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Implementation
Startup and Reconfiguration - 2

Engineer's Reference Manual

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About This Publication

This *Engineer's Reference Manual* provides a general guide to the process engineer's configuration, startup, and reconfiguration efforts for TPN-based TPS systems. The information presented defines how the various types of configuration data interact, and how the interaction affects the system as seen by the process engineer as the system operates.

If you are unsure of the terminology used in this and other implementation publications, refer to Section 19.

The mentions in this manual of "Universal Station" or "US" also apply to Universal Work Stations, unless otherwise defined.

This publication supports TPS system network Release 688. TPS is the evolution of TDC 3000X.

Several sections in this manual are designated as “Reserved.” In earlier versions of this Engineer’s Reference Manual, these sections contained information that was moved to new publications during the R400 bookset update. The following are the sections and the new publications:

- Sections 8 and 26 — Refer to *Hiway Gateway Implementation Guidelines*.
- Section 9 — Refer to *Data Entity Builder Manual*.
- Section 16 — Refer to *Application Module Implementation Guidelines*.
- Sections 24, 25, and 29 — Refer to *LCN Guidelines - Implementation, Troubleshooting, and Service*.

ATTENTION	With TPN R684, Enhanced Universal Control Network (EUCN) is introduced. In EUCN, the traditional coaxial cable system is no longer utilized and is replaced with a Fault Tolerant Ethernet (FTE) based communication network. Throughout the document, unless specifically mentioned, the terms HPM, NIM, and UCN are interchangeably used with the terms **EHPM**, **ENIM**, and **EUCN** respectively.

ATTENTION	With TPN R686, **Enhanced Network Bridge (ENB)** is introduced. The ENB is a variant of the NIM that allows communication between the LCN and both UCN and EUCN networks. It can communicate over coaxial-based UCN and FTE-based EUCN communication networks and provides a gateway function between the UCN and the EUCN. The ENB also facilitates on-process migration from HPM to EHPM (assuming you have redundant HPMs).

ATTENTION	With TPN R687, **Triconex Communication Module Interface (TCMI)** is introduced. The TCMI provides an interface between the FTE-based EUCN and Triconex TRICON Safety Manager System through the TCM. The TCMI communicates with the Triconex TRICON Safety Manager System using a TCM interface hardware located in the Triconex TRICON System chassis. The TCM facilitates communication between the TCMI and TRICON controller over Ethernet networks (using TSAA protocol). The TSAA Protocol is a messaging protocol that provides message formats used in application programs that reads and writes data to Triconex controllers. **Note:** For TRICONEX SMM to TCMI upgrade, the TRICON system must be at version **10.3** or later.

ATTENTION	TPN R687 also introduces the Experion Local Control Network (ELCN). ELCN allows for Local Control Network (LCN) coaxial based systems to be integrated with ELCN Fault Tolerant Ethernet (FTE) based systems, where certain LCN nodes may be upgraded to be equivalent ELCN nodes, which have their network interfaces provided via FTE. For more information on Experion LCN, refer to appropriate Honeywell ELCN/Experion documents.

The following table lists Honeywell ELCN/Experion documents.

Publication	Content Type
Experion LCN Hardware Upgrade Kit Instructions (51195195-415)	UEA installation
Experion LCN Quick Start Guide (EPDOC-X480-en-501)	General hardware/software/migration information
Experion Software Installation User's Guide (EPDOC-X136-en-501)	Software installation
Experion LCN Overview and Implementation Guide (EPDOC-X478-en-501)	Bridge hardware installation, software configuration, operation, servicing/troubleshooting
Experion LCN Planning, Installation, and Service Guide (HWDOC-X479-en-C)	Experion LCN system planning, hardware/software installation, servicing/troubleshooting
Experion LCN Specification (ELCN03)	General technical information
Fault Tolerant Ethernet Installation and Service Guide, (EPDOC-XX36-en-501)	FTE system installation, servicing/troubleshooting
UEA Hardware Installation and Maintenance Guide (HWDOC-X469-en)	General UEA planning, installation, and service information before it is commissioned as an ELCN appliance.
Integrated Experion-TPS User's Guide (EPDOC-XX66-en-501)	Supplementary installation tasks needed before using TPS Nodes on an Experion system. Describes configuration tasks needed for TPS Nodes.

Publication	Content Type
Virtualization Planning and Implementation Guide (EPDOC-X147-en)	Implementing networks, Preparing ESXi host, Administering virtualization
Server and Client Planning Guide (EPDOC-X128-en-501)	High-level planning/design for Experion servers, clients, controllers
Process Operations Manual (SW11-601)	Process operations, alarm/message handling, reporting, history functions, system operations, system menu functions, console/station peripheral devices
Integrated Experion-TPS User's Guide (EPDOC-XX66-en-501)	Supplementary installation and configuration tasks for Experion TPS Nodes
Experion PKS R501.1 Migration Planning Guide (EPDOC-XX70-en-5011)	Planning information for migration of Experion system from legacy R4xx system software to Experion R501.1 software.
Experion PKS Software Installation User's Guide (EPDOC-X136-en-501)	Experion software installation (various methods).
Switch Configuration Tool User's Guide (EPDOC-X246-en-501)	Experion switch configuration information
Experion Network Best Practices (WP-07-02-ENG)	Best practices for planning the installation of Experion FTE networks, and connecting them into plant IT networks.
Experion R501 Software Change Notice (EPDOC-X166-en-501)	Describes Experion R501 features/enhancements, overall product, release interoperabilities, system dependencies, problem resolutions, known issues, special considerations
Customer Release Guide R688, (CRG-688)	Experion LCN Migration information
TPN R688 Software Change Notice (TNDOC-X166-en-688)	Document changes, compatibility and migration/installation processes for the TPS Process Network Release of R688 software.
Experion Control Building User's Guide (EPDOC-XX19-en-501)	Procedures for basic tasks in the Control Builder application (configuring hardware devices, continuous control strategies, sequential control strategies).
Experion LCN Network Gateway Planning, Installation, and Service Guide (HWDOC-X608-en-A)	Experion LCN Network Gateway planning, hardware/software installation, servicing/troubleshooting

ATTENTION

Experion R511.4 and TPN R688.5 introduces EHPM with HART IOP support (HART HLAI and HART AO_16 modules). This involves optionally upgrading existing EHPM Conventional I/O to HART I/O for HLAI and HART AO_16 modules, thus providing the capability to control and monitor HART field devices using an EHPM controller.

Note that this upgrade applies only to Experion-integrated EHPMs and does not apply to PM/APM/HPM.

Support and Other Contacts

For support, contact your local Honeywell Process Solutions Customer Contact Center (CCC). To find your local CCC visit the website, https://www.honeywellprocess.com/en-US/contact-us/customer-support-contacts/Pages/default.aspx.

Table of Contents

SECTION 1 – ENGINEER'S REFERENCE MANUAL SUMMARY 1

1.1 Things to Decide Before Configuring or Reconfiguring 3
Figure 1-1 Representative TPS Hardware 6
1.2 Preferred Hardware Configuration 6
1.3 Universal Personality & Operator Personality 7
Table 1-1 Displays and Functions Accessed through Targets and Keys 7
1.4 Section Summaries 8

SECTION 2 – FILE SYSTEM OPERATIONS 15

2.0 Overview 15
2.1 File System Pathnames 16
2.1.1 Pathname Rules 17
2.2 Access to Volumes and Directories 19
2.3 System Volumes and User Volumes 20
Table 2-1 System Volumes 21
2.4 Typical File System Utility Commands 22
Table 2-2 Abbreviations 22
2.5 File Names and Suffixes 24
2.5.1 File Name Suffixes (Extensions) 25
Table 2-3 Suffixes 25
2.6 Cartridge Part Numbers 28

SECTION 3 – THE &ASY SYSTEM DIRECTORY AND ITS SPECIAL CHARACTERISTICS 30

3.0 Overview 30
3.1 &ASY's Role in Node Loading and Startup 31
3.2 Tools for Maintaining Backup Copies of &ASY 33

SECTION 4 – AREA (&D01-&D10) AND STANDARD ABSTRACT (&DSY) DIRECTORIES 34

4.0 Overview 34
4.1 The Role of &DSY and Other Data in Loading USs 35
4.1.1 The Fast-Load Feature 36
4.2 Changes to Area Database, Schematics, and Button Configuration 37

SECTION 5 – CONSOLE ORGANIZATION 38

5.0 Overview 38
5.1 Console Hints and Tips 39
5.2 Printer Failover 40
Table 5-1 Format of Printer Failover Text File 40
5.3 Personality Hints and Tips 42

SECTION 6 – NETWORK CONFIGURATION FILE 45

6.0 Overview 45
6.1 NCF Information 46

SECTION 7 – HM CONFIGURATION AND USE 49

7.0 Overview 49
7.1 Introduction 50
7.1.1 HM Options and Variations 50
7.1.2 Overview of HM Operation 52
7.2 Guidelines for Use of HM Storage Space 53
7.2.1 Volumes and Types of Data Stored in HMs 53

Table of Contents

Table 7-1 HM Data Types 54
7.2.2 Allocating HM Functions on the LCN 55
7.2.3 Assigning Units to HMs 60
7.2.4 Configuring History Groups 61
Figure 7-1 Reducing Data Owner Load 61
7.2.5 Requesting History through the LCN 62
7.2.6 Managing History Collection by Computers through the CG 63
7.3 Continuous History Configuration 64
7.3.1 Hourly, Shift, Daily, and Monthly Averages 65
7.3.2 Snapshots and User Averages 66
Table 7-2 Rates at which Snapshots (SS) are Collected 66
Figure 7-2 Continuous History Structure.ii.Snapshots and User Averages 68
7.3.3 Uses of Continuous History 69
7.3.4 Continuous History Configuration Forms and Displays 70
7.3.5 Continuous History Notes and Precautions 71
7.4 How to Estimate HM Volume Sizes 73
Table 7-3 Estimated Number of Cartridges to Fill an HM 74
7.4.1 Use of Tables and Charts to Estimate HM Volume Sizes 75
Table 7-4 Tables Used to Estimate HM Volume Size 77
Table 7-5 List of Volume-Size Charts in Section 7 78
7.4.2 HM Volume Configuration Example 79
Table 7-6 Summary of Variable Data used in Example 79
Table 7-7 Example Memory Required vs. Drive Capacity 79
7.4.3 Applying Volume-Size Estimates to Forms and Data Entry 80
Table 7-8 Picks on Volume Configuration Menu 80
7.4.4 HM Volume Size Estimator Tables and Figures 82
Table 7-9 HM Volume Size Estimator 82
Table 7-10 HM User Volume or Directory Size Estimator 92
Table 7-11 IDF Volume or Directory Size Estimator 93
Table 7-12 Example—Small System, One Area, One Cluster 94
Table 7-13 Example—IDF Volume Estimate (approximately 5 HCUs) 96
Table 7-14 Example—User Volumes, Small System, One Cluster, One Dual HM 97
Table 7-15 Value Sources for Volume Configuration 98
Figure 7-3 Area Volume Size Estimator Chart 101
Figure 7-4 AM Checkpoint Volume Size Estimator Chart 102
Figure 7-5 NIM/PM Checkpoint Volume Size Estimator Chart 103
Figure 7-6 NIM Checkpoint Volume Size Estimator Chart, 1 NIM 104
Figure 7-7 NIM/LM Checkpoint Volume Size Estimator Chart, 1 to 32 LMs 105
Figure 7-8 NIM/APM Checkpoint Volume Size Estimator Chart 106
Figure 7-9 Continuous History Vol. Size, Example 1 107
Figure 7-10 Continuous History Vol. Size, Example 2 108
Figure 7-11 Journal Volume Size Chart, Example 1 109
Figure 7-12 Journal Volume Size Chart, Example 2 110
7.5 Redundant HM Disk Option 111
Figure 7-13 Physical Arrangement of Redundant Disk Drives 112
7.5.1 Configuring Redundant HM Disk Drives 114
Table 7-16 Disk Drive Options 114
7.5.2 Synchronizing Redundant HM Disk Drives 115
7.5.3 Setting a Redundant HM Disk Drive Off-Line 116
7.5.4 Servicing Redundant HM Disk Drives 117
7.6 HM Initialization 118
7.6.1 Local HM Network Volume Configuration File, Lnp_NVCF.MM 119
7.7 How to Save and Restore Continuous History 120
7.7.1 Prerequisites for Saving and Restoring Continuous History 120
Table 7-17 NCF Configuration Items That Can't Be Changed 120
7.7.2 Procedure for Saving and Restoring Continuous History 121

Table of Contents

Table 7-18 Saving and Restoring Continuous History ... 121
7.7.3 Restoring the HM Group Definition Files (APL) without the Continuous History Data ... 126
Table 7-19 Restoring HM Group Configuration without History ... 126
7.8 HM Backup Tool Option Using the AM ... 131
7.9 History Module Fragmentation ... 132
Table 7-20 Preparing to Overcoming History Module Fragmentation ... 132
Table 7-21 Procedure for Overcoming HM Fragmentation ... 133

SECTION 8 – ALARM MANAGEMENT ... 135

8.0 Overview ... 135
8.1 Introduction ... 136
Table 8-1 New Functionality Table ... 136
8.2 Release 500 Alarm Differences ... 137
8.2.1 Release 520 Alarm Enhancements ... 141
8.3 Contact Cutout Basics ... 142
Table 8-2 Contact Cutout Changes in R500 ... 143
8.4 Contact Cutout - R500 ... 144
8.5 Contact Cutout - Display Changes ... 146
Table 8-3 Contact Cutout Scenario Overview ... 147
Table 8-4 Contact Cutout Alarm Summary Display Changes ... 148
8.6 Contact Cutout - Functions for the HG, NIM, and AM ... 151
Table 8-5 HG Contact Cutout Functionality ... 156
Table 8-6 NIM Contact Cutout Functionality ... 157
Table 8-7 AM Contact Cutout Functionality ... 158
8.7 Alarm Priorities and Alarm Actions ... 159
Table 8-8 Alarm Priority Choices ... 159
Table 8-9 Alarm Priority XXXXPR (E ALPRIOR) ... 159
Table 8-10 Alarm Enable State ALENBST (E ALENBST) ... 160
8.8 PRIMMOD Alarm Groups ... 163
8.8.1 Configure a PRIMMOD Point ... 164
Figure 8-1 Primary Module Point Example ... 165
8.8.2 Link Points in the Alarm Group to the PRIMMOD ... 166
Figure 8-2 PRIMMOD Parameter in PED ... 166
Figure 8-3 Point Detail Display with PRIMMOD Parameter ... 167
8.8.3 Rules For Referencing the PRIMMOD Point ... 168
8.8.4 Retrieving Events for a PRIMMOD Group ... 170
Figure 8-4 Event History Retrieval by PRIMMOD ... 170
Figure 8-5 Example of PRIMMOD Event History ... 171
8.8.5 Alarm Annunciation Using PRIMMOD Groups ... 172
Figure 8-6 PRIMMOD Alarm Annunciation ... 172
8.8.6 Using Multiple PRIMMODs for AM Alarms ... 173
8.8.7 Using Auxiliary Units ($AUXUNIT) ... 174
8.8.8 Other R520 Alarm Enhancements ... 177
8.8.9 R610 Alarm Summary Enhancement ... 180

SECTION 9 – DATA ENTITY BUILDER OPERATIONS ... 183

9.0 Reserved ... 183

SECTION 10 – NATIVE WINDOW SYSTEM PERFORMANCE DISPLAYS ... 185

10.0 Overview ... 185
10.1 Preface ... 186
Table 10-1 Procedures for Installing and Using the Displays ... 186
10.2 How to Install the System Performance Displays ... 187
10.2.1 Table of Current TLK1 Versions ... 188

Table of Contents

10.3 How to Call Up the System Performance Displays....191
Table 10-2 Procedure to Call Up a Performance Display....191
10.4 The Displays and Their Content....192
Table 10-3 Node-Related Displays....198
Table 10-4 Quick Trend Display....200
Table 10-5 Processor Free-Time Display....200
Table 10-6 Heap Displays....201
Table 10-7 Checkpoint Time and Interval Display....201
Table 10-8 Box/Slot Verification Display....201
Table 10-9 Clock (CLOCKSTAT) Displays....202
10.5 How to Interpret the Information on the System Performance Displays....203
Table 10-10 Memory-Use Values....204
Table 10-11 Processor Load Indicator....205
Table 10-12 Memory-Use Values....206
Figure 10-1 Parameter-access load values relationships....208
10.6 How to switch the clock source nodes without rebooting any other LCN Nodes....210
Table 10-13 Procedure to switch the Clock Source Nodes....211
Table 10-14 Procedure to switch the Clock Master and Slave....214
Table 10-15 Procedure to switch when there is no Master node in the network....215
Table 10-16 Status of the nodes when booted/shut down when NCF is not synchronized....216
10.7 Use the Clock Display to Find Crossed LCN Cables....217
Table 10-17 Checking Procedure for Crossed LCN Cables....218
10.8 Use the Channel Information Display to Monitor TPS/TPN Channel Activity....220
Table 10-18 Displaying Channel Information for a Node....221
Table 10-19 CHANINFO Display Definitions....222
10.9 Use the FTE Status Display....223
Table 10-20 Initializing Call Up of the Display....224
Table 10-21 Differences between $FTESTS1 and $FTESTS2....230
Table 10-22 Meaning of Different FTE Schematics....235
Table 10-23 Meaning of Different ETN Diagnostic Schematic....239
10.10 Use the ETN Diagnostic Display....241
10.11 Use the UCN Peer-To-Peer Traffic Analysis Tool....244
Figure 10-2 Main Schematic - $UCNP2P.DO....246
Table 10-24 $UCNP2P Initialization Target Information....247
Figure 10-3 Main Schematic – HELP Target....248
Figure 10-4 Main Schematic – Operation 1....249
Figure 10-5 Main Schematic – Operation 2....250
Figure 10-6 Run the UCNP2PLD AM/CL program and collect data to a file Target....252
Table 10-25 Error messages....254

SECTION 11 – SCHEMATIC FILES....257

11.0 Overview....257
11.1 Picture Editor Tips....258
Figure 11-1 Picture Editor File Relationships....259
Table 11-1 Color Priority....260
Table 11-2 Common Abbreviations....262

SECTION 12 – CONTROL LANGUAGE FILES....265

12.0 Overview....265
12.1 File Handling Tips....266

SECTION 13 – AREA DATABASE, CONTENT, AND USE....269

13.0 Overview....269

Table of Contents

13.1 Database Composition ... 270
13.2 Assigning Units to an Area ... 272
Figure 13-1 Unit Assignment Picks and Unit Annunciator Picks ... 272
13.3 Adding a New Volume or Directory to the Pathname Catalog ... 273
Table 13-1 Displays Available ... 273
Table 13-2 Methods of Accessing a Volume or Directory ... 274
Table 13-3 Procedure for Copying Files to an HM ... 274
Table 13-4 Adding a Pathname to an HM or to a Cartridge ... 275
Table 13-5 Making an Area Change ... 276

SECTION 14 – DATA BINDING IN THE TPS SYSTEM ... 277

14.0 Overview ... 277
Table 14-1 Summary of Data Binding in the TPS System ... 278
Figure 14-1 Quick Reference Matrix of the Effects of Data Changes ... 279
Figure 14-2 Configuration Sequences and Data Relationships ... 280
14.1 Binding of Unit, Area, and Console Names ... 281
14.2 Binding of NCF Data ... 283
Table 14-2 Detailed Matrix of NCF Data Binding Relationships ... 283
14.3 Binding of HM Local NVCF Data ... 284
Table 14-3 Detailed Matrix of NVCF Data Binding Relationships ... 284
14.4 Binding of Entity Data in the Data Entity Builder ... 285
Table 14-4 Detailed Matrix of DEB Data Binding Relationships ... 285
14.5 Binding of Schematic Data ... 287
Table 14-5 Detailed Matrix of NCF Schematic Data Binding Relationships ... 287
14.6 Binding of Data in CL Programs ... 288
Table 14-6 Detailed Matrix of NCF CL Data Binding Relationships ... 288
14.7 Binding of Entities and Schematics into the Area Database ... 289
Table 14-7 Detailed Matrix of Area Data Binding Relationships ... 289

SECTION 15 – ACTORS AND PROCESS CONTROL ... 291

15.0 Overview ... 291
15.1 Use of Actors ... 291

SECTION 16 – AM CONFIGURATION GUIDELINES ... 293

16.0 Reserved ... 293

SECTION 17 – DATA TO BE USED DURING CONFIGURATION ... 295

17.0 Overview ... 295
17.1 Publications Defining Configuration Data ... 296

SECTION 18 – AVOIDING MISTAKES AND ERRORS ... 297

18.0 Overview ... 297
18.1 Guidelines and Warnings ... 297
Table 18-1 Database Loading and Checkpointing Rules ... 298
Table 18-2 Procedure Used When Moving the System Volume (&ASY) ... 299

SECTION 19 – GLOSSARY OF TPS CONFIGURATION TERMS ... 303

19.0 Overview ... 303
19.1 Configuration Terms ... 303

SECTION 20 – NODE LOADING AND NODE DUMPS ... 309

20.0 Overview ... 309
20.1 Node Loading Failures ... 310
Table 20-1 Interpreting Cause of Node ... 311

Table of Contents

Table 20-2 Clearing a LOAD FAIL (from the System Status Display) 311
Table 20-3 Clearing a LOAD FAIL message (from the Console, Process Network Node, or Device Node Status Displays) 312
20.2 Fast-Load Feature 313
20.2.1 Fast-Load Scenario 315
Table 20-4 Loading a US from Itself 315
Table 20-5 Stages of the Cartridge Fast-Load Scenario 316
20.2.2 Fast-Load Implementation Considerations and Guidelines 317
Table 20-6 Display Abstracts Loaded First 317
20.2.3 Content and Maintenance of Fast-Load Cartridges 319
20.2.4 How to Prepare or Update a Fast-Load Cartridge 323
20.3 Node Dumps 332
20.3.1 Dump Failures 332
20.3.2 Save Error Blocks on Node Reload 333

SECTION 21 – CHECKPOINTING 337

21.0 Overview 337
21.1 How to Configure for Checkpointing 339
21.2 Checkpoint Functions 341
21.2.1 Demanding, Enabling, and Disabling Checkpoints 341
21.2.2 Automatic Checkpointing 343
21.2.3 Levels of Automatic Checkpointing 348
21.2.4 Checkpoint File Organization 351
21.3 Checkpoint Error Messages 354
21.3.1 System Error Messages—Hiway Checkpoint 355
21.3.2 System Error Messages—UCN Auto Checkpoint 356

SECTION 22 – PROCESSOR STATUS DATA POINT 357

22.0 Overview 357
22.1 Purpose of Processor Status Data Points 358
22.2 PSDP Parameters in All Nodes 359
22.3 Application Module PSDP Parameters 373
22.4 Computer Gateway PSDP Parameters 394
22.5 History Module PSDP Parameters 399
22.6 Hiway Gateway PSDP Parameters 403
22.7 Network Gateway PSDP Parameters 415
22.8 Universal Station PSDP Parameters 423
22.9 HM60 PSDP Parameters 450
22.10 Remote User Link Adapter (RULA) PSDP Parameters 452
22.11 Network Interface Module PSDP Parameters 453
22.12 Application Processing Platform PSDP Parameters 472
22.13 Global User Station PSDP Parameters 474
22.14 Unit Operations Data Point 475
22.15 Parameters On Every Point in the System 476

SECTION 23 – CONFIGURING FOR PERFORMANCE 483

23.0 Overview 483
23.1 The Performance Cluster Concept 484
23.1.2 Cluster Performance (68020-Based Processors) 487
23.2 The Honeywell Control Unit 490
23.3 Focused Load Concept 493
23.4 Factors that Affect System Performance 494
23.5 Estimating LCN Load on Your System 496
23.6 System load calculation tool 500

Table of Contents

23.7 HM Performance Hints and Rules of Thumb 509
23.7.1 HM Utilization 510
23.7.2 Continuous History Hints and Rules of Thumb 511
23.7.3 Fast Search User Volume 512
23.7.4 Directory Searches Hints and Rules of Thumb 513
23.7.5 Event Journal Hints and Rules of Thumb 515

SECTION 24 – NCF AND LCN STATUS DISPLAYS 517

24.0 Reserved 517

SECTION 25 – LCN RECONNECTION 519

25.0 Reserved 519

SECTION 26 – LCN/DATA HIWAY HARDWARE COMPATIBILITY 521

26.0 Reserved 521

SECTION 27 – HOW TO MOVE TO A NEW TPS RELEASE 523

27.0 Overview 523
27.1 What is a Release? 523
27.2 Upgrading Software 524
27.2.1 The Software Upgrade Process 525
27.2.2 Preparation for a Software Upgrade 526

SECTION 28 – PURCHASED OPTIONS 527

28.0 Overview 527
28.1 Key File Options 529
28.1.1 AM Redundancy 530
28.1.2 HG Point Display Ranges 532
28.1.3 Enhanced Trend Pens 534
28.1.4 HM Disk Redundancy 535
28.2 Hardware Options 537
28.2.1 Application Module Hardware Upgrades 539
28.2.2 Enhanced (68040) Computer Gateway 541
28.2.3 Computer Gateway to Plant Network Module Upgrade 542
28.2.4 Programmable Logic Controller Gateway Upgrades 543
28.2.5 Enhanced (68040) Hiway Gateways 544
28.2.6 Universal Station and Workstation Upgrades 545
28.2.6.1 Cartridge Drive Upgrades 546
28.2.6.2 Improved Display Screen Upgrades 547
28.2.6.3 Enhanced Processor or Memory Upgrades 548
28.2.6.4 Printer Enhancement Upgrades 549
28.2.6.5 Touch Screen Upgrade 550
28.2.6.6 Keylock Switch Replacement Upgrade 551
28.2.6.7 Keyboard Addition Upgrades 552
28.2.7 HM Upgrades 553
28.2.8 Time-Sync Upgrades for Network Interface Module 555
28.2.9 Precision Clock Sources 556
28.2.10 Process Manager to Advanced Process Manager Upgrades 557
28.2.11 LCN Extender 558
28.2.12 Micro TDC 3000 Upgrades 559

SECTION 29 – LCN CABLE DIAGNOSIS 561

29.0 Reserved 561

Table of Contents

SECTION 30 – EVENT-INITIATED REPORTS—IMPLEMENTATION AND USE 563

30.0 Overview 563
30.1 Implementation of Event-Initiated Reports 564
30.1.1 Message-Source Considerations 565
30.1.2 Area Reports 566
Table 30-1 $AREA and $CONS Information 566
30.1.3 Event History Reports 569
Table 30-2 The Item Parameter 569
Table 30-3 Date and Time Parameter 570
30.2 Operation of Event-Initiated Reports 574
30.2.1 Error Handling 575

SECTION 31 – CUSTOM SOFTWARE BACKPLANE AND GENERIC OVERLAYS .. 577

31.0 Overview 577
31.1 Custom Software Installation 578
Table 31-1 Installation Steps 578
31.1.1 The NET>&CUS Directory 579
31.1.2 Using the LCN Node Configuration Menu 580
Figure 31-1 LCN Node Configuration Menu 580
31.2 Generic Overlays 582
Table 31-2 Custom Software vs. Generic Overlay Differences 582
Table 31-3 Procedure to Incorporate a New Generic Overlay 582

SECTION 32 – REPORT TO OUTPUT FILE 583

32.0 Overview 583
32.1 Virtual Printer Assignments 584
Table 32-1 Virtual Printer Assignment One Area Example 585
Table 32-2 Virtual Printer Assignment Two Area Example 585
32.2 Setting Up a Configuration File 586
32.3 Sending Reports to a Virtual Printer File 588
32.4 Using File Descriptors to Identify Virtual Printer Files 589
32.5 Displaying and Printing Reports 590
32.6 Status and Error Messages 591
Table 32-3 VP CONFIG Error Messages 593
32.7 Error Handling 594
Table 32-4 SYStem Error Handling Process 594
Table 32-5 USER Error Handling Process 595
Table 32-6 SEVERE Status Handling Procedure 595
32.8 Purging and Protecting Virtual Printer Files 597

SECTION 33 – KEYBOARD BUTTON LED ASSIGNMENT AND CONTROL 599

33.0 Overview 599
33.1 Implementation 600
33.1.1 Message-Source Considerations 601
33.1.2 Button PRIMMOD Assignment 602
33.1.3 Button LED Control 604
33.1.4 Error Handling 606

SECTION 34 – LCN NODE VERSION REVISION LOGGING 607

34.0 Overview 607
34.1 General Functionality 608
Table 34-1 LCN Node, Board Description Header Record 610
Table 34-2 Data Hiway Box, Card Description Header Record 612

Table 34-3 UCN Node, Card Description Header Record ... 612
Table 34-4 LCN Nodes Reported ... 613
Table 34-5 Data Hiway Boxes Reported ... 615
Table 34-6 UCN Nodes Reported ... 616
Figure 34-1 LCN Node Version/Revision Logging Display indicating RNIM/TNIM ... 617
Figure 34-2 LCN Node Version/Revision Logging Display indicating Device Index, Authentication Group, and BOOT-only firmware version ... 618
Figure 34-3 LCN Node Version/Revision Logging Display indicating Device Index, Authentication Group, and BOOT and APP firmware versions ... 618
Figure 34-4 LCN Node Version/Revision Logging Display indicating TCMI ... 619
Figure 34-5 LCN Node Version/Revision Logging Display indicating an ELCN node ... 619
Figure 34-6 LCN Node Version/Revision Logging Display indicating EHPM's HART IOPs ... 622
34.2 Requirements ... 623
Table 34-7 Dedicated Custom Global DDB Indices ... 624
34.3 Installation Requirements ... 625
Table 34-8 Find a Directory ... 626
34.4 Initial (First Time) Installation ... 627
Table 34-9 Universal Station Configuration ... 628
34.5 Upgrade Installation ... 631
Table 34-10 Loading the Node ... 632
34.6 Operating the LCN Node Version/Revision Logging Function ... 633
Table 34-11 Call Up LCN Node Version/Revision Logging Display ... 633
Figure 34-6 LCN Node Version/Revision Logging Display ... 634
Table 34-12 Open Site ID Data Entry Port ... 635
Figure 34-7 LCN Node Version/Revision Logging Display (with Enter Site ID data entry port) ... 635
Figure 34-8 LCN Node Version/Revision Logging Display (with Site ID) ... 636
Table 34-13 Open LCN ID Data Entry Port ... 637
Figure 34-9 LCN Node Version/Revision Logging Display (with Enter LCN ID data entry port) ... 637
Figure 34-10 LCN Node Version/Revision Logging Display (with LCN ID) ... 638
Figure 34-11 LCN Node Version/Revision Logging Display (with Report Generation Status) ... 642
Figure 34-12 LCN Node Version/Revision Logging Display (with Report Generation In Progress) ... 643
Figure 34-13 LCN Node Version/Revision Logging Display (with Report Generation Complete or Failure) ... 644
Figure 34-14 Generated Report - Leftmost 80 Characters ... 645
Figure 34-15 Generated Report - Rightmost 80 Characters ... 646
Figure 34-16 LCN Node Version/Revision Logging Display (Printer Number data entry port) ... 648
Figure 34-17 LCN Node Version/Revision Logging Display (Printer Number in the ... 649
34.7 Files Generated by the LCN Node Version/Revision Logging Function ... 651
34.8 Error Conditions ... 659
Figure 34-18 LCN Node Version/Revision Logging Display (with a failure status) ... 659
Table 34-19 LCN Node Version/Revision Logging Display ... 661
34.9 Importing Report File into Spreadsheet ... 662

SECTION 35 – R530 TREND AND OPERATING DISPLAY FUNCTIONS ... 665

35.0 Overview ... 665
35.1 Configurable Access Levels on Parameters ... 666
Figure 35-1 System Wide Value, Console Data Selection ... 669
Figure 35-2 System Wide Values, NCF Console Data PAGE 5 with Configurable Access Level on Parameters Information ... 670
35.2 One Key Call Up of Point Trend ... 672

35.3 Save/Restore Trend Data....675
Figure 35-3 Saved Trend Data File....676
35.4 Detail Display Navigation....681
Figure 35-4 Connection Page in Detail Display with Connection....681
35.5 SP/OP Tolerance Check....682

SECTION 36 – R610 PERIODIC PRE-DEFINED DOCUMENTATION TOOL QUERY 685

36.0 Overview....685
36.1 Implementation....686
36.2 Periodic Pre-Defined Query Scenarios....692

SECTION 37 – R660 FINDING POINT INTERCONNECTIONS.... 695

37.0 Overview....695
37.1 Implementation....697
Table 37-1 Modifying the NCF....697
37.2 Operation....701
Figure 37-1 $INTRCON Schematic....701

Section 1 – Engineer's Reference Manual Summary

1.0 Overview

Introduction

This section introduces you to this publication and summarizes the content of its remaining sections.

References

Detailed actions and procedures are described in other publications and we assume that you have had some exposure to the **TotalPlant** Solution (TPS) System concepts.

For overviews and summaries of the implementation processes:

- see *System Overview,* or
- see *Implementation Overview*, or
- see *Configuration Data Collection Guide.*

Supplement to other publications

This publication supplements the detailed publications and is intended to help you to:

PLAN AHEAD! PLAN AHEAD! PLAN AHEAD! PLAN AHEAD!

by showing interactions and relationships in the engineering activities and the system, and the effects of configuration or configuration changes.

Start by making a complete backup set of all disks provided with the system. Refer to Section 2 for use of the Create Volume and FCOPY commands that are used to do this.

System Software

System software is delivered on disks or CD-ROMs. *See System Startup Guide-CD-ROM* when using a GUS.

Relationship to other publications

For startup information, refer to the *System Startup Guide*.

For engineers who are implementing a new LCN-based system, this publication is keyed to the startup guide by a "[TASK nn]" identifier on several of its headings. These system startup tasks are identified in the table of contents of the startup guide.

This publication also is directed to engineers who are redesigning and reconfiguring LCN-based TPS systems.

1.1 Things to Decide Before Configuring or Reconfiguring

Where to begin

Before configuring or reconfiguring your system, refer to Section 14 on data binding and consider which configuration changes can be made on-line after an NCF has been installed and is in use. You may want to defer some inconvenient tasks to another time.

Understand concepts

You should understand the following concepts:

- Organization of the plant into units and areas.
- Area assignments to consoles.
- Number and sizes of HM user volumes and directories (refer to Section 2 and Section 7).
- Naming and numbering conventions.

Naming and numbering conventions

For naming and numbering conventions, consult these references.

- For Units, Areas, and Consoles, see *Network Form Instructions*.
- For HM User Volumes, see Section 7 of this publication.
- For Logs, Groups, and Overview Displays, see *Area Form Instructions*.

Parameter information

Each major TPS device has an appropriate parameter reference dictionary. For specific parameter information:

- see *Hiway Gateway Parameter Reference Dictionary*, or
- see *PM Family Parameter Reference Dictionary*, or
- see *Computer Gateway Parameter Reference Dictionary*, or
- see *Logic Manager Parameter Reference Dictionary*, or
- see *Programmable Logic Controller Gateway Parameter Reference Dictionary*.

1.1 Things to Decide Before Configuring or Reconfiguring, Continued

File conventions

Consult these references for file and custom data segment conventions.

- For IDFs (entity files) and Exception Build Files, see the *Data Entity Builder Manual*.
- For Subpicture and Schematic Files, see the *Picture Editor Data Entry*.
- For CL Program Source Files and Custom Data Segments:
  - see *Control Language/Multifunction Controller Data Entry,* or
  - see *Control Language/Application Module Data Entry*, or
  - see *Control Language/Process Manager Data Entry*, or
  - see *Control Language/Advanced Process Manager Data Entry*.

Recommended hardware and personality

We recommend (and assume) that for your work you will use a Universal Station or a Universal Workstation loaded with the Universal Personality. This Universal Personality software contains both Engineering functions and the Operator functions.

Your Universal Station should also have two drives and a printer connected directly to the US.

Why this arrangement?

This arrangement provides disk operations that are faster than if the drive is connected to another US in the console, and it enables screen printing.

You can also switch quickly from Engineering functions to the Operator functions to see the results of your work as you enter data and load it in the nodes.

Load another US with Operator Personality functions

So you can see the results of your work, it's helpful to have another US in the same console loaded with the Operator Personality functions.

1.1 Things to Decide Before Configuring or Reconfiguring, Continued

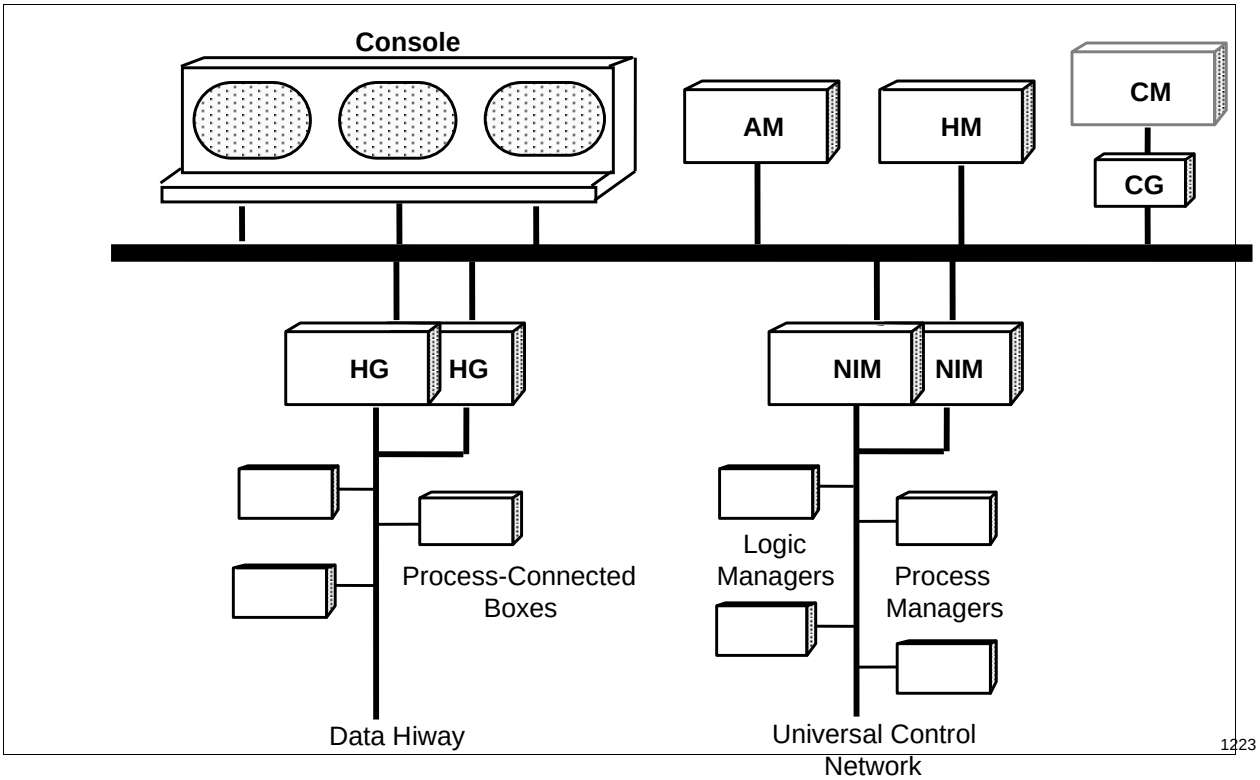
Conceptual organization

Figure 1-1 shows the conceptual organization of the hardware on a TPS system. The following are special items to be noted from this diagram:

- A **process area** is a portion of the process plant normally controlled by one operator.
- A **process unit** is a specific section of the plant (such as a boiler, furnace, or blender).
- A **console** is a logical collection of Universal Stations and their associated peripherals for use by one operator. A console is associated with one process area, and the area database configured for that area is to be loaded into each US in the console when the USs are loaded.
- **Peripherals** on a console are physically connected to only one Universal Station; however, they are generally available for use by other Universal Stations within the console, provided the Universal Station to which they are connected is operating on the LCN.
- **Mass-storage access**—The LCN is connected into the HM, not directly to the Winchester drives. Access to the Winchester disks by the LCN is possible only when the HM is operating on the LCN.

1.1 Things to Decide Before Configuring or Reconfiguring, Continued

Figure 1-1 Representative TPS Hardware



1.2 Preferred Hardware Configuration

Refer to Section 23—Configuration for Performance.

1.3 Universal Personality and Operator Personality

The meaning of "Personality" in this manual

In the Universal Station, we refer to the Universal Personality and the Operator Personality. For Universal Stations (USs) and Universal Work Stations (UWSs) operating on the Universal Personality (UP), these mentions mean the portion of the Universal Personality that contains all Engineering functions and all Operator functions. The Operator Personality refers only to the Operator functions in the USs and UWSs.

Differences between functions

The Engineering functions are those that are activated by targets (called "picks") on the Engineering Main Menu. Most other functions are Operator functions, however, there are several displays and functions that are shared by both the Engineering functions and the Operator functions. NOTE: For R500 there is no separate Engineering Personality to load; Engineering functions are included with Operator functions in the Universal Personality.

Access through targets and keys

These are the displays and functions that are accessed through the following targets or keys:

Table 1-1 Displays and Functions Accessed through Targets and Keys

Engineering Main Menu Targets	Operator Keyboard Keys
SYSTEM STATUS	SYST STATS
SYSTEM MENU	SYST MENU
CONSOLE STATUS	CONS STSTS

Calling functions in the Universal Personality

At a US running the Universal Personality, to call up the Engineering Main Menu from any display, hold CTL and press HELP (MENU). In some Engineering functions activities, you may need to do this twice, either because of a prompter that warns you about possible loss of data, or because you have to go through a lower-level menu to get to the main menu. To go to an Operator function from an Engineering functions activity, first return to the Engineering Main Menu.

Memory requirement for Universal Personality

6Mw of memory are required in USs functions and UWSs that are to operate using the Universal Personality.

1.4 Section Summaries

Introduction	The following are summaries of the content of each of the other sections in this manual:
Section 2—File System Operations	The file system stores software and data on disks and History Modules (HMs). This section defines the file system concepts and describes the most-often used Utilities commands.
Section 3—The &ASY Directory and its Special Characteristics	Describes the special characteristics of system directory &ASY, which contains the basic description files required for the startup of each node, including the network configuration file (NCF.CF). You need to know about these characteristics so that you can avoid problems related to this directory or recover from them.
Section 4—Area and Standard Abstract Directories	Describes the special characteristics of the area database directory and the abstract directories that define the appearance and content of the displays in the operator's personality.
Section 5—Console Organization	Explains how a console is defined, defines special characteristics of the devices that can be connected to a Universal Station, and provides some tips for optimum console performance and convenience.
Section 6—Network Configuration File	Describes the special characteristics of the Network Configuration File. This file contains network information that is vital for the operation of all nodes on the LCN. The content of the NCF is defined, as are its use in node startup. Also see Section 3—it discusses directory &ASY, the directory that contains the NCF.
Section 7—HM Volume Configuration and Initialization	Defines the requirements for configuring and starting up an HM. It also provides guidelines for use of HM storage space and for estimating the size of the volumes assigned to each.
Section 8—Reserved	In earlier versions of this manual, this section contained **Hiway, Box, and Slot Configuration Guidelines.** For this information, you must refer to *Hiway Gateway Implementation Guidelines*. This section has been retained to direct users familiar with an earlier version of this manual to the new location of the information and to preserve the validity of references to other sections of this manual.

1.4 Section Summaries, Continued

Section 9—Reserved	**Data Entity Builder Operations**—In earlier versions of this manual, this section contained guidelines for Data Entity Builder operations. Now you must refer to the *Data Entity Builder Manual*. This section has been retained to direct users familiar with an earlier version of this manual to the new location of the information and to preserve the validity of references to other sections of this manual.
Section 10—System Performance Displays	Explains how to monitor and evaluate system performance through access to the System Performance Displays. Help in interpreting the displays is included to aid in diagnosing the cause of the problem.
Section 11—Picture Editor and Custom Displays	Provides tips for the use of the Picture Editor to build custom (schematic) displays.
Section 12—Control Language (CL)	Provides tips and precautions for the use and handling of the data and files used in compiling, linking, and loading CL programs.
Section 13—Area Database, Content, and Use	Describes the content of the area database and how the area for a console is established. It also points out that changes to the area database actually take place in a US only when the database is loaded into that US. The relationship of the Engineering functions Unit Assignment display to the operator's personality's alarm summary and annunciator displays is defined.
Section 14—Data Binding in the TPS System	Introduces the concept of data binding and it describes the consequences of that binding. The effect of data binding on configuration and reconfiguration of the system is also discussed.
Section 15—Actors and Process Control	Advises that actors are not to be used for actions that are involved in process control.
Section 16—Reserved	In earlier versions of this manual, this section contained **AM Configuration Guidelines.** For this information, you must refer to the *Application Module Implementation Guidelines*. This section has been retained to direct users familiar with an earlier version of this manual to the new location of the information and to preserve the validity of references to other sections of this manual.

1.4 Section Summaries, Continued

Section 17—Data to be Used During Configuration	Relates the types of configuration data to the publications that define each type of data and to the configuration forms used to record each type of data.
Section 18—Avoiding Mistakes and Errors	Contains a collection of the significant guidelines, precautions, and warnings that appear in this and other publications. If you review this section from time to time, and implement its content, you should experience a minimal amount of rework and error correction.
Section 19—Glossary of TPS Configuration Terms	Summarizes the terms related to the configuration process. You can also refer to the *System Overview* for a more extensive glossary.
Section 20—Node Loading Guidelines	Provides guidelines for recovering from the failure of a node to load properly with software and data.
Section 21—Automatic Checkpointing	Describes how you can configure your system for automatic checkpointing for NIMs, HGs, AMs, and CGs, how automatic checkpointing functions, and what happens if an error occurs.
Section 22—Processor Status Data Point	Defines processor-status data points (PSDPs), discusses their use, and lists each PSDP parameter with its definition.
Section 23—Configuring for Performance	Defines two items that are the basis for system performance measurements and system integrity. These items are the performance cluster concept and the Honeywell control unit (HCU). Guidelines for configuring LCN-based equipment for predictable performance and for estimating AM performance are provided.
Section 24—Reserved	In earlier versions of this manual, this section provided information about **displays that provided information about NCF and LCN status**. For this information, you must refer to *LCN Guidelines - Implementation, Troubleshooting, and Service*. This section has been retained to direct users to the new information.

1.4 Section Summaries, Continued

Section 25—Reserved	In earlier versions of this manual, this section provided information about **LCN reconnection**. For this information, you must refer to *LCN Guidelines - Implementation, Troubleshooting, and Service*. This section has been retained to direct users to the new information.
Section 26—Reserved	In earlier versions of this manual, this section provided information about **displays that provided information about NCF and LCN status.** For this information, you must refer to *Hiway Gateway Implementation Guidelines*. This section has been retained to direct users to the new information.
Section 27—How to Move to a New TPS Release	This section defines a software release and provides general guidelines for upgrading to a new software release.
Section 28—Purchased Options	This section describes system options available for purchase and provides guidance and references for the implementation of the options.
Section 29—Reserved	In earlier versions of this manual, this section provided information about **diagnosing LCN cable problems.** For that information, refer to *LCN Guidelines - Implementation, Troubleshooting, and Service.*
Section 30—Event-Initiated Reports—Implementation and Use	This section provides information about the implementation and use of printed reports whose printing is initiated by user-defined events.
Section 31—Custom Software Backplane and Generic Overlay	The Custom Software Backplane is a provision that allows the addition of optional, standard, and custom software modules to a node without modifying the node's original personality software. Generic Overlays enable table-driven generation of pictures and CL sequences based on equipment lists and a generic source. This function enhances the system's effectiveness and friendliness for batch applications, and provides a useful tool for any application.
Section 32—Report to Output File	Reports can be sent to an electronic file that is a "virtual printer" to the TPS system. The user selects the number of the "printer" the data should go to by submitting a normal printer request.

1.4 Section Summaries, Continued

Section 33—Keyboard Button LED Assignment and Control	This section describes the implementation and use of CL messages to assign primmod values to buttons and control the LEDs on specified LED buttons associated with any of the 40 configurable LED buttons to be dynamically changed for the local Universal Station.
Section 34—LCN Node Version/Revision Logging function	The LCN Node Version/Revision Logging function is a software application package that operates on Universal Stations of the Honeywell TPS system. This function is a TPS "backplane" extension of the Universal Station Operator personality and Universal personality and is packaged as an External Load Module. The function is a display initiated version/revision report generator.
Section 35—R530 Trend and Operating Display functions	The following R530 functions are included in this section: • Configurable Access Level of Parameters - Access level is configured in the NCF for alarm limits, control limits, range limits, and tuning parameters on the Point Detail Display. • One Key Call Up of a Point Trend - A custom trend can be invoked by pressing the TREND key after selecting a point from a standard display. • Save Trend Data - Two new actors are provided to save and restore custom schematic trend data. • Detail Navigation - On pages of the Detail Display which contain input, output, and control connections, targets are added over any point names that are displayed. • SP/OP Tolerance Check - Manually entered SP and OP values for AM, HG, and NIM regulatory control points and OP values for HG and NIM analog output points are checked against a specified magnitude of change tolerance.

1.4 Section Summaries, Continued

Section 36— R610 Periodic Pre-Defined Documentation Tool Query	This function provides the ability to initiate and cancel pre-defined Documentation Tool queries through CL or scheduled ECs and have the query results automatically sent to a file or printer. Refer to *Command Processor Operation* for a discussion of Documentation Tool Query commands.
Section 37— R660 Finding Point Interconnections Function	This section describes the implementation and use of the Finding Point Interconnections function that can be initiated by operators to search for point interconnections in specified AM, UCN, and HG checkpoints.

Section 2 – File System Operations

2.0 Overview

Description

The file system stores software and data on disks and History Modules (HMs).

This section defines the file system concepts and describes the most-often used Utilities commands.

2.1 File System Pathnames

File usage

Data in the system is collected into named files that are stored in named volumes and directories on History Modules and on removable media (disks).

The information in these files is transferred to memory in the nodes on the LCN as it is needed.

Pathname format

Access to the files is through a pathname that consists of a device identifier, a volume or directory name, and a file name. The pathname format is:

```
device>vdir>file
```

Where ">" is a delimiter that marks the boundary between the pathname files and:

- `device` = the device name or physical-node identifier (for example, `$F3`, `NET`, or `PN:13`)
- `vdir` = the volume or directory name (1 to 4 characters, e.g., `&ASY`)
- `file` = (1- to 8-character name) (2-character suffix) (for example, `PMREG.EB`)

2.1.1 Pathname Rules

Introduction	Follow these rules while using and constructing pathnames.
Drive identification	Drives are referred to by their logical-device ID (LDID), which is established during network configuration. The LDID has the form `$Fn`, where "n" is a number from 1 through 20.
NET defined	`NET` is the device name for any volume that is stored in an HM. Only the HM with the named volume or directory responds.
Volume and directory usage	The device can be indicated by a physical-node identifier in the form: PN:nn Where nn is the node number established during network configuration. The number "nn" can be the node number of an HM, or of a US with a drive. The US must be in the same console, not in another console and must contain the removable medium whose name is in the "vdir" field. The `PN:nn` form must be used to access an HM that is running its initialization personality (&HMI).
Volume and directory names	Volume and directory names identify one of several partitions on a Winchester disk in an HM. HMs can have several volumes, each of which can have up to 63 directories. Each disk has one volume, and each can have up to 63 directories. NOTE: Backup and restore operations allow you up to 2046 directories on a disk by using an extended directory (-X) option, which is described in the section, 6.4 Create Volume, in the *Command Processor Operation* manual, and section, 7.7.5 Prepare Removable Media for Data Storage, in this document.

2.1.1 Pathname Rules, Continued

Volume and directory hierarchy

Each volume name and each directory name is unique. A given volume or directory name can exist only once in all of the HMs on an LCN.

There is an exception—each HM has a Local Volume that is never accessed by the device name `NET`. The Local Volume is accessed through a `PN:nn` physical-node identifier.

Directories are subdivisions of volumes. Files can be associated with volumes or with directories, but you can't access a file that is associated with a directory by using its volume name—use the directory name.

2.2 Access to Volumes and Directories

Introduction

While directories are subdivisions of volumes, pathnames can include either a volume name or a directory name in the volume/directory field.

Example

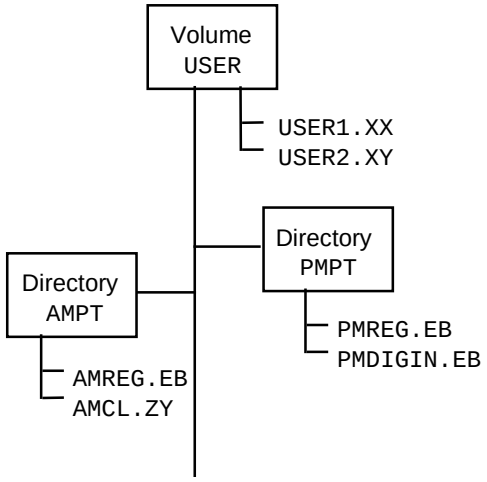
In the following pathname: `NET>VDIR>FILE.XX`

the `VIDR` field must contain either the name of a volume in an HM on the network (LCN) or the name of a directory in a volume on the network. If the file is in a directory, the system can find it through the directory name only, it doesn't need the volume name.

In this example, assuming volume `USER` is a volume on an HM, file `USER2.XY` can be found through this pathname:
`NET>USER>USER2.XY`

And file `AMCL.ZY` can be found through this pathname:
`NET>AMPT>AMCL.ZY`

But file `AMCL.ZY` cannot be found through this pathname:
`NET>USER>AMCL.ZY`



2.3 System Volumes and User Volumes

Description

Table 2-1 lists the system volumes provided by Honeywell and the directories those volumes contain. The “&” or “!” which begin all system volume names are the ampersand and exclamation point. When spoken, “&” is called the “and” character and “!” is called the “bang” character.

All volume and directory names are unique in an LCN. Some volume and directory names represent specific node pairs (“np” in Table 2-1) or specific unit numbers (“un” in Table 2-1). Each volume and directory exists only once in any HM. You can locate each volume and its directories in any HM, but only one instance of each can exist on the LCN. Volumes and directories are assigned to specific HM node pairs in the Volume Configuration activity of Network Configuration.

User volumes and user directories can have unique names that are 4-characters or less and that do not begin with “&” or “!”. It is helpful if you use names that convey some meaning. For example, you might give the name `PNTS` to a user volume that contains point-building information. You might name a directory in that volume `AMPT` to indicate that it contains AM points.

2.3 System Volumes and User Volumes, Continued

System Volumes and Directories

System Volume names, their Directories, and the use of the volumes are listed in Table 2-1.

Table 2-1 System Volumes and Directories

Volume	Directories	Volume Use
&0np	&ASY, &DSY, &KJF, &KFO, &LDR, & AMG, &ARG, &HGG, &NMG	System Files
&1np	&OPR, &HGO, &AMO, &CIO, &NMO, &UNP, &OP1	Personality load images
&2np	&AMD, &CGD, &HGD, &HMD, &MND, &OPD, &PMD	Dump volume
&3np	&Dan (10) (Note 1)	Area database
&4np	&Ehn (20) (Notes 1 and 2)	CL/MC object volume
&5np	&Fun (100), &Znn (20) (Note 1)	AM checkpoint
&6np	&Hun (100), &Znn (20) (Note 1)	CG checkpoint
&7np	&Ihn (20) (Notes 1 and 3)	HG checkpoint
&8np	&Ihn (20) (Notes 1 and 3)	NIM/PM/LM checkpoints
&9np	&Ehn (20) (Notes 1 and 2)	CL/PM Sequences, LM Ladder logic
!0np	!Aun (100) (Notes 1 and 4)	Continuous history, vol. 1
!1np	!Aun (100) (Notes 1 and 4)	Continuous history, vol. 2
!2np	!CSY, Cun (100) (Note 1)	Journal manager, journals
!4np	!ESY	On-proc, analysis, maint. support
!9np	(20) (Note 1)	HM local volume (Note 5)

Key:

np = HM node pair number
an = area number
hn = hiway number/UCN number
un = unit number
nn = node number

Note 1: The numbers in parentheses indicate the maximum number of each type of directory per system. Each volume can have no more than 63 directories of any type.

Note 2: The total number of &Ehn directories cannot exceed 20.

Note 3: The total number of &Ihn directories cannot exceed 20.

Note 4: The total number of &Aun directories cannot exceed 100.

Note 5: The HM personality images are not in volume &1np. They are &HMI (initialization personality) and &HMO (on-line personality), which are provided on disks and are copied to each HM's Local Volume (!9np). **&HMI and &HMO do not exist as directories on the LCN.** Only HMs use &HMI and &HMO and only out of their own Local Volume, not across the LCN.

2.4 Typical File System Utility Commands

Introduction

File-system utility commands that are often used during configuration and startup are described below. See *Command Processor Operation* for complete details.

Abbreviations

The following abbreviations are used in the command examples below:

Table 2-2 Abbreviations

Abbrev.	Command
dev	Disk LDID ($F1), “NET” for an on-process HM, “PN:nn” for an HM running its initialization personality.
volm	volume name (&01)
dir	directory name (&ASY)
vdr	volume or directory name (&01 or &ASY)
file	file name and suffix (NCF.CF)
-D	option: For LS command; omit list of files, list volume and directory information only. For other commands; give the details of the operation.
.	do all files/all suffixes in this operation
=	use the same file name for the destination-file name

Format a disk

To format a disk give it a volume name and specify it will hold “x” files

```
CR dev>volm> -F -MF x
```

Initialize a disk

To initialize a disk while retaining its existing format omit the “-F” option in the Create Volume command. Any data on the disk is deleted.

List volumes and directories

To list the volumes and directories in all HMs…

```
LV NET
```

List files on a disk or HM

To list files on a disk or HM…

```
LS dev>vdr>*.*
```

2.4 Typical File System Utility Commands, Continued

List files if names are not known

The files on a disk can be listed even if you don't know the volume name…

```
LS dev>>
```

Copy files

To copy all files from vdr1 to vdr2…

```
CP dev>vdr1>*.* dev>vdr2>=
```

To copy “filename.xx” and rename it “filname2.xx” from vdr1 to vdr2…

```
CP dev>vdr1>filename.xx dev>vdr2>filname2
```

When copied or renamed, files retain the same suffix; therefore, when renaming or copying files, you can't specify a suffix for the destination file.

Delete a file

To delete “filename.xx”…

```
DL dev>vdr>filename.xx -D
```

Copy a complete disk

To copy a complete disk for backup purposes (including volume name and boot record if any)…

```
FCOPY $Fs $Fd
```

Where s is the source drive number and d is the destination drive number.
The copy takes from several seconds to a few minutes. The destination disk must have been formatted with any name. Honeywell recommends that you have two backup copies. Use FCOPY to copy each cartridge to another cartridge. This will catch any directory structure problems on the first copy.

Back up files

To back up the (non-history and non-journal) content of an HM on disks…

```
BACKUP PN:nn $F1
```

Restore files

To restore a volume on an HM from disks…

```
RESTORE $F1 PN:nn
```

or

```
RESTORE $F1 NET>VOL
```

2.5 File Names and Suffixes

Introduction

There are restrictions to how file names are used and the suffixes that are attached to them. Those rules and pre-assigned suffixes are listed in the sections that follow.

Rules

Follow these rules when constructing file names:

- File names consist of one to eight alphanumeric characters. An under bar ("_") can be included, but no spaces. Each file name has a 2-character suffix that identifies the type of data in the file (in some cases, the system can assume the suffix and it's not necessary to include it in the file name).
- The file-name suffix restricts the use of a file to the functions that know the content and structure of the file.
- When the Utilities Copy command is used to copy a file, the original suffix is retained.
- When you use the Utilities' Create command to format a disk the medium is also initialized. This erases any data that may have been stored on the medium and establishes its volume name. Directories are then established with the Create Directory command.
- A disk that has already been formatted can be initialized (erased and renamed) without changing its format. To do this, omit the -F option in the command line for the Create Volume command.

2.5.1 File Name Suffixes (Extensions)

Introduction

During system implementation, you will work with standard system files that follow certain file-type standards. File types are identified by the file-name suffix.

Example

In the file name: `MGPNTS.DB` "DB" is the suffix that identifies this file type as an intermediate data file (IDF) used in entity building.

Use of suffixes

The following is an alphabetical list of suffixes and file types:

Table 2-3 Suffixes

Suffix	File Type
—	Temporary File
AG	Error Aggregate
AM	Noncyclic Archive Data
AO	AM/CL Object
BH	Batch History
BO	Boot File
BU	Text Editor Backup File
BR	Background Results
CF	Configuration File
CL	CL Source
CM	Journal File
CO	Configuration Object
CP	Checkpoint
DA	Area Database
DB	IDF
DC	Doc Tool Query
DF	User-Defined DDB File in Picture Editor
DM	Dynamic Cyclic File
DO	Display Abstract Object
DS	Display Abstract Source
DU	Memory Dump
DX	Picture Editor Print File
DY	DEB Error File
EB	Exception Build Source

2.5.1 File Name Suffixes (Extensions), Continued

Suffix	File Type
EC	Execute Command File
EF	DEB/Configuration Error File
EL	Edited List (DEB)
EM	CL Compiler Error Messages
EN	Event Name File
EO	Command Processor File
ER	Error File
FO	Free Format Log Object
FS	Free Format Log Source
GD	Global Descriptor File from compiling CDS
GM	Group Ctrl. File, Archive/Save
HF	Point Building Help File
JL	Logic Block Config. Listing
JO	Logic Block Config. Object
JS	Logic Block Config. Source
JT	Logic Block Temporary
KF	Software Options Key File
KL	Parameter Keylock Access Level
KN	An alternate extension for button file.
KO	Button Config. Object
KS	Button Config. Source
LD	Node Load File
LE	CL Error Listing
LM	CL Link Map
LO	Loadable Pers. Image Object
LS	CL Listing
MM	Permanent HM File
MO	CL/MC Object
MS	Miscellaneous File
PA	Printable Aggregate
PI	Personality Image
PL	Parameter List

2.5.1 File Name Suffixes (Extensions), Continued

Suffix	File Type
PS	Peer-Supplied List
QE	Equipment List Error File
QL	Equipment List successful compile listing
QO	Equipment List object file
QS	Equipment List source file
RD	Output from LVRLOG and the AUDIT command
RE	Same as RD, but comma separated
S	CLMI Load Module
SD	Data Segment Descriptor
SE	Standard Enumerations
SF	Include File for CL Interface
SL	Successful Entity List
SP	Standard Parameters
SS	Saved trend from using TR_SAVE in the Picture Editor
SU	Schedule EC Start Up
SV	Saved trend settings from Native Window Group Trend.
TI	Task Identifier
TO	Trend Memory Image
TR	CL Trace/Dump
UL	Unsuccessful Entity List
UM	Unit Control File for Save
VF	NCF View File
WA	Area Database Work File
WF	Network Config. Work File
X	User Source File (starts with X)
XI	Help (information) files
Y	User Source File (starts with Y)
Z	User Source File (starts with Z)
ZC	CLMI Configuration Modification Sample
ZI	CLM Builder Input File (BIF) Samples
ZS	Status Display Files (CLMI/port/device and so forth)
ZT	CLM Builder Template Definition File (TDFs) or Network Definition Table (NDT) Templates

2.6 Disk Drive and Disk Part Numbers

Introduction

To assure proper operation, disk drives and disks must meet Honeywell specifications. Order drives and disks from Honeywell using the part numbers listed in Table 2-4.

Disk drive and disk part numbers

Table 2-4 Disk Drives and Disks

Item	Part Number	Description
Disk Drive Assembly	51196929-135	3.5” internal disk drive
Disk Drive Assembly	51196933-100	3.5” internal disk drive. Fits 5.25” space. Black faceplate.
Disk	51196929-150	One 100MB IBM-formatted disk
Disks	51196929-160	Pack of 10 100MB IBM-formatted disks

Preparation for use

Use the Utilities Create Volume command to prepare each disk for use on the system. For additional information on disk care and use, see *Universal Station Service*.

2.7 Disk Drive Upgrade Kits

Introduction

Upgrade kits are provided for replacing floppy drives and Bernoulli cartridge drives and with drives.

Disk drive upgrade kits

Table 2-5 lists the six available upgrade kits and their respective model numbers. These upgrade kits cover the most common upgrade scenarios. If your upgrade scenario is not covered by any of the kits listed in Table 2-5, contact Honeywell for guidance.

The disk drive can be paired with either the 20MB or 100MB Bernoulli cartridge drive. This will allow the use of the FCOPY command to transfer data from the Bernoulli cartridge to the disk.

Note: The FCOPY command will only work when copying between removable media of the same capacity, or from a smaller capacity media to a larger capacity media.

Upgrade kit model numbers

Table 2-5 Disk Drive Upgrade Kits

Upgrade Scenario	Upgrade Kit Model Number
Single Bernoulli cartridge drive to single disk drive (Black faceplate)	MP-ZIP100-100
Single Bernoulli cartridge drive to dual disk drives (Black faceplates)	MP-ZIP101-100
Dual Bernoulli cartridge drives to dual disk drives (Black faceplates)	MP-ZIP102-100
Floppy drive(s) to single disk drive (Table mount)	MP-ZFZIP1-100
Floppy drive(s) to dual disk drives (Table mount)	MP-ZFZIP2-100
Universal Work Station floppy drive(s) to dual disk drives, or no drives to dual disk drives (New tower with disk drives installed)	MP-ZFZIP3-100

Section 3 – The &ASY System Directory and its Special Characteristics

3.0 Overview

Introduction

This section describes the special characteristics of system directory &ASY, which contains the basic description files required for the startup of each node, including the network configuration file (NCF.CF).

You need to know about these characteristics so that you can avoid problems related to this directory or recover from them.

LOAD states functionality

When loading nodes, the states may be in PWR_ON and QUALIF state. Refer to the *Process Operations Manual.*

3.1 &ASY's Role in Node Loading and Startup

Description

Several of the files in directory &ASY are accessed each time a node is reloaded and restarted. When a node is loaded, the location of the &ASY directory to be used is either implicitly stated (the source is the US that is initiating the load), or explicitly stated, as being on the network (NET) or on a specific disk drive ($Fn).

Note that the HM automatically uses the &ASY on the network when it reloads and restarts (autoboots) itself.

Configuration checks during startup

When a node starts up, the &ASY directory is accessed for information on the system configuration (NCF.CF file) by the node administrator software. The version of the NCF.CF file should be the same as that currently in use by other nodes on the LCN, and it will be if no changes have been made to NCF.CF since the system was first started up. It is possible to make changes to NCF.CF using the configurator in the on-line mode. The configurator is activated by selecting one of the Network Configuration picks (targets) on the Engineering Main Menu.

Note that the NET>&ASY is added as the default pathname when opting to print a NCF text file.

Reference

When such changes are made, there is some degree of impact on system operation. That impact and the steps you must take to resolve it are defined by the configuration displays that you may see in the *Network Form Instructions*. Also refer to *Network Data Entry*.

File access on startup

After the node administrator has started its part of the startup checks, the data-access software reads files on the system and parameter names from the &ASY directory. The first node started on the LCN sets the initial version of the data-access files; however, changes can be made through CL (the addition of custom names) and the version is updated in all nodes operational at the time of the CL operation.

Time to make backup copy of &ASY

It is at this point that you must be sure to make a backup disk copy of the &ASY, or you may be unable to load another node if the &ASY directory becomes unavailable (for example, the HM with the system volume is down or you spill something on the &ASY disk that has the updated files).

Two versions of &ASY directory

Honeywell supplies two versions of the &ASY directory on disks. The "startup" &ASY is set up with all LCN nodes as USs, and is used only to get the first US started, before anything else has been configured. The second version is the "empty" NCF version. It is this second version that is used from System Startup Task 6 and on—the version on which you build the NCF.WF and NCF.CF files for your specific system.

Product Disks

The disks provided by Honeywell have a set of "empty" data access-name files. Their presence is required for startup and, as you add names, you must be sure to keep your old set of Custom Name Library and Standard Parameter Set (.SE and .SP) files when a revised &ASY is sent or you will lose your custom names (for more information about these files, refer to *Control Language/Application Module Data Entry*).

Key to successful backup

The key to using the &ASY directory is to be sure you keep both a spare (current) and a backup (before the last change) disk copy that allows you to reload nodes, if necessary, when a change cannot be put on all nodes, or if it is urgent that a node be reloaded without making a change to all the nodes currently in operation.

This could happen if you wished to quickly restore a US with the Operator's Personality or Universal Personality.

3.2 Tools for Maintaining Backup Copies of &ASY

Description and File usage

Two Execute Command (EC) files are provided by Honeywell in the &EC directory on disk &Z1 (for 68040 and 68020 personalities) to help maintain a current database and NCF files.

- The first command file is ASY_BKUP.EC. It is used for building a complete &ASY from an HM.
- The second file is CLNCFBKP.EC. It allows a quick update of an existing &ASY disk with the dynamically changed files, from the HM, which affect the data-access names and the NCF files.

Instructions available

Instructions for the use of these .EC files are available as text in file TCO.XX in the &EC volume or directory (disk &Z1). To display the content of that file, on the Command Processor display, key in a command line as in this example:

```
PR $F1>&EC>TCO.XX
```

and press ENTER. The instructions appear on the display.

Section 4 – Area (&D01-&D10) and Standard Abstract (&DSY) Directories

4.0 Overview

Introduction

This section describes the special characteristics of the area database directory and the abstract directories that define the appearance and content of the displays in the Operator Personality.

4.1 The Role of &DSY and Other Data in Loading USs

Introduction

After it is loaded, the Universal Station's Operator Personality requires access to an area database and the standard abstracts, and optionally to the volume directory that contains custom schematics.

The Operator's Personality accesses the area database files that have been assigned to it in the NCF. Similarly, the standard abstracts are accessed, as are custom schematics and configured buttons, as indicated by the Pathname Catalog in the area database for the area loaded.

Pathname Catalog reference

For more information about the Pathname Catalog, refer to *Area Form Instructions*.

When files cannot be found

If HMs are being used as the load source and the area database files cannot be found, the load fails.

If the HM is being used as the load source and the standard abstract files cannot be found, the load fails.

If the custom schematic files cannot be found, the load completes if you press ENTER in response to the prompter that requests the schematic files.

Custom schematic files that are located on an HM, and that are not found during the load, are automatically accessed once the HM is operational and the schematic files are available over the LCN.

Picture Editor reference

For more information about user-built schematics and user-configured buttons, refer to the *Picture Editor Reference Manual*.

4.1.1 The Fast-Load Feature

Description

To facilitate fast recovery from system interruptions, such as a temporary loss of power, as soon as the System Status display abstracts have been loaded into a US, but before all abstracts and files are loaded, the System Status display appears and the US status goes from LOAD to PARTLOAD or WARNING.

As soon as the System Status display appears, the US can be used to load other nodes. Once all abstracts and files are loaded into the US, its status goes to OK (Operator Personality), UNVL (Universal Personality).

Procedure

A fast-load can be performed from an HM that is still running or from a fast-load disk. For more information about this feature, including the preparation of fast-load disks, refer to Section 20.

4.2 Changes to Area Database, Schematics, and Button Configuration

Description

Once all USs in a console are loaded and running, changes can be made to the area database and to schematics and button configuration without reloading the USs with their personalities.

Summary

Here is a summary of the major steps involved:

- Use the Data Entity Builder to make changes to the area database.
- Use the Picture Editor and the Button Configurator to make changes to schematics and button configuration. Compile the resulting source files and store the object files in &Dan or in a user volume (or directory). Be sure that the Pathname Catalog in the area database points to this directory.
- Use the AREA CHG target on the Console Status display at one US to change the area database on USs that are to operate with the new or revised area. Then, if needed, do an area change at the first US. The system resynchronizes messages, alarms, and system status across the area.

Section 5 – Console Organization

5.0 Overview

Introduction

This section explains how a console is defined. It defines the special characteristics of the devices that can be connected to a Universal Station, and it provides some tips for optimum console performance and convenience.

Description

A console is a configured "soft" definition of a collection of Universal Stations that are expected to be operated by one individual. During on-process operation, the Universal Stations in one console appear together on the System and Console Status displays.

Recall that Figure 1-1 illustrated a conceptual organization of Universal Stations. The following are some “rules” about the console’s organization.

5.1 Console Hints and Tips

Definition of a console	A "console" is defined by the configuration data supplied by you. A console is not automatically a set of furniture—it must be defined in the NCF.
The station number	Each Universal Station in a console is given a **station number** that is unique only within that console. The station number is used for functions such as cross-screen displays.
Physical location of console peripherals	The disk drives and printer are **local** (that is, physically wired) to only one Universal Station.
Access to console media drives	The disks can be accessed by any station in the console as long as the Universal Station node to which the disk drives are connected is operating on the LCN.
Restriction to media drives outside the console	The disks **cannot** be accessed by their logical-device ID (LDID) from outside the console (for example, a Universal Station in console 1 cannot access disk $F12 on a Universal Station in console 2 by the $F12 name). See Section 2.
Printer availability	In Release 600, A Universal Station can be configured to have the **Screen Print** function even though it is not hardwired to a printer. Before you can use the Console Status display to reassign the printer, you must configure the station to have a printer in the NCF node configuration. Then, from the Console Status display, reassign the US's printouts to a printer that is wired to another US on the console. Now you can execute screen prints. All functions of the printer will failover, except Real Time Journals. The Console Status display, however, will indicate a WARNING message because the printer is not physically wired. To overrides this message, you can attach a hardware jumpered connector to the US's printer port.

5.2 Printer Failover

Printer failover configuration file

The printer failover file allows the US to direct printouts to another printer in the console if the initial printer runs out of paper, jams, or fails. Currently in the TPS system, no *prebuilt* printer failover mechanism exists. Printer failover can be accomplished by creating a file in the Text Editor that indicates the printer failover assignment. All functions of the printer will failover, except Real Time Journals.

The printer failover file is created by the user through the Text Editor. The name of the file must be PRFAILnn.XX, where nn is the console number. This file must reside in the &ASY directory.

Example

A typical printer failover text file looks like this:

```
01P0203
02P0103
03P0102
```

where:
01=printer 1 in console nn
02=printer 2 in console nn
03=printer 3 in console nn

If printer one fails, the functions of printer one transfer to printer two. If printer two is not present, then printer three assumes printer one's functions.

Format of file

Table 5-1 shows the text file columns and contents. All columns do not have to be filled in, and "00" is a legal value.

Table 5-1 Format of Printer Failover Text File

Column	Definition
1,2	Printer Number. Example: 01
3	Device type: P (P = printer)
4,5	Number of first failover device: 00 to 10
6,7	Number of second failover device: 00 to 10
• •	• •
20,21	Number of ninth failover device: 00 to 10

Name and location of file

The name of the printer failover file created in the Text Editor should be named as follows ("nn" is the console number):
`PRFAILnn.XX`
Example:

`PRFAIL01.XX` is the printer failover file for console one.

After creating the file, copy it to the &ASY directory so it will load into the Universal Stations at load time.

5.3 Personality Hints and Tips

Engineering functions as used in this manual

In the following paragraphs, we refer to Engineering functions to mean the Engineering functions in the Universal Personality.

Engineering functions requirements

The Engineering functions **require** an Engineer's keyboard. If the Universal Station has the touch screen option and does not have an Engineer's keyboard, only the on-process functions (System Menu, System Status, Console Status) available through the Engineering Main Menu can be used, provided the Universal Station has the operator's panel (keyboard). If the Universal Station has neither the Engineer's Keyboard nor the touch screen, the Engineering functions cannot be used.

Engineering functions efficiency

The Engineering functions operate most efficiently in a Universal Station that has two disk drives and a printer directly connected. This allows for faster disk access and allows printing of screen images during the configuration process.

Universal Work Station configuration

If they are to operate with the Operator Personality, Universal Work Stations (UWSs) should be configured as members of the consoles whose process data they are to operate. A supervisor can use a UWS to monitor process data and schematic (custom, graphic) displays in other areas, but to participate in full control of an area, it must operate with the area database for that area. To use a UWS (or a US) to participate fully in more than one area, the Operator Personality's Area Change function (see Section 13 in the *Process Operations Manual*, binder TPS 3050) can be used to load a new area database. Universal Work Stations that use only the Engineering functions can be configured as a 1-station console.

Section 6 – Network Configuration File (NCF.CF) [Task 7-9]

6.0 Overview

Introduction

This section describes the special characteristics of the Network Configuration File. This file contains network information that is vital for the operation of all nodes on the LCN. The content of the NCF is defined, as is its use in node startup. Also see Section 3—it discusses directory &ASY, the directory that contains the NCF.

6.1 NCF Information

Purpose of the NCF

The Network Configuration File (NCF) describes the LCN hardware (numbers and types), the names for units, areas, and consoles, miscellaneous system values including shifts, days, and times, the HM volume configuration data, and so on. The NCF is used at startup of a node to allow establishment of communication on the LCN. The same NCF should be used by each node in the network, but you can use the configurator in the on-line mode to change the NCF. The configurator is activated by selecting one of the Network Configuration picks (targets) on the Engineering Main Menu.

Changing the NCF

Changes to the NCF are effective only after the revised NCF is loaded in one or more nodes. When such changes are made, there is some degree of impact on system operation. That impact and the steps you must take to resolve it are defined by the configuration displays (refer to *Network Form Instructions*, binder TPS 3030-1 and see *Network Data Entry*). Attempts to load a node using an NCF that is not known to the nodes already running on the LCN causes the load to fail (the time stamp for an NCF modified in on-line network configuration is "broadcast" to all nodes when it is installed by the network configurator. See the following Warning).

WARNING

The date/time stamp of the NCF file (NCF.CF) viewed using the Command Processor does NOT necessarily match the date/time of the NCF version on the System Status display. The System Status display, accessed from the Engineering Main Menu, shows the NCF Install Time. The date/time stamp of the NCF file is displayed on the Console Data display, which is accessed from the Engineering Main Menu by selecting the System Wide Values target, then selecting the Console Data target.

Allow for expansion

Plan ahead—you may want to include extra nodes and devices on consoles when you first configure your system. This eliminates the need to use on-line reconfiguration to add nodes, and having to shut down and restart other nodes and USs to advise them of the added nodes. Nodes that are configured into the system, but that don't actually exist, show up on status displays with an OFF status and extra devices such as disks configured on a node appear on the console-status display with a "service" message.

Two &ASY directories provided

Honeywell supplies two &ASY directories on disks, the "startup" &ASY directory, and the "empty" NCF directory. The first, or "startup," directory is set up with all LCN nodes as USs and is used only to get the first US started, before anything else has been configured. The second, or "empty," version contains the user's NCF.WF and NCF.CF files in which the network data for the specific system is built and stored in Startup Tasks 6 through 11.

Changes that affect the NCF

The NCF is affected by changes or additions to **any** of the following:

- Unit Names
- Area Names
- Console Names
- LCN Nodes
- System-Wide Values
- Volume Configuration

Changes that DON'T affect the NCF

Changes to HIWAY and BOX/SLOT CONFIGURATION do not affect the NCF.

Data is lost if you change HM volume configuration

Changes to the volume configuration of any HM *requires* the HM to be initialized before the changes are effective. HM files *must* be saved on another HM or disk before HM initialization because initialization erases the data on the HM. Also, if continuous history or journal volumes are changed, any *existing continuous history or journal data is lost*—it cannot be copied and reloaded. See Section 7.

Section 7 – HM Configuration and Use

7.0 Overview

Description

This section describes the History Module, its use, and operation. It provides guidelines for use of HM storage space and for estimating the size of the volumes assigned to each HM, including Continuous History volumes. Directions are provided for configuring and starting up an HM.

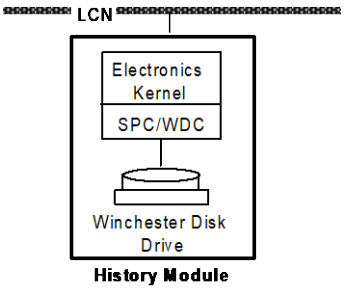
7.1 Introduction

Description

History Modules (HMs) are mass storage devices that store software, system files, system data, and user data. Most data stored in any HM can be accessed by any node on the LCN.

HM location in the TPS System

An HM is a node on the LCN. It includes an electronics kernel (the foundation electronics package in every node), a Smart Peripheral Controller (SPC), and from one, two, or four Winchester disk drives.



7.1.1 HM Options and Variations

Types of drives

Two types of Winchester drives are in use in HMs. While there are some physical and electrical differences in these drives (refer to *History Module Service*), the difference that matters to system engineers is the storage capacity of each type, which is as follows (KB = kilobytes = 1024 bytes):

- Wren III (Type 3) 135,900 KB
- WDA 210 215,040 KB
- WDA 445 454,130 KB
- WDA 875 896,032 KB
- WDA 1.8GB 1,836,736 KB

7.1.1 HM Options and Variations, Continued

Drive usage

Each HM can have more than one Winchester drive of the same type. Twice the single-drive capacity can be obtained by operating two drives in dual mode. Two or four drives can also be combined as Redundant drives.

Wren III and WDA drives can operate as redundant drives, using two or four Drives in redundant single or redundant dual mode. Each drive (or drive pair) stores a mirror image copy, so if one drive (or drive pair) should become unavailable, the other drive (or drive pair) is still available and the HM remains operational (refer to 7.5 for more information on HM Disk Redundancy).

Dual logical drives are physically one drive but are treated as two virtual drives by the system. The drives are available in the 875MB/1.8GB sizes. In NCF Volume Configuration, the number entered in the NUMBER OF WINCHESTER DISKS field must be 2. If the drives are redundant, then another dual logical drive is required, and they will appear to the system as four virtual drives. Although there are four virtual drives, the NUMBER OF WINCHESTER DISKS field is still set to 2, because the HM Redundancy keyfile option implements the redundancy.

7.1.2 Overview of HM Operation

Description

An HM operates with either its initialization personality (provided in disk directory &HMI) or with its on-line personality (provided in disk directory &HMO).

Initialization personality (HMOF)

When the HM is running its initialization personality (HMOF), the US Engineering functions' Network Configuration can initialize the HM, which establishes its volume configuration. Initialization also causes any previously stored file data to be lost.

When the initialization personality is running, user functions can access the HM, and the files in it, only by using the node-number pathname form. For example:

```
PN:43>VDIR>FILE.XX
```

System functions access the HM and the files in it by using the NET pathname form, shown below.

If the System and HM Status displays show an HM's status as HMOF, it is running the initialization personality.

On-line personality (OK, WARNING, SEVERE WARNING)

The HM's on-line personality is used for all on-process and implementation operations except HM initialization. When an HM is running its on-line personality, it can be accessed with the node-number pathname form. You can also use the network (LCN) pathname form. For example:

```
NET>VDIR>FILE.XX
```

If the System and HM Status displays show an HM's status as OK, WARNING or SEVERE WARNING, it is running the on-line personality.

Autobooting

A functional HM that has been on-line and loses its primary ac power source can restart itself with the on-process personality when power returns. This function is often referred to as "rebooting" or "autobooting."

Changing personalities

An HM's personality can be changed by using the HM Status display to reload the HM with the required personality.

7.2 Guidelines for Use of HM Storage Space

Description

Since LCN-based **TotalPlant** Solution (TPS) systems were first introduced, the storage capacity of individual Winchester drives has increased dramatically. Now it may be possible to accommodate all of the storage requirements for a system on a single HM.

Sharing storage among HMs

While it may be possible to store everything in one HM, there are often other reasons to have more than one HM. These reasons are explained in the following guidelines.
To make the most efficient use of your HMs, follow these guidelines whenever possible. They are in these categories:

- See 7.2.1 for volumes and types of data stored on HMs.
- See 7.2.2 for allocating functions on the LCN.
- See 7.2.3 to assign units to HMs.
- See 7.2.4 for configuring history groups.
- See 7.2.5 for requesting history through the LCN.
- See 7.2.6 to manage history collection by computers through the CG.

7.2.1 Volumes and Types of Data Stored in HMs

Local Volume

All HMs have an HM Local Volume (!9np) that stores the HM personality files and the local HM network configuration file (Lnp_NVCF.nn).

Others volumes

In addition, HMs can have the following numbers of volumes:

- HM with 1 drive or 2 redundant-partner drives—up to 14 volumes plus !9np.
- HM with dual (2) drives or dual redundant (4) drives—up to 29 volumes, plus !9np.

Each HM drive can accommodate 15 volumes, but 1 is the HM Local Volume (!9np), hence the remaining 14 or 29 volumes.

7.2.1 Volumes and Types of Data Stored in HMs, Continued

HM Data types

The following is a list of all of the types of data that can be stored in HMs. "np" is the node-pair number for a particular HM. It is defined on the HM Node Pair Selection Menu under Volume Configuration.

Table 7-1 HM Data Types

Volume Name	Data Type	Note Key	Description
&0np	System files	√	Network configuration, standard and custom parameter names, display abstracts, global description files (GDFs), key file, options and loader files.
&1np	Personality images	#	Loadable software images.
&2np	Dump volume	#	Image (hardware memory) of an LCN node. Dump files are used to accumulate error or failure data for later analysis.
&3np	Area database		Contains a directory for each area. Each directory contains a file that defines the content of the area's standard operator displays and the area's logs, journals, reports, and so on.
&4np	CL/MC object volume		User-defined CL/MC object code.
&5np	AM checkpoint	##	Reloadable checkpoint data for AMs.
&6np	CG checkpoint	##	Reloadable checkpoint data for CGs.
&7np	HG checkpoint	##	Reloadable checkpoint data for HGs.
&8np	NIM/PM checkpoint	##	Reloadable checkpoint data for NIMs/PMs.
&9np	CL/PM object volume		CL/PM sequences object code.
!0np	Continuous History	@§	First volume of continuous process history
!1np	Continuous History	@§	Second volume of continuous process history on second drive (if present).
!2np	Journals	❋	Journal manager and journals
!4np	On-process analysis	√@	Maintenance support files (on the HM with the system journals)
!9np	HM local volume	@	HM initialization personality, HM on-line personality, HM support files, local HM network configuration file.

Notes:

√ Indicates a volume that can exist only once on an LCN (in only one HM).

@ Indicates a volume that *must* be on an HM if the volume exists on the system.

Directories for different personality images can be assigned to &1np volumes on different HMs. Dump directories should be assigned to the same HM as the corresponding personality-image directory, if they reside on an HM. Do not save any other files other than node dumps to the dump directory. Storing other files will corrupt the dump data.

Directories for different checkpoints can be assigned to &5np—&8np volumes on different HMs.

§ Directories for different continuous history units can be assigned to !0np/!1np volumes on different HMs. Also, directories for different process units can be assigned to !2np volumes on different HMs.

❋ Journals for different process units and the system unit can be on different HMs.

7.2.2 Allocating HM Functions on the LCN

Performance cluster

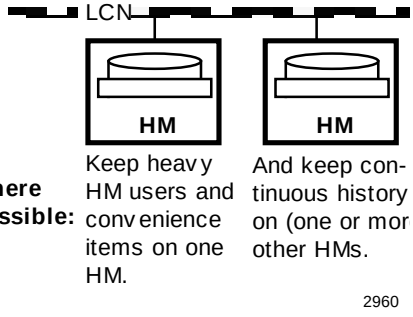
To yield a more responsive system, we recommend a performance cluster of nodes (Section 23) in which at least one HM is dedicated to support the cluster. All nodes that cause data flow in or out of an HM are HM resource users. These nodes are USs, NIMs, AMs, HGs, and CGs. The nodes defined for a performance cluster are:

- 4 Universal Stations
- 1 Hiway Gateway (or NIM) pair (that is: one and only one HG pair [primary and backup] or one and only one NIM pair)
- 1 Application Module
- 1 History Module
- 1 CG serving a CM (two or more clusters can share a CG)

At least one HM should be provided to support each performance cluster. A cluster may support one area (small system) or an area may need several clusters (large system).

Continuous history is a heavy disk user

The main thing to remember as you decide which functions should reside on which HM is that continuous history is a very heavy Winchester disk user, but it is given no special priority when it accesses the disk. This means that all other functions that require frequent disk access should be assigned to HMs that are not used to store continuous history.



Functions that access HM disks often include those associated with the following volumes:

- Personality images (volume &1np).
- System volumes (volumes &0np and !9np).
- CL volumes (volume &4np).
- Volumes that contain frequently used schematic displays (schematic object files are often stored in area volume &3np).
- Any other volumes that will have heavy (continuous) use.

The abbreviation “np” stands for the node-pair number for a particular HM. It is defined on the HM Node Pair Selection Menu under Volume Configuration.

7.2.2 Allocating HM Functions on the LCN, Continued

Volumes required on an HM

It's convenient to store data on HMs because you don't need to mount and remount several removable media (disks).
Only these files *must* be on an HM:

- continuous history volumes (!0np, !1np)
- journal volume (!2np)
- on-process analysis volume (!4np)
- HM local volume (!9np)

The remaining volumes can be on an HM or on removable media.

If HM storage is limited

If HM storage space is limited, consider keeping these on removable media:

- schematic and CL source files (not object files), and
- point files and IDB files.

Keep all common data on one HM

If you want to keep everything, or nearly everything, on HMs, collect all the volumes that apply equally across the LCN in one HM, preferably an HM with no continuous history. These volumes are:

- the system volume (&0np),
- the personality image volume (&1np),
- the dump volume (&2np), and
- the on-process analysis and maintenance volume (!4np).
- user volumes for schematic object code, &CUS, &CLX, TLK1, and so on.

These volumes typically use 20,000 KB to 40,000 KB. They reside in one place on the LCN and have no relationship to areas, units, or any other process grouping.

7.2.2 Allocating HM Functions on the LCN, Continued

Mixing non-history functions with continuous history

Honeywell has extensively tested and verified the 50 pps (parameters-per-second) and 3000 point (150 history groups) on non-system HM configurations with 68040 K4LCN processor boards using WDA 445 MB, WDA 875 MB, and WDA 1.8GB drives.
This 50 pps configuration is NOT recommended for any HMs with the 68020 processor or drives other than WDA 445 MB, WDA 875 MB, and WDA 1.8GB.
Also, note that it may be necessary that data owners (NIMs, HGs, PLCGs, AMs, and CGs) that the non-system HMs are collecting history from, have 68040 processors for preventing further overload.

On the system HM with a K4LCN processor, the recommendation is a maximum of 40 pps and 120 history groups with 445 MB/875 MB/1.8 GB WDA drives. A maximum of 40 pps history load has been reached with 68020 processors on non-system HMs. On system HMs, around 20 to 30 pps is more likely to be the maximum with 120 history groups (depending on drive types and other HM loads such as: checkpoints, requests for trends and pictures, logs, bursts of events, file access, and so on.).

If history overrun messages are received frequently, it may be necessary to reconfigure history in the HMs to cut the number of history groups and/or the frequency of the collection rate of the history groups (e.g., instead of 5 second collection rates, slow it to a 10, 20, or 60 second collection rates).

NOTE:— The parameters-per-second (pps) calculations should be done by hand. The NCF HM Checker, CTRL+F1, doesn't give the results, although it will give a warning if the 50 pps or the 150 history group limits are exceeded. This warning will also appear if the 40 pps or the 140-history group limit is exceeded, but the warning can be disregarded if the above recommendations are followed.

An example for 60-second history groups:

> 20 pps per history group ÷ 60 seconds = 0.333 pps per history group x 150 history groups = 50 pps

7.2.2. Allocating HM Functions on the LCN, Continued

When an HM is overloaded

If an HM is overloaded, or nearly so, this auxiliary node status message is presented:

```
CHECK SYSTEM LOAD xx SEC. HISTORY COLLECTION CYCLE OVERRUN
```

This can be caused by two different situations:

- HM disk or processor use is heavy and the HM cannot unload its temporary files as fast as it is filling them up.
- The HM can't finish its entire collection cycle in the time allowed.

(See this manual, HM Performance Hints and Rules of Thumb)

Temporary files are full

The first situation occurs when HM disk or processor use is heavy and the HM cannot unload its temporary files as fast as it is filling them up. If the HM's requests to the file manager are blocked too often, the HM has to stop collecting data while it clears out its temporary files.

HM can't complete cycle

When the second situation occurs, the cycle is always completed, but if it overruns, the HM sends the maintenance message and 1 or 2 samples of data are lost. This appears as an outage in the history files on the HM.

This can occur because the HM load is too heavy or because the load on the data owners (the nodes that collect history data—AMs, NIMs, and HGs) prevents a prompt response to the HM's requests for process data.

7.2.2 Allocating HM Functions on the LCN, Continued

How alarm messages are managed

To keep from filling the journals with excessive alarms, only 1 auxiliary node status message is sent out during a 1-hour period and a maximum of 3 maintenance recommendation messages are output during 24 hours.

Correcting the overloaded condition

If the above messages are received regularly, either an HM is overloaded or other nodes on the LCN are slowing it down by heavy disk accesses or because their own load prevents answering requests from the HM in a timely manner.

To relieve the situation, consider upgrading the HM and the data owner nodes that access it so that they use high-performance (68040-based) microprocessor boards.

7.2.3 Assigning Units to HMs

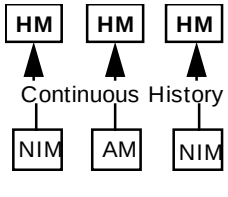
Points to keep in mind

When you use Volume Configuration on the Engineering Main Menu to assign units to HMs, keep these points in mind:

- Spread the load between HMs that collect history data.

  Data owners (AMs, NIMs, and HGs) that are heavily loaded should not be providing history to the same HM.

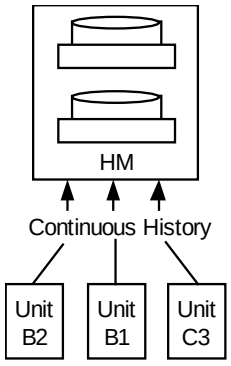
  History for a single process unit may not exist on multiple HMs.



2961

- On dual-drive HMs, many small units are better than a few large units because history volumes can be split only at unit boundaries.

  If you run out of room for a history volume, and all of your historical points are in one unit, the remaining history files cannot be created in a volume on the other disk—this can be done only if there are convenient unit boundaries where the volume can be divided.



2962

7.2.4 Configuring History Groups

The importance of reducing data owner load

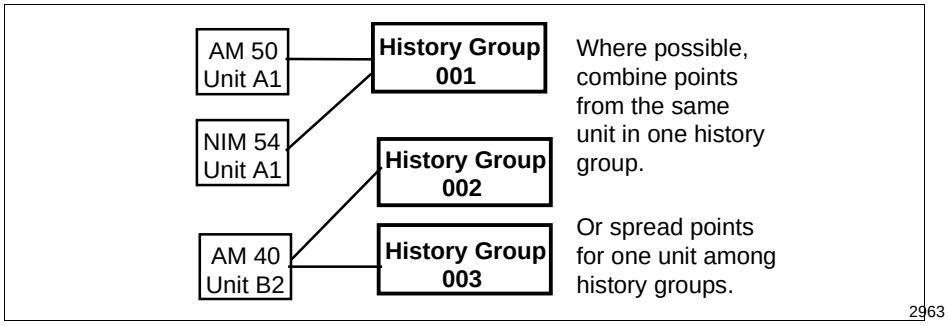
You can use history-group configuration to do much to reduce the load on the data owners (AMs, NIMs, and HGs). This could be important when NIMs or HGs are so busy that they can't accommodate the extra load caused by history-collection requests from HMs.

How to reduce data owner load

Set up your history groups so that they contain points from different data owners. For example, combine NIM (or HG) and AM points in the same unit in one history group (History Group 001 in Figure 7-1).

Then, not all of the requests for data for this group are being sent to one NIM or one AM at once, but are spread out between two or more nodes.

Figure 7-1 Reducing Data Owner Load



How the HM collects history data

The HM collects history data 3 groups at a time.

If, for example, you have 3 contiguous groups that have points that are all in one NIM or HG, that node gets a request for 60 points all at once, but you could have spread the requests for these 60 points over 3 noncontiguous groups.

CAUTION, R510 and later releases

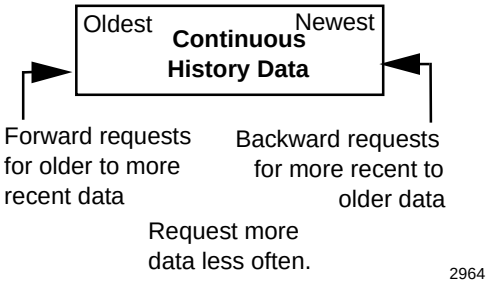
For R510 and later releases, if any point currently historized by a history group will be deleted as a result of loading other points into the history group, a warning is issued: “$CHxx(y) HISTORY WILL BE LOST – Press <F5> Overwrite To Continue If Desired”.

7.2.5 Requesting History through the LCN

Rules for requesting history data

Here are two general rules for requesting history data for logs and reports, and requests by user-written programs:

- **Rule 1**—When asking for the most recent data, request it in the "backward" direction and when asking for the oldest data, ask for it in the "forward" direction.
- **Rule 2**—Whenever possible, ask for more data less often.



Rule 1 explained

The reason for rule 1 is that history is always retrieved from one end of a history file to the other. Where it starts is determined by whether history is requested from a more recent time to an older time (backward), or from an older time to a more recent time (forward).

Controlling where the search begins, can save a lot of time. A corollary to this rule is, "If you don't need the pre-archived data, don't configure it."

Rule 2 explained

Rule 2 comes from the fact that there is tremendous overhead per point in setting up each request. Once it is done, however, the amount of data retrieved for each point has very little effect on the time that it takes to service the request.

It is much more efficient to wait 2 hours for snapshot data, then request the last 2 hours' worth of data for each point.

For example, retrieving 2 hours worth of snapshot data for 2400 points takes only slightly longer than it would take to retrieve an hour's worth.

7.2.6 Managing History Collection by Computers through the CG

Introduction

It is important to limit the number of continuous-history requests from a computer through the CG, because the HM has no way to control the rate at which it processes requests.

Rule for managing continuous-history requests

As a general rule, never send more than two requests at a time to a single HM.

To do so impairs operator interaction and background functions like report generation. Also, it interferes with the collection of data.

Remember that history requests to the HM are organized by unit. If a DDT contains points in three units and history for all of those units in a single HM, that HM receives three separate requests for that DDT, which causes an increase in the load on that HM.

Controlling history collection requests

These are the two ways that you can control the number of history requests:

- Run one ACP per HM on the LCN from which you are collecting history.
  - Set up all of the DDTs for that ACP so that they contain points from two units on the HM.
  - This way, two requests to the HM are generated for every DDT for this ACP.
- Run just one ACP to collect history from the LCN.
  - Each DDT for this ACP should contain points from multiple HMs.
  - Be sure to limit the number of units represented to two per HM.

Other combinations of these methods are possible, but remember:

- if you have more than one ACP accessing the same HM, or
- you have more than two units-per-HM in a DDT

you may be generating more than two history requests per HM, thus reducing your HM's performance.

7.3 Continuous History Configuration

Introduction

Continuous history is data collected for continuous data points over a period of time, and stored in user-configured volumes on one or more HMs. You can configure at least 150 History Groups (and possibly more) per HM. For each group, up to 20 point-parameters (form: `NAME.PARM`) can be collected in a collection cycle.

Types of data

Continuous history consists of these two types of data (see Figure 7-2):

- **Snapshot data**—instantaneous values from parameters that contain a real or a digital (enumerated) value.
- **Average data**—average values calculated from the sum of samples collected over a period, divided by the number of samples in the period. Only parameters that contain real values can be used for averages.

Common indicators

All continuous history data includes a time stamp that indicates the collection cycle in which the data was acquired. Average values are also accompanied by a "Normal" or a "Nonstandard" status indicator. "Normal" indicates that less than 10% of the samples during the average period were bad and "Nonstandard" indicates that 10% or more of the samples during the average were bad.

7.3.1 Hourly, Shift, Daily, and Monthly Averages

Description

Hourly, shift, daily, and monthly averages are standard values included in the continuous history for all systems that have continuous history volumes.

- **Hourly averages**—For each point in each history group, 171 hourly average values are stored. This covers a week of 168 hours with a margin of 3 hours.
- **Shift averages**—For each point in each history group, 43 shift average values are stored. This covers a week of shifts as short as 4 hours with a margin of one shift (168/4 = 42 shifts).
- **Daily averages**—For each point in each history group, 33 daily average values are stored. This covers a month of 31 days with a 2-day margin.
- **Monthly averages**—For each point in each history group, 14 monthly averages are stored. This covers a year of 12 months with a 2-month margin.

7.3.2 Snapshots and User Averages

Description

Snapshots and user averages are configurable options for each history group. In HM Volume Configuration, you select these options and you can enter a number of pre-archived hours to be stored for each.

Save rates

The rate (in seconds) at which snapshots are collected is adjustable. This table gives the maximum prearchive snapshot hours allowed and the recommended prearchive snapshot hours for each save rate.

Table 7-2 Rates at which Snapshots (SS) are Collected

Save Rate (secs)	Saves per Minute (60 ÷ Rate)	Maximum Prearchive SS Hours Allowed (R620 & later)	68020 Recommended Prearchive SS Hours
5	12	240	168
10	6	480	168
20	3	960	168
60	1	1330	168

The rate (in minutes) at which User Averages are collected is adjustable. The following table gives the maximum prearchive hours of User Averages allowed:

Save Rate (Minutes)	Maximum Prearchive User Average Hours Allowed (Hours)
3 min. (R620 & later)	746
4 min. (R620 & later)	996
5 min.	1,246
6 min.	1,496
10 min.	2,496
12 min.	2,996
15 min.	3,746
20 min.	4,996
30 min.	7,496

7.3.2 Snapshots and User Averages, Continued

Base period values

For snapshots (instantaneous values collected at the save rate), values for a base period of 8 hours are stored.

If you enter a nonzero value for prearchiving (range 0 to 2,880 hours) that number of additional hours is stored. As is indicated in Figure 7-2, this can use significant amounts of HM storage.

Base average values

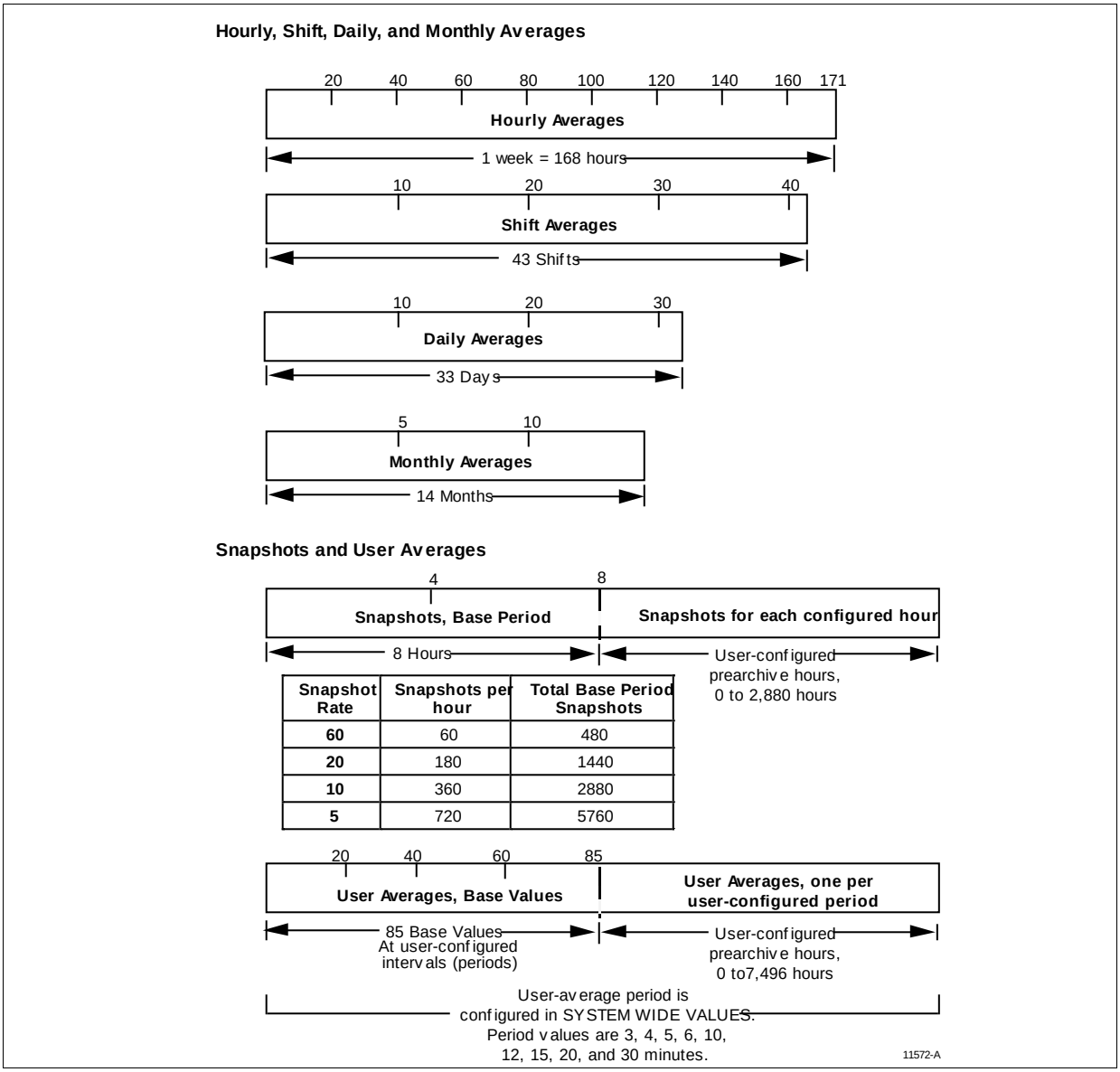
For user averages (averages collected at a user-specified interval), a base set of 85 values is stored (for a 6-minute interval, this would cover 8.5 hours). If you enter a nonzero value for prearchiving (range 0 to 7,496 hours) that number of additional hours is stored. As is indicated in Figure 7-2, this can use significant amounts of HM storage.

Notice

Because 4 hours of on-line data is included in each transfer to prearchive files, the number of hours of on-line data added to the number of prearchive hours, does not always equal the amount of continuous-history storage. At times, there can be as many as 4 hours of duplicate data.

7.3.2 Snapshots and User Averages, Continued

Figure 7-2 Continuous History Structure (R620 & Later)



7.3.3 Uses of Continuous History

Where continuous history is normally available

All types of continuous history (hourly, shift, daily, and monthly averages; snapshots; and user averages) are available through

- Process Variable Retrieval Display (Operator or Universal Personality), which is available through the System Menu.
- Standard Logs, which are configured in the Area database.
- Free Format Logs, which are configured using the Free Format Log Builder from the Engineering Main Menu, then added to an area database.

Other places to show continuous history

In addition, snapshot data is used for all trends—trend displays, trend records, and printed trends.

NOTE: *It is important to remember that historical-trend values for a point are available only if that point is configured in a history group that is configured for snapshot values.*

HG-source (trend memory in a box) values may be available for a point that is not in any HG group with snapshots. Of course, real-time data (current PV value for each minute the trend is running) is available because it does not have to be collected.

7.3.4 Continuous History Configuration Forms and Displays

Engineering functions activities and continuous history

Continuous history is configured in these Engineering functions Activities:

- **NETWORK CONFIGURATION, SYSTEM WIDE VALUES**—The user-average interval (3, 4, 5, 6, 10, 12, 15, 20, or 30 minutes) and shift data are configured using:
  - Form *SW88-515*
  - User Average Period Display
  - Shift Data Display

- **NETWORK CONFIGURATION, VOLUME CONFIGURATION**—The number of history groups per unit is defined and the save rate, snapshot, and user-average options for each history group are configured, using:
  - Form *SW88-517*
  - Continuous History Unit and Groups display
  - Continuous History Group Options display

- **HM HISTORY GROUPS**—This activity builds a reserved entity for each continuous history group. In this activity, the specific data points and parameters to be collected for the history group are defined using:
  - Form *HM88-500*
  - HM History Group Configuration display

7.3.5 Continuous History Notes and Precautions

Introduction

The following notes and precautions result from the design of the continuous history function.

Configured History Groups with no points

If you assign continuous history groups to process units in Volume Configuration and you don't configure any points for those groups in HM History Groups, a null default value for these points will still be written to disk when history is collected.

You should recognize that such empty groups cost processing time and are *not* "free."

HM Overloads

If the history collection function on an HM is overloaded, a maintenance recommendation is generated that says HM history is overloaded.

If this recommendation occurs consistently, you should review the section, Allocating HM Functions on the LCN, in this manual and consider reallocating HM functions on the LCN.

If this message occurs infrequently, particularly when you are starting up the HM, you can ignore it.

Scheduling Logs with Averages

Because hourly, shift, daily, and monthly averages are calculated just after the average interval is complete, logs that contain these averages should not be scheduled until at least five minutes past the end of the hour, shift, day, or month.

Copying continuous history

Copy continuous history to removable media or another HM only with the initialization personality (&HMI) running on the source HM. Since history collection is not active when the HM is in initialization personality, this ensures that historical data remains consistent.

Do not make the copy while the on-line personality (&HMO) is running on the source HM.

