472
8.117 PGMPRDOS (Set LPP license setting) ............................................................................... 474
8.118 PGMTRACE (Trace program interrupts) .......................................................................... 475
8.119 PLANT (Display or set STSI plant code) ........................................................................... 477
8.120 PR (Display prefix register) .............................................................................................. 478
8.121 PSCP (Send system control program priority message) .................................................. 479
8.122 PSW (Display or alter program status word) ................................................................. 480
8.123 PTP (Enable / disable PTP debugging) ............................................................................. 483
8.124 PTT (Display or set internal trace) .................................................................................... 485
8.125 PWD (Print working directory) ....................................................................................... 491
8.126 QCPUID (Display CPU ID) ............................................................................................. 492
8.127 QD (Query device information) ....................................................................................... 493
8.128 QPFKEYS (Display the current PF key settings) ............................................................... 497
8.129 QPID (Display process ID of Hercules) ............................................................................ 499
8.130 QPORTS (Display TCP/IP ports in use) ............................................................................ 500
8.131 QPROC (Display processors type and utilization) ............................................................ 501
8.132 QSTOR (Display main and expanded storage values) ...................................................... 502
8.133 QUIET (Toggle automatic refresh of console display data) .............................................. 503
8.134 QUIT (Terminate the emulator) ....................................................................................... 504
8.135 QUITMOUT (Display or set quit timeout value) ................................................................. 506
8.136 R (Display or alter real storage) ....................................................................................... 507
8.137 RESTART (Generate restart interrupt) ............................................................................... 509
8.138 RESUME (Resume Hercules) ........................................................................................... 510
| 8.139 | REXX (Display or set REXX interpreter settings) | 512 |
| 8.140 | RMMOD (Delete a module) | 519 |
| 8.141 | S (Instruction stepping) | 520 |
| 8.142 | S+ (Instruction stepping on) | 522 |
| 8.143 | S- (Instruction stepping off) | 524 |
| 8.144 | S? (Instruction stepping query) | 525 |
| 8.145 | S{+/-} dev (Turn CCW stepping on or off) | 526 |
| 8.146 | SAVECORE (Save a core image to a file) | 528 |
| 8.147 | SCLPROOT (Set or display SCLP base directory) | 530 |
| 8.148 | SCP (Send system control program command) | 532 |
| 8.149 | SCPECHO (Display or set echo to console and history of SCP replies) | 533 |
| 8.150 | SCPI MPLY (Display or set option to pass non-Hercules commands to the SCP) | 534 |
| 8.151 | SCRIPT (Run a sequence of commands contained in a file) | 535 |
| 8.152 | SSCMOUNT (Automatic SCSI tape mounts) | 537 |
| 8.153 | SF+ (Create a new shadow file) | 539 |
| 8.154 | SF- (Delete a shadow file) | 540 |
| 8.155 | SFC (Compress a shadow file) | 542 |
| 8.156 | SFD (Display shadow file statistics) | 543 |
| 8.157 | SFK (Perform a chkdsk on the active shadow file) | 544 |
| 8.158 | SH (Shell command) | 546 |
| 8.159 | SHCMDOPT (Display or set shell command option) | 548 |
| 8.160 | SHOWDVOLO1 (Display or set enable showing of DASD volcers in device list) | 550 |
| 8.161 | SHRD (Display or set shared device server trace) | 551 |
| 8.162 | SHRDPORT (Set shared device server port) | 553 |
| 8.163 | SIZEOF (Display size of structures) | 555 |
| 8.164 | SRVPRI0 (Display or set server threads process priority) | 556 |
| 8.165 | SSD (Signal shutdown) | 557 |
| 8.166 | START (Start CPU or printer / punch device) | 559 |
| 8.167 | STARTALL (Start all CPUs) | 560 |
| 8.168 | STOP (Stop CPU or printer / punch device) | 561 |
| 8.169 | STOPALL (Stop all CPUs) | 562 |
| 8.170 | STORE (Store CPU status at absolute zero) | 563 |
| 8.171 | SUSPEND (Suspend Hercules) | 564 |
| 8.172 | SYMPTOM (Instruction trace display option) | 566 |
| 8.173 | SYNCIO (Display SYNCIO device statistics) | 567 |
| 8.174 | SYSCLEAR (SYSTEM CLEAR RESET manual operation) | 568 |
| 8.175 | SYSEPOCH (Set base date for TOD clock) | 569 |
| 8.176 | SYRESET (SYSTEM RESET manual operation) | 571 |
| 8.177 | T (Instruction trace) | 572 |
| 8.178 | T+ (Instruction trace on) | 574 |
| 8.179 | T- (Instruction trace off) | 576 |
| 8.180 | T? (Instruction trace query) | 577 |
| 8.181 | T{+/-} CKD (Turn CKD _KEY tracing on or off) | 578 |
| 8.182 | T{+/-} dev (Turn CCW tracing on or off) | 580 |
| 8.183 | TIMERINT (Display or set timers update interval) | 583 |
| 8.184 | TLB (Display TLB tables) | 585 |
8.185  TODDRAG (Display or set TOD clock drag factor) .......................................................... 587
8.186  TODPrio (Display or set timer thread process priority) ............................................... 589
8.187  TRACEOPT (Instruction trace display options) ............................................................ 590
8.188  TT32 (Control / query CTCl-WIN functionality) ............................................................ 593
8.189  TZOFFSET (Set TOD clock offset from GMT) .............................................................. 595
8.190  U (Disassemble storage) ............................................................................................... 596
8.191  UPTIME (Display Hercules Emulator uptime) ............................................................... 598
8.192  V (Display or alter virtual storage) ............................................................................... 599
8.193  VERSION (Display version information) ........................................................................ 602
8.194  XPNDSIZE (Display or set expanded storage size) ....................................................... 603
8.195  YROFFSET (Set TOD clock offset from actual date) ..................................................... 606

9.  Shared Device Support ....................................................................................................... 607
  9.1  Basics ............................................................................................................................ 607
  9.2  Caching ......................................................................................................................... 607
  9.3  Compression .................................................................................................................. 607
  9.4  Usage of Shared Devices .............................................................................................. 608

10. Hercules 3270 Logo ........................................................................................................ 610
10.1  Function ........................................................................................................................ 610
10.2  Order Commands ....................................................................................................... 610
10.3  Variables ....................................................................................................................... 612
10.4  Sample .......................................................................................................................... 612

11. Starting the Hercules Emulator ....................................................................................... 615
11.1  Starting Hercules in Native Mode ................................................................................. 615
11.2  Starting Hercules with the Windows GUI ................................................................. 618
11.3  Starting Hercules with the Hercules Studio .............................................................. 619

12. The Run-Commands File ................................................................................................. 620
12.1  Function ........................................................................................................................ 620
12.2  Run-Commands File Statements ................................................................................ 620
12.3  Automating Hercules Startup ..................................................................................... 622

13. The “Hercules Automatic Operator” (HAO) Facility ......................................................... 625
13.1  HAO Introduction ........................................................................................................ 625
13.2  Defining HAO Rules .................................................................................................... 625
13.3  Deleting HAO Rules ..................................................................................................... 625
13.4  Substituting Substrings ............................................................................................... 626
13.5  Limitations ................................................................................................................... 626
13.6  Examples ....................................................................................................................... 626

14. REXX Support ................................................................................................................ 628
14.1  Prerequisites ................................................................................................................ 628
14.2  Using Rexx .................................................................................................................. 628
14.3  Command Environment ............................................................................................... 629
14.4  The Rexx Builtin Function “value()” ......................................................................... 629
14.5  Error Handling .............................................................................................................. 631

15. Submitting Jobs via the Socket Reader .......................................................................... 632
15.1  Socket Reader Basics ................................................................................................. 632
15.2  Submitting Jobs from Windows .................................................................................. 633
15.3  Submitting Jobs from Unix ......................................................................................... 634
Figure 45: CAPPING command (display current CPU capping value, capping set)......................... 298
Figure 46: CAPPING command (set CPU capping value)................................................................. 299
Figure 47: CAPPING command (disable capping)........................................................................... 299
Figure 48: CAPPING command (display current CPU capping value, capping not set)............... 299
Figure 49: CCKD OPTS command .................................................................................................. 304
Figure 50: CCKD HELP command................................................................................................. 305
Figure 51: CCKD STATS command............................................................................................... 305
Figure 52: CCKD command (set options)...................................................................................... 305
Figure 53: CD command (absolute path)....................................................................................... 306
Figure 54: CD command (relative path)......................................................................................... 306
Figure 55: CF command (display CPU status)................................................................................ 307
Figure 56: CF command (configure CPU offline).......................................................................... 308
Figure 57: CF command (configure CPU online)......................................................................... 308
Figure 58: CFALL command (display status of all CPUs)............................................................. 309
Figure 59: CFALL command (configure all CPUs offline).............................................................. 310
Figure 60: CFALL command (configure all CPUs online)............................................................. 310
Figure 61: CLOCKS command.................................................................................................... 311
Figure 62: CMDLEVEL command (set command group).............................................................. 313
Figure 63: CMDLEVEL command (display current command group)........................................... 313
Figure 64: CMDSEP command (display the current command line separator)................................ 315
Figure 65: CMDSEP command (set new command line separator).............................................. 316
Figure 66: CMDTGT command (display current setting)................................................................. 317
Figure 67: CMDTGT command (set target to SCP)....................................................................... 318
Figure 68: CMDTGT command (set target back to Hercules)..................................................... 318
Figure 69: CNSLPORT command (display current telnet client port)........................................... 319
Figure 70: CNSLPORT command (set telnet client port)............................................................... 320
Figure 71: CNSLPORT command (set telnet client port bound to specific address)..................... 320
Figure 72: CODEPAGE command (display current codepage conversion table)......................... 322
Figure 73: CODEPAGE command (set codepage conversion table)............................................. 322
Figure 74: CONKPALV command................................................................................................. 324
Figure 75: CP_UPD command (copy codepage to user tables)...................................................... 327
Figure 76: CP_UPD command (display ASCII user table)............................................................ 328
Figure 77: CP_UPD command (export user table)........................................................................ 328
Figure 78: CP_UPD command (import user table)........................................................................ 328
Figure 79: CP_UPD command (alter ASCII user table)............................................................... 329
Figure 80: CP_UPD command (reset user codepage tables).......................................................... 330
Figure 81: CP_UPD command (test user codepage tables)............................................................ 330
Figure 82: CPU command (set target CPU address permanently).................................................. 332
Figure 83: CPU command (set target CPU address permanently).................................................. 332
Figure 84: CPUIDFMT command (display current STIDP format)................................................ 334
Figure 85: CPUIDFMT command (set STIDP format bit)............................................................. 334
Figure 86: CPUMODEL command............................................................................................... 335
Figure 87: CPUPRIO command..................................................................................................... 336
Figure 88: CPUUSERIAL command.............................................................................................. 337
Figure 89: CPUVERID command.................................................................................................. 338
Figure 90: CR command (display control registers)...................................................................... 339
Figure 91: CR command (alter control register) ................................................................. 340
Figure 92: CSCRIPT command (cancel first script) ............................................................... 341
Figure 93: CSCRIPT command (cancel script with ID) ......................................................... 342
Figure 94: CSCRIPT command (cancel all scripts) ............................................................... 342
Figure 95: CTC command (enable debug packet tracing) ...................................................... 344
Figure 96: CTC command (disable debug packet tracing) ..................................................... 344
Figure 97: DEFINE command ............................................................................................. 345
Figure 98: MAINSIZE command (display size of main and expanded storage) .................. 349
Figure 99: MAINSIZE command (display size of main storage) ........................................... 349
Figure 100: MAINSIZE command (Set size of locked main storage) .................................. 349
Figure 101: MAINSIZE command (Set size of main and expanded storage) ...................... 349
Figure 102: DEFSYM command (list all symbols) ............................................................... 351
Figure 103: DEFSYM command (define new symbol) ......................................................... 351
Figure 104: DEFSYM command (clear defined symbol) ...................................................... 351
Figure 105: DELSYM command .......................................................................................... 352
Figure 106: DETACH command ......................................................................................... 353
Figure 107: DEVLINIT command ......................................................................................... 354
Figure 108: DEVLIST command (list all devices) ................................................................. 356
Figure 109: DEVLIST command (specify device class) ......................................................... 357
Figure 110: DEVLIST command (specify device number) .................................................... 357
Figure 111: DEVPRI0 command .......................................................................................... 358
Figure 112: DEVTMAX command (list maximum allowed device threads) ......................... 360
Figure 113: DEVTMAX command (set maximum allowed device threads) ......................... 360
Figure 114: DIAG8CMD command (display current settings) .............................................. 362
Figure 115: DIAG8CMD command (set new DIAG8CMD mode) ......................................... 362
Figure 116: DIR command ................................................................................................. 364
Figure 117: DS command ................................................................................................... 365
Figure 118: Subchannel-Information Block ........................................................................... 366
Figure 119: Path-Management-Control Word ................................................................. 366
Figure 120: Subchannel-Status Word .................................................................................. 367
Figure 121: ECPSVM ENABLE command ......................................................................... 371
Figure 122: ECPSVM STATS command ............................................................................. 371
Figure 123: ECPSVM LEVEL command ............................................................................. 371
Figure 124: ECPSVM DEBUG command .......................................................................... 372
Figure 125: ENGINES command ....................................................................................... 374
Figure 126: EXEC command ............................................................................................... 376
Figure 127: EXIT command ............................................................................................... 379
Figure 128: EXIT FORCE command .................................................................................. 379
Figure 129: EXT command ................................................................................................ 380
Figure 130: F(-) command ................................................................................................. 381
Figure 131: FCB command (display current FCB) ............................................................... 383
Figure 132: FCB command (load new FCB image) ............................................................... 383
Figure 133: FPC command (display value) ........................................................................ 384
Figure 134: FPC command (alter value) ............................................................................ 384
Figure 135: FPR command (display value) ........................................................................ 385
Figure 136: FPR command (alter value) ............................................................................ 386
Figure 137: G command ................................................................. 387
Figure 138: GPR command (display general purpose registers) ................................................................. 388
Figure 139: GPR command (alter general purpose register) ................................................................. 389
Figure 140: HAO command (define target rule) .................................................................................. 391
Figure 141: HAO command (define command) .................................................................................. 391
Figure 142: HAO command (list defined rules) .................................................................................. 392
Figure 143: HAO command (delete rule) ......................................................................................... 392
Figure 144: HAO command (delete all rules) .................................................................................... 392
Figure 145: HAO fired command ........................................................................................................ 392
Figure 146: HELP command ............................................................................................................ 394
Figure 147: HELP CPU* command .................................................................................................. 395
Figure 148: HELP MAINSIZE command .......................................................................................... 395
Figure 149: HERC command .......................................................................................................... 396
Figure 150: HERCLOGO command .................................................................................................. 397
Figure 151: HERCPRIO command .................................................................................................... 398
Figure 152: HST command (display command recall history list) .......................................................... 400
Figure 153: HST command (issue silent non-echoing command) .......................................................... 400
Figure 154: HTTP command (display HTTP server status) ............................................................... 402
Figure 155: HTTP command (stop HTTP server) ................................................................................ 402
Figure 156: HTTP command (set HTTP server root directory) ........................................................... 402
Figure 157: HTTP command (set HTTP server port and authorization) .............................................. 403
Figure 158: HTTP command (start HTTP server) ............................................................................. 403
Figure 159: I command ..................................................................................................................... 404
Figure 160: ICOUNT command ........................................................................................................ 406
Figure 161: ICOUNT command (sorted) .......................................................................................... 407
Figure 162: IODELAY command (display value) ............................................................................. 408
Figure 163: IODELAY command (set value) .................................................................................... 409
Figure 164: IPENDING command .................................................................................................... 411
Figure 165: IPL command ................................................................................................................ 413
Figure 166: K command ..................................................................................................................... 416
Figure 167: KD command ................................................................................................................ 417
Figure 168: LDMOD command ......................................................................................................... 418
Figure 169: LEGACYSENSEID command .......................................................................................... 420
Figure 170: LOADCORE command .................................................................................................. 421
Figure 171: LOADPARM command (display IPL parameter) ............................................................ 422
Figure 172: LOADPARM command (set IPL parameter) .................................................................... 423
Figure 173: LOG command (redirect output to a new logfile) ............................................................. 425
Figure 174: LOG command (stop output to logfile) .......................................................................... 425
Figure 175: LOGOPT command ....................................................................................................... 426
Figure 176: LPARNAME command (display LPAR name) .................................................................. 427
Figure 177: LPARNUM command (display LPARNUM) ..................................................................... 429
Figure 178: LPARNUM command (set LPARNUM) .......................................................................... 429
Figure 179: LPARNUM command (set LPARNUM BASIC) .............................................................. 429
Figure 180: LS command .................................................................................................................. 431
Figure 181: LSDEP command ............................................................................................................ 432
Figure 182: LSMOD command .......................................................................................................... 434
# Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hercules System Parameters</td>
<td>31</td>
</tr>
<tr>
<td>2</td>
<td>Hercules Device Definitions</td>
<td>32</td>
</tr>
<tr>
<td>3</td>
<td>Predefined symbols</td>
<td>38</td>
</tr>
<tr>
<td>4</td>
<td>Supported codepage mappings</td>
<td>63</td>
</tr>
<tr>
<td>5</td>
<td>Storage Allocation Units</td>
<td>77</td>
</tr>
<tr>
<td>6</td>
<td>Storage Allocation Units</td>
<td>111</td>
</tr>
<tr>
<td>7</td>
<td>Storage Allocation Units</td>
<td>165</td>
</tr>
<tr>
<td>8</td>
<td>Process Priority Conversions</td>
<td>168</td>
</tr>
<tr>
<td>9</td>
<td>Thread Priority Conversions</td>
<td>169</td>
</tr>
<tr>
<td>10</td>
<td>Multipliers for ‘MAXSIZE=’ and ‘EOTMARGIN=’ parameters</td>
<td>204</td>
</tr>
<tr>
<td>11</td>
<td>Default CU Types</td>
<td>227</td>
</tr>
<tr>
<td>12</td>
<td>Normal cursor handling</td>
<td>236</td>
</tr>
<tr>
<td>13</td>
<td>Extended cursor handling</td>
<td>237</td>
</tr>
<tr>
<td>14</td>
<td>Windows event handler</td>
<td>237</td>
</tr>
<tr>
<td>15</td>
<td>Message prefix overview</td>
<td>238</td>
</tr>
<tr>
<td>16</td>
<td>Hercules Console Commands (sorted alphabetically)</td>
<td>250</td>
</tr>
<tr>
<td>17</td>
<td>Hercules Console Commands (grouped by functionality)</td>
<td>258</td>
</tr>
<tr>
<td>18</td>
<td>Supported codepage mappings</td>
<td>322</td>
</tr>
<tr>
<td>19</td>
<td>Storage Allocation Units</td>
<td>348</td>
</tr>
<tr>
<td>20</td>
<td>Storage Allocation Units</td>
<td>437</td>
</tr>
<tr>
<td>21</td>
<td>Sense ID</td>
<td>494</td>
</tr>
<tr>
<td>22</td>
<td>Read Device Characteristics</td>
<td>495</td>
</tr>
<tr>
<td>23</td>
<td>Read Configuration Data</td>
<td>496</td>
</tr>
<tr>
<td>24</td>
<td>Storage Allocation Units</td>
<td>604</td>
</tr>
<tr>
<td>25</td>
<td>Supported CKD DASD Devices</td>
<td>637</td>
</tr>
<tr>
<td>26</td>
<td>Supported FBA DASD Devices</td>
<td>638</td>
</tr>
<tr>
<td>27</td>
<td>Correct CPU configuration (example 1)</td>
<td>640</td>
</tr>
<tr>
<td>28</td>
<td>Correct CPU configuration (example 2)</td>
<td>640</td>
</tr>
<tr>
<td>29</td>
<td>Correct CPU configuration (example 3)</td>
<td>641</td>
</tr>
<tr>
<td>30</td>
<td>Correct CPU configuration (example 4)</td>
<td>641</td>
</tr>
<tr>
<td>31</td>
<td>Correct CPU configuration (example 5)</td>
<td>642</td>
</tr>
<tr>
<td>32</td>
<td>Incorrect CPU configuration (example 6)</td>
<td>642</td>
</tr>
<tr>
<td>33</td>
<td>Architecture Facilities</td>
<td>645</td>
</tr>
<tr>
<td>34</td>
<td>Console commands related to command groups</td>
<td>653</td>
</tr>
<tr>
<td>35</td>
<td>Build options for system parameters and console commands</td>
<td>655</td>
</tr>
<tr>
<td>36</td>
<td>Environment Variables</td>
<td>656</td>
</tr>
<tr>
<td>37</td>
<td>Reading Syntax Descriptions</td>
<td>657</td>
</tr>
<tr>
<td>38</td>
<td>Reading Syntax Diagrams</td>
<td>660</td>
</tr>
</tbody>
</table>
1. Preface

1.1 Edition information
This edition applies to the Hercules S/370, ESA/390 and z/Architecture Emulator, Release 4.00.0 and to all subsequent versions, releases and modifications until otherwise indicated in new editions. Make sure you are using the correct edition for the level of software you are using.

1.2 What this book is about
This book is a guide for using and operating the Hercules Emulator and related additional products (both required and optional). For guidance in installation or debugging Hercules or for a general overview, additional manuals are available.
Please note that some information can be found in more than one manual. This redundancy is not intended to unnecessarily expand the manuals, rather to help find all necessary information in one place.

1.3 Who should read this book
This book is mainly intended for people who are responsible for operating the Hercules Emulator. It may also be useful if you are responsible for installing the Hercules Emulator.

1.4 What you need to know to understand this book
To understand this book, you should be familiar using software under the Linux, Microsoft Windows or Mac OS X operating systems. You should also have experience with Linux command shells or native DOS (Microsoft Disk Operating System) and the Microsoft Windows command shell.
Last but not least you should be familiar with IBM mainframe environments (hardware and software) and the underlying ideas and concepts as Hercules emulates IBM mainframe hardware.

1.5 How to use this book
This book is designed as a reference for all aspects the Hercules Emulator and related products. You can go through the book chapter by chapter or you can use the book as a reference for all questions regarding the operation of Hercules.

1.6 Revision Notice
Hercules Release: Version 4 Release 00 Modification 0
Publication Number: HEUR040000
SoftCopy Name: HerculesUserReference
Revision Number: HEUR040000-00
Date: November 21, 2015
1.7 Readers Comments

If you like or dislike anything of this book please send a mail or email to the address below. Feel free to comment any errors or lack of clarity. Please limit your comments on the information in this specific book and also include the “Revision Notice” just above. Thank you for your help.

Send your comments by email to the Hercules-390 discussion group:
hercules-390@yahoogroups.com

1.8 Legal Advice

Hercules implements only the raw S/370, ESA/390, and z/Architecture instruction set, it does not provide any operating system facilities. This means that you need to provide an operating system or standalone program which Hercules can load from an emulated disk or tape device. You will have to write the operating system or standalone program yourself unless you possess a license from IBM to run one of their operating systems on your PC or use IBM programs and operating systems which have been placed in the public domain.

**NOTE: It is YOUR responsibility to comply with the terms of the license for the operating system you intend to run on the Hercules Emulator.**

1.9 Trademarks

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- FLEX-ES is a registered trademark of Fundamental Software, Inc.
1.10 Acknowledgements

The Hercules manuals would not have been possible without the assistance of many people and I would like to thank all those who helped me. In particular I would like to thank:

- The Hercules developers for their documentation on various websites from which I derived a great deal of information.
- Roger Bowler and Fish for proof-reading the manuals.
- Loris Degioanni for allowing me to use parts of the original WinPcap documentation.
- Tom Brennan for allowing me to use parts of his Vista tn3270 documentation.
- My colleagues for working with early previews of the documentation, beginning with just a few pages.
- Mike Cairns for reviewing and editing the manuals.
- Robert Allan for providing the “Linux Installation” part.
- Lutz Mader for providing the “Mac OS X Installation” part.

If anyone feels they have been forgotten on this list please let me know.

Peter Glanzmann
2. Related Publications

2.1 Hercules – General Information
The Hercules “General Information” manual provides you an overview of the ideas and concepts of the Hercules Emulator as well as a documentation of the emulator’s functionality. It explains what Hercules does and does not do. It helps you decide if the software fits your needs fulfills your requirements.

2.2 Hercules – Installation Guide
The Hercules “Installation Guide” shows you how to install Hercules and all related optional and required software components under the Microsoft Windows, Linux and Apple MacIntosh OS X operating systems. After going through the installation guide you will have a working emulator environment ready to IPL a S370, S/390 or z/Architecture mainframe operating system.

2.3 Hercules – User Reference Guide
The Hercules “User Reference” leads you through all aspects of the emulator’s operation. It provides instruction in the operation of the Hercules Emulator with and without the Hercules GUIs. The usage details for the utilities are covered in the “Hercules Utilities” guide. After reading this manual you should be able to work with Hercules, to create a configuration file and to use Hercules commands through the console.

2.4 Hercules – Operations and Utilities Guide
The Hercules “Operations and Utilities Guide” describes the operation of Hercules as well as additional utilities that are delivered together with the emulator. Selected utilities from third-party suppliers are also covered in this manual. After reading this manual you should have the knowledge to operate Hercules and use the right utility for a certain housekeeping task within the Hercules environment. You should also be able to create virtual devices and understand backup / restore procedures.

2.5 Hercules – Messages and Codes
The “Messages and Codes” manual provides a detailed explanation of all Hercules related messages. It is the primary source for troubleshooting and debugging if you experience problems with Hercules.

2.6 Hercules – Reference Summary
The Hercules “Reference Summary” booklet lists all the system parameters, device definitions, console commands, Hercules utilities etc. along with their arguments. This booklet is intended as a quick reference guide for experienced users. Consult the Hercules ”User Reference Guide” and “Utilities Guide” for more detailed and additional information.
3. Summary of changes

3.1 Version 4, First Edition (HEUR040000-00)

This section describes briefly the various changes that have been made in the “User Reference Guide” related to the previous edition. The most significant changes made in this edition of the manual are the following:

- Chapter 3 (Summary of changes) added.
- Chapter 4 (Hercules Configuration File): New sections for the following system parameters added:
  - ARCHLVL (Set architecture level)
  - AUTOINIT (Automatic creation of empty tape files)
  - CAPPING (CPU capping feature)
  - CMDLEVEL (Set current command group)
  - CMDSEP (Command line separator)
  - CP_UPDT (User character conversion table)
  - CPUIDFMT (Set format BASIC / 0 / 1 STIDP generation)
  - DEFSTORE (Define main and expanded storage)
  - HAO (Hercules Automatic Operator)
  - HTTP (HTTP server configuration)
  - MAXRATES (MIPS/SIO rate reporting interval)
  - MEMLOCK (Lock Hercules memory)
  - MSGHLD (Timeout value of held messages)
  - MSGLEVEL (Message display output)
  - QUITMOUT (Quit timeout value)
  - SCPECHO (Echo to console and history of SCP replies)
  - SCPIMPLY (Pass non-Hercules commands to the SCP)
  - SCSIMOUNT (Automatic SCSI tape mounts)
  - SHOWDVOL1 (Enable showing of DASD volsers in device list)
  - SRVPRIO (Server threads priority)
  - SYMPTOM (Instruction trace display option)
- Chapter 6 (Device Definition Descriptions): New section “PTP (MPCPTP/PCPTP6 Channel-to-Channel link)” added.
- Chapter 7 (Hercules Console): New section “Programmed Function Key (PF Key) Support” added.
- Chapter 8 (Console Command Descriptions): New sections for the following console commands added:
  - $LOCATE (Display and verify Hercules control blocks)
- $TEST (Custom test command)
- $ZAPCMD (Enable or disable system parameters and console commands)
- ABS (Display or alter absolute storage)
- ARCHLVL (Set architecture level)
- AUTOINIT (Display or set the automatic creation of empty tape files)
- CACHESTATS (Display cache statistics)
- CAPPING (Display or set CPU capping value)
- CMDLEVEL (Display or set current command group)
- CMDSEP (Display or set current command line separator)
- CNSLPORT (Display or set console port)
- CODEPAGE (Display or set codepage conversion table)
- CP_UPDT (Create or modify user character conversion table)
- CPUIDFMT (Display or set format BASIC / 0 / 1 STIDP generation)
- CPUMODEL (Display or set CPU model number)
- CPUPRIO (Display or set CPU thread process priority)
- CPUSERIAL (Display or set CPU serial number)
- CPUVERID (CPU version code)
- DEFSTORE (Display or define main and expanded storage values)
- DEVPRIO (Display or set device threads process priority)
- DIAG8CMD (Display or set DIAGNOSE 8 command option)
- DIR (Display file and directory listing)
- ENGINES (Set processor engines type)
- EXEC (Execute a REXX script)
- FCB (Display current FCB or load new FCB image)
- HERCPRIO (Display or set Hercules process priority)
- HTTP (Start, stop, modify and display HTTP server)
- ICOUNT (Display individual instruction counts)
- KD (Clear held messages)
- LEGACYSENSEID (Display or set SENSE ID CCW (x'E4') feature)
- LS (Display file and directory listing)
- MAINSIZE (Display or set main storage size)
- MANUFACTURER (Display or set STSI manufacturer code)
- MAXCPU (Display or set maximum number of CPUs)
- MEMLOCK (Lock Hercules memory)
- MODEL (Display or set STSI model code)
- MODPATH (Display or set dynamic load module path)
- MSGLEVEL (Display or set the current message display output)
- MT (Control magnetic tape operation)
- NUMCPU (Display or set number of emulated CPUs)
- NUMVEC (Display or set number of vector facilities)
- PANTITLE (Display or set console window title)
- PGMPRDOS (Set LPP license setting)
- PLANT (Display or set STSI plant code)
- PTP (Enable / disable PTP debugging)
- QCPUID (Display CPU ID)
- QPFKEYS (Display the current PF key settings)
- QPID (Display process ID of Hercules)
- QPORTS (Display TCP/IP ports in use)
- QPROC (Display processors type and utilization)
- QSTOR (Display main and expanded storage values)
- QUITMOUT (Display or set quit timeout value)
- SCPECHO (Display or set echo to console and history of SCP replies)
- SCPIMPLY (Display or set option to pass non-Hercules commands to the SCP)
- SHCMDOPT (Display or set shell command option)
- SHRDPORT (Set shared device server port)
- SRVPRIO (Display or set server threads process priority)
- SYMPTOM (Instruction trace display option)
- SYSEPOCH (Set base date for TOD clock)
- TODPRIO (Display or set timer thread process priority)
- TZOFFSET (Set TOD clock offset from GMT)
- XPNDSIZE (Display or set expanded storage size)
- YROFFSET (Set TOD clock offset from actual date)

- The description of the Hercules Utilities has been moved to the “Operations and Utilities Guide”.

- Chapter 12 (The Run-Commands File) added.
- Chapter 13 (The “Hercules Automatic Operator” (HAO) Facility) added.
- Chapter 14 (REXX Support) added.
- Appendix D. Hercules Command Groups added.
- Appendix E. Build Options for System Parameters and Console Commands added.
- Appendix F. Environment Variables added.
- Appendix H. Links: List of links updated.
- Many additional examples have been added.
- Most output samples from console commands have been replaced.
4. Hercules Configuration File

4.1 The Configuration File

This chapter describes the configuration file for the Hercules Emulator. By default the configuration file is named “hercules.cnf” or “hercules.conf”. It is located in the configuration directory, refer to the Hercules Installation Guide for details of the directory structure. The configuration file contains the processor definitions in the system parameters section, the device layout in the device definitions section and Hercules runtime parameters also in the system parameters section.

The configuration file - especially the device definition part - is roughly equivalent to the IOCDS definitions found on a real mainframe environment. It is an ASCII text file that is read and interpreted by the Hercules Emulator during its initialization phase.

4.2 System Parameters

The system parameters describe the processor definition and some Hercules internal runtime parameters.

The processor definitions include the processor model, CPU serial number, memory configuration and architecture mode. They describe the processor hardware that is to be emulated.

The Hercules runtime parameters define values that Hercules requires as an emulated environment. These parameters include values like port numbers, directory paths and priorities.

The following table shows an overview of all valid system parameters. Please note that the availability of certain system parameters depends on the build options used when Hercules was compiled. For a list of all build options and the related system parameters please consult “Appendix E. Build Options for System Parameters and Console Commands”.

<table>
<thead>
<tr>
<th>System Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#</td>
<td>Comment line</td>
</tr>
<tr>
<td>*</td>
<td>Comment line</td>
</tr>
<tr>
<td>ARCHLVL</td>
<td>Set architecture level</td>
</tr>
<tr>
<td>ARCHMODE</td>
<td>Set initial architecture mode (alias for ARCHLVL system parameter)</td>
</tr>
<tr>
<td>ASN_AND_LX_REUSE / ALRF</td>
<td>ESAME ASN and LX REUSE feature (deprecated, use ARCHLVL instead)</td>
</tr>
<tr>
<td>AUTO_SCSI_MOUNT</td>
<td>Automatic SCSI tape mounts (deprecated, use SCSIMOUNT instead)</td>
</tr>
<tr>
<td>AUTOINIT</td>
<td>Automatic creation of empty tape files</td>
</tr>
<tr>
<td>AUTOMOUNT</td>
<td>Tape automount root directory</td>
</tr>
<tr>
<td>CAPPING</td>
<td>CPU capping feature</td>
</tr>
<tr>
<td>System Parameter</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>CCKD</td>
<td>Compressed CKD DASD options</td>
</tr>
<tr>
<td>CMDLEVEL</td>
<td>Set command group</td>
</tr>
<tr>
<td>CMDLVL</td>
<td>Set command group (alias for CMDLEVEL)</td>
</tr>
<tr>
<td>CMDSEP</td>
<td>Command line separator</td>
</tr>
<tr>
<td>CNSLPORT</td>
<td>Console port</td>
</tr>
<tr>
<td>CODEPAGE</td>
<td>Codepage conversion table</td>
</tr>
<tr>
<td>CONKPALV</td>
<td>Console and telnet clients keep-alive option</td>
</tr>
<tr>
<td>CP_UPDT</td>
<td>User character conversion table</td>
</tr>
<tr>
<td>CPUIDFMT</td>
<td>Set format BASIC / 0 / 1 STIDP generation</td>
</tr>
<tr>
<td>CPUMODEL</td>
<td>CPU model number</td>
</tr>
<tr>
<td>CPUPRIO</td>
<td>CPU thread process priority</td>
</tr>
<tr>
<td>CPUSERIAL</td>
<td>CPU serial number</td>
</tr>
<tr>
<td>CPUVERID</td>
<td>CPU version code</td>
</tr>
<tr>
<td>DEFSTORE</td>
<td>Define main and expanded storage</td>
</tr>
<tr>
<td>DEFSYM</td>
<td>Define a symbol</td>
</tr>
<tr>
<td>DEVPRIO</td>
<td>Device threads process priority</td>
</tr>
<tr>
<td>DEVTMAX</td>
<td>Maximum number of device threads</td>
</tr>
<tr>
<td>DIAG8CMD</td>
<td>DIAGNOSE 8 command option</td>
</tr>
<tr>
<td>ECPSVM</td>
<td>ECPS:VM support status (VM)</td>
</tr>
<tr>
<td>ENGINES</td>
<td>Processor engines type</td>
</tr>
<tr>
<td>HAO</td>
<td>Hercules Automatic Operator</td>
</tr>
<tr>
<td>HERCLOGO</td>
<td>Hercules logo file</td>
</tr>
<tr>
<td>HERCPRIO</td>
<td>Hercules process priority</td>
</tr>
<tr>
<td>HTTP</td>
<td>HTTP server configuration</td>
</tr>
<tr>
<td>HTTPPORT</td>
<td>HTTP server port (deprecated, use HTTP instead)</td>
</tr>
<tr>
<td>HTTPROOT</td>
<td>HTTP server root directory (deprecated, use HTTP instead)</td>
</tr>
<tr>
<td>System Parameter</td>
<td>Description</td>
</tr>
<tr>
<td>------------------------</td>
<td>------------------------------------------------------------------</td>
</tr>
<tr>
<td>IGNORE</td>
<td>Ignore subsequent INCLUDE errors</td>
</tr>
<tr>
<td>INCLUDE</td>
<td>Include configuration file</td>
</tr>
<tr>
<td>IODELAY</td>
<td>I/O interrupt wait time (LINUX)</td>
</tr>
<tr>
<td>LDMOD</td>
<td>Additional dynamic load modules</td>
</tr>
<tr>
<td>LEGACYSENSEID</td>
<td>SENSE ID CCW (x’E4’) feature</td>
</tr>
<tr>
<td>LOADPARM</td>
<td>IPL parameter</td>
</tr>
<tr>
<td>LOGOPT</td>
<td>Logging options</td>
</tr>
<tr>
<td>LPARNAME</td>
<td>LPAR name returned by DIAG x’204’</td>
</tr>
<tr>
<td>LPARNUM</td>
<td>LPAR identification number</td>
</tr>
<tr>
<td>MAINSIZE</td>
<td>Main storage size</td>
</tr>
<tr>
<td>MANUFACTURER</td>
<td>STSI manufacturer code</td>
</tr>
<tr>
<td>MAXCPU</td>
<td>Maximum number of CPUs</td>
</tr>
<tr>
<td>MAXRATES</td>
<td>MIPS/SIO rate reporting interval</td>
</tr>
<tr>
<td>MEMLOCK</td>
<td>Lock Hercules memory</td>
</tr>
<tr>
<td>MODEL</td>
<td>STSI model code</td>
</tr>
<tr>
<td>MODPATH</td>
<td>Dynamic load module path</td>
</tr>
<tr>
<td>MOUNTED_TAPE_REINIT</td>
<td>Control tape initialization</td>
</tr>
<tr>
<td>MSGHELD</td>
<td>Timeout value of held messages</td>
</tr>
<tr>
<td>MSGLEVEL</td>
<td>Message display output</td>
</tr>
<tr>
<td>MSGLVL</td>
<td>Message display output (alias for MSGLEVEL)</td>
</tr>
<tr>
<td>NUMCPU</td>
<td>Number of emulated CPUs</td>
</tr>
<tr>
<td>NUMVEC</td>
<td>Number of vector facilities</td>
</tr>
<tr>
<td>OSTAILOR</td>
<td>Tailor trace information for specific operating system</td>
</tr>
<tr>
<td>PANRATE</td>
<td>Console refresh rate</td>
</tr>
<tr>
<td>PANTITLE</td>
<td>Console window title</td>
</tr>
<tr>
<td>PGMPRDOS</td>
<td>LPP license setting</td>
</tr>
</tbody>
</table>
### System Parameter Description

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLANT</td>
<td>STSI plant code</td>
</tr>
<tr>
<td>QUITMOUT</td>
<td>Quit timeout value</td>
</tr>
<tr>
<td>REXX</td>
<td>REXX interpreter settings</td>
</tr>
<tr>
<td>SCLPROOT</td>
<td>SCLP base directory</td>
</tr>
<tr>
<td>SCPECHO</td>
<td>Echo to console and history of SCP replies</td>
</tr>
<tr>
<td>SCPIMPLY</td>
<td>Pass non-Hercules commands to the SCP</td>
</tr>
<tr>
<td>SCSIMOUNT</td>
<td>Automatic SCSI tape mounts</td>
</tr>
<tr>
<td>SHCMDOPT</td>
<td>Shell command option</td>
</tr>
<tr>
<td>SHOWDVOL1</td>
<td>Enable showing of DASD volsers in device list</td>
</tr>
<tr>
<td>SHRDPORT</td>
<td>Shared device server port</td>
</tr>
<tr>
<td>SRVPRIO</td>
<td>Server threads priority</td>
</tr>
<tr>
<td>SYMPTOM</td>
<td>Instruction trace display option (alias for TRACEOPT)</td>
</tr>
<tr>
<td>SYSEPOCH</td>
<td>Base date for TOD clock</td>
</tr>
<tr>
<td>TIMERINT</td>
<td>Internal timer update interval</td>
</tr>
<tr>
<td>TODDRAG</td>
<td>TOD clock drag factor</td>
</tr>
<tr>
<td>TODPRIO</td>
<td>Timer thread process priority</td>
</tr>
<tr>
<td>TRACEOPT</td>
<td>Instruction trace display option</td>
</tr>
<tr>
<td>TZOFFSET</td>
<td>TOD clock offset from GMT</td>
</tr>
<tr>
<td>XPNSIZE</td>
<td>Expanded storage size</td>
</tr>
<tr>
<td>YROFFSET</td>
<td>TOD clock offset from actual date</td>
</tr>
</tbody>
</table>

**Table 1: Hercules System Parameters**

### 4.3 Device Definitions

The device definitions describe the layout of the emulated hardware i.e: DASD, tape, terminals and printers. It is comparable with the IOCDS found in a real mainframe environment. Each emulated device must be specified in this part of the configuration file.

The following table shows an overview of all valid devices:
<table>
<thead>
<tr>
<th>Device Type</th>
<th>Device</th>
<th>Emulated by</th>
</tr>
</thead>
<tbody>
<tr>
<td>3270, 3278</td>
<td>Local non-SNA 3270 display or printer</td>
<td>TN3270 client connection</td>
</tr>
<tr>
<td>SYSG</td>
<td>Integrated 3270 (SYSG) console</td>
<td>TN3270 client connection</td>
</tr>
<tr>
<td>1052, 3215</td>
<td>Console printer-keyboards</td>
<td>Telnet client connection</td>
</tr>
<tr>
<td>1052-C, 3215-C</td>
<td>Integrated console printer-keyboards</td>
<td>Integrated on Hercules console</td>
</tr>
<tr>
<td>1442, 2501, 3505</td>
<td>Card readers</td>
<td>Disk file(s), ASCII or EBCDIC</td>
</tr>
<tr>
<td>3525</td>
<td>Card punch</td>
<td>Disk file, ASCII or EBCDIC</td>
</tr>
<tr>
<td>1403, 3211</td>
<td>Line printers</td>
<td>Disk file, ASCII</td>
</tr>
<tr>
<td>3410, 3420, 3422, 3430, 3480, 3490, 3590, 9347, 8809</td>
<td>Tape drives</td>
<td>Disk file, CD-ROM or SCSI tape</td>
</tr>
<tr>
<td>3088</td>
<td>Channel-to-Channel Adapter</td>
<td>“CTCT” driver</td>
</tr>
<tr>
<td>(( CTCI ))</td>
<td>Channel-to-Channel link to host TCP/IP stack</td>
<td>“CTCI” TUN/TAP driver</td>
</tr>
<tr>
<td>(( LCS ))</td>
<td>IBM 2216 router, IBM 3172 running ICP, IBM 8232 LCS device, LCS3172 driver of a P/390, IBM Open Systems Adapter (OSA)</td>
<td>“LCS” (LAN channel station) TUN/TAP driver</td>
</tr>
<tr>
<td>((QETH))</td>
<td>OSA Express IP Layer 2 support only. Supported only for Linux guests. TAP adapter must be bridged to a local LAN</td>
<td>“QETH” (OSA/QDIO Ethernet Adapter) TUN/TAP driver</td>
</tr>
<tr>
<td>3310, 3370, 9313, 9332, 9335, 9336, 0671</td>
<td>FBA direct access storage devices</td>
<td>Disk file</td>
</tr>
<tr>
<td>2305, 2311, 2314, 3330, 3340, 3350, 3375, 3380, 3390, 9345</td>
<td>CKD direct access storage devices</td>
<td>Disk file</td>
</tr>
<tr>
<td>2703</td>
<td>Communication line</td>
<td>TCP socket</td>
</tr>
</tbody>
</table>

Table 2: Hercules Device Definitions
4.4 Coding Rules

There are only a few rules for creating configuration files. The file must be an ASCII text file. Blank lines, or lines beginning with a hash ("#") sign or an asterisk ("*") are treated as comments and are not checked.

Except for the ARCHLVL statements, the system parameters may appear in any order but must precede any device definitions. Each system parameter must be coded on a separate line.

The device records may also appear in any order but must follow the system parameters. There must be one device definition for each I/O device or for each group of identical I/O devices.

4.5 Record Format

The following sections describe the format of the Hercules configuration file records. The format is slightly different between system parameters and device definitions.

4.5.1 Format of the system parameters

The record format of the system parameters is as follows:

```
  system-parameter  argument
```

where:

- `system-parameter` is the name of the system parameter.
- `argument` is the value assigned to the system parameter.

Examples:
- CPUMODEL  3090
- ENGINES   4*CP,2*AP,2*IP,2*IL
- HTTP      ROOT /usr/local/share/hercules/
- PANRATE   FAST

4.5.2 Format of the device definitions

The format of device definition is as follows:

```
  devnum(s)   devtype   [argument(s)]
```

where:

- `devnum(s)` is either: a single devnum (see details below), a range of devnums separated by a dash ("-"), a count of devnums seperated by a dot ("."), or a comma ("," separated list of devnums.

Examples include:
- 0200-0210
- 0300.10
If devnums specifies more than one device then all devices will have identical characteristics. All devices
defined as a group must be defined on a single channel. A channel is defined as a continuous group of
256 (or hexadecimal 100) devices. For example devices 0010 and 0020 are on the same channel,
whereas devices 0100 and 0210 are not on the same channel.

The devnum itself is either a 1 to 4 digit hexadecimal number in the range 0000 to FFFF for ESA/390 or
0000 to 0FFF for S/370. The device number uniquely identifies each device to the operating system.

`devtype` is the device type.

`argument(s)` is a list of parameters depending on the device type. These parameters are explained in the
sections that describe each device type.

Examples:

- 0120 3380 msvsv5r.120
- 0230.16 3270 GROUP1 192.168.100.0 255.255.255.0
- 0583-0587 3420 * maxsizeM=170 eotmargin=131072

### 4.6 Sample Configuration File

The following figure shows a real example of a Hercules configuration file, used for running the MVS 3.8J
operating system. Please note, that not all possible parameter and definitions are contained in this
sample.

```
# ******************************************************************************************
# Hercules V4.00.0 Emulator Control file
# MVS V3.8J
# ******************************************************************************************
#
# System parameters
# ******************************************************************************************
ARCHLVL                S/370                # Initial architecture mode
CAPPING                25                 # Initial architecture mode
CNSLPORT               3270               # Telnet client port
CODEPAGE               DEFAULT            # Codepage conversion table
CPUMODEL               7060               # CPU model
CPUSERIAL              001963             # CPU serial number
DEFSYM                  DASDPATH D:/MVS/DASD # Define symbol for CCKD DASD device path
DEFSYM                  READERPATH D:/MVS/READER # Define symbol for READER device path
DEFSYM                  PRINTPATH D:/MVS/PRINTER # Define symbol for PRINTER device path
DEFSYM                  PUNCHPATH D:/MVS/PUNCH # Define symbol for PUNCH device path
DEVTMAX                 0                  # Maximum number of device threads
ENGINES                CP                  # Processor engine type
HERCLOGO               HERCLOGO.TXT      # Hercules 3270 logo file
HTTP                   PORT 8089 NOAUTH  # HTTP server port / authorization data
```
HTTP                 ROOT D:\Hercules\html        # HTTP server root directory
HTTP                 START                        # Start the HTTP server
LOGOPT               TIMESTAMP                    # Hercules log options
LPARNAME             HERCULES                     # LPAR name returned by DIAG X'204'
MAINSIZE             16                           # Main storage in MB
MANUFACTURER         HRC                          # Manufacturer name returned by STSI
MAXCPU               1                            # Maximum number of CPUs
MODEL                7060                         # Model name returned by STSI
NUMCPU               1                            # Number of emulated CPUs
OSTAILOR             OS/390                       # Intended operating system
PANRATE              1000                         # Panel refresh rate [ms]
PANTITLE             "Hercules Emulator HMC"      # Hercules HMC window title
PGMPROOS             RESTRICTED                   # Emulation of IFL hardware
PLANT                ZZ                           # Plant name returned by STSI
SYSEPOCH             1900 +28                     # Base date for TOD clock
TIMERINT             50                           # Internal timer update interval
TRACEOPT             TRADITIONAL                  # Instruction trace display option
TZOFFSET             +0000                        # TOD clock offset from GMT

# ==============================================================================================
# Device Definitions
# ==============================================================================================
# Card Readers
# ==============================================================================================
000C  3505  $(READERPATH)/DUMMY.JCL  eof  ascii  trunk

# Card Punches
# ==============================================================================================
000D  3525  $(PUNCHPATH)/PCH00D.TXT  ascii  crlf

# Line Printers
# ==============================================================================================
000E  1403  $(PRINTPATH)/PRT00E.TXT  crlf
000F  1403  $(PRINTPATH)/PRT00F.TXT  crlf

# Local Non-SNA Terminals
# ==============================================================================================
0010  3270  *  192.168.0.101
0011  3270  *  192.168.0.101
00C0  3270  *  192.168.0.101
00C1  3270  *  192.168.0.101
00C2  3270  *  192.168.0.101
### CCKD DASD Devices

<table>
<thead>
<tr>
<th>Code</th>
<th>Type</th>
<th>Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>0130</td>
<td>2314</td>
<td>$(DASDPATH)/SORT00.CCKD</td>
</tr>
<tr>
<td>0131</td>
<td>2314</td>
<td>$(DASDPATH)/SORT01.CCKD</td>
</tr>
<tr>
<td>0132</td>
<td>2314</td>
<td>$(DASDPATH)/SORT02.CCKD</td>
</tr>
<tr>
<td>0133</td>
<td>2314</td>
<td>$(DASDPATH)/SORT03.CCKD</td>
</tr>
<tr>
<td>0134</td>
<td>2314</td>
<td>$(DASDPATH)/SORT04.CCKD</td>
</tr>
<tr>
<td>0135</td>
<td>2314</td>
<td>$(DASDPATH)/SORT05.CCKD</td>
</tr>
<tr>
<td>0140</td>
<td>3350</td>
<td>$(DASDPATH)/WORK00.CCKD</td>
</tr>
<tr>
<td>0141</td>
<td>3350</td>
<td>$(DASDPATH)/WORK01.CCKD</td>
</tr>
<tr>
<td>0148</td>
<td>3350</td>
<td>$(DASDPATH)/PRD000.CCKD</td>
</tr>
<tr>
<td>0149</td>
<td>3350</td>
<td>$(DASDPATH)/MVSRES.CCKD</td>
</tr>
<tr>
<td>0149</td>
<td>3350</td>
<td>$(DASDPATH)/MVSDLB.CCKD</td>
</tr>
<tr>
<td>0160</td>
<td>3340</td>
<td>$(DASDPATH)/PAGE00.CCKD</td>
</tr>
<tr>
<td>0161</td>
<td>3340</td>
<td>$(DASDPATH)/PAGE01.CCKD</td>
</tr>
<tr>
<td>0240</td>
<td>3350</td>
<td>$(DASDPATH)/PUB000.CCKD</td>
</tr>
<tr>
<td>0248</td>
<td>3350</td>
<td>$(DASDPATH)/SYSO00.CCKD</td>
</tr>
<tr>
<td>0344</td>
<td>3350</td>
<td>$(DASDPATH)/SPOOL0.CCKD</td>
</tr>
<tr>
<td>0345</td>
<td>3350</td>
<td>$(DASDPATH)/SPOOL1.CCKD</td>
</tr>
<tr>
<td>0348</td>
<td>3350</td>
<td>$(DASDPATH)/TST000.CCKD</td>
</tr>
</tbody>
</table>

### TAPE Devices

<table>
<thead>
<tr>
<th>Code</th>
<th>Type</th>
<th>Path</th>
</tr>
</thead>
<tbody>
<tr>
<td>0480</td>
<td>3420</td>
<td>*</td>
</tr>
<tr>
<td>0481</td>
<td>3420</td>
<td>*</td>
</tr>
</tbody>
</table>

---

**Figure 1: Sample Configuration File**

### 4.7 Symbol Substitution

In configuration statements, as well as in console commands and OAT files, symbols may be substituted for text. To substitute symbol `symbol` with its contents the symbol should be enclosed within parenthesis or braces and preceded by a `$` sign. For example, if symbol "foo" contains the text string "bar" then "$(foo)" or "${foo}" will be substituted with the string "bar".

Symbols are defined using a DEFSYM configuration statement or a DEFSYM panel command or can be operating system environment variables. There are several predefined symbols (see table below). To resolve the symbol substitution a symbol with that name defined via DEFSYM is searched first. If none can be found then a check is made to see if an environment variable with the same name exists.

If a symbol is not defined then an empty string will be substituted. By coding an additional default value following an equal sign ("=") or a colon-equal-sign (":=") the default value is substituted instead of an empty string if the symbol is not defined.
Note that the default value is a literal string and no substitution is applied to it. Thus attempting to use the syntax "$(foo=${bar})" will not yield the expected results. It will not be substituted with the currently defined value of the "bar" environment variable, but rather by the literal string "${bar" followed immediately by the literal character "}".

Symbols created with DEFSYM or environment variables can also be used as part of panel commands. For example the command "cd $(TAPEDIR)" will change the current directory to the resolved string for the symbol TAPEDIR.

It is important to note that symbol names, potentially being the names of environment variables, are subject to whatever case sensitivity the host operating system happens to enforce or allow. Under Windows environment variables are not case sensitive, whereas on other operating systems they may be. Thus "$(FOO)", "$(foo)" or "$(Foo)" all cause the same value to be substituted on Windows, whereas they could be substituted with completely different values under a case sensitive operating system.

### 4.7.1 Syntax

**Descriptive**

\[ $(\text{symbol}[[[:\text{=}]\text{default}]]) \]

or

\[ $(\text{symbol}[[[:\text{=}]\text{default}]]) \]

**Diagram**

```
$ symbol =default =default
```

### 4.7.2 Parameter

**symbol**

This is the name of the symbol.

**default**

This is the default value that takes place if the symbol is not defined.

### 4.7.3 Special symbols

#### 4.7.3.1 Predefined symbols

The symbols according to the following table are predefined and can be used without defining the symbol through a corresponding DEFSYM configuration statement or panel command.
<table>
<thead>
<tr>
<th>Symbol name</th>
<th>Assigned value</th>
<th>Example string</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDATE</td>
<td>Hercules build date</td>
<td>‘Sep 22 2010’</td>
</tr>
<tr>
<td>BTIME</td>
<td>Hercules build time</td>
<td>‘19:13:03’</td>
</tr>
<tr>
<td>CUU</td>
<td>3 digit device number, upper case hexadecimal digits</td>
<td>‘12A’</td>
</tr>
<tr>
<td>CUUU</td>
<td>4 digit device number, upper case hexadecimal digits</td>
<td>‘012A’</td>
</tr>
<tr>
<td>cuu</td>
<td>3 digit device number, lower case hexadecimal digits</td>
<td>‘12a’</td>
</tr>
<tr>
<td>cuuu</td>
<td>4 digit device number, lower case hexadecimal digits</td>
<td>‘012a’</td>
</tr>
<tr>
<td>DEVN</td>
<td>4 digit device number, upper case hexadecimal digits</td>
<td>‘012A’</td>
</tr>
<tr>
<td>HOSTARCH</td>
<td>Host system architecture</td>
<td>‘i686’</td>
</tr>
<tr>
<td>HOSTNAME</td>
<td>Name of the host system</td>
<td>‘GOOFY’</td>
</tr>
<tr>
<td>HOSTNUMCPUS</td>
<td>The number of CPUs of the host system</td>
<td>‘MP=8’</td>
</tr>
<tr>
<td>HOSTOS</td>
<td>Host operating system</td>
<td>‘Windows’</td>
</tr>
<tr>
<td>HOSTOSREL</td>
<td>Host operating system release</td>
<td>‘6.1.7600’</td>
</tr>
<tr>
<td>HOSTOSVER</td>
<td>Host operating system version</td>
<td>‘7 Ultimate Edition, 64-bit’</td>
</tr>
<tr>
<td>MODNAME</td>
<td>Module name of the startup program</td>
<td>‘hercules.exe’</td>
</tr>
<tr>
<td>MODPATH</td>
<td>Path name of the startup program</td>
<td>‘D:\Hercules\’</td>
</tr>
<tr>
<td>VERSION</td>
<td>Hercules version</td>
<td>‘3.07’</td>
</tr>
</tbody>
</table>

Table 3: Predefined symbols

### 4.7.3.2 Environment variables

If a symbol is not explicitly defined by a DEFSYM statement and an environment variable by the same name exists, then the string contents of that environment variable will be used for substitution.

### 4.7.3.3 Undefined symbols

If a symbol is not defined by an explicit DEFSYM, is not an automatically generated symbol or is not an environment variable, an empty string will be substituted.

### 4.7.4 Escaping substitution, recursion

To specify the '$' string without incurring substitution an additional '$' sign should be used. For example, $$(FOO) will not be substituted. If substitution is required but the preceding text is to contain a '$' sign as the very last character then $$$(FOO) would be specified. Thus if symbol FOO contains "BAR", then $$$(FOO) will remain "$$$(FOO)" while $$$(FOO) will become "$BAR". Substitution is not recursive, only one substitution pass is made.
4.7.5 Examples

Example 1:
The DEFSYM configuration statement

```
DEFSYM TAPEDIR "/home/hercules/tapes"
```

and the symbol substitution in the device definition

```
0380 3420 $(TAPEDIR)/scratch.aws
```

results in the following device definition used by Hercules

```
0380 3420 /home/hercules/tapes/scratch.aws
```

Example 2:
The DEFSYM configuration statement

```
DEFSYM DASDPATH "D:/HERCULES/DASD"
```

and the following symbol substitution in the device configuration

```
0148 3350 $(DASDPATH:=D:/MVS/DASD)/MVSRES.CKD
```

results in the following device definition with resolved DASDPATH symbol

```
0148 3350 D:/HERCULES/DASD/MVSRES.CKD
```

If however there is no symbol DASDPATH (the DEFSYM statement is missing) then the symbol in the
device definition is resolved with the defined default

```
0148 3350 D:/MVS/DASD/MVSRES.CKD
```

Example 3:
The device definition using the predefined symbol "CUUU"

```
0148.5 3350 D:/MVS/DASD/VOLSER.$(CUUU)
```

results in the following device definitions used by Hercules

```
0148 3350 D:/MVS/DASD/VOLSER.0148
0149 3350 D:/MVS/DASD/VOLSER.0149
014A 3350 D:/MVS/DASD/VOLSER.014A
014B 3350 D:/MVS/DASD/VOLSER.014B
014C 3350 D:/MVS/DASD/VOLSER.014C
```
5. System Parameter Descriptions

5.1 # (Comment line)

5.1.1 Function
The hash ("#") symbol marks the beginning of a comment or a full comment line.

5.1.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td># [anything]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td># [anything]</td>
</tr>
</tbody>
</table>

5.1.3 Parameter
anything Any text following the asterisk symbol.

5.1.4 Examples
Example 1:
Add comment lines to the configuration file and add comment after the system parameter.

```
# System Parameters
#
NUMCPU 2 # Number of emulated CPUs
MAINSIZE 1024 # Main storage in MB
```
5.2 * (Comment line)

5.2.1 Function
The asterisk ("*") symbol marks the beginning of a comment or a full comment line.

5.2.2 Syntax

Descriptive

* [anything]

Diagram

```
* [anything]
```

5.2.3 Parameter

`anything` Any text following the hash symbol.

5.2.4 Examples

Example 1:
Add comment lines to the configuration file and add comment after the system parameter.

```
*                          System Parameters
* NUMCPU 2                * Number of emulated CPUs
* MAINSIZE 1024            * Main storage in MB
```
5.3 ARCHLVL (Set architecture level)

5.3.1 Function

The ARCHLVL system parameter specifies the initial architecture mode. Additional ARCHLVL statements may be specified to enable or disable specific facilities, to override the STFLE (Store Facility List Extended) response and force it to return a certain (incorrect) bit pattern or to display the status (enabled or disabled) of facilities during startup. An overview of all architecture facilities can be found in “Appendix C. Architecture Facilities” on page 643.

5.3.2 Syntax

**Descriptive**

ARCHLVL {S/370 | ESA/390 | ESAME | z/ARCH}

or

ARCHLVL {ENABLE | DISABLE} facility [S/370 | ESA/390 | ESAME | z/ARCH]

or

ARCHLVL QUERY [facility | ALL]

or

ARCHLVL {ENABLE | DISABLE} bitno [S/370 | ESA/390 | ESAME | z/ARCH]

**Diagram**

![Diagram of ARCHLVL syntax]

- ARCHLVL
  - S/370
  - ESA/390
  - ESAME
  - z/ARCH

- ARCHLVL {ENABLE | DISABLE} facility
  - S/370
  - ESA/390
  - ESAME
  - z/ARCH

- ARCHLVL QUERY [facility | ALL]

- ARCHLVL {ENABLE | DISABLE} bitno
  - S/370
  - ESA/390
  - ESAME
  - z/ARCH
5.3.3 Parameter

- **S/370**  
  Use S/370 for OS/360, VM/370 and MVS 3.8.

- **ESA/390**  
  Use ESA/390 for MVS/XA, MVS/ESA, OS/390, VM/ESA, VSE/ESA, Linux/390 and ZZSA. zOS can be run until version 1.2 with ESA/390 mode without installed bimodal feature or until version 1.4 if the bimodal feature is installed.

- **ESAME**  
  Use ESAME (Enterprise System Architecture, Modal Extensions) for z/OS, z/VM, z/VSE and z/Linux. The ESAME mode is equivalent to z/Architecture mode at Architecture Level 2.

  When ESAME is specified, the machine will always be IPL’ed in ESA/390 mode but the system is capable of being switched into the z/Architecture mode after IPL. This is handled automatically by all z/Architecture operating systems.

- **z/ARCH**  
  Use z/ARCH for z/OS, z/VM, z/VSE and z/Linux. z/ARCH is similar to ESAME. The z/Arch mode is equivalent to z/Architecture mode at Architecture Level 3.

- **ENABLE**  
  Enable the specified facility. If no architecture mode is given as additional parameter the facility is enabled for all architecture modes.

- **DISABLE**  
  Disable the specified facility. If no architecture mode is given as additional parameter the facility is disabled for all architecture modes.

- **facility**  
  The name of the facility that has to be enabled, disabled or displayed. An overview of all architecture facilities can be found in “Appendix C. Architecture Facilities” on page 643.

- **bitno**  
  The bit number of the facility that has to be enabled or disabled. The format of *bitno* is \texttt{BITnn}, e.g. “BIT44” (Bit 44 = PFPO Facility Bit). An overview of all architecture facilities can be found in “Appendix C. Architecture Facilities” on page 643.

- **QUERY**  
  Display the settings for the specified facility.

- **ALL**  
  Specifies that all facilities have to be displayed.

5.3.4 Examples

Example 1:
Set the architecture level to S/370.

```
ARCHLVL S/370
```
Example 2:
Disable the ‘DECIMAL_FLOAT’ facility in z/Architecture mode.
ARCHLVL DISABLE DECIMAL_FLOAT z/ARCH

Example 3:
Force the PFPO feature to be enabled in all architecture modes.
ARCHLVL ENABLE BIT44

Example 4:
Display the facility settings during the Hercules startup messages.
ARCHLVL QUERY ALL
5.4 ARCHMODE (Initial architecture mode)

5.4.1 Function
The ARCHMODE parameter has been deprecated. This parameter was used to specify the initial architecture mode.
ARCHMODE is still accepted and is treated as an alias for the new ARCHLVL system parameter. All existing ARCHMODE statements should be changed to ARCHLVL. Please see ARCHLVL for details.

5.4.2 Syntax
See ARCHLVL system parameter.

5.4.3 Parameter
See ARCHLVL system parameter.

5.4.4 Examples
See ARCHLVL system parameter.
5.5 ASN_AND_LX_REUSE / ALRF (ESAME ASN and LX REUSE feature)

5.5.1 Function
The ASN_AND_LX_REUSE (ALRF) system parameter has been deprecated and is replaced by the ARCHLVL system parameter. Use “ARCHLVL ENABLE | DISABLE ASN_LX_REUSE” instead. See ARCHLVL system parameter for details.

5.5.2 Syntax
See ARCHLVL system parameter.

5.5.3 Parameter
See ARCHLVL system parameter.

5.5.4 Examples
See ARCHLVL system parameter.
5.6 AUTO_SCSI_MOUNT (Automatic SCSI tape mounts)

5.6.1 Function
The AUTO_SCSI_MOUNT system parameter has been deprecated and is replaced by SCSIMOUNT. See SCSIMOUNT system parameter for details.

5.6.2 Syntax
See SCSIMOUNT system parameter.

5.6.3 Parameter
See SCSIMOUNT system parameter.

5.6.4 Examples
See SCSIMOUNT system parameter.
5.7 AUTOINIT (Automatic creation of empty tape files)

5.7.1 Function
The AUTOINIT system parameter controls the automatic creation of empty tape files. AUTOINIT handles the "file not found" condition for a specified tape file. It controls if DEVINIT returns a "file not found" error or creates an empty tape file if the tape file could not be found. The default for AUTOINIT is OFF.

5.7.2 Syntax

Descriptive
AUTOINIT {ON | OFF}

Diagram

```
► AUTOINIT ► OFF ◄
```

5.7.3 Parameter

**ON**
When AUTOINIT is set ON, DEVINIT will initialize a blank, non-labeled tape if the specified tape file is not found. Next, DEVINIT writes two tapemarks, rewinds the tape and positions the tape to the beginning.

**OFF**
When AUTOINIT is set OFF (which is the default), DEVINIT will return a "file not found" error if the specified tape file is not found.

5.7.4 Examples

Example 1:
Switch on the automatic creation of empty tape files.
AUTOINIT ON
5.8 AUTOMOUNT (Tape automount root directory)

5.8.1 Function

Specifies the host system directory where the guest is allowed or not allowed to automatically load virtual tape volumes from. Prefix allowable directories with a ‘+’ (plus) sign and unallowable directories with a ‘-’ (minus) sign. The default prefix if neither is specified is the ‘+’ sign (an allowable directory).

All host system virtual tape volumes to be automounted by the guest must reside within one of the specified allowable host system directories or any of its subdirectories while not also being within any of the specified unallowable directories or any of their subdirectories, in order for the guest-invoked automount to be accepted.

Specifying a disallowed automount directory does not preclude the Hercules operator from manually mounting any file via the DEVINIT console command - even one in a currently defined disallowed automount directory. The AUTOMOUNT statement only controls guest-invoked automatic tape mounts and not manual tape mounts performed by the Hercules operator.

All directories must be specified on separate statements, but as many statements as needed may be specified in order to describe the desired allowable/unallowable directories layout. For convenience, an AUTOMOUNT console command is also provided to dynamically add new or remove existing automount directories at any time.

The automount feature is activated whenever you specify at least one allowable or unallowable directory. If only unallowable directories are specified, then the current directory becomes the only defined allowable automount directory by default.

All specified directories are always resolved to fully-qualified absolute directory paths before being saved.

Caution: Enabling this feature may have security consequences depending on which allowable host system directories you specify as well as how your guest operating system enforces authorized use of the Set Diagnose (X'4B') channel command code.

Refer to the description of the virtual tape device ‘NOAUTOMOUNT’ option for more information.

5.8.2 Syntax

Descriptive

AUTOMOUNT [ + | - ]directory

or

AUTOMOUNT {ADD directory | DEL directory}

Diagram

AUTOMOUNT

\[\text{directory}\]

or
5.8.3 Parameter

ADD or +  Add an entry to the list of allowable tape automount directories.

DEL or -  Delete an entry from the list of allowable tape automount directories.

directory  Specifies the host system directory where the guest is allowed or not to automatically load virtual tape volumes from.

5.8.4 Examples

Example 1:
Specify directory “D:\MVS\TAPE” as the host system directory from where the guest is allowed to automatically load virtual tape volumes.

AUTOMOUNT +D:/MVS/TAPE
    or
AUTOMOUNT ADD D:/MVS/TAPE
5.9 CAPPING (CPU capping feature)

5.9.1 Function
The CAPPING system parameter is used to cap the CPUs. If \textit{mips} is greater than zero then all of the ‘CP’ type processors are capped to this value. If \textit{mips} is equal to zero or “OFF” or the CAPPING system parameter is not coded in the configuration file then the capping is disabled.

Only CPUs of type CP are capped. CPUs of type IL, AP or IP are never capped. The CPU string on the Hercules device and status panel which shows the CPU usage turns from white to red during the time the CPU is capped.

5.9.2 Syntax

Descriptive
CAPPING \{mips | OFF | 0\}

Diagram

\[\begin{array}{c}
\text{CAPPING} \\
mips \\
\text{OFF} \\
0
\end{array}\]

5.9.3 Parameter

\textit{mips} \quad \text{Maximum total number of MIPS for all the ‘CP’ type processors.}

\text{OFF} \quad \text{Disables the CPU capping.}

0 \quad \text{This is the same as OFF.}

5.9.4 Examples

Example 1:
Set the CPU capping to 25 MIPS.

\texttt{CAPPING 25}

Example 2:
Disable the CPU capping feature.

\texttt{CAPPING OFF}
5.10 CCKD (Compressed CKD DASD options)

5.10.1 Function

The CCKD system parameter is used to alter CCKD processing. The CCKD system parameter supports the same options as the CCKD console command.

5.10.2 Syntax

**Descriptive**

```plaintext
CCKD option=value [,option=value [,option=value ...]]
```

where option can be:

- [COMP={-1 | n}]
- [,COMPPARM={-1 | n}]
- [,RA={2 | n}]
- [,RAQ={4 | n}]
- [,RAT={2 | n}]
- [,WR={2 | n}]
- [,GCINT={10 | n}]
- [,GCPARM={0 | n}]
- [,NOSTRESS={0 | 1}]
- [,FREEPEND={-1 | n}]
- [,FSYNC={0 | 1}]
- [,TRACE={0 | n}]
- [,LINUXNULL={0 | 1}]
- [,GCSTART={0 | 1}]

**Diagram**

```
  CCKD   option=value
```

where option can be:
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMP</td>
<td>-1/n</td>
</tr>
<tr>
<td>COMPPARM</td>
<td>-1/n</td>
</tr>
<tr>
<td>RA</td>
<td>2/n</td>
</tr>
<tr>
<td>RAQ</td>
<td>4/n</td>
</tr>
<tr>
<td>RAT</td>
<td>2/n</td>
</tr>
<tr>
<td>WR</td>
<td>2/n</td>
</tr>
<tr>
<td>GCINT</td>
<td>10/n</td>
</tr>
<tr>
<td>GCPARM</td>
<td>0/n</td>
</tr>
<tr>
<td>NOSTRESS</td>
<td>0/1</td>
</tr>
<tr>
<td>FREEPEND</td>
<td>-1/n</td>
</tr>
<tr>
<td>FSYNC</td>
<td>0/1</td>
</tr>
<tr>
<td>TRACE</td>
<td>0/n</td>
</tr>
<tr>
<td>LINUXNULL</td>
<td>0/1</td>
</tr>
<tr>
<td>GCSTART</td>
<td>0/1</td>
</tr>
</tbody>
</table>
5.10.3 Parameter

option Set a CCKD option. Multiple options may be specified, separated by commas with no intervening blanks.

The CCKD options are:

COMP=n Specifies the compression type to be used. This overrides the compression used for all CCKD files. The default (-1) means don’t override the compression. Valid compression types are:

   -1 Default
   0 None
   1 Zlib
   2 Bzip2

COMPPARM=n Overrides the compression parameter. A higher value generally means more compression at the expense of CPU and/or storage. The default (-1) means don’t override the compression parameter. The value of n can be from -1 and 9.

RA=n Sets the Number of read ahead threads. When sequential track or block group access is detected, some number (RAT=n) of tracks or block groups are queued (RAQ=n) to be read by one of the read ahead threads. The default is 2, the value of n can be a number from 1 to 9.

RAQ=n Sets the size of the read ahead queue. When sequential track or block group access is detected, some number (RAT=n) of tracks or block groups are queued in the read ahead queue. The default is 4, the value of n can be a number from 0 to 16. A value of zero disables read ahead.

RAT=n Sets the number of tracks or block groups to read ahead when sequential track or block group access is detected. The default is 2, the value of ratn can be a number from 0 to 16. A value of zero disables read ahead.

WR=n Sets the number of writer threads. When the cache is flushed, updated cache entries are marked write pending and a writer thread is signalled. The writer thread compresses the track or block group and writes the compressed image to the emulation file.

A writer thread is CPU-intensive while compressing the track or block group and I/O-intensive while writing the compressed image. The writer thread runs one nicer than the CPU thread(s). The default is 2, a value from 1 to 9 can be specified.

GCINT=n This is the number of seconds the garbage collector thread waits during an interval. At the end of an interval the garbage collector performs space recovery, flushes the cache and optionally ‘fsyncs’ the emulation file.

However, the file will not be ‘fsynced’ unless at least 5 seconds have elapsed since the last synchronization (FSYNC). The default is 10 seconds. You can specify a number between 1 and 60.

GCPARM=n A value affecting the amount of data moved during the garbage collectors space recovery routine. The garbage collector determines an amount of space to move based on the ratio of free space to used space in an emulation file and on the num-
The garbage collector wants to reduce the free space to used space ratio and the number of free spaces.

The value is logarithmic; a value of 8 means moving $2^8$ the selected value while a negative value similarly decreases the amount to be moved. Normally, 256K will be moved for a file in an interval. Specifying a value of 8 can increase the amount to 64M. At least 64K will be moved. Specifying a large value (such as 8) may not increase the garbage collection efficiency correspondingly. The default is 0. You can specify a number from -8 to 8.

**NOSTRESS**=$n$

Indicates whether stress writes will occur or not. A track or block group may be written under stress when a high percentage of the cache is pending write or when a device I/O thread is waiting for a cache entry. When a stressed write occurs, the compression algorithm and/or compression parm may be relaxed, resulting in faster compression but usually a larger compressed image.

If NOSTRESS is set to one, then a stressed situation is ignored. You would typically set this value to one when you want to create the smallest emulation file possible in exchange for a possible performance degradation. The default is 0. You can specify 0 (enable stressed writes) or 1 (disable stressed writes).

**FREEPEND**=$n$

Specifies the free pending value for freed space. When a track or block group image is written, the space it previously occupied is freed. This space will not be available for future allocations until $n$ garbage collection intervals have completed. In the event of a catastrophic failure, previously written track or block group images should be recoverable if the current image has not yet been written to the physical disk.

By default the value is set to -1 which means that if FSYNC is specified then the value is 1 otherwise it is 2. If 0 is specified then freed space is immediately available for new allocations. The default is -1. You can specify a number from -1 to 4.

**FSIZEC**=$n$

Enables or disables FSYNC. When FSYNC is enabled then the disk emulation file is synchronized with the physical hard disk at the end of a garbage collection interval (no more often than 5 seconds though).

This means that if FREEPEND is non-zero and a catastrophic error occurs, the emulated disks should be recovered coherently. However, FSYNC may cause performance degradation depending on the host operating system and / or the host operating system level. The default is 0 (fsync disabled), you can specify 0 (disable FSYNC) or 1 (enable FSYNC).

**TRACE**=$n$

Specifies the number of CCKD trace entries. You would normally specify a non-zero value when debugging or capturing a problem in CCKD code. When the problem occurs, you should enter the "k" Hercules console command which will print the trace table entries. The default is 0. You can specify a number between 0 and 200000. Each trace entry represents 128 bytes. Normally, for debugging, it is recommended to use 100000.

**LINUXNULL**=$n$

If set to 1 then tracks written to 3390 CCKD volumes that were initialized with the -linux option will be checked if they are null (that is if all 12 4096 byte user records contain zeroes). This is used by the DASDCOPY utility. The default is 0.

**GCSTART**=$n$

If set to 1 then space recovery will become active on any emulated disks that have free space. Normally space recovery will ignore emulated disks until they have been updated. The default is 0.
Notes:

- **raq** should be at least as large as **ra**. Read ahead threads are scheduled from entries in the read ahead queue. Likewise **rat** should not exceed **raq** because only **raq** tracks or block groups can be queued at any time.

- The number of writer threads **wr** should usually be 1 more than the number of host processors. This is because one writer thread could be CPU-bound (compressing a track or block-group image) and the other could be I/O-bound (writing the compressed image).

- The garbage collection interval governs the maximum time in seconds an updated track or block group image will reside in storage before being written to the emulation file. A large value may mean more data loss if a catastrophic error occurs. A small value may mean that more CPU time is spent compressing images.

  For example, suppose that a particular image is updated several times each second. If the interval is changed from the default 5 seconds to 1 second, then that image will be compressed and written 5 times more frequently. A large value may cause more cache flushes within a garbage collection interval. These kinds of flushes mean that a read will wait because there are no available cache entries, slowing the emulated operating system. A large value will also cause more pending free space to build up (since free space is flushed each interval). This may mean that the garbage collector space recovery routine will perform more work and the resulting emulation file may be larger.

- **Specify fsync=1 and gcint=5** if you are seriously concerned about your data being lost due to a failure. fsync will ensure your data on disk is coherent. However, fsync may cause a noticeable performance degradation. Note that an fsync will not be performed more often than every 5 seconds.

5.10.4 Examples

Example 1:
Set the CCKD options to use bzip2 as compression method and using maximum compression.

```
CCKD  COMP=2,COMPPARM=9
```

Example 2:
Set the CCKD options to use the default compression method, as well as default compression. Disable stressed writes and set the number of trace entries to 100000.

```
CCKD  COMP=-1,COMPPARM=-1,NOSTRESS=1,TRACE=100000
```
5.11 CMDLEVEL (Set current command group)

5.11.1 Function

The CMDLEVEL system parameter sets the current command group(s). A plus sign preceding the command group activates the console commands of this group, whereas a preceding minus sign deactivates the commands.

A table showing the affiliation of each console command to the various command groups can be found in ‘Appendix D. Hercules Command Groups’.

Some console commands are always active to keep Hercules operable, independent of the current active command group. These commands are listed under command group ‘NONE’ in the above mentioned table. Command group ‘NONE’ is the result of a ‘CMDLVL –ALL’ command.

The default command level is set to operator, maintenance, programmer and configuration (which corresponds to the command "CMDLEVEL -ALL +OPER +MAINT +PROG +CONFIG"). Some of the arguments can be abbreviated as shown in the syntax section below.

5.11.2 Syntax

Descriptive

CMDLEVEL {{+ | -} {ALL | OPERator | MAINT | PROGrammer | CONFIGuration | DEVELoper | DEBUG} [...]}

Diagram

5.11.3 Parameter

+ The plus sign activates the commands of the following command group.

- The minus sign deactivates the commands of the following command group.

ALL Command group ‘ALL’ contains all Hercules console commands. Specifying command group ‘+ALL’ enables all console commands whereas command group ‘-ALL’ equals to NONE. This disables all console commands with the exception of commands necessary to keep Hercules operable.
The 'OPERator' command group activates or deactivates all system operator commands.

Command group 'MAINT' activates or deactivates all system maintainer commands.

The 'PROGramer' command group activates or deactivates all systems programmer commands.

Command group ‘CONFIGuration’ activates or deactivates all system configuration commands.

The ‘DEVELoper’ command group activates or deactivates all system developer commands.

Command group ‘DEBUG’ activates or deactivates all debugging activity commands activities.

5.11.4 Examples

Example 1:
Set the command group to OPERATOR and PROGRAMMER.

CMDLEVEL -ALL +OPERATOR +PROGRAMMER

Example 2:
Allow all commands but exclude the DEBUG command group.

CMDLEVEL +ALL -DEBUG
5.12 CMDLVL (Set current command group)

5.12.1 Function
CMDLVL is an alias for CMDLEVEL. The CMDLVL system parameter sets the command group(s). See CMDLEVEL system parameter for details.

5.12.2 Syntax
See CMDLEVEL system parameter.

5.12.3 Parameter
See CMDLEVEL system parameter.

5.12.4 Examples
See CMDLEVEL system parameter.
5.13 CMDSEP (Command line separator)

5.13.1 Function
The CMDSEP system parameter sets the command line separator. The command line separator character is used to separate multiple panel commands on a single line. The default is OFF which means that there is no command line separator defined and therefore multiple panel commands on a single line are not supported.

5.13.2 Syntax

Descriptive

CMDSEP {char | OFF}

Diagram

```
  CMDSEP  | char   |
           | OFF    |
```

5.13.3 Parameter

`char` Specifies a single character that is used for command separation. This character must not be the period (".") the exclamation mark (!) or the hyphen (-). Although the command line separation character can be set to the number (hash) sign (#), this is not recommended because this could affect processing command lines that contain comments.

`OFF` OFF disables command separation. This is the default.

5.13.4 Examples

Example 1:
Set the command line separator to ‘;’.

CMDSEP ;

Example 2:
Disable command line separation.

CMDSEP OFF
5.14 CNSLPORT (Console port)

5.14.1 Function
The CNSLPORT parameter specifies the port number (in decimal), on which the telnet server will listen. The statement may also have the form host:port, where the telnet console server will bind to the specified address.

5.14.2 Syntax

**Descriptive**
CNSLPORT {3270 | port | host:port}

**Diagram**
```
+-----------------+      +-----------------+      +-----------------+
| CNSLPORT       |      | 3270             |      | port             |
|                 |      |                  |      |                  |
|                 |      | host:port        |      |                  |
```

5.14.3 Parameter

**host**
The IP address of the host to which the telnet server will bind to. If an IP address is given then it must be a valid IP address for the host system.

**port**
The port number (decimal) on which the telnet server will listen. The port number must not be in use by any other server. The port number must be in the range of 0 to 65535. Ports below 1024 cannot be used unless Hercules is running as root or is otherwise authorized to use low ports.

5.14.4 Examples

**Example 1:**
Set the port number on which the telnet server will listen to 3270.

```
CNSLPORT 3270
```

**Example 2:**
Specify 192.168.1.10 as the IP address of the host to which the telnet server will bind to and set the port number on which the telnet server will listen to 3270.

```
CNSLPORT 192.168.1.10:3270
```
5.15 CODEPAGE (Codepage conversion table)

5.15.1 Function
This parameter specifies the codepage conversion table used for the ASCII / EBCDIC translation. If no codepage is given the environment variable HERCULES_CP will be inspected. The default codepage used is "DEFAULT".

5.15.2 Syntax

Descriptive
CODEPAGE {DEFAULT | codepage | USER | MAINT cmd [operands]}

Diagram

5.15.3 Parameter

DEFAULT
"DEFAULT" specifies the traditional Hercules codepage.

codepage
Specifies the codepage conversion table used for ASCII / EBCDIC translation. Supported codepage mappings are shown in the table below. Iconv single byte codepages may also be used (e.g. “UTF8/EBCDIC-CP-NL”).

USER
This specifies that the user specific codepage conversion tables (see CP_UPDT system parameter and console command) have to be activated.

MAINT
MAINT and its arguments is the same as the CP_UPDT system parameter. Please see CP_UPDT for details.

Supported codepage mappings:

<table>
<thead>
<tr>
<th>Mapping</th>
<th>ASCII</th>
<th>EBCDIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>437/037</td>
<td>437 PC United States</td>
<td>037 United States/Canada</td>
</tr>
<tr>
<td>437/500</td>
<td>437 PC United States</td>
<td>500 Latin 1</td>
</tr>
<tr>
<td>437/1047</td>
<td>437 PC United States</td>
<td>1047 Open Systems Latin 1</td>
</tr>
<tr>
<td>819/037</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>037 United States/Canada</td>
</tr>
</tbody>
</table>
### Table 4: Supported codepage mappings

<table>
<thead>
<tr>
<th>Mapping</th>
<th>ASCII</th>
<th>EBCDIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>819/037v2</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>037 United States/Canada SHARE</td>
</tr>
<tr>
<td>819/273</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>273 CECP Austria/Germany</td>
</tr>
<tr>
<td>819/277</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>277 CECP Denmark/Norway</td>
</tr>
<tr>
<td>819/278</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>278 CECP Finland/Sweden</td>
</tr>
<tr>
<td>819/280</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>280 CECP Italy</td>
</tr>
<tr>
<td>819/284</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>284 CECP Spain</td>
</tr>
<tr>
<td>819/285</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>285 CECP United Kingdom</td>
</tr>
<tr>
<td>819/297</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>297 CECP France</td>
</tr>
<tr>
<td>819/500</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>500 CECP International</td>
</tr>
<tr>
<td>819/1047</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>1047 Open Systems Latin 1</td>
</tr>
<tr>
<td>850/273</td>
<td>850 PC Latin 1</td>
<td>273 Austria/Germany</td>
</tr>
<tr>
<td>850/1047</td>
<td>850 PC Latin 1</td>
<td>1047 Open Systems Latin 1</td>
</tr>
<tr>
<td>1252/037</td>
<td>1252 Windows Latin 1</td>
<td>037 United States/Canada</td>
</tr>
<tr>
<td>1252/037v2</td>
<td>1252 Windows Latin 1</td>
<td>037 United States/Canada SHARE</td>
</tr>
<tr>
<td>1252/1047</td>
<td>1252 Windows Latin 1</td>
<td>1047 Open Systems Latin 1</td>
</tr>
<tr>
<td>1252/1140</td>
<td>1252 Windows Latin 1</td>
<td>1140 United States/Canada with Euro sign</td>
</tr>
</tbody>
</table>

#### 5.15.4 Examples

**Example 1:**
Set the codepage conversion table to the default.

```
CODEPAGE DEFAULT
```

**Example 2:**
Set the codepage conversion table to 437/500.

```
CODEPAGE 437/500
```

**Example 3:**
Activate the user specific codepage conversion tables.

```
CODEPAGE USER
```
5.16 CONKPALV (Console and telnet clients keep-alive option)

5.16.1 Function

The CONKPALV parameter specifies the tn3270 console and telnet clients keepalive option values that control automatic detection of disconnected tn3270/telnet client sessions.

This is a built-in feature of TCP/IP and allows detection of unresponsive TCP/IP connections and not idle clients. That is to say, your connection will not be terminated after 3 seconds of idle time. Your 3270 session can remain idle for many minutes or hours or days without any data being transmitted. If the TCP/IP stack at the other end of the connection (not your 3270 client itself) fails to respond to the internal keepalive probe packets however, then it means that the TCP/IP stack itself is down or there has been a physical break in the connection.

Thus, even if your 3270 client is completely idle, your system's TCP/IP stack itself should still respond to the keepalive probes sent by the TCP/IP stack at the Hercules end of the link. If it doesn't, then TCP/IP will terminate the tn3270/telnet session which will cause Hercules to disconnect the terminal.

The three values can also be modified on-demand via the conkpalv panel command, which has the exact same syntax. Note that the syntax is very unforgiving: no spaces are allowed anywhere within the parentheses and each value must be separated from the other with a single comma.

Please also note that not all systems support being able to modify all three values. That is, not all values may be able to be changed, and it is system dependent which values you can change and which values you cannot. On Windows for example, the count value is ignored and cannot be changed from its default value of 10. Other systems may ignore one or more or all three values and use platform defaults instead. This is entirely system dependent. Check your system's documentation for details regarding which values can be changed and which cannot as well as how to adjust your system's default values.

5.16.2 Syntax

Descriptive

CONKPALV {(3,1,10) | (idle,intv,count)}

Diagram

```
>>> CONKPALV (3,1,10) (idle,intv,count)
```

5.16.3 Parameter

- **idle** The idle value specifies the number of seconds of inactivity until the first keep-alive probe is sent. The default for the idle value is 3 seconds.

- **intv** The intv value specifies the interval in seconds between the probes if no acknow-
Acknowledgement is received from the previous probe. The default for \textit{intv} is 1 second.

\textbf{count}

The \textit{count} value specifies the number of unacknowledged keep-alive packets sent before the connection is considered to have failed. The default value is 9 for non-Windows platforms and 10 for Windows systems.

\textit{Note:} On Windows platforms the count value is ignored and cannot be changed from its default value of 10.

\section*{5.16.4 Examples}

\textbf{Example 1:}

Set the tn3270 console and telnet clients keep-alive option settings on a Unix platform to the following values: 5 seconds of inactivity until the first keep-alive probe is sent, 3 seconds for the interval between the probes and to 15 unacknowledged keep-alive packets sent before the connection is considered to have failed.

\texttt{CONKPALV (5,3,15)}
5.17 CP_UPDT (User character conversion table)

5.17.1 Function

The CP_UPDT system parameter creates or modifies the contents of the user codepage tables. The tables can be populated with a 'CP_UPDT REFERENCE' statement which copies one of the provided codepage tables to the user tables or by a 'CP_UPDT IMPORT' statement which imports a previously created and with 'CP_UPDT EXPORT' exported table.

Changes in the user tables are made through one or more ‘CP_UPDT ALTER’ statements. These allow for up to 16 modifications at a time. The current contents of the user tables can be displayed on the console (and written to the log file) with ‘CP_UPDT DISPLAY’. Finally the changed user tables are activated with a ‘CODEPAGE USER’ statement.

In all CP_UPDT statements that require the selection of a user table (EBCDIC or ASCII), the EBCDIC table refers to the ‘guest to host’ (g2h) translation and the ASCII table refers to the ‘host to guest’ (h2g) translation.

5.17.2 Syntax

Descriptive

CP_UPDT command

where command can be:

ALTER {EBCDIC | ASCII | G2H | H2G} (pos, val[,pos, val]...)
DISPLAY {EBCDIC | ASCII | G2H | H2G}
EXPORT {EBCDIC | ASCII | G2H | H2G} filename
IMPORT {EBCDIC | ASCII | G2H | H2G} filename
REFERENCE [codepage]
RESET
TEST

Diagram

where command can be:
5.17.3 Parameter

**ALTER**  
Alters the user EBCDIC or ASCII table value at hex position *pos* to hex value *val*. Up to 16 pairs of hex digits may be specified within the parenthesis. ALTER can be abbreviated as ‘ALT’.

**DISPLAY**  
Displays the user EBCDIC or ASCII codepage table. DISPLAY can be abbreviated as ‘DIS’ or ‘DSP’.

**EXPORT**  
Exports the contents of the user EBCDIC or ASCII codepage table to file *filename*. EXPORT can be abbreviated as ‘EXP’.

**IMPORT**  
Imports the contents of file *filename* to the user EBCDIC or ASCII codepage table. IMPORT can be abbreviated as ‘IMP’.

**REFERENCE**  
Copies the specified codepage to the user EBCDIC and ASCII tables. If no codepage is specified, a list of valid codepages is displayed on the console. ‘REFERENCE’ can be abbreviated as ‘REF’.

**EBCDIC**  
The target for the command is the EBCDIC table. The EBCDIC table refers to the...
‘guest to host’ translation. ‘EBCDIC’ can be abbreviated as ‘E’.

**RESET**
Reset the internal user tables to binary zero.

**TEST**
Verify that user tables are transparent, i.e. the value at position n in g2h used as an index into h2g will return a value equal n (g2h<=h2g, h2g<=g2h).

**ASCII**
The target for the command is the ASCII table. The ASCII table refers to the ‘host to guest’ translation. ‘ASCII’ can be abbreviated as ‘A’.

**G2H**
This is the same as ‘EBCDIC’.

**H2G**
This is the same as ‘ASCII’.

**pos**
Specifies the hex position within the selected table.

**val**
Specifies the hex value for the selected position.

**filename**
Specifies the file name of the file to which the specified codepage has to be exported or from which the codepage table has to be imported.

**codepage**
 Specifies the codepage that has to be copied to the user tables.

### 5.17.4 Examples

**Example 1:**
Copy the Hercules default codepage to the user tables, alter the ASCII user table and activate the user tables.

```plaintext
CP_UPDT REFERENCE DEFAULT
CP_UPDT ALTER ASCII (5B,C0,5D,D0,7B,AD,7D,BD)
CODEPAGE USER
```
5.18 CPUIDFMT (Set format BASIC / 0 / 1 STIDP generation)

5.18.1 Function

The CPUIDFMT system parameter sets the STORE CPU ID (STIDP) format bit. The default STIDP format, if not explicitly set, is 'BASIC'. The format bit of the STIDP information specifies the format of the first two digits of the CPU identification number. When the format bit is '0' then the contents of the CPU identification number identifies the CPU. When the format bit is '1' then the CPU identification number identifies the system configuration as opposed to an individual CPU in the configuration and it identifies the logical partition in which the program is executed.

When the format is 'BASIC' the CPU identification number has the following hexadecimal format, where 'A' is the CPU address of the CPU.
- $x'Annnnn$ (Basic Mode)

When the format is '0' the CPU identification number has the following hexadecimal format where 'L' is a logical CPU address and 'P' is a logical partition identifier.
- $x'LPnnnn$ (LPAR mode)

When the format is '1' the CPU identification number has the following hexadecimal format where 'PP' is the user partition identifier (UPID). The UPID is an eight bit unsigned binary integer bound to a logical partition.
- $x'PPnnnn$ (LPAR mode)

In all cases $n$ is a digit derived from the serial number of the CPU.

For more information on the STORE CPU ID (STIDP) instruction and the format bit see IBM's "z/Architecture Principles of Operation" manual.

5.18.2 Syntax

Descriptive

CPUIDFMT {BASIC | 0 | 1}

Diagram

```
CPUIDFMT
    "BASIC"
    "0"
    "1"
```
5.18.3 Parameter

<table>
<thead>
<tr>
<th>BASIC</th>
<th>Set the format to 'BASIC'. The STIDP format bit is set to '0'.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Set the format to '0'. The STIDP format bit is set to '0'.</td>
</tr>
<tr>
<td>1</td>
<td>Set the format to '1'. The STIDP format bit is set to '1'.</td>
</tr>
</tbody>
</table>

5.18.4 Examples

Example 1:
Set the STORE CPU ID format to '1'.

```
CPUIDFMT 1
```

Example 2:
Set the STORE CPU ID format to 'BASIC'.

```
CPUIDFMT BASIC
```
5.19 CPUMODEL (CPU model number)

5.19.1 Function
The CPUMODEL parameter specifies the 4 hexadecimal digits CPU model number stored by the STIDP instruction.

5.19.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPUMODEL {0586</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>➔ CPUMODEL 0586 model ➔</td>
</tr>
</tbody>
</table>

5.19.3 Parameter

<table>
<thead>
<tr>
<th>model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any valid 4 digit hexadecimal CPU model number. A list of the valid model numbers can be found in the Hercules Windows GUI file &quot;cpu-types.txt&quot;. The default (&quot;0586&quot;) is not a mainframe CPU model number, but is related to the underlying PC architecture.</td>
</tr>
</tbody>
</table>

5.19.4 Examples

Example 1:
Specify a 7490 CPU model.

```
CPUMODEL 7490
```

Example 2:
Specify a 3090 CPU model.

```
CPUMODEL 3090
```
5.20 CPUPRIO (CPU thread process priority)

5.20.1 Function

CPUPRIO specifies the priority of the CPU thread. See section 5.82 “Process and Thread Priorities” for details. Default is a nice value of 15, which means a low priority such that I/O can be scheduled and completed in favour of CPU cycles. On multi-CPU systems a real CPU can be “dedicated” to Hercules by giving the CPU-thread a very high dispatching priority (-20).

Caution: CPUPRIO should not have a higher dispatching priority than the TOD clock and timer thread.

5.20.2 Syntax

Descriptive

CPUPRIO {15 | nn}

Diagram

```
CPUPRIO  15
         nn
```

5.20.3 Parameter

15 Specifies a CPU thread priority of 15. This is the default.

nn This value specifies the priority for the CPU thread. For details on the priority values see section 5.82 (“Process and Thread Priorities”). The default is 15.

5.20.4 Examples

Example 1:

Give the CPU-thread a very high dispatching priority of -20.

CPUPRIO -20
5.21 CPUSERIAL (CPU serial number)

5.21.1 Function
CPUSERIAL specifies the 6 hexadecimal digit CPU serial number stored by the STIDP instruction.

5.21.2 Syntax

| Descriptive    | CPUSERIAL `{000001 | serial}` |
|----------------|----------------------------------|

Diagram

```
CPUSERIAL  000001
           ^     |     
           |     v
           serial
```

5.21.3 Parameter

`serial` Any valid 6 digit hexadecimal CPU serial number. In BASIC mode, the high-order digit may be replaced with the processor number when MAXCPU is greater than one. In LPAR mode, the two high-order digits are replaced with either the LPAR number or the CPU number and LPAR number with the full serial number available via the STSI instruction. The default serial number is ‘000001’.

5.21.4 Examples

Example 1:
Set the CPU serial number to 001963.

CPUSERIAL 001963
5.22 CPUVERID (CPU version code)

5.22.1 Function
CPUVERID specifies the 2 hexadecimal digit CPU version code stored by the STIDP instruction. The default version code is “FD” when ARCHMODE S/370 or ARCHMODE ESA/390 is specified. For the z/ARCH (or ESAME architecture mode respectively) the version code is always stored as “00” and any value specified here is ignored.

5.22.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CPUVERID 00</td>
<td>(For z/ARCH and ESAME)</td>
<td></td>
</tr>
<tr>
<td>CPUVERID {FD</td>
<td>verid}</td>
<td>(For S/370 and ESA/390)</td>
</tr>
</tbody>
</table>

Diagram

For z/ARCH and ESAME:

```
CPUVERID 00
```

For S/370 and ESA/390:

```
CPUVERID FD verid
```

5.22.3 Parameter

`verid` Any valid 2 digit hexadecimal CPU version code. A list of valid version codes can be found in the Hercules Windows GUI file “cpu-types.txt”.

5.22.4 Examples

Example 1:
Set the CPU version code to FD.

```
CPUVERID FD
```
5.23 DEFSTORE (Define main and expanded storage)

5.23.1 Function

The DEFSTORE statement is used to specify the size of the main and expanded storage. Storage is allocated in megabytes, unless a specific unit is specified. The actual upper limit of the main and expanded storage is determined by the host system’s architecture, operating system, and on some systems the amount of physical memory and paging space you have available.

The practical limit depends on the maximum amount of storage that can be obtained by the “malloc” function (usually around 1 GB on 32-bit platforms; on 64-bit platforms the value should only be limited by available paging space).

An additional optional argument determines the locking state of the allocated memory (page lock by host operating system). The LOCKED option indicates that the memory is to be locked into storage while UN-LOCKED (the default) indicates that the memory is not locked into the storage.

Please note that Hercules preserves the last locking state of DEFSTORE for each type of storage. Once the storage is locked, any subsequent change to the storage size will honor the existing lock state of memory unless the lock state is specified again on the DEFSTORE command.

Caution: Do not lock storage unless sufficient real memory is available to back up the request. Failure to do so may require the host system to be rebooted.

5.23.2 Syntax

Descriptive

```
DEFSTORE {
  [MAIN msize[MB | KM | GM | TM | PM | EM] [UNLOCK | LOCK]]
  [{XSTOR | EXPANDED} size[MG | TG] [UNLOCK | LOCK]]
```

Diagram

```
DEFSODE storaotype

- MAIN msize
  - B
  - K
  - G
  - T
  - P
  - E

- XSTOR EXPANDED xsize
  - M
  - G
  - T
```
5.23.3 Parameter

**msize**
The value of `msize` must be a valid decimal number. The actual upper limit is determined by the host system’s architecture, the operating system and on some systems the amount of physical memory and paging space that is available.

For storage sizes less than 16M, sizes not on a 4K boundary are rounded up to the next 4K boundary. Otherwise, storage sizes not on a 1M boundary are rounded up to the next 1M boundary.

The minimum size is 4K for architecture levels ALS0 and ALS1 (S/370 and ESA/390), and 8K for architecture level ALS2 (ESAME) and higher. A maximum of 64M may be specified for architecture level ALS0 (S/370), 2048M (2G) for ALS1 (ESA/390) and 16E for architecture level ALS2 (ESAME) and higher.

The default on startup is 2M.

**xsize**
The value of `xsize` must be a valid decimal number. The actual upper limit is determined by the host system’s architecture, the operating system and on some systems the amount of physical memory and paging space that is available.

Storage sizes not on a 1M boundary are rounded up to the next 1M boundary. The lower limit and default is 0.

**B**
‘B’ determines that the number given is specified in bytes (no multiplier). Specifying the storage in bytes is possible only for main storage.

**K**
‘K’ determines that the number given is specified in kilobytes (multiplier 2**10). Specifying the storage in kilobytes is possible only for main storage.

**M**
‘M’ determines that the number given is specified in megabytes (multiplier 2**20). This is the default if no unit is appended.

**G**
‘G’ determines that the number given is specified in gigabytes (multiplier 2**30).

**T**
‘T’ determines that the number given is specified in terabytes (multiplier 2**40). On 32-bit machines the unit terabytes is not available.

**P**
‘P’ determines that the number given is specified in petabytes (multiplier 2**50). Specifying the storage in petabytes is possible only for main storage. On 32-bit machines the unit petabytes is not available.

**E**
‘E’ determines that the number given is specified in exabytes (multiplier 2**60). Specifying the storage in exabytes is possible only for main storage. On 32-bit machines the unit exabytes is not available.