7.3.5 Continuous History Notes and Precautions, Continued

Starting history collection after a power interruption	After a power interruption that causes the system's date and time to be lost, historical data is not collected until the date and time are set to something other than January 1983 (the default date), and history collection is explicitly enabled.
How to enable history collection	To enable history collection, select HISTORY MODULES from the System Status display, then select the HISTORY COLLECT target.
Loss of history after HM shutdown	After an HM is shutdown and then restarted, up to 15 minutes of continuous history may be lost. The time varies depending upon the amount of history collected and the amount of disk activity generated from other nodes.
When snapshots are available	Snapshot values that are collected in a given minute are not available for displays, logs, and reports until shortly after the beginning of the next minute. If such a snapshot is requested in the minute in which it is collected, question marks will appear as the value.
Abnormal time changes	System time changes can occur because someone changed the time through a Universal Station or because of a system clock malfunction. An “abnormal” time change is a time change that makes it impossible for portions of the continuous-history data to be retrieved. In general, an abnormal time change is a change that exceeds the normal time change of one hour or less and *then time is changed back again.* For retrieval of data for logs from the oldest data to more recent data, the most destructive time change is one that jumps forward in time and then backward. For retrieval of data from the most recent data to older data, the most destructive time change is one that jumps backward and then forward again.
Configuring prearchive hours	We recommend that you configure the prearchive hours for storage snapshots and user averages as recommended in Table 7-2, because larger values create very large files and may cause problems in using the Data Entity Builder to load History Group entities. One week of storage (168 hours) is reasonable for most situations and should cause no entity loading problems.

7.4 How to Estimate HM Volume Sizes

A tip: Make a rough estimate first, then readjust volume sizes

Most TPS systems have more than adequate HM storage capacity.

If you are just getting started, we recommend you:

- Estimate the volume sizes required for each of your HMs, then add from 20 to 30 percent to each of your estimates.
- Refer to the *System Startup Guide*, to get your system started.
- Use the command processor LS command to list the actual sectors used in each volume. Refer to *Command Processor Operation,* binder TPS 3030-1, and remember that 1 sector = 256 bytes.
- Allow your system to run for a short time (perhaps a few days) to allow it to collect checkpoint data.
- Readjust your volume sizes, allowing a margin of 10 to 20 percent for growth and future software releases. Make your user volumes large enough to fill each HM to at least 90 percent of full capacity.

Use guidelines

First, review the earlier section, Guidelines For Use of HM Storage Space, to determine the minimum number of HMs the system should have to attain good performance. Then, do one of the following:

- If the number of HMs the system will have is not already determined, assume the system will have the minimum number required for good performance as specified in the guidelines. Then make a trial allocation of volumes to those HMs.
- If the number of HMs the system will have is already determined, list each of the HMs in the system and make a trial allocation of volumes. See 7.2 for the guidelines. You may have to make compromises to get all required and convenience volumes allocated.

Estimate volume sizes

Next refer to the section, Use of Table and Charts to Estimate HM Volume Sizes, to make a trial estimate of the size of the volumes in each of the HMs on your list.

7.4 How to Estimate HM Volume Sizes, Continued

Check available storage

Once you have estimated the size of all of the volumes, add the volume sizes for each HM and compare the sum to available storage in Table 7-3 to determine how full each HM would be.

If an HM is not almost full, re-examine your estimates and increase volume sizes or add more user volumes to fill out the HM to about 90 percent of capacity.

When HM must be initialized and system reloaded

The following types of changes require that the History Module be initialized and your system reloaded: Volume Configuration, System Wide Values, and off-line changes.

Remember, you cannot add user volumes to the HM, without initializing the HM (you can create directories to partition existing volumes). Initializing the HM causes the loss of all files, so the backup of files to another HM or to disks is required. These are estimates of the number of disks that are needed to back up a completely full HM:

Table 7-3 Estimated Number of Disks to Fill an HM

HM Type	Single Drive	Disks	Dual Drives	Disks
Wren I I I	135,900 KB	2	271,800 KB	3
210 WDA	215,040 KB	3	430,080 KB	5
445 WDA	454,130 KB	5	908,260 KB	10
875 WDA	896,032 KB	10	1,792,064 KB	19
1.8GB WDA	1,836,736 KB	19	3,673,472 KB	37

Calculating number of disks required

Note that when using the WDA, the number of disks required are approximately 1 for every 100MB of disk space (actually, it is 95.7MB per disk). This proportion continues regardless of the size of your WDA. Also, note that the Backup command does not copy history files for points or journals, which can be a sizeable amount in some History Modules, thereby also saving on the number of disks necessary to backup an HM.

7.4.1 Use of Tables and Charts to Estimate HM Volume Sizes

Introduction

Several tables and charts are provided at the back of this section to assist you in estimating HM volume sizes and entering HM Volume Configuration data. Find each volume in the appropriate table or chart, estimate its size, and write it down on your list. Finally, add up all of the storage space that will be used on each HM, and verify that it doesn't exceed the HM's capacity, which is listed in Table 7-3.

To save time and calculation errors

You can save considerable time and minimize calculation errors by using a spreadsheet program on a personal computer to estimate your volume sizes and total HM storage space. In your spreadsheet, enter the equations from Table 7-9 for each type of volume, and then enter the values for each volume you need to estimate. The calculations in Table 7-12 and those for the volume-size charts at the back of this section were made with Microsoft® Excel on a Macintosh™ computer. Several similar spreadsheet programs are available for IBM™ PCs and IBM-compatible PCs. You can verify the equations you enter in your spreadsheet by entering the values used in Table 7-12 and comparing the results.

7.4.1 Use of Tables and Charts to Estimate HM Volume Sizes, Continued

Adjustment factors

The following factors are built into user-volume Table 7-13 and Table 7-14, but need further explanation:

- We suggest that instead of several HM user volumes, you use only a few user volumes on HMs and use directories within those volumes to identify the different types of data in the volumes. It is far easier to create new directories in a larger user volume than to create new volumes on an HM, which requires initialization of the HM (refer to *Command Processor Operation Manual*, for a description of the Utilities' Create Directory command).
- We suggest that you specify the number of files for IDF volumes at six times the number of IDF files expected because of the supporting files generated, particularly when errors occur.
- We suggest that you specify the number of files for the schematic volume at seven times the number of schematics expected to support the source, object, and library files for subpictures.
- We recommend that you specify the number of files in the CL volume at five times the number of CL programs expected. Specify the number of files in the CL-Custom GDF volume at the number of custom data segments, plus the number of custom parameter lists expected.

7.4.1 Use of Tables and Charts to Estimate HM Volume Sizes, Continued

List of tables

This is a list of the tables in subsection 7.4.4

Table 7-4 Tables Used to Estimate HM Volume Size

Table	Title	Description
7-9	HM Volume Size Estimator	Defines the calculations and constants that determine the size of each Honeywell-supplied volume that can reside on HMs.
7-10	HM User Volume Size Estimator	Defines the calculations and constants for estimating user-volume sizes (except IDF volumes).
7-11	IDF Volume Size Estimator	Defines the calculations and constants for estimating IDF-volume sizes.
7-12	Example, Small System	Provides a worked-out example of volume-size estimates.
7-13	Example of IDF Volume Estimate	Provides a worked-out example of IDF volume- size estimates.
7-14	Example, User Volume	Provides a worked-out example of user volume-size estimates.
7-15	Value Sources for Volume Configuration	Provides a line-by-line description of the Configuration source for each item to be filled in on the *HM Volume Configuration Forms.*

7.4.1 Use of Tables and Charts to Estimate HM Volume Sizes, Continued

List of Figures

Figure 7-3 through Figure 7-11 are charts of volume-size calculations for each of the volumes that require extensive calculations to estimate volume size.

These charts plot volume size vs. major variables that affect volume size.

Where larger HMs are in use and, therefore, very close volume-size estimates are not critical, you can use these charts to estimate your volume sizes, provided you add enough margin to the value you read off the chart to assure that the resulting volumes will be large enough. You should consider possible future expansions.

This is a list of the volume-size charts in this section:

Table 7-5 List of Volume-Size Charts in Section 7

Figure	Title	Description
7-3	Area Checkpoint Volume	Plots for one, five, and ten areas
7-4	AM Checkpoint Volume	Plots for AMs with 1 Mw, 2 Mw, 3 Mw, and 4 Mw memories
7-5	NIM Checkpoint Volume	Plots for 1 to 20 NIMs versus average number of PMs per NIM
7-6	NIM Checkpoint Volume, 1 NIM	Plot for 1 NIM versus average number of PMs per NIM
7-7	NIM/LM Checkpoint Volume, 1 to 32 LMs	Plot for 1 to 32 LMs on one NIM and its UCN
7-8	NIM/APM Checkpoint Volume, 1 to 31 LMs	Plot for 1 to 31 APMs on one NIM and its UCN
7-9	Continuous History, Example 1	Example of smaller history-volume sizes
7-10	Continuous History, Example 2	Example of larger history-volume sizes
7-11	Journal Volume Size, Example 1	Example of larger Journal-volume sizes
7-12	Journal Volume Size, Example 2	Example of smaller journal-volume sizes

7.4.2 HM Volume Configuration Example

Description

Tables 7-12, 7-13, and 7-14 contain examples of the HM volume configuration for a small system with one area and one cluster. The point mix used in this example is the approximate equivalent of the mix of points in five Honeywell Control Units (HCUs, see 23.2). The following is a summary of variable data used in this example:

Table 7-6 Summary of Variable Data used in Example

Variable Data	History Saved
770 data points	38 continuous history groups, saved for one week
40 schematic displays	38 snapshot history groups, saved for one week
20 free format logs	38 user-average history groups, saved for one week
10 sequence programs	1000 alarms journaled
5 units in the AM	200 operator changes journaled
One Data Hiway	200 operator messages journaled
One NIM, 5 PMs, 2 LMs	Standard CL-HM-file extensions

Relationships

The estimator tables and the example tables relate like this

- The values on **Table 7-12** were calculated using **Table 7-9**
- The values on **Table 7-13** were calculated using **Table 7-11**
- The values on **Table 7-14** were calculated using **Table 7-13**

Total HM memory required

The total HM memory required in this example is 270,578 KB. Here is how this relates to each of the types of HMs in use.

Table 7-7 Example Memory Required vs. Drive Capacity

HM Type	Single Drive	Percentage of HM Capacity	Dual Drives	Percentage of HM Capacity
Wren I I I	135,900 KB	199 %	271,800 KB	100 %
WDA 210	215,040 KB	126 %	430,080 KB	63%
WDA 445	454,130 KB	60 %	908,260 KB	30%

The data for this example won't fit on the first three HMs listed above. For the other HM versions, you should expand the volumes that contain variable data so that about 90% is allocated to accommodate future expansions (see the guidelines for using HM resources in 7.2).

7.4.3 Applying Volume-Size Estimates to Forms and Data Entry

Preparation

See our examples shown in Tables 7-18 through 7-20. If you accumulate your HM configuration data in a form similar to the way we did for those examples, you will have the data readily available that will be needed to fill out *HM Volume Configuration Form, SW88-517*. Refer to *Network Configuration Forms*, which contains *SW88-517*.

Value sources for volume configuration

Table 7-15 relates each line item on form *SW88-517* to the source of the value for that item. Each of these items also appears on the corresponding Network Configuration/Volume Configuration Display (without the line numbers). Of the nine volume-configuration displays, eight are called up only if you intend to configure the data each display represents on the HM you are configuring. The Volume Configuration Menu appears when you select VOLUME CONFIGURATION on the Engineering Main Menu, so you must fill in lines 1 through 9a on a copy of the form for each HM.

Picks on the Volume Configuration menu

The following are the seven picks (targets) on the Volume Configuration Menu that select the other displays, with the name of the display selected:

Table 7-8 Picks on Volume Configuration Menu

Pick	Display/Form-Part
PROGRAM IMAGE	Program Image Volume Configuration
	Area Database Volume Configuration
CHECKPOINT	Physical Node for Checkpoint Node Configuration
CONTINUOUS HISTORY	Continuous History Units and Groups, Continuous History Group Options
JOURNALS	Process Unit Journal Configuration
CL STORAGE	Program Image Volume Configuration
USER FILE STORAGE	User File Storage Configuration

7.4.3 Applying Volume-Size Estimates to Forms and Data Entry, Continued

Transferring data to the forms

Copy a set of the forms for each HM, fill out the Volume Configuration Menu part of the form, and then fill out only the other parts of the forms that represent data you intend to have on the HM you are configuring.

What calculates HM volume sizes

For some volumes, *Form SW88-517* and the configuration displays require you to fill in a volume size and number of files. For other volumes, the HM Checker (initiated by F1=CHECK) calculates the volume size and number of files, based on other types of input information. Table 7-15 defines the source of the input for each line on *Form SW88-517*.

7.4.4 HM Volume Size Estimator Tables and Figures

Table 7-9 HM Volume Size Estimator

Volume	Volume Use	Size Estimate
&0np (S)	System Volume (& System Directories): Startup files (&ASY, &DSY, &LDR &KJF, &KFO) GDFs (&AMG, &ARG, &HGG, &NMG)	6100 KB 5600 KB 11700 KB Total
&1np (S)	Personality Images other than HM HG* NIM* PM/APM/HPM/FSM/LM/SM/FB-IOPs AM* CG* US Operator Personality* US Universal Personality UNP Overlays NG* * There may be both 68020 microprocessor and 68040 microprocessor versions of these personalities in the system (cluster). If so, include both personalities (two times the value given) in your estimate, for each such case.	2100 KB 2100 KB 2100 KB for each NIM personality type, plus 23750 KB 23750 KB for other UCN devices. 2100 KB 2450 KB 3850 KB 4550 KB 4000 KB 4550 KB per UNP personality type, plus 4000 2100 KB KB for one set of UNP overlays Total Total—Use the sum of all node-type images to be stored on a specific HM.]
&2np (S)	Dump volume Mw CG 2.0 HG 2.0 NG 2.0 NIM 3.0 HM 3.0 HG 2.0 US 4.0 US 6.0 US 8.0 AM 3.0 AM 4.0 AM 5.0 AM 6.0 AM 7.0 AM 8.0 AM 16.0 Make the Dump Volume large enough to accommodate the total number of nodes you plan to dump at one time. The minimum allowable Dump Volume size is 7000 KB.	6500 KB 6500 KB 6500 KB 7000 KB 7000 KB 6500 KB 9000 KB (US with Operator Personality) 13500 KB (US with Universal Personality) 18000 KB (US with Universal Personality) 7000 KB 9000 KB 11250 KB 13500 KB 15750 KB 18000 KB 36000 KB If the Dump Volume for a node type is used, it must be on the same HM as the corresponding Personality Image (&1np). NOTE: All K4 LCNs are at least 4 Mw. The estimated number of KB is arrived at by multiplying 2250K by the number of Mw(Megaword) for the node type.

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Table 7-9 HM Volume Size Estimator, continued

Volume	Volume Use	Size Estimate
&3np (C/A)	Area	Total size estimate = (1198 KB * (no. of areas + 1)) + (150 KB * number of schematic source files) + (12 KB * number of schematic object files) + (80 KB * number of free format log source files) + (5 KB * number of free format log object files) These file size estimates are rules of thumb; your files may be larger than the estimates given here. Increase your estimates accordingly. Configuration considerations: For quicker access to schematics and free format logs, Honeywell recommends that you put these object files into the Fast Access User Volume on an HM. See section 23.5.3, Fast Access User Volume. NOTE: these files will not automatically be copied by FST_VOLZ.EC. IF you move to Fast Access User Volume, you must edit your FST_VOLZ.EC to copy the required schematics to the Fast Access User Volume disk. You can also build your area database using the pathname catalog to have schematics and free format log object files, to ensure availability in the event that the primary HM goes down. You can also put these object files on removable media to ensure availability of the files. Some users put their schematics in User volumes as system-wide object files, to make them available to all the users on the system. If you do this, apply the size estimates to the User volumes, not the Area volume. If HM space is limited, keep the object files on an HM and store the source files on removable media. See Note 2, Table 7 -10.
&4np (C/A)	CL/MC Object Files	Total size estimate = (4.5 KB * number of sequences) This figure assumes an average of 300 statements per sequence. If your average is different, use 0.015 KB per statement and multiply by the average number of statements per sequence. If HM space is limited, you can store CL source files and listings on another HM volume or on disks. Configuration consideration: Like the note in &3np, if you choose to put your CL/MC object files in a different volume, do not estimate space for this volume.
&5np (C/A)	AM Checkpoint	See “AM Checkpoint Values” in the notes at the end of this table.
&6np (C/A)	CG Checkpoint	See “CG Checkpoint Values” in the notes at the end of this table.
&7np (C/A)	HG Checkpoint	2146 KB used by each Data Hiway. This size is fixed; you can’t alter it.

Notes:
(S) System (LCN wide) data, mostly of fixed size. Volume &0np can only be stored in one HM. We also recommend that each of the other system data volumes be stored in only one HM.

(C/A) Cluster/Area-related data, all vary in size. All are candidates for splitting between HMs. All K4LCN boards contain at least 4 Mw of memory.

To get the estimated number of KB, multiply 2250 K by the number of Mw for the node type.
K = 1024; KB = 1024 bytes; 1 MB (megabyte) = 1024 KB; 1 Mw (megaword) = 2 MB.

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Table 7-9 HM Volume Size Estimator, continued

Volume	Volume Use	Size Estimate
&8np (C/A)	NIM/PM/APM/HPM/LM/SM Checkpoint	
	Sectors per NIM	SecPerNim = 11575 + (# of PMs * 2212) + (# of LMs * 2074) + (# of APMs * 7712) + (# of HPMs * 16012) + (# of SMs * 4012) + (# of FSM * 4012) + (4 future UCN nodes * 4012) + (# of FBIOPs * 1410)
	Calculate KB per NIM	KBPerNIM = Sectors * 0.25
	Calculate final KB estimate	Final_KB = KB per NIM * # of NIMs * 1.2 Where: # of PMs = Maximum planned number of PMs per NIM # of LMs = Maximum planned number of LMs per NIM # of APMs = Maximum planned number of APMs per NIM # of HPMs = Maximum planned number of HPMs per NIM # of SMs = Maximum planned number of SMs per NIM [Total of 31 PMs, LMs, APMs, HPMs, and SMs per UCN (per NIM)] # of NIMs = Number of NIMs on this LCN (20 NIMs max.; combined NIMs and HGs ≤ 20) **Redundancy example:** If the system has a redundant NIM, 4 redundant PMM, 4 redundant APM, 2 redundant LMM, 4 redundant HPM, 2 non-redundant SMM, and 4 FB IOPs. The equation would be: 1 NIM checkpoint size (=11575) + (4 PMM * 2212) + (2 LMM * 2074) + (4 APM * 7712) + (4 HPM * 16012) + (2 SMM * 4012) + (4 future * 4012) * (4 FBIOPs * 1410)

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Table 7-9 HM Volume Size Estimator, continued

Volume	Volume Use	Size Estimate
&9np (C/A)	PM Seq (in all PMs)	1 Seq (prog). = Avg. of ~300 statements @ 0.03 KB/statmt Therefore, estimate = 9.0 KB per sequence.
	APM/HPM Seq (in all APMs and HPMs)	1 Seq (prog). = Avg. of ~300 statements @ 0.038 KB/stat. Therefore, estimate = 11.4 KB per sequence.
	LM Ladder Logic prog.	Ladder Logic prog. = (Mem. size of all LMs * 4) + (9.6 * # of LL programs) = Estimated KB per LM. Total LMs + 100 = Volume Size in KB. Total for &9np =(amt. from PM seq + amt. from APM seq + amt. from HPM seq + amt. from Ladder Logic prog. + amt. from FSC SM Control program). Also see note. Note: Count each redundant LM pair as one LM.
	SM-Tricon Ladder Logic prog.	SM-Tricon Ladder Logic prog. = N/A. Safety Manager does not support LCN checkpointing of its Control Program.
	FSC SM Control program	Control program = 1000 KB * # of Control programs.

Notes: Available LM Memory Size (in K words [24 bits])

620-035	32 Kw	If memory size is unknown or there is a possibility of a future expansion, you can use the maximum size shown here. We recommend that you store CL source files and listings on another HM user volume or on removable media.

(C/A) Cluster/Area-related data, all vary in size. All are candidates for splitting between HMs.

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Table 7-9 HM Volume Size Estimator, continued

Volume	Volume Use	Size Estimate
!0np !1np	Continuous History	Volume Size = Online files size + Prearchive files size + Reserve file space
	Base Sectors	NCCR * 314 + 276 * (FCHSG + TCHSG + TWCHSG + SCHSG) + 278 * CHG
	Snapshot Sectors	(2580 * FSSG) + (1290 * TSSG) + (645 * TWSSG) + (215 * SSSG) sectors
	User Averages	86 sectors * UAG
	Snapshot Pre-Archive	(Total number of groups for this rate) (6000/X + 25 * X) + (1500/X) * (total hours for this rate)
	5 second	1205 * FSSG + 300 * (Total 5 sec. snapshot hours configured)
	10 second	605 * TSSG + 150 * (Total 10 sec. snapshot hours configured)
	20 second	305 * TWSSG + 75 * (Total 20 sec. snapshot hours configured)
	60 second	105 * TWSSG + 25 * (Total 60 sec. snapshot hours configured)
	User Averages Pre-Archive	[(60/UA * PAU (1) + 4) + 1) + (60/UA * PAU (2) +4) + 1) + (60/UA * PAU (n) +4) + 1)] sectors
	Reserve file space for R500	300 KB and 6 extra files

Where:	Is Defined As:
x	Collection rate (5, 10, 20, or 60 seconds)
y	Number of records per minute (5 sec. = 12, 10 sec = 6, 20 sec = 3, 60 sec =1)
CHG	Total number of Continuous History groups
FCHG	Total number of 5 second Continuous History groups
TCHG	Total number of 10 second Continuous History groups
TWCHG	Total number of 20 second Continuous History groups
SCHG	Total number of 60 second Continuous History groups
FCHSG	(FCHG/15) rounded up
TCHSG	(TCHG/15) rounded up
TWCHSG	(TWCHG/15) rounded up
SCHSG	(SCHG/15) rounded up
FSSG	Number of 5 second CH groups configured for snapshots
TSSG	Number of 10 second CH groups configured for snapshots
TWSSG	Number of 20 second CH groups configured for snapshots
SSSG	Number of 60 second CH groups configured for snapshots
PASS (n)	Hours configured for pre-archiving for snapshots in group n
NCCR	Number of configured collection rates (1- 4)
UAG	Number of CH groups configured for user averages
UA	Number of minutes configured in the user average interval
PAU (n)	Number of hours of pre-archiving for user averages in group n

Note: To Calculate the optional Pre-Archive values
- Use a spreadsheet and perform the calculation once for each group, or
- Multiply the average number of hours per group by the number of groups. Add in an error factor.

If all history groups have the same number of prearchive hours and the same Save Data Rate (5, 10, 20, 60 sec. intervals), simply calculate once and multiply by the number of snapshots and user average groups. Otherwise, make individual calculations for each group and add up the total number of sectors.

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Table 7-9 HM Volume Size Estimator, continued

Volume	Volume Use	Size Estimate
!2np (S) (note 1)	Journals	
(S) (note 2)	Burst events	Sectors = ((BurstEvnts * 61 * 1.5 + 122)/123) + 1
(S) (note 2)	System status changes	Sectors = ((StatChg * 61 * 1.2 + 122)/123) + 1
(S) (note 2)	System errors	Sectors = ((Errors * 61 + 122)/123) + 1
(C/A)	System maintenance events	Sectors = ((MaintEvnts * 61 + 122)/123) + 1
(C/A)	Alarms (per process unit)	Sectors = ((Alarms * 82 + 122)/123) + 1
(C/A)	Process chgs. (per proc. unit)	Sectors = ((ProcChgs * 61 * 1.5 + 122)/123) + 1
(C/A)	Operator msgs (per proc unit)	Sectors = ((OprMsgs * 61 * 3 + 122)/123) + 1
	Area Sequence of Events (per area)	Sectors = ((Area SOE Msg * 61 +122)/123) +1
	Calculate total sectors	Add up the system sectors (burst events, status changes, system errors, maintenance events). Next, add the per-process-unit sectors (alarms, process changes, operator messages, SOE messages) to the system-sectors total. You can either calculate and add up the sectors for each individual unit, or you can use the average number of events for each of the three types and multiply the sectors for all three by the number of process units in each HM. **NOTE:** SOE messages must be on the same HM as the process chgs. **NOTE**: If the AM/CL Process Change events are to be stored (Release 650 and later), care should be taken in deciding the number of Process Change events (ProcChgs). For more information on Journal AM/CL Process Changes, see Appendix J in *AM/CL Reference Manual*.
	Calculate final KB estimate	KB = Total sectors * 0.25

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Table 7-9 HM Volume Size Estimator, continued

!4np (S) (note 2)	Maintenance-support software	310 KB
!9np (S) (note 3)	HM Local Volume (Image) without &HMI with &HMI	 3486 KB (See the notes at the end of this table.) 4886 KB
User Volumes (C/A)	See Table 7-10	If HM space is limited, the number and size of HM user volumes can be kept small by keeping only current data in them and storing long-term data on removable media.

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Table 7-9 HM Volume Size Estimator, continued

Notes: (S) System (LCN wide) data, mostly of fixed size. Volume &0np can only be stored in one HM. We also recommend that each of the other system data volumes be stored in only one HM .

(C/A) Cluster/Area-related data, all vary in size. All are candidates for splitting between HMs. All K4LCN boards contain at least 4 Mw of memory.

Note 1: System data that resides on all journal HMs.
Note 2: System data that can only be stored in one HM.
Note 3: System data that resides in all HMs.

Total configuration and data space available (K = 1024)

HM with	One drive	Two drives
WREN III	135,900 KB	271,800 KB
WDA 210 MB	215,040 KB	430,080 KB
WDA 445 MB	454,130 KB	908,260 KB
WDA 1.8 GB	1,836,736 KB	3,673,472 KB

To estimate the system-file space in each HM, consider which of the system (S) volumes you assigned to which HM in the Volume Configuration portion of Network Configuration (System Startup Task 10).

If HM space is limited, you can choose not to store all files mentioned in this table in HMs. For example, files not required for "on process" operations, such as schematic source files in volume &3np, could be stored only on disks. It is possible to omit the HM Initialization Personality (&HMI) in volume !9np, but we strongly recommend that you include this space on all HMs, so that the HMs can automatically switch to off-line if a startup problem occurs.

AM Checkpoint Values
Checkpoint volume space for each AM = UM + UOH - UCPBS + MCDS + CL where:

UM = User Memory = 1986 KB for a 3.0 Mw AM
3948 KB for a 4.0 Mw AM
5908 KB for a 5.0 Mw AM
7870 KB for a 6.0 Mw AM
9832 KB for a 7.0 Mw AM
11792 KB for a 8.0 Mw AM
27482 KB for a 16.0 Mw AM

UOH = Unit Overhead = 28.7 KB * (number of units in this AM + 1)

UCPBS = Uncheckpointed Buffer Size = MEMCVBNX*0.034 KB

MEMCVBNX = Current-value-buffer memory size (for more information, see Section 6 in *Application Module Implementation Guidelines*, binder TPS 2035-1). A user-adjustable value with a default value = 4000 words.
MCDS = Multiple CDS Size; if this AM doesn't have any CDSs attached to points in two or more units, use 0; otherwise use 104.8 KB, unless you have a very clear understanding of your use of Custom Data Segments and you need a very accurate estimate of the checkpoint volume size.

If you need to calculate it:

MCDS = [(MCD*0.026 KB) + (MCDP*0.04 KB)]*(AUWCSD - 1)]

MCD = number of CDSs attached to points in different units
MCDP = total number of parameters in all the MCD CDSs attached to points in different units.
AUWCDS = Average number of units that have the same CDSs. For example, if a CDS is attached to four points, each of which is in a different unit in this AM, and another CDS is attached to two points, each of which is in a different unit in this AM, then:

$$\text{AUWCDS} = \frac{4 + 2}{2} = 3$$

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Table 7-9 HM Volume Size Estimator, continued

Notes: AM Checkpoint Values (Continued)

This is how the recommended MCDS value, 104.8 KB, is calculated:

MCD = 100 CDSs
MCDP = 4000 parameters
AUWCDS = 2 units
MCDS = [(100∗0.048) + (4000∗0.05)]∗(2 - 1) = 104.8 KB

CL = the size of the CL object code, in KB, in the unit with the largest number of CL object words.

To convert words to KB: $KB = \frac{no_words * 2}{1024}$

S) System (LCN wide) data, mostly of fixed size. Volume &0np can only be stored in one HM. We also recommend that each of the other system data volumes be stored in only one HM .

(C/A) Cluster/Area-related data, all vary in size. All are candidates for splitting between HMs. All K4LCN boards contain at least 4 Mw of memory.

The estimated number of KB is arrived at by multiplying 2250 K by the number of Mw for the node type.
K = 1024; KB = 1024 bytes; 1 MB (megabyte) = 1024 KB; 1 Mw (megaword) = 2 MB.

The size of the CLs cannot be determined until after they are compiled. This requires the AM to be up and running, which in turn requires the checkpoint to be loaded. Therefore, to determine the size to allocate for the checkpoint, use the formula CL=(User Memory ∗ 2). This is the maximum allowed size. This size may be adjusted later when the CL sizes are known.

Note: Where a calculation results in a fraction of a KB, round up to the next KB. Then, to assure plenty of space for your CLs, add the size of your largest unit a second time.

AM checkpoint volume size example: one 4.0 Mw AM, five units, MEMCVBNX = 2000, no CLs

UM = 3436 KB
UCPBS = 2000 ∗ 0.034 KB = 68 KB
UOH = 28.7 KB ∗ (5 +1) = 172.2 KB
MCDS = 104.8 KB

Checkpoint volume space for this AM = 3436 + 172 KB - 68 KB + 105 KB + 6872 KB = 10517 KB

CG Checkpoint Values
Checkpoint volume space for each CG = UM + UOH + MCDS + 44 KB
Where:

UM = User Memory = 1716 KB
UOH = Unit Overhead = 2 KB∗(number of units in this CG/CM +1) + TCDSPFU
MCDS = Multiple CDS Size = [(MCD∗0.041 KB) + (MCDP∗0.04 KB)]∗(AUWSCD-1)

And where:

TCDSPFU (for each unit) = Total CDS parameters for the unit = (0.054 KB∗CDSs)+(0.042 KB ∗PARAMS)

PARAMS = number of unique parameters in all CDSs for this unit, that is, count each parameter used in one CDS and each parameter used in more than one CDS as a unique parameter.

MCD = Number of CDSs attached to points that are in more than one unit.

MCDP = Number of parameters on all of the CDSs included in MCD.

AUWCDS = Average number of units with the same CDSs.

For example, if one CDS is attached to four points, each of which is in a different unit, and one other CDS is attached to two points, each of which is in a different unit, then:

$$AUWCDS = \frac{4 + 2}{2} = 3$$

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Table 7-9 HM Volume Size Estimator, continued

CG Checkpoint Values Continued)

Note: Where a calculation results in a fraction of a KB, round up to the next KB.

Example: for a CG with 4 units, 3 CDSs attached to points in more than one unit, 8 unique parameters in the CDSs in each unit, and the average number of units with the same CDSs is 3:

UM = 1716 KB

UOH = 2 KB*(4 + 1) + TCDSPFU(1, 2, 3, 4) = 10 KB + 2 KB = 12 KB

MCDS = [(3*0.041 KB) + (17*0.04 KB)]*(3-1) = 1.616 KB, round up to 2 KB

PARAMS = 8

MCD = 3

MCDP = 17

AUWCDS = 3

TCDSPFU (1) = (0.054 KB*3) + (0.042 KB*8) =0.498 KB

TCDSPFU (2) = (0.054 KB*3) + (0.042 KB*8) =0.498 KB

TCDSPFU (3) = (0.054 KB*3) + (0.042 KB*8) =0.498 KB

TCDSPFU (4) = (0.054 KB*3) + (0.042 KB*8) =0.498 KB

Sum of the four TCDSPFU values = 1.992 KB — round up to 2 KB

Checkpoint volume space for this CG = 1716 KB + 6 KB + 2 KB + 44 KB = 1768 KB

K = 1024; KB = 1024 bytes; 1 MB (megabyte) = 1024 KB; 1 Mw (megaword) = 2 MB.

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

User Volume Size

The following table allows you to estimate the size of your user volume or directory, based on the files you plan to allocate to this area of the History Module:

Table 7-10 HM User Volume or Directory Size Estimator

Recommended Minimum User Volumes or Directories	Estimated Function Size	Number of Files
Data Entity Builder IDFs (Note 1)	See Table 7-11	See Table 7-11
Exception-building source	225 KB per each 1000 entities (points)	35 per each 1000 entities
Schematics and Free-Format Logs (Note 2)	162 KB per schematic 85 KB per Free Format Log (includes support files)	7 * number of schematics 7 * number of Free Format Logs
Execute Command (EC) files	Approx. 0.05 KB per text line, per file. For example, 50 lines, 20 files = 50 * 0.05 * 20 = 50 KB	The maximum number of .EC files you expect to use
CL/AM source, object, and listing files	14.4 KB per 60-statement CL program	5 * number of CL programs
(Optional) CL/MC source, object, and listing files	90 KB * number of sequences (assumes an average of 300 statements per sequence)	3 * number of sequences
(Optional) CL/PM source, object, and listing files	108 KB * number of sequences (assumes average of 300 statements per sequence)	3 * number of sequences
Std. AM/CL-HM-file ext'ns	125 KB, minimum (Note 3)	3, minimum (Note 3)

Notes:

1. You may need more than one directory for IDFs. See Table 7-11.
2. This is a workspace directory for approximately 10% of all of your schematics and Free Format logs. If HM space is limited, you can create a permanent HM directory in a User volume or Area volume (&3np) and copy the object files there for on-line use. The space needed is shown at &3np on Table 7-9. You can tell the system where to find these directories when you configure the Path Name Catalog in Area Database Configuration. After copying the object files to this permanent directory, copy the source files to a disk, and delete the files from the workspace directory.
3. If optional CL extensions, AM custom software, or Background CL blocks are purchased, you must allow additional user-volume space. Typically, an additional 10 to 50 KB is adequate, but refer to the special documentation provided with these products for further information.

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Table 7-11 IDF Volume or Directory Size Estimator

Point Type	Points per Floppy (Note 2)	Memory Size in KB	Number of Files Needed (Note 2)
HG Points			
CB	72	5.25 * number of CB points	(number of CB points/72) * 6
DHP	85	4.5 * number of DHP points	(number of DHP points/85) * 6
EC	56	6.75 * number of EC points	(number of EC points/56) * 6
PIU	100	3.75 * number of PIU points	(number of PIU points/100) * 6
MC	72	5.25 * number of MC points	(number of MC points/72) * 6
AM Points			
AM (Note 3)	45	8.25 * number of AM points	(number of CIU points/45) * 6
CG Points			
CG	175	2 * number of CIU points	(number of CIU points/175) * 6
PM/NIM Points			
Analog Input	110	9 * number of points	(number of points/110) * 6
Analog Output	110	9 * number of points	(number of points/110) * 6
Digital Input	105	9.5 * number of points	(number of points/105) * 6
Digital Output	105	9.5 * number of points	(number of points/105) * 6
Digital Composite	140	7 * number of points	(number of points/140) * 6
Regulatory PV	105	9.5 * number of points	(number of points/105) * 6
Regulatory Cntl.	95	10.5 * number of points	(number of points/95) * 6
Logic	50	20 * number of points	(number of points/50) * 6
Flag	110	9 * number of points	(number of points/110) * 6
Timer	120	8 * number of points	(number of points/120) * 6
Numeric	120	8 * number of points	(number of points/120) * 6
Proc. Module	130	7.5 * number of points	(number of points/130) * 6
Floppy volumes needed = Sum of All Files from "Files Needed" Column/500 (see note 4) **Directory (HM) or Volume (Disk) Size: Add the values from the "Memory Size" column for each set of files that you assign to a directory or volume.**			
Notes: 1. It's convenient to store IDFs on an HM, but they can be stored on disks if you need the space for something else. 2. The sizes in these columns are set up so that you can copy HM IDFs for each point type to a disk backup. The sizes allow the IDFs and support files to fit on one disk. 3. In AM IDFs, include all points referenced by the AM points and calculate the IDF size accordingly.			

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Table 7-12 Example—Small System, One Area, One Cluster

Volume	Data Type	Size Estimate	Notes
&001	System volume; system-wide data	11700 KB	One &0np volume per system. ("np" is the node-pair number of the HM this volume is stored in.)
&101	Personality Load Image volume; system-wide data	66250 KB	This system has space reserved for all possible LCN nodes.
&201	Dump volume; system-wide data	36000 KB	Largest node memory in this system is a 16 Mw AM.
&301	Area volume; area-related data	1198 KB 15000 KB 1200 KB 32000 KB 2000 KB Total = 51398 KB	One area 100 schematic source files 100 schematic object files 400 free format log source files 400 free format log object files Total (with directory space for 1010 files)
&401	CL/MC object volume; cluster-related data	4.5 KB * 10 = 45 KB	10 sequence programs in MCs
&501	AM checkpoint volume; cluster-related data	UM+UOH-UCPBS+MCDS + CL= 3948 + 173 - 68 + 105 + 7896 = 12054KB	One 4.0 Mw AM, 5 units, MEMCVBNX = 2000, default value for MCDS, max. size for CL (CL= UM * 2)
&601	CG checkpoint volume; cluster-related data	0 KB	No CG in this system (cluster)
&701	HG checkpoint volume; cluster-related data	2146 KB	One Data Hiway in this system (cluster)
&801	NIM checkpoint volume; cluster-related data	SecPerNIM = 11,367 + (5 * 2212)+ (2 * 2072) = 24819 KBPerNIM = 24819 * 0.25 = 6204.75 KB Final KB est. = 6205 * 1.2 = 7,971 KB	One NIM with 5 PMs and 2 LMs
&901	CL/PM obj/LL volume;	9.0 * A + ((C*4) + (9.6 * B))*D + 100 = 787.2 KB	A = 10 sequence programs in PMs B = 1 ladder prog. per LM C = Memory size of 96.0 KB D = 2 LMs

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Table 7-12 Example—Small System, One Area, One Cluster, continued

Volume	Data Type	Size Estimate	Notes
!001 !101	Continuous history volumes; cluster-related data	Refer to Table 7-9 Base sectors = 2686 Snapshot sectors = 23485 User avg. sectors = 3010 Hourly Averages 6020 Shift Averages 1540 Daily Averages 1190 Monthly Averages 525 Pre-arch user avg sectors 60235 Total pre-arch sectors 477475 5 sec snapshot sectors 51005 10 sec snapshot sectors 232245 20 sec snapshot sectors 129050 60 sec snapshot sectors 64575 Total sectors = 604974 Calculated tracks = 18906 Final KB est. = 151248 Point per second = 37 All Groups: Prearchive hrs. for snapshots = 168 Prearch. hrs. for user averages = 168	Total 5 sec. hist groups = 1 Total 10 sec. hist groups = 9 Total 20 sec. hist groups = 10 Total 60 sec. hist groups = 15 5 sec. hist grps config as snapshots = 1 10 sec. hist grps config as snapshots = 9 20 sec. hist grps config as snapshots = 10 60 sec. hist grps config as snapshots = 15 Total of al 5 sec. grps config as pre-arch snapshots = 4 Total of al 10sec. grps config as pre-arch snapshots = 9 Total of al 20 sec. grps config as pre-arch snapshots = 10 Total of all 60 sec. grps config as pre-arch snapshots = 15 Number of configured collection rates = 4 Total cont hist grps this HM = 35 User average interval config in System ‘Wide Values = 6 min.
!201	Journal volume; cluster/area-related data	Refer to Table 7-9 Burst event sectors = 5581 Sys.status chg.sectors = 4169 System errors sectors = 3335 Sys.Maint.vent sectors = 3335 Process alarm sectors = 80002 Process chg. sectors = 80002 Operator msg sectors = 80002 SOE event sectors = 5002 Total sectors (+ 3-5 %) = 261428 261428 * 0.25 = 65357 KB Final KB est. = 65357 KB	16 process units, 16-char. tag names 7500 burst events 9999 system status changes 9999 system errors 9999 system maint. events 7500 process alarms per unit (16 units) 7500 process changes per unit (16 units) 3000 operator msgs per unit (16 units) 7500 SOE events
!401	Maintenance-support software, system-wide	310 KB	
!901	HM Local Volume; contains the software for this HM.	4886 KB	Includes the HM initialization image, &HMI

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Table 7-12 Example—Small System, One Area, One Cluster, continued

Volume	Data Type	Size Estimate	Notes
Total HM Space Needed:			
&001 = 1170 KB &101 = 62050 KB &201 = 36000 KB &301 = 51497 KB	&401 = 45 KB &501 = 12054 KB &601 = 0 KB &701 = 2146 KB &801 = 7446 KB	&901 = 977 KB !001/!101= 151248 KB !201 = 68473 KB !401 = 310 KB	!901 = 4886 KB User volumes (Table 7-14) = 154575 KB Grand total = 552877 KB Total System Data (S) = 120257 KB Total Cluster/Area Data (C/A) = 432620 KB
Notes: The maximum size of NCF.XX and ERRBK.XX files is 500 KB each.			

Table 7-13 Example—IDF Volume Estimate (approximately 5 HCUs)

IDF Type	Number of Points	Memory Size	Number of Files Needed (Note 1)
CB	70	5.25 * 70 = 367.5	70/72 * 6 = 5.8 6 Files
EC	45	6.75 * 45 = 303.75	45/65 * 6 = 4.8 5 Files
PIU	330	3.75 * 330 = 1237.5	330/100 * 6 = 19.8 20 Files
AM	325	8.25 * 325 = 2681.25	325/45 * 6 = 43.3 44 Files
	Total Points = 770 Pts.	Total for IDFs = 4590 KB	Total Files = 75 Files
Volumes needed = 66/500 < 1, but for convenience in volume naming, we'll use four volumes (CB, EC, PIU, and AM).			
Notes (from “Adjustment factors,” in 7.4.1): 1. We suggest that you specify the number of files for IDF volumes at size times the number of IDF files expected because of the supporting files generated, particularly when errors occur.			

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Table 7-14 Example—User Volumes, Small System, One Cluster, One Dual HM

User Volume	Volume Size		Number of Files	
Data Entity Builder IDFs	From Table 7-13; 4 volumes=	4590 KB	From Table 7-13; Total of 75 Files	
Exception Building source files (.EB)	770 < 1000, so estimate	225 KB	770 < 1000, so use:	35 Files.
Schematics and Free Format Logs	132 KB * 1000 schematics = 55 KB * 300 FF logs =	132000 KB 16500 KB	1000 * 7 (Note 2) = 300 * 7 (Note 2) =	7000 Files 2100 Files
Execute commands		50 KB		20 Files
CL/AM Files (Note 3)	14.4 KB * 10 CL programs =	144 KB	10 * 5 (Note 3) =	50 Files
CL/MC Files	90 KB * 10 CL sequences =	900 KB	10 * 3 =	30 Files
CL/AM Custom GDFs	8.2 KB * 5 CDSs =	41 KB	3 * 5 = 15 + 5 (Note 4) =	20 Files
Std CL/AM-HM-file extensions		125 KB	3 (directories &CUS and &CLX)	
	User Volumes Total:	**154575 KB**		

Notes (from "Adjustment factors," in 7.4.1):

2. We suggest that you specify the number of files for the schematic volume at seven times the number of schematics expected to support the source, object, and library files for subpictures.
3. We recommend that you specify the number of files in the CL volume at five times the number of CL programs expected.
4. Specify the number of files in the CL-Custom GDF volume at the number of custom data segments, plus the number of custom parameter lists expected.

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Volume configuration

This info. is needed for form *SW88-517* It is entered into the Volume Configuration display. *Line No.* in the table is the line on the form.

Table 7-15 Value Sources for Volume Configuration

Line No.	Item	Volume	Value Source
Volume Configuration Menu Display			
1	Node Pair Number	-	Network Configuration, LCN Nodes
2	Number of Winchester Disks	-	1 or 2 from system documents
3	Disk Type/Size	-	3 or size of WDA in KB (that is 215040 or 454130; see Table 7-7)
4	HM Init Personality	!9np	"Yes" if included in !9np estimate
5	System Volume	&0np	"Yes" if included in &0np estimate
6	GDF Files Included	&0np	"Yes" if included in &0np estimate
7	File Manager Descriptors?	&0np	"Yes" if you want system volume file descriptors
8	Area SOE Journal Size	!2np	"Yes" if area SOE configured for journals
9	Burst Buffer Size…	!2np	!2np estimate for Burst Buffer
10	System Unit Journals?	!2np	"Yes" if included in &!2np estimate
10a	Status Change, Error, Maint	!2np	Enter the values used for your !2np estimate
Program Image Volume Configuration—Select Node Display			
30	Node Pair Number	-	Network Configuration, LCN Nodes
31	Select All Node Types that apply	!1np	Select all node types on this LCN. "II" means nodes that have 68040 microprocessors
33	Hist. Mod. Dump Volume	&2np	Select if dump volume is to be on this HM
33	Dump Volume Size (KB)	&2np	Enter value selected for &2np from Table 7-9
Area Data Volume Configuration Display			
40	Node Pair Number	-	Network Configuration, LCN Nodes
41	File Manager Descriptors?	&3np	"Yes" if you want area volume file descriptors
42	Area Name	&3np	Network Config., Area Names
42	Volume Size	&3np	&3np estimate partitioned for each area on this HM (normally one)
42	Number of Files	&3np	No. of files in &3np estimate, partitioned for each area, plus approx. 10%

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Table 7-15 Value Sources for Volume Configuration, continued

Line No.	Item	Volume	Value Source
Physical Node for Checkpoint Configuration Display			
50	Node Pair Number	-	Network Configuration, LCN Nodes
51	Node Number	&5np-&9np	Enter node number for each node to be checkpointed
51	Volume Size	&5np-&8np	&5np-&8np estimate for each node
51	Number of Files	&5np-&8np	Enter 0 for HGs; each AM needs (5 * no. of units +2) files; each CG needs (no. of units + 1) * 4 files; each NIM needs (4 * no. of UCN nodes) + 4 files
Continuous History Unit and Groups Display			
60	Node Pair Number	-	Network Configuration, LCN Nodes
61	Unit ID	!0np, !1np	Net. Config., Unit Names
61	Number of Groups	!0np, !1np	Enter same number for each unit as it is/will be configured in HM History Group Configuration (1 to 120)
Continuous History HM/Unit Options			
65	Node Pair Number	-	Network Configuration, LCN Nodes
66/67	Save Rate	!0np, !1np	Select 5, 10, 20, or 60 sec. collection frequency
66/67	Save Options	!0np, !1np	Select SNAPSHOTS, USER AVERAGE, or both for each history group
66/67	Prearchive Hours—Snapshots	!0np, !1np	Enter hours used for each group in your estimate for !0np and !1np (0 to 2,880)
66/67	Prearchive Hours—User Average	!0np, !1np	Enter hours used for each group in your estimate for !0np and !1np (0 to 7,496)
66/67	Archive?	-	(not implemented)

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Table 7-15 Value Sources for Volume Configuration, continued

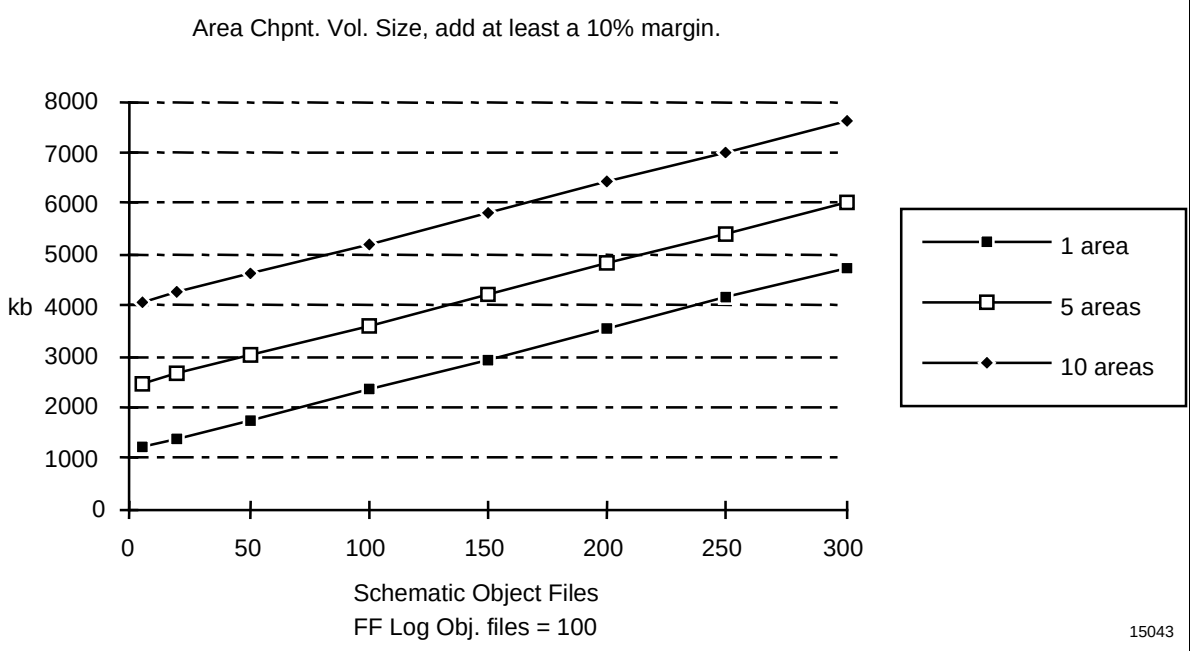
Continuous History Group Options			
Line No.	**Item**	**Volume**	**Value Source**
70	Node Pair Number	-	Network Configuration, LCN Nodes
71	Unit ID	!0np, !1np	Network Configuration, Unit Names
71	Group Number	!0np, !1np	No entry required
71	Save Rate	!0np, !1np	Select 5, 10, 20, or 60 sec. collection frequency
71	Save Options	!0np, !1np	Select SNAPSHOTS, USER AVERAGE, or both for each history group
71	Prearchive Hours—Snapshots	!0np, !1np	Enter hours used for each group in your estimate for !0np and !1np (0 to 2,880)
71	Prearchive Hours—User Average	!0np, !1np	Enter hours used for each group in your estimate for !0np and !1np (0 to 7,496)
71	Archive	-	Select NO (not available)
Process Unit Journal Configuration			
80	Node Pair Number	-	Network Configuration, LCN Nodes
81	Unit ID	!2np	Network Config., Unit Names
81	Process Alarm	!2np	No of process alarms in !2np estimate
81	Process Change	!2np	No of process changes in !2np estimate
81	Operator Message	!2np	No of operator messages in !2np estimate
CL Storage Volume Configuration (Sequences)			
110	Node Pair Number	-	Network Configuration, LCN Nodes
111	Hiway/Network	&4np (Hwy), &9np (UCN)	Data Hiway the MC is on, or UCN the PM is on, (0-20)
111	Hiway File Manager Descriptors	&4np	“Yes” if you want to enter descriptors for Hiway CL files
112	Network File Manager Descriptors	&9np	“Yes” if you want to enter descriptors for UCN CL files
113	Number of files	&4np (Hwy), &9np (UCN)	Enter the number of sequences used in the &4np or &9np sequence estimates, plus the number of LM (or ALM) ladder logic programs
113	Volume Size (KB)	&4np (Hwy), &9np (UCN)	&4np or &9np estimate

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Table 7-15 Value Sources for Volume Configuration, continued

User File Storage Configuration			
130	Node Pair Number	-	Network Configuration, LCN Nodes
131	Virtual Volume ID	(user name)	4-character user name
	Number of files	(user name)	Table 7-10 (1-9995)
	Volume Size (KB)	(user name)	Table 7-10
131	File Manager Descriptors	&4np	“Yes” if you want user volume file descriptors

Figure 7-3 Area Volume Size Estimator Chart

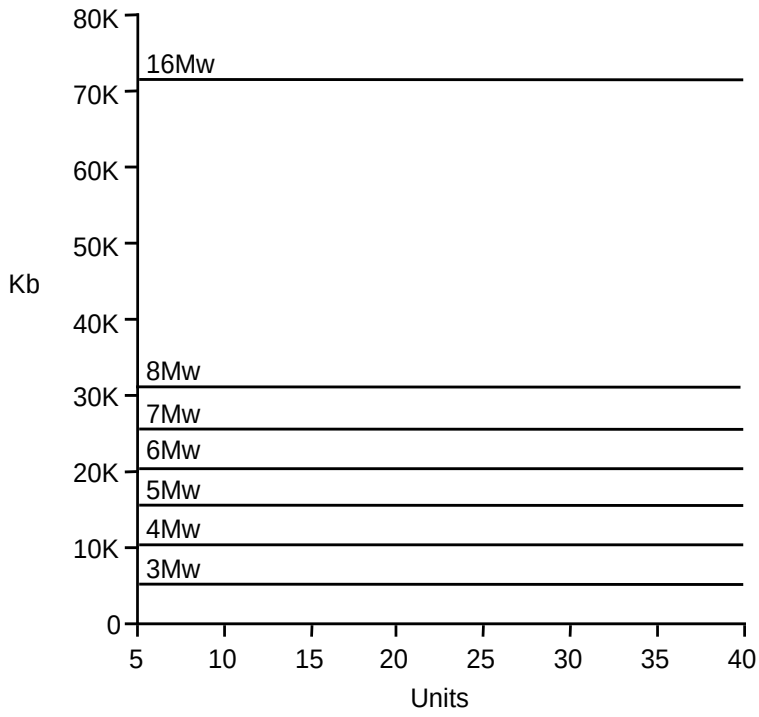


Notes: These values were calculated with the number of Free Format Log object files fixed at 100. If you have significantly more or fewer Free Format Log object files, add or subtract the different at 5 KB per object file.

We recommend that you add at least 10% safety margin to the values you read off this chart. You should also consider adding even more space for possible future expansion.

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Figure 7-4 AM Checkpoint Volume Size Estimator Chart



Legend	
16 Mw	71,700 - 72,700 Kb
8 Mw	31,000 - 32,000 Kb
7 Mw	25,800 - 26,800 Kb
6 Mw	20,700 - 21,700 Kb
5 Mw	15,600 - 16,600 Kb
4 Mw	10,500 - 11,500 Kb
3 Mw	5,400 - 6,400 Kb

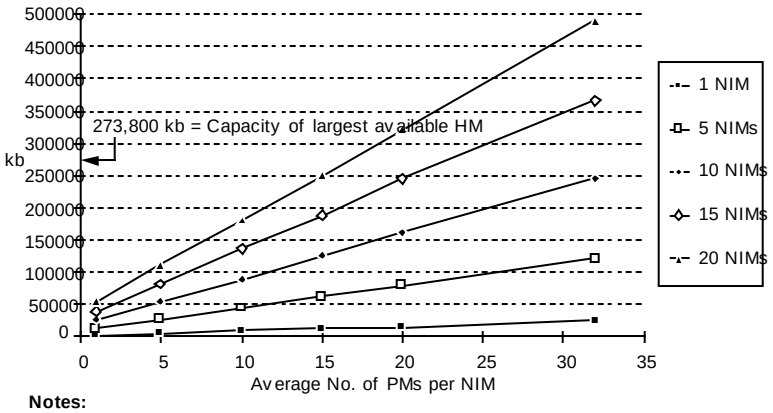
Notes:
These values were calculated for one AM with the niumber of units indicated.
The recommended default value for MCDS, 104.8 Kb, is included.

We recommend that you add at least a 10% safety margin to the values yuou read off this chart. You should also consider adding even more space for possible future expansion.

3702

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Figure 7-5 NIM/PM Checkpoint Volume Size Estimator Chart



Notes:

These values were calculated using an average number of PMs for each NIM. If your UCNs have widely different numbers of PMs, you may need to make an individual calculation for each NIM and its UCN, rather than using this chart.

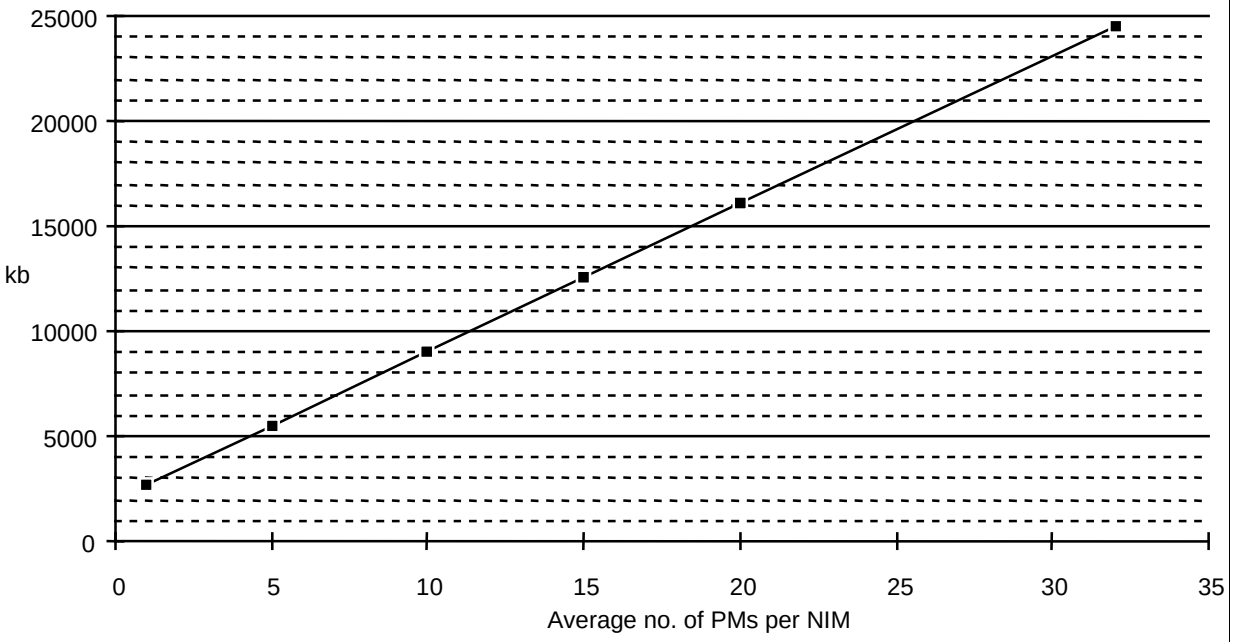
We recommend that you add at least a 10% safety margin to the values you read off t chart. You should also consider adding even more space for possible future expansion See Figure 7-5 for a volume-size chart for PMs on one NIM and its UCN.

If you have a mix of PMs and LMs, using the "Average No. of PMs per NIM" axis on this chart results in a somewhat larger volume size than is required. Figure 7-7 is a chart that shows volumes sizes for LMs, only, on a NIM and its UCN.

3703

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Figure 7-6 NIM Checkpoint Volume Size Estimator Chart, 1 NIM



Notes:

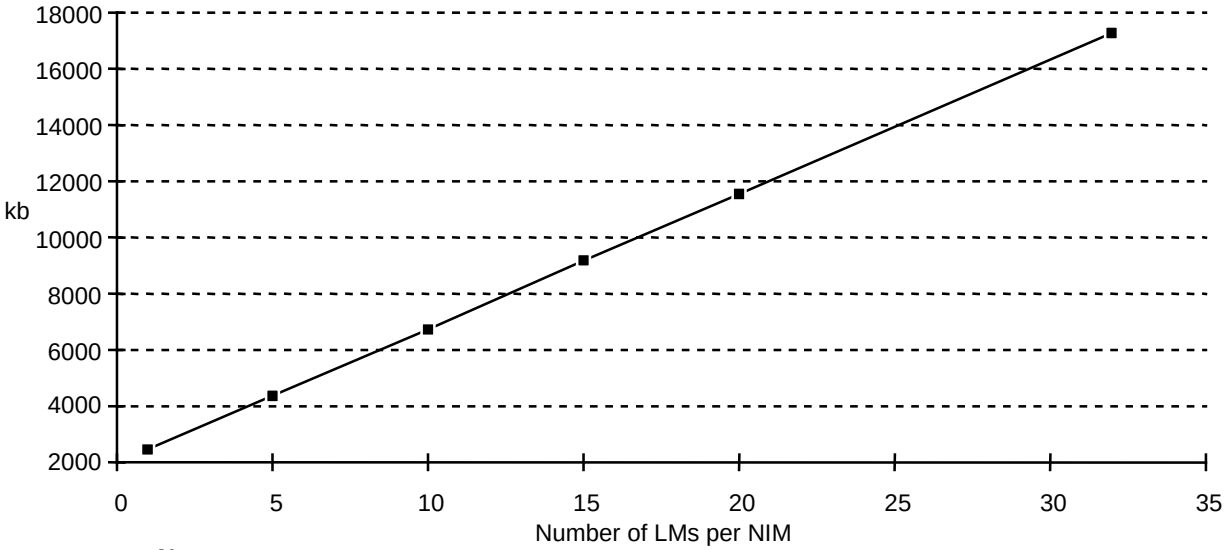
We recommend that you add at least a 10% safety margin to the values you read off this chart. You should also consider adding even more space for possible future expansion.

See Figure 7-4 for a volume-size chart for up-to-32 PMs and up to 20 NIMs.

3704

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Figure 7-7 NIM/LM Checkpoint Volume Size Estimator Chart, 1 to 32 LMs



Notes:

We recommend that you add at least a 10% safety margin to the values you read off this chart. You should also consider adding even more space for possible future expansion.

See Figures 7-4 and 7-5 for volume-size charts for NIMs with PMs on the

3705

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

NIM/APM Checkpoint Volume Size

The NIM/APM Checkpoint Volume Size Estimator Chart that follows reflects the following considerations:

- Values are calculated using an average number of APMs per NIM
- The base values are 1000 KB per APM and 1202 KB per NIM
- For the estimated APM KB size per NIM, the Y = MX + B formula is used (B is always 0), that is:
  (#APMs * 1000KB + 1 NIM *1202KB) * #NIMs = APM KB size

  Example: for 10 APM per NIM for 20 NIMS:

  (10 * 1000 KB + 1 * 1202 KB) * 20 = 224040 KB

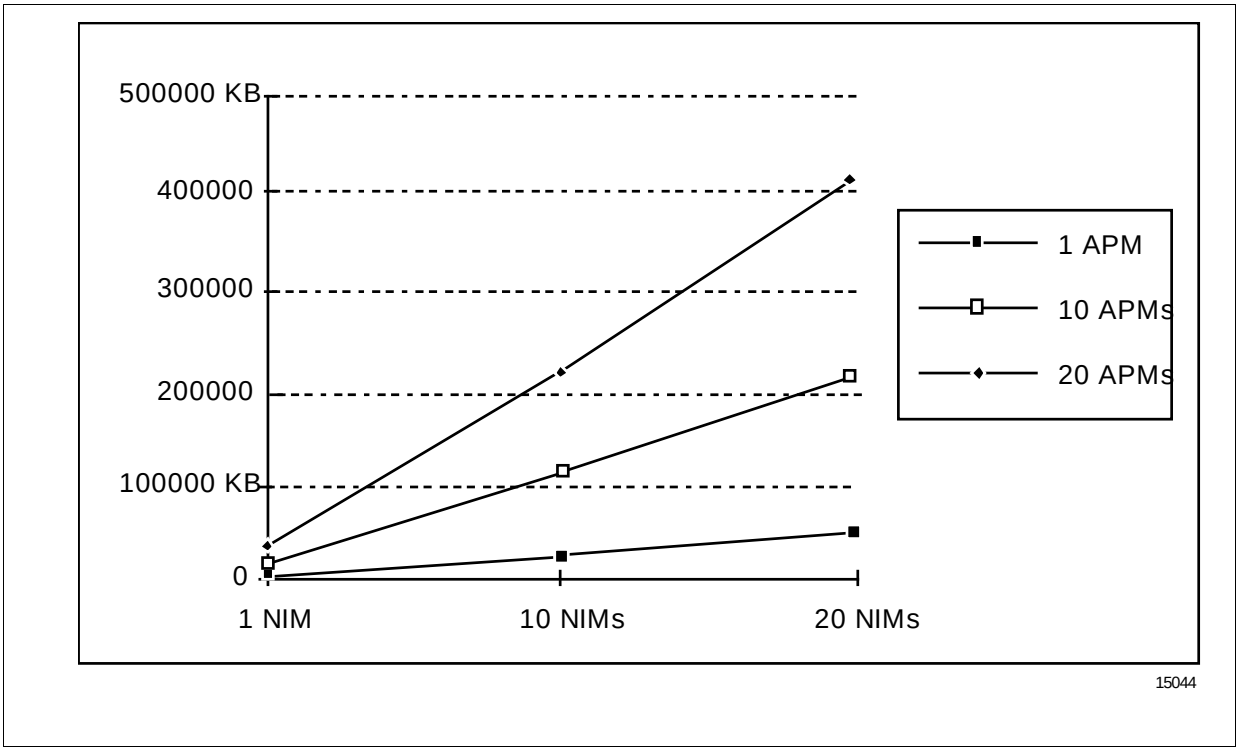
If number of APMs varies

If your UCNs have widely different numbers of APMs, you may need to make an individual calculation for each NIM and its UCN, rather than use this chart.

ATTENTION

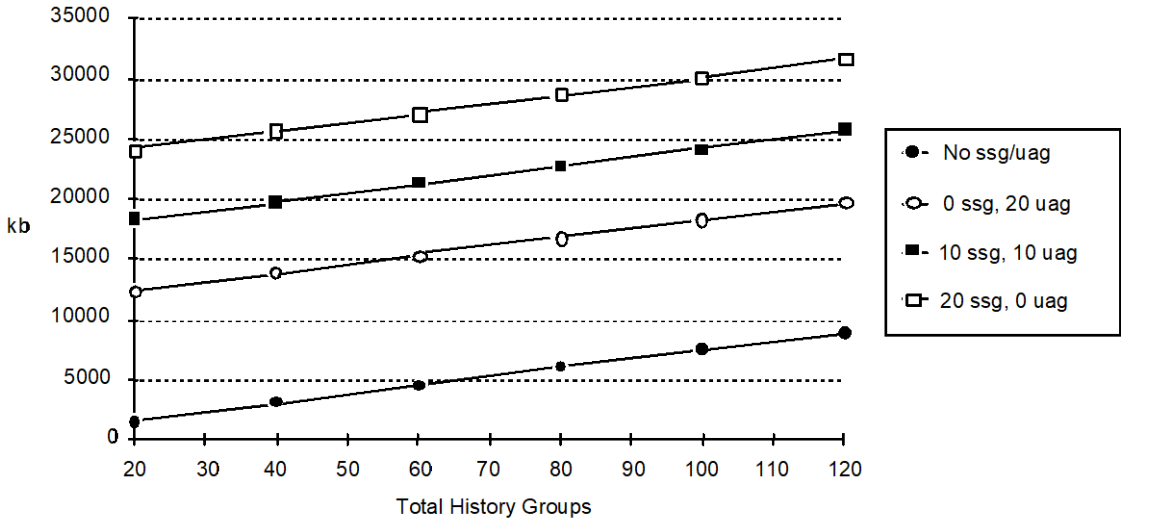
We recommend that you add at least 10% safety margin to the values you read off this chart. You can add even more for future expansion.

Figure 7-8 NIM/APM Checkpoint Volume Size Estimator Chart



7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Figure 7-9 Continuous History Vol. Size, Example 1



Notes:

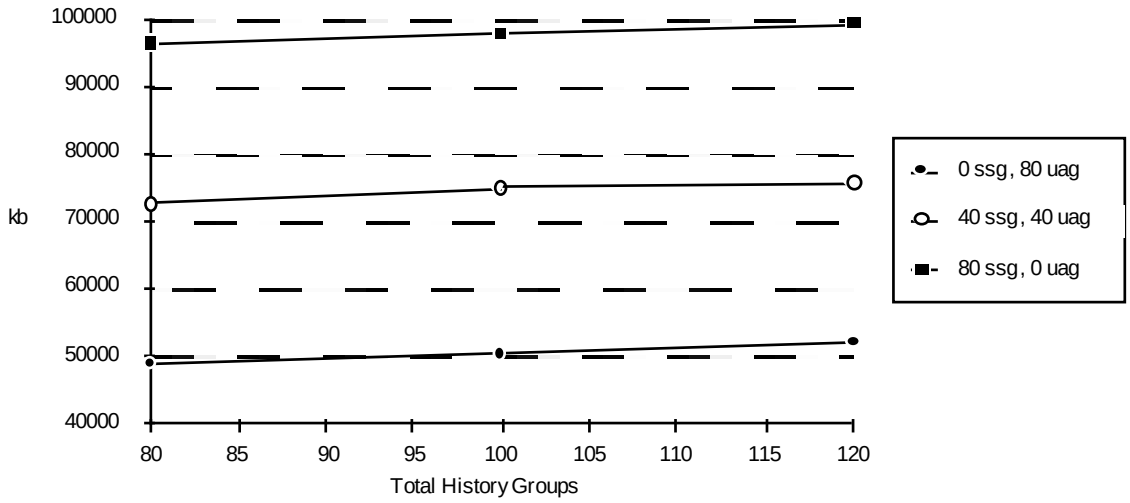
ssg = snap-shot grougs, uag = user-average groups.

All calculations are with fixed values of 168 prearchive hours, and a 5-minute user average period. Unless the continuous-history values for this HM are quite similar to those used for these calculations, we recommend that you use this chart only as a guide to the effect of configuration values on volume size.

2800

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Figure 7-10 Continuous History Vol. Size, Example 2



Notes:

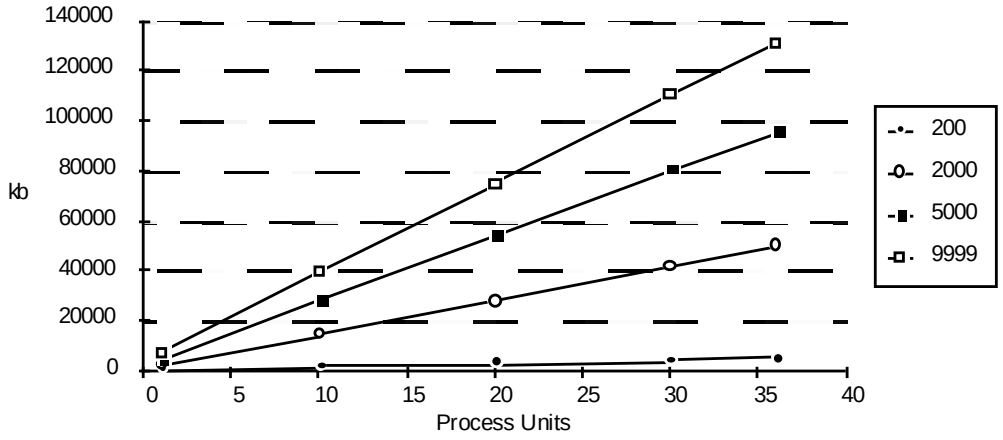
ssg = snap-shot groups, uag = user-average groups

All calculations are with fixed values of 168 prearchive hours, and a 5-minute user average period. Unless the continuous-history values for this HM are quite similar to those used for these calculations, we recommend that you use this chart only as a guide to the effect of configuration values on volume size.

2801

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Figure 7-11 Journal Volume Size Chart, Example 1



Notes: This table lists the number of events of each type used to calculate each of the four value series:

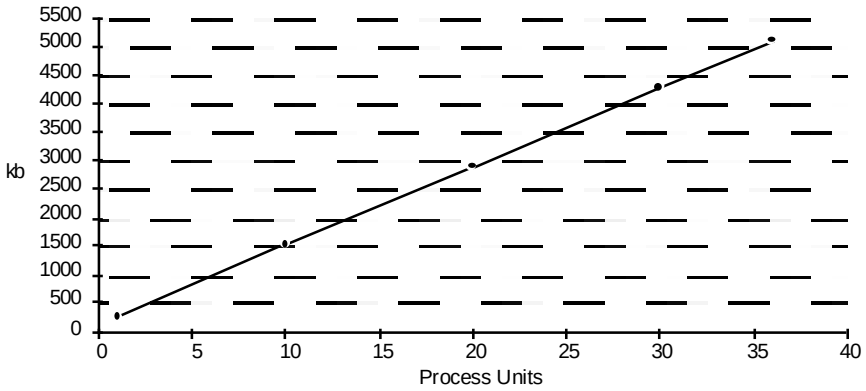
	200	2000	5000	9999
Burst events	400	2000	5000	9999
Syst status chgs	200	2000	5000	9999
System errors	200	2000	5000	9999
Syst maint events	200	2000	5000	9999
Alarms	200	2000	5000	9999
Process chgs	200	2000	5000	7500
Operator msgs	200	2000	3000	3000

Unless the journal values for this HM are quite similar to those used for these calculations, we recommend that you use this chart only as a guide to the effect of configuration values on volume size.

2802

7.4.4 HM Volume Size Estimator Tables and Figures, Continued

Figure 7-12 Journal Volume Size Chart, Example 2



Notes: The number of events of each type used in the calculations for this chart are as follows:

Burst events	400
Syst status chgs	200
System errors	200
Syst maint events	200
Alarms	200
Process chgs	200
Operator msgs	200

Unless the journal values for this HM are quite similar to those used for these calculations, we recommend that you use this chart only as a guide to the effect of configuration values on volume size.

2803

7.5 Redundant HM Disk Option

Redundant disk drive configurations

HMs with Wren III or WDA disk drives can be configured with redundant Winchester disk drives, if the HM Disk Redundancy Software option is purchased. When so configured, a failure or other interruption of the operation of one disk drive is reported but does not cause the HM to fail.

Synchronized "redundant partner" disk drives hold the same data because, once synchronized, each write operation writes identical data into both disk drives. A read operation is taken from only one of the drives. If the read is unsuccessful, data is read from its redundant partner and an alarm is raised.

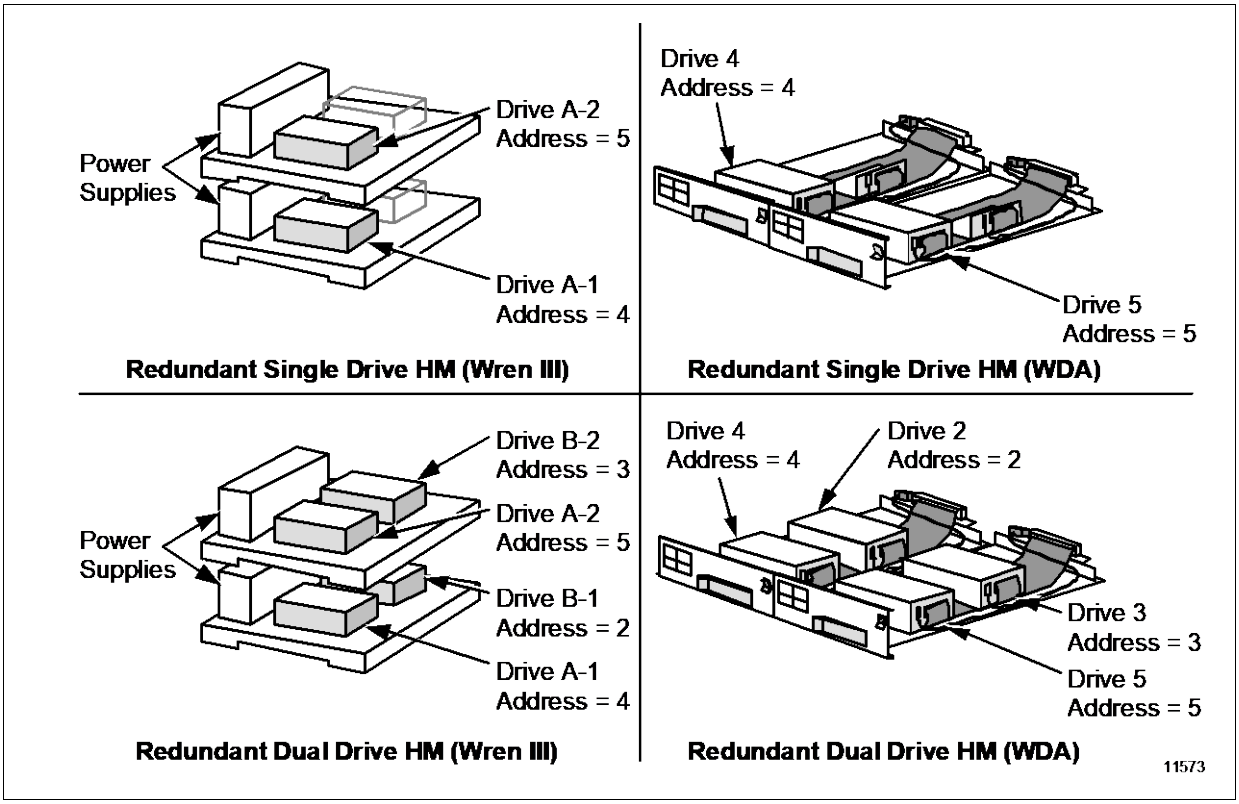
Physical location of redundant disk drives

Two types of redundant disk drives are used with the HM. They are the physically larger Wren III drives and the new, large capacity WDA drives. For redundant operation, the Wren III drives are housed on large slide trays in two separate modules above the five-slot HM electronics module.

The smaller WDA drives are located in small slide trays inside the five-slot HM electronics module. The physical location of the slide trays and their addresses for both designs are shown in Figure 7-13.

7.5 Redundant HM Disk Option, Continued

Figure 7-13 Physical Arrangement of Redundant Disk Drives



How the HM recognizes redundant disk drives

Redundant disk drives are recognized as such only if power is applied to both partners while the HM is started up. To prevent a single power supply failure from disrupting both redundant partners, each drive in a redundant pair has its own power supply. Where four drives are set up as redundant partners, each pair of drives has its own power supply.

Fall-back operation

Should one of the drives in a redundant pair need service, it can be taken off-line (if it has not already failed), repaired or replaced, and resynchronized, after which normal operation resumes. During the time one of the disk drives is off-line, the HM continues to operate by writing to and reading from the remaining drive.

WARNING

WARNING—R400 (or later) software does not rebuild the entire disk file structure after a redundant drive has been off-line. Instead, volumes are checked for the latest undamaged files and those files are restored on the redundant partner, regardless of its failed status.

DO NOT TURN POWER OFF ON A FAILED REDUNDANT DRIVE WITHOUT INSURING EITHER IT OR ITS REPLACEMENT HAS BEEN INITIALIZED BEFORE IT IS RETURNED TO OPERATION.

Resynchronizing after shutdown

For resynchronizing information, see *Command Processor Operation Manual*.

Resynchronizing after change from HMI to HMO

If a History Module running HMO has been loaded with the HMI personality, its redundant drive *must* be synchronized after HMO is reloaded.

7.5.1 Configuring Redundant HM Disk Drives

Description

HM disk drives can be redundant only if the HM Disk Redundancy Software option is purchased. If so, that option is displayed in the System Wide Values activity under Network Configuration.

Disk drive options are defined below. Whether a drive is a redundant partner or not is determined by its SCSI-bus address, which is selected by pinning in the HM (see *History Module Service*).

Table 7-16 Disk Drive Options

Options	Address of Initial Drive	Address of Redundant Partner Drive
One drive, no redundancy	5	None
Two drives, no redundancy (twice the storage of one drive)	5 3	None None
Two redundant drives (same storage as one, nonredundant drive)	5	4
Four drives, two redundant pairs (same storage as two, nonredundant drives)	5 3	4 2

Startup after configuration

The HM volumes for the drives (redundant or not) are established after Network Configuration is complete, when the HM is initialized (refer to the *System Startup Guide*, Task 15). Software and data can then be loaded into the HM, but the Initialization Personality (&HMI) makes only the initial drive(s) on-line to receive this information. The partner drive(s) receives its copy during synchronization.

7.5.2 Synchronizing Redundant HM Disk Drives

WARNING

WARNING—R400 or later software does not rebuild the entire disk file structure after a redundant drive has been off-line. Instead, volumes are checked for the latest undamaged files and those files are restored on the redundant partner, regardless of its failed status.

DO NOT TURN POWER OFF ON A FAILED REDUNDANT DRIVE WITHOUT INSURING EITHER IT OR ITS REPLACEMENT HAS BEEN INITIALIZED BEFORE IT IS RETURNED TO OPERATION.

References

For synchronizing information, see *Command Processor Operation manual*:

- Get HM disk drive status
- Synchronize HM disk drive

7.5.3 Setting a Redundant HM Disk Drive Off-Line

Procedure

A disk drive that needs service normally has `FAILED` status. If not, you can use the Utilities' `OFF` command to set an HM disk drive off-line for service or some other purpose. The `OFF` command is valid only if the specified disk drive's status is OK (see 7.5.2 in this manual) and it has a redundant partner whose status is OK.

WARNING

WARNING—R400 or later software does not rebuild the entire disk file structure after a redundant drive has been off-line. Instead, volumes are checked for the latest undamaged files and those files are restored on the redundant partner, regardless of its failed status.

DO NOT TURN POWER OFF ON A FAILED REDUNDANT DRIVE WITHOUT INSURING EITHER IT OR ITS REPLACEMENT HAS BEEN INITIALIZED BEFORE IT IS RETURNED TO OPERATION.

References

For more information, see *Command Processor Operation manual:*

- Set HM disk drive off-line

7.5.4 Servicing Redundant HM Disk Drives

Procedure

Do not attempt to service a redundant HM disk drive unless the system has issued a maintenance recommendation to do so. If so, use the Utilities `STA` command to run the Command Processor and verify that the affected drive's status is `OFFLINE, WARNING,` or `SEVERE`. Use the Sector Reassignment feature to do this. If in HMO, the drive must be offline. If in HMI, the drive may be online.

Sector reassignment using R400 or later

You can use the SMCC (the System Maintenance Control Center) in your TPS for online sector reassignment of redundant disk drives running under release 400 (or later). This allows repair of the disk without physically disconnecting the drive.

Sector reassignment reference

For instructions on reassigning sectors, refer to *History Module Service*, binder TPS 3060-2.

WARNING

WARNING—R400 or later software does not rebuild the entire disk file structure after a redundant drive has been off-line. Instead, volumes are checked for the latest undamaged files and those files are restored on the redundant partner, regardless of its failed status. DO NOT TURN POWER OFF ON A FAILED REDUNDANT DRIVE WITHOUT INSURING EITHER IT OR ITS REPLACEMENT HAS BEEN INITIALIZED BEFORE IT IS RETURNED TO OPERATION.

WARNING

WARNING—Before you turn power off, disconnect, or remove a disk drive in an operating HM (`OK` or `DISKPROB` status on the Node Status display), be sure that it is the correct drive. When four drives are in an HM, each pair of drives is served by a separate power supply. If you are servicing one of the redundant pairs, both drives in that side of the pair must be placed off-line before turning the drives' power off.

The drive addresses range from 2 through 5 and correspond to the address of the port on the SCSI bus that serves them. A label with the port number should have been affixed to each drive as the port was assigned. If you can't find such a label, refer to the system documentation and local records to determine for sure which physical drive is to be serviced. If you inadvertently shut down an on-line drive, severe disruption to the process and the system could result.

7.6 HM Initialization

Description

HM initialization is the process through which the volume configuration is established on an HM. After the `NETWORK CONFIGURATION` activity on the Engineer's Main Menu and other related tasks are completed (refer to the *System Startup Guide*, Task 1 through Task 14, then proceed with HM initialization (Task 15).

Procedure

HM initialization can be performed only when the HM is loaded with its initialization personality (directory &HMI is the load source). The actual initialization is triggered by using the F6 (INITIALIZE) function button when doing volume configuration from the volume-configuration display for a specific node pair.

When the HM is loaded with the initialization personality, files located on the HM can be accessed by only the physical node path form (`PN:n>vdr>filename.sx` where "n" is a node number, "vdr" is a volume or directory name, and "sx" is the file type or suffix).

It is essential that files you want to save be copied to another HM, or on disks, before HM initialization is performed. If the *configuration of continuous history or journal volumes is changed, existing volumes of those types that were copied before the volume changes cannot be restored afterward.* Doing so destroys the new configuration. If you need to preserve continuous history or journals, you must defer those types of volume-configuration changes. Refer to 7.7 in this manual for required procedures for saving and restoring continuous history.

CAUTION

CAUTION—When the HM is initialized, the file data it contains is lost regardless of whether a change was made to the volume configuration.

7.6.1 Local HM Network Volume Configuration File, Lnp_NVCF.MM

Description

Loading the &HMI does not in itself initialize the HM; only the F6 (INITIALIZE) operation from the volume-configuration display for that node pair starts the actual initialization. When the HM is initialized, it creates a local Network Volume Configuration File (Lnp_ NVCF.MM) that describes the partitioning of the Winchester drives based on the volume-configuration data installed in the current NCF file. The Lnp_NVCF.MM file is locally held in each HM's local volume (see Section 2) and the *data it contains is also on the &ASY directory* as part of the NCF data.

Procedure

When an HM reloads and restarts itself (autoboots), it checks the local Lnp NVCF.MM (it contains a record of which NCF was used) against the NCF on the &ASY directory and *if the NCF has changed, the HM loads the initialization personality*, not the normal on-process personality, and the configuration mismatch error is recorded on the real-time journal. If the initialization personality (&HMI) has not been placed on the local volume, the HM fails.

7.7 How to Save and Restore Continuous History

Introduction

When it is necessary to initialize an HM that has stored continuous history, you must use the guidelines presented here to assure that the history data is kept intact and useable. You may need to initialize an HM because it has been repaired or because you are changing volume configuration to change volumes other than continuous-history volumes. Continuous history cannot be restored to HMs with reconfigured continuous-history volumes.

7.7.1 Prerequisites for Saving and Restoring Continuous History

Conditions

To save and restore continuous history, the following must be true :

- The NCF configuration items related to continuous history cannot be changed at all from those that existed at the time the history data was saved. This means you cannot change any of the following:

Table 7-17 NCF Configuration Items That Can't Be Changed

Under Volume Configuration	Under System Wide Values
Continuous History	User Average Period
Units and Groups	Shift Data
Group Options	

- No file in the HM continuous-history volumes can be too large to fit on one removable medium (disk). This will generally not be a problem if you use disks, but if the configured prearchive hours exceed 168, it may be a problem if you still use floppies. If so, use the following Utilities' LS command to catalog the files to see if any of the files is too large to fit on a floppy (larger than 3988 sectors, as shown in the #BLKS column):

```
LS NET>!Auu>AG*.*
LS NET>!Auu>AH*.*
```

  where uu is the continuous-history unit number.

- The HM to be initialized must be running with the initialization personality (&HMI) when the continuous history is saved on removable media and when the history data is restored. If you attempt to save continuous history while the HM is running its on-process personality (&HMO), the history data will be inconsistent and the HM will fail after it is initialized and put back on process.

7.7.2 Procedure for Saving and Restoring Continuous History

Description

If you want to save the history group definition files (APL) configuration on the HM, but don't care to save the history data itself, refer to 7.7.3 in this manual for a shorter procedure.

This procedure (7.7.2) saves and restores the continuous history definition files (APL) configuration and history data only. Other HM volumes with their directories and files also need to be saved. For the other volumes, use either the Backup command or the Copy Volume command (see *Command Processor Operation*). These commands work with either HM personality (HM status = SEVERE or WARNING or OK). If the HM is in SEVERE or WARNING, make sure that the disc drives are OK. Otherwise, correct or replace them.

CAUTION

CAUTION— You cannot restore Continuous History or Continuous History Group Definitions if the Continuous History has been modified on this HM (like, adding Groups, modifying History Collection, and so on). EB files must be used to restore History Group Definitions.

Procedure

Follow this procedure:

Table 7-18 Saving and Restoring Continuous History

Step	Action

1	Get a new disk, label it BACKUP NCF and create a volume in it with &ASY. Copy all the files in the &ASY from NET to this disk. Set this disk aside for later use.
	Examples:
	`CR $F1>&ASY -F -MF 3000 -BS 1700`
	`CP NET>&ASY>*.* $F1>&ASY>= -D`

2	Use the Backup Command (or similar) to save all HM information to disks (except history). Example: `BACKUP PN:10 $F1`
3	After the Backup command is finished, and while the HM is running, load the HM with its initialization personality. On the History Module Status display, select the HM's node number, select LOAD/DUMP, select MANUAL LOAD and then INIT PROGRAM. Follow the prompters to initiate loading from the HM (if HMOFF files are in !9np, where np is for node pair). Or do a SHUTDOWN of the HM, wait for the QUALIF status and load the INIT Program from the &Z1 disk and the Data (NCF) from NET or the BACKUP NCF disk. When loading is complete, the HM status will be HMOFF OK.

7.7.2 Procedure for Saving and Restoring Continuous History, Continued

Procedure, continued

Table 7-18 Saving and Restoring Continuous History, continued

Step	Action

4	From the Engineering Main Menu, select COMMAND PROCESSOR, create a volume in a disk and use a Copy Volume command to copy the continuous history volumes from this HM to disks. These are examples of the command lines that would be needed to create and copy two history volumes (see *Command Processor Operation*):
	`CR $F1>HST1 -F -MF 3000 -BS 1700`
	`CPV PN:40>!001>  $F1>HST1 -A -D`
	`CPV PN:40>!101>  $F1>HST2 -A -D`
	Note: A dual-disk HM can have two history volumes, !0np and !1np. If so, be sure to copy both volumes.

5	Print out (DO $P#, where # is the printer number) the List Volumes command (LSV PN:nn, where nn is HM node number) to use the printout to create user directories later on.
6	Verify that all of the files in the HM history volume have been copied correctly on the removable media. Use the List File Attributes (LS) command with the -A option (LS $F1 -A) to see that the number of files in the HM volume and the number of files on the removable media are the same. Copy all of the files (with the $FCOPY command) on the removable media to other removable media to verify that they can be copied without errors. It is risky not to do this verification now—once the HM is initialized, it will be too late.
7	From the Engineering Main Menu select SUPPORT UTILITIES, then MODIFY VOLUME PATHS, then SET DEVICE PATH TO REM. MEDIA and put in &Z1 in $F1 (or lower drive number) and BACKUP NCF in $F2 (or higher drive number). Select MAIN MENU. Do not make changes to the VOLUME CONFIGURATION in the continuous history section, but it is OK to make changes to other items in the VOLUME CONFIGURATION. (Refer to the *System Startup Guide* or the *Network Data Entry* for more information on editing and making NCF changes to the VOLUME CONFIGURATION.) **Note**: The following step destroys all data on the HM: Initialize the HM. (On the Engineering Main Menu, select VOLUME CONFIGURATION, select the node-pair target for this HM, hold CTL and press F6, and wait for the HM INITIALIZATION COMPLETE message.)

7.7.2 Procedure for Saving and Restoring Continuous History, Continued

Procedure, continued

Table 7-18 Saving and Restoring Continuous History, continued

Step	Action
8	Shut down, wait for QUALIF, and Manual Load the HM with the Operator (Online) Personality from the &Z1 and BACKUP NCF disks. HM should go to HMON OK. Allow it to run for 5 minutes (to initialize the history files) then shut it back down, wait for QUALIF, and load the initialization program from the &Z1 and BACKUP NCF disks. HM should go to HMOFF OK.

9	Delete all continuous history files on the HM. If there are two continuous history volumes, be sure to delete all files in both of them (!0np and !1np). These are examples of the command lines:
	`DL PN:40>!001>*.*`
	`DL PN:40>!101>*.*`
	For volumes with directories, each directory must also have its files deleted:
	`DL PN:nn>!Auu>*.*` (nn = node number, uu = hist group no.)

10	**Note**: This is a mandatory step that prevents fragmentation. Once again, shut down, wait for QUALIF, and load the HM with its initialization personality from the &Z1 and BACKUP NCF disks, then continue with step 8. HM should go to HMOFF OK.

11	Copy the continuous history files you saved in step 2 to the appropriate HM volumes. These are examples of the command lines:
	`CPV $F1>HST1> PN:40>!001> -A -D`
	`CPV $F1>HST2> PN:40>!101> -A -D`
	or run this EC in &Z1:
	`EC $F1>&EC>RSCONTHS.EC`
	Be sure all of the history copy operations completed correctly, without any errors.

7.7.2 Procedure for Saving and Restoring Continuous History, Continued

Procedure, continued

Table 7-18 Saving and Restoring Continuous History, (continued)

Step	Action

12	COPY the BACKUP NCF and .SE & .SP files:
	1. Copy the &ASY directory from removable media to the HM (for System HM only):
	`CP $Fs>&ASY>*.* PN:nn>&ASY>= -D`
	where s is the source disk number and nn is the HM physical node number.
	2. Insert the &Z1 disk appropriate for your system in Drive s (source). Run this EC for all HMs:
	`EC $Fs>&EC>LOC_VOLZ.EC $Fs nn np`
	where nn is the HM physical node and np is the HM node pair number. Follow the screen instructions.
	Loading the `INIT` files is optional but recommended (if `HM INIT Personality`? has `YES` on the first page of the Volume Configuration menu). Wait for "EC Complete".

13	Autoboot the HM. The system HM has to be online for these steps to work for non-system HMs: 1. Call up the System Status Display. 2. Select HISTORY MODULES. 3. Select SHUTDOWN; then press ENTER. Wait for QUALIF. 4. Turn node power OFF to the HM for at least 5 seconds. 5. Turn the power ON to the node. 6. HM status should go to HMON OK (may take up to 1 hour) Redundant HM drives may have a status = SEVERE until synchronized in Step 18. **Note**: Nodes can be loaded while the HM is in the READY state.
14	Verify that the system date and time are correct. If not, refer to the *Process Operations Manual* and correct them.
15	Use the History Module Status display to enable history collection (select this HM's node number, select `HIST COLLECT`, and select `ENABLE COLLECT`. Current state becomes `ENABLE`). Wait a few minutes, then call up trends or other history displays to make sure it is working properly.

7.7.2 Procedure for Saving and Restoring Continuous History, Continued

Procedure, continued

Table 7-18 Saving and Restoring Continuous History, (continued)

Step	Action
16	Recreate missing directories: Use the LSV NETcommand to determine which directories are on the HM. Compare them to the printout you obtained earlier. If any directories are not present, use the CD command to create them.
17	Restore Saved data to the HM: Use the Restore command to reload volumes saved with the Backup command.
18	After the Restore command is complete, (don't do a Synch command while the Restore is still running since it can cause disc errors) synchronize the HM disks if redundant drives: `SYNCH PN:nn` where nn is the HM physical node number

7.7.3 Restoring the HM Group Definition Files (APL) without the Continuous History Data

Description

This procedure saves and restores continuous history group definition files (APL) and other volumes in the HM but not the history data.

Other HM volumes with their directories and files also need to be saved. To save them, use either the Backup command or the Copy Volume command (see *Command Processor Operation*). These commands work with either HM personality (HM status = SEVERE or WARNING or OK). If HM is in SEVERE or WARNING, make sure that the disc drives are OK; otherwise, correct or replace them. You will restore these other volumes at the appropriate point in the following procedure.

After release 230, the Backup command automatically saves the HM history group definition files (APL).

CAUTION

CAUTION—You cannot restore the Continuous History Group Definitions (APL) if the Continuous History groups have been modified on this HM (that is, adding Units and/or Groups). EB files must be used to restore History Group Definitions.

Procedure

Follow this procedure:

Table 7-19 Restoring HM Group Configuration without History

Step	Action

1	Get a new disk, label it BACKUP NCF and create a volume in it with &ASY. Copy all the files in the &ASY from NET to this disk. Set this disk aside for later use.
	Examples:
	`CR $F1>&ASY -F -MF 3000 -BS 1700`
	`CP NET>&ASY>*.* $F1>&ASY>= -D`

2	Use the Backup Command (or similar) to save all HM information to disks (except history). Example: `BACKUP PN:10 $F1`

7.7.3 Restoring the HM Group Definition Files (APL) without the Continuous History Data, Continued

Procedure, continued

Table 7-19 Restoring HM Group Configuration, continued

Step	Action
3	After the Backup command is finished, and while the HM is running, load the HM with its initialization personality. On the History Module Status display, select the HM's node number, select LOAD/DUMP, select MANUAL LOAD and then INIT PROGRAM. Follow the prompters to initiate loading from the HM (if HMOFF files are in !9np, where np is for node pair). Or do a SHUTDOWN of the HM, wait for the QUALIF status and load the INIT Program from the &Z1 disk and the Data (NCF) from NET or the BACKUP NCF disk. When loading is complete, the HM status will be HMOFF OK.
4	Print out (DO $P#, where # is the printer number) the List Volumes command (LSV PN:nn, where nn is HM node number) to use the printout to create user directories later on.
5	Verify that all of the files in the HM history volume have been copied correctly on the removable media. Use the List File Attributes (LS) command with the -A option (LS $F1 -A) to see that the number of files in the HM volume and the number of files on the removable media are the same. Copy all of the files (with the $FCOPY command) on the removable media to other removable media to verify that they can be copied without errors. It is risky not to do this verification now—once the HM is initialized, it will be too late.
6	From the Engineering Main Menu select SUPPORT UTILITIES, then MODIFY VOLUME PATHS, then SET DEVICE PATH TO REM. MEDIA and put in &Z1 in $F1 (or lower drive number) and BACKUP NCF in $F2 (or higher drive number). Select MAIN MENU. Do not make changes to the VOLUME CONFIGURATION in the Continuous History Unit and Group page, but it is OK to make changes to other items in the VOLUME CONFIGURATION. (Refer to the *System Startup Guide* or the *Network Data Entry* for more information on editing and making NCF changes to the VOLUME CONFIGURATION.) **Note**: The following step destroys all data on the HM: Initialize the HM. (On the Engineering Main Menu, select VOLUME CONFIGURATION, select the node-pair target for this HM, hold CTL and press F6, and wait for the HM INITIALIZATION COMPLETE message.)

7.7.3 Restoring the HM Group Definition Files (APL) without the Continuous History Data, Continued

Procedure, continued

Table 7-19 Restoring HM Group Configuration, continued

Step	Action
7	Shut down, wait for QUALIF, and Manual Load the HM with the Operator (Online) Personality from the &Z1 and Backup NCF disks. HM should go to HMON OK. Allow it to run for 5 minutes (to initialize the history files) then shut it back down, wait for QUALIF, and load the initialization program from the &Z1 and Backup NCF disks. HM should go to HMOFF OK.

8	As a safety measure, save for possible future use:
	DO NOT overwrite the files in the HM Backup disks. Use a different disk.
	
	1. COPY the APL files from the HM to a temporary disk.
	
	EXAMPLE SYNTAX:
	`CP PN:nn>!0np>APL*.MM $Fd>!0np>= -D`
	where nn = HM node number
	np = node pair number
	d = destination drive number
	
	2. UNPROTECT the files.
	`UNPT PN:nn>!0np>APL*.MM`
	
	3. DELETE the default history group, point definition files.
	
	EXAMPLE SYNTAX:
	`DL PN:nn>!0np>APL*.MM –D`

9	**Note**: This is a mandatory step that prevents fragmentation. Once again, shut down, wait for QUALIF, and load the HM with its initialization personality from the &Z1 and Backup NCF disks, then continue with step 10. HM should go to HMOFF OK.

10	COPY the two APL*.MM files you saved in step 2 in the first disk of the HM Backup disk:
	`CP $Fs>!0np>APL*.MM PN:nn>!0np>= -D`
	where s = source drive number
	np = node pair number
	nn = HM node number
	or run this EC in &Z1:
	`EC $F1>&EC>RSHSDEF.EC`
	
	Be sure all of the history copy operations completed correctly without errors.

7.7.3 Restoring the HM Group Definition Files (APL) without the Continuous History Data, Continued

Procedure, continued

Table 7-19 Restoring HM Group Configuration, continued

Step	Action

11	COPY the BACKUP NCF and .SE & .SP files:
	1. Copy the &ASY directory from removable media to the HM (for System HM only):
	`CP $Fs>&ASY>*.* PN:nn>&ASY>= -D`
	where s is the source disk number and nn is the HM physical node number.
	2. Insert the &Z1 disk appropriate for your system in Drive s (source). Run this EC for all HMs:
	`EC $Fs>&EC>LOC_VOLZ.EC $Fs nn np`
	where nn is the HM physical node and np is the HM node pair number. Follow the screen instructions.
	
	Loading the `INIT` files is optional but recommended (if `HM INIT Personality?` has `YES` on the first page of the Volume Configuration menu). Wait for “EC Complete”.

12	Autoboot the HM. The system HM has to be online for these steps to work for non-system HMs: 1. Call up the System Status Display. 2. Select HISTORY MODULES. 3. Select SHUTDOWN; then press ENTER. Wait for QUALIF. 4. Turn node power OFF to the HM for at least 5 seconds. 5. Turn the power ON to the node. 6. HM status should go to HMON OK (may take up to 1 hour) Redundant HM drives may have a status = SEVERE until synchronized in Step 17. NOTE: Nodes can be loaded while the HM is in the READY state.
13	Verify that the system date and time are correct. If not, refer to the *Process Operations Manual* and correct them.

7.7.3 Restoring the HM Group Definition Files (APL) without the Continuous History Data, Continued

Procedure, continued

Table 7-19 Restoring HM Group Configuration, continued

Step	Action
14	Use the History Module Status display to enable history collection (select this HM's node number, select `HIST COLLECT`, and select `ENABLE COLLECT`. Current state becomes `ENABLE`). Wait a few minutes, then call up trends or other history displays to make sure it is working properly.
15	Recreate missing directories: Use the LSV NETcommand to determine which directories are on the HM. Compare them to the printout you obtained earlier. If any directories are not present, use the CD command to create them.
16	Restore Saved data to the HM: Use the Restore command to reload volumes saved with the Backup command.
17	After the Restore command is complete, (don't do a Synch command while the Restore is still running since it can cause disc errors) synchronize the HM disks if redundant drives: `SYNCH PN:nn` where nn is the HM physical node number.

7.8 HM Backup Tool Option Using the AM

Description

Included with the Release 510 software is a History Module backup tool with features that give you greater flexibility in performing HM backups:

- Easy-to-configure, easy-to-monitor graphical interface
- Automatic scheduling of HM backups
- Configure full or incremental backups
- Back up to 55 source HM volumes or directories
- Back up to 55 associated PINs (local or remote LCN IDs)
- AM CL program backs up files to removable media
- Ability to pause, resume, or abort backup
- Online help displays to assist the user

Requirements

The optionally installed HM backup tool runs with R430 and later software. It requires an Application Module (AM) in order to use.

Tool location

The tool is found on the &Z3 disk in the TLK2 directory.

Installation

Installation instructions are included as an electronic file (HMBACKUP.XI) in the tool software.

ATTENTION

This tool does not format the media. For more information, read the help file GHLP.XH.

Schematic

The main schematic for HM backups is $HMBKSTS.0

7.9 History Module Fragmentation

Description

It is possible to get messages that indicate an HM is full while it actually has adequate storage space, but is not using that space effectively because of file fragmentation. This occurs over time with high HM usage, where files that are transferred to disk are fragmented (broken into pieces) as the HM finds available space to store them.

Procedure

If this has happened, you can overcome it by copying files from the HM to removable media, deleting the files from the HM, and then copying them back to the HM. To do so, use the following steps.

For brevity, these instructions are generalized rather than detailed. Each Utility's commands mentioned is accompanied by a reference to the paragraph number in the *Command Processor Operation* manual where a detailed description of the command is provided (see *Command Processor Operation*).

Preparing your HM for defragmentation

Follow the steps in Table 7-20 to prepare to defragment your HM.

Table 7-20 Preparing to Overcoming History Module Fragmentation

Step	Action
1	If you don't already have a list of all volumes and directories on all HMs on your system, use the List Volumes command (LV NET, 5.16) to obtain such a list.
2	Identify volumes and directories from your list of volumes and directories that have had long and frequent usage. Then use the LS command (5.15) to obtain information about the total sectors for each such volume and the number of sectors in use.

Read the warning that follows, then defragment your HM using the procedure in Table 7-21.

WARNING

WARNING—After the first two steps in Table 7-21, the volume and perhaps the HM will be temporarily unavailable to the network.

You will have to find a way to get along without that volume or History Module—or make its files available from removable media. If you don't fully understand the consequences of this, defer any further steps in this procedure until you do or until you get proficient help.

Defragmenting your HM

Use the procedure in Table 7-21 to defragment your HM.

Table 7-21 Procedure for Overcoming HM Fragmentation

Step	Action
1	Copy (CPV, 5.4, or CP, 5.3) all of the files in this volume and all of its directories in the volume to a removable medium or to removable media.
2	To help ensure that you have a valid copy and to provide an extra backup copy, copy everything you copied in step 3a to another removable medium (or media).
3	If this volume is !0np, !1np, or !2np, use the History Modules Status display to twice SHUT DOWN the HM, and thus cause it to restart (autoboot) itself.
4	Unprotect (5.23) each protected file in this volume and all of its directories [protected files are noted by a * in the P column of the file listing (catalog)].
5	Delete (5.9) all files in this volume and all of its directories.
6	If this volume is !1np, !4np, or !9np, use the History Modules Status display to twice SHUT DOWN the HM, and thus cause it to restart (autoboot) itself.
7	Copy (CPV, 5.4, or CP, 5.3) all of the files in this volume and all of its directories back to the volume on the HM. If files in the volume were fragmented, the number of sectors used will now be less than before.

Section 8 — Alarm Management

8.0 Overview

Description

This section provides information about Alarm Management functionality.

8.1 Introduction

Functionality

Alarm features include Emergency, High, and Low priority alarming on the Area Alarm Summary display and the Unit Alarm Summary display; colors, symbols, and characters for alarm priorities; audible alarm suppression; alarm management by selective display, and display freezing.

Function Differences

The following table shows functions that have been added in Release 500:

Table 8-1 New Functionality Table

Function	R410	R500
ALARM FILTERING	-----	View alarms by selected priority
ALARM SORTING	Sort by chronology	Sort by chronology or priority
THREE COLOR ALARMS	2-Color	2- or 3-Color configuration with seven colors to choose from
PRIORITY INDICATORS	E, H, L	Box, triangle, and inverted triangle; E, H, and L
ALARM WINDOW	-----	Alarm window bordered by box
DISPLAY FREEZING	-----	Freeze target with configurable timer or ramp key temporary freeze
HORN SUPPRESSION	-----	Low or high priority alarms
HORN ANNUNCIATION	Steady	Steady or Momentary
SINGLE POINT ALARM DISABLE/INHIBIT	-----	Select and disable/inhibit single point from Alarm Summary Display
CONFIGURABLE ACCESS LEVELS (FILTER, SORT, FREEZE, HORN SUPPRESSION)	-----	Keylock configurable in NCF
UNIT TARGETS	-----	Larger
ALARM COUNT	Total alarms displayed	Alarm counts displayed for each priority
CONTACT CUTOUT	See Contact Cutout	See Contact Cutout

Display Differences

The following alarm displays are different in R500:

- Area Alarm Summary Display
- Unit Alarm Summary Display
- Alarm Annunciator Display

8.2 Release 500 Alarm Differences

Access level configuration	Access levels for alarm management functions are configured through the NCF. These features can be restricted to Engineer, Supervisor, or Operator keylock access levels.
Low priority alarms	The NCF can be configured to include low priority alarms on the Area Alarm Summary.
Alarm display filtered by priority	The user may select three different filtering options by selecting one of the filtering targets located on the Area Alarm Summary or Unit Alarm Summary displays. The filtering options enable display of alarms with priority EMERGENCY, HIGH, LOW, EMERGENCY, HIGH, and EMERGENCY. By using the filter the user has the option of seeing emergency only, emergency and high, or if the NCF is configured for low alarms on the Area Alarm Summary, all three alarm priority levels. The filter will only occur on the station where the filtering is selected. The filter will remain set even if another display is called up. All target actions are journaled and keylock access can be configured in the NCF.
Alarm sorting	Alarms may be sorted by alarm priority or by chronological order. The [SORT] target is located on both the Area Alarm Summary and the Unit Alarm Summary display. The current sort selection is displayed to the right of the “SORT:” text. When the sort option displays “CHRON” all alarms displayed are sorted in descending chronological order, with the newest alarm on the first page and the oldest on the last. If the sort option displays “PRIORITY”, all alarms are displayed by alarm priority and within each priority in reverse chronological order. The sort affects only the current station and remains in effect until the sort target is reselected. All target actions are journaled and the initial sort mode and keylock access can be configured in the NCF.
Alarm symbols	Alarm symbols or characters can be selected during the NCF configuration. If characters are selected for reporting the alarm priority levels, “E” will be used for emergency, “H” will be used for high, and “L” will be used for low-level alarms. If symbols are selected, a square will be used for emergency, a triangle will be used for high, and an inverted triangle will be used for low.

8.2 Release 500 Alarm Differences, Continued

Alarm colors

Alarm colors are configurable through the NCF. The configuration allows the user to select one color for each of the three alarm levels. The alarm colors are used throughout the system. Seven colors are available:

- RED
- YELLOW
- MAGENTA
- GREEN
- BLUE
- CYAN
- WHITE

Alarm count

Area alarm count is displayed on the Area Alarm Summary, the Unit Alarm Summary and the Alarm Annunciator display for each alarm priority. The Unit Alarm Summary also displays a separate alarm count for unit alarms.

Alarm window

The alarm window is located at the top of the first page of the Area and Unit Alarm Summary display screens. It contains a listing of the five most recent alarms in reverse chronological order. When the window is full (five alarms) and a new alarm appears in the alarm window, all five alarms in the window are sorted into the alarm listing.