**LOCK**
Attempt to lock the storage (pages locked by the host operating system).

**UNLOCK**
Leave the store unlocked (no pages locked by the host operating system). This is the default.

**Notes:**
The actual upper limit is determined by the host system’s architecture and operating system and the amount of physical memory and available paging space. The total of MAINSIZE and XPNDSIZE on host systems with a 32-bit architecture will be limited to 4G; host systems with a 64-bit architecture will be limited to less than 16E.
Using minimum storage sizes, storage sizes less than or not on a 64K boundary for architecture level ALS0 (S/370) or not on a 1M boundary for architecture level ALS1 (ESA/390) and higher, it may be possible to generate error conditions not covered by the “Principles of Operations”.

Use of storage sizes greater than supported by the guest operating system may generate incorrect results or error conditions within the guest operating system.

### 5.23.4 Overview Storage Allocation Units

<table>
<thead>
<tr>
<th>Unit</th>
<th>Multiplier</th>
<th>Name (Symbol)</th>
<th>IEC Name (IEC Symbol)</th>
<th>Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>None</td>
<td>Byte (B)</td>
<td>Byte (B)</td>
<td>Main storage only</td>
</tr>
<tr>
<td>K</td>
<td>$2^{10}$</td>
<td>Kilobyte (kB)</td>
<td>Kibibyte (KiB)</td>
<td>Main storage only</td>
</tr>
<tr>
<td>M</td>
<td>$2^{20}$</td>
<td>Megabyte (MB)</td>
<td>Mebibyte (MiB)</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>$2^{30}$</td>
<td>Gigabyte (GB)</td>
<td>Gibibyte (GiB)</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>$2^{40}$</td>
<td>Terabyte (TB)</td>
<td>Tebibyte (TiB)</td>
<td>Not on 32-bit machines</td>
</tr>
<tr>
<td>P</td>
<td>$2^{50}$</td>
<td>Petabyte (PB)</td>
<td>Pebibyte (PiB)</td>
<td>Not on 32-bit machines</td>
</tr>
<tr>
<td>E</td>
<td>$2^{60}$</td>
<td>Exabyte (EB)</td>
<td>Exbibyte (EiB)</td>
<td>Not on 32-bit machines</td>
</tr>
</tbody>
</table>

Table 5: Storage Allocation Units

### 5.23.5 Examples

**Example 1:**
Set the size of the main storage to 1024 MB. Do not lock the memory into the storage.

```plaintext
DEFSTORE MAIN 1024
or
DEFSTORE MAIN 1024 UNLOCK
or
DEFSTORE MAIN 1024M
or
DEFSTORE MAIN 1024M UNLOCK
```
Example 2:
Set the size of the expanded storage to 256 MB. Do not lock the memory into the storage.

DEFSTORE XSTORE 256
    or
DEFSTORE XSTORE 256M
    or
DEFSTORE XSTORE 256 UNLOCK
    or
DEFSTORE XSTORE 256M UNLOCK

Example 3:
Set the main storage to 2 GB, the expanded storage to 512 MB and lock the memory into the storage.

DEFSTORE MAIN 2048 LOCK XSTORE 512 LOCK
    or
DEFSTORE MAIN 2048M LOCK XSTORE 512M LOCK
    or
DEFSTORE MAIN 2G LOCK XSTORE 512M LOCK
5.24 DEFSYM (Define a symbol)

5.24.1 Function
Defines symbol ‘symbol’ is to contain value ‘value’. The symbol can then be the object of a substitution used later in the configuration file or for console commands. If value contains blanks or spaces it must be enclosed within quotes or apostrophes. See chapter “Symbol Substitutions” for a more in-depth discussion on this feature.

Substitution is available in configuration statements, meaning it is possible to perform substitution in the DEFSYM statement itself. However, symbols are always defined as the last step in the process, so attempting to self-define a symbol will result in an empty string.

5.24.2 Syntax

Descriptive
DEFSYM symbol value

Diagram

```
>>> DEFSYM — symbol — value
```

5.24.3 Parameter

symbol The name of a symbol.
value The value that is assigned to the symbol.

5.24.4 Examples

Example 1:
Define a symbol “TAPEDIR” with the value “/home/hercules/tapes”.

DEFSYM TAPEDIR "/home/hercules/tapes"
5.25 DEVPRIO (Device threads process priority)

5.25.1 Function
DEVPRIO specifies the priority of the device threads. See section 5.82 “Process and Thread Priorities” for details.
Caution: DEVPRIO should not have a higher dispatching priority than the TOD clock and timer thread.

5.25.2 Syntax

Descriptive
DEVPRIO {8 | nn}

Diagram

```
ENDER

DEVPRIO
gen8

```

5.25.3 Parameter

8 Specifies a device threads priority of 8. This is the default

nn This value specifies the priority for the device threads. For details on the priority values see section 5.82 (“Process and Thread Priorities”). The default is 8.

5.25.4 Examples

Example 1:
Set a priority of 10 for the device threads.

DEVPRIO 10
5.26 DEVTMAX (Maximum number of device threads)

5.26.1 Function

DEVTMAX specifies the maximum number of device threads allowed.

5.26.2 Syntax

Descriptive

DEVTMAX {0 | -1 | 1-n}

Diagram

- DevMAX
  - 0
  - -1
  - 1-n

5.26.3 Parameter

0

Specify 0 to create an unlimited number of ‘semi-permanent’ threads on an ‘as-needed’ basis. This is the default. With this option, a thread is created to service an I/O request for a device if one does not already exist. When the I/O is complete the thread enters an idle state waiting for new work. If a new I/O request for the device arrives before the timeout period expires the existing thread will be reused. The timeout value is currently hard coded at 5 minutes.

Note that this option can cause one thread (or possibly more) to be created for each device in your configuration. Specifying 0 means there is no limit to the number of threads that can be created.

-1

Specify -1 to cause ‘one time only’ temporary threads to be created to service each I/O request to a device. Once the I/O request is complete, the thread exits. Subsequent I/Os to the same device will cause another worker thread to be created again.

1-n

Specify a value from 1 to n to set an upper limit to the number of threads that can be created to service any I/O request to any device. Like the “0” option, each thread once finished servicing an I/O request enters an idle state. If a new request arrives before the timeout period expires, the thread is reused.

If all threads are busy when a new I/O request arrives a new thread is created only if the specified maximum number of threads have not yet been reached. If the specified maximum number of threads already has been reached then the I/O request is placed in a queue and will be serviced by the first available thread (eg. by whichever thread becomes idle first).

This option was created to address a threading issue, possibly related to the Cyg-
win phtreads implementation on Windows systems. On Windows systems positive DEVTMAX values are currently not honoured and are treated identically as if the value 0 had been specified. The default for non-Windows systems is 0.

5.26.4 Examples

Example 1:
Set the upper limit for the number of device threads to 16.

DEVTMAX 16

Example 2:
Allow an unlimited number of device threads.

DEVTMAX 0
5.27 DIAG8CMD (DIAGNOSE 8 command option)

5.27.1 Function
This parameter specifies whether a command issued through Diagnose 8 will be executed by Hercules as a Hercules commands or not. An optional second argument can be specified to request whether the commands issued using the Diagnose 8 interface will be traced at the console. This may be useful for programs that routinely issue console commands using the Diagnose 8 interface.

Caution: Enabling this feature may have security consequences. When this feature is enabled it is possible for guest operating systems running under Hercules to issue commands directly to the host operating system by means of the Hercules 'sh' (shell) command. This ability may be disabled via the SHCMDOPT statement.

Note: There are some commands that are being prevented from being used by the Diagnose 8 interface. The list of commands that may not be executed by means of Diagnose 8 can be found in “Appendix D. Hercules Command Groups” under the column ‘NODIAG8’.

5.27.2 Syntax

Descriptive

```
DIAG8CMD {DISABLE | ENABLE [ECHO | NOECHO]}
```

Diagram

```
----- DIAG8CMD -----
   DISABLE
   ENABLE
   ECHO
   NOECHO
```

5.27.3 Parameter

DISABLE  Commands issued through the Diagnose 8 interface will generate a Specification Exception program interrupt on the issuing CPU. This is the default.

ENABLED  Commands issued through the Diagnose 8 interface will be executed by Hercules as Hercules commands.

ECHO     When ECHO is specified, a message is issued as the console is about to issue the command, the command is redisplayed as if it was entered through the console input line, and a final message is issued to indicate the command completed.

NOECHO   When NOECHO is specified, no such messages are displayed and the command completes silently, except for the output of the command itself if the Diagnose 8 interface did not request a response buffer. This is the default.
The value of ECHO or NOECHO has no effect on command output being placed into a response buffer if the Diagnose 8 interface requested one.

### 5.27.4 Examples

**Example 1:**
Specify that commands issued through the Diagnose 8 interface are executed as Hercules commands. Additionally issue a message, as the console is about to execute the command, then redisplay the command itself and give a final message, indicating the command has completed.

```
DIAG8CMD ENABLE ECHO
```
5.28 ECPSVM (ECPS:VM support status (VM))

5.28.1 Function

This parameter specifies, whether ECPS:VM (Extended Control Program Support : Virtual Machine) support is to be enabled and – if it is enabled – to which level. The purpose of ECPS:VM is to provide to the VM/370 operating system a set of shortcut facilities to perform hypervisor functions (CP Assists) and virtual machine simulation (VM Assists).

Although this feature does not affect VM operating system products operating in XA, ESA or z/Architecture mode, it will affect VM/370 and VM/SP products running under VM/XA, VM/ESA or z/VM. Running VM/370 and VM/SP products under VM/XA, VM/ESA or z/VM should be done with ECPS:VM disabled. ECPS:VM should not be enabled in AP or MP environments. ECPS:VM has no effect on non-VM operating systems. It is however recommended to disable ECPS:VM when running native non-VM operating systems.

If a specific level is given this value will be reported to the operating system when it issues a Store ECPS:VM level but it does not otherwise alter the ECPS:VM facility operations. Please note that this is a partial implementation.

Because the ECPSVM system parameter is processed by the same command processor like the ECPSVM console command, the same parameters can be specified. This may not make sense for all of them however. As an example the STATS parameter in the configuration is useless, because there are no statistics to display at this time.

Some of the arguments of the ECPSVM system parameter can be abbreviated as shown in the syntax section below.

5.28.2 Syntax

Descriptive

ECPSVM {Help | STats | DISable | ENable | DEBUG | NOdebug | Level [nn]}

Diagram

```
 ECPSVM ┌───┐
   │   │
   +-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
   │ Help│ STats │ DISable │ ENable │ DEBUG │ NOdebug │ Level │ nn │
   +-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
```
5.28.3 Parameter

Help
Display help with all available ECPSVM options.

STats
Show statistical counters.

DISable
Disable all ECPS:VM features. This is the default if ECPSVM is not coded.

ENable
Enable all ECPS:VM features.

DEBUG
Debug ECPS:VM features.

NOdebug
Turn debug modus off for ECPS:VM features.

Level
Set/show ECPS:VM level.

nn
The value \( nn \) specifies the support level that is reported to the operating system.

5.28.4 Examples

Example 1:
Enable “Extended Control Program Support : Virtual Machine” support.

ECPSVM ENABLE
or
ECPSVM EN

Example 2:
Enable “ECPS:VM” support and set the level reported to the operating system to 20.

ECPSVM LEVEL 20
or
ECPSVM L 20

Example 3:
Debug “ECPS:VM” features.

ECPSVM DEBUG
5.29 ENGINES (Processor engines type)

5.29.1 Function

The ENGINES parameter specifies the type of engine for each installed processor. The default engine type is CP. The number of installed processor engines is determined by the MAXCPU system parameter.

If the ENGINES system parameter specifies more than MAXCPU engines, the excess engines are ignored. If fewer than MAXCPU engines are specified, the remaining engines are set to type CP (the default). See the MAXCPU system parameter or console command for details regarding the compile time variable MAX_CPU_ENGINES.

For detailed explanations on the interrelationship between ENGINES, MAXCPU and NUMCPU please see “Appendix B. Configuration of Emulated CPUs”.

5.29.2 Syntax

Descriptive

ENGINES [nn*] {CP | IL | AP | IP} [, ... ]

Diagram

5.29.3 Parameter

nn* This is an optional repeat count.

CP Specifies a processor engine of type CP. This is the default.

IL Specifies a processor engine of type IL.

AP Specifies a processor engine of type AP.

IP Specifies a processor engine of type IP.
5.29.4 Examples

Example 1:
Specify 4 engines of type CP, 2 engines of type AP and 2 engines of type IP.

\[ \text{ENGINES } CP, CP, CP, CP, AP, AP, IP, IP \]
or
\[ \text{ENGINES } 4*CP, 2*AP, 2*IP \]

Example 2:
Specify 4 engines of type CP, 1 engine of type AP, 1 engine of type IP and 2 engines of type IL.

\[ \text{ENGINES } CP, CP, CP, CP, AP, IP, IL, IL \]
or
\[ \text{ENGINES } 4*CP, AP, IP, 2*IL \]

Example 3:
Specify 3 engines of type CP and 1 engines of type IL.

\[ \text{ENGINES } CP, CP, CP, IL \]
or
\[ \text{ENGINES } 3*CP, IL \]
5.30 HAO (Hercules Automatic Operator)

5.30.1 Function

The Hercules Automatic operator (HAO) feature is a facility that allows to automatically issue console commands in response to certain messages being issued. To use the HAO facility it is necessary to define a rule, consisting of a target and an associated command.

The Hercules Automatic Operator is only for those messages issued by Hercules to its console. It cannot be used for messages issued from the guest operating system.

The current implementation limits the total number of defined rules to 64. There is currently no way to define a command whose arguments varies based on actual message text. All of the defined HAO rules are checked for a match each time Hercules issues a message, there is no way at this time to stop the processing of subsequent rules.

HAO supports several commands. However when HAO is used in the configuration file, not all of the possible HAO commands make sense. As an example, there is no reason to define a rule in the configuration file and afterwards to delete it in one of the next statements. Therefore only those commands are listed here, that are useful during Hercules startup. For a list of all possible HAO commands see the HAO panel command.

5.30.2 Syntax

Descriptive

HAO command [operands]

  where command can be:

TGT target
CMD consolecmd
LIST [nn]

Diagram

```
\[\]
```

where command can be:

```
|----- TGT  target
|----- CMD  consolecmd
```
5.30.3 Parameter

**TGT**
This is the keyword to define a new rule (pattern).

**target**
Specifies the rule (pattern) to react on. The target is a regular expression pattern which is matched against the text of the messages that Hercules issues.

**CMD**
This is the keyword to specify a command for a previously defined rule.

**consolecmd**
Specifies the command to be executed if a target rule matches. The associated command must be a valid Hercules console command.

**LIST**
List all rules/commands or list only rule/command at index \( nn \).

**nn**
Number of the index to be listed or deleted.

5.30.4 Examples

Example 1:
Define the following target rule and the related command to be issued:
Check for message HHC01600E ("Unknown Hercules command") and issue "?" command (List all valid commands).

HAO TGT HHC01600E
HAO CMD HELP
5.31 HERCLOGO (Hercules logo file)

5.31.1 Function
HERCLOGO specifies the logo text file which defines a welcome screen that is presented when a TN3270 terminal connects to a Hercules 3270 device. For details on how to code the Hercules logo file, see section 10 ("Hercules 3270 Logo").

5.31.2 Syntax

```
Descriptive
HERCLOGO filename

Diagram
>>> HERCLOGO — filename

Descriptive

5.31.3 Parameter

filename The name (and optionally path) of a logo text file. If no path is specified the logo file is first searched in the current working directory and second in the directory where the Hercules executable resides.

5.31.4 Examples

Example 1:
Use the logo text file "HERCLOGO.txt" for the welcome screen.

HERCLOGO D:\HERCULES\CONF\HERCLOGO.TXT
5.32 HERCPRIO (Hercules process priority)

5.32.1 Function

The HERCPRIO parameter specifies the process priority for Hercules. See section 5.82 “Process and Thread Priorities” for details.

Caution: HERCPRIO should not have a higher dispatching priority than the TOD clock and timer thread.

5.32.2 Syntax

Descriptive

HERCPRIO {0 | $n$}

Diagram

```
\[ \begin{array}{c}
\text{HERCPRIO} \\
0 \\
\$n$
\end{array} \]
```

5.32.3 Parameter

0  
Specifies a process priority for Hercules of 0. This is the default

$n$  
This value specifies the process priority for Hercules. For details on the priority values see section 5.82 (“Process and Thread Priorities”). The default is 0.

5.32.4 Examples

Example 1:
Set the Hercules process priority to 0.

HERCPRIO 0
5.33 HTTP (HTTP server configuration)

5.33.1 Function
The HTTP statement configures the HTTP server. More than one HTTP statement can be coded in the configuration file. Depending on the given arguments the port on which the HTTP server will listen and the authorization (if any) or the location of the HTTP server files can be specified. Additional arguments allow to start or to stop the HTTP server. Please note, that the HTTP server is not started by default (i.e. without a “HTTP START” statement).

5.33.2 Syntax

**Descriptive**

HTTP {START | STOP | ROOT path | PORT port {NOAUTH | AUTH userid password}}

**Diagram**

```
HTTP
  START
  STOP
  ROOT path
  PORT port
  NOAUTH
  AUTH userid password
```

5.33.3 Parameter

**START**
Start the HTTP server (if it is stopped).

**STOP**
Stop the HTTP server (if it is started).

**ROOT**
Keyword to specify the root directory of the HTTP server files. The HTTP root can only be set if the HTTP server is in the stopped state.

**path**
The full path of the root directory where the HTTP server files reside. If this parameter is not specified the default value for Win32 builds of Hercules is the directory where the Hercules executables themselves reside. For non-Win32 builds it is the directory specified as the default package installation directory when the Hercules executables were built. This can vary depending on how the Hercules package was built, it is commonly “/usr/local/share/hercules”.

**PORT**
Keyword to specify the port on which the HTTP server will listen (including optional authorization information). The HTTP port and authorization information can only be set if the HTTP server is in the stopped state.

**port**
The port number must be either 80 or within the range of 1024 to 65535 inclusive.
NOAUTH  NOAUTH indicates that no userid and password are required to access the HTTP server.

AUTH  AUTH indicates that a userid and a password are required to access the HTTP server. The userid and password have to be coded after the AUTH parameter.

userid  The userid can be any valid string.

password  The password can be any valid string.

5.33.4 Examples

Example 1:
Activate the HTTP server under a Linux system listening on port 8081 and with the HTTP server files residing on "/usr/local/share/Hercules". Specify that authorization is required to access the HTTP server. The userid should be UID0001 and the password should be PSWD0001.

HTTP PORT 8081 AUTH UID0001 PSWD0001
HTTP ROOT /usr/local/share/Hercules
HTTP START

Example 2:
Activate the HTTP server under a Windows system listening on port 8088 and with the HTTP server files residing on "D:\Hercules\HTML". Specify that authorization is not required to access the HTTP server.

HTTP PORT 8088 NOAUTH
HTTP ROOT D:\Hercules\HTML
HTTP START
5.34 HTTPPORT (HTTP server port)

5.34.1 Function
The HTTPPORT parameter has been deprecated and is replaced by the HTTP system parameter. Use "HTTP PORT" instead. See the HTTP system parameter for details.

5.34.2 Syntax
See HTTP system parameter.

5.34.3 Parameter
See HTTP system parameter.

5.34.4 Examples
See HTTP system parameter.
5.35 HTTPROOT (HTTP server root directory)

5.35.1 Function
The HTTPROOT parameter has been deprecated and is replaced by the HTTP system parameter. Use "HTTP ROOT" instead. See the HTTP system parameter for details.

5.35.2 Syntax
See HTTP system parameter.

5.35.3 Parameter
See HTTP system parameter.

5.35.4 Examples
See HTTP system parameter.
5.36 IGNORE (Ignore subsequent INCLUDE errors)

5.36.1 Function
This system parameter indicates that errors caused by subsequent INCLUDE statements - for files which
do not exist - should be ignored rather than causing the Hercules startup to be aborted as it would other-
wise normally occur.

5.36.2 Syntax

Descriptive

IGNORE INCLUDE_ERRORS

Diagram

\[\text{INCLUDE}_\text{ERRORS} \quad \text{IGNORE} \quad \text{INCLUDE}_\text{ERRORS}\]

5.36.3 Parameter

INCLUDE_ERRORS Indicates that subsequent INCLUDE errors will be ignored.

5.36.4 Examples

Example 1:
Specify that errors caused by subsequent INCLUDE statements should be ignored.

IGNORE INCLUDE_ERRORS
5.37 INCLUDE (Include configuration file)

5.37.1 Function
An INCLUDE statement instructs the Hercules initialisation process to treat the contents of the file specified by filepath as if its contents had appeared in the configuration file at the point where the INCLUDE statement appears.

The included file itself may contain yet another INCLUDE statement as long as the maximum nesting depth of 8 is not exceeded.

5.37.2 Syntax

**Descriptive**

`INCLUDE filepath`

**Diagram**

```
+------------------------+
| INCLUDE               |
| filepath              |
+------------------------+
```

5.37.3 Parameter

`filepath` Specifies the path and the filename of the configuration file that is to be included.

5.37.4 Examples

**Example 1:**
Specify that Hercules should include the contents of the file "D:\S390\CONF\CONFIG2.CONF" into the configuration.

```
INCLUDE D:\S390\CONF\CONFIG2.CONF
```
5.38 IODELAY (I/O interrupt wait time (LINUX))

5.38.1 Function

IODELAY sets the amount of time in microseconds to wait after an I/O interrupt is ready to be set pending. This value can also be set using the Hercules console. The purpose of this parameter is to circumvent a bug in the Linux/390 and z/Linux ‘dasd.c’ device driver. The bug is more likely to occur under Hercules than on a real machine as Hercules may present an I/O interrupt sooner than a real machine.

NOTE: OSTAILOR LINUX no longer sets IODELAY to 800 since the problem described above is no longer present in recent versions of the Linux kernel.

5.38.2 Syntax

Descriptive

IODELAY {0 | usecs [NOWARN]}

Diagram

Example 1:

Set the amount of time to wait after an I/O interrupt is ready to be set pending to 1000 microseconds.

IODELAY 1000
Example 2:
Set the amount of time to wait after an I/O interrupt is ready to be set pending to 500 microseconds and suppress the warning message.

IODELAY 500 NOWARN
5.39 LDMOD (Additional dynamic load modules)

5.39.1 Function
LMOD provides the capability of defining additional modules that will be loaded by the Hercules Dynamic Loader. The default search order is within the Hercules directory and in the default DLL search path. Most systems also support absolute filenames (e.g. names starting with "/" or ".") in which case the default search path is not taken. Multiple LDMOD statements may be used.

5.39.2 Syntax

Descriptive

LMOD module [module [module ...]]

Diagram

```
LMOD module
```

5.39.3 Parameter

module A list of modules that are to be loaded by the Hercules Dynamic Loader.

5.39.4 Examples

Example 1:
Instruct Hercules to load the additional module named S37X (S/370 Extension) from the Hercules directory or the default DLL search path.

LMOD S37X
5.40 LEGACYSENSEID (SENSE ID CCW (x'E4') feature)

5.40.1 Function
This option specifies whether the SENSE ID CCW (x'E4') will be honoured for the devices that originally did not support that feature. This includes (but may not be limited to) 3410 and 3420 tape drives, 2311 and 2314 direct access storage devices and 2703 communication controllers. Because those legacy devices didn't originally support this command, and for compatibility reasons, the default is OFF or DISABLE.
Specify ON or ENABLE, if your guest operating system needs the Sense ID support to dynamically detect those devices. Note that most current operating systems will not detect those devices even though Sense ID is enabled because those devices never supported the Sense ID in the first place. This mainly applies to custom built or modified versions of guest operating systems that are aware of this specific Hercules capability.

5.40.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEGACYSENSEID {OFF</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="Diagram.png" alt="Diagram" /></td>
</tr>
</tbody>
</table>

5.40.3 Parameter

<table>
<thead>
<tr>
<th>OFF</th>
<th>Specify OFF or DISABLE if your guest operating system does not need the Sense ID support to dynamically detect devices that originally did not support that feature. This is the default.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISABLE</td>
<td>This is the same as ‘OFF’.</td>
</tr>
<tr>
<td>ON</td>
<td>Specify ON or ENABLE if your guest operating system needs the Sense ID support to dynamically detect devices that originally did not support that feature.</td>
</tr>
<tr>
<td>ENABLE</td>
<td>This is the same as ‘ON’.</td>
</tr>
</tbody>
</table>
5.40.4 Examples

Example 1:
Specify that the SENSE ID CCW will be honoured for devices that originally did not support that feature.

LEGACYSENSEID ENABLE
5.41 LOADPARM (IPL parameter)

5.41.1 Function
This parameter specifies the eight-character IPL parameter which is used by all MVS based operating systems (MVS 3.8J, MVS/SP, MVS/XA, MVS/ESA, OS/390, z/OS) to select the system start parameter.

5.41.2 Syntax

Descriptive

LOADPARM ipl_parameter

Diagram

```
keyboard LOADPARM     ipl_parameter
```

5.41.3 Parameter

**ipl_parameter**  The system parameter used for the IPL of the intended operating system. The parameter is operating system dependent, consult the relevant operating system documentation for details.

5.41.4 Examples

Example 1:
Use 0A8200M1 as system parameter for the IPL of the operating system.

```
LOADPARM 0A8200M1
```
5.42 LOGOPT (Logging options)

5.42.1 Function
The LOGOPT statement specifies the Hercules log options. It allows to insert or suppress the time stamp in front of each log message.

5.42.2 Syntax

**Descriptive**

LOGOPTS {TIMESTAMP | TIME | NOTIMESTAMP | NOTIME}

**Diagram**

```
  LOGOPTS
     TIMESTAMP
        TIME
           NOTIMESTAMP
                  NOTIME
```

5.42.3 Parameter

- **TIMESTAMP**  Insert a time stamp in front of each log message. This is the same as using TIME.
- **TIME**  Insert a time stamp in front of each log message. This is the same as using TIME-STAMP.
- **NOTIMESTAMP**  Display log messages without a timestamp. This is the same as using NOTIME.
- **NOTIME**  Display log messages without a timestamp. This is the same as using NOTIME-STAMP.

5.42.4 Examples

**Example 1:**
Specify that messages in the log are to be time stamped.

LOGOPTS TIMESTAMP
5.43 LPARNAME (LPAR name returned by DIAG x'204')

5.43.1 Function

LPARNAME defines the LPAR name returned by DIAG x'204'.

5.43.2 Syntax

Descriptive

LPARNAME {HERCULES | lparname}

Diagram

![Diagram showing LPARNAME with HERCULES and lparname]

5.43.3 Parameter

lparname Maximum 8 byte character name for the LPAR. The default is HERCULES.

5.43.4 Examples

Example 1:
Specify HERCULES as LPAR name returned by DIAG x'204'.

LPARNAME HERCULES
5.44 LPARNUM (LPAR identification number)

5.44.1 Function
The LPARNUM system parameter sets the LPAR identification number. It specifies the one- or two-digit hexadecimal LPAR identification number stored by the STIDP instruction, or BASIC. If a one-digit number from 1 to F (hexadecimal) is specified, then STIDP stores a format-0 CPU ID, unless a subsequent “CPUIDFMT 1” statement is specified. If zero or a two-digit hexadecimal number, except 10 (hexadecimal), is specified, then STIDP stores a format-1 CPU ID. For LPARNUM 10 the current CPUIDFMT is not changed. If LPARNUM is BASIC, then the STIDP instruction stores a basic-mode CPU ID. The default is LPARNUM 1 with a format-0 CPU ID.

5.44.2 Syntax

**Descriptive**
LPARNUM {BASIC | 1 | n | nn}

**Diagram**

```
   LPARNUM            BASIC
      1
      1...F
      0
     nn
```

5.44.3 Parameter

**BASIC**
Specifies that STIDP stores a basic-mode CPU ID.

**1**
Specifies the one-digit hexadecimal LPAR identification number. The STIDP instruction stores a format-0 CPU ID. This is the default.

**1 ... F**
Specifies the one-digit hexadecimal LPAR identification number. The STIDP instruction stores a format-0 CPU ID, unless a subsequent “CPUIDFMT 1” statement is specified.

**0**
Specifies 0 as LPAR identification number. The STIDP instruction stores a format-1 CPU ID.

**nn**
Specifies the two-digit hexadecimal LPAR identification number (except 10 hexadecimal). For LPARNUM 10 the current CPUIDFMT is not changed. The STIDP instruction stores a format-1 CPU ID.
5.44.4 Examples

Example 1:
Set the LPAR identification number to x'21' (Format-1 CPU ID).

LPARNUM 21

Example 2:
Set the LPAR identification number to x'A' (Format-0 CPU ID).

LPARNUM A

Example 3:
Set a basic-mode CPU ID.

LPARNUM BASIC
5.45 MAINSIZE (Main storage size)

5.45.1 Function

MAINSIZE specifies the size of the main storage. Storage is allocated in megabytes, unless a specific unit is specified. The actual upper limit of the main storage is determined by the host system's architecture, operating system, and on some systems the amount of physical memory and paging space you have available. The practical limit depends on the maximum amount of storage that can be obtained by "malloc" (usually around 1 GB on 32-bit platforms; on 64-bit platforms the value should only be limited by available paging space).

An additional optional argument determines the locking state of the allocated memory (page lock by host operating system). The LOCKED option indicates that the memory is to be locked into storage while UNLOCKED (the default) indicates that the memory is not locked into the storage.

Please note that Hercules preserves the last locking state of MAINSIZE. Once storage is locked, any subsequent change to the main storage size will honor the existing lock state of memory unless the lock state is specified again on the MAINSIZE command.

Caution: Do not lock main storage unless sufficient real memory is available to back up the request. Failure to do so may require the host system to be rebooted.

5.45.2 Syntax

Descriptive

MAINSIZE $msize[\{B | K | M | G | T | P | E\}] \{UNLOCK | LOCK\}$

Diagram

```
  MAINSIZE  msize
      M
      B
      K
      G
      T
      P
      E
      UNLOCK
      LOCK
```

5.45.3 Parameter

$msize$  
The value of $msize$ must be a valid decimal number. The actual upper limit is determined by the host system's architecture, the operating system and on some systems the amount of physical memory and paging space that is available.

For storage sizes less than 16M, sizes not on a 4K boundary are rounded up to the next 4K boundary. Otherwise, storage sizes not on a 1M boundary are rounded up to the next 1M boundary.

The minimum size is 4K for architecture levels ALS0 and ALS1 (S/370 and
ESA/390), and 8K for architecture level ALS2 (ESAME) and higher. A maximum of 64M may be specified for architecture level ALS0 (S/370), 2048M (2G) for ALS1 (ESA/390) and 16E for architecture level ALS2 (ESAME) and higher.

The default on startup is 2M.

B

‘B’ determines that the number given is specified in bytes (no multiplier).

K

‘K’ determines that the number given is specified in kilobytes (multiplier 2**10).

M

‘M’ determines that the number given is specified in megabytes (multiplier 2**20). This is the default if no unit is appended.

G

‘G’ determines that the number given is specified in gigabytes (multiplier 2**30).

T

‘T’ determines that the number given is specified in terabytes (multiplier 2**40). On 32-bit machines the unit terabytes is not available.

P

‘P’ determines that the number given is specified in petabytes (multiplier 2**50). On 32-bit machines the unit petabytes is not available.

E

‘E’ determines that the number given is specified in exabytes (multiplier 2**60). On 32-bit machines the unit exabytes is not available.

LOCK

Attempt to lock the storage (pages locked by the host operating system).

UNLOCK

Leave the store unlocked (no pages locked by the host operating system). This is the default.

Notes:

The actual upper limit is determined by the host system’s architecture and operating system and the amount of physical memory and available paging space. The total of MAINSIZE and XPNDSIZE on host systems with a 32-bit architecture will be limited to 4G; host systems with a 64-bit architecture will be limited to less than 16E.

Using minimum storage sizes, storage sizes less than or not on a 64K boundary for architecture level ALS0 (S/370) or not on a 1M boundary for architecture level ALS1 (ESA/390) and higher, it may be possible to generate error conditions not covered by the “Principles of Operations”.

Use of storage sizes greater than supported by the guest operating system may generate incorrect results or error conditions within the guest operating system.

5.45.4 Overview Storage Allocation Units

<table>
<thead>
<tr>
<th>Unit</th>
<th>Multiplier</th>
<th>Name (Symbol)</th>
<th>IEC Name (IEC Symbol)</th>
<th>Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>None</td>
<td>Byte (B)</td>
<td>Byte (B)</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>2**10</td>
<td>Kilobyte (kB)</td>
<td>Kibibyte (KiB)</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>2**20</td>
<td>Megabyte (MB)</td>
<td>Mebibyte (MiB)</td>
<td></td>
</tr>
</tbody>
</table>
### Unit Multiplier Name (Symbol) IEC Name (IEC Symbol) Restrictions

<table>
<thead>
<tr>
<th>Unit</th>
<th>Multiplier</th>
<th>Name (Symbol)</th>
<th>IEC Name (IEC Symbol)</th>
<th>Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>$2^{30}$</td>
<td>Gigabyte (GB)</td>
<td>Gibibyte (GiB)</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>$2^{40}$</td>
<td>Terabyte (TB)</td>
<td>Tebibyte (TiB)</td>
<td>Not on 32-bit machines</td>
</tr>
<tr>
<td>P</td>
<td>$2^{50}$</td>
<td>Petabyte (PB)</td>
<td>Pebibyte (PiB)</td>
<td>Not on 32-bit machines</td>
</tr>
<tr>
<td>E</td>
<td>$2^{60}$</td>
<td>Exabyte (EB)</td>
<td>Exbibyte (EiB)</td>
<td>Not on 32-bit machines</td>
</tr>
</tbody>
</table>

Table 6: Storage Allocation Units

#### 5.45.5 Examples

**Example 1:**
Set the size of the main storage to 1024 MB. Do not lock the memory into the storage.

```
MAINSIZE 1024
or
MAINSIZE 1024 UNLOCK
or
MAINSIZE 1024M
or
MAINSIZE 1024M UNLOCK
```

**Example 2:**
Set the size of the main storage to 4 GB. Lock the memory into the storage.

```
MAINSIZE 4096 LOCK
or
MAINSIZE 4G LOCK
```
5.46 MANUFACTURER (STSI manufacturer code)

5.46.1 Function
MANUFACTURER specifies the manufacturer name returned by the STSI instruction. The default name is HRC.

5.46.2 Syntax

Descriptive
MANUFACTURER {HRC | name}

Diagram

5.46.3 Parameter
name Any name with a maximum length of 16 characters. Valid characters are A-Z and 0-9. If MANUFACTURER is not specified in the configuration file then the default is HRC.

5.46.4 Examples
Example 1:
Set the manufacturer name returned by the STSI instruction to “HERC”.

MANUFACTURER HERC
5.47 MAXCPU (Maximum number of CPUs)

5.47.1 Function

The MAXCPU system parameter specifies the maximum number of installed processor engines. The combination of MAXCPU and NUMCPU controls the behaviour of how many CPU engines will be configured online upon startup and how many can be configured online later. The NUMCPU statement specifies the number of engines which will be configured online at startup time. All processors are CP engines unless otherwise specified by the ENGINES statement.

MAX_CPU_ENGINES is a compile-time variable which sets an upper limit on the value of MAXCPU. The value of MAX_CPU_ENGINES is displayed in the build information message on the Hercules control panel at startup time. To change the value of MAX_CPU_ENGINES you must rebuild Hercules. For Unix builds, specify "/configure --enable-multi-cpu=nn" before performing make. For Windows builds, specify "SET MAX_CPU_ENGINES=nn" before performing nmake.

MAX_CPU_ENGINES may be up to 128 on 64-bit Linux platforms. On Windows, and on all 32-bit platforms, the maximum value is 64. For performance reasons, values above 32 are not recommended for 32-bit platforms. If MAX_CPU_ENGINES is set to 1 then multiprocessing is disabled. See also the NUMCPU statement for a discussion of the performance implications of MAX_CPU_ENGINES.

The value of MAXCPU cannot exceed the value of MAX_CPU_ENGINES. If MAXCPU is not specified in the configuration file, then its initial value is equal to NUMCPU. If MAXCPU and NUMCPU are both omitted, then MAXCPU is set to 1.

For detailed explanations on the interrelationship between MAXCPU, ENGINES and NUMCPU please see “Appendix B. Configuration of Emulated CPUs”.

5.47.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAXCPU {1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Diagram" /></td>
</tr>
</tbody>
</table>

5.47.3 Parameter

| \nn | Specifies the maximum number of installed processor engines. The value of MAXCPU cannot exceed the value of MAX_CPU_ENGINES (see description above). |
5.47.4 Examples

Example 1:
Set the maximum number of installed processor engines to 8.

MAXCPU 8
5.48 MAXRATES (MIPS/SIO rate reporting interval)

5.48.1 Function
MAXRATES sets the MIPS/SIO rate reporting interval. When the interval is expired a MAXRATES command is automatically issued. The current rates will also be displayed during shutdown of Hercules. The default for the MAXRATES interval (if not coded in the configuration file) is 1440 minutes (1 day).

5.48.2 Syntax

Descriptive
MAXRATES [1440 | interval | MIDNIGHT]

Diagram

```
>>> MAXRATES 1440
```

5.48.3 Parameter

1440 This is the default that takes place if there is no MAXRATES interval is specified in the configuration file and sets the interval to 1440 minutes (1 day).

interval This specifies the interval time in minutes. Changes to the MAXRATES interval that are other than "MIDNIGHT" will set the current interval start time to the present; this includes a value of "1440".

MIDNIGHT Sets the interval to 1440 minutes (1 day) and the start time for the interval timer to midnight of the current day. This will cause the MAXRATE statistics to be date aligned.

5.48.4 Examples

Example 1:
Set the MAXRATES interval to 60 minutes.

MAXRATES 60
Example 2:
Set the MAXRATES interval to one day and the start time for the interval timer to midnight of the current day.

MAXRATES MIDNIGHT
5.49 MEMLOCK (Lock Hercules memory)

5.49.1 Function
The MEMLOCK system parameter is used to lock Hercules memory in storage. It defines the locking state of the allocated Hercules memory (page lock by host operating system). If the Hercules memory is locked in storage it cannot be paged out by the host operating system. This may result in some performance improvements.

This system parameter is available if Hercules is built with option "_HAVE_MLOCKALL". Currently MEMLOCK is only supported under Linux host operating systems.

5.49.2 Syntax

Descriptive

MEMLOCK {ON | OFF}

Diagram

| MEMLOCK | ON | OFF |

5.49.3 Parameter

ON  
ON indicates that the memory is to be locked into storage.

OFF  
OFF indicates that the memory is not to be locked into the storage.

5.49.4 Examples

Example 1:
Lock the Hercules memory in the storage.
MEMLOCK ON

Example 2:
Do not lock the Hercules memory in the storage.
MEMLOCK OFF
5.50 MODEL (STSI model code)

5.50.1 Function
MODEL specifies the model names returned by the STSI instruction. The optional second, third and the fourth operands specify the capacity model name, the permanent capacity model name and the temporary capacity model name respectively.

The default model name, if the MODEL system parameter is not coded, is “EMULATOR”.

5.50.2 Syntax

Descriptive

\[
\text{MODEL} \{ \text{EMULATOR} | \text{hdwmod} | = | * \}
\]

\[
\{ \text{EMULATOR} | \text{capmod} | = | * \}
\]

\[
[ \text{prnmod} | = | * ]
\]

[ \text{tmpmod} | = | * ]

Diagram

```
MODEL     EMULATOR
         hdwmod
          *

EMULATOR
         capmod
         *

         prnmod
         *

         tmpmod
         *
```

5.50.3 Parameter

**hdwmodel**
This specifies the hardware model name. This can be any name with a maximum length of 16 characters. Valid characters are A-Z and 0-9. Specifying a “=” resets the hardware model to “EMULATOR”; specifying an “*” leaves the current hardware model name intact. If the MODEL system parameter is not specified in the configuration file then the default name is “EMULATOR”.

**capmodel**
This optional parameter specifies the capacity model name. The capmodel can be any name with a maximum length of 16 characters. Valid characters are A-Z and 0-9. Specifying a “=” copies the current hardware model name to the capacity model; specifying an “*” leaves the current capacity model name intact. The default capa-
city model name is “EMULATOR”.

**prmmodel**
This specifies the permanent capacity model name. The *prmmodel* can be any name with a maximum length of 16 characters. Valid characters are A-Z and 0-9. Specifying a “=” copies the current capacity model name to the permanent capacity model; specifying an “*” leaves the current permanent capacity model name intact. The default permanent capacity model name is a null string.

**tmpmodel**
This specifies the temporary capacity model name. The *tmpmodel* can be any name with a maximum length of 16 characters. Valid characters are A-Z and 0-9. Specifying a “=” copies the current permanent capacity model name to the temporary capacity model; specifying an “*” leaves the current temporary capacity model name intact. The default temporary capacity model name is a null string.

### 5.50.4 Examples

**Example 1:**
Set the model name returned by the STSI instruction to “EMULATOR”.

```
MODEL EMULATOR
```

**Example 2:**
Set all model names returned by the STSI instruction to “EMULATOR”.

```
MODEL EMULATOR EMULATOR EMULATOR EMULATOR
```

or

```
MODEL EMULATOR = = =
```

**Example 3:**
Set all capacity model names returned by the STSI instruction to “HERCULES”, but leave the hardware model name as is.

```
MODEL * HERCULES HERCULES HERCULES
```
5.51 MODPATH (Dynamic load module path)

5.51.1 Function
MODPATH specifies the path where dynamic load modules are loaded from. If a MODPATH statement is coded then the path on the MODPATH statement is searched before the default path is searched. When a relative path is specified it is interpreted as a relative path within the default search path. If an absolute path is coded it is interpreted as such.

The default MODPATH is ‘hercules’ which means modules are loaded from the directory ‘hercules’ within the default LD_LIBRARY_PATH.

5.51.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
<th>MODPATH path</th>
</tr>
</thead>
</table>

Diagram


5.51.3 Parameter

path The path where dynamic load modules are loaded from.

5.51.4 Examples

Example 1:
Set the path from where dynamic load modules are loaded to “D:/HERCULES/MODIFICATIONS”.

MODPATH D:/HERCULES/MODIFICATIONS
5.52 MOUNTED_TAPE_REINIT (Control tape initialization)

5.52.1 Function

This system parameter specifies whether reinitialization of tape drive devices via the DEVINIT command in order to mount a new tape should be allowed if there is already a tape mounted on the drive. This option is meant as a safety mechanism to protect against accidentally unmounting a tape from the wrong device as a result of a simple typing error and thereby eventually cancelling a potentially important tape job. Please note that for SCSI tape drives the "DEVINIT nnnn **" command has no effect. The tape must be unmounted manually since it is a real physical device and not emulated via a disk file like '.AWS' or '.HET' tapes.

Specifying ALLOW, the default, indicates that new tapes may be mounted via "DEVINIT nnnn new-tape-filename" irrespective of whether or not there is already a tape mounted on the drive.

Specifying DISALLOW prevents new tapes from being mounted if one is already mounted. Before the new tape can be mounted the existing one has first to be unmounted (via the "DEVINIT nnnn ** command). Otherwise the DEVINIT attempt to mount the new tape is rejected.

5.52.2 Syntax

Descriptive

MOUNTED_TAPE_REINIT {ENABLE | ALLOW | DISABLE | DISALLOW}

Diagram

\[\begin{array}{c|c|c|c}
\text{MOUNTED TAPE_REINIT} & \text{ENABLE} & \text{ALLOW} & \text{DISABLE} & \text{DISALLOW} \\
\end{array}\]

5.52.3 Parameter

ENABLE Indicates that new tapes may be mounted irrespective of whether or not there is already a tape mounted on the drive. This is the default.

ALLOW This is the same as ENABLE.

DISABLE Prevents new tapes from being mounted if one is already mounted on the drive. Before the new tape can be mounted the currently mounted tape must first to be unmounted. Instead of DISABLE, the argument DISALLOW that has been used in earlier versions of Hercules can also be used.

DISALLOW This is the same as DISABLE.
5.52.4 Examples

Example 1:
Specify that new tapes are not being mounted if one is already mounted on the drive.

MOUNTED_TAPE_REINIT DISABLE

Example 2:
Specify that new tapes may be mounted even if one is already mounted on the drive.

MOUNTED_TAPE_REINIT ALLOW
5.53 MSGHLD (Timeout value of held messages)

5.53.1 Function
The MSGHLD system parameter is used to set the timeout value of held messages.

5.53.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
<th>MSGHLD  nn</th>
</tr>
</thead>
</table>

Diagram

```
MSGHLD   nn
```

5.53.3 Parameter

`nn` This value specifies the new timeout value of held messages in seconds.

5.53.4 Examples

Example 1:
Set the timeout interval for held messages to 30 seconds.

`MSGHLD  30`
5.54 MSGLEVEL (Message display output)

5.54.1 Function

The MSGLEVEL system parameter specifies the setting of the message level. It decides how many and what kind of messages are written to the Hercules console (and to the log).

The message level is set per default to 'terse' which turns the verbose message level off. To display the additional messages during configuration file processing Hercules can be started with the "-v" option which sets the verbose message level. As an alternative, the MSGLEVEL system parameter can be set to activate the verbose message level. In this case however, MSGLEVEL must be coded as one of the first statements in the configuration file to take effect at an early stage during configuration file processing.

In addition to the 'terse' level the following options are set by default (if not otherwise overwritten through the MSGLEVEL system parameter or console command): ‘nodebug’, ‘tape’, ‘dasd’, ‘comm’, ‘ur’, ‘scsi’, ‘ctca’, ‘graf’, ‘thread’ and ‘channel’.

Certain levels (on, off, text, time) can only be set if Hercules is built with one of the following build options: OPTION_MSGCLR or OPTION_MSGHLD.

5.54.2 Syntax

Descriptive

MSGLEVEL {option option ...}

where option can be:

<table>
<thead>
<tr>
<th>ON</th>
<th>OFF</th>
<th>TEXT</th>
<th>TIME</th>
<th>NODEBUG</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+</td>
<td>- ] DEBUG</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>- ] TAPE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>- ] DASD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>- ] COMM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>- ] UR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>- ] SCSI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>- ] CTCA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>- ] GRAF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>- ] THREAD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>- ] CHANNEL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>- ] VERBOSE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>- ] TERSE</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.54.3 Parameter

ON ON displays the messages in the default kind with message number followed by the message text.

OFF No messages are displayed.

TEXT Displays only the text part of the message (without message numbers).

TIME Prefix the messages with a timestamp.

NODEBUG The messages are not issued in debug mode (not prefixed additionally with the name of the source member and the line number that issues the message).

DEBUG The messages are prefixed additionally with the name of the source member and the line number that issues the message.

TAPE Display tape related messages.

DASD Display DASD related messages.

COMM Display communications related messages.

UR Display unit record related messages.
SCSI Display SCSI related messages.

CTCA Display CTCA and LCS related messages.

GRAF Display graphics (3270) related messages.

THREAD Display threading related messages.

CHANNEL Display channel related messages.

VERBOSE Displays additional messages during configuration file processing.

TERSE This turns the verbose message level off. This is the default unless VERBOSE is specified either through the MSGLEVEL system parameter or panel command or if Hercules is started with the “-v” option.

5.54.4 Examples

Example 1:
Turn the verbose level off.

    MSGLEVEL TERSE

Example 2:
Prefix messages with the name of the source member and the line number that issues the message (DEBUG level).

    MSGLEVEL DEBUG

Example 3:
Display no messages at all.

    MSGLEVEL OFF

Example 4:
Set a highly customized message processing. All messages have to be prefixed with a timestamp and additional messages during configuration file processing have to be displayed. SCSI related messages as well as unit record related messages have to be suppressed.

    MSGLEVEL TIME +DEBUG +VERBOSE -SCSI -UR
5.55 MSGLVL (Message display output)

5.55.1 Function
This parameter specifies the message level. MSGLVL is an alias for the MSGLEVEL system parameter. Please see MSGLEVEL for details.

5.55.2 Syntax
See MSGLEVEL command.

5.55.3 Parameter
See MSGLEVEL command.

5.55.4 Examples
See MSGLEVEL command.
5.56 NUMCPU (Number of emulated CPUs)

5.56.1 Function

NUMCPU specifies the number of emulated processor engines which will be configured online at startup time. The combination of NUMCPU and MAXCPU controls the behaviour of how many CPU engines will be configured online upon startup and how many can be configured online later.

NUMCPU cannot exceed the value of MAXCPU. If NUMCPU is less than MAXCPU then the remaining engines can be configured online later. The default NUMCPU value is 1. All processors are CP engines unless otherwise specified by the ENGINES system parameter.

Multiprocessor emulation works best if your host system actually has more than one physical CPU, but you can still emulate multiple CPUs nevertheless even on a uniprocessor system (and you might even achieve a small performance benefit when you do).

There is little point, however, in specifying NUMCPU greater than 1 unless your guest operating system (running under Hercules) is actually able to support multiple CPUs. If you do not actually need multiprocessor emulation, then setting MAX_CPU_ENGINES to 1 at compile time might even produce a slight performance advantage too.

For detailed explanations on the interrelationship between NUMCPU, MAXCPU and ENGINES please see “Appendix B. Configuration of Emulated CPUs”.

5.56.2 Syntax

**Descriptive**

NUMCPU \{ 1 | nn \}

**Diagram**

```
NUMCPU 1 nn
```

5.56.3 Parameter

**nn**

The number of emulated CPUs. NUMCPU must be less than or equal MAXCPU. If NUMCPU is larger than MAXCPU then an error message is issued, if it is less than MAXCPU then the remaining engines can be configured online later. The default for NUMCPU is 1.
5.56.4 Examples

Example 1:
Set the number of emulated CPUs to 4.

NUMCPU 4
5.57 NUMVEC (Number of vector facilities)

5.57.1 Function
NUMVEC defines the number of emulated vector facilities. Default is one per CPU (for the number of CPUs, see also the NUMCPU parameter). The vector facility is only available in ESA/390 mode by default.

5.57.2 Syntax

**Descriptive**
NUMVEC {0 | nn}

**Diagram**

```
  NUMVEC [0 | nn]
```

5.57.3 Parameter

**nn**
The number of desired vector facilities.

5.57.4 Examples

**Example 1:**
Set the number of emulated vector facilities to 1.

```
NUMVEC 1
```
5.58 OSTAILOR (Tailor trace information for specific operating system)

5.58.1 Function

OSTAILOR lets you specify the intended operating system. The effect of this parameter is to reduce control panel message traffic by selectively suppressing trace messages for program checks which are considered normal in the specified environment.

The argument QUIET suppresses all exception messages whereas the argument NULL suppresses none of them. The other options do suppress some messages and do not suppress other messages depending on the specified operating system.

Prefix values with a plus ("+") to combine them with existing values or with a minus ("-") to exclude them from existing values. To combine values the OSTAILOR statement has to be coded several times. Excluding values (although possible) does not make sense in the configuration file.

See also the PGMTRACE console command which also to further fine tune the tracing of program interrupt exceptions.

5.58.2 Syntax

Descriptive

OSTAILOR {[+ | -] z/OS | OS/390 | VM | VSE | z/VSE | LINUX | OPENSOLARIS | QUIET | NULL}

Diagram

5.58.3 Parameter

+ Specifies to combine the value with existing values.

- Specifies to exclude the value from existing values.

z/OS Code z/OS if you intend to run z/OS.
OS/390  Code OS/390 if you intend to run MVS/370, MVS/XA, MVS/ESA, OS/390.
VM       Code VM if you intend to run VM/370, VM/ESA or z/VM.
VSE      Code VSE if you intend to run VSE/370 or VSE/ESA.
z/VSE    Code z/VSE if you intend to run z/VSE.
LINUX    Code Linux if you intend to run Linux/390 or Linux for z/Series.
OpenSolaris Code OpenSolaris if you intend to run OpenSolaris for z/Series.
QUIET    QUIET discards all exception messages.
NULL     NULL allows all exception messages to be logged.

5.58.4 Examples

Example 1:
Specify Linux as the intended operating system and selectively suppressing trace messages for program checks which are considered normal in the Linux environment.

OSTAILOR LINUX

Example 2:
Do not specify the intended operating system and allow all exception messages to be logged.

OSTAILOR NULL

Example 3:
Specify VM, VSE and z/OS as the intended operating systems and selectively suppressing trace messages for program checks which are considered normal in these environments.

OSTAILOR VM
OSTAILOR +VSE
OSTAILOR +z/OS
5.59 PANRATE (Console refresh rate)

5.59.1 Function

PANRATE defines the rate, in milliseconds, at which the Hercules hardware console (HMC) will be refreshed. Please be aware that the panel refresh rate can reduce overall Hercules performance if PANRATE is set to fast.

5.59.2 Syntax

Descriptive

PANRATE {SLOW | FAST | rate}

Diagram

```
[ ] PANRATE [ ] [SLOW] [ ] [FAST] [ ] [rate]
```

5.59.3 Parameter

SLOW

SLOW is a synonym for a Hercules hardware console refresh rate of 500 milliseconds. This is also the default, if PANRATE is not specified.

FAST

FAST is a synonym for a Hercules hardware console refresh rate of 50 milliseconds.

rate

Any value between 1 (10) and 5000 milliseconds. A value less than the Linux system clock tick interval (10 on Intel platforms, 1 on Alpha platforms) or a value of more than 5000 will be rejected.

5.59.4 Examples

Example 1:
Set the panel refresh rate to 1 second.

PANRATE 1000
Example 2:
Set the panel refresh rate to 50 milliseconds.

PANRATE FAST
or
PANRATE 50

Example 3:
Set the panel refresh rate to 500 milliseconds.

PANRATE SLOW
or
PANRATE 500
5.60 PANTITLE (Console window title)

5.60.1 Function

PANTITLE specifies an optional console window title-bar string to be used in place of the default title supplied by the windowing system. This option allows one to distinguish between different Hercules sessions when running more than one instance of Hercules on the same machine.

The PANTITLE option takes effect only when the Hercules console is displayed on an ‘xterm’ terminal (commonly used on Unix systems) or in a Windows command prompt window. Note that this option has no effect when Hercules is run under the control of the Hercules Windows GUI since Hercules's console window is hidden in favour of using the GUI's window instead.

The default console title is a string consisting of the following information:

“LPARNAME – SYSTYPE * SYSNAME * SYSPLEX – System Status: colour”

SYSTYPE, SYSNAME and SYSPLEX are populated by the system call SCLP Control Program Identification. If any of these values is blank, then that field is not presented in the console title. The system status colour has following meanings:

RED One or more CPUs are in wait state.
AMBER One or more CPUs are not running.
GREEN Everything is working correctly.

5.60.2 Syntax

Descriptive

PANTITLE \{ text | "text text text" | "" \}

Diagram

```
>>> PANTITLE text
   "text text text"
```

5.60.3 Parameter

**text**

Specifies the console window title-bar string to be used. If the value contains any blanks it must be enclosed within double-quotes ("). An empty string ("") will remove the default console title.
5.60.4 Examples

Example 1:
Set the console window title-bar string to “Hercules Emulator HMC”.

PANTITLE "Hercules Emulator HMC"

Example 2:
Set the console window title-bar string to “Hercules_HMC”.

PANTITLE Hercules_HMC
5.61 PGMPRDOS (LPP license setting)

5.61.1 Function
PGMPRDOS specifies whether or not Hercules will run licensed program product (LPP) ESA or z/Architecture operating systems.

5.61.2 Syntax

Descriptive

PGMPRDOS {RESTRICTED | LICENSED}

Diagram

[Diagram showing PGMPRDOS with RESTRICTED and LICENSED options]

5.61.3 Parameter

RESTRICTED
When PGMPRDOS is set to RESTRICTED, Hercules will stop all CPUs when a licensed program product operating systems is detected. RESTRICTED is the default.

LICENSED
Setting PGMPRDOS to LICENSED will allow you to run licensed program product operating systems normally. This parameter has no effect on Linux/390, Linux for z/Series, or any 370-mode operating system.

If you are running Hercules under the Windows GUI a pop up window appears during startup which must be acknowledged before the startup continuous.

5.61.4 Examples

Example 1:
Allow licensed program product operating systems to run normally.

PGMPRDOS LICENSED

Example 2:
Disallow licensed program product operating systems to run.

PGMPRDOS RESTRICTED
5.62 PLANT (STSI plant code)

5.62.1 Function
PLANT specifies the plant name returned by the STSI instruction.

5.62.2 Syntax

Descriptive
PLANT {ZZ | name}

Diagram

5.62.3 Parameter

name Any name with a maximum length of four characters. Valid characters are A-Z and 0-9. If PLANT is not specified in the configuration file then the default name is ZZ.

5.62.4 Examples

Example 1:
Specify “HERC” as the plant name returned by the STSI instruction.

PLANT HERC
5.63 QUITMOUT (Quit timeout value)

5.63.1 Function
QUITMOUT is used for setting the timeout value for a second QUIT, EXIT or SSD command if Hercules is built with the option "OPTION_SHUTDOWN_CONFIRMATION". If Hercules is built without this option, then the QUITMOUT system parameter cannot be specified in the configuration file.

5.63.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUITMOUT nn</td>
</tr>
</tbody>
</table>

Diagram

```
[QUITMOUT nn]
```

5.63.3 Parameter

nn This specifies the timeout value where nn must be in the range of 2 to 60 seconds. If the timeout value is 0 then no second QUIT, EXIT or SSD command is necessary.

5.63.4 Examples

Example 1:
Set the quit timeout value to 30 seconds.

QUITMOUT 30
5.64 REXX (REXX interpreter settings)

5.64.1 Function
The REXX system parameter is used to manage the Rexx interpreter settings. It allows to specify the paths where the Rexx executables can be found and what extensions for the executables are to be used. If Hercules is built with support for both Rexx environments (Regina Rexx and Open Object Rexx) then the desired environments can be enabled or disabled. The message prefixes to be used for Rexx messages (issued through the “say” command) and error messages (issued through the Rexx interpreter) can be set separately.

5.64.2 Syntax

**Descriptive**

REXX option

where option can be:

ENABLE | START [REGINA | OOREXX]
DISABLE | STOP
PATHS | REXXPATHS {path [delimiter path ...] | RESET}
SYSPATH {ON | OFF | RESET}
EXTENSIONS | SUFFIXES {suffix [delimiter suffix ...] | RESET}
RESOLVER {ON | OFF | RESET}
MSGLEVEL {0 | 1 | RESET}
MSGPREFIX {messageprefix | OFF | RESET}
ERRPREFIX {errorprefix | OFF | RESET}
MODE {COMMAND | SUBROUTINE}

**Diagram**

![Diagram showing REXX option with ENABLE, START, REGINA, and OOREXX options]
5.64.3 Parameter

**ENABLE** Enables the Rexx environment that is specified as argument (Regina or ooRexx). This option is only available if Hercules is built with support for both Regina and ooRexx and cannot be used in a single Rexx environment.

If no environment is given as argument then the default Rexx environment (ooRexx) is started. ENABLE can be abbreviated as ‘ENA’.

**START** This is the same as ENABLE. START can be abbreviated as ‘STA’.

**DISABLE** Disables the currently active Rexx environment. This option is only available if Her-
Hercules is built with support for both Regina and ooRexx and cannot be used in a single Rexx environment.

DISABLE can be abbreviated as 'DIS'.

STOP
This is the same as DISABLE. STOP can be abbreviated as 'STO'.

REGINA
Given as argument to the ‘START’ or ‘ENABLE’ options, REGINA specifies that the Regina Rexx environment has to be started.

OOREXX
Given as argument to the ‘START’ or ‘ENABLE’ option, OOREXX specifies that the Open Object Rexx (ooRexx) environment has to be started.

PATHS
This is the keyword for specifying the search path(s) for the Rexx scripts. PATHS can be abbreviated as ‘PATH’.

REXXPATHS
This is the same as PATHS. REXXPATHS can be abbreviated as ‘REXXP’.

path
A path (or a list of paths, separated by a delimiter) in which Rexx executables will be searched. If the path is not specified when activating the Rexx environment then the default used is the current path taken from the environment variable ‘PATH’.

SYSPATH
Keyword for specifying, if the search for the Rexx executables should be extended to the system paths (when set to on ‘ON’) or if it should be limited to the defined PATHS / REXXPATHS (when set to ‘OFF’).

SYSPATH is set to ‘ON’ if not overwritten through the REXX system parameter in the configuration file or changed later on with the REXX console command.

EXTENSIONS
This is the keyword for specifying the filename extension(s) to be used to search the Rexx executables. EXTENSIONS can be abbreviated as ‘EXT’.

If a given script name is in the format filename.extension then it is used as is without any further processing.

SUFFIXES
This is the same as EXTENSIONS. SUFFIXES can be abbreviated as ‘SUF’.

suffix
A filename extension (or a list of filename extensions, separated by a delimiter) that identifies a Rexx executable. A filename extension must be specified in the format ".ext".

If there are no extensions specified the defaults used are ‘.REXX’, ‘.rexx’, ‘.REX’, ‘.rex’, ‘.CMD’, ‘.cmd’, ‘.RX’ and ‘.rx’.

delimiter
This is the delimiter used for separating multiple paths or multiple extensions. For Linux and Mac OS-X systems this is the colon (":"), for Windows systems it is the semicolon (";”).

RESOLVER
Keyword to define who will resolve the script name.

When set to “ON” then the Hercules Rexx interface will resolve the script name and issue appropriate messages in case the process fails. When set to ‘OFF’ then the script name will be passed as is to the Rexx interpreter.

RESOLVER is set to ‘ON’ if not overwritten through the REXX system parameter in the configuration file or changed later on with the REXX console command.

MSGLEVEL
This is the keyword for specifying the message level to be used. MSGLEVEL can
be abbreviated as ‘MSGL’.

0 Disables the display of the HHC17503I and HHC17504I messages. This is the default, if not explicitly set through the MSGLEVEL parameter.

1 Enables the display of the HHC17503I and HHC17504I messages when a script has finished:
HHC17503I REXX(package name) Exec/Script ‘script name’ RetRC(0)
HHC17504I REXX(package name) Exec/Script ‘script name’ RetValue’0’

MSGPREFIX This is the keyword used to set the prefix for standard messages (issued through ‘say’). MSGPREFIX can be abbreviated as ‘MSGP’. There is no message prefix set, unless explicitly specified with the MSGPREFIX parameter.

msgprefix Specifies the Rexx standard message prefix to be used. msgprefix can be any string up to 9 characters. Embedded blanks are not allowed.

ERRPREFIX This is the keyword used to set the prefix for error messages. ERRPREFIX can be abbreviated as ‘ERRP’. There is no error prefix set, unless explicitly specified with the ERRPREFIX parameter.

errorprefix Specifies the Rexx error message prefix to be used. errorprefix can be any string up to 9 characters. Embedded blanks are not allowed.

MODE This is the keyword used to specify the argument passing style to a Rexx script. If not explicitly specified, MODE is set to command style (‘COMMAND’).

COMMAND Specifies command style for passing arguments to a Rexx script. ‘COMMAND’ may be abbreviated as ‘COM’.

SUBROUTINE Specifies subroutine style for passing arguments to a Rexx script. ‘SUBROUTINE’ may be abbreviated as ‘SUB’.

ON Activates the specified option.

OFF Deactivates the specified option.

RESET Given as an argument to one of the options of the Rexx command this will reset the corresponding value to the default settings.

5.64.4 Examples

Example 1:
Enable ooRexx, set the filename extensions to be used to “.REXX” and “.REX” and set subroutine style for passing arguments to the Rexx script.

REXX ENABLE OOREXX
REXX EXTENSIONS .REXX;.REX
REXX MODE SUBROUTINE
Example 2:
Enable Regina Rexx and set the search path for the Rexx scripts to “D:\MVS\SCRIPTS”, but disable the search in the system path. Set the filename extensions to be used for the Rexx scripts to “.REXX”, “.REX” and “.RX”.

Finally set the message and error prefixes to RXMSG and RXERR and enable displaying the HHC17503I and HHC17504I messages after a Rexx script has been finished.

Use the default setting for the argument passing style.

REXX ENABLE REGINA
REXX PATH D:\MVS\SCRIPTS
REXX SYSPATH OFF
REXX EXTENSIONS .REXX;.REX;.RX
REXX MSGLEVEL 1
REXX MSGPREF RXMSG
REXX ERRPREF RXERR
5.65 SCLPROOT (SCLP base directory)

5.65.1 Function
The SCLPROOT system parameter sets the SCLP base directory. If a directory is given then SCLP disk I/O for the specified directory path is enabled. NONE disables SCLP disk I/O.

A subsequent list-directed IPL resets the path to the location of the .ins file, and a subsequent CCW-type IPL disables SCLP disk I/O.

5.65.2 Syntax

Descriptive
SCLPROOT {NONE | directory}

Diagram

5.65.3 Parameter
NONE
Disables SCLP disk I/O.

directory
Specifies the directory from which SCLP disk I/O is allowed. A subsequent IPL of an "ins" file or a subsequent CCW-type IPL will override this.

5.65.4 Examples
Example 1:
Disable SCLP disk I/O.

SCLPROOT NONE

Example 2:
Specifies "D:\SCLP\DISK" as the directory from which SCLP disk I/O is allowed.

SCLPROOT D:\SCLP\DISK
5.66 SCPECHO (Echo to console and history of SCP replies)

5.66.1 Function
SCPECHO allows it to route the SPC (\.') and priority SCP ('!') replies and responses to the Hercules console. The default is on (echo to the console) if SCPECHO is not coded.

5.66.2 Syntax

Descriptive
SCPECHO {OFF | ON}

Diagram

5.66.3 Parameter
OFF
Do not route the SPC and priority SCP replies and responses to the Hercules console. This is the default, if SCPECHO is not coded in the configuration file.

ON
Route the SPC and priority SCP replies and responses to the Hercules console.

5.66.4 Examples
Example 1:
Route SPC and priority SCP replies and responses to the Hercules console.

SCPECHO ON
5.67 SCPIMPLY (Pass non-Hercules commands to the SCP)

5.67.1 Function
SCPIMPLY allows it to pass all non-Hercules commands (commands unknown to Hercules) to the SPC if the SCP has enabled receipt of SCP commands. The default is off (no passing of unknown commands) if SCPIMPLY is not coded.

An example: The command "ping" is an unknown Hercules command. If the SCP running is SLES z/Linux then the ping would be sent as console input to SLES just as if the command has been prefixed with a '.' (period).

5.67.2 Syntax

Descriptive
SCPIMPLY {OFF | ON}

Diagram

```
   SCPIMPLY  OFF  ON
```

5.67.3 Parameter

OFF  Do not pass non-Hercules commands to the SCP. This is the default, if SCPIMPLY is not coded in the configuration file.

ON  Pass all non-Hercules commands to the SCP if the SCP has enabled receipt of SCP commands.

5.67.4 Examples

Example 1:
Pass non-Hercules commands to the SCP.

SCPIMPLY ON
5.68 SCSIMOUNT (Automatic SCSI tape mounts)

5.68.1 Function

The SCSIMOUNT parameter specifies whether automatic detection of SCSI tape mounts is enabled or not.

**NOTE!** Enabling this option may negatively impact Hercules performance depending on how the host operating system (Windows, Linux etc.) handles SCSI attached tape drive status queries.

5.68.2 Syntax

**Descriptive**

SCSIMOUNT {NO | YES | secs}

**Diagram**

```
borne NO ¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬－
5.69 SHCMDOPT (Shell command option)

5.69.1 Function
The SHCMDOPT system parameter defines the behaviour of the shell (sh) command. It specifies if shell commands (sh) are globally enabled or disabled either directly via the Hercules hardware console or programmatically via the DIAG8CMD interface.

5.69.2 Syntax

**Descriptive**

```
SHCMDOPT {DISABLE | ENABLE [DIAG8 | NODIAG8]}
```

**Diagram**

```
+----+ +----+ +----+ +----+ +----+
|    |   |    |   |    |   |
|    |   |    |   |    |   |
|    |   |    |   |    |   |
|    |   |    |   |    |   |
```

5.69.3 Parameter

**DISABLE**
When set to DISABLE, shell commands (sh) are globally disabled and will result in an error if entered either directly via the Hercules hardware console or programmatically via the DIAG8CMD interface.

**ENABLE**
When set to ENABLE, shell commands (sh) are globally enabled either directly via the Hercules hardware console or programmatically via the DIAG8CMD interface. This is the default.

**DIAG8**
When DIAG8 is specified (which is the default) the programmatic execution of shell commands (sh) via the DIAG8CMD interface is enabled. This is the default.

**NODIAG8**
When NODIAG8 is specified only the programmatic execution of shell commands via the DIAG8CMD interface is disabled; shell commands (sh) entered directly via the Hercules hardware console will still work.

**NOTE:** "entered directly via the Hercules hardware console" includes commands entered via the HTTP server facility or entered via "run command" (.rc) scripts.
5.69.4 Examples

Example 1:
Disable the programmatic execution of shell commands via the diagnose 8 interface but allow shell commands entered directly via the Hercules hardware console.

SHCMDOPT ENABLE NODIAG8

Example 2:
Globally disable the execution of shell commands.

SHCMDOPT DISABLE

Example 3:
Globally enable the execution of shell commands.

SHCMDOPT ENABLE DIAG8
5.70 SHOWDVOL1 (Enable showing of DASD volsers in device list)

5.70.1 Function
SHOWDVOL1 indicates whether to show the DASD VOL1 labels (volser) in the device list display. 'YES' shows the volser in addition to the usual filename, whereas 'NO' shows the device list in a traditional filename only format. The 'ONLY' option shows only the volser; the filename is not shown at all. The default is 'NO', which results in a traditional device list display. Note: This system parameter is only available if Hercules is built with "OPTION_SHOWDVOL1".

5.70.2 Syntax

Descriptive
SHOWDVOL1 {NO | YES | ONLY}

Diagram

\[
\begin{array}{c}
\text{SHOWDVOL1} \\
\text{NO} \\
\text{YES} \\
\text{ONLY}
\end{array}
\]

5.70.3 Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NO</td>
<td>NO shows the device list in the traditional filename only format. This is the default.</td>
</tr>
<tr>
<td>YES</td>
<td>YES shows the volser in addition to the usual filename.</td>
</tr>
<tr>
<td>ONLY</td>
<td>ONLY shows only the volser, the filename is not shown at all.</td>
</tr>
</tbody>
</table>

5.70.4 Examples

Example 1:
Show the DASD VOL1 labels (volser) in the device list.

SHOWDVOL1 YES

Example 2:
Show only the DASD VOL1 labels (volser) in the device list, don’t show the filenames.

SHOWDVOL1 ONLY
5.71 SHRDPORT (Shared device server port)

5.71.1 Function
SHRDPORT defines the port number (in decimal) on which the shared device server will listen. The shared device server will allow other Hercules instances to access devices on this instance. Currently only DASD devices may be shared. The default port is 3990. If you decide to use a different port number then you must specify this port number on the device statements for the other Hercules instances. If no SHRDPORT statement is present then the shared device server thread will not be activated.

5.71.2 Syntax

Descriptive

`SHRDPORT {3990 | port | START | STOP}

Diagram

```
>>> SHRDPORT 3990
               port
                START
                  STOP
```

5.71.3 Parameter

3990  
This is the default port for the shared device server. If this port number is used then the port number is not required to be coded on the device statements for other Hercules instances.

port  
Any valid port number.

START  
Start the shared device server thread.

STOP  
Stop the shared device server thread.

5.71.4 Examples

Example 1:  
Specify 3990 as the port used for the shared device server and start the shared device server thread.

```
SHRDPORT 3990
SHAREDPORT START
or
SHRDPORT 3990
```
Example 2:

Specify 3990 as the port used for the shared device server, but do not start the shared device server thread upon Hercules startup so that it can be started later on manually through the SHRDPORT console command.

```
SHRDPORT 3990
SHRDPORT STOP
```
5.72 SRVPRIO (Server threads priority)

5.72.1 Function
The SRVPRIO parameter specifies the priority of the server threads. See section 5.82 "Process and Thread Priorities" for details.

Caution: SRVPRIO should not have a higher dispatching priority than the TOD clock and timer thread.

5.72.2 Syntax

Descriptive
SRVPRIO {4 | nn}

Diagram

\[
\begin{align*}
& \text{SRVPRIO} \quad 4 \quad \text{nn} \\
\end{align*}
\]

5.72.3 Parameter
4
Specifies a server threads process priority of 4. This is the default

nn
This value specifies the process priority for the server threads. For details on the priority values see section 5.82 ("Process and Thread Priorities"). The default is 4.

5.72.4 Examples
Example 1:
Set the server threads process priority to 0.

HERCPRIO 0
5.73 SYMPTOM (Instruction trace display option)

5.73.1 Function
This parameter specifies the initial architecture mode. SYMPTOM is an alias for the TRACEOPT system parameter. Please see TRACEOPT for details.

5.73.2 Syntax
See TRACEOPT system parameter.

5.73.3 Parameter
See TRACEOPT system parameter.

5.73.4 Examples
See TRACEOPT system parameter.
5.74 SYSEPOCH (Base date for TOD clock)

5.74.1 Function
SYSEPOCH specifies the base date for the TOD clock. Use the default value (1900) for all systems except OS/360. Use 1960 for OS/360. Values other than these were formerly used to offset the TOD clock by a number of years to move the date before the year 2000 for non-Y2K-compliant operating systems. This use is deprecated and support will be removed in a future Hercules release after which only values of 1900 or 1960 will be accepted.

5.74.2 Syntax

**Descriptive**

SYSEPOCH {1900 | 1960 | year [+years | -years]}

**Diagram**

```
SYSEPOCH

+years
-years
```

5.74.3 Parameter

1900 Year 1900 is one of the two valid values for SYSEPOCH. 1900 is the default.

1960 Year 1960 is the second of the two valid values for SYSEPOCH.

year This is the base date for the TOD clock. The only supported values for SYSEPOCH are currently 1900 and 1960. Any other value will produce a warning message showing the equivalent values to specify in the SYSEPOCH statement. 1900 is the default.

+ years Specifies an optional positive year offset. It will be treated as though it had been specified using the YROFFSET statement.

- years Specifies an optional negative year offset. It will be treated as though it had been specified using the YROFFSET statement.
5.74.4 Examples

Example 1:
Specify year 1900 as the base date for the TOD clock.

SYSEPOCH 1900

Example 2:
Specify a positive year offset of 20 years to the default of 1900.

SYSEPOCH +20
5.75 TIMERINT (Internal timer update interval)

5.75.1 Function
The TIMERINT parameter sets the internal timer update interval in microseconds. This parameter specifies how frequently Hercules's internal timers-update thread updates the TOD clock, CPU Timer and other architectural related clock/timer values.

The default interval is 50 microseconds which strikes a reasonable balance between clock accuracy and overall host performance. The minimum allowed value is 1 microsecond and the maximum is 1,000,000 microseconds (one second).

CAUTION: While a lower TIMERINT value may help increase the accuracy of the guest's TOD clock and CPU Timer values it could also have severe negative impact on the overall performance of the host operating system. This is especially true when a low TIMERINT value is coupled with a high HERCPRIO and TODPRIO priority setting. Exercise extreme caution when choosing your desired TIMERINT in relationship to your chosen HERCPRIO and TODPRIO priority settings.

5.75.2 Syntax

**Descriptive**

```
TIMERINT {50 | interval}
```

**Diagram**

```
                                                                            ┌──────┐
                                                                            │ 50   │
                                                                            └──────┘
                   ┌──────────┐                                  ┌──────────┐
                TimerINT ∏----------------------------------------∏
                   │ interval │                                  │ interval │
```

5.75.3 Parameter

`interval` Specifies the timer update interval in microseconds. The minimum allowed value for the interval is 1 microsecond and the maximum is 1'000'000 microseconds (one second).

CAUTION: While a lower TIMERINT value may help increase the accuracy of the guest's TOD clock and CPU Timer values it could also have severe negative impact on the overall performance of the host operating system. This is especially true when a low value is coupled with a high HERCPRIO and TODPRIO priority setting.

Exercise extreme caution when choosing your desired TIMERINT in relationship to your chosen HERCPRIO and TODPRIO priority settings.

`interval` Specifies the timer update interval in microseconds. The minimum allowed value for the interval is 1 microsecond and the maximum is 1,000,000 microseconds (one second).
5.75.4 Examples

Example 1:
Set the timer update interval to 100 microseconds.

TIMERINT 100
5.76 TODDRAG (TOD clock drag factor)

5.76.1 Function
TODDRAG specifies the TOD clock drag factor. This parameter can be used to slow down or speed up the TOD clock by a factor of \( \text{factor} \). A significant slowdown can improve the performance of some operating systems which consume significant amounts of CPU time processing timer interrupts. A drag factor of 2.0 slows down the clock by 50%, a drag factor of 0.5 doubles the speed of the clock, a drag factor of 1.01 slows down the clock by 1% and 0.99 speeds up the clock by 1%.

5.76.2 Syntax

Descriptive

\[
\text{TODDRAG \{1.000000 | factor\}}
\]

Diagram

![Diagram of TODDRAG parameter]

5.76.3 Parameter

\( \text{factor} \)  
The factor by which the TOD clock will be slowed down or sped up. The default factor is 1.000000.

5.76.4 Examples

Example 1:
Slow down the TOD clock by 50%.

\[
\text{TODDRAG 2}
\]

Example 2:
Double the speed of the TOD clock.

\[
\text{TODDRAG 0.5}
\]
5.77 TODPRIO (Timer thread process priority)

5.77.1 Function
With this parameter you can specify the priority of the TOD clock and the timer threads. See section 5.82 (“Process and Thread Priorities”) for details.

Caution: TODPRIO should be given a dispatching priority equal to or higher than any other thread within Hercules (CPUPRIO, DEVPRIO, HERCPRIO, SRVPRIO).

5.77.2 Syntax

Descriptive
TODPRIO {-20 | nn}

Diagram

5.77.3 Parameter

15 Specifies a TOD clock process priority of -20. This is the default

nn This value specifies the priority of the TOD clock and the timer thread. For details on the priority values see section 5.82 (“Process and Thread Priorities”). The default for TODPRIO is -20.

5.77.4 Examples

Example 1:
Set the priority of the TOD clock and the timer threads to -20.

TODPRIO -20
5.78 TRACOPT (Instruction trace display option)

5.78.1 Function
TRACOPT sets the Hercules instruction tracing display option. In addition to the TRACOPT system parameter there is also a corresponding TRACOPT console command to dynamically display and/or update the current setting at any time.

5.78.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
</tr>
</thead>
</table>
TRACOPT {TRADITIONAL | REGSFIRST | NOREGS}

5.78.3 Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TRADITIONAL</td>
<td>TRADITIONAL (the default), displays the registers following the instruction about to be executed such that pressing enter (to execute the displayed instruction) then shows the next instruction to be executed followed by the updated registers display.</td>
</tr>
<tr>
<td>REGSFIRST</td>
<td>REGSFIRST displays the current register contents followed by the instruction about to be executed such that pressing enter (to execute the displayed instruction) then shows the updated registers followed by the next instruction to be executed.</td>
</tr>
<tr>
<td>NOREGS</td>
<td>NOREGS suppresses the registers display altogether and shows just the instruction to be executed.</td>
</tr>
</tbody>
</table>

5.78.4 Examples

Example 1:
Set the tracing display option to display the registers following the instruction about to be executed.

TRACOPT TRADITIONAL
5.79 TZOFFSET (TOD clock offset from GMT)

5.79.1 Function
TZOFFSET is used to define the offset of the TOD clock from the current system time. For GMT use the default value (0000). For time zones west of Greenwich specify a negative value (example: -0500 for US Eastern Standard Time, -0800 for US Pacific Standard Time). For time zones east of Greenwich, specify a positive value (example: +0100 for Central European Time, +0930 for South Australian Time).

5.79.2 Syntax

Descriptive
TZOFFSET {0000 | +hhmm | -hhmm}

Diagram

5.79.3 Parameter

0000 GMT time (0000 is the default value). Please note that this is also the correct setting if your system time (the time of the operating system on which Hercules is running) is set to local time rather than GMT.

hhmm Use a positive time in hours and minutes for time zones east of Greenwich.

hhmm Use a negative time in hours and minutes for time zones west of Greenwich.

5.79.4 Examples

Example 1:
Set the offset of the TOD clock from the current system time to Central European Time.

TZOFFSET +0100
5.80 XPNDSIZE (Expanded storage size)

5.80.1 Function
XPNDSIZE specifies the expanded storage size. Storage is allocated in megabytes, unless a specific unit is specified. The actual upper limit of the expanded storage is determined by the host system’s architecture, operating system, and on some systems the amount of physical memory and paging space you have available. The lower limit is 0.

The practical limit depends on the maximum amount of storage that can be obtained by “malloc” (usually around 1 GB on 32-bit platforms; on 64-bit platforms the value should only be limited by available paging space).

An additional optional argument determines the locking state of the allocated memory (page lock by host operating system). The LOCKED option indicates that the memory is to be locked into storage while UNLOCKED (the default) indicates that the memory is not locked into the storage.

Please note that Hercules preserves the last locking state of XPNDSIZE. Once storage is locked, any subsequent change to the expanded storage size will honor the existing lock state of memory unless the lock state is specified again on the XPNDSIZE command.

Caution: Do not lock expanded storage unless sufficient real memory is available to back up the request. Failure to do so may require the host system to be rebooted.

5.80.2 Syntax

Descriptive

XPNDSIZE xsize[M | G | T] [UNLOCK | LOCK]

Diagram

```
   M   UNLOCK
   G -   -
   T
```

5.80.3 Parameter

size

The value of xsize must be a valid decimal number. The actual upper limit is determined by the host system’s architecture, the operating system and on some systems the amount of physical memory and paging space that is available.

Storage sizes not on a 1M boundary are rounded up to the next 1M boundary. The lower limit and default is 0.

M

‘M’ determines that the number given is specified in megabytes (multiplier 2**20). This is the default if no unit is appended.
‘G’ determines that the number given is specified in gigabytes (multiplier $2^{30}$).

‘T’ determines that the number given is specified in terabytes (multiplier $2^{40}$). On 32-bit machines the unit terabytes is not available.

**LOCK**

Attempt to lock the storage (pages locked by the host operating system).

**UNLOCK**

Leave the store unlocked (no pages locked by the host operating system). This is the default.

**Notes:**

The actual upper limit is determined by the host system’s architecture and operating system, the guest operating system and the amount of physical memory and available paging space.

The total of MAINSIZE and XPNDSIZE on host systems with a 32-bit architecture will be limited to less than 4G; host systems with a 64-bit architecture will be limited to less than 16E.

Use of storage sizes greater than supported by the guest operating system may generate incorrect results or error conditions within the guest operating system.

### 5.80.4 Overview Storage Allocation Units

<table>
<thead>
<tr>
<th>Unit</th>
<th>Multiplier</th>
<th>Name (Symbol)</th>
<th>IEC Name (IEC Symbol)</th>
<th>Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>$2^{20}$</td>
<td>Megabyte (MB)</td>
<td>Mebibyte (MiB)</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>$2^{30}$</td>
<td>Gigabyte (GB)</td>
<td>Gibibyte (GiB)</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>$2^{40}$</td>
<td>Terabyte (TB)</td>
<td>Tebibyte (TiB)</td>
<td>Not on 32-bit machines</td>
</tr>
</tbody>
</table>

Table 7: Storage Allocation Units

### 5.80.5 Examples

**Example 1:**

Set the size of the expanded storage to 256 MB. Do not lock the memory into the storage.

```
XPNSIZE 256
  or
XPNSIZE 256M
  or
XPNSIZE 256 UNLOCK
  or
XPNSIZE 256M UNLOCK
```
Example 2:
Set the size of the expanded storage to 2 GB. Lock the memory into the storage.

XPNDSIZE 2048 LOCK
or
XPNDSIZE 2G LOCK
5.81 YROFFSET (TOD clock offset from actual date)

5.81.1 Function
Specifies the number of years the TOD clock is offset from the actual date. Positive numbers will move the clock forward in time while negative numbers will move it backward. A common value for non-Y2K-compliant operating systems is YROFFSET -28 which has the advantage that the day of the week and the presence or absence of February 29 is the same as the current year.

5.81.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>YROFFSET {+years</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Diagram" /></td>
</tr>
</tbody>
</table>

5.81.3 Parameter

+years Specifies the number of years the TOD clock is offset positive from the actual date. This value may not be specified as greater than +/-142 years, the total range of the TOD clock. Specifying a value that causes the computed TOD clock year to be more than 142 years later than SYSEPOCH will produce unexpected results.

-years Specifies the number of years the TOD clock is offset positive from the actual date. This value may not be specified as greater than +/-142 years, the total range of the TOD clock. Specifying a value that causes the computed TOD clock year to be earlier than the value of SYSEPOCH will produce unexpected results.

5.81.4 Examples

Example 1:
Specify 28 years to offset the TOD clock from the actual date.

```
YROFFSET -28
```
5.82 Process and Thread Priorities

This section covers details regarding the priority settings within Hercules. The relevant system parameters are:

- CPUPRIO
- DEVPRIO
- HERCPRIO
- SRVPRIO
- TODPRIO

5.82.1 Process Priorities

Under Linux a process is a thread and thread priority information applies instead.

For Windows the following conversions are used for translating Unix process priorities to Windows priority classes:

<table>
<thead>
<tr>
<th>Unix Process Priority</th>
<th>Windows Priority Class</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20 to -16</td>
<td>Realtime</td>
<td>Process that has the highest possible priority. The threads of the process preempt the threads of all other processes, including operating system processes performing important tasks. For example, a real-time process that executes for more than a very brief interval can cause disk caches not to flush or cause the mouse to be unresponsive.</td>
</tr>
<tr>
<td>-15 to -9</td>
<td>High</td>
<td>Process that performs time-critical tasks that must be executed immediately. The threads of the process preempt the threads of normal or idle priority class processes. An example is the Task List, which must respond quickly when called by the user, regardless of the load on the operating system. Use extreme care when using the high-priority class, because a high-priority class application can use nearly all available CPU time.</td>
</tr>
<tr>
<td>-8 to -1</td>
<td>Above Normal</td>
<td>Process that has priority above the Normal class but below the High class.</td>
</tr>
<tr>
<td>0 to 7</td>
<td>Normal</td>
<td>Process with no special scheduling needs.</td>
</tr>
<tr>
<td>8 to 15</td>
<td>Below Normal</td>
<td>Process that has priority above the Idle class but below the Normal class.</td>
</tr>
<tr>
<td>16 to 20</td>
<td>Low</td>
<td>Process whose threads run only when the system is idle. The threads of the process are preempted by the threads of any process running in a higher priority class. An example is a screen saver. The idle-priority class is inherited by child processes.</td>
</tr>
</tbody>
</table>

Table 8: Process Priority Conversions
Caution: On Windows, the value you choose for your process priority has a direct impact on how your thread priorities are interpreted! You should never modify one without understanding what impact you are doing so might have on the other!

5.82.2 Thread Priorities

On Linux/Unix hosts Hercules needs to be a setuid root program to allow it to reset its dispatching priority to a high (negative) value (i.e. “chown root.root hercules; chmod +s hercules”).

For Windows the following conversions are used for translating Linux/Unix thread priorities to Windows thread priorities:

<table>
<thead>
<tr>
<th>Unix Thread Priority</th>
<th>Windows Thread Priority</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>-20 to -16</td>
<td>Time Critical</td>
<td>Base priority of 15 for Idle, Below Normal, Normal, Above Normal, or High class processes, and a base priority of 31 for Realtime class processes.</td>
</tr>
<tr>
<td>-15 to -9</td>
<td>Highest</td>
<td>Priority 2 points above the priority class.</td>
</tr>
<tr>
<td>-8 to -1</td>
<td>Above Normal</td>
<td>Priority 1 point above the priority class.</td>
</tr>
<tr>
<td>0 to 7</td>
<td>Normal</td>
<td>Normal priority for the priority class.</td>
</tr>
<tr>
<td>8 to 15</td>
<td>Below Normal</td>
<td>Priority 1 point below the priority class.</td>
</tr>
<tr>
<td>16 to 19</td>
<td>Lowest</td>
<td>Priority 2 points below the priority class.</td>
</tr>
<tr>
<td>20</td>
<td>Idle</td>
<td>Base priority of 1 for Idle, Below Normal, Normal, Above Normal, or High class processes, and a base priority of 16 for Realtime class processes.</td>
</tr>
</tbody>
</table>

Table 9: Thread Priority Conversions

Caution: On Windows, your Thread Priority is interpreted differently based on your chosen Process Priority setting! You should never modify your Thread Priority settings without first reviewing your chosen Process Priority setting!
6. Device Definition Descriptions

6.1 Local non-SNA 3270 Devices

6.1.1 Function

The local non-SNA 3270 device statements are used to define terminals to the Hercules configuration. There are no required arguments for this particular device type but there are several optional arguments that may be specified.

To use this device a tn3270 client must connect to the host machine via the port number specified on the CNSLPORT statement. A valid tn3270 device type such as IBM-3278 must be used.

If the tn3270 client software allows it to specify a device type suffix (e.g. IBM-3278@GROUPNAME) then the suffix can be used to connect to that specific device number, if defined. If no suffix is used then the tn3270 client will be connected to the first available and defined 3270 device.

If a specific terminal device address is specified via the device type suffix of the tn3270 client software then it must be eligible to connect at that device address or the connection is immediately rejected. An alternative terminal device for which the tn3270 client might be eligible will not be automatically selected.

6.1.2 Syntax

Descriptive

\[
\text{devaddr} \ \text{devtype} \ [\{\text{groupname} \ | \ *} \ [\text{ipaddr} \ [\text{mask}]\]]
\]

Diagram

```
\[\text{devaddr} \quad \text{devtype} \]
\[\{\text{groupname} \ | \ *\} \quad \text{ipaddr} \quad \text{mask}\]
```

6.1.3 Parameter

\text{devaddr} \quad \text{This is the device address.}

\text{devtype} \quad \text{This is the device type. Valid terminal device types are 3270 and 3278.}

\text{groupname} \quad \text{If a terminal group name is given on the device statement then a device type suffix with this group name can be used to indicate that a device in this group is to be}
The terminal group name should be 1-8 alphanumeric characters in length, the first character being alphabetic and it should not be a hexadecimal number. Upper and lower case letters in the group name are considered to be equivalent.

The asterisk is used to indicate any terminal group name. It may be omitted if there are no additional arguments following the group name. If an IP address (and optionally mask) is specified and there is no specific group name desired then the asterisk must be coded to distinguish the terminal group name and the IP address arguments.

\texttt{ipaddr [mask]} The optional IP address and subnet masks specify the IP address(es) at which client(s) are allowed to connect via the device address identified by the device statement. This provides an additional means of specifying which device(s) a client tn3270 session may connect to.

If the IP address and mask (default 255.255.255.255 if not specified) of the tn3270 client attempting to connect match the IP address/mask entered on the device statement, then the client is eligible to connect at this device address. Otherwise the client is ineligible to connect at this device address and the next available device, if any, for which the client is eligible to connect, will be attempted.

If no permissible terminal devices remain (terminal devices for which the client is eligible to connect) or there are no more available terminal devices then the client connection is rejected.

The optional IP address and subnet mask may be specified in conjunction with the terminal group argument. In this case the terminal group argument must be specified ahead of the optional IP address and subnet mask arguments. To specify an IP address and a subnet mask without also specifying a terminal group use an asterisk ("*") as the group name substitute or placeholder.

If an IP address / mask are not specified then any client tn3270 session is allowed to connect to the device (provided they are also a member of the specified terminal group, if any).

The terminal group name must match if specified, regardless of any optional IP address / mask. To summarize, the device number suffix always takes precedence over any group name and any group name always takes precedence over any IP address/mask value.

\textbf{6.1.4 Examples}

\textbf{Example 1:}
Define a 3270 device on device address 0200.

\texttt{0200 3270}
**Example 2:**
Define a 3270 device on device address 0200. Allow clients with any terminal group name but only from IP address 192.168.0.100 to connect.

```
0200 3270 * 192.168.0.100
```

**Example 3:**
Define a 3270 device on device address 0200. Allow clients with any terminal group name but only from IP address 192.168.0.100 with subnet mask 255.255.255.0 to connect.

```
0200 3270 * 192.168.0.100 255.255.255.0
```

**Example 4:**
Define a 3270 device on device address 0200. Allow only clients with terminal group name CONSOLE and from IP address 192.168.0.100 with subnet mask 255.255.255.0 to connect.

```
0200 3270 CONSOLE 192.168.0.100 255.255.255.0
```

**Example 5:**
Define a 3270 device on device address 0200. Allow only clients with terminal group name TSOTERM to connect.

```
0200 3270 TSOTERM
```
6.2 Integrated 3270 (SYSG) Console

6.2.1 Function

The integrated 3270 (SYSG) console is similar to a local non-SNA 3270 device, except that it is not addressed by a subchannel number and it is supported only by certain system control programs. The SYSG console is defined like a 3270 device except that the device type is SYSG and the device address is ignored. Only one SYSG console can be defined in a configuration.

Use tn3270 client software to connect to the SYSG console device via the port number specified on the CNSLPORT statement, just as you would connect to a regular local non-SNA 3270 device.

The SYSG console configuration statement recognizes optional arguments which specify group name and IP address in the same way as previously described for a local non-SNA 3270 device. These optional arguments provide a means to ensure that a given tn3270 client can connect directly to the SYSG console.

If the group name and IP address arguments are not specified, then the SYSG console is considered to be a member of the general pool of devices eligible for connection to any incoming tn3270 client.

6.2.2 Syntax

Descriptive

devaddr SYSG [{groupname | *} [ipaddr [mask]]]

Diagram

```
devaddr  ---- SYSG

  *  groupname  ipaddr  [mask]
```

6.2.3 Parameter

**devaddr**

This is the device address. In the case of the integrated 3270 (SYSG) console this address is ignored.

**SYSG**

This is the device type. The only valid device type is SYSG.

**groupname**

If a terminal group name is given on the device statement then a device type suffix with this group name can be used to indicate that a device in this group is to be used. If it is specified as a terminal type suffix (e.g. IBM-3278@GROUPNAME) and there are no devices defined with that group name or no available devices remaining in that group then the connection is rejected. If no group name is specified as a
terminal type suffix then the connection will only be eligible to terminal devices
which also have no group name specified.

The terminal group name should be 1-8 alphanumeric characters in length, the first
character being alphabetic and it should not be a hexadecimal number. Upper and
lower case letters in the group name are considered to be equivalent.

* The asterisk is used to indicate any terminal group name. It may be omitted if there
are no additional arguments following the group name. If an IP address (and op-
tionally mask) is specified and there is no specific group name desired then the
asterisk must be coded to distinguish the terminal group name and the IP address
arguments.

\textbf{ipaddr [mask]} The optional IP address and subnet masks specify the IP address(es) at which
client(s) are allowed to connect via the device address identified by the device
statement. This provides an additional means of specifying which device(s) a client
tn3270 session may connect to.

If the IP address and mask (default 255.255.255.255 if not specified) of the tn3270
client attempting to connect match the IP address/mask entered on the device
statement, then the client is eligible to connect at this device address. Otherwise
the client is ineligible to connect at this device address and the next available de-
vice, if any, for which the client is eligible to connect, will be attempted.

If no permissible terminal devices remain (terminal devices for which the client is
eligible to connect) or there are no more available terminal devices then the client
connection is rejected.

The optional IP address and subnet mask may be specified in conjunction with the
terminal group argument. In this case the terminal group argument must be speci-
fied ahead of the optional IP address and subnet mask arguments. To specify an IP
address and a subnet mask without also specifying a terminal group use an aste-
risk (“*”) as the group name substitute or placeholder.

If an IP address / mask are not specified then any client tn3270 session is allowed
to connect to the device (provided they are also a member of the specified terminal
group, if any).

The terminal group name must match if specified, regardless of any optional IP
address / mask. To summarize, the device number suffix always takes precedence
over any group name and any group name always takes precedence over any IP
address/mask value.

**6.2.4 Examples**

**Example 1:**
Define an integrated 3270 (SYSG) console on device address 0000 (the device address is ignored for
SYSG consoles).

\texttt{0000 SYSG}
Example 2:
Define an integrated 3270 (SYSG) console on device address 0000. Allow only clients with terminal group name SYSGCONS and from IP address 192.168.0.100 with subnet mask 255.255.255.0 to connect.

```
0000 SYSG SYSGCONS 192.168.0.100 255.255.255.0
```

Example 3:
Define an integrated 3270 (SYSG) console on device address 0000. Allow clients with any terminal group name but only from IP address 192.168.0.100 to connect.

```
0000 SYSG * 192.168.0.100
```

Example 4:
Define an integrated 3270 (SYSG) console on device address 0000. Allow only clients with terminal group name SYSGCONS and from IP address 192.168.0.100 to connect.

```
0000 SYSG SYSGCONS 192.168.0.100
```

Example 5:
Define an integrated 3270 (SYSG) console on device address 0000. Allow only clients with terminal group name SYSGCONS to connect.

```
0000 SYSG SYSGCONS
```
6.3 Console Printer-Keyboard Devices

6.3.1 Function

These device statements are used to define “Console Printer-Keyboard” devices to Hercules. To use the Console Printer-Keyboard device a telnet client must connect to the host machine via the port number specified on the CNSLPORT statement in that configuration file.

If the telnet client software allows it to specify a device type suffix (e.g. ansi@0009) then the suffix can be used to specify the specific 1052 or 3215 device to which the client should connect. If no suffix is used in the telnet client software (or the software does not allow it), then the client will be connected to the first available 1052 or 3215 device for which it is eligible.

6.3.2 Syntax

Descriptive

devaddr devtype [NOPROMPT] [(groupname | *) [ipaddr [mask]]]

Diagram

```
 devaddr --- devtype             NOPROMPT
       \   \                           |
        *   ipaddr         mask
       /   /
  groupname
```

6.3.3 Parameter

devaddr This is the device address.

devtype This is the device type. Valid terminal device types are 1052 and 3215.

NOPROMPT The NOPROMPT argument may be specified to cause suppression of the “ENTER INPUT FOR CONSOLE DEVICE nnnn” prompt message which is otherwise normally issued to the device whenever the system is awaiting input from the device.

The NOPROMPT argument, if specified, must preceed the optional group name and any ipaddr mask arguments.

groupName If a terminal group name is given on the device statement then a device type suffix with this group name can be used to indicate that a device in this group is to be used. If it is specified as a terminal type suffix (e.g. IBM-3278@GROUPNAME) and there are no devices defined with that group name or no available devices remaining in that group then the connection is rejected. If no group name is specified as a
terminal type suffix then the connection will only be eligible to terminal devices which also have no group name specified.

The terminal group name should be 1-8 alphanumeric characters in length, the first character being alphabetic and it should not be a hexadecimal number. Upper and lower case letters in the group name are considered to be equivalent.

* The asterisk is used to indicate any terminal group name. It may be omitted if there are no additional arguments following the group name. If an IP address (and optionally mask) is specified and there is no specific group name desired then the asterisk must be coded to distinguish the terminal group name and the IP address arguments.

\[ \text{ipaddr} \[ \text{mask} \] \] The optional IP address and subnet masks specify the IP address(es) at which client(s) are allowed to connect via the device address identified by the device statement. This provides an additional means of specifying which device(s) a client tn3270 session may connect to.

If the IP address and mask (default 255.255.255.255 if not specified) of the tn3270 client attempting to connect match the IP address/mask entered on the device statement, then the client is eligible to connect at this device address. Otherwise the client is ineligible to connect at this device address and the next available device, if any, for which the client is eligible to connect, will be attempted.

If no permissible terminal devices remain (terminal devices for which the client is eligible to connect) or there are no more available terminal devices then the client connection is rejected.

The optional IP address and subnet mask may be specified in conjunction with the terminal group argument. In this case the terminal group argument must be specified ahead of the optional IP address and subnet mask arguments. To specify an IP address and a subnet mask without also specifying a terminal group use an asterisk ("*") as the group name substitute or placeholder.

If an IP address / mask are not specified then any client tn3270 session is allowed to connect to the device (provided they are also a member of the specified terminal group, if any).

The terminal group name must match if specified, regardless of any optional IP address / mask. To summarize, the device number suffix always takes precedence over any group name and any group name always takes precedence over any IP address/mask value.

### 6.3.4 Examples

**Example 1:**
Define a 1052 console printer-keyboard device on device address 0009.

0009 1052

**Example 2:**
Define a 1052 console printer-keyboard device on device address 0009 and suppress the “ENTER INPUT FOR CONSOLE DEVICE nnnn” prompt messages.

0009 1052 NOPROMPT
Example 3:
Define a 3215 console printer-keyboard device on device address 0009. Allow only clients with terminal group name CONSOLES and from IP address 192.168.0.100 to connect.

0009 3215 CONSOLES 192.168.0.100 255.255.255.0

Example 4:
Define a 3215 console printer-keyboard device on device address 0009. Allow only clients with terminal group name CONSOLES and from IP address 192.168.0.100 with subnet mask 255.255.255.0 to connect. Additionally suppress the “ENTER INPUT FOR CONSOLE DEVICE nnnn” prompt messages.

0009 3215 NOPROMPT CONSOLES 192.168.0.100 255.255.255.0

Example 5:
Define a 3215 console printer-keyboard device on device address 0009. Allow clients with any terminal group name but only from IP address 192.168.0.100 with subnet mask 255.255.255.0 to connect. Additionally suppress the “ENTER INPUT FOR CONSOLE DEVICE nnnn” prompt messages.

0009 3215 NOPROMPT * 192.168.0.100 255.255.255.0
6.4 Integrated Console Printer-Keyboard Devices

6.4.1 Function
These device statements are used to define “Integrated Console Printer-Keyboard” devices to the Hercules configuration. The statements have one optional argument, the default command prefix for sending input to the device. The default command prefix is “/”. All integrated devices must use a different command prefix.

To send a logon command to a 1052-C or 3215-C enter “/logon” on the Hercules console.

6.4.2 Syntax

Descriptive

devaddr devtype [{prefix | /}]

Diagram

```
   devaddr --- devtype --- / --- prefix
```

6.4.3 Parameter

devaddr     This is the device address.
devtype     This is the device type. Valid terminal device types are 1052-C and 3215-C.
prefix      This is the command prefix for the device. The default command prefix is “/”. All devices must use a different command prefix.

6.4.4 Examples

Example 1:
Define a 3215-C integrated console printer-keyboard device on device address 0009. Specify “/” as command prefix.

```
 0009 3215-C /
```
6.5 Card Reader Devices

6.5.1 Function
The card reader device statements are used to define card readers to the Hercules configuration. The argument specifies a list of file names containing card images. Additional arguments can be defined after the file names.

6.5.2 Syntax

Descriptive

\[
\text{devaddr} \, \text{devtype} \, \text{filename} \, [\text{filename} \, ...] \, [\text{SOCKDEV}] \, [\text{EOF}] \, [\text{INTRQ}]
\]
\[
[\text{MULTIFILE}] \, [\text{EBCDIC} \, [\text{AUTOPAD}]] \, [\text{ASCII} \, [\text{TRUNC}]]
\]

Diagram

\[
\begin{align*}
\text{devaddr} & \quad \text{devtype} \quad \text{filename} \quad \text{SOCKDEV} \\
\text{EOF} & \quad \text{INTRQ} \quad \text{MULTIFILE} \\
\text{EBCDIC} & \quad \text{AUTOPAD} \quad \text{ASCII} \quad \text{TRUNC}
\end{align*}
\]

6.5.3 Parameter

\text{devaddr} \quad \text{This is the device address.}

\text{devtype} \quad \text{This is the device type. Valid card reader types are 1442, 2501, 3505.}

\text{filename} \quad \text{The name (and optionally the path) of the card reader file.}

\text{SOCKDEV} \quad \text{Indicates that the card reader is a socket device, wherein the filename is actually a socket specification instead of a device filename. When used, there must be only one filename specified in the form "port", "host:port" or "sockpath/sockname". The device then accepts remote connections on the given TCP/IP port or Unix domain socket and reads data from the socket instead from a device file. This allows automatic remote submission of card reader data.}

See chapter 15 ("Submitting Jobs via the Socket Reader") for more details.
EOF specifies that unit exception status is presented after reading the last card in the file. This option is persistent and will remain in effect until the reader is reinitialized with the INTRQ option.

INTRQ specifies that unit check status with intervention required sense bytes is presented after reading the last card in the file. This option is persistent and will remain in effect until the reader is reinitialized with the EOF option.

MULTIFILE Specifies, when multiple files are entered, to automatically open the next input file and continue reading whenever EOF is encountered on a given file. If not specified reading stops once EOF is reached on a given file and an attention interrupt is required to open and begin reading the next file.

EBCDIC Specifies that the file contains fixed length 80-byte EBCDIC records with no line-end delimiters.

ASCII Specifies that the file contains variable length lines of ASCII characters delimited by LF (line feed) or CRLF (carriage return line feed) sequences at the end of each line.

If neither EBCDIC nor ASCII is coded then the device handler attempts to detect the format of the card image file when the device is first accessed. Auto-detection is not supported for socket devices and the default is ASCII if SOCKDEV is specified.

TRUNC With ASCII files, TRUNC defines, that lines longer than 80 characters are truncated instead of producing a unit check error.

AUTOPAD With EBCDIC files, AUTOPAD defines, that the file is automatically padded to a multiple of 80 bytes if necessary.

6.5.4 Examples

Example 1:
Define a 3505 card reader device on device address 000C. The name and path of the card reader file is "D:/JCL/DUMMY.JCL". A unit exception status has to be presented after reading the last card in the file.

```
000C 3505 D:/JCL/DUMMY.JCL EOF
```

Example 2:
Define a 1442 card reader device on device address 000C. The name and path of the card reader file is "D:/JCL/JCL.TXT". The file contains fixed length 80-byte EBCDIC records, automatically padded to a multiple of 80 bytes if necessary. A unit check status with intervention required sense bytes has to be presented after reading the last card in the file.

```
000C 1442 D:/JCL/JCL.TXT EBCDIC AUTOPAD INTRQ
```
Example 3:
Define a 2501 card reader device on device address 000C. The card reader is a socket device accepting remote connections from address 127.0.0.1 port 2501. The file contains variable length lines of ASCII characters delimited by line feed or carriage return line feed sequences at the end of each line. Lines longer than 80 bytes have to be truncated and a unit exception status has to be presented after reading the last card in the file.

000C 2501 127.0.0.1:2501 SOCKDEV ASCII TRUNC EOF
6.6 Card Punch Devices

6.6.1 Function
The card punch statement defines a card punch device to the Hercules configuration. The argument specifies the name of the file to which the punched output will be written. Additional arguments may be specified after the filename.

6.6.2 Syntax

Descriptive

`devaddr devtype filename [ASCII] [CRLF] [NOCLEAR]`

Diagram

```
devaddr  devtype  filename
       ASCII

       CRLF   NOCLEAR
```

6.6.3 Parameter

`devaddr` This is the device address.

`devtype` This is the device type. A valid card punch type is 3525.

`filename` The name (and optionally the path) of the card punch file.

`ASCII` ASCII specifies that the file will be written as variable length lines of ASCII characters, delimited by line feeds or carriage return line feed sequences. Trailing blanks are removed from each line. If the ASCII argument is not specified, the file is written as fixed length 80-byte EBCDIC records with no line-end delimiters.

`CRLF` This optional parameter specifies that carriage return line feed sequences are written at the end of each line. If the CRLF argument is not specified, line feeds are only written at the end of each line.

`NOCLEAR` This argument specifies that the output file will not be cleared to zero bytes when it is opened. If NOCLEAR is not specified, then any previous content of the file is destroyed when the file is opened for output.
6.6.4 Examples

Example 1:
Define a 3525 card punch device on device address 000D. The punched output has to be written to the file "D/PCH/PCH1.TXT" as variable length lines of ASCII records delimited by carriage return line feed sequences. Any existing output in the file has to be kept when the file is opened for output.

000D 3525 D:/PCH/PCH1.TXT ASCII CRLF NOCLEAR

Example 2:
Define a 3525 card punch device on device address 000D. The punched output has to be written to the file "D/PCH/PCH2.TXT" as fixed length 80-byte EBCDIC records with no line-end delimiters. Any existing output in the file will be destroyed when the file is opened for output.

000D 3525 D:/PCH/PCH2.TXT
6.7 Line Printer Devices

6.7.1 Function

The line printer device statement defines a printer to the Hercules configuration. The argument specifies the name of a file to which the printer output will be written. The output is written in the form of variable length lines of ASCII characters, delimited by line feeds or carriage return line feed sequences. Trailing blanks are removed from each line. Carriage control characters are translated to blank lines or ASCII form feed characters. If the file exists it will be overwritten.

If the filename begins with the vertical bar '|' pipe character, then it is removed and the remainder of the filename is interpreted as a command line (the name of a program or batch file followed by any necessary arguments) to which to "pipe" the printer output to. This is known as the "print-to-pipe" feature. All printer output is then sent to the piped programs stdin input, and all of the piped programs stdout and stderr output is piped back to Hercules for displaying on the hardware console.

SOCKDEV indicates that the line printer is a socket device wherein the filename is actually a socket specification in the form host:port instead of a device filename. The device then accepts remote connections on the given TCP/IP port and writes data to the socket instead to a device file. A Windows software that supports a socket printer is Fish's "HercPrt" (Hercules Remote Printer Spooler). It spools the print output from a Hercules socket printer and creates either PDF, RTF or just plain text files. A control file enables HercPrt to split the printouts on job separator page boundaries and name the file according the actual job accounting field values.

6.7.2 Syntax

Descriptive

```
devaddr devtype filename [CRLF] [NOCLEAR] [RAWCC] [FCBCHECK | NOFCBCHECK]
   [OPTBROWSE | OPTPRINT] [LPI={6 | lpi}] [INDEX={0 | idx}] [LPP={66 | lpp}]
      11:c1,12:c2,13:c3, ..., l10:c10,l11:c11,l12:c12}]
```

or

```
devaddr devtype [host:]port SOCKDEV
```

Diagram

```
 devaddr  devtype  filename  CRLF
        |         |       |
        |         |       |
        FCBCHECK
    NOCLEAR
    RAWCC
        |         |       |
        |         |       |
        NOFCBCHECK
```

Hercules Emulator V4.00 – User Reference Guide  Page 185
6.7.3 Parameter

**devaddr**  
This is the device address.

**devtype**  
This is the device type. Valid printer types are 1403 and 3211.

**filename**  
The name (and optionally the path) of the printer file or the “print-to-pipe” command line. If the filename begins with the vertical bar ‘|’ pipe character, then it is removed and the remainder of the filename is interpreted as a command line (the name of a program or batch file followed by any necessary arguments) to which to "pipe" the printer output to.

This is known as the "print-to-pipe" feature. All printer output is then sent to the piped programs stdin input, and all of the piped programs stdout and stderr output is piped back to Hercules for displaying on the hardware console.

If the "print-to-pipe" command line contains arguments, then quotes must be placed around the entire filename string including the vertical bar. If the "print-to-pipe" command line itself contains quotes, then the command line must be enclosed in apostrophes instead of quotes.

**CRLF**  
This optional parameter specifies that carriage return line feed sequences are written at the end of each line. If the CRLF argument is not specified then line feeds only are written at the end of each line.

**NOCLEAR**  
This argument specifies that the output file will not be cleared to zero bytes when it is opened. If NOCLEAR is not specified, then any previous content of the file is destroyed when the file is opened for output.

**RAWCC**  
RAWCC specifies that printer output CCWs are not to be interpreted, but simply dumped in hex to the printer output file. This is useful for debugging. Default is to interpret printer CCWs normally.
FCBCHECK  This argument specifies that an attempt to skip to a FCB channel for which no line number has been set will cause the command to be rejected with a unit check. This is the default.

NOFCBCHECK  This argument specifies that an attempt to skip to a FCB channel for which no line number has been set will cause the next line of output printed on the next line on the printer output. The opposite, FCBCHECK, is the default.

OPTBROWSE  Printing is optimized for browsing. This is the default.

OPTPRINT  Printing is optimized for printed output.

LPI=  Specifies the number of lines per inch. The value of lpi must be 6 or 8. The default number of lines per inch is 6.

INDEX=  Sets the 3211 indexing. The value of idx must be in the range of 0 - 31. The default is 0.

LPP=  Specifies the number of lines per page. The value of lpp must be numeric but is not further checked. Any number of lines per page is allowed. The default number of lines per page is 66.

FCB=  FCB specifies an initial FCB image to use for the printer. The argument must be given in the form l1:c1, ..., l12:c12 where 'l' and 'c' are numeric. 'l' is the line number and 'c' is the assigned channel. There is a maximum of 12 l:c pairs allowed.


host  This is the hostname or the IP address of the socket device.

port  This is the port number of the socket device.

SOCKDEV  SOCKDEV indicates that the line printer is a socket device wherein the filename is actually a socket specification instead of a device filename.

   When used, there must only be one filename specified in the form port or host:port. The device then accepts remote connections on the given TCP/IP port and writes data to the socket instead to a device file.

   This allows automatic remote spooling of line printer data. The sockdev option is mutually exclusive with all other printer options (like CRLF etc.) and must be specified alone.

6.7.4 Examples

Example 1:

Define a 1403 line printer device on device address 000E. The printed output has to be written to the file "D:\PRT\PRT1.TXT" with carriage return line feed sequences at the end of each line. Any existing output in the file has to be kept when the file is opened for output.

   000E 1403 D:\PRT\PRT1.TXT CRLF NOCLEAR
Example 2:
Define a 3211 line printer device on device address 000F. The printed output has to be written to the file "D:\PRT\PRT2.TXT" with line feeds only at the end of each line. Any existing output in the file will be overwritten when the file is opened for output.

000F 3211 D:/PRT/PRT2.TXT

Example 3:
Define a 1403 line printer device on device address 000E. The printed output has to be written to the file "D:\PRT\PRT1.TXT" with carriage return line feed sequences at the end of each line. A specific FCB has to be used and a skip to a FCB channel for which no line number has been set (channels 7 and 8) has to cause a unit check. The number of lines per inch must be 6 and the number of lines per page is 66. The output has to be optimized for printing.

000E 1403 D:/PRT/PRT1.TXT CRLF FCBCHECK LPI=6 LPP=66 OPTPRINT

Example 4:
Define a 1403 line printer device on device address 000E. The line printer is a socket device with the IP address 192.168.0.199 and port 1403. Output is written to the socket instead to a device file.

000E 1403 192.168.0.199:1403 SOCKDEV

Example 5:
Define a 1403 line printer device on device address 000E. The command line for the print-to-pipe feature is "/usr/bin/lpr", the argument for the 'lpr' program is "-Phplj" (Unix example). In the case of the Windows example the command line for the print-to-pipe feature is "C:\utils\pr", the argument for the 'pr' program is "-PLPT1:". Each printed line will have a carriage return line feed sequence at the end.

000E 1403 "/usr/bin/lpr -Phplj" crlf (for Unix)
000E 1403 "C:\utils\pr -s -PLPT1:" crlf (for Windows)
6.8 Emulated Tape Devices

Tape device statements are used to define tape devices to the Hercules configuration. Five types of emulation are supported:

- SCSI tapes
- Optical Media Attach (OMA) virtual files
- AWSTAPE virtual files
- HET virtual files
- Fake Tape virtual files

6.8.1 SCSI Tapes

6.8.1.1 Function

When defining SCSI tapes the argument specifies the tape device name (usually `/dev/nst0`). SCSI tapes are read and written using variable length EBCDIC blocks and filemarks exactly like a mainframe tape volume (see also the AUTO_SCSI_MOUNT system parameter).

6.8.1.2 Syntax

Descriptive

`devaddr devtype devname [--no-erg] |--blkid-32 | --blkid-22`

Diagram

```
稔 稔 稔 
稔 稔 devaddr devtype devname [--no-erg] 
稔 |
稔 --blkid-32 
稔 --blkid-22
```

6.8.1.3 Parameter

- `devaddr` This is the device address.
- `devtype` This is the device type. Valid device types are 3410, 3420, 3422, 3430, 3480, 3490, 8809 and 9347.
- `devname` The tape device name (usually “/dev/nst0” on Linux or “\\Tape0” on Windows).
- `--no-erg` This option is intended to prevent issuance of the Erase Gap command to those SCSI tape drives that do not support it (e.g. Quantum DLT series). It causes Her-
cules's device emulation logic to ignore any ‘Erase Gap’ commands issued to the drive and to return immediate success instead.

This option should only be used (specified) for drives such as the Quantum which support switching from read mode to write mode in the middle of a data stream without the need of an intervening ‘Erase Gap’ command. Specifying it for any other model SCSI drive may cause incorrect functioning as a result of the Erase Gap command not being issued to the actual SCSI hardware.

Check the manufacturer information for your particular model of SCSI-attached tape drive (and/or use Fish's "ftape" Windows utility) to determine whether or not this option is needed for your particular drive.

--blkid-32

This option indicates that your SCSI-attached tape drive only supports 32-bit block-ids (as used by 3590 drives) and not the 22-bit format used by 3480/3490 drives. You should only specify this option if you intend to define the drive as a model 3480 or 3490 device and then only if your actual SCSI drive uses 32-bit block-ids. If you define your Hercules tape drive as a model 3590 device however this option is not required as 3590 drives are already presumed to use 32-bit block-ids.

Specifying this option on a 3480/3490 device statement will cause Hercules device emulation logic to automatically translate the actual SCSI tape drive's 32-bit block-id into 22-bit format before returning it back to the guest operating system (since that is the format it expects it to be in for a model 3480/3490 drive), and to translate the guest's 22-bit format block-id into 32-bit format before sending it to the actual SCSI hardware (since that is the format that the actual hardware requires it to be in).

--blkid-22

This is the opposite of the above --blkid-32 option.

6.8.1.4 Examples

Example 1:
Define a 3420 tape device on device address 0580. The tape device is a SCSI-attached tape drive which only supports 32-bit block-ids.

0580 3420 /dev/nst0 --blkid-32

Example 2:
Define a 3490 tape device on device address 0581. The tape device is a SCSI-attached tape drive which supports 22-bit block-ids. Ignore any ‘Erase Gap’ commands.

0581 3490 \\.\Tape0 --no-erg --blkid-22
6.8.2 Optical Media Attach (OMA) virtual files

6.8.2.1 Function
OMA device statements are used to define Optical Media Attach (OMA) virtual files to the Hercules configuration. OMA virtual files are read-only files which normally reside on CDROM. OMA virtual tapes consist of one CDROM file corresponding to each physical file of the emulated tape. An ASCII text file called the “Tape Descriptor File” (TDF) specifies the names of the files which make up the virtual tape. The argument specifies the name of the tape descriptor file.

Each file on the virtual tape can be in one of the following three formats:

**TEXT**
- TEXT files consist of variable length ASCII records delimited by carriage return line feed (CRLF) sequences at the end of each record. Each record is translated to EBCDIC and presented to the program as one physical tape block.

**FIXED nnnnn**
- FIXED files consist of fixed length EBCDIC blocks of the specified length (nnnnn).

**HEADERS**
- HEADERS files consist of variable length EBCDIC blocks. Each block is preceded by a 12-byte header.

If you have any IBM manuals in BookManager format on CDROM, you can see some examples of TDF files in the “\TAPES” directory on the CDROM.

6.8.2.2 Syntax

```plaintext
Descriptive

devaddr devtype tdf

Diagram

 menj\ devaddr — devtype — tdf —––––––––––––––––––––––––––––––––––– menj
```

6.8.2.3 Parameter

**devaddr**
- This is the device address.

**devtype**
- This is the device type. Valid device types are 3410, 3420, 3422, 3430, 3480, 3490, 8809 and 9347.

**tdf**
- The filename (and path) of the tape descriptor file.
6.8.2.4 Examples

Example 1:
Define a 3480 tape device on device address 0582. The tape device is an Optical Media Attach (OMA) virtual file (CD-ROM). The filename of the Tape Descriptor File (TDF) is "B00105.TDF" located in the current search path.

0582 3480 /CDROM/TAPES/UAA186.TDF

Example 2:
Define a 3490 tape device on device address 0581. The tape device is an Optical Media Attach (OMA) virtual file (CD-ROM). The filename of the Tape Descriptor File (TDF) is "UAA186.TDF" located in path "/CDROM/TAPES/".

0581 3490 B00105.TDF
6.8.3 AWSTAPE virtual files

6.8.3.1 Function
AWSTAPE device statements are used to define AWSTAPE virtual files to the Hercules configuration. AWSTAPEs contain a complete tape in one file. AWSTAPE files consist of variable length EBCDIC blocks. Each block is preceded by a 6-byte header. Filemarks are represented by a 6-byte header with no data. This is the same format as is used by the IBM P/390 systems. The argument specifies the location of the AWSTAPE file.

6.8.3.2 Syntax

Descriptive

devaddr devtype {awsfile | *} [arguments]

where arguments can be:

[MAXSIZE={n[K | M | G | T] | 0} | 
MAXSIZEK={n | 0} | 
MAXSIZEM={n | 0}] 
[EOTMARGIN=n[K | M | G | T]] 
[READONLY={0 | 1}] 
[RO | NORING | RW | RING] 
[DEONIRQ={0 | 1}] 
[NOAUTOMOUNT]

Diagram

```
  devaddr  devtype  awsfile  *
        |             |
        | arguments   |
```

where arguments can be:
6.8.3.3 Parameter

**devaddr**

This is the device address.

**devtype**

This is the device type. Valid device types are 3410, 3420, 3422, 3430, 3480, 3490, 8809 and 9347.

**awsfile**

The filename (and path) of the AWSTAPE file or "*". An asterisk defines an empty tape station. The tape must be manually be loaded on request.

If the filename starts with the "@" character (at sign), the file then describes a list of tape emulation files to be loaded in succession. The syntax of each line in this file is identical to the information that can be coded directly after the device type in the overall configuration file. Any emulation file name parameter specified in this file may be substituted by the character ",", in which case it specifies a set of options to be applied to all additional emulation files specified in the list.

This function emulates an Automatic Cartridge Feeder (ACF). The ACF is a feature on Cartridge type tape drives (3480, 3490, etc.) that automatically loads a new tape when a tape is removed from the drive. There is no real control over this device by the host as it just keeps on feeding tapes one after the other. Although the
ACF feature is unique to cartridge type systems, the emulation accepts the use of the same technique for emulated 1/2 inch tapes reel drives as well.

Parameters are appended in succession. In all cases, if the same parameter is coded more than once, the last instance takes precedence. Therefore it is possible to specify a set of parameters in the base configuration file, another on an "*" line and another for each individual line in the list of files. Parameters are then appended in that order. A SCSI tape device should not be given in a file list.

The remaining parameters are described in section 6.8.6 ("Common parameters for AWS, HET and FakeTape virtual files").

**6.8.3.4 Examples**

**Example 1:**
Define a 3490 tape device on device address 0580. The tape device is an AWSFILE virtual file named "R0673A.AWS" located in path "/S390/TAPES/".

```
0580 3490 /S390/TAPES/R0673A.AWS
```

**Example 2:**
Define a 3490 tape device on device address 0580. The tape device is an AWSFILE virtual file named "R0674A.AWS" located in path "/S390/TAPES/". Mount the tape readonly and disable the support for guest-initiated automatic tape volume mounting for this device.

```
0580 3490 /S390/TAPES/R0674A.AWS READONLY=1 NOAUTOMOUNT
```
6.8.4 HET virtual files

6.8.4.1 HET virtual files
HET device statements are used to define HET virtual files to the Hercules configuration. These contain a complete tape in one file and have the same structure as the AWSTAPE format with the added ability to have compressed data. The first argument specifies the location of the HET file. The filename must end with ".HET" to be recognized by Hercules as a HET file (e.g. "023178.HET"). There are several additional arguments that control various HET settings.

6.8.4.2 Syntax

**Descriptive**

```
devaddr devtype {hetfile | *} [arguments]
```

where arguments can be:

- [AWSTAPE]
- [COMPRESS={0 | 1}]
- [IDRC={0 | 1}]
- [METHOD={1 | 2}]
- [LEVEL={n | 4}]
- [CHUNKSIZE={nnnn | 65535}]
- [MAXSIZE={n[K | M | G | T] | 0}]
- [MAXSIZEK={n | 0}]
- [MAXSIZEM={n | 0}]
- [EOTMARGIN={n[K | M | G | T]}]
- [READONLY={0 | 1}]
- [STRICTSIZE={0 | 1}]
- [RO | NORING | RW | RING]
- [DEONIRQ={0 | 1}]
- [NOAUTOMOUNT]

**Diagram**

```
\[ devaddr \rightarrow devtype \rightarrow hetfile \rightarrow * \]
```
where arguments can be:

- **AWSTAPE**
- **COMPRESS**
- **IDRC**
- **METHOD**
- **LEVEL**
- **CHUNKSIZE**
  - 65535
- **MAXSIZE**
  - 0
  - K
  - M
  - G
  - T
- **MAXSIZEK**
- **MAXSIZEM**
- **EOTMARGIN**
- **READONLY**
- **STRICTSIZE**
6.8.4.3 Parameter

**devaddr**
This is the device address.

**devtype**
This is the device type. Valid device types are 3410, 3420, 3422, 3430, 3480, 3490, 8809 and 9347.

**hetfile**
The filename (and path) of the HET file or "**". An asterisk defines an empty tape station. The tape must be manually loaded on request.

If the filename starts with the "@" character (at sign), the file then describes a list of tape emulation files to be loaded in succession. The syntax of each line in this file is identical to the information that can be coded directly after the device type in the overall configuration file. Any emulation file name parameter specified in this file may be substituted by the character "**", in which case it specifies a set of options to be applied to all additional emulation files specified in the list.

This function emulates an Automatic Cartridge Feeder (ACF). The ACF is a feature on cartridge type tape drives (3480, 3490, etc.) that automatically loads a new tape when a tape is removed from the drive. There is no real control over this device by the host as it just keeps on feeding tapes one after the other. Although the ACF feature is unique to cartridge type systems, the emulation accepts the use of the same technique for emulated 1/2 inch tapes reel drives as well.

Parameters are appended in succession. In all cases, if the same parameter is coded more than once, the last instance takes precedence. Therefore it is possible to specify a set of parameters in the base configuration file, another on an "**" line and another for each individual line in the list of files. Parameters are then appended in that order. A SCSI tape device should not be given in a file list!

**AWSTAPE**
The AWSTAPE argument causes HET files to be written in AWSTAPE format. This disables the additional feature provided by the HET format.

**IDRC**
COMPRESS and IDRC control whether compression should be used when writing to HET files. The value of n can be "1" to turn compression on (the default), or can be "0" to turn compression off. IDRC is currently a synonym for COMPRESS but may be used in the future to control another emulated tape drive feature. Therefore COMPRESS is the preferred method to turn compression on or off.

**COMPRESS**
This is the same as **IDRC**.

**METHOD**
The METHOD argument allows you to specify which compression method to use. A
value of “1” forces the use of ZLIB compression. A value of “2” forces the use of BZIP2 compression. The default is “1”.

**LEVEL=**

The LEVEL option controls the level of compression. It ranges from “1” (for fastest compression) to “9” (for best compression). The default compression level is “4”.

**CHUNKSIZE=**

The CHUNKSIZE option allows you to create HET files with different chunk sizes. The AWSTAPE (and therefore HET) formats allow each tape block to be logically broken up into smaller chunks. For instance, if the S/3x0 application creates tapes with a block size of 27998, those blocks would be broken down into nnnnn sized chunks. Although possible it is not recommended to change the chunk size, as decreasing this may reduce compression performance. The range of nnnnn is from 4096 to 65535. 65535 is the default.

**STRICITSIZE=**

Upon reaching the tape file size limit, depending on strictsize, the tape file will or will not be truncated to enforce the maxsize limit. The limit is only enforced during a write type operation. If the file already exists and the program only reads the file, then the file will not be truncated, regardless of the strictsize setting.

This affects any write that starts below the limit, but that would extend beyond the limit. The strictsize parameter only affects compressed HET files. On AWS tapes, the limit is always enforced, but the file is not truncated (the write does not occur, because first AWS tapes are never truncated and second the effects of the write are known in advance).

Regardless of strictsize, any write operation (Write, Write TM) will return a Unit Check with Equipment Check to the program if the file size exceeds the predefined limit. If strictsize is “0”, the write will actually have been performed on the tape file. When strictsize is set to “1”, the file will be truncated on the preceding tape block boundary.

Care must be taken that regardless of the strictsize setting, the tape may become unusable for the guest program should such an event occur (absence of a Tape Mark for example). This option has no effect if maxsize is 0. The default is “0” (do not truncate).

The remaining parameters are described in section 6.8.6 (“Common parameters for AWS, HET and FakeTape virtual files”).

### 6.8.4.4 Examples

**Example 1:**

Define a 3490 tape device on device address 0580. The tape device is a HET virtual file with name "R0674A.HET" located in path "/S390/TAPES/". BZIP2 compression has to be turned on at a level of 9 (best compression).

```
0580 3490 /S390/TAPES/R0674A.HET COMPRESS=1 METHOD=2 LEVEL=9
```

**Example 2:**

Define a 3490 tape device on device address 0580. The tape device is a HET virtual file with name "R0675A.HET" located in path "/S390/TAPES/". Mount the tape as read/write.

```
0580 3490 /S390/TAPES/R0675A.HET RING
```
6.8.5 *Fake Tape virtual files*

6.8.5.1 Function
Fake Tape virtual files contain a complete tape in one file. FakeTape files consist of variable length EBCDIC blocks. Each block is preceded by a 12-byte ASCII-hex-character header. Filemarks are represented by a 12-byte character header with no data. The FakeTape format is used by the Flex-ES system from Fundamental Software Inc (FSI). The argument specifies the location of the FakeTape file (for example “ickdsf.fkt”). “FLEX-ES” and “FakeTape” are trademarks of Fundamental Software, Inc.

6.8.5.2 Syntax

```
Descriptive

devaddr devtype {fakefile | *} [arguments]

where arguments can be:

[MAXSIZE={n[K | M | G | T] | 0}]
[MAXSIZEK={n | 0}]
[MAXSIZEM={n | 0}]
[EOTMARGIN={n[K | M | G | T]}]
[READONLY={0 | 1}]
[RO | NORING | RW | RING]
[DEONIRQ={0 | 1}]
[NOAUTOMOUNT]
```

Diagram

```
devaddr — devtype — fakefile — *

arguments

where arguments can be:
```
6.8.5.3 Parameter

**devaddr**
This is the device address.

**devtype**
This is the device type. Valid device types are 3410, 3420, 3422, 3430, 3480, 3490, 8809 and 9347.

**fakefile**
The filename (and path) of the Fake Tape virtual file or "**". An asterisk defines an empty tape station. The tape must be manually be loaded on request.

If the filename starts with the "@" character (at sign), the file then describes a list of tape emulation files to be loaded in succession. The syntax of each line in this file is identical to the information that can be coded directly after the device type in the overall configuration file. Any emulation file name parameter specified in this file may be substituted by the character "**", in which case it specifies a set of options to be applied to all additional emulation files specified in the list.

This function emulates an Automatic Cartridge Feeder (ACF). The ACF is a feature on Cartridge type tape drives (3480, 3490, etc.) that automatically loads a new tape when a tape is removed from the drive. There is no real control over this device by the host as it just keeps on feeding tapes one after the other. Although the ACF feature is unique to cartridge type systems, the emulation accepts the use of
the same technique for emulated 1/2 inch tapes reel drives as well.
Parameters are appended in succession. In all cases, if the same parameter is coded more than once, the last instance takes precedence. Therefore it is possible to specify a set of parameters in the base configuration file, another on an "***" line and another for each individual line in the list of files. Parameters are then appended in that order. A SCSI tape device should not be given in a file list.

The remaining parameters are described in section 6.8.6 ("Common parameters for AWS, HET and FakeTape virtual files").

6.8.5.4 Examples
Example 1:
Define a 3490 tape device on device address 0580. The tape device is a Fake Tape virtual file named "R0528A.FKT" located in path "/S390/TAPES/".

0580 3490 /S390/TAPES/R0528A.FKT

Example 2:
Define a 3490 tape device on device address 0580. The tape device is a Fake Tape virtual file named "R0528A.FKT" located in path "/S390/TAPES/". Mount the tape as read-only and present a device end if intervention is required during tape motion.

0580 3490 /S390/TAPES/R0528A.FKT NORING DEONIRQ=1
6.8.6 Common parameters for AWS, HET and Fake Tape virtual files

**MAXSIZE=**
This specifies the maximum number of bytes for the emulated file. The value is either \( n \) bytes or \( nx \) where \( x \) specifies the multiplier K, M, G, or T (see “Table 10” at the end of this section for details). Specifying zero for this parameter means “unlimited” (there is no limit on the file size). MAXSIZE defaults to “0”.

**MAXSIZEK=**
This is the same as MAXSIZE=, but specified in Kilobytes.

**MAXSIZEM=**
This is the same as MAXSIZE=, but specified in Megabytes.

**EOTMARGIN=**
Specifies the number of bytes remaining (before reaching MAXSIZE\(x\)) at which point the tape device will signal the presence of the “End-of-Tape” marker (reflector), thus allowing the program to switch to the next tape. The value is either \( n \) bytes or \( nx \) where \( x \) specifies the multiplier K, M, G, or T (see “Table 10” at the end of this section for details).

**READONLY=**
Specifies whether the tape is mounted read-only (without a write ring or with the cartridge protect switch set to "write protect"). A parameter of 1 means read-only; a parameter of 0 means read-write. If READONLY=1, RO or NORING is not specified; READONLY=0 is the default. Note that READONLY=0 does not override the host system file permission settings for the underlying AWS or HET file. If the AWS or HET file is marked read-only, the tape will be mounted read-only despite specification of READONLY=0.

**RO**
Specifies that the tape is mounted read-only (without a write ring or with the cartridge protect switch set to "write protect"). RO and NORING are equivalent to READONLY=1.

**NORING**
This is the same as RO.

**RW**
Specifies that the tape should be mounted read-write, if possible. RW and RING are equivalent to READONLY=0. This is the default if READONLY=1, RO or NORING is not specified. Note that RW and RING do not override the host system file permission settings for the underlying AWS or HET file. If the AWS or HET file is marked read-only, the tape will be mounted read-only despite specification of RW or RING.

**RING**
This is the same as RW.

**DEONIRQ=**
Specifies whether a device end is presented if intervention is required during tape motion. A parameter of 1 selects this option; a parameter of 0 turns it off.

**NOAUTOMOUNT**
Indicates that support for guest-initiated automatic tape volume mounting is to always be disabled for this tape device. Automatic guest tape-mount support is automatically globally enabled for all virtual (non-SCSI) tape devices by default whenever an allowable automount directory is defined via the AUTOMOUNT system parameter or the automount console command. The NOAUTOMOUNT option allows you to specifically disable such support for a given device.

The automount feature enables software running in guest operating systems to automatically mount, unmount and/or query for themselves the host "virtual tape volume" filename mounted on a tape drive, via the use of special CCW opcodes (0x4B Set Diagnose and 0xE4 Sense ID) without any intervention on the part of the Hercules operator. An example of such a program for DOS/VSE called TMOUNT is provided in the util subdirectory of the distributed source code.
This is a sticky option. When specified, automount support for the device remains disabled until the option is specifically removed via a devinit command without the option specified. This means if NOAUTOMOUNT is enabled for a device while global automount functionality is currently disabled (because no AUTOMOUNT statement was specified at Hercules startup), then automount functionality remains disabled for the device even should global automount functionality be later manually enabled via an automount con-sole command.

When the 0x4B Set Diagnose CCW is used to auto-mount a virtual tape volume onto a given tape drive, an absolute (fully-qualified) pathname should normally always be specified, but need not be if a path relative to the currently defined "default allowable" automount directory is used instead.

The default allowable automount directory is always the first "allowable" directory that was defined, or else the current directory if no allowable directories were specifically defined. There is always a default allowable directory whenever any allowable or unallowable automount directories are defined.

Fully-resolved, absolute-full-path filenames are defined as being those which, for Windows, have a ':' (colon) in the second position or, for other host operating systems (e.g. Linux), have a '/' (slash) in the first position. Paths which start with a '.' (period) are considered relative paths and will always be appended to the currently defined default allowable automount directory, before being resolved into fully-qualified paths by the host system (i.e. only fully-resolved absolute pathnames are used in the performance of the actual automatic tape volume mount).

For example, if more than one allowable automount directory is defined and the volume wishing to be mounted happens to reside in the second one, then a fully-qualified absolute pathname should of course be specified (or else one that is relative to the default directory which happens to resolve to the desired file).

All attempts to automount host files in any defined "disallowable" directory (or any subdirectory thereof [or otherwise not within any defined "allowable" directory or subdirectory]) will be rejected. An error message is always issued in such cases, just as one is whenever a successful mount or unmount is performed.

A sample guest automount program called TMOUNT for the DOS/VSE operating system is provided in the "util" subdirectory of the distributed source code.

### 6.8.6.1 Multipliers for 'MAXSIZE=' and 'EOTMARGIN=' parameters

<table>
<thead>
<tr>
<th>Unit</th>
<th>Multiplier</th>
<th>Name (Symbol)</th>
<th>IEC Name (IEC Symbol)</th>
<th>Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>2**10</td>
<td>Kilobyte (kB)</td>
<td>Kibibyte (KiB)</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>2**20</td>
<td>Megabyte (MB)</td>
<td>Mebibyte (MiB)</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>2**30</td>
<td>Gigabyte (GB)</td>
<td>Gibibyte (GiB)</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>2**40</td>
<td>Terabyte (TB)</td>
<td>Tebibyte (TiB)</td>
<td>Not on 32-bit machines</td>
</tr>
</tbody>
</table>

Table 10: Multipliers for 'MAXSIZE=' and 'EOTMARGIN=' parameters
6.8.7 Basic ACF (Automatic Cartridge Feeder) Support

6.8.7.1 Function
The ACF (Automatic Cartridge Feeder) is a feature on cartridge type tape drives (3480, 3490, etc.) that automatically loads a new tape when a tape is removed (ejected) from the drive. There is no real control over this functionality by the host as the device just keeps on feeding tapes one after the other.

Although the ACF features is unique to cartridge type tape systems the emulation accepts to use the same technique for emulated ½ inch tapes reel drives as well. ACF is supported through a file that contains a list of files (emulated tapes or cartridges) that will be loaded one after the other.

To manually reset the ACF to the top of the stack the DEVINIT panel command can be used to "reload" the ACF feature.

6.8.7.2 Syntax

Descriptive

\[ \text{devaddr devtype @filename [arguments]} \]

Diagram

\[ \text{devaddr} \quad \text{devtype} \quad @\text{filename} \]

\[ \text{arguments} \]

6.8.7.3 Parameter

\[ \text{devaddr} \quad \text{This is the device address.} \]

\[ \text{devtype} \quad \text{This is the device type. Valid device types are 3410, 3420, 3422, 3430, 3480, 3490, 8809 and 9347.} \]

\[ \text{@filename} \quad \text{The filename (without the prefixing ‘@’) contains a list of files that will be loaded one after the other. The filenames contained in the file list cannot describe another ACF file nor an SCSI tape handle (/dev/stx). However the files may be standard AWS, HET, Fake Tape or OMA files.} \]

\[ \text{arguments} \quad \text{These are the same arguments that apply to the AWS, HET, Fake Tape or OMA files, as described above.} \]
6.8.7.4 Syntax ACF description file

```
# comment line
* arguments
filename [arguments]
```

6.8.7.5 Parameter

`#` The hash symbol starts a comment line.

`*` Any options following the asterisk are applied to each file of the list, followed by the options specified on the device configuration entry, followed by the options specified on each individual entry of the file list. Care must be taken that all "*" lines are processed at once.

`filename` The filename (and path) of the AWS, HET, Fake Tape or OMA tape file.

`arguments` These are the same arguments that apply to the AWS, HET, Fake Tape or OMA files, as described above. The arguments are processed in the order in which they appear. Any conflicting argument overrides the previous one.

6.8.7.6 Examples

Example 1:
Define a 3490 Automatic Cartridge Feeder (ACF) on device address 0589. ZLIB compression is turned on. The file "newstack" describes a list of tape emulation files to be loaded in succession.

a) Hercules configuration file:

```
0589 3490 @NEWSTACK COMPRESS=1
```

b) "NEWSTACK" file:

```
* MAXSIZEM=16 EOTMARGIN=131072
tape01.aws COMPRESS=0
tape02.het MAXSIZEM=32 EOTMARGIN=65536
tape03.het MAXSIZE=0
```

The above example is equivalent to issuing the following (one at the start and one after each tape unload):
a) in the configuration file:

```
180 3420 tape01.aws maxsizeM=16 eotmargin=131072 compress=0
```

b) via devinit panel command:

```
devinit 180 tape02.het compress=1 maxsizeM=32 eotmargin=65536
devinit 180 tape03.het eotmargin=131072 compress=1 maxsize=0
```

**Example 2:**
Resolution of the arguments using ‘*’ lines.

The following ACF file

```
* compress=0
tape01.aws
* compress=1
tape02.aws
```

is equivalent to this one

```
* compress=1
tape01.aws
tape02.aws
```
6.9 Channel-to-Channel Adapters

6.9.1 Introduction

The Channel-to-Channel Adapter device statements define CTC adapters to the Hercules configuration. All of the communications emulation implemented within Hercules use a CTCA (Channel-to-Channel Adapter) type device. Depending on the type, the CTCA device will provide either a point-to-point or a virtual network adapter interface to the driving system’s TCP/IP stack or in the case of CTCT, a true CTCA connection to another instance of Hercules via a TCP/IP connection.

All current emulations, with the exception of VMNET and CTCT use the Universal TUN/TAP driver on Linux and TunTap32 (WinPCap) on the Windows platforms which creates a network interface on the driving system which allow Hercules to present frames to, and receive frames from the TCP/IP stack. This network interface is configured on Linux platforms by the ‘hercifc’ program which is invoked by Hercules after the TUN/TAP device is opened.

The following are the emulation types currently supported:

- CTCI (Channel-to-Channel link to TCP/IP stack)
- CTCT (Channel-to-Channel emulation via TCP Connection)
- LCS (LAN Channel Station emulation)
- PTP (MPCPTP/PCPTP6 Channel-to-Channel link)
- VMNET (Channel-to-Channel link via SLIP/VMNET)

6.9.2 CTCI (Channel-to-Channel link to TCP/IP stack)

6.9.2.1 Function

The CTCI is a point-to-point connection with the TCP/IP stack of the driving system on which Hercules is running.

6.9.2.2 Syntax

```
Descriptive
devaddr CTCI [-n | --dev] name
             [-s | --netmask] mask
             [-m | --macaddr] mac | 00:00:5E:nn:nn:nn
             [-t | --mtu] mtu | 1500 ]*Linux only
             [-i | --ibuff] {ibuff | 64} ]*Windows only
             [-k | --kbuff] {kbuff | 1024} ]*Windows only
             [-d | --debug]

guestip hostip
```
Diagram

```
.devaddr ---- CTCI ---- -n ---- name ----

--s --- mask

--netmask

-m ---- mac ---- 00:00:5E:nn:nn:nn

--mtu

-i ---- ibuff ---- 64

--ibuff

-k ---- kbuff ---- 1024

--kbuff

-d ---- guestip ---- hostip

--debug
```

6.9.2.3 Parameter

- **devaddr** This is the device address.

- **CTCI** This specifies the CTCI device/protocol type.

- **-n name** For Linux: Specifies the name of the tunnel device to use. The default name is "/dev/net/tun", which is correct for version 2.4 and above of the Linux kernel.

  For Windows: Identifies the host network adapter. If your network adapter does not have a permanent (static) IP address assigned to it (e.g. you use DHCP and have a dynamic IP assigned) then instead of specifying an IP address as the second parameter in the device statement, you must specify the MAC address of the adapter. In this case the second argument (hostip) must be coded as "0.0.0.0". This is simply a placeholder because two IP addresses are expected to satisfy the device definition syntax.

- **--dev name** This is the same as "-n name".

- **-s mask** This is the netmask to be configured on the link. Note: Since this is a point-to-point link netmask is meaningless from the perspective of the actual network device.

- **--netmask mask** This is the same as "-s mask".
--m mac
This is the optional hardware address of the interface in the format of either "xx:xx:xx:xx:xx:xx" or "xx-xx-xx-xx-xx-xx". The default is 00:00:5E:nn:nn:nn where the "nn:nn:nn" part is constructed from the last three octets of the specified guestip.

--macaddr mac
This is the same as "-m mac".

-t mtu
Linux only: Specifies the maximum transmission unit size (default 1500 bytes).

--mtu mtu
This is the same as "-t mtu".

-i ibuff
Windows only: This specifies the TunTap32 I/O buffer size in KB. nnnn hast to be between 16 and 1024 (1 MB). The default value is 64 KB.

--ibuff ibuff
This is the same as "-i ibuff".

-k kbuff
Windows only: This specifies the WinPcap device driver capture buffer size in KB. nnnn hast to be between 64 and 16384 (16 MB). The default value is 1024 (1 MB).

--kbuff kbuff
This is the same as "-k kbuff".

-d
Specifies that debugging output has to be produced on the Hercules control panel. This should normally be left unspecified.

--debug
This is the same as "-d".

guestip
Specifies the IP address of the guest operating system running under Hercules.

hostip
Identifies the host network adapter to use. If the host system is configured with DHCP this should instead be the MAC address of the ethernet adapter you wish to have Hercules use to connect to the outside world. If this parameter is specified using the -m or --dev option, then the value here must be specified as "0.0.0.0" to satisfy the statement syntax.

6.9.2.4 Examples
Example 1:
Define 3088 CTC adapters on device addresses 0E20 and 0E21. The device/protocol type is CTCI (Channel-to-Channel link to Linux TCP/IP stack). The IP address of the guest operating system running under Hercules is 192.168.1.99, the host IP address (the network adapter) to use is 192.168.1.100.

0E20.2 3088 CTCI 192.168.1.99 192.168.1.100
or
0E20 3088 CTCI 192.168.1.99 192.168.1.100
0E21 3088 CTCI 192.168.1.99 192.168.1.100
Example 2:
Define 3088 CTC adapters on device addresses 0E20 and 0E21. The device/protocol type is CTCI (Channel-to-Channel link to Win32 TCP/IP stack). The WinPcap device driver capture buffer has to be set to 2048 KB, the TunTap32 I/O buffer size has to be set to 128 KB. The IP address of the guest operating system running under Hercules is 192.168.1.99 and the MAC address of the network adapter to use is 00-80-B3-E1-DF-69.

```
0E20.2 3088 CTCI -n 00-80-B3-E1-DF-69 -k 2048 -i 128 192.168.1.99 0.0.0.0
```

or

```
0E20 3088 CTCI -n 00-80-B3-E1-DF-69 -k 2048 -i 128 192.168.1.99 0.0.0.0
0E21 3088 CTCI -n 00-80-B3-E1-DF-69 -k 2048 -i 128 192.168.1.99 0.0.0.0
```

Example 3:
Define 3088 CTC adapters on device addresses 0E20 and 0E21. The device/protocol type is CTCI (Channel-to-Channel link to Linux TCP/IP stack). The IP address of the guest operating system running under Hercules is 192.168.1.99, the host IP address (the network adapter) to use is 192.168.1.100. The maximum transmission size (MTU) should be 1492 bytes. The WinPcap device driver buffer size has to be set to 1024 KB and the TunTap32 I/O buffer size to 256 KB. Additionally debugging output has to be shown on the Hercules console.

```
0E20.2 3088 CTCI -k 1024 -i 256 -t 1492 -d 192.168.1.99 192.168.1.100
```

or

```
0E20 3088 CTCI -k 1024 -i 256 -t 1492 -d 192.168.1.99 192.168.1.100
0E21 3088 CTCI -k 1024 -i 256 -t 1492 -d 192.168.1.99 192.168.1.100
```
6.9.3 CTCT (Channel-to-Channel emulation via TCP Connection)

6.9.3.1 Function
This is an emulated Channel-to-Channel adapter to another Hercules system. CTCT only supports IP traffic and cannot be used to transport NJE, SNA, PVM, etc. type payloads. This may change in the future.

6.9.3.2 Syntax

Descriptive

\[ \text{devaddr} \ \text{CTCT} \ \text{lport} \ \text{rhost} \ \text{rport} \ \text{bufsize} \]

Diagram

\[ \text{devaddr} \quad \text{CTCT} \quad \text{lport} \quad \text{rhost} \quad \text{rport} \quad \text{bufsize} \]

6.9.3.3 Parameter

\textit{devaddr} This is the device address.

\textit{CTCT} This specifies the CTCT device/protocol type.

\textit{lport} Specifies the local TCP port. This is the TCP port that Hercules will listen on for this CTC adapter.

\textit{rhost} Specifies the remote host. This is the name or IP address of the remote host system that Hercules is running on, not the name or IP address of the OS running under this instance of Hercules.

\textit{rport} Specifies the remote TCP port. The rport parameter on this system must match the lport parameter on the remote system and vice versa.

\textit{bufsize} Specifies the buffer size for the link. If this link is used for IP traffic this parameter should be more than the MTU of the interface definition in the OS TCPIP stack.
6.9.4 Examples

Example 1:
Define 3088 CTC adapters on device addresses 0400 and 0401. The device/protocol type is CTCT (Channel-to-Channel emulation via TCP connection). The local TCP ports on which Hercules will listen are 30880 and 30881. The IP address of the remote host is 192.168.100.2, the remote ports are also 30880 and 30881. The buffer size for the link is 2048 KB.

0400.2 3088 CTCT 30880 192.168.100.2 30880 2048
or
0400 3088 CTCT 30880 192.168.100.2 30880 2048
0401 3088 CTCT 30881 192.168.100.2 30881 2048

6.9.5 CTCE (Enhanced Channel-to-Channel emulation via TCP Connection)

6.9.5.1 Function
The CTCE device type will emulate a real 3088 Channel-to-Channel Adapter also for non-IP traffic, enhancing the CTCT capabilities. CTCE connections are also based on TCP/IP between two (or more) Hercules instances, and requires an even-odd pair of port numbers per device side.

Only the even port numbers are to be configured; the odd numbers are just derived by adding 1 to the configured even port numbers. The socket connection pairs cross-connect, the arrows are showing the send -> receive direction:

InstanceA-lport-even -> InstanceB-rport-odd
InstanceB-lport-odd <- InstanceA-rport-even

CTCE connected Hercules instances can be hosted on either Unix or Windows platforms, both sides do not need to be the same.

6.9.5.2 Syntax

```
Descriptive
devaddr CTCE lpport raddress rport [mtu [sml]]

Diagram

devaddr CTCE lpport raddress rport

mtu

sml
```
**devaddr**  
This is the device address.

**CTCE**  
This specifies the device/protocol type.

**lport**  
Specifies the even TCP/IP port on the local system.

**raddress**  
Specifies the TCP/IP address of the remote system.

**rport**  
Specifies the even TCP/IP port on the remote system.

**mtu**  
Optional MTU buffer size. The default size is 32778.

**sml**  
Optional small minimum for the MTU buffer size. The default size is 8.

### 6.9.5.3 Examples

**Example 1:**
Define a 3088 CTC connection with the CTCE protocol between two Hercules instances. Instance A is using address 192.168.1.100, Instance B is using address 192.168.1.200.

**Definitions on Hercules Instance A with IP address 192.168.1.100:**

```plaintext
0E40 CTCT 30880 192.168.1.200 30880
0E41 CTCT 30882 192.168.1.200 30882
```

**Definitions on Hercules Instance B with IP address 192.168.1.200:**

```plaintext
0E40 CTCT 30880 192.168.1.100 30880
0E41 CTCT 30882 192.168.1.100 30882
```
6.9.6 LCS (LAN Channel Station)

6.9.6.1 Function

This statement defines an emulated LAN Channel Station adapter. This emulation mode appears to the operating system running in the Hercules machine as an IBM 8232 LCS device, an IBM 2216 router, an IBM 3172 running ICP (Interconnect Communications Program), the LCS3172 driver of an IBM P/390, or an IBM Open Systems Adapter (OSA).

Rather than a point-to-point link, this emulation creates a virtual ethernet adapter through which the guest operating system running in the Hercules machine can communicate. As such, this mode is not limited to TCP/IP traffic, but in fact will handle any ethernet frame.

6.9.6.2 Syntax

**Descriptive**

```
devaddr LCS [{-n | --dev} name]
   [{-o | --oat} file]
   [{-m | --mac} mac]
   [-d | --debug]
   [guestip]
```

**Diagram**

```
devaddr ─── LCS
       ├── -n ─── name
       └── --dev

       ├── -o ─── file
       └── --oat

       └── -m ─── mac
           └── --mac

       └── -d ─── guestip
           └── --debug
```

6.9.6.3 Parameter

**devaddr**

This is the address pair of the LCS device. This pair must be an even-odd address. This can be specified as two separate LCS statements with a single device address (“0E20 LCS…” and “0E21 LCS …”) or as a single statement with a device address count (“0E20.2 LCS …”).
LCS

This specifies the LAN Channel Station (LCS) device/protocol type.

-n name

Identifies the host network adapter to use:

On Linux systems this is name of the TUN/TAP special character device, normally /dev/net/tun.

On Windows this is either the IP or MAC address of the host systems network card. TunTap32 will automatically select the first network adapter it finds if the option is omitted, this may be not desirable for some users.

--dev name

This is the same as “-n name”.

-o file

file specifies the filename of the OSA Address Table (OAT). If this option is specified the optional --mac and guestip entries are ignored in preference to statements in the OAT file. For a description of the OAT file see next section.

--oat file

This is the same as “-o file”.

-m mac

mac is the optional hardware address of the interface coded in the format “xx:xx:xx:xx:xx:xx”. If you use the “-o/--oat” option do not specify an address here, it will be ignored.

--mac mac

This is the same “-m mac”.

-d

Specifies that debugging output has to be produced on the Hercules control panel. This should normally be left unspecified.

--debug

This is the same as “-d”.

guestip

This is an optional IP address of the Hercules (guest OS) side. This is only used to establish a point-to-point routing table entry on the driving system. If you use the “-o/--oat” option do not specify an address here, it will be ignored.

6.9.6.4 OSA Address Table (OAT) Syntax

The syntax for the OSA Address Table file is as follows:

*********************************************************
* Dev   Mode  Port  Entry specific information...
*********************************************************

0400  IP    00    PRI  172.021.003.032
0402  IP    00    SEC  172.021.003.033
0404  IP    00    NO   172.021.003.038
0406  IP    01    NO   172.021.002.016
040E  SNA   00

HWADD  00  02:00:FE:DF:00:42
HWADD  01  02:00:FE:DF:00:43
ROUTE  00  172.021.003.032  255.255.255.224

Figure 2: OSA Address Table (OAT) File Syntax

Dev
This is the base device address.

Mode
This is the operation mode: IP or SNA. (Note: The SNA operation mode is currently not implemented.

Port
This is the virtual (relative) adapter number.

Entry
This applies only for IP Mode and specifies where a packet with an unknown IP address is forwarded. PRI is the primary default entry, SEC is the entry to use when the primary is not available and NO specifies that this is not a default entry.

n.n.n.n
This specifies the home IP address.

When the operation mode is IP specify only the even (read) device number dev. The odd (write) address will be created automatically. Additionally two other statements can be included in the Address Translation file. These are the HWADD and ROUTE statements.

Use the HWADD statement to specify a hardware (MAC) address for a virtual adapter. The first parameter after the HWADD specifies the relative adapter for which the address is applied.

The ROUTE statement is included for convenience. It allows the 'hercifc' program to create a network route for this specific virtual adapter. Please note that it is not necessary to include point-to-point routes for each IP address in the table. This is done automatically by the emulation module.

The read / write devices can be swapped by coding the odd address of the even-odd pair in the OAT. Up to 4 virtual (relative) adapters (00-03) are currently supported.

If no Address Translation file is specified, the emulation module will create the following:
- An ethernet adapter (port 0) for TCP/IP traffic only.
- Two device addresses (devnum and devnum+1).

### 6.9.6.5 Examples

**Example 1:**
Define LCS (LAN Channel Station emulation) adapters on device addresses 0440 and 0441. The name of the TUN/TAP special character device is “/dev/net/tun”. The IP address of the Hercules guest OS side is 192.168.200.2.

```
0440.2 LCS -n /dev/net/tun 192.168.200.2
```

or

```
0440 LCS -n /dev/net/tun 192.168.200.2
0441 LCS -n /dev/net/tun 192.168.200.2
```
6.9.7 **PTP (MPCPTP/PCPTP6 Channel-to-Channel link)**

### 6.9.7.1 Function
The PTP is a point-to-point link to the driving system’s TCP/IP stack. From the point of view of the guest operating system in the Hercules machine it appears to be an MPCPTP and/or MPCPTP6 ESCON CTC link to another guest operating system.

### 6.9.7.2 Syntax

#### Descriptive

```
devaddr PTP [-n | --dev] name
               [[-m | --macaddr] mac]
               [[-t | --mtu] mtu | 1500]  *Linux only
               [[-i | --ibuff] {ibuff | 64}]  *Windows only
               [[-k | --kbuff] {kbuff | 1024}]  *Windows only
               [[-4 | --inet]]
               [[-6 | --inet6]]
               [-d | --debug]

guest1 host1
[guest2 host2]
```

#### Diagram

```
+-------------------+        +-------------------+        +-------------------+
| devaddr           |  PTP   | -n               |  name  |
+-------------------+        +-------------------+        +-------------------+
|                   |        | -m               |        |                   |
|                   |        | --mac            |        |                   |
+-------------------+        +-------------------+        +-------------------+
|                   |        | -t               |        |                   |
|                   |        | --mtu            |        |                   |
+-------------------+        +-------------------+        +-------------------+
|                   |        | -i               |        |                   |
|                   |        | --ibuff          |        |                   |
|                   |        | {ibuff | 64}       |        |                   |
+-------------------+        +-------------------+        +-------------------+
|                   |        | -k               |        |                   |
|                   |        | --kbuff          |        |                   |
|                   |        | {kbuff | 1024}      |        |                   |
+-------------------+        +-------------------+        +-------------------+
```
6.9.7.3 Parameter

**devaddr1-devaddr2**  These are the device addresses (address pair) of the PTP device.

**PTP**  This specifies the PTP device/protocol type.

**-n name**  For Linux: Specifies the name of the tunnel device to use. The default name is "/dev/net/tun", which is correct for version 2.4 and above of the Linux kernel.

For Windows: Identifies the host network adapter. If your network adapter does not have a permanent (static) IP address assigned to it (e.g. you use DHCP and have a dynamic IP assigned) then instead of specifying an IP address you must specify the MAC address of the adapter. TunTap32 will automatically select the first network adapter it finds if this option is omitted, this may not be desirable depending on your configuration.

**--dev name**  This is the same as “-n name”.

**--m mac**  This is the optional hardware address of the interface in the format of either “xx:xx:xx:xx:xx:xx” or “xx-xx-xx-xx-xx-xx”.

**--macaddr mac**  This is the same as “-m mac”.

**-t mtu**  Linux only: Specifies the maximum transmission unit size (default 1500 bytes).

**--mtu mtu**  This is the same as “-t mtu”.

**-i ibuff**  Windows only: This specifies the TunTap32 I/O buffer size in KB. *nnnn* has to be between 16 and 1024 (1 MB). The default value is 64 KB.

**--ibuff ibuff**  This is the same as “-i ibuff”.

**-k kbuff**  Windows only: This specifies the WinPcap device driver capture buffer size in KB. *nnnn* has to be between 64 and 16384 (16 MB). The default value is 1024 (1 MB).

**--kbuff kbuff**  This is the same as “-k kbuff”.

**-4**  Indicates that when a host name is specified for *guest1*, it must resolve to an IPv4 address.

**--inet**  This is the same as “-4”.

**-6**  Indicates that when a host name is specified for *guest1*, it must resolve to an IPv6 address.
--inet6
This is the same as “-6”.

-d
Specifies that debugging output has to be produced on the Hercules control panel. Warning: This will produce a tremendous amount of output to the Hercules console and should therefore normally be left unspecified.

--debug
This is the same as “-d”.

guest1
Specifies the host name or the IP address of the guest operating system running under Hercules.

host1
Identifies the host network adapter to use.

guest2
Specifies the host name or the IP address of the guest operating system running under Hercules.

host2
Identifies the host network adapter to use.

The values for guest1 and host1 must both be of the same address family, i.e. both IPv4 or both IPv6.

The values for guest2 and host2, if specified, must both be of the same address family, i.e. both IPv4 or both IPv6, and must not be of the same address family as guest1 and host1.

If a host name is specified for guest1 and the host name can be resolved to both an IPv4 and an IPv6 address, then use either the “-4/--inet” or the “-6/--inet6” option to specify which address family should be used. If neither the “-4/--inet” or the “-6/--inet6” option is specified then whichever address family the resolver returns first will be used.

If guest1/host1 or guest2/host2 are IPv4 addresses or are host names that will resolve to IPv4 addresses, guest1/host1 can be followed by the prefix size expressed in CIDR notation, for example 192.168.1.1/24. If the prefix size is specified it can have a value from 0 to 32; if it is not specified then a value of 32 is assumed. The prefix size is used to produce the equivalent subnet mask. For example, a value of 24 produces a subnet mask of 255.255.255.0.

If guest1/host1 or guest2/host2 are IPv6 addresses, or host names that resolve to IPv6 addresses, then host1/host2 can be followed by the prefix size expressed in CIDR notation, for example 2001:db8:3003:1::543:210f/48. If the prefix size is specified it can have a value from 0 to 128; if not specified a value of 128 is assumed.

If guest1, host1, guest2 or host2 are numeric IPv6 addresses, they can be coded between braces, for example [2001:db8:3003:1::543:210f].

6.9.7.4 Examples

Example 1:
Define a PTP device on addresses 0E20 and 0E21. The IP address of the guest operating system running under Hercules is 192.168.1.99, whereas the host IP address (the network adapter) to use is 192.168.1.100.

0E20.2 PTP 192.168.1.99 192.168.1.100
or
0E20 PTP 192.168.1.99 192.168.1.100
0E21 PTP 192.168.1.99 192.168.1.100
Example 2:
Define PTP (MPCPTP ESCON CTC link) adapters on device addresses 0440 and 0441. The name of the TUN/TAP special character device is "/dev/net/tun". The IP address of the Hercules guest OS side is 192.168.1.99, the host network adapter to use is 192.168.1.100

```
0440.2 PTP -n /dev/net/tun 192.168.1.99 192.168.1.100
    or
0440 PTP -n /dev/net/tun 192.168.1.99 192.168.1.100
0441 PTP -n /dev/net/tun 192.168.1.99 192.168.1.100
```

Example 3:
Define PTP (MPCPTP ESCON CTC link) adapters on device addresses 0E20 and 0E21. The WinPcap device driver capture buffer has to be set to 2048 KB and the TunTap32 I/O buffer size has to be set to 256 KB. The IP address of the guest operating system running under Hercules is 192.168.1.99 and the MAC address of the network adapter to use is 00-80-B3-E1-DF-69.

```
0E20.2 3088 PTP -n 00-80-B3-E1-DF-69 -k 2048 -i 256 192.168.1.99 0.0.0.0
     or
0E20 3088 PTP -n 00-80-B3-E1-DF-69 -k 2048 -i 256 192.168.1.99 0.0.0.0
0E21 3088 PTP -n 00-80-B3-E1-DF-69 -k 2048 -i 256 192.168.1.99 0.0.0.0
```

6.9.8 VMNET (Channel-to-Channel link via SLIP/VMNET)

6.9.8.1 Function
If the emulation mode is not specified on the configuration statement, it is assumed to be a point-to-point link to the driving system's TCP/IP stack using Willem Konynenberg's VMNET package. This provides the same function as the CTCI mode of operation, except that it uses a virtual SLIP interface instead of the TUN/TAP driver.
6.10 FBA DASD Devices

6.10.1 Function
This device statement is used to define a FBA DASD device to the Hercules configuration. The argument specifies the name of a file which contains the FBA DASD image or the INET address of a Hercules shared device server.

The file consists of fixed length 512-byte records each of which represents one physical block of the emulated disk. To allow access to a minidisk within a full-pack FBA DASD image file two additional arguments (origin and numblks) may be specified after the filename.

6.10.2 Syntax

**Descriptive**

```
devaddr devtype filename [origin | 0] [numblks] [sf=shadowfile] [SYNCIO]
```

**Diagram**

```
   devaddr  --  devtype  --  filename
       |            |            |
      0           origin

numblks  --  SF=shadowfile  --  SYNCIO

or

   devaddr  --  devtype  --  ipname
       |            |            |
      :port      :3990      :devnum

:devnum  --  COMP=n
```

6.10.3 Parameter

- **devaddr**  
  This is the device address.

- **devtype**  
  This is the device type. Valid device types are 3310, 3370, 9332, 9335, 9336, 0671.
filename  This specifies the filename (and path) of the file containing the DASD image.

origin  Specifies the relative block number within the DASD image file at which the minidisk begins. The number must be less than the number of blocks in the file. The default origin is zero.

numblks  Specifies the number of 512-byte blocks in the minidisk. This number must not exceed the number of blocks in the file minus the origin. If omitted or specified as an asterisk (**), then the minidisk continues to the end of the DASD image file.

SF=  Specifies a shadow file for the DASD device. Please refer to the following CKD DASD section for information regarding the use of the SF=shadow file option.

shadowfile  This is the base name of the shadow file. The handling of shadow files for FBA devices is identical as that for CKD devices. Please refer to the following CKD DASD section for information regarding the use of the SF=shadow file option.

SYNCIO  SYNCIO enables possible synchronous I/O and is explained in detail in the following CKD DASD section.

ipname  This is the host name or IP address of the system, where the Hercules shared device server is running.

port  This is the port number the shared device server is listening on. If the port is omitted then the default is 3990.

devnum  Devnum specifies the device number on the shared device server. If the device number is omitted then the default is the current device number on the local system.

COMP=n  This keyword requests that the data has to be transferred compressed between the client and the server. The argument n specifies the compression level (1-9). Values closer to 1 mean less compression but also less processor time to perform the compression. Values closer to 9 mean the data is compressed more but also more processor time is required to compress the data.

6.10.4 Examples

Example 1:
Define a 3310 FBA DASD device on device address 0120. The name and path of the file containing the DASD image is "D:/DASD/TST001.FBA".

0120 3310 D:/DASD/TST001.FBA

Example 2:
Define a 3370 FBA DASD device on device address 0120. The DASD device is attached to a shared device server which is running on a machine with IP address 192.168.200.1 and listening on port 3990. The device address of the DASD on the shared device server is 0121.

0120 3370 192.168.200.1:3990:0121
6.11 CKD DASD Devices

6.11.1 Function

This device statement is used to define a CKD DASD device to the Hercules configuration. The argument specifies the name of a file that contains the CKD DASD image or the INET address of a Hercules shared device server.

The file consists of a 512-byte device header record followed by fixed length track images. The length of each track image depends on the emulated device type and is always rounded up to the next multiple of 512 bytes.

Volumes larger than 2 GB (for example the 3390, model 3) can be supported by spreading the data across more than one file. Each file contains a whole number of cylinders. The first file (which contains cylinders 0-2518 in the case of a 3390) usually has "_.1" as the last two characters of its name. The ckddasd driver allocates the remaining files by replacing the last characters of the file name by the characters "_.2", "_.3" and so on.

If your operating system supports large file sizes (or 64-bit offsets) then volumes larger than 2GB can be kept in a single file. The two character suffix is not used in this case.

Alternatively the argument may specify the name of a file containing a compressed CKD DASD image (CCKD DASD files). The CKD driver will automatically detect whether the file contains a regular CKD image or a compressed CKD image.

6.11.2 Syntax

Descriptive

devaddr devtype filename [sf=shadowfile] [NOSYNCO | SYNCO] [READONLY] [FAKEWRITE] [CU=type]

or

devaddr devtype ipname [port | 3990] [:devnum] [COMP=n]

Diagram

```
devaddr --- devtype --- filename          SF=shadowfile
|                        NOSYNCO --- READONLY --- FAKEWRITE
|                        SYNCO ---

                          CU=type
```
6.11.3 Parameter

**devaddr**  
This is the device address.

**devtype**  
This is the device type. Valid device types are 2311, 2314, 3330, 3350, 3375, 3380, 3390 and 9345.

**filename**  
This specifies the filename (and optionally the path) of the file containing the DASD image.

**shadowfile**  
A shadow file contains all the changes made to the emulated DASD device since it was created, maintained until the next shadow file is created. The moment of the shadow file's creation can be thought of a snapshot of the current emulated DASD at that time, as if the shadow file is later removed the emulated DASD reverts back to the state it was when the snapshot was taken.

Using shadow files, the base files can be kept on a read-only device like CDROM or can be defined as read-only thus ensuring that these files can never be corrupted.

The shadow file does not have to actually exist when it is defined in the configuration file. The shadow operand of the sf= parameter is simply a filename template that will be used to name the shadow file whenever one is be created. Shadow files are created using the sf+ xxxx or sf+ * commands.

The shadow file name must have a position where the shadow file number will be set. This is either the character preceding the last period after the slash or the last character if there is no period. For example: sf=shadows/linux1_*.dsk.

Hercules console commands are provided to add a new shadow file, remove the current shadow file (with or without backward merge), compress the current shadow file and display the shadow file status and statistics.

Please note, that the "sf" parameter has to be coded in lowercase letters otherwise an error message is presented.

Details on how to work with shadow files can be found in chapter 8.153 ff.

**[NO]SYNCIO**  
SYNCIO enables possible "synchronous" I/O. This is a DASD I/O feature wherein guest I/O requests are completed “synchronously” during the actual emulated execution of the SIO / SSCH (START IO / START SUBCHANNEL) instructions rather than being deferred and executed asynchronously in a separate device I/O thread.

Only I/O which are known to be able to be completed without actually needing to perform any actual host I/O are completed synchronously (e.g. whenever the data being requested is found already be in the cache). If the requested data could not be found in the cache then actual host I/O will need to be done and the request is
SYNCH is the default for CKD devices. SYNCH statistics may be displayed via the Hercules SYNCH console command. SYNCH may be abbreviated as SYIO.

Note: If you plan on using SYNCH with Linux/390 and/or zLinux you might also want to take a look at the IODELAY system parameter as well.

**READONLY**

READONLY returns “write inhibited” sense when a write is attempted. Note that not all the sense bits may be set absolutely correctly.

**FAKEWRITE**

FAKEWRITE is a workaround for the READONLY sense problem that was mentioned above. In these cases the disk is not intended to be updated (e.g. MVS updates the DSCB last referenced field for a readonly file) and any writes appear to be successful even though nothing is actually written.

**type**

Specifies the type of control unit to which this device is attached. The use of this parameter does not necessarily imply that all functions of the specified control unit are emulated. The purpose is to force a particular control unit type to be indicated in the data returned by SENSE ID and similar CCW's.

Normally the default value is appropriate and this parameter need not to be specified. Additional to the table below the following values may be specified: 3990-3 and 3990-6. The default value depends on the device type as shown in table below.

**ipname**

This is the host name or IP address of the system where the Hercules shared device server is running.

**port**

This is the port number the shared device server is listening on. If omitted the default is 3990.

**devnum**

Devnum specifies the device number on the shared device server. If omitted the default is the current device number on the local system.

**COMP=n**

This keyword requests that the data has to be transferred compressed between the client and the server. The argument n specifies the compression level (1-9). Values closer to 1 mean less compression but also less processor time to perform the compression. Values closer to 9 mean the data is compressed more but also more processor time is required to compress the data.

Two other options LAZYWRITE and FULLTRACKIO have been deprecated. They are still accepted to support compatibility with older configuration files but do actually nothing. It is strongly recommended to remove these statements from the configuration file.

The following table shows the default Control Unit types depending on the device type:

<table>
<thead>
<tr>
<th>Device Type</th>
<th>Default CU Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>2311</td>
<td>2841</td>
</tr>
<tr>
<td>2314</td>
<td>2314</td>
</tr>
<tr>
<td>3330, 3340, 3350, 3375, 3380</td>
<td>3880</td>
</tr>
</tbody>
</table>
### 6.11.4 Examples

**Example 1:**
Define a 3390 CKD DASD device on device address 0A8C. The name and path of the file containing the DASD image is "D:/DASD/SARES1.CKD".

```
0A8C 3390 D:/DASD/SARES1.CKD
```

**Example 2:**
Define a 3390 CKD DASD device on device address 0AA2. The name and path of the file containing the DASD image is "D:/DASD/SARES1.CKD". Synchronous I/O has to be enabled and the device has to return the "write inhibited" sense when a write is attempted.

```
0AA2 3390 D:/DASD/SARES1.CKD SYNCIO READONLY
```

**Example 3:**
Define a 3390 CCKD DASD device on device address 0A00. The name and path of the file containing the DASD image is "D:/DASD/SARES1.CCKD". All changes to the DASD device have to go to the shadow file(s) "D:/SHADOW/SARES1_*.CCKD".

```
0A00 3390 D:/DASD/SARES1.CCKD SF=D:/SHADOW/SARES1_*.CCKD
```

**Example 4:**
Define a 3390 CKD DASD device on device address 0A8C. The DASD device is attached to a shared device server which is running on a machine with IP address 192.168.200.1 and listening on port 3990. The device address of the DASD on the shared device server is also 0A8C.

```
0A8C 3390 192.168.200.1:3990:0A8C
```
6.12 Communication Lines

6.12.1 BSC (Preliminary 2703 BSC Support)

6.12.1.1 Function
This statement describes a BSC emulation line entry to either link 2 Hercules engines or a custom made program emulating a 2780, 3780 or 3x74, or a custom made program interfacing to a real BSC line.

The communication is emulated over a TCP connection. All bytes are transferred as-is (except for doubling DLE in transparent mode) just as over a real BSC link. Emulated EIA (DCD, DTR, CTS, etc.) or X.21/V.11 leads (C, T, etc.) are treated differently depending on the DIAL option selected.

The line emulates a point-to-point BSC link. There is no point-to-multipoint handling.

6.12.1.2 Syntax

```
Descriptive

devaddr devtype DIAL={IN | OUT | INOUT | NO}
LHOST={hostname | ipaddress | *} LPORT={servicename | port}
RHOST={hostname | ipaddress | port}
RPORT={servicename | port}
[RTO={0 | -1 | nnn | 3000}]
[PTO={0 | -1 | nnn | 3000}]
[ETO={0 | -1 | nnn | 10000}]
```

Diagram

```
\[ \begin{diagram}
\text{devaddr} & \text{devtype} & \text{DIAL=}\{\text{IN} | \text{OUT} | \text{INOUT} | \text{NO}\} & \text{IN} & \text{OUT} & \text{INOUT} & \text{NO} \\
\text{LHOST=}\{\text{hostname} | \text{ipaddress} | *\} & \text{LPORT=}\{\text{servicename} | \text{port}\} & \text{RHOST=}\{\text{hostname} | \text{ipaddress} | \text{port}\} & \text{RPORT=}\{\text{servicename} | \text{port}\} \\
\text{RTO=}\{0 | -1 | nnn | 3000\} & \text{PTO=}\{0 | -1 | nnn | 3000\} & \text{ETO=}\{0 | -1 | nnn | 10000\}
\end{diagram} \]
```
6.12.1.3 Parameter

**devaddr**
This is the device address.

**devtype**
This is the device type. A valid device type is 2703.

**DIAL**
This specifies the call direction (if any). If DIAL=NO is specified the TCP outgoing connection is attempted as soon as an ENABLE CCW is executed. Also in this mode, an incoming connection will always be accepted. If DIAL=IN or INOUT is specified, a TCP incoming call is accepted only if an ENABLE CCW is currently executing on the device. With DIAL=OUT the ENABLE CCW is rejected. When DIAL=IN or INOUT is coded a DIAL CCW allows the application to establish a TCP connection to a specific host. For other DIAL values the DIAL CCW is rejected.

**LHOST**
Specifies which IP address to listen on. This also conditions the network interface from which incoming calls will be accepted. An asterisk ("*") means all incoming TCP calls are accepted regardless of the destination IP address or call origin. A given IP address when DIAL=OUT is specified has no effect.

**LPORT**
Specifies the TCP port for which to listen to incoming TCP calls. This value is mandatory for DIAL=IN, DIAL=INOUT or DIAL=NO. It is ignored for DIAL=OUT.

**RHOST**
Specifies the remote host to which to direct a TCP connection on a DIAL=NO line when an ENABLE CCW is executed. This value is mandatory when DIAL=NO is specified, It is ignored for other DIAL values.

**RPORT**
Specifies the remote port to which to direct a TCP connection on a DIAL=NO line when an ENABLE CCW is executed. This value is mandatory when DIAL=NO is specified, It is ignored for other DIAL values.

**RTO**
Specifies the number of milliseconds before terminating a read on a timeout when no read termination control character is received. A value of zero means the read ends immediately. "-1" specifies that there is no timeout.

**PTO**
Specifies the number of milliseconds before terminating a POLL on a timeout when no ACK or NACK sequence is received. A value of zero means the POLL ends immediately. "-1" specifies that there is no timeout.

**ETO**
Specifies the number of milliseconds before terminating a POLL on a timeout. The timeout applies when DIAL=NO, DIAL=IN or DIAL=INOUT is specified, the outgoing TCP call fails (DIAL=NO) and there is no previously or currently established TCP connection for this line. When DIAL=NO is specified the timeout defaults to 10 seconds, for DIAL=IN or DIAL=INOUT, the timeout defaults to "-1", meaning there is no timeout.

RTO, PTO and ETO are tuning options. In most cases using the default values will give the best result.
6.12.1.4 Examples

Example 1:
Define a 2703 BSC emulation line on device address 0023. The outgoing connection should be attempted as soon as an ENABLE CCW is expected, incoming connections should always be accepted (DIAL=NO). The IP address to listen on is 127.0.0.1 with port 3780. The remote host has the IP address 192.168.0.99 and the port to which to direct a TCP connection is 3781.

0023 2703 DIAL=NO LHOST=127.0.0.1 LPORT=3780 RHOST=192.168.0.99 RPORT=3781

Example 2:
Example 2 is basically the same as example 1, but needs optimized timing options. The timeout for terminating a read must be 5000 ms, the timeout for terminating a POLL must also be 5000 ms and the timeout for terminating an ENABLE operation must be 12000 ms.

0023 2703 DIAL=NO LHOST=127.0.0.1 LPORT=3780 RHOST=192.168.0.99 RPORT=3781 RT=5000 PTO=5000 ETO=12000

6.12.2 TTY (Preliminary 2703 TELE2 TTY Support)

6.12.2.1 Function
This statement describes a 2703 Telegraph Terminal Control Type II (TTY 33/35) stop/start line, providing access to the Host OS via a standard telnet client.

To the host OS the line emulates an asynchronous TELE2 connection. The communication is emulated over a telnet connection.

6.12.2.2 Syntax

**Descriptive**

\[ \text{devaddr} \ \text{devtype} \ \text{LPORT}=\text{port} \ \text{DIAL}=\text{IN} \ \text{TTY}=1 \]

**Diagram**

\[ \text{devaddr} \quad \text{devtype} \quad \text{LPORT}=\text{port} \quad \text{DIAL}=\text{IN} \quad \text{TTY}=1 \]

6.12.2.3 Parameter

- **devaddr**: This is the device address.
- **devtype**: This is the device type. A valid device type is 2703.
- **port**: Specifies the TCPIP port to listen on for incoming TCP calls.
DIAL=IN  Specifies that this line is for in-bound calls. This parameter is required.
TTY=1  Specifies that this definition is for a TTY port. This parameter is required.

6.12.2.4 Examples
Example 1:
Define a 2703 TTY emulation line on device address 00C3 listening on port 32003.

00C3 2703 LPORT=32003 DIAL=IN TTY=1
7. Hercules Console

7.1 Hercules Hardware Console

Various aspects of Hercules can be controlled with console commands. These commands are entered from the command line of the Hercules hardware management console (HMC).

The Hercules hardware management console window is the panel that is active by default after starting Hercules. An alternate semi-graphical "New Panel" display showing devices, registers etc. is also available. Pressing the escape key switches between the two panels.

The main Hercules screen contains a scrollable list of messages with a command input area and a system status line at the bottom of the screen. To scroll through the messages, use either the Page Up or Page Down keys, the Ctrl + Up Arrow or Ctrl + Down Arrow keys, or the Home or End and/or the Ctrl + Home or Ctrl + End keys.

Important messages are highlighted in a different color (usually red) and are prevented from being scrolled off the screen for two minutes. If Extended Cursor handling is available then important messages currently at the top of the screen can be removed early by moving the cursor to the line containing the message and then pressing enter.

Use the Insert key to switch between insert and overlay mode when typing in the command input area. Use the Home and End keys to move to the first or last character of the command you are typing, or the left/right arrow keys to move to a specific character. Use the Escape key to erase the input area. Pressing "Escape" when the command input area is already empty causes the screen to switch to the semi-graphical "New Panel" display mode, which shows the overall status of the system and devices.

When in the semi-graphical "New Panel" display mode there is no command input area. Instead, single character "hot keys" are used to issue some of the more common functions such as starting or stopping the CPU. The hot-keys are those which are highlighted. Pressing the '?' key displays brief help information on how to use the semi-graphical panel.

When a command is prefixed with a hyphen ('-'), the command will not be redisplayed at the console. This can be used in scripts and is also used internally when commands are to be invoked without being redisplayed at the console.

Prefixing a command with a hyphen ('-') makes it a silent non-echoing command and prevents the command from appearing in the command recall history list (see 'HST' command).

Commands can be executed in the background by specifying an ampersand ('&') as last argument:

- "SCRIPT ABC" runs in the foreground
- "SCRIPT ABC &" runs in the background
- "SCRIPT ABC &&" runs in the foreground but passes '&' as last argument
- "SCRIPT ABC & &" runs in the background and passes '& as last argument

Sample screenshots of the Hercules HMC are shown in the pictures on the following pages.
7.2 Web browser interface

It is not necessary to work directly on the PC where Hercules is running to enter the console commands. Instead of using the hardware management console on the Hercules server itself it is possible to work from a browser interface in a web browser.

The requirement to be able to work with the web browser interface is a running Hercules HTTP server. The HTTP server is started through the HTTPPORT and HTTPROOT system parameter. For details on configuring the HTTP server please see section "System Parameter Descriptions".

Figure 4: Hercules device and status panel
Once the HTTP server is started, the interface can be used from a web browser on any machine, that has a network connection to the Hercules server. With this interface you can operate Hercules nearly in the same way as you would do locally on the hardware management console.

The following picture shows the main panel of the web browser interface.

![Hercules web browser interface](image.png)

**Figure 5: Hercules web browser interface**

### 7.3 Using the keyboard

The usage of the keyboard in the Hercules hardware management console is distinguished between normal cursor handling and extended cursor handling.
7.3.1 Normal cursor handling

The normal cursor handling is available on all platforms (Windows and Unix).

<table>
<thead>
<tr>
<th>Key</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Esc</td>
<td>Erases the contents of the command input area. If the command input area is already empty, switches to semi-graphical New Panel.</td>
</tr>
<tr>
<td>Del</td>
<td>Deletes the character at the cursor position.</td>
</tr>
<tr>
<td>Backspace</td>
<td>Erases the previous character.</td>
</tr>
<tr>
<td>Insert</td>
<td>Toggles between insert mode and overlay mode.</td>
</tr>
<tr>
<td>Tab</td>
<td>Attempts to complete the partial file name at the cursor position in the command input area. If more than one possible file exists, a list of matching file names is displayed.</td>
</tr>
<tr>
<td>Home</td>
<td>Moves the cursor to the start of the input in the command input area. If the command input area is empty, scrolls the message area to the top.</td>
</tr>
<tr>
<td>End</td>
<td>Moves the cursor to the start of the input in the command input area. If the command input area is empty, scrolls the message area to the bottom.</td>
</tr>
<tr>
<td>Page Up</td>
<td>Scrolls the message area up one screen.</td>
</tr>
<tr>
<td>Page Down</td>
<td>Scrolls the message area down one screen.</td>
</tr>
<tr>
<td>Up arrow</td>
<td>Recalls the previous command into the input area.</td>
</tr>
<tr>
<td>Down arrow</td>
<td>Recalls the next command into the input area.</td>
</tr>
<tr>
<td>Right arrow</td>
<td>Moves cursor to the next character of the input area.</td>
</tr>
<tr>
<td>Left arrow</td>
<td>Moves cursor to the previous character of the input area.</td>
</tr>
<tr>
<td>Ctrl + Up arrow</td>
<td>Scrolls the message area up one line.</td>
</tr>
<tr>
<td>Ctrl + Down arrow</td>
<td>Scrolls the message area down one line.</td>
</tr>
<tr>
<td>Ctrl + Home</td>
<td>Scrolls the message area to the top.</td>
</tr>
<tr>
<td>Ctrl + End</td>
<td>Scrolls the message area to the bottom.</td>
</tr>
</tbody>
</table>

Table 12: Normal cursor handling

7.3.2 Extended cursor handling

The following additional keyboard functions are effective when the Hercules Extended Cursor Handling feature (OPTION_EXTCURS) is activated at compile time. At present, this feature is activated on the Windows platform only.
Table 13: Extended cursor handling

<table>
<thead>
<tr>
<th>Key or function</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTRL-Break</td>
<td>Simulates the External Interrupt Key being pressed.</td>
</tr>
<tr>
<td>CTRL-C</td>
<td>CTRL-C is currently caught, but there is no action taken.</td>
</tr>
<tr>
<td>Close</td>
<td>The normal close button (the red &quot;X&quot; box) has been disabled to prevent an unintended shutdown of Hercules. The close function via the Windows menu (&quot;File -&gt; Exit&quot;) however is still available. In this case Hercules initiates an immediate shutdown in order to close all files correctly.</td>
</tr>
<tr>
<td>Shutdown</td>
<td>Shutdown (&quot;Start -&gt; Shut down -&gt; Shut down&quot;) initiates an immediate shutdown of Hercules in order to close all files correctly.</td>
</tr>
<tr>
<td>Logoff</td>
<td>Logoff (&quot;Start -&gt; Shut down -&gt; Log off&quot;) initiates an immediate shutdown of Hercules in order to close all files correctly.</td>
</tr>
</tbody>
</table>

Table 14: Windows event handler

7.3.3 **Windows event handler**

Hercules has handlers for certain Windows events. The following table shows the trapped events and the according action(s).
7.4 Log formats

The appearance of the log in terms of prefixing the messages is dependent on the used environment. The most flexible ways of prefixing the messages is given when running Hercules using the WinGUI. Running Hercules with the native console gives only limited options. The following table show an overview of the log options, depending on the Hercules version used.

<table>
<thead>
<tr>
<th>Message Prefix</th>
<th>Native Hercules Console</th>
<th>Hercules with WinGUI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Time</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Process ID</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Prefix(es) visible on console</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Prefix(es) visible on hardcopy log</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Table 15: Message prefix overview**

Most of the console command examples in this book are made without the WinGUI and with LOGOPT set to NOTIMESTAMP as described below. This is to ensure that the sample output from the commands fits into the text boxes in this book.

7.4.1 Hercules Console

Using Hercules under Linux, Mac OS or Windows (without WinGUI) lets you prefix the console messages with a timestamp. The difference between these options is shown in the next figure.

Switching the option can be done with the `logopt` console command or can be set at startup time through the 'logopt' system parameter.

Please note that the console itself does not show the timestamp, independent of the 'logopt' settings. Only the hardcopy log does show the timestamp.

```plaintext
logopt notimestamp
HHCPN197I Log option set: NOTIMESTAMP

  gpr
  CPU0000: R0=0000000000000000 R1=0000000000000000
  CPU0000: R2=0000000000000000 R3=0000000000000000
  CPU0000: R4=0000000000000000 R5=0000000000000000
  CPU0000: R6=0000000000000000 R7=0000000000000000
  CPU0000: R8=0000000000000000 R9=0000000000000000
  CPU0000: RA=0000000000000000 RB=0000000000000000
  CPU0000: RC=0000000000000000 RD=0000000000000000
  CPU0000: RE=0000000000000000 RF=0000000000000000
```
7.4.2 Hercules console using the WinGUI

Using the WinGUI with the Windows version of Hercules gives you the possibility to prefix all messages with the current date, the current time and the process ID. These prefixing options can be selected individually in the “Format” tab of the “Advanced Logging Options”, where they can be separately turned on or off as showed in the next figure.

![Advanced Logging Options](image)

Figure 7: WinGUI Advanced Logging Options
The ‘logopt’ system parameter or console command has no effect when using the WinGUI. Prefixing the messages is only influenced over the GUI settings. The following figure shows the log messages using all prefixing options (date, time and process ID) as specified above.

```
2010/06/18 19:12:18.071 000008E4 HHC01416I Build information:
2010/06/18 19:12:18.071 000008E4 HHC01417I Windows (MSVC) build for AMD64
2010/06/18 19:12:18.071 000008E4 HHC01417I Modes: S/370 ESA/390 z/Arch
2010/06/18 19:12:18.071 000008E4 HHC01417I Max CPU Engines: 8
2010/06/18 19:12:18.071 000008E4 HHC01417I Using fthreads Threading Model
2010/06/18 19:12:18.072 000008E4 HHC01417I Using FishIO
2010/06/18 19:12:18.072 000008E4 HHC01417I Dynamic loading support
2010/06/18 19:12:18.072 000008E4 HHC01417I Using shared libraries
2010/06/18 19:12:18.072 000008E4 HHC01417I HTTP Server support
2010/06/18 19:12:18.072 000008E4 HHC01417I No SIGABEND handler
2010/06/18 19:12:18.072 000008E4 HHC01417I Regular Expressions support
2010/06/18 19:12:18.072 000008E4 HHC01417I Automatic Operator support
```

Figure 8: Message prefixing using the console of the Hercules WinGUI

### 7.5 Programmed Function Key (PF Key) Support

The Hercules console supports the usage of PF keys. The next sections show how to define and use PF keys with Hercules.

#### 7.5.1 Usage

The command to be assigned to the PF key has to be defined with a DEFSYM statement. This can be done through a DEFSYM system parameter statement in the Hercules configuration file or through a panel command (manually from the console or coded in the Hercules run-commands file).

On Windows systems PF keys PF01 to PF48 are assignable, on non-Windows systems PF01 to PF20. The following special keys must be used to access the PF keys:

- **PF01-PF12**: Press PF key only
- **PF13-PF24**: Press SHIFT and PF key
- **PF25-PF36**: Press CTRL and PF key
- **PF37-PF48**: Press ALT and PF key
7.5.2 Syntax

Descriptive

DEFSYM PFnn "[SUBST] {IMMED | DELAY} {HERC | SCP | PSCP} command [&n | &* | &$ [...]]"

Diagram

```
```

7.5.3 Parameter

PFnn
This identifies the PF key to be defined, where nn is a number from 01 to 48. This number must be specified with the leading zero for PF keys 1 - 9 (PF01, ..., PF09).

SUBST
This indicates that the PF key data might contain substitution placeholders (&n, see below).

IMMED
This indicates the point in time when the PF key is processed. IMMED indicates that the PF data is processed when the PF key is pressed.

DELAY
This indicates the point in time when the PF key is processed. DELAY indicates that the PF data is displayed on the command line when the PF key is pressed. The data may then be modified if necessary. To finally process the PF data the “ENTER” key must be pressed.

HERC
The command target for the assigned command is the Hercules Emulator.

SCP
The command target for the assigned command is the System Control Program (the guest operating system running under Hercules).

PSCP
The assigned command is a System Control Program (guest operating system) priority command.

command
This defines the command that is to be assigned to the PF key.

&n
A substitution placeholder is identified by an ampersand (“&”), followed by a decimal number from 0 to 9. If two ampersands are detected (“&&”) then a single ampersand is substituted.

&*
Variable “&*” represents all of the remaining tokens beyond the last substitution variable used. A single space is added between each token. Tokens can be enclosed in paired single or double quotes. The quotes are included as part of the token string.

&$
Variable “&$” represents the data remaining on the line past token 9. Variable “$*” (see below) does include the data from “&$”. A single space is added between each token.
Tokens can be enclosed in paired single or double quotes. The quotes are included as part of the token string.

### 7.5.4 Default PF Key Assignments

The following PF keys are defined per default:

- PF01 'SUBST IMMED herc help &0'
- PF10 'SUBST DELAY herc devinit &*
- PF11 'IMMED herc devlist TAPE'

### 7.5.5 Examples

**Example 1:**

```
DEFSYM PF01 "SUBST IMMED HERC HELP &0"
```

Typing ‘MAXRATES’ on the command line and pressing PF01 would place the following on the command line and immediately execute the command:

```
HERC HELP MAXRATES
```

**Example 2:**

```
DEFSYM PF02 "SUBST DELAY HERC DEVINIT &0 &*"
```

Typing ‘580 “HETTAPE.HET” RO’ on the command line and pressing PF02 would place the following on the command line:

```
HERC DEVINIT 580 “HETTAPE.HET” RO
```

Pressing an additional “ENTER” does execute the command.

**Example 3:**

```
DEFSYM PF03 "SUBST DELAY HERC DEVINIT &0 &* &1 &* &2"
```

Typing ‘T1 T2 T3 T4 T5 T6’ on the command line and pressing PF03 would place the following on the command line:

```
HERC DEVINIT T1 T2 T3 T4 T5 T6 T2 T3 T4 T5 T6 T3
```

Pressing an additional “ENTER” does execute the command.
## 7.6 Hercules Console Commands (sorted alphabetically)

The following table shows an overview of the valid Hercules console commands that can be entered in the control panel (Hercules console display). In this table the commands are sorted alphabetically rather than grouped by functionality.

Please note that the availability of certain commands depends on the build options used when Hercules was compiled. For a list of all build options and their related console commands please consult "Appendix E. Build Options for System Parameters and Console Commands".