Freeze alarm screen

The freeze function prevents new alarms from scrolling down into the alarm display once the alarm window is full, but does not prevent the alarm database from being updated. The page-forward and page-back keys allow the user to display all of the alarm pages while in the freeze mode. New alarms continue to be displayed in and cleared from the alarm window, and point values in the alarm lines continue to be updated. Normal deletions from the alarm display continue during the freeze, leaving spaces in the list. When the display is unfrozen, alarms that have occurred since the freeze began are inserted into the alarm lines and the list is resorted.

Freeze alarm screen, two methods

There are two methods of freezing the alarm screen:

- Select any of the four ramp keys on the Operator keyboard to initiate a momentary freeze. When any one of the four ramp keys is selected and held, the display freezes and the FREEZE DISPLAY text is highlighted in red indicating that a freeze is in progress. When the key is released the display resumes normal updating.
- Select the FREEZE DISPLAY target. The alarm display freezes in the same manner as when the ramp keys are used, but the alarm display remains frozen until the FREEZE DISPLAY target is selected a second time or until a timeout occurs. The timeout is configurable in the NCF. A timeout of zero seconds disables the freeze function so the freeze target will not appear on the summary display.

Freeze alarm rules

The FREEZE DISPLAY feature is reset if another display is called up and removes the alarm display. The freeze only occurs on the station where the FREEZE DISPLAY target or ramp keys are selected. All freeze/scroll target actions are journaled. Keylock access can be configured in the NCF.

Horn suppression

This can be accomplished by selecting a target on the Area Alarm Summary, Unit Alarm Summary, or the Alarm Annunciator display. To suppress horns based on alarm priority, the user selects the [AUDIBLE] target then selects one of the suppression options. All target actions are journaled and keylock access can be configured in the NCF. Horn suppression operates on a timeout which can be configured to zero seconds, in which case the target does not appear on the display.

8.2 Release 500 Alarm Differences, Continued

Horn annunciation

The user has the option of selecting “MOMENTARY” or “STEADY” state for each of the three contact output states. Each contact output state can be assigned to one or more of the following event types:

- Console Status Event
- System Status Event
- Operator Acknowledged Event
- Operator Confirm Event
- Low Priority Alarm
- High Priority Alarm
- Emergency Priority Alarm

Single point alarm disable/inhibit

A single point selected from the Area Alarm Summary or the Unit Alarm Summary can be disabled or inhibited by selecting the [ALARM DISABLE/INHIBIT] target. Disabled alarms are detected and stored in the HM journal but otherwise suppressed. They are not reported to the alarm summary displays. Inhibited alarms are not detected or distributed to the US or the HM. All target actions are journaled and keylock access can be configured in the NCF.

8.2.1 Release 520 Alarm Enhancements

Introduction

The R520 alarm enhancements allow the site engineer to configure batch alarming, using the existing TPS continuous process alarm system, and add flexibility to overall alarming functions. These functions, plus other general alarm enhancements, are monitored by an operator who can modify the functions, with the proper site security access level.

Product description

The R520 alarm functions used for batch alarming include:

- **AM multiple PRIMMOD (MPROD) alarms**—this option allows a single alarm on an AM point to be reflected in four Multiple PRIMMOD alarm groups or the standard PRIMMOD parameter group to be used for alarm displays and event history.
- **Auxiliary Unit (AUXUNIT)**—allows all process alarms on a point to be dynamically redirected from the point primary unit to an alternate unit for alarm displays.
- **Button PRIMMOD or MPROD assignment**—allows runtime assignment of a new PRIMMOD/Multiple PRIMMOD name to any of the 40 configurable LED buttons (allowing button assignments to be changed on the fly).
- **Button LED control**—allows the red and yellow LEDs on each of the 40 configurable LED buttons to be set to three possible modes (ON,OFF, or BLINK) using a CL program.
- **Area Database change actor**—a new actor that allows Area Database changes to be done from custom schematics and configurable buttons (allows operators to move easily from one area to another).
- **Silence horns on console**—an NCF configurable option that causes the silence button to silence all horns on the same console (across all areas if more than one area is on a console).
- **RTJ color alarms**—an NCF configurable option that allows all process alarms (SOE, process and sequence alarms) and return to normal events to be printed in color on the Real-Time Journal.
- **Keylevel Change Journal Suppression function**—allows the user to suppress the journaling of keylevel change events by actors.
- **PRIMMOD Status and Count actors**—are available for reading the composite alarm status and alarm count of a specified PRIMMOD or Multiple PRIMMOD. These are actor equivalents of the $PRIMSTS and $PRIMCNT collectors.

8.3 Contact Cutout Basics

Overview

This section will review the basic concept of contact cutout, including how this function is configured in the HG, AM, and NIM environments. It will then cover the detailed functionality with emphasis on what is new or changed for R500.

Review of contact cutout

Contact cutout is a state in an alarmable point in which alarms are "cut out" (not distributed). One use for this function might be in a hierarchical alarm situation where a failure (with resulting alarm) in one (primary) point causes failures in related (secondary) points. The alarm from the primary point might be of major importance, whereas the related alarms in the secondary points are of lesser importance, and might, in fact, constitute a nuisance for this particular scenario. In the HG, the contact cutout feature allows you to configure a primary point which, if in alarm, will cause alarms to be "cut out" in one or more points configured as secondary (to that primary). In the AM and NIM, contact cutout is implemented slightly differently, as we shall cover, but the same effect can be achieved.

Configuring contact cutout in the HG

In the HG, a contact cutout chain is configured using the parameter CCRANK, which has three possible states:

- NEITHER - This point is not part of a contact cutout chain
- PRIMARY - This point is a primary in a contact cutout chain
- SECONDARY - This point is a secondary in a contact cutout chain

To set up a chain, configure a point as a primary. Then configure one or more points as secondary points. When you configure an HG point as a secondary in the PED, a data entry box appears (for parameter CCPRIPNT) in which you must enter the tag name of the primary point. A primary point may have multiple secondary points.

Contact cutout in NIM and AM points

AM and NIM points cannot be directly configured as primary or secondary as is the case in the HG. AM and NIM points that are alarmable have a CONTCUT (Contact Cutout) parameter that is a logical (Boolean) type parameter with value of On or Off. This parameter is used to turn the contact cutout state on or off from CL.

In the AM, the CONTCUT parameter can be used with any point except numeric, which is not alarmable and does not have the parameter. Also, AM regulatory, counter, and timer points have another mechanism to implement contact cutout—the CCINPT and CCSRC parameters. This is covered in the next heading.

Another way to do contact cutout

AM regulatory, counter, and timer points have another way to implement contact cutout. A hierarchical structure can be configured directly using the parameters CCINPT and CCSRC. CCINPT (Contact Cutout Input required) is a Yes/No enumeration, which, if set to Yes, causes a data entry box to appear in the PED requiring entry of the point.parameter CCSRC (Contact Cutout Source). The source point.parameter entered here must be of type Boolean (On/Off). As an example, the Point-in-Alarm parameter (PTINAL) of a point (primary) could be entered as the Contact Cutout Source (CCSRC) in one or more other points (secondaries), thus achieving a primary/secondary chain analogous to the HG implementation.

Basic changes introduced in R500

In R500, alarm events that occur in a point that is in the cutout state are ignored. This behavior is the same as inhibited alarms. Alarm events include both going into the alarm state, and going out of the alarm state (return-to-normal). Prior to R500, cutout alarms behaved the same as disabled alarms. Table 8-2 lists the basic differences.

Table 8-2 Contact Cutout Changes in R500

Point State	Prior to R500	In R500
A point is in the contact cutout state	Alarms were not distributed to the US but were journaled in the HM. Return-to-normal events were distributed to the US and HM (this differs from disabled alarms—return-to-normal events are not distributed for points that have alarms disabled).	Alarms are not distributed to the US or HM. Return-to-normal events are not distributed to the US or HM.
A point goes out of the contact cutout state	Existing alarms are not distributed until the point returns to normal and goes into alarm again.	Alarms that exist are distributed again.

8.4 Contact Cutout - R500

New NCF option

A new contact cutout option is added to the NCF in R500. This option allows the user to select how existing unacknowledged alarms are handled when a point goes into the contact cutout state. To access this option:

- Go to the Engineering Main Menu
- Select [SYSTEM WIDE VALUES]
- Select [CONSOLE DATA]

Figure 8-1 shows the option that is available. There are two choices:

- CLEAR IMMEDIATELY—Clears all of the point's unacknowledged alarms from the Alarm Summary.
- CLEAR WHEN ACK'D—Leaves the point's unacknowledged alarms on the Alarm Summary, but backlights the time stamp. Clears the alarms when they are acknowledged by the operator. This is the default condition.

Note: If you make any changes to the NCF from the Console Data menus, you must reload all US nodes.

Contact Cutout NCF Change

CONTACT CUTOUT ALARMS ON ALARM SUMM

When contact cutout is applied

In R500, when a point goes into the contact cutout state, the following actions take place:

- All of the point's acknowledged alarms are cleared from the Alarm Summary Display.
- Depending on the contact cutout NCF option described above:
  - All of the point's unacknowledged alarms are cleared, or
  - The time stamps on all of the point's unacknowledged alarms are backlighted, and the alarms are cleared when they are acknowledged by the operator.
- The event is printed on the Real Time Journal (RTJ).

When contact cutout is removed and the point is in alarm

In R500, when a point goes out of the contact cutout state and the point has an alarm condition existing, the node will redistribute the alarm with the following results:

- If the alarm is on the Alarm Summary display, the backlighting is removed from the time stamp of the alarm, and the time stamp is changed to the time that contact cutout was removed. If the alarm is not displayed on the Alarm Summary, a new alarm message is displayed.
- The event is printed on the Real Time Journal (RTJ).

When an alarm returns to normal while in the cutout state, and contact cutout is removed

In R500, when a point returns to normal from an alarm while in the cutout state, and then goes out of the contact cutout state, the following actions take place:

- Backlighting is removed from the time stamps of the point's unacknowledged alarms on the Alarm Summary, and the priority indicator is backlit indicating that the point returned to normal. The alarms will be cleared when acknowledged by the operator. (The priority indicator is a single character (E, H, or L), or optionally a symbol, that indicates whether the alarm was Emergency, High, or Low. It is located in the column just to the right of the time stamp.)
- The event is printed on the Real Time Journal (RTJ).

8.5 Contact Cutout - Display Changes

Contact cutout scenarios	Refer to Tables 8-3 and 8-4 for contact cutout display information.
Primary alarm first	When the primary point goes into alarm and then the secondary point goes into alarm, the secondary point is cut out and does not appear on the display.
Secondary alarm first	If the primary point goes into alarm while the secondary point is in alarm, the unacknowledged secondary point goes from a normal alarm condition into contact cutout. In this case, instead of disappearing from the screen, the secondary point remains on the screen with a backlit time stamp. Primary point return-to-normal status removes contact cutout and the secondary point is re-alarmed.
Secondary re-alarming	When the secondary point is cut out, then the primary point returns to normal, the secondary point goes out of contact cutout. If the secondary point has been acknowledged before the primary point returns to normal, when the primary point returns to normal the data owner re-alarms the secondary point and it appears in the alarm window with a current time stamp and a flashing priority indicator. It then behaves like a normal point in alarm and is not cut out unless the primary goes back into alarm. If the secondary point has not been acknowledged before the primary point returns to normal, it displays on the screen with a backlit timestamp. After the primary point returns to normal, the old secondary alarm line with the backlit timestamp is deleted. The secondary point is then re-alarmed and appears in the alarm window with a current time stamp and a flashing priority indicator.
RTJ messages	Cutout status is distributed to the RTJ as “CUTOUT TRUE” only when the primary point goes into alarm after the secondary point has gone into alarm. In that scenario, when the primary point returns to normal after the secondary point has returned to normal, the RTJ receives the message “CUTOUT FALSE.”

8.5 Contact Cutout - Display Changes, Continued

CLEAR IMMEDIATELY

When CONTACT CUTOUT ALARMS is configured in the NCF to [CLEAR IMMEDIATELY], secondary alarms are automatically acknowledged. When this configuration is in effect, the display changes according to the ACK'D selections in the following table:

Table 8-3 Contact Cutout Scenario Overview

SCENARIO	PRIMARY POINT	SECONDARY POINT
A	(1) ALARM 1ST	(2) ALARM 2ND
	(3) RETURN TO NORMAL 1ST	(4) RETURN TO NORMAL 2ND
B	(1) ALARM 1ST	(2) ALARM 2ND
	(4) RETURN TO NORMAL 2ND	(3) RETURN TO NORMAL 1ST
C	(2) ALARM 2ND	(1) ALARM 1ST
	(3) RETURN TO NORMAL 1ST	(4) RETURN TO NORMAL 2ND
D	(2) ALARM 2ND	(1) ALARM 1ST
	(4) RETURN TO NORMAL 2ND	(3) RETURN TO NORMAL 1ST

8.5 Contact Cutout - Display Changes, Continued

Table 8-4 Contact Cutout Alarm Summary Display Changes

SCENARIO	ALARM STATE	EVENT ORDER/ POINT	ALARM ACK STATE*	DISPLAY CHANGES
A	ALARM	(1) PRIMARY 1ST	UNACK'D	PRIMARY: Point appears on the display. SECONDARY: N/A
			ACK'D	PRIMARY: Priority indicator stops flashing. SECONDARY: N/A
		(2) SECONDARY 2ND	- - - -	PRIMARY: No change SECONDARY: Point is cutout and does not appear.
	RETURN TO NORMAL	(3) PRIMARY 1ST	UNACK'D	PRIMARY: Priority indicator is backlit. SECONDARY: Point is alarmed and appears with current time stamp; priority indicator flashes.
			ACK'D	PRIMARY: Point is cleared. SECONDARY: Point is alarmed and appears with current time stamp; priority indicator flashes.
		(4)SECOND-ARY 2ND	UNACK'D	PRIMARY: No change SECONDARY: Priority indicator is backlit.
			ACK'D	PRIMARY: Point was cleared. SECONDARY: Point is cleared.
B	ALARM: (1) and (2) Same as Scenario A			
	RETURN TO NORMAL	(3) SECONDARY 1ST	UNACK'D	PRIMARY: No change. SECONDARY: No change. (Point is still cut out.)
			ACK'D	PRIMARY: N/A SECONDARY: Point never appears.
		(4) PRIMARY 2ND**	UNACK'D	PRIMARY: Priority indicator is backlit. SECONDARY: N/A
			ACK'D	PRIMARY: Point is cleared. SECONDARY: N/A

Table 8-4, Continued

SCENARIO	ALARM STATE	EVENT ORDER/ POINT	ALARM ACK STATE*	DISPLAY CHANGES
C	ALARM	(1) SECONDARY 1ST		PRIMARY: N/A SECONDARY: Point appears on the display.
		(2) PRIMARY 2ND***	UNACK'D	PRIMARY: Point appears on display. SECONDARY: Point is cutout and remains on screen with backlit timestamp. Message "CUTOUT TRUE" is distributed to the RTJ.
			ACK'D	PRIMARY: Point appears on display. SECONDARY: Secondary point is cleared.
	RETURN TO NORMAL	(3) PRIMARY 1ST	UNACK'D	PRIMARY: Priority indicator is backlit. SECONDARY: Secondary point goes out of contact cutout and is cleared from display. Point is re-alarmed and appears in alarm window with a new time stamp.
			ACK'D	PRIMARY: Point is cleared. SECONDARY: Secondary point goes out of contact cutout. Point is re-alarmed and appears in alarm window with current time stamp and flashing priority indicator. Acknowledged secondary point is still in alarm.
		(4) SECONDARY 2ND	UNACK'D	PRIMARY: N/A SECONDARY: Priority indicator is backlit.
			ACK'D	PRIMARY: N/A SECONDARY: Point is cleared.

* at the time of alarm state change
** message "CUTOUT FALSE" is distributed to RTJ
*** message "CUTOUT TRUE" is distributed to RTJ

Table 8-4, Continued

SCENARIO	ALARM STATE	EVENT ORDER/ POINT	ALARM ACK STATE*	DISPLAY CHANGES
D	ALARM: Same as Scenario C			
	RETURN TO NORMAL	(3) SECONDARY 1ST	UNACK'D	PRIMARY: No change. SECONDARY: No change. (Point is still cut out.)
			ACK'D	PRIMARY: No change. SECONDARY: N/A
		(4) PRIMARY 2ND**	UNACK'D	PRIMARY: Priority indicator is backlit. SECONDARY: Backlighting on timestamp is removed; priority indicator is backlit.
			ACK'D	PRIMARY: Point is cleared. SECONDARY: N/A
* at the time of alarm state change ** message "CUTOUT FALSE" is distributed to RTJ *** message "CUTOUT TRUE" is distributed to RTJ				

8.6 Contact Cutout - Functions for the HG, NIM, and AM

Overview

This section contains tables showing the contact cutout functionality for the HG, NIM, and AM in R500. These tables use the term “distribute” in connection with alarm and return-to-normal events. When an alarm or return-to-normal event is distributed, the destination is determined by alarm priority. Choices include US Alarm Summary displays, Real - Time Journal, and History Module journal.

With R681, the Selective Cutout feature allows the alarms of a point to pass through, though the secondary point is in the cutout state. The AM regulatory, counter, and flag points can be configured with the new parameters to enable selective cutout. In the HG, analog input, regulatory, digital input, analog composite, and digital composite points can be configured similarly. In the NIM, flag, numeric, regulatory control, regulatory PV, digital input, analog input, digital composite, and device control points can be configured with the new parameters. The alarm parameters are named $DHSELCT, $DISELCT, $HISELCT, $HHSELCT and so on. Selective Cutout operates in conjunction with the contact cutout feature.

When the parameter is set to ALLOW, the respective alarm passes through, even though the point is in the cutout state. When the parameter is set to CUTOUT, the particular alarm is blocked if the point is in the cutout state.

Backlighting

For contact cutout, backlighting of fields on the Unit and Area Alarm Summary displays is used for two purposes:

- The priority indicator is backlighted to indicate a return-to-normal event.
- The time stamp field is backlighted to indicate that the alarm will be cleared from the alarm summary when it is acknowledged because the point is no longer in an alarmable state. A backlit timestamp can result from alarm disable or inhibit, point inactive, or contact cutout.

8.6 Contact Cutout - Functions for the HG, NIM, and AM, Continued

Canceling a secondary point's alarm

The tables that follow use the phrase "cancel the secondary point's alarm." This involves the following steps:

- Clear acknowledged alarms
- Depending on the new NCF option CONTACT CUTOUT ALARMS ON ALARM SUMM:
  - Clear unacknowledged alarms, or
  - Backlight time stamp
- Send to RTJ

With R681, you can enable Selective Cutout in HG only if the parameter, CCRANK, is secondary. In AM and NIM, the new parameters are always available.

The following table shows the record on the Alarm Summary when an alarm is configured on a secondary point and cutout enabled later.

NCF option	R681 Functionality (Selective Cutout)	
	ALLOW	**CUTOUT**
Clear Immediately	The alarm on a secondary point for which the selective cutout parameter is set to ALLOW, is not removed from the alarm summary even if acknowledged. When the alarm returns to normal, it is removed from the alarm summary.	The alarm on a secondary point for which the selective cutout parameter is set to CUTOUT, is removed from the alarm summary.
Clear When Acknowledged	The timestamp of an alarm on a secondary point is not backlit. It is not removed from the alarm summary even if it is acknowledged. When the alarm returns to normal, it is removed from the alarm summary on acknowledgement.	The timestamp of an alarm on a secondary point is backlit if it is not acknowledged. Acknowledged alarms are removed from alarm summary.

8.6 Contact Cutout - Functions for the HG, NIM, and AM, Continued

The following section describes certain conditions and the corresponding behavior of alarms (in HG, AM, and NIM) when selective cutout is set to Allow/Cutout.

If	Then
• A cutout secondary point is already in alarm AND • Selective cutout is set to Allow AND • Primary point reports an alarm.	• The alarms remain. • on the screen irrespective of whether they have been acknowledged or not. • on the alarm summary without having their time stamps backlit. • New alarms are also reported to the alarm summary page and RTJ. The alarms behave like any other alarm.
• A cutout secondary point is already in alarm AND • Selective cutout is set to Allow.	• The alarms remain. • on the screen irrespective of whether they have been acknowledged or not. • on the alarm summary without having their time stamps backlit. • New alarms are also reported to the alarm summary page and RTJ. The alarms behave like any other alarm.

A secondary point is in cutout and the alarm value of $xxSELCT parameter is changed.	
Initially $HISELCT and $HHSELCT is allowed and later on at 17:45:00 $RPSELCT is allowed.	Initially only the PVHI and PVHH alarms are reported at 17:30:00. When $RPSELCT is allowed, PVROCP is also reported on the alarm summary and the RTJ. The time stamp of this alarm is 17:45:00.
Initially $HISELCT, $HHSELCT and $RPSELCT is allowed. Later $RPSELCT is cutout.	Initially PVHI, PVHH and PVROCP alarms are reported. When $RPSELCT is cutout, the PVROCP alarm behaves according to the NCF option selected. Option 1: CLEAR WHEN ACKD If this option is selected, the PVROCP alarm, if unacknowledged remains on the alarm summary with its time stamp backlit. The alarm is removed from the summary when it is acknowledged. Option 2: CLEAR IMMEDIATELY If this option is selected, the PVROCP alarm is removed from the alarm summary irrespective of whether it is acknowledged or not.

8.6 Contact Cutout - Functions for the HG, NIM, and AM, Continued

A point is in alarm and cutout. Selective cutout is allowed for a particular alarm type and the point is reconstituted.	
Secondary point is in cutout and alarms on PVHI and PVHH at 17:30:00. PVHI is also selectively cutout. The secondary point is changed to inactive and PVHH is also selectively cutout and reconstituted. The point is later made active at 17:45:00.	PVHI alarm is cut out and is present on the alarm summary with the time stamp 17:30:00. PVHH is cutout and is not shown on the alarm summary. When the secondary point is made inactive, PVHI alarm disappears from the summary if already acknowledged. At 17:45:00, when the point is active, PVHI and PVHH alarms of the secondary point appear on the alarm summary with the time stamp 17:45:00.
Secondary point is in cutout and alarms on PVHI and PVHH at 17:30:00. PVHI is also selectively cutout. The node is shutdown and later restarted at 17:45:00.	PVHI alarm is selectively cutout and is present on the alarm summary with the timestamp 17:30:00. PVHH is cutout and does not appear on the alarm summary. When the node is shutdown, the secondary point is backlit. When restarted at 17:45:00, PVHI and PVHH alarms of the secondary point appear on the summary with the revised time stamp.
Alarm Delay (applicable to HG only) A primary point is configured with an alarm on delay of 15 seconds and the secondary point is configured with an alarm on delay of 22 seconds. The secondary point goes into alarm on PVHI and the primary point is already in alarm. The selective cutout for the PVHI alarm of the secondary point is set to Allow.	The alarm of the primary point is reported after a lapse of 15 seconds. Therefore, the secondary point is cutout immediately. However, the PVHI alarm of the secondary point is reported after the delay of 22 seconds.
A secondary point in AM has the primary point in HG. The primary point goes to alarm on PVHI. At this point, the HG is shutdown. The secondary point's PVHI is set to allow. The PVHI alarms are annunciated for the secondary point. The alarm returns to normal. The PVHI alarms are annunciated again for the secondary point.	The secondary point is cutout when PVHI alarms are annunciated for the primary point. The PVHI alarm of the secondary point is passed through as the selective cutout is set to allow. The PVHI alarm of the secondary point is not reported as the point is cutout. The RTN is also reported. Note: Even though the HG is shut down, the secondary point remains in cutout.

8.6 Contact Cutout - Functions for the HG, NIM, and AM, Continued

HG functionality

Table 8-5 HG Contact Cutout Functionality

If the primary point...	And the secondary is...	Then the HG will... (In R500)
Goes into alarm from a non-alarm state	Not in alarm	Distribute the primary point's alarm.
Goes into alarm from a non-alarm state	Already in alarm	Distribute the primary point's alarm, then instruct the US to cancel the secondary point's alarm.
Returns to normal from an alarm state	Not in alarm, and did *not* return to normal while it was in cutout	Distribute a return-to-normal event for the primary point.
Returns to normal from an alarm state	Not in alarm, and *did* return to normal while it was in cutout	Distribute a return-to-normal event for the primary point, and instruct the US to remove the backlighting from the time stamps of the secondary point's unacknowledged alarms on the Alarm Summary, and backlight the point's priority indicator.
Returns to normal from an alarm state	Still in alarm	Distribute a return-to-normal event for the primary point, and then distribute the secondary point's alarm.

8.6 Contact Cutout - Functions for the HG, NIM, and AM, Continued

NIM Functionality

Table 8-6 NIM Contact Cutout Functionality

If the secondary point...	And the cutout condition...	Then the NIM will... (In R500)
Has gone into alarm	Is false	Distribute the secondary point's alarm.
Has gone into alarm	Is true	Do nothing.
Is still in alarm	Has changed from true to false	Distribute the secondary point's alarms*.
Is still in alarm	Has changed from false to true	Instruct the US to cancel the secondary point's alarms.
Has returned to normal	Has remained false	Distribute a return-to-normal event for the secondary point*.
Has returned to normal	Has remained true	Do nothing.
Has returned to normal	Has changed from false to true	Distribute a return-to-normal event for the secondary point*.
Has returned to normal while the point was cutout	Has changed from true to false	Instruct the US to remove the backlighting from the time stamps of the secondary point's unacknowledged alarms on the Alarm Summary, backlight the point's priority indicator, and send to RTJ.
* Note: Digital Input points that are configured for Change of State (COS) reporting generate an alarm each time the point changes state, never generate return-to-normal events, and do not regenerate alarms when contact cutout is removed.		

8.6 Contact Cutout - Functions for the HG, NIM, and AM, Continued

AM functionality

Table 8-7 AM Contact Cutout Functionality

If the secondary point...	And the cutout condition...	Then the AM will...(In R500)
Has gone into alarm	Is false	Distribute the secondary point's alarm.
Has gone into alarm	Is true	Do nothing.
Is still in alarm	Has changed from true to false	Distribute the secondary point's alarm.
Is still in alarm	Has changed from false to true	Instruct the US to cancel the secondary point's alarm.
Has returned to normal	Has remained false	Distribute a return-to-normal event for the secondary point.
Has returned to normal	Has remained true	Do nothing.
Has returned to normal	Has changed from false to true	Distribute a return-to-normal event for the secondary point.
Has returned to normal while the point was cutout	Has changed from true to false	Instruct the US to remove the backlighting from the time stamps of the secondary point's unacknowledged alarms on the Alarm Summary, backlight the point's priority indicator, and send to RTJ.

8.7 Alarm Priorities and Alarm Actions

Alarm priorities

The following table describes the functionality for the different alarm priority choices:

Table 8-8 Alarm Priority Choices

Priority Value	Action
NOACTION	Alarm is not displayed, printed, or journaled.
JOURNAL	Alarm is recorded in the Process Alarm Journal. It is not displayed or printed.
LOW	Alarm is recorded in the Process Alarm Journal, printed on the Real Time Journal (RTJ), and displayed on the Alarm Summary display.
HIGH	Alarm is recorded in the Process Alarm Journal, printed on the RTJ, and displayed on the Alarm Summary displays.
EMERGENCY	Alarm is recorded in the Process Alarm Journal, printed on the RTJ, and displayed on the Alarm Summary displays.
PRINTER (New for R500)	Alarm is printed on the RTJ. It is not displayed or journaled.
JNLPRINT (New for R500)	Alarm is recorded in the Process Alarm Journal and printed on the RTJ. It is not displayed.

Alarm actions

The following tables show alarm actions for different alarm priorities and the alarm enable states:

Alarm priority

All of these actions are based on an Alarm Enable State (ALENBST) of ENABLE.

Table 8-9 Alarm Priority XXXXPR (E:ALPRIOR)

	Backlit Trip Point Parameter in Det	Alarm Indicator in Overview	Alarm Indicator in Grp/Det	Alarm at RTJ printer
NO ACTION	Yes			
JOURNAL	Yes	Yes	Yes	No
PRINTER	Yes	Yes	Yes	Yes
JNLPRINT	Yes	Yes	Yes	Yes
LOW	Yes	Yes	Yes	Yes
HIGH	Yes	Yes	Yes	Yes
EMERGENCY	Yes	Yes	Yes	Yes

Alarm priority, more actions

Table 8-9 Alarm Priority XXXXPR (E:ALPRIOR), more actions

	Recorded in Event History	Displayed in Unit Alarm Summary	Displayed in Area Alarm Summary	Displayed in Alarm Annunciator Display
NO ACTION				
JOURNAL	Yes			
PRINTER				
JNLPRINT	Yes			
LOW	Yes	Yes	*	
HIGH	Yes	Yes	Yes	
EMERGENCY	Yes	Yes	Yes	Yes
* Default is no. The system can be configured to display LOW priority alarms in the Area Alarm Summary. This is done in the NCF, System Wide Values/Console Data.				

Alarm enable states

The alarm enable states for each alarm action is listed in the following two tables:

Table 8-10 Alarm Enable State ALENBST (E:ALENBST)

	Backlit Trip Point Parameter in Det	Alarm Indicator in Overview	Alarm Indicator in Grp/Det	Alarm at RTJ printer
INHIBIT	No	No	No	No
DISABLE	Yes	Yes	Yes	No
ENABLE	Yes	Yes	Yes	Yes

Table 8-10 Alarm Enable State ALENBST (E:ALENBST), more actions

	Recorded in Event History	Displayed in Unit Alarm Summary	Displayed in Area Alarm Summary	Displayed in Alarm Annunciator Display
INHIBIT	No	No	No	No
DISABLE	Yes (see NOTE)	No	No	No
ENABLE	**	**	**	**

** This action depends on the individual Alarm Priority (E:ALPRIOR)
NOTE: With R680, the Process Alarm Journal can optionally display the ALENBST for Disabled alarms. The journal will indicate the letter 'D' in the 127th column, between PRIMMOD and Event ID/Type entries (for an example, see the *Process Operations Manual*). The journal includes the 'D' indication for the RTN/ALM events of process alarms (event type 21) and HG generated SOE events only (event type 27). Both the Event History Retrieval display and the System Documentation tool include the 'D' indication in the retrieved journals.

By default the Process Alarm Journal does not denote disabled alarms. To select this option, you must make a change in the NCF – change the value of the following item in the System wide values -> Console data: ALENBST INDICATION IN JOURNAL FOR DISABLED ALARMS. For more information See *Network Form Instructions.*

Change of Alarm priority while in alarm

If an operator or a user application changes the alarm priority of a point when the point is in alarm, the data-owning node will rebroadcast the alarm.

The HM Alarm Journal records the alarm rebroadcast. When the HM Alarm Journal is retrieved, it displays the alarm events as though the point went into alarm multiple times with no return-to-normal condition in between alarms.

The US/GUS filters the alarms that are rebroadcast. If the alarm condition is already known to the US/GUS, the Real Time Journal is not printed again.

8.8 PRIMMOD Alarm Groups

Purpose

The following subsections describe PRIMMOD alarm groups, multiple PRIMMOD (MPROD), and Auxiliary Unit (AUXUNIT) functions that can be used to enhance and add flexibility to your alarm management configuration.

- The PRIMMOD function, described below, is available in R500.
- The multiple PRIMMOD, described later in this section, is available in R520.

PRIMMOD point

A PRIMMOD (primary module) point is a single point to which other points are linked. The PRIMMOD point provides a mechanism for grouping related points to create alarm groups to support more flexible and customized alarm annunciation. In batch operations, PRIMMOD parameters can be used to identify a set of points as belonging to a batch equipment unit or batch ID, or to identify the PRIMOD point responsible for manipulating the group of points.

PRIMMOD alarm groups

A PRIMMOD alarm group is simply any number of points linked to a single PRIMMOD point.

All points with matching PRIMMOD parameters are considered to be in the same group.

Benefits of PRIMMOD groups

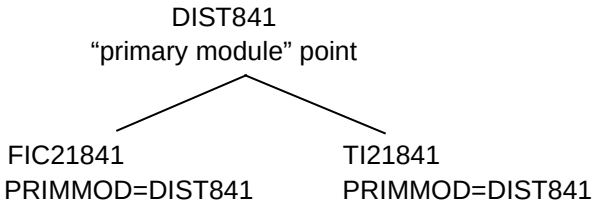
The benefits of PRIMMOD groups include:

- When a process alarm, operator change, or operator message is journaled, the PRIMMOD parameter goes to the journal along with the point name and descriptor; consequently, all events are “tagged” with the PRIMMOD name. To make use of this feature, you can retrieve journal events for a PRIMMOD group by using the Event History Retrieval display or the Documentation Tool.
- The US alarm manager maintains the composite alarm status (the highest alarm condition) for a PRIMMOD group. The status can be displayed to the operator by assigning the PRIMMOD group to an annunciator box on the Area Annunciator display, or assigning it to a button with LEDs.
- You can create customized schematics that reflect the alarm status of a PRIMMOD group. You can simply display the alarm status, or you can use Variants and Conditions to change the display appearance based on the alarm status.

8.8.1 Configure a PRIMMOD Point

Point configuration

To implement PRIMMOD groups, first you build or choose a point to be the "primary module" point. The primary module point can be a "low cost" point, such as a Numeric or Flag.

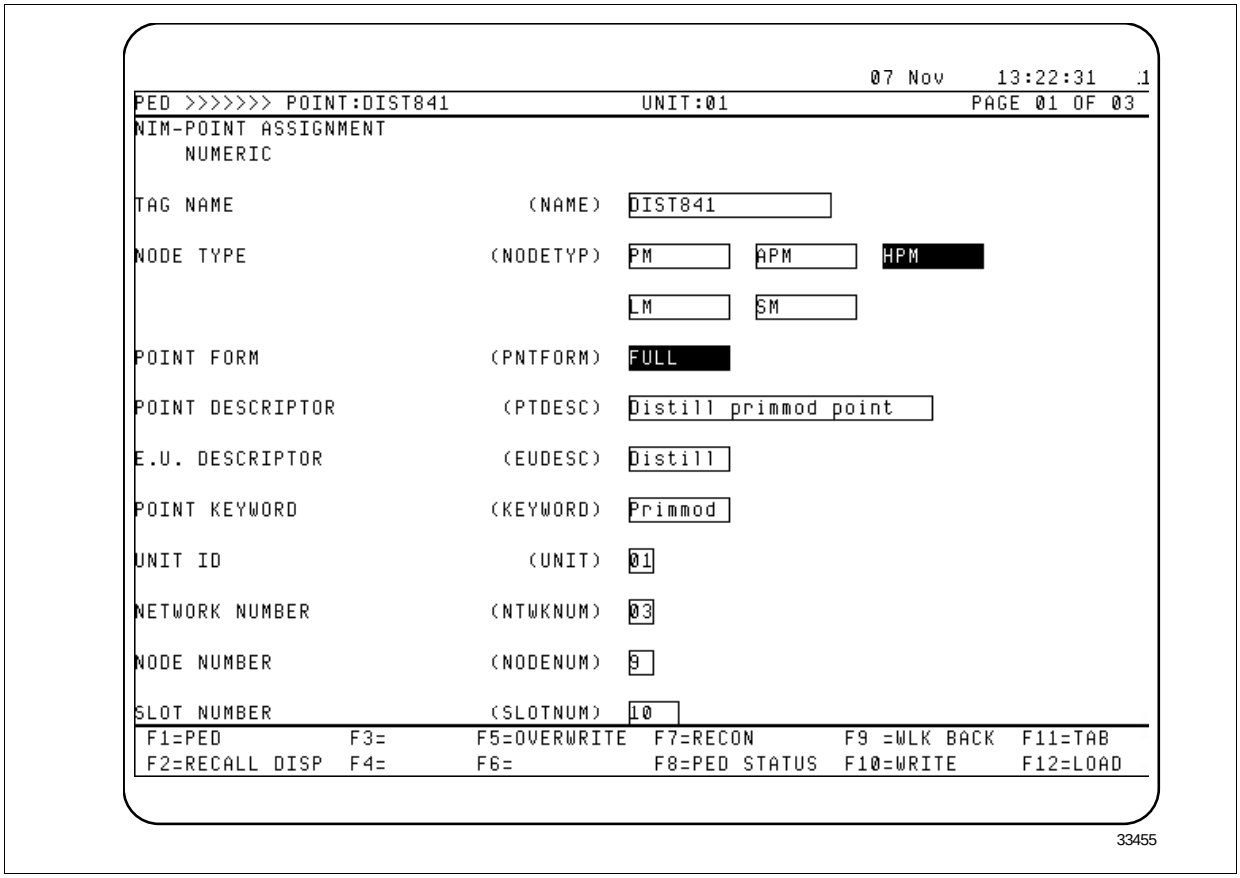


All LCN points have a PRIMMOD parameter except UCN component points and Computer Gateway (CG) points. In R500, PRIMMOD was added to all FULL form UCN points.

Example

Figure 8-1 shows a Numeric point type configured as the primary module point, because it is only to be used for alarm grouping. You can use a Basic Controller RV point or some other "low cost" point.

Figure 8-1 Primary Module Point Example



8.8.2 Link Points in the Alarm Group to the PRIMMOD

Identify points in the alarm group

When the PRIMMOD point has been created or identified, then identify the points that you will link to the PRIMMOD point.

Link points to alarm group

Next, for each point to be linked to the PRIMMOD alarm group, enter the PRIMMOD point name in the PRIMMOD parameter field of that point. Do this for all the points to be included in the PRIMMOD's alarm group. When linked, these points are "related" to the PRIMMOD's alarm group.

Example

Figure 8-2 shows the PED configuration display and Figure 8-3 shows the point detail display of FIC21841. The PRIMMOD parameter contains the name of the primary module point, DIST841, to which FIC21841 is "linked."

Figure 8-2 PRIMMOD Parameter in PED

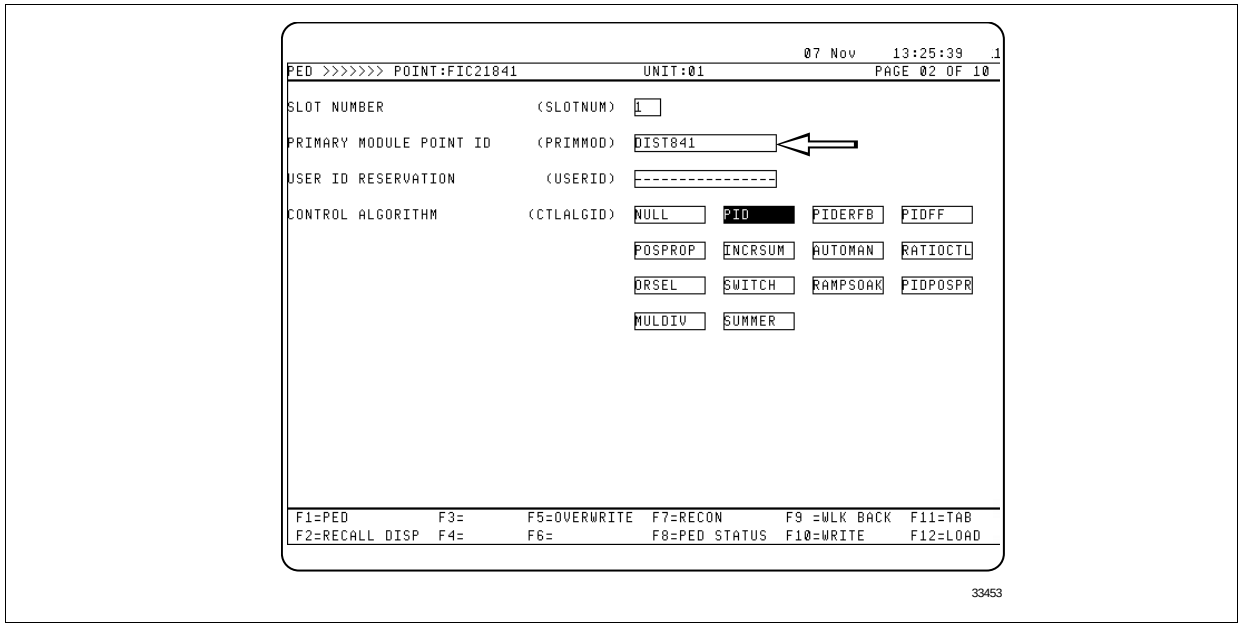
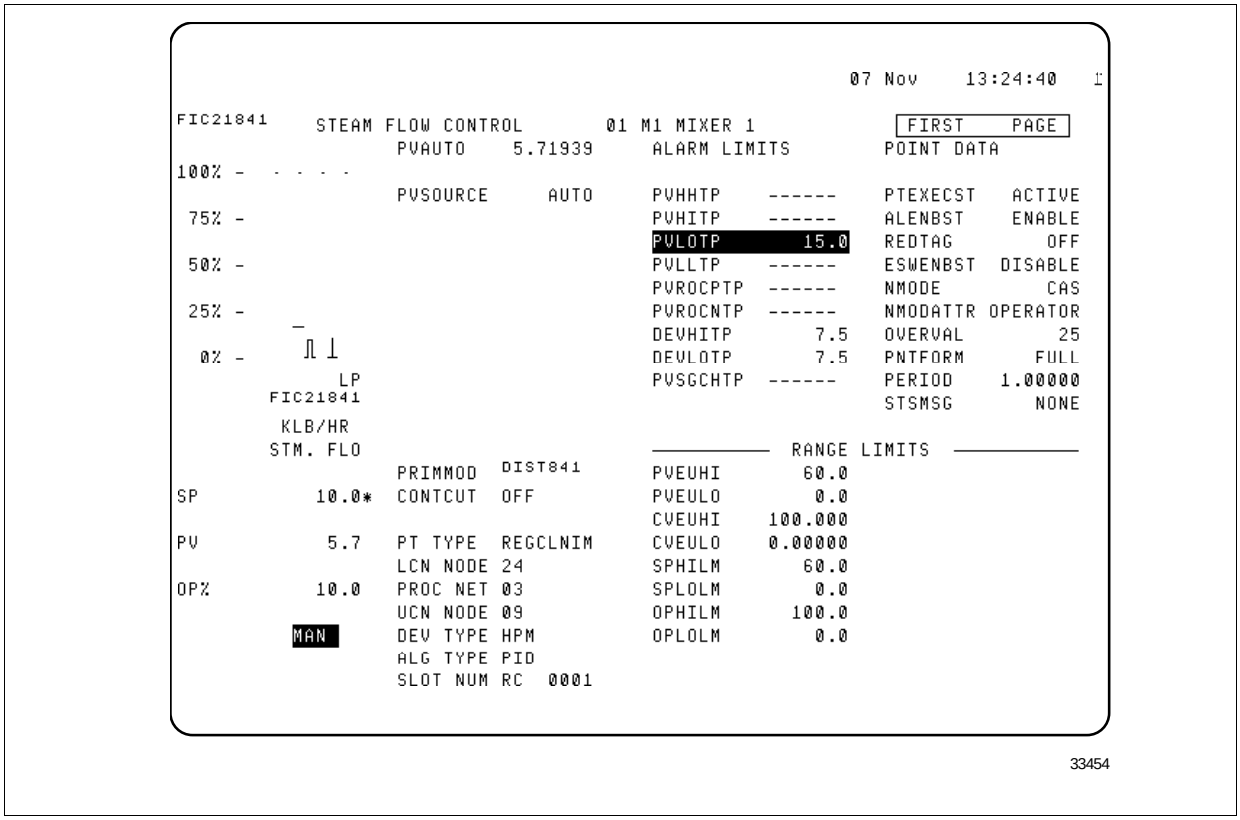


Figure 8-3 Point Detail Display with PRIMMOD Parameter



8.8.3 Rules For Referencing the PRIMMOD Point

Point rules

The following point rules apply when configuring alarm groups using PRIMMOD parameters:

- All points on the LCN have PRIMMOD parameters in their point structure, *except Computer Gateway points and component UCN points*.
- There is *no limit to the number of points* that can be grouped under a PRIMMOD point.
- Any type of LCN point can be used as a PRIMMOD point; however, the following *restrictions* apply when assigning points to a primary module:
  - The PRIMMOD value of an Application Module point can be any valid local LCN point.
  - The PRIMMOD value of a UCN point must be a point in the local gateway (NIM).
  - The PRIMMOD value of a hiway point must be a point in the local gateway (HG or PLCG).
- The error message "`ENTITY ID ERROR`" appears during point build if the PRIMMOD value of a NIM, HG, or PLCG point is not located in its local LCN node.

PRIMMOD parameter Help displays

The PRIMMOD parameter Help displays are in the PED. The parameter has the same functionality for all LCN point types.

8.8.3 Rules For Referencing the PRIMMOD Point, Continued

Summary of PRIMMOD restrictions

Table 8-11 summarizes the point restrictions when using PRIMMOD parameters.

Table 8-11 Summary of PRIMMOD Restrictions

If the PRIMMOD point is a...	These Points Can Reference It in their PRIMMOD parameter...
NIM Point	Local NIM Points AM Points
HG/PLCG Point	Local HG/PLCG Points AM Points
AM Point	AM Points

ATTENTION

AM PRIMMOD restrictions

Attention—These restrictions apply only to the modification of the PRIMMOD parameter on AM points. If a user is changing the value of a PRIMMOD parameter on an AM point, the following restrictions apply:

- AM PRIMMOD parameter changes from CL foreground programs is NOT allowed. An attempt to do so will result in a CL runtime error. AM PRIMMOD parameter changes from CL background programs is allowed.
- If an AM PRIMMOD parameter is being changed from a schematic, the new value must be an “on-node” point, that is, a point that is on the same AM node as the point being changed.

8.8.4 Retrieving Events for a PRIMMOD Group

Purpose

The PRIMMOD parameter can be used to tie events together for event history retrieval.

In R500, after selecting PROCESS ALARMS, PROCESS CHANGES, or OPERATOR MESSAGES on the Event History Retrieval display, a PRIMMOD target appears.

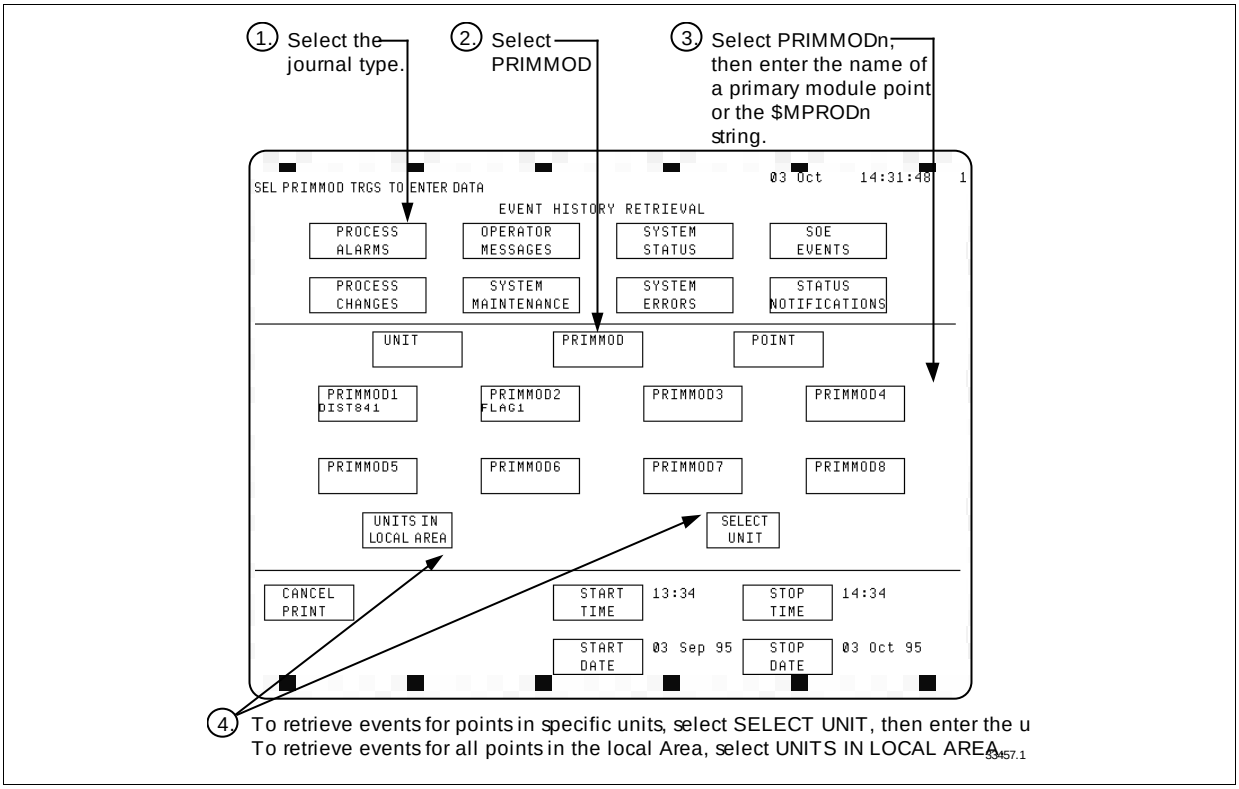
You can retrieve events for up to eight PRIMMOD groups.

Before R500, a MODULE target appeared instead of PRIMMOD, and only a Process Module type of point could be entered.

Procedure

Figure 8-4 shows how to retrieve events related to one or more PRIMMOD groups. (See the Process Operations Manual, SW11-601, for changes to the Event History Retrieval display in R600.)

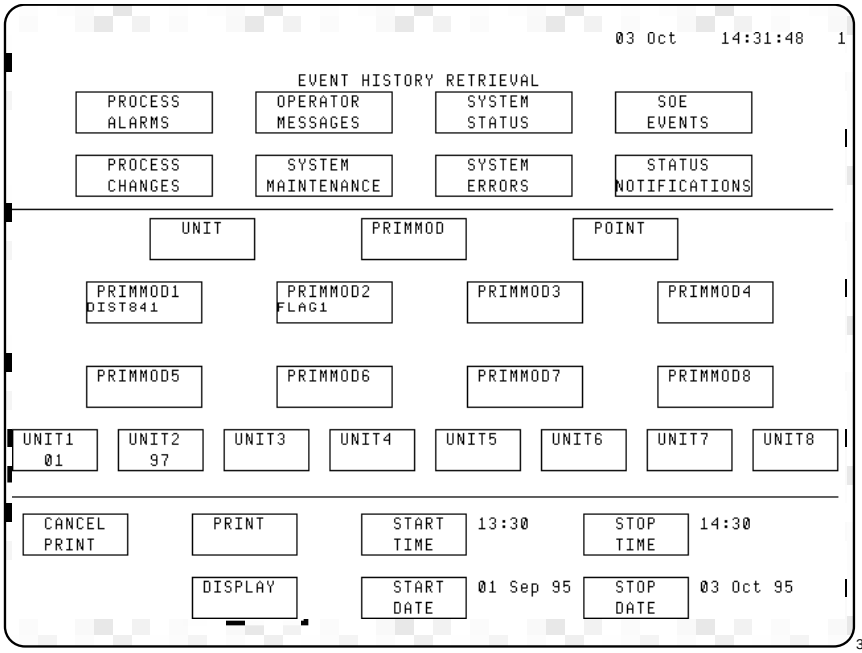
Figure 8-4 Event History Retrieval by PRIMMOD

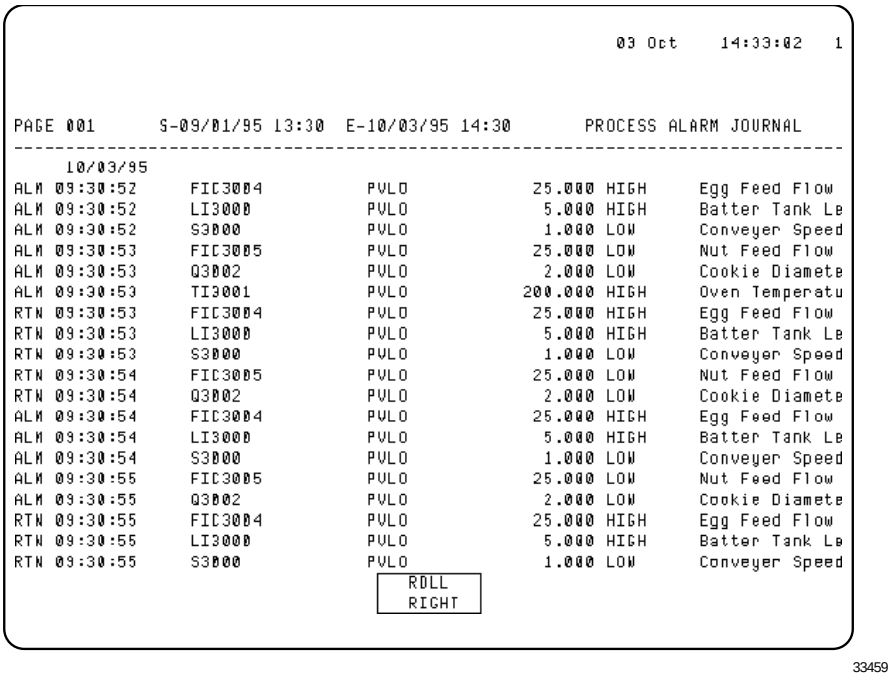


Example

In Figure 8-5, events were retrieved for points with DIST841 or FLAG1 in their PRIMMOD parameter in units 01 and 97.

Figure 8-5 Example of PRIMMOD Event History





8.8.5 Alarm Annunciation Using PRIMMOD Groups

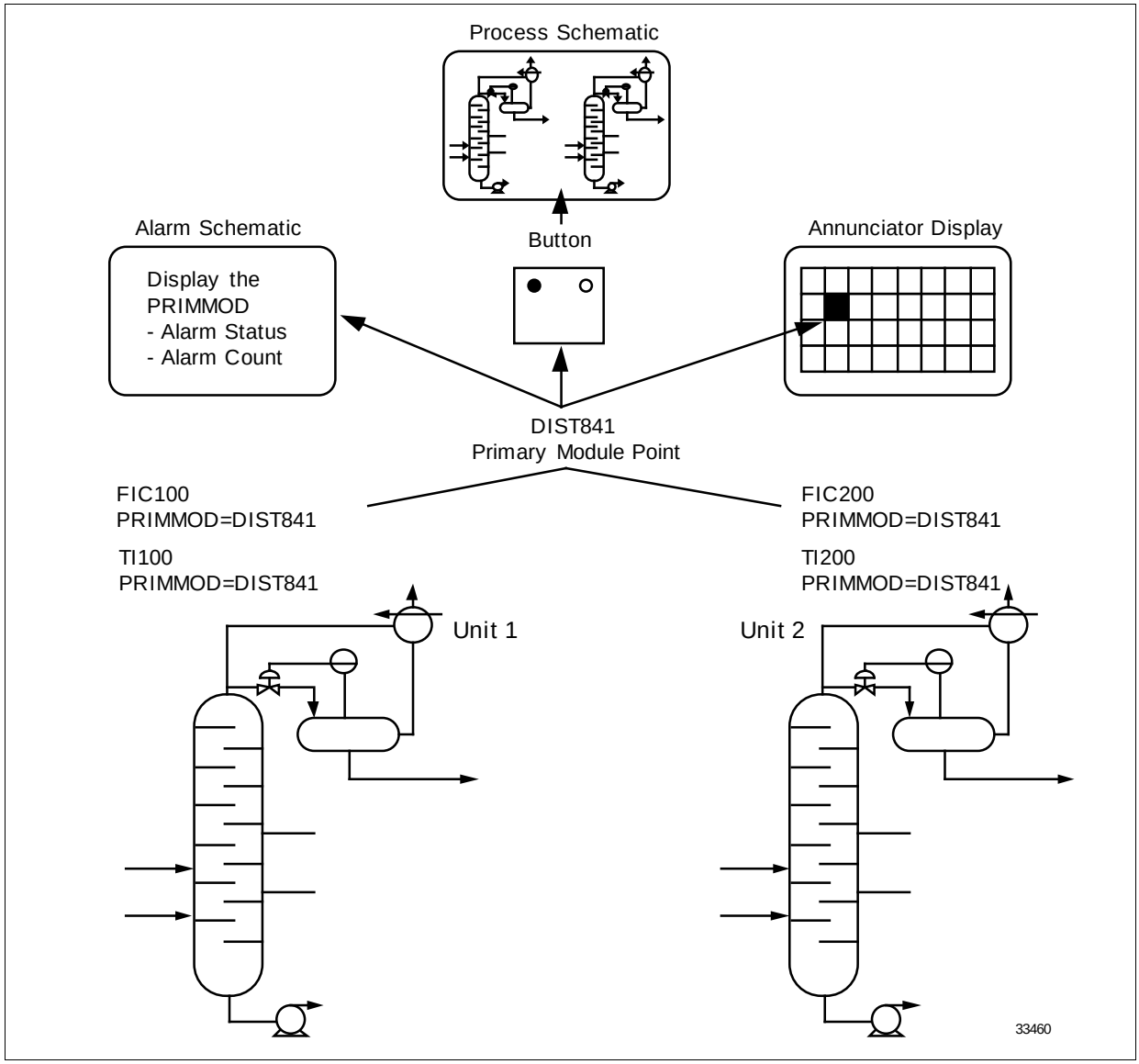
Description

Figure 8-6 shows, after the PRIMMOD point configuration is done, you can do the following to make use of the PRIMMOD group:

- assign PRIMMOD group to a button LED,
- assign PRIMMOD group to a box on the Area Annunciator display,
- build a custom schematic display that shows the alarm status of the PRIMMOD group.

If you build a point specifically to use as a primary module for alarm grouping, you may want to consider giving the primary module point the same name as the Schematic assigned to the button.

Figure 8-6 PRIMMOD Alarm Annunciation



8.8.6 Using Multiple PRIMMODs for AM Alarms

MPRODs

In R520, the Multiple PRIMMOD (MPROD) alarms option allows a single alarm on an AM point to be reflected in four alarm groups in addition to the standard PRIMMOD parameter group to be used for alarm displays and event history.

Background

The four additional alarm groups are identified by four string-type parameters, $MPROD1–$MPROD4. All AM alarmable points have these four $MPROD parameters. The PRIMMOD and $MPROD groups may be referenced from displays, and button LEDs, and used for event history retrieval.

Reference

Reference these publications for more information:

Publication	Section
Engineer's Reference Manual (this document)	8.8, PRIMMOD Alarm Groups
Application Module Control Functions	2.3.15 Process Alarms
Application Module Parameter Reference Dictionary	
Application Module Forms	
Application Module Form Instructions	
System Control Functions	4.3 Alarming

8.8.7 Using Auxiliary Units ($AUXUNIT)

Auxiliary unit

In R520, all alarmable AM, NIM, HG point types have an Auxiliary Unit ($AUXUNIT) parameter that allows all process alarms on a point to be dynamically redirected from the point's primary unit to an alternate unit for alarm displays.

Background

On the US, process alarms that have an $AUXUNIT parameter are directed to the Auxiliary Unit instead of the primary unit for unit alarm counters and alarm summaries. All other event types received at the US belong to the primary unit only.

A point's $AUXUNIT can be changed on a US by a schematic, DEB, ALTER PARAMS, or detail display. When an $AUXUNIT is changed, alarms from the prior Auxiliary Unit are cleared and alarms on the new Auxiliary Unit are displayed. The key level access can limit who is permitted to change this value.

If a point has an $AUXUNIT parameter, then both the primary and auxiliary units must be configured to the US's local area database in order to change a parameter value on that point. This also means that every area database with the desired $AUXUNIT assigned must also have the primary unit assigned in order to use the $AUXUNIT functionality.

Process Alarm Behavior

The alarm enable status of a point's assigned unit, not the auxiliary unit, determines the annunciation behavior of the point. Here is an example:

Assume that point TIC200 is assigned to unit A1 and has an $AUXUNIT of B2.

- If the Console alarm state for unit A1 is DISABLED, process alarms for point TIC200 will not be annunciated to this console regardless of the Console alarm state of unit B2.
- If the Console Alarm State for unit A1 is ENABLED, process alarms for point TIC200 will be annunciated to this console regardless of the Console Alarm State of unit B2.

Of course, individual alarm priority levels continue to apply.

The following tables show how the Console and System Alarm states affect the display of Auxiliary Unit alarms on the US Alarm displays.

Behavior of Console and System Alarms

Console Alarm State

A process alarm that occurs while the CONSOLE ALARM STATE for the primary unit is DISABLED will be filtered out at the US. The alarm will not appear on any of the alarm displays and will not be printed in the RTJ.
A process alarm that occurs while the CONSOLE ALARM state for the auxiliary unit is DISABLED will NOT be filtered out at the US.

CONSOLE ALARM STATE	Primary Unit Enable	Primary Unit Disable
Auxiliary Unit Enable	Yes	No
Auxiliary Unit Disable	Yes	No

Yes – Alarm WILL appear on the Alarm Summary displays
No – Alarm WILL NOT appear on the Alarm Summary displays

System Alarm State

A process alarm that occurs while the SYSTEM ALARM STATE for the primary unit is INHIBITED or DISABLED is not distributed by the data owners to the US. This means the alarm will not appear at any of the alarm displays and will not be printed in the RTJ (for DISABLED state) or sent to the HM (for the INHIBITED state).

SYSTEM ALARM STATE	Primary Unit Enable	Primary Unit Disable	Primary Unit Inhibit
Auxiliary Unit Enable	Yes	No	No
Auxiliary Unit Disable	Yes	No	No
Auxiliary Unit Inhibit	Yes	No	No

Yes – Alarm WILL appear on the Alarm Summary displays
No – Alarm WILL NOT appear on the Alarm Summary displays

8.8.7 Using Auxiliary Units ($AUXUNIT), Continued

Reference Refer to the following publications for more information:

Publication	Section
Application Module Control Functions	
Application Module Parameter Reference Dictionary	
Application Module Forms	
Application Module Form Instructions	
Data Hiway Box/Slot, and Data Point Forms	HG Point Forms
Process Manager Configuration Forms	PM Point Forms
Advanced Process Manager Configuration Forms	APM Point Forms
High-Performance Process Manager Configuration Forms	HPM Point Forms
Hiway Gateway Parameter Reference Dictionary	
Process Manager Parameter Reference Dictionary	
Network Forms	
Network Form Instructions	
Process Operations Manual	Section 7, Alarm and Message Annunciation

8.8.8 Other R520 Alarm Enhancements

Introduction

Other R520 alarm functions, some of which can be used for batch alarming, are briefly described in this subsection and references to more complete information are given.

Button LED control

For R520, Button LED control function allows user written CL applications to control (on/off/blink) the red and yellow LEDs on the 40 configurable LED buttons.

Reference these publications for more information:

Publication	Section
Engineer's Reference Manual (this document)	Keyboard Button LED Assignment and Control
Control Language/Application Module Reference Manual	
Configuration Data Collection Guide	Button Configuration Forms
Button Configuration Data Entry	
Area Form Instructions	

Button PRIMMOD or MPROD assignment

For R520, Button PRIMMOD or MPROD assignment allows runtime assignment of a new PRIMMOD name to any of the 40 configurable LED buttons (allowing button assignments to be changed on the fly).

Reference these publications for more information:

Publication	Section
Engineer's Reference Manual (this document)	33.0, Keyboard Button LED Assignment and Control
Control Language/Application Module Reference Manual	
Actor's Manual	
Configuration Data Collection Guide	Button Configuration Forms
Button Configuration Data Entry	
Area Form Instructions	

8.8.8 Other R520 Alarm Enhancements, Continued

Detail/Group access level

For R520, Detail/Group access level option—parameter modification and control actions on the detail and group displays can be restricted by NCF keylevel configuration. Reference these publications for more information:

Publication	Section
Control Language/Application Module Reference Manual	
Network Forms	
Network Form Instructions	

Area Database change actor

For R520, Area Database change actor—a new actor that allows Area Database changes to be done from custom schematics and configurable buttons (allows operators to move easily from one area to another).

Reference these publications for more information:

Publication	Section
Area Form Instructions	
System Startup Guide–Zip Drive	
Picture Editor Data Entry	
Network Form Instructions	
Picture Editor Reference Manual	
Actor's Manual	

Silence horns on console

For R520, the silence horns on console function is an NCF configurable option that causes the silence button to silence all horns on the same console (all areas assigned to that console). The horn silence button on one console will not silence the horn generated for another console, even if that console is on the same area.

WARNING

If there was one set of horns on a Universal Station within the console and that station had the Engineering Main Menu on display, when an alarm was detected, there would NOT be any audible annunciation. (The Alarm Summary LED would start to blink so there would be some visual clue.) Wire all annunciator blocks in a console together to a single set of horns so that if at least one station is not in Engineering function, the horns will still go off.

8.8.8 Other R520 Alarm Enhancements, Continued

Silence horns on console, continued

Reference these publications for more information:

Publication	Section
Process Operations Manual	"Silencing the Horn" Section 8
Network Forms	
Network Form Instructions	

RTJ color alarms

For R520, RTJ color alarms function is an NCF configurable option that allows all process alarms (SOE, process and sequence alarms) and return-to-normal events to be printed in color on the Real-Time Journal. Reference these publications for more information:

Publication	Section
Process Operations Manual	Printer Appendix
Network Forms	
Network Form Instructions	
System Startup Guide–Zip Drive	

Keylevel change journal suppression

For R520, keylevel change journal suppression function allows the user to suppress the journaling of keylevel change events by actors. Configure this option from the Engineering Main Menu by selecting System Wide Values, then selecting Console Data. Reference the Actors Manual, Section 3.3, 3.4 for more information:

PRIMMOD Status and Count actors

For R520, two actors are available for reading the composite alarm status and alarm count of a specified PRIMMOD or Multiple PRIMMOD. These are actor equivalents of the $PRIMSTS and $PRIMCNT collectors. Reference the Actors Manual for more information.

8.8.9 R610 Alarm Summary Enhancement

DATE Added to Process Alarm Displays in R610

In Release 610 the DATE of occurrence of each alarm has been added to the already existing TIME field in the process alarm displays – Area Alarm Summary, Unit Alarm Summary and Alarm Annunciator Display.

Description

When either process alarm display is called up, the TIME/DATE mode defaults to TIME and the text in the target is set to TIME. Each alarm entry displays the time that the corresponding alarm occurred.

By repeatedly selecting the TIME/DATE target, three modes toggle in the order of TIME, DATE or BOTH DATE & TIME. There is no timer associated with this target so the selected mode will remain in force as long as the display is not selected again. When another alarm display (any other display or PRIOR DISP) is selected, the mode defaults back to TIME regardless of its last mode state.

To accommodate the new target, the existing target "FREEZE DISPLAY" is shortened to "FREEZE DISP." When the display is frozen the text will read "DISP FROZEN." The time/date mode may be changed while the FREEZE display is engaged. Although the freeze mode remains in effect, the time/date field itself will be modified accordingly.

The "SORT : PRIORITY" target is also shortened and now reads "SORT: PRIORTY."

Reference

See *Process Operations Manual* for additional information about these displays.

8.8.10 R681 Alarm Summary Enhancement

System Alarm generated to indicate the change in the auxiliary status of the node in R681

With TPN R681/TPS R410, a system alarm is generated whenever a Honeywell software component (running on Microsoft Windows environment) fails in a GUS/APP/ES-T/ESVT/ACE-T node.

Description

The state of the HCI components configured on the GUS/APP/ES-T/ESVT/ACE-T nodes change on error conditions. The composite status of the HCI components is indicated in the auxiliary status of the node. When an HCI component fails and the auxiliary status of the node changes to SEVERE, a system alarm is generated. The System status display LED blinks to annunciate the change.

With all the HCI components on the node running, the auxiliary status shows OK. When the composite status of the HCI components changes to WARNING, the auxiliary status of the node changes to WARNING. If any of the HCI components fail, the auxiliary status of the node changes to SEVERE.

Reference

For more information about these displays, see *TPS System Implementation Guide for Microsoft Windows 2003/XP* and *System Components Configuration Utility User's Guide.*

Section 9 – Data Entity Builder Operations

9.0 Reserved

In earlier versions of this manual, this section contained guidelines for **Data Entity Builder Operations.** Refer to *Data Entity Builder Manual*. This section has been retained to direct users familiar with an earlier version of this manual to the new location of the information and to preserve the validity of references to other sections of this manual.

Section 10 – Native Window System Performance Displays (Toolkit)

10.0 Overview

Purpose of the Native Window system performance displays

These Native-Window displays are provided to facilitate your access to TPS system performance and loading data that you can use for the following purposes:

- To allow you to evaluate your present system performance and system loading to find opportunities to improve its performance or to add system load by adding additional functions or activities.
- To monitor system performance and system loading so that you become aware of deteriorating performance or increased system load before either causes a problem.
- To diagnose the cause of poor performance or high system loading so that you can make adjustments to correct the problem.

Some of the information on these displays may not be meaningful except to the most technically competent and experienced users. Such information is provided because it can be very useful to Honeywell technical people when you call them for assistance.

The "Toolkit"

Honeywell TPS system maintenance and service personnel often refer to these displays as the *Toolkit* displays. Although the term is not used in this document, it is considered synonymous with *Native Window System Performance* displays.

CAUTION—Honeywell makes no claim to the accuracy or usefulness of these displays. They are intended to assist a trained technician in diagnosing system problems.

Any value changes made from these displays are subject to the normal key switch and access lock restrictions.

10.1 Preface

Where these displays find performance information

In all but a few cases, the information on the Native-Window system performance displays is read from the Processor Status Data Points (PSDPs) in one or more nodes on the LCN. Every node has a PSDP and each node shares a common set of PSDP parameters. Each node type (AM, NIM, US, etc.) also has a unique set of PSDP parameters for its type.
For more information on PSDPs, refer to Section 22 in this manual.

How the displays are delivered

These displays are contained in volume or directory TLK1 on the Honeywell-provided media. The following are the media that contain TLK1:

Disk &Z1 - TLK1 is a directory on this disk.

The content of TLK1 can be automatically loaded when you install the system software. See 10.2 in this manual for the directory's size requirements.

Refer to 13.3 in this manual for detailed instructions for installing any volume or directory.

What you must do to install and use the displays

The following are the major steps for installing and using the System Performance displays:

Table 10-1 Procedures for Installing and Using the Displays

Step	Action	Reference
1	Install the displays in a volume or directory that the Pathname Catalog points to.	10.2
2	Call up the System Performance Display Menu, PERFMENU.	10.3
3	Select targets on the menu to call up the other displays.	10.4
4	Review the description of the content of the displays.	10.4
5	Follow the guidelines for using and interpreting the information on the displays.	10.5
6	Follow the instructions for using the clock display to check cables.	10.6

10.2 How to Install the System Performance Displays

TLK1 files are installed automatically in R500	For R500 and beyond, the TLK1 volume or directory is automatically loaded in an HM when you load the system software. For the R400 version, the TLK1 volume or directory is not automatically loaded in an HM when you load the system software; you must find space for its content and manually load it.
Memory space	In R400 and later, the approximate memory space occupied by TLK1 files is 180 KB.
Making performance displays available to your Universal Stations	If you have enough space in any volume or directory that a Pathname Catalog points to, you can copy the contents of TLK1 into such a volume or directory. This makes the system performance displays accessible in any US that is running with the area database that contains that Pathname Catalog.
Providing for updates	TLK1 displays are updated with major maintenance releases. For this reason, we suggest you make TLK1 a net directory and have each area's pathname catalog point to TLK1.
Detailed installation procedure	For the detailed procedure for installing a volume or directory that, like TLK1, is not automatically loaded in an HM when you load the system, refer to 13.3 in this manual.

10.2.1 Table of Current TLK1 Versions

DISPLAY	R400	R430	R431	R500	R520	R600	R620	R640	R650	R651	R660	R680	R681	R682	R684	R684
PERFMENU	R400	R430	R431	R500	R520	R600	R620	R640	R650	R651	R660	R680	R680	R680	R680	R680
NODEPERF	NONE	R411	R411	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500
DATACHNG	R232	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411
QUIKTRND	R400	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411
CPUCHKR	R400	R410	R410	R410	R410	R410	R410	R410	R410	R410	R410	R410	R410	R410	R410	R410
HEAPCHKR	R400	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411
HEAPMIN	R400	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411
PARCHKR	R400	R400	R400	R400	R400	R400	R400	R400	R400	R400	R400	R400	R400	R400	R400	R400
AMDETAIL	R400	R410	R410	R410	R410	R410	R410	R410	R410	R410	R410	R410	R410	R410	R410	R410
AMTREND	R400	R420	R420	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500
SLTCONFG	R232	R420	R431	R431	T431	R431	R431	R431	R431	R431	R431	R431	R431	R431	R431	R431
HEAPFRAG	R400	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411
CHKPTIME	R300	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411
CLOKMODE	R400	DELE-TED														
CLOKSYNC	R400	DELE-TED														
CLOKTRAN	R400	DELE-TED														
CLOKCABL	R320	DELE-TED														
UCNCOMM	R321	R411	R411	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500
UCNEVENT	R321	R411	R411	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500
NIMTREND	R322	R322	R322	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500
NGDETAIL	R400	R410	R410	R500	R500	R510	R510	R510	R510	R510	R510	R510	R510	R510	R510	R510
NGTREND	R400	R410	R410	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500
HMDETAIL	R400	R410	R410	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500
HMTREND	R400	R410	R410	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500
HGTREND		R322	R322	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500
UCNSUMM		R411	R411	R411	R411	R411	R411	R411	R411	R411	R4z11	R411	R411	R411	R411	R411
NODESTA1		R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411
NODESTA2		R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411
CNAMEREV		R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411
DRVSTS		R420	R420	R420	R510	R510	R510	R510	R510	R510	R510	R510	R510	R510	R510	R510
CBREV		R410	R410	R410	R410	R410	R410	R410	R410	R410	R410	R410	R410	R410	R410	R410

10.2.1 Table of Current TLK1 Versions, Continued

DISPLAY	R400	R430	R431	R500	R520	R600	R620	R640	R650	R651	R660	R680	R681	R682	R684	R688
IOPMDATA		R322	R322	R322	R322	R322	R322	R322	R322	R322	R322	R322	R322	R322	R322	R688
RULASTAT		R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411	R411
HWYPERF		R323	R323	R323	R323	R323	R323	R323	R323	R323	R323	R323	R323	R323	R323	R323
SISF		R420	R420	R420	R420	R420	R420	R420	R420	R420	R420	R420	R420	R420	R420	R420
UCNVERSN		R420	R420	R420	R420	R420	R420	R420	R420	R420	R420	R420	R420	R420	R420	R420
PLCGCOMM		R430	R430	R430	R510	R510	R510	R510	R510	R510	R510	R510	R510	R510	R510	R510
CALCULTR		R420	R431	R431	R431	R431	R431	R431	R431	R431	R431	R431	R431	R431	R431	R431
CLOKSTAT		R430	R431	R431	R431	R431	R431	R431	R431	R431	R431	R431	R431	R682	R431	R431
AXMPERF			R431	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500	R500
HISGRPS				R430	R430	R531	R531	R531	R531	R531	R531	R531	R531	R531	R531	R531
AMDIAGNS					R510	R510	R510	R510	R510	R510	R510	R510	R510	R510	R510	R510
ARCFGALM					R510	R510	R510	R510	R510	R510	R510	R510	R510	R510	R510	R510
EPLCGCOM					R510	R510	R510	R510	R510	R510	R510	R510	R510	R510	R510	R510
LCNVIEWR					R520	R520	R520	R520	R520	R520	R520	R520	R520	R520	R520	R520
LVRLOG						R430	R430	R430	R430	R430	R430	R430	R430	R430	R430	R430
HOLDBRTH						R530	R530	R530	R530	R530	R530	R530	R530	R530	R530	R530
CDET_CLR							R620	R620	R620	R620	R620	R620	R620	R620	R620	R620
AMCLDBUG									R650	R650	R650	R650	R650	R650	R650	R650
AMCLDSPL									R650	R650	R650	R650	R650	R650	R650	R650
CHANINFO										R651	R651	R651	R651	R651	R651	R651
HGDETAIL											R660	R660	R660	R660	R660	R660
NMDETAIL											R660	R660	R660	R660	R660	R660
UCNDEVUT												R680	R681	R681	R681	R681
CLSNODE												R680	R681	R681	R681	R681
LCNPERF												R680	R681	R681	R681	R681
CLKSWTCH														R682	R682	R682
Note: The .DS file is provided for the CLSNODE display. DIA1																

10.2.1 Table of Current TLK1 Versions, Continued

MRGLTHR													R681	R681	R681	R681
LNDGCBL													R681	R681	R681	R681
LNDGNST													R681	R681	R681	R681
LNDGERS													R681	R681	R681	R681
LNDGERA													R681	R681	R681	R681
LNDGPNG													R681	R681	R681	R681
$FTESTS1															R684	R684
$FTESTS2															R684	R684
$NODETYP																R688

ATTENTION

ATTENTION — Local database corruption fixes from R411 were backed into R410 before volume distribution. Uninitialized values cause an error on the first call up of a display using TLK1 DDB values after node load. Errors will not reoccur after the first display use.

10.3 How to Call Up the System Performance Displays

To call up the System Performance Displays Menu

If you have configured a button to call up the PERFMENU display, on a station with any operator display on the screen, press that button. The menu appears.

If you do not have a button to call up the menu, call up any operator display and follow these steps:

Table 10-2 Procedure to Call Up a Performance Display

Step	Action	Result
1	Press the [SCHEM] key.	A port appears in the upper-left region on the display.
2	In the port, enter PERFMENU and press the [ENTER] key.	The first page of the System Performance Displays Menu appears.
3	On the menu, select any target. To see the targets on menu page pages two or three, select the PAGE 2 or PAGE 3 target.	The selected display appears.

10.4 The Displays and Their Content

Performance Displays Menu

Below are pages 1, 2 and 3 of the Performance Displays Menu. To see any of the remaining displays, just select one of the targets on this display.
To see the second page, select the PAGE 2 target.
To see the third page, select the PAGE 3 target.

Performance Displays Menu (Page 1 of 3)

Performance Displays Menu (Page 2 of 3)

Performance Displays Menu (Page 3 of 3)

ATTENTION	ATTENTION— With TPN R684, two new FTE status schematics are introduced. $FTESTS1 shows the FTE status of the UCN nodes assigned to the selected ENIM. $FTESTS2 shows the status of all the FTE devices in the FTE community.

Performance Displays Menu (Page 3 of 3)

ATTENTION	ATTENTION— With TPN R686 and Experion R500, a new ETN diagnostic display is introduced. $ETNDIAG shows diagnostic data of all ETN nodes in the network.

Performance Displays Menu (Page 3 of 3)

ATTENTION

ATTENTION— With TPN R688.3 and Experion R501.6, a new Node Type schematic is introduced, “$NODETYP”. It displays the following information:

- Displays the $NODETYP parameter (which shows the node platform and node type)
- TPN Software Version/Revision
- External/Internal TPN Release of every TPN node on the LCN

Display descriptions

A brief description of the function of each display is beside each target and is generally self-explanatory. The explanations that follow describe the use of some displays for functions that may not be readily apparent. (For function LCN Node Version Revision Logging, R520, see *Engineer's Reference Manual*—this manual).

Current Display Parameter

In R600 a new read only parameter, CURRDSP, is implemented to enable the user to determine what display is on the Universal Station screen. The parameter allows the user to:

- Track which displays are most used.
- Determine which displays are no longer used.
- Determine the sequence of displays invoked by the operator.
- Find the name of the schematic that is currently on display.
- Put the schematic source filename on each schematic.

The contents of this PSDP can be queried by the same method as any current PSDP. This includes using a custom schematic, AM CL, etc.

Checker Target

Some displays have a **Checker Target** that allow you to set a test value for the parameter being displayed. For example, CPUCHKR uses a default value of 25 and compares all node CPUFREE values against that value. Any value less than or equal to the check value is reverse highlighted. Another example is the PARCHKR display with a default check value of 100. All values larger than or equal to the value are reverse highlighted. It depends on the specific parameter whether the test is "up" or "down" significant. The Checker Target allows setting a specific value for test and easy use since in some cases sorting out numbers is inconvenient.

Parameter Access and Value Change display

The DATACHNG display can be used to read up to 10 parameter values at once. You can also change one or more parameter values. You do this by selecting one of the parameter/value lines on this display. Then enter the entity name and parameter in the left port and the new value in the right port and press [ENTER]. Enter the entity name (tag name or reserved entity name) and parameter in the NAME.PARAM form.

You do not need an Engineer's Keyboard to use this display; when it first appears, "$", "(", and ")" appear in the name/parameter port. You can use them or strike over them, as necessary. Value changes from this display are subject to the normal key switch and access lock rules.

Node-related displays

The following displays contain information from a user-specified node or from all nodes on the LCN:

Table 10-3 Node-Related Displays

Display	Description
NODEPERF	Node performance display. Displays the values for key performance parameters in the PSDP for the node you select. Six of the values are shown as bar charts, as well as digital values. For an ELCN node, the ACTIVCBL parameter shows the value as “N/A”.
LCNPERF	LCN Load Information. Displays the selected load parameters for individual LCN nodes, estimated % of LCN load and the selected LCN load parameters.
CLSNODE	The CLSNODE display is used for assigning segment numbers to the LCN nodes.
PARCHKR	Displays the average parameter access rate per second from PSDP parameter PARSEC for each node on the LCN. Values for nodes not installed or not operating are blank.
AMTREND HMTREND NGTREND	Display a trend for each of several key PSDP parameter values for the node you select.
AMDETAIL HGDETAIL HMDETAIL NGDETAIL NMDETAIL UCNDEVUT	Display the values for a large number of significant PSDP parameters for the node you select.
HOLDBRTH	HOLDBRTH for a node increment when a data request is not provided within 2.5 seconds.
AMCLDBUG	Allows user to define the filter options for finding process changes caused by AM/CL, and for starting and stopping the collection of AM/CL process changes.
AMCLDSPL	Buffer that contains up to 100 of the last process changes caused by AM/CL. It lists the point names and the parameters changed, the values stored, and the names of the AM points and the AM/CL blocks that are performing the stores.
CHANINFO	Shows the names of applications that have been allocated channels in the applicable GUS or APP node.
$FTESTS1	Shows the FTE status of the UCN nodes assigned to the selected ENIM.
$FTESTS2	Shows the status of all the FTE devices in the FTE community.

$ETNDIAG	Shows diagnostic data of all ETN nodes in the network.
$NODETYP	Displays the $NODETYP parameter (which shows the node platform and node type), TPN Software Version/Revision, and External/Internal TPN Release of every TPN node on the LCN.

Quick Trend display for user-selected values

Table 10-4 Quick Trend Display

Display	Description
QUIKTRND	Provides up to four trend traces for parameter values you enter. Enter the entity name (tag name or reserved entity name) and parameter in the NAME.PARAM form. Instructions for the use of this display are built in. To see them, select SELECT FOR HELP .

LCN cable diagnostics

The $LNMENU target presents an LCN cable diagnostics menu. Refer to *LCN Guidelines - Implementation, Troubleshooting, and Service* for LCN cable diagnostics instructions.

Processor free-time display

Table 10-5 Processor Free-Time Display

Display	Description
CPUCHKR	For each node on the LCN, shows the average of the percentage of time the processor was idle or free over the last fifteen seconds. For each node, this value is read from PSDP parameter CPUFREE. Values for nodes not installed or not operating are blank.

Heap displays

The following displays contain heap memory information from all nodes on the LCN. Values for nodes not installed or not operating are blank. Heap memory is memory in a node that is reserved for use by the node software. The software uses and releases the heap memory dynamically, reducing the overall amount of memory needed to run the software.

Table 10-6 Heap Displays

Display	Description
HEAPCHKR	Displays the value in the nodes' PSDP HEAPFREE parameter. The HEAPFREE value is the number of heap words currently not in use.
HEAPMIN	Displays the value in the nodes' PSDP HEAPMIN parameter. The HEAPMIN value is the minimum number of heap words left free since the node was started.
HEAPFRAG	Checks each node's HEAPFRAG against an entered check value.

Checkpoint Time and Interval display

Table 10-7 Checkpoint Time and Interval Display

Display	Description
CHKPTIME	Shows period, offset, duration, and starting time values for the HM you select. These values are read from the node's PSDP TIMEBASE(n) value array. You can change the checkpoint period and offset from this display, but before you do, refer to 21.2.2 in this manual and heed the CAUTION about creating system performance problems.

Box/slot verification display

Table 10-8 Box/Slot Verification Display

Display	Description
SLTCONFG	Allows convenient verification of the box/slot configuration in the HG against the actual hardware in the box. Only HLPIU, LLPIU, LEPIU, DHP and the MCs are supported. To use, enter the two-digit hiway and box data. Mismatches in the configuration are marked in red. Incorrect entries generate an error display and a reset target.

Clock displays (CLOKSTAT)

The clock status (CLOKSTAT) display contains system clock information from all nodes on the LCN. Values for nodes not installed or not operating are blank.

Table 10-9 Clock (CLOKSTAT) Displays

Display	Description
CLOKMODE	Displays the clock operating mode for each LCN node: • MASTER—The node supplying the primary hardware clock. • SLAVE—The node supplying the backup hardware clock. • LISTENER—All other nodes using the LCN broadcast clock. • LOCAL—Any node using an internal precision reference.
CLOKCABL	Displays the clock operating mode for each LCN node: • ALTCABLA or ALTCABLB—Clocks are being received alternately on both cables. This is proper operation. • CBLA or CBLB—Clock received only on cable A or cable B. • NOUPDATE—No clock received on either cable.
CLOKSYNC	Displays the clock synchronization status for each LCN node. • PRECREF—Synchronized to an internal or ac precision reference. • SUBSYNCH—Synchronized to a time-frame received from the subchannel clock system. • DIGSYNCH—Synchronized to a time-frame received from the digital clock system. • NOTSYNC—Clock not synchronized.
CLOKTRAN	Displays the clock translation state for each LCN node. • TRNSLTR—Identifies which K2LCN/K4LCN-based node on the network is translating a subchannel clock to a digital clock. • NONTRNS—Identifies the other K2LCN/K4LCN nodes and all other non- K2LCN/K4LCN nodes. Clock translation is required in a system that mixes nodes using some K2LCN/K4LCN processor boards and some other processor boards. In a system using either all or no K2LCN/K4LCN processor boards, every node's status is NONTRNS.

See 10.6 in this manual for information on switching the clock source nodes.
See 10.7 in this manual for information on using the clock displays.

10.5 How to Interpret the Information on the System Performance Displays

A general recommendation

We recommend that you use these displays during normal operation to view and record key PSDP values when the system is running well as a "baseline." Then, from time to time or when there is evidence of overloading or poor performance, you can compare your baseline values with the new values to determine what has changed.

If you wait until there is evidence of trouble before you use these displays, it may be too late to take preventive measures. Even then, you will likely find these displays helpful, if not essential, for analyzing poor performance or overloading.

One way you can record the data on these displays is to use the Print Screen function.

The Processor Status Data Point

Except for some user-defined parameters, all parameters shown on the System Performance displays are read from processor status data points (PSDPs) in the LCN nodes. Every node has a PSDP and each PSDP has several hundred parameters and parameter values. For more information about PSDPs, including definitions of all PSDP parameters accessible by users, refer to Section 22 in this manual.

10.5 How to Interpret the Information on the Performance Displays, Continued

Guidelines for key parameter values

The following tables list PSDP parameters that are especially useful in monitoring the performance and loading. All nodes have these parameters.

Memory-Use Values

The following parameters contain memory-use values:

Table 10-10 Memory-Use Values

Parameter	Display	Guidelines
HEAPFREE	NODEPERF	This value typically exceeds 10,000 words. However, experience has shown that AMs can have HEAPFREE values in the range of 20,000 to 30,000 words and still operate properly.
HEAPMIN	NODEPERF	Except for AMs, this value should be 75,000 words or more.
HEAPFRAG	NODEPERF	This heap fragmentation value is normally 0 or 1. Values of 3 or 4 are rare, and can indicate impending node failure.
HEAPFRA2	NODEPERF	This heap fragmentation value is normally 0 or 1. Values of 3 or 4 are rare, and can indicate impending node failure.

Processor Load Indicator

CPUFREE indicates the load on the node's processor:

Table 10-11 Processor Load Indicators

Parameter	Display	Guidelines
CPUFREE	CPUCHKR	Except for short intervals (a few seconds), this value should not go below 15%. Nodes that use the 68020 microprocessor have significantly less processor-free time than those that use the 68040 microprocessor. In Release 500, CPUFREE calculations are based on clock time, not instruction loop times. Do not compare R500 values with previous release values. **ATTENTION: CPUFREE behavior with ELCN** With ELCN, there is a mismatch between the CPUFREE values shown on the Control Builder platform block and the Native Window. This is due to the fact that the Control Builder platform block's CPUFREE(%) value (parameter – CPUFREEAVG) indicates the overall UEA box processing capacity, whereas the Native Window's CPUFREE parameter value indicates the UEA box's LCN emulation processing capacity. Also, for the same load on an AM/ENIM, the CPUFREE values shown for a classic AM/ENIM and an ELCN-AM/ENIM are different as they are running on different hardware platforms.

Parameter-Access Load Values

The following parameters contain parameter-access load values:

Table 10-12 Memory-Use Values

Parameter	Display	Guidelines
PARSEC	PARCHKR	This is the average number of parameters-per-second requested from this node by other nodes. Normally it should not exceed the following values: • 68020 HG—630 parm./sec. + 90 points/sec. AM load (1200 parm./sec. with no AM load) • 68040 HG—960 parm./sec. + 120 points/sec. AM load (1800 parm./sec. with no AM load) • 68020 NIM—750 parm./sec. + 90 points/sec. AM load (1200 parm./sec. with no AM load) • 68040 NIM—1400 parm./sec. + 120 points/sec.(2000 parm./sec. with no AM load) • UEA-based ELCN ENIM—1540 parm./sec. + 132 points/sec.(2200 parm./sec. with no AM load)* • UVA-based ELCN ENIM—1750 parm./sec. + 150 points/sec.(2500 parm./sec. with no AM load)* • 68020 AM—90 points/sec. + 410 parameters/sec. support for other nodes • 68040 AM—120 points/sec. + 615 parameters/sec. support for other nodes • UEA-based ELCN AM—132 points/sec. + 677 parameters/sec. support for other nodes* • UVA-based ELCN AM—150 points/sec. + 769 parameters/sec. support for other nodes* • CG—100 parm./sec. + 500 points/sec. due to array access
RPARSEC	NODEPERF	Indicates this node's parameter-per-second read access rate on other nodes.
SPARSEC	NODEPERF	Indicates this node's parameter-per-second store access rate on other nodes.

RPARSEC and SPARSEC can help you to determine which nodes are causing a PARSEC load on this node.

ATTENTION

This note is to clarify the values that should not be exceeded, in the "Guidelines" column of PARSEC in the Memory-Use Values table,

above. For example, for “68020 HG—630 parm./sec. + 90 points per second AM load” the 90 points per second AM load, based on the cluster model, implies an AM read/store access on the HG of approximately 2 reads to 1 write per point.

ATTENTION

*If you have an ALL ELCN system, that is, all LCN nodes have been migrated to ELCN, note that the UEA and UVA variants of ELCN ENIM and AM have enhanced performance specification limits as described in the earlier table.

10.5 How to Interpret the Information on the Performance Displays, Continued

CAUTION

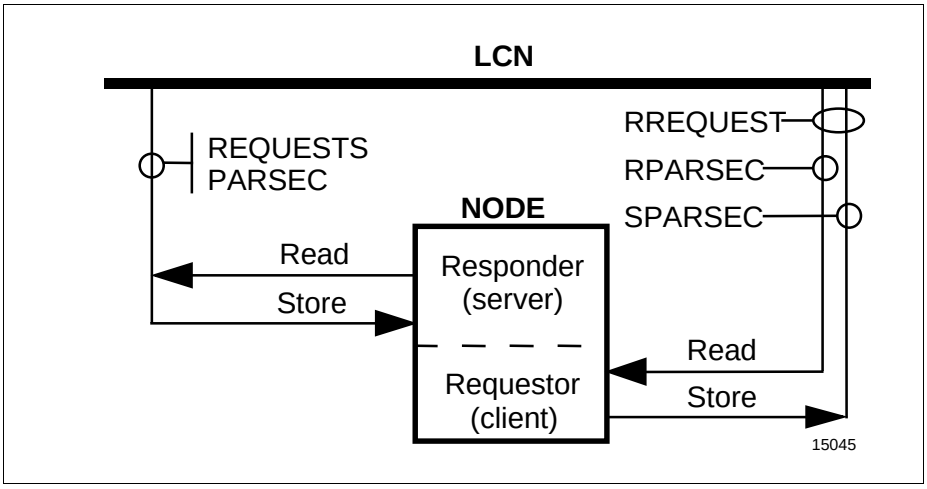
CAUTION— Parameters-per-second counts can be misleading because certain parameter requests count as one, but cause a heavy load on the data owner. Examples of parameter requests that create a heavy load are.

- accesses into value arrays
- requests by Group displays
- requests by Detail displays

Parameter-access load values, figure

The following conceptual figure shows the relationship of the parameter-access load values: PARSEC, RPARSEC, SPARSEC, REQUESTS, and RREQUESTS.

Figure 10-1 Parameter-access load values relationships



10.5 How to Interpret the Information on the Performance Displays, Continued

Trend displays

Below are some guidelines for interpreting the data on the trend displays provided in volume or directory TLK1. These apply to all the trend displays except QUIKTRND.

- When the display first appears, select SELECT & SPECIFY xx and enter the node number for a node of the type served by the display.
- Start the trend by selecting START TREND. In a few seconds, the trend traces should begin to appear at the right edge of the trend.
- The default trend scale (rate) is 24 hours. To change it, select CHANGE RATE and enter a new rate code. Available rate codes are on the second line on the display.
- Each of the trended parameter values is presented in digital form below the trend. The color of the parameter name and value indicates the color of the corresponding trace. The X axis range is also indicated by a number of the same color.
- To learn the meaning of the parameter values, refer to Section 22.

Using QUIKTRND

To use QUIKTRND, see its built-in help displays.

10.6 How to switch the clock-source nodes without rebooting any other LCN Nodes

Introduction

With TPN R682, the clock master and slave nodes can be switched online and does not require reboot of any other node in the network. During the clock mastership transition, the nodes go to Local mode. After the Master / Slave transition is complete all the nodes become Listeners to the new Master. This feature provides the following options:

- Swap the Master and Slave nodes
- Switch the clock Mastership and Slave to User specified nodes
- Switch only the Master node and keep the existing Slave with out any change
- Switch only the Slave node and keep the existing Master with out any change

CAUTION

In case of any unsuccessful switching analyze the status of the nodes and network.

ATTENTION

Mixed release network supports online switching of clock nodes, only if the current master and slave node and the proposed master and the slave node are in R682 or later releases.
If the LCN personalities are on mixed releases and the HM is not migrated to have latest overlays and displays, then the online switching of clock nodes is not supported.

ATTENTION

Ensure the following before using the CLKSWTCH functionality:

- The status of both LCN cables must be **OK** on the system status display.
- All the LCN nodes must show **Node is in Synch** on the NCF Status Display.

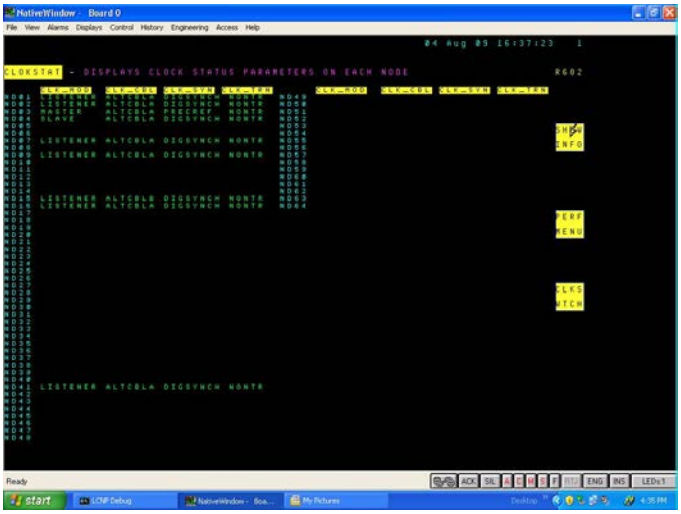
Failing to do so, CLKSWTCH does not function correctly.

To switch the clock source nodes

To switch the clock source nodes, the CLOKSTAT schematic is to be invoked by selecting the target from the PERFMENU display. To switch the clock source nodes, follow the procedures mentioned in Table 10-13.

10.6 How to switch the clock-source nodes without rebooting any other LCN Nodes Continued

Table 10-13 Procedure to switch the Clock Source Nodes

Step	Action	Result
1	From the PERFMENU display invoke the CLOKSTAT schematic.	CLOKSTAT schematic is displayed. 
2	Note down the current clock sources. Invoke the CLKSWTCH schematic by selecting the CLKSWTCH target. Note: This display can be invoked directly by using the SCHEM key.	The display gives the node number in which the display is being invoked. The option to enter the node numbers for the proposed clock master / slave is provided.

10.6 How to switch the clock-source nodes without rebooting any other LCN Nodes Continued

Table 10-13 Procedure to switch the Clock Source Nodes continued

3	Note down the new clock sources / reported errors. Enter the proposed clock source node numbers by selecting the ports. Note: By default, the ports are blank.	The entries in these ports are retained during the operation.
4	Select the SWITCH target. Note down the new clock sources / reported errors.	The SWITCH target initiates the switching by intimating the nodes that need to take up the Mastership and Slave.
	OR	
5	Select the SWAP target.	The SWAP target on the right swaps the Master node and the Slave node. The Master becomes the Slave and the Slave becomes the Master. This is active only when the network has a Master and a Slave node. Note: Entering the values on the ports shall disable the SWAP option.
6	Reload new master/slave clock sources and old master/slave clock sources.	If you install a new online NCF change with new clock sources, you must reload the new master/slave clock sources and old master/slave clock sources. All nodes should know who the master is per the online NCF change. The next time a node is reloaded, it will become in synchronization with the NCF changes. Before attempting to change TIME and DATE of the LCN, make sure to reload the station from where you will change the TIME and DATE. If the station is not reloaded, then the request for the change in time will continue to be sent to the old master, which cannot command a change in time to all of the listener nodes.

ATTENTION

The CLOKSTAT display also contains the information about the existing clock Master and Slave nodes in the network. Incase of multiple existences of the clock Master / Slave nodes in the network, the nodes are backlit in Red and also the multiple entries are displayed. The first occurrence is taken as the current Master node for further operations by the schematic.

Status Indication

The status of the operation is reported at the bottom of the schematic. On invocation, the status of the last performed operation, initiated from that node is displayed. The status is displayed in different colors as follows:

Status	Color
In Progress	Cyan
Completed	Green
Error / Warning (High severity)	Red
Error / Warning (Low severity)	Yellow

10.6 How to switch the clock-source nodes without rebooting any other LCN Nodes Continued

Switching the Clock Master and Slave

To switch the Clock Master and Slave, perform the Steps 1 through 4 mentioned in Table 10-13 and proceed with the other steps in the following procedure.

Table 10-14 Procedure to switch the Clock Master and Slave

Step	Action
1 through 4	Refer to Table 10-13.
5	To update NCF with new clock sources, refer to the Section, EDIT CLOCK SOURCE On-Line Network Reconfiguration Procedure in Network Data Entry manual.

Notes:

1. The NCF need not be updated for swapping the Master / Slave nodes. The NCF is to be updated, when one or both of the clock sources are changed.
2. When the node is selected from the NCF Status display, the node continues to display the NCF time stamp it is currently loaded with and displays the current NCF version.
3. To switch only the Master, select the Slave as the current Slave node number. To switch only the Slave node, select the Master as the current Master node number.

Switching when no Master node in the network

When there is no Master node in the network, all the nodes follow the local clock mode. To assign Mastership to a node when there is no Master node in the network, perform the following procedure.

10.6 How to switch the clock-source nodes without rebooting any other LCN Nodes Continued

Table 10-15 Procedure to switch when there is no Master node in the network

Step	Action
1	Invoke the CLOKSTAT schematic
2	Verify that no clock nodes exist
3	Invoke the CLKSWTCH schematic by selecting the CLKSWTCH target **Note:** There is no Master / Slave in the network
4	Enter the new node numbers by selecting the ports
5	Select the SWITCH target
6	Note down the new clock nodes if no errors are reported
7	Change the NCF to synchronize the clock node information

ATTENTION

When there is only a Clock Master on the network and a Slave has to be assigned, then enter the Slave node first and then the Master node. Selecting the Master node first displays the error message “EXISTING CLOCK NODES SELECTED.”

Booting a node when NCF is not synchronized with new clock node information

There is a change in the behavior of a node, if it is booted or shutdown when the NCF is not synchronized with the new clock node information.

Example: Node 10 and 11 are the current Master and Slave nodes as defined in NCF. These nodes are switched to Node 20 and 30 as Master and Slave and the NCF is not synchronized with the changes. The following table lists the behavior of the existing nodes and the new nodes in different scenarios.

10.6 How to switch the clock-source nodes without rebooting any other LCN Nodes Continued

Table 10-16 Status of the nodes when booted/shut down when NCF is not synchronized

If	Then
Node 10 is booted	The old Master node (Node 10) reads the NCF and tries to assign the Mastership. As the Mastership is taken only in the absence of a Master, the node comes up in the Listener mode. (Node 20 is the current Master).
Node 11 is booted	The old Slave node (Node 11) comes up as a Listener. (Node 20 is the current Master and 30 is the Slave).
Booting a node that is not defined as a clock node	The node shall listen to the New master and shall take up the Listener mode.
Shutting down and booting Node 20	On shutting down Node 20 which is the current Master, Node 30 takes up the Mastership. Other nodes shall continue to listen to the Master node which is Node 30. On rebooting Node 20, the node shall take up the Listener mode as it is not a clock source defined in NCF. NOTE: As Node 20 is not a clock source in NCF, booting the node does not make the node a Master. Node 20 becomes a Listener to the Master node that is Node 30.
Booting Node 10 or 11 when Node 20 and 30 are down	When the Nodes 20 and 30 are down, all the nodes rely on the local clock. When Node 10 or 11 is booted, the node takes up the Mastership as it is defined as the clock node in the NCF and there is no Master in the network.

10.7 Use the Clock Display to Find Crossed LCN Cables

Introduction

For an LCN segment where the clock signals from the clock master and slave nodes are provided by CS/R boards, you can use the CLOKCABL display to verify that the segment does not have crossed LCN cables.
Here, we discuss a procedure you can use to check for crossed LCN cables.

LCN cable checks that can't be made

This method of checking for crossed LCN cables:

- Can only be used on segments that use CS/R boards.
- It cannot detect crossed fiber-optic cables.

The LCNI tests in HVTS (Hardware Verification Test System) can be used to check crossed cables not covered by this method. Refer to *Hardware Verification Test System* for this information.

Normal clock operation

On systems using normally operating clocks, the CLOKCABL display should show each node using either ALTCBLA or ALTCBLB.

- The clock alternates between the A and B cables every 50 milliseconds.
- All nodes probably won't report using the same cable at the same instant.

Crossed cables can cause system failures

Operating with crossed LCN cables (coaxial or fiber optic) can cause a system failure if a cable malfunctions.

WARNING

WARNING—If you find crossed LCN cables when you make the check described below, you cannot safely reconnect the crossed cables while the system is controlling the process. This is because you will have to remove both the A and the B cables at the same time. If the system is controlling the process, defer reconnecting the crossed cables until the system can be taken off control, but do not defer for a long time.

False indications

When the clock subsystem is damaged, the CLOKCABL display cannot dependably show which cable is receiving clock signals.
If the following checking procedure does not give predictable results, your clock system may require maintenance.

10.7 Use the Clock Display to Find Crossed LCN Cables,
Continued

Clock checking procedure

This procedure checks for crossed cables. Remember, it can't find crossed fiber-optic cables and is only for LCN segments that use CS/R boards.

Table 10-17 Checking Procedure for Crossed LCN Cables

Step	Action
1	Call up the CLOKCABL display. Result: Every active node displays either ALTCBLA or ALTCBLB. All nodes don't have to show the same cable, but all must indicate "ALT" (alternating). This means an A and a B cable are connected to each node and all nodes are receiving the alternating clock messages. Note: You may still have crossed cables, but the electronics are OK. If this step fails, check for bad cables or faulty electronics.
2	Determine the two clock source nodes software has assigned: • Use the CLOKMODE display to determine MASTER and SLAVE. • If it doesn't show them, use SYSTEM WIDE VALUES and CLOCK SOURCE targets from the ENGINEERING MAIN MENU. Each of these nodes must have a CS/R board in its I/O slot. One supplies the cable A clock and the other supplies the cable B clock.
3	Remember any nodes containing K2LCN processors: • Use the CLOKTRAN display to note a node marked TRNSLTR. • Use the CLOKSYNC display to note nodes marked DIGSYNCH. Ignore these nodes containing K2LCNs in steps 4 through 7.
4	Physically locate a master or slave node. Remove the coaxial T-connector from its CS/R board (leave the LCN cables connected). Result: If there are no crossed cables, the CLOKCABL display shows either all CBLA or all CBLB at all active nodes on the system.
5	If the result of step 4 is not true, you probably have a crossed cable. Trace the cables and analyze the physical cable system. Example, if all but one node shows CBLA, the cables may be crossed between that node (CBLB) and the node that precedes it on the way from a CS/R board.
6	Uncross cables at the suspected node (remember the WARNING on the previous page). Result: If the display shows either all CBLA or all CBLB at all active nodes, the problem is solved. Reconnect the T-connector you removed in step 4 and continue to step 7.

Clock Checking Procedure, continued

Table 10-17 Checking Procedure for Crossed LCN Cables, continued

Step	Action
7	Check the CLOKCABL display again after a few moments. Note: It might take up to five minutes for a system to show all nodes operating properly, although the reaction is usually much quicker. Result: ALTCBLA or ALTCBLB at all nodes is proper operation.
8	Shut down, wait for `QUALIF,` and Manual Load the HM with the Operator (Online) Personality from the &Z1 and BACKUP NCF disks. HM should go to HMON OK. Allow it to run for 5 minutes (to initialize the history files) then shut it back down, wait for `QUALIF`, and load the initialization program from the &Z1 and BACKUP NCF disks. HM should go to HMOFF OK.

ATTENTION

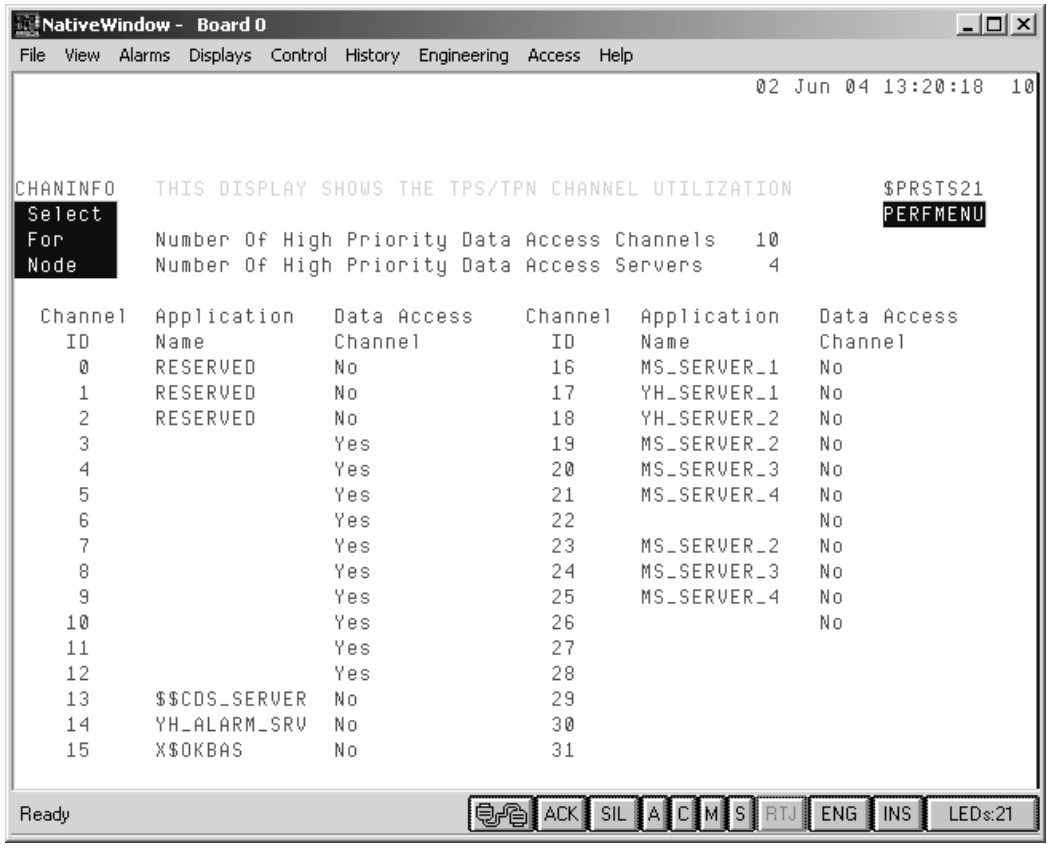
ATTENTION—Another method to find crossed LCN cables is by using the $LMENU display, part of the LCN Cable Diagnostics displays, which provides a count of single cable transmissions received by each LCN node. If an LCN cable is crossed, the display shows a smaller number for any node that does not receive the single cable transmission. All nodes must have R420 (or later) software loaded and the master LCN node must have a Revision D firmware K2LCN board. For more information, refer to the LCN Cable Statistics section of the LCN Guidelines - Implementation, Troubleshooting, and Service manual.

10.8 Use the Channel Information Display to Monitor TPS/TPN Channel Activity

Channel Information Display description (R651)

With R651, Information for each TPS channel in a GUS node or in an APP node is collected in PSDPs and then shown on the Channel Information Display (CHANINFO) below. The PSDPs contain information such as the task associated with each channel, and whether the channel is configured as a high-priority data access channel. Refer to section 22 for the list of GUS and APP node PSDPs, and the PSDP definitions.

There are a maximum of 30 configurable channels that are shown on the display. The channels are allocated during node start-up. However, there are applications that request a channel when the application is started. In this case, a channel is allocated to the application if there is an available channel.



10.8 Use the Channel Information Display to Monitor TPS/TPN Channel Activity, Continued

Displaying channel information for a node

Perform the procedure in Table 10-18 to view channel information for a particular GUS or APP node.

Table 10-18 Displaying Channel Information for a Node

Step	Action
1	Select the Select for Node target on the CHANINFO display. Result: An entry port appears.
2	Enter the node number of the GUS or APP node.
3	Press ENTER key. Result: CHANINFO display for the requested node appears.
4	For more information about the items shown on the CHANINFO display, press the HELP key to view the help display.

Definitions of CHANINFO display items

Definitions of the terms that can appear in the CHANINFO display are contained in Table 10-19. The table also lists the applicable external load module for each software application that is allocated a TPS/TPN channel.

10.8 Use the Channel Information Display to Monitor TPS/TPN Channel Activity, Continued

Table 10-19 CHANINFO Display Definitions

Application Name	External Load Module	Application Description*
MS_SERVER_1	MSCHEM	GUS actors and parameter access
MS_SERVER_2	MSCHEM	GUS alarm collectors
MS_SERVER_3	MSCHEM	GUS trend support
MS_SERVER_4	MSCHEM	GUS PMK Support (raise/lower keys)
X$OKBAS	MSCHEM	GUS operator keyboard support
YH_ALARM_SRV	GUSALG	GUS alarm summary
YH_SERVER_1	YGOCX	Faceplate data collection
YH_SERVER_2	YGOCX	Faceplate data store
$$CDS_SERVER	AMCL06	Custom Data Segments
RESERVED	N/A	Channels are reserved for internal use and are not available to any application

The applications listed are standard applications. When optional applications are used, the name of the optional application is displayed instead of the standard application.

10.9 Use the FTE Status Display

FTE Status Display description (R684)

With TPN R684, two new FTE status schematics are introduced. $FTESTS1 shows the FTE status of the UCN nodes assigned to the selected ENIM. $FTESTS2 shows the status of all the FTE devices in the FTE community.

There are 8 pages of statuses for $FTESTS2 . You can navigate to these eight pages using the Page Up and Page Down keys on the keyboard. In addition, you can use the Page Fwd and Page Back targets on the schematic to navigate to the pages. Both schematics enables you to see the details of the specified EUCN node by selecting the status line to reveal a detailed status.

FTE Status Display changes (R686)

With TPN R686, the UCN Status Display has been modified to show FTE Cable Status for ENIM/ENBs.
Use the $FTESTS1 schematic (filtered by UCN node) and the $FTESTS2 schematic (filtered by device indexes for the complete FTE community) to troubleshoot FTE cable faults.

In addition to the navigation targets provided on Page 3 of the PERFMENU schematic to call up the $FTESTS1 and $FTESTS2 schematics, you may use invisible targets on the UCN Status Display over the value of the UCN Cable Status to navigate to $FTESTS1 schematic and over the value of the FTE Cable Status to navigate to $FTESTS2 schematic. This applies to ENIMs and ENBs.
ATTENTION: This assumes that the NET>TLK1 schematics have been installed and added to the area database schematic search path.

ATTENTION: The $FTESTSx displays still require you to initially enter the EUCN Network Number (01-20), as well as the Primary ENIMs UCN Node Number. This is a one-time initialization that is remembered.
Please note that when navigating to the $FTESTSx displays from different UCNs that you remember to modify the EUCN Network Number (01-20), as well as the Primary ENIM's UCN Node Number by selecting the "SPECIFY EUCN" target of the $FTESTSx schematics.

The view of the FTE Community comes from the Primary ENIM/ENB and may be different for different EUCNs.

A disjoined node (for example, a double FTE cable fault) will still be

shown in the “X X X X” state on the $FTESTS2 schematic, but will no longer contribute to the overall composite FTE community status.

You can still use the “RESET STATS” target of the $FTESTS1 and $FTESTS2 schematics to clear disjoined nodes.

Note: For an HPM-EHPM/NIM-ENB/ENIM-ENB hybrid pair, only the EUCN nodes communicating over the FTE network (that is, ENIM, ENB, and EHPM) are shown on the $FTESTS1 and $FTESTS2 schematics, and only if the primary node is an ENB.

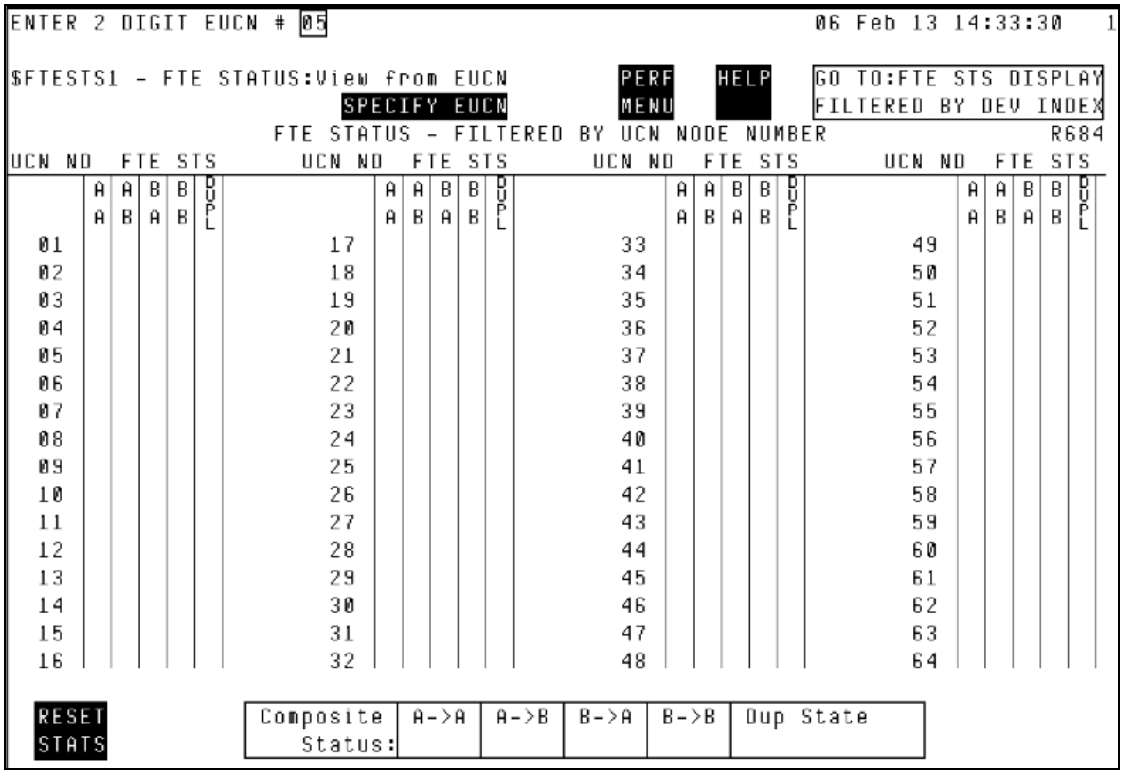
Initial call up of the display

Perform the following procedure to call up the display initially.

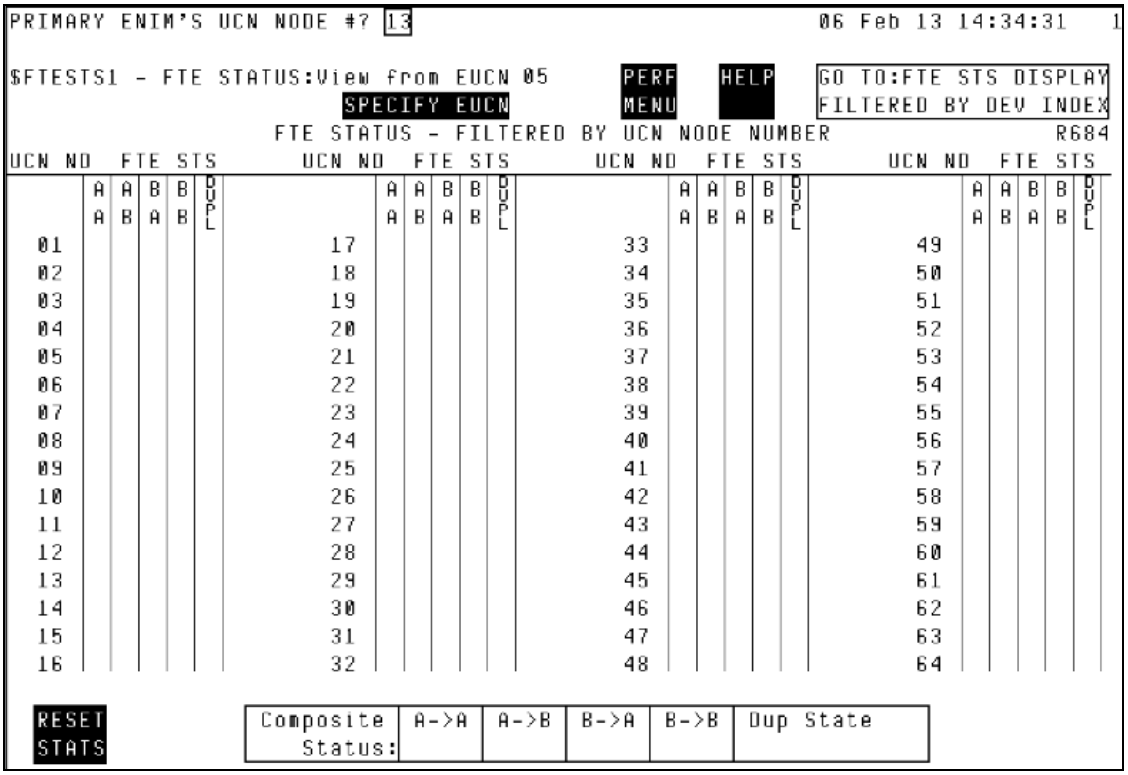
Table 10-20 Initializing Call Up of the Display

Step	Action
1	Click **Specify EUCN** target to view a particular EUCN (1-20).
2	Enter the two-digit EUCN number .
3	Enter the Primary ENIM’s UCN Node # so that the **Reset Stats** target can operate appropriately. The EUCN values are stored in the custom DDBs.

Entering the two-digit EUCN number



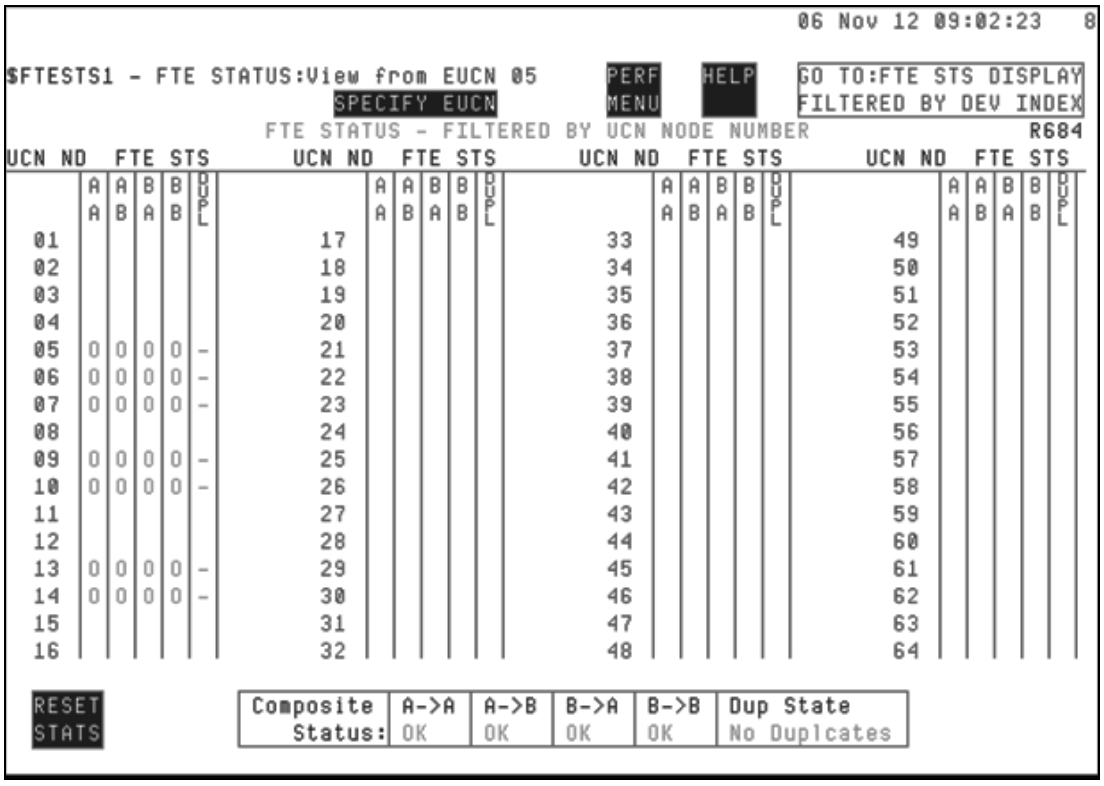
Entering the Primary ENIM's UCN Node #



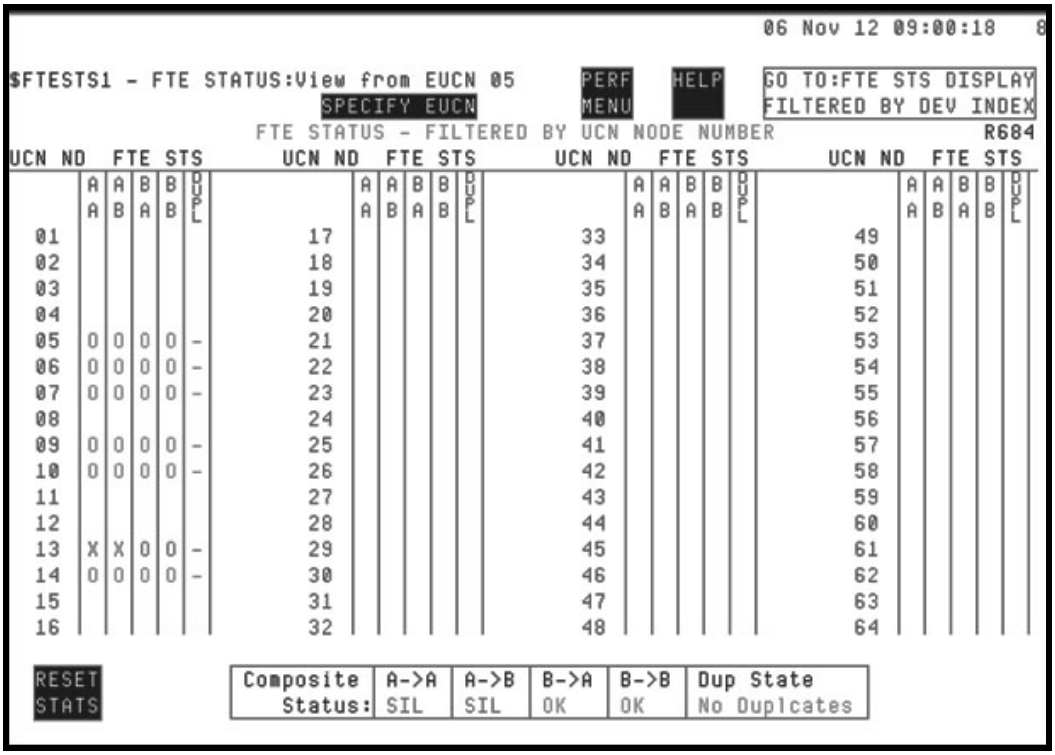
Interpreting the states of the FTE status

The following illustrations describes the states of the FTE cables on a EUCN network

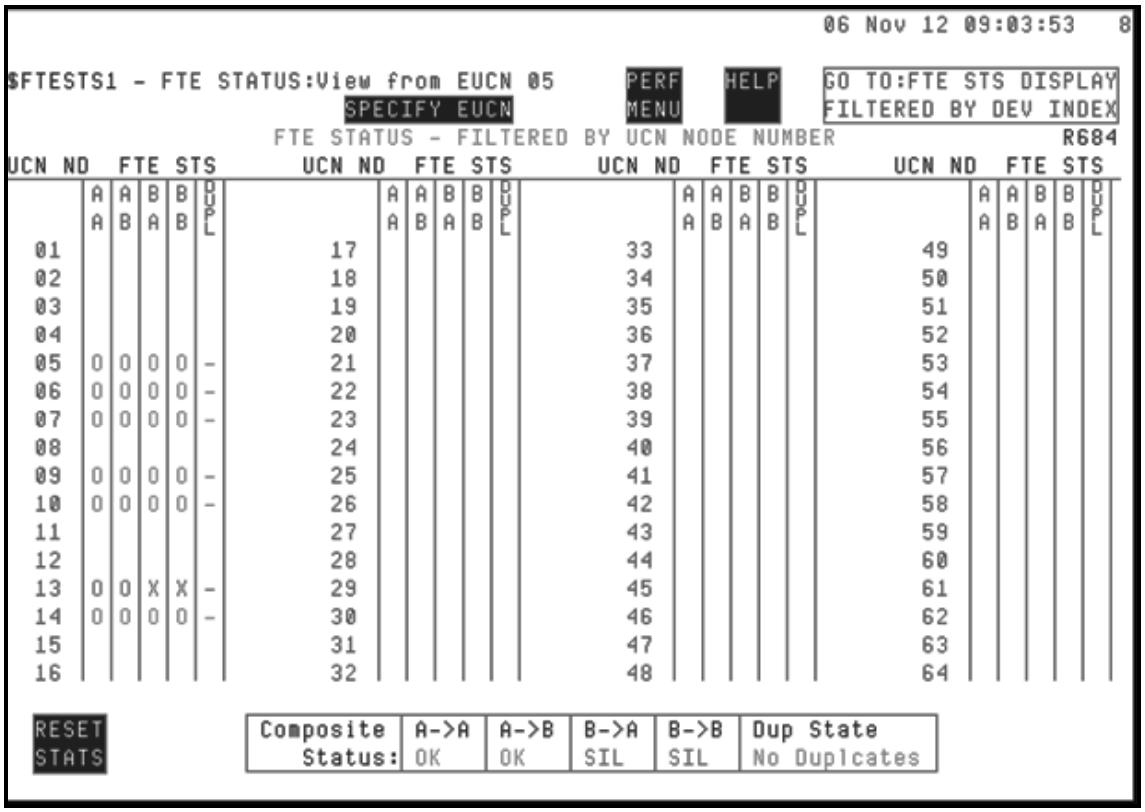
FTE Status Display (filtered by UCN) – All FTE Cables Good



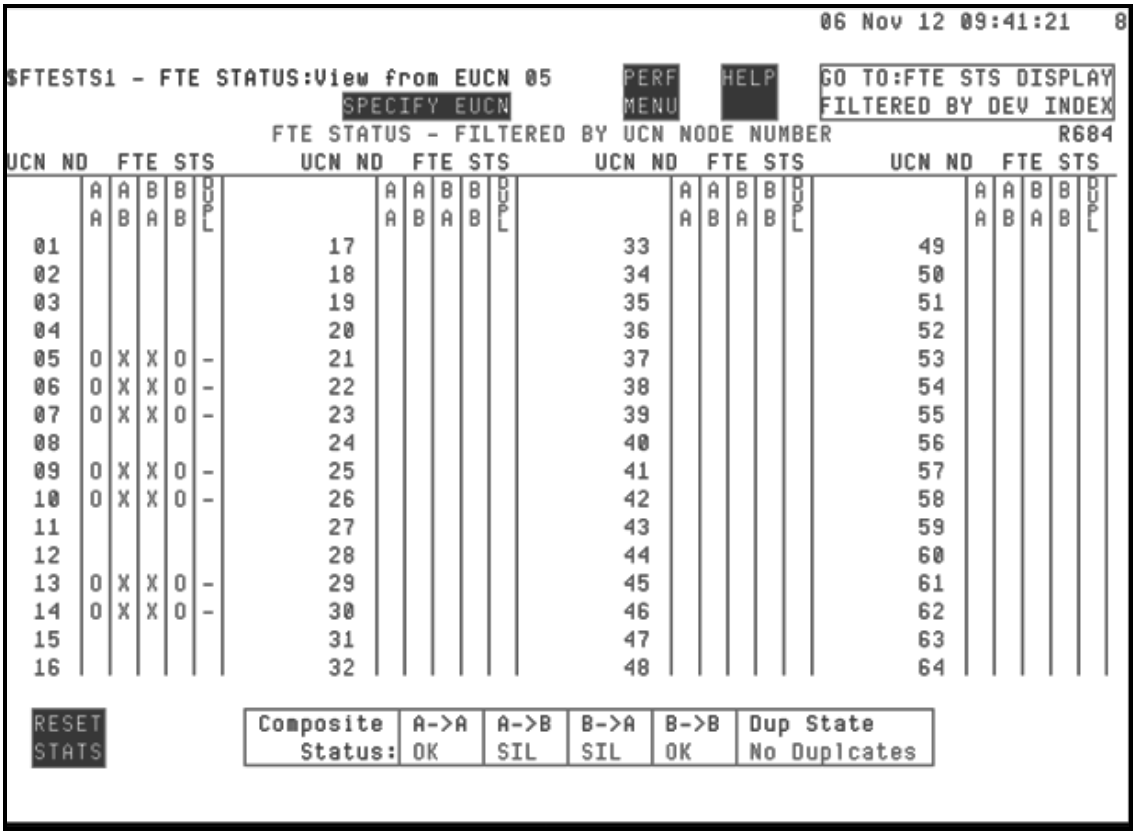
FTE Status Display (filtered by UCN) – Cable A shows BAD (FTE Cable “A” Pulled from EHPM 13’s EUCN I/F card)



FTE Status Display (filtered by UCN) – Cable B shows BAD (FTE Cable “B” Pulled from EHPM 13’s EUCN I/F card.



FTE Status Display (filtered by UCN) – Indication of Crossover Failure (Crossover Cable Pulled from FTE Switch)



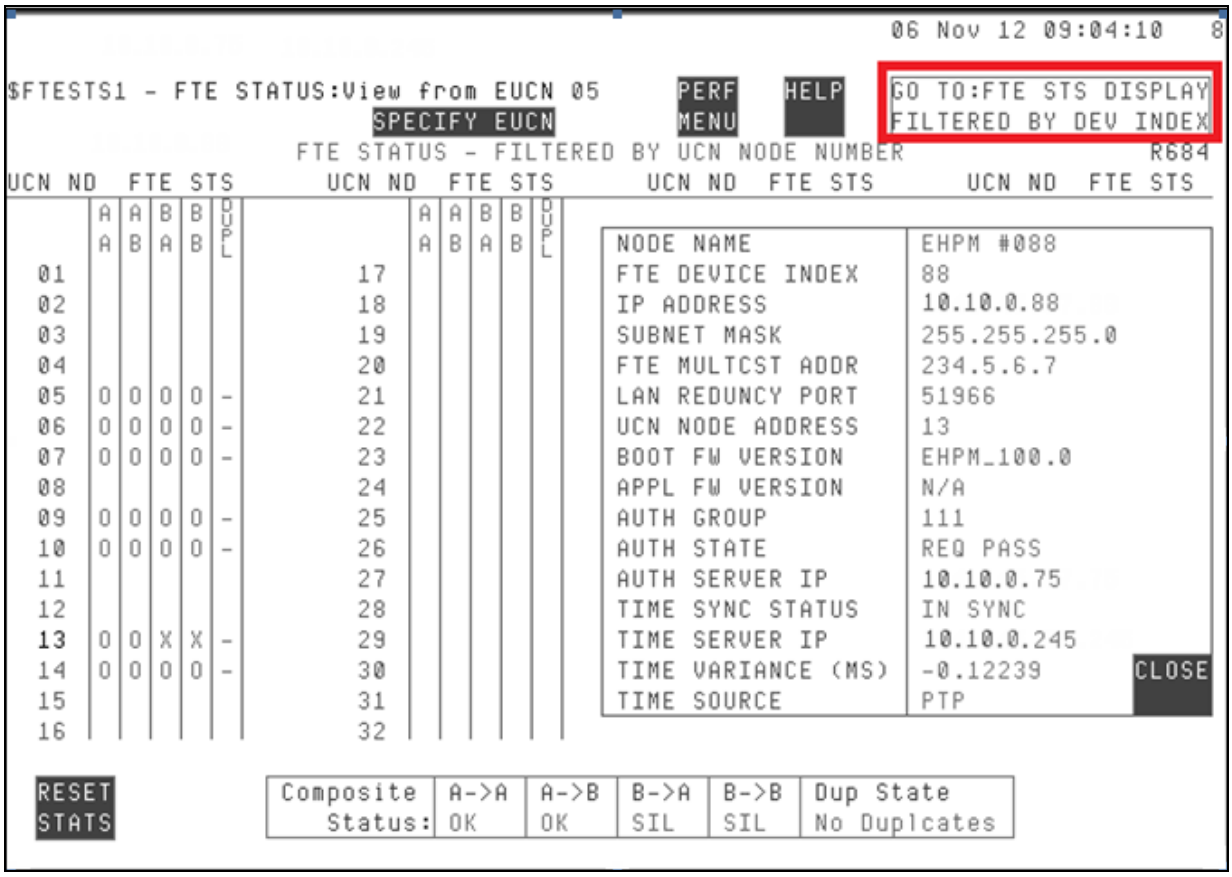
There are two FTE status schematics. The following table lists the differences between $FTESTS1 and $FTESTS2.

Differences between $FTESTS1 and $FTESTS2

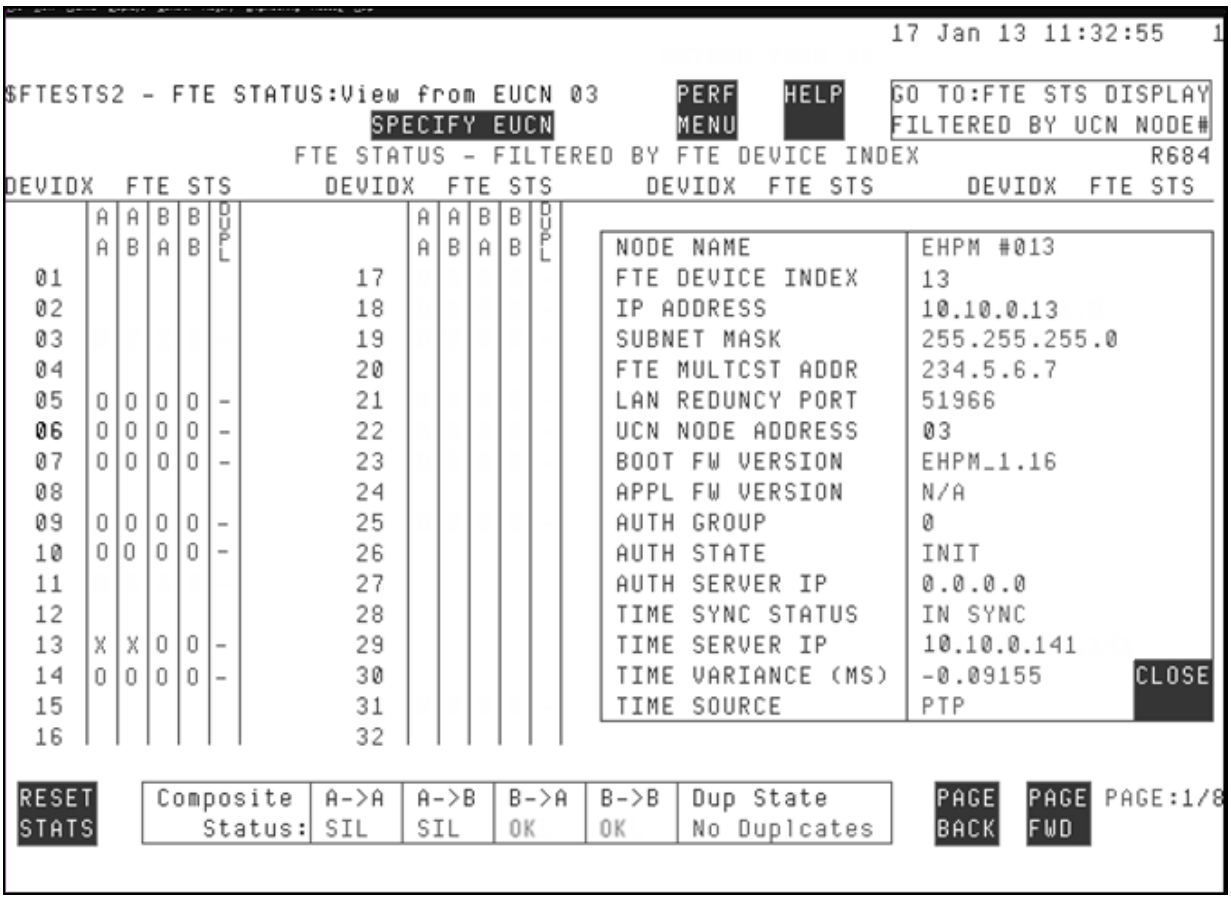
Table 10-21 Differences between $FTESTS1 and $FTESTS2

$FTESTS1	$FTESTS2
SFTESTS1 shows the FTE status of the UCN nodes assigned to the selected ENIM.	$FTESTS2 shows the status of all the FTE devices in the FTE community.
$FTESTS1 is filtered by the UCN Node Number, which has a range of 01-64.	$FTESTS2 is filtered by the FTE Device Index, which has a range of 01-509.

If you switch between $FTESTS1 and $FTESTS2 by selecting the target **GO TO FTE STS DISPLAY FILTERED BY DEV INDEX** available at the top right of each of the displays, the configuration values are retained.



The following illustration shows $FTESTS2 filtered by the FTE Device Index which has a range of 01-509. This display has eight (8) pages showing 64 FTE device indexes at a time. This display is showing the FTE Device Index of 13 (which is the EHPM for UCN node 10) with the bad "A" cable.
When the target over the bad FTE status is selected, a detail pane of information is shown which displays various important FTE related information. The Composite Status at the bottom of the display is also updated to show the current overall status.



Composite Status

It shows the composite status of all the FTE nodes.When the target over the FTE status is selected, a pane is displayed with important FTE related information. The Composite Status at the bottom of the display is also updated with the overall status. Composite status only shows red for individual status item that is wrong.
Note: The definitions are the same as the Experion FTE displays.

FTE Status Schematics scenarios

Note: ENIM is the Receiving Node and the associated EHPM is the Sending Node.

- A→A:
  0: When **Receiving Node's** A port is receiving communication from **Sending Node's** A port, the status **0** is indicated in green.
  X: When **Receiving Node's** A port is NOT receiving communication from **Sending Node's** A port, the status **X** is indicated in red**.**
- A→B
  0: When **Receiving Node's** B port is receiving communication from **Sending Node's** A port, the status **0** is indicated in green.
  X: When **Receiving Node's** B's port is NOT receiving communication from **Sending Node's** A port, the status **X** is indicated in red.
- B→A
  0: When **Receiving Node's** A port is receiving communication from **Sending Node's** B port, the status **0** is indicated in green.
  X: When **Receiving Node's** A port is NOT receiving communication from **Sending Node's** B port, the status **X** is indicated in red.
- B→B
  0: When **Receiving Node's** B port is receiving communication from **Sending Node's** B port, the status **0** is indicated in green.
  X: When **Receiving Node's** B port is NOT receiving communication from **Sending Node's** B port, the status **X** is indicated in red.

- **DUPL**:
  -: No duplicates
  P: Duplicate PdTag (PdTag stands for Physical Device Tag. This parameter shows the IOP physical device tag and it is used for display purposes only. For more information, refer to PM Family Parameter Reference Dictionary.
  D: Duplicate Device Index.
  B: Both Duplicate

Note: Individual lines of status show all red if anything is wrong. The individual EUCN nodes may show good status in $FTESTS1, but the composite status might be bad because another node in the FTE community might be bad. This node that is bad need not be an EUCN node. So, to view all the nodes in the FTE community (FTE Device Index range 1-509), you must scroll through all the 8 pages of $FTESTS2.

Detailed Status of the FTE schematics
Click each node to view the detail pane of information on the right side of the window.

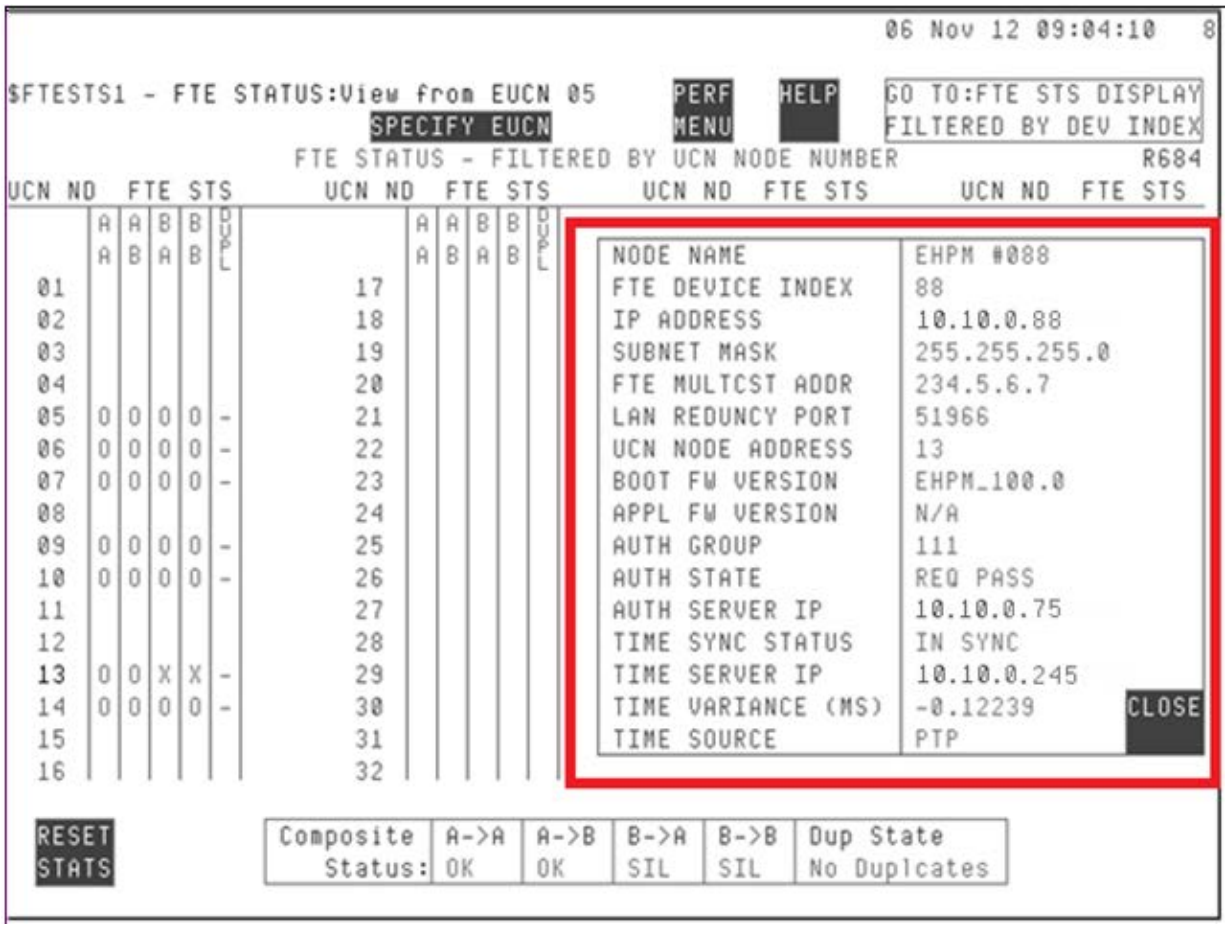


Table 10-22 Meaning of Different FTE Schematics

Description	Meaning
Node Name	The PdTag of the node, which is set by the device.
FTE Device Index	The FTE device index. This indicates the value from the hardware's rotary switches.
IP Address	Internet Protocol Address of the node. Last octet is set by the FTE device index.
Subnet Mask	Subnet Mask of the network.
FTE Multcst Addr	FTE Multicast Address: XXX.X.X.X (or bootp provided address)
LAN Reduncy Port	LAN Redundancy Port: 51966 (or bootp provided address)
UCN Node Address	The address of the node on the UCN. The UCN node address shows a floating address on the $FTESTS2 when the EUCN node is communicating through the FTE, but is not loaded with the personality. This is indicated in the UCN Node Address field on the $FTESTS2 as a tick mark ("`") followed by the node number.  For example, if a redundant EHPM in a left/right chassis is pinned as FTE Device Index 07 and 08, and configured as UCN node addresses 07 and 08, then the $FTESTS2 schematic shows the UCN Node Address field on the detail pane as "`07" and "`08", respectively, until the nodes are loaded with personality software. When the nodes are loaded, the UCN Node Address field shows "7" and "8" respectively. This matches the scrolling LED information on the front of the EHPM Comm/Ctrl board.
Boot FW Version	Boot Firmware Version
Appl FW Version	Application Firmware Version
Auth Group	Authentication Group. An identifier (odd number between 1-509) that groups EUCN nodes that communicates with each other. All EUCN nodes that communicates with each other must be in the same Authentication Group.
Auth State	Authentication State: Values can be NONE, INIT, REQ FAIL, REQ PASS, FAIL KEY, RESPSENT, RESPFAIL, RESPPASS, PENDING, OPERATE, SERVER, or MASTER.
Auth Server IP	Authentication Server's IP Address

Table 10-22 Meaning of Different FTE Schematics, Continued

Time Sync Status	Time Sync Status. Values can be NONE, LISTEN, IN SYNC, or FAILURE.
Time Server IP	The Time Source Server's IP Address
Time Variance (MS)	Indicates the node's time variance in milliseconds.
Time Source	Specific time source, where the values can be NONE, LCN, SNTP, or PTP.
RESET STATS	Helps to refresh the status of the disjoined node(s). This can take up to one minute, if the target is not selected.
Help	Shows the help for the display(s)

ATTENTION

To avoid performance impact on the ENIM, the FTE Detail Status for individual devices does not refresh the data automatically. To refresh the data on this display, re-select the specific target again.

$ETNDIAG Diagnostic Data

When a particular ETN node is selected, a detail pane of information is shown which displays various FTE network statistics. You can also use the CURR HOUR and PREV HOUR targets to view the current hour's and previous hour's FTE statistics.

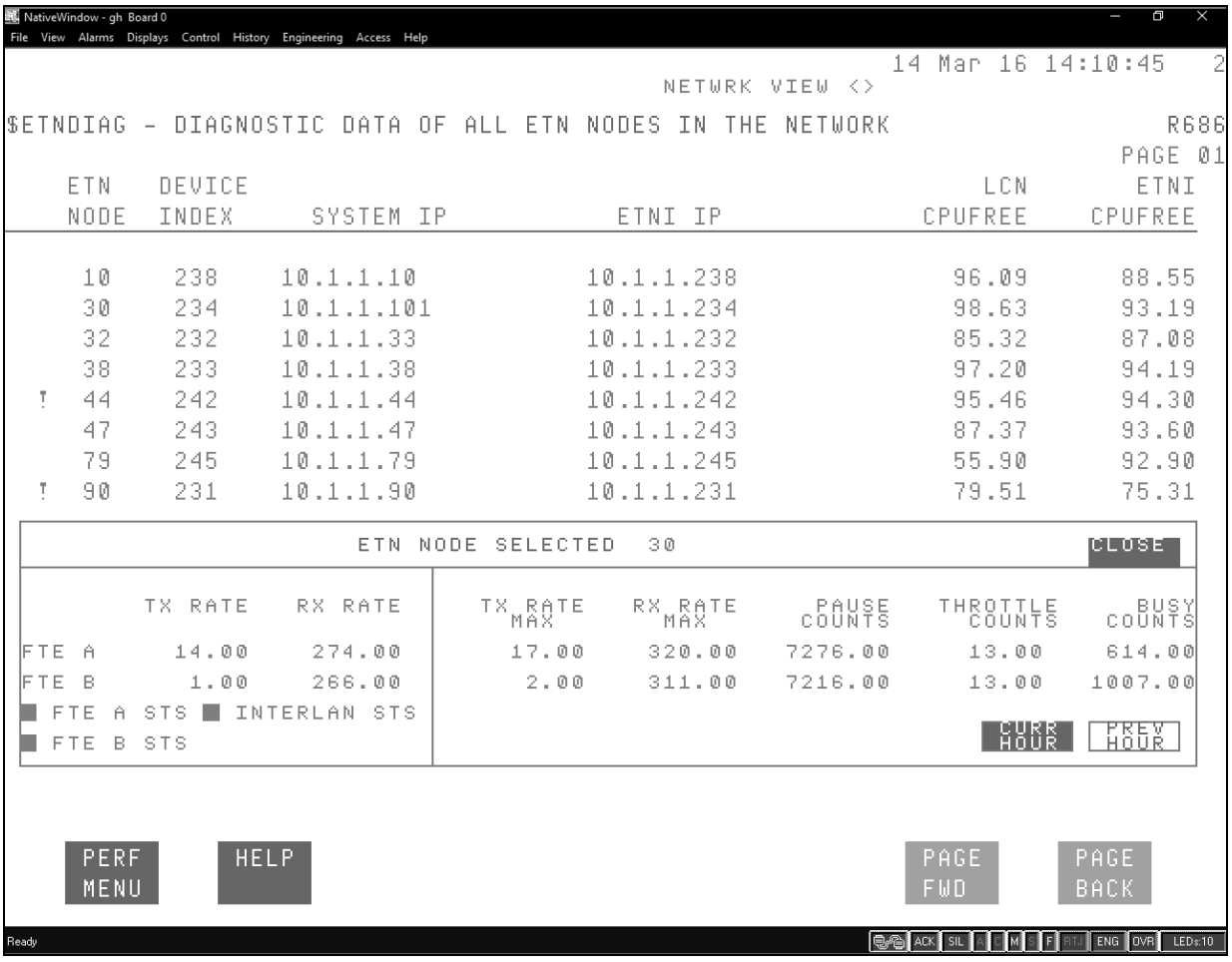


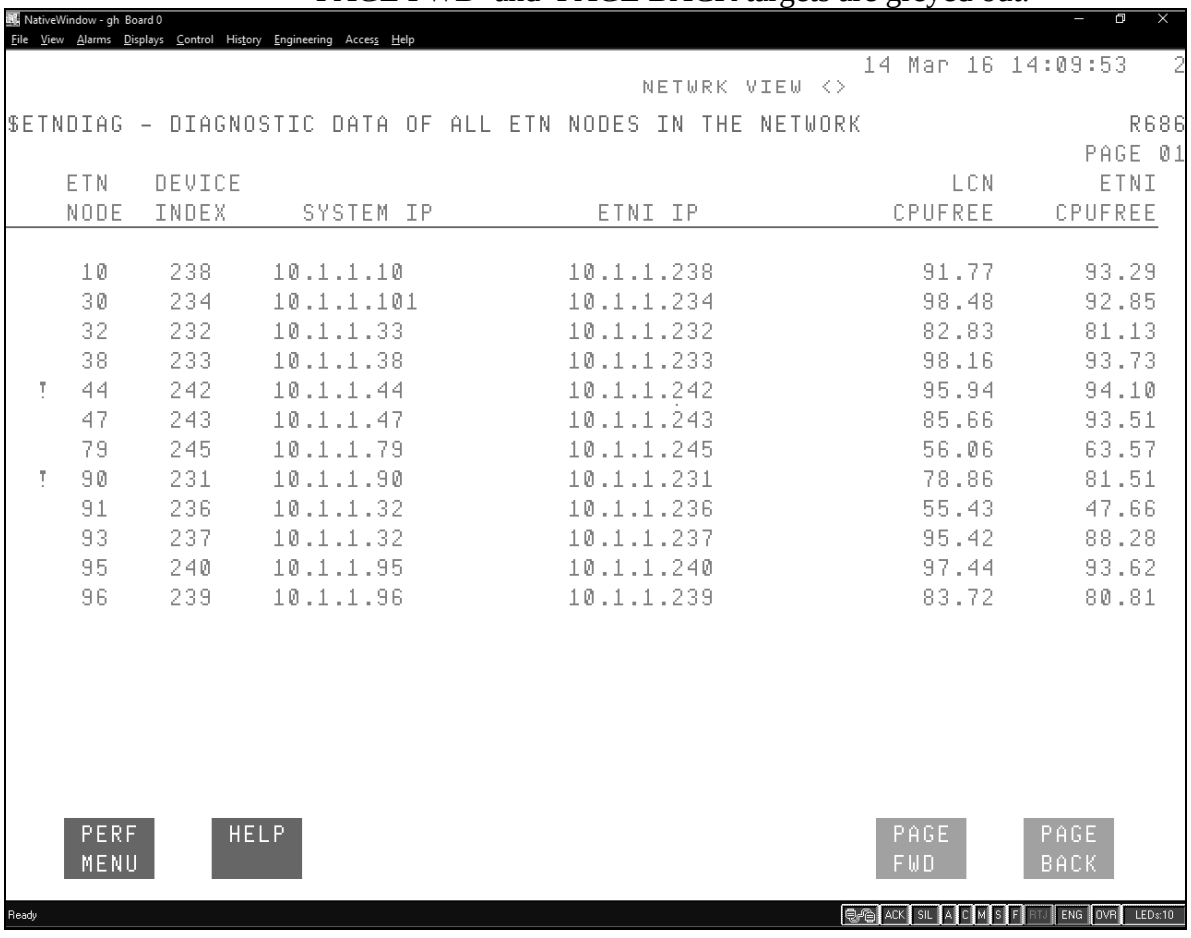
Table 10-23 Meaning of Different ETN Diagnostic Schematic

Description	Meaning
FTE NETWORK STATISTICS	
ETN Node	Shows the PdTag of the ETN node.
Device Index	Shows FTE device index of an ETNI processor board (which is the value set from the hardware's rotary switches).
SYSTEM IP	Shows IP address of X-Side (Microsoft Windows system) connected to ETNI processor board.
ETNI IP	Internet Protocol Address of the node. Last octet is set by the FTE device index.
LCN CPUFREE	Shows CPU free of ETN node's processor.
ETNI CPUFREE	Shows CPU free of ETNI processor board.
FTE A/B STS	Indicates Port A/B link status on ETNI-FTE interface.
INTERLAN STS	Indicates INTER-LAN communication status.
FTE NETWORK STATISTICS (calculated for both Current and Previous hour)	
FTE A/B TX RATE	Displays FTE Packet transmission rate for Port A/B.
FTE A/B RX RATE	Displays FTE Packet receive rate for Port A/B.
FTE A/B TX RATE MAX	Displays maximum FTE Packet transmission rate for Port A/B.
FTE A/B RX RATE MAX	Displays maximum FTE Packet receive rate for Port A/B.
FTE A/B PAUSE COUNTS	Number of times the Receive Processing is paused by the FTE Flow control logic.
FTE A/B THROTTLE COUNTS	Number of times the Receive Processing is blocked for one second due to high RX rate on the FTE link.
FTE A/B BUSY COUNTS	Number of times the Ethernet controller returned Busy status on receive.
LEGEND	
CONN_FAIL	Appears in place of System IP when ETNI doesn't have connection to X-Side.
!	Indicates composite failure status of ETNI FTE A/B cable and INTERLAN.
HELP	
HELP	Shows the help for the display(s).

10.10 Use the ETN Diagnostic Display

ETN Diagnostic Display description (TPN R686 and Experion R500)

With TPN R686 and Experion R500, a new ETN diagnostic display is introduced.
$ETNDIAG shows the diagnostic data of all ETN nodes in the network.
Each page shows maximum of 16 ETN nodes. You can navigate to these pages using the Page Up and Page Down keys on the keyboard. In addition, you can use the PAGE FWD and PAGE BACK targets on the schematic to navigate to the pages. It enables you to see the details of the specified ETN node by selecting the status line to reveal a detailed status.
Note: If the number of ETN nodes is less than or equal to 16, then the PAGE FWD and PAGE BACK targets are greyed out.



10.11 Use the $NODETYP schematic

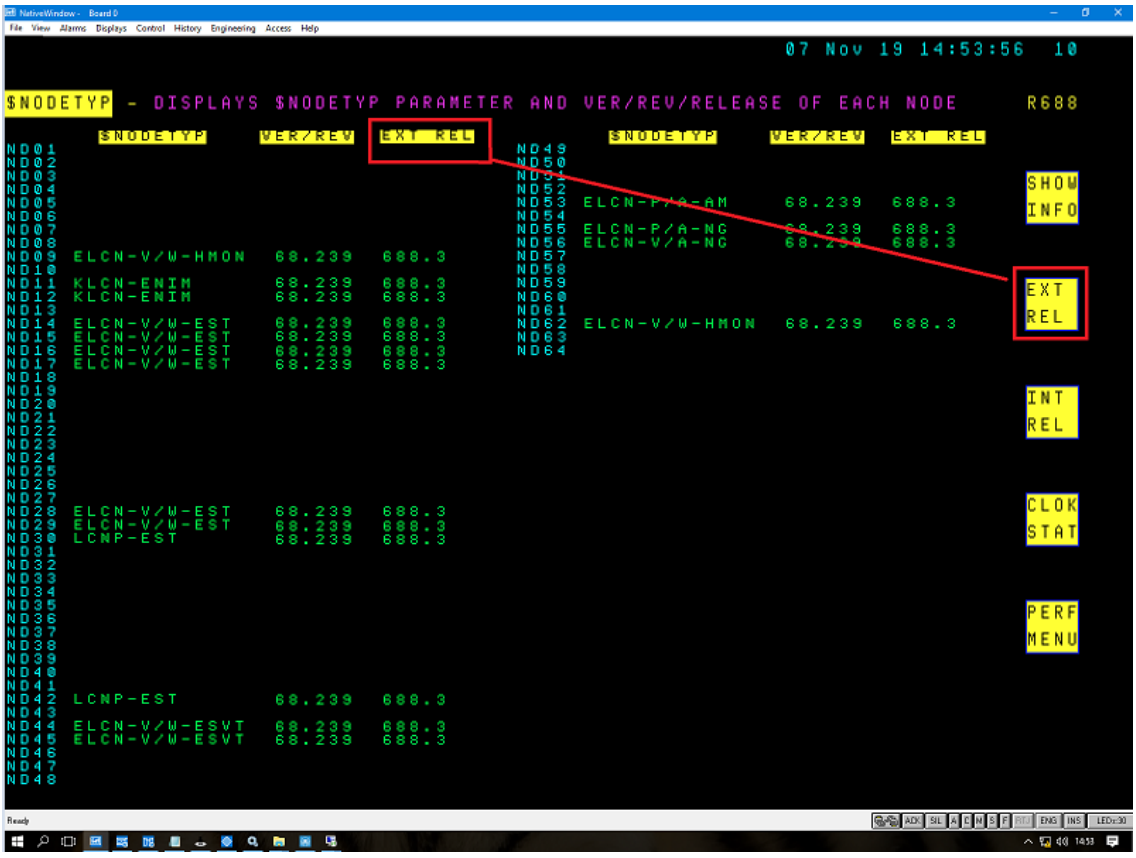
$NODETYP display

With TPN R688.3, a new diagnostic display “$NODETYP” is introduced. “$NODETYP” schematic displays the $NODETYP parameter (which shows the node platform and node type), TPN Software Version/Revision, and External/Internal TPN Release of every TPN node on the LCN.

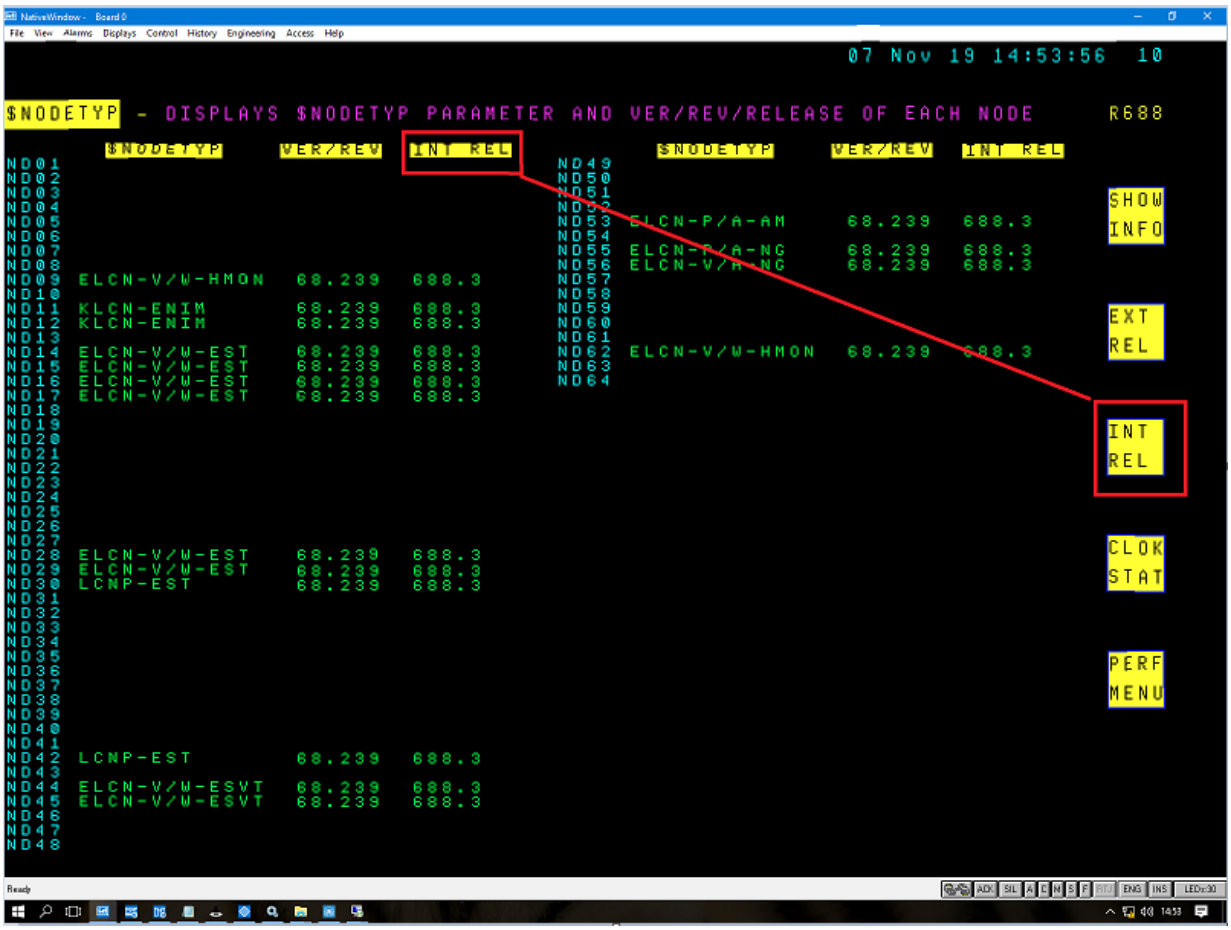
$NODETYP displays $NODETYP parameter and Ver/Rev/Release of each node.

Description	Meaning
SHOW INFO	Displays the help screen information for using the $NODETYP display.
EXT REL	Node’s external customer TPN release number.
INT REL	Node’s internal customer TPN release number used by Honeywell to determine which build specification is used to create the personality.
CLOKSTAT	This target calls up the CLOKSTAT schematic.
PERFMENU	This target calls up the PERFMENU schematic.

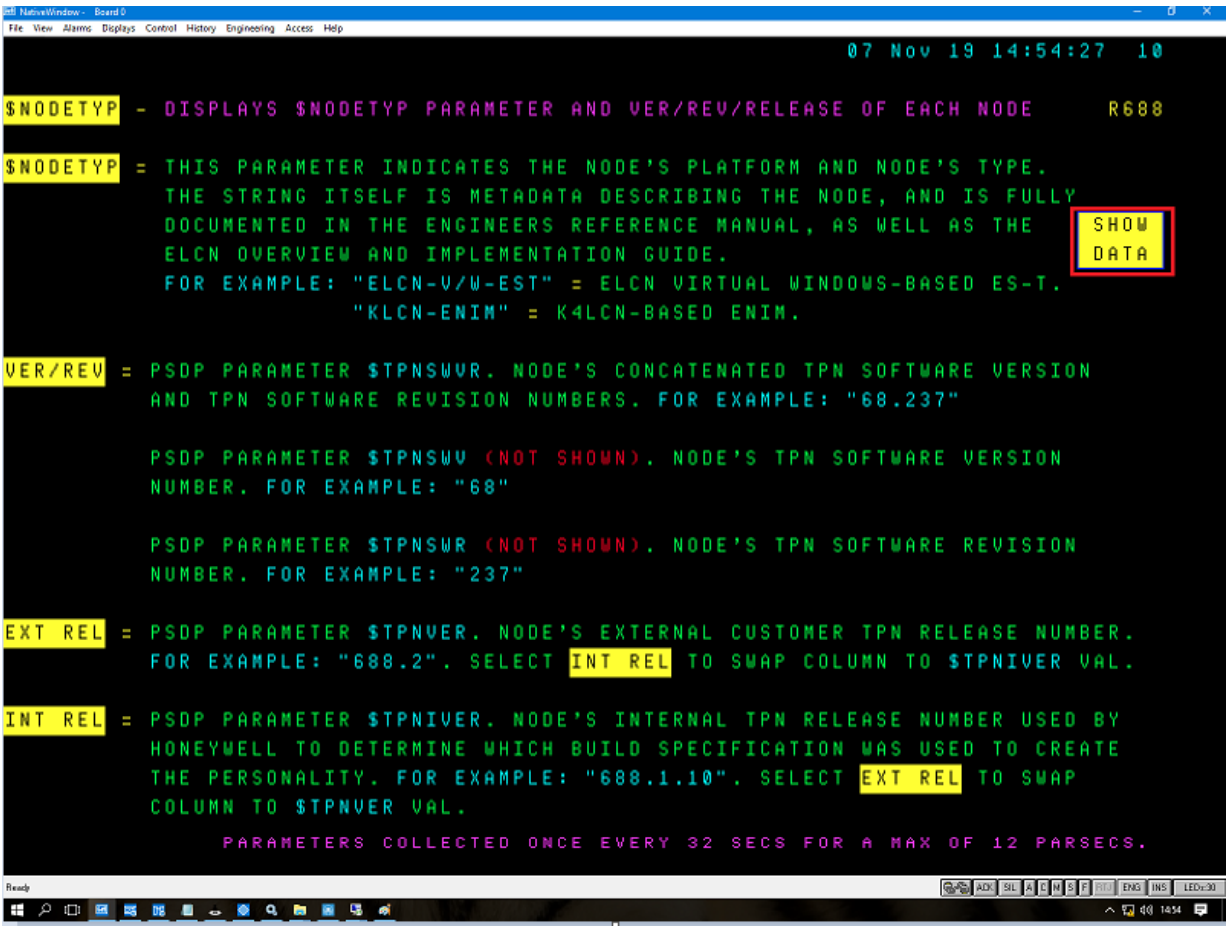
The following screenshot depicts the schematic when user clicks **EXT REL**.



The following screenshot depicts the schematic when user clicks **INT REL**.



This is the help screen for the $NODETYP schematic. Selecting "SHOW DATA" (or anywhere on the help display) takes you back to the main $NODETYP schematic."



10.12 Use the UCN Peer-To-Peer Traffic Analysis Tool

This section provides a representation of the Peer-to-Peer Traffic on a specified UCN.

Overview

The UCN Peer-to-Peer Traffic Analysis tool is a user interface in the form of a schematic (**$UCNP2P.DO**) which provides view to two main UCN peer-to-peer parameters for every node on a specified UCN, and also can create a spreadsheet file (that is, comma separated value file) containing these values. The values are average number of UCN Parameter Requests (NPRQUAVG) and the average number of UCN Parameter Responses (NPRSPAVG) values for all applicable nodes on a given UCN.

Tool Location

The UCN Peer–to-Peer Traffic Analysis Tool is available in two directories on the TPN media.

- The TLK1 directory of the &Z1 cartridge has the user interface schematic ($UCNP2P.DO)
- The TLK2 directory of the &Z3 cartridge has the installation instructions, AM/CL source file, Custom Data Segment and Parameter List source file, and Exception Build source file for the AM point.

Note: If you use the PRS2VOLZ.EC or PRS4VOLZ.EC Execute Command files, and choose to install TLK1 and TLK2, then the source files necessary for the UCN Peer-to-Peer Traffic Analysis tool will be automatically copied to the History Module.

Installation

Installation instructions for the UCN Peer-To-Peer Traffic Analysis Tool are included as an electronic text file (UCNP2PLD.XI) in the tool software inside the TLK2 directory.

10.12 Use the UCN Peer-To-Peer Traffic Analysis Tool (Operating instructions and examples)

This section describes and gives examples of the schematics that make up the UCN Peer-To-Peer Traffic Analysis Tool.

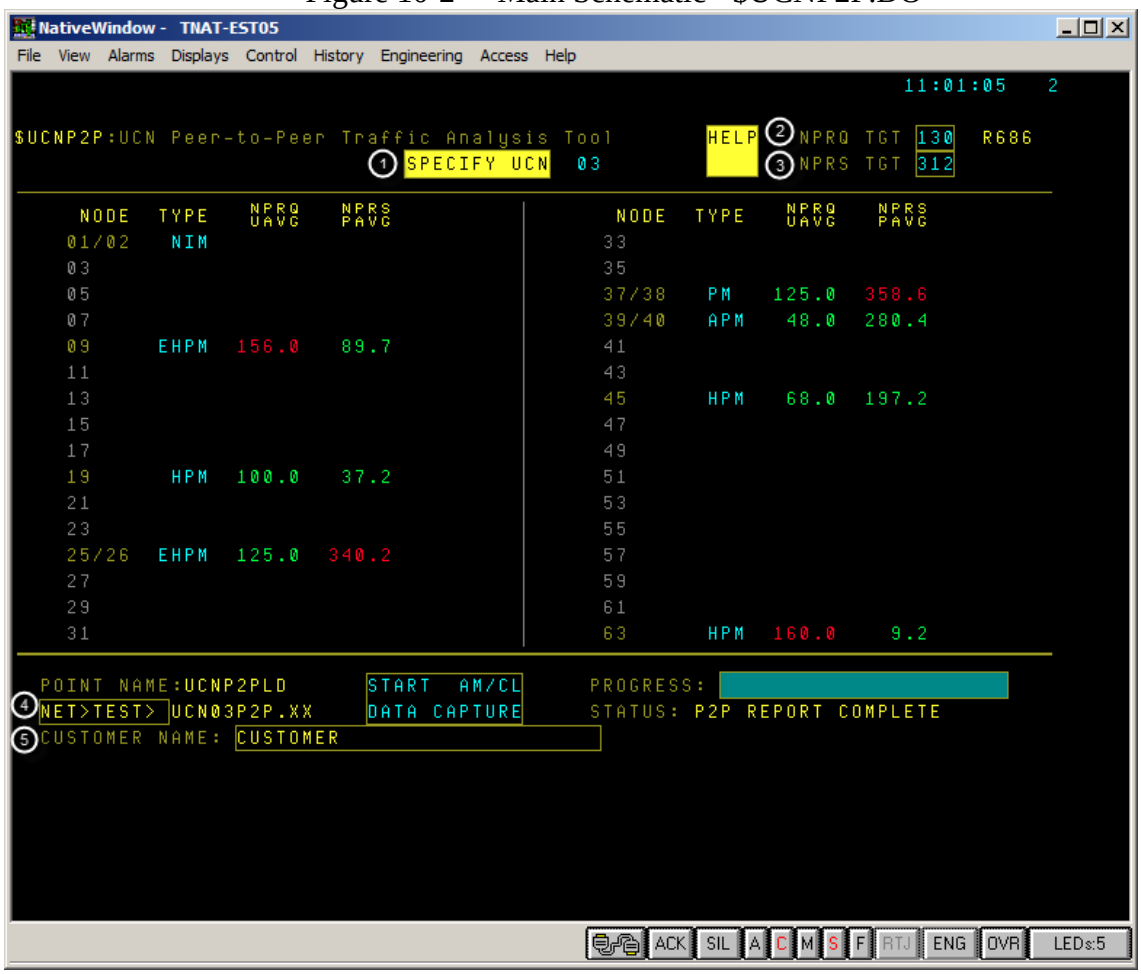
Main Schematic - $UCNP2P.DO

The following display is an example of the Main Schematic used to operate the UCN Peer-to-Peer Traffic Analysis Tool. The numbered screen selections and targets on this example correspond with the descriptive information on the following page.

From a station with a Universal Personality, Press SCHEM and enter $UCNP2P. By default, the schematic is installed into the TLK1 directory. Ensure that TLK1 is part of the default schematic search paths, or copy the $UCNP2P schematic to a directory in the default search path.

Note: The station MUST be in ENG keylock to use the schematic and application.

Figure 10-2 Main Schematic - $UCNP2P.DO



Note: Refer to the following table for information about each target highlighted in this figure.

10.12 Use the UCN Peer-To-Peer Traffic Analysis Tool (Operating instructions and examples)

Table 10-24 Main Schematic - $UCNP2P Initialization Target Information

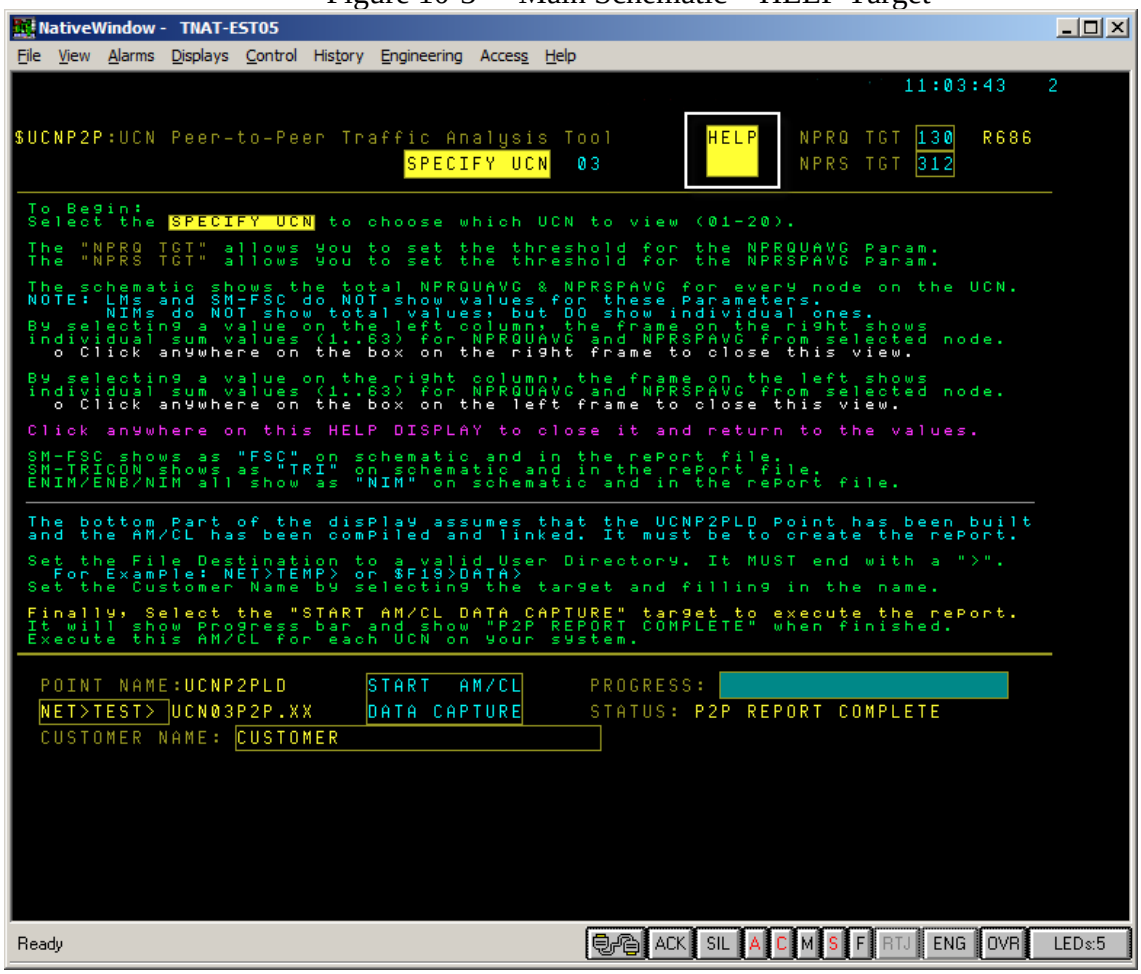
Numbered Screen Selection	Target	Information
1	SPECIFY UCN	Enter your UCN network number. If you need to switch to a different UCN network number, select the “SPECIFY UCN” target again and enter the new UCN network number.
2	NPRQ TGT	Enter the threshold value for the average number of UCN parameter requests per second between nodes (NPRQUAVG). If the values are less than the threshold, they will be shown in green, otherwise shown in red. It shows “50” by default.
3	NPRS TGT	Enter the threshold value for the average number of UCN parameter responses per second between nodes (NPRSPAVG). If the values are less than the threshold, they will be shown in green, otherwise shown in red. It shows “200” by default.
4		Select the target for the file destination path at the bottom left. It is set to “NET>TEST>” by default. Set it to a valid user directory, however, it must end with a ">". For example, NET>DATA> or $F19>FILE>.
5	CUSTOMER NAME	Enter a descriptive name for your site (for example, “Honeywell DE Lab”). It is set to “CUSTOMER” by default.

10.12 Use the UCN Peer-To-Peer Traffic Analysis Tool (Operating instructions and examples)

Main Schematic – HELP Target

Selecting the HELP target on the Main Schematic will bring up the Help Schematic, as shown in the following display. This help display provides an overview on how the UCN Peer to Peer Traffic Analysis Tool operates.

Figure 10-3 Main Schematic – HELP Target



Note: Click anywhere on the help display to close it and return to the main schematic.

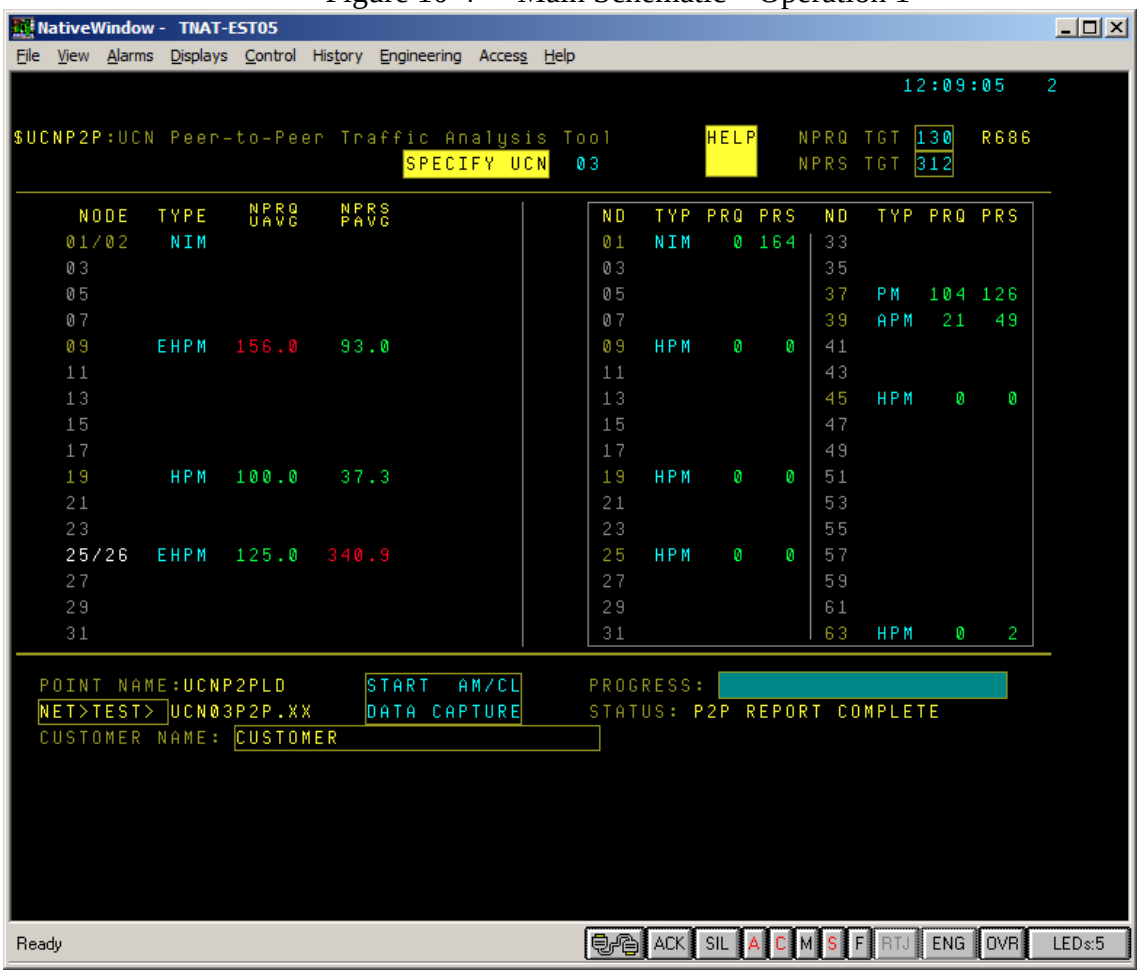
10.12 Use the UCN Peer-To-Peer Traffic Analysis Tool (Operating instructions and examples)

Main Schematic – Operation

1. After entering the “SPECIFY UCN”,”NPRQ TGT”, and “NPRS TGT” targets, the selected UCN Node configuration is shown. The NPRQUAVG(0) and NPRSPAVG(0) values are shown by default. These are the sums of (1..63) for those parameters.

2. Click on a value on the left column, then the node index turns white, and then the frame on the right shows the individual sum values (1..63). For example, node 25/26 target is chosen and the values on the right frame are values from $NM03B25.NPRQUAVG(1..63).

Figure 10-4 Main Schematic – Operation 1



Note: This figure shows an example of the display of parameter values for boxes 1-31.

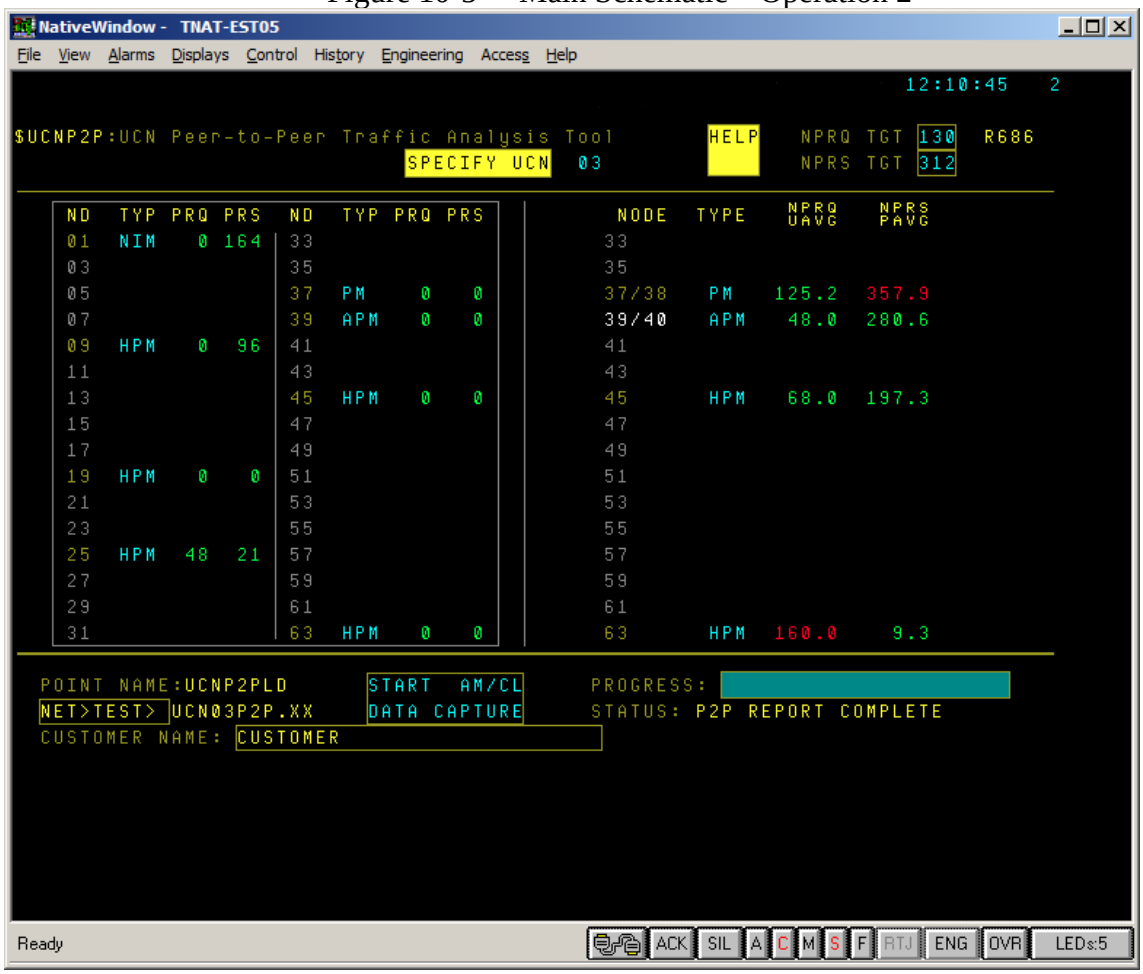
10.12 Use the UCN Peer-To-Peer Traffic Analysis Tool (Operating instructions and examples)

Main Schematic – Operation

3. Click anywhere on the box on the right frame to close this view and return to the default.

4. Click on a value on the right column, then the node index turns white, and then the frame on the left shows the individual sum values (1..63). For example, node 39/40 target is chosen and the values on the left frame are values from $NM03B39.NPRQUAVG(1..63).

Figure 10-5 Main Schematic – Operation 2



Note: This figure shows an example of the display of parameter values for boxes 33-63.

10.12 Use the UCN Peer-To-Peer Traffic Analysis Tool (Operating instructions and examples)

Main Schematic – Operation

5. Click anywhere on the box on the left frame to close this view and return to the default.

6. **Note:** No data is shown for SM-FSCs or LMs for the NPRQUAVG and NPRSPAVG parameters. NIMs do **NOT** show total values, but **DO** show individual ones.

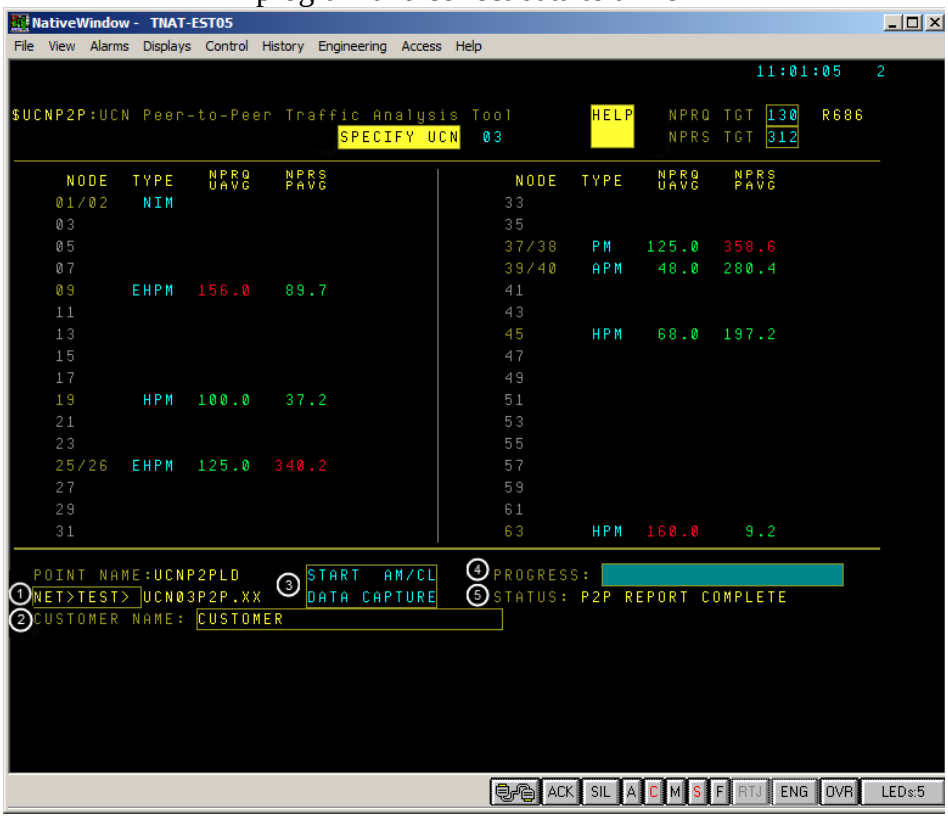
7. Special cases on schematics and report files are as follows:

   - SM-FSC is shown as "FSC" on the schematic and in the report file.
   - SM-TRICON is shown as "TRI" on the schematic and in the report file.
   - ENIM/ENB/NIM is shown as "NIM" on the schematic and in the report file.
   - EHPMs are shown as "EHPM" on the main schematic, but as "HPM" on the detail frame due to space restrictions. EHPMs are shown as "EHPM" in the report file.

10.12 Use the UCN Peer-To-Peer Traffic Analysis Tool (Operating instructions and examples)

Main Schematic – Run the UCNP2PLD AM/CL program and collect data to a file

Figure 10-6 Main Schematic – Run the UCNP2PLD AM/CL program and collect data to a file



Note: This figure shows an example of the main schematic for executing the UCNP2PLD tool - $UCNP2P.

1. Ensure that the target for the file destination path at the bottom left (numbered screen selection 1) and the target for "CUSTOMER NAME" (numbered screen selection 2) are entered correctly. Destination path must end with a ">". For example, NET>DATA> or $F19>FILE>.

2. Now, you are finally ready to run the AM/CL program, click on the "START AM/CL DATA CAPTURE" target (numbered screen selection 3) and then press ENTER.
   - It takes about 15 seconds to initialize (statuses are shown).
   - Next, the AM/CL program starts and you will see the "PROGRESS" bar (numbered screen selection 4) starts to update and the "Status" (numbered screen selection 5) changes to "P2P REPORT RUNNING" and blinks in white color.

- You will also notice that the filename updates will be in the form "UCNnnP2P.XX" (numbered screen selection 1), where nn is the UCN network number you entered above.
- Wait until this progress bar finishes and the "Status" (numbered screen selection 5) changes to "P2P REPORT COMPLETE". It could take up to 10 minutes on a large system to complete.

10.12 Use the UCN Peer-To-Peer Traffic Analysis Tool (Error Handling)

The following table provides a list of error messages that might be produced by the UCN Peer–to-Peer Traffic Analysis Tool application. These are shown on the $UCNP2P schematic, next to the text “Status:”

Table 10-25 Error Messages

Error Message	Meaning	Remedy
ERROR CREATING FILE	File path name invalid or HM has been powered off or failed.	Correct the pathname on the lower left of the $UCNP2P schematic. You may have forgotten to end the path name in “>”, for example, NET>TEST>. If it is an issue with History Module, restart History Module.
ERROR OPENING FILE	HM has been powered off or has failed.	Restart History Module.

10.12 Use the UCN Peer-To-Peer Traffic Analysis Tool (Data Return by Request Only)

Description

The intent of this tool is to provide Honeywell Development Engineering with a method of capturing peer-to-peer traffic on a specific UCN, as well as other key performance parameters.

Section V of the UCNP2PLD.XI Installation Instructions file (in the TLK2 directory) contains installation instructions and mentions specific data to be captured and returned to Honeywell. Do NOT return this data to Honeywell unless specifically requested by Honeywell TAC (or Honeywell Development Engineering) to do so. In certain circumstances, Honeywell TAC or Honeywell Development Engineering may request you to provide the requested data.

Section 11 – Schematic Files

11.0 Overview

Introduction

The Picture Editor is used to build the custom schematics (graphic displays) that describe the customer's process.

The Picture Editor allows you to interactively create a graphic representation of portions of the process for the operator to use. The schematic is written to a source file, using subpictures as desired.

Figure 11-1 illustrates the picture editor-file relationships.

References

Refer to *Picture Editor Data Entry*.

11.1 Picture Editor Tips

Introduction

The following tips may be useful for building schematics with the Picture Editor.

Text versus Graphic

Alpha (Text) versus Graphic—Each character is a distinct object and its text (alpha) has two levels: Foreground and Background. The priority scheme (where G is graphic, F is foreground text, and B is background text) is as follows:

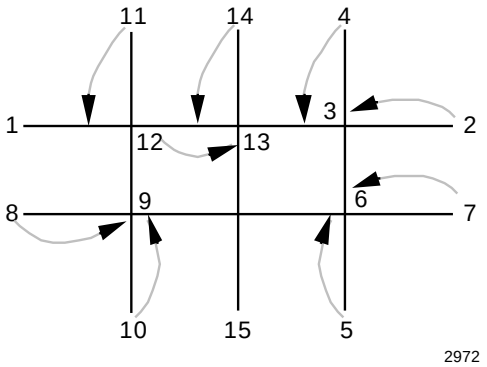
- GFB—Graphic object obliterates the portion of the alpha object under it.
- FBG—Alpha object obliterates the portion of the graphic object under it at a character-resolution level (that is, a space "blanks" a character position of the graphic, 8x16 pixels in size).
- FGB—Alpha object obliterates only the portion of the graphic object under the character lines of the alpha object (that is, graphic shows between and within open areas of characters). This can also provide more flexible color priorities.

Line optimization

If a line with text on top is desired, draw one line and set priority FBG so text shows on top.

You can draw lines with up to 50 segments. You can more efficiently draw complex images with lines and segments by retracing segments instead of drawing multiple lines.

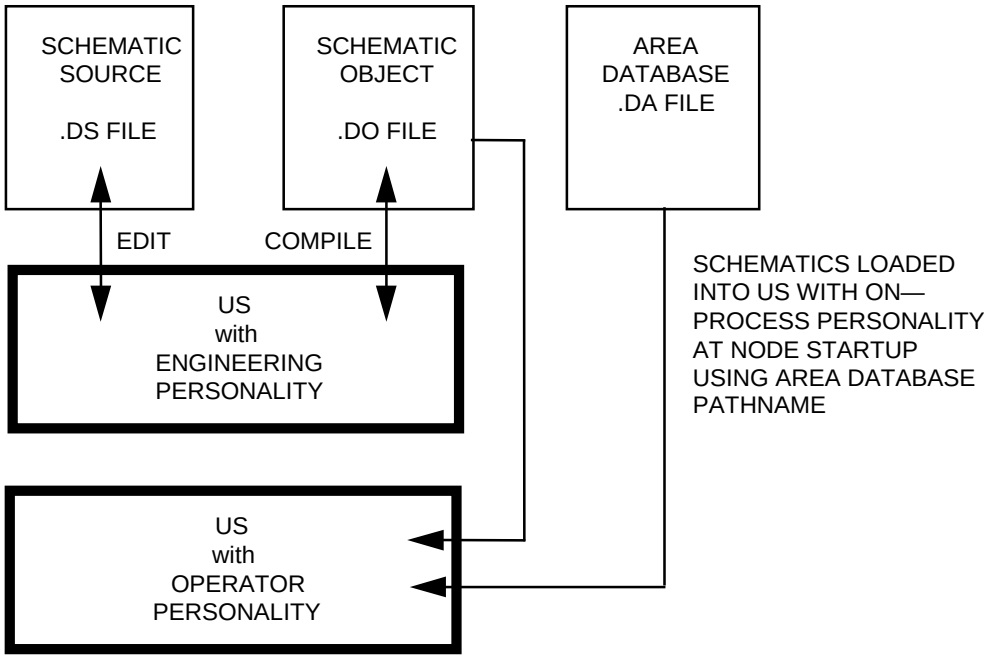
For example, you could more efficiently build, store, and invoke this apparent 5-line image by drawing it as fourteen segments, retracing as indicated by the dashed curves, than you could by drawing the image as five individual, one-segment lines.



Relationships

The figure below shows the relationships between Picture Editor files.

Figure 11-1 Picture Editor File Relationships



Note: The US Operator Personality is loaded as shown below. The room remaining for schematics depends on the size of the various components and the number of schematics depends on the size of the schematics load.

1. PERSONALITY IMAGE
2. NCF DATA
3. AREA DATABASE
4. STANDARD DISPLAY ABSTRACTS
5. BUTTON CONFIGURATION
6. SCHEMATICS (in order of pathname catalog)

1232

Color Priority

Remember that colors of graphic objects have a priority similar to that for alpha and graphic. The priority (and color "number") for the highest to lowest (highest covers or overwrites lower) color are the following:

Table 11-1 Color Priority

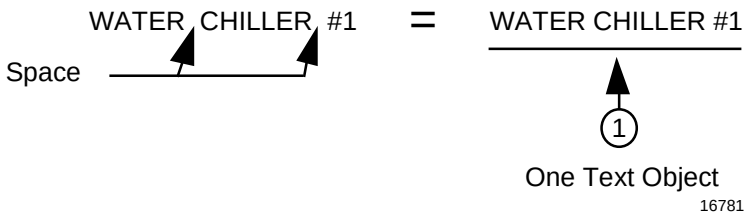
WHITE	7	MAGENTA	5	YELLOW	3	RED	1
CYAN	6	BLUE	4	GREEN	2		

Also remember that subpictures are added to the schematic using the current color. This affects the priority of the subpicture.

Text Optimization

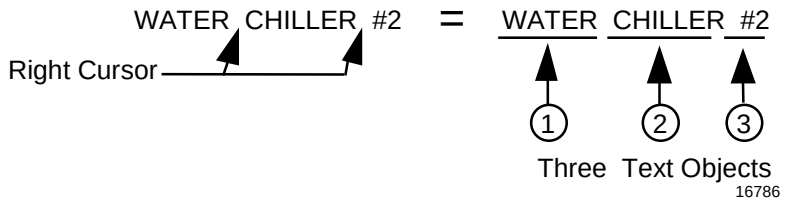
As the number of text objects increases, the size of the source and object files and the invocation time increase. The following characteristics of text objects should be understood to help keep text objects at a minimum:

- Characters added to a picture in separate ADD TEXT commands are held as separate text objects.
- Characters added on different lines of the picture are held as separate text objects.
- Horizontally contiguous characters are added as one text object if no behavior change occurs.
- A space created by the SPACE BAR is a legitimate character and takes room in the source and object files (see illustration below).



Text Optimization, continued

- A space created by the CURSOR controls is **not** a legitimate character. It acts as a delimiter for determining a new object (see illustration below).



NOTE: In this instance, the **cursor does not save space** because it causes the creation of another text object in the Picture Editor.

Subpictures

Performance of the display is always decreased by using subpictures. The primary purpose is to simplify schematic building by establishing a library of frequently used subpictures on the schematic volume or directory on an HM, if available, or on a special, library disk. A complex subpicture must be used three times before the overall size of the source files for schematics is reduced. A simple subpicture may have to be used 20 times before the overall size of the source is reduced; however, subpictures always reduce the size of the object file.

Common Abbreviations

The following common abbreviations are used in the Picture Editor:

Table 11-2 Common Abbreviations

Commands		Colors	
ADD	A	BLACK	BLK
DELETE	DEL or D	BLUE	BLU
LINE	L	CYAN	CY or C
MODIFY	MOD or M	GREEN	GR or G
		MAGENTA	MAG or M
MOVE	MOV	RED	R
NEW	N	WHITE	WH or W
READ	R	YELLOW	YEL or Y
SCALE	SC		
SELECT	SEL		
SET PATH	SP	**Intensity**	
SOLID	S		
SUBPICTURE	SUB	FULL	FUL or F
TEXT	T	HALF	H
TRANSLATE	TR		
WRITE	W		

Changing behavior

When changing behavior, first select the behavior to be changed, then add the new behavior.

Editing keys

The primary keys on the engineering keyboard for editing are:

CANCEL—Used to recover from the last command entered. Cancels and restores the schematic as it existed before last command.
ERASE—Used to erase last coordinates entered. The command is terminated if all coordinates for the command are erased.

Use separate removable media for files and subpictures

Using separate disk directories for Files and Subpictures—When building a schematic that uses many subpictures from a disk library, build the schematic on the library medium, then copy it to the display medium when complete. This prevents transferring large numbers of subpicture files to the build disk.

Building Displays

Enter text first, then subpictures, lines, and so on. There is less flexibility with text than with subpictures and lines. Enter lines in text mode as much as possible. This allows for faster build time and even lines and spaces.

Entities are bound to schematic when compiled

Remember that the entities are bound into the schematic as they are compiled. The entities referenced in the schematic must be built and loaded, and the owning node must be operating on the LCN when the schematic is compiled.

Deleting entity from node does not delete entity

Remember that deleting an entity from the owning node does not automatically delete the entity from references in schematics, CL programs, groups, and so on. If an entity is being removed from the system, the schematics, CL programs, groups, logs, and so on., must be rebuilt and recompiled with the entity reference removed.

Use layout forms

The schematic layout forms (*SW88-551* to *-559*) help to make the build process more efficient.

Schematic loading order

Remember that the schematics are loaded into a US at startup, based on the order listed in the pathname catalog, and the number of schematics loaded depends on the space available after loading the other data in the US, and the size of the schematics being loaded from the catalog.

CAUTION

CAUTION—**"Semireserved" Entity Names**—Several entity names are reserved for use by the Picture Editor and the Button Configurator. In many cases, if you happen to use one of these names for a data point name (tag name), there will be no conflict. If you do use one of these names as a tag name, that data point can't be accessed by the Picture Editor nor the Button Configurator. Therefore, if you are, or will be, using the Picture Editor or the Button Configurator, you must refer to Appendix C of the *Picture Editor Reference Manual*, to see the list of "semi-reserved" names, and to make sure that you don't use any of them as a tag name.

Section 12 – Control Language Files [Task 28]

12.0 Overview

Introduction

This section provides tips and precautions for the use and handling of the data and files used in compiling, linking, and loading CL programs.

Keep the following principles in mind during CL operations.

CAUTION

CAUTION—These items are extremely important because, if, for some reason, you are unable to use data from the HM to restart a node, you will need the backup &ASY medium to restart that node. The latest .SE , .SP files must be available to reload USs and CGs, and if they are not, you may have to go through a major rebuild of your CL functions. The .GD files must be available to rebuild and reload data points.

- Remember to copy your .SE and .SP files to any new &ASY medium provided with a software update.
  - The custom names you have built are saved only if you replace the empty .SE and .SP files on the Honeywell-supplied &ASY with the .SE and .SP files from your operating &ASY.
  - Execute-Command files ASY_BKUP.EC and CLNCFBKUP.EC are provided on the Honeywell &ASY disk to help maintain these files (see your latest *Customer Release Guide*). Immediately after copying these files, use the Utilities' Protect command to protect them from being accidentally overwritten or deleted (of course, you will need to unprotect them the next time you make such a backup copy).
- Also remember to make a backup copy of your custom GDF (.GD) files on a disk, so that if those files become unavailable from the HM you still have GDFs to use in rebuilding or reloading points with CDSs.

  These backup files should also be protected.

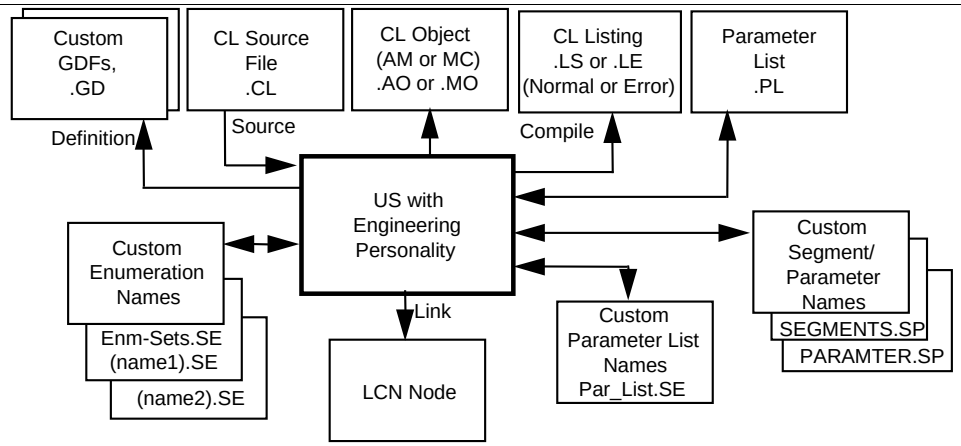
12.1 File Handling Tips

File name consistency	**Remember that a US or CG cannot start up unless the &ASY directory used by that node contains the version of the name files that is consistent with the other USs and CGs in operation on the LCN.**
Make backup copy	Be sure to make a backup copy when you update your parameter-list (.PL) files on your CL Parameter List volume or directory (through the Compiler's -UL option).
Use of two floppies	When using two disk drives for CL operations, the first disk drive has the disk with the source that contains the object, listing, GDFs, and parameter list and the second disk drive has the &ASY disk.
Entity not automatically deleted from CL reference	Remember that deleting an entity from the owning node does not automatically delete the entity from CL references.
Deleting points	Once a number of CL slots is established on an AM point, that number can't be reduced except by using the DEB to delete the point, then rebuilding the point. If the point is deleted and rebuilt, and CL is to be used with it again, CLSLOTS must be set to at least the number of blocks to be linked to the point, and the CL structures must then be relinked to the point.

File relationships

The figure below shows the relationships between CL files.

Figure 12-1 CL File Relationships



Note: There is a separate suffix for AM and MC object and listing files for normal listings or listings with errors.

The custom name files and standard parameter lists exist on the &ASY volume.

Section 13 – Area Database, Content, and Use

13.0 Overview

Introduction

This section describes the content of the area database and how the area for a console is established. It also points out that changes to the area database actually take place in a US only when the database is loaded into that US. The relationship of the Engineering functions' Unit Assignment display to the Operator's functions' alarm summary and annunciator displays is defined.

13.1 Database Composition

Description

The area database is a collection of standard display definitions, custom graphic displays (schematics), unit assignments, reports, and logs that are used by an operator to control his area of plant responsibility. The area database is loaded into each US and normally each US in a console is loaded with the same area database. Each area database contains information on the following:

Units Assignable to Area	Annunciator Display
Overview Display for Area	Real-Time Journaling Configuration for Area
Group Displays for Area	Report and Log Definitions for Area
Area and Unit Trend Displays for Area	Button Configuration for Area
Module Summary Definition	Display Set Definitions for Area
Custom Displays Pathname Catalog for Area	Hiway/Node Annunciation Policy

The area database contains pathnames for files that define custom schematics, free-format logs (FFLs) and button configuration (see Section 2 on file system operation). Any number of areas can refer to the same files.

Plan ahead

Plan ahead! Have the pathnames established, particularly those for button configuration, schematics, and free format logs, before building the area database.

Where database entries are used

Displays for any area can contain data from anywhere (any unit or node) in the system. Also any number of areas can access the same data.

Limits of unit assignment

Unit assignment for an area only designates which units and data points the operator can interact with and which alarms are reported to that operator.

When changes become effective

Changes can be made to an area at any time; however, the changes do not become effective until a US is reloaded with the new area. Note that **if any US is on a newly changed area, all USs on the same area must be reloaded to ensure consistent operation**.

Making changes

Once all USs in a console are loaded and running, changes can be made to the area database and to schematics and button configuration without reloading the USs with their personalities. Here is a summary of the major steps involved.

- Use the Data Entity Builder to make changes to the area database.
- Use the Picture Editor and the Button Configurator to make changes to schematics and button configuration. Compile the resulting source files and store the object files in &Dan (where an is area number) or in a user volume in the HM. Be sure that the Pathname Catalog in the area database points to this volume.
- Use the Console Status display on one US to change the area database in all USs that are to operate with the new or revised area. Then, if needed, also change it in the first US. The system resynchronizes messages, alarms, and system status across the area.

13.2 Assigning Units to an Area

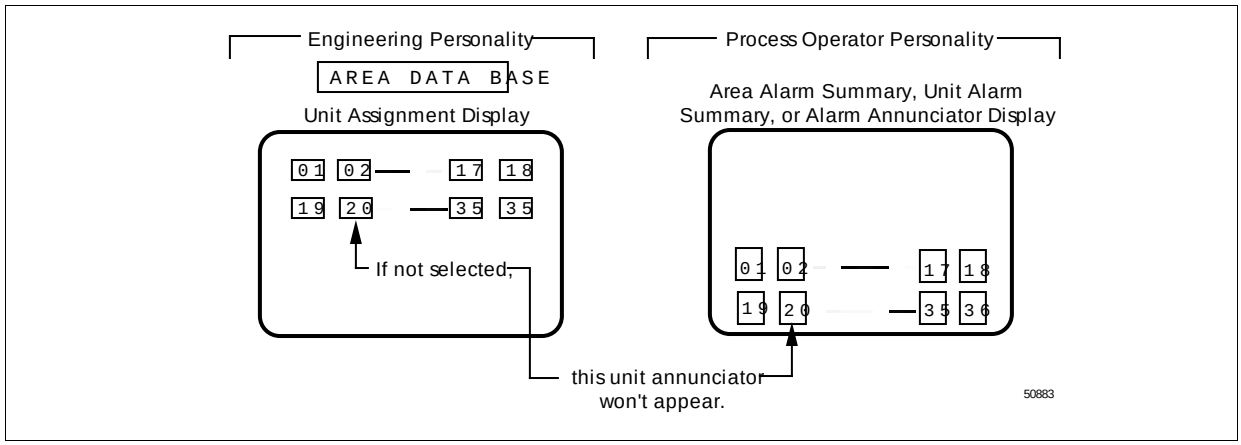
Description

Area database configuration includes the assignment of up to 36 process units to an area. The order in which the units are assigned can be used to determine the position of the unit-annunciator picks (targets) on the Area Alarm Summary Display, the Unit Alarm Summary Display, and the Alarm Annunciator Display.

Database assignment

In Area Database Configuration, the Unit Assignment Display has 36 picks—one for each possible unit. These picks have a one-for-one relationship to the unit-annunciator picks on the alarm summary displays and on the Alarm Annunciator Display, as shown on Figure 13-1. Unit picks that are not selected on the Unit Assignment Display remove the corresponding unit-annunciator pick from the alarm displays. Thus, you can leave space between the unit-annunciator picks and make them easier to use.

Figure 13-1 Unit Assignment Picks and Unit Annunciator Picks



13.3 Adding a New Volume or Directory to the Pathname Catalog

Introduction

Honeywell provides several displays that are used to investigate the system operation and performance of your **TotalPlant** Solution (TPS) system equipment.

In a few cases, the information on these displays may not be meaningful to customer personnel, but this information can be invaluable to Honeywell personnel who help to analyze difficult situations. If you contact our Technical Assistance Center (TAC) or the technical service facility in your region for help in diagnosing LCN problems, they may ask you for information from one or more of these displays.

Displays available

Table 13-1 is a list of the directory names containing the displays (files) currently available, their contents, and the top menus used to access them.

- For instructions for performing LCN Cable Diagnosis, refer to *LCN Guidelines - Implementation, Troubleshooting, and Service*.
- For instructions for performing System Performance Checks, refer to Section 10 in this document.

Table 13-1 Displays Available

Name	Contents	Top Menu
DIA1	LCN Cable Diagnostic Displays	$LNMENU
TLK1	System Performance Displays	PERFMENU

13.3 Adding a New Volume or Directory to the Pathname Catalog, Continued

Methods of accessing a volume or directory

There are two methods by which your system can call up these displays in a volume or directory:

Table 13-2 Methods of Accessing a Volume or Directory

	Method	Requirements
1	By calling files in volumes or directories on an HM (already listed in your pathname catalog).	• You must have room in an existing directory on the HM. • You can check currently assigned pathnames in the SCHEMATIC TITLES display in the Operator Personality's ORGANIZATIONAL SUMMARY from the SYSTEM MENU.
2	By calling files in volumes or directories on a disk.	• Use this method if you don't have enough room on an HM. • This method adds a pathname to the pathname catalog directory pointing to the disk.

Copy directories on a Honeywell disk to your HM

If you choose to install these files on an HM, first use the following procedure. If you choose to use disks (removable media), skip this procedure.

Table 13-3 Procedure for Copying Files to an HM

Step	Action
1	Place the Honeywell-supplied disk in an appropriate drive. You must be in Universal Personality.
2	Select COMMAND PROCESSOR from the Engineering Main Menu.
3	Type in the Utilities Copy command (CP) in a similar manner to the example shown below, then press [ENTER]. In this example, directory DIA1 is being copied from Drive 1 to the NET directory on the HM. `CP $F1>DIA1>*.DO NET>DIA1>= -D` Result: The directory is copied from the disk to the HM.

13.3 Adding a New Volume or Directory to the Pathname Catalog, Continued

Directory recommendation

We recommend adding directories TLK1 and DIA1 to a user volume and copying the files that correspond to each directory from the disk to the NET. During upgrades, Command EC files write to these directories.

Adding a pathname to either an HM or to a disk

Follow these steps to add the directory's pathname to the area's pathname catalog. Use a US in the Universal Personality.

Table 13-4 Adding a Pathname to an HM or to a disk

Step	Action
1	Select BUILDER COMMANDS from the Engineering Main Menu.
2	Select SELECT AREA from the Command Display.
3	Select the pick for the area served by the US, then press [ENTER]. Result: The Data Entity Builder now knows the area database you want to change.
4	Select RECONSTITUTE from the Command Display. Result: New ports appear.
5	In the ENTITY NAME port, type `$0ABSTRT` and press [ENTER]. Result: After a few seconds, the reconstituted Parameter Entry display for your pathname catalog appears.
6	In a spare SCHEMATIC PATHNAME port, type the pathname for your directory on either the HM or disk and press [ENTER]. Examples: `$F1>DIA1` or `NET>DIA1`
7	Hold the [CTL] key and press the [F12] key to LOAD. Result: This loads the pathname catalog into the workfile.
8	Press the [COMND] on the keyboard. Result: The Command Display appears.
9	Select INSTALL AREA and press [ENTER]. Result: This installs the modified area database in directory &Dnn (where "nn" represents the area number) and gets rid of the area workfile (.WF).

Doing an area change on each US

You may want these displays to always appear on a certain Universal Station or on several Universal Stations in several areas. If you want more than one station to access these displays, repeat this procedure for each Universal Station.

Follow these steps to do an area change. Use a US that is running the Operator functions. If you're using a disk, the disk containing the volume or directory in step 6 above must be mounted.

Table 13-5 Making an Area Change

Step	Action
1	Select the Universal Station whose database you want to change.
2	Select AREA CHG from the Console Status Display.
3	Select the target for the area whose database you just modified, then follow the prompters to complete the area change.
4	To check your work, press the [SCHEM] key, type in the display name, and press [ENTER]. Example: type `$LNMENU` [ENTER].

Area change schematic

Upon completion of an Area change in R520 and later systems, the US that changed areas will attempt to call up a custom built schematic. The schematic must be stored by the file name AREACHnn (nn = area changed to by US).

The schematic's object file (AREACHnn.DO) must reside in the same directory as the Area Data Base file AREAnn.DA. If the schematic is found, prior display information is deleted. This means that pressing the Prior Display key is ineffective after an area change (until some other display has been called). If an AREACHnn schematic is not found, the Console Status is called up.

Section 14 – Data Binding in the TPS System

14.0 Overview

Introduction

This section introduces the concept of data binding and describes the consequences of that binding. The effect of data binding on configuration and reconfiguration of the system are also discussed.

What is Data Binding?

The conversion of external references, such as entity and parameter names, files, and such, into the internal IDs, actual file use, and data is called binding. This process occurs at different times for different types of data in the NCF, NVCF, entities, schematics, CL, area database, and so on. First let's discuss the configuration-time binding.

When does it occur?

A summary of data-binding times for the TPS system is given in the following table. A detailed matrix of binding relationships is given for each of the discussion areas in the tables in this section.

Table 14-1 Summary of Data Binding in the TPS System

Type of Data	Binding Time	When Effective
NETWORK CONFIGURATION	NCF Installed	First Node Load
NETWORK VOLUME CONFIGURATION	NCF Installed	HM Initialize
UNIT/AREA/CONSOLE NAMES	NCF Installed	Node Load
AREA UNIT ASSIGNMENT	Area Install	Area Database Load
INTERENTITY REFERENCE	Entity Load	Entity Load
GROUPS/LOGS/TRENDS	Area Install	Area Database Load
SCHEMATICS	Compile	Area DB Load/Invoke
BUTTON CONFIGURATION	Compile	Area Database Load
CL DIRECT REFERENCE	Compile & Link	Link to Entity & Activate
CL INDIRECT REFERENCE	Link	Link to Entity & Activate
AREA PATHNAME LIBRARY	Invoked	Area Database Load

Effects of changes

The figure below provides a quick cross-reference of the effects of changes in each of the engineering activities. The matrix is set up to indicate that, if a change is made in the data listed on the left, the data listed at the top is affected and must be rebuilt or modified.