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>!message</td>
<td>SCP priority message</td>
</tr>
<tr>
<td>#</td>
<td>Silent comment</td>
</tr>
<tr>
<td>$locate</td>
<td>Display and verify Hercules control blocks</td>
</tr>
<tr>
<td>$test</td>
<td>Custom test command</td>
</tr>
<tr>
<td>$zapcmd</td>
<td>Enable or disable system parameters and console commands</td>
</tr>
<tr>
<td>*</td>
<td>Loud comment</td>
</tr>
<tr>
<td>.reply</td>
<td>SCP command</td>
</tr>
<tr>
<td>?</td>
<td>List all commands / command specific help (alias for help)</td>
</tr>
<tr>
<td>abs</td>
<td>Display or alter absolute storage</td>
</tr>
<tr>
<td>aea</td>
<td>Display AEA (absolute-effective-address) tables</td>
</tr>
<tr>
<td>aia</td>
<td>Display AIA (absolute-instruction-address) tables</td>
</tr>
<tr>
<td>ar</td>
<td>Display access registers</td>
</tr>
<tr>
<td>archlvl</td>
<td>Set architecture level</td>
</tr>
<tr>
<td>archmode</td>
<td>Set architecture mode (alias for ARCHLVL command)</td>
</tr>
<tr>
<td>attach</td>
<td>Configure device</td>
</tr>
<tr>
<td>auto_scsi_mount</td>
<td>Automatic SCSI tape mounts (deprecated, use SCSIMOUNT instead)</td>
</tr>
<tr>
<td>autoinit</td>
<td>Display or set the automatic creation of empty tape files</td>
</tr>
<tr>
<td>automount</td>
<td>Display or update allowable tape automount directories</td>
</tr>
<tr>
<td>b</td>
<td>Set breakpoint (synonym for B+)</td>
</tr>
<tr>
<td>b+</td>
<td>Set breakpoint (synonym for B)</td>
</tr>
<tr>
<td>b-</td>
<td>Delete breakpoint</td>
</tr>
<tr>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>cache</td>
<td>Execute cache related commands</td>
</tr>
<tr>
<td>cachestats</td>
<td>Display cache statistics</td>
</tr>
<tr>
<td>capping</td>
<td>Display or set CPU capping value</td>
</tr>
<tr>
<td>cckd</td>
<td>CCKD command</td>
</tr>
<tr>
<td>cd</td>
<td>Change directory</td>
</tr>
<tr>
<td>cf</td>
<td>Configure current CPU online or offline</td>
</tr>
<tr>
<td>cfall</td>
<td>Configure all CPU’s online or offline</td>
</tr>
<tr>
<td>clocks</td>
<td>Display TOD clock and CPU timer</td>
</tr>
<tr>
<td>cmdlevel</td>
<td>Display or set the current command group</td>
</tr>
<tr>
<td>cmdlvl</td>
<td>Alias for cmdlevel</td>
</tr>
<tr>
<td>cmdsep</td>
<td>Display or set command line separator</td>
</tr>
<tr>
<td>cmdtgt</td>
<td>Specify the command target</td>
</tr>
<tr>
<td>cnslport</td>
<td>Display or set console port</td>
</tr>
<tr>
<td>codepage</td>
<td>Display or set codepage conversion table</td>
</tr>
<tr>
<td>conkpalv</td>
<td>Display / alter console TCP/IP keep-alive settings</td>
</tr>
<tr>
<td>cp_updt</td>
<td>Create or modify user character conversion table</td>
</tr>
<tr>
<td>cpu</td>
<td>Define target CPU for console display and commands</td>
</tr>
<tr>
<td>cpuidfmt</td>
<td>Display or set format BASIC / 0 / 1 STIDP generation</td>
</tr>
<tr>
<td>cpumodel</td>
<td>Display or set CPU model number</td>
</tr>
<tr>
<td>cpuprio</td>
<td>Display or set CPU thread process priority</td>
</tr>
<tr>
<td>cpuserial</td>
<td>Display or set CPU serial number</td>
</tr>
<tr>
<td>cpuverid</td>
<td>Display or set CPU version code</td>
</tr>
<tr>
<td>cr</td>
<td>Display or alter control registers</td>
</tr>
<tr>
<td>cscript</td>
<td>Cancel a running script thread</td>
</tr>
<tr>
<td>ctc</td>
<td>Enable / disable CTC debugging</td>
</tr>
<tr>
<td>define</td>
<td>Rename device</td>
</tr>
<tr>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>defstore</td>
<td>Display or define main and expanded storage values</td>
</tr>
<tr>
<td>defsym</td>
<td>Define a symbol</td>
</tr>
<tr>
<td>delsym</td>
<td>Delete a symbol</td>
</tr>
<tr>
<td>detach</td>
<td>Remove device</td>
</tr>
<tr>
<td>devinit</td>
<td>Reinitialize device</td>
</tr>
<tr>
<td>devlist</td>
<td>List device, device class or all devices</td>
</tr>
<tr>
<td>devprio</td>
<td>Display or set device threads process priority</td>
</tr>
<tr>
<td>devtmax</td>
<td>Display or set max device threads</td>
</tr>
<tr>
<td>diag8cmd</td>
<td>Display or set DIAGNOSE 8 command option</td>
</tr>
<tr>
<td>dir</td>
<td>Display file and directory listing</td>
</tr>
<tr>
<td>ds</td>
<td>Display subchannel</td>
</tr>
<tr>
<td>ecpsvm</td>
<td>ECPS:VM commands</td>
</tr>
<tr>
<td>engines</td>
<td>Set processor engines type</td>
</tr>
<tr>
<td>exec</td>
<td>Execute a REXX script</td>
</tr>
<tr>
<td>exit</td>
<td>Terminate the emulator</td>
</tr>
<tr>
<td>ext</td>
<td>Generate external interrupt</td>
</tr>
<tr>
<td>f{+/-} addr</td>
<td>Mark frames usable / unusable</td>
</tr>
<tr>
<td>fcb</td>
<td>Display current FCB or load new FCB image</td>
</tr>
<tr>
<td>fpc</td>
<td>Display or alter floating point control register</td>
</tr>
<tr>
<td>fpr</td>
<td>Display or alter floating point registers</td>
</tr>
<tr>
<td>g</td>
<td>Turn off instruction stepping and start all CPUs</td>
</tr>
<tr>
<td>gpr</td>
<td>Display or alter general purpose registers</td>
</tr>
<tr>
<td>hao</td>
<td>Hercules Automatic Operator (HAO)</td>
</tr>
<tr>
<td>help</td>
<td>List all commands / command specific help</td>
</tr>
<tr>
<td>herc</td>
<td>Send Hercules command</td>
</tr>
<tr>
<td>herclogo</td>
<td>Read a new Hercules logo file</td>
</tr>
<tr>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>---------------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>hercprio</td>
<td>Display or set Hercules process priority</td>
</tr>
<tr>
<td>hst</td>
<td>History of commands</td>
</tr>
<tr>
<td>http</td>
<td>Start, stop, modify or display HTTP server</td>
</tr>
<tr>
<td>i</td>
<td>Generate I/O attention interrupt for device</td>
</tr>
<tr>
<td>icount</td>
<td>Display individual instruction counts</td>
</tr>
<tr>
<td>iodelay</td>
<td>Display or set I/O delay value</td>
</tr>
<tr>
<td>ipending</td>
<td>Display pending interrupts</td>
</tr>
<tr>
<td>ipl</td>
<td>IPL Normal from device xxxx</td>
</tr>
<tr>
<td>iplc</td>
<td>IPL Clear from device xxxx</td>
</tr>
<tr>
<td>k</td>
<td>Display CCKD internal trace</td>
</tr>
<tr>
<td>kd</td>
<td>Clear held messages</td>
</tr>
<tr>
<td>ldmod</td>
<td>Load a module</td>
</tr>
<tr>
<td>legacySenseid</td>
<td>Display or set SENSE ID CCW (x'E4) feature</td>
</tr>
<tr>
<td>loadcore</td>
<td>Load a core image from a file</td>
</tr>
<tr>
<td>loadparm</td>
<td>Set IPL parameter</td>
</tr>
<tr>
<td>loadtext</td>
<td>Load a text deck file</td>
</tr>
<tr>
<td>log</td>
<td>Direct log output</td>
</tr>
<tr>
<td>logopts</td>
<td>Change log options</td>
</tr>
<tr>
<td>lparname</td>
<td>Display or set LPAR name</td>
</tr>
<tr>
<td>lparnum</td>
<td>Display or set LPAR identification number</td>
</tr>
<tr>
<td>ls</td>
<td>Display file and directory listing</td>
</tr>
<tr>
<td>lsdep</td>
<td>List module dependencies</td>
</tr>
<tr>
<td>lsmod</td>
<td>List dynamic modules</td>
</tr>
<tr>
<td>mainsize</td>
<td>Display or set main storage size</td>
</tr>
<tr>
<td>manufacturer</td>
<td>Display or set STSI manufacturer code</td>
</tr>
<tr>
<td>maxcpu</td>
<td>Display or set maximum number of CPUs</td>
</tr>
<tr>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>maxrates</td>
<td>Display highest MIPS/SIO rate or set new reporting interval</td>
</tr>
<tr>
<td>memlock</td>
<td>Lock Hercules memory</td>
</tr>
<tr>
<td>message</td>
<td>Display message on console like VM</td>
</tr>
<tr>
<td>model</td>
<td>Display or set STSI model code</td>
</tr>
<tr>
<td>modpath</td>
<td>Display or set dynamic load module path</td>
</tr>
<tr>
<td>mounted_tape_reinit</td>
<td>Control tape initialization</td>
</tr>
<tr>
<td>msg</td>
<td>Display message on console like VM</td>
</tr>
<tr>
<td>msghld</td>
<td>Display or set timeout value of held messages</td>
</tr>
<tr>
<td>msglevel</td>
<td>Display or set the current message display output</td>
</tr>
<tr>
<td>msglvl</td>
<td>Display or set the current message display output (alias for msglevel command)</td>
</tr>
<tr>
<td>msgnoh</td>
<td>Display message on console like VM, but without header</td>
</tr>
<tr>
<td>mt</td>
<td>Control magnetic tape operation</td>
</tr>
<tr>
<td>numcpu</td>
<td>Display or set number of emulated CPUs</td>
</tr>
<tr>
<td>numvec</td>
<td>Display or set number of vector facilities</td>
</tr>
<tr>
<td>ostailor</td>
<td>Tailor trace information for specific operating system</td>
</tr>
<tr>
<td>panrate</td>
<td>Display or set console refresh rate</td>
</tr>
<tr>
<td>pantitle</td>
<td>Display or set console window title</td>
</tr>
<tr>
<td>pgmprdos</td>
<td>Set LPP license setting</td>
</tr>
<tr>
<td>pgmtrace</td>
<td>Trace program interrupts</td>
</tr>
<tr>
<td>plant</td>
<td>Display or set STSI plant code</td>
</tr>
<tr>
<td>pr</td>
<td>Display prefix register</td>
</tr>
<tr>
<td>pscp</td>
<td>Send system control program priority message</td>
</tr>
<tr>
<td>psw</td>
<td>Display or alter program status word</td>
</tr>
<tr>
<td>ptp</td>
<td>Enable / disable PTP debugging</td>
</tr>
<tr>
<td>ptt</td>
<td>Display or set internal trace</td>
</tr>
<tr>
<td>pwd</td>
<td>Print working directory</td>
</tr>
<tr>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>--------------------------------------------------------------------</td>
</tr>
<tr>
<td>qcpuid</td>
<td>Display CPU ID</td>
</tr>
<tr>
<td>qd</td>
<td>Query device information</td>
</tr>
<tr>
<td>qpfkeys</td>
<td>Display the current PF key settings</td>
</tr>
<tr>
<td>qpid</td>
<td>Display process ID of Hercules</td>
</tr>
<tr>
<td>qports</td>
<td>Display TCP/IP ports in use</td>
</tr>
<tr>
<td>qproc</td>
<td>Display processors type and utilization</td>
</tr>
<tr>
<td>qstor</td>
<td>Display main and expanded storage values</td>
</tr>
<tr>
<td>quiet</td>
<td>Toggle automatic refresh of console display data</td>
</tr>
<tr>
<td>quit</td>
<td>Terminate the emulator</td>
</tr>
<tr>
<td>quitmout</td>
<td>Display or set quit timeout value</td>
</tr>
<tr>
<td>r</td>
<td>Display or alter real storage</td>
</tr>
<tr>
<td>restart</td>
<td>Generate restart interrupt</td>
</tr>
<tr>
<td>resume</td>
<td>Resume Hercules</td>
</tr>
<tr>
<td>rexx</td>
<td>Display or set REXX interpreter settings</td>
</tr>
<tr>
<td>rmmod</td>
<td>Delete a module</td>
</tr>
<tr>
<td>s</td>
<td>Instruction stepping</td>
</tr>
<tr>
<td>s+</td>
<td>Instruction stepping on</td>
</tr>
<tr>
<td>s-</td>
<td>Instruction stepping off</td>
</tr>
<tr>
<td>s?</td>
<td>Instruction stepping query</td>
</tr>
<tr>
<td>s{+/-} dev</td>
<td>Turn CCW stepping on / off</td>
</tr>
<tr>
<td>savecore</td>
<td>Save a core image to a file</td>
</tr>
<tr>
<td>sclproot</td>
<td>Set or display SCLP base directory</td>
</tr>
<tr>
<td>scp</td>
<td>Send system control program command</td>
</tr>
<tr>
<td>scpecho</td>
<td>Display or set echo to console and history of SCP replies</td>
</tr>
<tr>
<td>scpimply</td>
<td>Display or set option to pass non-Hercules commands to the SCP</td>
</tr>
<tr>
<td>script</td>
<td>Run a sequence of console commands contained in a file</td>
</tr>
<tr>
<td><strong>Command</strong></td>
<td><strong>Description</strong></td>
</tr>
<tr>
<td>-------------</td>
<td>---------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>scsimount</td>
<td>Automatic SCSI tape mounts</td>
</tr>
<tr>
<td>sf+</td>
<td>Create a new shadow file</td>
</tr>
<tr>
<td>sf-</td>
<td>Delete a shadow file</td>
</tr>
<tr>
<td>sfc</td>
<td>Compress a shadow file</td>
</tr>
<tr>
<td>sfd</td>
<td>Display shadow file statistics</td>
</tr>
<tr>
<td>sfk</td>
<td>Perform a chkdsk on the active shadow file</td>
</tr>
<tr>
<td>sh</td>
<td>Shell command</td>
</tr>
<tr>
<td>shcmdopt</td>
<td>Display or set shell command option</td>
</tr>
<tr>
<td>showdvol1</td>
<td>Display or set enable showing of DASD volsers in device list</td>
</tr>
<tr>
<td>shrd</td>
<td>Display or set shared device server trace</td>
</tr>
<tr>
<td>shrdport</td>
<td>Set shared device server port</td>
</tr>
<tr>
<td>sizeof</td>
<td>Display size of structures</td>
</tr>
<tr>
<td>srvprio</td>
<td>Display or set server threads process priority</td>
</tr>
<tr>
<td>ssd</td>
<td>Signal Shutdown</td>
</tr>
<tr>
<td>start</td>
<td>Start CPU or printer / punch device</td>
</tr>
<tr>
<td>startall</td>
<td>Start all CPU’s</td>
</tr>
<tr>
<td>stop</td>
<td>Stop CPU or printer / punch device</td>
</tr>
<tr>
<td>stopall</td>
<td>Stop all CPU’s</td>
</tr>
<tr>
<td>store</td>
<td>Store CPU status at absolute zero</td>
</tr>
<tr>
<td>suspend</td>
<td>Suspend Hercules</td>
</tr>
<tr>
<td>symptom</td>
<td>Instruction trace display option (alias for TRACEOPT command)</td>
</tr>
<tr>
<td>syncio</td>
<td>Display syncio device statistics</td>
</tr>
<tr>
<td>sysclear</td>
<td>SYSTEM CLEAR RESET manual operation</td>
</tr>
<tr>
<td>sysePOCH</td>
<td>Set base date for TOD clock</td>
</tr>
<tr>
<td>sysreset</td>
<td>SYSTEM RESET manual operation</td>
</tr>
<tr>
<td>t</td>
<td>Instruction trace</td>
</tr>
</tbody>
</table>
Table 16: Hercules Console Commands (sorted alphabetically)

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>t+</td>
<td>Instruction trace on</td>
</tr>
<tr>
<td>t-</td>
<td>Instruction trace off</td>
</tr>
<tr>
<td>t?</td>
<td>Instruction trace query</td>
</tr>
<tr>
<td>t{+/-} CKD</td>
<td>Turn CKD_KEY tracing on / off</td>
</tr>
<tr>
<td>t{+/-} dev</td>
<td>Turn CCW tracing on / off</td>
</tr>
<tr>
<td>timerint</td>
<td>Display or set timers update interval</td>
</tr>
<tr>
<td>tlb</td>
<td>Display TLB tables</td>
</tr>
<tr>
<td>toddrag</td>
<td>Display or set TOD clock drag factor</td>
</tr>
<tr>
<td>todprio</td>
<td>Display or set timer thread process priority</td>
</tr>
<tr>
<td>traceopt</td>
<td>Instruction trace display option</td>
</tr>
<tr>
<td>tt32</td>
<td>Control / query CTCI-WIN functionality</td>
</tr>
<tr>
<td>tzoffset</td>
<td>Set TOD clock offset from GMT</td>
</tr>
<tr>
<td>u</td>
<td>Disassemble storage</td>
</tr>
<tr>
<td>uptime</td>
<td>Display Hercules Emulator uptime</td>
</tr>
<tr>
<td>v</td>
<td>Display or alter virtual storage</td>
</tr>
<tr>
<td>version</td>
<td>Display version information</td>
</tr>
<tr>
<td>xpndsize</td>
<td>Display or set expanded storage size</td>
</tr>
<tr>
<td>yroffset</td>
<td>Set TOD clock offset from actual date</td>
</tr>
</tbody>
</table>

7.7 Hercules Console Commands (grouped by functionality)

The next table shows an overview of the valid Hercules console commands that can be entered in the control panel (Hercules console display). In this table the commands are grouped by functionality.

Please note that the availability of certain commands depends on the build options used when Hercules was compiled. For a list of all build options and the related console commands please consult “Appendix E. Build Options for System Parameters and Console Commands”.

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>help</td>
<td>List all commands / command specific help</td>
</tr>
<tr>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>?</td>
<td>List all commands / command specific help (alias for help)</td>
</tr>
<tr>
<td>#</td>
<td>Silent comment</td>
</tr>
<tr>
<td>*</td>
<td>Loud comment</td>
</tr>
<tr>
<td>cmdlevel</td>
<td>Display or set the current command group</td>
</tr>
<tr>
<td>cmdlvl</td>
<td>Alias for cmdlevel</td>
</tr>
<tr>
<td>cmdsep</td>
<td>Display or set command line separator</td>
</tr>
<tr>
<td>message</td>
<td>Display message on console like VM</td>
</tr>
<tr>
<td>msg</td>
<td>Display message on console like VM</td>
</tr>
<tr>
<td>msgnoh</td>
<td>Display message on console like VM, but without header</td>
</tr>
<tr>
<td>quiet</td>
<td>Toggle automatic refresh of console display data</td>
</tr>
<tr>
<td>hst</td>
<td>History of commands</td>
</tr>
<tr>
<td>hao</td>
<td>Hercules Automatic Operator (HAO)</td>
</tr>
<tr>
<td>log</td>
<td>Direct logger output</td>
</tr>
<tr>
<td>logopt</td>
<td>Display or set logging options</td>
</tr>
<tr>
<td>msglevel</td>
<td>Display or set the current message display output</td>
</tr>
<tr>
<td>msglvl</td>
<td>Display or set the current message display output (alias for msglevel command)</td>
</tr>
<tr>
<td>ostailor</td>
<td>Tailor trace information for specific operating system</td>
</tr>
<tr>
<td>uptime</td>
<td>Display Hercules Emulator uptime</td>
</tr>
<tr>
<td>version</td>
<td>Display version information</td>
</tr>
<tr>
<td>exit</td>
<td>Terminate the emulator</td>
</tr>
<tr>
<td>quit</td>
<td>Terminate the emulator</td>
</tr>
<tr>
<td>quitmout</td>
<td>Display or set quit timeout value</td>
</tr>
<tr>
<td>cpu</td>
<td>Define target CPU for console display and commands</td>
</tr>
<tr>
<td>fcb</td>
<td>Display current FCB or load new FCB image</td>
</tr>
<tr>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>start</td>
<td>Start CPU or printer / punch device</td>
</tr>
<tr>
<td>stop</td>
<td>Stop CPU or printer / punch device</td>
</tr>
<tr>
<td>startall</td>
<td>Start all CPU's</td>
</tr>
<tr>
<td>stopall</td>
<td>Stop all CPU's</td>
</tr>
<tr>
<td>cf</td>
<td>Configure current CPU online or offline</td>
</tr>
<tr>
<td>cfall</td>
<td>Configure all CPU's online or offline</td>
</tr>
<tr>
<td>.reply</td>
<td>SCP command</td>
</tr>
<tr>
<td>!message</td>
<td>SCP priority message</td>
</tr>
<tr>
<td>scpecho</td>
<td>Display or set echo to console and history of SCP replies</td>
</tr>
<tr>
<td>scpimply</td>
<td>Display or set option to pass non-Hercules commands to the SCP</td>
</tr>
<tr>
<td>ssd</td>
<td>Signal Shutdown</td>
</tr>
<tr>
<td>ptt</td>
<td>Display or set internal trace</td>
</tr>
<tr>
<td>i</td>
<td>Generate I/O attention interrupt for device</td>
</tr>
<tr>
<td>ext</td>
<td>Generate external interrupt</td>
</tr>
<tr>
<td>restart</td>
<td>Generate restart interrupt</td>
</tr>
<tr>
<td>archlvl</td>
<td>Set architecture level</td>
</tr>
<tr>
<td>archmode</td>
<td>Set architecture mode (alias for ARCHLVL command)</td>
</tr>
<tr>
<td>engines</td>
<td>Set processor engines type</td>
</tr>
<tr>
<td>defstore</td>
<td>Display or define main and expanded storage values</td>
</tr>
<tr>
<td>mainsize</td>
<td>Display or set main storage size</td>
</tr>
<tr>
<td>xpndsize</td>
<td>Display or set expanded storage size</td>
</tr>
<tr>
<td>cpuprio</td>
<td>Display or set CPU thread process priority</td>
</tr>
<tr>
<td>devprio</td>
<td>Display or set device threads process priority</td>
</tr>
<tr>
<td>hercprio</td>
<td>Display or set Hercules process priority</td>
</tr>
<tr>
<td>srvprio</td>
<td>Display or set server threads process priority</td>
</tr>
<tr>
<td>todprio</td>
<td>Display or set timer thread process priority</td>
</tr>
<tr>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>maxcpu</td>
<td>Display or set maximum number of CPUs</td>
</tr>
<tr>
<td>numcpu</td>
<td>Display or set number of installed CPUs</td>
</tr>
<tr>
<td>numvec</td>
<td>Display or set number of vector facilities</td>
</tr>
<tr>
<td>loadparm</td>
<td>Set IPL parameter</td>
</tr>
<tr>
<td>lparsname</td>
<td>Display or set LPAR name</td>
</tr>
<tr>
<td>lparsnum</td>
<td>Display or set LPAR identification number</td>
</tr>
<tr>
<td>cpumodel</td>
<td>Display or set CPU model number</td>
</tr>
<tr>
<td>cpuserial</td>
<td>Display or set CPU serial number</td>
</tr>
<tr>
<td>cpuverid</td>
<td>Display or set CPU version code</td>
</tr>
<tr>
<td>cpuidfmt</td>
<td>Display or set format BASIC / 0 / 1 STIDP generation</td>
</tr>
<tr>
<td>cnslport</td>
<td>Display or set console port</td>
</tr>
<tr>
<td>capping</td>
<td>Display or set CPU capping value</td>
</tr>
<tr>
<td>manufactur</td>
<td>Display or set STSI manufacturer code</td>
</tr>
<tr>
<td>model</td>
<td>Display or set STSI model code</td>
</tr>
<tr>
<td>plant</td>
<td>Display or set STSI plant code</td>
</tr>
<tr>
<td>pgmprdos</td>
<td>Set LPP license setting</td>
</tr>
<tr>
<td>codepage</td>
<td>Display or set codepage conversion table</td>
</tr>
<tr>
<td>cp_updt</td>
<td>Create or modify user character conversion table</td>
</tr>
<tr>
<td>diag8cmd</td>
<td>Display or set DIAGNOSE 8 command option</td>
</tr>
<tr>
<td>shcmdopt</td>
<td>Display or set shell command option</td>
</tr>
<tr>
<td>legaciesendid</td>
<td>Display or set SENSE ID CCW (x'E4) feature</td>
</tr>
<tr>
<td>syseepoch</td>
<td>Set base date for TOD clock</td>
</tr>
<tr>
<td>tzoffset</td>
<td>Set TOD clock offset from GMT</td>
</tr>
<tr>
<td>yrroffset</td>
<td>Set TOD clock offset from actual date</td>
</tr>
<tr>
<td>ipl</td>
<td>IPL Normal from device xxxx</td>
</tr>
<tr>
<td>iplc</td>
<td>IPL Clear from device xxxx</td>
</tr>
<tr>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------------------------------------------------</td>
</tr>
<tr>
<td>sysreset</td>
<td>SYSTEM RESET manual operation</td>
</tr>
<tr>
<td>sysclear</td>
<td>SYSTEM CLEAR RESET manual operation</td>
</tr>
<tr>
<td>store</td>
<td>Store CPU status at absolute zero</td>
</tr>
<tr>
<td>sclproot</td>
<td>Set or display SCLP base directory</td>
</tr>
<tr>
<td>http</td>
<td>Start, stop, modify or display HTTP server</td>
</tr>
<tr>
<td>psw</td>
<td>Display or alter program status word</td>
</tr>
<tr>
<td>gpr</td>
<td>Display or alter general purpose registers</td>
</tr>
<tr>
<td>fpr</td>
<td>Display or alter floating point registers</td>
</tr>
<tr>
<td>fpc</td>
<td>Display or alter floating point control register</td>
</tr>
<tr>
<td>cr</td>
<td>Display or alter control registers</td>
</tr>
<tr>
<td>ar</td>
<td>Display access registers</td>
</tr>
<tr>
<td>pr</td>
<td>Display prefix register</td>
</tr>
<tr>
<td>timerint</td>
<td>Display or set timers update interval</td>
</tr>
<tr>
<td>clocks</td>
<td>Display TOD clock and CPU timer</td>
</tr>
<tr>
<td>ipending</td>
<td>Display pending interrupts</td>
</tr>
<tr>
<td>ds</td>
<td>Display subchannel</td>
</tr>
<tr>
<td>abs</td>
<td>Display or alter absolute storage</td>
</tr>
<tr>
<td>r</td>
<td>Display or alter real storage</td>
</tr>
<tr>
<td>v</td>
<td>Display or alter virtual storage</td>
</tr>
<tr>
<td>u</td>
<td>Disassemble storage</td>
</tr>
<tr>
<td>devtmax</td>
<td>Display or set max device threads</td>
</tr>
<tr>
<td>k</td>
<td>Display CCKD internal trace</td>
</tr>
<tr>
<td>memlock</td>
<td>Lock Hercules memory</td>
</tr>
<tr>
<td>attach</td>
<td>Configure device</td>
</tr>
<tr>
<td>detach</td>
<td>Remove device</td>
</tr>
<tr>
<td>define</td>
<td>Rename device</td>
</tr>
<tr>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>devinit</td>
<td>Reinitialize device</td>
</tr>
<tr>
<td>devlist</td>
<td>List device, device class or all devices</td>
</tr>
<tr>
<td>qcpuid</td>
<td>Display CPU ID</td>
</tr>
<tr>
<td>qd</td>
<td>Query device information</td>
</tr>
<tr>
<td>qpfkeys</td>
<td>Display the current PF key settings</td>
</tr>
<tr>
<td>qpid</td>
<td>Display process ID of Hercules</td>
</tr>
<tr>
<td>qports</td>
<td>Display TCP/IP ports in use</td>
</tr>
<tr>
<td>qproc</td>
<td>Display processors type and utilization</td>
</tr>
<tr>
<td>qstor</td>
<td>Display main and expanded storage values</td>
</tr>
<tr>
<td>mounted_tape_reinit</td>
<td>Control tape initialization</td>
</tr>
<tr>
<td>auto_scsi_mount</td>
<td>Automatic SCSI tape mounts (deprecated, use SCSIMOUNT instead)</td>
</tr>
<tr>
<td>scsimount</td>
<td>Automatic SCSI tape mounts</td>
</tr>
<tr>
<td>autoinit</td>
<td>Display or set the automatic creation of empty tape files</td>
</tr>
<tr>
<td>automount</td>
<td>Display or update allowable tape automount directories</td>
</tr>
<tr>
<td>mt</td>
<td>Control magnetic tape operation</td>
</tr>
<tr>
<td>cd</td>
<td>Change directory</td>
</tr>
<tr>
<td>dir</td>
<td>Display file and directory listing</td>
</tr>
<tr>
<td>ls</td>
<td>Display file and directory listing</td>
</tr>
<tr>
<td>pwd</td>
<td>Print working directory</td>
</tr>
<tr>
<td>sh</td>
<td>Shell command</td>
</tr>
<tr>
<td>exec</td>
<td>Execute a REXX script</td>
</tr>
<tr>
<td>rexx</td>
<td>Display or set REXX interpreter settings</td>
</tr>
<tr>
<td>cache</td>
<td>Execute cache related commands</td>
</tr>
<tr>
<td>cachestats</td>
<td>Display cache statistics</td>
</tr>
<tr>
<td>cckd</td>
<td>CCKD command</td>
</tr>
<tr>
<td>shrd</td>
<td>Display or set shared device server trace</td>
</tr>
<tr>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>shrdport</td>
<td>Set shared device server port</td>
</tr>
<tr>
<td>conkpalv</td>
<td>Display / alter console TCP/IP keep-alive settings</td>
</tr>
<tr>
<td>t</td>
<td>Instruction trace</td>
</tr>
<tr>
<td>t+</td>
<td>Instruction trace on</td>
</tr>
<tr>
<td>t-</td>
<td>Instruction trace off</td>
</tr>
<tr>
<td>t?</td>
<td>Instruction trace query</td>
</tr>
<tr>
<td>s</td>
<td>Instruction stepping</td>
</tr>
<tr>
<td>s+</td>
<td>Instruction stepping on</td>
</tr>
<tr>
<td>s-</td>
<td>Instruction stepping off</td>
</tr>
<tr>
<td>s?</td>
<td>Instruction stepping query</td>
</tr>
<tr>
<td>b</td>
<td>Set breakpoint (synonym for B+)</td>
</tr>
<tr>
<td>b+</td>
<td>Set breakpoint (synonym for B)</td>
</tr>
<tr>
<td>b-</td>
<td>Delete breakpoint</td>
</tr>
<tr>
<td>g</td>
<td>Turn off instruction stepping and start all CPUs</td>
</tr>
<tr>
<td>icount</td>
<td>Display individual instruction counts</td>
</tr>
<tr>
<td>pgmtrace</td>
<td>Trace program interrupts</td>
</tr>
<tr>
<td>savecore</td>
<td>Save a core image to a file</td>
</tr>
<tr>
<td>loadcore</td>
<td>Load a core image from a file</td>
</tr>
<tr>
<td>loadtext</td>
<td>Load a text deck file</td>
</tr>
<tr>
<td>modpath</td>
<td>Display or set dynamic load module path</td>
</tr>
<tr>
<td>ldmod</td>
<td>Load a module</td>
</tr>
<tr>
<td>rmmod</td>
<td>Delete a module</td>
</tr>
<tr>
<td>lsmod</td>
<td>List dynamic modules</td>
</tr>
<tr>
<td>lsdep</td>
<td>List module dependencies</td>
</tr>
<tr>
<td>iodelay</td>
<td>Display or set I/O delay value</td>
</tr>
<tr>
<td>ctc</td>
<td>Enable / disable CTC debugging</td>
</tr>
<tr>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------------------------------------</td>
</tr>
<tr>
<td>ptp</td>
<td>Enable / disable PTP debugging</td>
</tr>
<tr>
<td>tt32</td>
<td>Control / query CTCI-WIN functionality</td>
</tr>
<tr>
<td>toddrag</td>
<td>Display or set TOD clock drag factor</td>
</tr>
<tr>
<td>syncio</td>
<td>Display syncio device statistics</td>
</tr>
<tr>
<td>kd</td>
<td>Clear held messages</td>
</tr>
<tr>
<td>msghdl</td>
<td>Display or set timeout value of held messages</td>
</tr>
<tr>
<td>maxrates</td>
<td>Display highest MIPS/SIO rate or set new reporting interval</td>
</tr>
<tr>
<td>panrate</td>
<td>Display or set console refresh rate</td>
</tr>
<tr>
<td>pantitle</td>
<td>Display or set console window title</td>
</tr>
<tr>
<td>showdvol1</td>
<td>Display or set enable showing of DASD volsers in device list</td>
</tr>
<tr>
<td>defsym</td>
<td>Define a symbol</td>
</tr>
<tr>
<td>delsym</td>
<td>Delete a symbol</td>
</tr>
<tr>
<td>script</td>
<td>Run a sequence of console commands contained in a file</td>
</tr>
<tr>
<td>cscript</td>
<td>Cancel a running script thread</td>
</tr>
<tr>
<td>ecpsvm</td>
<td>ECPS:VM commands</td>
</tr>
<tr>
<td>aea</td>
<td>Display AEA (absolute-effective-address) tables</td>
</tr>
<tr>
<td>aia</td>
<td>Display AIA (absolute-instruction-address) tables</td>
</tr>
<tr>
<td>tlb</td>
<td>Display TLB tables</td>
</tr>
<tr>
<td>$locate</td>
<td>Display and verify Hercules control blocks</td>
</tr>
<tr>
<td>$test</td>
<td>Custom test command</td>
</tr>
<tr>
<td>$zapcmd</td>
<td>Enable or disable system parameters and console commands</td>
</tr>
<tr>
<td>sizeof</td>
<td>Display size of structures</td>
</tr>
<tr>
<td>suspend</td>
<td>Suspend Hercules</td>
</tr>
<tr>
<td>resume</td>
<td>Resume Hercules</td>
</tr>
<tr>
<td>herclogo</td>
<td>Read a new Hercules logo file</td>
</tr>
<tr>
<td>Command</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>traceopt</td>
<td>Instruction trace display option</td>
</tr>
<tr>
<td>symptom</td>
<td>Instruction trace display option (alias for TRACEOPT command)</td>
</tr>
<tr>
<td>cmdtgt</td>
<td>Specify the command target</td>
</tr>
<tr>
<td>herc</td>
<td>Send Hercules command</td>
</tr>
<tr>
<td>scp</td>
<td>Send system control program command</td>
</tr>
<tr>
<td>pscp</td>
<td>Send system control program priority message</td>
</tr>
<tr>
<td>sf+</td>
<td>Create a new shadow file</td>
</tr>
<tr>
<td>sf-</td>
<td>Delete a shadow file</td>
</tr>
<tr>
<td>sfc</td>
<td>Compress a shadow file</td>
</tr>
<tr>
<td>sfd</td>
<td>Display shadow file statistics</td>
</tr>
<tr>
<td>sfk</td>
<td>Perform a chkdsk on the active shadow file</td>
</tr>
<tr>
<td>t{+/-} CKD</td>
<td>Turn CKD_KEY tracing on / off</td>
</tr>
<tr>
<td>t{+/-} dev</td>
<td>Turn CCW tracing on / off</td>
</tr>
<tr>
<td>s{+/-} dev</td>
<td>Turn CCW stepping on / off</td>
</tr>
<tr>
<td>f{+/-} addr</td>
<td>Mark frames usable / unusable</td>
</tr>
</tbody>
</table>

Table 17: Hercules Console Commands (grouped by functionality)
8. Console Command Descriptions

8.1 !message (SCP priority message)

8.1.1 Function
The "!message" (SCP) command is used to enter a system control program (i.e. guest operating system) priority command on the Hercules console. The command to be issued has to be prefixed with an exclamation point '!'.

This command is similar to the "reply" command. It is up to the operating system to differentiate between them.

8.1.2 Syntax

Descriptive

!prio_msg

Diagram

▶️ !prio message ◀️

8.1.3 Parameter

prio_msg The priority message that will be routed to the system control program running under the Hercules Emulator.

8.1.4 Examples

For a similar sample please see the "reply" command.
8.2 # (Silent comment)

8.2.1 Function
The hash ("#") provides a convenient way of entering comments into the Hercules log file only with no other effect ("silent" comment). The comment is not processed in any way other than to echo it in the log file.

8.2.2 Syntax

**Descriptive**

# anytext

**Diagram**

```
>>> # anytext
```

8.2.3 Parameter

*anytext* This is the text that has to be written only to the Hercules log file ("silent" comment).

8.2.4 Examples

**Example 1:**
Write a text string to the log file only ("silent" comment).

```
# A comment that is written to the Hercules log file only
```

Figure 9: Silent comment
8.3 $LOCATE (Display and verify Hercules control blocks)

8.3.1 Function
The $LOCATE command displays and verifies various Hercules control blocks. The specified control block is displayed in a hex dump format.

8.3.2 Syntax

```plaintext
Descriptive
$LOCATE controlblock

Diagram

$LOCATE controlblock

8.3.3 Parameter
controlblock This specifies the control block to be verified and displayed. Currently the following control blocks are supported through the LOCATE command:

- sysblk (System Configuration Block)
- regs (CPU Register Context)
- hostinfo (Host System Information Block)

8.3.4 Examples
Example 1:
Locate the Hercules sysblk control block. Please note that not all hex columns can be displayed in the figure below. Missing columns have been marked with "\[\]".

```
HHC00013I Herc command: '$locate sysblk'
HHC90000D DBG: SYSBLK @ 0x002333C0 - Verified
HHC90000D DBG: sysblk+0x0000  53595342  ∫∫  002333C0  SYSBLK 4.00 ....#3.
HHC90000D DBG: sysblk+0x0020  00009DE0  ∫∫  00000000  ...../........          ....
HHC90000D DBG: sysblk+0x0040  00000000  ∫∫  60140000  ..........;..... ..`pc.......`...
HHC90000D DBG: sysblk+0x0060  00000000  ∫∫  04000000  .......H......................H.
HHC90000D DBG: sysblk+0x0060  00000000  ∫∫  B00D0000  ................  ........x.......
```
### Example 2:

Locate the Hercules regs control block. Please note that not all hex columns can be displayed in the figure below. Missing columns have been marked with "∫∫".

```
HHC00013I Herc command: '$locate regs'
HHC90000D DBG: REGS[00] @ 0x02BF6788 - Verified
HHC90000D DBG: regs+0x0000  52454753 ∫∫  00000000  REGS_CP00  4.00 ......g.
HHC90000D DBG: regs+0x0020  00009720 ∫∫  00000000  ... .3#........ K........................
HHC90000D DBG: regs+0x0040  00000000 ∫∫  00000000  ................ ................
HHC90000D DBG: regs+0x0060  00000000 ∫∫  00000000  ................ ................
HHC90000D DBG: regs+0x0080  AA8AE302 ∫∫  00000000  .........p...... ................
HHC90000D DBG: regs+0x00a0  00000000 ∫∫  00000000  ................ ................
HHC90000D DBG: regs+0x00c0  00000000 ∫∫  00000000  ................ ................
HHC90000D DBG: regs+0x00e0  AA8AE302 ∫∫  00000000  .........p...... ................
HHC90000D DBG: regs+0x0100  00000000 ∫∫  00000000  ................ ................
HHC90000D DBG: regs+0x0120  00000000 ∫∫  00000000  ................ ................
HHC90000D DBG: regs+0x0140  00000000 ∫∫  00000000  ................ ................
HHC90000D DBG: regs+0x0160  00000000 ∫∫  00000000  ................ ................
HHC90000D DBG: regs+0x0180  00000000 ∫∫  00000000  ................ ................
HHC90000D DBG: regs+0x01a0  00000000 ∫∫  00000000  ................ ................
HHC90000D DBG: regs+0x01c0  00000000 ∫∫  00000000  ................ ................
HHC90000D DBG: regs+0x01e0  00000000 ∫∫  00000000  ................ ................
```

### Example 3:

Locate the Hercules hostinfo control block. Please note that not all hex columns can be displayed in the figure below. Missing columns have been marked with "∫∫".

```
HHC00013I Herc command: '$locate hostinfo'
HHC90000D DBG: HOSTINFO @ 0x0036AE00 - Verified
HHC90000D DBG: sysname           = Windows
HHC90000D DBG: nodename          = GOOFY
HHC90000D DBG: release           = 6.1.7600
HHC90000D DBG: version           = 7 Ultimate Edition 64-bit
HHC90000D DBG: machine           = Intel(R) x64
HHC90000D DBG: cpu_brand         = Intel(R) Core(TM) i7 CPU Q 720 @ 1.60GHz
```
HHC90000D DBG: trycritsec_avail = YES
HHC90000D DBG:
HHC90000D DBG: num_procs = 8
HHC90000D DBG: num_packages = 1
HHC90000D DBG: num_physical_cpu = 4
HHC90000D DBG: num_logical_cpu = 8
HHC90000D DBG: bus_speed = 0Khz
HHC90000D DBG: cpu_speed = 1.6Ghz
HHC90000D DBG: vector_unit = YES
HHC90000D DBG: fp_unit = YES
HHC90000D DBG: cpu_64bits = YES
HHC90000D DBG: cpu_aes_extns = NO
HHC90000D DBG:
HHC90000D DBG: valid_cache_nums = YES
HHC90000D DBG: cachelinesz = 64
HHC90000D DBG: L1Dcachesz = 32KiB
HHC90000D DBG: L1Icachesz = 32KiB
HHC90000D DBG: L2cachesz = 256KiB
HHC90000D DBG: L3cachesz = 6MiB
HHC90000D DBG:
HHC90000D DBG: hostpagesz = 4KiB
HHC90000D DBG: AllocGran = 64KiB
HHC90000D DBG: TotalPhys = 7.9263GiB
HHC90000D DBG: AvailPhys = 6.1006GiB
HHC90000D DBG: TotalPageFile = 15.9245GiB
HHC90000D DBG: AvailPageFile = 13.9831GiB
HHC90000D DBG: TotalVirtual = 1.9999GiB
HHC90000D DBG: AvailVirtual = 1.8433GiB

Figure 12: $LOCATE command (Host System Information Block)
8.4 $TEST (Custom test command)

8.4.1 Function
The $TEST command is used for invoking a custom test command. It performs whatever function the user specifically coded it to do.

WARNING: Do not use this command unless you specifically coded the function that this command invokes. Unless you wrote this command you probably don’t know what it is actually doing. It could perform any function, up to crashing Hercules!

8.4.2 Syntax

Descriptive
$TEST req_parms [opt_parms]

Diagram

```
>>> $TEST req_parms [opt_parms]
```

8.4.3 Parameter

req_parms Any required parameter(s) for the specific implementation of the $TEST command.

opt_parms Any optional parameter(s) for the specific implementation of the $TEST command.

8.4.4 Examples

Example 1:
Invoke the Hercules test command. This implementation of $TEST does not require any parameter.

```
HHC00013I Herc command: '$test'
*** $test command: creating threads...
*** $test thread 00002590: sleeping for 2 seconds...
*** $test thread 00002594: sleeping for 4 seconds...
*** $test thread 000036BC: sleeping for 5 seconds...
*** $test thread 0000223C: sleeping for 1 seconds...
*** $test thread 000010C4: sleeping for 3 seconds...
*** $test thread 00002590: 2 second sleep done; rc=0
*** $test thread 00003070: sleeping for 3 seconds...
```
*** $test thread 0000223C: 1 second sleep done; rc=0
*** $test thread 00002AD8: sleeping for 6 seconds...
*** $test thread 00002594: 4 second sleep done; rc=0
*** $test thread 000028EC: sleeping for 4 seconds...
*** $test thread 000010C4: 3 second sleep done; rc=0
*** $test thread 00002F2C: sleeping for 2 seconds...
*** $test thread 00002494: sleeping for 1 seconds...
*** $test thread 00003070: 3 second sleep done; rc=0
*** $test command: waiting for threads to exit...
*** $test thread 00002494: 1 second sleep done; rc=0
*** $test thread 000036BC: 5 second sleep done; rc=0
*** $test thread 00002F2C: 2 second sleep done; rc=0
*** $test thread 000028EC: 4 second sleep done; rc=0
*** $test thread 00002AD8: 6 second sleep done; rc=0
*** $test command: test complete.

Figure 13: $TEST command
8.5 $ZAPCMD (Enable or disable system parameters and console commands)

8.5.1 Function

The $ZAPCMD console command allows it to enable or disable a given command name as a system parameter (configuration statement) or console command.

This is a console command used for debugging and requires that the debug command level has been set. This is the default for debug builds, but not for normal production builds.

To activate the $ZAPCMD console command for normal non-debug production release builds, use the following command sequence:

```
MSGLVL VERBOSE (optional)
MSGLVL DEBUG (optional)
CMDLVL DEBUG (required)
$ZAPCMD cmdname option
```

Note: It is possible to disable the $ZAPCMD console command itself, so be careful!

8.5.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ZAPCMD cmdname [CFG</td>
</tr>
</tbody>
</table>

Diagram

```
$ZAPCMD cmdname CFG
     NOCFG
     CMD
     NOCMD
```

8.5.3 Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>cmdname</td>
<td>Specifies the command name of the system parameter (configuration statement) or the console command that has to be enabled or disabled.</td>
</tr>
<tr>
<td>CFG</td>
<td>Enable the given command name as a system parameter (configuration statement).</td>
</tr>
<tr>
<td>NOCFG</td>
<td>Disable the given command name as a system parameter (configuration statement).</td>
</tr>
</tbody>
</table>
**CMD**
Enable the given command name as a console command.

**NOCMD**
Disable the given command name as a console command.

### 8.5.4 Examples

**Example 1:**
Disable ARCHLVL as a console command.

```
HHC00013I Herc command: 'archlvl s/370'
HHC01603I $zapcmd archlvl nocmd
HHC01603I archlvl s/370
HHC01600E Unknown command archlvl, enter 'help' for a list of valid commands
```

**Figure 14: $ZAPCMD command (disable console command)**
8.6  * (Loud comment)

8.6.1 Function
The asterisk ("*") provides a convenient way of entering comments into the Hercules log file and to the Hercules console with no other effect ("loud" comment). The comment is not processed in any way other than to echo it in the log file and at the console.

8.6.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
<th>* anytext</th>
</tr>
</thead>
</table>

Diagram


8.6.3 Parameter

<table>
<thead>
<tr>
<th>anytext</th>
</tr>
</thead>
<tbody>
<tr>
<td>This is the text that has to be written to the Hercules log file and displayed on the Hercules console (&quot;loud&quot; comment).</td>
</tr>
</tbody>
</table>

8.6.4 Examples

Example 1:
Write a text string to the log file and the console ("loud" comment).

* A comment that is written to the Hercules log file and displayed on the Hercules console

Figure 15: Loud comment
8.7 .reply (SCP command)

8.7.1 Function
The “.reply” (SCP) command is used to give a reply to a system control program (i.e. the guest operating system running under Hercules) message. To reply to a SCP message that gets issued to the Hercules console, prefix the reply with a period (dot).

8.7.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
<th>.reply</th>
</tr>
</thead>
</table>

Diagram

8.7.3 Parameter

reply The reply that will be routed to the system control program running under the Hercules Emulator.

8.7.4 Examples

Example 1:
Reply to message IGGN504A (“r 00,0148”).

```
* IGGN504A SPECIFY UNIT FOR CATALOG.MVS.MASTER ON MVSRES
  .r 00,0148
  HHCCP041I SYSCONS interface active
  IEE600I REPLY TO 00 IS;0148
```

Figure 16: SCP command
8.8  ? (List all commands / command specific help)

8.8.1 Function

The “?” command is an alias for the “help” command. Without any options it will display a sorted list of all commands matching the current command level with a short description. It is possible to specify a partial command name followed by an asterisk (‘*’) to get a list of all commands matching the partial command name. For example ‘? msg*’ will list all commands beginning with ‘msg’ and matching the current command level.

If the list is entered with a full command name it will display a long form of help information associated with that command if the command is available for the current command level. The list provided by the command without options shows with an asterisk in front of the description if there is additional information available.

The displayed help text may be limited to explaining the general format of the command and its various required or optional parameters and is not meant to replace the appropriate manual.

8.8.2 Syntax

Descriptive

? [command | cmd*]

Diagram

```
?  [command | cmd*]
```

8.8.3 Parameter

```
command  The Hercules console command to which additional information is desired.

cmd*     Provides a list of all commands beginning with the partial command name ‘cmd’ and matching the current command level.
```

8.8.4 Examples

Example 1:

List all valid console commands matching the current command level.

```
HHC00013I Herc command: '?'
HHC01603I
```
<table>
<thead>
<tr>
<th>HHC01602I Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HHC01602I -------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>HHC01602I !message</td>
<td>*SCP priority message</td>
</tr>
<tr>
<td>HHC01602I #</td>
<td>Silent comment</td>
</tr>
<tr>
<td>HHC01602I *</td>
<td>Loud comment</td>
</tr>
<tr>
<td>HHC01602I .reply</td>
<td>*SCP command</td>
</tr>
<tr>
<td>HHC01602I ?</td>
<td>alias for help</td>
</tr>
<tr>
<td>HHC01602I aea</td>
<td>Display AEA tables</td>
</tr>
<tr>
<td>HHC01602I ais</td>
<td>Display AIA fields</td>
</tr>
<tr>
<td>HHC01602I alrf</td>
<td>Command deprecated: Use &quot;archlvl&quot; instead</td>
</tr>
<tr>
<td>HHC01602I ar</td>
<td>Display access registers</td>
</tr>
<tr>
<td>HHC01602I archlvl</td>
<td>*Set Architecture Level</td>
</tr>
<tr>
<td>HHC01602I archmode</td>
<td>Alias for archlvl</td>
</tr>
<tr>
<td>HHC01602I asn_and_l</td>
<td>Command deprecated: Use &quot;archlvl&quot; instead</td>
</tr>
<tr>
<td>HHC01602I attach</td>
<td>*Configure device</td>
</tr>
<tr>
<td>HHC01602I auto_scsi</td>
<td>*Command deprecated - Use &quot;SCSIMOUNT&quot;</td>
</tr>
<tr>
<td>HHC01602I autoinit</td>
<td>*Display/Set automatic create empty tape file switch</td>
</tr>
<tr>
<td>HHC01602I automount</td>
<td>*Display/Update allowable tape automount directories</td>
</tr>
<tr>
<td>HHC01602I b</td>
<td>*Set breakpoint</td>
</tr>
<tr>
<td>HHC01602I b+</td>
<td>Set breakpoint</td>
</tr>
<tr>
<td>HHC01602I b-</td>
<td>*Delete breakpoint</td>
</tr>
<tr>
<td></td>
<td>several lines not displayed</td>
</tr>
<tr>
<td>HHC01602I s{+/-}dev</td>
<td>Turn CCW stepping on/off</td>
</tr>
<tr>
<td>HHC01602I t</td>
<td>*Instruction trace</td>
</tr>
<tr>
<td>HHC01602I t+</td>
<td>*Instruction trace on</td>
</tr>
<tr>
<td>HHC01602I t-</td>
<td>Turn off instruction tracing</td>
</tr>
<tr>
<td>HHC01602I t?</td>
<td>*Instruction trace query</td>
</tr>
<tr>
<td>HHC01602I timerint</td>
<td>*Display or set timers update interval</td>
</tr>
<tr>
<td>HHC01602I tlb</td>
<td>Display TLB tables</td>
</tr>
<tr>
<td>HHC01602I toddrag</td>
<td>Display or set TOD clock drag factor</td>
</tr>
<tr>
<td>HHC01602I todprio</td>
<td>Set/Display todprio parameter</td>
</tr>
<tr>
<td>HHC01602I traceopt</td>
<td>*Instruction trace display options</td>
</tr>
<tr>
<td>HHC01602I tt32</td>
<td>*Control/query CTCI-WIN functionality</td>
</tr>
<tr>
<td>HHC01602I tzoffset</td>
<td>Set tzoffset parameter</td>
</tr>
<tr>
<td>HHC01602I t{+/-}CKD</td>
<td>Turn CKD_KEY tracing on/off</td>
</tr>
<tr>
<td>HHC01602I t{+/-}dev</td>
<td>Turn CCW tracing on/off</td>
</tr>
<tr>
<td>HHC01602I u</td>
<td>Disassemble storage</td>
</tr>
<tr>
<td>HHC01602I uptime</td>
<td>Display how long Hercules has been running</td>
</tr>
<tr>
<td>HHC01602I v</td>
<td>*Display or alter virtual storage</td>
</tr>
<tr>
<td>HHC01602I version</td>
<td>Display version information</td>
</tr>
<tr>
<td>HHC01602I xpndsize</td>
<td>*Define/Display xpndsize parameter</td>
</tr>
<tr>
<td>HHC01602I yroffset</td>
<td>Set yroffset parameter</td>
</tr>
<tr>
<td>HHC01603I</td>
<td>(*) More help available.</td>
</tr>
</tbody>
</table>

**Figure 17:** “?” command
Example 2:
Display a list of commands beginning with ‘cpu’ and matching the current command level.

<table>
<thead>
<tr>
<th>Herc</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>cpu</td>
<td>Define target cpu for panel display and commands</td>
</tr>
<tr>
<td>cpuidfmt</td>
<td>Set format 0/1 STIDP generation</td>
</tr>
<tr>
<td>cpumodel</td>
<td>Set CPU model number</td>
</tr>
<tr>
<td>cpuprio</td>
<td>Set/Display cpuprio parameter</td>
</tr>
<tr>
<td>cpuserial</td>
<td>Set CPU serial number</td>
</tr>
<tr>
<td>cpuverid</td>
<td>Set CPU version number</td>
</tr>
</tbody>
</table>

(*) More help available.

Figure 18: “? CPU*” command

Example 3:
Display additional help text for the MAINSIZE command.

<table>
<thead>
<tr>
<th>Herc</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mainsize</td>
<td>Define/Display mainsize parameter</td>
</tr>
</tbody>
</table>

Format: mainsize [ mmmm | nnnS | [ lOCK | unlOCK ] ]

- mmmm - define main storage size mmmm Megabytes
- nnnS - define main storage size nnn S where S is the multiplier
- B = no multiplier
- K = 2**10 (kilo/kibi)
- M = 2**20 (mega/mebi)
- G = 2**30 (giga/gibi)
- T = 2**40 (tera/tebi)
- P = 2**50 (peta/pebi)
- E = 2**60 (exa/exbi)
- lOCK - attempt to lock storage (pages lock by host OS)
- unlOCK - leave storage unlocked (pagable by host OS)
- (none) - display current mainsize value

Note: Multipliers 'T', 'P', and 'E' are not available on 32bit machines.

Figure 19: “? MAINSIZE” command
8.9 ABS (Display or alter absolute storage)

8.9.1 Function
The ABS command allows you to display or alter absolute storage. Up to 64K of absolute storage can be displayed, up to 32 bytes of absolute storage can be altered.

8.9.2 Syntax

**Descriptive**

ABS {addr | addr.length | addr-addr | addr=value}

**Diagram**

```
ABS addr
    | addr.length
    | addr-addr
    | addr=value
```

8.9.3 Parameter

- **addr**
  Specifies the address of the absolute storage that is to be displayed. If *addr* is given without a length or without a second address for the end of the storage area then 64 bytes of absolute storage are displayed.

- **addr.length**
  Specifies the address of the absolute storage area that is to be displayed with starting address and length (from address *addr* with the length of *length*). The *length* value must be given in hexadecimal. The maximum length that can be specified is 64K.

- **addr-addr**
  Specifies an address range with start and end address (from begin address to end address) of the absolute storage area that is to be displayed.

- **addr=value**
  Specifies the address of the absolute storage area that is to be altered. *value* is a hex-string of up to 32 pairs of hex digits (32 bytes) which will be written to the absolute storage address given by the *addr* parameter. After altering the storage, 16 bytes of absolute storage starting at *addr* are displayed.
8.9.4 Examples

Example 1:

to be done.

```
HHC00013I Herc command: 'abs 00000000.ff'
```

Figure 20: ABS command (display absolute storage)

Example 2:

to be done.

```
HHC00013I Herc command: 'abs 00000000=FFFFFFFF'
```

Figure 21: ABS command (alter absolute storage)
8.10 AEA (Display AEA absolute-effective-address tables)

8.10.1 Function
Display the Hercules AEA tables. The AEA table is an address lookup accelerator which saves absolute data addresses for further lookups to eliminate the calls to logical_to_main. This shortens the translation path length.

8.10.2 Syntax

Descriptive
AEA

Diagram

8.10.3 Parameter
None.

8.10.4 Examples
Example 1:
Display the AEA tables

HHC00013I Herc command: 'aea'
HHC02282I aea mode DAT-Off
HHC02282I aea ar 0D 07 01 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20
HHC02282I aea common 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
HHC02282I aea cr[1] 0000000000000000
HHC02282I aea cr[7] 0000000000000000
HHC02282I aea cr[13] 0000000000000000
HHC02282I aea cr[r] 0000000000000000
HHC02282I aea alb[0] 0000000000000000
HHC02282I aea alb[1] 0000000000000000
HHC02282I aea alb[2] 0000000000000000
HHC02282I aea alb[3] 0000000000000000
HHC02282I aea alb[4] 0000000000000000
HHC02282I aea alb[5] 0000000000000000
HHC02282I aea alb[6] 0000000000000000
HHC02282I aea alb[7] 0000000000000000
Figure 22: AEA command
8.11 AIA (List AIA absolute-instruction-address fields)

8.11.1 Function
Display the Hercules AIA fields. The AIA fields are instruction fetch accelerators which save absolute instruction addresses for further lookups to shorten the translation path length.

8.11.2 Syntax

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIA</td>
</tr>
</tbody>
</table>

---

8.11.3 Parameter
None.

8.11.4 Examples
Example 1:
Display the AIA fields.

```
HHC00013I Herc command: 'aia'
HHC02283I AIV 000000000002f800 aip 0000000003AB0800 ip 0000000003AB01AA aie 0000000000000000 aim 0000000003A9F000
```

Figure 23: AIA command
8.12 AR (Display access registers)

8.12.1 Function
Display the current contents of the access registers.

8.12.2 Syntax

Descriptive
AR

Diagram

8.12.3 Parameter
None.

8.12.4 Examples
Example 1:
Display the access registers.

HHC00013I Herc command: 'ar'
HHC02272I Access registers
HHC02272I CP00: AR00=00000000 AR01=00000000 AR02=0000062A AR03=874653B0
HHC02272I CP00: AR04=87461860 AR05=07F51080 AR06=87465190 AR07=00000000
HHC02272I CP00: AR08=8746531C AR09=070D0060 AR10=00000000 AR11=00000000
HHC02272I CP00: AR12=00000000 AR13=00000000 AR14=00000000 AR15=00000000

Figure 24: AR command
8.13 ARCHLVL (Set architecture level)

8.13.1 Function
The ARCHLVL console command is used to display or set the architecture mode. Given without any parameters the ARCHLVL command displays the current setting of the architecture mode.

Additional parameters may be specified to set a new value for the architecture mode, to enable or disable specific facilities, to override the STFLE (Store Facility List Extended) response and force it to return a certain (incorrect) bit pattern or to display the status (enabled or disabled) of facilities. An overview of all architecture facilities can be found in “Appendix C. Architecture Facilities” on page 643.

8.13.2 Syntax

**Descriptive**

ARCHLVL [S/370 | ESA/390 | ESAME | z/ARCH]

or

ARCHLVL {ENABLE | DISABLE} facility [S/370 | ESA/390 | ESAME | z/ARCH]

or

ARCHLVL QUERY [facility | ALL]

or

ARCHLVL {ENABLE | DISABLE} bitno [S/370 | ESA/390 | ESAME | z/ARCH]

**Diagram**

```
ARCHLVL
   | S/370
   | ESA/390
   | ESAME
   | z/ARCH

or

ARCHLVL
   | ENABLE
   | DISABLE
   | facility
   | S/370
   | ESA/390
   | ESAME
   | z/ARCH

or
```
### 8.13.3 Parameter

**S/370**
Use S/370 for OS/360, VM/370 and MVS 3.8.

**ESA/390**
Use ESA/390 for MVS/XA, MVS/ESA, OS/390, VM/ESA, VSE/ESA, Linux/390 and ZZSA. zOS can be run until version 1.2 with ESA/390 mode without installed bimodal feature or until version 1.4 if the bimodal feature is installed.

**ESAME**
Use ESAME (Enterprise System Architecture, Modal Extensions) for z/OS, z/VM, z/VSE and z/Linux. The ESAME mode is equivalent to z/Architecture mode at Architecture Level 2.

When ESAME is specified, the machine will always be IPL’ed in ESA/390 mode but the system is capable of being switched into the z/Architecture mode after IPL. This is handled automatically by all z/Architecture operating systems.

**z/ARCH**
Use z/ARCH for z/OS, z/VM, z/VSE and z/Linux. z/ARCH is similar to ESAME. The z/Arch mode is equivalent to z/Architecture mode at Architecture Level 3.

**ENABLE**
Enable the specified facility. If no architecture mode is given as additional parameter the facility is enabled for all architecture modes.

**DISABLE**
Disable the specified facility. If no architecture mode is given as additional parameter the facility is disabled for all architecture modes.

**facility**
The name of the facility that has to be enabled, disabled or displayed. An overview of all architecture facilities can be found in “Appendix C. Architecture Facilities” on page 643.

**bitno**
The bit number of the facility that has to be enabled or disabled. The format of *bitno* is BITnn, e.g. “BIT44” (Bit 44 = PFPO Facility Bit). An overview of all architecture facilities can be found in “Appendix C. Architecture Facilities” on page 643.

**QUERY**
Display the facility settings.

**ALL**
Specifies that all facilities have to be displayed.
8.13.4 Examples

Example 1:
Display the current setting of the architecture mode.

```
HHC00013I Herc command: 'archlvl'
HHC02203I Value 'archmode': 'S/370'
```

Figure 25: ARCHLVL command (display architecture mode)

Example 2:
Set the architecture level to z/ARCH.

```
HHC00013I Herc command: 'archlvl z/arch'
```

Figure 26: ARCHLVL command (set new architecture mode)

Example 3:
Disable the 'DECIMAL_FLOAT' facility in z/Architecture mode.

```
HHC00013I Herc command: 'archlvl disable decimal_float z/arch'
HHC00898I Facility(DECIMAL_FLOAT) disabled for archmode z/Arch
```

Figure 27: ARCHLVL command (enable facility)

Example 4:
Force the enabling of the PFPO feature (bit number 44) for all architecture modes.

```
HHC00013I Herc command: 'archlvl enable bit44'
HHC00898I Facility(44) enabled for archmode S/370
HHC00898I Facility(44) enabled for archmode ESA/390
HHC00898I Facility(44) enabled for archmode z/Arch
```

Figure 28: ARCHLVL command (force on facility)

Example 5:
Query all facilities.

```
HHC00013I Herc command: 'archlvl query all'
HHC00890I Facility(N3)   Enabled
HHC00890I Facility(ESAME_INSTALLED)   Enabled
HHC00890I Facility(ESAME_ACTIVE)      Enabled
HHC00890I Facility(IDTE_INSTALLED)    Enabled
```

Figure 29: ARCHLVL command (query facilities)
### Figure 29: ARCHLVL command (query all)

#### Example 6:

Query the ‘MOVE_INVERSE’ facility.

```
HHC00013I Herc command: 'archlvl query move_inverse'
HHC00890I Facility(MOVE_INVERSE ) Enabled
```

### Figure 30: ARCHLVL command (query facility)
8.14 ARCHMODE (Set architecture mode)

8.14.1 Function
The ARCHMODE command has been deprecated. This command was used to specify the initial architecture mode.

ARCHMODE is still accepted and is treated as an alias for the ARCHLVL console command. However in the future the ARCHLVL command should be used instead. Please see ARCHLVL for details.

8.14.2 Syntax
See ARCHLVL console command.

8.14.3 Parameter
See ARCHLVL console command.

8.14.4 Examples
See ARCHLVL console command.
8.15 ATTACH (Configure device)

8.15.1 Function
The ATTACH command configures a new device and makes it available in the active configuration. The
effect of this command is immediately visible in the device display of the Hercules Windows GUI or the
Hercules “Peripherals” display if the GUI is not used.

8.15.2 Syntax

Descriptive
ATTACH devn type [argument [argument ...]]

Diagram

\[
\begin{align*}
\text{ATTACH} & \quad \text{devn} \quad \text{devtype} \\
& \quad \quad \quad \text{argument}
\end{align*}
\]

8.15.3 Parameter

devn The device number of the device that is to be configured in the current configuration.

type The device type that is to be configured in the current configuration. For valid de-
vice types see chapter 6 (Device Definition Descriptions).

argument These are the additional arguments for the device that is to be configured in the
current configuration. The arguments are dependent on the device type. For
additional information on valid arguments see chapter 6 (Device Definition De-
scriptions).

8.15.4 Examples

Example 1:
Attach a printer device to the active configuration.

HHCO0013I Herc command: 'attach 000f 1403 d:/mvs/prt/prt2.txt crlf'
HHCO2198I Device attached

Figure 31: ATTACH command (configure printer)
Example 2:
Attach a display terminal to the active configuration.

```
HHC00013I Herc command 'attach 0700 3270'
HHC02198I Device attached
```

Figure 32: ATTACH command (configure display terminal)
8.16 AUTO_SCSI_MOUNT  (Automatic SCSI tape mounts)

8.16.1 Function
The AUTO_SCSI_MOUNT panel command has been deprecated and is replaced by SCSIMOUNT. See SCSIMOUNT panel command for details.

8.16.2 Syntax
See SCSIMOUNT panel command.

8.16.3 Parameter
See SCSIMOUNT panel command.

8.16.4 Examples
See SCSIMOUNT panel command.
8.17 AUTOINIT (Display or set the automatic creation of empty tape files)

8.17.1 Function
The AUTOINIT console command controls the automatic creation of empty tape files. AUTOINIT handles the "file not found" condition for a specified tape file. It controls if DEVINIT returns a "file not found" error or creates an empty tape file if the tape file could not be found. Given without an argument AUTOINIT displays the current setting.

8.17.2 Syntax

Descriptive
AUTOINIT [ON | OFF]

Diagram

8.17.3 Parameter
ON When AUTOINIT is set ON, DEVINIT will initialize a blank, non-labeled tape if the specified tape file is not found. Next, DEVINIT writes two tapemarks, rewinds the tape and positions the tape to the beginning.

OFF When AUTOINIT is set OFF (which is the default), DEVINIT will return a "file not found" error if the specified tape file is not found.

8.17.4 Examples
Example 1:
Display the current AUTOINIT setting.

HHC00013I Herc command: 'autoinit'
HHC02203I Value 'autoinit': 'off'

Figure 33: AUTOINIT command (display current setting)


Example 2:

Set the automatic creation of empty tape files to ‘ON’.

```
23:05:25.148 00000ABC HHC00013I Herc command: 'autoinit on'
23:05:25.148 00000ABC HHC02204I Value 'autoinit' set to 'on'
```

Figure 34: AUTOINIT command (change setting)
8.18 AUTOMOUNT (Display or update allowable tape automount directories)

8.18.1 Function
The AUTOMOUNT command allows it to add or delete entries from the list of allowable/unallowable tape automount directories, or lists all currently defined list entries, if any.

The format of the directory operand for add/del operations is identical to that as described in the documentation for the AUTOMOUNT system parameter (i.e. prefix with '+' or '-' as needed).

The automount feature is appropriately enabled or disabled for all tape devices as needed depending on the updated empty/non-empty list state.

8.18.2 Syntax

Descriptive

AUTOMOUNT {ADD directory | DEL directory | LIST}

or

AUTOMOUNT [ + | - ]directory

Diagram

![Diagram of AUTOMOUNT command]

8.18.3 Parameter

ADD or + Add an entry to the list of allowable tape automount directories.

DEL or - Delete an entry from the list of allowable tape automount directories.

LIST List all currently defined list entries of allowable tape automount directories.

directory Specifies the host system directory where the guest is allowed or not to automatically load virtual tape volumes from.
8.18.4 Examples

Example 1:
Add entries to the list of allowable tape automount directories.

```
HHC00013I Herc command: 'automount add D:/MVS/Tape'
HHC02203I default allowed automount directory: 'D:/MVS/Tape/'
HHC00013I Herc command: 'automount add D:/MVS/Cart'
HHC02203I allowed automount directory: 'D:/MVS/Cart/'
```

Figure 35: AUTOMOUNT command (add entries)

Example 2:
List all currently defined list entries of allowable tape automount directories.

```
HHC00013I Herc command: 'automount list'
HHC02217I '+D:/MVS/Tape/'
HHC02217I '+D:/MVS/Cart/'
```

Figure 36: AUTOMOUNT command (list entries)

Example 3:
Delete an entry from the list of allowable tape automount directories.

```
HHC00013I Herc command: 'automount del D:/MVS/Cart'
HHC02220I Entry deleted
```

Figure 37: AUTOMOUNT command (delete entry)
8.19 B (Set breakpoint)

8.19.1 Function
The B (or B+) command sets a breakpoint. The argument gives an instruction address or a range of addresses where you wish to halt the execution. Once the breakpoint is reached, instruction execution is temporarily halted and the next instruction to be executed is displayed. You may then examine registers and/or storage etc. To continue execution after reaching a breakpoint, enter the “G” command.

The “B” command is synonymous with the “S+” command.

8.19.2 Syntax

**Descriptive**

B { addr | addr-addr}

**Diagram**

```
\[ \text{B} \quad \text{addr} \quad \text{addr-addr} \]
```

8.19.3 Parameter

- **addr**: Instruction address where instruction execution is to be stopped.
- **addr-addr**: Range of instruction addresses where instruction execution is to be stopped.

8.19.4 Examples

Example 1:
Set a breakpoint at instruction address 01000000.

```
HHC00013I Herc command: 'b+ 01000000'
HHC02229I Instruction break on range 1000000-1000000
```

Figure 38: B command
8.20 B+ (Set breakpoint)

8.20.1 Function
The B+ (or B) command sets a breakpoint. The argument gives an instruction address or a range of
addresses where you wish to halt the execution. Once the breakpoint is reached, instruction execution is
temporarily halted and the next instruction to be executed is displayed. You may then examine registers
and/or storage etc. To continue execution after reaching a breakpoint, enter the “G” command.
The “B+” command is synonymous with the “S+” command.

8.20.2 Syntax

### Descriptive

B+ { addr | addr-addr }

### Diagram

![Diagram of B+ command]

#### 8.20.3 Parameter

- **addr**
  Instruction address where instruction execution is to be stopped.

- **addr-addr**
  Range of instruction addresses where instruction execution is to be stopped.

8.20.4 Examples

**Example 1:**
Set a breakpoint at instruction address 01000000.

```
HHC00013I Herc command: 'b+ 01000000'
HHC02229I Instruction break on range 10000000-10000000
```

**Figure 39: B+ command**
8.21 B- (Delete breakpoint)

8.21.1 Function
The B- command removes any previously set breakpoint.

8.21.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-</td>
</tr>
</tbody>
</table>

8.21.3 Parameter
None.

8.21.4 Examples
Example 1:
Delete the previously set breakpoint.

```
HHC00013I Herc command: 'b-'
HHC02229I Instruction break off range 1000000-1000000
```

Figure 40: B- command
8.22 CACHE (Execute cache related commands)

8.22.1 Function
The CACHE command is used to execute various cache related commands. It allows to switch on or off the caching for the DASD system and to display the status of the system DASD caching. Given without an argument the CACHE command displays the cache statistics (see also CACHESTATS command).

8.22.2 Syntax

**Descriptive**

CACHE [DASD SYSTEM [ON | OFF]]

**Diagram**

![Diagram of CACHE command]

8.22.3 Parameter

**DASD SYSTEM** Displays the status of the DASD system caching if given without an additional argument, otherwise enables or disables the caching for all DASD devices.

**ON** Enables the caching for all DASD devices.

**OFF** Disables the caching for all DASD devices.

8.22.4 Examples

**Example 1:**
Display the status of the DASD system caching.

```
HHC00013I Herc command: 'cache dasd system'
HHC02203I dasd system cache: on
```

Figure 41: CACHE command (display status of DASD system caching)
Example 2:
Disable caching for all DASD devices.

```
HHC00013I Herc command: 'cache dasd system off'
HHC02204I dasd system cache set to off
```

Figure 42: CACHE command (disable caching for DASD devices)

Example 3:
Display the current cache statistics.

```
HHC00013I Herc command: 'cache'
HHC02294I Cache............          0
HHC02294I nbr .............        229
HHC02294I busy .............          0
HHC02294I busy% ............          0
HHC02294I empty .............          0
HHC02294I waiters ............          0
HHC02294I waits .............          0
HHC02294I buf size ........    2799616
HHC02294I hits ............       1415
HHC02294I fast hits .......       1115
HHC02294I misses ..........      56004
HHC02294I hit% ............          2
HHC02294I age .............      29617
HHC02294I last adjusted ... none
HHC02294I last wait ....... none
HHC02294I adjustments ......          0
HHC02294I Cache...............          1
HHC02294I nbr .............       1031
HHC02294I busy .............          3
HHC02294I busy% ............          3
HHC02294I empty .............       776
HHC02294I waiters ............          0
HHC02294I hits ............     13261
HHC02294I fast hits .......       1115
HHC02294I misses ..........      56004
HHC02294I hit% ............          97
HHC02294I age .............      13261
HHC02294I last adjusted ... none
HHC02294I last wait ....... none
HHC02294I adjustments ......          0
HHC02294I Cache[2] ...... not created
HHC02294I Cache[3] ...... not created
HHC02294I Cache[4] ...... not created
HHC02294I Cache[5] ...... not created
HHC02294I Cache[6] ...... not created
HHC02294I Cache[7] ...... not created
```

Figure 43: CACHE command (display cache statistics)
8.23 CACHESTATS (Display cache statistics)

8.23.1 Function
The CACHESTATS command displays the current Hercules cache statistics.

8.23.2 Syntax

Descriptive
CACHESTATS

Diagram

8.23.3 Parameter
None.

8.23.4 Examples
Example 1:
Display the current cache statistics.

```
HHC00013I Herc command: 'cachestats'
HHC02294I Cache............          0
HHC02294I nbr .............        229
HHC02294I busy ............          0
HHC02294I busy% ...........          0
HHC02294I empty ...........          0
HHC02294I waiters .........          0
HHC02294I waits ...........         39
HHC02294I buf size ........    2987008
HHC02294I hits ............       2014
HHC02294I fast hits .......       1039
HHC02294I misses ..........       4056
HHC02294I hit% ............         33
HHC02294I age .............       4569
HHC02294I last adjusted ... none
HHC02294I last wait ....... none
```
<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>HHC02294I adjustments</td>
<td>0</td>
</tr>
<tr>
<td>HHC02294I Cache</td>
<td>1</td>
</tr>
<tr>
<td>HHC02294I nbr</td>
<td>1031</td>
</tr>
<tr>
<td>HHC02294I busy</td>
<td>34</td>
</tr>
<tr>
<td>HHC02294I busy%</td>
<td>3</td>
</tr>
<tr>
<td>HHC02294I empty</td>
<td>887</td>
</tr>
<tr>
<td>HHC02294I waiters</td>
<td>0</td>
</tr>
<tr>
<td>HHC02294I waits</td>
<td>0</td>
</tr>
<tr>
<td>HHC02294I buf size</td>
<td>294912</td>
</tr>
<tr>
<td>HHC02294I hits</td>
<td>2706</td>
</tr>
<tr>
<td>HHC02294I fast hits</td>
<td>2436</td>
</tr>
<tr>
<td>HHC02294I misses</td>
<td>145</td>
</tr>
<tr>
<td>HHC02294I hit%</td>
<td>94</td>
</tr>
<tr>
<td>HHC02294I age</td>
<td>2851</td>
</tr>
<tr>
<td>HHC02294I last adjusted</td>
<td>none</td>
</tr>
<tr>
<td>HHC02294I last wait</td>
<td>none</td>
</tr>
<tr>
<td>HHC02294I adjustments</td>
<td>0</td>
</tr>
<tr>
<td>HHC02294I Cache[2]</td>
<td>not created</td>
</tr>
<tr>
<td>HHC02294I Cache[3]</td>
<td>not created</td>
</tr>
<tr>
<td>HHC02294I Cache[4]</td>
<td>not created</td>
</tr>
<tr>
<td>HHC02294I Cache[5]</td>
<td>not created</td>
</tr>
<tr>
<td>HHC02294I Cache[6]</td>
<td>not created</td>
</tr>
<tr>
<td>HHC02294I Cache[7]</td>
<td>not created</td>
</tr>
</tbody>
</table>

**Figure 44: CACHESTATS command**
8.24 CAPPING (Display or set CPU capping value)

8.24.1 Function
The CAPPING command displays or sets the CPU capping value. If \textit{mips} is greater than zero then the CPUs are capped to this value. If \textit{mips} is equal to zero or “OFF” then the capping is disabled.

Only CPUs of type CP are capped. CPUs of type IL, AP or IP are never capped. The CPU string on the Hercules device and status panel which shows the CPU usage turns from white to red during the time the CPU is capped.

8.24.2 Syntax

\textbf{Descriptive}

CAPPING \[ mips \mid \text{OFF} \mid 0 \]

\textbf{Diagram}

\[ \text{CAPPING} \]

\[ \begin{array}{c}
\text{mips} \\
\text{OFF} \\
0
\end{array} \]

8.24.3 Parameter

\textit{mips} \hspace{1cm} \text{Maximum total number of MIPS for all the ‘CP’ type processors.}

\textit{OFF} \hspace{1cm} \text{Disables the CPU capping.}

0 \hspace{1cm} \text{This is the same as OFF.}

8.24.4 Examples

\textbf{Example 1:}
Display the current CPU capping value (capping set).

\begin{verbatim}
HHC00013I Herc command: 'capping'
HHC00832I Central processors will be capped at 10 MIPS
\end{verbatim}

\textbf{Figure 45: CAPPING command (display current CPU capping value, capping set)}
Example 2:
Set the CPU capping value to 25 MIPS.

```
HHC00013I Herc command: 'capping 25'
HHC00877I Central processors are capped at 25 MIPS
```

**Figure 46: CAPPING command (set CPU capping value)**

Example 3:
Disable the CPU capping.

```
HHC00013I Herc command: 'capping off'
```

**Figure 47: CAPPING command (disable capping)**

Example 4:
Display the current CPU capping value (capping not set).

```
HHC00013I Herc command: 'capping'
HHC00838I Capping is not enabled
```

**Figure 48: CAPPING command (display current CPU capping value, capping not set)**
8.25 CCKD (CCKD command)

8.25.1 Function
The CCKD console command can be used to affect CCKD processing. The CCKD console command supports the same options as the CCKD system parameter.

8.25.2 Syntax

**Descriptive**

CCKD [HELP | STATS | OPTS | *option=value [,*option=value ... ]]]

where option can be:

- [COMP={-1 | $n}$]
- [,COMPPARM={-1 | $n$}]
- [,RA={2 | $n$}]
- [,RAQ={4 | $n$}]
- [,RAT={2 | $n$}]
- [,WR={2 | $n$}]
- [,GCINT={5 | $n$}]
- [,GCPARM={0 | $n$}]
- [,NOSTRESS={0 | 1}]
- [,FREEPEND={-1 | $n$}]
- [,FSYNC={0 | 1}]
- [,TRACE={0 | $n$}]
- [,LINUXNULL={0 | 1}]
- [,GCSTART={0 | 1}]

**Diagram**

```
  CCKD  +-------------------+  option=value
         +-------------------+
         |      HELP        |
         +-------------------+
         |      STATS       |
         +-------------------+
         |      OPTS        |
```
where option can be:

- **COMP=** \[-1\] 
- **COMPPARM=** \[-1\] 
- **RA=** \[2\] 
- **RAQ=** \[4\] 
- **RAT=** \[2\] 
- **WR=** \[2\] 
- **GCINT=** \[5\] 
- **GCPARM=** \[0\] 
- **NOSTRESS=** \[0\] 
- **FREEPEND=** \[-1\] 
- **FSYNC=** \[0\] 
- **TRACE=** \[0\] 
- **LINUXNULL=** \[0\] 
- **GCSTART=** \[0\]
8.25.3 Parameter

HELP
Display the CCKD help information.

STATS
Display the current CCKD statistics.

OPTS
Display the current CCKD options.

option
Set a CCKD option. Multiple options may be specified, separated by commas with no intervening blanks.

The CCKD options are:

COMP=n
Specifies the compression type to be used. This overrides the compression used for all CCKD files. The default (-1) means don’t override the compression. Valid compression types are:

-1 Default
0 None
1 Zlib
2 Bzip2

COMPPARM=n
Overrides the compression parameter. A higher value generally means more compression at the expense of CPU and/or storage. The default (-1) means don’t override the compression parameter. The value of n can be from -1 and 9.

RA=n
Sets the Number of read ahead threads. When sequential track or block group access is detected, some number (RAT=n) of tracks or block groups are queued (RAQ=n) to be read by one of the read ahead threads. The default is 2, the value of n can be a number from 1 to 9.

RAQ=n
Sets the size of the read ahead queue. When sequential track or block group access is detected, some number (RAT=n) of tracks or block groups are queued in the read ahead queue. The default is 4, the value of n can be a number from 0 to 16. A value of zero disables read ahead.

RAT=n
Sets the number of tracks or block groups to read ahead when sequential track or block group access is detected. The default is 2, the value of ratn can be a number from 0 to 16. A value of zero disables read ahead.

WR=n
Sets the number of writer threads. When the cache is flushed, updated cache entries are marked write pending and a writer thread is signalled. The writer thread compresses the track or block group and writes the compressed image to the emulation file.

A writer thread is CPU-intensive while compressing the track or block group and I/O-intensive while writing the compressed image. The writer thread runs one nicer than the CPU thread(s). The default is 2, a value from 1 to 9 can be specified.

GCINT=n
This is the number of seconds the garbage collector thread waits during an interval. At the end of an interval the garbage collector performs space recovery, flushes the cache and optionally ‘fsyncs’ the emulation file.

However, the file will not be ‘fsynced’ unless at least 5 seconds have elapsed since the last synchronization (FSIZE). The default is 10 seconds. You can specify a
number between 1 and 60.

**GCPARM=n**

A value affecting the amount of data moved during the garbage collectors space recovery routine. The garbage collector determines an amount of space to move based on the ratio of free space to used space in an emulation file and on the number of free spaces in the file. The garbage collector wants to reduce the free space to used space ratio and the number of free spaces.

The value is logarithmic; a value of 8 means moving 2^8 the selected value while a negative value similarly decreases the amount to be moved. Normally, 256K will be moved for a file in an interval. Specifying a value of 8 can increase the amount to 64M. At least 64K will be moved. Specifying a large value (such as 8) may not increase the garbage collection efficiency correspondingly. The default is 0. You can specify a number from -8 to 8.

**NOSTRESS=n**

Indicates whether stress writes will occur or not. A track or block group may be written under stress when a high percentage of the cache is pending write or when a device I/O thread is waiting for a cache entry. When a stressed write occurs, the compression algorithm and/or compression parm may be relaxed, resulting in faster compression but usually a larger compressed image.

If NOSTRESS is set to one, then a stressed situation is ignored. You would typically set this value to one when you want create the smallest emulation file possible in exchange for a possible performance degradation. The default is 0. You can specify 0 (enable stressed writes) or 1 (disable stressed writes).

**FREEPEND=n**

Specifies the free pending value for freed space. When a track or block group image is written, the space it previously occupied is freed. This space will not be available for future allocations until n garbage collection intervals have completed. In the event of a catastrophic failure, previously written track or block group images should be recoverable if the current image has not yet been written to the physical disk.

By default the value is set to -1 which means that if FSYNC is specified then the value is 1 otherwise it is 2. If 0 is specified then freed space is immediately available for new allocations. The default is -1. You can specify a number from -1 to 4.

**FSYNC=n**

Enables or disables FSYNC. When FSYNC is enabled then the disk emulation file is synchronized with the physical hard disk at the end of a garbage collection interval (no more often than 5 seconds though).

This means that if FREEPEND is non-zero and a catastrophic error occurs, the emulated disks should be recovered coherently. However, FSYNC may cause performance degradation depending on the host operating system and/or the host operating system level. The default is 0 (fsync disabled), you can specify 0 (disable FSYNC) or 1 (enable FSYNC).

**TRACE=n**

Specifies the number of CCKD trace entries. You would normally specify a non-zero value when debugging or capturing a problem in CCKD code. When the problem occurs, you should enter the "k" Hercules console command which will print the trace table entries. The default is 0. You can specify a number between 0 and 200000. Each trace entry represents 128 bytes. Normally, for debugging, it is recommended to use 100000.

**LINUXNULL=n**

If set to 1 then tracks written to 3390 CCKD volumes that were initialized with the -linux option will be checked if they are null (that is if all 12 4096 byte user records contain zeroes). This is used by the DASDCOPY utility. The default is 0.
GCSTART=n  If set to 1 then space recovery will become active on any emulated disks that have
free space. Normally space recovery will ignore emulated disks until they have
been updated. The default is 0.

Notes:

- raq should be at least as large as ra. Read ahead threads are scheduled from entries in the read
  ahead queue. Likewise rat should not exceed raq because only raq tracks or block groups can be
  queued at any time.

- The number of writer threads wr should usually be 1 more than the number of host processors.
  This is because one writer thread could be CPU-bound (compressing a track or block-group
  image) and the other could be i/o-bound (writing the compressed image).

- The garbage collection interval governs the maximum time in seconds an updated track or block
  group image will reside in storage before being written to the emulation file. A large value may
  mean more data loss if a catastrophic error occurs. A small value may mean that more CPU time
  is spent compressing images.

  For example, suppose that a particular image is updated several times each second. If the inter-
  val is changed from the default 5 seconds to 1 second, then that image will be compressed and
  written 5 times more frequently. A large value may cause more cache flushes within a garbage
  collection interval. These kinds of flushes mean that a read will wait because there are no avail-
  able cache entries, slowing the emulated operating system. A large value will also cause more
  pending free space to build up (since free space is flushed each interval). This may mean that the
  garbage collector space recovery routine will perform more work and the resulting emulation file
  may be larger.

- Specify fsync=1 and gcint=5 if you are seriously concerned about your data being lost due to a
  failure. fsync will ensure your data on disk is coherent. However, fsync may cause a noticeable
  performance degradation. Note that an fsync will not be performed more often than every 5
  seconds.

8.25.4 Examples

Example 1:
Display the CCKD options panel.

Figure 49: CCKD OPTS command

Example 2:
Display the CCKD help panel.

HHC00013I Herc command: 'cckd help'
HHC00345I Command parameters for cckd:
HHC00345I   help    Display help message
HHC00345I   stats   Display cckd statistics
<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>opts</td>
<td>Display cckd options</td>
</tr>
<tr>
<td>comp=&lt;n&gt;</td>
<td>Override compression</td>
</tr>
<tr>
<td>compparm=&lt;n&gt;</td>
<td>Override compression parm</td>
</tr>
<tr>
<td>ra=&lt;n&gt;</td>
<td>Set number readahead threads</td>
</tr>
<tr>
<td>raq=&lt;n&gt;</td>
<td>Set readahead queue size</td>
</tr>
<tr>
<td>rat=&lt;n&gt;</td>
<td>Set number tracks to read ahead</td>
</tr>
<tr>
<td>wr=&lt;n&gt;</td>
<td>Set number writer threads</td>
</tr>
<tr>
<td>gcint=&lt;n&gt;</td>
<td>Set garbage collector interval (sec)</td>
</tr>
<tr>
<td>gcparm=&lt;n&gt;</td>
<td>Set garbage collector parameter</td>
</tr>
<tr>
<td>gcstart</td>
<td>Start garbage collector</td>
</tr>
<tr>
<td>nostress=&lt;n&gt;</td>
<td>Disable stress writes</td>
</tr>
<tr>
<td>freepend=&lt;n&gt;</td>
<td>Set free pending cycles</td>
</tr>
<tr>
<td>fsync=&lt;n&gt;</td>
<td>Enable fsync</td>
</tr>
<tr>
<td>linuxnull=&lt;n&gt;</td>
<td>Check for null linux tracks</td>
</tr>
<tr>
<td>trace=&lt;n&gt;</td>
<td>Set trace table size</td>
</tr>
</tbody>
</table>

**Figure 50: CCKD HELP command**

**Example 3:**
Display the CCKD statistics panel.

```
HHC00013I Herc command: 'cckd stats'
HHC00347I cckd stats:
   reads....      2726 Kbytes...     10997
   writes...    141831 Kbytes...    179004
   readaheads      751 misses...        65
   syncios..      1149 misses...      1352
   switches.      3908 12 reads.      322 strs wrt.      914
   cachehits      1929 misses...      1979
   l2 hits..     15250 misses...       322
   waits............   i/o......       158 cache....         0
   garbage collector   moves....       984 Kbytes...    173612
```

**Figure 51: CCKD STATS command**

**Example 4:**
Set a CCKD parameter.

```
HHC00013I Herc command: 'cckd gcint=30'
HHC000346I cckd opts: comp=-1,compparm=-1,ra=2,raq=4,rat=2,wr=2,gcint=30
   gcparm=0,nostress=0,freepend=-1,fsync=0,linuxnull=0,trace=0
```

**Figure 52: CCKD command (set options)**
8.26 CD (Change directory)

8.26.1 Function
The CD command changes the current directory.

8.26.2 Syntax

Descriptive
CD path

Diagram

```
  ➔ CD — path ————
```

8.26.3 Parameter

**path**
This specifies the new path. The path can be specified absolute (“D:\S390\DASD”) or relative to the current path (“DASD”).

8.26.4 Examples

Example 1:
Change the current directory (absolute path).

```
HHC00013I Herc command: 'cd D:\MVS'
HHC02204I working directory set to D:\MVS
```

Figure 53: CD command (absolute path)

Example 2:
Change the current directory (relative path).

```
HHC00013I Herc command: 'cd DASD'
HHC02204I working directory set to D:\MVS\DASD
```

Figure 54: CD command (relative path)
8.27 CF (Configure current CPU online or offline)

8.27.1 Function
The CF command is used to configure a CPU online or offline. The number of the CPU to be taken online or offline has to be specified first with the CPU command (refer to the CPU command for further information). If the CF command is issued without a parameter, the actual status of the CPU is displayed.

Use the CFALL command to display the status of all CPUs or to configure all CPUs online or offline.

8.27.2 Syntax

**Descriptive**

CF [ON | OFF]

**Diagram**

```
+-------------------+
| CF                |
|                   |
| +-----+ +-----+  |
| | ON  | | OFF |  |
| +-----+ +-----+  
```

8.27.3 Parameter

**ON**
Place the specified CPU online.

**OFF**
Place the specified CPU offline.

8.27.4 Examples

Example 1:
Display the actual status of CPU 1.

```
HHC00013I Herc command: 'cpu 1'
HHC00013I Herc command: 'cf'
HHC00819I Processor CP01: online
```

Figure 55: CF command (display CPU status)
Example 2:
Configure CPU 1 offline.

```
HHC00013I Herc command: 'cpu 1'
HHC00013I Herc command: 'cf off'
HHC00101I Thread id 000010E0, prio 0, name 'Processor CP01' ended
HHC00820I Processor CP01: offline
```

Figure 56: CF command (configure CPU offline)

Example 3:
Configure CPU 1 online.

```
HHC00013I Herc command: 'cpu 1'
HHC00013I Herc command: 'cf on'
HHC00100I Thread id 000006F8, prio 0, name 'Processor CP01' started
HHC00811I Processor CP01: architecture mode 'S/370'
HHC00819I Processor CP01: online
```

Figure 57: CF command (configure CPU online)
8.28 CFALL (Configure all CPUs online or offline)

8.28.1 Function
The CFALL command is used to place all CPUs online or offline. If the CFALL command is issued without a parameter, the actual status of all CPUs is displayed.

8.28.2 Syntax

Descriptive
CFALL [ON | OFF]

Diagram

```
CFALL

ON
OFF
```

8.28.3 Parameter

ON          Place all CPUs online.
OFF         Place all CPUs offline.

8.28.4 Examples

Example 1:
Display the current status of all CPUs.

```
HHC00013I Herc command: 'cfall'
HHC17007I NumCPU = 04, NumVEC = 00, ReservedCPU = 00, MaxCPU = 04
HHC17008I Avgproc 001% 08; MIPS[2.44]; SIOS[2]
HHC17009I PROC CP00 - 003%; MIPS[0.43]; SIOS[0]
HHC17009I PROC CP01 - 001%; MIPS[0.13]; SIOS[2]
HHC17009I PROC CP02 - 001%; MIPS[0.10]; SIOS[0]
HHC17009I PROC CP03 - 000%; MIPS[0.09]; SIOS[0]
HHC17010I - Started: Stopping * Stopped
```

Figure 58: CFALL command (display status of all CPUs)
Example 2:

Configure all CPUs offline.

```
HHC00013I Herc command: 'cfall off'
HHC00811I Processor CP00: architecture mode 'ESA/390'
HHC00101I Thread id 00000450, prio 15, name 'Processor CP00' ended
HHC00101I Thread id 0000035C, prio 0, name 'Processor CP01' ended
HHC00101I Thread id 000010C4, prio 0, name 'Processor CP02' ended
HHC00101I Thread id 000013E4, prio 0, name 'Processor CP03' ended
HHC00101I Thread id 00000D78, prio 0, name 'Processor CP04' ended
HHC00101I Thread id 00000510, prio 0, name 'Processor CP05' ended
HHC00101I Thread id 000006F8, prio 0, name 'Processor CP06' ended
HHC00101I Thread id 00000C64, prio 0, name 'Processor CP07' ended
HHC00101I Thread id 0000137C, prio 0, name 'Timer' ended
Figure 59: CFALL command (configure all CPUs offline)
```

Example 3:

Configure all CPUs online.

```
HHC00013I Herc command: 'cfall on'
HHC00811I Processor CP00: architecture mode 'ESA/390'
HHC00100I Thread id 000001DC, prio 0, name 'Processor CP00' started
HHC00100I Thread id 00001370, prio 0, name 'Processor CP01' started
HHC00811I Processor CP01: architecture mode 'ESA/390'
HHC00100I Thread id 00000DA0, prio 0, name 'Processor CP02' started
HHC00811I Processor CP02: architecture mode 'ESA/390'
HHC00100I Thread id 0000132C, prio -20, name 'Timer' started
HHC00100I Thread id 0000091C, prio 0, name 'Processor CP03' started
HHC00811I Processor CP03: architecture mode 'ESA/390'
HHC00100I Thread id 00000680, prio 0, name 'Processor CP04' started
HHC00811I Processor CP04: architecture mode 'ESA/390'
HHC00100I Thread id 000013C4, prio 0, name 'Processor CP05' started
HHC00811I Processor CP05: architecture mode 'ESA/390'
HHC00100I Thread id 000010AC, prio 0, name 'Processor CP06' started
HHC00811I Processor CP06: architecture mode 'ESA/390'
HHC00100I Thread id 00000950, prio 0, name 'Processor CP07' started
HHC00811I Processor CP07: architecture mode 'ESA/390'
Figure 60: CFALL command (configure all CPUs online)
```
8.29 CLOCKS (Display TOD clock and CPU timer)

8.29.1 Function
The CLOCKS command is used to display the actual values of the emulator's various internal clocks and timers.

8.29.2 Syntax

**Descriptive**

CLOCKS

**Diagram**

\[ \text{CLOCKS} \]

8.29.3 Parameter
None.

8.29.4 Examples

Example 1:
Display the TOD clock and CPU timer.

HHC00013I Herc command: 'clocks'
HHC02274I tod = 08EDB7F06DEA3000 2038.282 00:19:05.843363
HHC02274I h/w = C6B345BF5EEA3000 2010.282 00:19:05.843363
HHC02274I off = 323A423102000000 28.001 00:00:00.000000
HHC02274I ckc = 0000000000000000 1900.001 00:00:00.000000
HHC02274I cpt = not decrementing
HHC02274I itm = FDA3714C 15:23:28.164060

Figure 61: CLOCKS command
8.30 CMDLEVEL (Display or set current command group)

8.30.1 Function

The CMDLEVEL command displays or sets the current command group(s). A plus sign preceding the command group activates the console commands of this group, whereas a preceding minus sign deactivates the commands.

A table showing the affiliation of each console command to the various command groups can be found in ‘Appendix D. Hercules Command Groups’.

Some console commands are always active to keep Hercules operable, independent of the current active command group. These commands are listed under command group ‘NONE’ in the above mentioned table. Command group ‘NONE’ is the result of a ‘CMDLVL –ALL’ command.

The default command level is set to operator, maintenance, programmer and configuration (which corresponds to the command "CMDLEVEL -ALL +OPER +MAINT +PROG +CONFIG"). Some of the arguments can be abbreviated as shown in the syntax section below.

8.30.2 Syntax

Descriptive

CMDLEVEL [ [+ | - ] { ALL | OPERator | MAINT | PROGrammer | CONFIGuration | DEVELoper | DEBUG} [...] ]

Diagram

8.30.3 Parameter

+ The plus sign activates the commands of the following command group.

- The minus sign deactivates the commands of the following command group.

ALL Command group ‘ALL’ contains all Hercules console commands. Specifying command group ‘+ALL’ enables all console commands whereas command group ‘-ALL’ equals to NONE. This disables all console commands with the exception of com-
mands necessary to keep Hercules operable.

**OPER**
The ‘OPERator’ command group activates or deactivates all system operator commands.

**MAINT**
Command group 'MAINT' activates or deactivates all system maintainer commands.

**PROG**
The ‘PROGramer’ command group activates or deactivates all systems programmer commands.

**CONFIG**
Command group ‘CONFIGuration’ activates or deactivates all system configuration commands.

**DEVEL**
The ‘DEVELoper’ command group activates or deactivates all system developer commands.

**DEBUG**
Command group ‘DEBUG’ activates or deactivates all debugging activity commands activities.

### 8.30.4 Examples

**Example 1:**
Set the command group to OPERATOR and PROGRAMMER.

```
HHC00013I Herc command: 'cmdlevel -all +operator +programmer'
HHC01606I cmdlevel[85] is 'operator programmer'
```

![Figure 62: CMDLEVEL command (set command group)](image)

**Example 2:**
Display the current command group(s).

```
HHC00013I Herc command: 'cmdlvl'
HHC01606I cmdlevel[1F] is 'operator maintenance programmer configuration'
```

![Figure 63: CMDLEVEL command (display current command group)](image)
8.31 CMDLVL (Display or set current command group)

8.31.1 Function
CMDLVL is an alias for CMDLEVEL. The CMDLVL command displays or sets the current command group(s). See CMDLEVEL for details.

8.31.2 Syntax
See CMDLEVEL command.

8.31.3 Parameter
See CMDLEVEL command.

8.31.4 Examples
See CMDLEVEL command.
8.32 CMDSEP (Display or set current command line separator)

8.32.1 Function
The CMDSEP command displays or sets the command line separator. The command line separator character is used to separate multiple panel commands on a single line. The default is OFF which means that there is no command line separator defined and therefore multiple panel commands on a single line are not supported.

8.32.2 Syntax

Descriptive
CMDSEP [char | OFF]

Diagram

8.32.3 Parameter
char
Specifies a single character that is used for command separation. This character must not be the period ('.'), the exclamation mark ('!') or the hyphen ('-'). Although the command line separation character can be set to the number (hash) sign ('#'), this is not recommended because this could affect processing command lines that contain comments.

OFF
OFF disables command separation. This is the default.

8.32.4 Examples
Example 1:
Set the current command separator to ':'.

HHC00013I Herc command: 'cmdsep'
HHC02203I Value 'cmdsep': 'Not set'

Figure 64: CMDSEP command (display the current command line separator)
Example 2:
Set the current command separator to ‘;’.

```
HHC00013I Herc command: 'cmdsep ;'
HHC02204I Value 'cmdsep' set to ';
```

Figure 65: CMDSEP command (set new command line separator)
8.33 CMDTGT (Specify the command target)

8.33.1 Function
The CMDTGT command specifies the target environment for all following commands entered on the command line of the Hercules hardware console.

8.33.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMDTGT {HERC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMDTGT &gt;&gt; HERC</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>? &lt;&lt;</td>
</tr>
</tbody>
</table>

8.33.3 Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>HERC</td>
</tr>
<tr>
<td>SCP</td>
</tr>
<tr>
<td>PSCP</td>
</tr>
<tr>
<td>?</td>
</tr>
</tbody>
</table>

8.33.4 Examples

Example 1:
Display the current target environment for commands.

```
HHC00013I Herc command: 'cmdtgt ?'
HHC02288I Commands are sent to 'herc'
```

Figure 66: CMDTGT command (display current setting)
Example 2:
Set the system control program as the target for commands.

| HHC00013I Herc command: 'cmdtgt scp'
| HHC02288I Commands are sent to 'scp' |

Figure 67: CMDTGT command (set target to SCP)

Example 3:
Set the command target from SCP or PSCP back to Hercules (see also HERC command).

| HHC00013I Herc command: 'herc cmdtgt herc'
| HHC02288I Commands are sent to 'herc' |

Figure 68: CMDTGT command (set target back to Hercules)
8.34 CNSLPORT (Display or set console port)

8.34.1 Function
The CNSLPORT command displays or sets the port number (in decimal), on which the telnet server will listen. The parameter of the command may also have the form host:port, where the telnet console server will bind to the specified address.

8.34.2 Syntax

Descriptive
CNSLPORT [port | host:port]

Diagram

```
CNSLPORT
    port
    host:port
```

8.34.3 Parameter

*host*  
The IP address of the host to which the telnet server will bind to. If an IP address is given then it must be a valid IP address for the host system.

*port*  
The port number (decimal) on which the telnet server will listen. The port number must not be in use by any other server. The port number must be in the range of 0 to 65535. Ports below 1024 cannot be used unless Hercules is running as root or is otherwise authorized to use low ports.

8.34.4 Examples

Example 1:
Display the current telnet client port.

```
HHC00013I Herc command: 'cns1port'
HHC17001I Console server listening for host 192.168.1.10 on port 3270
```

Figure 69: CNSLPORT command (display current telnet client port)
Example 2:
Set the port number on which the telnet server will listen to 3270.

HHC00013I Herc command: 'cnslport 3270'

Figure 70: CNSLPORT command (set telnet client port)

Example 3:
Specify 192.168.1.10 as the IP address of the host to which the telnet server will bind to and set the port number on which the telnet server will listen to 3270.

HHC00013I Herc command: 'cnslport 192.168.1.10:3270'

Figure 71: CNSLPORT command (set telnet client port bound to specific address)
8.35 CODEPAGE (Display or set codepage conversion table)

8.35.1 Function

The CODEPAGE command displays or sets the codepage conversion table. If an operand is given then the codepage is set to the specified page, if the page is valid. If no operand is specified, the current codepage is displayed.

With the QCODEPAGES panel command a list of all valid codepage mappings can be displayed.

8.35.2 Syntax

Descriptive

```
CODEPAGE [codepage | USER | MAINT cmd [operands]]
```

Diagram

```
CODEPAGE
codepage
USER
MAINT cmd
operands
```

8.35.3 Parameter

**DEFAULT**

“DEFAULT” specifies the traditional Hercules codepage.

**codepage**

Specifies the codepage conversion table used for ASCII / EBCDIC translation. Supported codepage mappings are shown in the table below. Iconv single byte codepages may also be used (e.g. “UTF8/EBCDIC-CP-NL”).

**USER**

This specifies that the user specific codepage conversion tables (see CPUPDT system parameter and console command) have to be activated.

**MAINT**

MAINT and its arguments is the same as the CP_UPDT system parameter. Please see CP_UPDT for details.

Supported codepage mappings:

<table>
<thead>
<tr>
<th>Mapping</th>
<th>ASCII</th>
<th>EBCDIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>437/037</td>
<td>437 PC United States</td>
<td>037 United States/Canada</td>
</tr>
<tr>
<td>437/500</td>
<td>437 PC United States</td>
<td>500 Latin 1</td>
</tr>
<tr>
<td>437/1047</td>
<td>437 PC United States</td>
<td>1047 Open Systems Latin 1</td>
</tr>
</tbody>
</table>
Mapping | ASCII | EBCDIC |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>819/037</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>037 United States/Canada</td>
</tr>
<tr>
<td>819/037v2</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>037 United States/Canada SHARE</td>
</tr>
<tr>
<td>819/273</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>273 CECP Austria/Germany</td>
</tr>
<tr>
<td>819/277</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>277 CECP Denmark/Norway</td>
</tr>
<tr>
<td>819/278</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>278 CECP Finland/Sweden</td>
</tr>
<tr>
<td>819/280</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>280 CECP Italy</td>
</tr>
<tr>
<td>819/284</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>284 CECP Spain</td>
</tr>
<tr>
<td>819/285</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>285 CECP United Kingdom</td>
</tr>
<tr>
<td>819/297</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>297 CECP France</td>
</tr>
<tr>
<td>819/500</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>500 CECP International</td>
</tr>
<tr>
<td>819/1047</td>
<td>819 ISO-8859-1 Latin 1</td>
<td>1047 Open Systems Latin 1</td>
</tr>
<tr>
<td>850/273</td>
<td>850 PC Latin 1</td>
<td>273 Austria/Germany</td>
</tr>
<tr>
<td>850/1047</td>
<td>850 PC Latin 1</td>
<td>1047 Open Systems Latin 1</td>
</tr>
<tr>
<td>1252/037</td>
<td>1252 Windows Latin 1</td>
<td>037 United States/Canada</td>
</tr>
<tr>
<td>1252/037v2</td>
<td>1252 Windows Latin 1</td>
<td>037 United States/Canada SHARE</td>
</tr>
<tr>
<td>1252/1047</td>
<td>1252 Windows Latin 1</td>
<td>1047 Open Systems Latin 1</td>
</tr>
<tr>
<td>1252/1140</td>
<td>1252 Windows Latin 1</td>
<td>1140 United States/Canada with Euro sign</td>
</tr>
</tbody>
</table>

Table 18: Supported codepage mappings

8.35.4 Examples

Example 1:
Display the current codepage conversion table.

HHC00013I Herc command: 'codepage'
HHC01476I Codepage is 'default'

Figure 72: CODEPAGE command (display current codepage conversion table)

Example 2:
Set the codepage conversion table to 437/037.

HHC00013I Herc command: 'codepage 437/037'
HHC01474I Using 'internal' codepage conversion table '437/037'

Figure 73: CODEPAGE command (set codepage conversion table)
8.36 CONKPALV (Display / alter console TCP/IP keep-alive settings)

8.36.1 Function
The CONKPALV command specifies the tn3270 console and telnet clients keepalive option values that control automatic detection of disconnected tn3270/telnet client sessions.

This is a built-in feature of TCP/IP and allows detection of unresponsive TCP/IP connections and not idle clients. That is to say, your connection will not be terminated after 3 seconds of idle time. Your 3270 session can remain idle for many minutes or hours or days without any data being transmitted. If the TCP/IP stack at the other end of the connection (not your 3270 client itself) fails to respond to the internal keepalive probe packets however, then it means that the TCP/IP stack itself is down or there has been a physical break in the connection.

Thus, even if your 3270 client is completely idle, your system's TCP/IP stack itself should still respond to the keepalive probes sent by the TCP/IP stack at the Hercules end of the link. If it doesn't, then TCP/IP will terminate the tn3270/telnet session which will cause Hercules to disconnect the terminal.

The three values can also be modified on-demand via the conkpalm panel command, which has the exact same syntax. Note that the syntax is very unforgiving: no spaces are allowed anywhere within the parentheses and each value must be separated from the other with a single comma.

Please also note that not all systems support being able to modify all three values. That is, not all values may be able to be changed, and it is system dependent which values you can change and which values you cannot. On Windows for example, the count value is ignored and cannot be changed from its default value of 10. Other systems may ignore one or more or all three values and use platform defaults instead. This is entirely system dependent. Check you system's documentation for details regarding which values can be changed and which cannot as well as how to adjust your system's default values.

8.36.2 Syntax

Descriptive

CONKPALV (idle,intv,count)

Diagram

\[\text{CONKPALV} \quad (idle,intv,count)\]

8.36.3 Parameter

idle The idle value specifies the number of seconds of inactivity until the first keep-alive probe is sent. The default for the idle value is 3 seconds.

intv The intv value specifies the interval in seconds between the probes if no acknowledgement is received from the previous probe. The default for intv is 1 second.
The *count* value specifies the number of unacknowledged keep-alive packets sent before the connection is considered to have failed. The default value is 9 for non-Windows platforms and 10 for Windows systems.

*Note:* On Windows platforms the count value is ignored and cannot be changed from its default value of 10.

### 8.36.4 Examples

#### Example 1:
Set the TCP/IP keep-alive settings to 5 seconds idle time, 3 seconds interval between the probes and disconnect after 15 consecutive failed probes.

```
HHC00013I Herc command: 'conkpalsv (5,3,15)'
```

Figure 74: CONKPALV command
8.37 CP_UPDT (Create or modify user character conversion table)

8.37.1 Function

The CP_UPDT console command creates or modifies the contents of the user codepage tables. The tables can be populated with a ‘CP_UPDT REFERENCE’ command which copies one of the provided codepage tables to the user tables or by a ‘CP_UPDT IMPORT’ command which imports a previously created and with ‘CP_UPDT EXPORT’ exported table.

Changes in the user tables are made through one or more ‘CP_UPDT ALTER’ commands. These allow for up to 16 modifications at a time. The current contents of the user tables can be shown on the console with ‘CP_UPDT DISPLAY’. Finally the changed user tables are activated with a ‘CODEPAGE USER’ command.

In all commands that require the selection of a user table (EBCDIC or ASCII), the EBCDIC table refers to the ‘guest to host’ (g2h) translation and the ASCII table refers to the ‘host to guest’ (h2g) translation.

8.37.2 Syntax

Descriptive

CP_UPDT command

where command can be:

ALTER {EBCDIC | ASCII | G2H | H2G} (pos, val[,pos,val]...)
DISPLAY {EBCDIC | ASCII | G2H | H2G}
EXPORT {EBCDIC | ASCII | G2H | H2G} filename
IMPORT {EBCDIC | ASCII | G2H | H2G} filename
REFERENCE [codepage]
RESET
TEST

Diagram

\[
\begin{center}
\text{CP_UPDT \hspace{2cm} command \hspace{2cm}}
\end{center}
\]

where command can be:

\[
\begin{center}
\text{ALTER EBCDIC (pos,val) ASCII (pos,val) G2H (pos,val) H2G (pos,val)}
\end{center}
\]
### 8.37.3 Parameter

**ALTER**
Alters the user EBCDIC or ASCII table value at hex position `pos` to hex value `val`. Up to 16 pairs of hex digits may be specified within the parenthesis. ALTER can be abbreviated as ‘ALT’.

**DISPLAY**
Displays the user EBCDIC or ASCII codepage table. DISPLAY can be abbreviated as ‘DIS’ or ‘DSP’.

**EXPORT**
Exports the contents of the user EBCDIC or ASCII codepage table to file `filename`. EXPORT can be abbreviated as ‘EXP’.

**IMPORT**
Imports the contents of file `filename` to the user EBCDIC or ASCII codepage table. IMPORT can be abbreviated as ‘IMP’.

**REFERENCE**
Copies the specified codepage to the user EBCDIC and ASCII tables. If no codepage is specified, a list of valid codepages is displayed on the console. ‘REFERENCE’ can be abbreviated as ‘REF’.

**RESET**
Reset the internal user tables to binary zero.

**TEST**
Verify that user tables are transparent, i.e. the value at position `n` in g2h used as an index into h2g will return a value equal `n` (g2h<>h2g, h2g<>g2h).

**EBCDIC**
The target for the command is the EBCDIC table. The EBCDIC table refers to the ‘guest to host’ translation. ‘EBCDIC’ can be abbreviated as ‘E’.
**ASCII**

The target for the command is the ASCII table. The ASCII table refers to the 'host to guest' translation. ‘ASCII’ can be abbreviated as ‘A’.

**G2H**

This is the same as ‘EBCDIC’.

**H2G**

This is the same as ‘ASCII’.

**pos**

Specifies the hex position within the selected table.

**val**

Specifies the hex value for the selected position.

**filename**

Specifies the file name of the file to which the specified codepage has to be exported or from which the codepage table has to be imported.

**codepage**

Specifies the codepage that has to be copied to the user tables.

### 8.37.4 Examples

**Example 1:**

Copy the Hercules default codepage to the user tables.

```
HHC00013I Herc command: 'cp_updt reference default'
HHC01478I Codepage 'default' copied to 'user'
```

*Figure 75: CP_UPD command (copy codepage to user tables)*
Example 2:
Display user ASCII table.

```
HHC00013I Herc command: 'cp_updt display ascii'
HHC01484I Codepage: Displaying user table ascii/h2g
HHC01485I Codepage: _0_1_2_3 _4_5_6_7 _8_9_A_B _C_D_E_F 0... 4... 8... C...
HHC01486I Codepage: _1_ 10111213 3C3D3226 18191A27 221D351F 1...
HHC01486I Codepage: _2_ 405A7F7B 5B6C507D 4D5D5C4E 6B604B61 !"#$%&' ()*+ ,-./ 2...
HHC01486I Codepage: _3_ F0F1F2F3 F4F5F6F7 F8F9A5E 4C7E6E6F 0123 4567 3...
HHC01486I Codepage: _4_ 7CC1C2C3 C4C5C6C7 C89D1D2 D34D5D6 @ABC DEFG HIJK LMNO 4...
HHC01486I Codepage: _5_ D7D8D9E2 E7E8E9AD E0BD5F6D PQRS TUW XYZ{ }^_ 5...
HHC01486I Codepage: _6_ 79818283 84858687 8899192 93949596 abc defg hijk lmo
HHC01486I Codepage: _7_ B_ 99899A2 A3A4A5A6 A7A8A9C0 A0BD107 pqrs tuvw xyz{ }^_ 7...
HHC01486I Codepage: _8_ 6DC5142 43444748 52535457 56586367 ........ 8...
HHC01486I Codepage: _9_ 719C9EBC CCCDDBDD DFEFCB0 B1B2B3B4 ........ 9...
HHC01486I Codepage: A_ 4555CEDE 49690406 AB0BABA8 B7A8AB8 ........ A...
HHC01486I Codepage: B_ 090A14BB 15B8B17 1BB91C1E BC20BEBF ........ B...
HHC01486I Codepage: C_ 21232428 292A2B2C 3031CA33 343638CF ........ C...
HHC01486I Codepage: D_ 393A3B3E 41464A4F 5962DA64 65667072 ........ D...
HHC01486I Codepage: E_ 73E17475 76777880 8C8D8E88 EFEDEEDF ........ E...
HHC01486I Codepage: F_ 909A9B9D 9F0ACAE AFFDEFEB 3FEAFAFF ........ F...
```

Figure 76: CP_UPD command (display ASCII user table)

Example 3:
Export the ASCII user table to file ‘ascii.cp’.

```
HHC00013I Herc command: 'cp_updt export ascii d:\mvs\conf\ascii.cp'
HHC01490I Codepage: Exported user table ascii/h2g to file d:\mvs\conf\ascii.cp
```

Figure 77: CP_UPD command (export user table)

Example 4:
Import the ASCII user table from file ‘ascii.cp’.

```
HHC00013I Herc command: 'cp_updt import ascii d:\mvs\conf\ascii.cp'
HHC01490I Codepage: Imported user table ascii/h2g from file d:\mvs\conf\ascii.cp
```

Figure 78: CP_UPD command (import user table)
Example 5:
Alter the ASCII user table as follows, display the changed table and activate it:
- Change position x'5B' to value x'C0' and position x'5D' to value x'D0'
- Change position x'7B' to value x'AD' and position x'7D' to value x'B0'

HHC00013I Herc command: 'cp_updt alter ascii (5b,c0,5d,d0,7b,ad,7d,b0)'
HHC01487I Codepage: Altering user table ascii/h2g
HHC01488I Codepage: Pos[5B] was AD is C0
HHC01488I Codepage: Pos[5D] was BD is D0
HHC01488I Codepage: Pos[7B] was C0 is AD
HHC01488I Codepage: Pos[7D] was D0 is BD

HHC00013I Herc command: 'cp_updt display ascii'
HHC01484I Codepage: Displaying user table ascii/h2g

Figure 79: CP_UPD command (alter ASCII user table)
Example 6:
Reset the internal user tables to binary zero.

```
HHC00013I Herc command: 'cp_updt reset'
HHC01491I Codepage 'user' is deleted

HHC01484I Codepage: Displaying user table ascii/h2g, table is invalid
HHC01485I Codepage: _0_1_2_3_4_5_6_7_8_9_A_B_C_D_E_F_0...8...C...
HHC01486I Codepage: 0_00000000 00000000 00000000 00000000 .... .... .... 0_
HHC01486I Codepage: 1_00000000 00000000 00000000 00000000 .... .... .... 1_
HHC01486I Codepage: 2_00000000 00000000 00000000 00000000 .... .... .... 2_
HHC01486I Codepage: 3_00000000 00000000 00000000 00000000 .... .... .... 3_
HHC01486I Codepage: 4_00000000 00000000 00000000 00000000 .... .... .... 4_
HHC01486I Codepage: 5_00000000 00000000 00000000 00000000 .... .... .... 5_
HHC01486I Codepage: 6_00000000 00000000 00000000 00000000 .... .... .... 6_
HHC01486I Codepage: 7_00000000 00000000 00000000 00000000 .... .... .... 7_
HHC01486I Codepage: 8_00000000 00000000 00000000 00000000 .... .... .... 8_
HHC01486I Codepage: 9_00000000 00000000 00000000 00000000 .... .... .... 9_
HHC01486I Codepage: A_00000000 00000000 00000000 00000000 .... .... .... A_
HHC01486I Codepage: B_00000000 00000000 00000000 00000000 .... .... .... B_
HHC01486I Codepage: C_00000000 00000000 00000000 00000000 .... .... .... C_
HHC01486I Codepage: D_00000000 00000000 00000000 00000000 .... .... .... D_
HHC01486I Codepage: E_00000000 00000000 00000000 00000000 .... .... .... E_
HHC01486I Codepage: F_00000000 00000000 00000000 00000000 .... .... .... F_
```

Figure 80: CP_UPD command (reset user codepage tables)

Example 7:
Test the internal user tables.

```
HHC00013I Herc command: 'cp_updt test'
HHC01487I Codepage: Testing user table ebcdic/g2h vs. ascii/h2g
HHC01491I Codepage: g2h pos[15] = 0A; h2g pos[0A] = 25
HHC01491I Codepage: g2h pos[AD] = 5B; h2g pos[5B] = C0
HHC01491I Codepage: g2h pos[BD] = 5D; h2g pos[5D] = D0
HHC01491I Codepage: g2h pos[C0] = 7B; h2g pos[7B] = AD
HHC01491I Codepage: g2h pos[D0] = 7D; h2g pos[7D] = BD
HHC01487I Codepage: Testing user table ascii/h2g vs. ebcdic/g2h
HHC01492I Codepage: h2g pos[5B] = C0; g2h pos[C0] = 7B
HHC01492I Codepage: h2g pos[5D] = D0; g2h pos[D0] = 7D
HHC01492I Codepage: h2g pos[7B] = AD; g2h pos[AD] = 5B
HHC01492I Codepage: h2g pos[7D] = BD; g2h pos[BD] = 5D
HHC01492I Codepage: h2g pos[BD] = 15; g2h pos[15] = 0A
```

Figure 81: CP_UPD command (test user codepage tables)
8.38 CPU (Define target CPU for console displays and commands)

8.38.1 Function
The CPU command sets the target CPU for console displays and commands in a Hercules multi-CPU environment. If the Hercules configuration file sets a single CPU environment, then no CPU command is necessary. If the NUMCPU system parameter in the Hercules configuration file is set greater than one and no CPU command is given, then always the first CPU (CPU 0) is the target for console displays and commands.

If a CPU address is given through the CPU command then this specifies the CPU to which all subsequent panel commands will apply to. If an optional command follows the CPU address, the command will execute on this CPU and the target CPU will not be permanently changed.

For example entering command “CPU 0F” followed by command “GPR” will change the target CPU for panel displays and commands and then display the general purpose registers for CPU #15 whereas the command “CPU 0F GPR” will execute the GPR command on CPU #15, but will not change the target CPU for subsequent panel displays and commands.

Please note that the command “CPU 1 CPU 2” does no change the target to CPU 2 as the last command (CPU 2) is issued under the temporary CPU 1 environment.

8.38.2 Syntax

Descriptive

CPU hh [cmd]

Diagram

```
CPU --- hh --- [cmd]
```

8.38.3 Parameter

hh
The hexadecimal CPU address of the CPU in the multiprocessor configuration which you wish all console commands to apply to. For example, entering “CPU 0F” followed by a subsequent command “GPR” in a multi-CPU configuration will display the general purpose registers for CPU #15 in the configuration, as opposed to CPU #0. The CPU address is then permanently set to CPU #15, as long as no other CPU command is given.

cmd
This is the Hercules command that will execute on CPU hh. In this case the CPU address applies only for this command and is not permanently set to CPU hh.
8.38.4 Examples

Example 1:
Set the target address for subsequent Hercules commands to CPU #4 in a multiprocessor configuration and display the general purpose registers for this CPU.

```
HHC00013I Herc command: 'cpu 4'
HHC00013I Herc command: 'gpr'
HHC02269I General purpose registers
HHC02269I CP04: GR00=00000000 GR01=062B7000 GR02=0178F500 GR03=040C1E18
HHC02269I CP04: GR04=00000000 GR05=00000021 GR06=00000000 GR07=0146B847
HHC02269I CP04: GR08=00000000 GR09=03EB0980 GR10=00F67400 GR11=04755D78
HHC02269I CP04: GR12=0146A848 GR13=040C0390 GR14=00000000 GR15=00000336
```

Figure 82: CPU command (set target CPU address permanently)

Example 2:
Set the target address temporarily to CPU #2 in a multiprocessor configuration and display the general purpose registers for this CPU.

```
HHC00013I Herc command: 'cpu 2 gpr'
HHC02269I General purpose registers
HHC02269I CP02: GR00=762DDDF8 GR01=00010016 GR02=00F52D28 GR03=0428E294
HHC02269I CP02: GR04=00FACD80 GR05=01175397 GR06=0428EF58 GR07=00F3C4B8
HHC02269I CP02: GR08=0428E268 GR09=81174398 GR10=0175F060 GR11=00FD12C0
HHC02269I CP02: GR12=03FCDD790 GR13=0428E390 GR14=8101250C GR15=811744F4
```

Figure 83: CPU command (set target CPU address permanently)
8.39 CPUIDFMT (Display or set format BASIC / 0 / 1 STIDP generation)

8.39.1 Function

The CPUIDFMT command displays or sets the STORE CPU ID (STIDP) format bit. The default STIDP format, if not explicitly set, is 'BASIC'. The format bit of the STIDP information specifies the format of the first two digits of the CPU identification number. When the format bit is '0' then the contents of the CPU identification number identifies the CPU. When the format bit is '1' then the CPU identification number identifies the system configuration as opposed to an individual CPU in the configuration and it identifies the logical partition in which the program is executed.

When the format is 'BASIC' the CPU identification number has the following hexadecimal format, where 'A' is the CPU address of the CPU.

- \( x'\text{Annnnn}' \) (Basic Mode)

When the format is '0' the CPU identification number has the following hexadecimal format where 'L' is a logical CPU address and 'P' is a logical partition identifier.

- \( x'\text{LPnnnn}' \) (LPAR mode)

When the format is '1' the CPU identification number has the following hexadecimal format where 'PP' is the user partition identifier (UPID). The UPID is an eight bit unsigned binary integer bound to a logical partition.

- \( x'\text{PPnnnn}' \) (LPAR mode)

In all cases \( n \) is a digit derived from the serial number of the CPU.

For more information on the STORE CPU ID (STIDP) instruction and the format bit see IBM's "z/Architecture Principles of Operation" manual.

8.39.2 Syntax

**Descriptive**

CPUIDFMT [BASIC | 0 | 1]

**Diagram**

```
CPUIDFMT
```

```
  BASIC
  0
  1
```
8.39.3 Parameter

<table>
<thead>
<tr>
<th>BASIC</th>
<th>Set the format to 'BASIC'. The STIDP format bit is set to '0'.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Set the format to '0'. The STIDP format bit is set to '0'.</td>
</tr>
<tr>
<td>1</td>
<td>Set the format to '1'. The STIDP format bit is set to '1'.</td>
</tr>
</tbody>
</table>

8.39.4 Examples

Example 1:
Display the current STIDP format.

```
HHC00013I Herc command: 'cpuidfmt'
HHC02203I Value 'CPUIDFMT': '0'
```

Figure 84: CPUIDFMT command (display current STIDP format)

Example 2:
Set STIDP format to '1'.

```
HHC00013I Herc command: 'cpuidfmt 1'
```

Figure 85: CPUIDFMT command (set STIDP format bit)
8.40 CPUMODEL (Display or set CPU model number)

8.40.1 Function
The CPUMODEL command displays or sets the 4 hexadecimal digits CPU model number stored by the STIDP instruction.

8.40.2 Syntax

Descriptive
CPUMODEL [model]

Diagram

```
CPUMODEL model
```

8.40.3 Parameter

`model` Any valid 4 digit hexadecimal CPU model number. A list of the valid model numbers can be found in the Hercules Windows GUI file "cpu-types.txt".

8.40.4 Examples

Example 1:
Specify a 7060 CPU model.

```
HHC00013I Herc command: 'cpumodel'
HHC02203I cpumodel : 7060
```

Figure 86: CPUMODEL command
8.41 CPUPRIO (Display or set CPU thread process priority)

8.41.1 Function

The CPUPRIO command is used to change the priority of the CPU thread. See section 5.82 for details on process and thread priorities. On multi-CPU systems a real CPU can be “dedicated” to Hercules by giving the CPU-thread a very high dispatching priority (-20). Given without an argument the CPUPRIO command displays the current CPU thread process priority.

Caution: CPUPRIO should not have a higher dispatching priority than the TOD clock and timer thread.

8.41.2 Syntax

Descriptive

CPUPRIO [nn]

Diagram

\[ \text{CPUPRIO} \quad [nn] \]

8.41.3 Parameter

nn    This value specifies the priority for the CPU thread. For details on the priority values see section 5.82 (“Process and Thread Priorities”).

8.41.4 Examples

Example 1:
Set the CPU process priority to -20.

HH00013I Herc command: 'cpuprio -20'
HH02204I cpuprio set to -20

Figure 87: CPUPRIO command
8.42 CPUSERIAL (Display or set CPU serial number)

8.42.1 Function

The CPUSERIAL command displays or sets the 6 hexadecimal digit CPU serial number stored by the STIDP instruction.

8.42.2 Syntax

Descriptive

CPUSERIAL serial

Diagram

\[ \text{CPUSERIAL} \quad \text{serial} \]

8.42.3 Parameter

serial Any valid 6 digit hexadecimal CPU serial number. In BASIC mode, the high-order digit may be replaced with the processor number when MAXCPU is greater than one. In LPAR mode, the two high-order digits are replaced with either the LPAR number or the CPU number and LPAR number with the full serial number available via the STSI instruction. The default serial number is ‘000001’.

8.42.4 Examples

Example 1:
Set the CPU serial number to 001963.

HHC00013I Herc command: 'cpuserial 001963'
HHC02204I cpuserial set to 001963

Figure 88: CPUSERIAL command
8.43 CPUVERID (CPU version code)

8.43.1 Function
The CPUVERID command displays or sets the 2 hexadecimal digit CPU version code stored by the STIDP instruction. The default version code is "FD" when ARCHMODE S/370 or ARCHMODE ESA/390 is specified. For the z/ARCH (or ESAME architecture mode respectively), the version code is always stored as "00" and any value specified here is ignored.

8.43.2 Syntax

Descriptive
CPUVERID verid

Diagram

```
CPUVERID — verid
```

8.43.3 Parameter

verid Any valid 2 digit hexadecimal CPU version code. A list of valid version codes can be found in the Hercules Windows GUI file “cpu-types.txt”.

8.43.4 Examples

Example 1:
Set the CPU version code to FD.

```
HHC00013I Herc command: 'cpuverid fd'
HHC02204I cpuverid set to FD
```

Figure 89: CPUVERID command
8.44 CR (Display or alter control registers)

8.44.1 Function
The CR command displays or alters the actual contents of the control registers.

8.44.2 Syntax

**Descriptive**

CR \[nn=xxxxxxxx | nn=xxxxxxxxxxxxxxxx]\]

**Diagram**

```
 CR  nn=xxxxxxxx
     nn=xxxxxxxxxxxxxxxx
```

8.44.3 Parameter

**nn**  This specifies the optional register number (00-15) to be altered.

**xxxxxxxx**  This is the register value in hexadecimal (1-8 hex digits for 32-bit registers, 1-16 hex digits for 64-bit registers).

8.44.4 Examples

**Example 1:**
Display the control registers.

```
HHC00013I Herc command: 'cr'
HHC02271I Control registers
HHC02271I CP00: CR00=5FB1EE40 CR01=3FFFE07F CR02=3F149FC0 CR03=00000001
HHC02271I CP00: CR04=00010001 CR05=3FFE7040 CR06=FE000000 CR07=3FFFE07F
HHC02271I CP00: CR08=00000000 CR09=00000000 CR10=00000000 CR11=00000000
HHC02271I CP00: CR12=01984E80 CR13=3FFFE07F CR14=FF8BF15F CR15=03150010
```

Figure 90: CR command (display control registers)
Example 2:
Alter control register number 15.

```
HHC00013I Herc command: 'cr 15=ffffffff'
HHC02271I Control registers
HHC02271I CP00: CR00=5FB1EE40 CR01=3FFFFE07F CR02=3F149FC0 CR03=00000001
HHC02271I CP00: CR04=00010001 CR05=3FFE7040 CR06=FE000000 CR07=3FFFFE07F
HHC02271I CP00: CR08=00000000 CR09=00000000 CR10=00000000 CR11=00000000
HHC02271I CP00: CR12=01984E80 CR13=3FFFFE07F CR14=FF8BF15F CR15=FFFFFFFF
```

Figure 91: CR command (alter control register)
8.45 CSCRIPT (Cancel a running script thread)

8.45.1 Function

The CSCRIPT command cancels a currently running script or all scripts. If ‘*’ or ‘ALL’ is given as argument then all running scripts are cancelled. If no argument is given only the first running script is cancelled. To cancel a specific script, then ‘id’ can be given as argument, where ‘id’ is the ID number of the script to be cancelled. The ‘SCRIPT’ command may be used to display a list of all currently running scripts. If no script is running, no action is taken.

8.45.2 Syntax

Descriptive

CSCRIPT [* | ALL | id]

Diagram

```
Êʬ¬¬¬ CSCRIPT ¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬�行{“”}'
Example 2:
Cancel the script with the ID number 4 from the remaining four running scripts.

HHC00013I Herc command: 'cscript 4'
HHC02259E Script 4 aborted: 'user cancel request'
HHC00007I Previous message from function script_abort() at script.c(837)
HHC02265I Script 4: file 'D:/MVS/Conf/Script3.rc' aborted due to previous conditions

Figure 93: CSCRIPT command (cancel script with ID)

Example 3:
Cancel all still running scripts (with IDs 3, 5 and 6).

HHC00013I Herc command: 'cscript all'
HHC02259E Script 3 aborted: 'user cancel request'
HHC00007I Previous message from function script_abort() at script.c(837)
HHC02265I Script 3: file 'D:/MVS/Conf/Script2.rc' aborted due to previous conditions
HHC02259E Script 5 aborted: 'user cancel request'
HHC00007I Previous message from function script_abort() at script.c(837)
HHC02265I Script 5: file 'D:/MVS/Conf/Script4.rc' aborted due to previous conditions
HHC02259E Script 6 aborted: 'user cancel request'
HHC00007I Previous message from function script_abort() at script.c(837)
HHC02265I Script 6: file 'D:/MVS/Conf/Script5.rc' aborted due to previous conditions

Figure 94: CSCRIPT command (cancel all scripts)
8.46 CTC (Enable / disable CTC debugging)

8.46.1 Function
The CTC command enables or disables the debug packet tracing for the specified CTCI / LCS / PTP device group(s) identified by `devnum` or for all CTCI / LCS / PTP device group(s) if `devnum` is not specified or specified as 'ALL'.

8.46.2 Syntax

Descriptive

CTC DEBUG {ON | OFF} [devnum | ALL]

Diagram

```
CTC  ---  DEBUG  ---
      |                |
      |                |
      |              ON|
      |              OFF|
      |                |
        devnum       ALL
```

8.46.3 Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>Enables the debug packet tracing.</td>
</tr>
<tr>
<td>OFF</td>
<td>Disables the debug packet tracing.</td>
</tr>
<tr>
<td><code>devnum</code></td>
<td>Specifies the CTCI / LCS / PTP device group(s) for which debug packet tracing has to be enabled or disabled.</td>
</tr>
<tr>
<td>ALL</td>
<td>Enables or disables the debug packet tracing for all CTCI / LCS / PTP device groups. 'ALL' is the default if no device group is specified.</td>
</tr>
</tbody>
</table>

8.46.4 Examples

Example 1:
Enable the debug packet tracing for all CTCI / LCS / PTP devices. Please note that not all hex columns can be displayed in the figure below. Missing columns have been marked with "∫∫".

```
HHC00013I Herc command: 'ctc debug on all'
HHC02204I CTC debug set to on ALL
HHC00910I 0:0E20 CTC: sending packet to device 'tun0'
HHC00964I CTC: packet trace: +0000< 4500011C ∫∫ C0A80063 E....X..@......c ........ .7M|y..
HHC00964I CTC: packet trace: +0010< C0A80001 ∫∫ C6E342A9 ......y.U|....B. {y...."..PT.z
```
Figure 95: CTC command (enable debug packet tracing)

Example 2:
Disable the debug packet tracing.

HHC00013I Herc command: 'ctc debug off'
HHC02204I CTC debug set to off

Figure 96: CTC command (disable debug packet tracing)
8.47 DEFINE (Rename device)

8.47.1 Function
The DEFINE command can be used to “rename” a device (change the device number).

8.47.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEFINE olddevice newdevice</td>
</tr>
</tbody>
</table>

Diagram

```
DEFINE olddevice newdevice
```

8.47.3 Parameter

- **olddevice**: The device number of the device that has to be renamed.
- **newdevice**: The new device number, to which the device should now be attached.

8.47.4 Examples

**Example 1:**
Rename two devices.

```
HHC00013I Herc command: 'define 00c5 00c6'
HHC00013I Herc command: 'define 0481 0482'
```

Figure 97: DEFINE command
8.48 DEFSTORE (Display or define main and expanded storage values)

8.48.1 Function

The DEFSTORE command is used to specify the size of the main and expanded storage. Given without an argument the DEFSTORE command displays the current size of the main and expanded storage. If only the type of storage is given, the current storage size of this type is displayed. Storage is allocated in megabytes, unless a specific unit is specified. The actual upper limit of the main and expanded storage is determined by the host system’s architecture, operating system, and on some systems the amount of physical memory and paging space you have available.

The practical limit depends on the maximum amount of storage that can be obtained by the “malloc” function (usually around 1 GB on 32-bit platforms; on 64-bit platforms the value should only be limited by available paging space).

When increasing the storage size Hercules attempts to allocate first the new storage. If the new allocation is successful then the previously allocated memory will be freed. This is to prevent a situation where the old memory is freed first, then the new allocation fails and a reallocation of the memory in the previous size also fails because of storage fragmentation and therefore leaving Hercules without memory.

When decreasing the storage the memory will stay allocated in the previous size but the storage size will appear as decreased. Subsequent increases will not reallocate memory unless they go over the already allocated amount.

An additional optional argument determines the locking state of the allocated memory (page lock by host operating system). The LOCKED option indicates that the memory is to be locked into storage while UN-LOCKED (the default) indicates that the memory is not locked into the storage.

Please note that Hercules preserves the last locking state of DEFSTORE for each type of storage. Once the storage is locked, any subsequent change to the storage size will honor the existing lock state of memory unless the lock state is specified again on the DEFSTORE command.

Caution: Do not lock storage unless sufficient real memory is available to back up the request. Failure to do so may require the host system to be rebooted.

8.48.2 Syntax

Descriptive

DEFSTORE [MAIN [msize[B | K | M | G | T | P | E] [UNLOCK | LOCK]]]

[\{XSTOR | EXPANDED\} [xsize[M | G | T] [UNLOCK | LOCK]]]

Diagram

```
\[DEFSTORE\]

\[storagetype\]
```
8.48.3 Parameter

**msize**

The value of *msize* must be a valid decimal number. The actual upper limit is determined by the host system’s architecture, the operating system and on some systems the amount of physical memory and paging space that is available.

For storage sizes less than 16M, sizes not on a 4K boundary are rounded up to the next 4K boundary. Otherwise, storage sizes not on a 1M boundary are rounded up to the next 1M boundary.

The minimum size is 4K for architecture levels ALS0 and ALS1 (S/370 and ESA/390), and 8K for architecture level ALS2 (ESAME) and higher. A maximum of 64M may be specified for architecture level ALS0 (S/370), 2048M (2G) for ALS1 (ESA/390) and 16E for architecture level ALS2 (ESAME) and higher.

The default on startup is 2M.

**xsize**

The value of *xsize* must be a valid decimal number. The actual upper limit is determined by the host system’s architecture, the operating system and on some systems the amount of physical memory and paging space that is available.

Storage sizes not on a 1M boundary are rounded up to the next 1M boundary. The lower limit and default is 0.

**B**

‘B’ determines that the number given is specified in bytes (no multiplier). Specifying the storage in bytes is possible only for main storage.

**K**

‘K’ determines that the number given is specified in kilobytes (multiplier $2^{10}$). Specifying the storage in kilobytes is possible only for main storage.

**M**

‘M’ determines that the number given is specified in megabytes (multiplier $2^{20}$). This is the default if no unit is appended.

**G**

‘G’ determines that the number given is specified in gigabytes (multiplier $2^{30}$).

**T**

‘T’ determines that the number given is specified in terabytes (multiplier $2^{40}$). On 32-bit machines the unit terabytes is not available.
‘P’ determines that the number given is specified in petabytes (multiplier $2^{50}$). Specifying the storage in petabytes is possible only for main storage. On 32-bit machines the unit petabytes is not available.

‘E’ determines that the number given is specified in exabytes (multiplier $2^{60}$). Specifying the storage in exabytes is possible only for main storage. On 32-bit machines the unit exabytes is not available.

**LOCK**

Attempt to lock the storage (pages locked by the host operating system).

**UNLOCK**

Leave the store unlocked (no pages locked by the host operating system, pageable by host OS). This is the default.

**Notes:**

The actual upper limit is determined by the host system’s architecture and operating system and the amount of physical memory and available paging space. The total of MAINSIZE and XPNDSIZE on host systems with a 32-bit architecture will be limited to 4G; host systems with a 64-bit architecture will be limited to less than 16E.

Using minimum storage sizes, storage sizes less than or not on a 64K boundary for architecture level ALS0 (S/370) or not on a 1M boundary for architecture level ALS1 (ESA/390) and higher, it may be possible to generate error conditions not covered by the “Principles of Operations”.

Use of storage sizes greater than supported by the guest operating system may generate incorrect results or error conditions within the guest operating system.

### 8.48.4 Overview Storage Allocation Units

<table>
<thead>
<tr>
<th>Unit</th>
<th>Multiplier</th>
<th>Name (Symbol)</th>
<th>IEC Name (IEC Symbol)</th>
<th>Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>None</td>
<td>Byte (B)</td>
<td>Byte (B)</td>
<td>Main storage only</td>
</tr>
<tr>
<td>K</td>
<td>$2^{10}$</td>
<td>Kilobyte (kB)</td>
<td>Kibibyte (KiB)</td>
<td>Main storage only</td>
</tr>
<tr>
<td>M</td>
<td>$2^{20}$</td>
<td>Megabyte (MB)</td>
<td>Mebibyte (MiB)</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>$2^{30}$</td>
<td>Gigabyte (GB)</td>
<td>Gibibyte (GiB)</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>$2^{40}$</td>
<td>Terabyte (TB)</td>
<td>Tebibyte (TiB)</td>
<td>Not on 32-bit machines</td>
</tr>
<tr>
<td>P</td>
<td>$2^{50}$</td>
<td>Petabyte (PB)</td>
<td>Pebibyte (PiB)</td>
<td>Not on 32-bit machines</td>
</tr>
<tr>
<td>E</td>
<td>$2^{60}$</td>
<td>Exabyte (EB)</td>
<td>Exbibyte (EiB)</td>
<td>Not on 32-bit machines</td>
</tr>
</tbody>
</table>

| Table 19: Storage Allocation Units |
8.48.5 Examples

Example 1:
Display the current size of the main and expanded storage.

```
HHC00013I Herc command: 'defstore'
HHC17003I MAIN storage is 256 M (mainsize); storage is not locked
HHC17003I EXPANDED storage is 256 M (xpndsize); storage is not locked
```

Figure 98: MAINSIZE command (display size of main and expanded storage)

Example 2:
Display the current size of the main storage.

```
HHC00013I Herc command: 'defstore main'
HHC17003I MAIN storage is 256 M (mainsize); storage is not locked
```

Figure 99: MAINSIZE command (display size of main storage)

Example 3:
Set the size of the main storage to 512 MB. Lock the storage into the memory.

```
HHC00013I Herc command: 'defstore main 512 lock'
HHC01428I Locking main storage
HHC17003I MAIN storage is 512 M (mainsize); storage is locked
```

Figure 100: MAINSIZE command (Set size of locked main storage)

Example 4:
Set the size of the main and expanded storage to 512 MB each. Lock the main storage into the memory, but do not lock the expanded storage.

```
HHC00013I Herc command: 'defstore main 512M lock xstor 512M unlock'
HHC01428I Locking main storage
HHC17003I MAIN storage is 512 M (mainsize); storage is locked
HHC17003I EXPANDED storage is 512 M (xpndsize); storage is not locked
```

Figure 101: MAINSIZE command (Set size of main and expanded storage)
8.49 DEFSYM (Define a symbol)

8.49.1 Function
The DEFSYM command defines symbol ‘symbol’ as to contain value ‘value’. The symbol can then be the
object of a substitution for later panel commands. If the value contains blanks or spaces then it must be
enclosed within quotes or apostrophes. See chapter “Symbol Substitutions” for a more in-depth discus-
sion on this feature.

8.49.2 Syntax

Descriptive
DEFSYM [symbol [value]]

Diagram

\[ \text{DEFSYM} \quad \text{symbol} \quad \text{value} \]

8.49.3 Parameter

symbol
The name of a symbol. If no symbol name (and optionally a value) is given then all
previously defined symbols are listed.

value
The value that is assigned to the symbol. If the value is omitted then the previously
defined symbol is cleared, the symbol itself is not deleted.

8.49.4 Examples

Example 1:
List all defined symbols.

HHC00013I Herc command: 'defsym'
HHC02199I Symbol VERSION  '3.0.7.6879'
HHC02199I Symbol BDATE    'Oct 12 2010'
HHC02199I Symbol BTIME    '18:23:14'
HHC02199I Symbol HOSTNAME 'GOOFY'
HHC02199I Symbol HOSTOS   'Windows'
HHC02199I Symbol HOSTOSREL '6.1.7600'
HHC02199I Symbol HOSTOSVER 'NT '
HHC02199I Symbol HOSTARCH 'i686'
HHC02199I Symbol HOSTNUMCPUS  'MP=8'
HHC02199I Symbol MODNAME       'hercules.exe'
HHC02199I Symbol MODPATH       'D:\Hercules\'
HHC02199I Symbol PF01          'SUBST IMMED herc help &0'
HHC02199I Symbol PF11          'IMMED herc devlist TAPE'
HHC02199I Symbol PF10          'SUBST DELAY herc devinit &*'
HHC02199I Symbol CUU           '$(CUU)'
HHC02199I Symbol CCUU          '$(CCUU)'
HHC02199I Symbol DASDPATH      'D:/MVS/DASD'
HHC02199I Symbol READERPATH    'D:/MVS/READER'
HHC02199I Symbol PRINTPATH      'D:/MVS/PRINTER'
HHC02199I Symbol PUNCHPATH     'D:/MVS/PUNCH'
HHC02199I Symbol CSS           '0'
HHC02199I Symbol SUBCHAN       '0008'

Figure 102: DEFSYM command (list all symbols)

Example 2:
Define new symbol (and list the symbols afterwards).

HHC00013I Herc command: 'defsym TAPEDIR "D:\MVS\TAPE"'
HHC00013I Herc command: 'defsym'
HHC02199I Symbol VERSION       '3.0.7.6879'
HHC02199I Symbol BDATE         'Oct 12 2010'
HHC02199I Symbol BTIME         '18:23:14'
.
several lines not displayed
.
HHC02199I Symbol SUBCHAN       '0008'
HHC02199I Symbol TAPEDIR       'D:\MVS\TAPE'

Figure 103: DEFSYM command (define new symbol)

Example 3:
Clear defined symbol (and list the symbols afterwards).

HHC00013I Herc command: 'defsym TAPEDIR'
HHC00013I Herc command: 'defsym'
HHC02199I Symbol VERSION       '3.0.7.6879'
HHC02199I Symbol BDATE         'Oct 12 2010'
HHC02199I Symbol BTIME         '18:23:14'
.
several lines not displayed
.
HHC02199I Symbol SUBCHAN       '0008'
HHC02199I Symbol TAPEDIR       ''

Figure 104: DEFSYM command (clear defined symbol)
8.50 DELSYM (Delete a symbol)

8.50.1 Function
The DELSYM command deletes a symbol. Please note that the “DELSYM symbol” command actually deletes the symbol while the “DEFSYM symbol” command (without a given value) clears the symbol, but does not delete it.

8.50.2 Syntax

Descriptive
DELSYM symbol

Diagram

```
>>> DELSYM — symbol ————
```

8.50.3 Parameter

symbol This is the name of the symbol to be deleted.

8.50.4 Examples

Example 1:
Delete symbol TAPEDIR.

```
02:24:08 HHC00013I Herc command: 'delsym TAPEDIR'
```

Figure 105: DELSYM command
8.51 DETACH (Remove device)

8.51.1 Function
The DETACH command removes a device from the current configuration. The effect of this command is immediately visible in the device display of the Hercules Windows GUI and the Hercules “Peripherals” display.

8.51.2 Syntax

Descriptive

DETACH device

Diagram

```plaintext
Ëʬ¬¬ DETACH ¬¬¬ device ¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬ÊÍ
```

8.51.3 Parameter

device
The device number of the device that is to be removed from the current configuration.

8.51.4 Examples

Example 1:
Detach device 000F from the active configuration.

```
HHC00013I Herc command: 'detach 000F'
HHC01465I 0:000F device detached
```

Figure 106: DETACH command
8.52 DEVINIT (Reinitialize device)

8.52.1 Function

The DEVINIT command can be used to reopen an existing device. The arguments (if any) override the
arguments specified in the configuration file for this device. If no arguments (beneath the device number)
are given, then the DEVINIT command will reinitialize the device with the same arguments that were pre-
viously specified. The device type cannot be changed and must not be specified.

This command can be used to rewind a tape, to mount a new tape or disk image file on an existing de-
vice, to load a new card deck into a reader, or to close and reopen a printer or punch device.

8.52.2 Syntax

Descriptive

DEVINIT devnum [argument [argument ... ]]

Diagram

\[\text{DEVINIT} \quad \text{devnum} \quad \downarrow \quad \text{argument} \]

8.52.3 Parameter

\textit{devnum} \quad The device number of the device to be reinitialized.

\textit{argument} \quad Any arguments that are acceptable for the kind of device being reinitialized.

8.52.4 Examples

Example 1:

Initialize a tape device.

```
HHC00013I Herc command: 'devinit 0480 D:/MVS/TAPE/RPF142.HET compress=1 method=1 level=4'
HHC00221I 0:0480 Tape file 'D:/MVS/TAPE/RPF142.HET', type 'het': format type 'HET file'
HHC00222I 0:0480 Tape file 'D:/MVS/TAPE/RPF142.HET', type 'het': option 'compress' accepted
HHC00222I 0:0480 Tape file 'D:/MVS/TAPE/RPF142.HET', type 'het': option 'method' accepted
HHC02245I 0:0480 device initialized
```

Figure 107: DEVINIT command
8.53 DEVLIST (List device, device class or all devices)

8.53.1 Function
The DEVLIST command lists devices that are defined in the active Hercules configuration and displays their current status. Depending on the given argument DEVLIST shows information about one device only (when devnum is specified) or about all devices of a certain device class (when devclass is specified). Without an argument DEVLIST displays information about all defined devices.

8.53.2 Syntax

Descriptive
DEVLIST [devnum | devclass]

Diagram


8.53.3 Parameter

devnum  This specifies the device number of the device for which the status has to be displayed.

devclass  This specifies the device class for which DEVLIST has to display the status information.

Valid device classes are:

CON  (Console devices)
CTCA  (Channel-to-channel adapter)
DASD  (Disk devices)
DSP  (Terminals)
LINE  (Communication lines)
PCH  (Card punch devices)
PRT  (Printer devices)
QETH  (QETH devices)
8.53.4 Examples

Example 1:

List all devices of the current configuration.

```
HHC00013I Herc command: 'devlist'
HHC02279I 0:000C 3505 D:/MVS/READER/DUMMY.JCL ascii trunc eof IO[2] open  
HHC02279I 0:000D 3525 D:/MVS/PUNCH/PCH00D.TXT ascii crlf IO[2] open  
HHC02279I 0:000E 1403 D:/MVS/PRINTER/PRT00E.TXT crlf brows fcbrck IO[2] open  
HHC02279I 0:000F 1403 D:/MVS/PRINTER/PRT00F.TXT crlf browse fcck IO[2] open  
HHC02279I 0:0010 3270 192.168.0.101 IO[173] open  
HHC02279I 0:0011 3270 192.168.0.101 IO[61] open  
HHC02279I 0:00C0 3270 192.168.0.101 IO[1] open  
HHC02279I 0:00C1 3270 * 192.168.0.101 mask 255.255.255.255 IO[2]  
HHC02279I 0:00C2 3270 * 192.168.0.101 mask 255.255.255.255 IO[2]  
HHC02279I 0:00C3 3270 * 192.168.0.101 mask 255.255.255.255 IO[2]  
HHC02279I 0:00C4 3270 * 192.168.0.101 mask 255.255.255.255 IO[2]  
HHC02279I 0:0130 2314 D:/MVS/DASD/SORT00.CCKD [200 cyls] [0 sfs] IO[30] open  
HHC02279I 0:0131 2314 D:/MVS/DASD/SORT01.CCKD [200 cyls] [0 sfs] IO[30] open  
HHC02279I 0:0132 2314 D:/MVS/DASD/SORT02.CCKD [200 cyls] [0 sfs] IO[30] open  
HHC02279I 0:0133 2314 D:/MVS/DASD/SORT03.CCKD [200 cyls] [0 sfs] IO[30] open  
HHC02279I 0:0134 2314 D:/MVS/DASD/SORT04.CCKD [200 cyls] [0 sfs] IO[30] open  
HHC02279I 0:0135 2314 D:/MVS/DASD/SORT05.CCKD [200 cyls] [0 sfs] IO[30] open  
several lines not displayed  
HHC02279I 0:0148 3350 D:/MVS/DASD/SPOOL0.CCKD [560 cyls] [0 sfs] IO[22] open  
HHC02279I 0:0149 3350 D:/MVS/DASD/SPOOL1.CCKD [560 cyls] [0 sfs] IO[22] open  
HHC02279I 0:0150 3350 D:/MVS/DASD/SPOOL2.CCKD [560 cyls] [0 sfs] IO[22] open  
HHC02279I 0:0151 3350 D:/MVS/DASD/SPOOL3.CCKD [560 cyls] [0 sfs] IO[22] open  
HHC02279I 0:0152 3350 D:/MVS/DASD/SPOOL4.CCKD [560 cyls] [0 sfs] IO[22] open  
HHC02279I 0:0153 3350 D:/MVS/DASD/SPOOL5.CCKD [560 cyls] [0 sfs] IO[22] open  
HHC02279I 0:030E 1403 D:/MVS/LOG/hardcopy.log crlf browse fcbck IO[15] open  
HHC02279I 0:0344 3350 D:/MVS/DASD/SPOOL0.CCKD [560 cyls] [0 sfs] IO[41] open  
HHC02279I 0:0345 3350 D:/MVS/DASD/SPOOL1.CCKD [560 cyls] [0 sfs] IO[150] open  
HHC02279I 0:0346 3350 D:/MVS/DASD/SPOOL2.CCKD [560 cyls] [0 sfs] IO[150] open  
HHC02279I 0:0347 3350 D:/MVS/DASD/SPOOL3.CCKD [560 cyls] [0 sfs] IO[150] open  
HHC02279I 0:0348 3350 D:/MVS/DASD/SPOOL4.CCKD [560 cyls] [0 sfs] IO[150] open  
HHC02279I 0:0349 3350 D:/MVS/DASD/SPOOL5.CCKD [560 cyls] [0 sfs] IO[150] open  
HHC02279I 0:0480 3420 * IO[2]  
HHC02279I 0:0481 3420 * IO[2]  
HHC02279I 0:0E20 3088 CTCI 192.168.0.99/192.168.0.101 () IO[0]  
```

Figure 108: DEVLIST command (list all devices)
**Example 2:**

List all devices of class DSP (display).

```
HHCO0013I Herc command: 'devlist dsp'
HHCO2279I 0:0010 3270 192.168.0.101 IO[173] open
HHCO2279I 0:0011 3270 192.168.0.101 IO[61] open
HHCO2279I 0:00C0 3270 192.168.0.101 IO[1] open
HHCO2279I 0:00C1 3270 192.168.0.101 IO[1] open
HHCO2279I 0:00C2 3270 * 192.168.0.101 mask 255.255.255.255 IO[2]
HHCO2279I 0:00C3 3270 * 192.168.0.101 mask 255.255.255.255 IO[2]
HHCO2279I 0:00C4 3270 * 192.168.0.101 mask 255.255.255.255 IO[2]
HHCO2279I 0:00C5 3270 * 192.168.0.101 mask 255.255.255.255 IO[2]
```

**Figure 109: DEVLIST command (specify device class)**

**Example 3:**

List one device (0148) by device number.

```
HHCO0013I Herc command: 'devlist 0148'
HHCO2279I 0:0148 3350 D:/MVS/DASD/MVSRES.CCKD [560 cyls] [0 sfs] IO[92230] open
```

**Figure 110: DEVLIST command (specify device number)**
8.54 DEVPRI0 (Display or set device threads process priority)

8.54.1 Function

The DEVPRI0 command is used to change the priority of the device threads. See section 5.82 for details on process and thread priorities. Given without an argument the DEVPRI0 command displays the current device threads process priority.

Caution: DEVPRI0 should not have a higher dispatching priority than the TOD clock and timer thread.

8.54.2 Syntax

**Descriptive**

DEVPRI0 [nn]

**Diagram**

```
DEVPRI0  nn
```

8.54.3 Parameter

nn This value specifies the priority for the device threads. For details on the priority values see section 5.82 (“Process and Thread Priorities”).

8.54.4 Examples

Example 1:
Set the device threads process priority to 10.

```
HHC00013I Herc command: 'devprio 10'
HHC02204I devprio set to 10
```

Figure 111: DEVPRI0 command
8.55 DEVTMAX (Display or set maximum device threads)

8.55.1 Function

The DEVTMAX command displays the current setting of the DEVTMAX system parameter along with the actual device threads statistics. As an additional argument a new value for the maximum device threads may be specified.

8.55.2 Syntax

**Descriptive**

DEVTMAX [-1 | 0 | 1-n]

**Diagram**

```
DEVTMAX
   -1
   0
   1-n
```

8.55.3 Parameter

0 Specify 0 to create an unlimited number of ‘semi-permanent’ threads on an ‘as-needed’ basis. This is the default. With this option, a thread is created to service an I/O request for a device if one does not already exist. When the I/O is complete the thread enters an idle state waiting for new work. If a new I/O request for the device arrives before the timeout period expires the existing thread will be reused. The timeout value is currently hard coded at 5 minutes.

Note that this option can cause one thread (or possibly more) to be created for each device in your configuration. Specifying 0 means there is no limit to the number of threads that can be created.

-1 Specify -1 to cause ‘one time only’ temporary threads to be created to service each I/O request to a device. Once the I/O request is complete, the thread exits. Subsequent I/Os to the same device will cause another worker thread to be created again.

1-n Specify a value from 1 to n to set an upper limit to the number of threads that can be created to service any I/O request to any device. Like the “0” option, each thread once finished servicing an I/O request enters an idle state. If a new request arrives before the timeout period expires, the thread is reused.

If all threads are busy when a new I/O request arrives a new thread is created only if the specified maximum number of threads have not yet been reached. If the specified maximum number of threads already has been reached then the I/O request
is placed in a queue and will be serviced by the first available thread (e.g. by whichever thread becomes idle first).

This option was created to address a threading issue, possibly related to the Cygwin pthreads implementation on Windows systems. On Windows systems positive DEVTMAX values are currently not honoured and are treated identically as if the value 0 had been specified. The default for non-Windows systems is 0.

### 8.55.4 Examples

**Example 1:**
Display the maximum allowed device threads along with the current statistics.

```plaintext
HHC00013I Herc command: 'devtmax'
HHC02241I Max device threads: 0, current: 5, most: 5, waiting: 4, max exceeded: 0
```

**Figure 112: DEVTMAX command (list maximum allowed device threads)**

**Example 2:**
Set the maximum allowed device threads to 25.

```plaintext
HHC00013I Herc command: 'devtmax 25'
```

**Figure 113: DEVTMAX command (set maximum allowed device threads)**
8.56 DIAG8CMD (Display or set DIAGNOSE 8 command option)

8.56.1 Function
The DIAG8CMD command specifies whether a command issued through Diagnose 8 will be executed by Hercules as a Hercules commands or not. An optional second argument can be specified to request whether the commands issued using the Diagnose 8 interface will be traced at the console. This may be useful for programs that routinely issue console commands using the Diagnose 8 interface. If no argument is given, DIAG8CMD displays the current settings.

Caution: Enabling this feature may have security consequences. When this feature is enabled it is possible for guest operating systems running under Hercules to issue commands directly to the host operating system by means of the Hercules ‘sh’ (shell) command. This ability may be disabled via the SHCMDOPT statement.

Note: There are some commands that are being prevented from being used by the Diagnose 8 interface. The list of commands that may not be executed by means of Diagnose 8 can be found in “Appendix D. Hercules Command Groups” under the column ‘NODIAG8’.

8.56.2 Syntax

Descriptive
DIAG8CMD [DISABLE | ENABLE [ECHO | NOECHO]]

Diagram

```
DIAG8CMD
     | DISABLE
     | ENABLE
     | ECHO
     | NOECHO
```

8.56.3 Parameter

DISABLE Commands issued through the Diagnose 8 interface will generate a Specification Exception program interrupt on the issuing CPU. This is the default together with NOECHO.

ENABLE Commands issued through the Diagnose 8 interface will be executed by Hercules as Hercules commands.

ECHO When ECHO is specified, a message is issued as the console is about to issue the command, the command is redisplayed as if it was entered through the console input line, and a final message is issued to indicate the command completed.
NOECHO

When NOECHO is specified, no such messages are displayed and the command completes silently, except for the output of the command itself if the Diagnose 8 interface did not request a response buffer. This is the default together with DISABLE.

The value of ECHO or NOECHO has no effect on command output being placed into a response buffer if the Diagnose 8 interface requested one.

8.56.4 Examples

Example 1:
Display the current DIAG8CMD settings.

```
HHC00013I Herc command: 'diag8cmd'
HHC02203I DIAG8CMD : disable, no echo
```

Figure 114: DIAG8CMD command (display current settings)

Example 2:
Specify that commands issued through the Diagnose 8 interface are executed as Hercules commands. Additionally issue a message, as the console is about to execute the command, then redisplay the command itself and give a final message, indicating the command has completed.

```
HHC00013I Herc command: 'diag8cmd enable echo'
```

Figure 115: DIAG8CMD command (set new DIAG8CMD mode)
8.57 DIR (Display file and directory listing)

8.57.1 Function
The DIR command displays a list of files and subdirectories in the current directory. The DIR command is only available when running Hercules under Microsoft Windows. For Linux and Mac OS X please use the "LS" command.

8.57.2 Syntax

**Descriptive**

DIR

**Diagram**

![Diagram of DIR command]

8.57.3 Parameter
None.

8.57.4 Examples
Example 1:

Show the list of files and subdirectories in the current directory.

```
HHC00013I Herc command: 'dir'
Volume in drive D is Hercules
Volume Serial Number is 6CD7-297E

Directory of D:\Hercules
11.07.2010  01:13    <DIR>          .
11.07.2010  01:13    <DIR>          ..
16.12.2007  01:00           282'624 AWSBrowse32.exe
16.12.2007  01:00           503'808 AWSBrowse32D.exe
16.12.2007  01:00           274'432 AWSBrowse32U.exe
16.12.2007  01:00           491'520 AWSBrowse32UD.exe
28.02.2007  06:24           323'072 AWSBrowse64.exe
28.02.2007  06:24           647'168 AWSBrowse64D.exe
28.02.2007  06:24           317'440 AWSBrowse64U.exe
28.02.2007  06:24           636'416 AWSBrowse64UD.exe
```
Figure 116: DIR command
8.58 DS (Display subchannel)

8.58.1 Function
The DS command shows the subchannel information for a given device number.

8.58.2 Syntax

Descriptive
DS devnum

Diagram


8.58.3 Parameter

devnum The device number for which the subchannel information has to be displayed.

8.58.4 Examples

Example 1:
Display subchannel information for device 0AE0.

```
HHC00013I Herc command: 'ds 0ae0'
HHC02268I 0:0AE0 D/T3390 Subchannel Number[0028]
HHC02268I Path Management Control Word (PMCW)
HHC02268I IntParm:00F3F8A8
HHC02268I Flags:189D Dev:0AE0
HHC02268I LPM:80 PNM:00 LPUM:80 PIM:80
HHC02268I MBI:0183 POM:FF PAM:80
HHC02268I CHPID0:0A 1:00  2:00  3:00
HHC02268I CHPID1:0A 4:00  5:00  6:00  7:00
HHC02268I Misc:00000001
HHC02268I Subchannel Status Word (SCSW)
HHC02268I Flags:08C0 SCHC:4020 DS:00 SS:00 Count:0001 CCW:7F01CB70
HHC02268I Device Status is Normal
HHC02268I Subchannel Status is Normal
```

Figure 117: DS command
8.58.5 Explanations

The information presented in the output from the Display Subchannel command is taken from the Subchannel-Information Block (SCHIB). The Subchannel-Information Block shows - beneath other areas - the Path-Management-Control Word (PMCW) and the Subchannel-Status Word (SCSW). The format of the SCHIB is shown on the following page.

<table>
<thead>
<tr>
<th>Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>12</td>
</tr>
</tbody>
</table>

**Figure 118: Subchannel-Information Block**

Words 0-6 of the SCHIB contain the Path-Management-Control Word (PMCW). The format of the PMCW is the following:

<table>
<thead>
<tr>
<th>Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
</tbody>
</table>

**Figure 119: Path-Management-Control Word**

Legend:

 ISC  Interruption-Subclass Code
 E    Enabled
 LM   Limit Mode
MM    Measurement-Mode Enable
D    Multipath Mode
T    Timing Facility
V    Device Number Valid
LPM   Logical-Path Mask
PNOM  Path-Not-Operational Mask
LPUM  Last-Path-Used Mask
PIM   Path-Installed Mask
MBI   Measurement-Block Index
POM   Path-Operational Mask
PAM   Path-Available Mask
CHPIDs Channel-Path Identifiers
F    Measurement Block Format Control
X    Extended Measurement Word Enable
S    Concurrent Sense

The Subchannel>Status Word (SCSW) provides information about the status of a subchannel and its associated devices. The format of the SCSW is as follows:

<table>
<thead>
<tr>
<th>Word</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
</tbody>
</table>

**Legend:**

Key    Subchannel Key
S    Suspend Control
L    ESW Format
CC   Deferred Condition Code
F    Format
P    Prefetch
I    Initial-Status Interruption Control
A    Address-Limit-Checking Control
U    Suppress-Suspend Interruption
Z    Zero Condition Code
E    Extended Control

**Figure 120: Subchannel-Status Word**
<table>
<thead>
<tr>
<th>N</th>
<th>Path Not Operational</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Reserved</td>
</tr>
<tr>
<td>FC</td>
<td>Function Control</td>
</tr>
<tr>
<td>AC</td>
<td>Activity Control</td>
</tr>
<tr>
<td>SC</td>
<td>Status Control</td>
</tr>
<tr>
<td>Count</td>
<td>Residual Count</td>
</tr>
</tbody>
</table>

Details about the control blocks, that have been described here only briefly, can be found in IBM's "z/Architecture Principles of Operation" manual.
8.59 ECPSVM (ECPS:VM commands)

8.59.1 Function
This command specifies, whether ECPS:VM (Extended Control Program Support : Virtual Machine) support is to be enabled and – if it is enabled – to which level. Issuing command ECPSVM HELP displays a list of all available commands.

The purpose of ECPS:VM is to provide to the VM/370 operating system a set of shortcut facilities to perform hypervisor functions (CP Assists) and virtual machine simulation (VM Assists).

Although this feature does not affect VM operating system products operating in XA, ESA or z/Architecture mode, it will affect VM/370 and VM/SP products running under VM/XA, VM/ESA or z/VM. Running VM/370 and VM/SP products under VM/XA, VM/ESA or z/VM should be done with ECPS:VM disabled. ECPS:VM should not be enabled in AP or MP environments. ECPS:VM has no effect on non-VM operating systems. It is however recommended to disable ECPS:VM when running native non-VM operating systems.

If a specific level is given this value will be reported to the operating system when it issues a Store ECPS:VM level but it does not otherwise alter the ECPS:VM facility operations. Please note that this is a partial implementation.

Some of the arguments of the ECPSVM command can be abbreviated as shown in the syntax section below.

8.59.2 Syntax

Descriptive
ECPSVM [Help | S|T|a|t|s | D|I|S|a|b|l|e | E|N|a|b|l|e | D|E|B|U|G | N|O|d|e|b|u|g | L|e|v|e|l | n|n]

Diagram

```
ECPSVM

Help
STats
DISable
ENable
DEBUG
NODebug
Level [nn]
```
8.59.3 Parameter

Help
Display help with all available ECPSVM options.

STATS
Show statistical counters.

DISABLE
Disable all ECPS:VM features. This is the default if ECPSVM is not coded.

ENABLE
Enable all ECPS:VM features.

DEBUG
Debug ECPS:VM features.

NDEBUG
Turn debug modus off for ECPS:VM features.

LEVEL
Set/show ECPS:VM level.

nn
The value nn specifies the support level that is reported to the operating system.

8.59.4 Examples

Example 1:
Enable the ECPS:VM features.

HHC0013I Herc command: 'ecpsvm enable'
HHC01719I ECPS:VM Command processor invoked
HHC01707I ECPS:VM VM ASSIST feature SVC Enabled
HHC01707I ECPS:VM VM ASSIST feature SSM Enabled
HHC01707I ECPS:VM VM ASSIST feature LPSW Enabled
HHC01707I ECPS:VM VM ASSIST feature STNSM Enabled
HHC01707I ECPS:VM VM ASSIST feature STOSM Enabled
HHC01707I ECPS:VM VM ASSIST feature SIO Enabled
HHC01707I ECPS:VM VM ASSIST feature VTIMER Enabled
HHC01707I ECPS:VM VM ASSIST feature STCTL Enabled
HHC01707I ECPS:VM VM ASSIST feature LCTL Enabled
HHC01707I ECPS:VM VM ASSIST feature SCNRU Enabled
HHC01707I ECPS:VM VM ASSIST feature SCNVU Enabled
HHC01707I ECPS:VM CP ASSIST feature FREE Enabled
HHC01707I ECPS:VM CP ASSIST feature FRET Enabled
HHC01707I ECPS:VM CP ASSIST feature LCKPG Enabled
HHC01707I ECPS:VM CP ASSIST feature ULKPG Enabled
HHC01707I ECPS:VM CP ASSIST feature SCNRU Enabled
HHC01707I ECPS:VM CP ASSIST feature SCNVU Enabled
HHC01707I ECPS:VM CP ASSIST feature DISP0 Enabled
HHC01707I ECPS:VM CP ASSIST feature DISP1 Enabled
HHC01707I ECPS:VM CP ASSIST feature DISP2 Enabled
HHC01707I ECPS:VM CP ASSIST feature DNNCWW Enabled
HHC01707I ECPS:VM CP ASSIST feature DFCWW Enabled
HHC01707I ECPS:VM CP ASSIST feature FCCWS Enabled

Hercules Emulator V4.00 – User Reference Guide Page 370
Example 2:
Show ECPS:VM statistical counters.

```
HHC00013I Herc command: 'ecpsvm stats'
HHC01791I ECPS:VM Command processor invoked
HHC01702I +-----------+----------+----------+-------+
HHC01706I | VM ASSIST | Calls    | Hits     | Ratio |
HHC01702I +-----------+----------+----------+-------+
HHC01701I | Total     | 0        | 0        | 100%  |
HHC01702I +-----------+----------+----------+-------+
HHC01704I 11 entry/entries not shown and never invoked
HHC01702I +-----------+----------+----------+-------+
HHC01706I | CP ASSIST | Calls    | Hits     | Ratio |
HHC01702I +-----------+----------+----------+-------+
HHC01701I | Total     | 0        | 0        | 100%  |
HHC01702I +-----------+----------+----------+-------+
HHC01704I 23 entry/entries not shown and never invoked
HHC01722I ECPS:VM Command processor complete
```

Figure 122: ECPSVM STATS command

Example 3:
Show the ECPS:VM level.

```
HHC00013I Herc command: 'ecpsvm level'
HHC01791I ECPS:VM Command processor invoked
HHC01712I Current reported ECPS:VM level is 20
HHC01713I But ECPS:VM is currently disabled
HHC01722I ECPS:VM Command processor complete
```

Figure 123: ECPSVM LEVEL command
Example 4:

Debug the ECPS:VM features.

```
HHC00013I Herc command: 'ecpsvm debug'
HHC01719I ECPS:VM Command processor invoked
HHC01707I ECPS:VM VM ASSIST feature SVC Debug On
HHC01707I ECPS:VM VM ASSIST feature SSM Debug On
HHC01707I ECPS:VM VM ASSIST feature LPSW Debug On
HHC01707I ECPS:VM VM ASSIST feature STNSM Debug On
HHC01707I ECPS:VM VM ASSIST feature STOSM Debug On
HHC01707I ECPS:VM VM ASSIST feature SIO Debug On
HHC01707I ECPS:VM VM ASSIST feature VTIMER Debug On
HHC01707I ECPS:VM VM ASSIST feature STCTL Debug On
HHC01707I ECPS:VM VM ASSIST feature LCTL Debug On
HHC01707I ECPS:VM VM ASSIST feature DIAG Debug On
HHC01707I ECPS:VM VM ASSIST feature IUCV Debug On
HHC01708I All ECPS:VM VM ASSIST features Debug On
HHC01707I ECPS:VM CP ASSIST feature FREE Debug On
HHC01707I ECPS:VM CP ASSIST feature FRET Debug On
   several lines not displayed
   .
HHC01707I ECPS:VM CP ASSIST feature FCCWS Debug On
HHC01707I ECPS:VM CP ASSIST feature CCWGN Debug On
HHC01707I ECPS:VM CP ASSIST feature UXCCW Debug On
HHC01707I ECPS:VM CP ASSIST feature TRBRG Debug On
HHC01707I ECPS:VM CP ASSIST feature TRLOK Debug On
HHC01707I ECPS:VM CP ASSIST feature VIST Debug On
HHC01707I ECPS:VM CP ASSIST feature VIPT Debug On
HHC01707I ECPS:VM CP ASSIST feature STEVL Debug On
HHC01707I ECPS:VM CP ASSIST feature FREEX Debug On
HHC01707I ECPS:VM CP ASSIST feature FRETX Debug On
HHC01707I ECPS:VM CP ASSIST feature PMASS Debug On
HHC01707I ECPS:VM CP ASSIST feature LCPSPG Debug On
HHC01708I All ECPS:VM CP ASSIST features Debug On
HHC01709I ECPS:VM global debug On
HHC01722I ECPS:VM Command processor complete
```

Figure 124: ECPSVM DEBUG command
8.60 ENGINES (Set processor engines type)

8.60.1 Function

The ENGINES command specifies the type of engine for each installed processor. The default engine type is CP. The number of installed processor engines is determined by the MAXCPU system parameter.

If the ENGINES command specifies more than MAXCPU engines, the excess engines are ignored. If fewer than MAXCPU engines are specified, the remaining engines are set to type CP (the default). See the MAXCPU system parameter or console command for details regarding the compile time variable MAX_CPU_ENGINES.

For detailed explanations on the interrelationship between ENGINES, MAXCPU and NUMCPU please see “Appendix B. Configuration of Emulated CPUs”.

8.60.2 Syntax

Descriptive

ENGINES [nn*] {CP | IL | AP | IP} [, ... ]

Diagram

```
  ENGINES
    nn*
      CP
      IL
      AP
      IP
```

8.60.3 Parameter

nn* This is an optional repeat count.

CP Specifies a processor engine of type CP. This is the default.

IL Specifies a processor engine of type IL.

AP Specifies a processor engine of type AP.

IP Specifies a processor engine of type IP.
8.60.4 Examples

Example 1:

Specify two engines of type CP, one engine of type IP and one engine of type AP.

```
HHC00013I Herc command: 'engines 2*cp,ip,ap'
HHC00027I Processor CP00: engine 00 type 0 set: 'CP'
HHC00027I Processor CP01: engine 01 type 0 set: 'CP'
HHC00027I Processor IP02: engine 02 type 5 set: 'IP'
HHC00027I Processor AP03: engine 03 type 2 set: 'AP'
```

Figure 125: ENGINES command
8.61 EXEC (Execute a REXX script)

8.61.1 Function
The EXEC console command executes a Rexx script. EXEC invokes Rexx within the Hercules process to execute the Rexx script and commands will be executed synchronously within the Hercules process.

The EXEC command is only available if Hercules is built with Rexx support (see the Hercules “Installation Guide” for details on how to activate Rexx support and the Hercules “General Information” manual for more details about the Rexx support). Chapter 14 ("REXX Support") in this manual contains additional information about using Rexx with Hercules.

8.61.2 Syntax

Descriptive
EXEC [COMMAND | SUBROUTINE] rexx [argument [argument ...]]

Diagram
EXEC  COMMAND  SUBROUTINE  rexx  argument

8.61.3 Parameter

COMMAND Specifies command style for passing arguments to a Rexx script. ‘COMMAND’ may be abbreviated as ‘COM’. If not specified then the argument passing style is determined by the Rexx mode settings (form the REXX system parameter or console command).

SUBROUTINE Specifies subroutine style for passing arguments to a Rexx script. ‘SUBROUTINE’ may be abbreviated as ‘SUB’. If not specified then the argument passing style is determined by the Rexx mode settings (form the REXX system parameter or console command).

rexx This is the name (and optionally the path) of a Rexx script.

If the name of the Rexx to be executed is given without a pathname, the script is searched within the path that has been defined with the REXX command or the default path if no path has been set for the Rexx environment (see the REXX console command for more details).

If a path is specified in the EXEC command, then the Rexx will not be searched in the defined path of the Rexx environment.

argument These are the arguments (separated by spaces) to be passed to the Rexx script.
8.61.4 Examples

Example 1:
Execute Rexx script "testrexx.rexx" with arguments 'arg1', 'arg2' and 'arg3'.

```
HHC00013I Herc command: 'exec testrexx arg1 arg2 arg3'
testrexx started
testrexx version . . . . : REXX-Regina_3.6(MT) 5.00 31 Dec 2011
testrexx source . . . . : WIN64 COMMAND d:\mvs\conf\testrexx.REX
testrexx hostenv . . . . : HERCULES
testrexx date . . . . . : 6 May 2012
testrexx time . . . . . : 02:39:19
testrexx arguments . . . : arg1 arg2 arg3
testrexx Hercules version : 3.08.0
testrexx RC environment . : D:\MVS\CONF\Hercules_Test.rc
HHC02208I Uptime 04:02:33
testrexx ended
```

Figure 126: EXEC command

The executed REXX script from example 1 is the following:

```
/* REXX */
parse arg parms

parms = space(parms)
argc  = words(parms)

parse version ver
parse source src

env = address()

parse var src . . cmd
who = filespec("n",cmd)
parsed var who who "." .

say who " started"
say who " version . . . :" ver
say who " source . . . :" src
say who " hostenv . . . :" env

say who " date . . . :" date()
say who " time . . . :" time()
```
if parms = ""
    then do
        say who " arguments . . . : no arguments given"
        ret = 0
    end
else do
    say who " arguments . . . :" parms
    ret = parms
    end

Say who " Hercules version :" value('version',,'SYSTEM')
Say who " RC environment . :" value('HERCULES_RC',,'ENVIRONMENT')

address hercules 'uptime'

say who " ended"

exit ret
8.62 EXIT (Terminate the emulator)

8.62.1 Function

The EXIT command (see also the QUIT command) initiates the Hercules shutdown. It terminates all threads, detaches all channels and devices and releases the configuration. Finally it terminates the emulator. If the guest OS has enabled "Signal Shutdown" then a signal shutdown request is sent to the guest OS and termination will begin after the guest OS has shutdown.

The EXIT command acts different depending on how Hercules was built. If Hercules was not compiled with the option 'OPTION_SHUTDOWN_CONFIRMATION' then the command acts as described above.

If Hercules however was built with option 'OPTION_SHUTDOWN_CONFIRMATION' then the following special processing for terminating the emulator takes place.

If EXIT is entered and the command level is not set to 'developer', 'debug' or 'all' then EXIT will first check that all online CPUs are stopped. If any CPU is not in the stopped state message HHC00069I is displayed indicating the number of CPUs still running.

Message HHC02266A follows that prompts for confirmation by entering a second EXIT command within a certain time period (default 10 seconds) to start termination of the emulator. If the time period has expired then the process starts over. This is to prevent an inadvertent shutdown of Hercules while still a guest OS is running.

The time period for the second EXIT command can be set to another value by using the 'QUITMOUT' console command or system parameter.

If all processors are stopped or the command level is set to "developer", "debug" or "all" then quit stops Hercules immediately. 'EXIT FORCE' will also terminate the emulator immediately without any further checks.

8.62.2 Syntax

**Descriptive**

EXIT [FORCE]

**Diagram**

```
EXIT
  |     |
  V     V
   FORCE
```

8.62.3 Parameter

**FORCE**  Terminate the emulator immediately.
8.62.4 Examples

Example 1:
Initiate the Hercules shutdown.

```plaintext
HHC00013I Herc command: 'exit'
HHC00069I Guest is not quiesced; there are 8 CPUs active
HHC02266A Reenter command 'exit' again within 10 seconds to execute
HHC00013I Herc command: 'exit'
HHC01420I Begin Hercules shutdown
HHC01421I Releasing configuration

several lines not displayed

HHC01422I Configuration release complete
HHC01423I Calling termination routines

several lines not displayed

HHC02103I Logger: logger thread terminating
HHC01412I Hercules terminated
```

Figure 127: EXIT command

Example 2:
Initiate an immediate Hercules shutdown.

```plaintext
HHC00013I Herc command: 'exit force'
HHC01420I Begin Hercules shutdown
HHC01421I Releasing configuration

several lines not displayed

HHC01422I Configuration release complete
HHC01423I Calling termination routines

several lines not displayed

HHC02103I Logger: logger thread terminating
HHC01412I Hercules terminated
```

Figure 128: EXIT FORCE command
8.63 EXT (Generate external interrupt)

8.63.1 Function
The EXT command generates an external interrupt (the virtual INTERRUPPT key is pressed).

8.63.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EXT</td>
<td></td>
</tr>
</tbody>
</table>

Diagram

![EXT Diagram]

8.63.3 Parameter
None.

8.63.4 Examples

Example 1:
Generate an external interrupt.

```
HHC00013I Herc command: 'ext'
HHC02228I Key 'interrupt' pressed
```

Figure 129: EXT command
8.64 F{+/-} (Mark frames usable or unusable)

8.64.1 Function
The F{+/-} command is used to mark storage frames as usable or unusable.

8.64.2 Syntax

```
Descriptive
F{+ | -} addr

Diagram
F + addr

8.64.3 Parameter
+  Mark storage frame as usable.
-  Mark storage frame as unusable.

addr    The address of the storage frame that has to be marked usable or unusable.

8.64.4 Examples
Example 1:
Mark frame at address x'01000000' as unusable.

HHC00013I Herc command: 'f- 01000000'
HHC02204I frame 01000000 set to unusable

Figure 130: F{-} command
8.65 FCB (Display current FCB or load new FCB image)

8.65.1 Function

The FCB command is used to load a new FCB image or set the LPI (lines per inch) and LPP (lines per page) settings for a given 1403 or 3211 printer. Without arguments the FCB command displays the current settings for the printer.

To change settings, the printer must be stopped first ("STOP devaddr") and then started again ("START devaddr").

8.65.2 Syntax

Descriptive

FCB devicenum [LPI=lpI] [LPP=lpP]
[FCB=l1:c1,l2:c2,l3:c3, ... ,l10:c10,l11:c11,l12:c12]

Diagram

\[ FCB \to \text{devicenum} \to \text{LPI=lpI} \to \text{LPP=lpP} \]

8.65.3 Parameter

\text{devicenum} \quad \text{This is the device number of the printer for which the current settings have to be listed or changed.}

\text{LPI=} \quad \text{Specifies the number of lines per inch. The value of \( lpI \) must be 6 or 8.}

\text{LPP=} \quad \text{Specifies the number of lines per page. The value of \( lpP \) must be numeric but is not otherwise checked. Any number of lines per page is allowed.}

\text{FCB=} \quad \text{FCB= specifies an new FCB image to use for the printer. The argument must be given in the form } l1:c1, ... ,l12:c12 \text{ where } 'l' \text{ and } 'c' \text{ are both numeric. The value of } 'l' \text{ is the line number and the value of 'c' is the assigned channel. There is a maximum of 12 'l:c' pairs allowed.}
8.65.4 Examples

Example 1:
Display the current FCB for the printer with device address 000E.

```
HHC00013I Herc command: 'fcb 000e'
HHC02210I 0:000E lpi=6 index=0 lpp=66 fcb=1:1,7:2,13:3,19:4,...,43:8,49:10,55:11,61:12,63:9
```

Figure 131: FCB command (display current FCB)

Example 2:
Stop the printer with device address 000E. Set lines per inch to 6, lines per page to 66 and load a new FCB image for the printer. Then start the printer again.

```
HHC00013I Herc command: 'stop 000e'
HHC02214I 0:000E device stopped
HHC00013I Herc command: 'fcb 000e lpi=6 lpp=66 fcb=1:1,6:2,12:3,18:4,...,48:9,54:10,60:11,66:12'
HHC02210I 0:000E lpi=6 index=0 lpp=66 fcb=1:1,6:2,12:3,18:4,...,48:9,54:10,60:11,66:12
HHC00013I Herc command: 'start 000e'
HHC02214I 0:000E device started
```

Figure 132: FCB command (load new FCB image)
8.66  FPC (Display or alter floating point control register)

8.66.1  Function
The FPC command displays or alters the actual content of the floating point control register. Enter FPC by itself to display the register value without altering it.

8.66.2  Syntax

Descriptive

FPC [xxxxxxxx]

Diagram

```
\[\text{FPC} \quad \text{x\ldots x\ldots x}\]
```

8.66.3  Parameter

`xxxxxxxx`  This is the register value in hexadecimal (1-8 hex digits).

8.66.4  Examples

Example 1:
Display the floating point control register.

```
HHC00013I Herc command: 'fpc'
HHC02276I Floating point control register: 00000000
```

Figure 133: FPC command (display value)

Example 2:
Alter the floating point control register.

```
HHC00013I Herc command: 'fpc 00000103'
HHC02276I Floating point control register: 00000103
```

Figure 134: FPC command (alter value)
8.67 FPR (Display or alter floating point registers)

8.67.1 Function
The FPR command displays or alters the actual contents of the floating point registers (basic format). If the AFP bit is set in Control Register 0 then additional floating point registers are displayed (extended format). Enter FPR by itself to display the register values without altering them.

8.67.2 Syntax

Descriptive
FPR \( [nn=xxxxxxxxxxxxxxxxx] \)

Diagram

\[ \text{FPR} \quad nn=xxxxxxxxxxxxxxxxx \]

8.67.3 Parameter

\( nn \) This specifies the register number (0,2,4,6 or 0-15, depending on the Control Register 0 AFP bit) to be altered.

\( xxxxxxxxxxxxxxxx \) This is the register value in hexadecimal (1-16 hex digits for 64-bit registers).

8.67.4 Examples
Example 1:
Display the floating point registers.

\[ \text{HHC00013I Herc command: 'fpr'} \]
\[ \text{HHC02270I Floating point registers} \]
\[ \text{HHC02270I CP00: FPR0=0000000000000000 FPR2=0000000000000000 FPR6=0000000000000000} \]
\[ \text{HHC02270I CP00: FPR4=0000000000000000 FPR6=0000000000000000} \]

Figure 135: FPR command (display value)
Example 2:
Alter the floating point register 04.

```
HHC00013I Herc command: 'fpr 04=000000000000ffff'
HHC02270I Floating point registers
HHC02270I CP00: FPR0=0000000000000000 FPR2=0000000000000000
HHC02270I CP00: FPR4=000000000000FFFF FPR6=0000000000000000
```

Figure 136: FPR command (alter value)
8.68 G (Turn off instruction stepping and start all CPUs)

8.68.1 Function
The G command turns off the instruction stepping and starts all the CPUs. This command has also to be used to continue normal processing after stopping the instruction stepping with the S- command.

8.68.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
</tr>
</tbody>
</table>

Diagram

8.68.3 Parameter
None.

8.68.4 Examples
Example 1:
Stop the instruction stepping and start the CPU.

```
HHC00013I Herc command: 'g'
```

Figure 137: G command
8.69 GPR (Display or alter general purpose registers)

8.69.1 Function
The GPR command displays or alters the actual content of the general purpose registers. Enter GPR by itself to display the register values without altering them.

8.69.2 Syntax

Descriptive

GPR [nn=xxxxxxxx | nn=xxxxxxxxxxxxxxxx]

Diagram

```
>>> GPR
    nn=xxxxxxxx
    nn=xxxxxxxxxxxxxxxx
```

8.69.3 Parameter

nn This specifies the optional register number (00-15) to be altered.

xxxxxxxx This is the register value in hexadecimal (1-8 hex digits for 32-bit registers, 1-16 hex digits for 64-bit registers).

8.69.4 Examples

Example 1:
Display the general purpose registers.

```
HHC00013I Herc command: 'gpr'
HHC02269I General purpose registers
HHC02269I CP00: GR00=00000000 GR01=00000000 GR02=0252E12C GR03=02501EB0
HHC02269I CP00: GR04=02502400 GR05=000000C0 GR06=01379E76 GR07=00000000
HHC02269I CP00: GR08=0248EF58 GR09=00000000 GR10=0252EF7F GR11=0252DF80
HHC02269I CP00: GR12=813799C8 GR13=0252DF80 GR14=81379D22 GR15=000000C0
```

Figure 138: GPR command (display general purpose registers)
Example 2:
Alter general purpose register number 15.

HHC00013I Herc command: 'gpr 15=ffffffff'
HHC02269I General purpose registers
HHC02269I CP00: GR00=00000000 GR01=00000000 GR02=0252E12C GR03=02501EB0
HHC02269I CP00: GR04=02502400 GR05=000000C0 GR06=01379E76 GR07=00000000
HHC02269I CP00: GR08=0248EF58 GR09=00000000 GR10=0252EF7F GR11=0252DF80
HHC02269I CP00: GR12=813799C8 GR13=0252DF80 GR14=81379D22 GR15=000000C0

Figure 139: GPR command (alter general purpose register)
8.70 HAO (Hercules Automatic Operator)

8.70.1 Function

The Hercules Automatic operator (HAO) feature is a facility that allows to automatically issue console commands in response to certain messages being issued. To use the HAO facility it is necessary to define a rule, consisting of a target and an associated command.

The Hercules Automatic Operator is only for those messages issued by Hercules to its console. It cannot be used for messages issued from the guest operating system.

The current implementation limits the total number of defined rules to 64. There is currently no way to define a command whose arguments varies based on actual message text. All of the defined rules are checked for a match each time Hercules issues a message, there is no way at this time to stop the processing of subsequent rules.

8.70.2 Syntax

Descriptive

HAO command [operands]

where command can be:

TGT target

CMD consolecmd

DEL nn

CLEAR

LIST [nn]

Diagram

\[\text{HAO} \quad \text{command} \quad \text{TGT} \quad \text{target} \quad \text{CMD} \quad \text{consolecmd} \quad \text{DEL} \quad \text{nn} \quad \text{CLEAR} \quad \text{LIST}\]\n
where command can be:
8.70.3 Parameter

TGT  This is the keyword to define a new rule (pattern).

target  Specifies the rule (pattern) to react on. The target is a regular expression pattern which is matched against the text of the messages that Hercules issues.

CMD  This is the keyword to specify a command for a previously defined rule.

consolcmd  Specifies the command to be executed if a target rule matches. The associated command must be a valid Hercules console command.

LIST  List all rules/commands or list only rule/command at index nn.

DEL  Delete rule and command at index nn.

nn  Number of the index to be listed or deleted.

CLEAR  Specifies to delete all defined rules. This stops the Automatic Operator.

8.70.4 Examples

Example 1:
Define target rule: Check for message HHC01600E ("Unknown Hercules command").

```
HHC00013I Herc command: 'hao tgt hhc01600e'
HHC00077I The 'target' was placed at index 0
```

Figure 140: HAO command (define target rule).

Example 2:
Define command for target rule: Issue "?” command (List all valid commands).

```
HHC00013I Herc command: 'hao cmd help'
HHC00077I The 'command' was placed at index 0
```

Figure 141: HAO command (define command)
Example 3:
List all defined rules.

```
HHC00013I Herc command: 'hao list'
HHC00087I The defined Hercules Automatic Operator rule(s) are:
HHC00088I Index 00: target 'hhc01600e' -> command 'help'
HHC00082I 1 rule(s) displayed
```

Figure 142: HAO command (list defined rules)

Example 4:
Delete rule at index 0.

```
HHC00013I Herc command: 'hao del 0'
HHC00086I Rule at index 0 successfully deleted
```

Figure 143: HAO command (delete rule)

Example 5:
Delete all rules (stop Hercules Automatic Operator).

```
HHC00013I Herc command: 'hao clear'
HHC00080I All HAO rules are cleared
```

Figure 144: HAO command (delete all rules)

Example 6:
Sample of automatic execution of a command (triggered via the use of an unknown console command, as defined in examples 1 and 2).

```
HHC00013I Herc command: 'offload'
HHC01600E Unknown herc command 'offload', enter 'help' for a list of valid commands
HHC00007I Previous message from function ProcessPanelCommand() at cmdtab.c[286]
HHC00081I Match at index 00, executing command 'help'
HHC00013I Herc command: 'help'
HHC01602I Command  Description
HHC01602I ------  -----------------------------
HHC01602I help   list all commands / command specific help
HHC01602I ?      alias for help
HHC01602I cmdlevel Display/Set current command group
HHC01602I cmdlvl  Alias for cmdlevel

Figure 145: HAO fired command
8.71 HELP (List all commands / command specific help)

8.71.1 Function

The "help" command without any options will display a sorted list of all commands matching the current command level with a short description. It is possible to specify a partial command name followed by an asterisk ("*")) to get a list of all commands matching that partial command name. For example 'help msg*' will list all commands beginning with 'msg' and matching the current command level.

If the list is entered with a full command name it will display a long form of help information associated with that command if the command is available for the current command level. The list provided by the command without options shows with an asterisk in front of the description if there is additional information available.

The displayed help text may be limited to explaining the general format of the command and its various required or optional parameters and is not meant to replace the appropriate manual.

8.71.2 Syntax

```
HELP [command | cmd*]
```

8.71.3 Parameter

- **command**  The Hercules console command to which additional information is desired.
- **cmd**  Provides a list of all commands beginning with the partial command name ‘cmd’ and matching the current command level.

8.71.4 Examples

Example 1:

List all valid console commands matching the current command level.

```
HHC00013I Herc command: 'help'
HHC01603I
HHC01602I Command Description
```
HHC01602I ------ -----------------------------------------------
HHC01602I !message *SCP priority message
HHC01602I # Silent comment
HHC01602I * Loud comment
HHC01602I .reply *SCP command
HHC01602I ? alias for help
HHC01602I aea Display AEA tables
HHC01602I aia Display AIA fields
HHC01602I alrf Command deprecated: Use "archlvl" instead
HHC01602I ar Display access registers
HHC01602I archlvl *Set Architecture Level
HHC01602I archmode Alias for archlvl
HHC01602I asn_and_l Command deprecated: Use "archlvl" instead
HHC01602I attach *Configure device
HHC01602I auto_scsi *Command deprecated - Use "SCSIMOUNT"
HHC01602I autoinit *Display/Set automatic create empty tape file switch
HHC01602I automount *Display/Update allowable tape automount directories
HHC01602I b *Set breakpoint
HHC01602I b+ Set breakpoint
HHC01602I b- *Delete breakpoint
.
several lines not displayed
.
HHC01602I s{+/-}dev Turn CCW stepping on/off
HHC01602I t *Instruction trace
HHC01602I t+ *Instruction trace on
HHC01602I t- Turn off instruction tracing
HHC01602I t? *Instruction trace query
HHC01602I timerint *Display or set timers update interval
HHC01602I tlb Display TLB tables
HHC01602I toddrag Display or set TOD clock drag factor
HHC01602I todprio Set/Display todprio parameter
HHC01602I traceopt *Instruction trace display options
HHC01602I tt32 *Control/query CTCI-WIN functionality
HHC01602I tzoffset Set tzoffset parameter
HHC01602I t{+/-}CKD Turn CKD_KEY tracing on/off
HHC01602I t{+/-}dev Turn CCW tracing on/off
HHC01602I u Disassemble storage
HHC01602I uptime Display how long Hercules has been running
HHC01602I v *Display or alter virtual storage
HHC01602I version Display version information
HHC01602I xpndsize Define/Display xpndsize parameter
HHC01602I yroffset Set yroffset parameter
HHC01603I
HHC01610I (*) More help available.

Figure 146: HELP command
Example 2:
Display a list of commands beginning with ‘cpu’ and matching the current command level.

<table>
<thead>
<tr>
<th>Herc00013I Herc command: 'help cpu'*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herc01603I</td>
</tr>
<tr>
<td>Herc01602I Command</td>
</tr>
<tr>
<td>Herc01602I Description</td>
</tr>
<tr>
<td>Herc01602I ------</td>
</tr>
<tr>
<td>Herc01602I cpu</td>
</tr>
<tr>
<td>Herc01602I cpuidfmt</td>
</tr>
<tr>
<td>Herc01602I cpumodel</td>
</tr>
<tr>
<td>Herc01602I cpuprio</td>
</tr>
<tr>
<td>Herc01602I cpuserial</td>
</tr>
<tr>
<td>Herc01602I cpuverid</td>
</tr>
<tr>
<td>Herc01603I</td>
</tr>
<tr>
<td>Herc01610I (*) More help available.</td>
</tr>
</tbody>
</table>

Figure 147: HELP CPU* command

Example 3:
Display additional help text for the MAINSIZE command.

<table>
<thead>
<tr>
<th>Herc00013I Herc command: 'help mainsize'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herc01603I</td>
</tr>
<tr>
<td>Herc01602I Command</td>
</tr>
<tr>
<td>Herc01602I Description</td>
</tr>
<tr>
<td>Herc01602I</td>
</tr>
<tr>
<td>Herc01602I mainsize</td>
</tr>
<tr>
<td>Herc01603I</td>
</tr>
<tr>
<td>Herc01603I Format: mainsize [ mmmm</td>
</tr>
<tr>
<td>Herc01603I mmmm - define main storage size mmmm Megabytes</td>
</tr>
<tr>
<td>Herc01603I nnnS - define main storage size nnn S where S is the multiplier</td>
</tr>
<tr>
<td>Herc01603I B = no multiplier</td>
</tr>
<tr>
<td>Herc01603I K = 2**10 (kilo/kibi)</td>
</tr>
<tr>
<td>Herc01603I M = 2**20 (mega/mebi)</td>
</tr>
<tr>
<td>Herc01603I G = 2**30 (giga/gibi)</td>
</tr>
<tr>
<td>Herc01603I T = 2**40 (tera/tebi)</td>
</tr>
<tr>
<td>Herc01603I P = 2**50 (peta/pebi)</td>
</tr>
<tr>
<td>Herc01603I E = 2**60 (exa/exbi)</td>
</tr>
<tr>
<td>Herc01603I 1OCK - attempt to lock storage (pages lock by host OS)</td>
</tr>
<tr>
<td>Herc01603I unlOCK - leave storage unlocked (pagable by host OS)</td>
</tr>
<tr>
<td>Herc01603I (none) - display current mainsize value</td>
</tr>
<tr>
<td>Herc01603I</td>
</tr>
<tr>
<td>Herc01603I Note: Multipliers 'T', 'P', and 'E' are not available on 32bit machines</td>
</tr>
</tbody>
</table>

Figure 148: HELP MAINSIZE command
8.72 HERC (Send Hercules command)

8.72.1 Function
The HERC command sends a command in any CMDTGT mode to the Hercules Emulator. See also CMDTGT, SCP and PSCP commands.

8.72.2 Syntax

Descriptive

HERC [cmd]

Diagram

| HERC | cmd |

8.72.3 Parameter

`cmd` This is the command to be sent to the Hercules Emulator.

8.72.4 Examples

Example 1:
Send a Hercules command in SCP or PSCP command target mode..

```
HHC00013I Herc command: 'herc psw'
HHC02278I Program status word: 040C6000 815E43EA
HHC02300I sm=04 pk=0 cmwp=C as=ar cc=2 pm=0 am=31 ia=15E4308
```

Figure 149: HERC command
8.73 HERCLOGO (Read new Hercules logo file)

8.73.1 Function
The HERCLOGO command loads a new logo file for 3270 terminal sessions. The logo file defines a welcome screen that is presented when a TN3270 terminal connects to a Hercules 3270 device. For details on how to code the logo file see chapter 10. If no filename is specified then the built-in logo is used instead.

8.73.2 Syntax

Descriptive
HERCLOGO [filename]

Diagram

```
HERCLOGO [filename]
```

8.73.3 Parameter

filename
The name (and optionally path) of a logo text file. If no path is specified the logo file is first searched in the current working directory and second in the directory where the Hercules executable resides. If no filename is specified the built-in logo is used instead.

8.73.4 Examples

Example 1:
Load a new logo file.

```
HHC00013I Herc command: 'herclogo d:\hercules\conf\herclogo.txt'
```

Figure 150: HERCLOGO command
8.74 HERCPRIO (Display or set Hercules process priority)

8.74.1 Function
The HERCPRIO console command is used to change the process priority for Hercules. See section 5.82 for details on process and thread priorities. Given without an argument the HERCPRIO command displays the current Hercules process priority.

Caution: HERCPRIO should not have a higher dispatching priority than the TOD clock and timer thread.

8.74.2 Syntax

Descriptive
HERCPRIO [nn]

Diagram

8.74.3 Parameter

nn This value specifies the process priority for Hercules. For details on the priority values see section 5.82 (“Process and Thread Priorities”).

8.74.4 Examples

Example 1:
Set the Hercules process priority to 0.

Figure 151: HERCPRIO command
8.75 HST (History of commands)

8.75.1 Function
The HST command displays a list of the last commands entered from the command line. Usually every issued command is automatically added to the command recall history list. To prevent a command from appearing in the command recall history list it must be prefixed with a hyphen ('-') to make it a silent non-echoing command.

8.75.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>HST [-1]</td>
</tr>
<tr>
<td>HST [-] n</td>
</tr>
<tr>
<td>HST {L</td>
</tr>
</tbody>
</table>

Diagram

-1

n

L or 0

8.75.3 Parameter

-1  HST -1 is the same as HST without argument and retrieves the last entered command.

[-]n  If n is a positive number then HST retrieves the n-th command from the list. If n is a negative number then HST retrieves the n-th last command from the list.

L or 0  HST L or HST 0 (number "0") displays a list of the last ten commands entered on the command line.
8.75.4 Examples

Example 1:
Display a list of the last ten commands entered.

```
HHC00013I Herc command: 'hst 0'
HHC02273I Index 30: 'aia'
HHC02273I Index 31: 'ar'
HHC02273I Index 32: 'clocks'
HHC02273I Index 33: 'cr'
HHC02273I Index 34: 'maxrates 60'
HHC02273I Index 35: 'help ds'
HHC02273I Index 36: 'gpr'
HHC02273I Index 37: 'http stop'
HHC02273I Index 38: 'http port 8080 noauth'
HHC02273I Index 39: 'http start'
```

Figure 152: HST command (display command recall history list)

Example 2:
Prevent a command from being added to the command recall history list and display a list of the last ten entered commands.

```
HHC00013I Herc command: 'psw'
HHC02300I Program status word: 0000000000000000 0000000000000000
HHC02278I Program status word: 0000000000000000 0000000000000000
HHC00013I Herc command: 'hst 0'
HHC02273I Index 30: 'aia'
HHC02273I Index 31: 'ar'
HHC02273I Index 32: 'clocks'
HHC02273I Index 33: 'cr'
HHC02273I Index 34: 'maxrates 60'
HHC02273I Index 35: 'help ds'
HHC02273I Index 36: 'gpr'
HHC02273I Index 37: 'http stop'
HHC02273I Index 38: 'http port 8080 noauth'
HHC02273I Index 39: 'http start'
```

Figure 153: HST command (issue silent non-echoing command)
8.76 HTTP (Start, stop, modify and display HTTP server)

8.76.1 Function
The HTTP console command configures the HTTP server. Depending on the given arguments the port on which the HTTP server will listen and the authorization (if any) or the location of the HTTP server files can be specified. Additional arguments allow to start or to stop the HTTP server. Given without an argument the HTTP command displays the current state of the HTTP server.

8.76.2 Syntax

Descriptive
HTTP [START | STOP | ROOT path | PORT port (NOAUTH | AUTH userid password)]

Diagram

8.76.3 Parameter

START
Start the HTTP server (if it is stopped).

STOP
Stop the HTTP server (if it is started).

ROOT
Keyword to specify the root directory of the HTTP server files. The HTTP root can only be set if the HTTP server is in the stopped state.

path
The full path of the root directory where the HTTP server files reside. If this parameter is not specified the default value for Win32 builds of Hercules is the directory where the Hercules executables themselves reside. For non-Win32 builds it is the directory specified as the default package installation directory when the Hercules executables were built. This can vary depending on how the Hercules package was built, it is commonly “/usr/local/share/hercules”.

PORT
Keyword to specify the port on which the HTTP server will listen (including optional authorization information). The HTTP port and authorization information can only be set if the HTTP server is in the stopped state.

port
The port number must be either 80 or within the range of 1024 to 65535 inclusive.
NOAUTH indicates that no userid and password are required to access the HTTP server.

AUTH indicates that a userid and a password are required to access the HTTP server. The userid and password have to be coded after the AUTH parameter.

userid
The userid can be any valid string.

password
The password can be any valid string.

8.76.4 Examples

Example 1:
Display the HTTP server status.

```
HHC00013I Herc command: 'http'
HHC01809I HTTP server is waiting for requests
HHC01811I HTTP server root directory D:/HERCULES/HTML/
HHC01808I HTTP server port is port=80 noauth
```

Figure 154: HTTP command (display HTTP server status)

Example 2:
Stop the HTTP server.

```
HHC00013I Herc command: 'http stop'
HHC01805I HTTP server signaled to stop
HHC00101I Thread id 0000097C, prio 0, name 'HTTP server' ended
```

Figure 155: HTTP command (stop HTTP server)

Example 3:
Set the HTTP server root directory to “D:\Hercules\html”.

```
HHC00013I Herc command: 'http root D:/Hercules/html'
HHC02204I httproot set to D:/Hercules/html/
```

Figure 156: HTTP command (set HTTP server root directory)
Example 4:
Set the HTTP server port to 8081 with required authorization for access. The userid should be set to "hercuser" and the password to "hercpswd".

```
HHC00013I Herc command: 'http port 8081 auth hercuser hercpswd'
HHC02204I port set to port=8081 auth userid<hercuser> password<hercpswd>
```

Figure 157: HTTP command (set HTTP server port and authorization)

Example 5:
Start the HTTP server.

```
HHC00013I Herc command: 'http start'
HHC01807I HTTP server signaled to start
HHC00100I Thread id 00001344, prio 0, name 'HTTP server' started
HHC01802I Using HTTPROOT directory 'D:/Hercules/html/'
HHC01803I Waiting for HTTP requests on port 8081
```

Figure 158: HTTP command (start HTTP server)
8.77 I (Generate I/O attention interrupt for device)

8.77.1 Function
The I command generates an I/O attention interrupt for a certain device.

8.77.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>I device</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Diagram" /></td>
</tr>
</tbody>
</table>

8.77.3 Parameter

device The number of the device for which an I/O attention interrupt will be generated.

8.77.4 Examples

Example 1:
Generate an I/O attention interrupt for device 0148.

HHC00013I Herc command: 'i 000f'
HHC02230I 0:000F attention request raised

Figure 159: I command
8.78 ICOUNT (Display individual instruction counts)

8.78.1 Function
The ICOUNT command displays statistic information about how often every single machine instruction has been executed so far. By default the list sorted by the instruction code. An additional SORT option displays the instructions sorted by the usage count and percentage of usage.

The command is only available if Hercules is built with the “OPTION_INSTRUCTION_COUNTING” option. This option is not activated by default because ICOUNT is a debugging command.

8.78.2 Syntax

Descriptive
ICOUNT [SORT | CLEAR]

Diagram

8.78.3 Parameter
SORT Displays the instructions sorted by the usage count and percentage of usage.
CLEAR Clears the counters and start counting from zero.