Effects of changes, continued

Figure 14-1 Quick Reference Matrix of the Effects of Data Changes

Effect of Changes: X = Up to severe impact if certain nodes not reloaded; I = HM must be initialized; U = US(s) must be reloaded; O = Affects only owning node, or file change	Type of Data Change							
	NCF	NYCF	Area Data	Node Data	Schematics	Groups, Trends	Logs, Reports	CL Programs
Unit Names	X	I						
Area Names	X							
Console Names	X							
System Wide Values	X							
System or User Volumes	X	I						
Entity Data			U	O	O	O	O	O
Delete Entity References			U	O	O	O	O	O
Groups, Trends, Logs, Reports			U			O	O	
Area Pathname Catalog			U					
Schematics			U		O			
Button Configuration			U					
CL Programs								O

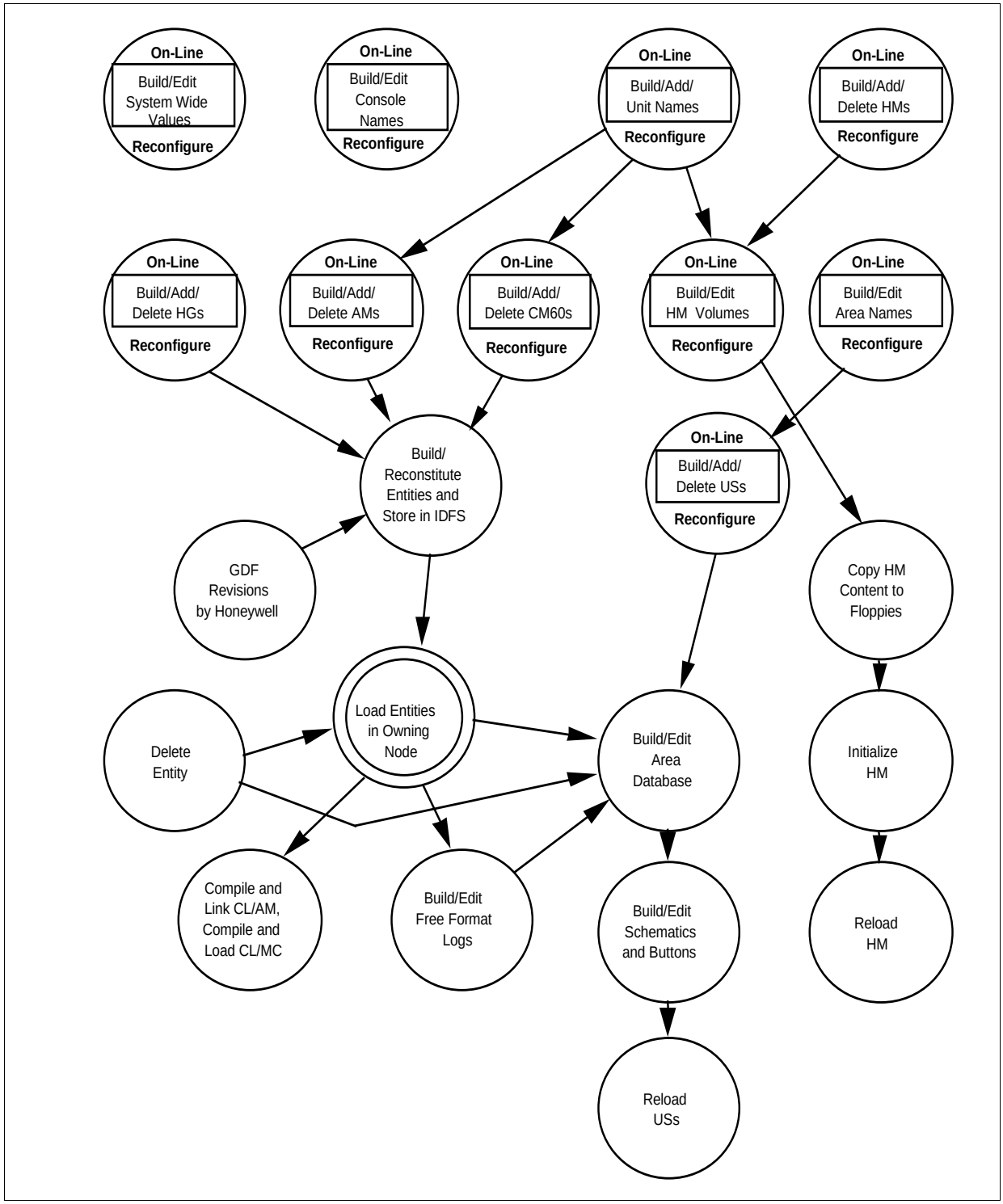
Node data is the owning node's database.

1235

Sequence and relationship of data changes

Figure 14-2 is a "bubble chart" that indicates the sequence and relationship of data changes. The special "on-line reconfigure" bubbles indicate that changes to that data affect the NCF and require certain nodes on the LCN to be reset and then reloaded with the new NCF in the data that is loaded. For the "on-line reconfigure" bubbles, the nodes that must be reloaded and the order in which they must be reloaded is indicated by the "on-line" Network Configuration displays. Refer to Network Form Instructions and Network Data Entry for more details. Where an “on-line reconfigure” bubble leads to a regular bubble (that is, “Build/Add/Delete AMs” leads to “Build/ Reconstitute Entities and Store in .EBs or IDFs”), the appropriate nodes must be reloaded BEFORE performing the second type of data change (“Build/Reconstitute Entities and Store in .EBs or IDFs”).

Figure 14-2 Configuration Sequences and Data Relationships



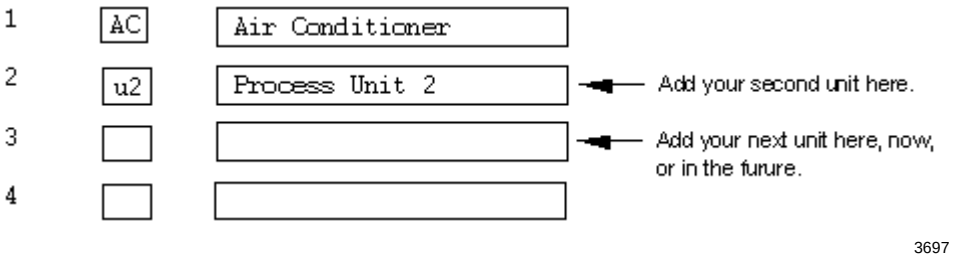
14.1 Binding of Unit, Area, and Console Names

Description

At configuration time, the unit, area, and console name lists that were created are used in various engineering activities. The position of a name in a list is retained for later use, and if you reconfigure the names by rearranging them, not just adding on the end of the list, the external name that appears, when used by the system, will be different from what you intended. The system maintains the list position as originally configured, which affects external name conversions as well as many file-system volume and directory names that use the unit and area number (internal list position, not external name) as part of the volume or directory name. It isn't just the NCF that refers to these names, data points also do. To change the position in the lists you have to rebuild all the data points.

An example

For example, in this sketch, the first unit configured is AC. The system knows this unit by its index number 1. "AC" and "Air Conditioner" are external names. Most of the system knows the unit as "the unit with index 1," not by the external names. Once you get this configuration loaded in the NCF.CF file and the nodes begin to use it, the unit IDs and names can get hopelessly confused if you make subsequent changes except by adding units at the next-higher indexes.



Entries for Unit IDs

Unit-Names configuration includes configuring unit IDs. The unit ID consists of two characters. If only numbers are used, you can enter a single digit in either position or you can enter two digits, but you can't enter a single digit and two digits that amount to the same number. For example, you can enter "1" and "02," but you can't enter "1" and "01." You can enter "03" and "4," but you can't enter "03" and "3."

Plan ahead

Rearranging the area, unit, and console name lists has widespread effects that must be understood. Basically, do it correctly the first time and only add to the lists thereafter. Table 14-8 in paragraph 14.8 details the area database binding. Unit names have wide-spread effects because they are embedded in IDFs and other structures. Area names affect only the USs in which the affected area database is loaded.

14.2 Binding of NCF Data

Description

The details of data binding in the NCF are shown in Table 14-2. Changes can be made to the working NCF, but they do not become "known" until the working NCF is installed by the configurator. At the time the NCF is installed, you must be aware that the new NCF will not be usable until all nodes that are affected by the change have been shut down and reloaded with data that includes the new NCF.

The time stamp is changed every time the NCF is installed (F2 operation is performed on the NCF), whether or not any data changes occurred.

Table 14-2 Detailed Matrix of NCF Data Binding Relationships

TYPE OF DATA	BINDING TIME				NOTES
	CONFIG	INSTALL	LOAD	AREA LOAD	
Unit Names		xx		xx	Position in list at area load time.
Area Names		xx		xx	Position in list at area load time.
Console Names		xx		xx	Position in list at area load time.
US Node Configuration		xx			Node configuration only, no data.
HG Node Configuration		xx			Node configuration only, no data.
AM Node Configuration		xx			Node configuration only, no data.
HM Node Configuration		xx			Node configuration only, no data.
CG Node Configuration		xx			Node configuration only, no data.
System Wide Values		xx			System values for paper size, jogs, % increments, shift definition, batch, and so on.
HM Volume Configuration		xx			NVCF is used to setup the HM configuration during HM initialization. If volume configuration is changed, the affected HMs must be initialized.

14.3 Binding of HM Local NVCF Data

Description

Table 14-3 gives the detailed data-binding relationships for the NVCF. The NVCF is created (as file Lnp_NVCF.MM) in the HM's local volume when the HM is initialized (F6 Initialize function in Volume Configuration). If an HM is reloaded or autoboots for any reason, and the NVCF in the local volume and the NVCF data in the NCF on the &ASY directory being used do not match, the HM comes up in its initialization personality, not in its normal operational personality. *Remember that before initializing the HM, you must first save critical files (to another HM or to a removable medium) or the data in the files on the HM being initialized will be lost.*

Table 14-3 Detailed Matrix of NVCF Data Binding Relationships

TYPE OF DATA	BINDING TIME			NOTES
	CONFIG	INSTALL	HM INIT	
Volume Selections			xx	NVCF changed at install time, but data not effective until HM initialized.
Volume Sizes/Allocation			xx	
User Volume Assignment			xx	
History Assignment			xx	
Checkpoint Assignment			xx	
Journal Assignment			xx	
Archiving Assignment			xx	
CL/D Storage Assignment			xx	

14.4 Binding of Entity Data in the Data Entity Builder

Description

The binding of entity-build data by the DEB occurs at several different times, depending upon the type of data and the operation being performed. The following discussion explains the binding time for entities, parameters, and values. Table 14-4 gives detailed data-binding relationships for the data handled by the DEB.

Table 14-4 Detailed Matrix of DEB Data Binding Relationships

TYPE OF DATA	BINDING TIME			NOTES
	BUILD	LOAD	RECON-STRUCT	
Entity Name		xx		Name used in IDF and error files as external form.
Parameter Name	xx	xx(1)	xx(2)	1. For entity references. 2. If GDFs are revised.
ASCII Data	xx			
Custom State Names		xx		Not automatically updated when changes to custom name parameter occur.
Value Range Checks	xx(1)	xx(2)	xx(3)	1. Not for HG parameters. 2. For entity references. 3. If GDFs are revised.
Default Values	xx(1)	xx(2)	xx(3)	1. Initially at build. 2. PED reset to defaults after F12 load command. 3. If GDFs are revised.

14.4 Binding of Entity Data in the Data Entity Builder,
Continued

When names and values are bound	Parameter names and enumeration values are bound at the time ENTER is pressed. This means parameter names and enumeration values are held in internal form in the IDF.
Steps that occur when an entity is loaded	As an entity is loaded, two steps occur: first the entity ID is established in the node and then the parameter data is loaded to the entity. If the data owner fails the load because of bad data, or any other condition, the entity has still been established and future load operations must use the overwrite option.
Owning node must be running when entity is built and loaded	Entity IDs (tag names) are bound at load time. This means reference entities (entity names referred to by the entity being loaded) must be built and loaded, and the owning node must be running on the LCN.
Prevent load-time errors by loading entities that reference each other from the same IDF	Entities that reference each other (for example, A110 references A200 and A200 references A110) must be loaded from the same IDF, using the multiple-load command, to prevent load-time errors. This command establishes all entities before loading so that such cross-references are correctly satisfied. If the entities do reside in different IDFs, load the entities, check the error files after all IDFs have been loaded, and then reload the entities that had a reference error. If the cross-referenced entity does not exist in the same IDF than it must have been previous loaded thereby prevented load time errors from occurring.
External names can't change after load time	Parameters that allow you to set the external name of a state or value (self-defining enumerations), are bound at load time. The DEB prevents modification of the external names once the entity has been loaded. The entity must be deleted and rebuilt if you want to change the external names.

14.5 Binding of Schematic Data

Description

Schematics cannot be used until they are compiled into object files used by the area database. The compilation of the schematic cannot be done until all entities referred to in the schematic are built and loaded in the owning nodes, and the owning nodes are running on the LCN. The compilation requires obtaining the internal IDs of the entities and their parameters that are held in the owning node.

This means that there is no way to see the final schematic, as it will appear in the Operator's Personality, until called from an Operator's Personality. Table 14-5 provides detailed data-binding relationships for schematic variable data, either values or conditions used for behavior control.

Remember that deleted entities require that schematics that used them be rebuilt, recompiled, and replaced in the volume or directory pointed to by the Pathname Catalog.

Table 14-5 Detailed Matrix of NCF Schematic Data Binding Relationships

TYPE OF DATA	BINDING TIME				NOTES
	BUILD/ EDIT	COMPILE	AREA LOAD	INVOKE	
Subpictures	xx				
Entity Name		xx			
Parameter Name		xx			
ASCII Data	xx				
Custom State names		xx			
Schematic Object File			xx(1)	xx(2)	1. If configured to reside in memory database. 2. If on removable medium or HM file.

14.6 Binding of Data in CL Programs

Description

At CL program COMPILE time, direct references (use of EXTERNAL statement on a block or point name in block header) require the entities to be built and loaded, and the owning node to be running on the network. Indirect references are resolved at link time.

As a CL program is linked, direct- and indirect-entity references require the entities to be built and loaded, and the owning node to be running on the network.

Table 14-6 Detailed Matrix of NCF CL Data Binding Relationships

TYPE OF DATA	BINDING TIME			NOTES
	EDIT	COMPILE	LINK	
Entity Name (Direct)		xx		Rechecked at Link time.
Entity Name (Indirect)			xx	
Parameter Name		xx		Rechecked at Link time.
Custom State Names		xx		
Custom GDFs		xx		Rechecked at Link time.
ASCII Data		xx		
Default Data		xx		

14.7 Binding of Entities and Schematics into the Area Database

Description

In order for the area to be configured, the unit and area names must be defined. Additionally, all references to process or system-entity names and parameters require the owning node to be loaded with the data and operating on the LCN. This means that configuration of groups, trends, and logs cannot be completed until the entities used in them are built and loaded. Schematics are referred to by only pathname at configuration time, so schematic object files do not need to exist during configuration.

The second binding step occurs when the US is loaded (with the appropriate NCF) and the assigned area database is loaded. At that time, the pathnames for schematics are used to access the compiled object files *and the files must exist*. Note that the schematic object files can exist only if the entities referred to are built and loaded before the compile step in the Picture Editor.

Table 14-7 Detailed Matrix of Area Data Binding Relationships

TYPE OF DATA	BINDING TIME				NOTES
	EDIT	AREA INSTALL	AREA	INVOKE LOAD	
Entity Name (Direct)		xx			
Parameter Name Groups		xx			
Overviews		xx			
Process Module Group		xx			
Trends		xx			
Logs		xx			
Journals and Reports		xx			
Alarm Annunciation Policy		xx			
Unit/Area/Console Names			xx		
Custom State Names		xx			
Schematic Object			xx	xx(1)	1. When invoked, if not in memory.
Help/Associated/ Related Display		xx			Area database

Section 15 – Actors and Process Control

15.0 Overview

Introduction

This section advises that actors are not to be used for actions that are involved in process control.

15.1 Use of Actors

What actors do

In Universal Stations, actors are used to assign actions to targets (picks) on schematic (custom/graphic) display and to the configurable buttons on the Operator's Keyboard. An actor is executed one time, each time its target is selected, or each time its configurable button is pressed.

Actors can call up a specific display, create text-input ports (TIPS) for data entry by an operator, read the data entered, and store the data in a display or in the system database. Actors are very useful for defining relationships between schematic displays and for making it easy for operators to use and move between displays.

Actors can be very useful to operators for setting up conditions in the control system; for example, for setting up initial control conditions for a sequential operation, starting a sequence or initiating an abnormal-condition handler. While an actor can initiate control actions, it does not have the feedback mechanisms nor continuous monitoring capability that is required for process control; therefore, *actors are not suitable for implementation of control strategies*. Control strategies must reside in AMs, CMs, NIMs, CGs, PMs, LMs, and process-connected boxes.

Section 16 – AM Configuration Guidelines

16.0 Reserved

In earlier versions of this manual, this section contained **AM Configuration Guidelines**. Refer to *Application Module Implementation Guidelines* for that information. This section has been retained to direct users familiar with an earlier version of this manual to the new location of the information and to preserve the validity of references to other sections of this manual.

Section 17 – Data To Be Used During Configuration

17.0 Overview

Introduction

This section relates the types of configuration data to the publications that define each type of data and to the configuration forms used to record each type of data.

17.1 Publications Defining Configuration Data

References

For information about the overall configuration-data collection process, refer to the *Configuration Data Collection Guide*. Also, refer to the *System Startup Guide* for the System Startup Task Record.

Before configuring the system

The following forms should be completed and referenced data should be available before starting to configure the system. Doing this paper work first will help to prepare you for efficient configuration of your system.
This list does not include the various hiway-related publications. Refer to the *Application* binder in the *Basic System* bookset.

Data to be Configured	Publication	Form Used
Unit Configuration	Network Form Instructions	Network Forms
Area Names Configuration	Network Form Instructions	Network Forms
Console Configuration	Network Form Instructions	Network Forms
LCN Nodes	Network Form Instructions	Network Forms
System Wide Values	Network Form Instructions	Network Forms
Volume Configuration	Network Form Instructions	Network Forms
Hiway Configuration	Network Form Instructions	Network Forms
Box/Slot Configuration	HG Parameter Reference Dictionary	HG Data Point Forms
Hiway Gateway Points	HG Parameter Reference Dictionary	HG Data Point Forms
Process Manager Points	PM Parameter Reference Dictionary	PM Configuration Forms
Advanced Process Manager Points	APM Parameter Reference Dictionary	APM Configuration Forms
Logic Manager Points	LM Parameter Reference Dictionary	Logic Manager Forms
PLC Gateway Points	PLCG Parameter Reference Dictionary	PLCG Forms
Application Module Points	AM Parameter Reference Dictionary	AM Data Point Forms
Computing Module Points	CM Parameter Reference Dictionary	CM Data Point Forms
Picture Editor	Picture Editor Form Instructions	Picture Editor Forms
Button Configuration	Button Configuration Form Instructions	Button Configuration Forms
Area Database Configuration	Area Form Instructions	Area Forms
HM History Groups Configuration	HM History Group Form Instructions	HM History Group Forms

Section 18 – Avoiding Mistakes and Errors

18.0 Overview

Introduction	Notes in this section may help you avoid mistakes and errors.

18.1 Guidelines and Warnings

Introduction	This section contains a collection of the significant guidelines, precautions, and warnings that appear in this and other publications. If you review this section from time to time, and implement its content, you should experience a minimal amount of rework and error correction.
Make a backup set	Start by making a complete backup set of all removable media (disks) supplied by Honeywell.
Write protect	Remember to write protect the removable media used to store your configuration.

Follow the DEB-loading and checkpointing rules

Remember to follow the DEB-loading and system-checkpointing rules to keep the database consistent:

Table 18-1 Database Loading and Checkpointing Rules

Rules	Description
1	The order in which entities are loaded to a node is significant. For all references to properly work, always load from the most current checkpoint medium, or if using the DEB, always use the same files in the same order to ensure that the sequence of point loading is consistent and the internal entity IDs remain the same. For more information, refer to the *Data Entity Builder Manual*.
2	Always make changes to the existing database. Do not delete an entity and reload it to make a simple change. Be sure to reload the last, correct, checkpoint data to reloaded nodes before doing any operation that loads or links to entities in the nodes.
3	The "directory" of external entity names is distributed among the owning nodes; there is no central directory. Thus, all nodes must be running in the normal on-process personality to ensure that points are not duplicated.
4	Remember that deleting a point and reloading it changes its internal ID and that all references have been broken by the delete.

Follow a sequence

Follow the sequence of the tasks in the system-loading and startup guide. This provides for the most efficient startup scenario.

Make a backup of the old NCF before making a new one

Always make a backup copy on a removable medium of the old NCF (directory &ASY) before installing a new one. This allows recovery of the system without restarting nodes, if the changed NCF causes problems in loading nodes or the HM autoboots because of a power interruption.
If you do not have a removable copy of the NCF in use on the LCN and the HM NCF has been changed from what other operating nodes are using, then certain nodes must be reset and loaded from the HM, including the new copy of NCF in the data that is loaded. See the on-line Network Configuration displays and also refer to *Network Data Entry*.

Precautions when moving the system volume (&ASY)

Moving the system volume from one HM to another requires special considerations. This is because the system volume contains the network configuration file NCF.CF and uses the network pathform for access.
Before making configuration changes, load both HMs with the HM INIT personality and perform the required changes in the order given below:

Table 18-2 Procedure Used When Moving the System Volume (&ASY)

Step	Action
1	Install the new HM configuration.
2	Reload both HMs with the HM INIT personality.
3	Initialize the HM that previously held the system volume.
4	Initialize the HM that will contain the system volume.
5	Copy the HM's personality image files to both HM's local volumes.
6	Reboot the HM that previously held the system volume.
7	Reboot the HM that now contains the system volume.

Limitations of the "NET" command

Remember, "`NET`" cannot be used to access files in an HM loaded with its initialization personality.
The physical-node pathname (`PN:n>volm>file.sx`) is the only type of pathname you are allowed to use for an HM during initialization. This includes the initial loading of the system files to the HM (&ASY, &HMO, and optionally, &HMI).

Check for errors

Always check the Data Entity Builder error files.
The errors listed may indicate that references to other entities were not satisfied because the entities had not been loaded.

Use of multiple-load command

If two entities reference each other, the entities must be simultaneously loaded by using the multiple-load command.
Write the two entities to the same IDF and multiple load them. The multiple-load command is a 2-pass operation that allows establishing the entities, then loading the data, so that references are satisfied.

Entities must exist

Remember that groups, trends, and logs cannot be built unless the entities used are built and loaded.

The owning node for entities must be running on the LCN to allow access and external/internal conversions to occur. Group Edit in the Operator function allows some flexibility in this area.

You can't overwrite an entity's location to change it

Remember that you cannot change an entity's location, unit, or build type by loading with overwrite.
You must delete the entity and load it again to change these characteristics.

Deleting an entity does not delete references to it

Remember that deleting an entity does not delete references to that entity in schematics, logs, groups, and so on.
Each reference to the entity must be deleted in the specific function that used it.

Internal IDs are different

Remember that if an entity is deleted, changed, or loaded again with the same name, it is a different entity and references built before the delete will not connect to the entity when it is loaded again.
The internal ID is unique for each entity loaded, even if it has a name that previously appeared in the node, only so long as the database is kept consistent by following the DEB-loading and the checkpointing-operation rules.

CL compiling caution

Always make a copy of the HM files *.SE and *.SP to a current disk copy of &ASY when CL has compiled new custom parameter names.

The new parameter names are propagated across the LCN and the data-access function prevents startup of any node when the &ASY directory (removable medium or HM) does not contain the same list of parameter names as is currently in use by the operating nodes. Also, always make a backup copy of any updates you make to the custom parameter-list (.PL) files on your Custom Parameter List volume or directory.

After you make these copies, use the Utilities' Protect command to prevent overwriting or deletion of these files.

18.1 Guidelines and Warnings, Continued

Know when binding occurs	Remember when binding occurs for the type of data you are working with. Refer to Figure 14-1.
Names must be the same	Remember that the NCF, NVCF for the HM, and parameter name files (.SE, .SP) for data access must be the same as any operating nodes on the LCN at the time a node is loaded and started up. The loaded node will not be allowed to start up on the LCN if there is a mismatch of critical data in these files.
Copy .SE and .SP files	Remember to copy your .SE and .SP files to any new &ASY disk volume provided in a software update**.** The custom names you have built are saved only if you replace the empty .SE and .SP files provided on the standard &ASY medium with the .SE and .SP files from your operating &ASY. After you make these copies, use the Utilities' Protect command to prevent overwriting or deletion of these files.
Backup your custom GDF files	Remember to make a backup copy of your custom GDF (.GD) files on a disk. Use the Utilities' Protect command to prevent overwriting or deletion of these files.
Know how adding and deleting points affect files	Remember that adding or deleting points can affect group and overview display definitions, schematics, and reports**.** Group and overview display definitions must be reloaded if points they contain are added or deleted. Report definitions must be reloaded if points they refer to are added or deleted. Schematics must be recompiled if points they contain are added or deleted.

Section 19 – Glossary of TPS Configuration Terms

19.0 Overview

Introduction

This is a glossary that summarizes the terms related to the configuration process. You may also wish to refer to *System Overview*, which contains a more extensive glossary.

19.1 Configuration Terms

Alias

Alternative name for a given disk or HM volume in Release 200 and earlier releases. It has no meaning in R210 and later releases.

Alias point

An HG data point that uses the same box and slot on a Data Hiway as another point in the same HG, but has a different tag name—an alias. Alias points are created by building and loading only the HG-resident parameters for a point that already exists in the box and slot, and then loading the point in the HG. This new point in the HG then has access to the data in the designated box and slot. Alias points usually have virtually identical data, but different unit assignments. This allows alarms for such points to be generated for more than one unit.

Autoboot

A History Module that has been through System Startup Tasks 14, 15, and 16 can reload and restart itself, if its power has been interrupted or if its power was turned off and then back on. This is referred to as "an autoboot" or "autobooting."

Bind

The conversion of external entity and parameter names to the internal entity ID and parameter ID, as used for LCN communications. The external/internal conversion can be performed by only the owning node of the external entity. This means the entity to be bound must be built and loaded, and the owning node must be running on the LCN, at the binding time.

Bootload	The loading of a program or data into a node or device directly without intervention through some other node or device. This term arises out of the notion that such an operation is like "pulling itself up by its bootstraps." In the **TotalPlant** Solution (TPS) system, loading a Universal Station by itself and not through the Console Status display at another US is referred to as "bootloading" the US. Also, a History Module can bootload itself (also see "Autoboot").
Build	Entities are built by interacting with the Data Entity Builder's Parameter Entry Displays (PEDs) or by exception building. The entities can then be stored into an IDF for future loading to the owning node. Building *does not* include loading in the owning node.
Checkpoint	Storing of the process database from a module or gateway in files from which the data can be reloaded into the module or gateway, should it be necessary to restart it. Where a gateway serves process devices, such as the boxes on a Data Hiway, their process data can be included in the checkpoint files, and reloaded. The term "checkpoint" refers to a "snapshot" of the data is acquired at some point in time.
Compile	Custom (schematic or graphic) displays, CL programs, free format logs, and button configurations are compiled from source data (either stored, edited images, or textual source programs) into final object "code" that is actually used at runtime, by the appropriate function. In general, direct references to entities in the system must be bound at compile time. This means the entity must be built and loaded, and the owning node must be running on the LCN, at compile time.
Crash	The unexpected failure of a node that is caused by a situation the software or firmware in that node cannot manage or under which it cannot continue to operate. For example, as a node is loaded, the software checks for proper hardware revision levels, and if they are not proper, loading stops and the node crashes.
Directory	A named subdivision of a volume to which one or more files is assigned. Each disk is a volume. HMs can have several volumes. Each volume can have up to 63 directories. System-reserved directory names begin with "&" or "!".

Directory	A named subdivision of a volume to which one or more files is assigned. Each disk is a volume. HMs can have several volumes. Each volume can have up to 63 directories. System-reserved directory names begin with "&" or "!".
Entity	Entities are named collections of data that can be accessed across the LCN. There are two major entity categories: process data points and reserved entities. Reserved entities are treated differently than process data points (see the *Data Entity Builder Manual*).
Error	A misoperation from which the hardware or software can recover. For example, memory errors that are corrected by the memory's EDAC feature, and errors in data transfers that are detected and recovered by repeating the transfer.
Establish	Entity IDs are established on the LCN at load time. This means the entity can be referenced by its external name, provided the owning node is running on the LCN. The owning node performs the external to internal name conversion to allow access to data within the entity. An entity can be established but remain "not loaded" because of errors or failures that prevent access to parameter data within the entity.
Exception Build	Use of a prebuilt entity as a template and building a number of new entities, based on a text file of source data. Exception-built entities are always stored in an IDF. The template entity must reside in an IDF, either the IDF being built if the &M control line is used or another IDF if the &X control line is used, in the exception-build source code.
Format	Typical use of this term is for the operation of formatting disks or HMs. Formatting consists of writing track headers, establishing the volume name for a disk, and building the bad-sector table for the HM. Formatting destroys any previous data on the medium.
HM Load	The operation of loading the system software to the HM(s).

IDF (Intermediate Data File)	The IDF is a file used by the Data Entity Builder to store the build information for an entity. It is not the complete entity description, but contains the data necessary to support loading to the destination node.
Initialize	For an HM, initialize is establishing the volumes that exist on the HM. The volume directories are cleared, so all data previously available can no longer be accessed and must be restored. This term is sometimes used in place of "format" when referring to disks. The utilities support initializing the removable media (clearing the directory and renaming the volume) without "formatting" (writing track headers).
Invoke	This is the action of calling up a specific function or display on the US. Typically used for describing the action of calling up a schematic display.
Kilobyte (KB)	Kilobyte—1024 bytes
LCN (Local Control Network)	The link through which all the nodes communicate. The term is often used to generically name the link with the nodes attached—the system.
LDID (Logical Device Identifier)	This is a "name" by which disk and printer devices can be accessed on a console through the utilities. The LDID is of the form $Fn for disks, and $Pn for the printer (n is 1-20).
Link	The operation of binding final components into the system. Typically, this is used to describe the CL-link operation where a CL-object program is linked to the entity(s) that uses it. Any indirect entity reference, which was not bound at compile time, must be bound at link time. This means the entity must be built and loaded, and the owning node must be running on the LCN, at compile time.

Load	"Load" is used for several operations in the system: • Loading a specific node's memory with a personality image from a removable medium or HM. • Loading an entity, using the DEB, to its destination node (or file in the case of the area database). • Loading an area database from its file to memory when a US is loaded and started up. • Loading a checkpointed database from the checkpoint file to the memory in an HG or AM.
Megabyte (MB)	1024 KB (kilobytes)
Megaword (Mw)	1 Mw = 2 MB
NCF (Network Configuration File)	The NCF contains the description of the system, so that each node is aware of the system structure.
Node	The individual components connected to the LCN are called nodes, and sometimes modules. Generally, nodes are logical and modules are physical. The node types are • US —Universal Station • HG —Hiway Gateway • AM —Application Module • HM —History Module • CM —Computing Module (DPS6 through the CG) • CG —Computer Gateway
np	Notation used to represent an HM node pair number. In LCN Node Configuration, a node pair number is assigned to each single HM, and to each primary/secondary HM node pair.

On-Line Reconfiguration	Changes to Network Configuration that are made with the configurator in the on-line mode. Such changes require that specified nodes be shutdown and reloaded with data that includes the revised network configuration file (NCF).
Owning Node	The node on the LCN in which an entity resides. This node contains the external/internal entity ID-conversion capability, knows whether a parameter exists on the entity and, ultimately, contains the data for the entity.
PED (Parameter Entry Display)	The information on an entity being built by the Data Entity Builder that is displayed on the US screen. The information consists of multiple displays, called the PED set, and the status of the data in each display is available in the PED Set Status Display.
Personality	A specific software image in a node on the LCN. Nodes typically have multiple personalities but they don't coexist. For example, the US has the Operator's Personality and the Universal Personality. Each requires complete memory load to put the personality in operation. Other nodes have an on-line personality and an off-line personality.
Reconfigure	See On-Line Reconfiguration
Removable Media	disks. Such a medium can be removed from its drive and replaced by another medium of the same type.
Reconstitute	The "back-building" operation—reconstituting an entity from its owning node or area database file to the Data Entity Builder for display. In a batch or multiple reconstitute operation, the data is placed directly into an IDF.
Volume	The name by which a disk or a section of an HM is known. Refer to "directory." System-reserved volume names begin with "!" or "&".

Section 20 – Node Loading and Node Dumps

20.0 Overview

Description

The first part of this section provides guidelines for recovering from the failure of a node to properly load with software and data.

Next, this section provides guidelines and instructions for implementation of fast-load Emulated disk(s) for quick recovery from interrupted operation, such as a power failure.

Finally, this section provides guidelines for dumping the memory contents of failed node for analysis.

20.1 Node Loading Failures

Why a node fails or crashes

As each node on the LCN (including USs) is loaded with software and data, the system checks for proper hardware and software revision levels and for adequate memory in the node. If an incorrect revision level is detected or the node is found to have inadequate memory, the node may fail ("crash").

Do not try to concurrently load both HGs in an HG pair, nor both NIMs in a NIM pair—one of the gateways may fail. First, finish the loading of one of the gateways as the primary, then load the other node as the secondary.

Information about the crash

Information about such "crashes" is available through the Real-Time Journal, so one of the first nodes to be loaded should be a US (with a physical printer) with the Operator Personality. Once that US is loaded, the Real-Time Journal should be enabled so that any errors detected will be reported in the journal (on the printer).

Revision or memory error crash

If a node "crashes" because of a revision or a memory error, the node goes to the `FAIL` state and "`-190`" may appear in the LED display on the module. The journal message (all on one line) is in this form:

```
hh:mm:ss  nnnn  $$NODE ADMIN  CRASH  DET- NODE ADMIN
42
    OFF- NODE ADMIN       x   y     60001
```

Where:

- `hh:mm:ss` is the hour, minute, and second when the "crash" occurred.
- `nnnn` is the module type and number, and interpret the meaning of X and Y by using Table 20-1.

Revision or memory error crash, continued

Table 20-1 Interpreting Cause of Node "Crash"

IF …	THEN …
X = 1	A board revision-level mismatch was detected and Y is the board's slot number.
X = 2	A required board type is missing and Y contains an indication of the type of board.
X = 3	Inadequate memory was detected and Y = the amount of missing memory in KB.
X = 4 and Y = 0	A software-revision mismatch was detected.
X = 5	A board firmware-revision-level mismatch was detected and Y = the board's slot number.

If any of these errors are reported, a hardware technician should check all boards in the node to determine if any are missing, if any are the wrong type, or if any have incorrect option selections (by jumper pins). Also, ensure there are no more than TWO empty slots between boards. Having more than TWO empty slots between boards disallows the Back Plane Integrity Check.

Other errors

Other types of loading errors can also be reported in the journal. Most of these are described elsewhere in this manual.

Clearing a LOAD FAIL message

To determine the cause of the error message and to clear a LOAD FAIL message, follow one of the procedures below:

Table 20-2 Clearing a LOAD FAIL (from the System Status Display)

Step	Action
1	Select the "RETURN" target.
2	All error messages will disappear.

The following table applies to AM, PM, CG, etc. displays:

Table 20-3 Clearing a LOAD FAIL Message (from the Console, Process Network Node; or Device Node Status Displays

Step	Action
1	Select the failed node number.
2	AUTOLOAD NET, AUTOLOAD LOCAL, MANUAL LOAD, and DUMP NODE targets appear.
3	Select one of the LOAD targets.
4	Red/Yellow message with cause of failure appears.
5	Select error message on top of the screen (see Note). Result: The error message is cleared and you can try to reload the node.

NOTE

If after reading the “reason for failure” message, a different screen is invoked, the error on top of the screen will disappear.

If a different screen is on the US, other than where the LOAD FAIL was caused, then the error message on top of the screen MUST be selected to take you to the displays listed above to clear the message.

20.2 Fast-Load Feature

Description

In the event of a system disruption, such as a power failure, once the required nodes have power reapplied and are ready to be reloaded, then a “path to the system” can be quickly restored through the use of a user-prepared fast-load disk, or from an HM that is running and has the right volumes and data.

A thorough understanding of the design of your system is invaluable. If, for instance, the power failure affected all HMs, recovery can be accomplished by using the latest fast-load disk is probably the quickest method. In the case where some of the HMs cannot be accessed, will not “autoboot” (see below), you should use the fast-load disk using one of the HMs instead of ALL data coming from disk.

Each fast-load disk (or HM) contains the software and data required to reload one Universal Station; and to reload one NIM or one HG.

Prior to R650, APP nodes could not be loaded without a system HM. With R650, the APP node can be loaded with the APP or AM personality using a fast-load disk mounted in a US/GUS. The fast-load disk can be used if the system HM fails or if the APP node’s communication with the HM is lost.

GUS nodes can be loaded manually from a fast-load disk mounted on a different US/GUS (not the local node) without requiring the system HM to be on-line.

You can prepare more than one fast-load disk to restore other paths to the system.

References

See the *Process Operations Manual* for instructions on the use of a fast-load disk to reload a US and a NIM or HG to reestablish a path to the system, in the Fast Load Procedure section. For additional reloading options available on a System Status display, see the LCN Node Reloading and Status Information section.

See the *TPS System Operations Guide* for instructions on loading an APP node without using the HM.

Necessity of updating checkpoint files

Effective use of the fast-load procedure requires careful use of the guidelines presented later in this section, especially the regular updating of checkpoint files and other data on your fast-load disks.

AUTOLOAD targets

To facilitate the quick restoration of paths to the system of a single node, AUTOLOAD LOCAL and AUTOLOAD NET targets (picks) appear on the Console Status display, the Gateways Status display, and the node status displays for other nodes.

These targets simplify the single node loading process by automatically searching disk drives on the US (AUTOLOAD LOCAL) or HMs (AUTOLOAD NET) for the directories that contain the files and data to be loaded.

NOTE

To speed the restoration of paths to the system for multiple nodes, loading requests should be initiated from the System Status display. See the LCN Node Reloading and Status Information section of the *Process Operations Manual*.

History Module "Autoboot" feature

When power is first applied to all nodes on an LCN, the HMs load themselves, or "autoboot."

If the necessary files are available on HMs, you can load the first Universal Station quickly using the procedure shown in Table 20-3 in "Fast-Load Scenario" which follows.

These files are stored on the HMs in the system volume (&0np), personality images (&1np), area database (&3np), and the HG or NIM checkpoint (&7np, &8np) volumes. If all these files are not provided, the startup procedure will go as far as it can, then it will ask for you to supply the missing files.

20.2.1 Fast-Load Scenario

Introduction

When power returns, all modules self-test and the HMs autoboot. You must start an US quickly so you can load the remainder of the system.

Loading a US from itself

This procedure allows a Universal Station to be loaded from a running HM that has the correct volumes (&1np and &3np) required for fast-load.

Table 20-4 Loading a US from Itself

Step	Action
1	Push back the upper part of the black frame enclosing the operator's keyboard and push the [RESET] button. Result: The screen will clear.
2	After the ">" prompt is displayed on the screen, press [LOAD]. Result: `N,1,2,3,4,X?` is displayed.
3	Type N and press [ENTER]. Result: `OPR,UNP?` is displayed.
4	Choose Operator or Universal personality by typing O or U. Then press [ENTER]. Result: Loading begins. Wait for the System Status Display to appear. At this time, not everything has been loaded into the US, however, the standard abstracts *have* been loaded. Continue on without waiting for the button configuration, external load modules, and memory-resident schematics to be loaded. **NOTE:** If loading external load modules, and using backplane packages (XYPLOT, OPBASE, and OPEQLT, for example) you must have sufficient memory to load them. Reference the optional package documentation for memory requirements.
5	Press [CONS STATS] to choose the Console Status display.
6	From the Console Status display, select the node to be loaded and then select the LOAD/DUMP target.
7	Press the AUTOLOAD NET target if you want to fast load from your History Module. Press ENTER and the load will start from the network. Press the AUTOLOAD LOCAL target if you want to fast load from a disk. Press ENTER and the load will start using the LOCAL removable media.

Node loading

If all the files needed are on an HM or disk, the node loading procedure is automatic from this point. If all the files are not available, the procedure will go as far as it can, then it will ask for you to supply the missing files. The stages of the fast-load scenario that follow will aid you in analyzing the process and determining what files might be needed.

Stages of the Disk Fast-Load scenario

If you don't have all the files on an HM from which you can load the rest of the nodes, or if the HM did not autoboot, you may want to load from a disk. The following steps can take place at more than one console, using more than one fast-load disk:

Table 20-5 Stages of the Disk Fast-Load Scenario

Stage	Description
1	The fast-load disk is used to "bootload" one US in a console. The node status display abstracts are among the first to be brought into the US memory, and when they are available for a user to initiate loading of the NIM or HG. The US status goes from LOAD (or READY) to OK.
2	The status remains OK unless one or more files could not be loaded into the US, at which time the status normally becomes OK.
3	As soon as the System Status display appears on the US, the user selects the NIM or HG and uses the AUTO LOCAL LOAD target to start the loading of that NIM or HG.
4	When the UCN Status display or Hiway Status display is available, the user restores the database(s) to the Devices on the UCN and Data Hiway boxes.
5	When it is convenient, the HM or HMs that contain system files are restarted and all other nodes on the LCN are reloaded, using the HM(s) as the source of the files and data. To restore full operation of USs that were started from fast-load disks, but may be using out-of-date custom names or schematics, they must be shutdown and reloaded from the network (HMs). ALL nodes displaying WARNING MUST ALL be shutdown at the same time before loading ANY AM, U/GUS/EST, CG, and or NG.

20.2.2 Fast-Load Implementation Considerations and Guidelines

Introduction

This section presents considerations and guidelines you should be aware of while conducting Fast-Load operations.

Access to Display Abstracts

When a US is reloaded or begins an area change, the following critical, standard, display abstracts and the button-configuration file, are brought into the US memory first, to hasten access to them:

Table 20-6 Display Abstracts Loaded First

Title	Abstract Name
Top 2 Lines	TOP2LINE
Console Status	CON_ASGN
System Status	SYS_STAT
Gateway Status	NODE_STS
Mount Display	FLOPPYH
Group Display	GROUP
Module Group Display	MOD_GRP

Area database

After the standard displays are in the US memory, the schematic displays named by the user in the Area Database Pathname Catalog to be memory resident are brought into US/GUS/ES-T memory.

Access is not available to US memory displays until the stations memory displays are available.

Access is not available to displays that do not reside in the US memory, until after all of the memory-resident displays are in the US memory.

An Area Change is not allowed until the US is completely loaded (all memory-resident displays are in the US memory).

20.2.2 Fast-Load Implementation Considerations and Guidelines, Continued

All schematics should be available

If, during a US load or Area Change, a memory-resident schematic display cannot be found, a prompter appears that asks that the volume that contains the schematic be mounted; therefore, it is important to be sure that the fast-load disk contains all the schematics that are configured in the Pathname Catalog in the Area Database are memory resident, so that such prompts will not slow the loading process. In the operator's personality, you can examine the Schematic Titles display to determine which schematics were copied into memory (the names of these schematics are yellow). If they are CYAN, they are NOT memory resident.

The information above means that you should consider the paths you need to quickly reestablish access, and carefully plan which displays you name in the Pathname Catalog to be memory resident and in what order. You should also consider the order in which you name volumes and directories that contain displays, because the US searches those volumes and directories in the order you name them. For more information, refer to the *Area Form Instructions*.

20.2.2 Fast-Load Implementation Considerations and Guidelines, Continued

Loading "Offnet" nodes and the NCF issues

A node that was failed but now has power applied and has not yet been seen by the US that is being used to reestablish a path to the system, can NOT be loaded from that US until THIS node sees THAT node. As a consequence of this feature, it is impossible to load a node that is running on a portion of the LCN that is separated (a different logical network) from the LCN portion the US is on. Thus, it is impossible for the US and the node that is loaded to be running on a different version of the Network Configuration File (NCF). You can determine if this has happened through the NCF Status display. To recover from this situation, the separated LCN portions must be reconnected. Refer to *LCN Guidelines - Implementation, Troubleshooting, and Service* for assistance.

Directory &ASY, impact of missing files or files with incorrect revisions

A successful load of any node requires that the NCF, standard enumerations (.SE) and standard parameter files (.SP) in directory &ASY be found and be at the correct revision level. To avoid difficulty in the quick restoration of paths to the system or to determine the reason for a problem in restoring one or more paths to the system, consider the following (if you are not familiar with the terms "bootload" or "autoboot," refer to Section 19):

- **Bootloading a US from removable media**—The disk is searched to find the &ASY directory. If it is not found, or if the NCF it contains is at an incompatible revision level, prompter NCF, 1, 2, 3, 4, X? appears, requesting that you mount a disk with a valid NCF and indicate its location.
- **Autobooting an HM**—The disc drive(s) on the HM being loaded and all operating HMs are searched to find the &ASY directory. If not found, retries continue for up to 30 minutes. If &ASY is not found, or if one of the files is at an incompatible revision level, the HM fails (crashes).
- **Loading a node from a Universal Station**—The network (all operating HMs) is searched to find the &ASY directory. If it is not found, and the program and the data sources were both on the (HMs), the node being loaded fails (crashes). If the &ASY is found but it contains files at an incompatible revision level, the node being loaded crashes. If the &ASY is not found on any HM, and the sources of both the program and data were on removable media, the load proceeds. If one of the removable media is found to contain the &ASY, or if in response to a prompter, you mount a disk that contains the &ASY.

20.2.3 Content and Maintenance of Fast-Load Disks

Contents of the Fast-Load disk for all nodes other than APP/ESVT nodes

A Honeywell-provided .EC file is used to prepare a fast-load disk, as described in 20.2.4. The disk is given a user-specified volume name and contains the following software and data:

- **Volume &OPR**—contains the US Operator function (.PI) files and boot loader if US personality is loaded.
- **Directory &ASY**—contains system files; including the Network Configuration File, NCF.CF, *.SE, *.SP, ERRBK.xx, VPCONF??.XX, SCHEDxx.BR, KEYLEVEL.KL, *.LD.
- **Directory &LDR**—contains boot loader, quality-logic test, and off-line test files.
- **Directory &DSY**—contains standard display-abstract object files and may contain user-built schematic-display object files.
- **Directory &Daa**—contains the area database for area aa where “aa” represents an area number from 01 to 10.
- **Directory &NMO** (present only if the path to the system is through a NIM with a UCN)—contains the NIM on-line personality (.PI) files.
- **Directory &UCN** (present only if the path to the sytem is through a NIM with a UCN)—contains the PM/APM/HPM/SMM/SM/LMM on-line personality (.PI) files.
- **Directory &HGO** (present only if the path to the system is through an HG and Data Hiway)—contains the HG on-line personality (.PI) files.
- **Directory &Ixx**—contains the checkpoint files for the Data Hiway number (01 to 20) or the Universal Control Network number (01 to 20).
- **Directory &UXS**—contains the GUS/UxS/EST personality (.PI) files and boot loader if GUS/UxS/EST personality is loaded.

ATTENTION

With release R650, a GUS node can be loaded with the GUS personality or Operator personality using a fast-load cartridge (containing the GUS personality files or Operator personality files) mounted in a different US/GUSEST.

The fast-load cartridge that is used to load the GUS/UxS/EST node with the GUS/UxS/EST personality will contain &UXS directory. The fast-load cartridge that is used to load the GUS/EST node with the operator personality will contain &OPR directory. A fast-load cartridge can contain either the operator personality files or GUS personality files but not both.

20.2.3 Content and Maintenance of Fast-Load disks,
Continued

WARNING

WARNING—When you add or modify Custom Data Segments (CDSs) or custom packages, you must copy the resulting updated .SE and .SP files (in the &ASY directory) to your fast load disks. If you do not, the nodes (US, UxS, EST, GUS, AM, APP, ESVT, CG, NG) that are loaded will not match the other RUNNING nodes.

Contents of the Fast-Load disk for APP nodes

The Honeywell provided FAST_APP.EC file is used to prepare a fast-load disk for loading the APP/AM/ESVT personality without using the HM. The disk contains the following software and data:

- **Volume nnn**—contains the personality (.PI) files, boot loader and so on (n is the volume specified while creating the fast-load cartridge).
- **Directory &AXM**—contains the APP/ESVT personality (.PI) files if you select the APP/ESVT personality to be loaded.
- **Directory &AMO**—contains the AM personality (.PI) files if you select the AM personality to be loaded.
- **Directory &LDR**—contains the boot loader, quality-logic test, and off-line test files.
- **Directory &ASY**—contains system files; including the Network Configuration File, NCF.CF.
- **Directory &CUS**—contains external load modules for custom software and CL extension files.
- **Directory &CLX**—contains the set-definition files for AM custom software.
- **Directory &Fn**—contains checkpoint files.

Keep your fast-load disk convenient for the user

It is possible to create additional directories on a fast-load disk and to copy to them, the US's Universal Personality for convenience in loading a US with those personalities, as allowed under Honeywell's software licensing policy. We do not recommend this for fast-load disks intended for actual fast restoration of a path to the system, because the presence of additional personalities causes an additional step in the loading procedure, and it is possible that an operator could select the wrong personality. Additionally, should an operator select the Universal Personality, it takes longer to load than the operator's personality, because there are more files to load.

20.2.3 Content and Maintenance of Fast-Load disks, Continued

Checkpoints and NCFs established

Initial checkpoints and NCF are established when you prepare a fast-load disk. The disks should be regularly updated with new checkpoint data and if NCF changes are installed, the NCF should be updated, or any CDS updates.

Checkpoint frequently

NIM or HG checkpoints should be saved frequently. To update checkpoint data, request a demand checkpoint (SAVE DATA) for the appropriate process network and specify the appropriate fast-load disk as the checkpoint destination.

You may wish to use the CLNCFBKP.EC command file to update your NCFs on fast-load disks. User instructions are provided in that command file. The CLNCFBKP.EC file is also provided on the disk &Z1 (for 68040 and 68020).

20.2.4 How to Prepare or Update a Fast-Load Disk

Preparation

Use command file FST_VOLZ.EC to prepare a fast-load disk to update selected directories on the disk. This .EC file is provided by Honeywell on disks &Z1. If you need to reestablish more than one path to the system, you may need to prepare more than one fast-load disk. Figure 20.1 is a high-level flow chart of FST_VOLZ.EC. The command file asks several questions that you answer by keying in "y" or "yes", or "n" or "no". Other questions ask you to key in a few characters. Press ENTER after each answer. Note this command file is applicable for US/GUS/EST/APP/NIM/HG/CG/AM/ESVT and all UCN devices.

Table 20-7 Procedure for Preparing a Fast-Load Disk

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Place the disk with EC files in a drive.</td></tr>
<tr><td>2</td><td>Place a new disk or one with data you no longer need in a drive, or place an existing fast-load disk that is to be updated in a drive.</td></tr>
<tr><td>3</td><td>This step is optional, but is recommended to help you to verify that the fast-load disk was built correctly.
Execute a Prompt Data On command followed by a Data Out command to direct the command file's prompter and messages to a printer. To do this, enter the following commands and press ENTER after each command is entered:

PD ON
DO $Pn (n is the printer number)</td></tr>
<tr><td>4</td><td>On the Command Processor display, key in the following command line and press ENTER:

EC $Fn>&EC>FST_VOLZ.EC $Fd aa hu NET PTH1
<table>
<tr><th>Where</th><th>Is the…</th></tr>
<tr><td>n</td><td>number of the drive with the .EC files disk</td></tr>
<tr><td>d</td><td>number of the drive with the destination (fast load) disk</td></tr>
<tr><td>aa</td><td>area number (00 to 10) for the fast-load US.</td></tr>
<tr><td>hu</td><td>process network number (hiway or UCN number; 01 to 20).</td></tr>
<tr><td>NET</td><td>source of the software and data to be placed on the fast-load (destination) disk. If the source is not an HM(s), use a disk drive number ($Fs).</td></tr>
<tr><td>PTH1</td><td>name you wish to give the fast-load disk.</td></tr>
</table></td></tr>
</table>

20.2.4 How to Prepare or Update a Fast-Load Disk, Continued

Preparation of Fast-Load disk for APP/ESVT nodes

Use command file FAST_APP.EC to prepare a fast-load disk. This .EC file is provided by Honeywell along with the software upgrade. Figure 20-2 is a high-level flow chart of the FAST_APP.EC. The command file asks several questions that you answer by keying in “y” or “yes”, or “n” or “no”. Other questions ask you to key in a few characters. Press ENTER after each answer.

Table 20-8 Procedure for Preparing a Fast-Load Disk

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Place the disk with EC files in a drive.</td></tr>
<tr><td>2</td><td>Place a new disk or one with data you no longer need in a drive.</td></tr>
<tr><td>3</td><td>This step is optional, but is recommended to help you to verify that the fast-load disk was built correctly.

Execute a Prompt Data On command followed by a Data Out command to direct the command file's prompter and messages to a printer. To do this, enter the following commands and press ENTER after each command is entered:

PD ON
DO $Pn (n is the printer number)</td></tr>
<tr><td>4</td><td>On the Command Processor display, key in the following command line and press ENTER:

EC $Fn>&EC>FAST_APP.EC $Fd FAST

<table><tr><th>Where</th><th>Is the…</th></tr><tr><td>n</td><td>number of the drive with the .EC files disk</td></tr><tr><td>d</td><td>number of the drive with the destination (fast load) disk</td></tr><tr><td>FAST</td><td>name you wish to give the fast-load disk.</td></tr></table></td></tr>
<tr><td></td><td></td></tr>
</table>

20.2.4 How to Prepare or Update a Fast-Load Disk, Continued

Construction of Fast-Load disk for APP nodes

The command file asks questions to verify the information on the command line or to give you opportunities to change that information. The flow chart in Figure 20-2 shows the types of questions that are asked, according to your responses to preceding questions.

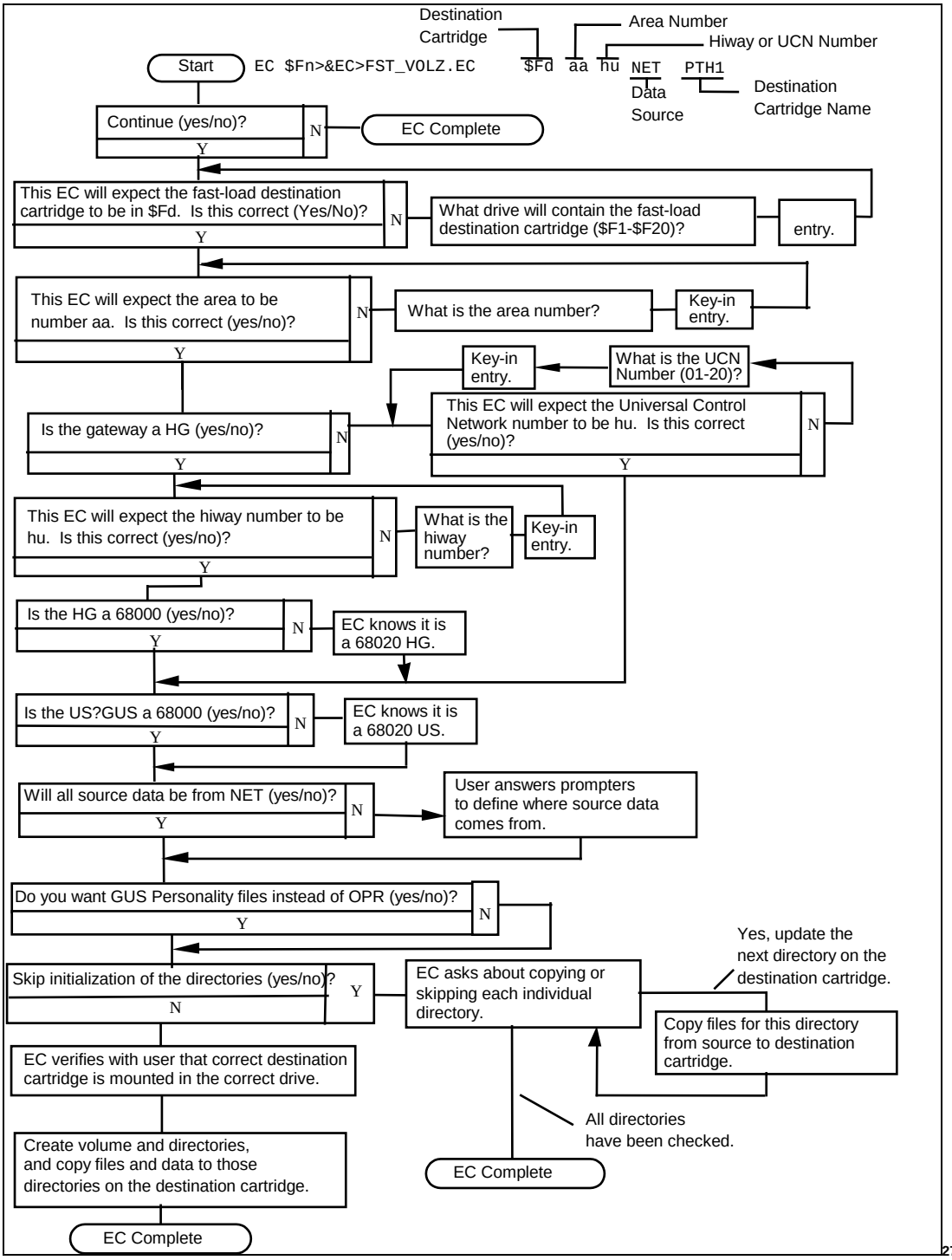
If you need to stop building the fast-load disk, hold [CTL] and press [COMND] (the BREAK key). When the command file reaches the next pause, its operation terminates. After you do this, you may have a disk that is of little or no use.

Preparation or updating of a fast-load disk is relatively easy will take several minutes to complete. Once the FAST APP disk has been created, you should verify that it is operational. you can use the disk on a GUS/EST to reload and restart an APP/ESVT but ONLY if the HM is not available. To test this, the HM(s) would have to be non-operational.

Refer to the *AM Implementation Guidelines Manual* for detailed instructions for such a load.

20.2.4 How to Prepare or Update a Fast-Load Disk, Continued

Figure 20-1 FST_VOLZ .EC Flow



20.2.4 How to Prepare or Update a Fast-Load Disk, Continued

FAST_APP.EC

FAST_APP.EC is a template that you can customize (for specific nodes) according to your requirements. You can create your own EC file to create fast-load cartridges to load APP nodes. You can also make your own customized versions of this file if all AM checkpoints cannot fit into a single removable media. The fast-load cartridge created by the unmodified FAST_APP.EC file has all possible AM/APP checkpoints and related files. Therefore, the fast-load cartridge can load all of the system APP nodes or AM nodes (depending on the personality files included).

The FAST_APP.EC file:

- creates the fast-load volume and directories
- copies either the AM (&AMO) or APP (&AXM) personality files from HM or &Z3 disk to fast-load media
- copies &LDR, &ASY, &CUS and &CLX from NET to fast-load media
- copies all AM/APP checkpoint data on the net to the fast-load media

FAST_APP.EC optionally allows you to update any of the directories on the APP/AM Fast-Load cartridge without having to re-create the volume.

ATTENTION Honeywell recommends that you disable the auto checkpointing before executing this EC file.

Note: The fast-load cartridge can contain either the AM or APP personality files, but not both. If both personality files are present in the fast-load cartridge, the AM personality files will be loaded by default.

20.2.4 How to Prepare or Update a Fast-Load Disk, Continued

FAST_APP.EC

Procedure for creating the AM/APP Fast-load cartridge:

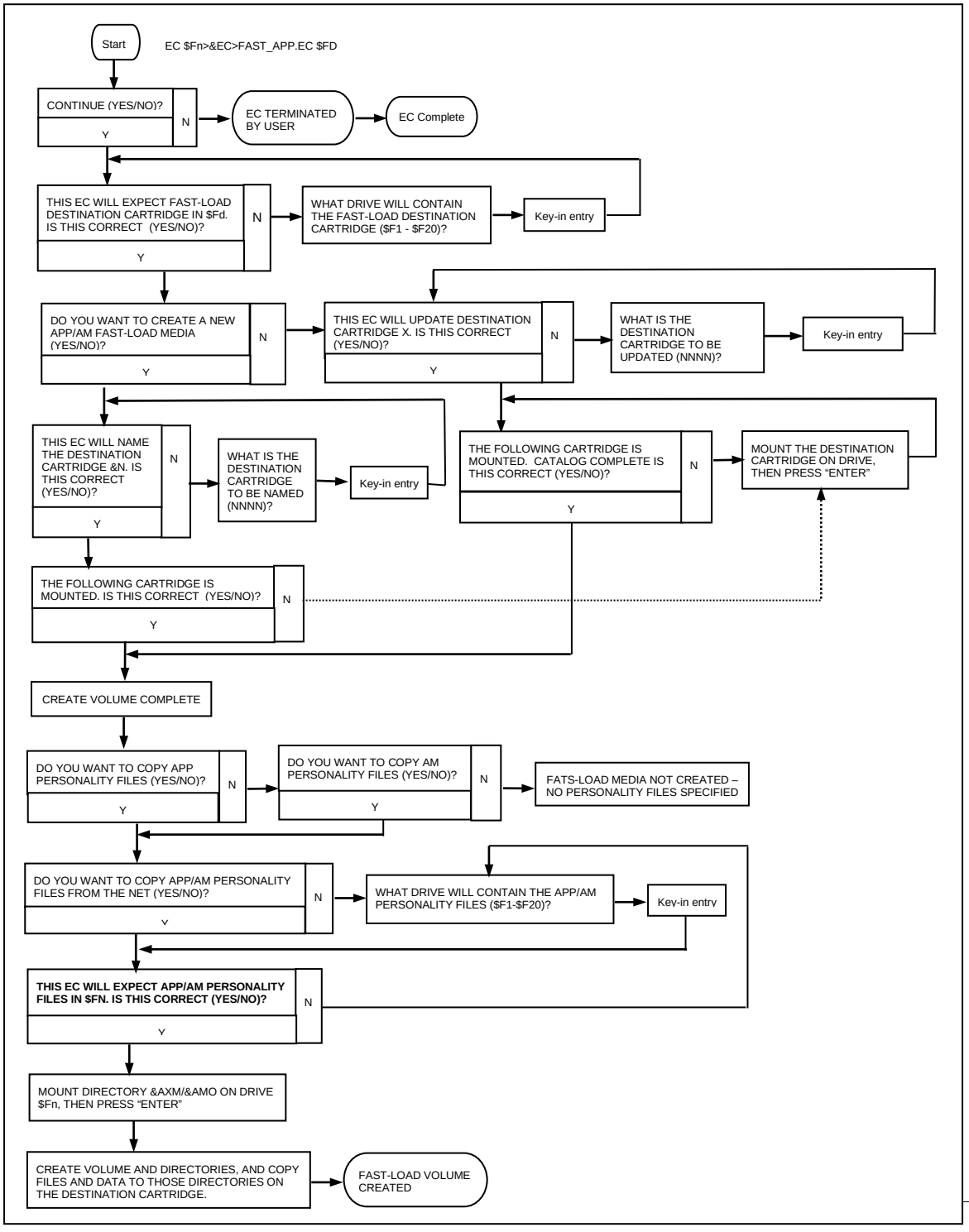
1. Click Access → Mount/Dismount Emulated Disks.
2. In the Mount/Dismount Emulated Disks dialog box, Mount &Z3 on the drive.
3. Create a cartridge and specify the emulated disk information.
4. Mount the emulated/physical disk on the drive.
5. From the Engineering Menu, select Command Processor.
6. Type `EC $FS>&EC>FAST_APP.EC $FD`

   where $FS represents the source drive and $FD represents destination drive.

Press ENTER. The command file asks several questions that you answer by keying in “y” or “yes”, or “n” or “no”. Other questions ask you to key in a few characters. Press ENTER after each answer.

20.2.4 How to Prepare or Update a Fast-Load Disk, Continued

Figure 20-2 FAST_APP.EC Flow Chart



20.2.4 How to Prepare or Update a Fast-Load Disk, Continued

Verifying a Fast-Load disk for all nodes other than APP node

You can use any or all of the following activities to help to verify that a fast-load disk has been built or updated correctly. For the best assurance, do all of them.

- Use optional step 3, above, to print the results of execution of the FST_VOLZ.ECcommand file, then after the disk is built or updated, examine the printout for any reported errors. If any were reported, try to eliminate the cause of the error and repeat steps 1 through 4, above. As an alternative to printing, you can use a DO command to direct the output to a user file and then use the Text Editor to examine the user file for reported errors.
- Use the Copy Volume command to copy a new or updated fast-load disk to another disk. This verifies that all directories and files on the new or updated fast-load disk can be read. The disk that accepts the copy must have been initialized with a format that can accept the content of the fast-load disk. These are examples of command lines that
  - Initializes the disk to accept the copy,
  - Copy all directories and files from the fast-load disk to the second disk, and
  - Include an optional Write Boot command that, if used, enables the second disk to also be used as a fast-load disk.

```
CV $F2>PTH1> -F -MF 600 -MD
CPV $F1>PTH1> $F2>PTH1 -A -D
WB $F2>&LDR
```

  For more information about these commands, see *Command Processor Operation*.
- In a test situation, rather than after an actual disruption, use the new or updated fast-load disk to startup a reset or shut down the Universal Station and the NIM or HG on the valve path it serves. Refer to the *Process Operations Manual* for more information about using such a disk to start up and load notes.

20.2.4 How to Prepare or Update a Fast-Load Disk, Continued

Verifying a Fast-Load disk for APP nodes

You can use any or all of the following activities to help verify that a fast-load disk has been built or updated correctly. For the best assurance, do all of them.

- Use optional step 3 in Table 20-8 Procedure for preparing a Fast-Load disk, to print the results of execution of the FAST_APP.EC command file. After the disk is built or updated, examine the printout for any reported errors. If any errors were reported, try to eliminate the cause of the error and repeat steps 1 through 4. As an alternative to printing, you can use a DO command to direct the output to a user file and then use the Text Editor to examine the user file for reported errors.
- Use the Copy Volume command to copy a new or updated fast-load disk to another disk. This verifies that all directories and files on the new or updated fast-load disk can be read. The disk that accepts the copy must have been initialized with a format that can accept the content of the fast-load disk.

20.3 Node Dumps

Introduction

When a node fails, useful or vital information about the cause of the failure is often contained in the information retained in the node's memory. If this information is dumped on (stored on) an HM or a disk before the node is restarted, if requested, the information can be sent to Honeywell for analysis.

Configure a Dump volume

It is recommended you configure a Dump volume (&2np) on an HM (for more information, refer to Section 7 or see Tables 7-1 and 7-9) and keep each node's dump state as ENABLE (on the Console Status or node status display, select a node, select ENABLE LD/DUMP, then select ENABLE DUMP). With R4xx and above a NODE DUMP target appears when the node is selected. If a node has failed (was not intentionally shut down), proceed with the dump before initiating a load.

If Honeywell requests a copy of the dump information, you can use the Command Processor to copy the dump data from the HM to a disk to Honeywell.

20.3.1 Dump Failures

Introduction

If a node dump is unsuccessful for some reason, such as inadequate dump volume space or a transfer error, you can usually repeat the dump (of course, if the dump did not complete because of inadequate space on the dump medium, you must resolve that problem). To retry the dump, shut down the node to force it to fail again (on the Console Status or node status display, select the node whose dump failed, select SHUT DOWN, and press ENTER). Then you can retry the dump.

Overwritten data

In this situation, some of the data in the node's lower memory can be overwritten. This is better than no dump data at all. Should you use this technique, be sure to mark the disk used to store the dump data, to indicate that the data was obtained after a "forced failure."

20.3.2 Save Error Blocks on Node Reload

Introduction

With R681, the System HM is enhanced to retrieve the following information of a failed node:

- Valid error blocks
- Register information
- Node attributes such as node number, version, node type, personality type, and processor type

When a node fails, the System HM retrieves and saves the information to a file in the system HM.

NOTE: The System HM can save the error block information for multiple failed nodes.

ATTENTION

You can analyze the node failure using the error block information saved in the system HM and/or the node dumps. Honeywell recommends collecting node dumps, as the node dumps provide a more detailed description about the node failure.

LCN node support

The new feature supports the failure of the following LCN node types:

- AM
- Non-System HM
- HG
- NIM
- CG
- NG
- US
- GUS
- APP

Experion support

The new feature supports the failure of the following node types in Experion:

- ES-T
- ESVT
- ACE-T

Information from a failed node

The System HM retrieves the valid error blocks of a failed node and converts them to ASCII format. The converted error blocks information is saved in a text file in HM. The format of the text file corresponds to the SMCC Detailed Module Error block display. You can open the text file using the text editor for analyzing the error block information. This file can be transferred through File Transfer.

Similarly, the register information and the node attributes of a failed node are saved in the text file.

ATTENTION

You cannot save the error block information of a failed node if the System HM is not available. &ASY directory must be available in the System HM.

HM Text file

The text file ERRBK.XX is used for saving the error block information and resides in the NET>&ASY directory of HM. When a node fails, the valid error blocks are added at the beginning of this file. The text file can accommodate the error block information for a maximum of 10 failed nodes.

NOTE: When retrieving error block information from multiple failed nodes, the system HM retrieves only the first error block information from the multiple failed nodes. However, all the valid error blocks are retrieved from the latest failed node.

If the error block information cannot be retrieved or saved in a text file, a System Error Journal (SEJ) is generated.

If the &ASY directory is not available, the error blocks of a failed node are not retrieved and saved.

If the ERRBK.XX file is protected then a temporary file is not created and a SEJ is generated. If the ERRBK.XX file is not accessible and is not protected, the error block information is retrieved and saved in a temporary file.

When a node failure occurs subsequently, the System HM performs the following:

- Retrieves the error block information from the temporary file and saves it to the ERRBK.XX file.
- Deletes the temporary file.
- Retrieves the error block information from the latest failed node and updates the ERRBK.XX.

Error block information

The system HM can retrieve and save up to a maximum of 32 valid error block information of a failed node in the HM text file. The text file contains the information displayed in SMCC /MAINTENANCE > MODULE ERROR > DETAILED MODULE ERRORS.

The detailed error block contains Error Entity Type, Error Severity, Error Desc Size, Error Desc Type, Occurrence Time, Task name, Program Counter1, Program Counter2, Program Counter3, Param1 and Param2.

For example:
Rec=1; Error Entity Type=$ILLOGICAL_CONDITION;
Error Desc Type=$Software_Error; Time=6/25/2007 11:41:39:8005
Task Name=UG$_RED; PC1=003D0D34; PC2=004059DA;
PC3=0040614A
Param1 INTEGERS Values=170,180; Param2 INTEGERS Values=0,0

Register information

The System HM retrieves the register information from a failed node and saves them in the text file. The register information contains the following details:

- Address registers: A0, A1, A2, A3, A4, A5, A6, and A7.
- Data registers: D0, D1, D2, D3, D4, D5, D6, and D7.

Format of register information:
D0=00000000;D1=00000007;D2=41A66032 D3=00000000
D4=00000000;D5=00000002;D6=00000001;D7=00000008
A0=800B99E0;A1=002DCBB5;A2=002DCB8F;A3=00507A00;
A4=800B9AF2;A5=800B9A14;A6=000B8C82;A7=800B99C6

Node attributes

The System HM retrieves the node attributes from a failed node and saves them in a text file.
The following node attributes are saved in the text file:
Node number,version, node type, personality type, and processor type.

Format of node attribute:
Failed Node=1
Version=68.10; Type=US; Personality=usonp;
Processor=G$K2LCN_with_8MW

Section 21 – Checkpointing

21.0 Overview

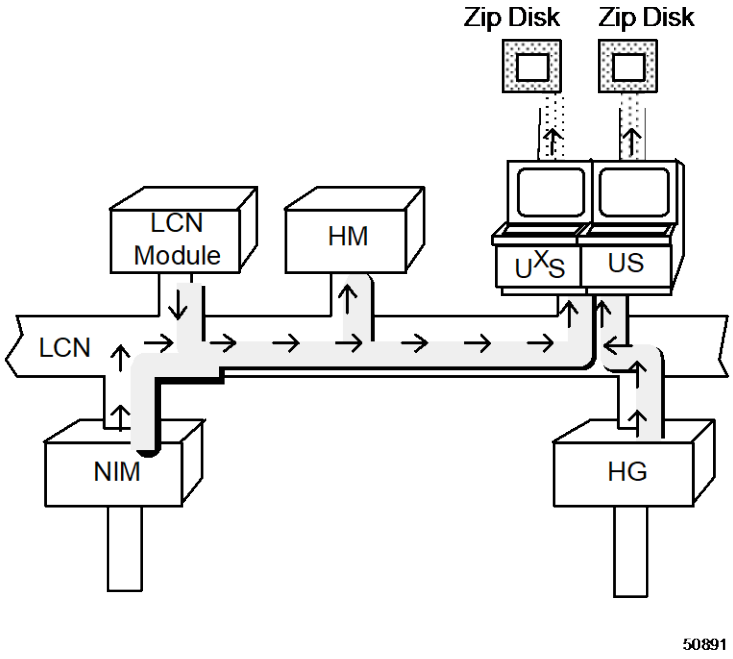
Description

This section defines checkpointing. It describes how you configure your system for checkpointing for HGs, NIMs, AMs, and CGs.

It also explains how automatic checkpointing functions, and what happens if an error occurs.

What is checkpointing?

Checkpointing is the storing of the process database from a module or gateway in files, from which the data can be reloaded into the module or gateway, should it be necessary to restart it. Where a gateway serves process devices, such as the boxes on a Data Hiway, or PMs or LMs on a Universal Control Network, their process data can be included in the checkpoint files, and reloaded. The term "checkpoint" arises from the notion that a "snapshot" of the data is acquired at some point in time—a "checkpoint."



Initiating a checkpoint

Through the module or gateway status displays, you can enable automatic checkpoints—the collection of checkpoint data every four hours, and you can demand a checkpoint at any time.

Good checkpointing practices

To protect their data in case of a failure, you can configure your system to automatically request checkpointing. This procedure stores checkpoint data to the hard disk on an HM.

Always make it a practice to periodically perform a demand checkpoint of all critical nodes. Save these checkpoints to removable media. In the unlikely event of a hard disk failure, you will have checkpoint data from which you can recover your data.

21.1 How to Configure for Checkpointing

Preparation

For demand checkpointing to removable media, no configuration is necessary other than to use the Utilities' Create Volume command to initialize the disks that will receive the checkpoints.

We recommend each removable medium (volume) used to receive checkpoints be initialized with at least 240 files.

When you save a checkpoint on a removable medium, if they don't already exist, appropriate checkpoint directories are created on the medium. These directories are listed on Table 2-1 in this manual.

WARNING

WARNING—If you reconfigure checkpoint volumes on an HM that is on-line, you will have to copy all of the data on that HM to removable media or another HM. You must copy all of the data on the HM because it must be initialized, which erases the content of the HM.

The HM must then be reloaded with the new volume configuration and the data that was copied from it.

How many checkpoint volumes are needed?

Configure a checkpoint volume on an HM for each node that is to have automatic checkpointing (you can use more than one HM for checkpointing).

This is accomplished in the Volume Configuration portion of Network Configuration, on form *SW88-517*, which represents the Physical Node for Checkpoint Configuration Display.

References

Refer to *Network Form Instructions* for instructions for filling in form *SW88-517*.

See *Network Data Entry* for instructions covering the installation of the new NCF and restarting the HM with the new volumes.

Also refer to *Engineer's Reference Manual*—this manual.

Creating checkpoint directories

Appropriate checkpoint directories in checkpoint volumes on HMs are created during system startup Task 18, as each node is started up for the first time. At that time, the appropriate Honeywell-provided null-checkpoint medium is used as the data source for load operation.

Added LCN nodes

If you add a node to the LCN that needs checkpoints, unless you intend to use only removable media for the checkpoints (this means no automatic checkpointing), you must reconfigure HM volumes to add a checkpoint volume for the new node (see the *Warning* above).

If you add units to an AM or a CG, if the HM checkpoint volume for the node affected is large enough (see *Engineer's Reference Manual*—this manual), you need only to add a checkpoint directory for the unit and copy the master checkpoint file into that directory.

See *Application Module Implementation Guidelines* for the procedure to add a checkpoint directory.

21.2 Checkpoint Functions

Introduction

Checkpoints can be called on demand or automatically, as requested by the user. These operations will be covered in the sections which follow.

CAUTION

First, some precautions

- Do not try to concurrently load both HGs in an HG pair, nor both NIMs in a NIM pair—because one of the gateways may fail. Complete loading of one of the gateways as the primary, then the other can be loaded as the secondary.
- When you do a demand checkpoint to a removable medium, use just-initialized disks only. If, for some reason, a demand checkpoint to a removable medium is not completed and that medium contained an older checkpoint, some of the checkpoint data will be new and some may be old. This results in useless data.
- Use demand checkpoints as backups for HM checkpoint data, rather than copies of HM checkpoint data. If more than one disk is needed, the data for one unit may be split between disks, and such data can't be reloaded.

CAUTION

With TPN R684, checkpointing EUCN nodes (ENIM or EHPM) may take slightly more time as compared to checkpointing UCN nodes (NIM or HPM), because of the Request Data Response (RDR) transfer mechanism of the EUCN through the Ethernet.

21.2.1 Demanding, Enabling, and Disabling Checkpoints

Requesting a demand checkpoint

The node status displays for AMs and CGs, and the process-network (UCN and Data Hiway) status displays have a SAVE DATA target (pick). The SAVE DATA target can be used to request a demand checkpoint at any time. When the SAVE DATA target is used, prompters request that the medium specifies where the checkpoint is to be stored. NET specifies the checkpoint is to go to the HM that has the checkpoint volume for the physical node. $Fn specifies a removable media drive. If more than one disk is needed to complete the checkpoint, prompters ask you to mount a new medium.

21.2.1 Demanding, Enabling, and Disabling Checkpoints, Continued

Auto save

When you select the AUTO SAVE target, `ENABLE` and `DISABLE` targets appear, and just above them, this line appears:

```
Current State:  Enable (Disable)
```

Select the target for the other state, and the current state changes. In the enable state, automatic checkpointing for the node is enabled and occurs as described in the Automatic Checkpointing section which follows. The disable state prevents automatic checkpointing for this node. These states have no effect on demand checkpointing, and demand checkpointing has no enable or disable states.

We recommend that you disable automatic checkpointing for a node and do not request a demand checkpoint when you are using the DEB to load entities in the node.

Because AMs can have hot, warm, and cold restarts, the time of the last AM checkpoint (automatic or demand) is shown on the Node Status display for each AM. Users can consider this time in deciding which type of restart to use. Refer to *Application Module Control Functions* for definitions of hot, warm, and cold restarts.

Refer to *Hiway Gateway Implementation Guidelines* for additional information on the HG database and HG checkpointing.

CAUTION

When you do a demand checkpoint to removable media, use just-initialized disks only. If, for some reason, a demand checkpoint to a removable medium is not completed and that medium contained an older checkpoint, some of the checkpoint data will be new and some may be old. This results in useless data.

Use demand checkpoints as backups for HM checkpoint data, rather than copies of HM checkpoint data. If more than one disk is needed, the data for one unit may be split between disks, and such data can't be reloaded.

21.2.2 Automatic Checkpointing

Description

Each HM, with checkpoint volumes, independently cycles through its list of physical nodes to checkpoint. If automatic checkpointing is enabled (`Auto Save` status on the node status display is `Enable`), a checkpoint from each logical node in the physical node is requested. This applies to HGs, NIMs, AMs, and CGs.

Each physical AM and CG has as many logical nodes as it has units. Each NIM and HG has only one logical node.

Checkpoint cycle time

The standard automatic checkpoint-cycle time is 4 hours. This means that every 4 hours, each logical node is asked for its checkpoint data. If the checkpointing for all logical nodes is complete within 4 hours, the next cycle begins at the start of the next 4-hour cycle. If it is not complete when the time arrives for the next cycle, the next cycle begins as soon as the previous cycle is complete.

The cycle starting times are (in 24-hour format)

- 00:30 am 12:30 pm
- 04:30 am 16:30 pm
- 08:30 am 20:30 pm

Checkpoint time-out

If a requested checkpoint for a logical node is not complete within 60 minutes, a time-out message is printed on the Real-Time Journal (see 21.3 in this manual) and the cycle continues as described above. If a node fails while being checkpointed, a failure message is printed in the Real-Time Journal and the cycle continues as described above.

If a primary HM fails during a checkpoint cycle, its secondary HM doesn't continue with the cycle, but restarts checkpoint cycles at the next cycle start time.

Automatic checkpoints at intervals other than 4 hours

Each History Module with checkpoint volumes contains five Processor Status Data Point (PSDP) parameters that allow you to monitor automatic-checkpointing functions and to change from the standard automatic-checkpoint interval and offset.

The first four of these parameters represents time in hours, minutes, and seconds. The fifth parameter is an integer. You can view these parameters in the TLK1 displays. See 10.4 in this manual for TLK1 clock displays.

CAUTION

If you set up an HM for frequent checkpointing, be careful not to create any system performance problems. Frequent checkpointing increases both the HM and network workloads. Even though a 10 second delay is set up between units being checkpointed, do not configure the same HM for both frequent checkpointing and continuous history.

CAUTION

If the default automatic checkpoint period is modified, the allowable range for the period is 00:01 hours to 12:59 hours. **Do not use** 00:00 hours to force continuous checkpointing. History access will become blocked if automatic checkpointing is disabled on any node being checkpointed by that HM.

Automatic checkpoint parameters

Here is a list of the five PSPD automatic-checkpoint parameters:

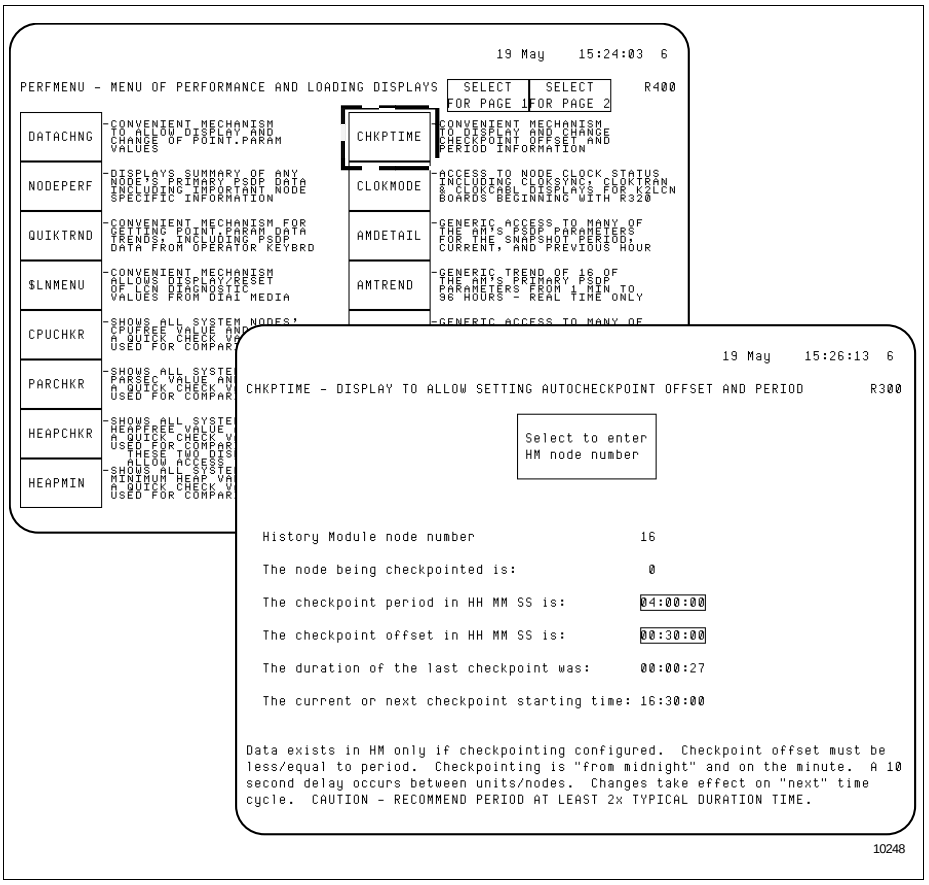
- TIMEBASE(1)—This HM's automatic-checkpoint interval. The default value of this parameter is 4 hours. You can view and change this parameter. Seconds may be displayed; however, if they are entered, they are arbitrarily set to zero. The new Period must be greater than or equal to the Offset, the parameter in TIMEBASE(2). The new Period, converted to minutes, must be an exact divisor of 1440, the number of minutes in a day (24 hours/day times 60 minutes/hour).
- TIMEBASE(2)—This HM's automatic-checkpoint offset value. The default value of this parameter is 30 minutes. You can view and change this parameter. Seconds may be displayed; however, if they are entered, they are arbitrarily set to zero. The new Offset must be less than the Period, the parameter in TIMEBASE(1).
- TIMEBASE(3)—The time it took to complete the last automatic-checkpointing cycle. This is a view-only parameter.
- TIMEBASE(4)—Start time of the current or last automatic checkpoint. This is a view-only parameter. A nonzero value for seconds may be displayed since the internal dynamics of the HM can keep the automatic checkpoint from starting exactly on the minute (seconds = 00). The starting time is updated whenever a new Period or Offset is entered. If a new Period or Offset is entered during a checkpoint's duty cycle, the current starting time is overwritten by the new starting time.
- NODENUM—The number of the node currently being processed. If no automatic checkpointing is in progress, this parameter contains a value of zero.

To change parameters

These PSDP parameters can be changed by using the PERFMENU display CHKPTIME as shown in the following figure. Also, any of these parameters can be included in a custom display by referencing the PSDP for the node and the desired parameter. For example, to display the time it took to complete the last checkpoint for HM 16, reference $PRSTS16.TIMEBASE (3).

21.2.2 Automatic Checkpointing, Continued

CHKPTIME Display



If you change period or offset

Because automatic checkpointing is initiated “on the minute,” a new Period or Offset is not be recognized until the next “on the minute.” If both the Period and Offset are to be changed, complete both changes before the next “on the minute.”

21.2.2 Automatic Checkpointing, Continued

How an auto checkpoint file is constructed

An auto checkpoint file is set up in the local volume of each HM configured for automatic checkpointing, when automatic checkpointing starts up for the first time. The file is given a network unique name by using its HM pair number. The initial auto checkpoint file is named Cxx_CPNT.MM, where xx is the HM pair number 1 - 20. It is built as a protected file.

What happens if auto checkpoint file is corrupted

If the file gets corrupted, it is renamed CP_RNzzz.MM, where zzz is an integer between 0 and 30, and a new Cxx_CPNT.MM file is created.

If the corrupted file was detected while the intervals or offsets were being changed, the new file contains the new values.

If the corrupted file was discovered during an HM startup, the new file contains the default values.

Detecting automatic checkpoint errors

If the auto checkpoint file is corrupted, an error message appears in the real-time journal, that warns that the file was corrupted and that a renamed file has been set up.

If a requested checkpoint for a logical node is not completed within 60 minutes, a time-out message appears in the real-time journal (see 21.3) and the cycle continues. If a node fails while being checkpointed, a failure message is printed in the real-time journal and the cycle continues.

If a primary node fails during its checkpoint cycle, its designated secondary, if it has one, doesn't continue with the cycle but restarts checkpointing at the next cycle time.

21.2.3 Levels of Automatic Checkpointing

Summary of states

The three levels of automatic checkpointing, the status displays to use for viewing and modification, and checkpoint state descriptions are summarized in the following table:

Table 21-1 Autocheckpoint States

Level	Status Display	State	Description
NIM	Gateway Status display	ENABLE	Checkpoint Control will attempt to checkpoint the NIM, and then proceed to attempt checkpointing of devices on the UCN based on • UCN checkpoint state, and • individual device checkpoint states.
		DISABLE	Checkpoint Control will not attempt to checkpoint the NIM or any devices on the UCN.
UCN	UCN Status display	ENABLE	Checkpoint Control will attempt to checkpoint any devices on the UCN with checkpoint state of ENABLE.
		INHIBIT	Checkpoint Control will not attempt to checkpoint any devices on the UCN.
Device	UCN Status display or	ENABLE	Checkpoint Control will attempt to checkpoint this device.
	Device Status display (PM,APM,LM)	INHIBIT	Checkpoint Control will not attempt to checkpoint this device.

21.2.3 Levels of Automatic Checkpointing, Continued

Default on a node load

The default automatic checkpointing states on a node load (of a node with no active primary) for the different levels are shown in the following table:

Table 21-2 Default Autocheckpoint States on Node Load

Type of Node Load	Checkpoint Level	Auto Checkpoint Default State
Primary NIM	NIM	Defaults to checkpoint state in the checkpoint file used to load.
	UCN	INHIBIT
	Device	Each device's checkpoint state will default to the state as it was saved in the checkpoint file used to load.
Primary Device	NIM	Unaffected by device load.
	UCN	Unaffected by device load.
	Device	INHIBIT

21.2.3 Levels of Automatic Checkpointing;, Continued

Review of autocheckpoint disable levels

If you are relying on autocheckpointing to provide current checkpoint files for your UCN, keep in mind the three levels that must be enabled for a UCN node to be checkpointed.

For example, suppose it became necessary for you to reload the NIM. As listed in the above table, Default Autocheckpoint States on Node Load, the autocheckpoint state for the UCN defaults to INHIBIT on a NIM load. If you forget to change the checkpoint state back to ENABLE, the next time autocheckpointing is initiated for the UCN, checkpointing will be performed for the NIM (if NIM state is ENABLE) but not for any other nodes on the UCN. If database changes are then made and the NIM is checkpointed, the NIM checkpoint file will contain the new information but the process box checkpoint file will not be updated.

The following table shows the results of the different combinations of autocheckpoint states for the different levels of autocheckpointing:

Table 21-3 Autocheckpoint State Combinations

NIM	UCN	Process boxes(all)	Nodes that will be checkpointed
ENABLE	ENABLE	ENABLE	NIM Process boxes
ENABLE	ENABLE	INHIBIT	NIM only
ENABLE	INHIBIT	ENABLE	NIM only
ENABLE	INHIBIT	INHIBIT	NIM only
DISABLE	ENABLE	ENABLE	None
DISABLE	ENABLE	INHIBIT	None
DISABLE	INHIBIT	ENABLE	None
DISABLE	ENABLE	INHIBIT	None
DISABLE	INHIBIT	INHIBIT	None

Understanding how these levels affect the checkpoint files created during an automatic checkpoint will help you avoid creating inconsistent checkpoint files that may cause point fragments if used to load a node.

21.2.4 Checkpoint File Organization

Introduction

You can use the Utilities' List File Attributes command (LS or CAT) to list the files in your checkpoint directories (see Table 2-1 for the directory names). The lists include the date and time of each checkpoint. Old checkpoint data is retained while new data is being stored, so while the data is being stored there are two copies of each file.

Filename symbols

The symbols used in filenames in the following tables have these definitions:

bb	=	Box number
hh	=	Hiway number (1 through 20)
mm	=	UCN Node number (1 through 32)
r	=	Revision level of this file (r = 1 or 2) r = 1 the first time the file is saved, r = 2 the second time, then it alternates each time the file is saved.
uu	=	UCN number (1 through 20)
uuu	=	Unit number (1 through 100)

HG Checkpoint Files

Checkpoint files are grouped in the HG as shown below.

Table 21-4 HG Checkpoint Files

HG Checkpoint Files	Description
HG0hhAXr.CP	AUX data (R520 and newer)
HG0hhbbL.CP	MC Logic Block data
HG0hhbbr.CP	Box-resident data
HG0hhEXr.CP	ASSOCDSP data (R520 and newer)
HG0hhHGr.CP	HG-resident data
HG0hhMAS.CP	Master-revision file
HG0hhOPr.CP	Output alarm data (R520 and newer)

21.2.4 Checkpoint File Organization, Continued

NIM Checkpoint Files

Checkpoint files are grouped in the NIM as shown below.

Table 21-5 NIM Checkpoint Files

NIM Checkpoint Files	Description
NM0mmNMr.CP	NIM-resident data file
NM0mmMAS.CP	NIM master file
LM0mmuur.CP	LM-resident data file
LM0mmuuM.CP	LM master file
PM0mmuur.CP	PM-resident data file
PM0mmuuM.CP	PM-master file
APMmmuur.CP	APM-resident data file
APMmmuuM.CP	APM-master file
HPMmmuur.CP	HPM-resident data file
HPMmmuuM.CP	HPM-master file
SM0mmuur.CP	SM-resident data file
SM0mmuuM.CP	SM-master file

AM Checkpoint Files

Checkpoint files are grouped in the AM as shown below.

Table 21-6 AM Checkpoint Files

AM Checkpoint Files	Description
AMuuuMAS.CP	Master checkpoint file
AMuuuPDr.CP	Point data
AMuuuNTr.CP	Point names
AMuuuLAr.CP	CL
AMuuuCDr.CP	Custom DSDs

With an automatic checkpoint, only the data that changes will be checkpointed. This causes some files to be version one and some files to be version two. With a manual checkpoint, all data is saved and all files will have the same version.

21.2.4 Checkpoint File Organization, Continued

CG Checkpoint Files

Checkpoint files are grouped in the CG as shown below.

Table 21-7 CG Checkpoint Files

CG Checkpoint File Group	Description
CIuuuMAS.CP	Master checkpoint file
CIuuuPDr.CP	Point data
CIuuuNTr.CP	Point names
CIuuuCDr.CP	Custom DSDs

21.3 Checkpoint Error Messages

Introduction

Error messages are printed in the real-time journal, if the journal is active on a US with the Operator Personality, and:

- if a node processing a checkpoint request fails or,
- if a requested checkpoint is not complete within 60 minutes (timed out).

Error message form

The messages are in this form:

```
Checkpoint of UNI uu in XX nd to HM nd Failed; Code nn
Checkpoint of UNI uu in XX nd to HM nd Timed Out
Checkpoint of HWY hh in HG nd to HM nd Failed; Code nn
Checkpoint of HWY hh in HG nd to HM nd Timed Out
Checkpoint of HWY hh in NM nd to HM nd Failed; Code nn
Checkpoint of HWY hh in NM nd to HM nd Timed Out
```

Where:

- uu = unit number
- XX = AM or CG
- nd = node number
- hh = hiway number
- nn = error code number

Error code meaning

The meaning of the error codes are:

Table 21-8 Error Code Meaning

Code	Checkpoint Error
05	A File Manager error against the HM, possibly a bad drive, bad sector, or bad data on the drive.
06	File access error, such as trying to access a protected file. The AM Processor Status Point parameter CPFMERR* contains a code that further defines the type of error: Code / CPFMERR Error 03 Physical error 20 Device not found 26 Insufficient storage space 28 Exceeded maximum number of files per volume * See 22.1 for information on accessing CPFMERR.
07	Auxiliary file access error.
14	Target node failed.
15	Target node had an unexpected state change, such as being reset during the checkpoint operation.
36	Duplicate directory error.

21.3.1 System Error Messages—Hiway Checkpoint

Introduction

Checkpoint errors may cause messages to be printed in the Real-time Journal and in the System Error Journal.

Message form

The messages are in the form:

```
D$ CP CHKPNT   AA BB CC DD
```

where:

AA = Indicates the internal HG module name:

- 14 = lost process event
- 15 = lost hiway event
- 16 = lost peripheral event
- 178 = file manager error
- 181 = HG database errors
- 182 = checkpoint task – report Box DB errors

BB = Provides a cause-of-error indication:

- nn = number of node that lost event
- 190 = Error against HM (bad drive, sector, or data)
- 194 = File Manager error.
- 195 = Checkpoint volume full or not enough room to do checkpoint.
- 199 = Checkpointing inhibited
- 205 = Box in TEST control state; must be FULL or BASIC.
- 216 = Gateway cannot communicate with Process Network.
- 220 = Hiway Error
- 221 = Data Inconsistency (checkpoint file may be protected or corrupted)

CC =

- 5001 through 5063 (the last two digits are the box number)
- 60nn (nn is the HG file number)
- 0 (the system crashed)

DD = Event serial number

21.3.2 System Error Messages—UCN Auto Checkpoint

Introduction

If an automatic checkpoint operation is not completely successful, a software error message will be reported to the System Error Journal and the Real Time Journal. The software task that reports these errors is (the slow command handler), the NIM processing task responsible for checkpoint and restore operations:

```
UG$_CH_SLOW   28, 94, nn, xx
```

where:

`nn` = node's UCN node number, 1 through 64

`xx` = type of error as listed in Table 4

xx Value	Meaning
05	Checkpoint volume too small to create the checkpoint file.
07	&Inn checkpoint volume not found on an HM.
41	UCN communication problem—NIM cannot send checkpoint request to UCN node.
55	UCN node is in IDLE state and cannot be checkpointed. Database may not be valid.
65	I/O link resource error. Not enough resources on I/O link to checkpoint IOM.
66	UCN node is in softfail state, so cannot respond to checkpoint request.
68	Checkpoint file on HM is wrong version or wrong revision. Proper upgrade of checkpoint files is needed.
69	Checkpoint request rejected by the UCN node. Contact Honeywell TAC.
73	Communication problem on the I/O link.

Section 22 – Processor Status Data Point

22.0 Overview

Introduction

This section defines processor-status data points (PSDPs), discusses their use, and lists each PSDP parameter with its definition.

RULA PSDP parameters

The Universal Station may have additional PSDP parameters related to the optional software module RULA (Remote User LCN Access). The RULA User Manual shipped with the software (MP-RLSW01) describes these RULA PSDP parameters.

22.1 Purpose of Processor Status Data Points

Description

Every node on the LCN has a Processor Status Data Point (PSDP) that contains several parameters common to all LCN nodes. These parameters reflect important status and memory-use values.

Additionally, there are node specific (e.g., AM, US) parameters for the PSDP that reflect performance and configuration.

How to see PSDP parameters and their values

You can see many of the PSDP parameters in the TLK1 display set and you can change the values of certain parameters. PSDP parameters can also be used in custom schematics built by the user.

Refer to section 10 in this manual for use of the TLK1 display set and using the DATACHNG display. This is the generic Parameter Access and Value Change display.

How to read a PSDP parameter using DATACHNG

The PSDP's name is $PRSTSnn, where nn is the LCN node number.

To read the value of PSDP parameter DVCSTATE in node 38, on the DATACHNG display, enter

```
$PRSTS38.DVCSTATE
```

in the `VARIABLE ID` port and press [ENTER].

When PSDP parameters are valid

The values of PSDP parameters that are updated periodically are not meaningful until the end of the first sample period following node startup or an LCN time change.

No error indication is provided if you access such values before they are valid.

22.2 PSDP Parameters in All Nodes

ATTENTION These PSDP Parameters can be found in all nodes

$COMSTAT (R681)

Remote Node visibility. Indicates the visibility status of the remote node with respect to the selected node.
Source – System
TYPE – Array [1..96] of Enum of $COMVIS
Value Range – OK
a:mrg
b:mrg
ab:mrg

Default Value – OK
Access Lock – View Only

$CBLMTP (R681)

Cable marginal threshold limit. A value > 0 activates the marginal state functionality for the cable. If the number of errors on the cable is greater than the threshold limit, the cable auxiliary status is indicated as MRGNAL.
Source – User
TYPE – Integer
Value Range – 0-2
Default Value – 0
Access Lock – ENG

$NDM1TP (R681)

Node marginal threshold limit for 1 minute. A value > 0 activates the marginal state functionality for the node. If the number of errors (for 1 minute) on the node is greater than the threshold limit, the node auxiliary status is indicated as MRGNAL.
Source – USER
TYPE – Integer
Value Range – 0-3
Default Value – 0
Access Lock – ENG

$NDM15TP (R681)

Node marginal threshold limit for 15 minutes. A value > 0 activates the marginal state functionality for the node. If the number of errors (for 15 minute) on the node is greater than the threshold limit, the node auxiliary status is indicated as MRGNAL.
Source – USER
TYPE – Integer
Value Range – 0-10
Default Value – 0
Access Lock – ENG

$TPNIVER (R688.3)
RNOS – Indicates the node's Internal TPN Release number that is used by Honeywell to determine which build specification was used to create the personality. This number combined with $TPNSWVR can pinpoint exactly what is running on the node.
TYPE - String of 12 characters, for example, "688.1.11"

$TPNSWV (R688.3)
RNOS – Indicates the node's TPN Software Version number.
TYPE - String of 8 characters, for example, "68"

$TPNSWR (R688.3)
RNOS – Indicates the node's TPN Software Revision number.
TYPE - String of 8 characters for example, "237"

$TPNSWVR (R688.3)
RNOS – Indicates the node's concatenated TPN Software Version and TPN Software Revision numbers.
TYPE - String of 8 characters, for example, "68.237"

$TPNVER (R688.3)
RNOS – Indicates the node's External Customer TPN Release number.
TYPE - String of 8 characters, for example, "688.3"

ACTION An integer that indicates what action should be taken as a result of a change to the NCF. 0 = no action, 1 = restart, 2 = HM initialization.
TYPE—Integer

ACTIVCBL RNOS—Identifies currently active LCN cable. 0 = cable A, 1 = cable B.
TYPE—Integer

AUXQUAL APPLICATION—Auxiliary device status qualifier to indicate annunciation requirements on console.
PURPOSE—Indicates device specific status annunciation policy for the status display.
TYPE—Enumeration of $AUXQUAL. This parameter can have one of these values: NORMAL, INDICATE, ANNUNC, JOURNAL.

AUXSTAT APPLICATION—Auxiliary device status to be displayed by MMI in certain node types (for example, the HM disk redundancy status or the CG link status).
PURPOSE—Indicates device specific status information on the node status display.
TYPE—String Array

CABLESTS An integer that indicates the status of the LCN cables.

0 = No State
1 = No Cable Suspect
2 = Cable A Suspect (Cable B OK)
3 = Cable B Suspect (Cable A OK)
4 = Both Cables Suspect
5 = Cable A Marginal (Cable B OK)
6 = Cable B Marginal (Cable A OK)
7 = Cable A Suspect & Cable B Marginal
8 = Cable B Suspect & Cable A Marginal
9 = Both Cables Marginal
TYPE—Integer

CBREV(i) An array (1..32) of the currently loaded Custom Systems Overlays (a.k.a. sets) loaded in the node. These 24 character strings list the overlay name, revision, and memory load address. This allows DATACHNG or any schematic to list the Load Modules.
PURPOSE—Provides a check on custom software packages.
TYPE—String Array

CLKRESET RNOS—Allows a forced resynch of hardware clock after a problem has occurred. STORE ONLY PARAMETER!
PURPOSE—Provides a clock synch command.
TYPE—Boolean
Storing either TRUE or FALSE to this parameter causes a reevaluation of the hardware clock. This is useful after a faulty clock board has been replaced, to force a reevaluation of the clock hardware immediately instead of waiting for the periodic reevaluation.

CLK_CBL Indicates the clock cable select status. A value of NOUPDATE means neither cable is receiving clock updates; CBLA means that the node is receiving clock updates on cable A only; CBLB means that the node is receiving clock updates on cable B only; ALTCBLA means that the node is alternately receiving clock updates on both cables and the last update was received on cable A, and ALTCBLB means the node in receiving clock updates on both cables and the last update was received on cable B.
TYPE—Enumeration of $CLK_CBL. The states are: NOUPDATE / CBLA / CBLB /ALTCBLA / ALTCBLB.

ATTENTION For the CLOKSTAT schematic, the CLK_CBL parameter shows a value of “N/A” for all ELCN nodes. The CLK_CBL parameter does not apply to ELCN nodes.

CLK_MOD Indicates the clock mode. A value of MASTER means this node is the LCN clock master. SLAVE means that the node is the clock slave. LISTENER means the node has listen-only selected, and LOCAL means the node is in local mode.
TYPE—Enumeration of $CLK_MOD. The states are: MASTER / SLAVE / LISTENER / LOCAL.

CLK_SYN Indicates the source that is currently being used to synchronize the clock. A value of NOTSYN means the clock is not synchronized to either the clock hardware interrupt or the line power frequency. PRECREF means that the clock is using the precision reference or the line power frequency. DIGSYNCH means the clock is using the digital received time frame. SUBSYNCH means the clock is using the subchannel received time frame.
TYPE—Enumeration of $SYN_SRC. The states are: NOTSYN / PRECREF / DIGSYNCH / SUBSYNCH.

CLK_TRN Indicates the clock translator status of the node. A value of TRNSLTR means that this node is the translator of clock signals from the old hardware clock format to the new (K2LCN) clock format. A value of NONTRNS means the node is not the translator node.
TYPE—Enumeration of $TRAN_MD. States are: TRNSLTR/NONTRNS.

CLK_WRD Contains an integer representation of the clock system hardware status word.

COMM(i) RNOS—Provides cable statistics on each node on LCN including the communications and driver level.
PURPOSE— Provides LCN communication and cable reliability data.
TYPE—Array of Integers (Large and complex structure, array of 1200)
Refer to Appendix C in LCN Guidelines - Implementation, Troubleshooting, and Service.

CMNT_TIME(i) This array lists the time stamps on the operator comments associated with Status Accountant objects listed in this node's status detail. This array is indexed by object number.
TYPE—Array of Time

CPUFREE RNOS—Percent of free processor (CPU) time over previous 15 seconds.
Purpose— Indicates the CPU load versus capacity.
TYPE—Real

ATTENTION: CPUFREE behavior with ELCN

With ELCN, there is a mismatch between the CPUFREE values shown on the Control Builder platform block and the Native Window. This is due to the fact that the Control Builder platform block's CPUFREE(%) value (parameter – CPUFREEAVG) indicates the overall UEA box processing capacity, whereas the Native Window's CPUFREE parameter value indicates the UEA box's LCN emulation processing capacity.

Also, for the same load on an AM/ENIM, the CPUFREE values shown for a classic AM/ENIM and an ELCN-AM/ENIM are different as they are running on different hardware platforms.

CPUMAX

RNOS—Maximum percent CPU free time (maximum CPUFREE value) over 15-second sample period during current hour.
PURPOSE—Indicates the CPU loading range.
TYPE—Real

CPUMIN

RNOS—Minimum percent CPU free time over 15-second sample period during current hour.
PURPOSE—Indicates the CPU loading range.
TYPE—Real

CUR_NCF
Indicates the revision level of the currently loaded NCF. Can be used with parameter IMPACT to determine the impact of an NCF change.
TYPE—Time

DVCERCNT(i)
The error count of a particular “device” attached to this node. This array is indexed by device number (1..129).
TYPE—Integer

DVCLDID
Indicates the logical device identifier.
TYPE—String

DVCSTATE(i)
The state of a particular “device” attached to this node. This array is indexed by device number (1..129).
TYPE—Enumeration of DVCSTATE

DVCSUBST(i)
The substate of a particular “device” attached to this node. This array is indexed by device number (1..129).
TYPE—Enumeration of DVCSUBST

DVCTRCNT(i)
The transaction count for a particular “device” attached to this node. This array is indexed by device number (1..129).
TYPE—Integer

DVCVVID
Indicates the device virtual volume identifier.
TYPE—String

HEAPBCN2
Current number of blocks of free pool 2 heap memory.
TYPE—Real

HEAPBCNT
RNOS—Current number of free Pool 1 heap blocks.
TYPE—Real

HEAPFRA2
RNOS—Percent of Pool 2 heap fragmentation (0=no fragmentation, 100=totally fragmented). A value above 2 or so indicates problems in heap.
TYPE—Integer

HEAPFRAG
RNOS—Percent of Pool 1 heap fragmentation (0=no fragmentation, 100=totally fragmented). A value above 2 or so indicates problems in heap.
TYPE—Integer

HEAPFRE2
RNOS—Current amount of free heap (words, one word = 16 bits) memory in node. Pool 2 only.
TYPE—Real

HEAPFREE
RNOS—Current amount of free heap (words, one word = 16 bits) memory in node. Pool 1 only.
TYPE—Real

HEAPMIN
RNOS—Minimum number of words of heap ever reached since node started. Pool 1 only.
TYPE—Real

HEAPMIN2
RNOS—Minimum number of words of heap ever reached since node stated. Pool 2 only.
TYPE—Real

HEAPTOT2
RNOS—Heap Pool 2 total amount of heap memory (words, one word = 16 bits).
TYPE—Real

HEAPTOTL RNOS—SYSGENed total amount of heap memory (words) plus section 12 returned memory. Pool 1 only.
Refer to *Application Module Implementation Guidelines* for a definition of heap memory.
TYPE—Real

IMPACT Indicates the impact if this node is not reloaded with the latest available NCF.
TYPE—Integer
0 – Severe
1 – High
2 – Moderate
3 – Insynch if the values of the parameters NEW_NCF and CUR_NCF are equal.
3 – No impact if the values of the parameters NEW_NCF and CUR_NCF are not equal.