8.78.4 Examples
Example 1:
Display the individual instruction counts.

HHCO0013I Herc command: 'icount'
HHCO2292I Instruction count display:
HHCO2292I Inst '04' count 32688
HHCO2292I Inst '05' count 3695113
HHCO2292I Inst '06' count 1211081
HHCO2292I Inst '07' count 5523916
HHCO2292I Inst '08' count 95360
<table>
<thead>
<tr>
<th>Instruction</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>'0E'</td>
<td>20764</td>
</tr>
<tr>
<td>'0F'</td>
<td>955</td>
</tr>
<tr>
<td>'10'</td>
<td>113522</td>
</tr>
<tr>
<td>'11'</td>
<td>38753</td>
</tr>
<tr>
<td>'12'</td>
<td>5743006</td>
</tr>
<tr>
<td>'13'</td>
<td>189520</td>
</tr>
<tr>
<td>'14'</td>
<td>625578</td>
</tr>
<tr>
<td>'15'</td>
<td>504659</td>
</tr>
<tr>
<td>'16'</td>
<td>148266</td>
</tr>
<tr>
<td>'17'</td>
<td>114403</td>
</tr>
<tr>
<td>'18'</td>
<td>12153723</td>
</tr>
<tr>
<td>'19'</td>
<td>4082623</td>
</tr>
<tr>
<td>'1A'</td>
<td>586980</td>
</tr>
<tr>
<td>'1B'</td>
<td>2519610</td>
</tr>
<tr>
<td>'1C'</td>
<td>4505</td>
</tr>
<tr>
<td>'1D'</td>
<td>25093</td>
</tr>
<tr>
<td>'1E'</td>
<td>1237759</td>
</tr>
<tr>
<td>'1F'</td>
<td>6595895</td>
</tr>
<tr>
<td>'B6'</td>
<td>78</td>
</tr>
<tr>
<td>'B7'</td>
<td>46856</td>
</tr>
<tr>
<td>'BA'</td>
<td>1518619</td>
</tr>
<tr>
<td>'BB'</td>
<td>584272</td>
</tr>
<tr>
<td>'BD'</td>
<td>464448</td>
</tr>
<tr>
<td>'BE'</td>
<td>538116</td>
</tr>
<tr>
<td>'BF'</td>
<td>877819</td>
</tr>
<tr>
<td>'D1'</td>
<td>234238</td>
</tr>
<tr>
<td>'D2'</td>
<td>2827438</td>
</tr>
<tr>
<td>'D3'</td>
<td>64695</td>
</tr>
<tr>
<td>'D4'</td>
<td>8923</td>
</tr>
<tr>
<td>'D5'</td>
<td>945073</td>
</tr>
<tr>
<td>'D6'</td>
<td>104993</td>
</tr>
<tr>
<td>'D7'</td>
<td>722277</td>
</tr>
<tr>
<td>'D8'</td>
<td>1641</td>
</tr>
<tr>
<td>'D9'</td>
<td>4296</td>
</tr>
<tr>
<td>'DE'</td>
<td>80</td>
</tr>
<tr>
<td>'F1'</td>
<td>43</td>
</tr>
<tr>
<td>'F2'</td>
<td>411</td>
</tr>
<tr>
<td>'F3'</td>
<td>1741</td>
</tr>
<tr>
<td>'F8'</td>
<td>2</td>
</tr>
</tbody>
</table>

Figure 160: ICOUNT command
Example 2:
Display the individual instruction counts sorted by usage count and percentage of usage.

```
HHC00013I Herc command: 'icount sort'
HHC02292I Sorted instruction count display:
HHC02292I Inst '47' count 45073338 (19%)
HHC02292I Inst '58' count 30958976 (13%)
HHC02292I Inst '91' count 17490895 ( 7%)
HHC02292I Inst '50' count 17148150 ( 7%)
HHC02292I Inst '18' count 12193746 ( 5%)
HHC02292I Inst '41' count 7487721 ( 3%)
HHC02292I Inst '1F' count 6621520 ( 2%)
HHC02292I Inst '40' count 6394646 ( 2%)
HHC02292I Inst '12' count 5782677 ( 2%)
HHC02292I Inst '54' count 5649330 ( 2%)
HHC02292I Inst '07' count 5526616 ( 2%)
HHC02292I Inst '5E' count 4976470 ( 2%)
HHC02292I Inst '19' count 4096278 ( 1%)
HHC02292I Inst '96' count 3834527 ( 1%)
HHC02292I Inst '95' count 3765941 ( 1%)
HHC02292I Inst '94' count 3755916 ( 1%)
several lines not displayed
HHC02292I Inst 'B20D' count 4941 ( 0%)
HHC02292I Inst '1C' count 4591 ( 0%)
HHC02292I Inst 'B209' count 4442 ( 0%)
HHC02292I Inst 'DD' count 4296 ( 0%)
HHC02292I Inst '5C' count 3566 ( 0%)
HHC02292I Inst '57' count 3391 ( 0%)
HHC02292I Inst '8D' count 3127 ( 0%)
HHC02292I Inst 'F3' count 1741 ( 0%)
HHC02292I Inst 'DC' count 1641 ( 0%)
HHC02292I Inst '4E' count 1339 ( 0%)
HHC02292I Inst '97' count 1046 ( 0%)
HHC02292I Inst '0F' count 955 ( 0%)
HHC02292I Inst '93' count 699 ( 0%)
HHC02292I Inst '4F' count 435 ( 0%)
HHC02292I Inst 'F2' count 411 ( 0%)
HHC02292I Inst 'B206' count 179 ( 0%)
HHC02292I Inst 'B6' count 114 ( 0%)
HHC02292I Inst 'DE' count 80 ( 0%)
HHC02292I Inst 'F1' count 43 ( 0%)
HHC02292I Inst 'B208' count 30 ( 0%)
HHC02292I Inst 'B202' count 15 ( 0%)
HHC02292I Inst 'B203' count 6 ( 0%)
HHC02292I Inst '20' count 3 ( 0%)
HHC02292I Inst 'B200' count 2 ( 0%)
HHC02292I Inst 'F8' count 2 ( 0%)
HHC02292I Inst '35' count 1 ( 0%)
```

Figure 161: ICOUNT command (sorted)
8.79 IODELAY (Display or set I/O delay value)

8.79.1 Function
The IODELAY command displays the current setting or sets the amount of time in microseconds to wait after an I/O interrupt is ready to be set pending. The purpose of this parameter is to bypass a bug in the Linux/390 and z/Linux ‘dasd.c’ device driver. The problem is more apt to happen under Hercules than on a real machine, as Hercules may present an I/O interrupt sooner than a real machine.

NOTE: OSTAILOR LINUX no longer sets IODELAY to 800 since the problem described above is no longer present in recent versions of the Linux kernel.

8.79.2 Syntax

Descriptive
IODELAY [usecs [NOWARN]]

Diagram

```
>>> IODELAY usecs NOWARN <<<
```

8.79.3 Parameter

usecs Amount of time in microseconds to wait after an I/O interrupt is ready to be set pending.

NOWARN If the IODELAY value is non-zero a warning message will be issued unless NOWARN is specified.

8.79.4 Examples

Example 1:
Display the current IODELAY value.

```
HHC00013I Herc command: 'iodelay'
HHC02203I iodelay       : 0
```

Figure 162: IODELAY command (display value)
Example 2:
Change the IODELAY value to 50 microseconds.

```
HHC00013I Herc command: 'iodelay 50'
HHC02204I iodelay          set to 50
```

Figure 163: IODELAY command (set value)
8.80 IPENDING (Display pending interrupts)

8.80.1 Function
The IPENDING command displays the pending interrupts for each CPU and some lock information.

8.80.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPENDING</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Diagram" /></td>
</tr>
</tbody>
</table>

8.80.3 Parameter
None

8.80.4 Examples

Example 1:
Display pending interrupts.

```
HHC00013I Herc command: 'ipending'
HHC00850I Processor CP00: CPUint=00000001 (State:00000081)&(Mask:CF00EC4B)
HHC00851I Processor CP00: interrupt not pending
HHC00852I Processor CP00: I/O interrupt not pending
HHC00853I Processor CP00: clock comparator not pending
HHC00854I Processor CP00: CPU timer not pending
HHC00855I Processor CP00: interval timer pending
HHC00856I Processor CP00: ECPS vtimer not pending
HHC00857I Processor CP00: external call not pending
HHC00858I Processor CP00: emergency signal not pending
HHC00859I Processor CP00: machine check interrupt not pending
HHC00860I Processor CP00: service signal not pending
HHC00861I Processor CP00: mainlock held: no
HHC00862I Processor CP00: intlock held: no
HHC00863I Processor CP00: waiting for intlock: no
HHC00864I Processor CP00: lock not held
HHC00865I Processor CP00: connected to channelset 0000
HHC00866I Processor CP00: state STARTED
```
HHC00867I Processor CP00: instcount 111019557
HHC00868I Processor CP00: siocount 5181
HHC00869I Processor CP00: psw 070E000000000000
HHC00850I Processor CP01: CPUint=80000000 (State:80000001)&(Mask:8000000A)
HHC00851I Processor CP01: interrupt pending
HHC00852I Processor CP01: I/O interrupt not pending
HHC00853I Processor CP01: clock comparator not pending
HHC00854I Processor CP01: CPU timer not pending
HHC00855I Processor CP01: interval timer not pending
HHC00856I Processor CP01: ECP5 vtimer not pending
HHC00857I Processor CP01: external call not pending
HHC00858I Processor CP01: emergency signal not pending
HHC00859I Processor CP01: machine check interrupt not pending
HHC00860I Processor CP01: service signal not pending
HHC00861I Processor CP01: mainlock held: no
HHC00862I Processor CP01: intlock held: no
HHC00863I Processor CP01: waiting for intlock: no
HHC00864I Processor CP01: lock not held
HHC00865I Processor CP01: connected to channelset 0001
HHC00866I Processor CP01: state STOPPED
HHC00867I Processor CP01: instcount 0
HHC00868I Processor CP01: siocount 0
HHC00869I Processor CP01: psw 0000000000000000
HHC00870I config mask 00000003 started mask 00000001 waiting mask 00000001
HHC00871I syncbc mask 00000000
HHC00872I signaling facility not busy
HHC00873I TOD lock not held
HHC00874I mainlock not held; owner ffff
HHC00875I intlock not held; owner ffff
HHC00881I I/O interrupt queue: (NULL)

Figure 164: IPENDING command
8.81 IPL (IPL Normal from device xxxx)

8.81.1 Function

This console command performs the Initial Program Load (IPL) Normal manual function from the given device. The IPL command may also be used to perform a load from CD-ROM or server. For example if a standard SUSE S/390 Linux distribution CD is loaded and mounted on /cdrom, this CD-ROM may then be IPL’ed using "IPL /cdrom/suse.ins".

If the first operand is a device name (devnum is a 1- to 4-digit hexadecimal number), a CCW-type IPL is initiated from the indicated device number and SCLP disk I/O is disabled.

If the first operand is a filename a list-directed IPL is performed from the specified ".ins" file and SCLP disk I/O is enabled for the directory path where the ".ins" file is located.

An optional ‘LOADPARM’ keyword followed by a 1-8 character string can be used to set the LOADPARM prior to IPL.

An optional ‘PARM’ keyword followed by a string can also be passed to the IPL command processor. The string will be loaded into the low-order 32 bits of the general purpose registers (4 characters per register for up to 64 bytes). The PARM option behaves similarly to the VM IPL command.

An optional ‘CLEAR’ keyword will initiate a Load Clear manual control function, prior to starting an IPL.

8.81.2 Syntax

Descriptive

IPL {devnum | filename} [LOADPARM iplparm | PARM parmstring] [CLEAR]

Diagram

\[\text{IPL} \quad \text{devnum} \quad \text{filename} \quad \text{LOADPARM} \quad \text{iplparm} \quad \text{PARM} \quad \text{parmstring} \quad \text{CLEAR}\]

8.81.3 Parameter

\begin{itemize}
  \item \textit{devnum} \quad The device address from which the emulator will IPL the system.
  \item \textit{filename} \quad The name of a ".ins" file to be loaded.
  \item \textit{LOADPARM} \quad This is the optional LOADPARM keyword.
  \item \textit{iplparm} \quad This is an 1-8 byte character string used to set the LOADPARM prior to the IPL.
\end{itemize}
The parameter is operating system dependent, consult the relevant operating system documentation for details.

**PARM**

This is the optional PARM keyword.

**parmstring**

The character string (max. 64 bytes) to be passed to the IPL command processor. The character string will be loaded into the low-order 32 bits of the GPRs (4 characters per register).

**CLEAR**

Initiate a Load Clear manual control function, prior to starting an IPL.

### 8.81.4 Examples

**Example 1:**

IPL normal from device 0148.

```
HHC00013I Herc command: 'ipl 0148'
HHC01315I 0:00C2 CH: ccw 03000000 20000001 => 040C0000 0001CEFA 00000000 00000000 .................
HHC01312I 0:00C2 CH: stat 0200, count 0001 "
HHC01313I 0:00C2 CH: sense 40000000 00000000 00000000 00000000 00000000 00000000
HHC01314I 0:00C2 CH: sense INTREQ
HHC01315I 0:00C3 CH: ccw 03000000 20000001 => 040C0000 0001CEFA 00000000 00000000 .................
HHC01312I 0:00C3 CH: stat 0200, count 0001 "
HHC01313I 0:00C3 CH: sense 40000000 00000000 00000000 00000000 00000000 00000000
HHC01314I 0:00C3 CH: sense INTREQ
HHC01315I 0:00C4 CH: ccw 03000000 20000001 => 040C0000 0001CEFA 00000000 00000000 .................
HHC01312I 0:00C4 CH: stat 0200, count 0001 "
HHC01313I 0:00C4 CH: sense 40000000 00000000 00000000 00000000 00000000 00000000
HHC01314I 0:00C4 CH: sense INTOREQ
HHC01315I 0:00C5 CH: ccw 03000000 20000001 => 040C0000 0001CEFA 00000000 00000000 .................
HHC01312I 0:00C5 CH: stat 0200, count 0001 "
HHC01313I 0:00C5 CH: sense 40000000 00000000 00000000 00000000 00000000 00000000
HHC01314I 0:00C5 CH: sense INTOREQ
HHC01315I 0:0480 CH: ccw 03000000 20000001 => 040C0000 0001CEFA 00000000 00000000 .................
HHC01312I 0:0480 CH: stat 0200, count 0001 "
HHC01313I 0:0480 CH: sense 40220000 00000000 00000000 00000000 00000000 00000000
HHC01314I 0:0480 CH: sense INTOREQ EOC WRI
HHC01315I 0:0481 CH: ccw 03000000 20000001 => 040C0000 0001CEFA 00000000 00000000 .................
HHC01312I 0:0481 CH: stat 0200, count 0001 "
HHC01313I 0:0481 CH: sense 40220000 00000000 00000000 00000000 00000000 00000000
HHC01314I 0:0481 CH: sense INTOREQ EOC WRI
```

Figure 165: IPL command
8.82 IPLC (IPL Clear from device xxxx)

8.82.1 Function
The IPLC console command has been deprecated. Please use the IPL command with the CLEAR option instead. See the IPL command for details.

8.82.2 Syntax
See IPL console command.

8.82.3 Parameter
See IPL console command.

8.82.4 Examples
See IPL console command.
8.83 K (Display CCKD internal trace)

8.83.1 Function
The K command displays the internal CCKD trace entries. Because the default value for the CCKD trace entries is set to zero, the trace must first be enabled by setting a trace entry value. This can be done either with the system parameter or the console command "CCKD TRACE=n", where n specifies the number of available trace entries and can be in the range of 1 to 200000.

Please note that the K command can produce a lot of messages depending on the available trace entries.

8.83.2 Syntax

Descriptive
K

Diagram

8.83.3 Parameter
None.

8.83.4 Examples

Example 1:
Display the current CCKD trace entries.

```
HHC00013I Herc command: 'k'
HHC00399I CCKD file: internal cckd trace
HHC00398I 02:07:32.759838 0:0148> start i/o file[0] bufcur 2588 cache[207]
HHC00398I 02:07:32.759842 0:0148> end i/o bufcur 2588 cache[207] waiters 0
HHC00398I 02:07:32.759848 0:0148> start i/o file[0] bufcur 2588 cache[207]
HHC00398I 02:07:32.759852 0:0148> read trk 2589 (synchronous)
HHC00398I 02:07:32.759854 0:0148> 0 rdtrk 2589
HHC00398I 02:07:32.759857 0:0148> 0 rdtrk[208] 2589 syncio cache miss
HHC00398I 02:07:32.759868 0:0148> read trk 2589 (asynchronous)
HHC00398I 02:07:32.759872 0:0148> 0 rdtrk 2589
HHC00398I 02:07:32.759875 0:0148> 0 rdtrk[208] 2589 cache miss
HHC00398I 02:07:32.759888 0:0148> 0 rdtrk[208] 2589 buf 00000000000007F67CD0 len 19456
HHC00398I 02:07:32.759892 0:0148> trk[2589] read_trkimg
```
HHC00398I 02:07:32.759894 0:0148> file[0] l2[10,29] trk[2589] read_l2ent 0x4d08
HHC00398I 02:07:32.759898 0:0148> file[0] l2[10,29] trk[2589] read_l2ent 0x14c1f2f 6290 6290
HHC00398I 02:07:32.759901 0:0148> file[0] l2[10,29] trk[2589] read_l2ent 0x14c1f2f 6290
HHC00398I 02:07:32.759904 0:0148> file[0] l2[10,29] trk[2589] read_l2ent 0x14c1f2f 6290
HHC00398I 02:07:32.759912 0:0148> file[0] l2[10,29] trk[2589] read_l2ent 0x14c1f2f 6290
HHC00398I 02:07:32.759922 0:0148> uncompress comp 1 len 6290 maxlen 19456 trk 2589
HHC00398I 02:07:32.760018 0:0148> start i/o file[0] bufcur 2589 cache[208]
HHC00398I 02:07:32.760022 0:0148> end i/o bufcur 2589 cache[208] waiters 0

HHC00398I 02:07:32.759918 0:0148> 0 rdtrk[208] 2589 complete buf 0000000007F67CD0:0100560009
HHC00398I 02:07:32.759922 0:0148> uncompress zlib newlen 13065 rc 0
HHC00398I 02:07:32.760018 0:0148> start i/o file[0] bufcur 2589 cache[208]
HHC00398I 02:07:32.760022 0:0148> end i/o bufcur 2589 cache[208] waiters 0
HHC00398I 02:07:32.760022 0:0148> start i/o file[0] bufcur 2589 cache[208]
HHC00398I 02:07:32.760022 0:0148> start i/o file[0] bufcur 2589 cache[208]

Figure 166: K command
8.84 **KD (Clear held messages)**

### 8.84.1 Function
The KD command is an alias for 'MSGHLD CLEAR' and is used to release all held messages without having to wait for the timeout period to expire.

### 8.84.2 Syntax

**Descriptive**

KD

**Diagram**

```
KD
```

### 8.84.3 Parameter
None.

### 8.84.4 Examples

Example 1:
Release all held messages.

```
HHC00013I Herc command: 'kd'
HHC02226I Held messages cleared
```

**Figure 167: KD command**
8.85 LDMOD (Load a module)

8.85.1 Function
The LDMOD command instructs the Hercules Dynamic Loader to load an additional module. The default search order is within the Hercules directory and in the default DLL search path.

8.85.2 Syntax

Descriptive

LMOD  module [module [module ...]]

Diagram

8.85.3 Parameter

module  A list of modules that are to be loaded.

8.85.4 Examples

Example 1:
Load module “S37X” (S/370 Extension).

HHC00013I Herc command: 'ldmod s37x'
HHC01526I HDL: loading module 's37x'...
HHC01527I HDL: module 's37x' loaded

Figure 168: LDMOD command
8.86 LEGACYSENSEID (Display or set SENSE ID CCW (x'E4') feature)

8.86.1 Function

The LEGACYSENSEID command specifies whether the SENSE ID CCW (x'E4') will be honoured for the devices that originally did not support that feature. This includes (but may not be limited to) 3410 and 3420 tape drives, 2311 and 2314 direct access storage devices and 2703 communication controllers. Because those legacy devices didn't originally support this command, and for compatibility reasons, the default is OFF or DISABLE.

Specify ON or ENABLE, if your guest operating system needs the Sense ID support to dynamically detect those devices. Note that most current operating systems will not detect those devices even though Sense ID is enabled because those devices never supported the Sense ID in the first place. This mainly applies to custom built or modified versions of guest operating systems that are aware of this specific Hercules capability.

Given without an argument the LEGACYSENSEID command displays the current setting.

8.86.2 Syntax

**Descriptive**

`LEGACYSENSEID {OFF | DISABLE | ON | ENABLE}`

**Diagram**

```
LEGACYSENSEID
    OFF
    DISABLE
    ON
    ENABLE
```

8.86.3 Parameter

**OFF** Specify OFF or DISABLE if your guest operating system does not need the Sense ID support to dynamically detect devices that originally did not support that feature. This is the default.

**DISABLE** This is the same as ‘OFF’.

**ON** Specify ON or ENABLE if your guest operating system needs the Sense ID support to dynamically detect devices that originally did not support that feature.

**ENABLE** This is the same as ‘ON’.
8.86.4 Examples

Example 1:
Specify that the SENSE ID CCW will be honoured for devices that originally did not support that feature.

| HHC00013I Herc command: 'legacysenseid enable' |
| HHC02204I legacysenseid set to enabled |

Figure 169: LEGACYSENSEID command
8.87 LOADCORE (Load a core image from a file)

8.87.1 Function
The LOADCORE command allows you to load a binary data file into real storage. This function is used mainly for emulator debugging purposes. A certain core snapshot that was saved can be restored at any later time to reproduce some tests with identical real storage values. The file \textit{filename} is presumed to be a pure binary image file previously created via the SAVECORE command. Please note that you must stop all CPUs (see STOP / STOPALL commands) before loading a core image from a file.

8.87.2 Syntax

\textbf{Descriptive}

\textbf{LOADCORE} \textit{filename} [\textit{address} | 0]

\textbf{Diagram}

\textbf{Diagram}

\begin{center}
\begin{tikzpicture}
\node (loadcore) at (0,0) {LOADCORE \hspace{0.5cm} \textit{filename}};
\node (address) at (2,0) {\textit{address}};
\node (zero) at (4,0) {0};
\draw[->] (loadcore) -- (address);
\draw[->] (address) -- (zero);
\end{tikzpicture}
\end{center}

8.87.3 Parameter

\textbf{filename} \hspace{1cm} This argument specifies the file name (and optionally the path) of the file from which the core image will be loaded.

\textbf{address} \hspace{1cm} This specifies the start address of the real storage to where the saved file has to be loaded to. A value of zero, the default, means the beginning of real storage.

8.87.4 Examples

Example 1:
Load a core image file to address zero of real storage.

\begin{verbatim}
HHC00013I Herc command: 'stopall'
HHC00013I Herc command: 'loadcore d:\core02.bin 0'
HHC02250I Loading file 'd:\core02.bin' to location 0
HHC02249I Operation complete
\end{verbatim}

Figure 170: LOADCORE command
8.88 LOADPARM (Set IPL parameter)

8.88.1 Function
The LOADPARM command displays or changes the eight-character IPL parameter which is used by all MVS based operating systems (MVS 3.8J, MVS/SP, MVS/XA, MVS/ESA, OS/390, z/OS) to select the system parameter.

8.88.2 Syntax

Descriptive
LOADPARM [ipl parameter]

Diagram

8.88.3 Parameter

*ipl parameter* The system parameter used for the IPL of the intended operating system. The parameters are operating system dependent, the manuals of the operating system must be consulted for details.

8.88.4 Examples

Example 1:
Display the current LOADPARM setting.

```
HHC00013I Herc command: 'loadparm'
HHC02203I loadparm : 014800M1
```

Figure 171: LOADPARM command (display IPL parameter)
Example 2:
Change the current LOADPARM setting.

```
HHC00013I Herc command: 'loadparm 014800t1'
HHC02204I loadparm set to 014800T1
```

Figure 172: LOADPARM command (set IPL parameter)
8.89 LOADTEXT (Load a text deck file)

8.89.1 Function
The LOADTEXT command is essentially identical to the LOADCORE command (see section 8.87 for details) except that it loads a text deck file with “TXT” and “END” 80 byte records (i.e. an object deck).

8.89.2 Syntax

Descriptive

LOADTEXT filename [address]

Diagram

\[\text{LOADTEXT} \quad \text{filename} \quad \text{address}\]

8.89.3 Parameter

filename This argument specifies the file name (and optionally the path) of the file from which the text deck will be loaded.

address This specifies the start address of the real storage to where the saved text deck file will be loaded.

8.89.4 Examples
See LOADCORE command for similar examples.
8.90 LOG (Direct logger output)

8.90.1 Function
The LOG command lets you redirect the log output to another destination.

8.90.2 Syntax

\[
\text{LOG } [\text{newfile} \mid \text{OFF}]
\]

8.90.3 Parameter

- **newfile**: The file name and optionally the path to which the log output has to be written to.
- **OFF**: Stops the output going to the logfile.

8.90.4 Examples

**Example 1:**
Redirect the log output to a new logfile destination.

```
HHC00013I Herc command: 'log d:/mvs/log/newlog.txt'
```

Figure 173: LOG command (redirect output to a new logfile)

**Example 2:**
Stop the output going to the logfile.

```
HHC00013I Herc command: 'log off'
HHC02101I Logger: log closed
```

Figure 174: LOG command (stop output to logfile)
8.91 LOGOPT (Display or set logging options)

8.91.1 Function
The LOGOPT command lets you display or change the logging options. "TIMESTAMP" inserts a time stamp in front of each log message, whereas "NOTIMESTAMP" displays log messages with no time stamps. Entering the command without any argument displays the current logging options.

8.91.2 Syntax

Descriptive
LOGOPT [TIMESTAMP | NOTIMESTAMP | TIME | NOTIME]

Diagram

```
LOGOPT
+-------------------+-------------------+
| TIMESTAMP         | NOTIMESTAMP       |
| TIME              | NOTIME            |
```

8.91.3 Parameter
TIMESTAMP Insert a time stamp in front of each log message. This is the same as using TIME.
TIME Insert a time stamp in front of each log message. This is the same as using TIMESTAMP.
NOTIMESTAMP Display log messages without a timestamp. This is the same as using NOTIME.
NOTIME Display log messages without a timestamp. This is the same as using NOTIMESTAMP.

8.91.4 Examples
Example 1:
Display log messages without a timestamp in front of each message.

```
HHC00013I Herc command: 'logopt notimestamp'
HHC02204I logopts set to NOTIMESTAMP
```

Figure 175: LOGOPT command
8.92 LPARNAME (Display or set LPAR name)

8.92.1 Function
The LPARNAME command is used to display the current LPAR name or to define the LPAR name returned by the DIAG x'204'.

8.92.2 Syntax

Descriptive
LPARNAME [lparname]

Diagram

8.92.3 Parameter

lparname This specifies the new LPAR name. The value must be maximum 8 alphanumeric characters. If this parameter is omitted the current LPAR name is displayed.

8.92.4 Examples

Example 1:
Display the current LPAR name.

HHC00013I Herc command: 'lparname'
HHC02203I lparname : HERCULES

Figure 176: LPARNAME command (display LPAR name)
8.93 LPARNUM (Display or set LPAR identification number)

8.93.1 Function
The LPARNUM console command displays or set the LPAR identification number. It specifies the one- or two-digit hexadecimal LPAR identification number stored by the STIDP instruction, or BASIC. If a one-digit number from 1 to F (hexadecimal) is specified, then STIDP stores a format-0 CPU ID, unless a subsequent “CPUIDFMT 1” statement is specified. If zero or a two-digit hexadecimal number, except 10 (hexadecimal), is specified, then STIDP stores a format-1 CPU ID. For LPARNUM 10 the current CPUIDFMT is not changed. If LPARNUM is BASIC, then the STIDP instruction stores a basic-mode CPU ID. The default is LPARNUM 1 with a format-0 CPU ID.

8.93.2 Syntax

Descriptive
LPARNUM [BASIC | n | nn]

Diagram

```
  LPARNUM
  ┌───┬───┐
  │ 1...F │
  │     │
  │ 0    │
  │      │
  └───┬───┘
       │
       └───┘
```

8.93.3 Parameter

BASIC Specifies that STIDP stores a basic-mode CPU ID.

1 ... F Specifies the one-digit hexadecimal LPAR identification number. The STIDP instruction stores a format-0 CPU ID, unless a subsequent “CPUIDFMT 1” statement is specified.

0 Specifies 0 as LPAR identification number. The STIDP instruction stores a format-1 CPU ID.

nn Specifies the two-digit hexadecimal LPAR identification number (except 10 hexadecimal). For LPARNUM 10 the current CPUIDFMT is not changed. The STIDP instruction stores a format-1 CPU ID.
8.93.4 Examples

Example 1:
Display the current LPARNUM.

```
HHC00013I Herc command: 'lparnum'
HHC02203I lparnum : 00
```

Figure 177: LPARNUM command (display LPARNUM).

Example 2:
Set LPARNUM to 21.

```
HHC00013I Herc command: 'lparnum 21'
HHC02204I lparnum set to 21
```

Figure 178: LPARNUM command (set LPARNUM).

Example 3:
Set LPARNUM BASIC.

```
HHC00013I Herc command: 'lparnum BASIC'
HHC02204I lparnum set to BASIC
```

Figure 179: LPARNUM command (set LPARNUM BASIC).
8.94 LS (Display file and directory listing)

8.94.1 Function
The LS command displays a list of files and subdirectories in the current directory. The LS command is only available when running Hercules under Linux and Mac OS X. For Microsoft Windows please use the "DIR" command.

8.94.2 Syntax

**Descriptive**

LS

**Diagram**

![Diagram of LS command]

8.94.3 Parameter
None.

8.94.4 Examples

**Example 1:**
Show the list of files and subdirectories in the current directory.

HHC00013I Herc command: 'ls -l'
total 868
drw-r-xr-x 3 hercules hercgrp 4096 2010-11-30 15:49 backups
-rw-r--r-- 1 hercules hercgrp 2350 2008-02-18 22:48 condcode
drw-r-xr-x 2 hercules hercgrp 4096 2010-11-30 16:29 dasd
drw-r-xr-x 2 hercules hercgrp 4096 2007-02-23 21:12 docs
-rw-r--r-- 1 hercules hercgrp 1150 2008-02-18 22:48 ibcdasdi.00c
-rw-r--r-- 1 hercules hercgrp 786 2008-02-18 22:48 ibcdasdi.cnf
drw-r-xr-x 2 hercules hercgrp 4096 2010-11-30 17:06 jcl
-rw-r--r-- 1 hercules hercgrp 1758 2010-12-01 18:43 mvs.cnf
-drwxr-xr-x 1 hercules hercgrp 1229 2008-02-13 20:43 mvsdasd
-rw-r----- 1 hercules hercgrp 11032 2010-12-03 15:49 mvslog.txt
-rw-r----- 1 hercules hercgrp 0 2010-12-03 15:40 pch00d.txt
-rw-r----- 1 hercules hercgrp 330245 2010-11-30 15:12 pch013.txt
-rw-r----- 1 hercules hercgrp 0 2010-12-03 15:40 prt00e.txt
-rw-r----- 1 hercules hercgrp 38121 2010-12-03 15:43 prt00f.txt
Figure 180: LS command
8.95 LSDEP (List module dependencies)

8.95.1 Function
This function lists the Hercules module dependencies.

8.95.2 Syntax

**Descriptive**
LSDEP

**Diagram**

```
>>> LSDEP <<<
```

8.95.3 Parameter
None.

8.95.4 Examples

**Example 1:**
List the module dependencies.

```plaintext
HHC00013I Herc command: 'lsdep'
HHC01535I HDL: dependency 'HERCULES' version '3.0.7.6835' size 11
HHC01535I HDL: dependency 'REGS' version '3.03' size 47760
HHC01535I HDL: dependency 'DEVBLK' version '3.05' size 3360
HHC01535I HDL: dependency 'SYSBLK' version '4.00' size 49824
HHC01535I HDL: dependency 'WEBBLK' version '2.17' size 40
```

Figure 181: LSDEP command
8.96 LSMOD (List dynamic modules)

8.96.1 Function
The LSMOD command lists all the loaded Hercules dynamic modules and shows details for each module.

8.96.2 Syntax

Descriptive
LSMOD

Diagram

8.96.3 Parameter
None.

8.96.4 Examples
Example 1:
List the dynamic modules.

HHC00013I Herc command: 'lsmod'
HHC01531I HDL: dll type = load, name = s37x, flags = (unloadable, not forced)
HHC01531I HDL: dll type = load, name = hdt3088, flags = (unloadable, not forced)
HHC01532I HDL: symbol = debug_tt32_tracing, loadcount = 1, owner = hdt3088
HHC01532I HDL: symbol = debug_tt32_stats, loadcount = 1, owner = hdt3088
HHC01533I HDL: devtype(s) = CTCI-WIN VMNET CTCT CTCI 3088 LCS
HHC01533I HDL: dll type = load, name = hdt3420, flags = (unloadable, not forced)
HHC01533I HDL: devtype(s) = 9348 9347 8809 3590 3490 3480 3422 3420 3411 3410
HHC01531I HDL: dll type = load, name = hdt3270, flags = (unloadable, not forced)
HHC01533I HDL: devtype(s) = SYSG 3287 3270 3215 1052
HHC01531I HDL: dll type = load, name = hdt1403, flags = (unloadable, not forced)
HHC01533I HDL: devtype(s) = 3211 1403
HHC01531I HDL: dll type = load, name = hdt3525, flags = (unloadable, not forced)
HHC01533I HDL: devtype(s) = 3525
HHC01531I HDL: dll type = load, name = hdt3505, flags = (unloadable, not forced)
HHC01533I HDL: devtype(s) = 3505 2501 1442
HHC01531I HDL: dll type = load, name = dynecrypt, flags = (unloadable, not forced)
HHC01532I HDL: symbol = z900_perform_cryptographic_key_management_operation, loadcount = 1, ...
HHC01532I HDL: symbol = z900_perform_cryptographic_computation, loadcount = 1, owner = dyncrypt
HHC01532I HDL: symbol = z900_compute_message_authentication_code, loadcount = 1, owner = ...
HHC01532I HDL: symbol = z900_compute_last_message_digest, loadcount = 1, owner = dyncrypt
HHC01532I HDL: symbol = z900_compute_intermediate_message_digest, loadcount = 1, owner = ...
HHC01532I HDL: symbol = z900_cipher_message_with_output_feedback, loadcount = 1, owner = ...
HHC01532I HDL: symbol = z900_cipher_message_with_counter, loadcount = 1, owner = dyncrypt
HHC01532I HDL: symbol = z900_cipher_message_with_cipher_feedback, loadcount = 1, owner = ...
HHC01532I HDL: symbol = z900_cipher_message_with_chaining, loadcount = 1, owner = dyncrypt
HHC01532I HDL: symbol = s390_perform_cryptographic_key_management_operation, loadcount = 1, ...
HHC01532I HDL: symbol = s390_perform_cryptographic_computation, loadcount = 1, owner = dyncrypt
HHC01532I HDL: symbol = s390_compute_message_authentication_code, loadcount = 1, owner = ...
HHC01532I HDL: symbol = s390_compute_last_message_digest, loadcount = 1, owner = dyncrypt
HHC01532I HDL: symbol = s390_compute_intermediate_message_digest, loadcount = 1, owner = ...
HHC01532I HDL: symbol = s390_cipher_message_with_output_feedback, loadcount = 1, owner = ...
HHC01532I HDL: symbol = s390_cipher_message_with_counter, loadcount = 1, owner = dyncrypt
HHC01532I HDL: symbol = s390_cipher_message_with_cipher_feedback, loadcount = 1, owner = ...
HHC01532I HDL: symbol = s390_cipher_message_with_chaining, loadcount = 1, owner = dyncrypt
HHC01532I HDL: dll type = load, name = hdteq, flags = (unloadable, not forced)
HHC01532I HDL: symbol = hdl_device_type_equates, loadcount = 1, owner = hdteq
HHC01532I HDL: dll type = main, name = *Hercules, flags = (not unloadable, not forced)
HHC01532I HDL: symbol = panel_display, loadcount = 1, owner = *Hercules
HHC01532I HDL: symbol = panel_command, loadcount = 1, owner = *Hercules
HHC01532I HDL: symbol = parse_args, loadcount = 0, owner = *Hercules
HHC01533I HDL: devtype(s) = 9336 9335 9332 9313 3370 3310 0671 9345 3390 3380 3375 3350 3340...

Figure 182: LSMOD command
8.97 MAINSIZE (Display or set main storage size)

8.97.1 Function

The MAINSIZE command is used to specify the size of the main storage. Given without an argument the MAINSIZE command displays the current size of the main storage. Storage is allocated in megabytes, unless a specific unit is specified. The actual upper limit of the main storage is determined by the host system's architecture, operating system, and on some systems the amount of physical memory and paging space you have available. The practical limit depends on the maximum amount of storage that can be obtained by “malloc” (usually around 1 GB on 32-bit platforms; on 64-bit platforms the value should only be limited by available paging space).

When increasing the main size Hercules attempts to allocate first the new storage. If the new allocation is successful then the previously allocated memory will be freed. This is to prevent a situation where the old memory is freed first, then the new allocation fails and a reallocation of the memory in the previous size also fails because of storage fragmentation and therefore leaving Hercules without memory.

When decreasing the main storage the memory will stay allocated in the previous size but the storage size will appear as decreased. Subsequent increases will not reallocate memory unless they go over the already allocated amount.

An additional optional argument determines the locking state of the allocated memory (page lock by host operating system). The LOCKED option indicates that the memory is to be locked into storage while UNLOCKED (the default) indicates that the memory is not locked into the storage.

Please note that Hercules preserves the last locking state of MAINSIZE. Once storage is locked, any subsequent change to the main storage size will honor the existing lock state of memory unless the lock state is specified again on the MAINSIZE command.

Caution: Do not lock main storage unless sufficient real memory is available to back up the request. Failure to do so may require the host system to be rebooted.

8.97.2 Syntax

Descriptive

MAINSIZE [msize[B | K | M | G | T | P | E] [UNLOCK | LOCK]]

Diagram
8.97.3 Parameter

**m**size

The value of *msize* must be a valid decimal number. The actual upper limit is determined by the host system's architecture, the operating system and on some systems the amount of physical memory and paging space that is available.

For storage sizes less than 16M, sizes not on a 4K boundary are rounded up to the next 4K boundary. Otherwise, storage sizes not on a 1M boundary are rounded up to the next 1M boundary.

The minimum size is 4K for architecture levels ALS0 and ALS1 (S/370 and ESA/390), and 8K for architecture level ALS2 (ESAME) and higher. A maximum of 64M may be specified for architecture level ALS0 (S/370), 2048M (2G) for ALS1 (ESA/390) and 16E for architecture level ALS2 (ESAME) and higher.

The default on startup is 2M.

**B**

‘B’ determines that the number given is specified in bytes (no multiplier).

**K**

‘K’ determines that the number given is specified in kilobytes (multiplier 2**10).

**M**

‘M’ determines that the number given is specified in megabytes (multiplier 2**20). This is the default if no unit is appended.

**G**

‘G’ determines that the number given is specified in gigabytes (multiplier 2**30).

**T**

‘T’ determines that the number given is specified in terabytes (multiplier 2**40). On 32-bit machines the unit terabytes is not available.

**P**

‘P’ determines that the number given is specified in petabytes (multiplier 2**50). On 32-bit machines the unit petabytes is not available.

**E**

‘E’ determines that the number given is specified in exabytes (multiplier 2**60). On 32-bit machines the unit exabytes is not available.

**LOCK**

Attempt to lock the storage (pages locked by the host operating system).

**UNLOCK**

Leave the store unlocked (no pages locked by the host operating system). This is the default.

**Notes:**

The actual upper limit is determined by the host system's architecture and operating system and the amount of physical memory and available paging space. The total of MAINSIZE and XPNDSIZE on host systems with a 32-bit architecture will be limited to 4G; host systems with a 64-bit architecture will be limited to less than 16E.

Using minimum storage sizes, storage sizes less than or not on a 64K boundary for architecture level ALS0 (S/370) or not on a 1M boundary for architecture level ALS1 (ESA/390) and higher, it may be possible to generate error conditions not covered by the "Principles of Operations".

Use of storage sizes greater than supported by the guest operating system may generate incorrect results or error conditions within the guest operating system.
8.97.4 Overview Storage Allocation Units

<table>
<thead>
<tr>
<th>Unit</th>
<th>Multiplier</th>
<th>Name (Symbol)</th>
<th>IEC Name (IEC Symbol)</th>
<th>Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>None</td>
<td>Byte (B)</td>
<td>Byte (B)</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>$2^{10}$</td>
<td>Kilobyte (kB)</td>
<td>Kibibyte (KiB)</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>$2^{20}$</td>
<td>Megabyte (MB)</td>
<td>Mebibyte (MiB)</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>$2^{30}$</td>
<td>Gigabyte (GB)</td>
<td>Gibibyte (GiB)</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>$2^{40}$</td>
<td>Terabyte (TB)</td>
<td>Tebibyte (TiB)</td>
<td>Not on 32-bit machines</td>
</tr>
<tr>
<td>P</td>
<td>$2^{50}$</td>
<td>Petabyte (PB)</td>
<td>Pebibyte (PiB)</td>
<td>Not on 32-bit machines</td>
</tr>
<tr>
<td>E</td>
<td>$2^{60}$</td>
<td>Exabyte (EB)</td>
<td>Exbibyte (EiB)</td>
<td>Not on 32-bit machines</td>
</tr>
</tbody>
</table>

Table 20: Storage Allocation Units

8.97.5 Examples

Example 1:
Display the current size of the main storage.

```
HHC00013I Herc command: 'mainsize'
HHC17003I MAIN storage is 001 GBytes 'mainsize'; storage is not locked
```

Figure 183: MAINSIZE command (display size of main storage)

Example 2:
Set the size of the main storage to 512 MB. Do not lock the memory into the storage.

```
HHC00013I Herc command: 'mainsize 512'
HHC17003I MAIN storage is 512 MBytes 'mainsize'; storage is not locked
```

Figure 184: MAINSIZE command (Set size of unlocked main storage)
Example 3:
Set the size of the main storage to 256 MB. Lock the memory into the storage.

```
HHC00013I Herc command: 'mainsize 256 lock'
HHC01428I Locking main storage
HHC17003I MAIN     storage is 256 MBytes 'mainsize'; storage is locked
```

Figure 185: MAINSIZE command (Set size of locked main storage)
8.98 MANUFACTURER (Display or set STSI manufacturer code)

8.98.1 Function
The MANUFACTURER console command displays or sets the manufacturer name returned by the STSI instruction. If no argument is given, the current manufacturer name is displayed.

8.98.2 Syntax

Descriptive
Descriptive
MANUFACTURER [name]

Diagram

８９８ MANUFACTURER ［name］

8.98.3 Parameter
name Any name with a maximum length of four characters.

8.98.4 Examples
Example 1:
Set the STSI manufacturer name to ‘HRC’.

Figure 186: MANUFACTURER command (set STSI manufacturer code)
8.99 MAXCPU (Display or set maximum number of CPUs)

8.99.1 Function

The MAXCPU command displays or sets the maximum number of installed processor engines. The combination of MAXCPU and NUMCPU controls the behaviour of how many CPU engines will be configured online upon startup and how many can be configured online later. The NUMCPU statement specifies the number of engines which will be configured online at startup time. All processors are CP engines unless otherwise specified by the ENGINES statement.

MAX_CPU_ENGINES is a compile-time variable which sets an upper limit on the value of MAXCPU. The value of MAX_CPU_ENGINES is displayed in the build information message on the Hercules control panel at startup time. To change the value of MAX_CPU_ENGINES you must rebuild Hercules. For Unix builds, specify "./configure --enable-multi-cpu=nn" before performing make. For Windows builds, specify "SET MAX_CPU_ENGINES=nn" before performing nmake.

MAX_CPU_ENGINES may be up to 128 on 64-bit Linux platforms. On Windows, and on all 32-bit platforms, the maximum value is 64. For performance reasons, values above 32 are not recommended for 32-bit platforms. If MAX_CPU_ENGINES is set to 1 then multiprocessing is disabled. See also the NUMCPU statement for a discussion of the performance implications of MAX_CPU_ENGINES.

The value of MAXCPU cannot exceed the value of MAX_CPU_ENGINES. If MAXCPU is not specified in the configuration file, then its initial value is equal to NUMCPU. If MAXCPU and NUMCPU are both omitted, then MAXCPU is set to 1.

Given without an argument the MAXCPU statement displays the current maximum number of installed processor engines.

For detailed explanations on the interrelationship between MAXCPU, ENGINES and NUMCPU please see “Appendix B. Configuration of Emulated CPUs”.

8.99.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAXCPU [nn]</td>
</tr>
</tbody>
</table>

Diagram

```
MAXCPU
```

8.99.3 Parameter

<table>
<thead>
<tr>
<th>nn</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specifies the maximum number of installed processor engines. The value of MAXCPU cannot exceed the value of MAX_CPU_ENGINES.</td>
</tr>
</tbody>
</table>
8.99.4 Examples

Example 1:
Display the number of installed processor engines.

```
HHC00013I Herc command: 'maxcpu'
HHC02203I maxcpu : 2
```

Figure 187: MAXCPU command (display current number of installed processors)

Example 2:
Set the maximum number of installed processor engines to 8.

```
HHC00013I Herc command: 'maxcpu 8'
HHC02204I maxcpu set to 8
```

Figure 188: MAXCPU command (set number of installed processors)
8.100  MAXRATES (Display highest MIPS/SIO rate or set new reporting interval)

8.100.1 Function

The MAXRATES command shows the maximum observed MIPS (million instructions per second) and SIO (Start I/O) rates reached during the current reporting interval (up to the time the command is issued). It lets you also set the MAXRATES reporting interval to a new value.

If there is no MAXRATES reporting interval set in the configuration file then the default value for reporting the rates is 1440 minutes (1 day). When the interval is expired a MAXRATES command is automatically issued. The current rates will also be displayed during shutdown of Hercules.

8.100.2 Syntax

Descriptive

MAXRATES [interval | MIDNIGHT]

Diagram

\[\text{MAXRATES} \quad \text{interval} \quad \text{MIDNIGHT}\]

8.100.3 Parameter

\textbf{interval} \quad \text{This is the new interval time in minutes. The default MAXRATES interval that is active after startup of Hercules (if not otherwise specified in the configuration file), is 1440 minutes (1 day). Changes to the MAXRATES interval that are other than “MIDNIGHT” will set the current interval start time to the present; this includes a value of “1440”.

\textbf{MIDNIGHT} \quad \text{Sets the interval to 1440 minutes (1 day) and the start time for the interval timer to midnight of the current day. This will cause the MAXRATE statistics to be date aligned.}
8.100.4 Examples

Example 1:
Change the MAXRATES interval from the default value (or the last manually set interval value) to 60 minutes.

```
HHC00013I Herc command: 'maxrates 60'
HHC02204I maxrates       set to 60 minutes
```

Figure 189: MAXRATES command (set the interval time)

Example 2:
Display the maximum observed MIPS and I/O rates during the last interval.

```
HHC00013I Herc command: 'maxrates'
HHC02272I Highest observed MIPS and I/O/s rates:
HHC02272I From Thu Apr 19 22:58:34 2012 to Fri Apr 20 22:58:34 2012
HHC02272I MIPS: 105.333858
HHC02272I IO/s: 3068
HHC02272I From Fri Apr 20 22:58:34 2012 to Fri Apr 20 23:06:38 2012
HHC02272I MIPS: 5.678100
HHC02272I IO/s: 54
HHC02272I Current interval is 1440 minutes
```

Figure 190: MAXRATES command (display maximum rates)
8.101 MEMLOCK (Lock Hercules memory)

8.101.1 Function

The MEMLOCK console command is used to lock Hercules memory in storage. It defines the locking state of the allocated Hercules memory (page lock by host operating system). Given without argument MEMLOCK displays the current setting. If Hercules memory is locked in storage it cannot be paged out by the host operating system. This may result in some performance improvements.

This console command is available if Hercules is built with option "_HAVE_MLOCKALL". Currently MEMLOCK is only supported under Linux host operating systems.

8.101.2 Syntax

Descriptive

MEMLOCK [ON | OFF]

Diagram

[Diagram showing MEMLOCK with ON and OFF options]

8.101.3 Parameter

ON

ON indicates that the memory is to be locked into storage.

OFF

OFF indicates that the memory is not to be locked into the storage.

8.101.4 Examples

Example 1:

Do not lock Hercules memory in storage.

HHC00013I Herc command: 'memlock off'

Figure 191: MEMLOCK command
8.102 MESSAGE (Display message on console like VM)

8.102.1 Function

The MESSAGE command is actually a VM CP command. It is used to transmit message text to the virtual console of other active users.

However, some programmers also use this command as a simplified way to display messages on the own virtual machine console by using "MESSAGE * <message text>". One program that uses this is the IBM "System z" port of Solaris which is only capable of running under z/VM.

So basically, all the MESSAGE command does is to display a message on the Hercules console with VM like headers. Therefore the MESSAGE command is not really intended to be used directly from the Hercules console as shown in the example below, although it does not hurt doing so.

The MESSAGE command is the same as MSG. See also the MSG and MSGNOH commands in this manual.

8.102.2 Syntax

Descriptive

MESSAGE parms

Diagram

▶️ MESSAGE parms ◀️

8.102.3 Parameter

parms Specifies the required and optional parameters as described in IBM's VM "CP Commands and Utilities Reference" manual.

8.102.4 Examples

Example 1:
Display a message on the own virtual machine console.

HHC00013I Herc command: 'message * transmitted message to VM console'
20:50:33 * MSG FROM HERCULES: transmitted message to VM console

Figure 192: MESSAGE command
8.103 MODEL (Display or set STSI model code)

8.103.1 Function

The MODEL console command displays or sets the model names returned by the STSI instruction. If no argument is given the current STSI model names are displayed.

The optional operands specify the hardware model name, the capacity model name, the permanent capacity model name and the temporary capacity model name respectively.

8.103.2 Syntax

Descriptive

MODEL [hdwmod | = | * [capmod | = | * [prmmod | = | * [tmpmod | = | *)]]]

Diagram

```
 MODEL
  hdwmod
  = *

 capmod
  * 

 prmmod
  = *

 tmpmod
  = *
```

8.103.3 Parameter

**hdwmodel**

This specifies the hardware model name. This can be any name with a maximum length of 16 characters. Valid characters are A-Z and 0-9. Specifying a “=” resets the hardware model to “EMULATOR”; specifying an “*” leaves the current hardware model name intact. If the MODEL system parameter is not specified in the configuration file then the default name is “EMULATOR”.

**capmodel**

This optional parameter specifies the capacity model name. The capmodel can be any name with a maximum length of 16 characters. Valid characters are A-Z and 0-9. Specifying a “=” copies the current hardware model name to the capacity model; specifying an “*” leaves the current capacity model name intact. The default capacity model name is “EMULATOR”.

**prmmodel**

This specifies the permanent capacity model name. The prmmodel can be any name with a maximum length of 16 characters. Valid characters are A-Z and 0-9. Specifying a “=” copies the current capacity model name to the permanent capacity model; specifying an “*” leaves the current permanent capacity model name intact.
The default permanent capacity model name is a null string.

**tmpmodel**

This specifies the temporary capacity model name. The *tmpmodel* can be any name with a maximum length of 16 characters. Valid characters are A-Z and 0-9. Specifying a “=” copies the current permanent capacity model name to the temporary capacity model; specifying an “*” leaves the current temporary capacity model name intact. The default temporary capacity model name is a null string.

### 8.103.4 Examples

**Example 1:**

Set the STSI model name (hardware model and capacity model) to “EMULATOR”.

```
HHC00013I Herc command: 'model emulator emulator'
HHC02204I hdw model set to EMULATOR
HHC02204I cap model set to EMULATOR
HHC02204I prm model set to
HHC02204I tmp model set to
```

Figure 193: MODEL command (set STSI model name, variant 1)

**Example 2:**

The same could also be specified using the following simplified command:

```
HHC00013I Herc command: 'model emulator ='
HHC02204I hdw model set to EMULATOR
HHC02204I cap model set to EMULATOR
HHC02204I prm model set to
HHC02204I tmp model set to
```

Figure 194: MODEL command (set STSI model name, variant 2)

**Example 3:**

Set the STSI model name, the permanent capacity model name and the temporary model name to “HERCULES”, but leave the capacity model name intact.

```
HHC00013I Herc command: 'model hercules * hercules ='
HHC02204I hdw model set to HERCULES
HHC02204I cap model set to EMULATOR
HHC02204I prm model set to HERCULES
HHC02204I tmp model set to HERCULES
```

Figure 195: MODEL command (set STSI model name, variant 1)
8.104 MODPATH (Display or set dynamic load module path)

8.104.1 Function
The MODPATH command displays or sets the dynamic load module path. If a MODPATH is defined then this path is searched before the default path is searched. When a relative path is specified it is interpreted as a relative path within the default search path. If an absolute path is coded it is interpreted as such. The default MODPATH is “hercules” which means modules are loaded from the directory “hercules” within the default LD_LIBRARY_PATH.

8.104.2 Syntax

Descriptive
MODPATH [path]

Diagram

```
MODPATH [path]
```

8.104.3 Parameter

path The path where dynamic load modules are loaded from.

8.104.4 Examples

Example 1:
Display the current dynamic load module path.

```
HHC00013I Herc command: 'modpath'
HHC01508I HDL: loadable module directory is 'D:/Hercules/
```

Figure 196: MODPATH command (display dynamic load module path)
Example 2:
Set the current dynamic load module path to “D:/Hercules/Modules”.

HHC00013I Herc command: 'modpath D:/Hercules/Modules'
HHC01508I HDL: loadable module directory is 'D:/Hercules/Modules'

Figure 197: MODPATH command (set dynamic load module path)
8.105 MOUNTED_TAPE_REINIT (Control tape initialization)

8.105.1 Function
The MOUNTED_TAPE_REINIT command controls whether reinitialization of tape drive devices via the
DEVINIT command in order to mount a new tape should be allowed if there is already a tape mounted on
the drive. Without a parameter given the current setting is displayed.
Specifying ALLOW indicates that new tapes may be mounted via "DEVINIT nnnn new-tape-filename"
irrespective of whether or not there is already a tape mounted on the drive.
Specifying DISALLOW prevents new tapes from being mounted if one is already mounted. Before the
new tape can be mounted the existing one has first to be unmounted (via the "DEVINIT nnnn ** com-
mmand). Otherwise the DEVINIT attempt to mount the new tape is rejected.
This option is meant as a safety mechanism to protect against accidentally unmounting a tape from the
wrong device as a result of a simple typing error and thereby eventually cancelling a potentially important
tape job.
Please note that for SCSI tape drives the "DEVINIT nnnn ** command has no effect. The tape must be
unmounted manually since it is a real physical device and not emulated via a disk file like '.AWS' or '.HET'
tapes.

8.105.2 Syntax

Descriptive
MOUNTED_TAPE_REINIT [ENABLE | ALLOW | DISABLE | DISALLOW]

Diagram

\[\begin{array}{c}
\text{MOUNTED_TAPE_REINIT} \\
\mid-------------------------\\
\text{ENABLE} \\
\text{ALLOW} \\
\text{DISABLE} \\
\text{DISALLOW} \\
\end{array}\]

8.105.3 Parameter

ENABLE Indicates that new tapes may be mounted irrespective of whether or not there is
already a tape mounted on the drive. This is the default.
ALLOW This is the same as ENABLE.
DISABLE Prevents new tapes from being mounted if one is already mounted on the drive.
Before the new tape can be mounted the currently mounted tape must first to be
unmounted. Instead of DISABLE, the argument DISALLOW that has been used in
earlier versions of Hercules can also be used.
DISALLOW  This is the same as DISABLE.

8.105.4 Examples

Example 1:
Display current tape mount settings.

```
HHC00013I Herc command: 'mounted_tape_reinit'
HHC02203I mounted_tape_reinit: enabled
```

Figure 198: MOUNTED_TAPE_REINIT command (display settings).

Example 2:
Disallow tape mount reinitialization.

```
HHC00013I Herc command: 'mounted_tape_reinit disable'
HHC02204I mounted_tape_reinit set to disabled
```

Figure 199: MOUNTED_TAPE_REINIT command (disable tape mount reinitialization)
8.106 MSG (Display message on console like VM)

8.106.1 Function
The MSG command is actually a VM CP command. It is used to transmit message text to the virtual console of other active users.

However, some programmers also use this command as a simplified way to display messages on the own virtual machine console by using "MSG * <message text>". One program that uses this is the IBM "System z" port of Solaris which is only capable of running under z/VM.

So basically, all the MSG command does is to display a message on the Hercules console with VM like headers. Therefore the MSG command is not really intended to be used directly from the Hercules console as shown in the example below, although it does not hurt doing so.

The MSG command is the same as MESSAGE. See also the MESSAGE and MSGNOH commands in this manual.

8.106.2 Syntax

Descriptive
MSG parms

Diagram

8.106.3 Parameter
parms This specifies the required and optional parameters as described in IBM's VM "CP Commands and Utilities Reference" manual.

8.106.4 Examples
Example 1:
Display a message on the own virtual machine console.

```
18:24:09 msg * transmitted message to VM console
18:24:09 18:24:09 * MSG FROM HERCULES: transmitted message to VM console
```

Figure 200: MSG command
8.107 MSGHLD (Display or set timeout of held messages)

8.107.1 Function
The MSGHLD console command is used to display or set the timeout value of held messages. It is also possible to release all held messages without having to wait for the timeout period to expire.

8.107.2 Syntax

Descriptive
MSGHLD \{ nnn | INFO | CLEAR \}

Diagram

8.107.3 Parameter

nnn This value specifies the new timeout value of held messages in seconds.
INFO Display the current message held time setting.
CLEAR Release the held messages immediately. The command 'KD' can be used as a shortcut for 'MSGHLD CLEAR'.

8.107.4 Examples

Example 1:
Set the new timeout interval for held messages to 30 seconds.

HHC00013I Herc command: 'msghld 30'
HHC02204I message hold time set to 30 seconds

Figure 201: MSGHLD command (set new interval)
**Example 2:**

Release all held messages.

| HHCO0013I Herc command: 'msgld clear' |
| HHCO2226I Held messages cleared |

**Figure 202: MSGHLD command (release messages)**
8.108 MSGLEVEL (Display or set the current message display output)

8.108.1 Function

The MSGLEVEL command displays the current setting of the message level or allows setting a new message level. It decides how many and what kind of messages are written to the Hercules console (and to the log). Given without an argument MSGLEVEL displays the current message level settings.

The message level is set per default to ‘terse’ which turns the verbose message level off. To display the additional messages during configuration file processing Hercules can be started with the “-v” option which sets the verbose message level. As an alternative, the MSGLEVEL system parameter can be set to activate the verbose message level. In this case however, MSGLEVEL must be coded as one of the first statements in the configuration file to take effect at an early stage during configuration file processing.

In addition to the ‘terse’ level the following options are set by default (if not otherwise overwritten through the MSGLEVEL system parameter or console command): ‘nodebug’, ‘tape’, ‘dasd’, ‘comm’, ‘ur’, ‘scsi’, ‘ctca’, ‘graf’, ‘thread’ and ‘channel’.

Certain levels (on, off, text, time) can only be set if Hercules is built with one of the following build options: OPTION_MSGCLR or OPTION_MSGHLD.

8.108.2 Syntax

Descriptive

MSGLEVEL [option option ...]

where option can be:

<table>
<thead>
<tr>
<th>ON</th>
<th>OFF</th>
<th>TEXT</th>
<th>TIME</th>
<th>NODEBUG</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+</td>
<td>-] DEBUG</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>-] TAPE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>-] DASD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>-] COMM</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>-] UR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>-] SCSI</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>-] CTCA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>-] GRAF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>-] THREAD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>-] CHANNEL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>-] VERBOSE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>[+</td>
<td>-] TERSE</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Diagram

where option can be:

- ON
  - OFF
  - TEXT
  - TIME
  - NODEBUG
  - DEBUG
  - TAPE
  - DASD
  - COMM
  - UR
  - SCSI
  - CTCA
  - GRAF
  - THREAD
  - CHANNEL
  - VERBOSE
  - TERSE

8.108.3 Parameter

ON  ON displays the messages in the default kind with message number followed by the message text.

OFF  No messages are displayed.

TEXT  Displays only the text part of the message (without message numbers).

TIME  Prefix the messages with a timestamp.

NODEBUG  The messages are not issued in debug mode (not prefixed additionally with the name of the source member and the line number that issues the message).

DEBUG  The messages are prefixed additionally with the name of the source member and the line number that issues the message.

TAPE  Display tape related messages.

DASD  Display DASD related messages.

COMM  Display communications related messages.

UR  Display unit record related messages.
SCSI Display SCSI related messages.

CTCA Display CTCA and LCS related messages.

GRAF Display graphics (3270) related messages.

THREAD Display threading related messages.

CHANNEL Display channel related messages.

VERBOSE Displays additional messages during configuration file processing.

TERSE This turns the verbose message level off. This is the default unless VERBOSE is specified either through the MSGLEVEL system parameter or panel command or if Hercules is started with the "-v" option.

8.108.4 Examples

Example 1:
Display the current message level.

HHC00013I Herc command: 'msglevel'
HHC17012I MSGLEVEL = terse nodebug tape dasd ur comm ctca graf scsi

Figure 203: MSGLEVEL command (display message level)

Example 2:
Set the message level to supress UR and SCSI related messages.

HHC00013I Herc command: 'msglvl -ur -scsi'
HHC17012I MSGLEVEL = terse nodebug tape dasd comm ctca graf

Figure 204: MSGLEVEL command (suppress certain messages)

Example 3:
Set the message level to DEBUG.

HHC00013I Herc command: 'msglevel debug'
cmdtab.c 350 21:01:56 HHC90000D DBG: Panel_Exit CommandLockCounter 0
logmsg.c 261 HHC00007I Previous message from function ProcessPanelCommand() at cmdtab.c[350]
cmdtab.c 361 21:01:56 HHC90000D DBG: RC = 0
logmsg.c 261 HHC00007I Previous message from function ProcessPanelCommand() at cmdtab.c[361]
logmsg.c 261 HHC00007I Previous message from function ProcessPanelCommand() at cmdtab.c[361]
cmdtab.c 602 21:02:01 HHC02101I Logger: log closed

Figure 205: MSGLEVEL command (set message level DEBUG)
8.109 MSGLVL (Display or set the current message display output)

8.109.1 Function
MSGLVL is an alias for MSGLEVEL. The MSGLVL command displays the current setting of the message level or allows it to set a new message level. See MSGLEVEL for details.

8.109.2 Syntax
See MSGLEVEL command.

8.109.3 Parameter
See MSGLEVEL command.

8.109.4 Examples
See MSGLEVEL command.
8.110 MSGNOH (Display message on console like VM, but without header)

8.110.1 Function

The MSGNOH command is actually a VM CP command. It is used to transmit message text to the virtual console of other active users without the standard MESSAGE command header. However, some programmers also use this command as a simplified way to display messages on the own virtual machine console by using "MSGNOH * <message text>".

So basically, all the MSGNOH command does is to display a message on the Hercules console (like the MESSAGE and MSG commands) but without VM like headers. Therefore the MSGNOH command is not really intended to be used directly from the Hercules console as shown in the example below, although it does not hurt doing so.

See also the MESSAGE and MSG commands in this manual.

8.110.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
<th>MSGNOH parms</th>
</tr>
</thead>
</table>

Diagram

8.110.3 Parameter

parms Specifies the required and optional parameters as described in IBM's VM "CP Commands and Utilities Reference" manual.

8.110.4 Examples

Example 1:
Display a message on the own virtual machine console.

HHC00013I Herc command: 'msgnoh * transmitted message to VM console'

transmitted message to VM console

Figure 206: MSGNOH command
8.111 MT (Control magnetic tape operation)

8.111.1 Function
The MT command performs various actions on magnetic tapes. All operations can be used on a valid tape device. The device must not have any I/O operation in process or pending.

Please note that the WTM operation will truncate the tape after the last WTM written if it is not at the logical end of the tape when the WTM is issued. No warnings are given.

8.111.2 Syntax

Descriptive

MT device operation

where operation can be:

REW
ASF [nnnn | 1]
FSF [nnnn | 1]
BSF [nnnn | 1]
FSR [nnnn | 1]
BSR [nnnn | 1]
WTM [nnnn | 1]
DSE
DVOL1

Diagram

MT — device — operation

where operation can be:

REW
ASF [nnnn | 1]
8.111.3 Parameter

device

This specifies the device address of the tape to which the operation will be performed.

REW

Rewind the tape.

ASF

Position the tape at file nnnn.

FSF

Forward space nnnn files.

BSF

Backward space nnnn files.

FSR

Forward space nnnn records.

BSR

Backward space nnnn records.

WTM

Write nnnn tapemarks.

DSE

Data secure erase.

DVOL1

This must be a number in the range of 1-9999. The default is one if nnnn is not specified.
This must be a number in the range of 1-9999. The default is one if nnnn is not specified.

### 8.111.4 Examples

**Example 1:**
Rewind a tape.

```
HHC00013I Herc command: 'mt 0480 rew'
HHC02800I 0:0480 rew complete
HHC02802I 0:0480 Current file number 1
HHC02803I 0:0480 Current block number 0
```

Figure 207: MT command (REW operation)

**Example 2:**
Position the tape at file number 5.

```
HHC00013I Herc command: 'mt 0480 asf 5'
HHC02800I 0:0480 asf complete
HHC02802I 0:0480 Current file number 5
HHC02803I 0:0480 Current block number 775
```

Figure 208: MT command (ASF operation)

**Example 3:**
Forward space 2 files.

```
HHC00013I Herc command: 'mt 0480 fsf 2'
HHC02800I 0:0480 fsf complete
HHC02802I 0:0480 Current file number 7
HHC02803I 0:0480 Current block number 2471
```

Figure 209: MT command (FSF operation)

**Example 4:**
Forward space 3 records.

```
HHC00013I Herc command: 'mt 0480 fsr 3'
HHC02800I 0:0480 fsr complete
HHC02802I 0:0480 Current file number 7
HHC02803I 0:0480 Current block number 2474
```

Figure 210: MT command (FSR operation)
Example 5:
Write 3 tapemarks.

```
HHC00013I Herc command: 'mt 0480 wtm 3'
HHC02800I 0:0480 wtm complete
HHC02802I 0:0480 Current file number 10
HHC02803I 0:0480 Current block number 2477
```

Figure 211: MT command (WTM operation)

Example 6:
Erase a tape.

```
HHC00013I Herc command: 'mt 0480 dse'
HHC02800I 0:0480 dse complete
HHC02802I 0:0480 Current file number 1
HHC02803I 0:0480 Current block number 0
```

Figure 212: MT command (DSE operation)
**8.112 NUMCPU (Display or set number of emulated CPUs)**

**8.112.1 Function**

The NUMCPU commands display or set the number of emulated processor engines which will be configured online at startup time. The combination of NUMCPU and MAXCPU controls the behaviour of how many CPU engines will be configured online upon startup and how many can be configured online later.

NUMCPU cannot exceed the value of MAXCPU. If NUMCPU is less than MAXCPU then the remaining engines can be configured online later. The default NUMCPU value is 1. All processors are CP engines unless otherwise specified by the ENGINES system parameter.

Multiprocessor emulation works best if your host system actually has more than one physical CPU, but you can still emulate multiple CPUs nevertheless even on a uniprocessor system (and you might even achieve a small performance benefit when you do).

There is little point, however, in specifying NUMCPU greater than 1 unless your guest operating system (running under Hercules) is actually able to support multiple CPUs. If you do not actually need multiprocessor emulation, then setting MAX_CPU_ENGINES to 1 at compile time might even produce a slight performance advantage too.

Given without an argument the NUMCPU command displays the current number of emulated CPUs.

For detailed explanations on the interrelationship between NUMCPU, MAXCPU and ENGINES please see “Appendix B. Configuration of Emulated CPUs”.

**8.112.2 Syntax**

**Descriptive**

NUMCPU [nn]

**Diagram**

```
<< NUMCPU [nn] >>
```

**8.112.3 Parameter**

*nn*  

The number of emulated CPUs. NUMCPU must be less than or equal MAXCPU. If NUMCPU is larger than MAXCPU then an error message is issued, if it is less than MAXCPU then the remaining engines can be configured online later.
8.112.4 Examples

Example 1:
Display the current number of emulated CPUs.

```
HHC00013I Herc command: 'numcpu'
HHC02203I numcpu        : 2
```

Figure 213: NUMCPU command (display current number of emulated CPUs)

Example 2:
Set the number of emulated CPUs to 4 (increase from 2 currently).

```
HHC00013I Herc command: 'numcpu 4'
HHC00100I Thread id 0000080C, prio 0, name 'Processor CP02' started
HHC00811I Processor CP02: architecture mode 'S/370'
HHC00100I Thread id 00000CB4, prio 0, name 'Processor CP03' started
HHC00811I Processor CP03: architecture mode 'S/370'
HHC02204I numcpu         set to 4
```

Figure 214: NUMCPU command (increase emulated CPUs)

Example 3:
Set the number of emulated CPUs to (reduce from 4 currently).

```
HHC00013I Herc command: 'numcpu 2'
HHC00101I Thread id 0000080C, prio 0, name 'Processor CP02' ended
HHC00101I Thread id 00000CB4, prio 0, name 'Processor CP03' ended
HHC02204I numcpu         set to 2
```

Figure 215: NUMCPU command (reduce emulated CPUs)
8.113 NUMVEC (Display or set number of vector facilities)

8.113.1 Function
The NUMVEC command displays or sets the number of emulated vector facilities. The vector facility is only available in ESA/390 mode by default. Given without an argument the NUMVEC command displays the current number of vector facilities.

8.113.2 Syntax

**Descriptive**

NUMVEC [nn]

**Diagram**

![Diagram](image)

8.113.3 Parameter

*nn* This is the number of desired vector facilities.

8.113.4 Examples

**Example 1:**
Display the current number of vector facilities.

HHC00013I Herc command: 'numvec'
HHC02203I numvec        : 1

Figure 216: NUMVEC command (display current number of vector facilities)

**Example 2:**
Set the number of vector facilities to 2.

HHC00013I Herc command: 'numvec 2'
HHC022204I numvec        set to 2

Figure 217: NUMVEC command (set number of vector facilities)
8.114 OSTAILOR (Tailor trace information for specific operating system)

8.114.1 Function

The OSTAILOR command lets you display or (re-)specify the intended operating system. The effect of this parameter is to reduce control panel message traffic by selectively suppressing trace messages for program checks which are considered normal in the specified environment.

The argument QUIET suppresses all exception messages, whereas the argument NULL suppresses none of them. The other options do suppress some messages and do not suppress other messages depending on the specified operating system.

Prefix values with a plus (+) to combine them with existing values or with a minus (-) to exclude them from existing values. See also the PGMTRACE console command which allows you to further fine tune the tracing of program interrupt exceptions.

8.114.2 Syntax

Descriptive

OSTAILOR [[+ | -] z/OS | OS/390 | VM | z/VSE | VSE | LINUX | OPENSOLARIS | QUIET | NULL]

Diagram

```
OSTAILOR
+ z/OS
- OS/390
  VM
  VSE
- z/VSE
  LINUX
  OPENSOLARIS
    QUIET
    NULL
```

8.114.3 Parameter

+ Specifies to combine the value with existing values.
- Specifies to exclude the value from existing values.

z/OS Code z/OS if you intend to run z/OS.
OS/390  Code OS/390 if you intend to run MVS/370, MVS/XA, MVS/ESA, OS/390.
VM     Code VM if you intend to run VM/370, VM/ESA or z/VM.
VSE    Code VSE if you intend to run VSE/370 or VSE/ESA.
z/VSE  Code z/VSE if you intend to run z/VSE.
LINUX  Code Linux if you intend to run Linux/390 or Linux for z/Series.
OpenSolaris Code OpenSolaris if you intend to run OpenSolaris for z/Series.
QUIET  QUIET discards all exception messages.
NULL   NULL allows all exception messages to be logged.

8.114.4 Examples

Example 1:
Display the currently specified intended operating system.

HHC00013I Herc command: 'ostailor'
HHC02203I ostailor : z/OS

Figure 218: OSTAILOR command (display intended operating system)

Example 2:
Change the specified intended operating system to Linux.

HHC00013I Herc command: 'ostailor linux'
HHC00013I Herc command: 'ostailor'
HHC02203I ostailor : LINUX

Figure 219: OSTAILOR command (specify intended operating system)
Example 3:
Set the specified intended operating system to VM and combine it with z/OS and VSE, then display the currently specified value(s).

```
HHC00013I Herc command: 'ostailor vm'
HHC00013I Herc command: 'ostailor +z/OS'
HHC00013I Herc command: 'ostailor +vse'
HHC00013I Herc command: 'ostailor'
HHC02203I ostailor : Custom(0x7B7673FFF7DE7FB4)
```

Figure 220: OSTAILOR command (combine intended operating systems)

Example 4:
Display the currently specified intended operating system(s) and exclude z/OS from the existing values. Then display again the currently specified value(s).

```
HHC00013I Herc command: 'ostailor'
HHC02203I ostailor : Custom(0x7B7673FFF7DE7FB4)
HHC00013I Herc command: 'ostailor -z/OS'
HHC00013I Herc command: 'ostailor'
HHC02203I ostailor : Custom(0xFFFFFFFFFFFFFFFC)
```

Figure 221: OSTAILOR command (combine intended operating systems)
8.115 PANRATE (Display or set console refresh rate)

8.115.1 Function
The PANRATE command shows the current setting of the console (panel) refresh rate and allows a new value to be set.

8.115.2 Syntax

Descriptive

PANRATE [SLOW | FAST | rate]

Diagram

\[\begin{align*}
&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\\&\end{align*}\]

8.115.3 Parameter

SLOW  SLOW is a synonym for a panel refresh rate of 500 milliseconds.

FAST  FAST is a synonym for a panel refresh rate of 50 milliseconds.

rate  Any value between 1 (10) and 5000 milliseconds. A value less than the Linux system clock tick interval (10 on Intel platforms, 1 on Alpha platforms) or a value of more than 5000 will be rejected.

8.115.4 Examples

Example 1:
Display current panel refresh rate.

\[
\text{HHC00013I Herc command: 'panrate'}
\]
\[
\text{HHC02203I panrate : 1000}
\]

Figure 222: PANRATE command (list current panel refresh rate)
Example 2:
Set panel refresh rate to 500 milliseconds.

```
HHC00013I Herc command: 'panrate 500'
HHC02204I panrate       set to 500
```

Figure 223: PANRATE command (set new panel refresh rate)
8.116 PANTITLE (Display or set console window title)

8.116.1 Function
The PANTITLE command displays or sets an optional console window title-bar string to be used in place of the default title supplied by the windowing system. This option allows one to distinguish between different Hercules sessions when running more than one instance of Hercules on the same machine. Given without an argument the PANTITLE command displays the current console window title.

The PANTITLE option takes effect only when the Hercules console is displayed on an ‘xterm’ terminal (commonly used on Unix systems) or in a Windows command prompt window. Note that this option has no effect when Hercules is run under the control of the Hercules Windows GUI since Hercules's console window is hidden in favour of using the GUI's window instead.

The default console title is a string consisting of the following information:

“LPARNAME – SYSTYPE * SYSNAME * SYSPLEX – System Status: colour”

SYSTYPE, SYSNAME and SYSPLEX are populated by the system call SCLP Control Program Identification. If any of these values is blank, then that field is not presented in the console title. The system status colour has following meanings:

- **RED** One or more CPUs are in a disabled wait state.
- **AMBER** One or more CPUs are not running.
- **GREEN** Everything is working correctly.

8.116.2 Syntax

**Descriptive**

PANTITLE [text | "text text text" | ""

**Diagram**

```
>>> PANTITLE  text  "text text text"
```

8.116.3 Parameter

- **text** Specifies the optional console window title-bar string to be used. If the value contains any blanks it must be enclosed within double-quotes ("). An empty string ("") will remove the default console title.
8.116.4 Examples

Example 1:
Set the console window title to “Hercules Emulator HMC”.

```
HHC00013I Herc command: 'pantitle "Hercules Emulator HMC"'
HHC02204I pantitle       set to Hercules Emulator HMC
```

Figure 224: PANTITLE command (set a new console window title)

Example 2:
Remove the current window console title.

```
HHC00013I Herc command: 'pantitle ""'
HHC02204I pantitle       set to (none)
```

Figure 225: PANTITLE command (remove console window title)
8.117 PGMPRDOS (Set LPP license setting)

8.117.1 Function
The PGMPRDOS command specifies whether or not Hercules will run licensed program product (LPP) ESA or z/Architecture operating systems.

8.117.2 Syntax

Descriptive

PGMPRDOS {RESTRICTED | LICENSED}

Diagram

EVENT PGMPRDOS RESTRICTED LICENSED

8.117.3 Parameter

RESTRICTED When PGMPRDOS is set to RESTRICTED, Hercules will stop all CPUs when a licensed program product operating systems is detected. RESTRICTED is the default.

LICENSED Setting PGMPRDOS to LICENSED will allow you to run licensed program product operating systems normally. This parameter has no effect on Linux/390, Linux for z/Series, or any 370-mode operating system. If you are running Hercules under the Windows GUI a pop up window appears during startup which must be acknowledged before the startup continuous.

8.117.4 Examples

Example 1:
Allow licensed program product operating systems to run normally.

HHC00013I Herc command: 'pgmprdos licensed'

Figure 226: PGMPRDOS command
8.118 PGMTRACE (Trace program interrupts)

8.118.1 Function
The PGMTRACE command without arguments displays the actual trace program interrupt options. Given with
an argument (interruption code) the command changes the current options. Precede the interruption
code with a minus sign to stop tracing of that particular interruption code. See also the OSTAILOR con-
sole command which allows you to further fine tune the tracing of program interrupt exceptions.

8.118.2 Syntax

Descriptive
PGMTRACE [-] intcode

Diagram

8.118.3 Parameter

intcode Specifies the interruption code for which trace information is to be written to the
Hercules log or for which the trace information is to be stopped. intcode has to be a
valid program interruption code in the range from 0x01 to 0x40.

- A minus sign, directly preceding the intcode parameter, stops tracing for that partic-
ular interruption code.

8.118.4 Examples

Example 1:
Display the current program interruption trace settings.

Figure 227: PGMTRACE command (display settings)
Example 2:
Change the current program interruption trace settings.

```
HHC00013I Herc command: 'pgmtrace 04'
HHC00013I Herc command: 'pgmtrace'
HHC02281I * = Tracing suppressed; otherwise tracing enabled
HHC02281I 00000000000000001111111111111111222222222222222233333333333333334
HHC02281I 123456789ABCDEF0123456789ABCDEF0123456789ABCDEF0123456789ABCDEF0
HHC02281I  *    **  *     *              **   **  *   *  *    *
```

Figure 228: PGMTRACE command (change settings)
8.119 PLANT (Display or set STSI plant code)

8.119.1 Function
The PLANT console command displays or sets the plant name returned by the STSI instruction. If no argument is given, the current plant name is displayed.

8.119.2 Syntax

Descriptive

PLANT [name]

Diagram

```
> PLANT [name] <
```

8.119.3 Parameter

name Any name with a maximum length of four characters.

8.119.4 Examples

Example 1:
Set the STSI plant name to 'ZZ'.

```
HHC00013I Herc command: 'plant ZZ'
HHC02204I plant set to ZZ
```

Figure 229: PLANT command (set STSI plant name)
8.120  PR (Display prefix register)

8.120.1  Function
The PR command displays the contents of the prefix registers.

8.120.2  Syntax

Descriptive

PR

Diagram

Example 1:
Display the prefix register.

Example 1:

HHC00013I Herc command: 'pr'
HHC02277I Prefix register: 7FA03000

Figure 230: PR command
8.121 PSCP (Send system control program priority message)

8.121.1 Function
The PSCP command sends a system control program (i.e. guest operating system) priority command in any CMDTGT mode.

8.121.2 Syntax

**Descriptive**

PSCP \[cmd\]

**Diagram**

```
PSCP  \[cmd\]
```

8.121.3 Parameter

*cmd* This is the command to be sent as a system control program (i.e. guest operating system) priority command.

8.121.4 Examples
For a similar sample please refer to the SCP command.
8.122 PSW (Display or alter program status word)

8.122.1 Function
The PSW command displays or alters the actual content of the Program Status Word (PSW).

8.122.2 Syntax

**Descriptive**

PSW \[operand=value [operand=value ... ]\]

where operand can be:

SM=\(xx\)
PK=\(nn\)
CMWP=\(x\)
AS=[PRI | SEC | HOME]
CC=\(n\)
PM=\(x\)
IA=xxxxxxxxx
AM=[24 | 31 | 64]

**Diagram**

```
PSW

\[\text{operand=value} \]
```

where operand can be:

- SM=xx
- PK=nn
- CMWP=x
8.122.3 Parameter

SM=xx  Modifies the PSW system mask (xx is 2 hexadecimal digits).

PK=nn  Modifies the PSW protection key (nn is decimal 0 to 15).

CMWP=x  Modifies the EC/M/W/P bits of the PSW (x is 1 hexadecimal digit).

AS=aspace  This modifies the PSW address space control bits. The address space aspace must be ‘PRI’, ‘SEC’ or ‘HOME’.

CC=n  Modifies the PSW condition code (n is decimal 0 to 3).

PM=x  Modifies the PSW program mask (x is one hexadecimal digit).

IA=xxxxxxxx  Modifies the PSW instruction address (xxxxxxxx is one to 16 hexadecimal digits).

AM=amode  Modifies the addressing mode bits of the PSW. The addressing mode amode must be 24, 31 or 64 bit.

8.122.4 Examples

Example 1: Display the Program Status Word.

HHC00013I Herc command: 'psw'
HHC02278I Program status word: 070E000000000000
HHC02300I sm=07 pk=0 cmwp=E as=pri cc=0 pm=0 am=24 ia=0

Figure 231: PSW command (display PSW).
Example 2:
Change the PSW condition code to zero.

```
HHC00013I Herc command: 'psw cc=0'
HHC02278I Program status word: 070E000000000000
HHC02300I sm=07 pk=0 cmwp=E as=pri cc=0 pm=0 am=24 ia=0
```

Figure 232: PSW command (modify condition code)

Example 3:
Change the PSW condition code to zero and the addressing mode bits to AM=31.

```
HHC00013I Herc command: 'psw cc=0 am=31'
HHC02278I Program status word: 070E000080000000
HHC02300I sm=07 pk=0 cmwp=E as=pri cc=0 pm=0 am=31 ia=0
```

Figure 233: PSW command (modify condition code and addressing mode)
8.123 PTP (Enable / disable PTP debugging)

8.123.1 Function
The PTP command enables or disables debug tracing for the device group identified by devnum or for all device group(s) if devnum is not specified or specified as ‘ALL’.

8.123.2 Syntax

Descriptive

PTP DEBUG {ON | OFF} [devnum | ALL] [mask]

Diagram

8.123.3 Parameter

ON Enables the PTP debug tracing.

OFF Disables the PTP debug packet tracing.

devnum Specifies the PTP device group(s) for which debug tracing has to be enabled or disabled.

ALL Enables or disables the debug tracing for all PTP device groups. 'ALL' is the default if no device group is specified.

mask Specifies the type of debug output to be produced. mask is a value from 1 to 255. The following debug output can be selected:

- Xxx
- Xxx
8.123.4 Examples

Example 1:
Enable the debug tracing for all PTP devices. Please note that not all hex columns can be displayed in the figure below. Missing columns have been marked with "[ ]".

```
HHC00013I Herc command: 'ptp debug on all'
HHC02204I PTP debug set to on ALL
```

Figure 234: PTP command (enable debug tracing)

Example 2:
Disable the PTP debug tracing.

```
HHC00013I Herc command: 'ptp debug off'
HHC02204I PTP debug set to off
```

Figure 235: PTP command (disable debug tracing)
8.124 PTT (Display or set internal trace)

8.124.1 Function
The PTT command sets or displays the internal trace options. When specified with no operands, the PTT command displays the trace options and the contents of the internal trace table.

When specified with operands, the PTT command sets the trace options and/or specifies which events are to be traced. If the last operand is numeric, it sets the size of the trace table and activates the trace.

The following events can be traced:
- Internal logger events
- Internal timer events
- Internal threading events
- Instruction information events
- Instruction error events
- Program interrupt events
- Interlocked instruction type events
- SIE instruction events
- SIGP instruction events
- I/O instruction events
- LCS timing events
- QETH timing events

The following options can be set:
- Lock table before updating
- Timestamp table entries
- Wraparound trace table
- Automatic display timeout
- Table size

8.124.2 Syntax

Descriptive

```
PTT [events] [options] [TO=nnn] [mmmmm]
```

where events can be:

- [NO] LOG
- [NO] TMR
- [NO] THR
[NO]INF
[NO]ERR
[NO]PGM
[NO]CSF
[NO]SIE
[NO]SIG
[NO]IO
[NO]LCS
[NO]QETH

and where options can be:

[NO]LOCK
[NO]TOD
[NO]WRAP

Diagram

\[\text{PTT} \quad \text{events} \quad \text{options} \quad \text{TO}=\text{nnn}\]

where events can be:

\[\text{NO} \quad \text{LOG}\]
\[\text{NO} \quad \text{TMR}\]
\[\text{NO} \quad \text{THR}\]
\[\text{NO} \quad \text{INF}\]
\[\text{NO} \quad \text{ERR}\]
8.124.3 Parameter

**NOxxxxxxx**  Deselects the specified trace entry type or deselecteds the specified option.

**LOG**  Selects the internal logger trace entries.

**TMR**  Selects the internal timer trace entries.

**THR**  Selects the internal threading trace entries.

**INF**  Selects the instruction information trace entries.

**ERR**  Selects the instruction error trace entries.

**PGM**  Selects the program interrupt trace entries.

**CSF**  Selects the interlocked instruction type trace entries.

**SIE**  Selects the SIE instruction trace entries.
**SIGP** Selects the SIGP instruction trace entries.

**IO** Selects the I/O instruction trace entries.

**LCS** Selects the LCS timing trace entries.

**QETH** Selects the QETH timing trace entries.

**LOCK** Lock table before updating

**TOD** Timestamp table entries

**WRAP** Specifies that the trace table has be overwritten when it is full. As soon as the end of the table is reached, the next entry to be written to the table goes to the start and overlays the trace entry that was formerly there.

**TO=nnn** Timeout in seconds before the automatic issuance of the PTT command is to occur, to print (display) the internal trace table.

**mmmmm** Number of trace entries to be kept.

### 8.124.4 Examples

**Example 1:**
Display the current defaults, then set the pthread trace options and start the trace.

```
HHCC0013I Herc command: 'ptt'
HHCC0012I Ptrace: lock tod wrap to 0 0
HHCC0013I Herc command: 'ptt prog inter signal io threads logger nowrap 10000'
```

Figure 236: PTT command (display trace options / set options and start trace)

**Example 2:**
Display the pthread trace entries.

```
HHCC0013I Herc command: 'ptt'
cmdbtab.c:342 05:23:33.429599 00001084 unlock 00820738 00000000 0
dyngui.c:145 05:23:33.429601 00001084 lock before 002334f8 00000000
dyngui.c:145 05:23:33.429602 00001084 lock after 002334f8 00000000 0
dyngui.c:175 05:23:33.429603 00001084 unlock 002334f8 00000000 0
dyngui.c:1818 05:23:33.429604 00001084 lock before 009473d8 00000000
dyngui.c:1818 05:23:33.429605 00001084 lock after 009473d8 00000000 0
dyngui.c:1821 05:23:33.429620 00001084 unlock 009473d8 00000000 0
dyngui.c:1818 05:23:33.429621 00001084 lock before 009473d8 00000000
dyngui.c:1818 05:23:33.429622 00001084 lock after 009473d8 00000000 0
dyngui.c:1821 05:23:33.429634 00001084 unlock 009473d8 00000000 0
logger.c:493 05:23:33.429906 00001118 unlock 0036a774 00000000 0
logger.c:504 05:23:33.429907 00001118 lock before 0036a774 00000000
logger.c:504 05:23:33.429909 00001118 lock after 0036a774 00000000 0
```
<table>
<thead>
<tr>
<th>Function</th>
<th>Line Number</th>
<th>Time</th>
<th>Address</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>logger.c</td>
<td>505</td>
<td>05:23:33.429919</td>
<td>00001118 broadcast</td>
<td>broadcast</td>
</tr>
<tr>
<td>logger.c</td>
<td>506</td>
<td>05:23:33.429921</td>
<td>00001118 unlock</td>
<td>unlock</td>
</tr>
<tr>
<td>logger.c</td>
<td>121</td>
<td>05:23:33.429935</td>
<td>00000CE4 wait after</td>
<td>wait after</td>
</tr>
<tr>
<td>logger.c</td>
<td>156</td>
<td>05:23:33.429936</td>
<td>00000CE4 unlock</td>
<td>unlock</td>
</tr>
<tr>
<td>hao.c</td>
<td>589</td>
<td>05:23:33.429943</td>
<td>00000CE4 lock before</td>
<td>lock before</td>
</tr>
<tr>
<td>hao.c</td>
<td>589</td>
<td>05:23:33.429944</td>
<td>00000CE4 lock after</td>
<td>lock after</td>
</tr>
<tr>
<td>hao.c</td>
<td>610</td>
<td>05:23:33.429945</td>
<td>00000CE4 lock after</td>
<td>lock after</td>
</tr>
<tr>
<td>logger.c</td>
<td>115</td>
<td>05:23:33.429946</td>
<td>00000CE4 lock after</td>
<td>lock after</td>
</tr>
<tr>
<td>logger.c</td>
<td>115</td>
<td>05:23:33.429947</td>
<td>00000CE4 lock after</td>
<td>lock after</td>
</tr>
<tr>
<td>logger.c</td>
<td>121</td>
<td>05:23:33.429948</td>
<td>00000CE4 wait before</td>
<td>wait before</td>
</tr>
<tr>
<td>cpu.c</td>
<td>1744</td>
<td>05:23:33.429955</td>
<td>00000B34 wait after</td>
<td>wait after</td>
</tr>
<tr>
<td>cpu.c</td>
<td>1759</td>
<td>05:23:33.429957</td>
<td>00000B34 unlock</td>
<td>unlock</td>
</tr>
<tr>
<td>external.c</td>
<td>54</td>
<td>05:23:33.429966</td>
<td>00000B34 *EXTINT</td>
<td>*EXTINT</td>
</tr>
<tr>
<td>external.c</td>
<td>127</td>
<td>05:23:33.429968</td>
<td>00000B34 unlock</td>
<td>unlock</td>
</tr>
<tr>
<td>control.c</td>
<td>6474</td>
<td>05:23:33.429981</td>
<td>00000B34 lock before</td>
<td>lock before</td>
</tr>
<tr>
<td>control.c</td>
<td>6474</td>
<td>05:23:33.429982</td>
<td>00000B34 lock after</td>
<td>lock after</td>
</tr>
<tr>
<td>control.c</td>
<td>6497</td>
<td>05:23:33.429986</td>
<td>00000B34 unlock</td>
<td>unlock</td>
</tr>
<tr>
<td>control.c</td>
<td>4570</td>
<td>05:23:33.430008</td>
<td>00000B34 lock before</td>
<td>lock before</td>
</tr>
<tr>
<td>control.c</td>
<td>4570</td>
<td>05:23:33.430009</td>
<td>00000B34 lock after</td>
<td>lock after</td>
</tr>
<tr>
<td>control.c</td>
<td>4581</td>
<td>05:23:33.430011</td>
<td>00000B34 unlock</td>
<td>unlock</td>
</tr>
<tr>
<td>control.c</td>
<td>4570</td>
<td>05:23:33.430028</td>
<td>00000B34 lock before</td>
<td>lock before</td>
</tr>
<tr>
<td>control.c</td>
<td>4570</td>
<td>05:23:33.430029</td>
<td>00000B34 lock after</td>
<td>lock after</td>
</tr>
<tr>
<td>control.c</td>
<td>4581</td>
<td>05:23:33.430031</td>
<td>00000B34 unlock</td>
<td>unlock</td>
</tr>
<tr>
<td>control.c</td>
<td>4570</td>
<td>05:23:33.430069</td>
<td>00000B34 lock before</td>
<td>lock before</td>
</tr>
<tr>
<td>control.c</td>
<td>4570</td>
<td>05:23:33.430070</td>
<td>00000B34 lock after</td>
<td>lock after</td>
</tr>
<tr>
<td>control.c</td>
<td>4581</td>
<td>05:23:33.430072</td>
<td>00000B34 unlock</td>
<td>unlock</td>
</tr>
<tr>
<td>control.c</td>
<td>4632</td>
<td>05:23:33.430287</td>
<td>00000B34 lock before</td>
<td>lock before</td>
</tr>
<tr>
<td>control.c</td>
<td>4632</td>
<td>05:23:33.430288</td>
<td>00000B34 lock after</td>
<td>lock after</td>
</tr>
<tr>
<td>control.c</td>
<td>4642</td>
<td>05:23:33.430290</td>
<td>00000B34 unlock</td>
<td>unlock</td>
</tr>
<tr>
<td>cpu.c</td>
<td>1586</td>
<td>05:23:33.430349</td>
<td>00000B34 lock before</td>
<td>lock before</td>
</tr>
<tr>
<td>cpu.c</td>
<td>1586</td>
<td>05:23:33.430349</td>
<td>00000B34 lock after</td>
<td>lock after</td>
</tr>
<tr>
<td>cpu.c</td>
<td>1744</td>
<td>05:23:33.430494</td>
<td>00000B34 lock before</td>
<td>lock before</td>
</tr>
<tr>
<td>cpu.c</td>
<td>1744</td>
<td>05:23:33.430494</td>
<td>00000B34 lock after</td>
<td>lock after</td>
</tr>
</tbody>
</table>

Figure 237: PTT command (display trace entries)

Example 3:
Set the pthread trace options, start the trace and issue automatic display of the trace entries after 2 minutes.

HHC90012I Pttrace: prog inter signal io threads logger lock tod nowrap to 0 10000
HHC00003I Herc command: 'ptt prog inter signal io threads logger nowrap to=120 10000'
HHC00100I Thread id 00001610, prio 0, name 'PTT timeout timer' started
pttrace.c:270 05:24:09.648613 00001084 lock before 0036aca0 00000000
pttrace.c:270 05:24:09.648615 00001084 lock after 0036aca0 00000000 0
logger.c:493 05:24:09.648652 00001118 unlock 0036a774 00000000 0
logger.c:504 05:24:09.648654 00001118 lock before 0036a774 00000000 0
logger.c:504 05:24:09.648655 00001118 lock after 0036a774 00000000 0
logger.c:505 05:24:09.648667 00001118 broadcast 00000000 0036a77c 0
<table>
<thead>
<tr>
<th>Source File</th>
<th>Timestamp</th>
<th>Type</th>
<th>Comment</th>
<th>Address</th>
<th>Flags</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>logger.c:506</td>
<td>05:24:09.648668</td>
<td>unlock</td>
<td>00001118</td>
<td>0036a774</td>
<td>00000000</td>
<td>0</td>
</tr>
<tr>
<td>logger.c:121</td>
<td>05:24:09.648747</td>
<td>wait after</td>
<td>00000000</td>
<td>0036a774</td>
<td>0036a77c</td>
<td>0</td>
</tr>
<tr>
<td>logger.c:156</td>
<td>05:24:09.648749</td>
<td>unlock</td>
<td>0036a774</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Hao.c:589</td>
<td>05:24:09.648758</td>
<td>lock before</td>
<td>00000000</td>
<td>00830f18</td>
<td>00000000</td>
<td>0</td>
</tr>
<tr>
<td>Hao.c:589</td>
<td>05:24:09.648759</td>
<td>lock after</td>
<td>00830f18</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Hao.c:610</td>
<td>05:24:09.648761</td>
<td>unlock</td>
<td>00830f18</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>logger.c:115</td>
<td>05:24:09.648763</td>
<td>lock before</td>
<td>0036a774</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>logger.c:115</td>
<td>05:24:09.648764</td>
<td>lock after</td>
<td>0036a774</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>logger.c:121</td>
<td>05:24:09.648765</td>
<td>wait before</td>
<td>0036a774</td>
<td>0036a77c</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Ptrace.c:272</td>
<td>05:24:09.648844</td>
<td>create</td>
<td>00001610</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Ptrace.c:275</td>
<td>05:24:09.648845</td>
<td>unlock</td>
<td>0036aca0</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Cmdtab.c:342</td>
<td>05:24:09.648848</td>
<td>unlock</td>
<td>00820738</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Dyngui.c:145</td>
<td>05:24:09.648851</td>
<td>lock before</td>
<td>002334f8</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Dyngui.c:145</td>
<td>05:24:09.648852</td>
<td>lock after</td>
<td>002334f8</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Dyngui.c:175</td>
<td>05:24:09.648854</td>
<td>unlock</td>
<td>002334f8</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Dyngui.c:1818</td>
<td>05:24:09.648856</td>
<td>lock before</td>
<td>009473d8</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Dyngui.c:1818</td>
<td>05:24:09.648857</td>
<td>lock after</td>
<td>009473d8</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Dyngui.c:1821</td>
<td>05:24:09.648892</td>
<td>unlock</td>
<td>009473d8</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Dyngui.c:1821</td>
<td>05:24:09.648893</td>
<td>lock before</td>
<td>009473d8</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Dyngui.c:1821</td>
<td>05:24:09.648894</td>
<td>lock after</td>
<td>009473d8</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Dyngui.c:1821</td>
<td>05:24:09.648929</td>
<td>unlock</td>
<td>009473d8</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Control.c:4642</td>
<td>05:24:11.878330</td>
<td>unlock</td>
<td>00233b54</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Cpu.c:1586</td>
<td>05:24:11.878333</td>
<td>lock before</td>
<td>00233b54</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Cpu.c:1586</td>
<td>05:24:11.878334</td>
<td>lock after</td>
<td>00233b54</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Cpu.c:1744</td>
<td>05:24:11.878336</td>
<td>wait before</td>
<td>00233b54</td>
<td>030a6d94</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Cpu.c:1744</td>
<td>05:24:11.885597</td>
<td>wait after</td>
<td>00233b54</td>
<td>031a6d94</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Cpu.c:1759</td>
<td>05:24:11.885599</td>
<td>unlock</td>
<td>00233b54</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Cpu.c:1586</td>
<td>05:24:11.885601</td>
<td>lock before</td>
<td>00233b54</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Cpu.c:1586</td>
<td>05:24:11.885602</td>
<td>lock after</td>
<td>00233b54</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>External.c:54</td>
<td>05:24:11.885607</td>
<td>*EXTINT</td>
<td>00001004</td>
<td>00000002</td>
<td>00000000</td>
<td></td>
</tr>
<tr>
<td>External.c:127</td>
<td>05:24:11.885609</td>
<td>unlock</td>
<td>00233b54</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Control.c:6474</td>
<td>05:24:11.885622</td>
<td>lock before</td>
<td>00233b54</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Control.c:6474</td>
<td>05:24:11.885623</td>
<td>lock after</td>
<td>00233b54</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Control.c:6497</td>
<td>05:24:11.885627</td>
<td>unlock</td>
<td>00233b54</td>
<td>00000000</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

HHC00101I Thread id 00001610, prio 0, name 'PTT timeout timer' ended

Figure 238: PTT command (start trace and issue automatic display)
8.125 PWD (Print working directory)

8.125.1 Function
The PWD command prints the current working directory.

8.125.2 Syntax

Descriptive

PWD

Diagram

8.125.3 Parameter
None.

8.125.4 Examples
Example 1:
Print the current working directory.

HHC00013I Herc command: 'pwd'
HHC02204I working directory set to d:\hercules

Figure 239: PWD command
8.126 QCPUID (Display CPU ID)

8.126.1 Function
The QCPUID command displays the CPU ID and STSI results presented to the SCP.

8.126.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
<th>QCPUID</th>
</tr>
</thead>
</table>

Diagram

-figure- QCPUID

8.126.3 Parameter
None.

8.126.4 Examples
Example 1:
Display the default CPUID.

```
HHC00013I Herc command: 'qcpuid'
HHC17004I CPUID = 1900196370600000
HHC17005I CPC SI = 7060.7060-H70.HRC.ZZ.0000000000001963
```

Figure 240: QCPUID command
8.127 QD (Query device information)

8.127.1 Function
The QD command queries one or all devices or device classes depending on the given argument. The
device number can be either a single device number or a multiple device number specification. The
device class is either CHAN, CON, CTCA, DASD, DSP, FCP, LINE, OSA, PCH, PRT, RDR or TAPE. If
no argument is given all devices are queried.

8.127.2 Syntax

Descriptive
QD [devnum | devclass]

Diagram

```
QD └── devnum └── devclass
```

8.127.3 Parameter

**devnum**  The device number or multiple device number specification of the device(s) to be
queried.

**Devclass** Specifies the device class to be queried. The device class is either CHAN, CON,
CTCA, DASD, DSP, FCP, LINE, OSA, PCH, PRT, RDR or TAPE

8.127.4 Examples

Example 1:
Query DASD device with address 0AE0.

```
HHC00013I Herc command: 'qd 0148'
HHC02280I 0:0148 SNSID 00 FF383002 335000
HHC02280I 0:0148 RDC 00 38300233 50000000 00000000 022B001E
HHC02280I              10  80004B36 00B90000 00000000 022B0096
HHC02280I              20  00000000 00000000 00FF0000 00000000
HHC02280I 0:0148 RCD 00 C4010100 4040F3F3 F5F0F0F0 F0C8D9C3 |D... 3350000HRC|
HHC02280I              10  E9E9F0F0 F0F0F0F0 F0F0F0F0 F0F10300 |ZZ000000000001..|
```
8.127.5 Explanations for device class DASD

The Sense ID (SNSID) is describing the type and the model number of the subsystem and logical volume of the channel and has the following format:

<table>
<thead>
<tr>
<th>Bytes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>---</td>
</tr>
<tr>
<td>1-2</td>
<td>Subsystem Type</td>
</tr>
<tr>
<td>3</td>
<td>Subsystem Model and Architecture</td>
</tr>
<tr>
<td>4-5</td>
<td>Device Type</td>
</tr>
<tr>
<td>6</td>
<td>Device Model</td>
</tr>
<tr>
<td>7</td>
<td>Reserved</td>
</tr>
<tr>
<td>8-11</td>
<td>Command Interface Word (CIW) for Read Configuration Data</td>
</tr>
<tr>
<td>12-15</td>
<td>Command Interface Word (CIW) for Set-Interface-Identifier</td>
</tr>
<tr>
<td>16-19</td>
<td>Command Interface Word (CIW) for Read-Node-Identifier</td>
</tr>
</tbody>
</table>

Table 21: Sense ID
The Read Device Characteristics (RDC) defines the characteristics of the logical volume. The format is the following:

<table>
<thead>
<tr>
<th>Bytes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>Subsystem type</td>
</tr>
<tr>
<td>2</td>
<td>Subsystem model number and architecture</td>
</tr>
<tr>
<td>3-4</td>
<td>Device type</td>
</tr>
<tr>
<td>5</td>
<td>Device model</td>
</tr>
<tr>
<td>6-9</td>
<td>Subsystem and device facilities</td>
</tr>
<tr>
<td>10</td>
<td>Device class code</td>
</tr>
<tr>
<td>11</td>
<td>Device type code</td>
</tr>
<tr>
<td>12-13</td>
<td>Number of primary cylinders</td>
</tr>
<tr>
<td>14-15</td>
<td>Tracks per cylinder</td>
</tr>
<tr>
<td>16</td>
<td>Number of sectors</td>
</tr>
<tr>
<td>17-19</td>
<td>Track length</td>
</tr>
<tr>
<td>20-21</td>
<td>Length of HA and R0</td>
</tr>
<tr>
<td>22</td>
<td>Track capacity calculation formula</td>
</tr>
<tr>
<td>23-27</td>
<td>Track capacity calculation factors F1 through F5</td>
</tr>
<tr>
<td>28-29</td>
<td>First alternate cylinder address</td>
</tr>
<tr>
<td>30-31</td>
<td>Number of alternate tracks</td>
</tr>
<tr>
<td>32-33</td>
<td>First diagnostic cylinder address</td>
</tr>
<tr>
<td>34-35</td>
<td>Number of diagnostic tracks</td>
</tr>
<tr>
<td>36-37</td>
<td>First device support cylinder address</td>
</tr>
<tr>
<td>38-39</td>
<td>Number of device support tracks</td>
</tr>
<tr>
<td>40</td>
<td>MDR record ID</td>
</tr>
<tr>
<td>41</td>
<td>OBR record ID</td>
</tr>
<tr>
<td>42</td>
<td>Control unit type code</td>
</tr>
<tr>
<td>43</td>
<td>Read trackset parameter length</td>
</tr>
<tr>
<td>44-45</td>
<td>Maximum record zero length</td>
</tr>
<tr>
<td>46</td>
<td>Reserved</td>
</tr>
<tr>
<td>47</td>
<td>Track set size</td>
</tr>
<tr>
<td>48</td>
<td>Track capacity calculation factor F6</td>
</tr>
<tr>
<td>49-50</td>
<td>RPS sector calculation factors</td>
</tr>
<tr>
<td>51-53</td>
<td>Reserved</td>
</tr>
<tr>
<td>54</td>
<td>Device and control unit features</td>
</tr>
<tr>
<td>55</td>
<td>Reserved</td>
</tr>
<tr>
<td>56</td>
<td>Real control unit type code</td>
</tr>
<tr>
<td>57</td>
<td>Real device type code</td>
</tr>
<tr>
<td>58-63</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

Table 22: Read Device Characteristics
The Read Configuration Data (RCD) contains configuration data. It shows how the internal disk subsystem is configured. The RCD has the following format:

<table>
<thead>
<tr>
<th>Bytes</th>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>000-031</td>
<td>NED1</td>
<td>Volume NED (logical volume within the subsystem)</td>
</tr>
<tr>
<td>032-063</td>
<td>NED2</td>
<td>NED for the RAID array</td>
</tr>
<tr>
<td>064-095</td>
<td>NED3</td>
<td>NED for the logical subsystem</td>
</tr>
<tr>
<td>096-127</td>
<td>NED4</td>
<td>Token NED (establishes a relationship among all configuration data records in a control unit in the subsystem)</td>
</tr>
<tr>
<td>128-223</td>
<td></td>
<td>Reserved</td>
</tr>
<tr>
<td>224-255</td>
<td>QNEQ</td>
<td>General NEQ (describes paths and addresses)</td>
</tr>
</tbody>
</table>

Table 23: Read Configuration Data

Legend:

NED  Node Element Descriptor
NEQ  Node Element Qualifier
8.128 QPFKEYS (Display the current PF key settings)

8.128.1 Function
The QPFKEYS command displays the current PF key settings.

8.128.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>QPFKEYS</td>
</tr>
</tbody>
</table>

Diagram

![Diagram of QPFKEYS]

8.128.3 Parameter
None.

8.128.4 Examples

Example 1:
Display the current PF key settings.

```
HHC00013I Herc command: 'qpfkeys'
HHC17199I PF01 'SUBST IMMED herc help &0'
HHC17199I PF02 'SUBST IMMED herc hst &0'
HHC17199I PF03 'UNDEFINED'
HHC17199I PF04 'UNDEFINED'
HHC17199I PF05 'IMMED herc maxrates'
HHC17199I PF06 'IMMED herc uptime'
HHC17199I PF07 'IMMED herc qproc'
HHC17199I PF08 'SUBST IMMED herc qd &0'
HHC17199I PF09 'UNDEFINED'
HHC17199I PF10 'UNDEFINED'
HHC17199I PF11 'SUBST DELAY herc &**'
HHC17199I PF12 'IMMED herc cmdtgt herc'
HHC17199I PF13 'UNDEFINED'
HHC17199I PF14 'UNDEFINED'
HHC17199I PF15 'SUBST IMMED herc sfd &0'
HHC17199I PF16 'SUBST IMMED herc sfc &0'
HHC17199I PF17 'SUBST IMMED herc sfc &0 &1'
```
Figure 242: QPFKEYS command
8.129 QPID (Display process ID of Hercules)

8.129.1 Function
The QPID command displays the process ID of Hercules.

8.129.2 Syntax

Descriptive

QPID

Diagram

Ex– QPID

8.129.3 Parameter
None.

8.129.4 Examples
Example 1:
Display the process ID of Hercules.

HHC00013I Herc command: 'qpid'
HHC17013I Process ID = 3544

Figure 243: QPID command
8.130 QPORTS (Display TCP/IP ports in use)

8.130.1 Function
The QPORTS command displays the TCP/IP ports in use.

8.130.2 Syntax

Descriptive
QPORTS

Diagram

8.130.3 Parameter
None.

8.130.4 Examples
Example 1:
Display the TCP/IP ports in use.

```
HHC00013I Herc command: 'qports'
HHC17001I Server ' http' is listening on port 8089
HHC17001I Server ' shared_dasd' is listening on port 3999
HHC17001I Server ' console' is listening on port 3278
```

Figure 244: QPORTS command
8.131 QPROC (Display processors type and utilization)

8.131.1 Function
The QPROC command displays the processors type and their utilization.

8.131.2 Syntax

Descriptive
QPROC

Diagram

8.131.3 Parameter
None.

8.131.4 Examples
Example 1:
Display the processors type and utilization.

HHC00013I Herc command: 'qproc'
HHC170071 NumCPU = 08, NumVEC = 00, ReservedCPU = 00, MaxCPU = 08
HHC170081 Avgproc 028% 08; MIPS[39.71]; SIOS[998]
HHC170091 PROC CP00 - 067%; MIPS[10.11]; SIOS[358] - Host Kernel(00:00:00.202) User(00:00:39.203)
HHC170091 PROC CP01 - 060%; MIPS[ 8.84]; SIOS[329] - Host Kernel(00:00:00.202) User(00:00:19.640)
HHC170091 PROC CP02 - 046%; MIPS[12.77]; SIOS[255] - Host Kernel(00:00:00.124) User(00:00:15.974)
HHC170091 PROC CP03 - 032%; MIPS[ 4.63]; SIOS[151] - Host Kernel(00:00:00.156) User(00:00:12.792)
HHC170091 PROC CP04 - 009%; MIPS[ 1.09]; SIOS[ 51] - Host Kernel(00:00:00.078) User(00:00:10.670)
HHC170091 PROC CP05 - 005%; MIPS[ 0.65]; SIOS[ 13] - Host Kernel(00:00:00.000) User(00:00:08.470)
HHC170091 PROC CP06 - 008%; MIPS[ 1.22]; SIOS[ 41] - Host Kernel(00:00:00.078) User(00:00:06.754)
HHC170091 PROC CP07 - 002%; MIPS[ 0.36]; SIOS[ 8] - Host Kernel(00:00:00.031) User(00:00:06.598)
HHC17010I - Started        : Stopping        * Stopped

Figure 245: QPROC command
8.132 QSTOR (Display main and expanded storage values)

8.132.1 Function
The QSTOR command displays the current main and expanded storage values.

8.132.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
<th>QSTOR</th>
</tr>
</thead>
</table>

Diagram

8.132.3 Parameter
None.

8.132.4 Examples
Example 1:
Display the current main and expanded storage values.

```
HHC00013I Herc command: 'qstor'
HHC17003I MAIN     storage is 006 GBytes 'mainsize'
HHC17003I EXPANDED storage is 000 MBytes 'xpndsize'
```

Figure 246: QSTOR command
8.133 QUIET (Toggle automatic refresh of console display data)

8.133.1 Function

The QUIET command either disables automatic screen refreshing if it is currently enabled or enables it if it is currently disabled. When disabled you will not be able to see the response of any entered command nor any messages issued by the system nor be able to scroll the display, etc. Basically all screen updating is disabled. Entering ‘quiet’ again re-enables screen updating.

Please note that the QUIET command is disabled in the dyngui and therefore is not available when using the Hercules WinGUI.

8.133.2 Syntax

Descriptive
QUIET

Diagram

8.133.3 Parameter

None.

8.133.4 Examples

Example 1:
Change between automatic refresh of console display data.

HHC00013I Herc command: 'quiet'
HHC02203I automatic refresh: disabled
HHC00013I Herc command: 'quiet'
HHC02203I automatic refresh: enabled

Figure 247: QUIET command
8.134 QUIT (Terminate the emulator)

8.134.1 Function

The QUIT command (see also the EXIT command) initiates the Hercules shutdown. It terminates all threads, detaches all channels and devices and releases the configuration. Finally it terminates the emulator. If the guest OS has enabled “Signal Shutdown” then a signal shutdown request is sent to the guest OS and termination will begin after the guest OS has shutdown.

The QUIT command acts different depending on how Hercules was built. If Hercules was not compiled with the option 'OPTION_SHUTDOWN_CONFIRMATION' then the command acts as described above.

If Hercules however was built with option 'OPTION_SHUTDOWN_CONFIRMATION' then the following special processing for terminating the emulator takes place.

If QUIT is entered and the command level is not set to 'developer', 'debug' or 'all' then QUIT will first check that all online CPUs are stopped. If any CPU is not in the stopped state message HHC00069I is displayed indicating the number of CPUs still running.

Message HHC02266A follows that prompts for confirmation by entering a second QUIT command within a certain time period (default 10 seconds) to start termination of the emulator. If the time period has expired then the process starts over. This is to prevent an inadvertent shutdown of Hercules while still a guest OS is running.

The time period for the second QUIT command can be set to another value by using the 'QUITMOUT' console command or system parameter.

If all processors are stopped or the command level is set to 'developer', 'debug' or 'all' then quit stops Hercules immediately. 'QUIT FORCE' will also terminate the emulator immediately without any further checks.

8.134.2 Syntax

Descriptive
QUIT [FORCE]

Diagram
QUIT

8.134.3 Parameter

FORCE Terminate the emulator immediately.
8.134.4 Examples

Example 1:
Initiate the Hercules shutdown.

HHC00013I Herc command: 'quit'
HHC00069I Guest is not quiesced; there are 8 CPUs active
HHC02266A Reenter command 'exit' again within 10 seconds to execute
HHC00013I Herc command: 'exit'
HHC01420I Begin Hercules shutdown
HHC01421I Releasing configuration
   several lines not displayed
   several lines not displayed
   HHC01422I Configuration release complete
   HHC01423I Calling termination routines
   several lines not displayed
   several lines not displayed
   HHC02103I Logger: logger thread terminating
HHC01412I Hercules terminated

Figure 248: QUIT command

Example 2:
Initiate an immediate Hercules shutdown.

HHC00013I Herc command: 'quit force'
HHC01420I Begin Hercules shutdown
HHC01421I Releasing configuration
   several lines not displayed
   several lines not displayed
   HHC01422I Configuration release complete
   HHC01423I Calling termination routines
   several lines not displayed
   several lines not displayed
   HHC02103I Logger: logger thread terminating
HHC01412I Hercules terminated

Figure 249: QUIT FORCE command
8.135 QUITMOUT (Display or set quit timeout value)

8.135.1 Function
The QUITMOUT console command is used to display or set the timeout value for a second QUIT, EXIT or SSD command if Hercules is built with the option "OPTION_SHUTDOWN_CONFIRMATION". If Hercules is built without this option, then the QUITMOUT console command is not available. If QUITMOUT is given without argument it displays the current setting.

8.135.2 Syntax

Descriptive
QUITMOUT [nn]

Diagram

8.135.3 Parameter

nn This specifies the timeout value where nn must be in the range of 2 to 60 seconds. If the timeout value is 0 then no second QUIT, EXIT or SSD is necessary.

8.135.4 Examples

Example 1:
Display the current QUITMOUT value.

HHC01603I quitmout
HHC17100I Timeout value for 'quit' and 'ssd' is '10' seconds

Figure 250: QUITMOUT command
8.136 R (Display or alter real storage)

8.136.1 Function
The R command allows you to display or alter real storage. Up to 64K of real storage can be displayed, up to 32 bytes of real storage can be altered.

8.136.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>R {addr</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Diagram" /></td>
</tr>
</tbody>
</table>

8.136.3 Parameter

- **addr**: Specifies the address of the real storage that is to be displayed. If `addr` is given without a length or without a second address for the end of the storage area then 64 bytes of real storage are displayed.

- **addr.length**: Specifies the address of the real storage area that is to be displayed with starting address and length (from address `addr` with the length of `length`). The `length` value must be given in hexadecimal. The maximum length that can be specified is 64K.

- **addr=addr**: Specifies an address range with start and end address (from begin address to end address) of the real storage area that is to be displayed.

- **addr=value**: Specifies the address of the real storage area that is to be altered. `value` is a hex-string of up to 32 pairs of hex digits (32 bytes) which will be written to the real storage address given by the `addr` parameter. After altering the storage, 16 bytes of real storage starting at `addr` are displayed.
8.136.4 Examples

Example 1:
Display 256 bytes of real storage starting from location x'00000000'.

<table>
<thead>
<tr>
<th>Herc Command</th>
<th>Real Storage Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>'r 00000000.ff'</td>
<td><img src="image" alt="Real Storage Display" /></td>
</tr>
</tbody>
</table>

Figure 251: R command (display real storage)

Example 2:
Alter 4 bytes of real storage at location x'00000000' to x'FFFFFFFF'.

<table>
<thead>
<tr>
<th>Herc Command</th>
<th>Real Storage Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>'r 00000000=FFFFFFFF'</td>
<td><img src="image" alt="Real Storage Display" /></td>
</tr>
</tbody>
</table>

Figure 252: R command (alter real storage)
8.137 RESTART (Generate restart interrupt)

8.137.1 Function
The RESTART command generates a restart interrupt (the virtual RESTART key is pressed).

8.137.2 Syntax

Descriptive
RESTART

Diagram
[Diagram showing RESTART]

8.137.3 Parameter
None.

8.137.4 Examples
Example 1:
Generate restart interrupt.

HHC00013I Herc command: 'restart'
HHC02228I Key 'restart' pressed

Figure 253: RESTART command
8.138 RESUME (Resume Hercules)

8.138.1 Function

This command resumes a Hercules session that had been previously suspended with the SUSPEND command (see section 8.171 for details). The data necessary to resume the session is read from a packed (zipped) file called “hercules.srf.gz” located in the current configuration directory.

In order for an instance to be resumed HERCULES must be started with a configuration file describing the configuration at suspend time. For example, MAINSIZE and XPNDSIZE must match and all devices present at suspend time must be present at resume time.

Disk devices must be at the same state as they were at suspend time. They can however be a different file type. For example a disk could be a CCKD disk at suspend time then a CKD disk could be created using DASDCOPY and HERCULES resumed using the CKD disk instead.

HERCULES must also be configured similarly as at suspend time. For example if 4 emulated CPUs were active at suspend time then the session cannot be resumed on a HERCULES with a maximum of two CPUs. Similarly you will not be able to resume a session in z/Architecture mode for a HERCULES that was built without z/Architecture.

After entering the RESUME command on the Hercules console the suspend file is re-imported and the CPUs are put in the STARTED state again resuming guest program operations at the same point and in the same state as the suspend file was created.

There are some caveats when resuming guest operating system processing:

- As seen by the guest operating system, the TOD clock will appear to jump a large value. Some guests may not cope very well with this. For example some guests may be dismayed because certain interrupts will occur way past its due time. Also for S/370 an interval timer interrupt may be lost if the guest is interrupted for more than half the Interval Timer wrap time (around 8 hours).

- Although some effort has been put in order to make this as transparent as possible (that is, it should appear to the guest operating system that the STOP key was pressed for a large amount of time), some state information may be missed.

- Some guest operating systems will fare better if the suspend state is prepared first. For MVS, as an example, it seems to help when a QUIESCE command and a SYSTEM RESTART manual operation are issued prior to suspend the system.

8.138.2 Syntax

Descriptive

RESUME

Diagram

Æʬ¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬ÊÍ
8.138.3 Parameter
None.

8.138.4 Examples
Example 1:
Resume a Hercules session.

```
00:52:48 HHCD00131 Herc command: 'resume'
00:52:48 HHCD00111 Processor CP00: architecture mode 'S/370'
00:52:48 HHCD001011 Thread id 00000028, prio -15, name 'Processor CP00' ended
00:52:48 HHCD001011 Thread id 000014DC, prio 0, name 'Processor CP01' ended
00:52:48 HHCD001011 Thread id 00000CE8, prio 0, name 'Processor CP02' ended
00:52:48 HHCD001011 Thread id 0000155C, prio 0, name 'Processor CP03' ended
00:52:48 HHCD001011 Thread id 00001694, prio -20, name 'Timer' ended
00:52:48 HHCD020071 SR: resuming suspended file 'Fri Nov 19 00:51:50 2010' created
```

Figure 254: RESUME command
8.139  REXX (Display or set REXX interpreter settings)

8.139.1 Function
The REXX console command is used to manage the Rexx interpreter settings. It allows to specify the
paths where the Rexx executables can be found and what extensions for the executables are to be used.
If Hercules is built with support for both Rexx environments (Regina Rexx and Open Object Rexx) then
the environments can be dynamically enabled or disabled. The message prefixes to be used for Rexx
messages (issued through the “say” command) and error messages (issued through the Rexx interpreter)
can be set separately.
If the command is given without any arguments it displays the current Rexx interpreter settings.

8.139.2 Syntax

Descriptive

REXX [option]

where option can be:

ENABLE | START [REGINA | OOREXX]
DISABLE | STOP
PATHS | REXXPATHS {path [delimiter path ...] | RESET}
SYSPATH {ON | OFF | RESET}
EXTENSIONS | SUFFIXES {suffix [delimiter suffix ...] | RESET}
RESOLVER {ON | OFF | RESET}
MSGLEVEL {0 | 1 | RESET}
MSGPREFIX {messageprefix | OFF | RESET}
ERRPREFIX {errorprefix | OFF | RESET}
MODE {COMMAND | SUBROUTINE}

Diagram

REXX option

where option can be:
8.139.3 Parameter

ENABLE  Enables the Rexx environment that is specified as argument (Regina or ooRexx). This option is only available if Hercules is built with support for both Regina and ooRexx and cannot be used in a single Rexx environment.
If no environment is given as argument then the default Rexx environment is started.

The default can be specified with the HREXX_PACKAGE environment variable (for details see chapter 14 “REXX Support”). If this variable is not set the ooRexx is the default package used.

ENABLE can be abbreviated as ‘ENA’.

**START**

This is the same as ENABLE. START can be abbreviated as ‘STA’.

**DISABLE**

Disables the currently active Rexx environment. This option is only available if Hercules is built with support for both Regina and ooRexx and cannot be used in a single Rexx environment.

DISABLE can be abbreviated as ‘DIS’.

**STOP**

This is the same as DISABLE. STOP can be abbreviated as ‘STO’.

**REGINA**

Given as argument to the ‘START’ or ‘ENABLE’ options, REGINA specifies that the Regina Rexx environment has to be started.

**OOREXX**

Given as argument to the ‘START’ or ‘ENABLE’ option, OOREXX specifies that the Open Object Rexx (ooRexx) environment has to be started.

**PATHS**

This is the keyword for specifying the search path(s) for the Rexx scripts. PATHS can be abbreviated as ‘PATH’.

**REXXPATHS**

This is the same as PATHS. REXXPATHS can be abbreviated as ‘REXXP’.

**path**

A path (or a list of paths, separated by a delimiter) in which Rexx executables will be searched. If the path is not specified when activating the Rexx environment then the default used is the current path taken from the environment variable ‘PATH’.

**SYSPATH**

Keyword for specifying if the search for the Rexx executables should be extended to the system paths used for executables (when set to on ‘ON’) or if it should be limited to the defined PATHS / REXXPATHS (when set to ‘OFF’).

**EXTENSIONS**

This is the keyword for specifying the filename extension(s) to be used to search the Rexx executables. EXTENSIONS can be abbreviated as ‘EXT’.

If a given script name is in the format *filename.extension* then it is used as is without any further processing

**SUFFIXES**

This is the same as EXTENSIONS. SUFFIXES can be abbreviated as ‘SUF’.

**suffix**

A filename extension (or a list of filename extensions, separated by a delimiter) that identifies a Rexx executable. A filename extension must be specified in the format “.ext”.

If there are no extensions specified the defaults used are ‘.REXX’, ‘.rexx’, ‘.REX’, ‘.rex’, ‘.CMD’, ‘.cmd’, ‘.RX’ and ‘.rx’.

**delimiter**

This is the delimiter used for separating multiple paths or multiple extensions. For Linux and Mac OS-X systems this is the colon (‘:’), for Windows systems it is the semicolon (‘;’).
### RESOLVER
Keyword to define who will resolve the script name.

When set to “ON” then the Hercules Rexx interface will resolve the script name and issue appropriate messages in case the process fails. When set to “OFF” then the script name will be passed as is to the Rexx interpreter.

For examples of the different behaviour of the EXEC command depending on the RESOLVER settings please see the next section.

### MSGLEVEL
This is the keyword for specifying the message level to be used. MSGLEVEL can be abbreviated as ‘MSGL’.

- **0**
  Disables the display of the HHC17503I and HHC17504I messages when a script has finished.

- **1**
  Enables the display of the HHC17503I and HHC17504I messages when a script has finished:

  ```
  HHC17503I REXX(package name) Exec/Script 'script name' RetRC(0)
  HHC17504I REXX(package name) Exec/Script 'script name' RetValue’0’
  ```

### MSGPREFIX
This is the keyword used to set the prefix for standard messages (issued through ‘say’). MSGPREFIX can be abbreviated as ‘MSGP’.

- **msgprefix**
  Specifies the Rexx standard message prefix to be used. `msgprefix` can be any string up to 9 characters. Embedded blanks are not allowed.

### ERRPREFIX
This is the keyword used to set the prefix for error messages. ERRPREFIX can be abbreviated as ‘ERRP’.

- **errorprefix**
  Specifies the Rexx error message prefix to be used. `errorprefix` can be any string up to 9 characters. Embedded blanks are not allowed.

### MODE
This is the keyword used to specify the argument passing style to a Rexx script.

- **COMMAND**
  Specifies command style for passing arguments to a Rexx script. ‘COMMAND’ may be abbreviated as ‘COM’.

- **SUBROUTINE**
  Specifies subroutine style for passing arguments to a Rexx script. ‘SUBROUTINE’ may be abbreviated as ‘SUB’.

### ON
Activates the specified option.

### OFF
Deactivates the specified option.

### RESET
Given as an argument to one of the options of the Rexx command this will reset the corresponding value to the default settings.
8.139.4 Examples

Example 1:
Display the current Rexx interpreter settings (defaults).

```
HHC00013I Herc command: 'rexx'
HHC17500I REXX(Regina) Rexx Path ( 0) -
HHC17500I REXX(Regina) Sys Path (18) - (ON)
HHC17500I REXX(Regina) Extensions( 9) - ;.REXX;.rexx;.REX;.rex;.CMD;.cmd;.RX;.rx
HHC17500I REXX(Regina) Resolver - (ON)
HHC17500I REXX(Regina) Msg Level - 0
HHC17500I REXX(Regina) Msg Prefix - (OFF)
HHC17500I REXX(Regina) Err Prefix - (OFF)
HHC17500I REXX(Regina) Mode - (Command)
HHC17500I REXX(Regina) REXX-Regina_3.6(MT) 5.00 31 Dec 2011
HHC17500I REXX(Regina) WIN64 FUNCTION Instore
```

Figure 255: REXX command (display interpreter settings)

Example 2:
Set the path for Rexx executables to “d:\mvs\conf” and “d:\mvs\rexx”.

```
HHC00013I Herc command: 'rexx paths d:\mvs\conf;d:\mvs\rexx'
HHC17500I REXX(Regina) Rexx Path ( 2) -d:\mvs\conf;d:\mvs\rexx
HHC17500I REXX(Regina) Sys Path (18) - (ON)
HHC17500I REXX(Regina) Extensions( 9) - ;.REXX;.rexx;.REX;.rex;.CMD;.cmd;.RX;.rx
HHC17500I REXX(Regina) Resolver - (ON)
HHC17500I REXX(Regina) Msg Level - 0
HHC17500I REXX(Regina) Msg Prefix - (OFF)
HHC17500I REXX(Regina) Err Prefix - (OFF)
HHC17500I REXX(Regina) Mode - (Command)
HHC17500I REXX(Regina) REXX-Regina_3.6(MT) 5.00 31 Dec 2011
HHC17500I REXX(Regina) WIN64 FUNCTION Instore
```

Figure 256: REXX command (set PATH)

Example 3:
Set the extensions for Rexx executables to "*.rexx" and "*.rex".

```
HHC00013I Herc command: 'rexx suffixes .rexx;.rex'
HHC17500I REXX(Regina) Rexx Path ( 2) -d:\mvs\conf;d:\mvs\rexx
HHC17500I REXX(Regina) Sys Path (18) - (ON)
HHC17500I REXX(Regina) Extensions( 3) - ;.rexx;.rex
HHC17500I REXX(Regina) Resolver - (ON)
HHC17500I REXX(Regina) Msg Level - 0
HHC17500I REXX(Regina) Msg Prefix - (OFF)
HHC17500I REXX(Regina) Err Prefix - (OFF)
HHC17500I REXX(Regina) Mode - (Command)
```

Figure 256: REXX command (set PATH)
Figure 257: REXX command (set EXTENSION)

Example 4:
Set the prefix for Rexx error messages to “RXERR”.

Example 5:
Disable the error message prefixing.

Example 6:
Messages issued when a Rexx script could not be found and RESOLVER is set to ‘ON’.
Figure 260: REXX command (RESOLVER ON)

Example 7:
Messages issued when a Rexx script could not be found and RESOLVER is set to ‘OFF’.

Figure 261: REXX command (RESOLVER OFF)
8.140  RMMOD (Delete a module)

8.140.1 Function
The RMMOD command deletes (unloads) modules.

8.140.2 Syntax

Descriptive
RMMOD module [module [module ...]]

Diagram

```
    RMMOD module
```

8.140.3 Parameter
module The names of the modules that have to be unloaded. If a device is still bound to a module then a message is issued and the module is not deleted.

8.140.4 Examples

Example 1:
Delete module “S37X” (S/370 Extension).

```
HHC00013I Herc command: 'rmmod s37x'
HHC01528I HDL: unloading module 's37x'...
HHC01529I HDL: module 's37x' unloaded
```

Figure 262: RMMOD command
8.141 S (Instruction stepping)

8.141.1 Function
This command sets the instruction stepping and breaking range. The instruction stepping is totally separate from the instruction tracing range (See T command).

A range can be specified. If there is no range then the range includes all addresses. “S 0” eliminates the range and all addresses will be stepped. With or without a given range, the S command displays whether instruction stepping is on or off and the range if any.

The S command by itself does not activate instruction stepping. Use the S+ command to activate instruction stepping.

8.141.2 Syntax
The S command has the following syntax:

**Descriptive**

S [addr-addr | addr:addr | addr.length | 0]

**Diagram**

```
 addr-addr
 addr:addr
 addr.length
```

8.141.3 Parameter

- **addr-addr**  
  Specifies an address range with start and end address (from begin address to end address).

- **addr:addr**  
  Specifies an address range with start and end address (from begin address to end address).

- **addr.length**  
  Specifies an address range with start and length (from begin address with the specified length).

- **0**  
  No range is specified or an existing range is reset. Instruction stepping is set for all addresses.
8.141.4 Examples

Example 1:
Set instruction stepping range with begin and end address and query the range afterwards.

```
HHC00013I Herc command: 's 100000-101000'
HHC02229I Instruction stepping off range 100000-101000
HHC00013I Herc command: 's?'
HHC02229I Instruction stepping off range 100000-101000
```

Figure 263: S command (address range)

Example 2:
Set instruction stepping range with start address and length and query the range afterwards.

```
HHC00013I Herc command: 's 100000.1000'
HHC02229I Instruction stepping off range 100000.1000
HHC00013I Herc command: 's?'
HHC02229I Instruction stepping off range 100000-101000
```

Figure 264: S command (address with length)

Example 3:
Set instruction stepping for all addresses and query the range afterwards.

```
HHC00013I Herc command: 's 0'
HHC02229I Instruction stepping off
HHC00013I Herc command: 's?'
HHC02229I Instruction stepping off
```

Figure 265: S command (all addresses)
8.142 S+ (Instruction stepping on)

8.142.1 Function

This command turns on the instruction stepping. After turning instruction stepping on, each ENTER from the console allows Hercules to execute exactly one instruction and lists detailed trace information.

The trace information includes the executing CPU, the PSW, the executed instruction in hexadecimal and in disassembled form as well as register hexadecimal displays of all involved register types.

A range can be specified as for the “S” command, otherwise the existing range is used. If there is no range (or range was specified as 0) then the range includes all addresses.

When an instruction within the range is about to be executed, the CPU is temporarily stopped and the next instruction is displayed. You may then examine registers and/or storage etc. before you press Enter to execute the instruction and stop at the next instruction. To turn off instruction stepping and continue normal execution, enter the “G” command.

8.142.2 Syntax

Descriptive

S+ [addr-addr | addr:addr | addr.length | 0]

Diagram

 addr-addr
 addr:addr
 addr.length
 0

8.142.3 Parameter

addr-addr Specify an address range with start and end address (from begin address to end address).

addr:addr Specify an address range with start and end address (from begin address to end address).

addr.length Specify an address range with start and length (from begin address with the specified length).

0 No range is specified or an existing range is reset. Instruction stepping is set for all addresses.
8.142.4 Examples

Example 1:

Turn on instruction stepping.

HHC00013I Herc command: 's+
HHC0229I Instruction stepping on
HHC00811I Processor CP00: architecture mode 'S/370'
HHC02267I CP00: PSW=0000014800000080 INST=05F0 BALR 15,0 branch_and_link_register
HHC02267I CP00: GR00=00000000 GR01=00000000 GR02=00000000 GR03=00000000
HHC02267I CP00: GR04=00000000 GR05=00000000 GR06=00000000 GR07=00000000
HHC02267I CP00: GR08=00000000 GR09=00000000 GR10=00000000 GR11=00000000
HHC02267I CP00: GR12=00000000 GR13=00000000 GR14=00000000 GR15=00000000
HHC00834I Processor CP00: running state selected
HHC02267I CP00: PSW=0000014800000082 INST=980E0010 LM 0,14,16(0) load_multiple
HHC02267I CP00: R:00000010:K:06=00000000 00000000 00000000 00000000 ................
HHC02267I CP00: GR00=00000000 GR01=00000000 GR02=00000000 GR03=00000000
HHC02267I CP00: GR04=00000000 GR05=00000000 GR06=00000000 GR07=00000000
HHC02267I CP00: GR08=00000000 GR09=00000000 GR10=00000000 GR11=00000000
HHC02267I CP00: GR12=00000000 GR13=00000000 GR14=00000000 GR15=40000082
HHC00834I Processor CP00: running state selected
HHC02267I CP00: PSW=000000014800000086 INST=41A0F05A LA 10,90(0,15) load_address
HHC02267I CP00: R:000000DC:K:06=F1 E5D5C9D7 D458FFFF 76B3BD00 1VNIPM......
HHC02267I CP00: GR00=00000000 GR01=00000000 GR02=00000000 GR03=00000000
HHC02267I CP00: GR04=00000000 GR05=00000000 GR06=00000000 GR07=00000000
HHC02267I CP00: GR08=00000000 GR09=00000000 GR10=00000000 GR11=00000000
HHC02267I CP00: GR12=00000000 GR13=00000000 GR14=00000000 GR15=40000082
HHC00834I Processor CP00: running state selected
HHC02267I CP00: PSW=000000014800000088 INST=D200FC7D0008 MVC 3197(1,15),8(0) move_character
HHC02267I CP00: R:00000C07:K:06=F1 E5D5C9D7 D458FFFF 76B3BD00 1VNIPM......]
HHC02267I CP00: R:00000008:K:06=F1000000 00000000 00000000 00000000 1...............
HHC02267I CP00: GR00=00000000 GR01=00000000 GR02=00000000 GR03=00000000
HHC02267I CP00: GR04=00000000 GR05=00000000 GR06=00000000 GR07=00000000
HHC02267I CP00: GR08=00000000 GR09=00000000 GR10=00000000 GR11=00000000
HHC02267I CP00: GR12=00000000 GR13=00000000 GR14=00000000 GR15=40000082
HHC00834I Processor CP00: running state selected
HHC02267I CP00: PSW=000000014800000090 INST=95000009 CLI 9(0),0 compare_logicalImmediate
HHC02267I CP00: R:00000009:K:06=000000 00000000 00000000 00000000 00 ...............
HHC02267I CP00: GR00=00000000 GR01=00000000 GR02=00000000 GR03=00000000
HHC02267I CP00: GR04=00000000 GR05=00000000 GR06=00000000 GR07=00000000
HHC02267I CP00: GR08=00000000 GR09=00000000 GR10=00000000 GR11=00000000
HHC02267I CP00: GR12=00000000 GR13=00000000 GR14=00000000 GR15=40000082
HHC00834I Processor CP00: running state selected

Figure 266: S+ command
8.143 S- (Instruction stepping off)

8.143.1 Function
This command turns off the instruction stepping. To continue normal processing after stopping the instruction stepping use the "G" command.

8.143.2 Syntax

**Descriptive**

S-

**Diagram**

```
S- ________________________________
```

8.143.3 Parameter
None.

8.143.4 Examples

Example 1:
Turn off instruction stepping.

```
HHC00013I Herc command: 's-
HHC02229I Instruction stepping off range 40130-441c6
```

Figure 267: S- command
8.144 S? (Instruction stepping query)

8.144.1 Function
The S? command displays whether instruction stepping is on or off and the active range if any.

8.144.2 Syntax

Descriptive
S?

Diagram

8.144.3 Parameter
None.

8.144.4 Examples
Example 1:
Query instruction stepping.

HHC00013I Herc command: 's?'
HHC02229I Instruction stepping off range 100000-101000

Figure 268: S? command
8.145  S{+/-} dev (Turn CCW stepping on or off)

8.145.1 Function
This command turns on (s+ dev) or turns off (s- dev) the CCW stepping function. After CCW stepping is turned on every execution of a CCW has to be confirmed by hitting ENTER on the Hercules console and produces detailed trace output.

8.145.2 Syntax

Descriptive

S{+ | -} devaddr

Diagram

Êʬ¬¬¬ S ¬¬¬§¬¬¬ + ¬¬¬§¬¬¬ devaddr

8.145.3 Parameter

devaddr  This is the address of the device for which CCW stepping will be turned on or off.

+  The plus sign turns on the CCW stepping for the given device. The plus sign must immediately follow the S command (without an intervening blank).

-  The minus sign turns off the CCW stepping for the given device. The minus sign must immediately follow the S command (without an intervening blank).

8.145.4 Examples

Example 1:
Turn on CCW stepping.

HHC00013I Herc command: 's+0148'
HHC02204I CCW step for 0:0148 set to on
HHC00396I 0:0148 start i/o file[1] bufcur -1 cache[-1]
HHC01315I 0:0148 CHAN: ccw 02000000 60000018 => 02000000 60000018 00000000 00000000 ....-........
HHC00431I 0:0148 CKD file 'D:/MVS/DASD/MVSRES.CCKD': seeking to cyl 0 head 0
HHC00396I 0:0148 read trk 0 (asynchronous)
HHC00396I 0:0148 0 rtrk 0
HHC00396I 0:0148 0 rtrk[0] 0 cache miss
HHC00396I 0:0148 0 rtrk[0] 0 buf 07AB5C88 len 19456
Figure 269: S+ dev command

Example 2:
Turn off CCW stepping.

```
HHC00013I Herc command: 's-0148'
HHC02204I CCW step for 0:0148 set to off
```

Figure 270: S- dev command
8.146 SAVECORE (Save a core image to a file)

8.146.1 Function
The SAVECORE command allows you to save a portion of real storage in binary form to a file. This command is used mainly for emulator debugging purposes. A certain core snapshot can be saved and then be restored at any later time to reproduce some tests with identical real storage values.

Please note that you have to stop all CPUs (see STOP/STOPALL commands) before saving the core image to a file.

8.146.2 Syntax

Descriptive

SAVECORE filename [start | * ] [end | * ]

Diagram

```
SAVECORE filename  *  start  *  end
```

8.146.3 Parameter

**filename**
This argument specifies the file name (and optionally the path) of the file where the core image will be written to.

**start or ***
Start specifies the start address of the real storage to be saved to the file filename. The asterisk (*) means the first byte of the first modified page as determined by the storage-key changed bit.

**end or ***
End specifies the end address of the real storage to be saved to the file filename. The asterisk (*) means the last byte of the last modified page as determined by the storage-key changed bit.
8.146.4 Examples

Example 1:
Save the first 4096 bytes of real storage to file D:\core01.bin.

```
HHC00013I Herc command: 'stopall'
HHC00013I Herc command: 'savecore d:\core01.bin 00000000 0001000'
HHC02248I Saving locations 00000000-0001000 to file 'd:\core01.bin'
HHC02249I Operation complete
```

Figure 271: SAVECORE command (save specific area)

Example 2:
Save all real storage to file D:\core02.bin.

```
HHC00013I Herc command: 'stopall'
HHC00013I Herc command: 'savecore d:\core02.bin * *'
HHC02248I Saving locations 00000000-00FFFFFF to file 'd:\core02.bin'
HHC02249I Operation complete
```

Figure 272: SAVECORE command (save from begin to end)
8.147 SCLPROOT (Set or display SCLP base directory)

8.147.1 Function

The SCLPROOT command sets or displays the SCLP base directory. If a directory is given then SCLP disk I/O for the specified directory path is enabled. NONE disables SCLP disk I/O.

A subsequent list-directed IPL resets the path to the location of the .ins file, and a subsequent CCW-type IPL disables SCLP disk I/O. If no operand is specified, SCLPROOT displays the current setting.

8.147.2 Syntax

**Descriptive**

SCLPROOT [NONE | directory]

**Diagram**

```
  SCLPROOT [NONE | directory]
```

8.147.3 Parameter

**NONE**

Disables SCLP disk I/O.

**directory**

Specifies the directory from which SCLP disk I/O is allowed. A subsequent IPL of an "ins" file or a subsequent CCW-type IPL will override this.

8.147.4 Examples

**Example 1:**

Display SCLP base directory.

```
HHC00013I Herc command: 'sclproot'
HHC02204I SCLP disk I/O set to disabled
```

**Figure 273: SCLPROOT command (display SCLP base directory)**
Example 2:
Set SCLP base directory.

```
HHC00013I Herc command: 'sclproot d:\iso'
HHC00013I Herc command: 'sclproot'
HHC02204I sclproot    set to d:/iso/
```

Figure 274: SCLPROOT command (set SCLP base directory)
8.148 SCP (Send system control program command)

8.148.1 Function
The SCP command sends a command to the system control program (the guest operating system running under Hercules) in any CDMTGT mode.

8.148.2 Syntax

**Descriptive**
SCP [cmd]

**Diagram**

![SCP Diagram]

8.148.3 Parameter

*cmd* This is the command to be sent to the system control program (guest operating system).

8.148.4 Examples

**Example 1:**
Send a reply (“r 00,0148”) to the system control program running under Hercules when in HERC or PSCP command target mode.

```
* IGGN504A SPECIFY UNIT FOR CATALOG.MVS.MASTER ON MVSRES
scp r 00,0148
NHCCP041I SYSCONS interface active
IEE600I REPLY TO 00 IS;0148

Figure 275: SCP command
```
8.149 SCPECHO (Display or set echo to console and history of SCP replies)

8.149.1 Function
SCPECHO switches the SPC (\ '.') and priority SCP ('!') replies and responses to the Hercules console on or off or displays the current setting if no argument is given. This is to manage passwords being displayed and journaled.

The default for SCPECHO is off if it is not explicitly switched on in the Hercules configuration file.

8.149.2 Syntax

Descriptive

SCPECHO [OFF | ON]

Diagram

```
  SCPECHO
    OFF
    ON
```

8.149.3 Parameter

OFF
Do not route the SPC and priority SCP replies and responses to the Hercules console.

ON
Route the SPC and priority SCP replies and responses to the Hercules console.

8.149.4 Examples

Example 1:
Switch echo to Hercules console for SCP and priority SCP commands on and off.

```
HHC00013I Herc command: 'scpecho on'
HHC02204I SCP, PSCP echo set to on

HHC00013I Herc command: 'scpecho off'
HHC02204I SCP, PSCP echo set to off
```

Figure 276: SCPECHO command
8.150 SCPIMPLY (Display or set option to pass non-Hercules commands to the SCP)

8.150.1 Function
SCPIMPLY allows it to switch on or off the passing of all non-Hercules commands (commands unknown to Hercules) to the SPC if the SCP has enabled receipt of SCP commands. Given without an argument the command displays the current value.

The default for SCPIMPLY is off if it is not explicitly switched on in the Hercules configuration file.

8.150.2 Syntax

Descriptive
SCPIMPLY [OFF | ON]

Diagram

```
 SCPIMPLY
      OFF  ON
```

8.150.3 Parameter

OFF
Do not route the SPC and priority SCP replies and responses to the Hercules console. This is the default, if SCPECHO is not coded in the configuration file.

ON
Route the SPC and priority SCP replies and responses to the Hercules console.

8.150.4 Examples

Example 1:
Switch passing of non-Hercules commands to the SCP on and off.

```
HHC00013I Herc command: 'scpimply'
HHC02204I Value 'scpimply' set to 'off'

HHC00013I Herc command: 'scpimply on'
HHC02204I Value 'scpimply' set to 'on'
```

Figure 277: SCPIMPLY command
8.151 SCRIPT (Run a sequence of commands contained in a file)

8.151.1 Function
The SCRIPT command sequentially executes the commands contained within the file \textit{filename}. The script file itself may also contain script commands but the system ensures that no more than 10 levels of scripts are invoked at any one time to avoid recursion loops. Enter the command without any arguments to list all currently running scripts.

8.151.2 Syntax

\textbf{Descriptive}

\texttt{SCRIPT \ [filename \ [filename \ ...]]}

\textbf{Diagram}

\begin{center}
\includegraphics[width=0.5\textwidth]{script_diagram.png}
\end{center}

8.151.3 Parameter
\textit{filename} \quad The name (and optionally the path) of the script file to be executed.

8.151.4 Examples
Example 1:
Execute script file “Script1.rc”.

\begin{verbatim}
HHC00013I Herc command: 'script D:\MVS\Conf\Script1.rc'
HHC02260I Script 5: begin processing file 'D:/MVS/Conf/Script1.rc'
\end{verbatim}

Figure 278: SCRIPT command (Execute script file)
Example 2:
List all currently running scripts.

```
HHC00013I Herc command: 'script'
HHC02315I Script id:2, tid:00000D2C, level:1, name:D:\MVS\Conf\Script1.rc
HHC02315I Script id:3, tid:00000A4C, level:1, name:D:\MVS\Conf\Script2.rc
HHC02315I Script id:4, tid:000017E8, level:1, name:D:\MVS\Conf\Script3.rc
HHC02315I Script id:5, tid:00000E6C, level:1, name:D:\MVS\Conf\Script4.rc
HHC02315I Script id:6, tid:00000B50, level:1, name:D:\MVS\Conf\Script5.rc
```

Figure 279: SCRIPT command (list currently running scripts)
8.152 SCSIMOUNT (Automatic SCSI tape mounts)

8.152.1 Function

The SCSIMOUNT command displays or modifies the automatic SCSI tape mount option. When entered without any operands it displays the current value and any pending tape mount requests. Entering a value between 1 and 99 enables the option and specifies how often (in seconds) to query SCSI tape drives to automatically detect when a tape has been mounted. When a tape is mounted an unsolicited device attention interrupt will be presented to the guest operating system.

Notes: Enabling this option may negatively impact Hercules performance depending on how the host operating system (Windows, Linux, etc.) processes SCSI attached tape drive status queries.

8.152.2 Syntax

Descriptive

SCSIMOUNT [NO | YES | secs]

Diagram

| SCSIMOUNT | NO |
| YES |
| secs |

8.152.3 Parameter

NO

No indicates that the SCSIMOUNT option is disabled and forcing all SCSI tape mounts to be done manually via an appropriate DEVINIT command.

YES

Yes enables the option and causes periodic queries of the SCSI tape drive in a five second interval to automatically detect when a tape is mounted. YES is equivalent with 'SCSIMOUNT 5'.

secs

A value from 1 to 99 seconds inclusive enables the option and causes periodic queries of the SCSI tape drive every secs seconds to automatically detect when a tape is mounted.
8.152.4 Examples

Example 1:
Enable the SCSI tape mount option and display the current settings.

HHC00013I Herc command: 'scsimount yes'
HHC02204I scsimount set to yes
HHC00013I Herc command: 'scsimount'
HHC02203I scsimount : 5

Figure 280: SCSIMOUNT command (enable SCSI tape mount option)

Example 2:
Enable the SCSIMOUNT option and query the SCSI tape drive every 15 seconds.

HHC00013I Herc command: 'scsimount 15'
HHC02204I scsimount set to 15

Figure 281: SCSIMOUNT command (enable SCSI tape mount option and set interval)
8.153 SF+ (Create a new shadow file)

8.153.1 Function

With the SF+ command a new shadow file for a certain dasd device (or for all dasd devices that have shadow files) is created.

8.153.2 Syntax

Descriptive

SF+ {device | *}

Diagram

```
 SF+    device  *  
```

8.153.3 Parameter

`device`  This specifies the device for which a new shadow file will be created.

`*`  Specifying an asterisk it is possible to create a (new) shadow file for all dasd devices that have a shadow file defined in their configuration file definition statements.

8.153.4 Examples

Example 1:
Create a new shadow file for device 0148.

```
HHC00013I Herc command: 'sf+ 0148'
HHC00320I 0:0148 CCKD file[1] 'D:/MVS/SHADOW/MVSRES_1.CCKD': shadow file succesfully added
HHC00333I 0:0148 size free nbr st reads writes l2reads    hits switches
HHC00336I 0:0148 [*]  21623269   0%   0       0       0       0       0        0
HHC00338I 0:0148 D:/MVS/DASD/MVSRES.CCKD
HHC00339I 0:0148 [0]  21621981 0% 0 rd       0       0       0
HHC00340I 0:0148 D:/MVS/SHADOW/MVSRES_*.CCKD
HHC00341I 0:0148 [1]       1288   0%    0 rw       0       0       0
```

Figure 282: SF+ command
8.154 SF- (Delete a shadow file)

8.154.1 Function
The SF- command removes a shadow file. Depending on the MERGE / NOMERGE / FORCE parameter the changes are incorporated in the base file or discarded.

If MERGE is specified or defaulted then the contents of the current file is merged into the previous file, the current file is removed and the previous file becomes the current file.

If NOMERGE is specified then the contents of the current file is discarded and the previous file becomes the current file. However if the previous file is read-only then a new shadow file is created ("re-added") and that becomes the current file.

The FORCE option is required when doing a merge to a base file and the base file is read-only because the 'ro' option was specified on the device configuration statement.

8.154.2 Syntax

Descriptive
SF- {device | *} [MERGE | NOMERGE | FORCE]

Diagram

8.154.3 Parameter

device
This specifies the device for which a shadow file should be deleted.

* 
Specifying an asterisk it is possible to remove a shadow file for all dasd devices that have shadow files.

MERGE
The MERGE parameter (which is the default) specifies that all changes or updates that have been made to the shadow file will be committed.

NOMERGE
The NOMERGE parameter specifies that all changes or updates that have been made to the shadow file will be discarded instead of being committed.

FORCE
The FORCE parameter is used when doing a merge to a base file that is read-only because the 'ro' option was specified on the device configuration statement.
**8.154.4 Examples**

**Example 1:**
Remove a shadow file for device 0148 with backwards merge (i.e. *commit* all of the changes/updates).

```
HHC00013I Herc command: 'sf- 0148'
HHC00325I 0:0148 CCKD file[1] 'D:/MVS/SHADOW/MVSRES_1.CCKD': shadow file successfully merged
HHC00333I 0:0148 size free nbr st reads writes l2reads hits switches
HHC00334I 0:0148 readahead misses
HHC00335I 0:0148 -----------------------------------------------
HHC00336I 0:0148 [*] 21627652 0% 9 881 21 14 712 1520
HHC00337I 0:0148 74 23
HHC00338I 0:0148 D:/MVS/DASD/MVSRES.CCKD
HHC00339I 0:0148 [0] 21627652 0% 9 rw 881 21 14
HHC00340I 0:0148 D:/MVS/SHADOW/MVSRES_*.CCKD
```

Figure 283: SF- command

**Example 2:**
Remove a shadow file for device 0148 without backwards merge (i.e. *discard* all of the changes/updates).

```
HHC00013I Herc command: 'sf- 0148 nomerge'
HHC00325I 0:0148 CCKD file[1] 'D:/MVS/SHADOW/MVSRES_1.CCKD': shadow file successfully removed
HHC00333I 0:0148 size free nbr st reads writes l2reads hits switches
HHC00334I 0:0148 readahead misses
HHC00335I 0:0148 -----------------------------------------------
HHC00336I 0:0148 [*] 21627652 0% 9 883 20 14 715 1520
HHC00337I 0:0148 79 25
HHC00338I 0:0148 D:/MVS/DASD/MVSRES.CCKD
HHC00339I 0:0148 [0] 21627652 0% 9 rw 883 20 14
HHC00340I 0:0148 D:/MVS/SHADOW/MVSRES_*.CCKD
```

Figure 284: SF- NOMERGE command
8.155 SFC (Compress a shadow file)

8.155.1 Function
The SFC command compresses a shadow file.

8.155.2 Syntax

Descriptive
SFC \{device | *\}

Diagram

\[\text{SFC} \quad \text{device} \quad \ast\]

8.155.3 Parameter

*device* This specifies the device for which the shadow file will be compressed.

* Specifying an asterisk it is possible to compress the shadow files for all DASD devices that have a shadow file.

8.155.4 Examples

Example 1:
Compress the shadow file for dasd device 0148.

```
HHC00013I Herc command: 'sfc 0148'
HHC00358I 0:0148 CCKD file 'D:/MVS/DASD/MVSRES.CCKD': file already compressed
HHC00333I 0:0148 size free nbr st reads writes l2reads hits switches
HHC00334I 0:0148 readsheads misses
HHC00335I 0:0148 --------------------------------------------------------------------
HHC00336I 0:0148 [*] 21631751 0% 9 885 425 15 715 1522
HHC00337I 0:0148 D:/MVS/DASD/MVSRES.CCKD
HHC00338I 0:0148 [0] 21627652 0% 9 rd 884 20 15
HHC00339I 0:0148 D:/MVS/SHADOW/MVSRES_.CCKD
HHC00340I 0:0148 [1] 4099 0% 0 rw 1 405 0
```

Figure 285: SFC command
8.156 SFD (Display shadow file statistics)

8.156.1 Function

The SFD command displays statistical information about the specified shadow file(s).

8.156.2 Syntax

Descriptive

SFD {device | *}

Diagram

```
>>> SFD [device *]
```

8.156.3 Parameter

device

This specifies the device for which shadow file statistics will be written to the log file.

* Specifying an asterisk it is possible to create statistical output for all dasd devices that have shadow files.

8.156.4 Examples

Example 1:

Display statistical information for the shadow file of dasd device 0148.

```
HHC00013I Herc command: 'sfd 0148'
HHC00333I 0:0148 size free nbr st reads writes l2reads hits switches
HHC00334I 0:0148 readsheads misses
HHC00335I 0:0148 ---------------------------------------------------------------
HHC00336I 0:0148 [*] 21632514 0% 10 885 424 15 715 1522
HHC00337I 0:0148 79 25
HHC00338I 0:0148 D:/MVS/DASD/MVSRES.CCKD
HHC00339I 0:0148 [0] 21627652 0% 9 rd 884 20 15
HHC00340I 0:0148 D:/MVS/SHADOW/MVSRES_.CCKD
HHC00341I 0:0148 [1] 4862 15% 1 rw 1 404 0
```

Figure 286: SFD command
8.157 SFK (Perform a chkdsk on the active shadow file)

8.157.1 Function
The SFK command performs a chkdsk on the active shadow file(s).

8.157.2 Syntax

Descriptive

\[ \text{SFK \{device} | \ast\} \ [n] \]

Diagram

\[ \text{SFK} \quad \text{device} \quad \ast \quad n \]

8.157.3 Parameter

\textit{device} \hspace{1cm} \text{This specifies the device for which active shadow file a chkdsk is to be performed.}

\ast \hspace{1cm} \text{Specifying an asterisk it is possible to perform a chkdsk for the active shadow files of all dasd devices.}

\textit{n} \hspace{1cm} \text{The optional check level to be performed (default is 2):}

-1 devhdr, cdevhdr, l1 table
0 devhdr, cdevhdr, l1 table, l2 tables
1 devhdr, cdevhdr, l1 table, l2 tables, free spaces
2 devhdr, cdevhdr, l1 table, l2 tables, free spaces, trkhdrs
3 devhdr, cdevhdr, l1 table, l2 tables, free spaces, trkimgs
4 devhdr, cdevhdr, build everything else from recovery

Use the check level ‘4’ only after making a backup and be prepared to wait a long time!
8.157.4 Examples

Example 1:
Perform chkdsk level '2' for the shadow file of dasd device 0148.

```
HHC00013I Herc command: 'sfk 0148 2'
HHC00333I 0:0148  size free nbr st  reads writes l2reads hits switches
HHC00334I 0:0148  readahead  misses
HHC00335I 0:0148  ---------------------------------------------------------------
HHC00336I 0:0148 [*] 21632514  0% 10  886 426  16 715  1523
HHC00337I 0:0148 79  25
HHC00338I 0:0148 D:/MVS/DASD/MVSRES.CCKD
HHC00339I 0:0148 [0] 21627652  0% 9 rd 884  20  15
HHC00340I 0:0148 D:/MVS/SHADOW/MVSRES_*_.CCKD
HHC00341I 0:0148 [1]  4862  15% 1 rw  2 406  1
```

Figure 287: SFK command (chkdsk level 2)

Example 2:
Perform chkdsk level '4' for the shadow file of dasd device 0148.

```
HHC00013I Herc command: 'sfk 0148 4'
HHC00372I 0:0148 CCKD file 'D:/MVS/DASD/MVSRES.CCKD': trk[10320] recovered offset 0x1003 len 763
HHC00373I 0:0148 CCKD file 'D:/MVS/DASD/MVSRES.CCKD': 1 trk images recovered
HHC00377I 0:0148 CCKD file 'D:/MVS/DASD/MVSRES.CCKD': free space rebuilt
HHC00333I 0:0148  size free nbr st  reads writes l2reads hits switches
HHC00334I 0:0148  readahead  misses
HHC00335I 0:0148  ---------------------------------------------------------------
HHC00336I 0:0148 [*] 21632514  0% 10  886 426  16 715  1523
HHC00337I 0:0148 79  25
HHC00338I 0:0148 D:/MVS/DASD/MVSRES.CCKD
HHC00339I 0:0148 [0] 21627652  0% 9 rd 884  20  15
HHC00340I 0:0148 D:/MVS/SHADOW/MVSRES_*_.CCKD
HHC00341I 0:0148 [1]  4862  15% 1 rw  2 406  1
```

Figure 288: SFK command (chkdsk level 4)
8.158 SH (Shell command)

8.158.1 Function

The SH command passes the given command and the parameters (if any) as-is to the shell for processing. The results of the passed command are displayed on the Hercules console.

The special ‘STARTGUI’ command must be used if the command being started either directly or indirectly starts a Windows graphical user interface (non command-line) program (e.g. Notepad). If STARTGUI is not used in such cases then Hercules will hang until the graphical user interface program is closed. Note that starting a batch file (command line program) that itself starts a graphical user interface program still requires using STARTGUI.

If “foo.bat” contains “start notepad.exe” then issuing “sh foo.bat” will hang Hercules until Notepad is being closed. The same applies if “sh start foo.bat” is used. The correct way is using ‘STARTGUI’ for invoking foo.bat is “sh startgui foo.bat”.

8.158.2 Syntax

Descriptive

SH [STARTGUI] command [arg [arg ... ]]

Diagram

```
  ┌───┐ ┌─────┐  ┌───┐  ┌───┐  ┌───┐
  │ SH │ │ STARTGUI │ │ command │ │ arg │
  └───┘ └───┘    └───┘    └───┘
```

8.158.3 Parameter

STARTGUI

STARTGUI must be used if the command passed to the shell either directly or indirectly starts a Windows graphical user interface (non command-line) program.

command

The command that is to be passed to the shell.

arg

These are the parameters passed to the command.
### 8.158.4 Examples

Example 1:
Display the current working directory through the shell command 'DIR'.

```
HHC00013I Herc command: 'sh dir'
Volume in drive D is Hercules
Volume Serial Number is E21F-FE83

Directory of D:\hercules

13.10.2010 21:23 <DIR> ..
16.12.2007 01:00 282'624 AWSBrowse32.exe
16.12.2007 01:00 503'808 AWSBrowse32D.exe
16.12.2007 01:00 274'432 AWSBrowse32U.exe
16.12.2007 01:00 491'520 AWSBrowse32UD.exe
28.02.2007 06:24 323'072 AWSBrowse64.exe
28.02.2007 06:24 647'168 AWSBrowse64D.exe
28.02.2007 06:24 317'440 AWSBrowse64U.exe
28.02.2007 06:24 636'416 AWSBrowse64UD.exe
16.12.2007 01:00 934 awshet.reg
12.10.2010 18:24 14'336 cckdcdsk.exe
12.10.2010 18:24 13'824 cckdcomp.exe
12.10.2010 18:24 73'728 cckddiag.exe
12.10.2010 18:24 15'360 cckdswap.exe
...
several lines not displayed
...
16.12.2007 01:00 131'072 TunTap32.dll
16.12.2007 01:00 344'064 TunTap32D.dll
16.12.2007 01:00 135'168 TunTap32U.dll
16.12.2007 01:00 344'064 TunTap32UD.dll
28.02.2007 06:27 144'384 TunTap64.dll
28.02.2007 06:27 561'664 TunTap64D.dll
28.02.2007 06:27 147'456 TunTap64U.dll
28.02.2007 06:27 565'760 TunTap64UD.dll
13.06.2010 22:04 <DIR> util
12.10.2010 18:24 19'968 vmfplc2.exe
13.10.2010 21:23 8'157 x.log
20.07.2005 11:48 59'904 zlib1.dll
127 File(s) 24'988'911 bytes
5 Dir(s) 67'712'364'944 bytes free
```

Figure 289: SH command
8.159 SHCMDOPT (Display or set shell command option)

8.159.1 Function
The SHCMDOPT console command specifies the behaviour of the shell (sh) command. It defines if shell commands (sh) are globally enabled or disabled either directly via the Hercules hardware console or programmatically via the DIAG8CMD interface. Given without an argument SHCMDOPT displays the current setting.

8.159.2 Syntax

**Descriptive**

SHCMDOPT [DISABLE | ENABLE [DIAG8 | NODIAG8]]

**Diagram**

```
\[ SHCMDOPT \]
\[ DISABLE \]
\[ ENABLE \]
\[ DIAG8 \]
\[ NODIAG8 \]
```

8.159.3 Parameter

**DISABLE** When set to DISABLE, shell commands (sh) are globally disabled and will result in an error if entered either directly via the Hercules hardware console or programmatically via the DIAG8CMD interface.

**ENABLE** When set to ENABLE, shell commands (sh) are globally enabled either directly via the Hercules hardware console or programmatically via the DIAG8CMD interface. This is the default.

**DIAG8** When DIAG8 is specified (which is the default) the programmatic execution of shell commands (sh) via the DIAG8CMD interface is enabled. This is the default.

**NODIAG8** When NODIAG8 is specified only the programmatic execution of shell commands via the DIAG8CMD interface is disabled; shell commands (sh) entered directly via the Hercules hardware console will still work.

NOTE: "entered directly via the Hercules hardware console" includes commands entered via the HTTP server facility or entered via "run command" (.rc) scripts.
8.159.4 Examples

Example 1:
Display the current shell command option setting.

```
HHC00013I Herc command: 'shcmdopt'
HHC02203I shcmdopt : Enabled
```

Figure 290: SHCMDOPT command (display current shell command options)

Example 2:
Disable the programmatic execution of shell commands via the DIAG8CMD interface, while still allowing shell commands (sh) entered directly via the Hercules hardware console.

```
HHC00013I Herc command: 'shcmdopt enable nodiag8'
HHC02204I shcmdopt set to Enabled NoDiag8
```

Figure 291: SHCMDOPT command (change shell command options)
8.160 SHOWDVOL1 (Display or set enable showing of DASD volsers in device list)

8.160.1 Function
SHOWDVOL1 indicates whether to show the DASD VOL1 labels (volser) in the device list display. 'YES' shows the volser in addition to the usual filename, whereas 'NO' shows the device list in a traditional filename only format. The 'ONLY' option shows only the volser; the filename is not shown at all. Enter the command without any operands to display the current settings on the console. Note: This console command is only available if Hercules is built with "OPTION_SHOWDVOL1".

8.160.2 Syntax

Descriptive
SHOWDVOL1 [NO | YES | ONLY]

Diagram

```
SHOWDVOL1

NO
YES
ONLY
```

8.160.3 Parameter

NO
NO shows the device list in the traditional filename only format. This is the default.

YES
YES shows the volser in addition to the usual filename.

ONLY
ONLY shows only the volser, the filename is not shown at all.

8.160.4 Examples

Example 1:
Show the DASD VOL1 labels (volser) in the device list.

```
HHC00013I Herc command: 'showdvoll yes'
HHC02204I showdvoll set to YES
```

Figure 292: SHOWDVOL command
8.161 SHRD (Display or set shared device server trace)

8.161.1 Function
The SHRD command has two functions. Depending on the given arguments it initializes the shared device server trace table and starts the trace or it displays the contents of the current trace table.

8.161.2 Syntax

Descriptive

SHRD TRACE[=n]

Diagram

Figure 293: SHRD command (initialize shared device server trace table)

8.161.3 Parameter

TRACE       Keyword TRACE, when specified without a decimal number, displays the current contents of the trace table.

n           This specifies the trace table size (decimal). If the TRACE argument is given with a number then a trace table with a size of n elements initialized.

8.161.4 Examples

Example 1:
Initialize the shared device server trace table with a size of 2500 trace entries.

HHC00013I Herc command: 'shrd trace=2500'

Figure 293: SHRD command (initialize shared device server trace table)
Example 2:
Print the Shared Device Server trace table.

```
HHC00013I Herc command: 'shrd trace'
HHC00043I Shared: 1290125714.658483 0148:start cur 5966 cache 150
HHC00043I Shared: 1290125714.658486 0148:client_request e2 00 148 1
HHC00043I Shared: 1290125714.658490 0148:client_send e2 00 148 1 0
HHC00043I Shared: 1290125714.658543 0000:recvData 00 00 148 1 0
HHC00043I Shared: 1290125714.658548 0148:client_recv 00 00 148 1 0
HHC00043I Shared: 1290125714.658551 0148:client_response 00 00 148 1 0
HHC00043I Shared: 1290125714.658559 0148:ckd_read trk 5940
HHC00043I Shared: 1290125714.658566 0148:ckd_read trk 5940 cache hit 205
HHC00043I Shared: 1290125714.658576 0148:end cur 5940 cache 205
HHC00043I Shared: 1290125714.658579 0148:client_request e3 00 148 1
HHC00043I Shared: 1290125714.658582 0148:client_send e3 00 148 1 0
HHC00043I Shared: 1290125714.658645 0000:recvData 00 00 148 1 0
HHC00043I Shared: 1290125714.658649 0148:client_recv 00 00 148 1 0
HHC00043I Shared: 1290125714.658652 0148:client_response 00 00 148 1 0
HHC00043I Shared: 1290125714.659060 0148:start cur 5940 cache 205
HHC00043I Shared: 1290125714.659063 0148:client_request e2 00 148 1
HHC00043I Shared: 1290125714.659067 0148:client_send e2 00 148 1 0
HHC00043I Shared: 1290125714.659121 0000:recvData 00 00 148 1 0
HHC00043I Shared: 1290125714.659125 0148:client_recv 00 00 148 1 0
HHC00043I Shared: 1290125714.659126 0148:client_response 00 00 148 1 0
HHC00043I Shared: 1290125714.659128 0148:client_response 00 00 148 1 0
HHC00043I Shared: 1290125714.659134 0148:ckd_read trk 2550
HHC00043I Shared: 1290125714.659149 0148:ckd_read trk 2550 cache hit 107
HHC00043I Shared: 1290125714.659152 0148:end cur 2550 cache 107
HHC00043I Shared: 1290125714.659155 0148:client_request e3 00 148 1
HHC00043I Shared: 1290125714.659209 0148:client_request e3 00 148 1 0
HHC00043I Shared: 1290125714.659209 0000:recvData 00 00 148 1 0
HHC00043I Shared: 1290125714.659213 0148:client_recv 00 00 148 1 0
HHC00043I Shared: 1290125714.659216 0148:client_response 00 00 148 1 0
HHC00043I Shared: 1290125714.659654 0148:start cur 2550 cache 107
HHC00043I Shared: 1290125714.659657 0148:client_request e2 00 148 1
HHC00043I Shared: 1290125714.659660 0148:client_send e2 00 148 1 0
HHC00043I Shared: 1290125714.659720 0000:recvData 00 00 148 1 0
HHC00043I Shared: 1290125714.659724 0148:client_recv 00 00 148 1 0
HHC00043I Shared: 1290125714.659727 0148:client_response 00 00 148 1 0
HHC00043I Shared: 1290125714.659733 0148:ckd_read trk 2553
HHC00043I Shared: 1290125714.659738 0148:ckd_read trk 2553 cache miss -1
HHC00043I Shared: 1290125714.659744 0148:client_request e8 00 148 1 4
HHC00043I Shared: 1290125714.659845 0000:recvData 10 15 148 1 6541
HHC00043I Shared: 1290125714.660025 0000:recvData 00 00 148 1 11957 (uncompressed)
HHC00043I Shared: 1290125714.660030 0148:client_recv 00 00 148 1 11957
HHC00043I Shared: 1290125714.660045 0148:end cur 2553 cache 172
HHC00043I Shared: 1290125714.660049 0148:client_request e3 00 148 1
HHC00043I Shared: 1290125714.660052 0148:client_send e3 00 148 1 0
HHC00043I Shared: 1290125714.660111 0000:recvData 00 00 148 1 0
```

Figure 294: SHRD command (display shared device server trace table)
8.162 SHRDPORT (Set shared device server port)

8.162.1 Function

The SHRDPORT command defines the port number (in decimal) on which the shared device server will listen and starts or stops the shared device server. The shared device server will allow other Hercules instances to access devices on this instance. Currently only DASD devices may be shared.

8.162.2 Syntax

Descriptive

SHRDPORT [port | START | STOP]

Diagram

```
>>> SHRDPORT  [port]  START  STOP
```

8.162.3 Parameter

port  This is the port number for the shared device server. Any valid port number can be specified. Specifying a port number starts the shared device server. It is not necessary to issue an explicit start command.

START  Starts the shared device server if it is in the stopped state.

STOP      Stops the shared device server if it is in the started state.

8.162.4 Examples

Example 1:

Start the shared device server.

```
HHC00013I Herc command: 'shrdport start'
HHC00100I Thread id 000003E8, prio  0, name 'Shared device server 0.1' started
HHC00737I Shared: waiting for shared device requests on port 3000
```

Figure 295: SHRDPORT command (start the shared device server)
Example 2:
Set the port number for the shared device server to 3999. To change the port number the shared device server has first to be stopped.

```
20:05:26 HHCD0013I Herc command: 'shrdport stop'
20:05:37 HHCD0013I Herc command: 'shrdport 3999'
20:05:37 HHCD00100I Thread id 000B00, prio 0, name 'Shared device server 0.1' started
20:05:37 HHCD00737I Shared: waiting for shared device requests on port 3999
```

Figure 296: SHRDPORT command (set port number)
8.163 SIZEOF (Display size of structures)

8.163.1 Function
The SIZEOF command shows the size of various Hercules internal structures.

8.163.2 Syntax

**Descriptive**
SIZEOF

**Diagram**

```
>>> SIZEOF <<<
```

8.163.3 Parameter
None.

8.163.4 Examples

**Example 1:**
Display the size of internal structures.

```
HHC00013I Herc command: 'sizeof'
HHC02257I (unsigned short) .. 2
HHC02257I (void *) ............ 4
HHC02257I (unsigned int) .... 4
HHC02257I (long) ............. 4
HHC02257I (long long) ....... 8
.
several lines not displayed
.
HHC02257I REGS (copy len) ... 1584
HHC02257I PSW ................. 40
HHC02257I DEVLK ............... 3096
HHC02257I TLB entry .......... 36
HHC02257I TLB table .......... 36864
HHC02257I CPU_BITMAP ........ 4
HHC02257I STFL_BYTESIZE ..... 10
```

Figure 297: SIZEOF command
8.164 SRVPRIO (Display or set server threads process priority)

8.164.1 Function
The SRVPRIO command is used to change the priority of the server threads. See section 5.82 for details on process and thread priorities. Given without an argument the SRVPRIO command displays the current server threads process priority.

Caution: SRVPRIO should not have a higher dispatching priority than the TOD clock and timer thread.

8.164.2 Syntax

Descriptive

SRVPRIO [nn]

Diagram

![Diagram of SRVPRIO command]

8.164.3 Parameter

nn This value specifies the process priority for the server threads. For details on the priority values see section 5.82 (“Process and Thread Priorities”).

8.164.4 Examples

Example 1:
Set the server threads process priority to 0.

```
HHC00013I Herc command: 'srvprio 0'
HHC02204I srvprio set to 0
```

Figure 298: SRVPRIO command
8.165  SSD (Signal shutdown)

8.165.1 Function
The SSD (signal shutdown) command signals an imminent hypervisor shutdown to the guest. Guests who
support this are supposed to perform a shutdown upon receiving this request.

An implicit ssd command is given on a hercules QUIT or EXIT command if the guest supports SSD. In
that case Hercules shutdown will be delayed until the guest has shutdown.

The SSD command acts different depending on how Hercules was built. If Hercules was not built with
option 'OPTION_SHUTDOWN_CONFIRMATION' (#UNDEF in file feature.h) then the command acts as
described above.

If Hercules however was built with option “OPTION_SHUTDOWN_CONFIRMATION” then a special pro-
cessing for SSD takes place.

If SSD is entered and the command level is not set to 'developer', 'debug' or 'all' then SSD first issues
message HHC02266A that prompts for confirmation by entering a second SSD command within a certain
time period (default 10 seconds) to signal the hypervisor shutdown. If the time period has expired then the
process starts over. This is to prevent an inadvertent shutdown of a running guest OS.

The time period for the second SSD command can be set to another value by using the 'QUITMOUT'
console command or configuration statement.

If the command level is set to 'developer', 'debug' or 'all' then SSD immediately signals the hypervisor
shutdown. 'SSD FORCE' also performs an immediate signal shutdown without any further checks.

8.165.2 Syntax

Descriptive
SSD [FORCE]

Diagram

8.165.3 Parameter

FORCE  Perform the signal shutdown immediately.
8.165.4 Examples

Example 1:
Signal an imminent hypervisor shutdown to the guest operating system.

<table>
<thead>
<tr>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HHC00013I Herc command: 'ssd'</td>
<td>Confirm command by entering 'ssd'</td>
</tr>
<tr>
<td>HHC02266A Confirm command by</td>
<td>again within 10 seconds</td>
</tr>
<tr>
<td>HHC00013I Herc command: 'ssd'</td>
<td></td>
</tr>
</tbody>
</table>

Figure 299: SSD command

Example 2:
Signal an immediate imminent hypervisor shutdown to the guest operating system.

<table>
<thead>
<tr>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HHC00013I Herc command: 'ssd force'</td>
<td></td>
</tr>
</tbody>
</table>

Figure 300: SSD FORCE command
8.166 START (Start CPU or printer / punch device)

8.166.1 Function
The START command by itself (without argument) simply starts a stopped CPU, whereas START devicenum presses the (virtual) start button on printer or punch device devicenum.

8.166.2 Syntax

Descriptive
START [devicenum]

Diagram

```
.START [devicenum]
```

8.166.3 Parameter

devicenum The device number of the printer or punch device which should be started.

8.166.4 Examples

Example 1:
Start the printer device 000E.

```
HHC00013I Herc command: 'start 000e'
HHC02212I 0:000E device started
```

Figure 301: START command (start printer)

Example 2:
Start CPU 1.

```
HHC00013I Herc command: 'cpu 1'
HHC00013I Herc command: 'start'
HHC00834I Processor CP01: running state selected
```

Figure 302: START command (start CPU)
8.167  STARTALL (Start all CPUs)

8.167.1 Function
The STARTALL command starts all CPUs.

8.167.2 Syntax

Descriptive

STARTALL

Diagram

Example 1:
Start all CPU's.

HHC00013I Herc command: 'startall'

Figure 303: STARTALL command
8.168 STOP (Stop CPU or printer / punch device)

8.168.1 Function
The STOP command by itself (without argument) simply stops a started CPU, whereas STOP \textit{devicenum} presses the (virtual) stop button on printer or punch device \textit{devicenum}.

8.168.2 Syntax

Descriptive

\texttt{STOP \{devicenum\}}

Diagram

\begin{center}
\includegraphics[width=\textwidth]{stop_diagram}
\end{center}

8.168.3 Parameter

\textit{devicenum} \quad The device number of the printer or punch device which should be stopped-

8.168.4 Examples

Example 1:
Stop the printer device 000E.

\begin{verbatim}
HHC00013I Herc command: 'stop 000e'
HHC02214I 0:000E device stopped
\end{verbatim}

Figure 304: STOP command (stop printer)

Example 2:
Stop CPU 1.

\begin{verbatim}
HHC00013I Herc command: 'cpu 1'
HHC00013I Herc command: 'stop'
HHC00834I Processor CP01: manual state selected
\end{verbatim}

Figure 305: STOP command (stop CPU)
8.169 STOPALL (Stop all CPUs)

8.169.1 Function
The STOPALL command stops all CPUs

8.169.2 Syntax

Descriptive
STOPALL

Diagram

8.169.3 Parameter
None.

8.169.4 Examples
Example 1:
Stop all CPU's.

HHC00013I Herc command: 'stopall'

Figure 306: STOPALL command
8.170 STORE (Store CPU status at absolute zero)

8.170.1 Function
The STORE command stores the CPU status of the active CPU at absolute zero.

8.170.2 Syntax

Descriptive
STORE

Diagram

8.170.3 Parameter
None.

8.170.4 Examples
Example 1:
Store status for active CPU.

HHC00817I Processor CP00: store status completed

Figure 307: STORE command
8.171 SUSPEND (Suspend Hercules)

8.171.1 Function

This command lets you suspend the current Hercules session and shutdown the host machine. Subsequently the suspended session can be resumed (see “RESUME” command). The data necessary to be saved for a later restart is saved in a packed (zipped) file called “hercules.srf.gz” which is located in the current configuration path.

After entering the SUSPEND command the CPUs are put in a stopped state and the contents of the main storage, CPU states, I/O device states and internal Hercules states are dumped onto the “Hercules.srf.gz” file. After the SUSPEND command has finished writing to the suspend file, it schedules an immediate shutdown of Hercules.

Currently device state is only fully saved for CKD disks. Each device class (e.g. TAPE, RDR, PUN, CTC) will need code to save and restore their state. Some states may not be possible to restore (e.g. active TCP/IP connections at the time of suspend). Currently the vector facility state is not saved, neither is the ECPSVM state.

The created suspend file is designed to be HERCULES release independent and to be host architecture independent. For example it is possible to take a suspend file created on HERCULES 3.05.0 on an Intel machine and resume on a Sun machine running HERCULES 3.07.0.

Please note that there are some caveats with suspend / resume processing which can affect the guest operating system running under Hercules. These caveats are described in the chapter about RESUME processing (8.138, RESUME).

There are some caveats when suspending and resuming guest operating system processing:

- As seen by the guest operating system, the TOD clock will appear to jump a large value. Some guests may not cope very well with this. For example some guests may be dismayed because certain interrupts will occur way past its due time. Also for S/370 an interval timer interrupt may be lost if the guest is interrupted for more than half the Interval Timer wrap time (around 8 hours).
- Although some effort has been put in order to make this as transparent as possible (that is, it should appear to the guest operating system that the STOP key was pressed for a large amount of time), some state information may be missed.
- Some guest operating systems will fare better if the suspend state is prepared first. For MVS, as an example, it seems to help when a QUIESCE command and a SYSTEM RESTART manual operation are issued prior to suspend the system.

8.171.2 Syntax

Descriptive

SUSPEND

Diagram

Êʬ¬¬¬ SUSPEND ¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬¬ÊÍ
8.171.3 Parameter
None.

8.171.4 Examples
Example 1:
Suspend the Hercules session.

```
HHC00013I Herc command: 'suspend'
HHC01420I Begin Hercules shutdown
HHC02272I Highest observed MIPS and IO/s rates
HHC02272I   from Sun Sep 26 00:00:00 2010
HHC02272I     to Sun Sep 26 03:50:21 2010
HHC02272I   MIPS: 0.00  IO/s: 0
HHC01421I Releasing configuration
HHC00101I Thread id 000001FG, prio  0, name 'Processor CP00' ended
HHC00101I Thread id 000017A4, prio  0, name 'Processor CP01' ended
HHC01465I 0:000C device detached
HHC01465I 0:000D device detached
HHC01465I 0:000E device detached
.  
  several lines not displayed.
  .
HHC01465I 0:0480 device detached
HHC01465I 0:0481 device detached
HHC01465I 0:0E20 device detached
HHC01422I Configuration release complete
HHC01423I Calling termination routines
HHC01500I HDL: begin shutdown sequence
HHC01501I HDL: calling 'panel_cleanup'
HHC01502I HDL: calling 'panel_cleanup' complete
HHC02103I Logger: logger thread terminating
```

Figure 308: SUSPEND command
8.172 SYMPTOM (Instruction trace display option)

8.172.1 Function
The SYMPTOM command determines how the registers are displayed during instruction tracing and stepping. SYMPTOM is an alias for the TRACEOPT console command. Please see TRACEOPT for details.

8.172.2 Syntax
See TRACEOPT console command.

8.172.3 Parameter
See TRACEOPT console command.

8.172.4 Examples
See TRACEOPT console command.
8.173 SYNCIO (Display SYNCIO device statistics)

8.173.1 Function
This command shows the SYNCIO device statistics for all DASD devices.

8.173.2 Syntax

Descriptive
SYNCIO

Diagram

8.173.3 Parameter
None.

8.173.4 Examples
Example 1:
Display SYNCIO device statistics.

```
HHC00013I Herc command: 'syncio'
HHC02239I 0:0130 synchronous:      2 asynchronous:      1
HHC02239I 0:0131 synchronous:      48 asynchronous:      11
HHC02239I 0:0132 synchronous:      2 asynchronous:      1
HHC02239I 0:0133 synchronous:      2 asynchronous:      1
several lines not displayed
HHC02239I 0:034A synchronous:      7 asynchronous:      1
HHC02239I 0:034B synchronous:      13 asynchronous:      8
HHC02239I 0:0480 synchronous:      2326 asynchronous:    629
HHC02239I 0:0481 synchronous:      44 asynchronous:      19
HHC02240I Total synchronous:      57957 asynchronous:    9267   86%
```

Figure 309: SYNCIO command
8.174 SYSCLEAR (SYSTEM CLEAR RESET manual operation)

8.174.1 Function
The SYSCLEAR command issues a SYSTEM CLEAR RESET manual operation. This is the same as the "SYSRESET CLEAR" command. It clears the main storage to x'00'. Additionally the general purpose registers, control registers, etc. are reset to their initial value. At this point the system is essentially in the same state as it was just after having been started.

Please note that all CPUs must be stopped prior to issuing a system clear reset or the function will be rejected with a message.

8.174.2 Syntax

Descriptive
SYSCLEAR

Diagram

```
>>> SYSCLEAR
```

8.174.3 Parameter
None.

8.174.4 Examples

Example 1:
CLEAR RESET the system.

```
HHC00013I Herc command: 'stopall'
HHC00013I Herc command: 'sysclear'
HHC02311I sysclear completed
```

Figure 310: SYSCLEAR command
8.175 SYSEPOCH (Set base date for TOD clock)

8.175.1 Function
The SYSEPOCH command specifies the base date for the TOD clock. Use the default value (1900) for all systems except OS/360. Use 1960 for OS/360. Values other than these were formerly used to offset the TOD clock by a number of years to move the date before the year 2000 for non-Y2K-compliant operating systems. This use is deprecated and support will be removed in a future Hercules release after which only values of 1900 or 1960 will be accepted.

8.175.2 Syntax

Descriptive
SYSEPOCH {1900 | 1960 | year [+years | -years]}

Diagram

8.175.3 Parameter

1900 Year 1900 is one of the two valid values for SYSEPOCH. 1900 is the default.

1960 Year 1960 is the second of the two valid values for SYSEPOCH.

year This is the base date for the TOD clock. The only supported values for SYSEPOCH are currently 1900 and 1960. Any other value will produce a warning message showing the equivalent values to specify in the SYSEPOCH statement. 1900 is the default.

+ years Specifies an optional positive year offset. It will be treated as though it had been specified using the YROFFSET statement.

- years Specifies an optional negative year offset. It will be treated as though it had been specified using the YROFFSET statement.
8.175.4 Examples

Example 1:
Specify year 1900 as the base date for the TOD clock and use an offset of 28 years.

HHC00013I Herc command: 'sysepoch 1900 +28'

Figure 311: SYSEPOCH command (with offset)

Example 2:
Specify year 1960 as the base date for the TOD clock without an offset.

HHC00013I Herc command: 'sysepoch 1960'

Figure 312: SYSEPOCH command (without offset)
8.176 SYSRESET (SYSTEM RESET manual operation)

8.176.1 Function
The SYSRESET command issues a SYSTEM RESET manual operation. Without any arguments or with
the “NORMAL” argument only a CPU and I/O subsystem reset are performed. When the “CLEAR” argu-
ment is given then this command is identical function to the “SYSCLEAR” command.
Please note that all CPUs must be stopped prior to issuing a system reset or the function will be rejected
with a message.

8.176.2 Syntax

Descriptive
SYSRESET [NORMAL  |  CLEAR]

Diagram

Describe

8.176.3 Parameter
NORMAL  Performs only a CPU and I/O subsystem reset. This is the same as “SYSRESET”
without any argument given.
CLEAR  This clears the main storage to x'00'. Additionally the general purpose registers,
control registers, etc. are reset to their initial value. At this point the system is es-
sentially in the same state as it was just after having been started. “SYSRESET
CLEAR” is identical in functionality to the “SYSCLEAR” command.

8.176.4 Examples
Example 1:
RESET CLEAR the system.

HHCO00013I Herc command: 'stopall'
HHCO00013I Herc command: 'sysreset clear'
HHCO2311I sysreset clear completed

Figure 313: SYSRESET CLEAR command
8.177 T (Instruction trace)

8.177.1 Function

This command sets the instruction tracing range. Instruction tracing is totally separate from the instruction stepping and breaking range. With or without a range the “T” command displays whether tracing is on or off and the range, if any.

The “T” command by itself does not activate instruction tracing. Use the “T+” command to activate instruction tracing. The command “T 0” eliminates the range (all addresses will be traced).

8.177.2 Syntax

Descriptive

T [addr addr | addr:addr | addr.length | 0]

Diagram

```
T
```

8.177.3 Parameter

*addr addr*  Specifies an address range with start and end address (from begin address to end address).

*addr:addr*  Specifies an address range with start and end address (from begin address to end address).

*addr.length*  Specifies an address range with start and length (from begin address with the specified length).

*0*  No range is specified or an existing range is reset. The tracing is active for all addresses.
8.177.4 Examples

Example 1:
Set instruction tracing range with begin and end address and query the range afterwards.

```
HHC00013I Herc command: 't 100000-101000'
HHC02229I Instruction tracing off range 100000-101000
HHC00013I Herc command: 't?'
HHC02229I Instruction tracing off range 100000-101000
```

Figure 314: T command (address range)

Example 2:
Set instruction tracing range with start address and length and query the range afterwards.

```
HHC00013I Herc command: 't 1000000.1000'
HHC02229I Instruction tracing off range 1000000.1000
HHC00013I Herc command: 't?'
HHC02229I Instruction tracing off range 1000000-1001000
```

Figure 315: T command (address with length)

Example 3:
Set instruction tracing for all addresses and query the range afterwards.

```
HHC00013I Herc command: 't 0'
HHC02229I Instruction tracing off
HHC00013I Herc command: 't?'
HHC02229I Instruction tracing off
```

Figure 316: T command (all addresses)
8.178 T+ (Instruction trace on)

8.178.1 Function

This command turns on instruction tracing. A range can be specified as for the “T” command. Instruction tracing is totally separate from the instruction stepping and breaking range.

After turning instruction tracing on, every instruction is listed with detailed trace information. The trace information includes the executing CPU, the PSW, the executed instruction in hexadecimal and in disassembled form as well as register hexadecimal displays of all involved register types.

This function is similar to the instruction stepping. The difference between these two function is that with instruction stepping the execution of every instruction has to be initiated by hitting ENTER on the Hercules console, whereas instruction tracing – once started – traces the instructions without interruption.

Please note that this function will create an enormous amount of output in the Hercules log. Running it on a relatively current machine (3 GHz HT Processor) for 10 seconds creates more than 10 MB of trace data.

8.178.2 Syntax

Descriptive

T+ [addr-addr | addr:addr | addr.length | 0]

Diagram

```
 addr-addr
 addr:addr
 addr.length
```

8.178.3 Parameter

addr-addr  Specifies an address range with start and end address (from begin address to end address).

addr:addr  Specifies an address range with start and end address (from begin address to end address).

addr.length  Specifies an address range with start and length (from begin address with the specified length).

0  No range is specified or an existing range is reset. The tracing is active for all addresses.
8.178.4 Examples

Example 1:

Turn instruction tracing on.

```plaintext
HHC00013I Herc command: 't+'
HHC0229I Instruction tracing on
HHC02267I CP00: PSW=00000014800000080 INST=05F0 BALR 15,0 branch_and_link_register
HHC02267I CP00: GR00=00000000 GR01=00000000 GR02=00000000 GR03=00000000
HHC02267I CP00: GR04=00000000 GR05=00000000 GR06=00000000 GR07=00000000
HHC02267I CP00: GR08=00000000 GR09=00000000 GR10=00000000 GR11=00000000
HHC02267I CP00: GR12=00000000 GR13=00000000 GR14=00000000 GR15=00000000
HHC02267I CP00: PSW=00000014800000082 INST=980E0010 LM 0,14,16(0) load_multiple
HHC02267I CP00: R00000000:K06=00000000 00000000 00000000 00000000 ................
HHC02267I CP00: GR00=00000000 GR01=00000000 GR02=00000000 GR03=00000000
HHC02267I CP00: GR04=00000000 GR05=00000000 GR06=00000000 GR07=00000000
HHC02267I CP00: GR08=00000000 GR09=00000000 GR10=00000000 GR11=00000000
HHC02267I CP00: GR12=00000000 GR13=00000000 GR14=00000000 GR15=40000082
HHC02267I CP00: PSW=00000014800000080 INST=41A0F05A LA 10,90(0,15) move_character
HHC02267I CP00: R000000DC:K06=41800100 41A0F08A 1B984700 F06E5890 .......0..q..0>..
HHC02267I CP00: GR00=00000000 GR01=00000000 GR02=00000000 GR03=00000000
HHC02267I CP00: GR04=00000000 GR05=00000000 GR06=00000000 GR07=00000000
HHC02267I CP00: GR08=00000000 GR09=00000000 GR10=00000000 GR11=00000000
HHC02267I CP00: GR12=00000000 GR13=00000000 GR14=00000000 GR15=40000082
HHC02267I CP00: PSW=00000014800000080 INST=95000009 CLI 9(0),0 compare_logical_immediate
HHC02267I CP00: R00000009:K06=F1000000 00000000 00000000 00000000 1............
HHC02267I CP00: GR00=00000000 GR01=00000000 GR02=00000000 GR03=00000000
HHC02267I CP00: GR04=00000000 GR05=00000000 GR06=00000000 GR07=00000000
HHC02267I CP00: GR08=00000000 GR09=00000000 GR10=00000000 GR11=00000000
HHC02267I CP00: GR12=00000000 GR13=00000000 GR14=00000000 GR15=40000082
HHC02267I CP00: PSW=00000014800000090 INST=4780F050 BC 8,80(0,15) branch_on_condition
HHC02267I CP00: R000000D2:K06=6800 FD2E2820 28402860 41800100 41A0 ....... -......
HHC02267I CP00: GR00=00000000 GR01=00000000 GR02=00000000 GR03=00000000
HHC02267I CP00: GR04=00000000 GR05=00000000 GR06=00000000 GR07=00000000
HHC02267I CP00: GR08=00000000 GR09=00000000 GR10=00000000 GR11=00000000
HHC02267I CP00: GR12=00000000 GR13=00000000 GR14=00000000 GR15=40000082
```

Figure 317: T+ command
8.179 T- (Instruction trace off)

8.179.1 Function
This command turns off the instruction tracing function.

8.179.2 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-</td>
</tr>
</tbody>
</table>

Diagram

8.179.3 Parameter
None.

8.179.4 Examples
Example 1:
Turn off instruction tracing.

HHC00013I Herc command: 't-
HHC02229I Instruction tracing off range 1000000-1001000

Figure 318: T- command
8.180  T? (Instruction trace query)

8.180.1  Function
The “T?” command displays whether instruction tracing is on or off and the range if any.

8.180.2  Syntax

Descriptive
T?

Diagram

8.180.3  Parameter
None.

8.180.4  Examples
Example 1:
Query instruction tracing.

HHC00013I Herc command: 't?'
HHC02229I Instruction tracing off range 1000000-1001000

Figure 319: T? command
8.181 T{+/-} CKD (Turn CKD_KEY tracing on or off)

8.181.1 Function
The “T{+/-}CKD” command turns the CKD key tracing on (T+CKD) or turns it off (T-CKD). Please note that the command has to be issued without any intervening blanks.

8.181.2 Syntax

Descriptive

T{+ | -}CKD

Diagram

```
T + CKD
```

8.181.3 Parameter

T+CKD The T+CKD turns on the CKD key trace. The plus sign and the CKD argument must immediately follow the T command (without an intervening blank).

T-CKD The T-CKD turns off the CKD key trace. The minus sign and the CKD argument must immediately follow the T command (without an intervening blank).

8.181.4 Examples

Example 1:
Turning the CKD key trace on.

```
HHC00013I Herc command: 't+ckd'
HHC002204I CKD key trace set to on
HHC00423I 0:0148 CKD file 'D:/MVS/DASD/MVSRES.CCKD': search key 'SYS1.NUCLEUS
HHC00423I 0:0148 CKD file 'D:/MVS/DASD/MVSRES.CCKD': search key 'IEANUC01'
HHC00423I 0:0148 CKD file 'D:/MVS/DASD/MVSRES.CCKD': search key 'IEAVNP01'
HHC00423I 0:0148 CKD file 'D:/MVS/DASD/MVSRES.CCKD': search key 'IEAVNPB2'
HHC00423I 0:0148 CKD file 'D:/MVS/DASD/MVSRES.CCKD': search key 'SYS1.LOGREC
HHC00423I 0:0148 CKD file 'D:/MVS/DASD/MVSRES.CCKD': search key 'SYS1.SVCLIB
HHC00423I 0:0148 CKD file 'D:/MVS/DASD/MVSRES.CCKD': search key 'IEAVNP11'
HHC00423I 0:0148 CKD file 'D:/MVS/DASD/MVSRES.CCKD': search key 'SYSCATLG'
```
Figure 320: T+CKD command

Example 2:
Turning the CKD key trace off.

HHC00013I Herc command: 't-ckd'
HHC02204I CKD key trace set to off

Figure 321: T-CKD command
8.182 T{+/\-} dev (Turn CCW tracing on or off)

8.182.1 Function
This command turns the CCW tracing for a certain device on (T+dev) or turns it off (T-dev). It is possible to trace several devices concurrently. To enable the tracing of more than one device the T+ command must be issued for each device. The traces can be turned off independently of each other.

This function is similar to the CCW stepping described in section 8.145. The difference between these two function is that with CCW stepping the execution of every CCW has to be initiated by hitting ENTER on the Hercules console, whereas CCW tracing – once started – traces the instructions without interruption.

Notes:
- The tracing function will create an enormous amount of output in the Hercules log.
- The command has to be issued without any intervening blanks.

8.182.2 Syntax

Descriptive
T{+ | -}devaddr

Diagram

\[\begin{align*}
\text{T} & \quad + \quad \text{devaddr} \\
\end{align*}\]

8.182.3 Parameter
+ The plus sign turns on the CCW tracing for the given device. The plus sign must immediately follow the T command (without an intervening blank).
- The minus sign turns off the CCW tracing for the given device. The minus sign must immediately follow the T command (without an intervening blank).

\text{devaddr} This specifies the address of the device for which the CCW tracing is to be turned on or off.
8.182.4 Examples

Example 1:

Turn on the CCW tracing for device 0148.

```
HHC0013I Herc command: 't+0148'
HHC02204I CCW trace for 0:0148 set to on
HHC0396I 0:0148 read trk 0 (asynchronous)
HHC0014I 0:0148 0 rdtrk 0
HHC0396I 0:0148 0 rdtrk[0] 0 cache miss
HHC0396I 0:0148 0 rdtrk[0] 0 buf 07B8F9ED len 19456
HHC0396I 0:0148 0 rdtrk[0] read_trkimg
HHC0396I 0:0148 0 rdtrk[0] 0 active -1 -1 -1
HHC0396I 0:0148 0 rdtrk[0] cache[0] miss
HHC0396I 0:0148 0 rdtrk[0] fd[18] read, off 0x0000000000000d08 len 2048
HHC0396I 0:0148 0 rdtrk[0] cache[0] l2[0] read offset 0x00000d08
HHC0396I 0:0148 0 rdtrk[0] cache[0] l2[0] read_trkimg
HHC0396I 0:0148 0 rdtrk[0] cache[0] l2[0] read_l2ent 0xd08
HHC0396I 0:0148 0 rdtrk[0] cache[0] l2[0] read_l2 0 active -1 -1 -1
HHC0396I 0:0148 0 rdtrk[0] l2[0,0] cache[1] miss
HHC0396I 0:0148 0 rdtrk[0] l2[0,0] fd[17] read, off 0x0000000000000508 len 2343
HHC0396I 0:0148 0 rdtrk[0] l2[0,0] cache[1] miss
HHC0396I 0:0148 0 rdtrk[0] l2[0,0] cache[1] l2[0] read_trkimg
HHC0396I 0:0148 0 rdtrk[0] l2[0,0] cache[1] l2[0] read_l2ent 0x116f079
HHC0396I 0:0148 0 rdtrk[0] l2[0,0] cache[1] l2[0] read_l2 0 active 1 0 0
HHC0396I 0:0148 0 rdtrk[0] l2[0,0] l2[0,0] cache[1] l2[0] read_l2ent 0x508
HHC0396I 0:0148 0 rdtrk[0] l2[0,0] l2[0,0] cache[1] l2[0] read_l2 0 active 1 0 0
HHC0396I 0:0148 0 rdtrk[0] l2[0,0] l2[0,0] cache[1] l2[0] read_l2ent 0x116f079
HHC0396I 0:0148 0 rdtrk[0] l2[0,0] l2[0,0] cache[1] l2[0] read_l2 0 active 1 0 0
HHC0396I 0:0148 0 rdtrk[0] l2[0,0] l2[0,0] cache[1] l2[0] read_l2ent 0x508
HHC0396I 0:0148 0 rdtrk[0] l2[0,0] l2[0,0] cache[1] l2[0] read_l2 0 active 1 0 0
```

Figure 322: T+ dev command

Example 2:
Turn off the CCW tracing for device 0148.

<table>
<thead>
<tr>
<th>Herc command: 't-0148'</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCW trace for 0:0148 set to off</td>
</tr>
</tbody>
</table>

Figure 323: T- dev command

Example 3:
Turn on the CCW tracing for several devices.

<table>
<thead>
<tr>
<th>Herc command: 't+0344'</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCW trace for 0:0344 set to on</td>
</tr>
<tr>
<td>Herc command: 't+0345'</td>
</tr>
<tr>
<td>CCW trace for 0:0345 set to on</td>
</tr>
</tbody>
</table>

Figure 324: T+ dev command (for several devices)
8.183 TIMERINT (Display or set timers update interval)

8.183.1 Function

The TIMERINT parameter displays or sets the internal timer update interval in microseconds. This parameter specifies how frequently Hercules's internal timers-update thread updates the TOD clock, CPU Timer and other architectural related clock and timer values.

The default interval is 50 microseconds which attempts to strike a reasonable balance between clock accuracy and overall host performance.

8.183.2 Syntax

Descriptive

TIMERINT [interval]

Diagram

\[ \text{TIMERINT} \quad \text{interval} \]

8.183.3 Parameter

interval Specifies the timer update interval in microseconds. The minimum allowed value for the interval is 1 microsecond and the maximum is 1'000'000 microseconds (one second).

CAUTION: While a lower TIMERINT value may help increase the accuracy of the guest's TOD clock and CPU Timer values, it could also have severe negative impact on the overall performance of the host operating system. This is especially true when a low value is coupled with a high HERCPRIO and TODPRIO priority setting.

Exercise extreme caution when choosing your desired TIMERINT in relationship to your chosen HERCPRIO and TODPRIO priority settings.
8.183.4 Examples

Example 1:
Display current timers update interval.

```
HHC00013I Herc command: 'timerint'
HHC02203I timerint      : 50
```

Figure 325: TIMERINT command (list current value)

Example 2:
Set timers update interval to 100 microseconds.

```
HHC00013I Herc command: 'timerint 100'
HHC02204I timerint       set to 100
```

Figure 326: TIMERINT command (set new value)
8.184 TLB (Display TLB tables)

8.184.1 Function
The TLB command shows the actual contents of the TLB (Translation Lookaside Buffer) tables.

8.184.2 Syntax

Descriptive
TLB

Diagram

8.184.3 Parameter
None.

8.184.4 Examples

Example 1:
Display the TLB tables.