INS_UNIT Indicates the installation unit. An installation unit is a section of the NCF. Changes to certain installation units affect certain LCN node types and not others. This is used to determine which nodes need to be reloaded after an NCF change.
TYPE—String

MCREV(i) DATA ACCESS—Identifies the time stamp of custom name files in use on the LCN. Indexes give:

1	ENM_SETS.SE	Time stamp of custom name files in current use on the LCN.
2	PAR_LIST.SE	
3	PARAMETR.SP	
4	SEGMENTS.SP	
5	ENM_SETS.SE	Time stamp of custom name files in use at node load time.
6	PAR_LIST.SE	
7	PARAMETR.SP	
8	SEGMENTS.SP	

A revision of zero or 1/1/79 indicates a normal empty file, a revision past the year 2015 indicates a revision mismatch was detected during the load (node is shown as CNAMEREV or WARNING). Other revision dates are real revisions and should match closely with the corresponding "last modified" date of the disk copy of these files on the &ASY volume.
PURPOSE— Identifies the US, AM, and CG custom name files time stamp in use and when the node was loaded.
TYPE—Date Array

NCF_SYNC Indicates if the NCF has changed.
TYPE—Boolean

NETVERS Indicates the version of the local LCN.
TYPE—Integer

NEW_NCF Indicates the revision of the latest available NCF. Can be used with parameter IMPACT to determine the impact of an NCF change.
TYPE—Time

NODESTAT(i) RNOS—Provides node's view of other LCN node states on the LCN. This array is indexed by LCN physical node number. Possible values are: NOT_CONF, OFF_NET, PN_ALIVE, LOCAL_BT, NETWK_BT, UND_TEST, QUALIFID, LOADED, RUNNING, TERMNATE, and FAILED. Array (1-96)
PURPOSE—Provides LCN consistency check for node isolation and LCN reconnect functionality.
TYPE—Enumeration array of $PNSTATE.

NODE_NO DATA ACCESS—Gives the integer node number for node.
PURPOSE—Provides integer node number for reference.
TYPE—Integer

NOTE_TIM(i) Indicates the time stamp associated with the last state change of a status message shown on the Status Detail display. This time array is indexed by message number.
TYPE—Time

OB_BUILT The total integer number of status messages currently defined in this node.
TYPE—Integer

OB_CMNT(i) Indicates the operator comment associated with a status message shown on the Status Detail display. This string array is indexed by message number.
TYPE—String

OB_ENTTY(i) Indicates the entity associated with a status message shown on the Status Detail display. This array is indexed by message number.
TYPE—Entity

OB_NAME(i) Indicates the name of a status message object shown on the Status Detail display left side. This string array is indexed by message number.
TYPE—String array 0 to 1000.

OB_NOTE(i) Indicates the explanation string associated with the latest state change of a status message shown on the status detail display right side. This string array is indexed by message number.
TYPE—String

OB_SCHEM(i) Indicates the name of the schematic that is associated with a status message shown on the Status Detail display. This string array is indexed by message number.
TYPE—String

OB_STATE(i) Indicates the latest state of a status message shown on the Status Detail display. This array (0 to 1000) is indexed by message number. OB_STATE (0) = NODE STATE.
TYPE—Enumeration of $SASTATE. Values are OK, WARNING, SEVERE, FAIL.

OSTRANOD(i) RNOS—Indicates if an LCN node is "ISOLATED" or not as viewed by this node. This BOOLEAN array is indexed by LCN physical node number.

PURPOSE—Provides LCN consistency check for node isolation and LCN reconnect functionality.

TYPE—Boolean array

PARSEC DATA ACCESS—Parameters/sec rate based on IDB service from any function set in the physical node during the previous 15 seconds. Indicates the number of parameters requested *from this* node to support nodes on LCN. This parameter has a different meaning in Network Gateways (see 22.7). Actually PARSEC counts how many parameters are flowing through the LCN Data Access Servers on this node. This is a count from all data owners in this node (PSDP, UNITOPS, node specific data owner, and so on.).

RPARSEC and SPARSEC are a count of how many parameters are flowing through this node's LCN Data Access Requestor tasks.

So, typically PARSEC counts how many parameters are being served to the other nodes on the network. RPARSEC and SPARSEC count how many parameters this node is requesting of other nodes (and of itself).
In the case of the "X-nodes" (AxM, UsX, APP, IN, EST, ESVT, ACE-T)., requests from the TPN Server go through the DA requestor tasks and affect the RPARSEC and SPARSEC parameters. If the target data owner is local to the node, these parameters also affect PARSEC. If the target data owner is not local, PARSEC is not affected.

PURPOSE—Indicates the load on this node from the system.

TYPE—Real

PFPSHLDB DATA ACCESS—The "hold breath" count since reload or reset based on the Data Access timeout. A similar name is used in the AM.

PURPOSE—Indicates the difficulty in accessing data in another node due to the other node's loading.

TYPE—Real

PTSESTBL DATA ACCESS—Number of process points currently established (loaded) in the node.
PURPOSE—Indicates the point capacity currently used.
TYPE—Integer

REQUESTS DATA ACCESS—Indicates the number of Data Access parameter requests (LCN messages) that this node received per second during the previous 15 second period. The units of this parameter are LCN messages per second.

TYPE—Real

RNUMREAD Indicates the number of Data Access parameter requests (LCN messages) that this node made, per second, that occurred in the previous 15 second period that contained any reads. The units of this parameter are LCN messages per second.

TYPE—Real

RNUMSTOR Indicates the number of Data Access parameter requests (LCN messages) that this node made, per second, that occurred in the previous 15 second period that contained any stores. The units of this parameter are LCN messages per second.

TYPE—Real

RPARSEC DATA ACCESS—Read parameters/sec rate based on IDB requests to any LCN node during previous 15 seconds. Indicates the number of parameters *this* node is requesting *from* other nodes on LCN.

PURPOSE—Indicates the system request load from this node.

TYPE—Real

RREQUEST

DATA ACCESS—Indicates the number of Data Access parameter requests (LCN messages) that this node made, per second, that occurred in the previous 15 second period. The units of this parameter are LCN messages per second.

PURPOSE—Indicates the data owner load from this node.

TYPE—Real

SERVTIME

DATA ACCESS—Indicates the average time that a Data Access request (LCN message) took to complete during the previous 15 second period. The units of this parameter are in milliseconds.

PURPOSE—Indicates the data access processing efficiency.

TYPE—Real, milliseconds

SPARSEC

DATA ACCESS—Store parameters/sec rate based on IDB requests to any LCN function during the previous 15 seconds. Indicates the number of parameters *this* node is writing *to* other nodes on LCN.

PURPOSE—Indicates the system response load from this node.

TYPE—Real

22.3 Application Module PSDP Parameters

Introduction

The following PSDP parameters are only in AMs. Refer to the *Application Module Parameter Reference Dictionary* for more detailed information about each parameter including value ranges and value types.

NOTE: For PSDP parameters for the Application Module^{X} (A^{X}M), see the Application Module^{X} User Guide.

Reference

Refer to *Application Module Implementation Guidelines* for further discussion of the AM PSDP memory-allocation parameters.

$AUTOSAV (R620)

CONTROL KERNEL- The auto checkpointing enable/disable status of this node on the LCN.
PURPOSE- Allows you to read the current status (ENABLE or DISABLE) of auto checkpointing, and allows you to enable or disable auto checkpointing.
TYPE- ATTRIB

$CLDAVGC (R650)

CONTROL KERNEL— Average number of AM/CL Process Change events per second serviced in the current hour.

$CLDAVGP (R650)

CONTROL KERNEL— Average number of AM/CL Process Change events per second serviced in the previous hour.

$CLDAVGS (R650)

CONTROL KERNEL— Average number of AM/CL Process Change events serviced in the last snapshot period (nominally 15 seconds).

$CLDBACT (R650)

CONTROL KERNEL— Activate or inactivate the AM/CL Process Changes function. Inactivating the AM/CL debugger frees up the memory.

$CLDBAPT[1..5] (R650)

CONTROL KERNEL— AM/CL point name filter for AM/CL Process Changes.

$CLDBBLK[1..5] (R650)
CONTROL KERNEL— AM/CL block name filter for AM/CL Process Changes.

$CLDBDPT[1..5] (R650)
CONTROL KERNEL— Point name portion of the destination point name/unit name filter pair for AM/CL Process Changes.

$CLDBEHR (R650)
CONTROL KERNEL— Determines if the AM/CL Process Change events are sent to the HM.

$CLDBEXP[1..5] (R650)
CONTROL KERNEL— Used to suppress the matching of AM/CL Process Change parameter ($CLDBPAR).

$CLDBFIL (R650)
CONTROL KERNEL— Indicates if the AM/CL Process Change event strings are sent to a file.

$CLDBFNM (R650)
CONTROL KERNEL— Pathname to the file that is used for writing the AM/CL Process Changes when the file output option (parameter $CLDBFIL) is enabled.

$CLDBFST (R650)
CONTROL KERNEL— Status return code for the File Manager when the AM encounters an error while it writes the AM/CL Process Changes output to a file.

$CLDBMEM (R650)
CONTROL KERNEL— Indicates if the AM/CL Process Change events are sent to the local memory table or not.

$CLDBMTB[1..100] (R650)
CONTROL KERNEL— Memory table of AM/CL Process Changes output.

$CLDBOND (R650)
CONTROL KERNEL— Indicates whether or not on-node AM/CL Process Change events are collected in history.

$CLDBPAR[1..5] (R650)
CONTROL KERNEL— Destination parameter name filter for AM/CL Process Changes.

$CLDBPRT (R650)	CONTROL KERNEL— Determines if the AM/CL Process Change events are sent to the Event Manager (RTJ) for printing or not.
$CLDBSTS (R650)	CONTROL KERNEL— Runtime status for AM/CL Process Change events.
$CLDBUNT[1..5] (R650)	CONTROL KERNEL— Unit name portion of the destination point name/unit name filter pair for AM/CL Process Changes.
$CLDMAXC (R650)	CONTROL KERNEL— Maximum number of AM/CL Process Change events per cycle serviced in the current hour.
$CLDMAXP (R650)	CONTROL KERNEL— Maximum number of AM/CL Process Change events per cycle serviced in the previous hour.
$CLDMINC (R650)	CONTROL KERNEL— Minimum number of AM/CL Process Change events per cycle serviced in the current hour.
$CLDMINP (R650)	CONTROL KERNEL— Minimum number of AM/CL Process Change events per cycle serviced in the previous hour.
$ROLLATP (R640)	CONTROL KERNEL—Rolling Average Alarm Trip Point
$ROLLPRA (R640)	CONTROL KERNEL—Rolling Average Process Accumulation
ADAVGC	CONTROL KERNEL—Alarms per second in current hour.
ADAVGP	CONTROL KERNEL—Alarms per second in previous hour.
ADAVGS	CONTROL KERNEL—Alarms per second in snapshot period.
ADMAXC	CONTROL KERNEL—Maximum alarms per cycle in current hour.
ADMAXP	CONTROL KERNEL—Maximum alarms per cycle in previous hour.
ADMINC	CONTROL KERNEL—Minimum alarms per cycle in current hour.
ADMINP	CONTROL KERNEL—Minimum alarms per cycle in previous hour.

ALBURST

CONTROL KERNEL—Maximum number of process alarms in any one second since load or value reset.
PURPOSE—Indicates the peak alarm load from the AM.
TYPE—Integer

AMDATA(i)

CONTROL KERNEL—Internal AM data use only.
AMDATA (54) = 0 for primary AM, = 1 for secondary AM.

AMDATA (48) = an integer that represents the amount of additional redundancy buffer in use. See AM Implementation Guidelines – Section 8.3.

AMMEMADJ

CONTROL KERNEL—Total user memory heap used from current AM load configuration.
PURPOSE—Indicates memory usage in the AM.
TYPE—Real

AMMEMAOP

CONTROL KERNEL—Total user memory minus software options (such as CBREV table size).
PURPOSE—Indicates memory usage in the AM.
TYPE—Real

AMMEMTOT

CONTROL KERNEL—Total AM memory used for point data, CLs, CDSs, buffers for checkpoint and off-node I/O.

AMOVRABT

CONTROL KERNEL—AM abort trip point for Fast Processor (number of cycles behind/before node crash). If set to -1, AM will never crash.

AMOVRTHR

CONTROL KERNEL—Alarm trip-point count for Fast Processor (number of cycles).

AMSCHDMP(i)

CONTROL KERNEL—Dump schedule for unit i.

BKGCLBC

CONTROL KERNEL—Number of background CL blocks unable to be queued/second in current hour.
PURPOSE—Indicates AM loading.
TYPE—Real

BKGCLBP

CONTROL KERNEL—Number of background CL blocks unable to be queued per second in previous hour.
PURPOSE—Indicates AM loading.
TYPE—Real

BKGCLBS

CONTROL KERNEL—Number of background CL blocks unable to be queued per second in snapshot period.
PURPOSE—Indicates AM loading.
TYPE—Real

BKGCLC

CONTROL KERNEL—Number of background CL block run per second in current hour.
PURPOSE—Indicates AM loading.
TYPE—Real

BKGCLNR(i)

CONTROL KERNEL—Name of background CL block running as background task (i).
PURPOSE—Indicates AM loading.
TYPE—Real

BKGCLP

CONTROL KERNEL—Number of background CL block run per second in previous hour.
PURPOSE—Indicates AM loading.
TYPE—Real

BKGCLS

CONTROL KERNEL—Number of background CL block run per second in snapshot period.
PURPOSE—Indicates AM loading.
TYPE—Real

BKGDANC

CONTROL KERNEL—Number of background CL off node Data Access requests/sec in current hour.
PURPOSE—Indicates AM loading.
TYPE—Real

BKGDANP

CONTROL KERNEL—Number of background CL off node Data Access requests/sec in previous hour.
PURPOSE—Indicates AM loading.
TYPE—Real

BKGDANS

CONTROL KERNEL—Number of background CL off node Data Access requests/sec in snapshot period.
PURPOSE—Indicates AM loading.
TYPE—Real

BKGDAREQ

CONTROL KERNEL—Number of background CL data access requestors.
PURPOSE—Indicates AM loading.
TYPE—Real

BKGELTIM(i)

CONTROL KERNEL—Elapsed time (sec) background CL task (i) has been in the run state.
PURPOSE—Indicates AM loading.
TYPE—Real

BKGFMC

CONTROL KERNEL—Number of background file manager requests in the current hour.
PURPOSE—Indicates AM loading.
TYPE—Real

BKGFMP

CONTROL KERNEL—Number of background file manager requests in the previous hour.
PURPOSE—Indicates AM loading.
TYPE—Real

BKGFMS

CONTROL KERNEL—Number of background file manager requests in the snapshot period.
PURPOSE—Indicates AM loading
TYPE—Real

BKGPNTRN(i)

CONTROL KERNEL—Point name associated with the CL running as background task (i).
PURPOSE—Indicates AM loading.
TYPE—String

BKGQFUL

CONTROL KERNEL—Background queue-full status.
PURPOSE—Indicates AM loading.
TYPE—Boolean

BKGQTIME

CONTROL KERNEL—Time the last background CL block was in the queue.
PURPOSE—Indicates AM loading.
TYPE—Real

BKGQUEUE

CONTROL KERNEL—Number of background CL blocks queued.
PURPOSE—Indicates AM loading.
TYPE—Real

BKGRUN

CONTROL KERNEL—Number of background tasks active.
PURPOSE—Indicates AM loading.
TYPE—Real

BKGSTACK

CONTROL KERNEL—Background task stack size assuming background CL option is used. This is set in the NCF.

BKGTASKS

CONTROL KERNEL—Number of background CL tasks, assuming background CL option is used.

CDSAVGC CONTROL KERNEL—CDS parameter accesses per second in current hour.

CDSAVGP CONTROL KERNEL—CDS parameter accesses per second in previous hour.

CDSAVGS CONTROL KERNEL—CDS parameter accesses per second in snapshot period.

CLAVGC CONTROL KERNEL—Average CLs per second in current hour.

CLAVGP CONTROL KERNEL—Average CLs per second in previous hour.

CLAVGS CONTROL KERNEL—Average CLs per second in snapshot period.

CLBACKF CONTROL KERNEL—CL backward-branch limit for fast processor.

CLBACKIP CONTROL KERNEL—Number of back branches allowed on a CL block linked to an IPP point.
PURPOSE—Indicates AM loading.
TYPE—Integer

CLBACKS CONTROL KERNEL—CL backward-branch limit for slow processor.

CLMAXC CONTROL KERNEL—Maximum CLs per second in current hour.

CLMAXP CONTROL KERNEL—Maximum CLs per second in previous hour.

CLMINC CONTROL KERNEL—Minimum CLs per second in current hour.

CLMINP CONTROL KERNEL—Minimum CLs per second in previous hour.

CLPZAVGC(i) CONTROL KERNEL—Average size of clean point in current hour for each possible clean point in words; secondary only.

CLPZAVGP(i) CONTROL KERNEL—Average size of clean point in previous hour for each possible clean point in words; secondary only.

CLPZMX(i) CONTROL KERNEL—Maximum size of a clean point in words for each possible clean point since the last startup or resynch of AM; secondary only.

CLPZMXC(i) CONTROL KERNEL—Maximum size of a clean point in current hour for each possible clean point; secondary only.

CLPZMXP(i) CONTROL KERNEL—Maximum size of a clean point in previous hour for each possible clean point; secondary only.

CLPZS(i) CONTROL KERNEL—Size of most recent clean point in words for each possible clean point; secondary only.

CLPZSP(i) CONTROL KERNEL—Size of previous (second most recent) clean point in words for each possible clean point; secondary only.

CPFMERR CONTROL KERNEL—Last checkpoint file manager error. The value 51 means no error.

CPTIMEC(i) CONTROL KERNEL—Time to checkpoint unit (i).

CPTIMEFL CONTROL KERNEL—Time (minute) to checkpoint all AM units to disk.

CPTIMEHM CONTROL KERNEL—Time (minute) to checkpoint all AM units to the HM.

CSCODE CONTROL KERNEL—Total code size of custom packages loaded.

CSHEAPC CONTROL KERNEL—Current Pool 1 heap used by loaded custom packages.
PURPOSE—Indicates AM loading.
TYPE—Real

CSHEAPMX CONTROL KERNEL—Maximum Pool 1 heap used by custom packages since node loaded.

CSHEAPT CONTROL KERNEL—Total Pool 1 heap limit for custom packages loaded.

CVBAVGS CONTROL KERNEL—Average current value buffer memory used per cycle during snapshot period.

DIAGSTAT AM ANALYSIS—For R510. A Boolean that indicates the diagnostic collection status of the following parameters: MAXFPTNM, MAXSPTNM, MAXCLNM. TRUE means collection is enabled. FALSE (default) means collection is disabled. **NOTE:** This is a high cost activity; enable collection for short study periods only. See other AM ANALYSIS parameters in this section.

EIPAVGC CONTROL KERNEL—Average point process specials (PPS) per cycle in current hour. Note: If you observe a negative number, then the AM/CLM is averaging more than nine PPSs per second and exceeded the maximum integer value of 32,767 (9*60*60=32,400 per hour).

EIPAVGP CONTROL KERNEL—Average point process specials (PPS) per cycle in previous hour. Note: If you observe a negative number, then the AM/CLM is averaging more than nine PPSs per second and exceeded the maximum integer value of 32,767 (9*60*60=32,400 per hour).

EIPAVGS CONTROL KERNEL—Average point process specials (PPS) per cycle in a snapshot period. Note: If you observe a negative number, then the AM/CLM is averaging more than nine PPSs per second and exceeded the maximum integer value of 32,767 (9*60*60=32,400 per hour).

EIPMAXC CONTROL KERNEL—Maximum point process specials (PPS) per cycle in current hour. Note: If you observe a negative number, then the AM/CLM is averaging more than nine PPSs per second and exceeded the maximum integer value of 32,767 (9*60*60=32,400 per hour).

EIPMAXP CONTROL KERNEL—Maximum point process specials (PPS) per cycle in previous hour. Note: If you observe a negative number, then the AM/CLM is averaging more than nine PPSs per second and exceeded the maximum integer value of 32,767 (9*60*60=32,400 per hour).

EIPMINC CONTROL KERNEL—Minimum point process specials (PPS) per cycle in current hour. Note: If you observe a negative number, then the AM/CLM is averaging more than nine PPSs per second and exceeded the maximum integer value of 32,767 (9*60*60=32,400 per hour).

EIPMINP CONTROL KERNEL—Minimum point process specials (PPS) per cycle in previous hour. Note: If you observe a negative number, then the AM/CLM is averaging more than nine PPSs per second and exceeded the maximum integer value of 32,767 (9*60*60=32,400 per hour).

FPTMAVGC CONTROL KERNEL—Average duration (milliseconds) of processing for Fast Point Processor in the current hour; secondary only.

FPTMAVGP CONTROL KERNEL—Average duration (milliseconds) of processing for Fast Point Processor in the previous hour; secondary only.

FPTMS CONTROL KERNEL—Duration (milliseconds) of processing for Fast Point Processor for the most recently completed FPP cycle; secondary only.

FPTMSP CONTROL KERNEL—Duration (milliseconds) of processing for Fast Point Processor for the previous (second most recently completed) FPP cycle; secondary only.

GETAVGC CONTROL KERNEL—Average non-CDS parameter fetches per second in current hour (from this AM). Note: These are internal requests from this AM to itself that do not go through data access; however, it also includes fast CDS accesses if AMCL04 is loaded. By contrast, PARSEC counts parameters that go through data access.

GETAVGP CONTROL KERNEL—Average non-CDS parameter fetches per second in previous hour (from this AM). Note: These are internal requests from this AM to itself that do not go through data access; however, it also includes fast CDS accesses if AMCL04 is loaded. By contrast, PARSEC counts parameters that go through data access.

GETAVGS CONTROL KERNEL—Average non-CDS parameter fetches per second in snapshot period (from this AM). Note: These are internal requests from this AM to itself that do not go through data access; however, it also includes fast CDS accesses if AMCL04 is loaded. By contrast, PARSEC counts parameters that go through data access.

HEAPMAXP CONTROL KERNEL—Maximum heap for permanent memory data.

IDLAVGC CONTROL KERNEL—Average idle time (%) in current hour.

IDLAVGP CONTROL KERNEL—Average idle time (%) in previous hour.

IDLAVGS CONTROL KERNEL—Average idle time (%) in snapshot period.

IDLAVGSP CONTROL KERNEL—Average idle time (%) in previous snapshot period.
PURPOSE—Indicates AM loading.
TYPE—Real

IPCVBOVC CONTROL KERNEL—CVB overflow count for current hour.
PURPOSE—Indicates capacity being pushed near limit.
TYPE—Integer

IPCVBOVP
CONTROL KERNEL—CVB overflow count for previous hour.
PURPOSE—Indicates capacity being pushed near limit.
TYPE—Integer

IPDAOVER
CONTROL KERNEL—Prefetch/poststore overruns, dynamic.
PURPOSE—Indicates capacity being pushed near limit.
TYPE—Integer

IPDAOVRC
CONTROL KERNEL—Prefetch/poststore overruns, dynamic, increment/decrement for current hour.
PURPOSE—Indicates capacity being pushed near limit.
TYPE—Integer

IPDAOVRP
CONTROL KERNEL—Prefetch/poststore overruns, dynamic, increment/decrement for previous hour.
PURPOSE—Indicates capacity being pushed near limit.
TYPE—Integer

IPOVRRNC
CONTROL KERNEL—IPP overruns in current hour.
PURPOSE—Indicates capacity being pushed near limit.
TYPE—Integer

IPOVRRNP
CONTROL KERNEL—IPP overruns in previous hour.
PURPOSE—Indicates capacity being pushed near limit.
TYPE—Integer

IPOVRRUN
CONTROL KERNEL—IPP overrun count expressed as a difference between system cycles and IPP processing cycles.
PURPOSE—Indicates capacity being pushed near limit.
TYPE—Integer

IPOVRTHR
CONTROL KERNEL—IPP overrun alarm threshold. -1 = stop.
PURPOSE—Allows setting a different alarming limit.
TYPE—Integer

IPPFAVGC
CONTROL KERNEL—Average number of prefetches per second from IPP in this hour.
PURPOSE—Indicates IPP load in node.
TYPE—Real

IPPFAVGP CONTROL KERNEL—Average number of prefetches per second from IPP in previous hour.
PURPOSE—Indicates IPP load in node.
TYPE—Real

IPPFAVGS CONTROL KERNEL—Average snapshot period IPP prefetchs per second.
PURPOSE—Indicates IPP load in node.
TYPE—Real

IPPFMAXC CONTROL KERNEL—Maximum number of IPP prefetches per cycle in current hour.
PURPOSE—Indicates IPP load in node.
TYPE—Integer

IPPFMAXP CONTROL KERNEL—Maximum number of IPP prefetches per cycle in previous hour.
PURPOSE—Indicates IPP load in node.
TYPE—Integer

IPPRAVGP CONTROL KERNEL—Average number of IPP points per second in previous hour.
PURPOSE—Indicates IPP load in node.
TYPE—Real

IPPRAVGS CONTROL KERNEL—Average snapshot IPP points per second.
PURPOSE—Indicates IPP load in node.
TYPE—Real

IPPRCYCC CONTROL KERNEL—Number of IPP processing cycles lost in this hour.
PURPOSE—Indicates IPP load in node.
TYPE—Integer

IPPRCYCP CONTROL KERNEL—Number of IPP processing cycles lost in last hour.
PURPOSE—Indicates IPP load in node.
TYPE—Integer

IPPRMAXC CONTROL KERNEL—Maximum number of IPP points per cycle this hour.
PURPOSE—Indicates IPP load in node.
TYPE—Integer

IPPRMAXP CONTROL KERNEL—Maximum number of IPP points per cycle last hour.
PURPOSE—Indicates IPP load in node.
TYPE—Integer

IPPSAVGC CONTROL KERNEL—Average number of IPP stores per second this hour.
PURPOSE—Indicates IPP load in node.
TYPE—Real

IPPSAVGP CONTROL KERNEL—Average number of IPP stores per second last hour.
PURPOSE—Indicates IPP load in node.
TYPE—Real

IPPSAVGS CONTROL KERNEL—Average number of IPP snapshot stores per second.
PURPOSE—Indicates IPP load in node.
TYPE—Real

IPPSMAXC CONTROL KERNEL—Maximum number of IPP stores per cycle this hour.
PURPOSE—Indicates IPP load in node.
TYPE—Integer

IPPSMAXP CONTROL KERNEL—Maximum number of IPP stores per-cycle last hour.
PURPOSE—Indicates IPP load in node.
TYPE—Integer

LAST_CLB AM ANALYSIS—For R510. The name of the CL block last executed in the foreground. A string of 8 characters. Default value is blanks. **NOTE:** Array of string parameters can be read from foreground CL programs (not background). This is existing functionality. See other AM ANALYSIS parameters in this section.

LAST_ENT AM ANALYSIS—For R510. The name of the entity last processed by the fast or slow point processors. A string length of 16 characters. Default value is blanks. See other AM ANALYSIS parameters in this section.

MAXCLNM AM ANALYSIS—For R510. The names of the last two slowest CL block names. A string length of 55 characters. Default value is blanks. See other AM ANALYSIS parameters in this section.

MAXFPTNM AM ANALYSIS—For R510. The names of the last two slowest entities detected on the fast point processor. A string length of 33 characters. Default value is blanks. See other AM ANALYSIS parameters in this section.

MAXSPTNM AM ANALYSIS—For R510. The names of the last two slowest entities detected on the slow point processor. A string length of 33 characters. Default value is blanks. See other AM ANALYSIS parameters in this section.

MCVBAVGC CONTROL KERNEL—Average current value buffer memory used per cycle during current hour.

MCVBAVGP CONTROL KERNEL—Average current value buffer memory used per cycle during previous hour.

MCVBMAXC CONTROL KERNEL—Maximum current value buffer memory used per cycle during current hour.

MCVBMAXP CONTROL KERNEL—Maximum current value buffer memory used per cycle during previous hour.

MCVBMINC CONTROL KERNEL—Minimum current value buffer memory used per cycle during current hour.

MCVBMINP CONTROL KERNEL—Minimum current value buffer memory used per cycle during previous hour.

MCVBMNCC CONTROL KERNEL—Cycle for minimum current value buffer memory used during current hour.

MCVBMNCP CONTROL KERNEL—Cycle for minimum current value buffer memory used during previous hour.

MCVBMXCC CONTROL KERNEL—Cycle for maximum current value buffer memory used during current hour.

MCVBMXCP CONTROL KERNEL—Cycle for maximum current value buffer memory used during previous hour.

MEMADJNX CONTROL KERNEL—Change (delta) in AM user memory heap for next AM load based on NCF configuration.
PURPOSE—Indicates AM loading.
TYPE—Real

MEMCDPN(i) CONTROL KERNEL—Memory required for unit (i) CDS and point name storage.

MEMCKPT CONTROL KERNEL—Memory used for checkpoint.

MEMCL(i) CONTROL KERNEL—Memory required for unit(i) CL blocks.

MEMCS(i) CONTROL KERNEL—User memory usage by all custom packages on a per unit basis.

MEMCVBLM CONTROL KERNEL—Size of CVBs at last AM start.

MEMCVBMX CONTROL KERNEL—Largest amount of memory used by a CVB since the AM was last started.

MEMCVBNX CONTROL KERNEL—Sets size of CVBs on startup.

MEMCVBTH CONTROL KERNEL—CVB alarm threshold.

MEMFREE CONTROL KERNEL—Free memory for point data, CLs, CDSs, checkpoint, and off node buffers.

MEMIOLM CONTROL KERNEL—Memory reserved for prefetch, poststore buffers.

MEMPTS(i) CONTROL KERNEL—Memory required for unit (i) point storage.

MIPCVBLM CONTROL KERNEL—IPP memory reserved the CVB.
PURPOSE—Indicates IPP load in node.
TYPE—Integer

MIPCVBMX CONTROL KERNEL—Maximum CVB memory used by IPP since load.
PURPOSE—Indicates IPP load in node.
TYPE—Integer

MIPIOTOT CONTROL KERNEL—IPP fetch/store memory reserved.
PURPOSE—Indicates IPP load in node.
TYPE—Real

MSAVGC CONTROL KERNEL—CL messages per second serviced in current hour.

MSAVGP CONTROL KERNEL—CL messages per second serviced in previous hour.

MSAVGS CONTROL KERNEL—CL messages per second serviced in snapshot period.

MSMAXC	CONTROL KERNEL—Maximum CL messages per cycle serviced in current hour.
MSMAXP	CONTROL KERNEL—Maximum CL messages per cycle serviced in previous hour.
MSMINC	CONTROL KERNEL—Minimum CL messages per cycle serviced in current hour.
MSMINP	CONTROL KERNEL—Minimum CL messages per cycle serviced in previous hour.
NUMPTS(i)	CONTROL KERNEL—Number of unit (i) points.
OVERRUNS	CONTROL KERNEL—Number of fast processor cycle overruns currently behind. A small negative number (-1 or -2) is sometimes seen in this value. This value may be interpreted to mean zero overruns.
OVRFASTC	CONTROL KERNEL—Number of fast processor cycle overruns in current hour.
OVRFASTP	CONTROL KERNEL—Number of fast processor cycle overruns in previous hour.
OVRSLOWC	CONTROL KERNEL—Number of slow processor cycle overruns in current hour.
OVRSLOWP	CONTROL KERNEL—Number of slow processor cycle overruns in previous hour.
PFAVGC	CONTROL KERNEL—Average number of prefetches per second in current hour.
PFAVGP	CONTROL KERNEL—Average number of prefetches per second in previous hour.
PFAVGS	CONTROL KERNEL—Average number of prefetches per second in snapshot period.
PFMAXC	CONTROL KERNEL—Maximum number of prefetches per cycle in current hour.
PFMAXP	CONTROL KERNEL—Maximum number of prefetches per cycle in previous hour.
PFMINC	CONTROL KERNEL—Minimum number of prefetches per cycle in current hour.
PFMINP	CONTROL KERNEL—Minimum number of prefetches per cycle in previous hour.

22.3 Application Module PSDP Parameters, Continued

PFMNCYCC CONTROL KERNEL—Cycle in current hour when prefetches minimum.

PFMNCYCP CONTROL KERNEL—Cycle in previous hour when prefetches minimum.

PFMXCYCC CONTROL KERNEL—Cycle in current hour when prefetches maximum.

PFMXCYCP CONTROL KERNEL—Cycle in previous hour when prefetches maximum.

PFPSHLDC CONTROL KERNEL—Number of times control processing “held its breath” for 5 second during current hour.

PFPSHLDP CONTROL KERNEL—Number of times control processing “held its breath” for 5 second during previous hour. See also PFPSHLDB in section 22.2.

PFPSHLDT CONTROL KERNEL—“Hold Breath” alarm limit. The initial value is 5. If the value is above 5 in an hour, there is a warning.

PFPSOVER CONTROL KERNEL—Current prefetch/poststore overrun count. It adds one to its count for each time a Prefetch/poststore is not completed within ½ second. It decements one for each time a prefetch/poststore is completed.within ½ second (with lower bound of 0).

PFPSOVRC CONTROL KERNEL—Total prefetch/poststore overrun count in current hour. It adds one to its count for each time a Prefetch/poststore is not completed within ½ second. It decements one for each time a prefetch/poststore is completed within ½ second (with lower bound of 0).

PFPSOVRP CONTROL KERNEL—Total prefetch/poststore overrun count in previous hour. It adds one to its count for each time a Prefetch/poststore is not completed within ½ second. It decements one for each time a prefetch/poststore is completed within ½ second (with lower bound of 0).

PRAVGC CONTROL KERNEL—Average points per second in current hour.

PRAVGP CONTROL KERNEL—Average points per second in previous hour.

PRAVGS CONTROL KERNEL—Average points per second in snapshot period.

PRCSTATE CONTROL KERNEL—Processor state.

PRMAXC CONTROL KERNEL—Maximum points per cycle in current hour.

PRMAXP CONTROL KERNEL—Maximum points per cycle in previous hour.

PRMINC CONTROL KERNEL—Minimum points per cycle in current hour.

PRMINP CONTROL KERNEL—Minimum points per cycle in previous hour.

PRMNCYCC CONTROL KERNEL—Cycle in current hour when the minimum number of points per second was processed.

PRMNCYCP	CONTROL KERNEL—Cycle in previous hour when the minimum number of points per second was processed.
PRMXCYCC	CONTROL KERNEL—Cycle in current hour when the maximum number of points was processed.
PRMXCYCP	CONTROL KERNEL—Cycle in previous hour when the maximum number of points was processed.
PROCTYPE	CONTROL KERNEL—Type of CPU in AM (1=68040, 2=68020).
PROUNT(i)	CONTROL KERNEL—Process unit (i) exists flag.
PSAVGC	CONTROL KERNEL—Average number of poststores per second in current hour.
PSAVGP	CONTROL KERNEL—Average number of poststores per second in previous hour.
PSAVGS	CONTROL KERNEL—Average number of poststores per second in snapshot period.
PSMAXC	CONTROL KERNEL—Maximum number of poststores per cycle in current hour.
PSMAXP	CONTROL KERNEL—Maximum number of poststores per cycle in previous hour.
PSMINC	CONTROL KERNEL—Minimum number of poststores per cycle in current hour.
PSMINP	CONTROL KERNEL—Minimum number of poststores per cycle in previous hour.
PSMNCYCC	CONTROL KERNEL—Cycle in current hour when the minimum number of poststores occurred.
PSMNCYCP	CONTROL KERNEL—Cycle in previous hour when the minimum number of poststores occurred.
PSMXCYCC	CONTROL KERNEL—Cycle in current hour when the maximum number of poststores occurred.
PSMXCYCP	CONTROL KERNEL—Cycle in previous hour when the maximum number of poststores occurred.
REDBFMIN	CONTROL KERNEL—Minimum redundancy buffer space available in words since the last startup or resynchronization; Secondary AM only.
REDBFZ	CONTROL KERNEL—Redundancy buffer size in words; Secondary AM only. The base value is 122,880.

REDCONFG CONTROL KERNEL—Indicates, when true, that this AM is configured for redundancy.

REDINOP CONTROL KERNEL—Indicates, when true, that this AM is operating in redundant mode.

REDTRAP CONTROL KERNAL—Hex address, as a string, for a bad instruction trap to be used if trigger code has been set to REDTRIP: Secondary AM only.

REDTRIP CONTROL KERNEL—Special test function. Used to initiate special trap function and test functionality; Secondary AM only.

RESRVMEM Reserved memory. Memory reserved for future options. For information, refer to 7.2 in *AM Implementation Guidelines*.

RESYNCS(N) CONTROL KERNEL—Indicates the number of resynchronizations since start up for each possible cause of resynch. Reasons (n=):

1. Total number of resynchronizations
2. Redundant bus parity
3. Insufficient room
4. Clean point too large
5. Transient backdoor failure
6. Transient LCN failure

Note : This is an array of 10 elements, but only the first 6 are used.

SFWRERR CONTROL KERNEL—Last detected software error code.

SNAPTIME CONTROL KERNEL—Period (sec) for snapshot averages.

STACKADD CONTROL KERNEL—Maximum additional stack size of all custom packages loaded. This amount is added to FPP and SPP runtime stack sizes.

STRAVGC CONTROL KERNEL—Average stores per second in current hour.

STRAVGP CONTROL KERNEL—Average stores per second in previous hour.

STRAVGS CONTROL KERNEL—Average stores per second in snapshot period.

TIMEDOWN(I) CONTROL KERNEL—Seconds unit (i) was down before last startup.

22.3 Application Module PSDP Parameters, Continued

TMEMCDPN	CONTROL KERNEL—Total memory used for CDS descriptors and point names.
TMEMCL	CONTROL KERNEL—Total memory used for CL.
TMECS	CONTROL KERNEL—Total user memory used by all custom packages loaded.
TMEMPTS	CONTROL KERNEL—Total memory used for point data.
UNMEMTOT(I)	CONTROL KERNEL—Total memory for unit (i) point data, CL, and CDS.

22.4 Computer Gateway PSDP Parameters

$AUTOSAV (R620)

CG FUNCTIONS- The auto checkpointing enable/disable status of this node on the LCN.
PURPOSE- Allows you to read the current status (ENABLE or DISABLE) of auto checkpointing, and allows you to enable or disable auto checkpointing.
TYPE- ATTRIB

$CGINGR (n)

CG FUNCTIONS—General configuration and data holding parameter for debug. Indexed where:

- n = 1 for number of seconds between time synch messages.
- n = 2 for maximum seconds for host to confirm message.
- n = 3 controls form of floating point conversion.
- n = 4 selects baud rate for link.
- n = 5 selects bisynch or HDLC_LAPB protocol.
- n = 6 for number of links.
- n = 7 selects primary/secondary mode of operation.
- n = 8 for number of times ENQ sent before link failed.
- n = 9 for number of times NAK sent before link failed.
- n = 10 for selection of station ID.
- n = 11 for time delay between messages.
- n = 12 to set number of HDLC retrys.

PURPOSE—Supplies configuration, load, and debug data.
TYPE—Integer array

$CGSTRNG (n)

CG FUNCTIONS—General configuration descriptions. Index of 1 supplies 40 character configuration title.
PURPOSE—Supplies configuration and debug descriptions.
TYPE—String array

ACPRATE
CG FUNCTIONS—Number of ACP turn-on messages/minute during the last 1 minute sample period.
PURPOSE—Indicates the parameter store load from this node.
TYPE—Real

DDTGRAT(i)
CG Functions—Data Definition Tables parameters/sec "get" rate based on number of DDT get requests from the ULP. Index 1 is for rate during the last full 1 minute sample period. Index 2 is for the rate over the previous 1 minute sample period.
Purpose—Indicates the CM-60/50 load on the LCN.
Type—Real

DDTSRAT(i)
CG FUNCTIONS—Data Definition Tables parameters per minute "store" rate based on number of DDT store requests to the ULP. Index 1 is for rate during the last full 1 minute sample period. Index 2 is for the rate over the previous 1 minute sample period.
PURPOSE—Indicates the CM-60/50 load on the LCN.
TYPE—Real

DL1_STS
CG Functions—Current status of data link #1.

DL2_STS
CG Functions—Current status of data link #2.

GHISTRT(i)
CG Functions—Get History Rate—GETHIS parameters/sec rate based on number of GETHIS value requests from the ULP with outage, time change, and start of definition records in count. Index 1 is for rate during the last full 1 minute sample period. Index 2 is for the rate over the previous 1 minute sample period.
Purpose—Indicates HM history access load by the CM-60/50.
Type—Real

GPARGRT(i) CG FUNCTIONS—Single point parameters per minute "get" rate based on number of single point parameter get requests from the ULP. Index 1 is for the parameter rate during the last full 1-minute sample period. Index 2 is for the rate over the previous 1-minute sample period. Index 3 is for the element rate during the last full 1-minute sample period. Index 4 is for the rate over the previous 1-minute sample period.
PURPOSE—Indicates the CM-60/50 load on the LCN.
TYPE—Real

GPARSRT(n) CG FUNCTIONS—Single point parameters/sec "store" rate based on number of single point parameter store requests from the ULP. Index 1 is for the parameter rate during the last full 1-minute sample period. Index 2 is for the rate over the previous 1-minute sample period. Index 3 is for the element rate during the last full 1-minute sample period. Index 4 is for the rate over the previous 1-minute sample period.
PURPOSE—Indicates the CM-60/50 load on a node or nodes.
TYPE—Real

NMACIDP CG FUNCTIONS—Number of ACIDP points currently built.
PURPOSE—Indicates the capacity used of the 250 possible.
TYPE—Integer

NMCRDP CG Functions—Number of CRDP points currently built.
Purpose—Indicates the capacity used of the 250 possible.
TYPE—Integer

RECVRAT (n) CG FUNCTIONS—Rate per minute of data transfers from ULP to CG. Indexed where:

- n = 1 for number of words.
- n = 2 for number of blocks.
- n = 3 for number of messages.

Rate per second is calculated over a 1-minute sample period.
PURPOSE—Indicates the link utilization or load.
TYPE—Real

UDSIPRAT(n) CG FUNCTIONS—Rate per minute of data transfers to CG from US for user displays. Indexed where:

- n = 1 for number of words per second.
- n = 2 for number of blocks per second.
- n = 3 for number of messages per second.

Rate per second is calculated over a 1-minute sample period.
PURPOSE—Indicates the operator display load.
TYPE—Real

UDSOPRAT(n) CG FUNCTIONS—Rate per minute of output data transfers to US from CG for user displays. Indexed where:

- n = 1 for number of words per second.
- n = 2 for number of blocks per second.
- n = 3 for number of messages per second.

Rate per second is calculated over a 1-minute sample period.
PURPOSE—Indicates the operator display load.
TYPE—Real

ULT_STS CG FUNCTIONS—Current status of ULP processor

XMITRAT(n) CG FUNCTIONS—Rate per minute of data transfers from CG to ULP. Indexed where:

- n = 1 for number of words.
- n = 2 for number of blocks.
- n = 3 for number of messages.

PURPOSE—Indicates the link utilization or load.
TYPE—Real

22.5 History Module PSDP Parameters

$HISTCOL (R620)

HM FUNCTIONS – Allows you to read the current status (enable/disable) of history collection for this HM node on the LCN, and also allows you to enable or disable history collection for the HM node.
TYPE - ATTRIB

CHCYCAV(i)

HM FUNCTIONS—Average continuous history collection cycle time (seconds) per type of history for the last hour. This is the time for all nodes with type to respond to the history request.

1 60 second average collection time.

2 20 second average collection time.

3 10 second average collection time.

4 5 second average collection time.

PURPOSE—Indicates the response time for gathering history.

TYPE—Real array

CHCYCMN(i)

HM FUNCTIONS—Minimum continuous history collection cycle time (seconds) per type of history for the last hour. This is the time for all nodes with type to respond to the history request.

1 60 second minimum collection time.

2 20 second minimum collection time.

3 10 second minimum collection time.

4 5 second minimum collection time.

PURPOSE—Indicates the response time for gathering history.

TYPE—Real array

CHCYCMX(i)

HM FUNCTIONS—Maximum continuous history collection cycle time (seconds) per type of history for the last hour. This is the time for all nodes with type to respond to the history request.

1 60 second maximum collection time.

2 20 second maximum collection time.

3 10 second maximum collection time.

4 5 second maximum collection time.

PURPOSE—Indicates the response time for gathering history.

TYPE—Real array

CHWATAV(i)

HM FUNCTIONS—Average continuous history wait time (waiting for the minute synch) for each type collection cycle for the last hour.

1 60 second average wait time.

2 20 second average wait time.

3 10 second average wait time.

4 5 second average wait time.

PURPOSE—This value indicates the amount of free time the continuous history function has each minute. This is the total time spent collecting *and* processing the last history type data.

TYPE—Real array

CHWATMN(i)

HM FUNCTIONS—Minimum continuous history wait (free) time for history type during the last hour.

1 60 second minimum wait time.

2 20 second minimum wait time.

3 10 second minimum wait time.

4 5 second minimum wait time.

PURPOSE—This value indicates the amount of free time the continuous history function has each minute. This value may be negative and is indicative of the total time spent collecting *and* processing the last minute's history type data.

TYPE—Real array

CHWATMX(i)

HM FUNCTIONS—Maximum continuous history wait (free) time for history type during the last hour.

1 60 second maximum wait time.

2 20 second maximum wait time.

3 10 second maximum wait time.

4 5 second maximum wait time.

PURPOSE—This value indicates the amount of free time the continuous history function has each minute. This value may be negative and is indicative of the total time spent collecting *and* processing the last history type data.

TYPE—Real array

HMVOLNAM(i)

HM FUNCTIONS—Array of configured volume names and virtual device names (such as WR01, WR12).

1 to 15	fifteen virtual volume names drive 0 or 5.
16 to 30	fifteen virtual volume names drive 1 or 4.
31 to 45	fifteen virtual volume names drive 3.
46 to 60	fifteen virtual volume names drive 2.
61 to 75	fifteen virtual device names drive 0 or 5.
76 to 90	fifteen virtual device names drive 1 or 4.
91 to 105	fifteen virtual device names drive 3.
106 to 120	fifteen virtual device names drive 2.

PURPOSE—Provides name list for HM disk configuration.
TYPE—Array of string

NMCHPTS(i)

HM FUNCTIONS—Number of history points currently loaded in continuous history groups indicated:

1. 60 second point count.
2. 20 second point count.
3. 10 second point count.
4. 5 second point count.
5. Total count of all history groups loaded.

PURPOSE—Indicates the history capacity used.
TYPE—Integer array

NODENUM

HM FUNCTIONS—Identifies the node currently being checkpointed.

PURPOSE—Allows monitoring of checkpoint operation.
TYPE—Integer

TIMEBASE (n)

HM FUNCTIONS—Provides data on checkpoint operation. For n=:

6. checkpoint period.
7. checkpoint offset.
8. last checkpoint elapsed time.
9. next checkpoint start time.

PURPOSE—Allows monitoring the HM checkpoint operation.
TYPE—Array of date/time

Note: Date/time data type is not directly useable in schematics. CHKPTIME display has special handling for proper display and operation.

22.6 Hiway Gateway PSDP Parameters

Only used for HGs

The following PSDP parameters are only in HGs.

Reference

See *Hiway Gateway Parameter Reference Dictionary* that provides more detailed information about each parameter including value ranges and value types.

$AUTOSAV (R620)

HG FUNCTIONS- The auto checkpointing enable/disable status of this node on the LCN.
PURPOSE- Allows you to read the current status (ENABLE or DISABLE) of auto checkpointing, and allows you to enable or disable auto checkpointing.
TYPE - ATTRIB

$BXRSTRP (R680)

HG FUNCTIONS – ENABLE/INHIBIT the system alarm.
PURPOSE – Allows you to select between the two options, ENABLE/INHIBIT. The ENABLE option annunciates the system alarm, when the Hiway box state changes are caused by the point load or change of address related parameters of DHP or PIU. The INHIBIT option, suppresses the system alarm, when the Hiway box state changes are caused by the point load or change of address related parameters of DHP or PIU. This value is read from the SYSTEM ALARM ON DHP/PIU POINT LOAD option of NCF when HG is rebooted. The user can redefine the value.
TYPE – Enumeration
DEFAULT – ENABLE

$EIPMAXC (R660)

HG FUNCTIONS –The maximum number of EIP events in any one second in the current hour.
PURPOSE - Indicates the loading on HG with respect to Event Initiated Processing.
TYPE – Integer

$EIPMAXP (R660)

HG FUNCTIONS –The maximum number of EIP events in any one second in the previous hour.
PURPOSE - Indicates the loading on HG with respect to Event Initiated Processing.
TYPE – Integer

$EIPTOTC (R660)

HG FUNCTIONS –The total number of EIP events sent to the LCN in the current hour.
PURPOSE - Indicates the loading on HG with respect to Event Initiated Processing.
TYPE – Real

$EIPTOTP (R660)

HG FUNCTIONS –The total number of EIP events sent to the LCN in the previous hour.
PURPOSE - Indicates the loading on HG with respect to Event Initiated Processing.
TYPE – Real

$EIPTOTS (R660)

HG FUNCTIONS –The total number of EIP events sent to the LCN in the previous 15 seconds.
PURPOSE - Indicates the loading on HG with respect to Event Initiated Processing.
TYPE – Real

$EVTMAXC (R660)

HG FUNCTIONS –The maximum number of events in any one second during the current hour.
PURPOSE - Indicates the loading on HG with respect to the processing of all events and alarms.
TYPE – Integer

$EVTMAXP (R660)

HG FUNCTIONS –The maximum number of events in any one second during the previous hour.
PURPOSE - Indicates the loading on HG with respect to the processing of all events and alarms.
TYPE – Integer

$EVTTOTC (R660)

HG FUNCTIONS –The total number of events sent to the LCN in the current hour.
PURPOSE - Indicates the loading on HG with respect to the processing of all events and alarms.
TYPE – Real

$EVTTOTP (R660)	HG FUNCTIONS –The total number of events sent to the LCN in the previous hour. PURPOSE - Indicates the loading on HG with respect to the processing of all events and alarms. TYPE – Real
$NODMAXC (R660)	DATA ACCESS - Maximum number of node data access in any one second in the current hour. PURPOSE - Indicates the loading on HG due to the processing of data access requests that has resulted in a Hiway read or store. TYPE – Integer
$NODMAXP (R660)	DATA ACCESS - Maximum number of node data accesses in the current hour. PURPOSE - Indicates the loading on HG because of the processing of data access requests that have resulted in Hiway reads or stores. TYPE – Integer
$NODTOTC (R660)	DATA ACCESS - Maximum number of node data accesses in the current hour. PURPOSE - Indicates the loading on HG because of the processing of data access requests that have resulted in Hiway reads or stores. TYPE – Real
$NODTOTP (R660)	DATA ACCESS - Total number of node data accesses in the previous hour. PURPOSE - Indicates the loading on HG because of the processing of data access requests that have resulted in Hiway reads or stores. TYPE - Real
$NODTOTS (R660)	DATA ACCESS - Total number of node data accesses in the last 15 seconds. PURPOSE - Indicates the loading on HG because of the processing of data access requests that have resulted in Hiway reads or stores. TYPE – Real

$OPOVRC (R640)

HG FUNCTIONS –The number of overruns in the current hour.
PURPOSE - Indicates that the OP alarm scanning task did not complete a cycle within the OP alarm scan period specified by $OPSNPRD (use $HIWAYxx.$OPSNPRD). It's also available through the HG Node Status display at the bottom: HWY ALM ENB/DIS.
TYPE—Real
NOTE: The OP alarm scanning task will not stop the current cycle even if it overruns until it completes the cycle. The value in $OPOVRC can be reset by disabling the OP alarm function.

$OPOVRP (R640)

HG FUNCTIONS – The number of overruns in the previous hour.
PURPOSE – Indicates that the OP alarm scanning task did not complete a cycle within the OP alarm scan period specified by $OPSNPRD.
TYPE—Real
NOTE: The OP alarm scanning task will not stop the current cycle even if it overruns until it completes the cycle. The value in $OPOVRP can be reset by disabling the OP alarm function.

$OPOVRUN (R640)

HG FUNCTIONS – The cumulative total of OP overruns detected during the OP alarm-scanning task.
PURPOSE – Indicates that the OP alarm scanning task did not complete a cycle within the OP alarm scan period specified by $OPSNPRD.
TYPE – REAL
NOTE: The OP alarm scanning task will not stop the current cycle even if it overruns until it completes the cycle. The value in $OPOVRUN can be reset by disabling the OP alarm function.

$PARMAXC (R660)

DATA ACCESS – The maximum parameter access rate in any one- second in the current hour.
PURPOSE – Indicates the loading on HG because of the processing of data access requests that have resulted in Hiway reads or stores.
TYPE – Integer

$PARMAXP (R660)

DATA ACCESS – The maximum parameter access rate in any one-second during the previous hour.
PURPOSE – Indicates the loading on HG because of the processing of data access requests that have resulted in Hiway reads or stores.
TYPE – Integer

$PARSECC (R660)

DATA ACCESS – The parameter access rate (running average per second) in the current hour.
PURPOSE – Indicates the loading on HG because of the processing of data access requests that have resulted in Hiway reads or stores.
TYPE – Real

$PARSECP (R660)

DATA ACCESS – The parameter access rate (overall average per second) in the previous hour.
PURPOSE – Indicates the loading on HG because of the processing of data access requests that have resulted in Hiway reads or stores.
TYPE – Real

$PRCMAXC (R660)

HG FUNCTIONS –The maximum number of process alarms in any one second in the current hour.
PURPOSE – Indicates the loading on HG with respect to the processing of process alarms and sequence of events.
TYPE – Integer

$PRCMAXP (R660)

HG FUNCTIONS –The maximum number of process alarms in any one second in the previous hour.
PURPOSE – Indicates the loading on HG with respect to the processing of process alarms and sequence of events.
TYPE – Integer

$PRCTOTC (R660)

HG FUNCTIONS –The total number of process alarms sent to the UCN in the current hour.
PURPOSE - Indicates the loading on HG with respect to the processing of process alarms and sequence of events.
TYPE – Real

$PRCTOTP (R660)

HG FUNCTIONS –The total number of process alarms sent to the UCN in the previous hour.
PURPOSE - Indicates the loading on HG with respect to the processing of process alarms and sequence of events.
TYPE – Real

$PRCTOTS (R660)

HG FUNCTIONS –The total number of process alarms sent to the UCN in the previous 15 seconds.
PURPOSE - Indicates the loading on HG with respect to the processing of process alarms and sequence of events.
TYPE – Real

$RDAVGC (R660)

DATA ACCESS – The parameter read rate (running average per second) in the current hour.
PURPOSE - Indicates the loading on HG because of the processing of data-access read requests.
TYPE – Real

$RDAVGP (R660)

DATA ACCESS – The parameter read rate (overall average per second) in the previous hour.
PURPOSE - Indicates the loading on HG because of the processing of data-access read requests.
TYPE – Real

$RDAVGS (R660)

DATA ACCESS – The parameter read rate (per second) in the last 15 seconds.
PURPOSE - Indicates the loading on HG because of the processing of data-access read requests.
TYPE – Real

$RDMAXC (R660)

DATA ACCESS – The maximum number of parameters that have been read in any one second in the current hour.
PURPOSE - Indicates the loading on HG because of the processing of data-access read requests.
TYPE – Real

$RDMAXP (R660)

DATA ACCESS – The maximum number of parameters that have been read in any one second in the previous hour.
PURPOSE - Indicates the loading on HG because of the processing of data-access read requests.
TYPE – Integer

$SEQMAXC (R660)

HG FUNCTIONS –The maximum number of sequence events/messages in any one second in the current hour.
PURPOSE - Indicates the loading on HG with respect to the processing of sequence events and CL messages.
TYPE – Integer

$SEQMAXP (R660)

HG FUNCTIONS –The maximum number of sequence events/messages in any one second in the previous hour.
PURPOSE - Indicates the loading on HG with respect to the processing of sequence events and CL messages.
TYPE – Integer

$SEQTOTC (R660)

HG FUNCTIONS –The maximum number of sequence events/messages sent to the LCN in the current hour.
PURPOSE - Indicates the loading on HG with respect to the processing of sequence events and CL messages.
TYPE – Real

$SEQTOTP (R660)

HG FUNCTIONS –The maximum number of sequence events/messages sent to the LCN in the previous hour.
PURPOSE - Indicates the loading on HG with respect to the processing of sequence events and CL messages.
TYPE – Real

$SEQTOTS (R660)

HG FUNCTIONS –The maximum number of sequence events/messages sent to the LCN in the previous 15 seconds.
PURPOSE - Indicates the loading on HG with respect to the processing of sequence events and CL messages.
TYPE – Real

$STRMAXC (R660)

DATA ACCESS –The maximum number of parameters stored in any one second in the current hour.
PURPOSE - Indicates the loading on HG with respect to the processing of requests for data-access stores.
TYPE – Integer

$STRMAXP (R660)	DATA ACCESS –The maximum number of parameters stored in any one second in the previous hour. PURPOSE - Indicates the loading on HG with respect to the processing of requests for data-access stores. TYPE – Integer
ALBURST	The maximum number of events that has occurred in any one second since the HG was loaded or the parameter was reset by the operator. Event types included in this count are the same as for EVTRATE. TYPE – Integer
BOXBUFFS(i)	HG FUNCTIONS—The number of change and alarm buffers for box (i). PURPOSE—Indicates the HG/Hiway load due to AM/US actions. TYPE—Real
BXACCESS(i)	HG FUNCTIONS—The number of accesses per second to Hiway address (i) based on the 15 second sample rate of DHI board data. PURPOSE—Indicates the load level on the Hiway. TYPE—Real
CPTIMEFL (R660)	The time required to checkpoint to a drive. PURPOSE - The parameter indicates the time taken for the last checkpoint, initiated either through System Status Display or by auto-checkpointing. TYPE – Real

CPTIMEHM (R660)
The time required to checkpoint to an HM.
PURPOSE - Indicates the loading on HG with respect to check- pointing. The parameter indicates the time taken for the last checkpoint, initiated either through System Status Display or by auto-checkpointing.
TYPE – Real

DHMSGSEC(i)
DATA ACCESS—The number of messages per second sent to 1 of 5 data handler streams. Message requests entering HGs are split into 5 parallel queues of differing priority, depending on the requesting function. The queue with index 1 is the highest priority queue and queue 5 is the lowest priority queue. This parameter represents the average number of messages per second flowing through a particular queue during the last 15 second period.
Queue 1—HG internal operations and operator changes.
Queue 2—CG and AM control actions.
Queue 3—history gathering and display call ups, including demand updates after a change from a display.
Queue 4—trends, normal display updates, and tools and friendly display queries.
Queue 5—point build, slow updates, SMCC access, and organizational summaries.
These are displayed in the PERFMENU schematic HGDETAIL (R660).
PURPOSE—Indicates internal load on DA queues and handlers.
TYPE—Real

DHPARSEC(i)
DATA ACCESS—Parameter requests entering HGs are split into 5 parallel queues of differing priority depending on the requesting function. The queue with index 1 is the highest priority queue and queue number 5 is the lowest priority queue. This parameter represents the average number of parameters per second flowing through a particular queue during the last 15 second period.
Queue 1—HG internal operations and operator changes.
Queue 2—CG and AM control actions.
Queue 3—history gathering and display call ups, including demand updates after a change from a display.
Queue 4—trends, normal display updates, and tools and friendly display queries.
Queue 5—point build, slow updates, SMCC access, and organizational summaries.
These are displayed in the PERFMENU schematic HGDETAIL (R660).
PURPOSE—Indicates internal load on DA queues and handlers.
TYPE—Real

EVTRATE

HG FUNCTIONS—Pure 15 second count (not a rate) of events and alarms.
PURPOSE—Indicates the event load from the Hiway.
TYPE—Real

HWYERR(i)

HG FUNCTIONS—The number of errors per minute for address (i) based on a 1 hour sample rate of data to be kept by driver on each Hiway box address.
PURPOSE—Indicates the error rate on Hiway communications.
TYPE—Real

HYSTARTS

HG FUNCTIONS—The number of IOCB (I/O control block) chain starts on the Hiway.
PURPOSE—Indicates the Hiway load due to AM/US actions.
TYPE—Real
Note:
For Simple Gateway, HYSTARTS indicates the number of chain starts on the FTE.
For Junction Gateway, HYSTARTS indicates the number of chain starts on both Hiway and FTE.

IOCBS

HIWAY DRIVER—Number of IOCBs (I/O control blocks) based on a 15 second sample rate.
PURPOSE—Indicates the load level on the Hiway.
TYPE—Real
Note:
For Simple Gateway, IOCBS indicates the number of IOCBs on the FTE during the last 15-second sample period.
For Junction Gateway, IOCBS indicates the number of IOCBs on both Hiway and FTE during the last 15-second sample period.

POLLRES

HG FUNCTIONS—Number of Hiway poll responses per second based on a 15 second sample rate of DHI board data (corresponds to Hiway address 65 in board data).
PURPOSE—Indicates the load level on the Hiway.
TYPE—Real
Note:
For emulated Hiway, POLLRES indicates the value as zero.

POLLS

HG Functions—Number of hiway polls per second based on a 15 second sample rate of DHI board data (corresponds to Hiway address 64 in board data).
Purpose—Indicates the load level on the Hiway.
Type—Real
Note:

For emulated Hiway, POLLS indicates the value as zero.

STRAVGC (R660)

The parameter store rate (running average per second) in the current hour.
PURPOSE - Indicates the loading on HG with respect to the processing of requests for data-access stores.
TYPE – Real

STRAVGP (R660)

The parameter store rate (overall average per second) in the previous hour.
PURPOSE - Indicates the loading on HG with respect to the processing of requests for data-access stores.
TYPE – Real

STRAVGS (R660)

The parameter store rate (per second) in the last 15 seconds.
PURPOSE - Indicates the loading on HG with respect to the processing of requests for data-access stores.
TYPE – Real

22.7 Network Gateway PSDP Parameters

ATTENTION

One of three values can be returned for Network Gateway PSDP parameters:

- Average values and the array values (indexes shown in Table 22-1) are based on one minute sample periods.
- Four parameters (NGPAGSDE(i), NGPAREAD(i), NGPAREQS, NGPASTOR(i)) are based on the data access 15 sec sample period.
- Counts where the totals are since a node reload.

AALONEIN

NG FUNCTIONS—Cable A alone-in-ring.
PURPOSE—Cable status on the PIN.
TYPE—Boolean

ABADADDR

NG FUNCTIONS—Cable A bad address passed.
PURPOSE—Cable status on the PIN.
TYPE—Boolean

ACBLSTAT(i)

NG FUNCTIONS—Cable A detail operational data. See Table 22-1 for index descriptions.
PURPOSE—Cable status on the PIN.
TYPE—Array of integer

Table 22-1 Network Gateway Index Values

Index	Description	Index	Description
1	TOKENS PASSED	**25**	REMOD THRESHOLD XCEDED
2	TOKENS HEARD	**26**	FRAGMENT THRSHLD XCEDED
3	NO SUCCESSOR	**27**	NO DRIVER Rx BUFFER
4	WHO FOLLOWS	**28**	Rx FROM INACTIVE NODE
5	TOKEN PASS FAILED	**29**	Rx FROM INACTIVE SAP
6	NOISE BURST	**30**	LCC SPARE 3
7	CHECKSUM ERROR	**31**	LCC SPARE 2
8	E BIT ERROR	**32**	LCC SPARE 1
9	FRAME FRAGMENT	**33**	Tx 0 PACKET
10	Rx FRAME TOO LONG	**34**	Tx 1 PACKET
11	NO Rx RESOURCES	**35**	Tx 2 PACKET
12	Rx OVERRUN	**36**	Tx 3 PACKET
13	DUPLICATE RWR	**37**	Tx NO BUFFER
14	NULL RWR	**38**	Tx SPARE 2
15	NO RESPONSE RWR	**39**	Tx SPARE 1
16	UNEXPECTED RESPONSE RWR	**40**	Rx 0 PACKET
17	ERROR IN RESPONSE RWR	**41**	Rx 1 PACKET
18	Tx UNDERRUN	**42**	Rx 2 PACKET
19	TBC SPARE 1	**43**	Rx 3 PACKET
20	TOKEN ROTATION TIME	**44**	Rx BAD MESSAGE
21	TOKEN ROTATION THRSHOLD XCEDED	**45**	Rx SPARE 2
22	TOKEN PASS FAIL THRSHOLD XCEDED	**46**	Rx SPARE 1
23	NOISE THRESHOLD EXCEEDED	**47**	COM SPARE 2
24	FCS THRESHOLD EXCEEDED	**48**	COM SPARE 1

ADUPADDR
NG FUNCTIONS—Cable A duplicate address detected.
PURPOSE—Cable status on the PIN.
TYPE—Boolean

AINRINGR
NG FUNCTIONS—Cable A in-ring-requested.
PURPOSE—Cable status on the PIN.
TYPE—Boolean

ANONGIBD
NG FUNCTIONS—Cable A sees no NGI board.
PURPOSE—Cable status on the PIN.
TYPE—Boolean

AONLINEE
NG FUNCTIONS—Cable A property on-line.
PURPOSE—Cable status on the PIN.
TYPE—Boolean

ASILENTT
NG FUNCTIONS—Cable A silent – no activity.
PURPOSE—Cable status on the PIN.
TYPE—Boolean

ASUCCCHG
NG FUNCTIONS—Cable A successor node change.
PURPOSE—Cable status on the PIN.
TYPE—Boolean

ASUSPECT
NG FUNCTIONS—Cable A quality is suspect.
PURPOSE—Cable status on the PIN.
TYPE—Boolean

AXMTHANG
NG FUNCTIONS—Cable A transmit hang detected.
PURPOSE—Cable status on the PIN.
TYPE—Boolean

BALONEIN
NG FUNCTIONS—Cable B alone-in-ring.
PURPOSE—Cable status on the PIN.
TYPE—Boolean

BBADADDR
NG FUNCTIONS—Cable B bad address passed.
PURPOSE—Cable status on the PIN.
TYPE—Boolean

BCBLSTAT(i)
NG FUNCTIONS—Cable B detail operational data. See Table 22-1, earlier in this subsection, for index descriptions.
PURPOSE—Cable status on the PIN.
TYPE—Array of integer

BDUPADDR
NG FUNCTIONS—Cable B duplicate address detected.
PURPOSE—Cable status on the PIN.
TYPE—Boolean

BINRINGR
NG FUNCTIONS—Cable B in-ring-requested.
PURPOSE—Cable status on the PIN.
TYPE—Boolean

BNONGIBD
NG FUNCTIONS—Cable B sees no NGI board.
PURPOSE—Cable status on the PIN.
TYPE—Boolean

BONLINEE
NG FUNCTIONS—Cable B property on-line.
PURPOSE—Cable status on the PIN.
TYPE—Boolean

BSILENTT
NG FUNCTIONS—Cable B silent – no activity.
PURPOSE—Cable status on the PIN.
TYPE—Boolean

BSUCCCHG
NG FUNCTIONS—Cable B successor node change.
PURPOSE—Cable status on the PIN.
TYPE—Boolean

BSUSPECT
NG FUNCTIONS—Cable B quality is suspect.
PURPOSE—Cable status on the PIN.
TYPE—Boolean

BXMTHANG
NG FUNCTIONS—Cable B transmit hang detected.
PURPOSE—Cable status on the PIN.
TYPE—Boolean

LOCTITLE
The 2-character name of the local LCN. TYPE—String

LOC_DESC
The 20-character description of the local LCN. Type—String

LOC_NUMB
The number associated with the local LCN. TYPE—Real

NGPAGSDE(i)
DATA ACCESS—Total number of get self-defining enum requests from network. An array of 256 (indexed 0-255) values indexed by network number. NGPAGSDE(0) is the total of NGPAGSDE(1..255).

NOTE: This parameter's values are kept by data access and exist in all nodes, but only if the node is an NG is the value valid.

PURPOSE—Provides loading i.nformation on NG.
TYPE—Real

NGPAREAD(i)
DATA ACCESS—Total number of parameter reads from a particular network. An array of 256 (indexed 0-255) values indexed by network number. NGPASTOR(0) is the total of NGPASTOR(1..255). NGPAREAD(0) is the total of NGPAREAD(1..255).

NOTE: This parameter's values are kept by data access and exist in all nodes, but only if the node is an NG is the value valid.

PURPOSE—Provides loading information on NG.
TYPE—Real

NGPAREQS

DATA ACCESS—Total count of parameter access requests since last reset to 0. Storing any value to this parameter resets NGPAREQS, NGPAREAD(i), NGPASTOR(i), and NGPAGSDE(i) to zero.

NOTE: This parameter's values are kept by data access and exist in all nodes, but only if the node is an NG is the value valid.
PURPOSE—Provides loading information on NG.
TYPE—Real

NGPASTOR(i)

DATA ACCESS—Total number of parameter stores from a particular network. An array of 256 (indexed 0-255) values indexed by network number. NGPASTOR(0) is the total of NGPASTOR(1..255).

NOTE: This parameter's values are kept by data access and exist in all nodes, but only if the node is an NG is the value valid.
PURPOSE—Provides loading information on NG.
TYPE—Real

PARSEC

Because the NG has no points (except the PSDP), this parameter would be fairly useless for performance measurement purposes. Therefore, in the NG only, this parameter represents the number of parameters per second being read or stored from and to this LCN by all other LCNs, summed with the PARSEC for this NG's PSDP. In other words, PARSEC in the NG is a measure of the number of parameters per second that are "flowing through" the NG. Also see PARSEC in subsection 22.2.

RECVAVGM

NG FUNCTIONS—Average receive message size in bytes.
PURPOSE—NG performance and loading data.
TYPE—Real

RECVERRS

NG FUNCTIONS—Number of PIN errors reported.
PURPOSE—NG performance and loading data.
TYPE—Real

RECVFLMG
NG FUNCTIONS—Number of receive file messages.
PURPOSE—NG performance and loading data.
TYPE—Real

RECVFLWD
NG FUNCTIONS—Word count for receive messages.
PURPOSE—NG performance and loading data.
TYPE—Real

RECVMSGS
NG FUNCTIONS—Total number of receive messages.
PURPOSE—NG performance and loading data.
TYPE—Real

RECVPKTS
NG FUNCTIONS—Number of receive 512 word packets.
PURPOSE—NG performance and loading data.
TYPE—Real

RECVTMOT
NG FUNCTIONS—Time out for receive messages.
PURPOSE—NG performance and loading data.
TYPE—Real

RECVWORD
NG FUNCTIONS—Total number of receive words.
PURPOSE—NG performance and loading data.
TYPE—Real

REMTITLE(i)
The 2 character name of the remote LCN whose number is i.
TYPE—String

REM_DESC(i)
The 20 character description of the remote LCN whose number is i.
TYPE—String

XMITAVGM
NG FUNCTIONS—Average transmit message size in bytes.
PURPOSE—NG performance and loading data.
TYPE—Real

XMITERRS
NG FUNCTIONS—Number of PIN errors reported.
PURPOSE—NG performance and loading data.
TYPE—Real

XMITFLMG
NG FUNCTIONS—Number of transmit file messages.
PURPOSE—NG performance and loading data.
TYPE—Real

XMITFLWD
NG FUNCTIONS—Word count for transmit messages.
PURPOSE—NG performance and loading data.
TYPE—Real

XMITMSGS
NG FUNCTIONS—Total number of transmit messages.
PURPOSE—NG performance and loading data.
TYPE—Real

XMITPKTS
NG FUNCTIONS—Number of transmit 512 word packets.
PURPOSE—NG performance and loading data.
TYPE—Real

XMITTMOT
NG FUNCTIONS—TIME OUT FOR TRANSMIT MESSAGES.
PURPOSE—NG PERFORMANCE AND LOADING DATA.
TYPE—REAL

XMITWORD
NG Functions—Total number of transmit words.
PURPOSE—NG performance and loading data.
TYPE—Real

22.8 Universal Station PSDP Parameters

$ANPPROP (R670)

This parameter propagates the annunciation policy of the node/network/IOP to all the stations in a console. Only an ON value can be stored to this parameter. If you attempt to store an OFF value, an error is reported. When the propagation is complete, the boolean flag is reset to OFF.

Source: User
Value Type: Boolean
Access Lock: Engineer
Residency: US
Value Range: ON
OFF (default)

$CALCPRD (R680)

This parameter enables the load calculation task and controls the periodicity of load calculations. A value of 0 indicates that the task is stopped. A value > 3 indicates the periodicity (in seconds) at which the load calculations are performed.

Source: User
Value Type: Integer
Access Lock: Engineer
Residency: US
Value Range: 0, 4 – 600 seconds
0 seconds (default)

$CALSTAT (R680)

This parameter indicates the status of LCN load calculation tool running on the US node. The following values indicate the status of the tool:
OFF – The US task is stopped.
ON – The US task is running fine.
ERROR – An error has occurred during startup or execution of the load calculation task.

Source: System
Value Type: Enumeration
Access Lock: View-only
Residency: US
Value Range: ON, OFF, ERROR
OFF (default)

$CBLACCL

This R510 parameter returns the ordinal value of the access level required to use the LCN Cable Swapping function. This value is configured in the NCF.

$CBLINHT

This R510 parameter returns the time remaining, in minutes, until LCN Cable Swapping will resume.

$CBLNCFT

This R510 parameter returns the time value, configured in the NCF, for LCN Cable Swapping. When the value is zero, LCN cable swapping is disabled.

$CLSNODE (nn) (R680)

This parameter indicates the segment number to which the node belongs to, if TPN Bridge is present.
Source: User
Value Type: Integer Array (1…96)
Access Lock: Engineer
Residency: US
Value Range: 0 - 7
0 (default)

$IOPADD (R670)

This parameter disables the system alarm annunciation for an IOP. Setting this flag to ON transfers the addresses from the IOP TO DISABLE row to the first available empty row in the $IOPANP schematic. When the addresses are transferred, the Boolean flag is reset to OFF.
Source: User
Value Type: Boolean
Access Lock: Engineer
Residency: US
Value Range: ON
OFF (default)

$IOPBXAD (R670)

This parameter specifies the UCN node number of the IOP to be disabled in the $IOPANP schematic.

Source: System
Value Type: Integer
Access Lock: Engineer
Residency: US
Value Range: 1 - 64
0 (default)

$IOPBXAP(bb) (R670)

This parameter specifies the UCN node number of the disabled IOPs.

Source: System
Value Type: Integer Array (1…16)
Access Lock: Read only
Residency: US
Value Range: 1 - 64
0 (default)

$IOPDEL(dd) (R670)

This parameter enables the disabled IOP in the $IOPANP schematic. When this parameter is set to ON, the value for $IOPNWAP(dd), $IOPBXAP(dd) and $IOPMDAP(dd) are set to zero. The value OFF for $IOPDEL(dd) parameter indicates that the corresponding row has been used for disabling an IOP. The user can only store an ON value to this parameter, otherwise an error is reported. Disabling the IOP is the only mechanism by which the value of this parameter can be changed to OFF.

Source: User
Value Type: Boolean Array (1…16)
Access Lock: Engineer
Residency: US
Value Range: OFF
ON (default)

$IOPMDAD (R670)

This parameter specifies the module number of the IOP to be disabled in the $IOPANP schematic.

Source: User
Value Type: Integer
Access Lock: Engineer
Residency: US
Value Range: 1 - 40
0 (default)

$IOPMDAP(mm) (R670)

This parameter specifies the module number of the disabled IOPs.
Source: System
Value Type: Integer Array (1…16)
Access Lock: Read only
Residency: US
Value Range: 1 - 40
0 (default)

$IOPNWAD R670)

This parameter specifies the Network number of the IOP to be disabled in the $IOPANP schematic.
Source: User
Value Type: Integer
Access Lock: Engineer
Residency: US
Value Range: 1 - 20
0 (default)

$IOPNWAP(nn) (R670)

This parameter reads the Network number of the disabled IOPs.
Source: System
Value Type: Integer Array (1...16)
Access Lock: Read only
Residency: US
Value Range: 1 - 20
0 (default)

$LDALDB (R680)

This parameter allows the user to set the deadband for the system alarms that are generated when the total LCN load or total Parameters per Message crosses the specified trip limits. A value between 0 and 99 is to be specified to generate the system alarms. If this parameter value=100, the system alarms are not generated even if the total LCN load or total Parameters per Message crosses the specified trip limits. The unit of deadband for total LCN load is in % and the unit of deadband for total Parameters per Message is 100th of $PPMLOTP.
Source: User
Value Type: Integer
Access Lock: Engineer
Residency: US
Value Range: 0 – 99, 100
100 (default)

$LDALFL (ss) (R680)

This parameter indicates the status of the system alarm, when the total LCN load on the network and the total Parameters per Message crosses the trip limits.

Source: System
Value Type: Boolean
Access Lock: View-only
Residency: US
Value Range: TRUE, FALSE
FALSE (default)

$LDHHTP (ss) (R680)

This parameter shall have the high high trip point for the parameter ESTIMATED % of LCN LOAD.

Source: User
Value Type: Real Array (0…7)
Access Lock: Engineer
Residency: US
Value Range: $LDHITP (ss) - 100
65 (default)

$LDHITP (ss) (R680)

This parameter indicates the high trip point for the parameter total ESTIMATED % of LCN LOAD.

Source: User
Value Type: Real Array (0…7)
Access Lock: Engineer
Residency: US
Value Range: 35 - $LDHHTP (ss)
55 (default)

$LMSGSEC (ss) (R680)

This parameter indicates the total MESSAGES PER SECOND on the network.

Source: System
Value Type: Real Array (0…7)
Access Lock: View-only
Residency: US
Lower Limit: 0
0 (default)

$LPARMSG (ss) (R680)

This parameter indicates the total PARAMETERS PER MESSAGE on the network.
Source: System
Value Type: Real Array (0…7)
Access Lock: View-only
Residency: US
Lower Limit: 0
0 (default)

$LPARSEC (ss) (R680)

This parameter indicates the total PARAMETERS PER SECOND on the network.
Source: System
Value Type: Real Array (0…7)
Access Lock: View-only
Residency: US
Lower Limit: 0
0 (default)

$NODEANP(nn) (R670)

This parameter reads/writes to the local annunciation policy of any US/GUS on an LCN.
Source: User
Value Type: Boolean Array (1...96)
Access Lock: Engineer
Residency: US
Value Range: ON (ENABLE), OFF (DISABLE)

$NWANPnn(bb) (R670)

This parameter reads and writes from/to the local annunciation policy of any US/GUS on an LCN. The value of this parameter represents the system alarm annunciation policy for a particular box/module on hiway/UCN.

Source: User
Value Type: Boolean Array (1...64)
Access Lock: Engineer
Residency: US
Value Range: ON (ENABLE), OFF (DISABLE)

$PARLIMC (ss) (R680)

This parameter allows some fine-tuning (bias factor) to be performed on the LCN load calculation.

Source: User
Value Type: Real
Access Lock: Engineer
Residency: US
Value Range: (-10) – (+10)
0 (default)

$PARLIMX (ss) (R680)

This parameter allows some fine-tuning to be performed on the LCN load calculation. The user can specify a value for PARLIMX other than 4500. This value is based on the number of parameters per second that equate to 100% loading of the system configuration.

Source: User
Value Type: Integer
Access Lock: Engineer
Residency: US
Value Range: 0 – 5000
4500 (default)

$PICCAN (R660)

This R660 parameter cancels the AM/HG/UCN point-interconnection-search that is in progress. If the $PICCAN value is set to ON (Cancel target), the Point Interconnection query is cancelled and the request is set to OFF. See section 37 for information on finding point interconnections.

Source: User
Value Type: Boolean
Access Lock: Operator
Residency: US
Value Range: OFF (default)
ON

$PICDEF (R660)

This R660 parameter defines whether the $INTRCON display uses the default value for the Point-Interconnection-search query request parameter.

If the $PICDEF value is set to ON (default), the Point Interconnection function uses the entity type of the requested point as the search query request parameter. You can also select $PICQRYA (for AM), $PICQRYH (for HG), or $PICQRYU (for UCN) or any other Point-Interconnection -search request parameters.

If the $PICDEF value is set to OFF, the point interconnection display uses the value in $PICQRY as the Point-Interconnection -search query request parameter.

See section 37 for information on finding point interconnections.

Source: User
Value Type: Boolean
Access Lock: Operator
Residency: US
Value Range: OFF (default)
ON

$PICENT (R660)

This R660 parameter identifies the current entity (Entity target) that is used in the Point-Interconnection-search. The values are meaningful only during the execution of the Point-Interconnection-search. See section 37 for information on finding point interconnections.

Source: User
Value Type: String of 19 characters
Access Lock: Read Only
Residency: US
Value Range: " " (Null) (default)
1 to 19 characters that represent the TPN point name used in the search.

$PICFILE (R660)

This R660 parameter defines whether the Point Interconnection search results are sent to the file specified in the operator find names Fnm query.

If the $PICFILE value (file target) is set to ON, the Point Interconnection results are sent to the file specified in the operator find names Fnm query. If the $PICFILE value is set to OFF, the data is not sent to the file. The file status can be seen in the $PICFST file status parameter. See section 37 for information on finding point interconnections.

Source: User
Value Type: Boolean
Access Lock: Operator
Residency: US
Value Range: OFF (default)
ON

$PICFST (R660)

This R660 parameter stores the Point Interconnection status of the file output. See section 37 for information on finding point interconnections.
Source: System
Value Type: Integer
Access Lock: Read Only
Residency: US
Value Range: 0 (default) through 32767

NOTE**:** 51 is the status OK value, refer to *CL/AM Reference Manual* for the File Manager Status Return Values List.

$PICPRNT (R660)

This R660 parameter defines whether the Point-Interconnection-search results are sent to the printer specified in the Fnm query.

If the $PICPRNT value (Print) is set to ON, the Point-Interconnection results are sent to the printer specified in the Fnm query file used in the search. If the $PICPRNT value is set to OFF, the data is not sent to the printer.

See section 37 for information on finding point interconnections.
Source: User
Value Type: Boolean
Access Lock: Operator
Residency: US
Value Range: OFF (default)
ON

$PICQRY (R660)

This R660 parameter is the descriptor (string name) of an Fnm query. The operator enters this descriptor into the $INTRCON display to see the results of the appropriate Point-Interconnection-search query. $PICDEF overrides the $PICQRY option if the operator selects the default as $PICDEF.

After the operator enters the descriptor in the Fnm Query port, the value is retained until the operator enters a new descriptor value or the US is restarted. If the query is not defined, then all the AM/HG/UCN nodes on the LCN are searched on the NET and the printing and file output options are disabled.

NOTE: The descriptor name should not be "--" or a "NULL" string. These strings can be interpreted by the $INTRCON schematic as a signal to clear the name.

See section 37 for information on finding point interconnections.
Source: User
Value Type: String of 64 characters
Access Lock: Operator
Residency: US
Value Range: "" (Null) (default)
A 1 to 64-character string that specifies the query used for the point-interconnection-search.

$PICQRYA (R660)

This R660 parameter is the default Fnm query to be used by the Point-Interconnection-search for AM points.
$PICQRYA is a string name of a Documentation Tool query saved in the sysqry.dc file with the descriptor entry. This entry describes the default search parameters when the requested point type belongs to the AM.
A request error results when the operator sets the default $PICDEF parameter to ON and $PICQRYA contains a NULL value.

After the engineer enters the $PICQRYA value in the Fnm Query port, the value is retained until the engineer enters a new value, or the US is restarted.

NOTE: The descriptor name should not be "--" or a "NULL" string. These strings can be interpreted by $INTRCON schematic as an empty string and the parameter value will be reset.

The value for $PICQRYA is entered through a schematic display such as DATCHNG display.

See section 37 for information on finding point interconnections.
Source: User
Value Type: String of 64 characters
Access Lock: Engineer
Residency: US
Value Range: "" (Null) (default)
A 1 to 64 character string that is the name of the point-interconnection-search query.

$PICQRYH (R660)

This R660 parameter holds the default Fnm query to be used by the point interconnection display for an HG point. $PICQRYH is a string name of a Documentation Tool query that has been saved in the sysqry.dc file with the descriptor entry. This entry describes the default search parameters when the requested point type belongs to the HG.
A request error is initiated if the operator sets the default $PICDEF parameter to ON and $PICQRYH contains a null value.
When the engineer enters a value for the $PICQRYH parameter, the value is retained until the engineer enters a new value or the US is restarted.

NOTE: The descriptor name should not be "--" or a "NULL" string. These strings can be interpreted by the $INTRCON schematic as an empty string and the parameter value will be reset.

The value for $PICQRYH can be entered through the DATCHNG display.

See section 37 for information on finding point interconnections.
Source: User
Value Type: String of 64 characters
Access Lock: Engineer
Residency: US
Value Range: "" (Null) (default)
A 1 to 64 character string that is the name of the point-interconnection-search query.

$PICQRYU (R660)

This R660 parameter holds the default Fnm query to be used by the point interconnection display for a UCN point. $PICQRYU is a string name of a Documentation Tool query that has been saved in the sysqry.dc file with the descriptor entry. This entry describes the default search parameters when the requested point type belongs to the UCN.

A request error is initiated if the operator sets the default $PICDEF parameter to ON and $PICQRYU contains a NULL value.

When the engineer enters a value for the $PICQRYU parameter, the value is retained until the engineer enters a new value or the US is restarted.

NOTE: The descriptor name should not be "--" or a "NULL" string. These strings can be interpreted by the $INTRCON schematic as an empty string and the parameter value will be reset.

The value for $PICQRYU can be entered through the DATCHNG display.

See section 37 for information on finding point interconnections.
Source: User
Value Type: String of 64 characters
Access Lock: Engineer
Residency: US
Value Range: "" (Null) (default)
A 1 to 64 character string that is the name of the point-interconnection-search query.

$PICREQ (R660)

This R660 parameter activates the point interconnection display.

If $PICREQ is set to ON, the point interconnection display is activated. When the request is processed, $PICREQ is set to the OFF state. Setting the value to OFF has no effect.

See section 37 for information on finding point interconnections.
Source: User
Value Type: Boolean
Access Lock: Operator
Residency: US
Value Range: OFF (default)
ON

$PICRSLT[1..36] (R660)

This R660 parameter is a memory table that contains the Point-Interconnection-search results. Up to 36 string values can be used to represent the outputs seen on the $INTRCON schematic.

NOTE: $PICRSLT should contain a valid subscript (1..36) to read the value. The 36 string values represent a maximum of 72 interconnections. If the number of interconnections exceeds 72, the display results stop after first 72 values. The print and file interconnection outputs continue until the interconnection search is finished.

See section 37 for information on finding point interconnections.
Source: System
Value Type: Array 1..36 of string 76 characters
Access Lock: Read Only
Residency: US
Value Range: "" (Null) (default)
76 characters that represent an output from point-interconnection-search.

$PICSTAT (R660) This R660 parameter returns the current interconnection search status.

The values displayed are,

INACTIVE	– request is currently off
BUSY	– search is in progress
UNAVAILABLE	– interconnection search cannot be executed
ERROR <cccc...>	– type of error encountered

where <cccc…> indicates:
- PRT – Printer error
- FILE – File error
- MED– Pathname media error
- CONV– Conversion error
- INT – Internal error

See section 37 for information on finding point interconnections.
Source: System
Value Type: String of 28 characters
Access Lock: Read Only
Residency: US
Value Range: UNAVAILABLE (default)
1 to 28 characters that represent the status of the point-interconnection-search.

$PICTMST (R660) This R660 parameter contains the start time of the current Point Interconnection search.

See section 37 for information on finding point interconnections.
Source: System
Value Type: Time
Access Lock: Read Only
Residency: US
Value Range: 00:00:00 (default)
Represents the start time of the Point-Interconnection-search. Example: 12:01:59.

$PICTMEN (R660)

This R660 parameter contains the end time of the current Point Interconnections search. See section 37 for information on finding point interconnections.
Source: System
Value Type: Time
Access Lock: Read Only
Residency: US
Value Range: 00:00:00 (default)
Represents the end time of the Point-Interconnection-search. Example: 12:01:59.

$PPMALFL (ss) (R680)

This parameter indicates the status of system alarm, when the total Parameters per Message on the network has crossed the trip limits.
Source: System
Value Type: Boolean
Access Lock: View-only
Residency: US
Value Range: TRUE, FALSE
FALSE (default)

$PPMLLTP (ss) (R680)

This parameter indicates the low low trip point for the parameter PARAMETERS PER MESSAGE.
Source: User
Value Type: Real Array (0…7)
Access Lock: Engineer
Residency: US
Value Range: 0 - $PPMLOTP (ss)
20 (default)

$PPMLOTP (ss) (R680)

This parameter indicates the low trip point for the parameter PARAMETERS PER MESSAGE.
Source: User
Value Type: Real Array (0…7)
Access Lock: Engineer
Residency: US
Lower Limit: $PPMLLTP (ss)
100 (default)

$TOTLOAD (ss) (R680)

This parameter represents the total ESTIMATED % OF LCN LOAD of the network.
Source: System
Value Type: Real Array (0…7)
Access Lock: View-only
Residency: US
Value Range: 0 – 100
0 (default)

ACKEM(n)

This R500 integer parameter returns the number (0-600) of acknowledged emergency alarms for each priority in the specified unit.
If the Unit is not configured, the counters are zero.
TYPE—Integer
n = Area relative unit number (1-36). This number corresponds to that seen on the Console Status Display > Unit Assignment Display.

ACKHI(n)

This R500 integer parameter returns the number (0-600) of acknowledged high alarms in the specified unit.
If the Unit is not configured, the counters are zero.
TYPE—Integer
n = Area relative unit number (1-36). This number corresponds to that seen on the Console Status Display > Unit Assignment Display.

ACKLO(n)

This R500 integer parameter returns the number (0-600) of acknowledged low alarms in the specified unit.
If the Unit is not configured, the counters are zero.
TYPE—Integer
n = Area relative unit number (1-36). This number corresponds to that seen on the Console Status Display > Unit Assignment Display.

AREAALM

MMI FUNCTIONS—Total number of events processed by this US or $U^{X}S$ in the previous 15 second period. All events are counted, including process alarms, state changes, etc. This parameter measures event throughput.
PURPOSE—Indicates the event load on the TPN and US.
TYPE—Real

CURRDSP (R600)

PURPOSE—Find the name of the schematic currently on display.
Track which displays are most used.
Determine which displays are no longer used.
Determine the sequence of displays invoked.
Put the schematic source filename on each schematic.
TYPE— String

NMSCHPR

MMI FUNCTIONS—Number of parameters requested on the last schematic display callup.
PURPOSE—Indicates the display load on the LCN.
TYPE—Real

QSTS(1)

This R510 array type parameter returns the name of the last requested query of a prebuilt Documentation Tool query for a custom schematic. Read Only. See section 36 for information on executing pre-defined Doc Tool queries.
Reference: *Documentation Tool* manual, and section 19 of the *Actors Manual*.

QSTS(2)

This R510 array type parameter returns the status of the last requested query of a prebuilt Documentation Tool query for a custom schematic. Read Only. See section 36 for information on executing pre-defined Doc Tool queries.

QSTS(3)

This R510 array type parameter returns the invocation date/time of the last requested query of a prebuilt Documentation Tool query for a custom schematic. Read Only. See section 36 for information on executing pre-defined Doc Tool queries.

QRYSORT (R610)

This R610 functionality is extended to support schematics, thus allowing schematics that used the "query actors" to make use of the sort capabilities.

The QRYSORT value is from 0 to 6, as described in the Predefined Queries section of the Engineer Reference Manual. The QRYSORT parameter is initialized to 0 at node startup.

Note: The PSDP parameters can be accessed and/or changed by the following means: DATACHNG Schematic, CL, or Customer Schematic.

See the following table for query sort values.

TYPE	QRYSORT Value	Definition
Temporary	0	"No Sort." The Sort Directive in the CL/CP (Command Processor) query will override this option.
	1	"Sort by Entity Name." Automatically reset to 'No Sort' at completion of Query. The Sort Directive in the CL/CP will override this option.
	2	"Sort by user specified first field." Automatically reset to 'No Sort' at completion of Query. The Sort Directive in the CL/CP will override this option.
Node Global	3	"No Sort." This option overrides the CL/CP Sort Directive. This value is not automatically reset. Once set, this option can only be changed to another Node Global type or Reset.
	4	"Sort by Entity Name." This option overrides the CL/CP Sort Directive. This value is not automatically reset. Once set, this option can only be changed to another Node Global type or Reset.
	5	"Sort by first user specified field." This option overrides the CL/CP Sort Directive. This value is not automatically reset. Once set, this option can only be changed to another Node Global type or Reset.
Reset	6	Used to Reset the Node Global options. Once a Node Global option is set, it can be changed to a temporary type only by setting this option. Setting this option, resets the PSDP value to 0.

UBOOL(1..100)

This R610 parameter provides an array of 100 Boolean values.

Data Type: Boolean
Access Lock: Operator
Residency: US
Value Range: On/Off

UENT(1..100)

This R610 parameter provides an array of 100 Entity values.

Data Type: Entity
Access Lock: Operator
Residency: US
Value Range: Entity

UINTEGER(1..100)

This R610 parameter provides an array of 100 Integer values.

Data Type: Integer
Access Lock: Operator
Residency: US
Value Range: Integer

UNACKEM(n)

This R500 integer parameter returns the number (0-600) of unacknowledged emergency alarms for each priority in the specified unit.
If the Unit is not configured, the counters are zero.
TYPE—Integer
n = Area relative unit number (1-36). This number corresponds to that seen on the Console Status Display > Unit Assignment Display.

UNACKHI(n)

This R500 integer parameter returns the number (0-600) of unacknowledged high alarms in the specified unit.
If the Unit is not configured, the counters are zero.
TYPE—Integer
n = Area relative unit number (1-36). This number corresponds to that seen on the Console Status Display > Unit Assignment Display.

UNACKLO(n)

This R500 integer parameter returns the number (0-600) of unacknowledged low alarms in the specified unit.
If the Unit is not configured, the counters are zero.
TYPE—Integer
n = Area relative unit number (1-36). This number corresponds to that seen on the Console Status Display > Unit Assignment Display.

UNIT_ID(n)

This R500 parameter returns a two-character string that is the user-configured Unit ID, as defined in the NCF Unit Names.
If the Unit is not configured, "garbage" is returned. This will be fixed in a maintenance release.
TYPE—2 character string
n = Area relative unit number (1-36). This number corresponds to that seen on the Console Status Display > Unit Assignment Display.

UNITASSG(n)

This R500 parameter returns one of the following enumerated values, indicating if the unit is under the control of any station loaded with the local Area database.
NO (deassigned)
YES (assigned)
If the Unit is not configured, the status is NO.
TYPE—ENUM: UNITASGN
n = Area relative unit number (1-36). This number corresponds to that seen on the Console Status Display > Unit Assignment Display.

UNITCONS(n)

This R500 parameter returns one of the following enumerated values, indicating if the process alarms for the unit will be annunciated on the stations in the local console (Console Alarm Status):
ENABLE (alarms are annunciated)
DISABLE (alarms are not annunciated)
If the Unit is not configured, the status is DISABLE.
TYPE—ENUM: ALENBST
n = Area relative unit number (1-36). This number corresponds to that seen on the Console Status Display > Unit Assignment Display.

UNITRECV(n)

This R500 parameter returns one of the following enumerated values, indicating the current unit alarm recovery state:
NOLOST (no lost events)
RECVREQD (recovery has been requested)
LOSTEVNT (lost events exist, but no recovery has been requested)
RECINPRG (recovery is in progress)
If the Unit is not configured, the status is NOLOST.
TYPE—ENUM: UNITREC
n = Area relative unit number (1-36). This number corresponds to that seen on the Console Status Display > Unit Assignment Display.

UNITSTAT(n)

This R500 parameter returns an enumerated value indicating the current composite alarm status of the specified unit. The values are listed below in order of precedence:
UNACKEM
UNACKHI
UNACKLO
ACKEM
ACKHI
ACKLO

If all the counters are zero, the status is NOALARM.
If the Unit is not configured, the status is NOTCONFG
TYPE—ENUM:$ALRMSTS
n = Area relative unit number (1-36). This number corresponds to that seen on the Console Status Display > Unit Assignment Display.

UNITSYS(n)

This R500 parameter returns one of the following enumerated values, indicating if the process alarms for the unit will be annunciated on any stations system-wide (System Alarm Status):
ENABLE (alarms are annunciated, historized, and journalized.)
DISABLE (alarms are not annunciated. The process alarm event history collection and RTJ are not affected.)
INHIBIT (alarms are not annunciated, and the process alarm event history collection and RTJ are stopped.)
If the Unit is not configured, the status is DISABLE.
TYPE—ENUM: ALENBST
n = Area relative unit number (1-36). This number corresponds to that seen on the Console Status Display > Unit Assignment Display.

UREAL(1..100)

This R610 parameter provides an array of 100 Real values.

Data Type: Real
Access Lock: Operator
Residency: US
Value Range: Real

USKEYACC

This R610 parameter provides the ability to read and write to the keylevel access parameter of any GUS (or US) on a TPN. This parameter is available to all GUSs, USs, and AMs connected to the same TPN, independent of the console. The change will be journalized to both the HM and to the RTJ. The following are possible key values:
ENGR (changes key access of the station to Engineer)
SUP (changes key access of the station to Supervisor)
OPR (changes key access of the station to Operator)
RESET (resets the value of the parameter to reflect the actual hardware key switch)
VIEW or OPR is displayed when the hardware key switch is in the Operator position, depending on the current default set by the ACCESS CHG target on the Console Status display. Storing the value “VIEW” for the USKEYACC parameter is blocked.

NOTE: The USKEYACC parameter can be changed only when the access level is Engineer. Consider the following scenario. Initially the station Keylock is in ENGINEER. You will be able to change the local Keylock level to either SUPERVISOR or OPERATOR using the PSDP parameter USKEYACC. Now the access level is no longer ENGINEER, so you will not be able to change the access level from the local station using the PSDP parameter. The options now available to the user are to change the Keylevel access from another station that has Engineer access or to turn the local Keylock position to ENGINEER.

Data Type: $keyvalu
Access Lock: Engineer
Residency: US
Value Range: VIEW (View)
OPR (Operator)
SUP (Supervisor)
ENGR (Engineer)
RESET (Reset)

USTRING(1..50)

This R610 parameter provides an array of 50 String values, each 40 characters long.

Data Type: Entity
Access Lock: Operator
Residency: US
Value Range: Up to 40 characters

22.9 HM60 PSDP Parameters

STATE

See the RULA User's Manual for information about PSDP parameters.

STATE1

See the RULA User's Manual for information about PSDP parameters.

LNCONECT(i)

ARCHIVER—An array indexed by node number that contains the local history connection status of every node on the network as known to this archiver node.
PURPOSE—Indicates current history status.

LHBRSTTM

COLLECTOR—The time at which the largest burst of exception reports occurred.
PURPOSE—Indicates time of heaviest load.
TYPE—Time/date

LHCOSTOT

COLLECTOR—Total number of exception reports for historized parameters received during the last period by local history on this data owner.

1 Last minute
2 Last hour maximum
3 Last hour minimum
4 Last hour average
5 Max since load

PURPOSE—Indicates historizing rate on network by this node.
TYPE—Array of real

LHMEMUSE

COLLECTOR—The memory usage by local history functions in this data owner.

1 Allocated
2 Available
3 Parameters loaded
4 Parameter rate

PURPOSE—Indicates memory usage in node.
TYPE—Array of real

LHOVERNS(i)

COLLECTOR—An array indexed by scan class specifying the number of overruns that have occurred on this data owner in the last period.

1 Last minute
2 Last hour maximum
3 Last hour minimum
4 Last hour average

PURPOSE—Indicates excessive history or system loading.
TYPE—Array of real

22.10 Remote User Link Adapter (RULA) PSDP Parameters

Reference

For a list of PSDP parameters for Remote User LCN Access (RULA), see the RULA User's Manual.

22.11 Network Interface Module PSDP Parameters

$AUTOSAV (R620)
The auto checkpointing enable/disable status of this node on the LCN.
PURPOSE- Allows you to read the current status (ENABLE or DISABLE) of auto checkpointing, and allows you to enable or disable auto checkpointing.
TYPE - ATTRIB

$EIPMAXC (R660)
The maximum number of EIP events in any one second in the current hour.
PURPOSE - Indicates the loading on NIM with respect to Event Initiated Processing.
TYPE – Integer

$EIPMAXP (R660)
The maximum number of EIP events in any one second in the previous hour.
PURPOSE - Indicates the loading on NIM with respect to Event Initiated Processing.
TYPE – Integer

$EIPTOTC (R660)
The total number of EIP events sent to the LCN in the current hour.
PURPOSE - Indicates the loading on NIM with respect to Event Initiated Processing.
TYPE – Real

$EIPTOTP (R660)
The total number of EIP events sent to the LCN in the previous hour.
PURPOSE - Indicates the loading on NIM with respect to Event Initiated Processing. The EIP events for this parameter include the process-special EIP events and CL message EIP events.
TYPE – Real

$EIPTOTS (R660)
The total number of EIP events sent to the LCN in the previous 15 seconds.
PURPOSE - Indicates the loading on NIM with respect to Event Initiated Processing. The EIP events for this parameter include the process-special EIP events and CL message EIP events.
TYPE – Real

$EPNI2RX (R686)

The EPNI2 receive average messages per second (calculated every 10 seconds) on the node.
PURPOSE – Indicates the average messages per second (calculated every 10 seconds) received by the ENB FTE interface of the EPNI2. This includes both unicast and multicast messages (excluding FTE diagnostic messages).
TYPE – Real
Note: This parameter is only applicable for primary ENB nodes. This parameter's value for NIM nodes and ENIM nodes (as well as secondary ENB nodes) will always be zero (0.0).
Note: Beginning with TPN R686.3, this parameter is shown on the "NMDETAIL" Toolkit Display.
For more information, see section "EUCN On-Process Migration" in the *UCN Guidelines (UN12-610)*.

$EPNI2TX (R686)

The EPNI2 transmit average messages per second (calculated every 10 seconds) on the node.
PURPOSE – Indicates the average messages per second (calculated every 10 seconds) transmitted by the ENB FTE interface of the EPNI2. This includes both unicast and multicast messages (excluding FTE diagnostic messages).
TYPE – Real
Note: This parameter is only applicable for primary ENB nodes. This parameter's value for NIM nodes and ENIM nodes (as well as secondary ENB nodes) will always be zero (0.0).
Note: Beginning with TPN R686.3, this parameter is shown on the "NMDETAIL" Toolkit Display.
For more information, see section "EUCN On-Process Migration" in the *UCN Guidelines (UN12-610)*.

$EVTMAXC (R660)

The maximum number of events in any one second during the current hour.
PURPOSE - Indicates the loading on NIM with respect to the processing of all events and alarms.
NOTE: EIP EVENTS ARE NOT INCLUDED.
TYPE – Integer

$EVTMAXP (R660)

The maximum number of events in any one second during the previous hour.
PURPOSE - Indicates the loading on NIM with respect to the processing of all events and alarms.
NOTE: EIP EVENTS ARE NOT INCLUDED.
TYPE – Integer

$EVTTOTC (R660)

The total number of events sent to the LCN in the current hour.
PURPOSE - Indicates the loading on NIM with respect to the processing of all events and alarms.
NOTE: EIP EVENTS ARE NOT INCLUDED.
TYPE – Real

$EVTTOTP (R660)

The total number of events sent to the LCN in the previous hour.
PURPOSE - Indicates the loading on NIM with respect to the processing of all events and alarms.
NOTE: EIP EVENTS ARE NOT INCLUDED.
TYPE – Real

$MUALMNM(xx) (R680)

The number of MUs consumed by the configured Alarmable Numeric point type.
PURPOSE – Indicates the number of MUs consumed by the configured Alarmable Numeric point type of the selected node in HPM.
NOTE: (xx) indicates the HPM node number.
TYPE – Integer

$MUARRAY(xx) (R680)

The number of MUs consumed by the configured Array point type.
PURPOSE – Indicates the number of MUs consumed by the configured Array point type of the selected APM/HPM node.
NOTE: (xx) indicates the APM/HPM node number.
TYPE – Integer

$MUDEVCT(xx) (R680)	The number of MUs consumed by the configured Device Control point type. PURPOSE – Indicates the number of MUs consumed by the configured Device Control point type of the selected APM/HPM node. **NOTE**: (xx) indicates the APM/HPM node number. TYPE – Integer
$MUDIGCP(xx) (R680)	The number of MUs consumed by the configured Digital Composite point type. PURPOSE – Indicates the number of MUs consumed by the configured Digital Composite point type of the selected PM/APM/HPM node. **NOTE**: (xx) indicates the PM/APM/HPM node number. TYPE – Integer
$MUFREE(xx) (R680)	The number of available MUs in the selected node. PURPOSE – Indicates the available number of MUs of the selected node in PM/APM/HPM. **NOTE**: (xx) indicates the PM/APM/HPM node number. TYPE – Integer
$MULOGIC(xx) (R680)	The number of MUs consumed by the configured Logic point type. PURPOSE – Indicates the number of MUs consumed by the configured Logic point type of the selected PM/APM/HPM node. **NOTE**: (xx) indicates the PM/APM/HPM node number. TYPE – Integer
$MUNUM(xx) (R680)	The number of MUs consumed by the configured Numeric point type. PURPOSE – Indicates the number MUs consumed by the configured non-Alarmable Numeric point type of the selected node in PM/APM/HPM. **NOTE**: (xx) indicates the PM/APM/HPM node number. TYPE – Integer

$MUPRMOD(xx) (R680)	The number of MUs consumed by the configured Process Module point type. PURPOSE – Indicates the number MUs consumed by the configured Process Module point type of the selected node in PM/APM/HPM. **NOTE**: (xx) indicates the PM/APM/HPM node number. TYPE – Integer
$MURGCTL(xx) (R680)	The number of MUs consumed by the configured Regulatory Control point type. PURPOSE – Indicates the number MUs consumed by the configured Regulatory Control point type of the selected node in PM/APM/HPM. **NOTE**: (xx) indicates the PM/APM/HPM node number. TYPE – Integer
$MURGPV(xx) (R680)	The number of MUs consumed by the configured Regulatory PV point type. PURPOSE – Indicates the number MUs consumed by the configured Regulatory PV point type of the selected node in PM/APM/HPM. **NOTE**: (xx) indicates the PM/APM/HPM node number. TYPE – Integer With TPN R684, the limit of NPVSLOT is increased from 125 to 400. Hence, the number of MUs consumed by the configured HPM Regulatory PV point type increases with the increase in the value of NPVSLOT to store the additional HPM Regulatory PV slots.
$MUSTRNG(xx) (R680)	The number of MUs consumed by the configured String point type. PURPOSE – Indicates the number MUs consumed by the configured String point type of the selected node in APM/HPM. **NOTE**: (xx) indicates the APM/HPM node number. TYPE – Integer
$MUTIME(xx) (R680)	The number of MUs consumed by the configured Timer point type. PURPOSE – Indicates the number MUs consumed by the configured Times point type of the selected node in APM/HPM. **NOTE**: (xx) indicates the APM/HPM node number. TYPE – Integer

$NODETYP (R687)

This parameter returns a string indicating the Node platform and Node type.
The string has two parts. First part is the string indicating the node platform and second part is the node type string. Node platforms indicated are as follows:

- KLCN - Nodes with K4LCN/K2LCN board type
- LCNP - Nodes with LCNP board type
- ETN - Enhanced Experion-TPS Nodes
- ELCN-P/W – ELCN Experion-TPS node on physical platform
- ELCN-V/W – ELCN Experion-TPS node on virtual platform
- ELCN-P/A – ELCN Appliance Node on physical platform
- ELCN-V/A – ELCN Appliance Node on virtual platform

Source - System
Type – 16 character string
Residence – All
Value Range – “” (Null) (default)

22.11 Network Interface Module PSDP Parameters, Continued

$NODMAXC (R660)	Maximum number of node data accesses in any one second in the current hour. PURPOSE - Indicates the loading on NIM because of the processing of data-access requests that resulted in UCN reads or stores. TYPE – Integer
$NODMAXP (R660)	Maximum number of node data accesses in any one second in the previous hour. PURPOSE - Indicates the loading on NIM because of the processing of data-access requests that resulted in UCN reads or stores. TYPE – Integer
$NODTOTC (R660)	Total number of node data accesses in the current hour. PURPOSE - Indicates the loading on NIM because of the processing of data-access requests that resulted in UCN reads or stores. TYPE – Real
$NODTOTP (R660)	Total number of node data accesses in the previous hour. PURPOSE – Indicates the loading on NIM because of the processing of data-access requests that resulted in UCN reads or stores. TYPE – Real
$NODTOTS (R660)	Total number of node data accesses in the last 15 seconds. PURPOSE – Indicates the loading on NIM because of the processing of data-access requests that resulted in UCN reads or stores. TYPE – Real
$P2PEU2U (R686)	The peer-to-peer EUCN to UCN average messages per second (calculated every 10 seconds) on the node. PURPOSE – Indicates the average of the number of UCN messages per second from EUCN nodes to UCN nodes (calculated every 10 seconds) on the ENB. This includes both Requests and Responses. It does not include Acknowledgements. TYPE – Real **Note:** This parameter is only applicable for primary ENB nodes. This parameter's value for NIM nodes and ENIM nodes (as well as secondary ENB nodes) will always be zero (0.0). **Note:** Beginning with TPN R686.3, this parameter is shown on the "NMDETAIL" Toolkit Display. For more information, see section "EUCN On-Process Migration" in the *UCN Guidelines (UN12-610).*

$P2PU2EU (R686)

The peer-to-peer UCN to EUCN average messages per second (calculated every 10 seconds) on the node.
PURPOSE – Indicates the average of the number of UCN messages per second from UCN nodes to EUCN nodes (calculated every 10 seconds) on the ENB. This includes both Requests and Responses. It does not include Acknowledgements.
TYPE – Real
Note: This parameter is only applicable for primary ENB nodes. This parameter's value for NIM nodes and ENIM nodes (as well as secondary ENB nodes) will always be zero (0.0).
Note: Beginning with TPN R686.3, this parameter is shown on the "NMDETAIL" Toolkit Display.
For more information, see section "EUCN On-Process Migration" in the *UCN Guidelines (UN12-610)*.

$PAISLOT(xx) (R680)

The number of Analog Input points configured on the node.
PURPOSE – Indicates the number Analog Input points configured on the selected LM/SM node.
NOTE: (xx) indicates the LM/SM node number.
TYPE – Integer

$PAOSLOT(xx) (R680)

The number of Analog Output points configured on the node.
PURPOSE – Indicates the number Analog Output points configured on the selected LM/SM node.
NOTE: (xx) indicates the LM/SM node number.
TYPE – Integer

$PARMAXC (R660)

The maximum parameter access rate in any one-second in the current hour.
PURPOSE – Indicates the loading on NIM because of the processing of data-access requests that resulted in UCN reads or stores.
TYPE – Integer

$PARMAXP (R660)	The maximum parameter access rate in any one-second during the previous hour. PURPOSE – Indicates the loading on NIM because of the processing of data access requests that resulted in UCN reads or stores. TYPE – Integer
$PARSECC (R660)	The parameter access rate (running average per second) in the current hour. PURPOSE – Indicates the loading on NIM because of the processing of data-access requests that resulted in UCN reads or stores. TYPE – Real
$PARSECP (R660)	The parameter access rate (overall average per second) in the previous hour. PURPOSE – Indicates the loading on NIM because of the processing of data-access requests that resulted in UCN reads or stores. TYPE – Real
$PARSLOT(xx) (R680)	The number of Array points configured on the node. PURPOSE – Indicates the total number of Array points configured on the selected APM/HPM node. **NOTE**: (xx) indicates the APM/HPM node number. TYPE – Integer
$PCTLSLT(xx) (R680)	The number of Regulatory Control points configured on the node. PURPOSE – Indicates the number of Regulatory Control points configured on the selected PM/APM/HPM node. **NOTE**: (xx) indicates the PM/APM/HPM node number. TYPE – Integer
$PDCSLOT(xx) (R680)	The number of Digital Composite points configured on the node. PURPOSE – Indicates the number of Digital Composite points configured on the selected PM/APM/HPM/LM/SM node. **NOTE**: (xx) indicates the PM/APM/HPM/LM/SM node number. TYPE – Integer

$PDEVSLT(xx) (R680)	The number of Device Control points configured on the node. PURPOSE – Indicates the number of Device Control points configured on the selected APM/HPM node. **NOTE**: (xx) indicates the APM/HPM node number. TYPE – Integer
$PDISLOT(xx) (R680)	The number of Digital Input points configured on the node. PURPOSE – Indicates the number of Digital Input points configured on the selected LM/SM node. **NOTE**: (xx) indicates the LM/SM node number. TYPE – Integer
$PDOSLOT(xx) (R680)	The number of Digital Output points configured on the node. PURPOSE – Indicates the number of Digital Output points configured on the selected LM/SM node. **NOTE**: (xx) indicates the LM/SM node number. TYPE – Integer
$PFLAG(xx) (R680)	The number of Flag points configured on the node. PURPOSE – Indicates the number of Flag points configured on the selected APM/HPM node. **NOTE**: (xx) indicates the APM/HPM node number. TYPE – Integer
$PLOGSLT(xx) (R680)	The number of Logic points configured on the node. PURPOSE – Indicates the number of Logic points configured on the selected PM/APM/HPM/LM/SM node. **NOTE**: (xx) indicates the PM/APM/HPM/LM/SM node number. TYPE – Integer
$PNUMRIC(xx) (R680)	The number of Numeric points configured on the node. PURPOSE – Indicates the number of Numeric points configured on the selected APM/HPM node. **NOTE**: (xx) indicates the APM/HPM node number. TYPE – Integer

$PPMSLOT(xx) (R680)
The number of Process Module points configured on the node.
PURPOSE – Indicates the number of Process Module points configured on the selected PM/APM/HPM node.
NOTE: (xx) indicates the PM/APM/HPM node number.
TYPE – Integer

$PPVSLOT(xx) (R680)
The number of Regulatory PV points configured on the node.
PURPOSE – Indicates the number of Regulatory PV points configured on the selected PM/APM/HPM node.
NOTE: (xx) indicates the PM/APM/HPM node number.
TYPE – Integer

$PRCMAXC (R660)
The maximum number of process alarms in any one second in the current hour.
PURPOSE – Indicates the loading on NIM with respect to the processing of process alarms and sequence of events.
TYPE – Integer

$PRCMAXP (R660)
The maximum number of process alarms in any one second in the previous hour.
PURPOSE – Indicates the loading on NIM with respect to the processing of process alarms and sequence of events.
TYPE – Integer

$PRCTOTC (R660)
The total number of process alarms sent to the LCN in the current hour.
PURPOSE – Indicates the loading on NIM with respect to the processing of process alarms and sequence of events.
TYPE – Real

$PRCTOTP (R660)
The total number of process alarms sent to the LCN in the previous hour.
PURPOSE – Indicates the loading on NIM with respect to the processing of process alarms and sequence of events.
TYPE – Real

$PRCTOTS (R660)	The total number of process alarms sent to the LCN in the previous 15 seconds. PURPOSE – Indicates the loading on NIM with respect to the processing of process alarms and sequence of events. TYPE – Real
$PTIME(xx) (R680)	The number of Timer points configured on the node. PURPOSE – Indicates the number of Timer points configured on the selected PM/APM/HPM/LM/SM node. **NOTE**: (xx) indicates the PM/APM/HPM/LM/SM node number. TYPE – Integer
$PUALMNM(xx) (R680)	The number of PUs consumed by the configured Alarmable Numeric point type. PURPOSE – Indicates the number of PUs consumed by the configured Alarmable Numeric point type of the selected HPM node. **NOTE**: (xx) indicates the HPM node number. TYPE – Real
$PUANLIN(xx) (R680)	The number of PUs consumed by the configured Analog Input point type. PURPOSE – Indicates the number of PUs consumed by the configured Analog Input point type of the selected node in LM/SM. **NOTE**: (xx) indicates the LM/SM node number. TYPE – Real
$PUANLOP(xx) (R680)	The number of PUs consumed by the configured Analog Output point type. PURPOSE – Indicates the number of PUs consumed by the configured Analog Output point type of the selected node in LM/SM. **NOTE**: (xx) indicates the LM/SM node number. TYPE – Real

$PUDEVCT(xx) (R680)
The number of PUs consumed by the configured Device Control point type.
PURPOSE – Indicates the number of PUs consumed by the configured Device Control point type of the selected node in APM/HPM.
NOTE: (xx) indicates the APM/HPM node number.
TYPE – Integer

$PUDIGCP(xx) (R680)
The number of PUs consumed by the configured Digital Composite point type.
PURPOSE – Indicates the number of PUs consumed by the configured Digital Composite point type of the selected node in PM/APM/HPM/LM/SM.
NOTE: (xx) indicates the PM/APM/HPM/LM/SM node number.
TYPE – Real

$PUDIGIN(xx) (R680)
The number of PUs consumed by the configured Digital Input point type.
PURPOSE – Indicates the number of PUs consumed by the configured Digital Input point type of the selected node in LM/SM.
NOTE: (xx) indicates the LM/SM node number.
TYPE – Real

$PUDIGOP(xx) (R680)
The number of PUs consumed by the configured Digital Output point type.
PURPOSE – Indicates the number of PUs consumed by the configured Digital Output point type of the selected node in LM/SM.
NOTE: (xx) indicates the LM/SM node number.
TYPE – Real

$PUFREE(xx) (R680)
The number of available PUs in the node.
PURPOSE – Indicates the number of PUs available in the selected PM/APM/HPM/LM/SM node.
NOTE: (xx) indicates the PM/APM/HPM/LM/SM node number.
TYPE – Real

$PULOGIC(xx) (R680)	The number of PUs consumed by the configured Logic point type. PURPOSE – Indicates the number of PUs consumed by the configured Logic point type of the selected PM/APM/HPM/LM/SM node. **NOTE**: (xx) indicates the PM/APM/HPM/LM/SM node number. TYPE – Integer
$PUPRMOD(xx) (R680)	The number of PUs consumed by the configured Process Module point type. PURPOSE – Indicates the number of PUs consumed by the configured Process Module point type of the selected node in PM/APM/ **NOTE**: (xx) indicates the PM/APM/HPM node number. TYPE – Integer
$PURGCTL(xx) (R680)	The number of PUs consumed by the configured Regulatory Control point type. PURPOSE – Indicates the number of PUs consumed by the configured Regulatory Control point type of the selected node in PM/APM/HPM. **NOTE**: (xx) indicates the PM/APM/HPM node number. TYPE – Integer
$PURGPV(xx) (R680)	The number of PUs consumed by the configured Regulatory PV point type. PURPOSE – Indicates the number of PUs consumed by the configured Regulatory PV point type of the selected node in PM/APM/HPM. **NOTE**: (xx) indicates the PM/APM/HPM node number. TYPE – Integer With TPN R684, the limit of NPVSLOT is increased from 125 to 400 and the limit of NFASTPV is increased from 125 to 200. The number of PUs consumed by the configured HPM Regulatory PV Control point types increases with the increase in the value of NPVSLOT and NFASTPV to execute the additional HPM Regulatory PV slots. An increase in the value of NFASTPV increases the number of PUs consumed by the Regulatory PV point type if the scanrate is not Reg4Log4.
$PUTIME(xx) (R680)	The number of PUs consumed by the configured Timer point type. PURPOSE – Indicates the number of PUs consumed by the configured Timer point type of the selected node in LM/SM node. **NOTE**: (xx) indicates the LM/SM node number. TYPE – Real

22.11 Network Interface Module PSDP Parameters,

Continued

$RDAVGC (R660)	The parameter read rate (running average per second) in the current hour. PURPOSE – Indicates the loading on NIM because of the processing of data-access read requests. TYPE – Real
$RDAVGP (R660)	The parameter read rate (overall average per second) in the previous hour. PURPOSE – Indicates the loading on NIM because of the processing of data-access read requests. TYPE – Real
$RDAVGS (R660)	The parameter read rate (per second) in the last 15 seconds. PURPOSE - Indicates the loading on NIM because of the processing of data-access read requests. TYPE – Real
$RDMAXC (R660)	The maximum number of parameters that have been read in any one second in the current hour. PURPOSE - Indicates the loading on NIM because of the processing of data-access read requests. TYPE—Integer
$RDMAXP (R660)	The maximum number of parameters that have been read in any one second in the previous hour. PURPOSE - Indicates the loading on NIM because of the processing of data-access read requests. TYPE—Integer
$SEQMAXC (R660)	The maximum number of sequence events/messages in any one second in the current hour. PURPOSE - Indicates the loading on NIM with respect to the processing of sequence events and messages. TYPE – Integer

22.11 Network Interface Module PSDP Parameters, Continued

$SEQMAXP (R660)	The maximum number of sequence events/messages in any one second in the previous hour. PURPOSE - Indicates the loading on NIM with respect to the processing of sequence events and messages. TYPE – Integer
$SEQMEM(xx) (R680)	The sum of sequence slot size of all the Process Module points. PURPOSE - Indicates the sum of sequence slot size of all the Process Module points in the selected PM/APM/HPM node. **NOTE**: (xx) indicates the PM/APM/HPM node number. TYPE – Integer
$SEQTOTC (R660)	The maximum number of sequence events/messages sent to the LCN in the current hour. PURPOSE - Indicates the loading on NIM with respect to the processing of sequence events and messages. TYPE – Real

22.11 Network Interface Module PSDP Parameters, Continued

$SEQTOTP (R660)	The maximum number of sequence events/messages sent to the LCN in the previous hour. PURPOSE - Indicates the loading on NIM with respect to the processing of sequence events and messages. TYPE – Real
$SEQTOTS (R660)	The maximum number of sequence events/messages sent to the LCN in the previous 15 seconds. PURPOSE - Indicates the loading on NIM with respect to the processing of sequence events and messages. TYPE – Real
$STRMAXC (R660)	The maximum number of parameters stored in any one second in the current hour. PURPOSE - Indicates the loading on NIM with respect to the processing of requests for data-access stores. TYPE – Integer
$STRMAXP (R660)	The maximum number of parameters stored in any one second in the previous hour. PURPOSE - Indicates the loading on NIM with respect to processing of requests for data-access stores. TYPE – Integer
ALBURST	The maximum number of events in any one second that has occurred since the NIM was loaded or the parameter was reset by the operator. Event types included in this count are the same as for EVTRATE. TYPE— Integer
CPTIMEFL (R660)	The time required to checkpoint to a drive. PURPOSE - Indicates the loading on NIM with respect to check-pointing. The parameter also indicates the time taken for the last checkpoint, initiated either through the System Status Display or by auto-checkpointing. TYPE – Real

CPTIMEHM (R660) The time required to checkpoint to an HM.
PURPOSE - Indicates the loading on NIM with respect to check-pointing. The parameter also indicates the time taken for the last checkpoint, initiated either through the System Status Display or by autocheck pointing.
TYPE – Real

DHMSGSEC(i) Parameter requests entering NIMs are split into 5 parallel queues of differing priority, depending on the requesting function. The queue with index 1 is the highest priority queue and queue number 5 is the lowest priority queue. This parameter represents the average number of messages per second flowing through a particular queue during the last 15 second period. These values can be seen in the PERFMENU schematic NIMDETAIL (R660).

Queue 1—NIM internal operations and operator changes.
Queue 2—CG and AM control actions.
Queue 3—history gathering and display call ups, including demand updates after a change from a display.
Queue 4—trends, normal display updates, and tools and friendly display queries.
Queue 5—point build, slow updates, SMCC access, and organizational summaries.

DHPARSEC(i) Parameter requests entering NIMs are split into 5 parallel queues of differing priority depending on the requesting function. The queue with index 1 is the highest priority queue and queue number 5 is the lowest priority queue. This parameter represents the average number of parameters per second flowing through a particular queue during the last 15 second period. These values can be seen in the PERFMENU schematic NIMDETAIL (R660).

Queue 1—NIM internal operations and operator changes.
Queue 2—CG and AM control actions.
Queue 3—history gathering and display call ups, including demand updates after a change from a display.
Queue 4—trends, normal display updates, and tools and friendly display queries.
Queue 5—point build, slow updates, SMCC access, and organizational summaries.

22.11 Network Interface Module PSDP Parameters, Continued

STRAVGC (R660) The parameter store rate (running average per second) in the current hour.
PURPOSE - Indicates the loading on NIM with respect to the processing of requests for data-access stores.
TYPE – Real

STRAVGP (R660) The parameter store rate (overall average per second) in the previous hour.
PURPOSE - Indicates the loading on NIM with respect to the processing of requests for data-access stores.
TYPE – Real

STRAVGS (R660) The parameter store rate (per second) in the last 15 seconds.
PURPOSE - Indicates the loading on NIM with respect to the processing of requests for data-access stores.
TYPE – Real

22.12 Application Processing Platform PSDP Parameters

$CHANNME (R651) Channel Utilization – Contains the application name associated with each channel.
TYPE: 12 character string array (0-31). Not all applications have a name.

$CHNHIGH (R651) Channel Utilization – Contains the number of reserved high priority data access channels.
TYPE: Integer

$CHNDASR (R651) Channel Utilization – Contains the number of high priority data access servers.
TYPE: Integer

$CHNRESR (R651) Channel Utilization –Specifies whether the channels are reserved for high priority data access.
TYPE: Boolean array (0-31). If any element is true, then the CHANINFO display shows YES (reserved) for that channel.

$CHNCONF (R651) Channel Utilization – Specifies whether each of the channels is configured.
TYPE: Boolean array (0-31). If any element is true, then the CHANINFO display shows YES or NO for that channel. If not configured, CHANINFO will show blank.

$CHNACTI (R651) Channel Utilization – Specifies whether each of the channels is an active data access channel.

$XACCESS Initial Security Setting – This PSDP can be in one of the following states:

- READ ONLY – The Microsoft Windows 2000-side can read but cannot write TPS Network data.
- READ WRITE ONLY FOR CL INITIATED – The Microsoft Windows 2000-side can read TPS Network data, but can only write TPS Network data from applications that are initiated by CL on the TPS Network-side.
- READ WRITE – The Microsoft Windows 2000-side can read and write TPS Network data from CL-initiated and non-CL initiated applications (this state cannot be set by any means unless the XACCESS external load module is loaded.

22.12 Application Processing Platform PSDP Parameters, Continued

ATTENTION

For nodes that run CL server and TPN Server, the initial security setting ($XACCESS) must be set to READ-WRITE. Currently $XACCESS security is limited when Microsoft Windows 2000 appplications use the TPN Server to access TPN data.

The TPN Server supports only read-only access and read-write access. When read-write only for CL Initiated Applications is selected, the TPN Server will default to read-only access.

22.13 Global User Station PSDP Parameters

$CHANNME (R651) Channel Utilization – Contains the application name associated with each channel.
TYPE: 12 character string array (0-31). Not all applications have a name.

$CHNHIGH (R651) Channel Utilization – Contains the number of reserved high priority data access channels.
TYPE: Integer

$CHNDASR (R651) Channel Utilization – Contains the number of high priority data access servers.
TYPE: Integer

$CHNRESR (R651) Channel Utilization –Specifies whether the channels are reserved for high priority data access.
TYPE: Boolean array (0-31). If any element is true, then the CHANINFO display shows YES (reserved) for that channel.

$CHNCONF (R651) Channel Utilization – Specifies whether each of the channels is configured.
TYPE: Boolean array (0-31). If any element is true, then the CHANINFO display shows YES or NO for that channel. If not configured, CHANINFO will show blank.

$CHNACTI (R651) Channel Utilization – Specifies whether each of the channels is an active data access channel.

22.14 Reserved

This section number has been reserved to maintain the existing section numbering.

22.15 Parameters On Every Point in the System

Introduction

Some parameters are on every point in the system, including reserved points such as the processor status data points (PSDPs). These parameters are known as the “generic” and “internal” parameters. The “internal” parameters reveal individual fields of the internal form of the point id. The “generics,” as the name implies, contain information of a general nature that applies to all points. Internal and generic parameters are “read only”.

Entity forms

A **TotalPlant** Solution (TPS) system **entity** (tagname) has an external (alpha string) form (for example, 'A100') and an internal (numeric) form. The external form uses regular uppercase ASCII characters and can be 19 bytes long (16 for the entity name, 2 for the network name, and one delimiter character '\'). The internal form is stored and passed around the LCN as a 16-character string (regardless of the long tag option setting). Checkpoint files and memory lists of entities always have 16 bytes of storage for the strings associated with each entity. If the name is shorter, it is blank-filled to the right. The internal number is not kept with the entity name, but is stored in the system and associated with the name when needed. One or two character LCN names are permitted.

External form parameters

Some parameters associated with the external form of the entity are:

NAME
LOCTITLE
LOC_DESC
LOC_NUMB

Examples:
A100.NAME = 'A100' or FE\A100.NAME = 'FE\A100
$PRSTSxx.LOCTITLE = 'FE'
$PRSTSxx..LOC_DESC = 'Fuels East'
$PRSTSxx..LOC_NUMB = 5

Also, associated with the NG PSDP are REMTITLE[1..64], REM_DESC[1..64], and REM_NUMB[1..64] for the same information about remote LCNs.
If A100 is on network FE, then A100 will compare with FE\A100 if the context you're in uses the Data Access routine written for comparing entities.

Date and Time Parameters

$ADATE2	The ASCII date in the form DD/MM/YY where DD is the day (01-31), MM is the month (01-12), and YY is the year (00-99), maximum of 8 characters and no spaces. Also see $ADATE.
$ADATE	The ASCII date in the form MM/DD/YY where MM is the month (01-12), DD is day (01-31), and YY is the year (00-99). Maximum of 8 characters and no spaces. Also see $ADATE2.
$ADATIM2	The ASCII date and time in the form DD/MM/YY hh:mm:ss:msms where DD is the day (01-31), MM is the month (01-12), YY is the year (00-99), hh is the hour (00-23), mm is the minute (00-59), ss is seconds (00-59), and msms is the tenths of milliseconds (0-9999). Maximum of 22 characters and no spaces. Also see $ADATIME.
$ADATIME	The ASCII date and time in the form MM/DD/YY hh:mm:ss:msms where MM is the month (01-12), DD is the day (01-31), YY is the year (00-99), hh is the hour (00-23), mm is the minute (00-59), ss is seconds (00-59), and msms is the tenths of milliseconds (0-9999). Maximum of 22 characters and no spaces. Also see $ADATIM2.
$ATIME	The ASCII time in the form hh:mm:ss where hh is the hour (00-23), mm is the minute (00-59), and ss is seconds (00-59). Maximum of 8 characters and no spaces.
$IDAY	The integer value of the day of the month (01-31), of up to two digits.
$IHOUR	The integer value of the current hour (00-23), of up to two digits.
$IMIN	The integer value of the current minute (00-59), of up to two digits.
$IMONTH	The integer value of the current month (01-12), of up to two digits.
$IMSEC	The integer value of the current tenth of milliseconds (0000-9999), of up to four digits.
$ISEC	The integer value of the current second (00-59), of up to two digits.
$IYEAR	The integer value of the current year (0000-2047) of up to four digits.

$MONTH The enumerated value of the current month (JANUARY-DECEMBER), maximum of 8 characters and no spaces (SEPTEMBR is shortened).
TYPE: $MONTH

$TIMODAY The current LCN time in internal LCN time format. A 48-bit counter of the number of tenths of milliseconds since base time (Monday January 1, 1979 00:00:00:0000).

$WEEKDAY The enumerated value of the current day of the week (SUNDAY-SATURDAY), maximum of 8 characters and no spaces (WEDNESDY is shortened).
TYPE: $WEEKDAY

$YNCTIME Indicates whether or not time is currently synchronized.

Internal Entity Parameters

CRB The number of the LCN to which the node containing this point is connected. A value of zero indicates the point is on the local LCN. If CRB is requested for a local LCN point using the full notation (for example, FE\A100) then the actual number of the local LCN will be returned instead of zero. Points on remote LCNs never return the local value of zero.

DATA_RLM The data realm of this point. The data realm is used internally, in part, to route messages to the proper LCN node. Its value varies depending on point type and the point's data owner. For example: DATA_RLM for AM points is equal to the unit number plus one; it's the hiway number plus one for HG points, and the physical node number plus one for the PSDPs, etc.

ENT_TYPE This point's entity type ENT_TYPE is returned as an enumeration value of the entity type enumeration set.
TYPE—Enumeration of ENTYTYPE

FUNC_SET This point's function set. The function set is used internally, in part, to route messages to the proper LCN node. Its value varies depending on the point type and the "data owner" of the point.

LRC

This point's local routing code. The LRC is used as an index into a logical node's entity database. A logical node contains all the points with the same function set and data realm (see FUNC_SET and DATA_RLM). Note: In the AM, each unit is a logical node. There will be holes left in the index from deleting points. The system will fill in the holes as you add new points. Use the Documentation Tool to see the LRC codes for a node, unit, etc.

Internal Entity Fields

The internal form of the entity uses 8 bytes of storage to describe an entity with a unique number. The fields of the internal entity are:

Internal Entity Field	Parameter
entity type	ENT_TYPE
unit	UNIT or UNITNAME
LCN	CRB (0 = local LCN)
function set	FUNC_SET
data realm	DATA_RLM
revision	SERIAL
local routing code (2 bytes)	LRC

Note that the LCN-function set-data portion of the entity ID is used as a communication address to route Data Access requests around the LCN. Once the request is in the right node, the local routing code directs it to the right entity.

Whenever an entity is deleted, the storage location that it occupied in the database is cleared out by placing blanks in the name and zeros in every field of the internal ID except the revision. The revision field is incremented by one so that the next entity that occupies that storage location will not get the same internal entity ID even if it uses the same entity type and unit, etc.

NAME

The name of this point. For example, A100.NAME would return the string: A100. If the CRB field of the internal entity id used in the request is set to zero (local LCN), the value of NAME returns the local notation (for example, “A100”). If the CRB field is set to a nonzero value, the value of NAME returns the remote notation (for example, FE\A100). This is useful for determining if an internal entity id in your database is still valid. For example, the US uses this parameter to detect that a point in a compiled group has changed so that it can display MISMATCH in that slot. *Performance tip*: it is faster to get the name of a point using the NAME parameter than it is to do the opposite, that is, get the internal entity id by converting the entity name.
TYPE—String

NODE_NO

The physical node number of the node where this point resides. Variable results can be returned for the $UNITOPS point (see subsection 22.12).

NODETYPE

The node type of the node where this point resides. The value of NODETYPE is an integer that can be converted to a node type using the following list:

0 = CG, CM60, CM60N, CM60S, etc.
1 = HG
2 = HM
3 = AM, APP, ESVT
4 = US, EP, UNP, UWS, UXS, GUS, ES-T
5 = reserved
6 = reserved
7 = reserved
8 = NIM
9 = NG

SERIAL

This point’s revision level. This number is incremented each time a position in the logical node entity database has an entity deleted. Its value ranges from 0 to 255. When a point is rebuilt, all other fields of the internal entity id can remain the same except this field. Therefore, it can indicate a “rebuild count” of an entity.

SUBSCRPT	This point’s subscript. Most points are not subscripted and return an error if this parameter is requested. An example of a point type that is subscripted is the GROUP point type. The subscript of a GROUP point is related to the GROUP point's group number. No process point types are subscripted.
UNIT	This point’s unit number. UNIT is the index into the unit assignment table for the unit associated with this point. Also see UNITNAME. For example, if a point is in unit AA and AA is the first unit in the unit table, UNIT returns a value of 1. The PSDPs are in the SY (system) unit and return 101 as the value of UNIT.
UNITNAME	This point’s unit name. UNITNAME is returned as an enumeration value of the unit enumeration set. Also see UNIT.

Section 23 – Configuring for Performance

23.0 Overview

Introduction

This section defines two items that are the basis for system performance measurements and system integrity. These items are

- The Performance Cluster concept, and
- The Honeywell Control Unit (HCU)

Other performance described

Guidelines for configuring LCN-based equipment for predictable performance and for estimating AM performance are also provided.

Finally, this section includes History Module performance hints.

23.1 The Performance Cluster Concept

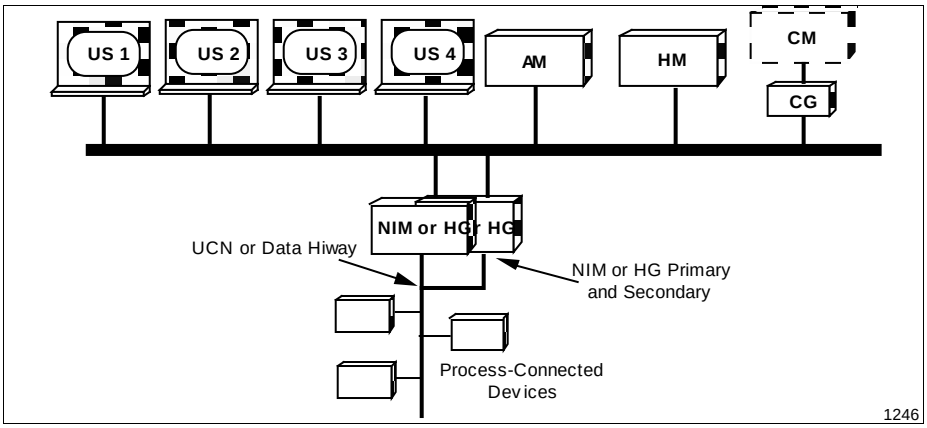
Introduction

The LCN is a complex network of different types of nodes, and to facilitate network configuration and understanding the effect of that configuration on system performance and integrity, the performance-cluster concept was developed. We recommend it as an aid in configuring the system hardware.

The Performance Cluster

An operator in a plant is usually responsible for a specific process. That process employs a set of equipment used to produce a product. The performance-cluster concept aligns the LCN-based **TotalPlant** Solution (TPS) System equipment needed to support such an operator. An example of a cluster is shown below.

Figure 23-1 The Performance Cluster



Each performance cluster includes one physical Universal Control Network (UCN) or one physical Data Hiway. The process is connected to the process-connected devices on the UCN or hiway and they are carried through to the LCN by a NIM pair (UCN) or by an HG pair (hiway). Advanced control is organized into units and is processed in an AM. Process history is collected by an HM.

The performance of the cluster is adequate to handle the process and to provide maximum responsiveness to the operator.
While it is possible to configure the equipment in combinations other than that of the cluster, **the performance values given here apply to only the cluster with the mix of equipment described here**.

Notice

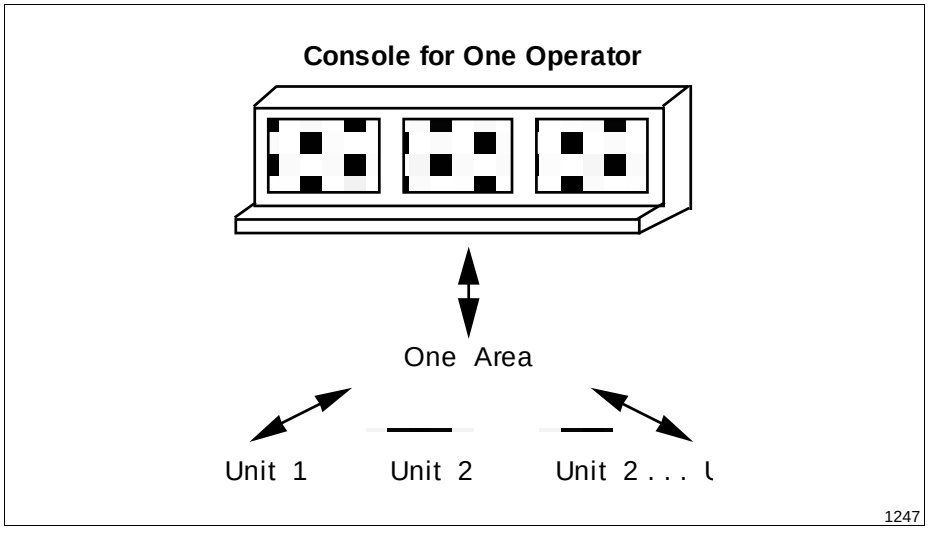
This section provides performance data for performance clusters that include either an HG and a Data Hiway or a NIM and a Universal Control Network (UCN). This data is valid for UCNs with Process Managers, only. At the time this publication is printed, performance data for clusters that include a UCN with one or more Logic Managers (LMs) is not available. This section will be revised when performance data for clusters with LMs is available.

The statements about performance of the performance cluster assume that one NIM pair and associated Universal Control Network are included in the cluster, or that one HG pair and associated Data Hiway are included in the cluster, but not both. In this section, "NIM/HG" refers to either a NIM or an HG, but not both.

The Console, Area, and Units of the cluster

A console that consists of one to four Universal Stations is provided in the cluster for the operator's use in monitoring and controlling his or her area in the process. That area consists of one or more physical process units, which are sets of process inputs and outputs on a piece of plant equipment. The figure below illustrates this concept.

Figure 23-2 Console, Area, and Units



23.1.1 Performance Cluster Capacity

Introduction

Here, we list the capacities expected from the nodes in a cluster using 68020 and 68040-based processors.

Application Module

The AM serves the area with up to 220 valves under advanced control at a rate of up to 90 control points per second for 68020 AMs. This is increased to 290 valves and 120 control points/sec for 68040 AMs.

History Module

The HM serves the area, collecting up to 2400 history points on a 68020 HM, and can provide storage for other cluster- and area-related data (refer to 7.2 and see Table 7-9). We recommend a separate HM be used to store "convenience-" and system-related data (refer to 7.2 and see Table 7-9). For a 68040 based HM this can be increased to 3000 points.

Console

The console serves the area and one operator.
It has from one to four USs and we recommend a minimum of three.
In large systems, a separate engineer's console with one US, a disk drive, and a printer is useful.

Process connections to the area

One NIM pair or one HG pair serves the area. Each 68020 NIM pair handles up to 8000 data points. Each HG pair handles up to 3000 data points. The parameter access per second limits are as follows.

	No AM Control	**AM Control at AM Limit**
HG 68020	1200	630
HG 68040	1800	960
NIM 68020	1200	750
NIM 68040	2000*	1400*

*ATTENTION – If you have an ALL ELCN system, that is, all LCN nodes have been migrated to ELCN, note that the ELCN ENIM and AM have enhanced performance specification limits. For more information, see section “Estimating LCN Load on Your System”.

23.1.2 Cluster Performance (68020-Based Processors)

Introduction

To state the performance of a cluster, it is necessary to define the operating conditions at the time the performance is measured. The following values are for a 1-second measurement period.

Universal Station No. 1

Has a Group Display that is updated every 4 seconds. This display shows 5 NIM/HG points (total of 100 parameters), 3 AM points (total of 60 parameters), and 4 trend-pen points (2 NIM/HG points, 2 AM points) updated every 4 seconds.

Universal Station No. 2

A Group Display is called up. This display is updated every 4 seconds. It shows 8 NIM/HG points (total of 240 parameters), and 4 trend-pen points (total of 4 parameters) updated every 4 seconds.

Universal Station No. 3

Has a Schematic Display that is updated every 4 seconds. This display shows 150 update areas (total of 150 parameters), and 4 trend-pen points (2 NIM/HG points and 2 AM points) updated every 4 seconds.

Universal Station No. 4

A Schematic Display is called up. This display is updated every 4 seconds. It shows 150 update areas with 100 NIM/HG-point parameters and 50 AM parameters, and 4 trend-pen points (2 NIM/HG points and 2 AM points) updated every 4 seconds.

Application Module

The 68020 AM has a 90 control points per second processing capacity with 100 parameters input from NIM/HG points and 50 output parameters to the NIM/HG (150 "off-node" parameters). This is with automatic checkpointing in progress. 68040 increased to 120 PTS/Sec.

23.1.2 Cluster Performance (68020-Based Processors), Continued

NIM or HG

The NIM/HG is handling 1 alarm per second with a burst of 30 alarms per second, once per minute.

History Module

The 68020 HM is collecting history for 2400 points per minute (1600 NIM/HG points and 800 AM points) for three history groups (60 points) per second. Automatic checkpointing is in progress for the NIM/HG, AM, and this cluster's event journal is on this HM. The 68040 increased to 3000 PTS/Sec.

Computer Gateway

Every 5 seconds, the CG inputs 100 parameters; 60 of these are from the NIM/HG and 40 are from the AM. The CG outputs to the AM every 1 minute, which is an insignificant load on the AM.

Overhead

In a multiple cluster system, about 10% of additional data-transfer overhead occurs because of cross-cluster transactions.

23.1.3 LCNEs in Performance Clusters

Introduction

LCN Extenders (LCNE and XLCNE2) can be used to connect two clusters. What follows are some important guidelines for positioning LCNEs and XLCNE2s in a network.

References

Refer to *LCN Guidelines - Implementation, Troubleshooting, and Service*.

Guidelines

The following is a summary of those guidelines:

- Both NIM/HGs in a NIM/HG pair should be on the same coaxial-cable LCN segment. They should not be separated by an LCNE or XLCNE2 and a fiber-optic LCN segment.
- All USs in a console should be on the same coaxial-cable segment. NIM/HGs that often communicate with a given US should be on the same coaxial-cable segment as that US.
- If the Clock Source Repeater is not used, the two clock-source nodes must be on the same coaxial-cable segment.
- Each LCNE or XLCNE2 can be housed in the chassis for one of these node types: NIM/HG, AM, HM, CG, or US. Because the NIM/HG is the least likely of these node types to have its power turned off, it should be considered as the first choice.

23.2 The Honeywell Control Unit

Description

The HCU is the second concept that performance measurements are based on. The HCU represents a 10-valve control unit. The cluster can be expected to handle from 10 to 20 HCUs, depending on the mix of point-processing rates and the memory used by the points in the AM. Table 23-1 defines the mix of points in the HCU

Notes about the sample Honeywell Control Unit

The total number of NIM/HG points is	89 maximum
The total number of AM points is	65
The total number of data points in the HCU is	154

Percentage of AM fetches and stores for CDS parameters	30%
Percentage of AM fetches and stores on the same point	30%
Percentage of all fetches and stores to other units	5%

For every 4 HCUs, a CG adds about 4 points to initiate ACPs, but the data references are out of the points listed on Table 23-1. The load on the AM is about 440 fetches and 40 stores per second (120 per second for the cluster).

Average AM Pt/Sec. rate for one HCU

68020 HPHCCU = 5.1 points per second
68040 HCU+ = 8.45 points per second

Table 23-1 Sample Honeywell Control Unit (HCU) Point Mix (68020-Based AM)

Node	Point Type	Number	Processing Period in Seconds	Comments
NIM	Regulatory	10		These are the 10 valves. One of them (10%) uses DDC control from the AM (AM output goes to the valve through the OP parameter of a PMAO point).
	Nonregulatory Analog Input Analog Output Digital Input Digital Output Digital Composite	 55 1 15 3 2		 No history No history No history No history
HG	Regulatory	1 4 5 1 2		These are the 10 valves. One of them (10%) uses DDC control from the AM. Cascade to a PID in the box Data Acquisition, only.
	Nonregulatory RV (CB) PIU Analog Input PIU Analog Output PIU Digital Input PIU Digital Output PIU Digital Composite	 10 45 1 15 3 2		 No history No history No history No history
AM	Regulatory DDC Basic Primary Highest Primary Ratio Simple Calculation	 1 1 3 3 19	 1 2 10, 15, 60 2, 5, 15 2 at 5, 1 at 10, 8 at 15, 7 at 30, 1 at 60	 Various algorithms and four different CL blocks.
	CL + PID	5	15	
	CL + CL	5	10, 2 at 15, 1 at 30, 1 at 60	
	Other	3	5, 10, 15	
	Nonregulatory	18 2 3 2	(Not scheduled) (Not scheduled) 10 300	 No history No history No history
HM	History Groups	8		History for 126 points

Note: Effective AM HCU load = 5.1 Points per Second per HCU

Table 23-2 Sample Honeywell Control Unit (HCU) Point Mix (68040-Based AM) continued

Node	Point Type	Number	Processing Period in Seconds	Comments
NIM	Regulatory	10		These are the 10 valves. One of them (10%) uses DDC control from the AM (AM output goes to the valve through the OP parameter of a PMAO point).
	Nonregulatory Analog Input Analog Output Digital Input Digital Output Digital Composite	 55 1 15 3 2		 No history No history No history No history
HG	Regulatory	1 4 5 1 2		These are the 10 valves. One of them (10%) uses DDC control from the AM. Cascade to a PID in the box Data Acquisition, only.
	Nonregulatory RV (CB) PIU Analog Input PIU Analog Output PIU Digital Input PIU Digital Output PIU Digital Composite	 10 45 1 15 3 2		 No history No history No history No history
AM	Regulatory DDC Basic Primary Highest Primary Ratio Simple Calculation	 1 1 3 3 19	 1 1 10, 15, 30 1, 2 10 3 at 5, 11 at 10, 3 at 15, 2 at 30	 Various algorithms and four different CL blocks.
	CL + PID	5	2 at 5, 3 at 10	
	CL + CL	5	5,3 at 10,15	
	Other	3	2, 5, 10	
	Nonregulatory	 18 2 3 2	 (Not scheduled) (Not scheduled) 5 120	 No history No history No history
HM	History Groups	8		History for 126 points

Note: Effective AM HCU load = 8.45 Points per Second per HCU

23.3 Focused Load Concept

Data owner nodes

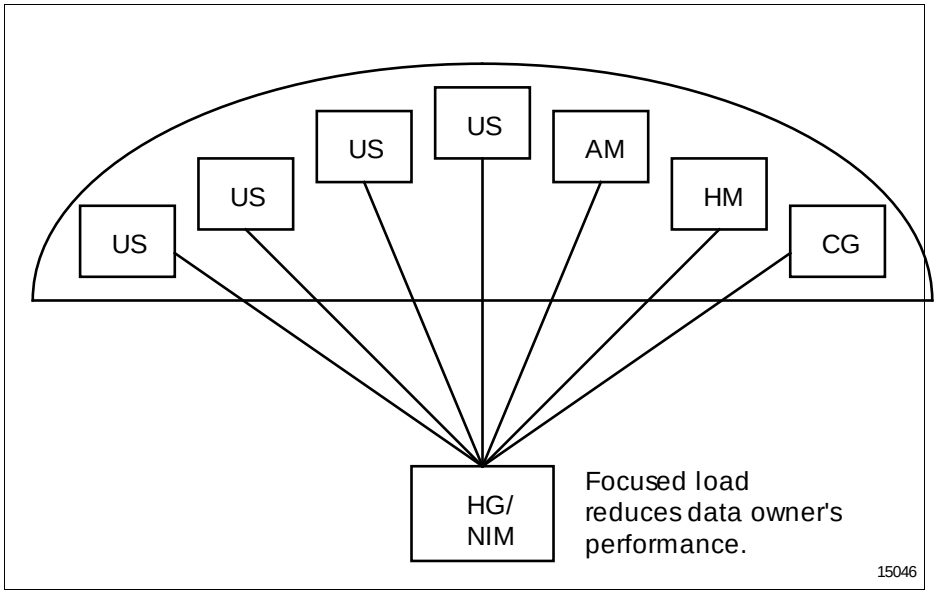
In relation to the performance load cluster, you must also consider the effect of a **focused load** on a node. Data is "owned" by such nodes as the HG, NIM, AM, and CG. When a data owner is accessed by other nodes to obtain data for such things as history and displays, a load is imposed on the data owning node. A focused load occurs when a number of nodes request data simultaneously from a data owner and the amount of data requested is great.
A focused load can also occur on a UCN node (PM, APM, etc.) when other nodes simultaneously request large amounts of data.

Performance problems

A focused load can cause performance problems. Increasing the number of USs in a console, or temporarily increasing the number of USs using a display that accesses one or two data owners, during a plant upset, for example, can aggravate performance problems. In the structure of the LCN, the typical hierarchy of access can cause a load to be focused on one data owning node, as the following figure shows, and can lead to performance problems on that node.

Concept figure

Figure 23-3 Focused Load on Data Owner



23.4 Factors that Affect System Performance

Introduction

Here we discuss configuration or operational factors that you can use to improve system performance.

Don't configure boxes that do not exist

Data Hiway performance is enhanced if you don't configure process-connected boxes that do not exist. Failed boxes should be repaired and placed back in service as soon as practical, because failed boxes that are not restarted impair hiway performance.

Give priority to preferred access devices

Configure preferred access devices on Data Hiways (HGs, Operator Stations, and computers) with the highest priorities (lowest hiway addresses) to provide quick access for these devices. If you have hiway-grant errors for such devices, consider rearranging the addresses for the more critical devices (for more information, refer to *Hiway Gateway Implementation Guidelines*).

Do not exceed a Data Hiway's rated load

The content of Data Hiways should be carefully organized so that the total load on any HG pair does not exceed the rated load of the HG (refer to *Hiway Gateway Implementation Guidelines*).

Use the cluster concept

Follow the cluster concept as closely as practical. A cluster should handle control for only one area.

Minimize cross-cluster activity

Take care that cross-cluster activity caused by access from other consoles doesn't become a normal operating condition. This increases the load on the AM and the NIM/HG pair.

Organize the pathname catalog

Organize the pathname catalog in the area database so that the most-often-used schematics are listed first. This reduces the search time to access HM resident displays. The US “remembers” the last three custom schematics accessed from the HM to further improve performance.

Complex schematics take longer

Complex schematics (those with many subpictures, complex solids, and such) are less efficient to display and take longer to call up to the screen.

23.5 Estimating LCN Load on Your System

An experience-based estimator

The estimator chart provided below was derived through actual operating experience. Most of the data that contributed to the chart was obtained from Honeywell's Large System Test Facility in Phoenix.
You can use this estimator to obtain an estimate of the load on your LCN at the time you take the required data.

Remember, this yields only an estimate

We believe this estimate is conservative, but any decisions or changes you make as a result of using this estimator are your responsibility.

What we learned by developing this estimator

Sustained overloading of an LCN is rare. The average load on most LCNs rarely exceeds 30%. If you have symptoms of overloading such a slow access times or overrun error messages, the problem is more likely caused by loading of individual nodes, rather than exceeding the LCN capacity.

How to make an estimate

Perform the following steps:

Table 23-2 Estimating LCN Load on Your System

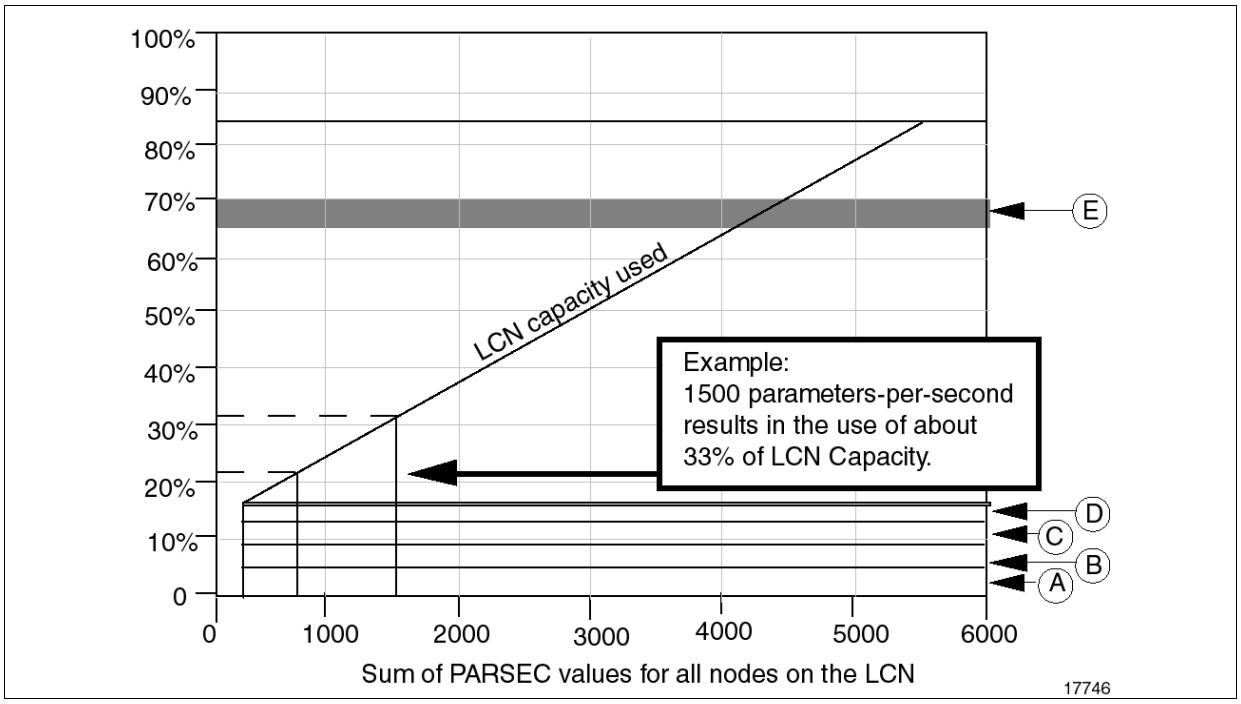
Step	Action	Result
1	On the PERFMENU display (see Section 10), select PARCHKR.	The PARCHKR display appears showing the PARSEC value for each node on the LCN.
2	Add all of the PARSEC values.	The total parameters per second value for the LCN.
3	Use the total parameters per second value to find the % value.	This is the estimated LCN load at the time you read the PARSEC values. If yours is a small system with little history collection, 4-hour checkpointing, and a low event load , the load will be about 10% less than the chart indicates.

The LCN load estimator chart

Use this chart to estimate your LCN load. For smaller LCN systems (30 nodes or less), reduce the estimate from the chart by 10 percent. This chart was set up for a large, busy system.

*If you have an ALL ELCN system, that is, all LCN nodes have been migrated to ELCN, note that the UEA and UVA variants of ELCN ENIM and AM have enhanced performance specification limits as described in figure “LCN Load Estimator Chart and explanatory notes (All ELCN system)”.

Figure 23-4 LCN Load Estimator Chart and explanatory notes



Explanatory notes for Figure 23-4:

A Estimated base load for 64 running but non-operating nodes.

B Estimated heavy alarm load in 64-node LCN (12/sec. + 180 burst/min.).

C Estimated checkpoint load with 7 Hiways/UCNs, 7 AMs, 2 CGs, 10 minute checkpoint interval; checkpoints taking about 5 minutes.

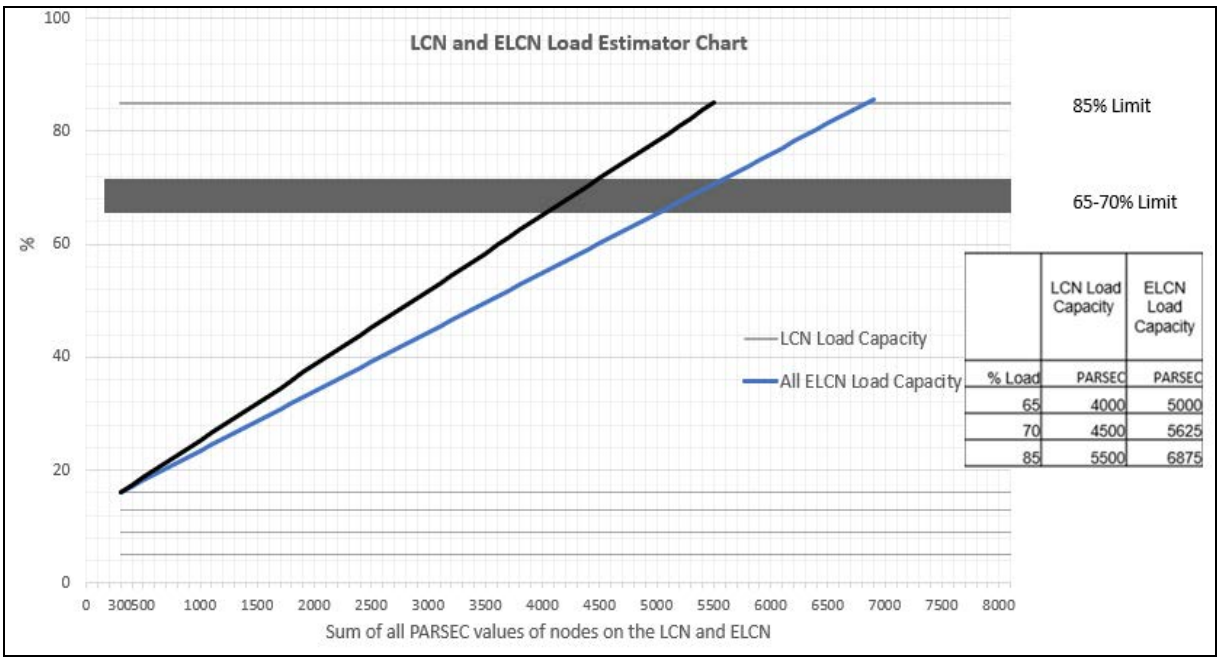
D Estimated history load with 15,000 history pts, 1 min. rate, 7 HMs.

E Practical limit (65-70%) for a constant LCN load.

23.5 Estimating LCN Load; on Your System, Continued

Use this chart to estimate your LCN load for an ALL ELCN system.

Figure 23-5 LCN Load Estimator Chart and explanatory notes (All ELCN system)



ATTENTION

If you have an ALL ELCN system, that is, all LCN nodes have been migrated to ELCN, note that the total LCN PARSEC limit for ELCN ENIM and AM is increased by 25%.

The overall LCN PARSEC limits with an ALL ELCN system can be safely be increased as shown in the following table.

Specification	65% overall PARSEC load	70% overall PARSEC load	85% overall PARSEC load (maximum)
Original specification	4000	4500	5500
ALL ELCN system (increased by 25%)	5000	5625	6875

NOTE

A characteristic of highly loaded LCN operation is a swing of 15-20% around the average LCN load. Based on tests with the Large System Test Facility, the average load on any operational LCN system should not exceed 60-65%. Exceeding this load may cause the loss of redundancy (one of a pair of nodes will crash). The busiest customer systems in the field today have an LCN load in the 30% range.

Operating with more than 85% LCN load

Extended operation with an LCN load that exceeds about 85% can cause any of the following:

- One of the nodes in a redundant-node pair fails (crashes).
- Long display call-up and update times.
- AM overruns, “hold-breath” messages, and prefetch or prestore problems.
- HM history overruns and history loss.
- Loss of synchronization in digital clocks (LCN segments with only K2LCN processor boards).
- Inability to ride-through LCN cable failures.

23.6 System load calculation tool

Introduction

With R680, the LCN load can be monitored using the System Load Calculation Tool. The LCN Load is calculated based on a formula and the calculated value is displayed in the LCNPERF schematic. The display can be accessed through the LCNPERF target in PERFMENU.

For more information about viewing the load details through LCNPERF display, refer Section 18.19 of the *Process Operations Manual.*

ATTENTION – If you have an ALL ELCN system, that is, all LCN nodes have been migrated to ELCN, note that the ELCN ENIM and AM have enhanced performance specification limits. The LCNPERF schematic has not yet been updated to include the enhanced performance specification limits, most notably, a more accurate calculation for “ESTIMATED % LCN LOAD” for an ELCN System. This will be updated in a future TPN release.

Purpose

The load calculation tool provides an online mechanism to calculate the total load on LCN and other LCN load related parameters. The LCNPERF schematic displays the following:

- A tabular view of the selected load parameters for individual LCN nodes
- Estimated percentage of LCN load
- The selected LCN load parameters

The parameters displayed in the LCNPERF schematic can be used for the following purposes:

- Monitoring the LCN load
- Changing the Trip limits
- Enabling / Disabling load calculation task

Load Calculation Formula

The LCN load calculation tool runs on the US node. The PSDP parameter $CALCPRD enables the load calculation task and controls the periodicity of load calculations.

ATTENTION

ATTENTION –Honeywell recommends enabling the load calculation task only on one or two nodes per segment, as it accesses more than 200 parameters.

When the load calculation task is enabled on any US/GUS node, the CPUFREE of that node reduces by 10%-13% initially and will have an offset of 4%-5% after the initialization. This does not have any significant effect on the performance of the node.

The following formula is used for calculating the total estimated percentage of load on LCN:

Formula 1: For calculating the total Estimated % of Load on LCN

Percentage load on LCN =((total_par_sec + 1500 + (msg_per_sec * 7))/ 8800) * 100 * ($PARLIMX (0)/4500) + $PARLIMC (0).

where,

total_par_sec is the total number of parameters (on AM, NIM, HG, CG and NG nodes) per second.

msg_per_sec is the number of messages (on AM, NIM, HG, CG and NG nodes) per second.

Note: The Base load is calculated as follows:
(1500/8800)*100 = 17.05 %

The base load is 17.05% for a typical traffic on LCN for non-data access. When multiple segments are configured on a network, the base load of 17.05 will be distributed amongst the segments. This distribution helps to avoid the base load being reckoned repeatedly.

Trip limits

The trip limits are used for diagnosing the LCN load parameter values. If the load values cross the trip limits, the load values are indicated in different colors and a system alarm is raised.

The following are the configurable PSDP parameters for the trip limits:

- $PPMLOTP (0) (Low trip limit for parameters per message)
- $PPMLLTP (0) (Low low trip limit for parameters per message)
- $LDHITP (0) (High trip limit for estimated percentage of LCN load)
- $LDHHTP (0) (High high trip limit for estimated percentage of LCN load)

Node specific load details

The schematic displays the node specific details for the following node type groupings:

- AM/APP/ESVT, NIM, HG, CG and NG nodes
- US/GUS/ES-T, HM nodes
- All Nodes

The following load related parameters are displayed in the schematic for each node that is configured and running on the LCN:

- PARSEC - Parameters per second
- MSGSEC - Messages per second
- PARMSG - Parameters per message (Calculated as PARSEC/MSGSEC)
- CPUFREE
- Node status

Node specific load details, Continued

The parameter values are displayed in different colors based on the load. The following table lists the limits and the applicable color indication for the node specific parameters:

Parameter	Limit	Color	Node Status
MESSAGES PER SECOND (REQUESTS)	<=35	CYAN	NA
	>= 35 AND <=40	YELLOW	HI MSG RATE
	> 40	RED	HH MSG RATE
PARAMETERS PER MESSAGE (PARSEC / REQUESTS)	>=50	CYAN	NA
	>= 20 AND < 50	YELLOW	LW MSG EFF
	< 20	RED	LW MSG EFF
CPUFREE (CPUFREE)	>40	CYAN	NA
	>20 AND <= 40	YELLOW	HEAVY LOAD
	<= 20	RED	OVER LOAD

LCN load details

The schematic displays the following LCN load details:

- TOTAL LCN PARSEC – Total parameters per second
- TOTAL LCN MSG/SEC – Total messages per second
- AVERAGE LCN PAR/MSG – Average LCN parameters per message
- ESTIMATED % LCN LOAD
- LCN LOAD Status (LOW, MODERATE, HEAVY, EXTREMELY HEAVY)
- Trip limits for parameters $LPARMSG (AVG PARAMETERS PER MESSAGE) and $TOTLOAD (ESTIMATED % LCN LOAD)

LCN load details,
Continued

The following table lists the limits, color indication and the applicable PSDP parameters for the LCN load parameters:

Load Parameter	Limit	Color	PSDP parameters
AVG PARAMETERS PER MESSAGE	>= $PPMLOTP(0)	GREEN	$PARMSG(ss)
	>= PPMLLTP (0) AND <= $PPMLOTP (0)	YELLOW	
	< $PPMLLTP (0) OR If $PPMALFL (0) set to TRUE.	RED	
ESTIMATED % LCN LOAD	< $LDHITP (0)	GREEN	$TOTLOAD(ss)
	>= $LDHITP (0) AND <= $LDHHTP (0)	YELLOW	
	> $LDHHTP (0) OR If $LDALFL (0) is set to TRUE.	RED	
LCN LOAD STATUS	< 35 – LCN LOAD IS LOW	GREEN	N/A
	>= 35 AND < $LDHITP(0) – LCN LOAD IS MODERATE		
	>= $LDHITP (0) AND <= $LDHHTP(0) – LCN LOAD IS HEAVY	YELLOW	
	> $LDHHTP (0) – LCN LOAD IS EXTREMELY HEAVY or If $LDALFL(0) is set to TRUE.	RED	

System alarms

The system alarms (of event type 49) are generated when the parameter $LPARMSG or $TOTLOAD crosses the configured limit. The PSDP parameter $LDALDB allows you to set the deadband for the system alarms. The generated alarm indicates the parameter that triggered the alarm. The system alarms are generated only for the LCN level load details and not for the node level load details. When the system alarm is raised, the US node on which the tool runs is switched to MAINT state.

Note: When the deadband value is set to 100, the system alarms are not raised even if the parameter $LPARMSG or $TOTLOAD crosses the configured limit.

A tip: Load analysis

The LCN load specific parameters and the node specific parameters can be historized and used for analyzing the load on LCN. The PSDP parameters used for representing the LCN load cannot be historized. However, these load specific PSDP parameter values can be stored in the custom parameters of an AM custom point. Alternately PSDP parameters can be historized directly in PHD. The customized parameters can be historized and used for generating Trend reports.

TPN bridge support

If a TPN bridge exists in the network, the LCN load parameters are calculated and displayed for each individual segment.

If the LCN nodes are grouped into various segments, (similar to the actual TPN-Bridge cluster membership), the schematic displays the following details:

- The load parameter of nodes that belong to a specific segment.
- The LCN load parameters of a specific segment.

LCN node – segment relationship

The LCN nodes are grouped into segments, to monitor the segment-wise load on the LCN. If a TPN bridge exists in the network, the physically connected LCN nodes of the TPN bridge network are grouped into segments. If there is no TPN bridge in the network, the nodes can be grouped into segments based on the criteria such as type, controlling specific process units and so on. The CLSNODE.DS can be compiled and used for defining the node membership on these network segments.

CLSNODE.DS file

For load calculations, the CLSNODE display is used for assigning segment numbers to the LCN nodes. Before invoking the CLSNODE display, the **INITIALIZE CLSNODE** target in the CLSNODE.DS file is to be modified using the Picture Editor. All the nodes in the network is to be assigned with a segment number. By default, 0 is assigned as segment number for all the nodes. The segment number is to be assigned to the LCN nodes as shown in the following example:
SS_INT(ENT20.$CLSNODE(94),5);
Where,
94 – denotes the LCN Node number
5 – denotes the segment number

CLSNODE.DS file,
Continued

The CLSNODE.DS file is compiled and is used later for initializing the node-segment relationship.

When a US node is rebooted and/or a node is moved to a different segment, the default value 0 is assigned to the segment number of all the nodes. The segment numbers are re-assigned using the CLSNODE.DS file.

The CLSNODE.DS file can be edited and the node-segment relationship can be saved permanently using the picture editor. The segment numbers can be dynamically assigned to the nodes by directly accessing the CLSNODE.DS file.

Reference

For more information about CLSNODE display, refer Section 18.19 of the *Process Operations Manual.*

CLSNODE display

The $CLSNODE(nn) (where nn is the node number ranging from 1 through 96) parameter array for an US node appears in the CLSNODE display. The parameter value indicates the segment number assigned to the nodes. These segment numbers are displayed in individual boxes for each node in the CLSNODE display. The segment numbers corresponding to the node numbers can be edited in the individual boxes.

When the node-segment is defined, use the INITIALIZE CLSNODE target to write the segment number to the PSDP parameters.

The node-segment relationship must be defined using the CLSNODE display for every node on which the load calculation tool is running.

References

With TPS 340, LCNLOAD_G400.PCT is provided as an RAC display utility. This display is used for viewing/analyzing the total load on the LCN and on the AM/NIM/HG/CG/NG nodes.

See Section 8 of the *TPS System and Process Operations Guide* for further information on LCNLOAD_G400.PCT.

For information about PSDP parameters, refer Section 23.5.

23.7 HM Performance Hints and Rules of Thumb

Introduction

The following section gives you hints and rules of thumb for improving the performance of your History Module (HM) in the following areas:

- HM utilization
- Continuous history
- Directory Searches
- Event Journal

CAUTION

These hints and rules of thumb are generally true. Like all general principles, however, there are exceptions to the rules, so the rules should be applied thoughtfully. HM system performance, in particular, is highly dependent on system configuration and system load because each user's environment and system configuration has unique characteristics. *Response time and load percentages should be used only as guidelines.*

23.7.1 HM Utilization

HM utilization

Use the following hints and rules of thumb to determine if your HM is over utilized or under utilized:

1) If the HM's average CPUFREE is below 40%, the HM is fully loaded; you should not add any additional burden to it. Keep the rest of the CPU free in the event of process upset, which cause heavy burst loads.
2) A corollary to rule 1: If your HM's average CPUFREE is already below 35%, seriously consider reducing the load on your HM, because it may not be able to handle heavy burst loads. This is especially true if this HM's performance already is slow.
3) If the average number of disk transfers exceeds 800-900 transfers per minute, the HM is fully loaded; you should not add any additional burden to it.
4) A corollary to rule 3: If your HM's average disk usage exceeds 1000 transfers per minute, seriously consider reducing the load on your HM, because it may not be able to handle heavy burst loads. This is especially true if this HM's performance already is slow.
5) To track the load on your HM, historize its CPUFREE and disk transfers per minute using regulatory AM points.

23.7.2 Continuous History Hints and Rules of Thumb

Rules of thumb

1) Use this guideline to decide if you can put more load on your HM: a full 40 PPS load of continuous history of any single collection rate will add approximately 11% CPU load (for a 68020 processor) and 3.5 disk transfers per second. Equivalent loads are: 2400 60-second points, 800 20-sec points, 400 10-sec points and 200 5-sec points.
2) Use this guideline to decide if you can put more load on your HM: a full 40 PPS load of continuous history of mixed collection rates will add approximately 17% CPU load (for a 68020 processor) and 5 disk transfers per second.
3) Schedule background functions (logs, history retrieval, journal retrieval, checkpoints, prints to virtual printers) so that the HM is not overloaded with requests all at once and, especially, not during its (continuous history) marshalling and average calculation cycles. Try to stagger the background requests before and after these cycles.
4) Ask for more history (both event and continuous history) less often, rather than less history more often. For continuous history, a good approach is to ask for 1 hour's worth of snapshots every 60 minutes (but schedule it 3-8 minutes after the top of the hour).
5) Request backward retrievals for recent continuous history data. Request forward retrievals for older history data. If the rules are observed, the difference in load on the HM for these retrievals can be as high as 10:1 (as described in the following scenario):

   For 999 hours of 1-minute continuous history snapshots, you want to retrieve the last 5 hours of 1-minute snapshot data. A forward search loads the HM because the search occurs from the beginning of the file (59700 samples) before the requested data is located. A backward search does not load the HM because the last point collected is the first sample accessed; therefore, no search is required. Not all functions can do backward retrieval.
6) Know and apply the rules for programming effective continuous history retrievals (See Section 7 of this manual). Inefficient retrieval of continuous history snapshot data often imposes extremely burdensome (and unnecessary) loads on an HM and is the major cause of HM performance degradation.
7) Configure only as much continuous history snapshot data as you will need. Configuring many hours of snapshot data creates large files and impacts performance. This effect is multiplied for fast history. For example, 8 hours of 5 second data takes twelve times as much disk space as 8 hours of 60 second data.

23.7.3 Fast Search User Volume

Improve system performance

In R500, an HM fast search user volume is available to provide you with directory searches 20 times faster than the standard linear volume/directory search method by using an AVL (binary search) tree algorithm. This means quicker access to schematics and other files in the user volume. Also, the fast search volume usually improves performance of all system functions that rely heavily on directory searches, including copy files, delete file, create file, copy file, read file, and schematic access. This value of this function becomes even more significant as you move to larger History Modules, which will have more files to search.

Binary search vs. linear search

Files not on a fast search user volume are located using a linear volume/directory search. This is very time consuming for user volumes configured for many files because all configured volume directory entries are searched to the requested file, even if these entries are empty. This is often a significant factor in slow schematic call ups. Honeywell's AVL (binary search) tree algorithm maintains a single fast search user volume with directories of frequently used files and does a binary search of the sorted files in that volume, significantly speeding the search process.

Configuration

By setting up a fast search directory in the fast search volume the HM can locate files very quickly. The fast search volume is always the first user volume defined in the user volume configuration page in the HM.

Implementation

For maximum performance, Honeywell recommends the following:

1) Specify fast search directories first in the search path sequence.
2) Configure the fast search volume with as much space as possible.
3) Configure the fast search volume for the maximum number of files (9995).
4) Place performance-critical schematics, pictures, CL's and other critical files in the fast search volume.

NOTE: The fast search volume is limited to 63 directories and 9995 files. File descriptors are not available with the fast access option.

23.7.4 Directory Searches Hints and Rules of Thumb

Increase speed of directory searches

Hints and rules of thumb that increase efficiency and speed of linear directory searches:

1) Avoid using file descriptors. Configuration of file descriptors on a volume will degrade the directory search performance of that volume by between 35 and 100%, depending on HM configuration and system load. Especially avoid file descriptors on the system (&0np) and area (&3np) volumes.
2) Create volumes with fewer files. All file entries configured in a volume are compared on a directory search. Therefore, the smaller the number of files configured in the volume the faster the search (shown below). Create one or more fast search user volumes by configuring 500 or fewer files.

   Requirement: Search for a schematic in 10 paths, where the schematic is found in the last path searched. All 10 searches in volumes configured for the same number of files. Note these search times are approximations and will vary dependent on HM load and configuration.

Number of files configured in User Volume	Search time (seconds) for 68020 processor
9995	18 sec.
1000	3.8 sec.
500	3.0 sec.

Number of files configured in Area Volume (&3np)	Search time (seconds) for 68020 processor
5000	3.8 sec.
1000	2.0 sec.
500	1.8 sec.

Increase speed of directory searches,continued

3) The Area Database volume (&3np) has a memory resident directory and offers fast directory searches. Under light HM load, a directory search in the area volume is from 2 to 3 times faster (using a 68020 processor) than a user volume configured for the same number of files. Access to the area volume is also more consistent. This speed difference is even greater under plant upset/trip and heavy HM loads.
4) Place schematics and logs in fast search volumes.
5) Configure search paths with performance in mind.
6) The WDA 445 and 512 drives are faster than WREN (I)(II)(III) and WDA 210 drives because of a read cache on the drive controller. Faster seek and read times also marginally increase performance.

23.7.5 Event Journal Hints and Rules of Thumb

Event Journal rules of thumb

Event Journal hints and rules of thumb include:

1) The “burst buffer" is not a buffer at all. It is the file on the HM: **`NET>!2np>BB000000.CM`** (where np is the HM node pair number). This file is used as temporary storage for events before they are passed on to the journal event sorting and distribution functions. HM memory usage is not affected by the size of the burst buffer.
2) It is a good idea to configure the burst buffer for 3 times the maximum event burst that you expect. This sizing is very important because if the burst buffer overflows events are permanently lost and cannot be recovered.

ATTENTION

Note that the burst buffer is sized to hold process alarms and will only hold about one third as many operator messages (the largest event).

Event Journal rules of thumb, continued

3) The HM will time sort events when the events are received in the HM sorting task within 10 seconds of the time the event occurred. Events that are received in the HM sorting task outside of this 10 second window are written directly out to disk without being time sorted.
4) SOE (Sequence of Events) events are post-sorted on retrieval (Release 410 and after) and are *always* displayed in the proper time order.

Section 24 – NCF and LCN Status Displays

24.0 Reserved

In earlier versions of this manual, this section contained information about **NCF and LCN Status Displays.** Refer to *LCN Guidelines - Implementation, Troubleshooting, and Service* for this information. This section has been retained to direct users familiar with an earlier version of this manual to the new location of the information and to preserve the validity of references to other sections of this manual.

Section 25 – LCN Reconnection

25.0 Reserved

In earlier versions of this manual, this section contained **LCN Reconnection** information. Refer to *LCN Guidelines - Implementation, Troubleshooting, and Service* for this information. This section has been retained to direct users familiar with an earlier version of this manual to the new location of the information and to preserve the validity of references to other sections of this manual.

Section 26 – LCN/Data Hiway Hardware Compatibility

26.0 Reserved

In earlier versions of this manual, this section contained **LCN/Data Hiway Hardware Compatibility** information. Refer to *Hiway Gateway Implementation Guidelines* for this information. This section has been retained to direct users familiar with an earlier version of this manual to the new location of the information and to preserve the validity of references to other sections of this manual.

Section 27 – How to Move to a New TPS Release

27.0 Overview

Introduction

This section defines a “release,” provides general advice about upgrading your system software.

27.1 What is a Release?

Introduction

From time to time, Honeywell releases a new version of the LCN-based **TotalPlant** Solution (TPS) system, usually with a designator such as, "Release 500" or “R500”

What a “Release” contains

These releases provide or offer new hardware or software products or upgrades to existing products.

Usually, each major release is accompanied by a *Customer Release Guide* that defines the changes provided or offered in the release and provides instructions for implementation of that release.

27.2 Upgrading Software

New software

Most, if not all, releases are accompanied by new software. New software for a system that is on-line and involved in process control can usually be loaded into its node without breaking any "path to a valve," by using the Software Upgrade process.

System data translation

In many releases, it is necessary to translate some of the system data, such as the data in checkpoint files, to make it compatible with a new software release.

Translators are provided for this purpose, usually in the Engineering functions, and instructions for them are provided in the *Customer Release Guide* that accompanies the release.

27.2.1 The Software Upgrade Process

Description

The upgrade sequence is designed to ensure an uninterrupted "path to the valve" and continuing operator visibility of the process, with a minimum of disruption and unnecessary alarming. It is based on a characteristic of TPS that allows nodes running on differing releases of software to coexist on the same LCN even though they are unable to exchange data.

Is the upgrade process required?

When new-release software is compatible with the previous release, the Software Upgrade process is not used.

Instead, you load the new software images on the HM and, when convenient, reload and restart each individual node.

The *Customer Release Guide*, or in some cases a release letter, specifies whether this procedure is appropriate.

What is required?

The Software Upgrade process is to be used when a software release includes changes that make new software for one or more nodes incompatible with the previous version. You must choose between:

- Taking the whole system down for reloading, or
- Following the upgrade scenario

If you follow the upgrade scenario, you can do a node-by-node changeover while continuing to view and control the process.

27.2.2 Preparation for a Software Upgrade

Plan ahead

Before starting, plan ahead. Know and record the sequence you will follow and know what recovery steps are appropriate at each stage in the event of problems.

Keep control system in steady state

HG and NIM redundancy are lost and functionality is reduced during portions of this process. The control system should be in a steady state and no unrelated Engineering functions should be attempted during the upgrade.

Limit control commands

Control commands should be limited to changes of OP, SP, and Mode. It is best to start out with all nodes up and running their normal personality software to make sure that they have compatible configuration files.

Save to removable media

A useful preliminary step is saving to disks the following:

- Directory &ASY
- Checkpoints for all nodes
- Area Database.

Save these removable media in a secure place for use if you need to restart a node with old-release software before the upgrade process is complete.

Do one cluster at a time

If your system consists of two or more Performance Clusters (see Section 23 in this manual), we recommend that you complete the update of one cluster before starting the next.

Reference

Refer to the *Customer Release Guide* that accompanies the new release for Software Upgrade instructions.

Section 28 – Purchased Options

28.0 Overview

Key File Options

Several software options are enabled through a Key File volume or directory (&KFO) that is generated by Honeywell for each LCN. For a new system, the Key File Options purchased for that system are installed during the initial system start up (for more information, refer to the *System Startup Guide*).

Subsection 28.1 provides the following information for each Key File Option:

- The function of each key file option.
- How to install the option on an already operating system.
- How to remove the option, if that is possible.

Other software

Several application software options are available from Honeywell. Many of these are installed through the Custom Software Backplane (for more information, see Section 31 in this manual). Instructions for the installation and use of each of these applications is included in the application package.

For information about currently available application software, contact your Honeywell account representative or site support specialist.

Hardware options

In earlier versions of the *Engineer's Reference Manual*, subsection 28.2 provided specific information about kits available to add hardware options to **TotalPlant** Solution (TPS) systems. Because the hardware options offered by Honeywell have expanded significantly, it is no longer practical to provide information about specific kits in this section. Instead, subsection 28.1 now contains general information about the types of kits available with guidelines for system configuration changes you may need to make to accommodate newly installed hardware options.

Most hardware options are either built into the TPS systems before they are shipped, or are delivered as kits for installation in the field. The built-in options are supported by the Site Planning, Installation, and Service publications in this bookset. Each hardware option kit includes a copy of its installation instructions.

For information about currently available hardware options, contact your Honeywell account representative or site support specialist.

Hardware to support Key File Option

The following HM Disk Redundancy Key File Option requires a History Module with dual disk drives.

Software key-files

If purchased, the software options described here are enabled by keys built into the &KFO volume or directory by Honeywell. The &KFO volume or directory is provided for each Local Control Network.

28.1 Key File Options

Introduction

In this section, each Key File Option is described, including the documents that contain further information on that key file, along with a brief installation procedure.

If the option can be removed after installation, that removal procedure is mentioned.

Installation of the key-files

The installation of the keys is accomplished in

- NETWORK CONFIGURATION, under SYSTEM WIDE VALUES.

For a first time startup, these options are enabled by installing the key-file options during initial Network Configuration. Refer to the *System Startup Guide.* The instructions for installing the key files for a first-time startup are in the “Configure System Wide Values” task.

Enabling these options in nodes that are already running, requires a change to SYSTEM WIDE VALUES through on-line reconfiguration, and requires that the affected nodes be shut down and reloaded with files and data including the modified Network Configuration File (NCF). Instructions for doing this for each option are provided in the remainder of this section.

28.1.1 AM Redundancy

Description

A secondary Application Module backs up the operation of the primary AM. All of the application data in the primary AM is transferred to the secondary AM, where an exact copy of the data is maintained to be used if the primary AM should become inoperative.

This option can be installed only in enhanced AMs with the 68020 microprocessor.

References

Refer to the *Application Module Implementation Guidelines* binder to review guidelines for the implementation of Application Modules, including guidelines for the AM Redundancy option.

Refer to *Application Module Implementation Guidelines* of this manual for a list of the processor status data point (PSDP) parameters related to AM Redundancy and definition the meaning of the values they contain.

Refer to the *LCN Guidelines - Implementation, Troubleshooting* to review instructions for adding a new node to an operating system.

Refer to the *LCN System Installation* manual for installation instructions for the AM Redundancy hardware.

Refer to the *Five/Ten-Slot Module Service* for service instructions including board locations and spare parts information.

Refer to the *Network Data Entry* for instructions for on-line reconfiguration. This manual is used to install the new configuration on the network.

28.1.1 AM Redundancy, Continued

How to install the enhancement

Follow the kit instructions packed with the hardware options kit. A backup AM can be added to an existing AM by adding a new AM to the LCN and installing and interconnecting each AM. Power must be turned off in each AM if any modifications are made to it.

Changes must be made in each of the following Engineering Main Menu activities:

- LCN NODES—Add the backup node and add the new node's number as the redundant node.
- VOLUME CONFIGURATION—The AM checkpoint volume size must be recalculated and reconfigured.

For more information, refer to the *Application Module Implementation Guidelines*. Also see Tables 7-1 and 7-7 in *Engineer's Reference Manual* - this manual.

To startup, apply power to the AMs and see the *Application Module Implementation Guidelines*.

How to take out the enhancement

Shut down the backup AM. If LCN NODES reconfiguration was completed, the backup nodes' status on the Node Status Display will then be OFF. If Volume Configuration was completed, and if you need to, you can reconfigure to go back to the original AM checkpoint volume size.

28.1.2 HG Point Display Ranges

Description

Adds HG data point parameters that specify a scale that is different than the full sensor range, for the PV and SP bars on the point's Group and Detail displays.

For example, if the sensor has a range of 0°C to 100°C, values can be entered in the display range parameters to make 0% on the bar represent 50°C, and to make 100% on the bar represent 75°C.

Hardware required

None.

References

Refer to the *Process Operations Manual*. It provides instructions for changing the display range and for use of the Group and Detail displays.

Refer to *Network Data Entry*. It provides instructions for on-line reconfiguration that is needed to install the option in the Universal Stations.

How to install the option

In SYSTEM WIDE VALUES, reconfigure SOFTWARE OPTIONS, using the &KFO volume provided by Honeywell to enable this option. After installing the new Keyfile option, shutdown and reload all Stations (US/UxS/GUS/EST), one at a time. After reloading all Stations, shutdown and reload all HGs.

Note: Shutdown the backup HG and reload it. Then shutdown the primary HG (the backup HG is activated) and reload it.

To startup, follow the reconfiguration instructions on the Network Configuration displays and refer to *Network Data Entry*.

How to take out the option

To take out this option, you must obtain a new key option file from the Honeywell software distribution center, modify the NCF (System Wide Values/Software Options/Load New Keyfile). After installing the new Keyfile option, shutdown and reload all Stations (US/UxS/GUS/EST), one at a time. After reloading all Stations, shutdown and reload all HGs.

Note: Shutdown the backup HG and reload it. Then shutdown the primary HG (the backup HG is activated) and reload it.

Instead of taking out this option, you can eliminate its effect for any HG point by placing "--------" (NaN) in the display range parameters, PVDSPHI, PVDSPLO, SPDSPHI, and SPDSPLO.

28.1.3 Enhanced Trend Pens

Description

Provides a Pen Assignment display that operators use to assign point parameters to trend pens (without this option, pen assignments are made through the Group display). A zigzag in a trend pattern indicates that a pen has had a parameter reassigned to it. This option also adds a trend-pen calibration function.

Hardware required

None.

References

Refer to the *Process Operations Manual*. It provides a description of, and instructions for, the Pen Assignment display.

How to install the option

In SYSTEM WIDE VALUES, reconfigure SOFTWARE OPTIONS, using the &KFO volume provided by Honeywell to enable this option.

To startup, follow the reconfiguration instructions on the Network Configuration displays and refer to *Network Data Entry*.

How to take out the option

To take out this option, you must get a new key option file from the Honeywell software distribution center, modify the NCF (System Wide Values/Software Options/Load New Keyfile), then reload all US nodes.

28.1.4 HM Disk Redundancy

Description

HMs with Wren III disk drives and HMs with WDAs (Winchester Disk Assemblies) can be configured with redundant disk drives, if the HM Disk Redundancy Software Option is purchased. When so configured, a failure or other interruption of the operation of one of the disk drives is reported but does not cause the HM to fail. The HM continues to operate because the same data has been stored in both drives, and read/writes continue on the "good" drive.

References

Refer to 7.5 of this manual for information about the operation of redundant disk drives, configuring redundant HM disk drives, and synchronizing the drives.

See *Command Processor Operation*. It provides instructions for using commands related to HM disk redundancy: SYN, STA, and OFF. Refer to the *Network Data Entry* for instructions for on-line re-configuration needed to install the new configuration on the network.

For service information, see *History Module Service*. It also includes the setting for the SCSI bus address on each drive to establish redundant-drive partners.

How to install the enhancement

Changes must be made in the following Engineering Main Menu activities. On-line reconfiguration can be used to install the new configuration on the network.

- SYSTEM WIDE VALUES—Reconfigure SOFTWARE OPTIONS, using the &KFO volume provided by Honeywell to enable this option.
- VOLUME CONFIGURATION—If there are two drives and they are redundant partners, configure the Number of Disks as 1. If there are four drives that are to serve as dual, redundant partners, configure the Number of Disks as 2. If the disk drives are changing to Wren IIIs, change the Type of Winchester Disks to 3.

After installing redundant drives, you must restore the primary drive as explained above. Then, use the SYN command to copy all of the data from the initial drive to its redundant partner. When the partner drives contain the same data, they are said to be synchronized.

28.1.4 HM Disk Redundancy, Continued

How to take out the enhancement

When the HM is started up with either the &HMO (on process) or &HMI (initialization) images, if one of the partner drives (or drive pairs) does not have power applied, the system won't recognize redundant drives and will assume that the HM is to operate without disk redundancy.

To take out this option, you must get a new key option file from the Honeywell software distribution center, modify the NCF (System Wide Values/Software Options/Load New Keyfile), then reload all US nodes.

28.2 Hardware Options

Introduction

In some cases, new hardware that can be added to existing TPS systems is provided as whole modules and devices. For other hardware options and upgrades, kits are provided that contain the parts necessary to add the hardware and instructions for the installation of that hardware.

CAUTION

In any case, new hardware *should be installed only by people who have been trained to understand the impact of the new equipment and its installation on system operation and performance.*

The hardware kits and instructions available from Honeywell are only for people with such training and experience.

High-performance processors

Many hardware upgrades involve replacing the standard processor with the high-performance processor. When first used in releases R210 and 210M1, the HMPU processor/memory board (with 2 Mw of memory and a math coprocessor) was the high-performance design used. Later high-performance designs now include the HPK2-2 and HPK2-3 (with 2 Mw and 3 Mw of memory on-board), and the K2LCN series of processor/memory boards with from 2 Mw to 6 Mw of on-board memory. The HMPU is still required in redundant AMs because it is the only board with a math coprocessor on board.

Both the HMPU and HPK2 series of boards can work in conjunction with separate EMEM external memory boards to increase a module's total memory. The K2LCN series of boards cannot interface with external memory in this way. Some application software packages require the use of an HMPU board. This requirement is identified in the documentation provided with each such package. Some standard software options, such a the Math Library for AMs, require an HMPU board. This requirement is identified with systems with such options are configured.

All of the above boards are still valid high-performance boards, provided the memory requirements of the software release are applicable.

You should inform your hardware maintenance staff about the high-performance processor requirements defined here, so that they will not replace a required board with an improper one.

High-performance processors, continued

You should inform your hardware maintenance staff about the high-performance processor requirements defined here, so that they will not replace a required board with an improper one.

Additional configuration changes

Network Configuration (NCF) changes are required by many kits. They can be made through on-line reconfiguration, which usually requires a shut down and reloading of the affected nodes. See the *Network Data Entry*, for on-line NCF reconfiguration instructions.

General installation references

New hardware not provided with kit instructions can be installed by referring to the appropriate publications in the system bookset, especially the following publications:

- See *LCN Guidelines - Implementation, Troubleshooting, and Service*
- See *LCN System Installation*
- See *LCN System Checkout*
- See *Process Manager Implementation Guidelines*
- See *Smartline Transmitter Integration Manual*
- See *Process Manager/Advanced Process Manager Installation*
- See *Process Manager/Advanced Process Manager Checkout*
- See *Process Manager/Advanced Process Manager Service*
- See *Logic Manager Implementation Guidelines*
- See *Logic Manager Installation*
- See *Logic Manager Service*
- See *Advanced Process Manager Implementation Guidelines*
- See *Universal Control Network Guidelines*
- See *Universal Control Network Installation*

28.2.1 Application Module Hardware Upgrades

Description

The Application Module can be upgraded from a standard (68020-based) microprocessor to an enhanced (68040-based) microprocessor to increase the speed and performance of the module.

Newer software releases may also require additional memory as well as the enhanced processor. Larger memories accommodate more user information, such as more:

- Data Points
- CL Programs or
- Custom Data Segments

With R500, AMs can use memory from 3.0 Mw to 16.0 Mw (Mw = megawords). The minimum AM memory requirement for various software releases are:

- R200 requires a minimum of 1.5 Mw
- R300 requires a minimum of 2 Mw
- R400 or later requires a minimum of 2 Mw
- R500 or later requires a minimum of 3 Mw

Upgrade kits offer more memory, enhanced processing, or both.

References

See *Application Module Implementation Guidelines* to check guidelines for AM configuration, including information about the effect of the AM memory size on user memory and checkpoint volume size. Also, see Section 7 in this manual for aid in configuring volume sizes.
The AM checkpoint volume size is not affected by installing an enhanced processor, but if an LCN has both an enhanced and a standard (68020) AM, the Personality Image volume must be made larger, because two versions of the AM image will be present.

See *Five/Ten-Slot Module Service* for service instructions including board locations and spare parts information. Refer to the *Network Data Entry*. It provides instructions for on-line reconfiguration that are needed to install the new configuration on the network.

28.2.1 Application Module Hardware Upgrades, Continued

How to install additional memory

The AM checkpoint volume size must be recalculated and reconfigured in VOLUME CONFIGURATION.

For more information see *Application Module Implementation Guidelines* and *Engineer's Reference Manual* - this manual. You can use on-line reconfiguration to install the new configuration on the network.

To startup, apply power and use the AM Status display to reload and restart the AM.

How to take out additional memory

Remove power from the AM and remove the new memory board(s). If Volume Configuration was completed, and if you need to, you can reconfigure to go back to the original AM checkpoint volume size.

How to install the enhanced processor

In `VOLUME CONFIGURATION`, under `PROGRAM IMAGE` for this AM, select `AM IV` {`AM IV` indicates an enhanced (68040) AM and `AM II` indicates a standard 68020 AM}.

To startup, follow the reconfiguration instructions on the Network Configuration displays and refer to *Network Data Entry*.

How to take out the enhanced processor

Reinstall the original boards. If Volume Configuration has been changed, reconfigure under PROGRAM IMAGE to change from `AM IV` back to `AM II`.

28.2.2 Enhanced (68040) Computer Gateway

Description

The enhanced CG uses the higher-performance Motorola 68040 microprocessor to add speed and performance to older TPS systems. In addition, these boards contain the added memory required by newer software releases:

- CGs using releases up to and including R310 require 1 Mw of memory.
- CGs using releases from R400 require 2 Mw of memory.

References

See Section 7 of this manual for instructions for configuring volume sizes. The HM-checkpoint volume size is not affected the 68020 option, but if an LCN has both an enhanced and a standard (68020) CG, the Personality Image volume must be made larger, because two versions of the CG image will be present (see Table 7-9).

Refer to the *Five/Ten-Slot Module Service* for service instructions, including board placement and parts information.

How to install the microprocessor enhancement

In VOLUME CONFIGURATION, under PROGRAM IMAGE for this CG, select `CM IV` (`CM IV` indicates an enhanced (68040) CG and `CM II` indicates a standard 68020 CG).

To startup, follow the reconfiguration instructions on the Network Configuration displays and refer to *Network Data Entry*, binder TPS 3030-1.

How to take out the enhancement

Reinstall the original boards. If Volume Configuration has been changed, reconfigure under `PROGRAM IMAGE` to change from `CM IV` back to `CM II`.

28.2.3 Computer Gateway to Plant Network Module Upgrade

Description

There are two upgrade options that will convert a standard Computer Gateway to a Plant Network Module and one upgrade option that will upgrade a Computer Gateway to a Computer Gateway with a high-performance microprocessor.

References

See Section 7 of this manual for instructions for configuring volume sizes.

Refer to the *Five/Ten-Slot Module Service* for service instructions, including board placement and parts information.

How to install the microprocessor enhancement

In VOLUME CONFIGURATION, under PROGRAM IMAGE for this CG, select `CM IV`(`CM IV` indicates an enhanced (68040) CG and `CM II` indicates a standard 68020 CG).

To startup follow the reconfiguration instructions on the Network Configuration displays and refer to *Network Data Entry*.

How to take out the enhancement

Reinstall the original boards. If Volume Configuration has been changed, reconfigure under `PROGRAM IMAGE` to change from `CM IV` back to `CM II`.

28.2.4 Programmable Logic Controller Gateway Upgrades

Description

There are several upgrade options for the Programmable Logic Controller Gateway. Some add redundant partner PLCGs, some enhanced performance, and some do both.

References

See Section 7 of this manual for instructions if it is necessary to configure volume sizes.

Refer to the *Five/Ten-Slot Module Service* for service instructions, including board placement and parts information.

How to install the enhancement

Follow the installation instructions contained in the kit. No reconfiguration is required when installing a relay-panel upgrade.

To startup, follow the reconfiguration instructions on the Network Configuration displays and refer to *Network Data Entry*.

How to take out the enhancement

Reinstall the original boards. If Volume Configuration has been changed, reconfigure under `PROGRAM IMAGE`.

28.2.5 Enhanced (68040) Hiway Gateways

Description

The enhanced HGs use the higher-performance Motorola 68040 microprocessor. The enhanced HG can handle significantly higher parameter-access loads than the standard (68020) HG.

Kits are available to enhance capability and increase memory.

References

See Section 7 of this manual for instructions for configuring volume sizes. The HM checkpoint volume size is not affected by this option, but if an LCN has both an enhanced (68040) and a standard (68020) HG, the Personality Image volume must be made larger, because two versions of the HG image will be present.

See the *Five/Ten-Slot Module Service* for service instructions, including board placement and parts information.

How to install the microprocessor enhancement

In VOLUME CONFIGURATION, under PROGRAM IMAGE for this HG, select `HG IV` [`HG IV` indicates an enhanced (68040) HG and `HG II` indicates a standard 68020 HG].

To startup, follow the reconfiguration instructions on the Network Configuration displays and refer to the *Network Data Entry*.

How to take out the enhancement

Reinstall the original boards. If VOLUME CONFIGURATION has been changed, reconfigure under PROGRAM IMAGE to change from `HG IV` back to `HG II`.

28.2.6 Universal Station and Workstation Upgrades

Description

There are several upgrades that can be added to the Universal Station and Universal Workstation. We have broken these upgrades into categories:

Table 28-3 Upgrade Categories to the Universal Station or Workstation

Category	Action	Subsection
Disk Drive	Replaces Floppy Disk Drives and Cartridge Disk Drives with drives. Kits are available for both the Universal Station and the Universal Workstation.	28.2.6.1 2.6, 2.7
Improved Display Screen	Improves display monitor quality. Kits are available for both Universal Station and Universal Workstation.	28.2.6.2
Enhanced Processor or Memory Addition	Upgrades from standard-performance processor to high-performance processor or adds extra memory. Kits are available for both the Universal Station and the Universal Workstation.	28.2.6.3
Printer Enhancement	Replaces printer with higher-speed printer. Applicable to both the Universal Station and the Universal Workstation.	28.2.6.4
Touch Screen	Kit adds an Upper-Tier touch screen to a Universal Station. Not usable on the Universal Workstation.	28.2.6.5
Keylock Switch Replacement	Improves the security of the Keylock Switch. Not usable on the Universal Workstation.	28.2.6.6
Keyboard Additions	Adds keyboards to the workstation. Not usable on the Universal Station.	28.2.6.7

Go to the subsection describing the category of interest.

28.2.6.1 Disk Drive Upgrades

Description

Drives use disks. Disk drives replace the floppy and cartridge drives previously supplied with the Universal Stations.

References

Refer to the *Process Operations Manual*. It describes drive operation.

Refer to the *Universal Station Service* for disk service instructions including troubleshooting, assembly, disassembly, and replacement parts.

Refer to the *Universal Work Station Installation, Operation, and Service* for drive service instructions including troubleshooting, assembly, disassembly, and replacement parts.

Refer to the *Network Data Entry*. It provides on-line reconfiguration instructions.

Refer to *LCN System Installation*. It describes the emplacement of cabling of the drive(s).

Refer to *LCN System Checkout*. It describes equipment checkout, application of power, and validation of the drive(s).

How to install the enhancement

Follow the instructions that come with the kit(s).

Under LCN NODES, select this US and enter the number(s) for the disk drive(s). If this US had floppy drives, delete those numbers.

To perform startup, follow the instructions on the on-line reconfiguration displays and refer to *Network Data Entry*.

How to take out the enhancement(s)

Reverse the kit instructions to remove the drives and, if you wish, re-install the cartridge or floppy drives. If you reinstalled floppy drives, you must reconfigure for this US under LCN Nodes to delete the drive number(s) and reenter the floppy drive number(s). If you do not go back to floppies and leave a drive number configured, that drive will appear to be out of service.

28.2.6.2 Improved Display Screen Upgrades

Description

Improved display resolution and improved cursor performance can be attained by upgrading a Universal Station or a Universal Workstation with a non-interlaced-scanning display monitor and the EPDG and EPDG-I/O boards.

References

While installing a US kit, check the installation instructions packed with the kit. Also refer to *Universal Station Service*.

While installing a UWS kit, check the installation instructions packed with the kit. Also refer to *Universal Work Station Installation, Operation, and Service.*

These publications provide service instructions, including board placement and parts information.

How to install the enhancement

Follow the kit instructions that are packed with the kit.

No software changes or configuration changes are required.

Use another US (or UWS) to restart (reload) this US, or if another US is not available, reload (bootload) this US by itself. See the *Operator's Digest* (the pocket guide) for these procedures.

How to take out the enhancement

Reverse the kit instructions and use another US or UWS to restart (reload) this US, or if another US is not available, reload (bootload) this US by itself.

28.2.6.3 Enhanced Processor or Memory Upgrades

Description

Enhanced Universal Stations and Universal Workstations contain the Motorola 68040-based microprocessor that adds speed and performance to older TPS systems. In addition, these boards contain the added memory required by newer software releases:

- USs and UWSs using releases up to and including R230 require 2 Mw of memory.
- USs and UWSs using releases from R300 to R410 require 3 Mw of memory.
- The Universal Personality through the R400 series requires the larger 4 Mw of memory.
- The Operator Personality for R500 requires 4 Mw of memory.
- The Universal Personality for R500 requires 6 Mw of memory.

There are also some kits which add only memory to earlier versions of the standard (68020) Universal Stations and Workstations.

References

See Section 7 of this manual for instructions for configuring volume sizes.

If an LCN has both an enhanced (68040) and a standard (68020) US, the Personality Image volume must be made larger, because two versions of the US image will be present (see Table 7-9).

Refer to the *Universal Station Service* for service instructions, including board placement and parts information.

How to install the microprocessor enhancement

In VOLUME CONFIGURATION, under PROGRAM IMAGE for this US, select `US IV` [`US IV` indicates an enhanced (68040) US and `US II` indicates a standard 68020 US].

To startup, follow the reconfiguration instructions on the Network Configuration displays and refer to *Network Data Entry*.

How to take out the enhancement

Reinstall the original boards. If Volume Configuration has been changed, reconfigure under `PROGRAM IMAGE` to change from `US IV` back to `US II`.

28.2.6.4 Printer Enhancement Upgrades

Description

The ASPI 46 Printer is a 400 cps (characters per second) high-speed replacement for the standard 150 cps matrix printer (ASPI 32 or ASPI 41). It plugs into the same connector as the standard printer and requires no software changes.

Hardware required

ASPI 46 Printer. No kit is required.

References

Refer to the *Process Operations Manual*. It describes printer operation, ribbon replacement, and paper replacement.

Refer to the *Universal Station Service* for printer service instructions including troubleshooting, assembly, disassembly, and replacement parts.

Refer to the *Network Data Entry*. It provides on-line reconfiguration instructions, should they be needed (see "Network Configuration," below).

Refer to *LCN System Installation*. It describes the emplacement, cabling, and application of power to the printer.

Refer to *LCN System Checkout*. It describes equipment checkout, application of power, and validation of the ASPI 46 printer.

How to install the enhancement

Connect the printer to the printer port on a Universal Station or Workstation (refer to Appendix A in *LCN System Installation*).

- If there was no printer on this US, under LCN NODES, select this US and enter the printer number.
- If Network Configuration was not changed, start up by just applying power to the printer (refer to the *Process Operations Manual* for operating instructions).
- If Network Configuration was changed, see *Network Data Entry* for instructions about on-line reconfiguration displays.

How to take out the enhancement

Remove the ASPI 46 printer, and if you wish, replace it with the old printer. If Network Configuration was changed, and is not changed back, a missing printer will appear to be out of service. Use on-line reconfiguration to change the printer number back to blank.

28.2.6.5 Touch Screen Upgrade

Description

A touchscreen can be installed in a US in the upper tier of a console. This touchscreen is the improved “smart frame” type.

References

Refer to the *Process Operations Manual*. It describes touchscreen operation.

Refer to the *Universal Station Service* for touchscreen service instructions including troubleshooting, assembly, disassembly, and replacement parts.

Refer to the *Network Data Entry*. It provides on-line reconfiguration instructions.

How to install the enhancement

If this US had no touchscreen, under LCN NODES, select this US and select YES under TOUCH SCREEN.

If Network Configuration was changed, startup following the instructions on the on-line reconfiguration displays and refer to *Network Data Entry*.

Otherwise, apply power and startup the US through the Console Status display at another US.

How to take out the enhancement

Reverse the kit instructions to remove the touch screen. If Network Configuration was changed, reconfigure to select NO under TOUCH SCREEN.

28.2.6.6 Keylock Switch Replacement Upgrade

Description	An older keylock switch can be replaced with a more secure keylock.
References	Refer to the *Universal Station Service* for service instructions including troubleshooting, assembly, disassembly, and replacement parts.
How to install the enhancement	Follow the kit instructions. No configuration changes are required.
How to take out the enhancement	No scheme to take out the enhancement is offered.

28.2.6.7 Keyboard Addition Upgrades

Description

The R300 (and later) software release supports use of the Universal Personality, which allows both the Supervisor's Keyboard and the Engineer's Keyboard to be used at the same time. These kits provide for either the Engineer's or Supervisor's keyboard to be added to a Universal Workstation

They can be installed only on the Universal Workstation.

References

Refer to the *Process Operations Manual*. It describes proper operation.

Refer to the *Universal Work Station Installation, Operation, and Service* for service instructions including troubleshooting, assembly, disassembly, and replacement parts.

How to install the upgrade

Follow the instructions that come with the kit.

Restart the node using the *Process Operations Manual*, if necessary.

How to take out the enhancement

Reverse the kit instructions to return to a single keyboard.

28.2.7 HM Upgrades

Description

History Modules that are to run on Release 210 and later releases, including R300 and R400, must either have EMPU and EMEM boards, or they must have an HMPU, HPK2 or K2LCN microprocessor board.

The enhanced HMs use one of the higher-performance HMPU, HPK2, or K2LCN microprocessor boards. Each of these boards uses the 68020 microprocessor. The 68020-based microprocessor improves the processing rate of the HM.
HMs with Wren III disk drives and HMs with WDAs can be configured with redundant disk drives, if the HM Disk Redundancy Software Option is purchased.

The minimum HM memory and Winchester drive requirements for various software releases are:

- R210 requires a minimum of 1.5 Mw. Wren I, II, or III can be used.
- R230 requires a minimum of 1.5 Mw. Use any Wren drive or WDA.
- R300 requires a minimum of 2 Mw. Use Wren II or III or WDA.
- R400 requires a minimum of 2 Mw. Wren III or WDA can be used.
- R500 requires a minimum of 3 Mw. Wren III or WDA can be used.

References

Refer to this manual for information about the operation of redundant disk drives, configuring redundant HM disk drives, and synchronizing the drives. For information about the HM Redundancy Key File Option, refer to this manual.

See *Command Processor Operation*. It provides instructions for using commands related to HM disk redundancy: SYN, STA, and OFF. Refer to the *Network Data Entry*. It provides instructions for on-line reconfiguration that are needed to install the new configuration on the network.

For service information, see *History Module Service*. It also includes the setting for the SCSI bus address on each drive that establishes redundant-drive partners.

Startup considerations

If any type of Wren drive is being converted to one or more Wren III or WDA drives, it may be necessary to transfer the content of the HM to the new drives. Before installing the hardware kit, use the Utilities BACKUP command to store the HM content (less continuous history and journals) on removable media (disks). After the modified HM is started with the on-process personality, use the RESTORE command to return the data to the primary drive.
The HM has to be shut down to install an upgrade kit, so after the drive(s) is added, apply power to the node and drive(s). Use the Node Status display to startup the initial drive.

28.2.8 Time-Sync Upgrades for Network Interface Module

Description

Network Interface Modules (NIMs) can be upgraded to add Time-Sync capability.

References

Refer to the *Universal Control Network Guidelines*.

Refer to the *Process Operations Manual*. It describes proper operation.

How to install the upgrade

Follow the instructions that come with the kit. Restart the node using the *Process Operations Manual*, if necessary.

28.2.9 Precision Clock Sources

Description

A precision clock source is added to the LCN when more accurate time keeping is required than may be available with the standard power-line-frequency clock source.

This option is used where there is inadequate accuracy in the frequency of the ac power source.

References

The Installation Instructions that are included in the hardware kits. Refer to *LCN Guidelines - Implementation, Troubleshooting, and Service* for additional clock source information.

How to install the enhancement

Follow the instructions provided. To startup, reapply power and startup the clock-source node using the appropriate Node Status display.

How to take out the enhancement

Reverse the kit instructions and reload and restart the clock-source node using the appropriate Node Status display.

28.2.10 Process Manager to Advanced Process Manager Upgrades

Description

Kits are available to upgrade a Process Manager to an Advanced Process Manager.

References

Refer to *Process Manager/Advanced Process Manager Service*.

Refer to *Process Manager/Advanced Process Manager Checkout*.

Refer to the *Process Operations Manual*. It describes proper operation.

How to install the upgrade

The Process Manager you are upgrading must be at software release R300 or later.

Follow the installation instructions packed with the kit.

How to take out the enhancement

Reverse the kit instructions.

28.2.11 LCN Extender

Description

The LCN Extender (LCNE or XLCNE2) is a hardware module that is installed in selected nodes to allow two nodes to be separated by a fiber optic LCN. Coaxial cable LCNs can be up to 300 meters in length and fiber-optic LCN segments can be up to 8000 meters in length.

References

Refer to *LCN Guidelines - Implementation, Troubleshooting, and Service*. It defines where the LCN Extenders (LCNEs or XLCNE2s) are installed and how the fiber-optic cables are connected.

How to install the enhancement

Refer to *LCN Guidelines - Implementation, Troubleshooting, and Service* for installation information.

After installing the LCNE or XLCNE2 boards in the appropriate nodes, reapply power and use the appropriate Node Status Display to reload and restart each node.

How to take out the enhancement

Remove the LCNE and XLCNE2 boards from the nodes, reconnect (if that is possible) and properly terminate the coaxial cables using the appropriate Node Status Display to reload and restart each node.

28.2.12 Micro TDC 3000 Upgrades

Introduction

The Micro TDC 3000 system is available in two sizes:

- The original six-node version, and
- The current-production eight-node version.

Six-node Micro TDC 3000

The six-node Micro TDC 3000 system is delivered in two configurations:

- Version A, consisting of two electronics towers, each capable of holding three LCN nodes. There is a single power supply in each tower. A single 14” CRT monitor is supplied along with four nodes:
  - Universal Station
  - Application Module
  - Network Interface Module
  - History Module
- Version B, which includes the same towers, components and nodes of Version A, plus an additional 14” CRT monitor and Universal Station node.

Optional nodes may be added to either version to include a total maximum of six nodes per Micro TDC 3000.

Eight-node Micro TDC 3000

The eight-node Micro TDC 3000 system is also delivered in two configurations:

- Version A, consisting of two electronics towers, each capable of holding four LCN nodes. There is a single power supply in each tower. A single 20” CRT monitor is supplied along with four LCN nodes:
  - Universal Station
  - Application Module
  - Network Interface Module
  - History Module

Eight-node Micro TDC 3000, continued

- Version B, which includes the same towers, components and nodes of Version A, plus an additional 20” CRT monitor and Universal Station node.

Optional nodes may be added to either version to include a total maximum of eight nodes per Micro TDC 3000.

Description

Upgrade kits are available for either the six-node or eight-node types. The kits allow you to change from Version A to Version B, add a keyboard, and achieve full TPS system status by placing each node on its own power supply.

LCN restrictions removed

Micro TDC 3000 units that have been upgraded to full TPS system status need not be restricted to the six or eight node maximum systems.

References

Refer to *Micro TDC 3000 User’s Manual* for installation and service information. Also refer to *Multinode Module Service* for specific service information on the special 10-slot module used in the Micro TDC system.

How to install the enhancement

Follow the kit instructions.

If configuration changes are required, refer to *Network Data Entry* for on-line reconfiguration instructions.

How to take out the enhancement

No scheme to take out the enhancement is offered.

Section 29 – LCN Cable Diagnosis

29.0 Reserved

In earlier versions of this manual, this section contained information about **LCN Cable Diagnosis**. Refer to *LCN Guidelines - Implementation, Troubleshooting, and Service* for that information. This section has been retained to direct users familiar with an earlier version of this manual to the new location of the information and to preserve the validity of references to other sections of this manual.

Section 30 – Event-Initiated Reports—Implementation and Use

30.0 Overview

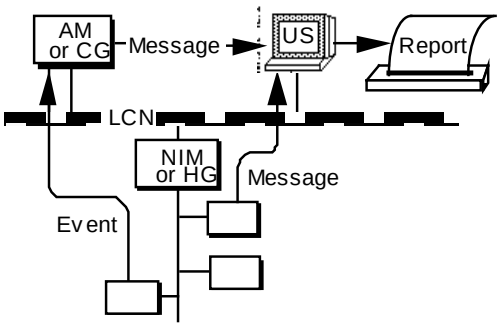
Introduction

This section describes the implementation and use of event-initiated printed reports.

Description

An Event-Initiated Report is a printed report that is initiated by a message from a user-written program to one or more Universal Stations.

It is the user-written program that detects the event that initiates printing of the report.



Event-Initiated Reports can also be directed to files on a History Module or removable media. For more information, see Report to Output File section of this manual.

How is the report initiated?

One way that a program could be notified of an event is through the event-initiated processing (EIP) function that is available through the EIP-related parameters in most HG points and in NIM digital points (see *System Control Functions*).

30.1 Implementation of Event-Initiated Reports

Introduction

Any user-written program can send a message that initiates an Event-Initiated Report, including:

- Advanced Control Programs (ACPs) in upper-level processors connected to a CG
- CL programs in AMs
- Sequence programs in APMs, PMs and MCs

Classes of reports

There are two classes of Event-Initiated Reports:

- Area Reports from logs, reports, journals, and trends configured in the Area Database
- Event History Reports

Message sending capabilities

Characteristics of message-sending capabilities of AMs, APMs, CGs, and PMs/MCs that you should consider as you implement event-initiated reports are found later in this section. Other important information can be found in the following publications.

References

For more detailed information:

- See the *Control Language/Multifunction Controller Reference Manual*
- See the *Control Language/Application Module Reference Manual*
- See the *Control Language/Process Manager Reference Manual*
- See the *Control Language/Advanced Process Manager Reference Manual*
- See the *Computer Gateway User Manual*

30.1.1 Message-Source Considerations

Introduction

The following is a summary of the characteristics of message-sending capabilities of AMs, APMs, CGs, and PMs/MCs that you should consider as you implement event-initiated reports.

Messages from AMs

The messages from AMs consist of up to 16 individual message items of various types. Maximum string length is 64 characters.

Messages from APMs

There is no maximum message item length from APMs, but the total string length is limited to 60 characters if the destination is a CRT or 71 characters if the destination is the LOG.

Messages from CGs

The messages from CGs originate in the upper-level processor as complete strings of up to 120 characters.