HHC00013I Herc command: 'tlb'
HHC02284I tlbID 0x000E3B mainstor 000000003A81000
HHC02284I  ix         asd          vaddr       pte  id  c  p  r  w  ky  main
HHC02284I *000 00000000FFD7C00 0000000000000000 0000000000000001 0E3B 0 0 1 0 0 0 00000000
HHC02284I *001 00000000FFD7C00 0000000000000080 0000000000000001 0E3B 0 0 1 0 0 0 00000800
HHC02284I *002 00000000FFD7C00 0000000000000100 0000000000000011 0E3B 0 0 0 0 0 0 FC580000
HHC02284I *003 00000000FFD7C00 0000000000000180 0000000000000011 0E3B 0 0 1 1 0 0 00018000
HHC02284I 004 00000000FFF27C00 0000000000000200 0000000000000021 0E31 0 0 1 0 0 0 00020000
HHC02284I 005 00000000FFF27C00 0000000000000280 0000000000000021 0E31 0 0 1 0 0 0 00028000
HHC02284I 006 00000000FFF27C00 0000000000000300 0000000000000031 0E31 0 0 1 0 0 0 00030000
HHC02284I 007 00000000FFF27C00 0000000000000380 0000000000000031 0E31 0 0 1 0 0 0 00038000
HHC02284I *008 00000000FFF27C00 0000000000000400 0000000000000041 0E3B 0 0 1 0 0 0 00040000
HHC02284I *009 00000000FFF27C00 0000000000000480 0000000000000041 0E3B 0 0 0 0 0 0 FC583800
.    several lines not displayed
.    HHC02284I *3F6 00000000FFF27C00 0000000000FFB000 0000000000FFB001 0E3B 0 0 1 1 0 0 00FFB000
HHC02284I *3F7 00000000FFF27C00 0000000000FFB000 0000000000FFB001 0E3B 0 0 1 1 0 0 00FFB000
Figure 327: TLB command
8.185 TODDRAG (Display or set TOD clock drag factor)

8.185.1 Function
The TODDRAG command displays the current setting of the TOD clock drag factor or sets a new value. This parameter can be used to slow down or speed up the TOD clock by a factor of \( nn \). A significant slowdown can improve the performance of some operating systems which consume large amounts of CPU time processing timer interrupts. A drag factor of 2.0 slows down the clock by 50%, a drag factor of 0.5 doubles the speed of the clock, a drag factor of 1.01 slows down the clock by 1% and 0.99 speeds up the clock by 1%.

8.185.2 Syntax

**Descriptive**

TODDRAG [factor]

**Diagram**

\[ \text{TODDRAG} \quad \text{factor} \]

8.185.3 Parameter

(factor) The factor to which the TOD clock has to be slowed down or sped up.

8.185.4 Examples

Example 1:
Display current TOD clock drag factor.

```
HHC00013I Herc command: 'todddrag'
HHC02203I toddrag       : 1.000000
```

Figure 328: TODDRAG command (display TOD clock factor)
Example 2:
Speed up the clock by 10%.

<table>
<thead>
<tr>
<th>HHC00013I Herc command: 'toddrag 0.9'</th>
</tr>
</thead>
<tbody>
<tr>
<td>HHC02204I toddrag set to 0.9</td>
</tr>
</tbody>
</table>

Figure 329: TODDRAG command (set TOD clock factor)
8.186 TODPRIO (Display or set timer thread process priority)

8.186.1 Function

The TODPRIO command is used to change the process priority of the TOD clock and the timer threads. See section 5.82 for details on process and thread priorities. Given without an argument the TODPRIO command displays the current Hercules process priority.

Caution: TODPRIO should be given a dispatching priority equal to or higher than any other thread (CPUPRIO, DEVPRIO, HERCPRIO and SRVPRIO) within Hercules.

8.186.2 Syntax

Descriptive

TODPRIO [nn]

Diagram

\[\text{TODPRIO} \quad nn\]

8.186.3 Parameter

nn This value specifies the priority of the TOD clock and the timer thread. For details on the priority values see section 5.82 (“Process and Thread Priorities”).

8.186.4 Examples

Example 1:
Set the process priority of the TOD clock and the timer threads to 0.

HHC00013I Herc command: 'todprio -20'
HHC02204I todprio set to -20

Figure 330: TODPRIO command
8.187 TRACEOPT (Instruction trace display options)

8.187.1 Function

The TRACEOPT command determines how the registers are displayed during instruction tracing and stepping. Entering the command without any argument simply displays the current trace mode.

8.187.2 Syntax

Descriptive

TRACEOPT [TRADITIONAL | REGSFIRST | NOREGS]

Diagram

```
TRACEOPT

TRADITIONAL
REGSFIRST
NOREGS
```

8.187.3 Parameter

TRADITIONAL Displays the registers following the instruction about to be executed such that pressing enter (to execute the displayed instruction) then shows the next instruction to be executed followed by the updated registers display.

REGSFIRST Displays the current register contents followed by the instruction about to be executed such that pressing enter (to execute the displayed instruction) then shows the updated registers followed by the next instruction to be executed.

NOREGS Suppresses the register display altogether and shows just the instruction to be executed.

8.187.4 Examples

Example 1:
Display the instruction trace in traditional mode (instruction followed by registers).

```
HHC00013I Herc command: 'traceopt traditional'
HHC02203I Hercules inst trace displayed: traditional mode
HHC02267I CP00: PSW=040C10000010DC4 INST=58E00230 L 14,560(0,0) load
HHC02267I CP00: V:00000230:K:06=00000000 00000000 00000000 00FD4000 ..............
HHC02267I CP00: GR00=00000000 GR01=00000000 GR02=00000000 GR03=00000000
```
HHC02267I CP00: GR04=00000000 GR05=00000000 GR06=00000000 GR07=00FFDE28
HHC02267I CP00: GR08=00000000 GR09=4001D0A4 GR10=00000000 GR11=00000000
HHC02267I CP00: GR12=00000000 GR13=00000000 GR14=00000000 GR15=00000000
HHC02267I CP00: CR00=C080EC40 CR01=0FFD7C00 CR02=FFFFFFFF CR03=00000000
HHC02267I CP00: CR04=00000000 CR05=00000000 CR06=00000000 CR07=00000000
HHC02267I CP00: CR08=00000000 CR09=00000000 CR10=00000000 CR11=00000000
HHC02267I CP00: CR12=00000000 CR13=00000000 CR14=EFC00000 CR15=00FEBB10
HHC02267I CP00: PSW=040C10000001D0C8 INST=50E070BC ST 14,188(0,7) store
HHC02267I CP00: V:00FFDEE4:K:06=00FFDE28 00000000 4001D0A4 00000000 .......... 
HHC02267I CP00: GR00=00000000 GR01=00000000 GR02=00000000 GR03=00000000
HHC02267I CP00: GR04=00000000 GR05=00000000 GR06=00000000 GR07=00FFDE28
HHC02267I CP00: GR08=00000000 GR09=4001D0A4 GR10=00000000 GR11=00000000
HHC02267I CP00: GR12=00000000 GR13=00000000 GR14=00000000 GR15=00000000
HHC02267I CP00: CR00=C080EC40 CR01=0FFD7C00 CR02=FFFFFFFF CR03=00000000
HHC02267I CP00: CR04=00000000 CR05=00000000 CR06=00000000 CR07=00000000
HHC02267I CP00: CR08=00000000 CR09=00000000 CR10=00000000 CR11=00000000
HHC02267I CP00: CR12=00000000 CR13=00000000 CR14=EFC00000 CR15=00FEBB10

Figure 331: TRACEOPT command (TRADITIONAL)

Example 2:
Display the instruction trace in regsfirst mode (registers followed by instruction).

HHC00013I Herc command: 'traceopt regsfirst'
HHC02203I Hercules inst trace displayed: regsfirst mode
HHC02267I CP00: PSW=040C00000001D09A
HHC02267I CP00: GR00=00000000 GR01=00000000 GR02=00000000 GR03=00000000
HHC02267I CP00: GR04=00000000 GR05=00000000 GR06=00000000 GR07=00000000
HHC02267I CP00: GR08=00000000 GR09=00000000 GR10=00000000 GR11=00000000
HHC02267I CP00: GR12=00000000 GR13=00000000 GR14=00000000 GR15=00000000
HHC02267I CP00: CR00=C080EC40 CR01=0FFD7C00 CR02=FFFFFFFF CR03=00000000
HHC02267I CP00: CR04=00000000 CR05=00000000 CR06=00000000 CR07=00000000
HHC02267I CP00: CR08=00000000 CR09=00000000 CR10=00000000 CR11=00000000
HHC02267I CP00: CR12=00000000 CR13=00000000 CR14=EFC00000 CR15=00FEBB10
INST=50700230 ST 7,560(0,0) store
HHC02267I CP00: V:00000230:K:06=00000000 00000000 00FD4000 .......... 
HHC02267I CP00: PSW=040C00000001D09E
HHC02267I CP00: GR00=00000000 GR01=00000000 GR02=00000000 GR03=00000000
HHC02267I CP00: GR04=00000000 GR05=00000000 GR06=00000000 GR07=00000000
HHC02267I CP00: GR08=00000000 GR09=00000000 GR10=00000000 GR11=00000000
HHC02267I CP00: GR12=00000000 GR13=00000000 GR14=00000000 GR15=00000000
HHC02267I CP00: CR00=C080EC40 CR01=0FFD7C00 CR02=FFFFFFFF CR03=00000000
HHC02267I CP00: CR04=00000000 CR05=00000000 CR06=00000000 CR07=00000000
HHC02267I CP00: CR08=00000000 CR09=00000000 CR10=00000000 CR11=00000000
HHC02267I CP00: CR12=00000000 CR13=00000000 CR14=EFC00000 CR15=00FEBB10
INST=50900234 ST 9,564(0,0) store
HHC02267I CP00: V:00000234:K:06=00000000 00000000 00FD4000 070E0000 .......... ..
HHC02267I CP00: PSW=040C00000001D0A2

Figure 332: TRACEOPT command (REGSFIRST)
Example 3:
Display the instruction trace in noregs mode (instruction only).

```
HHC00013I Herc command: 'traceopt noregs'
HHC02203I Hercules inst trace displayed: noregs mode
HHC02267I CP00: V:00FFDEC8:K:06=00000000 00000000 00000000 00000000 ...............  
HHC02267I CP00: PSW=040C10000001DC4 INST=58E00230 L 14,560(0,0) load
HHC02267I CP00: V:00000230:K:06=00000000 00000000 00000000 00FD4000 ............. 
HHC02267I CP00: PSW=040C10000001DC8 INST=50E070BC ST 14,188(0,7) store
HHC02267I CP00: V:00FFDEE4:K:06=00FFDE28 00000000 4001D0A4 00000000 ........ .}u....
HHC02267I CP00: PSW=040C10000001DC0 INST=58E00234 L 14,564(0,0) load
HHC02267I CP00: V:00000234:K:06=00000000 00000000 00FD4000 070E0000 ............. 
HHC02267I CP00: PSW=040C10000001D00 INST=50E070C4 ST 14,196(0,7) store
HHC02267I CP00: V:00FFDEEC:K:06=4001D0A4 00000000 00000000 00000000 .|u..............
HHC02267I CP00: PSW=040C10000001D0D4 INST=58D00010 L 13,16(0,0) load
```

Figure 333: TRACEOPT command (NOREGS)
8.188 TT32 (Control / query CTCI-WIN functionality)

8.188.1 Function
The TT32 command controls or queries the CTCI-WIN functionality for a given device address. It allows you to enable or disable global CTCI-WIN debug tracing, or displays TunTap32 statistics for the specified CTC device.

8.188.2 Syntax

**Descriptive**

TT32 {DEBUG | NODEBUG | STATS devnum}

**Diagram**

```
>>> TT32 <<<
      DEBUG
      NODEBUG
       STATS devnum
```

8.188.3 Parameter

- **DEBUG**: Enable global CTCI-WIN debug tracing.
- **NODEBUG**: Disable global CTCI-WIN debug tracing.
- **STATS**: Display TunTap32 statistics for CTC device.
- **devnum**: Device number of the device for which the TunTap32 statistics have to displayed.

8.188.4 Examples

**Example 1:**
Enable global CTCI-WIN debug tracing.

```
HHC00013I Herc command: 'tt32 debug'
HHC02204I TT32 debug set to enabled
```

Figure 334: TT32 DEFAULT command
Example 2:
Disable global CTCI-WIN debug tracing.

```
HHC00013I Herc command: 'tt32 nodebug'
HHC02204I TT32 debug set to disabled
```

Figure 335: TT32 NODEBUG command

Example 3:
Display TunTap32 statistics for device 0E20.

```
HHC00013I Herc command: 'tt32 stats 0e20'
HHC04101I D:\Hercules\TunTap32.dll Statistics:
   Size of Kernel Hold Buffer:       1024K  
   Size of DLL I/O Buffer:             64K  
   Maximum DLL I/O Bytes Received:      4K  
   0  Total Write Calls
   0  Total Write I/Os
   0  Packets To All Zeroes MAC Written
   0  Total Packets Written
   0  Total Bytes Written
   
   346  Total Read Calls
   1770  Total Read I/Os
   0  Internally Handled ARP Packets
   0  Packets From Ourself
   913  Total Ignored Packets
   0  Packets To All Zeroes MAC Read
   950  Total Packets Read
   524372  Total Bytes Read
```

Figure 336: TT32 STATS command
8.189 TZOFFSET (Set TOD clock offset from GMT)

8.189.1 Function
The TZOFFSET command is used to define the offset of the TOD clock from the current system time. For GMT use the default value (0000). This is also the correct setting if your system time (the time of the operating system on which Hercules is running) is set to local time rather than GMT. For time zones west of Greenwich specify a negative value (example: -0500 for US Eastern Standard Time, -0800 for US Pacific Standard Time). For time zones east of Greenwich, specify a positive value (example: +0100 for Central European Time, +0930 for South Australian Time).

8.189.2 Syntax

Descriptive
TZOFFSET {+hhmm | -hhmm}

Diagram

8.189.3 Parameter
+hhmm Use a positive time in hours and minutes for time zones east of Greenwich.
-hhmm Use a negative time in hours and minutes for time zones west of Greenwich.

8.189.4 Examples

Example 1:
Set the offset of the TOD clock from the current system time to Central European Time.

HHC00013I Herc command: 'tzoffset +0100'
HHC02204I tzoffset       set to +0100

Figure 337: TZOFFSET command
8.190 U (Disassemble storage)

8.190.1 Function
The U command lets you disassemble storage. The argument specifies the storage address to be disassembled. The length of the storage area can be given as an optional argument. The listed storage area is formatted as one line per instruction. Every instruction is shown as a hexadecimal string and as readable assembler statement. Storage areas that cannot be disassembled (data areas) are marked with question marks. Up to 64K bytes can be disassembled.

8.190.2 Syntax

**Descriptive**

```
U [R | V | P | H] {addr.length | addr-addr}
```

**Diagram**

```
U

 addr.length

 addr-addr

 R

 V

 P

 H
```

8.190.3 Parameter

**R**
The optional 'R' argument will force real address translation mode instead of current PSW mode.

**V**
The optional 'V' argument will force virtual address translation mode instead of current PSW mode.

**P**
The optional 'P' argument will force primary space address translation mode instead of current PSW mode.

**H**
The optional 'H' argument will force home space address translation mode instead of current PSW mode.

**addr.length**
Specifies the address of the storage area that is to be disassembled with starting address and length (from address addr with the length of length). The length value must be given in hexadecimal. The maximum length that can be specified is 64K.

**addr-addr**
Specifies an address range with start and end address (from begin address to end address) of the storage area that is to be disassembled. The range specified must not exceed 64K.
8.190.4 Examples

Example 1:

Disassemble 4096 bytes beginning at address 00040130.

```
HHC02289I u 00040130.1000  
HHC02289I P00040130: 90DF02EC  STM  13,15,748(0)  store_multiple
HHC02289I P00040134: 4160000C  LA  6,12(6,0)  load_address
HHC02289I P00040138: 58606160  L  6,352(0,6)  load
HHC02289I P0004013C: 58300010  L  3,16(0,0)  load
HHC02289I P00040140: 58430184  L  4,388(3,0)  load
HHC02289I P00040144: 55C06058  CL  12,88(0,6)  compare_logical
HHC02289I P00040148: 478060E0  BC  8,224(0,6)  branch_on_condition
HHC02289I P0004014C: 8840000A  SRL  4,10(0)  shift_right_single_logical
HHC02289I P00040150: 47F060E4  BC  15,228(0,6)  branch_on_condition
HHC02289I P00040154: 58506228  L  5,552(0,6)  load
HHC02289I P00040158: 5850622C  L  5,556(0,6)  load
HHC02289I P0004015C: 58AB0000  L  10,0(11,0)  load
HHC02289I P00040160: 12AA  LTR  10,10  load_and_test_register
HHC02289I P00040164: B60082B0  STCTL 0,0,688(8)  store_control
HHC02289I P00040168: D40303086166  NC  776(4,0),358(6)  and_character
HHC02289I P0004016C: B6000308  STCTL 0,0,776(0)  store_control
HHC02289I P00040170: 465060FC  BCT  5,252(0,6)  branch_on_count
HHC02289I P00040174: 94DF820C  OI  524(8),32  or_immediate
HHC02289I P00040178: 48E301DC  LH  14,476(3,0)  load_halfword
HHC02289I P0004017C: 54A06234  N  10,564(0,6)  and
HHC02289I P00040180: 15AE  CLR  10,14  compare_logical_register
HHC02289I P00040184: 4720620E  BC  2,526(0,6)  branch_on_condition
HHC02289I P00040188: 98DF02EC  LM  13,15,748(0)  load_multiple
HHC02289I P0004018C: 07F7  BCR  15,7  branch_on_condition_register
HHC02289I P00040190: 456060FC  BCT  5,252(0,6)  branch_on_count
HHC02289I P00040192: 55A06230  CL  10,560(0,6)  compare_logical
HHC02289I P00040198: B6000308  STCTL 0,0,776(0)  store_control
HHC02289I P000401A0: 47000004  BC  4,526(0,6)  branch_on_condition
HHC02289I P000401A4: 9840000A  SRL  4,5(0)  shift_right_single_logical
HHC02289I P000401A8: 4720620E  BC  2,526(0,6)  branch_on_condition
HHC02289I P000401AC: B6000308  STCTL 0,0,776(0)  store_control
HHC02289I P000401B0: D40303086166  NC  776(4,0),358(6)  and_character
HHC02289I P000401B4: D6030308616A  OC  776(4,0),362(6)  or_character
HHC02289I P000401B8: B7000308  LCTL 0,0,776(0)  load_control
HHC02289I P000401BC: A8010308  STOSM 776(0),1  store_then_or_system_mask
HHC02289I P000401C0: ACFE0308  STNSM 776(0),254  store_then_and_system_mask
HHC02289I P000401C4: B8000308  STCTL 0,0,776(0)  store_control
HHC02289I P000401CC: D6082800308  OC  688(1,8),776(0)  or_character
```

Figure 338: U command
8.191 UPTIME (Display Hercules Emulator uptime)

8.191.1 Function
The UPTIME console command displays how long the Hercules Emulator has been running.

8.191.2 Syntax

**Descriptive**
UPTIME

**Diagram**

```
>>> UPTIME <<<
```

8.191.3 Parameter
None.

8.191.4 Examples

Example 1:
Display how long the Hercules Emulator has been running so far (uptime < 1 day).

```
HHC00013I Herc command: 'uptime'
HHC02208I Uptime 06:33:12
```

*Figure 339: UPTIME command (uptime < 1 day)*.

Example 2:
Display how long the Hercules Emulator has been running so far (uptime > 1 week).

```
HHC00013I Herc command: 'uptime'
HHC02208I Uptime 3 weeks, 5 days, 16:48:15.
```

*Figure 340: UPTIME command (uptime > 1 week).*
8.192 V (Display or alter virtual storage)

8.192.1 Function
The V command displays or alters virtual storage. Up to 64K of virtual storage can be displayed, up to 32 bytes of virtual storage can be altered.

8.192.2 Syntax

### Descriptive

V [P | S | H] {addr | addr.length | addr-addr | addr=value}

### Diagram

```
  V  addr
     P   addr.length
     S   addr-addr
     H   addr=value
```

8.192.3 Parameter

- **P**
  The optional 'P' argument will force primary space address translation mode instead of current PSW mode.

- **S**
  The optional 'P' argument will force secondary space address translation mode instead of current PSW mode.

- **H**
  The optional 'H' argument will force home space address translation mode instead of current PSW mode.

- **addr**
  Specifies the address of the virtual storage that is to be displayed. If `addr` is given without a length or without a second address for the end of the storage area then 64 bytes of virtual storage are displayed.

- **addr.length**
  Specifies the address of the virtual storage area that is to be displayed with starting address and length (from address `addr` with the length of `length`). The `length` value must be given in hexadecimal. The maximum length that can be specified is 64K.

- **addr-addr**
  Specifies an address range with start and end address (from begin address to end address) of the virtual storage area that is to be displayed.

- **addr=value**
  Specifies the address of the virtual storage area that is to be altered. `value` is a hex-string of up to 32 pairs of digits (32 bytes) which will be written to the virtual storage address given by the `addr` parameter. After altering the storage, 16 bytes of real storage starting at `addr` are displayed.
8.192.4 Examples

Example 1:
Display 256 (x’FF’) bytes of virtual storage starting from address x’00010000’.

```
HHC00013I Herc command: ‘v 00010000.ff’
HHC02291I V:00010000 (primary) R:00010000
HHC02291I V:00010000:K:04=4770A1C8 5820901C 47F0A1F0 91802003 ....H......0-Oj...
HHC02291I V:00010010:K:04=47E0A1EC 58202004 47F0A1F0 96803200 \...\......0-0o...
HHC02291I V:00010020:K:04=91803200 4770A1FE 12224770 A1DC5850 j......~......&
HHC02291I V:00010030:K:04=30201FCC 195C4770 A01C50CD 30245820 ......*......&
HHC02291I V:00010040:K:04=30089140 320047E0 A28441B0 202C5860 .}..\s......\s...
HHC02291I V:00010050:K:04=02FC98CD D19005ED 58C031F4 12CC4780 .q.J......{.4....
HHC02291I V:00010060:K:04=A24E9120 300047E0 A2424160 203047F0 s+}\s......\s......0
HHC02291I V:00010070:K:04=A2464160 20485870 31F445ED A2E458CD s.\s......4.\sU.\}
HHC02291I V:00010080:K:04=31F812CC 4780A2E2 187C4160 203045E0 .\s......s.\s......\sU.\}
HHC02291I V:00010090:K:04=A2E458CD 31FC12CC 4780A276 187C4160 \sU.\{......s.\s-
HHC02291I V:000100A0:K:04=204045E0 A2E41B0 202C58BD 02FC98CD \..\sU.\}\s\q.
HHC02291I V:000100B0:K:04=19C05ED 91803001 4770A2DA 1FC59C0 J....\s......\s...
HHC02291I V:000100C0:K:04=305047B0 A2A691C0 32004770 A2A659C0 .\.swj{\..swj{\.
HHC02291I V:000100D0:K:04=20047800 A2DA585C 305412CC 4770A2DA \s......\s......s...
HHC02291I V:000100E0:K:04=4A8114B0 0001BA18 30547770 A2DA5810 \s......\s......s...
HHC02291I V:000100F0:K:04=305858F0 001058F0 P2645800 F0005000 \s......0\s......0&.
```

Figure 341: V command (display virtual storage with length)

Example 2:
Change virtual storage at address x’00010000’ to x’FFFFFFF’.

```
HHC00013I Herc command: ‘v 00010000=FFFFFFF’
HHC02291I V:00010000 (primary) R:00010000
HHC02291I V:00010000:K:06=FFFFFFF 5820901C 47F0A1F0 91802003 ..........0-0j...
```

Figure 342: V command (alter virtual storage)

Example 3:
Display virtual storage from address x’00010000’ to address x’00010100’.

```
HHC00013I Herc command: ‘v 00010000-00010100’
HHC02291I V:00010000 (primary) R:00010000
HHC02291I V:00010000:K:06=FFFFFFF 5820901C 47F0A1F0 91802003 ..........0-0j...
HHC02291I V:00010010:K:06=47E0A1EC 58202004 47F0A1F0 96803200 \...\......0-0o...
HHC02291I V:00010020:K:06=91803200 4770A1FE 12224770 A1DC5850 j......~......&
HHC02291I V:00010030:K:06=30201FCC 195C4770 A01C50CD 30245820 ......*......&
HHC02291I V:00010040:K:06=30089140 320047E0 A28441B0 202C5860 .}..\s......\s...
HHC02291I V:00010050:K:06=02FC98CD D19005ED 58C031F4 12CC4780 .q.J......{.4....
HHC02291I V:00010060:K:06=A24E9120 300047E0 A2424160 203047F0 s+}\s......\s......0
HHC02291I V:00010070:K:06=A2464160 20485870 31F445ED A2E458CD s.\s......4.\sU.\}
```

Hercules Emulator V4.00 – User Reference Guide   Page 600
Figure 343: V command (display virtual storage with range)

Example 4:
Display 256 (x’FF’) bytes of virtual storage starting from address x’00010000’. Force Secondary translation instead of current PSW mode.

Figure 344: V command (display virtual storage with ‘S’ option)
8.193 VERSION (Display version information)

8.193.1 Function
The version command is used to display various version and build information about the Hercules emulator.

8.193.2 Syntax

Descriptive
VERSION

Diagram

Expr: VERSION

8.193.3 Parameter
None.

8.193.4 Examples
Example 1:
Display the Hercules version information.

HHC00013I Herc command: 'version'
HHC01413I Hercules version 3.07-svn-6583
HHC01414I (c) Copyright 1999-2010 by Roger Bowler, Jan Jaeger, and others
HHC01415I Built on Sep 24 2010 at 23:46:56
HHC01416I Build information:
HHC01417I Windows (MSVC) build for i386
HHC01417I Modes: S/370 ESA/390 z/Arch
.
several lines not displayed
.
HHC01417I Regular Expressions support
HHC01417I Automatic Operator support
HHC01417I Machine dependent assists: cmpxchg1 cmpxchg4 cmpxchg8 fetch_dw store_dw
HHC01417I Running on GOOFY Windows-6.1.7600. 7 Ultimate Edition, 32-bit i686 MP=8

Figure 345: VERSION command
8.194 XPNDSIZE (Display or set expanded storage size)

8.194.1 Function

The XPNDSIZE command is used to specify the size of the main storage in megabytes. Given without an argument the XPNDSIZE command displays the current size of the expanded storage. Storage is allocated in megabytes, unless a specific unit is specified. The actual upper limit of the expanded storage is determined by the host system's architecture, operating system, and on some systems the amount of physical memory and paging space you have available. The lower limit is 0.

The practical limit depends on the maximum amount of storage that can be obtained by “malloc” (usually around 1 GB on 32-bit platforms; on 64-bit platforms the value should only be limited by available paging space).

When increasing the expanded size Hercules attempts to allocate first the new storage. If the new allocation is successful then the previously allocated memory will be freed. This is to prevent a situation where the old memory is freed first, then the new allocation fails and a reallocation of the memory in the previous size also fails because of storage fragmentation and therefore leaving Hercules without memory.

When decreasing the expanded storage the memory will stay allocated in the previous size but the storage size will appear as decreased. Subsequent increases will not reallocate memory unless they go over the already allocated amount.

An additional optional argument determines the locking state of the allocated memory (page lock by host operating system). The LOCKED option indicates that the memory is to be locked into storage while UNLOCKED (the default) indicates that the memory is not locked into the storage.

Please note that Hercules preserves the last locking state of XPNDSIZE. Once storage is locked, any subsequent change to the expanded storage size will honor the existing lock state of memory unless the lock state is specified again on the XPNDSIZE command.

Caution: Do not lock expanded storage unless sufficient real memory is available to back up the request. Failure to do so may require the host system to be rebooted.

8.194.2 Syntax

Descriptive

XPNDSIZE [xsize[M | G | T] [UNLOCK | LOCK]]
8.194.3 Parameter

`size`  
The value of `xsize` must be a valid decimal number. The actual upper limit is determined by the host system's architecture, the operating system and on some systems the amount of physical memory and paging space that is available.

Storage sizes not on a 1M boundary are rounded up to the next 1M boundary. The lower limit and default is 0.

M  
‘M’ determines that the number given is specified in megabytes (multiplier `2**20`). This is the default if no unit is appended.

G  
‘G’ determines that the number given is specified in gigabytes (multiplier `2**30`).

T  
‘T’ determines that the number given is specified in terabytes (multiplier `2**40`). On 32-bit machines the unit terabytes is not available.

LOCK  
Attempt to lock the storage (pages locked by the host operating system).

UNLOCK  
Leave the store unlocked (no pages locked by the host operating system). This is the default.

Notes:
The actual upper limit is determined by the host system's architecture and operating system, the guest operating system and the amount of physical memory and available paging space.

The total of MAINSIZE and XPNDSIZE on host systems with a 32-bit architecture will be limited to less than 4G; host systems with a 64-bit architecture will be limited to less than 16E.

Use of storage sizes greater than supported by the guest operating system may generate incorrect results or error conditions within the guest operating system.

8.194.4 Overview Storage Allocation Units

<table>
<thead>
<tr>
<th>Unit</th>
<th>Multiplier</th>
<th>Name (Symbol)</th>
<th>IEC Name (IEC Symbol)</th>
<th>Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>2**20</td>
<td>Megabyte (MB)</td>
<td>Mebibyte (MiB)</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>2**30</td>
<td>Gigabyte (GB)</td>
<td>Gibibyte (GiB)</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>2**40</td>
<td>Terabyte (TB)</td>
<td>Tebibyte (TiB)</td>
<td>Not on 32-bit machines</td>
</tr>
</tbody>
</table>

Table 24: Storage Allocation Units
8.194.5 Examples

Example 1:
Display the current size of the expanded storage.

```
HHC00013I Herc command: 'xpndsize'
HHC17003I EXPANDED storage is 256 MBytes 'xpndsize'; storage is not locked
```

Figure 346: XPNDSIZE command (display size of expanded storage)

Example 2:
Set the size of the expanded storage to 128 MB. Do not lock the memory into the storage.

```
HHC00013I Herc command: 'xpndsize 128'
HHC17003I EXPANDED storage is 128 MBytes 'xpndsize'; storage is not locked
```

Figure 347: XPNDSIZE command (set size of unlocked expanded storage)

Example 3:
Set the size of the expanded storage to 512 MB. Lock the memory into the storage.

```
HHC00013I Herc command: 'xpndsize 512 lock'
HHC01428I Locking expanded storage
HHC17003I EXPANDED storage is 512 MBytes 'xpndsize'; storage is locked
```

Figure 348: XPNDSIZE command (set size of locked expanded storage)
8.195 YROFFSET (Set TOD clock offset from actual date)

8.195.1 Function
The YROFFSET command specifies the number of years the TOD clock is offset from the actual date. Positive numbers will move the clock forward in time while negative numbers will move it backward. A common value for non-Y2K-compliant operating systems is YROFFSET -28 which has the advantage that the day of the week and the presence or absence of February 29 is the same as the current year.

8.195.2 Syntax

Descriptive

YROFFSET {+years | -years}

Diagram

\[ \begin{align*}
\text{YROFFSET} & \quad +\text{years} \\
\text{-years} & \quad \end{align*} \]

8.195.3 Parameter

+years  
Specifies the number of years the TOD clock is offset positive from the actual date. This value may not be specified as greater than +/-142 years, the total range of the TOD clock. Specifying a value that causes the computed TOD clock year to be more than 142 years later than SYSEPOCH will produce unexpected results.

-years  
Specifies the number of years the TOD clock is offset positive from the actual date. This value may not be specified as greater than +/-142 years, the total range of the TOD clock. Specifying a value that causes the computed TOD clock year to be earlier than the value of SYSEPOCH will produce unexpected results.

8.195.4 Examples

Example 1:
Specify 28 years to offset the TOD clock from the actual date.

HHC00013I Herc command: 'yroffset -28'
HHC02204I yroffset set to -28

Figure 349: YROFFSET command
9. Shared Device Support

9.1 Basics

Shared Device Support (see also "General Information" manual) allows multiple Hercules instances to share devices. The device will be local to one Hercules instance and remote to all other Hercules instances. The local instance is the server for that device and the remote instances are the clients. It is possible that each instance acts as both a client and a server. If a local instance declares a device as remote on another instance and on this remote instance the device is defined again as remote on a third instance, then the original instance will have to hop through this second instance to get to the real device.

It is not necessary to IPL an operating system on the device server. Any number of Hercules instances can act as a server in a "HERCPLEX".

When "SHRDPORT" is specified in the Hercules configuration the thread "shared_server" is started at the end of Hercules initialization. If Shared Device Support is requested on a device statement then the Hercules instances cannot initialize these devices until the server is started on each system. In this case the device trying to access a server gets the 'connecting' bit set on in the DEVBLK and the device still needs to initialize. After the shared server is started a thread is attached for each device that is attempting to complete the connection (the device init handler).

9.2 Caching

Cached records (i.e. CKD tracks or FBA blocks) are kept independently on both the client and server sides. Whenever the client issues a START request to initiate a channel program, the server will return a list of records to purge from the clients cache. These will have been updated by other clients since the last START request. If the list is too large the server will indicate that the client should purge all records for the device.

9.3 Compression

Data that would normally be transferred uncompressed between the client and the host can optionally be compressed by specifying the "COMP=n" keyword on the device configuration statement (see below) or on the attach command. The value n of the "COMP=n" keyword is the zlib compression parameter which must be a number between 1 and 9. A value closer to 1 means less compression but less processor time to perform the compression. A value closer to 9 means the data is compressed more but also more processor time is required to compress the data.

If the server is on localhost then you should not specify compression. Otherwise you are just stealing processor time from Hercules to facilitate compression/decompression. If the server is on a local network then a low value such as 1, 2 or 3 is recommended. There is a tradeoff curve, attempting to trade CPU cycles for network traffic to derive an optimal throughput.

If the devices on the server are compressed devices (i.e. CCKD or CFBA) then the records (track images or block groups) may be transferred compressed regardless of the "COMP=n" settings. This depends on whether the client supports the compression type (zlib or bzip2) of the record on the server and whether the record is actually compressed in the server cache.

An example may help to explain this: Suppose on the client that you execute one or more channel programs to read a record on a CKD track, update a record on the same track, and then read another (or the same) record on the track. For the first read the server will read the track image and pass it to the client as it was originally compressed in the file. To update a portion of the track image the server must decompress the track image so data in it can be updated. When the client next reads from the track image the track image is uncompressed.
Specifying "COMP=n" means that uncompressed data sent to the client will be compressed. If the data to be sent to the client is already compressed then the data is sent as is unless the client has indicated that it does not support that compression algorithm.

### 9.4 Usage of Shared Devices

To use a device on a remote Hercules instance, instead of specifying a file name on the device statement, an IP address or a DNS name is specified.

#### 9.4.1 Syntax

**Descriptive**

\[
\text{loc\_devnum dev\_type host[}:\text{port} | :3990] [\text{:rem\_devnum}] [\text{COMP=n}]
\]

**Diagram**

![Diagram of shared device syntax]

#### 9.4.2 Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>loc_devnum</strong></td>
<td>This specifies the device address on the local Hercules instance.</td>
</tr>
<tr>
<td><strong>dev_type</strong></td>
<td>This is the device type.</td>
</tr>
<tr>
<td><strong>host</strong></td>
<td>This specifies the host name or the IP address of the system where the Shared Device Server is running.</td>
</tr>
<tr>
<td><strong>port</strong></td>
<td>The port number on which the Shared Device Server is listening. If the port number is omitted then the default port (3990) is used.</td>
</tr>
<tr>
<td><strong>rem_devnum</strong></td>
<td>This is the device address of the device on the remote Hercules instance. If the remote device address is omitted then the default is the current device number on the local system.</td>
</tr>
<tr>
<td><strong>COMP=n</strong></td>
<td>This keyword requests that the data has to be transferred compressed between the client and the server. The argument ( n ) specifies the compression level (1-9). A value closer to 1 means less compression but also less processor time to perform the compression. A value closer to 9 means the data is compressed more but also more processor time is required to compress the data.</td>
</tr>
</tbody>
</table>
9.4.3 Examples

Example 1:
There is a shared device server on the local host listening on port 3990 and we want to use its 0100 device as our 0100 device. The device statement will look like this:

0100 3390 localhost:3990:0100

Because the default port number is actually 3990 and the default remote device address is the same as the local device number the above statement (providing we do not have actually a file named 'localhost' ) could be shortened as follows:

0100 3390 localhost

Example 2:
Device sharing can also be split between multiple instances. For example, suppose the following device definitions and system parameter for instance A:

SHRDPORT 3990
0100 3390 localhost:3991
0101 3390 mvscat.dasd

And for instance B we have the following device definitions and system parameter:

SHRDPORT 3991
0100 3390 mvsres.dasd
0101 3390 localhost

In this case each instance acts as both a client and a server. Both instances of Hercules are running on the same machine.

The above examples may be clearer if we specify also all the default values. To show this the same configuration is used but in this case the Hercules instances are running on separate physical machines:

Hercules instance A (machine IP 192.168.200.1):

SHRDPORT 3990
0101 3390 mvscat.dasd # Local on 192.168.200.1 (mvscat.dasd)

Hercules instance B (machine IP 192.168.200.2):

SHRDPORT 3991
0100 3390 mvsres.dasd # Local on 192.168.200.2 (mvsres.dasd)
10. Hercules 3270 Logo

10.1 Function

The Hercules 3270 logo is the initial welcome screen that is presented when a 3270 terminal connects to a Hercules 3270 device. While in previous releases of Hercules this logo screen was hardcoded it can now be customized.

The customized logo is stored in a plain text file which contains positioning orders, attributes and supports variable substitutions. Each line in the text file represents either an order statement or a plain text line. If no logo file is specified then Hercules uses a built-in default logo. Upon startup Hercules will first look in the current directory for a file called "herclogo.txt". The name of the logo file can also be specified as a startup option by using the "-b" flag. The file may also be specified using the "LOGOFILE" system parameter or can be changed during Hercules operation using the "HERCLOGO" console command.

10.2 Order Commands

Order commands are used to set the current buffer position, set the highlight and/or protected attributes, to force a skip to a new line and to specify text alignment.

10.2.1 Set Buffer Address

Descriptive

@SBA \textit{x,y}

Diagram

\begin{center}
\textbf{\large @SBA \textit{x,y}}
\end{center}

The Set Buffer Address order sets the current buffer position to row \textit{x} and column \textit{y}. Row and column both begin counting with zero.

10.2.2 Set Field

Descriptive

@SF \{H | P | HP\}
The Set Field order sets the highlight ("H") and/or protected ("P") attribute.

### 10.2.3 New Line

The New Line order forces a skip to a new line.

### 10.2.4 Align

The Align order specifies the text alignment relative to the left and right borders of the terminal. When the alignment is other than "NONE" a new line is automatically inserted after each line of text. If the alignment is "NONE" then the text will be written without skipping to the next line.
10.3 Variables

It is possible to imbed substitution variables in the outgoing text. Substitution is indicated by enclosing the variable name between "$" and ""). The Hercules version as an example can be specified by the following string: $(VERSION)

The following variables are defined. It is also possible to specify environment variable names.

- $(VERSION)
The Hercules version.
- $(HOSTNAME)
The host name, on which Hercules is running.
- $(HOSTOS)
The host operating system.
- $(HOSTOSREL)
The release of the host operating system.
- $(HOSTOSVER)
The version of the host operating system.
- $(HOSTARCH)
The host architecture.
- $(HOSTNUMCPUS)
The number of host CPUs. UP (Uniprocessor for one CPU), or MP=n (Multiprocessor for more than one CPUs).
- $(LPARNAME)
The LPAR name specified in the configuration file.
- $(CSS)
The logical channel subsystem set or channel set for the terminal.
- $(SUBCHAN)
The subchannel number for the terminal.
- $(CCUU), $(ccuu), $(CUU), $(cuu)
Various forms of the device number of the terminal.

10.4 Sample

The file "herclogo.txt" is provided in the Hercules distribution as a sample template. This sample reflects the contents of the built-in logo.

```
@ALIGN NONE
@SBA 0,0
@SF P
Hercules Version :
@SF HP
$(VERSION)
@NL
@SF P
Host name :
```
@SF HP
$(HOSTNAME)
@NL
@SF P
Host OS           :
@SF HP
$(HOSTOS)-$(HOSTOSREL) $(HOSTOSVER)
@NL
@SF P
Host Architecture :
@SF HP
$(HOSTARCH)
@NL
@SF P
Processors        :
@SF HP
$(HOSTNUMCPUS)
@NL
@SF P
Chanl Subsys      :
@SF HP
$(CSS)
@NL
@SF P
Device number     :
@SF HP
$(CCUU)
@NL
@SF P
Subchannel        :
@SF HP
$(SUBCHAN)
@SF P
@ALIGN LEFT

HHH          HHH   The S/370, ESA/390 and z/Architecture
HHH          HHH                 Emulator
HHH          HHH
HHH          HHH   EEEE RRR   CCC U U L   EEEE  SSS
HHHhhhhhhhhhhhhhhhh E R R C U U L E S
HHHhhhhhhhhhhhhhh  EEE RRR C U U L EEE SS
HHHhhhhhhhhhhhhhh EEE RRR C U U L EEE SS
HHH          HHH   EEEE R  R  CCC  UU  LLLL EEEE SSS
HHH          HHH
HHH          HHH
HHH          HHH   I can’t believe it’s not a MAINFRAME

Figure 350: Logo File

Copyright (c) 1999-2010 Roger Bowler, Jan Jaeger, and others
This above sample file results in the following Hercules Logo screen:

![Hercules Logo Screen](image-url)

**Figure 351: Logo Screen**
11. Starting the Hercules Emulator

11.1 Starting Hercules in Native Mode

Hercules can be manually started from a Windows Command Prompt or can be started by calling a batch file (the preferred way). In both cases the syntax is the same.

11.1.1 Syntax

Descriptive

```
HERCULES [{-f configfile | --config=configfile}]
 [-r rcfile | --rcfile=rcfile]
 [-b logfile | --herclogo=logfile]
 [-d | --daemon]
 [-p dyndir | --modpath=dyndir]
 [-l dynmod [...] | --ldmod=dyndir [...]]
 [-s symbol=value [...] | --defsym=symbol=value [...]]
 [-v | --verbose]
 [-h | --help]
[>logfile]
```

Diagram

```
  HERCULES  |{-f configfile --config=configfile}|
             |                  |{-r rcfile --rcfile=rcfile}|
             |                  |{-b logfile --herclogo=logfile}
             |                  |{-d --daemon}
             |                  |{-p dyndir --modpath=dyndir}
             |                  |{-l dynmod [...] --ldmod=dyndir [...]}
             |                  |{-s symbol=value [...] --defsym=symbol=value [...]}
             |                  |{-v --verbose}
             |                  |{-h --help}
             |                  |[>logfile]
```
11.1.2 Parameter

- `configfile`  
  --config=configfile
  This is the name of the configuration file. If the filename is not specified the default is HERCULES.CNF. The name of the default configuration file may be overridden by the 'HERCULES_CNF' environment variable.

- `rcfile`  
  --rcfile=rcfile
  This specifies the name of the Hercules run-commands file. The run-commands file automatically executes panelcommands upon startup.

- `logfile`  
  --logofile=logfile
  Specifies the name of a customized logo text file in the current Hercules directory (for details on how to customize a logofile see chapter 10).

- `daemon`  
  --daemon
  Specifies that Hercules is to be run in “daemon” mode, wherein it runs invisibly with no attached console.

- `dyndir`  
  --modpath=dyndir
  This is the directory from which dynamic modules are to be loaded. The general search order is the following:
  1. -p from startup argument.
  2. HERCULES_LIB environment variable.
  3. MODULES_DIR compile time definition
  4. The path where Hercules was found and if this is not resolved, then "hercules" is used as pathname.

- `dynmod`  
  --ldmod=dynmod
  This is the name of an additional dynamic load module to be loaded at startup. More than one additional module may be specified, although each must be preceded with the "-l" option.

- `sym=value`  
  --defsym=symbol=value
  Specifies a symbol definition where `sym` is the name of the symbol and `val` is the value that is assigned to the symbol. This option has the same effect as a DEFSYM statement in the configuration file.

  If there is a DEFSYM statement in the configuration file that has the same name for the symbol as a symbol defined in the startup command then the configuration DEFSYM statement takes precedence.
-v  --verbose  Specifies that Hercules is to be started with "MSGLEVEL VERBOSE" which displays additional messages during configuration file processing.

-h  --help  Display help information regarding the syntax of the command-line arguments.

>logfile  This is an optional log file which will receive a copy of all messages displayed on the control panel.

### 11.1.3 Examples

**Example 1:**
Start Hercules using the configuration file "D:\MVS\CONF\MVS38J.CONF" and write all messages to the log file "D:\MVS\LOGS\HERCULES.LOG".

```
HERCULES -f D:\MVS\CONF\MVS38J.CONF >D:\MVS\LOGS\HERCULES.LOG
```

**Example 2:**
Start Hercules using the configuration file "D:\S390\CONF\zLINUX.CNF" and with a logfile called "zLINUX_Logo.txt". Display additional messages during configuration file processing.

```
HERCULES -f D:\S390\CONF\zLINUX.CNF -b zLINUX_Logo.txt -v
```

**Example 3:**
Start Hercules using the configuration file "D:\S390\CONF\zLINUX.CNF" and define a symbol named "DASDPATH" that contains the path of the DASD files ("D:\MVS\DASD").

```
HERCULES -f D:\MVS\CONF\MVS38J.CONF -s DASDPATH=D:\MVS\DASD
```

**Example 4:**
Start Hercules using the configuration file "D:\MVS\CONF\MVS38J.CONF" and automatically execute the panel commands contained in the run-commands file "D:\MVS\CONF\MVS38.RC"

```
HERCULES -f D:\MVS\CONF\MVS38J.CONF -r D:\MVS\CONF\MVS38.J.RC
```
11.2 Starting Hercules with the Windows GUI

The Windows GUI can be started by just clicking on the GUI icon. Then all necessary settings required to start Hercules can be specified using the GUI itself.

Alternatively the Windows GUI may also be manually started from a Windows Command Prompt or can be started by calling a batch file (which is the preferred way of these two options). In both cases the syntax is the same.

11.2.1 Syntax

Descriptive

HERCGUI [-f configfile]

Diagram

```
HERCGUI  [-f configfile]
```

11.2.2 Parameter

- `-f configfile` This is the name of a configuration file. If the HercGUI is started with the name of a configuration file then the HercGUI will automatically "power on" Hercules once the HercGUI itself is started. This is called the "Auto-Power-On" feature. When using this feature in conjunction with a Hercules ".RC" (run commands) file it is possible to totally automate Hercules startup and IPL.

11.2.3 Examples

Example 1:
Start Hercules using the HercGUI with the "Auto-Power-On" feature using the configuration file "D:\MVS\CONF\MVS38J.CONF".

HERCGUI -f D:\MVS\CONF\MVS38J.CONF

Example 2:
Start the HercGUI without a configuration file.

HERCGUI
11.3 Starting Hercules with the Hercules Studio

The Hercules Studio can be started by navigating to the 'Applications -> System Tools -> Hercules Studio' menu entry and selecting it from there. Then all necessary settings required to start Hercules can be specified using the Hercules Studio itself.

Alternatively the Hercules Studio may also be manually started from a command shell or can be started by calling a script file. In both cases the syntax is the same.

11.3.1 Syntax

<table>
<thead>
<tr>
<th>Descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>HerculesStudio [-f configfile] [-r rcfile]</td>
</tr>
</tbody>
</table>

Diagram

```
 HérculesStudio -f configfile [-r rcfile]
```

11.3.2 Parameter

- **-f configfile**  This is the name of a configuration file. If the Hercules Studio is started with the name of a configuration file then it will automatically “power on” Hercules once the Hercules Studio itself is started. This is called the “Auto-Power-On” feature. When using this feature in conjunction with a Hercules “.RC” (run-commands) file it is possible to totally automate Hercules startup and IPL.

- **-r rcfile**  This is the name of an optional RC (run-commands) file. This file contains Hercules console commands that are issued exactly as if the commands were entered from the Hercules system console.

11.3.3 Examples

Example 1:
Start Hercules Studio using the configuration file “mvs38j.cnf” and the run-commands file "autoipl.rc".

HerculesStudio -f mvs38j.cnf -r autoipl.rc
12. The Run-Commands File

12.1 Function

Hercules supports the ability to have console commands automatically executed at startup via the ‘run-commands’ file. If the run-commands file is found to exist when Hercules starts then each line of the file is read and interpreted as a console command, exactly as if the command were entered from the HMC system console.

The default filename for the run-commands file is "hercules.rc". The default name may be overridden by setting the "HERCULES_RC" environment variable.

Except for the 'pause' command (see below), each command read from the run-commands file is logged to the console preceded by a “>” (greater-than sign) character. Thus you can easily distinguish between console commands entered from the keyboard from those entered via the run-commands file.

Comment lines starting with '#' are treated as "silent comments" and are thus not logged to the console whereas comment lines starting with '*' are treated as "loud comments" and will be logged.

12.2 Run-Commands File Statements

There is a number of different types of commands that can be specified within a run-commands file. These commands are the following:

- "herccmd" (any valid Hercules console command)
- PAUSE  (delay the processing of the next command)
- #  (issue silent comment)
- *  (issue loud comment)

12.2.1 Hercules Console Commands

In the run-commands file any valid Hercules console command ("herccmd") can be specified. This includes the ‘sh’ (shell) command. Each command that is read from the run-commands file is logged to the console preceded by a ‘>’ (‘greater-than’ sign) character. This is to distinguish between console commands entered manually from the keyboard from those commands entered via the run-commands file.
Examples:

MAXRATES MIDNIGHT
IPL 0148

12.2.2 PAUSE

Descriptive

PAUSE \{nnn \mid nnn.nnn\}

Diagram

A pause command is supported in order to introduce a brief delay before reading and processing the next line in the file. The value \( nnn \) can be any number from 1 to 999 and specifies the number of seconds to delay before reading the next line. Beginning with Hercules version 4.0 pause can also be specified for sub-second delays (e.g. "PAUSE 0.125" to delay the next command for 125 milliseconds).

Examples:

PAUSE 2
PAUSE 0.375

12.2.3 # (Silent Comment)

Descriptive

# \[ comment \]

Diagram

Lines starting with "#" are treated as "silent comments". They are intended as comments just for the run-commands file itself and are thus not logged to the console. That means they are not visible when Hercules is started and the run-commands file is executed.
Examples:

```
# ==============================================================
# This comment block will not be logged to the console
# ==============================================================

12.2.4 *(Loud Comment)*

### Descriptive

```
* [comment]
```

### Diagram

```
[comment]
```

Lines starting with "*" are treated as "loud comments". They will be logged to the console and thus are visible when the run-commands file is executed.

Examples:

```
* ==============================================================
* This comment block will be logged to the console
* ==============================================================
```

### 12.3 Automating Hercules Startup

Creative use of the run-commands file can completely automate Hercules startup. The next figure shows a sample run-commands file that does the following:

- "pause 1" – Wait one second before processing the first Hercules command. (1)
- "cmdlevel all" – Set the current command group to ALL. This allows that all Hercules commands can be issued. (2)
- "help" – Display all valid commands for the chosen command group that has been set before with CMDLEVEL. (3)
- "maxrates midnight" – Set the MAXRATES reporting interval to midnight to have the MIPS and I/O statistics issued date aligned. (4)
- "sh startgui "D:\MVS\TERMINALS.BAT"" – Execute the named batch file in the shell to start a couple of tn3270 sessions. See details below. (5)
- "pause 3" – Wait three seconds until all tn3270 sessions have been successfully connected. (6)
• “ipl 0148” – Finally IPL MVS 3.8J from device address 148. (7)

---

```bash
# Hercules RUN-COMMANDS (RC) File
#
# --- Wait 1 second before issuing Hercules commands (1) ---
pause 1
#
# --- Set command level to 'ALL' (2) ---
cmdlevel all
#
# --- Display all valid Hercules panel commands (3) ---
help
#
# --- Display and reset maxrates values (4) ---
maxrates midnight
#
# --- Start tn3270 sessions (5) ---
sh startgui "D:\MVS\TERMINALS.BAT"
#
# --- Wait 3 second before IPL'ing MVS (6) ---
pause 3
#
# --- IPL MVS 3.8J (7) ---
ipl 0148
```

---

**Figure 352: Run-commands (.rc) file**

With the run-commands file shown above the Hercules startup is fully automated. After starting Hercules there is no manual intervention required until MVS is up and running.
The next figure shows the batch file that is used in the run-commands file (step 5) to start the tn3270 sessions.

```
@ECHO OFF
REM *******************************************************************************************
REM Start master console and wait for connection to Hercules
REM *******************************************************************************************
START /D "C:\Program Files (x86)\TomBrennanSoftware\VistaTN3270" VistaTN3270.EXE MVS38J_MST.SES
CHOICE /t 1 /d y
REM *******************************************************************************************
REM Start operator console and wait for connection to Hercules
REM *******************************************************************************************
START /D "C:\Program Files (x86)\TomBrennanSoftware\VistaTN3270" VistaTN3270.EXE MVS38J_OPR.SES
CHOICE /t 1 /d y
REM *******************************************************************************************
REM Start TSO terminals and wait for connection to Hercules
REM *******************************************************************************************
START /D "C:\Program Files (x86)\TomBrennanSoftware\VistaTN3270" VistaTN3270.EXE MVS38J_TSO.SES
CHOICE /t 1 /d y
START /D "C:\Program Files (x86)\TomBrennanSoftware\VistaTN3270" VistaTN3270.EXE MVS38J_TSO.SES
EXIT
```

**Figure 353: Batch file to start tn3270 sessions**

The CHOICE command used in the batch file is to issue a delay before trying to connect the next tn3270 session.

The "/t" parameter specifies the number of seconds to pause before a default choice is made. Option "/d" specifies the default choice that is issued after the timeout has expired. The character given as argument must be in the set of choices specified by the "/c" option (defaults are 'Y' and 'N').
13. The “Hercules Automatic Operator” (HAO) Facility

13.1 HAO Introduction

The Hercules Automatic Operator (HAO) feature is a facility which can automatically issue panel commands in response to specific messages appearing on the Hercules console.

To use the Hercules Automatic Operator facility, you first define a rule consisting of a target and the associated command. The target is a regular expression pattern used to match against the text of the various messages that Hercules issues as it runs. Whenever a match is found, the rule “fires” and its associated command is automatically issued.

The Hercules Automatic Operator facility only operates on messages issued to the Hercules console. These messages may originate from Hercules itself or from the guest operating system via the SCP SYSCONS interface or via the integrated console printer-keyboard (3215-C or 1052-C). HAO cannot intercept messages issued by the guest operating system to its own terminals.

13.2 Defining HAO Rules

To define a HAO rule, enter the command

HAO TGT target

to define the rule’s target match pattern, followed by the command

HAO CMD command

to define the rule’s associated panel command.

The target is a regular expression as defined by your host platform. When running on Linux, Hercules uses POSIX Extended Regular Expression syntax. On a Windows platform, regular expression support is provided by Perl Compatible Regular Expression (PCRE). The HAO facility can only be used if regular expression support was included in Hercules at build time.

The associated command is whatever valid Hercules panel command you wish to issue in response to a message being issued that matches the given target pattern.

13.3 Deleting HAO Rules

To delete a fully or partially defined HAO rule, first use the following command to get a list of all of the defined (or partially defined) rules

HAO LIST [nnn]

Where nnn is the (optional) number of an existing rule. This gives you the list of all rules with the specified identifier or lists the rule with identifier ‘nnn’. Then use the next command to delete the specific rule identified by the identifier ‘nnn’

HAO DEL nnn
To every rule there is a number assigned as the rule is defined. The rules then are subsequently identified by their numeric value.

It is also possible to delete all defined or partially defined rules by issuing the following command

HAO CLEAR

### 13.4 Substituting Substrings

The command may contain special variables ($1, $2, $3, etc.) which will be replaced by the values of “capturing groups” in the match pattern. A capturing group is a part of the regular expression enclosed in parenthesis which is matched with text in the target message. In this way commands may be constructed which contain substrings extracted from the message which triggered the command.

The following special variables are recognized:

- $1 to $9 – the text which matched the first to ninth capturing group in the target regular expression.
- $` – the text preceding the regular expression match.
- $' – the text following the regular expression match.
- $$ – replaced by a single dollar sign.

Note that the substitution of a $n variable does not occur if there are fewer than $n capturing groups in the regular expression.

### 13.5 Limitations

The current implementation limits the total number of defined rules to 64. This limit may be raised by increasing the value of the HAO_MAXRULE constant in module “hao.c” and rebuilding Hercules.

All defined rules are checked for a match each time Hercules issues a message. There is no way to specify “stop processing subsequent rules”. If a message is issued that matches two or more rules, each associated command is then issued in sequence.

### 13.6 Examples

#### Example 1:

Issue the command “i 0700” in response to the message:

HHC01090I 0:0700 COMM: client 127.0.0.1 devtype 3270: connection reset

The following HAO commands define the desired rule:

HAO TGT HHC01090I 0:{[0-9A-F]{3,4}}
HAO CMD i $1
Example 2:
Use the dot matrix display of a 3480 tape unit to implement an automatic tape library (please note that the first HAO command has been split over two lines to fit on the page):

```
HAO TGT HHC00224I 0:{[0-9A-F]{4}} Tape file *, type aws:
  display (?:".{8}" / )?"M([A-Z0-9]{1,6})\s*S"
HAO CMD devinit $1 D:\MVSTAPES\$2.AWSTAPE
```
14. REXX Support

14.1 Prerequisites

Support for Rexx (both ooRexx and Regina Rexx) is built into the downloadable version of Hercules. The only thing needed is to install one (or both) of the two supported Rexx packages (see Appendix H. Links). If the Rexx packages are installed with the standard installation procedures (using the provided installers) then the needed environment variables are created automatically during the installation and no manual action is required. For more information on how to build Rexx support into Hercules please refer to the “Installation Guide”.

14.2 Using Rexx

Rexx can be used in various ways within Hercules:

- Invoking Rexx scripts explicitly through the EXEC console command.
- Invoking Rexx in the run-commands file.
- Invoking Rexx in the configuration file.

14.2.1 Explicitely invoking Rexx

The EXEC console command may be used to explicitly invoke a Rexx script. The required argument is the name (and optionally path) of the Rexx script. Optional arguments will be passed to the Rexx script.

Example 1:

EXEC d:\rexx\script.rex arg1 arg2

In the above example the Rexx script named “script.rex” located on drive d: in directory “rexx” will be called with “arg1” and “arg2” as arguments.

14.2.2 Implicitely invoking Rexx

Rexx will be invoked implicitly if existing script files (e.g. a configuration file or a run-commands file) start with “/*”.

Example:

/* REXX */

SELECT
   WHEN SYSTEM = 'S/370' THEN DO
      ADDRESS HERCULES 'ARCHLVL S/370'
      ADDRESS HERCULES 'ENGINES 1*CP'
      ADDRESS HERCULES 'MAINSIZE 16'
      ADDRESS HERCULES 'XPNDSIZE 0'
   END
WHEN SYSTEM = 'ESA/390' THEN DO
  ADDRESS HERCULES 'ARCHLVL ESA/390'
  ADDRESS HERCULES 'MAINSIZE 2048'
  ADDRESS HERCULES 'ENGINES 2*CP'
  ADDRESS HERCULES 'XPNDSIZE 2048'
END
WHEN SYSTEM = 'z/ARCH' THEN DO
  ADDRESS HERCULES 'ARCHLVL z/ARCH'
  ADDRESS HERCULES 'MAINSIZE 4096'
  ADDRESS HERCULES 'ENGINES 4*CP,2*AP'
  ADDRESS HERCULES 'XPNDSIZE 0'
END
OTHERWISE DO
  SAY 'Invalid architecture mode specified'
  RETURN 16
END

The above extract from a configuration file shows the different settings of system parameters depending on the value of a variable.

14.3 Command Environment

Hercules commands can be issued from Rexx through the Hercules command environment. The Hercules command environment is the default environment, therefore it is not necessary to specify it, when using Hercules commands within a Rexx script.

Example 1:
Executing the Hercules ‘ARCHLVL’ command from a Rexx script specifying the Hercules command environment.

ADDRESS HERCULES 'ARCHLVL S/370'

Example 2:
Executing the Hercules ‘ARCHLVL’ command from a Rexx script without specifying the Hercules command environment.

'ARCHLVL S/370'

14.4 The Rexx Builtin Function “value()”

Hercules symbols and environment variables can be retrieved with “value()” or “getenv()”. The builtin function “getenv()” is obsolete and has been replaced by “value()” and should no longer be used.
14.4.1 Function

The Rexx built-in function “value()” is used to retrieve the value of existing variables. An optional parameter can be used to search within a specific variable pool. To retrieve the values of Hercules symbols the “SYSTEM” pool must be specified, to retrieve the values of Hercules (and other) environment variables the “ENVIRONMENT” pool must be specified. See the Regina Rexx documentation for more details on “value().”

14.4.2 Syntax

Descriptive

VALUE (symbol [,value] [,pool])

Diagram

```
VALUE (symbol, value, pool)
```

14.4.3 Parameter

**symbol**

This names an existing variable. If *symbol* does not name an existing variable, the default value is returned, and the NOVALUE condition is not raised.

If *symbol* is not a valid symbol name and the function is used to access an normal Rexx variable, an error occurs.

**value**

If the optional second parameter *value* is specified, the variable will be set to that value, after the old value has been extracted.

**pool**

The optional parameter *pool* might be specified to select a particular variable pool to search for *symbol*. The contents and format of *pool* is implementation dependent.

The default is to search in the variables at the current procedural level in Rexx. Which *pools* that are available is implementation dependent, but typically one can set variables in application programs or in the operating system.

Specify “SYSTEM” to retrieve the value of a Hercules symbol or “ENVIRONMENT” to retrieve the value of a Hercules (or another) environment variable.
14.4.4 Examples

Example 1:
Retrieve the value of the Hercules symbol "version".

```
say 'Hercules version = ' VALUE('version',,'SYSTEM')
```

Example 2:
Retrieve the value of the Hercules environment variable "HERCULES_RC".

```
say 'Hercules RC = ' value('HERCULES_RC',,'ENVIRONMENT')
```

14.5 Error Handling

The error handling differentiates between the following types of errors:

- Command Errors
- Command Failures

An invalid command ('command not found') is treated as a 'command error'. Command errors may be handled with “SIGNAL ON ERROR”.

Failures in an otherwise valid command are treated as 'command failures'. Command failures may be handled with “SIGNAL ON FAILURE”.

Command return codes < 0 are interpreted as ERROR, return codes > 0 are interpreted as FAILURE. Hercules will abort the startup process if the configuration file Rexx script returns with a non-zero return code.
15. Submitting Jobs via the Socket Reader

15.1 Socket Reader Basics

The "sockdev" option allows you to submit cards directly to a Hercules card reader from outside of Hercules. The card reader must be defined with the "sockdev" keyword and either a TCP/IP port number or the name of a Unix Domain Socket. Then whenever you want to submit a card deck to that particular card reader, you use an external program to connect to the socket and transmit the cards to the reader. Socket readers were implemented by Fish, based upon code originally contributed by Malcolm Beattie.

Socket readers are defined in the Hercules configuration like this:

<table>
<thead>
<tr>
<th>Descriptive</th>
</tr>
</thead>
<tbody>
<tr>
<td>devnum devtype sockspec SOCKDEV [option [option ... ]]</td>
</tr>
</tbody>
</table>

Diagram

```
  devnum --- devtype --- sockspec --- SOCKDEV
    |                  |
    | option          |
```

Parameters devnum, devtype and the keyword SOCKDEV are the same as described in chapter 6.5 ("Card Reader Devices").

The socket specification sockspec can take any of the following formats:

- **ipaddr:port**
  - The reader listens on the specific IP address and port number. *ipaddr* must be The IP address of an interface on the local system.
  - For example, "127.0.0.1:1234" is used to accept only jobs submitted locally via the loopback interface.

- **hostname:port**
  - Similar to the previous example, where *hostname* must resolve to an IP address belonging to the local system.
  - Example: "localhost:1234".

- **port**
  - The reader listens on the specified port number and accepts jobs submitted from any IP address defined on the local system.
  - Example: "1234".

- **path/name**
  - The reader listens on the specified Unix Domain Socket.
  - Example: "/tmp/hercdr.00C"
15.2 Submitting Jobs from Windows

The “HercRdr” program is distributed as part of Fish’s GUI package and allows you to send jobs to a socket reader via TCP/IP. Simply enter “HercRdr” from the command line (i.e. from a “Command Prompt” window if you are using Windows NT / 2K / XP) to submit your file(s).

The following screen print shows the help information from the HercRdr program that is displayed whenever the program is called without parameters:

```
D:\HERCULES>hercrdr
Submits card file(s) to a Hercules card reader bound to a given socket:port.

Format:

HERCRDR [-nnn] [host:port] file [file...]

Where:

- nnn  timeout value in seconds (1-999; default is 3)
- host:port sock_spec of target reader (if not specified, value of HERCRDR environ var is used, if set)
- file  file(s) to be submitted

Examples:

HERCRDR localhost:1234 fileone.txt filetwo.txt
set HERCRDR=localhost:1234
HERCRDR file3.txt file4.txt
HERCRDR override:5678 filefive.txt
HERCRDR 192.168.0.1:5678 666.txt 777.txt 888.txt 999.txt

Returns:

-1 unclassified error
0 file(s) successfully submitted
1 no route to host (bad sock_spec or connection refused)
2 timeout value exceeded while trying to connect
3 transmission error (e.g. connection prematurely closed)
4 file not found (or other file error)

Figure 354: HercRdr Help Screen
```
15.2.1 How to submit jobs directly from SPF/PC

If you are lucky enough to have a copy of the excellent editor SPF/PC Version4 or SPF/Pro (produced by CTC but unfortunately no longer available), then you can submit jobs directly from your edit session. The SUB command can be implemented by means of a REXX macro such as the following one, provided by Volker Bandke:

```rexx
/* +----------------------------- REXX -----------------------------+ */
/*                                                                    */
/*      Name: D:\APPS\SPFPRO\REXX\USER\SUB.SPF                        */
/*                                                                    */
/*      Type: SPF edit macro                                          */
/*                                                                    */
/*      Desc: submit JCL to MVS 3.8                                   */
/*                                                                    */
/*      Creation date: 24 Aug 1999, creation time: 18:49:40           */
/*                                                                    */
/*      Author: (c) Volker Bandke                                     */
/*                                                                    */
/* +----------------------------------------------------------------+ */
'isredit macro (p1 p2 p3 p4 p5 p6 p7 p8 p9)'
"ISREDIT (member) = MEMBER"
"ISPEXEC CONTROL ERRORS CANCEL"
parse upper var member file '.' ext
do
  'ISREDIT REPLACE' $$$$$$$$.SPF '.ZF .ZL'
  ADDRESS "CMD" "HERCRDR 192.168.1.102:3505 $$$$$$$$.SPF"
  zedsmsg = 'File submitted'
  zedlmsg = 'The member '||member||' has been submitted to MVS'
  'ispexec setmsg msg(isrz000)'
  ADDRESS "CMD" "DELETE $$$$$$$$.SPF"
end
EXIT 0
```

Figure 355: SUBmit REXX for SPF/PC

15.3 Submitting Jobs from Unix

Submitting jobs from Unix can be done in two different ways, described in detail in the next sections:

- Using a Perl script
- Using the netcat program

15.3.1 Using a Perl script

Malcolm Beattie has provided a simple Perl script which can submit jobs using either TCP/IP or Unix Domain Sockets. The script is invoked using one of the following command formats:
Here is the Hercsub script:

```perl
#!/usr/bin/perl
use Socket;
use IO::Socket::UNIX;
use IO::Socket::INET;

if (@ARGV < 1) {
    print STDERR "Usage: hercsub socket_spec [job]\n";
    exit 2;
}

my $spec = shift @ARGV;
my $sock;

if ($spec =~ m{^/}) {
    $sock = IO::Socket::UNIX->new(Peer => $spec);
} else {
    $sock = IO::Socket::INET->new(PeerAddr => $spec);
}

die "Failed to connect to socket $spec: $!
unless defined($sock);

while (<>) {
    print $sock $_;
}

------------- end of hercsub -------------
```

**Figure 356: The Hercsub Perl Script**

### 15.3.2 Using the netcat program

The netcat (nc) program can also be used to submit files to a Hercules reader via TCP/IP. Install netcat (which is useful for many other things as well) and use the following syntax:

```bash
nc -w1 localhost 1234 < dummy.jcl
```

For more information on the netcat program, type `man nc` from the Unix shell.
Appendix A: Supported DASD Device Types

The following tables show the supported DASD device types and models with their sizes. The symbol "[*]" in the size column means that any size can be specified, else the size defaults to the first listed model.

**CKD Devices**

<table>
<thead>
<tr>
<th>Devicetype-Model</th>
<th>Cylinders</th>
<th>Alternate Cylinders</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM 2311</td>
<td>[*]</td>
<td></td>
</tr>
<tr>
<td>IBM 2311-1</td>
<td>200</td>
<td>2</td>
</tr>
<tr>
<td>IBM 2314</td>
<td>[*]</td>
<td></td>
</tr>
<tr>
<td>IBM 2314</td>
<td>200</td>
<td>3</td>
</tr>
<tr>
<td>IBM 3330</td>
<td>[*]</td>
<td></td>
</tr>
<tr>
<td>IBM 3330-1</td>
<td>404</td>
<td>7</td>
</tr>
<tr>
<td>IBM 3330-2</td>
<td>808</td>
<td>7</td>
</tr>
<tr>
<td>IBM 3330-11</td>
<td>808</td>
<td>7</td>
</tr>
<tr>
<td>IBM 3340</td>
<td>[*]</td>
<td></td>
</tr>
<tr>
<td>IBM 3340-1</td>
<td>348</td>
<td>1</td>
</tr>
<tr>
<td>IBM 3340-35</td>
<td>348</td>
<td>1</td>
</tr>
<tr>
<td>IBM 3340-2</td>
<td>696</td>
<td>2</td>
</tr>
<tr>
<td>IBM 3340-70</td>
<td>696</td>
<td>2</td>
</tr>
<tr>
<td>IBM 3350</td>
<td>[*]</td>
<td></td>
</tr>
<tr>
<td>IBM 3350-1</td>
<td>555</td>
<td>5</td>
</tr>
<tr>
<td>IBM 3375</td>
<td>[*]</td>
<td></td>
</tr>
<tr>
<td>IBM 3375-1</td>
<td>959</td>
<td>1</td>
</tr>
<tr>
<td>IBM 3380</td>
<td>[*]</td>
<td></td>
</tr>
<tr>
<td>IBM 3380-1</td>
<td>885</td>
<td>1</td>
</tr>
<tr>
<td>IBM 3380-A</td>
<td>885</td>
<td>1</td>
</tr>
<tr>
<td>IBM 3380-B</td>
<td>885</td>
<td>1</td>
</tr>
<tr>
<td>Devicetype-Model</td>
<td>Cylinders</td>
<td>Alternate Cylinders</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------</td>
<td>---------------------</td>
</tr>
<tr>
<td>IBM 3380-D</td>
<td>885</td>
<td>1</td>
</tr>
<tr>
<td>IBM 3380-J</td>
<td>885</td>
<td>1</td>
</tr>
<tr>
<td>IBM 3380-2</td>
<td>1770</td>
<td>2</td>
</tr>
<tr>
<td>IBM 3380-E</td>
<td>1770</td>
<td>2</td>
</tr>
<tr>
<td>IBM 3380-3</td>
<td>2665</td>
<td>3</td>
</tr>
<tr>
<td>IBM 3380-K</td>
<td>2665</td>
<td>3</td>
</tr>
<tr>
<td>EMC 3380 K+</td>
<td>3339</td>
<td>3</td>
</tr>
<tr>
<td>EMC 3380 K++</td>
<td>3993</td>
<td>3</td>
</tr>
<tr>
<td>IBM 3390</td>
<td>[*]</td>
<td>1</td>
</tr>
<tr>
<td>IBM 3390-1</td>
<td>1113</td>
<td>1</td>
</tr>
<tr>
<td>IBM 3390-2</td>
<td>2226</td>
<td>2</td>
</tr>
<tr>
<td>IBM 3390-3</td>
<td>3339</td>
<td>1</td>
</tr>
<tr>
<td>IBM 3390-9</td>
<td>10017</td>
<td>3</td>
</tr>
<tr>
<td>IBM 3390-27</td>
<td>32760</td>
<td>3</td>
</tr>
<tr>
<td>IBM 3390-54</td>
<td>65520</td>
<td>3</td>
</tr>
<tr>
<td>IBM 9345</td>
<td>[*]</td>
<td></td>
</tr>
<tr>
<td>IBM 9345-1</td>
<td>1440</td>
<td>0</td>
</tr>
<tr>
<td>IBM 9345-2</td>
<td>2156</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 25: Supported CKD DASD Devices
## FBA Devices

<table>
<thead>
<tr>
<th>Devicetype-Model</th>
<th>Blocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM 3310</td>
<td>[*]</td>
</tr>
<tr>
<td>IBM 3310-1</td>
<td>125664</td>
</tr>
<tr>
<td>IBM 3370</td>
<td>[*]</td>
</tr>
<tr>
<td>IBM 3370-A1</td>
<td>558000</td>
</tr>
<tr>
<td>IBM 3370-B1</td>
<td>558000</td>
</tr>
<tr>
<td>IBM 3370-A2</td>
<td>712752</td>
</tr>
<tr>
<td>IBM 3370-B2</td>
<td>712752</td>
</tr>
<tr>
<td>IBM 9313</td>
<td>[*]</td>
</tr>
<tr>
<td>IBM 9313-1</td>
<td>246240</td>
</tr>
<tr>
<td>IBM 9332</td>
<td>[*]</td>
</tr>
<tr>
<td>IBM 9332-200</td>
<td>360036</td>
</tr>
<tr>
<td>IBM 9332-400</td>
<td>360036</td>
</tr>
<tr>
<td>IBM 9336-600</td>
<td>554800</td>
</tr>
<tr>
<td>IBM 9335</td>
<td>[*]</td>
</tr>
<tr>
<td>IBM 9335-1</td>
<td>804714</td>
</tr>
<tr>
<td>IBM 9336</td>
<td>[*]</td>
</tr>
<tr>
<td>IBM 9336-10</td>
<td>920115</td>
</tr>
<tr>
<td>IBM 9336-20</td>
<td>1672881</td>
</tr>
<tr>
<td>IBM 9336-25</td>
<td>1672881</td>
</tr>
<tr>
<td>IBM 0671-08</td>
<td>513072</td>
</tr>
<tr>
<td>IBM 0671</td>
<td>574560</td>
</tr>
<tr>
<td>IBM 0671-04</td>
<td>624456</td>
</tr>
</tbody>
</table>

Table 26: Supported FBA DASD Devices
Appendix B. Configuration of Emulated CPUs

This appendix describes the cooperation of the system parameter related to the emulated CPUs in more detail. The system parameter that define the emulated CPUs are:

- **ENGINES** (Processor engine type)
- **MAXCPU** (Maximum number of CPUs)
- **NUMCPU** (Number of emulated CPUs)

**B.1 General Explanations and Rules**

The **ENGINES** parameter specifies the type of engine for each emulated processor (valid types are CP, AP, IP or IL). **MAXCPU** specifies the maximum number of installed processor engines, whereas **NUMCPU** defines the number of emulated processor engines that are configured online at IML time.

The **ENGINES** statement specifies any mixture of CPU types up to **MAXCPU**, the maximum number of installed processors. **NUMCPU** configures the processor engines in the order that they are specified on the **ENGINES** statement.

**NUMCPU** must be less than or equal to **MAXCPU**. If **NUMCPU** is larger than **MAXCPU** then an error message is issued during the processing of the Hercules configuration file. If it is less than **MAXCPU** then the remaining engines can be configured online later by the operating system.

**B.2 Examples**

Some examples show the cooperation of these statements and the resulting configurations. In the tables the following abbreviations and colours are used:

**CPUs and status**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP</td>
<td>CPU of type CP specified</td>
</tr>
<tr>
<td>IP</td>
<td>CPU of type IP specified</td>
</tr>
<tr>
<td>AP</td>
<td>CPU of type AP specified</td>
</tr>
<tr>
<td>(D)</td>
<td>CPU got its type by default</td>
</tr>
<tr>
<td>O</td>
<td>CPU is taken online</td>
</tr>
<tr>
<td>F</td>
<td>CPU is taken offline</td>
</tr>
</tbody>
</table>

**Colours**

- **Green** - Resulting configuration as expected
- **Yellow** - Resulting configuration may or may be not as expected (defaults or ignored engines)
- **Red** - Resulting configuration is in error. The Hercules configuration file must be corrected.
Example 1:

ENGINES CP,CP,CP,AP,IP,IP,CP,CP
MAXCPU 8
NUMCPU 8

All CPUs are configured online with the type defined.

<table>
<thead>
<tr>
<th>CPU and State</th>
<th>CPU 1</th>
<th>CPU 2</th>
<th>CPU 3</th>
<th>CPU 4</th>
<th>CPU 5</th>
<th>CPU 6</th>
<th>CPU 7</th>
<th>CPU 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAXCPU</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>NUMCPU</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>ENGINES</td>
<td>CP</td>
<td>CP</td>
<td>CP</td>
<td>AP</td>
<td>IP</td>
<td>IP</td>
<td>CP</td>
<td>CP</td>
</tr>
<tr>
<td>CPU type</td>
<td>CP</td>
<td>CP</td>
<td>CP</td>
<td>AP</td>
<td>IP</td>
<td>IP</td>
<td>CP</td>
<td>CP</td>
</tr>
<tr>
<td>Status</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

Table 27: Correct CPU configuration (example 1)

Example 2:

ENGINES CP,CP,CP,AP,IP,IP,CP,CP
MAXCPU 8
NUMCPU 4

All CPUs are defined with the specified type and the first four CPUs are taken online. The rest of the CPUs are taken offline.

<table>
<thead>
<tr>
<th>CPU and State</th>
<th>CPU 1</th>
<th>CPU 2</th>
<th>CPU 3</th>
<th>CPU 4</th>
<th>CPU 5</th>
<th>CPU 6</th>
<th>CPU 7</th>
<th>CPU 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAXCPU</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>NUMCPU</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>ENGINES</td>
<td>CP</td>
<td>CP</td>
<td>CP</td>
<td>AP</td>
<td>IP</td>
<td>IP</td>
<td>CP</td>
<td>CP</td>
</tr>
<tr>
<td>CPU type</td>
<td>CP</td>
<td>CP</td>
<td>CP</td>
<td>AP</td>
<td>IP</td>
<td>IP</td>
<td>CP</td>
<td>CP</td>
</tr>
<tr>
<td>Status</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
</tr>
</tbody>
</table>

Table 28: Correct CPU configuration (example 2)
Example 3:

ENGINES CP,CP,CP,AP,IP,IP,CP,CP
MAXCPU 6
NUMCPU 4

All CPUs up to the number of MAXCPU are defined with their specified type. Four CPUs, as specified in NUMCPU, are taken online, the other two CPUs are taken offline. Please note that the two excess CPUs that are specified in the ENGINES are ignored, because MAXCPU is set only to six engines.

<table>
<thead>
<tr>
<th>CPU and State</th>
<th>CPU 1</th>
<th>CPU 2</th>
<th>CPU 3</th>
<th>CPU 4</th>
<th>CPU 5</th>
<th>CPU 6</th>
<th>CPU 7</th>
<th>CPU 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAXCPU</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>NUMCPU</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>ENGINES</td>
<td>CP</td>
<td>CP</td>
<td>CP</td>
<td>AP</td>
<td>IP</td>
<td>IP</td>
<td>CP</td>
<td>CP</td>
</tr>
<tr>
<td>CPU type</td>
<td>CP</td>
<td>CP</td>
<td>CP</td>
<td>AP</td>
<td>IP</td>
<td>IP</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Status</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>F</td>
<td>F</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

Table 29: Correct CPU configuration (example 3)

Example 4:

ENGINES CP,CP,CP,AP,IP,IP
MAXCPU 8
NUMCPU 4

The first four engines are defined with their specified type and are taken online because of the NUMCPU system parameter. The next two CPUs are also defined with their specified type, but are taken offline, because of the NUMCPU value. MAXCPU is set to eight CPUs but ENGINES specifies only the type of six of the engines, so the remaining two CPUs are defined per default as type CP and are taken offline as specified in NUMCPU.

<table>
<thead>
<tr>
<th>CPU and State</th>
<th>CPU 1</th>
<th>CPU 2</th>
<th>CPU 3</th>
<th>CPU 4</th>
<th>CPU 5</th>
<th>CPU 6</th>
<th>CPU 7</th>
<th>CPU 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAXCPU</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>NUMCPU</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>ENGINES</td>
<td>CP</td>
<td>CP</td>
<td>CP</td>
<td>AP</td>
<td>IP</td>
<td>IP</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>CPU type</td>
<td>CP</td>
<td>CP</td>
<td>CP</td>
<td>AP</td>
<td>IP</td>
<td>IP</td>
<td>CP(D)</td>
<td>CP(D)</td>
</tr>
<tr>
<td>Status</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
</tr>
</tbody>
</table>

Table 30: Correct CPU configuration (example 4)
Example 5:

ENGINES CP,CP,AP,IP
MAXCPU 6
NUMCPU 6

The first four engines are defined with their specified type and are taken online. The next two CPUs are defined per default as type CP, because the number in MAXCPU exceeds the number of CPUs in the ENGINES statement. These additional two CPUs are also taken online through the NUMCPU statement.

<table>
<thead>
<tr>
<th>CPU and State</th>
<th>CPU 1</th>
<th>CPU 2</th>
<th>CPU 3</th>
<th>CPU 4</th>
<th>CPU 5</th>
<th>CPU 6</th>
<th>CPU 7</th>
<th>CPU 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAXCPU</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>NUMCPU</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>ENGINES</td>
<td>CP</td>
<td>CP</td>
<td>AP</td>
<td>IP</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>CPU type</td>
<td>CP</td>
<td>CP</td>
<td>AP</td>
<td>IP</td>
<td>CP(D)</td>
<td>CP(D)</td>
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<td>O</td>
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</tr>
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</table>

Table 31: Correct CPU configuration (example 5)

Example 6:

ENGINES CP,CP,AP,IP
MAXCPU 6
NUMCPU 8

This configuration leads to an error. While the first four CPUs would be taken online with their specified types and the next two CPUs would be of type CP per default and be taken offline, the excess engines from NUMCPU compared against MAXCPU lead to an error message and a failing configuration.

<table>
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<tr>
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<th>CPU 1</th>
<th>CPU 2</th>
<th>CPU 3</th>
<th>CPU 4</th>
<th>CPU 5</th>
<th>CPU 6</th>
<th>CPU 7</th>
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<td>CP</td>
<td>CP</td>
<td>AP</td>
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Table 32: Incorrect CPU configuration (example 6)
## Appendix C. Architecture Facilities

The following table shows which architecture facilities are enabled or disabled by default, depending on the specified architecture mode.

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<tr>
<th>Facility</th>
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<th>ESA/390</th>
<th>ESAME</th>
<th>z/ARCH</th>
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Table 33: Architecture Facilities
## Appendix D. Hercules Command Groups

The following table shows the affiliation of each console command to the various command groups. The command groups are selected with the CMDLEVEL / CMDLVL system parameter in the configuration file or the console commands of the same name.

<table>
<thead>
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<th>OPER (0x01)</th>
<th>MAINT (0x02)</th>
<th>PROG (0x04)</th>
<th>NONE (0x08)</th>
<th>CONFIG (0x10)</th>
<th>DEVEL (0x20)</th>
<th>DEBUG (0x40)</th>
<th>ALL (0x7F)</th>
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<td></td>
</tr>
<tr>
<td>tt32</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>t{+/-} dev</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>t{+/-} CKD</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>u</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>uptime</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>v</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>version</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>xpndsize</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>yroffset</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Table 34: Console commands related to command groups
Appendix E. Build Options for System Parameters and Console Commands

There are a number of system parameters and console commands that depend on the build options set at compile time. They are only available when the corresponding build options have been set when Hercules has been built.

Most of these build option are enabled by default. That means the corresponding system parameters and console commands are available without any further action. A few build options however are disabled by default. If the corresponding system parameters and console commands are required the build options must be set and Hercules must be rebuilt.

Instead of changing the Hercules source files to activate specific build options, the HQA feature (Hercules Build Configurations Quality Assurance) has been introduced. The HQA features allows changing build options by using an environment variable or by using the new configuration or makefile options. For more details about the HQA feature consult the “Installation Guide”.

The following table gives an overview about build options affecting system parameters and console commands.

<table>
<thead>
<tr>
<th>Hercules build option</th>
<th>Default</th>
<th>System parameter / console command</th>
</tr>
</thead>
<tbody>
<tr>
<td>_FEATURE ASN AND LX REUSE</td>
<td>X</td>
<td>alrf / asn_and_lx_reuse ¹</td>
</tr>
<tr>
<td>_FEATURE CPU RECONFIG</td>
<td>X</td>
<td>cf / cfall</td>
</tr>
<tr>
<td>_FEATURE ECPSVM</td>
<td>X</td>
<td>ecpsvm</td>
</tr>
<tr>
<td>_FEATURE SYSTEM_CONSOLE</td>
<td>X</td>
<td>!message / .reply / scpecho / scpimply / ssd</td>
</tr>
<tr>
<td>_FW_REF</td>
<td>X</td>
<td>t{+/-}addr / s{+/-}dev / sf-dev / sf+dev / sfc / sfid / sfk / t{+/-}dev</td>
</tr>
<tr>
<td>_HAVE MLOCKALL</td>
<td></td>
<td>memlock / memfree</td>
</tr>
<tr>
<td><em>MSVC</em></td>
<td></td>
<td>dir ²</td>
</tr>
<tr>
<td>ENABLE OBJECT REXX</td>
<td>X</td>
<td>rexx / exec</td>
</tr>
<tr>
<td>ENABLE REGINA REXX</td>
<td>X</td>
<td>rexx / exec</td>
</tr>
<tr>
<td>OPTION CAPPING</td>
<td>X</td>
<td>capping</td>
</tr>
<tr>
<td>OPTION CKD KEY TRACING</td>
<td>X</td>
<td>t{+/-}ckd</td>
</tr>
<tr>
<td>OPTION CMD TGT</td>
<td>X</td>
<td>cmdtgt / herc / pscp / scp</td>
</tr>
<tr>
<td>OPTION CONFIG SYMBOLS</td>
<td>X</td>
<td>qpfkeys / defsym / delsym</td>
</tr>
<tr>
<td>OPTION DYNAMIC LOAD</td>
<td>X</td>
<td>modpath / ldmod / lsdep / lsmod / rmmod</td>
</tr>
<tr>
<td>OPTION HAO</td>
<td>X</td>
<td>hao</td>
</tr>
<tr>
<td>OPTION HTTP_SERVER</td>
<td>X</td>
<td>http / httpport / httproot ³</td>
</tr>
<tr>
<td>Build Option</td>
<td>Value</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>OPTION_INSTRUCTION_COUNTING</td>
<td>icount</td>
<td></td>
</tr>
<tr>
<td>OPTION_IODELAY_KLUDGE</td>
<td>X iodelay</td>
<td></td>
</tr>
<tr>
<td>OPTION_LPP_RESTRICT</td>
<td>X pgmprdos</td>
<td></td>
</tr>
<tr>
<td>OPTION_MIPS_COUNTING</td>
<td>X maxrates</td>
<td></td>
</tr>
<tr>
<td>OPTION_MSGHLD</td>
<td>kd / msghdl</td>
<td></td>
</tr>
<tr>
<td>OPTION_PTTRACE</td>
<td>X ptt</td>
<td></td>
</tr>
<tr>
<td>OPTION_SCSI_TAPE</td>
<td>X auto_scsi_mount / scsimount 4</td>
<td></td>
</tr>
<tr>
<td>OPTION_SET_STS_INFO</td>
<td>X manufacturer / model / plant</td>
<td></td>
</tr>
<tr>
<td>OPTION_SHARED_DEVICES</td>
<td>X shrdport</td>
<td></td>
</tr>
<tr>
<td>OPTION_SHUTDOWN_CONFIRMATION</td>
<td>quitmout</td>
<td></td>
</tr>
<tr>
<td>OPTION_TAPE_AUTOMOUNT</td>
<td>X automount</td>
<td></td>
</tr>
<tr>
<td>OPTION_W32_CTCI</td>
<td>X tt32</td>
<td></td>
</tr>
<tr>
<td>OPTION_SHOWDVOL1</td>
<td>showdvol1</td>
<td></td>
</tr>
<tr>
<td>PANEL_REFRESH_RATE</td>
<td>X panrate</td>
<td></td>
</tr>
</tbody>
</table>

**Table 35: Build options for system parameters and console commands**

**Notes:**

1. “alrf” and “asn_and_lx_reuse” have been deprecated and replaced by “archlevel enable asn_lx_reuse”.
2. “_MSVC_” is a build option that is automatically set when Hercules is built on a Windows platform. On Linux and Mac platforms the option is not set and the “ls” console command is available instead.
3. “httpport” and “httproot” have been deprecated and replaced by “http”.
4. “auto_scsi_mount” has been deprecated and replaced by “scsimount”.
# Appendix F. Environment Variables

The following table lists the Hercules environment variables. The table is sorted by the usage (configuration, build, ...) and the name of the environment variable.

<table>
<thead>
<tr>
<th>Usage</th>
<th>Environment Variable</th>
<th>Description</th>
<th>Platform</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hercules Build</td>
<td>BZIP2_DIR</td>
<td>Path to the BZIP2 package</td>
<td>Windows</td>
</tr>
<tr>
<td>Hercules Build</td>
<td>PCRE_DIR</td>
<td>Path to the PCRE package</td>
<td>Windows</td>
</tr>
<tr>
<td>Hercules Build</td>
<td>ZLIB_DIR</td>
<td>Path to the ZLIB package</td>
<td>Windows</td>
</tr>
<tr>
<td>Hercules Configuration</td>
<td>HERCULES_CNF</td>
<td>Default name of configuration file</td>
<td>All</td>
</tr>
<tr>
<td>Hercules Configuration</td>
<td>HERCULES_CP</td>
<td>Hercules Codepage</td>
<td>All</td>
</tr>
<tr>
<td>Hercules Configuration</td>
<td>HERCULES_RC</td>
<td>Default name of run-commands file</td>
<td>All</td>
</tr>
<tr>
<td>Hercules Configuration</td>
<td>HERCULES_LIB</td>
<td>Dynamic load modules path</td>
<td>All</td>
</tr>
<tr>
<td>Hercules Configuration</td>
<td>HREXX_PACKAGE</td>
<td>Name of REXX package</td>
<td>All</td>
</tr>
<tr>
<td>Hercules Configuration</td>
<td>LD_LIBRARY_PATH</td>
<td>Dynamic load modules path</td>
<td>All</td>
</tr>
<tr>
<td>Hercules Configuration</td>
<td>REXX_DIR</td>
<td>Path to the REXX package</td>
<td>All</td>
</tr>
</tbody>
</table>

Table 36: Environment Variables
## Appendix G. Syntax

This book uses two kinds of describing the syntax of configuration statements, console commands and utilities. These are:

- Syntax descriptions
- Syntax diagrams

### G.1 Reading Syntax Descriptions

All syntax descriptions in this book (configuration statements, console commands and utilities) use a common structure as described in the following table.

<table>
<thead>
<tr>
<th>Syntax Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEYWORDS</td>
<td>Keywords are denoted with upper case letters. Obey the spelling. In the actual statements or commands they can be coded in upper case or lower case letters.</td>
</tr>
<tr>
<td>variables</td>
<td>All user defined values are denoted with lower case italic letters. In the actual statements or commands they can be coded in upper case or lower case letters.</td>
</tr>
<tr>
<td>{}</td>
<td>Signifies that all or some portion of the code elements between the braces are required elements. Note that the braces are not part of the statements and must be not coded.</td>
</tr>
<tr>
<td>[ ]</td>
<td>Signifies that all or some portion of the code elements between the square brackets can optionally appear but are not required elements. Note that the square brackets are not part of the statements and must be not coded.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>xxxx,...</td>
<td>Signifies that there can be more than one value in a comma delimited list. Note that the dots are not part of the statements and must be not coded.</td>
</tr>
<tr>
<td>xxxx ...</td>
<td>Signifies that there can be more than one value in a blank space delimited list. Note that the dots are not part of the statements and must be not coded.</td>
</tr>
</tbody>
</table>

Table 37: Reading Syntax Descriptions
## G.2 Reading Syntax Diagrams

All syntax diagrams in this book (configuration statements, console commands and utilities) use a common structure as described in the following table.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>➔</td>
<td>This symbol indicates the beginning of a syntax diagram.</td>
</tr>
<tr>
<td>➔</td>
<td>This symbol indicates the end of a syntax diagram.</td>
</tr>
<tr>
<td>➔</td>
<td>This symbol indicates that the syntax diagram is continued on the next line.</td>
</tr>
<tr>
<td>➔</td>
<td>This symbol indicates that the syntax diagram is a continuation from the previous line.</td>
</tr>
<tr>
<td>required_element</td>
<td>A required element (keyword or variable) appears on the main path of the horizontal line. You must specify this element.</td>
</tr>
<tr>
<td>optional_choice</td>
<td>An optional element (keyword or variable) appears below the main path of the horizontal line. You may or may not specify this element.</td>
</tr>
</tbody>
</table>
| required_choice_1
  required_choice_2
  required_choice_3 | A required choice (keyword or variable) appears vertically stacked in the main path of the horizontal line. You must choose one of the available options. |
| optional_choice_2
  optional_choice_3 | An optional choice (keyword or variable) appears vertically stacked below the main path of the horizontal line. You may choose one of the available options. |
<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Symbol" /> <strong>PARM=</strong> <img src="image2.png" alt="Option" /> <strong>option_1</strong> <img src="image3.png" alt="Option" /> <strong>option_2</strong> <img src="image4.png" alt="Option" /> <strong>option_3</strong></td>
<td>A keyword with options. Only one of the available options may be specified. The underscored option is the default if the whole keyword statement is not coded.</td>
</tr>
<tr>
<td><img src="image5.png" alt="Symbol" /> <strong>default_choice_1</strong> <img src="image6.png" alt="Option" /> <strong>optional_choice_1</strong> <img src="image7.png" alt="Option" /> <strong>optional_choice_2</strong></td>
<td>An optional choice (keyword or variable) with default appears vertically stacked with the default value above the main path of the horizontal line and the remaining optional elements below the main path of the horizontal line. Only one of the available options may be specified. If none of these elements is explicitly specified, the default above the main line is taken.</td>
</tr>
<tr>
<td><img src="image8.png" alt="Symbol" /> <strong>optional_choice</strong></td>
<td>An arrow returning to the left of an element below the main path of the horizontal line indicates an optional repeatable item. A character within the arrow path means that repeated items have to be separated by that character. If there is no character within the arrow path then the items are separated by a blank.</td>
</tr>
<tr>
<td><img src="image9.png" alt="Symbol" /> <strong>optional_choice</strong></td>
<td>An arrow returning to the left of an element on the main path of the horizontal line indicates an required repeatable item. A character within the arrow path means that repeated items have to be separated by that character. If there is no character within the arrow path then the items are separated by a blank.</td>
</tr>
<tr>
<td><img src="image10.png" alt="Symbol" /> <strong>SEGMENT</strong></td>
<td>This symbol is a reference to a syntax segment, which is described separately below the main syntax diagram. Complex syntax diagrams are occasionally broken into separated simpler segments.</td>
</tr>
</tbody>
</table>
### Symbol Description

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Segment" /></td>
<td>This symbol indicates a syntax segment which is referenced from a main syntax diagram that is shown above the syntax segment.</td>
</tr>
<tr>
<td><img src="image" alt="KEYWORDS" /></td>
<td>Keywords are denoted with upper case letters. Obey the spelling. Lower case letters are optional and can be omitted (for example DI$able). In the actual statements or commands the keywords can be coded in upper case or lower case letters.</td>
</tr>
<tr>
<td><img src="image" alt="variables" /></td>
<td>All user defined values are denoted with lower case italic letters. They represent user supplied names or values. In the actual statements or commands they can be coded in upper case or lower case letters.</td>
</tr>
</tbody>
</table>

#### Table 38: Reading Syntax Diagrams

### G.3 Sample Syntax Description

The following figure shows a sample of a complex syntax description. This is not an example of an existing system parameter or panel command. It is used mainly to demonstrate the “look and feel” of syntax descriptions.

#### Syntax

CMDNAME  
required_argument [optional_argument]  
{required_choice_1 | required_choice_2 | required_choice_3}  
[optional_choice_1 | optional_choice_2]  
REQUIRED_KEYWORD=variable  
[OPTIONAL_KEYWORD=variable]  
[DEFAULT_KEYWORD | KEYWORD_1 | KEYWORD_2]  
[KEYWORD=default_choice | KEYWORD={choice_1 | choice_2}]  
repeatable_item_n {repeatable_item_n ...}  
repeatable_item_n {,repeatable_item_n ,...}  
fragment_name  
(variable_1, variable_2)
fragment_name

```
[DEFAULT KEYWORD | KEYWORD_1 | KEYWORD_2 | KEYWORD_3 | KEYWORD_4]
KEYWORD={choice_1 | choice_2 | choice_3 | choice_4}
```

Figure 357: Sample Syntax Description

### G.4 Sample Syntax Diagram

The next figure shows a sample of a complex syntax diagram. It shows the same example as in the syntax description in the previous section. Like in the example before it is not based on an existing system parameter or panel command. It is used mainly to demonstrate the “look and feel” of syntax descriptions.

```
Syntax

ordial: CMDNAME — required_argument — optional_argument —

ordial: required_choice_1 — required_choice_2 — required_choice_3

ordial: REQUIRED_KEYWORD=variable — OPTIONAL_KEYWORD=variable

ordial: DEFAULT_KEYWORD — KEYWORD=default_choice

ordial: KEYWORD_1 — KEYWORD_2 —

ordial: REPEATABLE_CHOICE — REPEATABLE_CHOICE

ordial: fragment_name — ( — variable_1 — , — variable_2 — )
```

Figure 358: Sample Syntax Diagram
Appendix H. Links

- The Hercules System/370, ESA/390, and z/Architecture Emulator
  
  http://www.hercules-390.eu

- Hercules source code repositories
  
  https://github.com/rbowler/spinhawk (release 3.xx development stream)
  https://github.com/rbowler/sandhawk (release 4.xx development stream)
  https://github.com/hercules-390/hyperion (cutting-edge developer sandbox)

- Hercules Developer Snapshots (Dave Wade)
  
  http://www.smrcc.org.uk/members/g4ugm/snapshots/

- Hercules PDF Documentation (Peter Glanzmann)
  
  http://hercdoc.glanzmann.org

- The MVS Tur(n)key System, Version 3 (Volker Bandke)
  

- Hercules WinGUI (“Fish”, David B. Trout)
  
  http://www.softdevlabs.com/Hercules/hercgui-index.html

- CTCI-WIN (“Fish”, David B. Trout)
  
  http://www.softdevlabs.com/Hercules/CTCI-WIN-index.html

- Hercules Studio (Jacob Dekel)
  
  http://www.mvsdasd.org/hercstudio
• Hebe – Hercules Image Manager (Robin Atwood)
  http://kde-apps.org/content/show.php/Hebe?content=126738

• WinPcap, Politecnico di Torino
  http://www.winpcap.org

• Vista tn3270, Tom Brennan Software
  http://www.tombrennansoftware.com

• X3270, Paul Mattes
  http://x3270.bgp.nu

• AWSBROWSE (“Fish”, David B. Trout)
  http://www.softdevlabs.com/Hercules/hercgui-index.html

• XMIT Manager
  www.cbttape.org

• CBT MVS Utilities Tape (CBTTAPE)
  www.cbttape.org

• Microsoft Visual C++ 2008 Express
  http://www.microsoft.com/express/download/
• ZLIB
  http://www.zlib.net
  http://www.softdevlabs.com/Hercules/ZLIB1-1.2.3-bin-lib-inc-vc2008-x86-x64.zip

• BZIP2
  http://www.bzip.org
  http://www.softdevlabs.com/Hercules/BZIP2-1.0.5-bin-lib-inc-vc2008-x86-x64.zip

• PCRE
  http://www.pcre.org
  http://www.softdevlabs.com/Hercules/PCRE-6.4.1-bin-lib-inc-vc2008-x86-x64.zip

• Regina REXX
  http://regina-rexx.sourceforge.net/

• Open Object Rexx (ooRexx)
  http://www.oorexx.org/