Messages from PMs, MCs

The messages from PMs and MCs consist of up to seven individual message items of various types. Message items are limited to eight characters or less. For example, “Error has occurred”.
This means that not all of the event-initiated message options can be used in one message, but you can use the “=” and “,” separators to reduce the number of items (see the Operation of Event-Initiated Reports section that follows).

In addition, PMs and MCs cannot handle variable time arguments. They must use the `$RMINS` or `$RSECS` options to specify time for event-history retrievals.

Use of separators with message items

In the following message descriptions, spaces are shown as separators between options and option components. “=” and “,” can also be used as separators. For messages from PMs and MCs, this is important because of the seven message item limit. For example, `$AREA 05` (two message items) could be written `$AREA=05` (one message item), and `ALM UNT A1 A2 A3` (five message items) could be written `ALM,UNT A1,A2,A3` (two message items).

30.1.2 Area Reports

Introduction

Any log, report, journal, and trend configured in the Area Database can be initiated by an Area Report.

Reference

See *Area Form Instructions*.

Area Report message form

Initiate the report by sending a message in this form:

"$OUT_RPT <rprtname> $AREA an $CONS cn $CONF parname (ix)"

Where <rprtname> is a name found in the left-most field of the Report/Log/Trend/Journal menu that is called up through the System Menu.

The other fields are optional and can be in any order. The meaning of these fields is as described below.

$AREA an and $CONS cn

The unit that contains a data point sending the message determines which US receives the CL message. For each combination of an area that contains the unit and a console, the system tries to print the specified report. The $AREA an and $CONS cn options provide a way to eliminate multiple attempts to print the report.

In other words, if two stations in a console have different areas, with each area containing the designated unit, then the area report will print twice. This also holds true if virtual printers are used. If three areas in a console have the same unit, the area report will print three times.

Table 30-1 $AREA and $CONS Information

IF…	THEN the unit…
$AREA an is used	Selects the area numbered "an." This is useful if the unit where the message originates is assigned to more than one area.
$CONS cn is used	Selects the console numbered "cn." This is useful if the area is assigned to more than one console.

If the unit is not assigned to the specified area or the area is not on the specified console, no report is printed.

$CONF parname (ix)

Specifies confirmation of completion of the printing of this report by storing a real number of 1.0 or 2.0 in parameter parname(ix).
The parname field contains the name of a parameter (usually a CDS parameter in the point to which this CL block is attached) and (ix) contains an optional index to an array-value in this parameter. This field can be used by the user-written program to determine when printing of the report is finished. The user-written program is expected to place 0.0 in the named parameter before the message is sent and then to check for a nonzero number placed there by the Report Manager when printing is finished.

1.0 means "successful completion." 2.0 means "unsuccessful completion," because the printer could not print or could not complete printing of the report.

Sending an area-report from a CL program

To send an area-report message from a CL program (CL/AM, CL/PM, or CL/MC) use a statement like this:

```
SEND:  "$OUT_RPT  FFL1  <options, if any>"
```

Note the use of quotation marks around the message.

Sending an area-report from a user program

To send an area-report message from a user program in a computer or computing module connected to a CG, use the computer's or computing module's Send Message function.
These functions are described in the indicated paragraphs in the following publications:

- See the *Computer Gateway User Manual*
- See the *Processor Gateway User Manual*
- See the *CM50S User Manual*

In R210, it was necessary to have the Real-Time Journal enabled to print these reports. This is no longer necessary.

Why specify an area and console number?

If your message does not specify an area and a console number, the system tries to print the report at an appropriate US. An appropriate US is any US that has the point's unit sending the message assigned to its area database. If that US does not have the report in its area database, it issues a “report not found” message.

You can avoid this by specifying the area and the console.

The following is an example of a CL block with a SEND message that specifies an area and console number:

```
SEND: “$OUT_RPT FFL941 $AREA 01 $CONS 06 $CONF STATUS(1)”
```

This prints Free Format Log FFL941 in Area 01 at console 06. It prints on the printer specified for FFL941 under the System Menu.

30.1.3 Event History Reports

Introduction

Any of the reports available through the Event History Retrieval display (called up through the System Menu) can be initiated by an Event History Report.

Event History Report form

Initiate the report by sending a message in this form:

"$OUT_EHR rpt item <date & time> <options, if any>"

The parameter rpt is the type of report.

The item parameter defines the items to be included in the report and item qualifiers.

rpt is defined as follows:

ALM = process alarms, item must be UNT, MOD, or PNT.
MSG = operator messages, item must be UNT, MOD, or PNT.
CHG = process changes, item must be UNT, MOD, or PNT.
SOE = sequence of events, item must be UNT.
STS = system status, item must be HBX, HWY, ABX, NOD, or ALL.
MNT = system maintenance, item must be HBX, HWY, ABX, NOD, or ALL.
ERR = system errors, item must be HBX, HWY, ABX, NOD, NOD, or ALL.
ENGR = engineer changes, item must be NOD or ALL.

The remaining parameters of the report are listed and defined below.

The "item" parameter

The item parameter defines the items to be included in the report and item qualifiers, as follows:

Table 30-2 The Item Parameter

Parameter	Definition
UNT uu uu	Defines the units whose data is to be included in the report, and uu is the unit ID. There can be up to eight uu unit IDs. The unit IDs have to be assigned to the Area Data Base.
PNT ptname	Defines the points to be included in the report and ptname is a point name. There can be up to eight point names.
MOD modname	Defines the process modules to be included in the report. Modname is a process-module point name. There can be up to 8 modname process-module point names.
HBX hn bn bn	Defines the process network, and boxes on that network, whose data is to be included in the report. hn is the process network (hiway or UCN) number (1 through 20), and bn is the number of a box on that network. There can be up to eight bn box numbers.
HWY hn	Defines the process network whose data is to be included in the report, and hn is the process network (hiway or UCN) number (1 through 20).
ABX	Specifies that data for all boxes on all process networks be included in the report.
NOD nn nn	Defines the nodes whose data is to be included in the report, and nn is a node number. There can be up to eight nn node numbers.
ALL	Specifies that all data of the type indicated by rpt is to be included in the report.

The <date & time> parameter

The `<date & time>` parameter defines the time interval whose data is included in the report. Use one of these methods to define the time interval:

Table 30-3 Date and Time Parameter

Parameter	Definition
`$ATIME Beg_time End_time`	Defines the absolute values of the start date and time, and then the stop date and time. Specify these as a dd MMM yy hh:mm:ss character string, or as a Time variable in seconds, where MMM is JAN, FEB, and so on.
`$RMINS ttttt`	Defines the time in minutes before the time this message is sent that is the start of the report's interval. The time this message is sent is the end of the report's time interval. ttttt designates minutes and must be an integer. This integer defines how far back in history the report should cover. For example, if you use $RMINS 1440, the report includes the last 1440 minutes (24 hours) of history reports The report's end time is the time the report was requested. The report's start and stop times are established at the time the CL SEND: statement is executed.
`$RSECS ttttt`	Defines the time in seconds before the time this message is sent that is the start of the report's interval. The time this message is sent is the end of the report's time interval. ttttt designates seconds and must be an integer. This integer defines how far back in history the report should cover. For example, if you use $SECS 3600, the report includes the last 3600 seconds (1 hour) of history. The report's end time is the time the report was requested. The report's start and stop times are established at the time the CL SEND: statement is executed.
`$IMINS date_time ttttt`	Defines the report interval time as a start time and date, followed by an interval time in minutes. Specify date_time as a dd mmm yy hh:mm:ss character string. ttttt is a value (string, real, or integer) of up to five digits, in a range from 0 to 32767 minutes (32767 minutes = 546.12 hours); or it can be a time value of up to 24 hours (an hh:mm:ss character string or an LCN time type).
`$ISECS date_time ttttt`	Defines the report interval time as a start time and date, followed by an interval time in seconds. Specify date_time as a dd mmm yy hr:mm:ss character string, or as a TIME variable. Here, ttttt is a value (string, real, or integer) of up to five digits, in a range from 0 to 32767 seconds (32767 seconds = 546.12 minutes = 9.1 hours); or it can be a time value of up to 24 hours (an hh:mm:ss character string or an LCN time type).

30.1.3 Event History Reports, Continued

The <options, if any> parameter

This entry represents the options

- $AREA an
- $CONS cn
- $CONF parname (ix)

which were defined for Area Reports, the section above. In addition, the option $PTR pn may be entered, where pn is the number of the printer on the console where the report is to be printed.

Sending an Event History Report from a CL program

The following is the general form of a CL statement that sends an event-history report (64 characters max.):

```
SEND: "$OUT_EHR rpt item <date & time> <options, if any>"
```

Sending an Event History Report from a CL program, continued

Following is an example of an AM/CL block that sends out an alarm report on PM point TIC21841 to printer 1:

```
BLOCK REPORT(POINT REPORT; AT GENERAL)
SEND: "$OUT_EHR ALM PNT TIC21841 $ATIME $PTR 1"
```

Following is an example of an AM/CL block that prints process alarms for the 1st 18 minutes of the hour starting at 9:00 a.m., Sept. 16, 1993:

```
PACKAGE

CUSTOM
PARAMETER STATUS: NUMBER ARRAY(1..5)
END CUSTOM

BLOCK REPORT (POINT REPORT; AT BACKGRND)
SET STATUS(1) = 0.0
SEND: “$OUT_EHR ALM UNT 01 $IMINS 16 SEP 93 09:00:00 18 $CONS
1 $PTR 1”
END REPORT
END PACKAGE
```

Following is an example where the CL block prints process alarms for 70 minutes in the past hour relative to now (present time).

```
PACKAGE

CUSTOM
PARAMETER STATUS: NUMBER ARRAY(1..5)
END CUSTOM

BLOCK REPORT (POINT REPORT; AT BACKGRND)
SET STATUS(1) = 0.0
SEND: “$OUT_EHR ALM UNT 01 $RMINS 70 $CONS 1 $PTR 1”
END REPORT
END PACKAGE
```

Sending an Event History Report from a user program

To send an area-report message from a user program in a computer or computing module connected to a CG, use the computer's or computing module's Send Message function.

These functions are described in the following publications:

- *CM50S User Manual*
- *Processor Gateway User Manual*
- *CG User Manual*

30.2 Operation of Event-Initiated Reports

Introduction

Because Event-Initiated Reports are initiated by user-written programs, the tasks of operators at a console are unaffected by this function, except that the printers must be kept supplied with paper and ribbons, and must be on-line, ready to print the reports.

Operator interaction

It is possible to prepare a user-written program that initiates such a report after interaction with an operator and, in such a case, a local operating procedure would likely be developed.

R210 stipulation

In R210, it was necessary to enable the Real-Time Journal for Event-Initiated Reports to function. This is no longer necessary.

Message constraints

In addition to causing the specified report or log to be printed, the messages described here are distributed as normal CL messages. These messages may be subjected to the following constraints:

- Message displays and the Real-Time Journal may truncate the ends of these messages because of message-width limitations.
- Time variables are displayed and printed only with the time component. The date is not included.

30.2.1 Error Handling

Introduction

Error handling varies according to how far the message progressed toward the actual printing of the report or log, as defined for the following cases.

Report successfully delivered

If the specified report is successfully delivered to a printer, the confirmation parameter value (if one is specified) changes to 1 (refer to the `$CONF parname(ix)` parameter in the Area Reports section).

CL SEND statement errors

Any errors that occur as a CL SEND statement is executed are described in the Real Time Journal and in Operator Messages in the Event History Menu, which you will find under the System Menu.

Printer fails

If the printer fails, the confirmation parameter value (if one is specified) changes to 2 (refer to 30.1.1, the `$CONF parname(ix)` parameter).

Message errors

If a receiving area or console cannot interpret the arguments of a report request, a “synthetic” CL message is built as an error message. These messages report errors such as argument-syntax errors and report names not found in the Area Database.

No error reported

In some cases, a US cannot detect that an Event-Initiated Report has been sent to it, so no error can be reported. These cases include the following:

- Misspelled `$OUT_RPT` or `$OUT_EHR` character strings.
- The unit to which the message-originating point belongs is not assigned to the specified area.
- The specified area is not assigned to the specified console.
- The specified printer number is not that of a printer on the specified console.

Section 31 – Custom Software Backplane and Generic Overlays

31.0 Overview

Introduction

The Custom Software Backplane is a provision that allows the addition of optional, standard, and custom software modules to a node without modifying the node's original personality software.

Such software modules are loaded and linked to personality software. This is somewhat analogous to plugging a circuit board into a hardware backplane where it is able to access functions provided by the backplane.

Benefits

A significant benefit of this software is that it allows a new function to be added to an LCN node after it is installed and operational. Other benefits include:

- Installation of functions independent of standard software release schedules.
- Extra software logic does not encumber a node if it is not needed.
- Memory savings because this approach produces a software module typically smaller than personality software.

31.1 Custom Software Installation

Introduction

When a optional, standard, or custom software module is to be included in a system, the documentation that comes with that module provides detailed information about how the module is incorporated into the system. This is necessary because the module may be created long after the main system is installed and standard LCN or UCN documentation cannot anticipate what the new functionality might be.

If custom software is being added to the AM, because of CL extension and memory management considerations, directory NET>&CLX must be accessed as well. See the *Application Module Implementation Guidelines* for further information on adding custom software to the AM.

The remaining instructions in this section will assist you in installing optional, standard, or custom software modules in nodes other than the AM.

Installation steps

The following is a brief summary of the typical installation steps. If there are conflicts between these steps and the specific instructions supplied with your custom software, follow the specific instructions.

Table 31-1 Installation Steps

Step	Action
1	Have the software modules available on removable media (disks).
2	Using the Create Directory (CD) command, create the NET>&CUS directory on your HM if one does not already exist. Refer to *Command Processor Operation*.
3	Copy the software module files (with .LO file extensions) from your distribution media to the NET>&CUS directory.
4	Configure the node that the custom software will be used on. Declare module names, specify additional memory if required, and keep external directives set to the NO default.
5	Check and install the new NCF.
6	Shut down and reload the node just configured, using the new NCF.

Additional information about phases of a custom software installation is contained in the sections to follow.

31.1.1 The NET>&CUS Directory

Allocating space for the NET>&CUS directory

All custom software modules will be transferred from distribution media to the NET>&CUS directory on the History Module. If this directory does not exist, you must allocate space for it on the HM.

Estimating space for the &CUS directory

You must estimate the space needed for the &CUS directory.

Use the Utilities List File attributes command (see *Command Processor Operation*) to list the software module files (.LO files) on the Honeywell-provided distribution media. From the list, determine the total number of sectors used by all files with a .LO extension. Use this formula to determine the total space needed:

[464 + (# of sectors used by .LO files)] / 4 = Total in KB

The result is the minimum space in kilobytes required to store your custom software in the NET>&CUS directory on the History Module.

31.1.2 Using the LCN Node Configuration Menu

Introduction

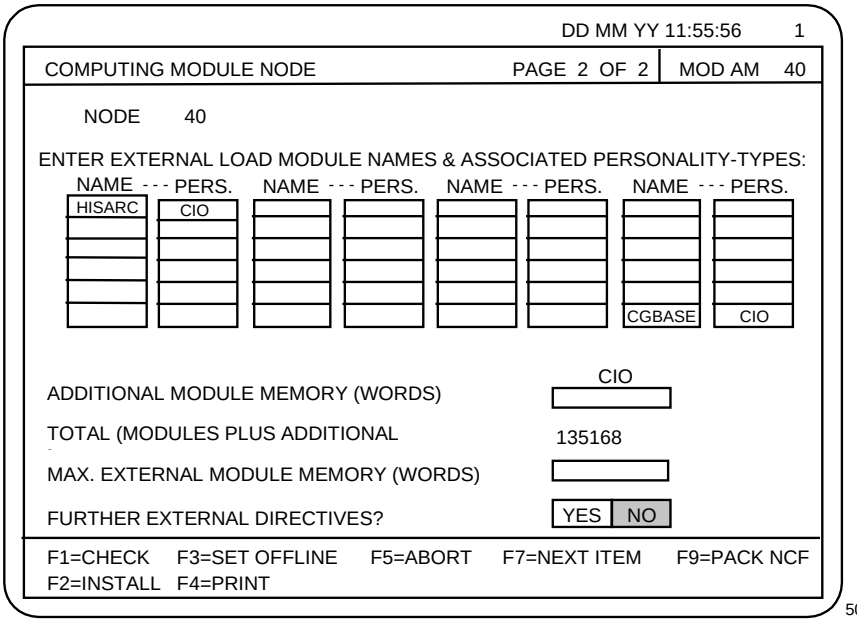
Space for custom software is allocated by selecting parameters on Page 2 of the LCN Node Configuration Menu. This section explains it.

Finding the LCN Node Configuration Menu

From the Engineering Main Menu, select LCN NODES to reach page 1 of the Node Configuration display. Then use the keys labeled [PAGE FWD] or [PAGE BACK], as necessary, to find the desired node.
If you are adding a node not yet known to the NCF, you can enter the appropriate data on any page of the Node Configuration display.

Once the desired node is found, select MODIFY NODE to get to Page 2. An example of the page is shown below:

Figure 31-1 LCN Node Configuration Menu



In the sections that follow, each selection on this page is described.

Specifying custom software to be installed

Key in the names of the custom software modules to be added. You must also key in the personality name for each module if the default has not been specified.
If a module name is entered for a module that depends on another module, the second module will also appear in the menu boxes.

ADDITIONAL MODULE MEMORY selection

This field entry lets you reserve more memory words than are required for the module code. This feature is rarely used because most programs dynamically allocate memory space from the system heap memory.

Unless your custom module documentation states otherwise, leave this value set to zero.

Calculating total memory

After you have keyed in all the names of all the modules, press [ENTER] and the configurator calculates the amount of memory required.
At this time, the configurator checks for modules that depend on modules you have named and adds them to the list.

The configurator then actually reads the header of each custom module file and sums the total memory required.

MAXIMUM EXTERNAL MODULE MEMORY selection

Enter in the MAXIMUM EXTERNAL MODULE MEMORY field the actual amount of memory you want allocated. In most cases, this will be the same as the total size estimated above.

If you anticipate an increase in the size of a custom module (such as, while doing software development), you can increase this number. You *must* enter a value in this field for the software to load properly.

FURTHER EXTERNAL DIRECTIVES selection

Unless your custom module documentation states otherwise, always leave this selection at NO .

31.2 Generic Overlays

Introduction

Overlays provide a capability for table-driven generation of pictures and CL sequences based on equipment lists and a generic source. This function enhances the system's effectiveness and friendliness for batch applications, and provides a useful tool for any application. Generic Overlays can be used only by the Engineer's personality and the Universal personality in the Universal Station.

Although similar to them, they function a little differently from the custom software modules. Generic overlays are very simple to add to the system.

Differences

The following table illustrates the differences between custom software files and generic overlay files:

Table 31-2 Custom Software versus Generic Overlay Differences

Function	Custom Software	Generic Overlay
Directory	NET>&CUS	NET>&OVG
File Extension	.LO	.OV

Actually, generic overlay files may be loaded from any directory declared in the modify path menu. However, we strongly recommend you use the NET>&OVG directory path.

Incorporating and invoking a new generic overlay

Simply follow these steps to incorporate a new generic overlay:

Table 31-3 Procedure to Incorporate a New Generic Overlay

Step	Action
1	Copy the files with .OV extensions from the distribution media to the NET>&OVG directory (recommended).
2	Select SUPPORT UTILITIES from the Engineering Main Menu, then select MODIFY VOLUME PATHS to check that the path to the .OV files is set correctly. Correct the path if necessary.
3	Now select COMMAND PROCESSOR from the Engineering Main Menu and invoke the overlay by simply typing its name. No node configuration or other setup is required.

Section 32 – Report to Output File

32.0 Overview

Description

The Report to Output File feature provides a means of saving reports and journals electronically. They are:

- Saved on either the History Module or on removable media, and
- Displayed or printed as requested from schematics or the Command Processor display.

How is it done?

The feature is implemented by using a virtual printer. The system "thinks" it is writing to a printer, but the output is diverted to a file in a volume on electronic storage media.

How the data is routed to various output files is established by the user with a virtual printer configuration file. In this file, the user not only establishes the filenames and paths, but also indicates how errors are handled.

Exceptions

The Report to Output function does not apply to

- Printed Trends or
- Real-Time Journals.

32.1 Virtual Printer Assignments

What "assigning" a virtual printer means

Unlike physical printers, virtual printers are actually files on a history module or a removable medium. They are not physically connected to a console or to a Universal Station. Assignment of a virtual printer is just a way of representing the US on which a virtual printer's status and errors are reported (annunciated).

Typically, each US in a console operates the same Area database, so status and errors for any virtual printer are reported on only one US. If more than one Area database is used in the console, status and errors for a virtual printer are reported on the appropriate US on each Area database. This is illustrated in the examples below.

Virtual Printer assignment

Physical printers are assigned on a system using numbers from 1 to 10. Virtual printers are numbered in the range from 11 to 30. Universal Stations on a console have numbers from 1 to 10.

In a console with a one area, the lowest numbered US (not a node number) on a console, the system assigns virtual printer (VP) number 11. The next higher numbered US is assigned 12, then assignment continues until all 20 virtual printers have been assigned.

NOTE: Only stations with operator personalities or universal personalities are assigned virtual printers.

One-area example

Perhaps an example will better illustrate the printer assignments.

In our example, let's say three stations within a console are using either Operator Personality or Universal Personality. The node numbers assigned to those Universal Stations are 34, 35, and 36, but their station numbers are 1, 5, and 7—not necessarily in the same order. Table 32-1 shows the node numbers and their corresponding station numbers.

Notice all 20 virtual printer numbers are assigned in sequence from the lowest station number to highest station number, regardless of each US's node number or the node number's order.

Also note all stations may not necessarily be assigned the same number of virtual printers. In the example, station number 7 has only 6 virtual printers assigned.

Table 32-1 Virtual Printer Assignment One Area Example

US Node Number	Station Number	Virtual Printer Number Assignments						
36	**1**	11	14	17	20	23	26	29
34	**5**	12	15	18	21	24	27	30
35	**7**	13	16	19	22	25	28	

Two-area example

In a console with four USs,

- two USs are loaded with Area 1, and
- two USs are loaded with Area 2.

Table 32-2 shows the virtual printer assignments.

Table 32-2 Virtual Printer Assignment Two Area Example

Station Number	Console Virtual Printer Assignments (two different areas in the console)									
1 (Area 1)	11	13	15	17	19	21	23	25	27	29
2 (Area 1)	12	14	16	18	20	22	24	26	28	30
3 (Area 2)	11	13	15	17	19	21	23	25	27	29
4 (Area 2)	12	14	16	18	20	22	24	26	28	30

Status changes and errors for Area 1 reports output to virtual printer 12 are reported (annunciated) on station 2.
Status changes and errors for Area 2 reports output to virtual printer 12 are reported (annunciated) on station 4.

32.2 Setting Up a Configuration File

Introduction

You must build a configuration file to define virtual printers. The Command Processor editor (ED) is used to build the configuration file.

Naming the configuration file

Only one configuration file per console is allowed and the file must be named:

```
VPCONFnn.XX
```

Where:

- nn is the two digit console number from 01 to 10.
- The file extension must be XX.
- The file must be saved in the &ASY directory.

Activating the virtual printers

After the file is established and its contents are specified, you must reload *all* the console's Universal Stations running operator or universal personality for the virtual printers to become effective.

Contents of a configuration file

The contents of the configuration file are records defining the VP (virtual printer) number and its options. A report is usually written to a VP that has been set up just for it.

Constructing the configuration file

Build each configuration record in the configuration file as follows:

```
VP: PATH>FILENAME.XT FO FO ERROR
```

The parameters in each record are explained below.

VP

The virtual printer number from 11 through 30.

PATH

If you are sending your data to the HM, use the path
NET>VDIR

If data is being sent to removable media, use the path
$Fn>VDIR

Note, however, that any volume or directory designation beginning with a "!" or "&" are disallowed.

FILENAME.XT

FILENAME can be up to eight valid alphanumeric or wildcard characters. The suffix (.XT) must begin with X, Y, or Z and be in either upper or lower case. It can be followed by any valid alphanumeric or wildcard character.

- WILDCARD—Each wildcard character is specified by entering a question mark (?). If one or more wildcard characters are entered, each question mark is replaced by a random numeric digit (0–9).
- VOLUME—The volume (see "PATH," above) must exist at the time a filename is created by your configuration file. A missing volume is considered an error.
- REPORT CREATION—Only a single virtual printer report is placed in a file that has been named with wildcard characters. If the file was named without wildcard characters, a new report is appended to the reports currently in the file.
- FINDING FILES—If your filename contains wildcard characters, you cannot readily determine what filenames the system assigned. Determine system-assigned names by listing your filenames after the file(s) has been used.

ERROR

This field specifies how errors are to be handled:

- If SYS is specified, the system handles errors as long as it can.
- If USER is specified, and if failover was unsuccessful or was not specified, an information screen is presented to the user so recovery options can be specified.
- If the field is left blank, the system defaults to the USER option.

See "Error Handling" in this section to review the error handling process.

FO

Each FO is a FailOver two-digit number.
This specifies the virtual printer number(s) that is used if this virtual printer number cannot be used.

- Any number of FOs, up to the maximum chain of 19, can be assigned. The VP cannot specify itself as a failover printer.
- Any real printer, numbered from 1 to 10, cannot be specified.
- Failover does not migrate from one failover chain to another. That is, if all the VPs specified in the failover chain of a certain printer fail, there is no attempt to follow any of those VPs' failover chains.
- On systems at R410 and later, failover occurs for demanded reports and reports and logs initiated by CL programs, but it does not occur for reports requested through the Organizational Summary displays.

32.3 Sending Reports to a Virtual Printer File

Sending a report

Send reports to a virtual printer in exactly the same way as you would to a physical printer. Just change the printer number you normally request, to the virtual printer number.

Specifying printer numbers

Printer numbers are specified as follows:

- On the Report/Log/Trend/Journal Menu, Event History Menu, and PV Retrieval Menu. For more information refer to the *Process Operations Manual*.
- When reports, trends, logs, and journals are defined in Area database configuration. For more information, refer to *Area Form Instructions*.

32.4 Using File Descriptors to Identify Virtual Printer Files

Introduction

File descriptors can be very helpful in identifying individual virtual printer files. You list these files using a Command Processor LS command with the File Descriptor option:

```
LS Net>VDIR>FILE.* -FD
```

When a report is stored in a virtual printer file, the system enters the following in its file descriptor:

```
|1 - 8|10-17|19 -  26|
| DATE|TIME |RPT NAME|
```

CL programs, including CL programs that send Event Initiated Reports, can enter a string of up-to-36 characters in the file descriptor by using the SEND command's $DESC option (for more information about Event Initiated Reports see Section 30 of this manual).

Entering 36-character descriptor in a CD parameter

In this example, the custom data parameter DESCSTR, is given the string content "I'M A 36-CHARACTER DESCRIPTOR STRING."

```
CUSTOM
      PARAMETER DESCSTR: STRING
      VALUE = "I'M A 36-CHARACTER DESCRIPTOR STRING"
END CUSTOM
```

Writing a file descriptor string

Then, when this CL program executes, the report SYSTATUS is written and the parameter DESCSTR is placed in the file descriptor.

```
BLOCK ROF (POINT ROFPOINT; AT GENERAL)
      SEND: "$OUT_RPT SYSTATUS $DESC DESCSTR"
END ROF
```

A file descriptor with program written string has this form:

```
|1 - 8|10-17|19 -  26|28                -               64|
| DATE|TIME |RPT NAME|I'M A 36-CHARACTER DESCRIPTOR STRING|
```

Demand-Initiated file descriptors

For Demand-Initiated reports, the date, time, and report name are written in automatically. You cannot enter a file descriptor string into these reports.

32.5 Displaying and Printing Reports

Introduction

You may use either schematics or the Command Processor to display and print reports stored in virtual printer files.

Using schematics

There are two Picture Editor actors that can be placed in a schematic. They follow the existing rules of Picture Editor format:

DSP_FILE (PATH>FILENAME)

PRT_FILE (PATH>FILENAME)

The actors `R_STR` and `R_INT` can be used with both of the above as shown in these examples:

```
DSP_FILE(R_STR(1,10,21,'ENTER PATH AND
FILENAME',TRUE,0))

PRT_FILE(R_STR(1,10,21,'ENTER PATH AND
FILENAME',TRUE,0),
        R_INT(1,12,2,'ENTER PRINTER NUMBER',TRUE,0))
```

You must know the name and path of the report.

Reference

Refer to the *Picture Editor Reference Manual* and check the following information:

`R_INT`	Read Integer Data	F.4.7
`R_STR`	Read String Data	F.4.13
	Screen regions	F.1.7
	Parameter explanation	F.6.1

Using the Command Processor

Because many of the report filenames may be generated by the system, you will probably use the LS command with the -FD option to determine which reports you want displayed.
The LS command produces a list of the file descriptors in each file. Based on the descriptor contents, you can choose which files you want displayed and printed.

After you have determined the files you want, use the regular PRINT (P or PR) command to print your report.

32.6 Status and Error Messages

Introduction

This subsection describes the status messages and error messages that are generated by virtual printer operations, and their causes. Universal Station status changes associated with the messages are also described.

For information about how the system and operators handle virtual printer errors, see 32.7.

Two classes of messages

Virtual printer operations generate these two classes of messages:

- Messages that report status changes and errors related to reports directed to a virtual printer. These messages include the phrase "REPORT_MEDIA."
- Messages that report status changes and errors related to the system interpreting (parsing) a virtual printer configuration file. These messages include the phrase "VP CONFIG."

How to see the messages

Virtual printer messages are available on the Status Detail display for the US to which the virtual printer is assigned. They are also available on the Status Notification display. The Status Detail display has only the most recent messages, while you can see all of the messages on Status Notification display.

Use the Console Status display to call up the Status Detail display. For detailed instructions, see Section 14 of the *Process Operations Manual*.

The Status Notification display is accessed through the Event History Retrieval display. For detailed instruction see Section 10 of the *Process Operations Manual*.

US status changes

The system generates two messages that are not considered as error messages and do not change the status of the assigned US. These VP CONFIG messages are:

NO ERRORS FOUND IN CONFIGURATION FILE
NO CONFIGURATION FILE FOUND

All other messages are error messages, and all of these change the US status.

- REPORT MEDIA messages change the US status to SEVERE.
- VP CONFIG messages change the US status to WARNING.

When a VP CONFIG message is generated, the Status Detail display message says:

SYNTAX ERRORS IN FILE, STATUS NOTIFICATION LOG HAS DETAILS.

When this message appears, call up the Status Notification display to see the error message(s).

REPORT MEDIA error messages

These messages are generated when a report cannot be delivered to a virtual printer. The messages explain why the operation could not be completed. For example, the following is a portion of an actual message:

OK—> SEVERE VP# $F3 VP13 SPECIFIED VOLUME IS NOT ON THE MEDIA

In this case the report was directed to drive $F3, volume VP13, virtual printer 13, but the name of the volume on the disk mounted in drive $F3 was JOHN. Because the specified volume was not found, the system could not determine if VP13 was in that volume or not, so it did not report a virtual printer number (the field after “VP#” is blank).

VP CONFIG error messages

Table 32-3 lists phrases in virtual printer configuration file error messages and the probable causes of those messages. These messages also refer to the virtual printer number or if that cannot be determined, the line number of the virtual printer record in the configuration file.

Table 32-3 VP CONFIG Error Messages

Error message Phrase	Probable Causes
While processing VP #	• Colon missing after a VP number in a configuration file record • Virtual printer number not in the range from 11 to 30 • An non-numeral used in virtual printer number
While processing comment removal	Comment delimiter missing ({ or }) or an extra opening or closing delimiter
While processing path name	• No space between ":" and the beginning of the configuration record path name • Invalid pathname syntax • Invalid device ($Fn or NET) • File name extension (suffix) that doesn't begin with X, Y, or Z
While processing fail over table	• Virtual printer number not in the range from 11 to 30 • Circular reference in a fail over table (virtual printer references itself)
While processing—unable to open file	• Incorrect configuration file name • An attempt to place a configuration file in a volume or directory other than &ASY
While processing—bad read operation	• An I/O error encountered while trying to read a file
While processing bad failover entry	• An FO field referenced a virtual printer not configured • Duplicate virtual printer numbers in a failover table
While processing media full keyword	Error field in a configuration record contains something other than SYS or USER.
While processing unexpected data	An unexpected character follows SYS or USER in a configuration record
While processing unknown area	This type of error should not occur. If it does, contact TAC or the equivalent service in your region.

32.7 Error Handling

Introduction

You may choose (see 32.3) one of two methods of error handling:
- SYStem or
- USER.

This section describes how the system handles errors when each of these methods have been specified.

SYStem error handling

If SYStem error handling has been specified, the system checks to see if the error is caused by lack of space in a file or directory. If true, the system invokes the sequences in the order shown in Table 32-4.
If the error is *not* caused by lack of file or directory space, a failover attempt is tried immediately (Table 32-5, Stage 2).

Table 32-4 SYStem Error Handling Process

Stage	IF…	THEN …
1	• There is not enough file space or • No more entries can be handled by the directory.	The system tries to make room by deleting an unprotected file in the directory. An attempt is made to dispatch the report. If successful the error process is halted. If unsuccessful, another unprotected file is deleted and the attempt is retried. After all unprotected files are deleted, the process continues…
2	• There is still not enough space.	A FailOver swap is attempted. That is… If the user has specified one or more FailOver virtual printers, the system chooses each failover virtual printer in turn in an attempt to dispatch the report. After all virtual printers in that Failover sequence are tried unsuccessfully, the error process continues.
3	• The previous attempts fail.	The system puts the US in the SEVERE state. Result: The operator must direct error handling through the USER error sequence (see "Answering a USER error" in 32.7)

USER error handling

USER error handling invokes the following sequences.

Table 32-5 USER Error Handling Process

Stage	IF…	THEN …
1	• An error occurs.	A FailOver swap is attempted. That is… If the user has specified one or more FailOver virtual printers, the system chooses each failover virtual printer in turn in an attempt to dispatch the report. After all virtual printers in that Failover sequence are tried unsuccessfully, the error process continues…
2	• The previous attempts fail.	The system puts the US in the SEVERE state Result: The operator must direct error handling through the USER error sequence (see "Answering a USER error" in 32.7)

Answering a USER error

Regardless of the error handling specified, you must manually resolve a SEVERE status problem with the following procedure.

Table 32-6 SEVERE Status Handling Procedure

Step	Action
1	Use the [CONS STATS] key to… call up the CONSOLE STATUS AND ASSIGNMENT display.
2	Select STATUS DETAIL which calls the STATUS DETAIL display.
3	Select the virtual printer status line that shows the transition to the SEVERE state.
4	Select VIEW OBJECT DETAIL The MEDIA ERROR CORRECTIONS OPTIONS display appears.
5	Select one of these options to resolve the problem: • RETRY (After you have fixed the problem) • RETRY with a different Virtual Printer • ABORT

Changing the US from SEVERE or WARNING state back to OK

To do so, you must shut down and reload the US.

We recommend that on the Status Detail display, you enter a comment for the status line (object) that notes that the error that caused the change of state has been resolved. You should also inform others who may be concerned that the error has been resolved. Instructions for entering and viewing comments are in the *Process Operations Manual*.

32.8 Purging and Protecting Virtual Printer Files

Why should virtual printer files be purged or protected?

Virtual Printer files that are no longer used should be purged from the system. If the system runs out of space, automatic error handling procedures may purge files that you don't want destroyed.

For these reasons, you should do your own "housekeeping" by protecting the files you don't want destroyed and purging the files you don't need.

Purging virtual printer files

You must use the Command Processor to manually delete the report files.

Since many of the filenames may have been generated by the system, use the LS command, then choose the files you either want to delete or save.

You can save files for future use by copying them to external media.

Protecting virtual printer files

You can avoid destroying files that you still need on the system by protecting them.

To protect files, refer to 5.24 in *Command Processor Operation*, binder TPS 3030-1.

Section 33 – Keyboard Button LED Assignment and Control

33.0 Overview

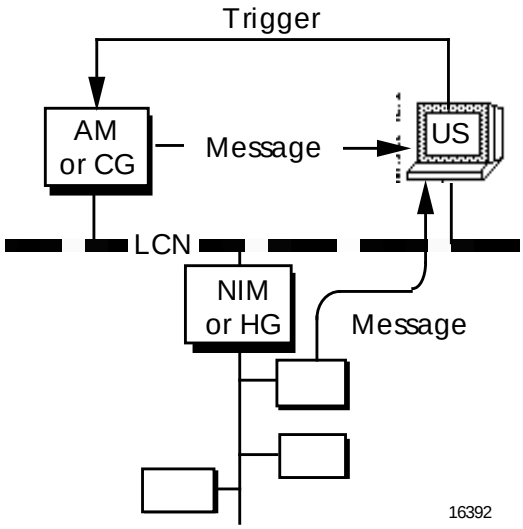
Introduction

This section describes the implementation and use of CL messages to assign primmod values to buttons and control the LEDs on the buttons.

Description

This section describes primmod assignments on specified LED buttons associated with any of the 40 configurable LED buttons to be dynamically changed for the local Universal Station.

References to LEDs are specific to the red and yellow lights visible on each of the LED buttons on the US keyboard. Each LED can be set to one of three possible states: ON, OFF, or BLINK.



How is the CL message initiated?

One way a program could be notified to send a CL message which controls the buttons is—

A schematic in a US sends a trigger value to the point containing the CL program which has a message to send.

33.1 Implementation

Introduction

Any user-written program can send a message that controls the buttons, including:

- Advanced Control Programs (ACPs) in upper-level processors connected to a CG
- CL programs in AMs
- Sequence programs in APMs, PMs, and MCs

Types of messages

There are two types of these CL messages:

- Button PRIMMOD Assignment
- Button LED Control

Message sending capabilities

Characteristics of message-sending capabilities of AMs, APMs, CGs, and PMs/MCs that you should consider as you implement these messages are found later in this section. Other important information can be found in the following publications.

References

For more detailed information:

- See the *Control Language/Multifunction Controller Reference Manual*
- See the *Control Language/Application Module Reference Manual*
- See the *Control Language/Process Manager Reference Manual*
- See the *Control Language/Advanced Process Manager Reference Manual*
- See the *Computer Gateway User Manual*
- See the *Button Configuration Data Entry*
- See the *Button Configuration Form Instructions*

33.1.1 Message-Source Considerations

Introduction

Here a summary of the characteristics of message-sending capabilities of AMs, APMs, CGs, and PMs/MCs that you should consider.

Messages from AMs

The messages from AMs consist of up to 16 individual message items of various types. Maximum string length is 64 characters.

Messages from APMs

There is no maximum message item length from APMs, but the total string length is limited to 60 characters, if the destination is a CRT, or 71 characters if the destination is the Real Time Journal.

Messages from CGs

The messages from CGs originate in the upper-level processor as complete strings of up to 120 characters.

Messages from PMs, MCs

The messages from PMs and MCs consist of up to seven individual message items of various types. Message items are limited to eight characters or less. For example, "Error has occurred."

This means that not all of the message options can be used in one message, but you can use the "=" and "," separators to reduce the number of items.

Use of separators with message items

In the following message descriptions, spaces are shown as separators between options and option components. "=" and "," can also be used as separators. For messages from PMs and MCs, this is important because of the seven message item limit.
For example, `$AREA 05` (two message items) could be written `$AREA=05` (one message item), and `ALM UNT A1 A2 A3` (five message items) could be written `ALM,UNT A1,A2,A3` (two message items).

33.1.2 Button PRIMMOD Assignment

Overview

With R520, Button Primmod Assignment permits US LED Buttons to be dynamically assigned to different primmod values by using a schematic utilizing an actor or by using a CL message. The types of CL messages which can be used include AM, MC, and PM/APM/HPM.

CL SEND statement

A predefined form of the SEND statement (see example below) allows you to assign a primmod or clear a previous assignment on a specified LED button. The message is distributed to all US nodes whose area databases contain the unit of the point to which the CL belongs. The CL message can be further filtered by console and/or area databases. The primmod is stored to lamp specific data with the LED buttons and will occur even if the lamp specific data was previously assigned with a unit id, an annunciator group, or no value. (For detailed information on the actors that can assign and read primmod names associated with the configurable buttons, see the Actors Manual)

Example of CL SEND Statement to assign Primmod

The following predefined form of the SEND statement will be recognized to allow you to assign a Primmod value to the lamp-specific data associated with a specific configurable LED button:

```
SEND:$BTN_PRM<button><Primmod>$AREA=aa$CONS=bb $CLEAR
$BYPASS
```

Where:

`$BTN_PRM` is a keyword that must be specified;
`<button>` symbolic button name that is a string of 1..8 characters;
`<Primmod>` Primmod name that is a string of 1..16 characters (except for PM & MC);

Example of CL SEND Statement to assign Primmod , continued

$AREA is an option that allows you to specify a particular area;
aa must be specified with the $AREA option and is a valid area number from 1..10;
$CONS is an option that allows you to specify a particular console;
bb must be specified with the $CONS option and is a valid area number from 1..10
$CLEAR is an option that allows you to clear the lamp-specific data assignment;
$BYPASS is an option that allows you to specify that the SEND message will go to only the HM and not to the Operator Message Summary or the RTJ.
Note: The button assignment will still occur as usual.

Node Startup/Area Change

During node startup and area change, the US will create "default" symbolic names of "AN_CNFxx," where xx represents a 1- or 2-digit configurable LED button number from 7 to 46. Any of the "default" symbolic names that are overwritten during node startup or area change by the Button Name File will not be recognized as valid symbolic names.

Button Name File

The text editor is used to create the Button Name File. A symbolic name can be defined for the 40 configurable LED buttons in the file consisting of the maximum file size of 1000 lines, allowing adequate room for user comments. These symbolic names are used in the CL messages and actors to identify the destination button. (For detailed information on the Button Name File, see *Button Configuration Data Entry* and *Button Configuration Form Instructions.*)

Actor GET PRIMMOD

This actor allows the user to retrieve a primmod value assigned to the lamp-specific data of a configurable LED button. This actor can be used in a target action within a custom schematic, or a button action assigned to a configurable button, and will retrieve a primmod only on the local US (see *Actors Manual*).

33.1.3 Button LED Control

Overview

Button LED Control permits US Button LED states to be dynamically changed via an AM, MC, or a PM type CL Send statement.

CL SEND statement

The primary intent of the SEND statement function is to allow user-written applications to alter the red and yellow LEDs on the configurable LED buttons. These LEDs are set ON, OFF, or BLINK using a single SEND statement. This occurs even if the lamp specific data was previously assigned with a unit id, an annunciator group, or primmod name.

CL SEND example

Following is an example of a CL SEND statement that allows a custom user application to alter the behavior of the red and/or yellow LEDs on the configurable buttons.

```
SEND:"$BTN_LED<button>RED=<state>YEL=<state>$AREA=aa$CONS
=bb$BYPASS"
```

Where:

$BTN_LED is the first keyword that must always be specified;

<button> symbolic button name, which is a string of 1..8 characters that must always be specified as the second field in the string;

RED is a keyword that must be specified to alter the red LED;

YEL is a keyword that must be specified to alter the yellow LED;

<state> must be specified when the RED or YEL keyword is used (ON, OFF, or BLI);

$AREA is an option that allows you to specify a particular area;

aa must be specified with the $AREA option and is a valid area number from 1..10;

$CONS is an option that allows you to specify a particular console;

bb must be specified with the $CONS option and is a valid console number from 1..10;

$BYPASS is an option that allows you to specify that the SEND message will go to only the HM and not to the Operator Message Summary or the RTJ.

Note: Normal SEND statement syntax and variable rules apply.

```
SEND: "$BTN_LED AN_CNF22 RED=OFF YEL=BLI $BYPASS"
```

33.1.3 Button LED Control, Continued

Area Database Change

Performing an area change will cause the Button Configuration file and its associated Button Name file to be read in for the specified area. The Button LEDs status will be reset to reflect the status specified in the Button Configuration file. The Button Name file is an optional way to rename the configurable buttons. See the Button Configuration Data Entry Manual – Section 7 for information on building this file.

Once a Button Name File has been successfully read, any user-defined symbolic names specified in the Button Name File will overwrite the corresponding "default" button names. The defined symbolic button names will be recognized as valid names only upon completion of node startup or an area change. The "default" symbolic names overwritten during node startup or area change will be no longer be recognized as valid symbolic names.

RED/YEL keywords

This function allows the user to alter both the red and yellow LEDs, but if only the red LED is specified in the SEND statement, only the red LED behavior is altered; likewise for the yellow LED. In addition to the symbolic button name, the user must specify at least one of the LED keywords in the SEND statement.

BYPASS Option

This option provides a way to specify that a SEND message should NOT go to, or bypass, the Message Summary and the RTJ printer.

33.1.4 Error Handling

Introduction

This section describes error handling for Button Primmod Assignment: and Button LED Control.

Button Name File

When a Button Name File is not found upon completion of startup or area change, no Status Accountant object and message is generated. When it is successfully found, a message is generated and displayed on the Status Detail display.
In addition to the existing two object messages, any of four messages may appear on the Status Detail Display for a US after node startup or area change. If an attempt is made to edit the button file, while at the same time performing an area change, a message is generated ("Error occurred attempting to read button name file").

CL SEND statement message

If the SEND message references an invalid symbolic button name (one that is not a default name or one previously defined) or an invalid primmod name, this could result in not receiving alarm notifications. Any of four messages associated with invalid SEND messages may appear as SEND objects on the Status Detail Display for a US after node startup or area change.

Actors

When a target or button with a series of actors begin executing, continued execution depends upon the successful execution of the previous actor. Therefore, error handling associated with the new actors will be based upon whether or not continued actor execution should occur.

CAUTION

An Area Change will update the configurable LED buttons to reflect their preconfigured lamp specific data assignment. However, it is not recommended that you execute SEND messages at the exact same time as initiating an Area Change request because there is no way to ensure whether the SEND messages are processed before or after the Area Change. Not following this recommendation may result in the configurable LED buttons reflecting a state that is not expected.

Section 34 – LCN Node Version Revision Logging

34.0 LVRLOG Overview

Introduction

The **LCN Node Version/Revision Logging** function is a software application package which operates on Universal Stations of the Honeywell TPS system. This function is a TPS "backplane" extension of the Universal Station Operator personality and Universal personality. This function is packaged as an External Load Module.

Description

The LCN Node Version/Revision Logging function is a display initiated version/revision report generator.

With R670, you can initiate the LVRLOG application in GUS or LCN-connected ES-C nodes. For details, refer to the *TPS System Operations Guide, TP07W*.

34.1 LVRLOG General Functionality

Report generation

With the LCN Node Version/Revision Logging function, the operator can request (from a single provided Universal Station display) the generation of a report which details the following:

- each node on the LCN (also each card in the node)
- each Data Hiway connected to the LCN (also each Box on the DataHiway)
- each UCN connected to the LCN (also each Module on the UCN and each card in the Module)

The information in the report includes the version and revision for the hardware, firmware, and software currently being used on the system. This report includes information down to the card level. The limiting factor is the electronic accessibility of information from particular electronic modules (not all modules can be accessed for version/revision information). The report contains node, module, and card type and number information.

For the LCN nodes, the report includes the version and revision of the personality software currently loaded in the node. For the LCN nodes, the report also includes the name, the version, the revision and the memory location of each External Load Module loaded in the node.

ATTENTION

Throughout this LCN Node Version/Revision Logging function section the term “Universal Station” is used to denote the station on which the user communicates with the Honeywell TPS system. Actually, you can use a Universal Station, a Universal Station^{X}, a Universal Work Station or a Global User Station (through the Native Window) to communicate with the Honeywell TPS system.

User interface

A single custom display (LVRLOG) is used by the operator to—

- enter “user entered” 8 character “site” identifier.
- enter “user entered” 8 character “LCN ID.”
- initiate the generation of the report.
- view the generated report via a “display window” that can be paged.
- enter LCN console printer number.
- initiate printing of the generated report on the LCN console printer.
- cancel printing of the generated report.

Report format

The generated report is in the form of two text files which reside in the History Module. The first file is generated for display and printing by the LCN system. The second file is generated specifically for import into Microsoft Excel. To facilitate the import of the report into Microsoft Excel, the fields in this file's records are separated by commas. The records in both of the text files are a maximum of 132 characters in length. Both generated report files contain embedded field heading information as appropriate to identify the data.

Example

```
0 07/10/96 15:30:54

1 SITEID   LCNID    PNN  NODET  NODEN  BOARDT           SLOTN          HWV  HWR  FWV  FWR  FWT  SWV  SWR  SWNAME  SWLOC
2 IAC_UHF  Test_Sys 01   HG     06     K2LCN-2MW        01             00   M    00   B    01   50   30   HGO
2 IAC_UHF  Test_Sys 01   HG     06     K2LCN-LCN        01             02   A    00   A    01   50   30   HGO
2 IAC_UHF  Test_Sys 01   HG     06     HWY              02             00   K    00   L    01   50   30   HGO

1 SITEID   LCNID    PNN  NODET  NODEN  BOARDT           SLOTN          HWV  HWR  FWV  FWR  FWT  SWV  SWR  SWNAME  SWLOC
2 IAC_UHF  Test_Sys 02   NIM    09     HPK2-3MW         01             04   K    00   B    01   50   13   NMO
2 IAC_UHF  Test_Sys 02   NIM    09     LCNI             02             00   F    00   C    01   50   13   NMO
2 IAC_UHF  Test_Sys 02   NIM    09     EPNI             05             02   H    00   B    01   50   13   NMO

1 SITEID   LCNID    PNN  NODET  NODEN  BOARDT           SLOTN          HWV  HWR  FWV  FWR  FWT  SWV  SWR  SWNAME  SWLOC
2 IAC_UHF  Test_Sys      US     26     K4LCN_8MW        01             05   A    00   A    01   50   49   UP
2 IAC_UHF  Test_Sys      US     26     K4LCN_LCN        01             03   A    00   A    01   50   49   UP
2 IAC_UHF  Test_Sys      US     26     EPDG/SCSI        05             02   H    01   H    01   50   49   UP
2 IAC_UHF  Test_Sys      US     26     LOADMOD                                                   50   01   UPLVR   00C0E11A
2 IAC_UHF  Test_Sys      US     26     LOADMOD                                                   50   09   UPBASE  00C1C61C

1 SITEID   LCNID    PNN  NODET  NODEN  BOARDT           SLOTN          HWV  HWR  FWV  FWR  FWT  SWV  SWR  SWNAME  SWLOC
2 IAC_UHF  Test_Sys      HMON   50     K2LCN-8MW        01             04   J    00   B    01   50   33   HMO
2 IAC_UHF  Test_Sys      HMON   50     K2LCN-LCN        01             02   A    00   A    01   50   33   HMO
2 IAC_UHF  Test_Sys      HMON   50     SPC              02             01   F    00   G    01   50   33   HMO

3 SITEID   LCNID    HWY  BOXT   BOXN   CARDT            CARDN                                                          BOXSIZE
4 IAC_UHF  Test_Sys 01   HG     02

3 SITEID   LCNID    HWY  BOXT   BOXN   CARDT            CARDN                                                          BOXSIZE
4 IAC_UHF  Test_Sys 01   HLPIU  05     ANALOGIN         01                                                             REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     ANALOGIN         02                                                             REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     ANALOGOT         03                                                             REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     DIGIN            04                                                             REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     DIGOUT           05                                                             REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     DIGIN            06                                                             REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     DIGIN            07                                                             REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     DIGIN            08                                                             REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     NONE             09                                                             REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     NONE             10                                                             REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     NONE             11                                                             REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     NONE             12                                                             REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     NONE             13                                                             REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     NONE             14                                                             REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     NONE             15                                                             REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     NONE             16                                                             REGULAR

5 SITEID   LCNID    UCN  NODET  NODEN  CARDT     MODN  FILEN  CARDN  FILEP    HWR       FWR       SWV  SWR  SWNAME  REDUNCY
6 IAC_UHF  Test_Sys 02   NIM    01     MODEM                                   27
6 IAC_UHF  Test_Sys 02   NIM    01     PROTOCOL                                                  00   01
6 IAC_UHF  Test_Sys 02   NIM    01     UCNLLN                                                    3B   01
6 IAC_UHF  Test_Sys 02   NIM    01     DRIVER                                                    3B   01
6 IAC_UHF  Test_Sys 02   NIM    01     TBC                                     00

5 SITEID   LCNID    UCN  NODET  NODEN  CARDT     MODN  FILEN  CARDN  FILEP    HWR       FWR       SWV  SWR  SWNAME  REDUNCY
6 IAC_UHF  Test_Sys 02   APM    13     APMMMOD         01     01     FILE_1   2A                                      REDUN_2F
6 IAC_UHF  Test_Sys 02   APM    13     APMMCOM         01     02     FILE_1   24        42        42   04   APMCOM  REDUN_2F
6 IAC_UHF  Test_Sys 02   APM    13     APMMCOMD        01     02     FILE_1   22                                      REDUN_2F
6 IAC_UHF  Test_Sys 02   APM    13     APMMIOL         01     03     FILE_1   13        41                            REDUN_2F
6 IAC_UHF  Test_Sys 02   APM    13     APMMCTL         01     04     FILE_1   26        43        42   01   APMCTL  REDUN_2F
6 IAC_UHF  Test_Sys 02   APM    13     APMMCTLD        01     04     FILE_1   00                                      REDUN_2F
6 IAC_UHF  Test_Sys 02   APM    13     APMMTBC                                 08
6 IAC_UHF  Test_Sys 02   APM    13     HLAI      01 a  01     06             24        3.3
6 IAC_UHF  Test_Sys 02   APM    13     AO        06 a  01     11             02        3.4
6 IAC_UHF  Test_Sys 02   APM    13     DI        07 a  01     12             01        3.3
6 IAC_UHF  Test_Sys 02   APM    13     NONE      08 a  01     13
6 IAC_UHF  Test_Sys 02   APM    13     PI        09 a  01     14             20        3.3
7 REPORT   COMPLETE
```

Key value definitions

The first character of each file record is a “key” to the contents of the record. The definition of the key values is as follows:

0 = Heading and Error records
1 = LCN node, card description (and load module description) header record
2 = LCN node, card description (and load module description) record
3 = Data Hiway box, card description header record
4 = Data Hiway box, card description record
5 = UCN node, card description header record
6 = UCN node, card description record
7 = Completion record

The key value can be used to identify the record types, when the file is imported into Microsoft Excel.

Meanings of header record field descriptors

The meanings of the header record field descriptors are as follows:

Table 34-1 LCN Node, Board Description Header Record

Field Descriptor	Field Descriptor Meaning
SITEID	Site ID, 8 character user entered
LCNID	LCN ID, 8 character user entered
PNN	Process Network Number (LCN node associated DH or UCN Number)
NODET	LCN Node Type
NODEN	LCN Node Number
BOARDT	Node Board Type (or LOADMOD if Load Module)
SLOTN	Node Slot Number
HWV	Hardware Version
HWR	Hardware Revision For an ELCN node, the hardware revision ranges from M to Z.
FWV	Firmware Version
FWR	Firmware Revision
FWT	Firmware Type
SWV	Software Version
SWR	Software Revision
SWNAME	Personality or Load Module name

SWLOC	Location of Load Module Beginning TPN 687, the SWLOC columns display the node platform and the node type in addition to load address of the load module. Node platform can be of the following types: • KLCN for node with K4LCN/K2LCN board type • LCNP for node with physical LCNP board type • ETN for Enhanced T-Node • For ELCN, node types are ELCN-P/W, ELCN-V/W, ELCN-P/A, or ELCN-V/A. Where: • P/W – Experion TPS node on physical Microsoft Windows platform • V/W – Experion TPS node on virtual Microsoft Windows platform • P/A – Appliance Node on physical platform • V/A – Appliance Node on virtual platform Refer to *TPN R687 enhancements* in this section for a list of node types and corresponding text displayed in AUDIT.

Meanings of header record field descriptors, continued

Table 34-2 Data Hiway Box, Card Description Header Record

Field Descriptor	Field Descriptor Meaning
SITEID	Site ID, 8 character user entered
LCNID	LCN ID, 8 character user entered
HWY	Data Hiway Number
BOXT	Box Type
BOXN	Box Number
CARDT	Card Type
CARDN	Card Number
BOXSIZE	Box Size

Table 34-3 UCN Node, Card Description Header Record

Field Descriptor	Field Descriptor Meaning
SITEID	Site ID, 8 character user entered
LCNID	LCN ID, 8 character user entered
UCN	Universal Control Network Number
NODET	UCN Node Type
NODEN	UCN Node Number
CARDT	Card Type Beginning TPN 688.5, for an EHPM controller with HART IOPs (HART HLAI and HART AO_16 modules), the CARDT column will display “HLAI_H” for HART HLAI module and “AO_16_H” for a HART AO_16 module.
MODN	Module Number
FILEN	File Number
CARDN	Card Number
FILEP	File Position
HWR	Hardware Revision
FWR	Firmware Revision
SWV	Software Version
SWR	Software Revision
SWNAME	Software Name
REDUNCY	Redundancy

Node (Boxes) reported

Information on the following specific LCN Nodes, Data Hiway Boxes, and UCN Nodes is provided in the report generated by the LCN Node Version/Revision Logging function. Not all modules can be accessed for version/revision information. In the case of the Data Hiway, revision/version information is not available at the box or card level.

Table 34-4 LCN Nodes Reported

LCN Node Report Descriptor	Full LCN Node Name
US	Universal Station (also Universal Work Station)
$U^{X}S$	Universal Station^{X}
AM	Application Module
$A^{X}M$	Application Module^{X}
HM	History Module
NG	Network Gateway
CG	Computer Gateway
HG	Hiway Gateway
NIM	Network Interface Module
CLM	Control Link Module (for CLM R500 and later). (Before CLM R500, any AM which is configured as a CLM is reported as an AM.)
AMX	AMX (for AMX R500 and later). (Before AMX R500, any NIM which is configured as an AMX is reported as a NIM.)
GUS	Global User Station (available with LCN R510)
EST	Experion Station TPS
ESVT	Experion Server TPS
ACE-T	Application Control Environment
APP	Application Processing Platform
EAPP	Experion APP
ENIM	Enhanced Network Interface Module
EHB	Experion Hiway Bridge
ETN	Enhanced TPS Node*
ELCN	Experion LCN node

* For the Enhanced TPS Node, the LVRLOG report displays the WSI2 hardware revision (HWR) as B or later and EPDG/SCSI hardware revision (HWR) as I or later.

ATTENTION

1. Any PLCG (Programmable Logic Controller Gateway) or EPLCG (Enhanced Programmable Logic Controller Gateway) is reported as a HG.

Node (Boxes) reported, continued

Table 34-5 Data Hiway Boxes Reported

Data Hiway Box Report Descriptor	Full Data Hiway Box Name
CB	Basic Controller
AU	Analog Unit
HLPIU	High Level Process Interface Unit
LEPIU	Low Energy Process Interface Unit
LLPIU	Low Level Process Interface Unit
CBRCD	Basic Controller Reserve Controller Director
EC	Extended Controller
ECRCD	Extended Controller Reserve Controller Director
MC	Multifunction Controller
MCRCD	Multifunction Controller Reserve Controller Director
DHP	Data Hiway Port / TPCD 620 Hiway Interface Module
OPSTA	Operator Station, Basic or Enhanced
H4500	Honeywell 4500 Computer
HG	Hiway Gateway
GPCI	General Purpose Computer Interface

Table 34-6 UCN Nodes Reported

UCN Node Report Descriptor	Full UCN Node Name
PM	Process Manager
APM	Advanced Process Manager
HPM	High-Performance Process Manager
LM	Logic Manager
SM	Safety Manager (Triconex TRICON System) (available with LCN R500)
SM	Safety Manager (Honeywell FSC System) (available with LCN R510)
NIM	Network Interface Module
ENIM	Enhanced Network Interface Module
EHPM	Enhanced High Performance Process Manager
ENB	Enhanced Network Bridge
TCMI	Triconex Communication Module Interface

TPN R686 enhancements

Beginning with TPN R686, the following changes have been made to enhance the LVRLOG report.

1) LVRLOG report indicates whether a UCN node is configured as THISNIM (shown in the report as “TNIM”) or REMOTNIM (shown in the report as “RNIM”) as per the UCN node’s NODEASSN parameter configuration. This is indicated in the “MODN” column. The MODN column also indicates the module number of a UCN node. The following figure is for example purpose only.

Figure 34-1 LCN Node Version/Revision Logging Display indicating RNIM/TNIM

UCN	NODET	NODEN	CARDT	MODN	FILEN	CARDN	FILEP
10	HPM	33	HPMMCOM	TNIM	01	01	LEFT
10	HPM	33	HPMMCTL	TNIM	01	01	LEFT
10	HPM	33	HPMMASIC	TNIM	01	01	LEFT
10	HPM	33	HPMMFPGA	TNIM(1)	01	01	LEFT
10	HPM	33	HPMMIOL	TNIM	01	02	LEFT
10	HPM	33	HPMMUCNIF	TNIM	01	02	LEFT
10	HPM	33	HPMMTBC	TNIM			
10	HPM	33/34	DI	02 a	01	03	
10	HPM	33/34	AO_16	02 a	01	04	
10	HPM	33/34	DO_32	03 a	01	05	
10	HPM	33/34	PI	04 a	01	06	
UCN	NODET	NODEN	CARDT	MODN	FILEN	CARDN	FILEP
10	HPM	39	HPMMCTL	RNIM	01	01	LEFT
10	HPM	39	HPMMASIC	RNIM	01	01	LEFT
10	HPM	39	HPMMFPGA	RNIM(2)	01	01	LEFT
10	HPM	39	HPMMIOL	RNIM	01	02	LEFT
10	HPM	39	HPMMUCNIF	RNIM	01	02	LEFT
10	HPM	39	HPMMTBC	RNIM			

(1) HPM 33 on UCN is configured as THISNIM (TNIM).

(2) HPM 39 on UCN is configured as REMOTNIM (RNIM).

2) LVRLOG report indicates Device Index, Authentication Group, and, BOOT and APP firmware versions on the xxxxFTE line in the “FILEN”, “CARDN”, and “FWR” columns respectively for EUCN nodes. The following figures are for example purposes only.

Figure 34-2 LCN Node Version/Revision Logging Display indicating Device Index, Authentication Group, and BOOT-only firmware version

UCN	NODET	NODEN	CARDT	MODN	FILEN	CARDN	FILEP	HWR	FWR	SWV	SWR	SWNAME	REDUNCY
10	EHPM	27	HPMMCOM	TNIM	01	06	RIGHT	H	D	68	155	HPCMHP	REDUN
10	EHPM	27	HPMMCTL	TNIM	01	06	RIGHT			68	155	HPCTHP	REDUN
10	EHPM	27	HPMMASIC	TNIM	01	06	RIGHT	FF					REDUN
10	EHPM	27	HPMMFPGA	TNIM	01	06	RIGHT	A					REDUN
10	EHPM	27	HPMMIOL	TNIM	01	07	RIGHT	K		50	00		REDUN
10	EHPM	27	HPMMUCNIF	TNIM	01	07	RIGHT	C					REDUN
10	EHPM	27	HPMMFTE	TNIM	128(1)	129(2)		P	EHPM_4.9(3)		N/A(4)		
10	EHPM	27	HPMMOVRAL	TNIM						68	155		
10	EHPM	28	HPMMCOM	TNIM	01	01	LEFT	H	D	68	155	HPCMHP	REDUN
10	EHPM	28	HPMMCTL	TNIM	01	01	LEFT			68	155	HPCTHP	REDUN
10	EHPM	28	HPMMASIC	TNIM	01	01	LEFT	FF					REDUN
10	EHPM	28	HPMMFPGA	TNIM	01	01	LEFT	A					REDUN
10	EHPM	28	HPMMIOL	TNIM	01	02	LEFT	K		50	00		REDUN
10	EHPM	28	HPMMUCNIF	TNIM	01	02	LEFT	FF					REDUN
10	EHPM	28	HPMMFTE	TNIM	127	129		P	EHPM_4.9		N/A		
10	EHPM	28	HPMMOVRAL	TNIM						68	155		

(1) DEVIDX = 128

(2) AUTHENTICATION GROUP = = 129

(3) BOOT FIRMWARE = EHPM_4.9

(4) APP FIRMWARE = N/A (i.e. None)

Figure 34-3 LCN Node Version/Revision Logging Display indicating Device Index, Authentication Group, and, BOOT and APP firmware versions

UCN	NODET	NODEN	CARDT	MODN	FILEN	CARDN	FILEP	HWR	FWR	SWV	SWR	SWNAME	REDUNCY
02	EHPM	07	HPMMCOM	TNIM	01	01	LEFT	FF	C	68	155	HPCMHP	REDUN
02	EHPM	07	HPMMCTL	TNIM	01	01	LEFT			68	155	HPCTHP	REDUN
02	EHPM	07	HPMMASIC	TNIM	01	01	LEFT	B					REDUN
02	EHPM	07	HPMMFPGA	TNIM	01	01	LEFT	A					REDUN
02	EHPM	07	HPMMIOL	TNIM	01	02	LEFT	K		50	00		REDUN
02	EHPM	07	HPMMUCNIF	TNIM	01	02	LEFT	B					REDUN
02	EHPM	07	HPMMFTE	TNIM	95(1)	113(2)		P	EXP432.1-09.0(3)		EXP432.1-09.0(4)		
02	EHPM	07	HPMMOVRAL	TNIM									
02	EHPM	08	HPMMCOM	TNIM	01	06	RIGHT	FF	C	68	155	HPCMHP	REDUN
02	EHPM	08	HPMMCTL	TNIM	01	06	RIGHT			68	155	HPCTHP	REDUN
02	EHPM	08	HPMMASIC	TNIM	01	06	RIGHT	B					REDUN
02	EHPM	08	HPMMFPGA	TNIM	01	06	RIGHT	A					REDUN
02	EHPM	08	HPMMIOL	TNIM	01	07	RIGHT	G		50	00		REDUN
02	EHPM	08	HPMMUCNIF	TNIM	01	07	RIGHT	B					REDUN
02	EHPM	08	HPMMFTE	TNIM	96	113		P	EXP432.1-09.0		EXP432.1-09.0		
02	EHPM	08	HPMMOVRAL	TNIM									

(1) DEVIDX = 95

(2) AUTHENTICATION GROUP = = 113

(3) BOOT FIRMWARE = EXP432.1-09.0

(4) APP FIRMWARE = EXP432.1-09.0

} EXPERION-LABELED FIRMWARE USED FOR OPTIONAL EXPERION INTEGRATION

TPN R687 enhancements

TCMI Enhancements

Beginning with TPN R687, the following changes have been made to enhance the LVRLOG report.

For a TCMI node, the LVRLOG report NODET column will show "TCMI" and the CARDT column will show "SMMFTE" to indicate that the media type is FTE (whereas, for a SMM Triconex node, it will show "SMMTBC").

Figure 34-4 LCN Node Version/Revision Logging Display indicating TCMI

```
5 SITEID  LCNID   UCN  NODET  NODEN  CARDT    MODN  FILEN  CARDN  FILEP       HWR     FWR     SWV  SWR  SWNAME  REDUNCY
6           03   TCMI   15    SMMMOD   TNIM                 00
6           03   TCMI   15    SMMCOM   TNIM          RIGHT        C           68  01  SMPI    PRIMARY
6           03   TCMI   15    SMMPLATF TNIM                                      TRICON
6           03   TCMI   15    SMMFTE   TNIM  6      91             00      UEA_100.1-11.0  TCMI_100.1-25.0

5 SITEID  LCNID   UCN  NODET  NODEN  CARDT    MODN  FILEN  CARDN  FILEP       HWR     FWR     SWV  SWR  SWNAME  REDUNCY
6           03   TCMI   16    SMMMOD   TNIM                 00
6           03   TCMI   16    SMMCOM   TNIM          RIGHT        C           68  01  SMPI    SECONDRY
6           03   TCMI   16    SMMPLATF TNIM                                      TRICON
6           03   TCMI   16    SMMFTE   TNIM  5      91             00      UEA_100.1-11.0  TCMI_100.1-25.0
```

ELCN Enhancements

Beginning with TPN 687, the LVRLOG report SWLOC column will show ELCN-P/W, ELCN-V/W, ELCN-P/A, or ELCN-V/A to indicate the network type. For an ELCN node, the hardware revision for ranges from M to Z. The network types are defined as follows:

P/W – physical platform/Microsoft Windows-based
V/W - virtual platform/Microsoft Windows-based
P/A - physical platform/appliance
V/A - virtual platform/appliance

The following figure shows an example of an excerpt from an LVRLOG report indicating ELCN the network type and hardware revision:

Figure 34-5 LCN Node Version/Revision Logging Display indicating an ELCN node

```
1 SITEID  LCNID  PNN  NODET  NODEN  BOARDT      SLOTN  HWV  HWR  FWV  FWR  FWT  SWV  SWR  SWNAME  SWLOC
2                07   ENIM   44     LCNP4-16M   01     05   M    00   H    01   68   212  NMO     ELCN-P/A
2                07   ENIM   44     LCNP4-LCN   01     03   M    00   C    01   68   212  NMO
2                07   ENIM   44     EPNI2       04     07   A    00   A    01   68   212  NMO
2                07   ENIM   44     LOADMOD                                              68   201  ENIM    00F6DF7C
2                07   ENIM   44     LOADMOD                                              68   201  ENAME   00F6E69C
```

The following table provides the list of node types and corresponding text displayed in LVRLOG.

$NODETYP Value	Meaning	Display in SWLOC
ELCN Nodes		
ELCN-P/A-AM	ELCN Physical (UEA) Appliance AM	ELCN-P/A
ELCN-V/A-AM	ELCN Virtual Appliance AM	ELCN-V/A
ELCN-P/A-ENIM	ELCN Physical (UEA) Appliance ENIM	ELCN-P/A
ELCN-V/A-ENIM	ELCN Virtual Appliance ENIM	ELCN-V/A
ELCN-P/A-EPLCG	ELCN Physical (UEA) Appliance EPLCG	ELCN-P/A
ELCN-V/A-EPLCG	ELCN Virtual Appliance EPLCG	ELCN-V/A
ELCN-P/A-EHB	ELCN Physical (UEA) Appliance EHB	ELCN-P/A
ELCN-V/A-EHB	ELCN Virtual Appliance EHB	ELCN-V/A
ELCN-P/A-NG	ELCN Physical (UEA) Appliance NG	ELCN-P/A
ELCN-V/A-NG	ELCN Virtual Appliance NG	ELCN-V/A
ELCN-P/W-APP	ELCN Physical Microsoft Windows-based ACE-T	ELCN-P/W
ELCN-P/W-APP	ELCN Physical Microsoft Windows-based EAPP	ELCN-P/W
ELCN-P/W-EST	ELCN Physical Microsoft Windows-based ES-T	ELCN-P/W
ELCN-P/W-ESVT	ELCN Physical Microsoft Windows-based ESVT	ELCN-P/W
ELCN-P/W-HMOF	ELCN Physical Microsoft Windows-based HM (OFF PROCESS)	ELCN-P/W
ELCN-P/W-HMON	ELCN Physical Microsoft Windows-based HM	ELCN-P/W
ELCN-P/W-OPR	ELCN Physical Microsoft Windows-based Operator Personality Universal Station Module	ELCN-P/W
ELCN-P/W-UNVL	ELCN Physical Microsoft Windows-based Universal Personality Universal Station Module	ELCN-P/W
ELCN-V/W-APP	ELCN Virtual Microsoft Windows-based ACE-T	ELCN-V/W
ELCN-V/W-APP	ELCN Virtual Microsoft Windows-based EAPP	ELCN-V/W
ELCN-V/W-EST	ELCN Virtual Microsoft Windows-based ES-T	ELCN-V/W
ELCN-V/W-ESVT	ELCN Virtual Microsoft Windows-based ESVT	ELCN-V/W
ELCN-V/W-HMOF	ELCN Virtual Microsoft Windows-based HM (OFF PROCESS)	ELCN-V/W
ELCN-V/W-HMON	ELCN Virtual Microsoft Windows-based HM	ELCN-V/W
ELCN-V/W-OPR	ELCN Virtual Microsoft Windows-based Operator Personality Universal Station Module	ELCN-V/W

ELCN-V/W-UNVL	ELCN Virtual Microsoft Windows-based Universal Personality Universal Station Module	ELCN-V/W
ETN Nodes		
ETN-AM	ETN based Application Module	ETN-AM
ETN-APP	ETN based Application Processing Platform (EAPP)	ETN-APP
ETN-APP	ETN based Application Processing Platform (ACET)	ETN-APP
ETN-EST	ETN based Experion Station	ETN-EST
ETN-ESVT	ETN based Experion Server	ETN-ESVT
ETN-OPR	ETN based Operator Personality Universal Station Module	ETN-OPR
ETN-OPR	ETN based Operator Personality Universal Station Module (PCUS)	ETN-OPR
ETN-UNVL	ETN based Universal Personality Universal Station Module	ETN-UNVL
ETN-UNVL	ETN based Universal Personality Universal Station Module (PCUS)	ETN-UNVL
KLCN-based Nodes		
KLCN-AM	K2/K4LCN based Application Module	KLCN-AM
KLCN-EHB-JG	K2/K4LCN based Experion Hiway Bridge – Junction Gateway	KLCN-EHB
KLCN-EHB-SG	K2/K4LCN based Experion Hiway Bridge – Simple Gateway	KLCN-EHB
KLCN-ENB	K4LCN based Enhanced Network Bridge	KLCN-ENB
KLCN-ENIM	K4LCN based Enhanced Network Interface Module	KLCN-ENIM
KLCN-HG	K2/K4LCN based Hiway Gateway Module	KLCN-HG
KLCN-HMOF	K2/K4LCN based History Module (OFF PROCESS)	KLCN-HMOF
KLCN-HMON	K2/K4LCN based History Module	KLCN-HMON
KLCN-NIM	K2/K4LCN based Network Interface Module	KLCN-NIM
KLCN-NG	K2/K4LCN based Network Gateway Module	KLCN-NG
KLCN-OPR	K2/K4LCN based Operator Personality Universal Station Module	KLCN-OPR
KLCN-UNVL	K2/K4LCN based Universal Personality Universal Station Module	KLCN-UNVL
LCNP4-based Nodes		
LCNP-AM	LCNP4 based Application Module	LCNP-AM
LCNP-APP	LCNP4 based Application Processing Platform	LCNP-APP
LCNP-APP	LCNP4 based Application Processing Platform (EAPP)	LCNP-APP

LCNP-APP	LCNP4 based Application Processing Platform (ACET)	LCNP-APP
LCNP-EST	LCNP4 based Experion Station	LCNP-EST
LCNP-ESVT	LCNP4 based Experion Server	LCNP-ESVT
LCNP-GUS	LCNP4 based Global User Station	LCNP-GUS
LCNP-OPR	LCNP4 based Operator Personality Universal Station Module	LCNP-OPR
LCNP-OPR	LCNP4 based Operator Personality Universal Station Module (PCUS)	LCNP-OPR
LCNP-UNVL	LCNP4 based Universal Personality Universal Station Module	LCNP-UNVL
LCNP-UNVL	LCNP4 based Universal Personality Universal Station Module (PCUS)	LCNP-UNVL

TPN R688.5 enhancements

EHPM HART Enhancements

Beginning with TPN R688.5, for an EHPM controller with HART IOPs (HART HLAI and HART AO_16 modules), the CARDT column will display “HLAI_H” for a HART HLAI module and “AO_16_H” for a HART AO_16 module.

The following figure shows an example of an excerpt from an LVRLOG report indicating HART version of IOPs.

Figure 34-6 LCN Node Version/Revision Logging Display indicating EHPM HART IOPs (HART HLAI and HART AO_16 modules)

```
5,SITEID  ,LCNID   ,UCN ,NODET ,NODEN ,CARDT    ,MODN, FILEN ,CARDN
6,PHX     ,LAB     ,03  ,EHPM  ,63    ,HLAI_H   ,01 a, 01    ,03
6,PHX     ,LAB     ,03  ,EHPM  ,63    ,HLAI_H   ,01 b, 01    ,11
6,PHX     ,LAB     ,03  ,EHPM  ,63    ,AO_16_H  ,02 a, 01    ,04
6,PHX     ,LAB     ,03  ,EHPM  ,63    ,AO_16_H  ,02 b, 01    ,12
```

34.2 LVRLOG Requirements

Hardware requirements

The LCN Node Version/Revision Logging function requires (or can optionally utilize) the following TPS system hardware:

- Universal Station (optional, at least one (1) Universal Station, Universal Station^X, Universal Work Station, or Global User Station is required)
- Universal Station^X (optional)
- Universal Work Station (optional)
- Global User Station (optional) (Global User Station available after R510)
- Matrix Printer (Console Printer) (optional)
- Signum 2043 Printer (optional)
- History Module

When used with a Global User Station, the LCN Node Version/Revision Logging function will operate only in the "native window."

The LCN Node Version/Revision Logging function requires dedicated memory in each Universal Station, Universal Station^X, Universal Work Station or Global User Station on which it is to be used.

Memory requirements

The LCN Node Version/Revision Logging function must have sufficient memory dedicated to the use of the function. The following personalities require the indicated amount of dedicated memory:

Operator Personality - 61K bytes (approximately)
Universal Personality - 61K bytes (approximately)

Software requirements

The LCN Node Version/Revision Logging function requires a Universal Station loaded with an Operator or Universal personality of LCN Release 432, LCN Release 510, or LCN Release 520. The function software must be configured and loaded into each US from which the report generation function is to be initiated.

Software requirements, continued

The function utilizes the following Honeywell Developer's Display Data Base (DDB) indices in the definition of Custom Global Display Data Base variables: (2830 through 2834 inclusive — are assigned for use by Phoenix Custom Systems Developers).

ATTENTION

Indices used to define Custom Global Display Data Base variables have been dedicated (see *Actors Manual, SW09-55*) as follows:

Table 34-7 Dedicated Custom Global DDB Indices

From - To	Dedicated for Use by
100 — 1999	Yamatake Honeywell Developers
2000 — 3999	Honeywell Phoenix Custom Systems Developers
4000 — 5999	Honeywell Canada Developers
6000 — 7999	Honeywell PACE Developers
8000 — 9999	Honeywell Fort Washington Developers
10000 — 11999	Honeywell Icotron Developers
12000 — 13999	Honeywell / third party projects and joint ventures
14000 — 15999	Honeywell Toolkits Developers

WARNING

Caution should be taken in the use of the LCN Node Version/Revision Logging function that would conflict with the use of Custom Global Display Data Base variables defined using indices dedicated for other uses.

34.3 LVRLOG Installation Requirements

Distributed files

The LCN Node Version/Revision Logging function software is composed of several files which must be loaded on the target system. The distributed disk contains the following load files necessary for installation.

Two load object (.LO) files are provided—one load object (.LO) file for each personality, Operator and Universal. These files can be found on the provided LCN Software removable media (disk &Z1) under the &CUS directory.

Load Object File	Disk &Z1
OPLVR.LO	LCN Node Version/Revision Logging function software for Operator Personality.
UPLVR.LO	LCN Node Version/Revision Logging function software for Universal Personality.

One schematic file (.DO) is provided. This file is located on the provided removable media (disk &Z1) under the TLK1 directory.

Schematic File	Disk &Z1
LVRLOG.DO	Display used to initiate action of the LCN Node Version/Revision Logging function for R432 and R5xx systems.

Finding directory for storage of displays

In the Operator or Universal Personality, find a directory that can be used for the storage of displays as follows:

Table 34-8 Find a Directory

Step	Action	Result
1	Press the SYST MENU key.	SYSTEM MENU appears.
2	Touch or TAB and SELECT the ORGANIZATIONAL SUMMARY MENU target.	ORGANIZATIONAL SUMMARY MENU appears.
3	Touch or TAB and SELECT the SCHEMATIC TITLES target.	At the bottom of the screen, a DISPLAY target appears.
4	Touch or TAB and SELECT the DISPLAY target.	The TITLE SUMMARY - SCHEMATIC appears.
5	Choose one of the PATHNAMES FOR SCHEMATIC SEARCH that starts with “NET.” The pathname should have the general form “NET>xxxx>”.	

The name of the directory is in the field represented as “xxxx” (to be used in steps later in this section). Choose the directory that is used to store the “Toolkit” displays.

34.4 LVRLOG Initial (First Time) Installation

Initial installation

The information in this section is for the initial installation. Refer to the Upgrade Installation section if the software is already installed.

History Module directories

Using the Command Processor function of the Engineering (LCN R4XX systems only) or Universal Personality, determine if the directory &CUS exists in the System History Module.

```
LSV NET
```
(list volumes on the network)

If the directory (&CUS) does not exist, use the Create Directory command to create a directory under a volume on the History Module.

```
CD NET>vol> &CUS
```
(vol is an existing volume on the History Module)

Copying Load Files to the HM

Mount the disk containing the LCN Node Version/Revision Logging software in a removable media drive. Using the Command Processor function of the Engineering (LCN R4XX systems only) or Universal Personality, execute the following command to copy the LCN Node Version/Revision Logging software package files to the History Module.

```
CP  $Fx>&CUS>OPLVR.LO  NET>&CUS>=  -D
CP  $Fx>&CUS>UPLVR.LO  NET>&CUS>=  -D
```
(where x = the removable media drive number)

Mount the disk containing the LCN Node Version/Revision Logging schematic in a removable media drive. Using the Command Processor function of the Engineering (LCN R4XX systems only) or Universal Personality, execute the following command to copy the LCN Node Version/Revision Logging software package files to the History Module.

```
CP  $Fx>TLK1>LVRLOG.DO  NET>xxxx>=  -D
```
(where x = the removable media drive number)
(where xxxx = the previously chosen display object storage directory)

Universal Station configuration

Table 34-9 Universal Station Configuration

Step	Action
1	From the Modify Volume Paths display in the Engineering (LCN R4XX systems only) or Universal Personality, set the NCF Backup Path to a removable media pathname. $Fx>&ASY> where x = drive number Insert a backup &ASY disk in the removable media drive.
2	From the Main Menu of an Engineering (LCN R4XX systems only) or Universal Personality, touch or TAB and SELECT the LCN NODES target.
3	A display will appear with a target for each node possible on the LCN. Verify that the Configurator is in the ON-LINE mode in the upper right corner of the display. Select the target for the node number of the Universal Station that is to be configured. The PAGE FWD key may be required to display the target for the desired US number.
4	A display will appear which allows the configuration of the selected US. If this US has not already been configured onto the network, do so at this time.
5	Touch or TAB and SELECT the MODIFY NODE target.
6	The next display that appears (page 2) will allow you to configure the software on the selected US. This display contains 24 entry ports to enter Module Names, and 24 entry ports to enter Personality Types for external load modules. NOTE: It is important that you do not use the ENTER key until instructed. Use the TAB keys to move from port to port, or if you have a touchscreen, use that feature.

Universal Station configuration, continued

Table 34-9 Universal Station Configuration, continued

Step	Action
7	If the US being configured is used as both Operator and Universal personalities, key in the module names and personality types for both personalities. If the US being configured is always in the Operator personality, key in the name and personality type for the Operator personality. In this case, the Universal personality module does not have to be configured. If the US being configured is always in the Universal personality, key in the name and personality type for the Universal personality. In this case, the Operator personality module does not have to be configured. Module / Type / Personality OPLVR / OPR / Operator UPLVR / UP / Universal
8	Key in the required Module Names (in the entry ports for the External Load Module Name) and required Personality Types (in the entry ports for the Associated Personality Type), but— **do not press the ENTER key**. Touch or TAB and SELECT the NO target for the `USE DEFAULT PERSONALITY TYPE?` question.
9	Press the <ENTER> key.
10	The LCN Configurator will determine the total size of the Software defined for each personality configured. The LCN Configurator will then return the size for each personality configured along side the line “TOTAL (MODULES PLUS ADDITIONAL MEMORY).” Round each of these numbers up to the next 1 K. Add 2 K to the rounded numbers. Key the totals into the associated boxes along side the line “MAXIMUM EXTERNAL MODULE MEMORY (WORDS).” This extra memory will allow for possible future maintenance or upgrade releases to be loaded without requiring an NCF change.
11	Press the <ENTER> key.
12	Press the CTL and one key together: (i.e., F1, to check the new NCF) Press the CTL and two keys together: (i.e., F2, to install the new NCF)

Universal Station configuration, continued

Table 34-9 Universal Station Configuration, continued

Step	Action
13	Press the <ENTER> key.
14	Return to the Engineering (LCN R4XX systems only) or Universal Personality Main Menu display. A message will appear at the bottom of the display indicating the successful completion of the NCF installation. The Universal Station is now ready to be loaded with the addition of the LCN Node Version/Revision Logging software.

15	Proceed with the loading of the US using the normal US load procedure:
	
	1. Shut down and reload the US.
	
	2. Check if the new function is available for use:
	
	Use the [CONS STATS] key to call up the CONSOLE STATUS display. Select STATUS DETAIL which calls up the STATUS DETAIL display.
	
	3. After allowing time to load (several minutes, more on large systems),
	if the function is NOT available, the status will read:
	`Cust.Loader (OK --> Warning) (Description of problem...)`
	
	NOTE:
	Usually this error indicates that the configured software requires that more memory be configured in the NCF. Follow Steps 1-15 to correct the problem.

16	The entire above procedure (Universal Station Configuration) must be repeated for each Universal Station on which the LCN Node Version/Revision Logging function is to operate.

34.5 LVRLOG Upgrade Installation

Description

The information in this section is for installing an upgrade of the software. Refer to the "Initial Installation" section if the software is being installed for the first time.

Copying the Load Files to the HM

Mount the disk containing the LCN Node Version/Revision Logging software in a removable media drive. Using the Command Processor function of the Engineering (LCN R4XX systems only) or Universal Personality, execute the following command to copy the LCN Node Version/Revision Logging software package files to the History Module.

```
CP  $Fx>&CUS>OPLVR.LO  NET>&CUS>=  -D
CP  $Fx>&CUS>UPLVR.LO  NET>&CUS>=  -D
```

(where x = the removable media drive number)

Mount the disk containing the LCN Node Version/Revision Logging schematic in a removable media drive. Using the Command Processor function of the Engineering (LCN R4XX systems only) or Universal Personality, execute the following command to copy the LCN Node Version/Revision Logging software package files to the History Module.

```
CP  $Fx>TLK1>LVRLOG.DO  NET>xxxx>=  -D
```

(where xxxx = the previously chosen display object storage directory chosen during initial installation)

Loading the node

Table 34-10 Loading the Node

Step	Action
1	1. Shut down and reload the node. 2. Check if the new function is available for use: Use the [CONS STATS] key to call up the CONSOLE STATUS display. Select STATUS DETAIL which calls up the STATUS DETAIL display. 3. After allowing time to load (several minutes more on large systems), if the function is NOT available, the status will read: `Cust.Loader (OK --> Warning) (Description of problem...)` NOTE: Usually this error indicates that the upgraded software requires that more memory be configured in the NCF. Follow Steps 1-15 in "Universal Station Configuration" section to correct the problem.
2	Step 1 above must be repeated for each Universal Station on which the LCN Node Version/Revision Logging function is to operate.

34.6 Operating the LCN Node Version/Revision Logging Function (LVRLOG)

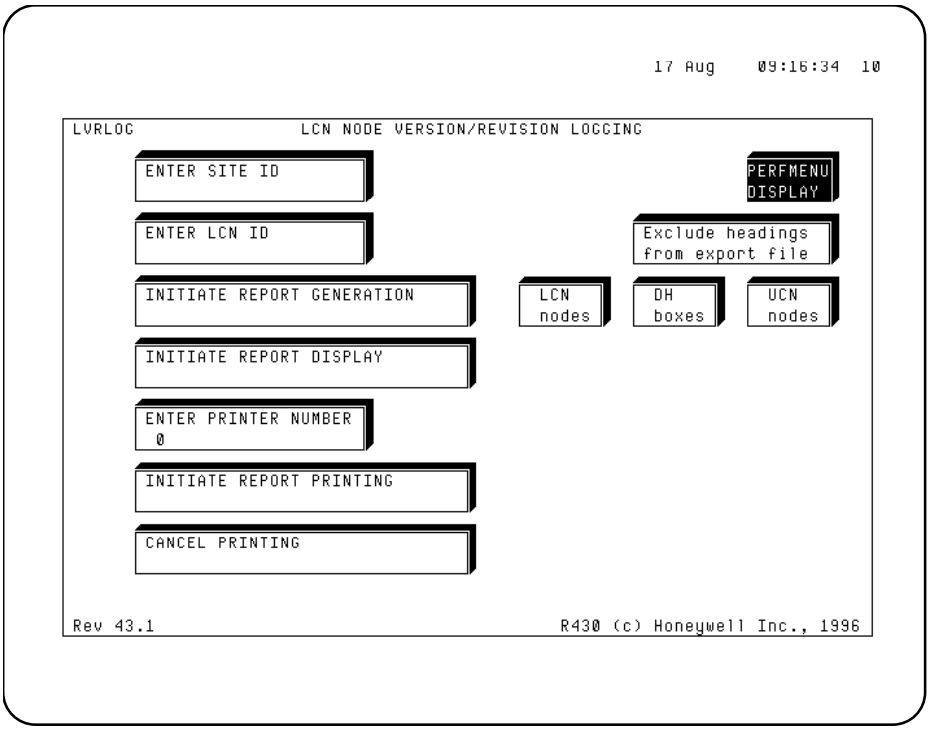
Call Up LCN Node Version/Revision Logging Display

Use the LCN NODE VERSION/REVISION LOGGING display to communicate with the LCN Node Version/Revision Logging function.

Table 34-11 Call Up LCN Node Version/Revision Logging Display

Step	Action
1	Press the operator keyboard SCHEM key. A prompt of "ENTER SCHEMATIC NAME" will appear in the upper left corner of the screen and an associated port will open.
2	Key in LVRLOG.
3	Press the <ENTER> key. The LCN NODE VERSION/REVISION LOGGING display (Figure 34-1) will appear on the screen.

Figure 34-6 LCN Node Version/Revision Logging Display



16424

34.6 Operating the LCN Node Version/Revision Logging Function (LVRLOG), Continued

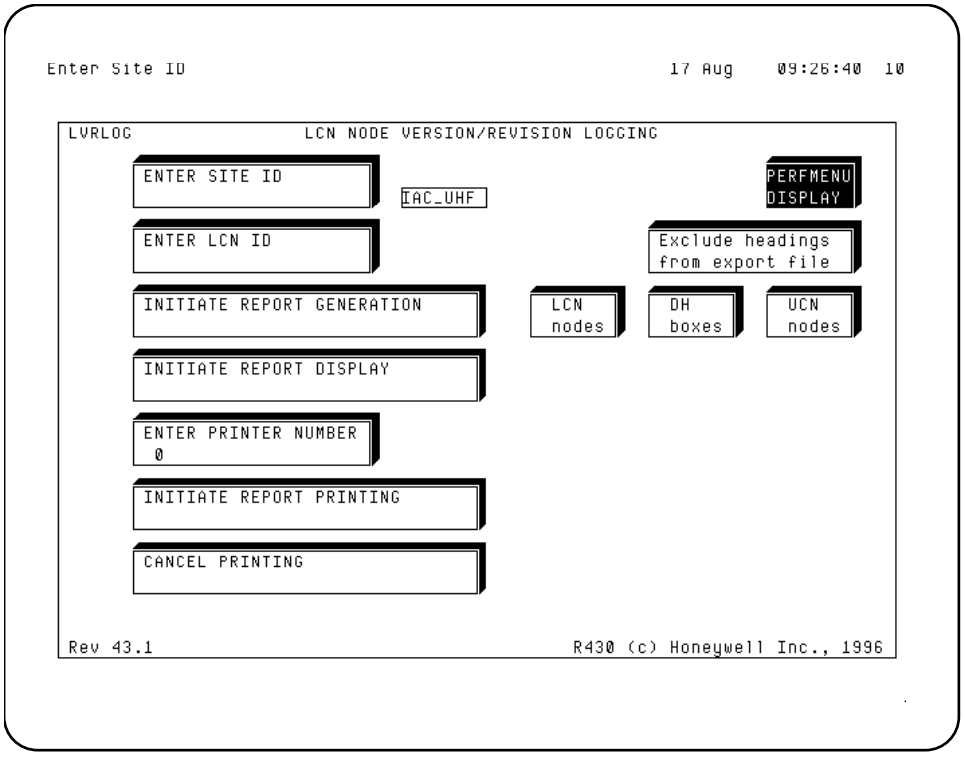
Enter Site ID

The Site ID that appears in the generated report can be entered or modified.

Table 34-12 Open Site ID Data Entry Port

Step	Action
1	Touch or TAB and SELECT the ENTER SITE ID target. The target will change color (from cyan to green) and a data entry port will open to the right of the target.
2	Enter a 1 - 8 character alphanumeric Site ID.
3	Press the <ENTER> key.

Figure 34-7 LCN Node Version/Revision Logging Display (with "Enter Site ID" data entry port)

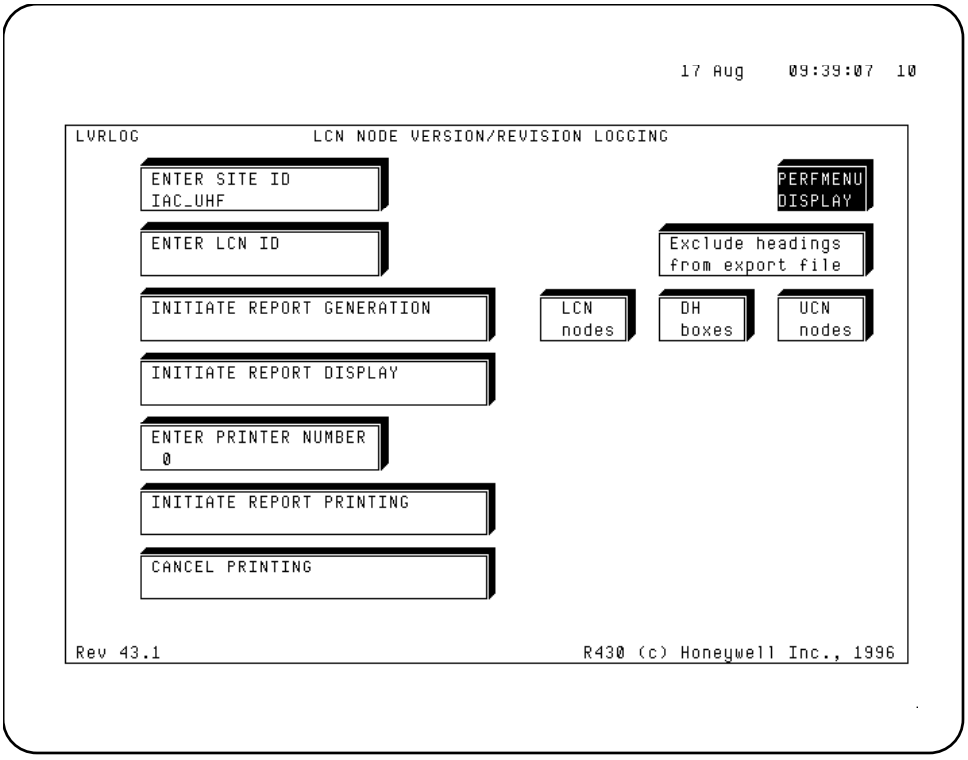


16425

Enter Site ID, continued

The data entry port will close, the target will change color (from green to cyan) and the Site ID that was entered will now appear within the border of the target.

Figure 34-8 LCN Node Version/Revision Logging Display (with Site ID)



16426

34.6 Operating the LCN Node Version/Revision Logging Function (LVRLOG), Continued

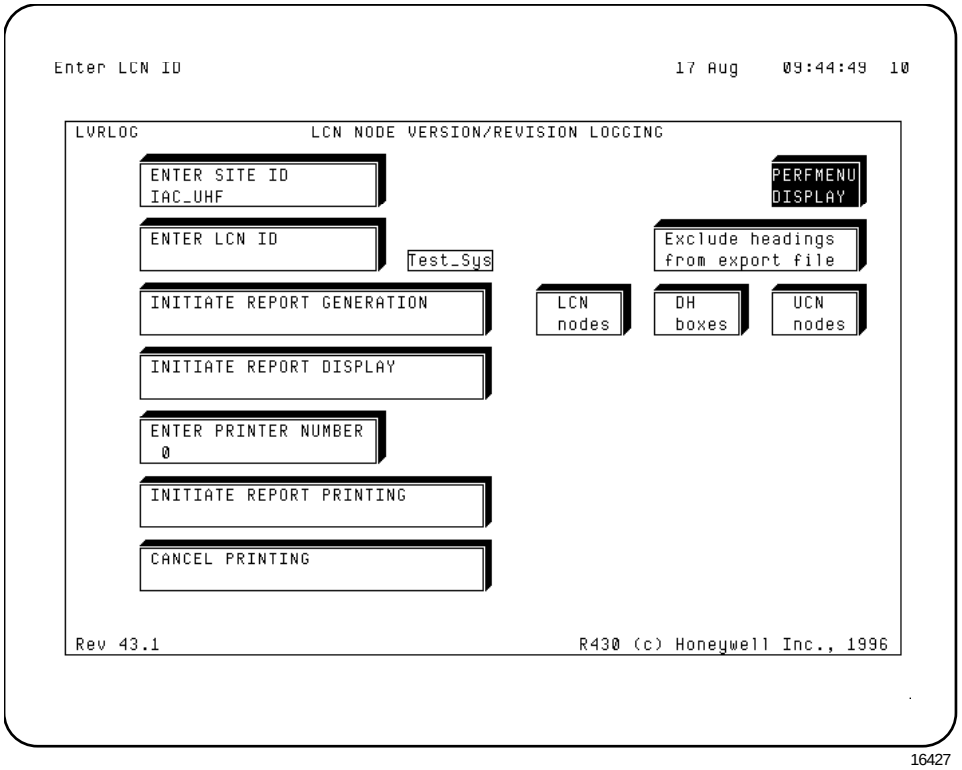
Enter LCN ID

The LCN ID that will appear in the generated report can be entered or modified.

Table 34-13 Open LCN ID Data Entry Port

Step	Action
1	Touch or TAB and SELECT the ENTER LCN ID target. The target will change color (from cyan to green) and a data entry port will open to the right of the target.
2	Enter a 1 - 8 character alphanumeric LCN ID. Press the <ENTER> key.

Figure 34-9 LCN Node Version/Revision Logging Display (with "Enter LCN ID" data entry port)

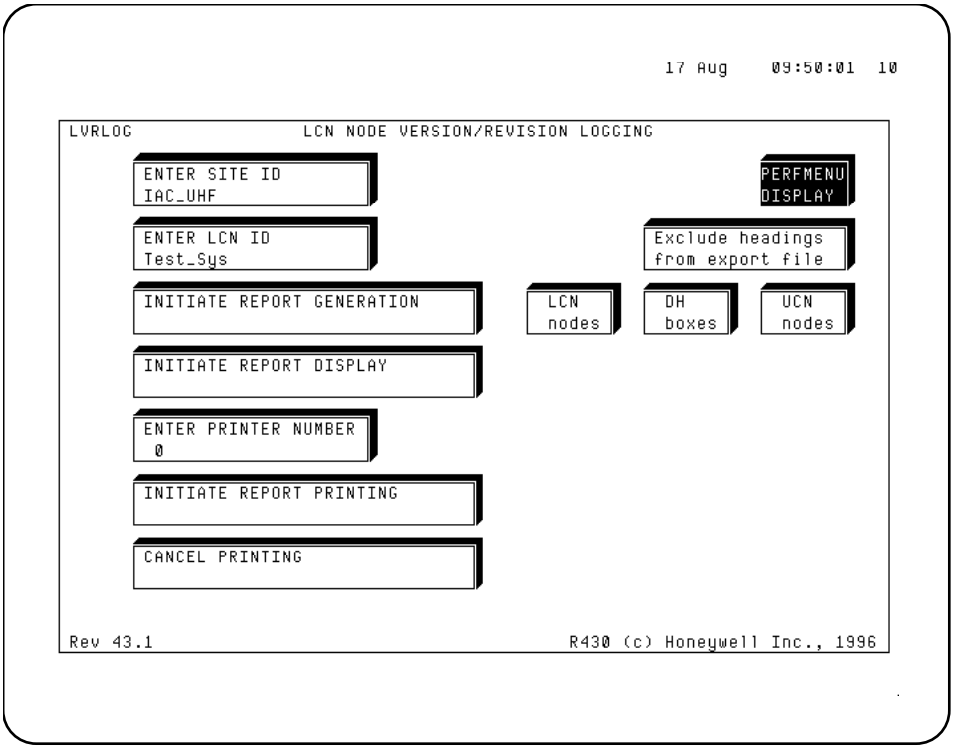


16427

Enter LCN ID, continued

The data entry port will close, the target will change color (from green to cyan) and the LCN ID that was entered will now appear within the border of the target.

Figure 34-10 LCN Node Version/Revision Logging Display (with LCN ID)



16428

Export file format option

You may choose to have the export file generated **with heading** information or **without heading** information. The use of the export file **without heading** information may ease the job of importing the file into some applications.

If you choose to have the export file generated **without** heading information, you must **select** the "Exclude headings from export file" target. If you choose to have the export file generated **with** heading information, you must **deselect** the "Exclude headings from export file" target.

Target is in Selected state if…	Target is in the Deselected state if…
the target is colored green (and is full intensity).	the target is colored cyan (and is half intensity).

When you touch TAB and SELECT…	The Target will …
the cyan colored "Exclude headings from export file" target,	change color from cyan to green (thus selecting the target).
the green colored "Exclude headings from export file" target,	change color from green to cyan (thus deselecting the target).

The state (selected or deselected) that the "Exclude headings from export file" target is in when the report generation is initiated, determines the format of the generated export file.

See the section of this document entitled "Export File (LVRLOG.RE)" for a description of the export file.

Touch or TAB and SELECT (as required to select or deselect) the "Exclude headings from export file" target (see Figure 34-5).

Select report Node/Box subset

The three node/box subset targets (the “LCN nodes” target, the “DH boxes” target and the “UCN nodes” target in Figure 34-5) allow you to choose the system nodes and boxes for the generated report.

Node/Box is Selected if...	Node/Box is Deselected if...
the subset target is colored green (and is full intensity).	the subset target is colored cyan (and is half intensity).

When you touch TAB and SELECT…	The Target will …
one of the cyan colored node/box subset targets,	change color from cyan to green (thus selecting the target).
one of the green colored node/box subset targets,	change color from green to cyan (thus deselecting the target).
At least one of the three node/box subset targets will remain in the selected state at all times. The display will reject an attempt to set all three node/box subset targets to the deselected state.	
the last node/box subset target in the selected state,	The display will **not** deselect the node/box subset target; instead, the display will generate an audible error tone and display the message “ERROR” in the upper left corner of the display.

If...	Then...
the “LCN nodes” target is in the selected state when the report generation is started,	the generated report will contain all of the LCN nodes information.
the “DH boxes” target is in the selected state when the report generation is started,	the generated report will contain all of the Data Hiway boxes information.
the “UCN nodes” target is in the selected state when the report generation is started,	the generated report will contain all of the UCN nodes information.

Select report Node/Box subset, continued

Touch or TAB and SELECT (as required to select or deselect) the three node/box subset targets (the "LCN nodes" target, the "DH boxes" target and the "UCN nodes" target).

Initiate Report Generation

Before initiating the report generation, verify that all LCN nodes, DH boxes, and UCN nodes that you want information on (included in the generated report), are in as "normal" an operating state as possible. Examples are:

If...	They...
the LCN nodes are in the OFF, FAIL, PWR_ON, or ISOLATED states,	will **not** be included in the generated report.
the DH boxes are in the HWY ERR state,	will **not** be included in the generated report.
the UCN nodes are in the OFFNET state,	will **not** be included in the generated report.

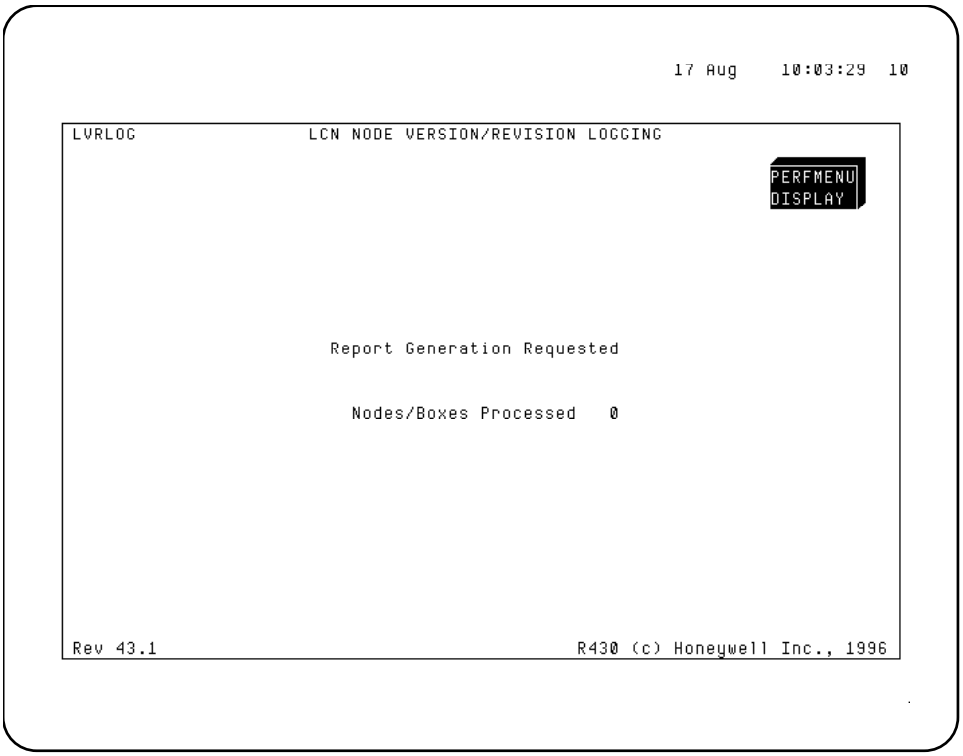
The above examples do not cover <u>all</u> cases in which the node or box will not be included in the generated report.

Touch or TAB and SELECT the INITIATE REPORT GENERATION target in the LCN Node Version/Revision Logging Display (see Figure 34-5).

Initiate report generation, continued

All targets (except the PERFMENU DISPLAY target) will disappear from the display. The report generation status of "Report Generation Requested" will appear approximately in the center of the display. The message "Nodes/Boxes Processed 0" will appear three lines under the report generation status.

Figure 34-11 LCN Node Version/Revision Logging Display (with Report Generation Status)

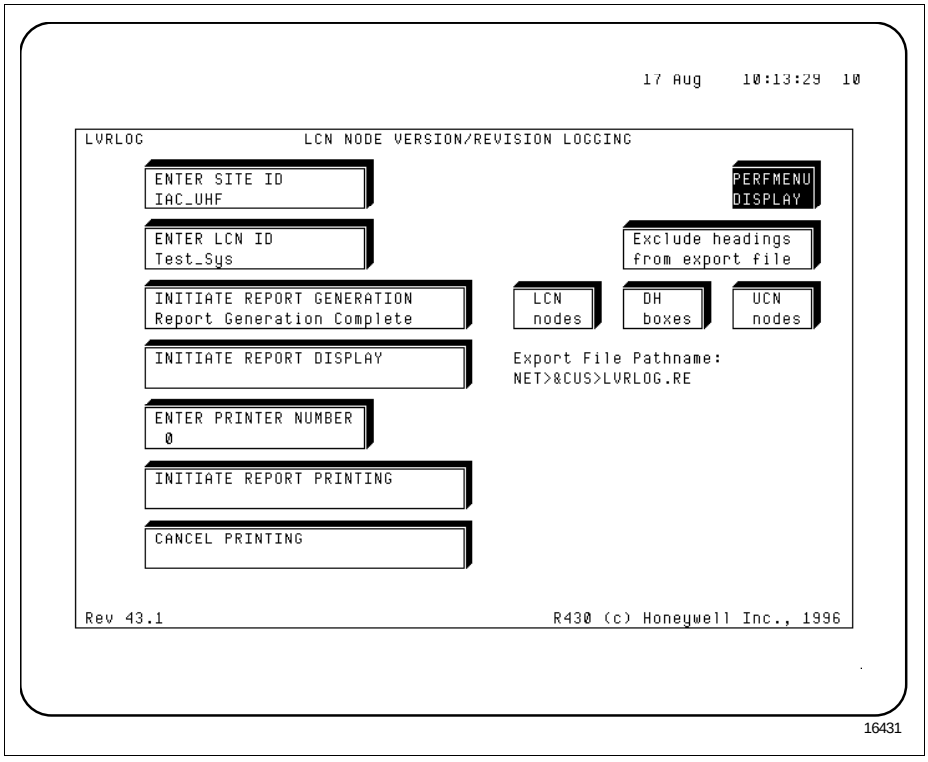


16429

Initiate report generation, continued

In a few seconds, the report generation status will change to “Report Generation In Progress.” The number field in the message “Nodes/Boxes Processed 0” will begin to be updated with a running total of the LCN nodes, Data Hiway boxes, and Universal Control Network nodes processed in the generation of the report.

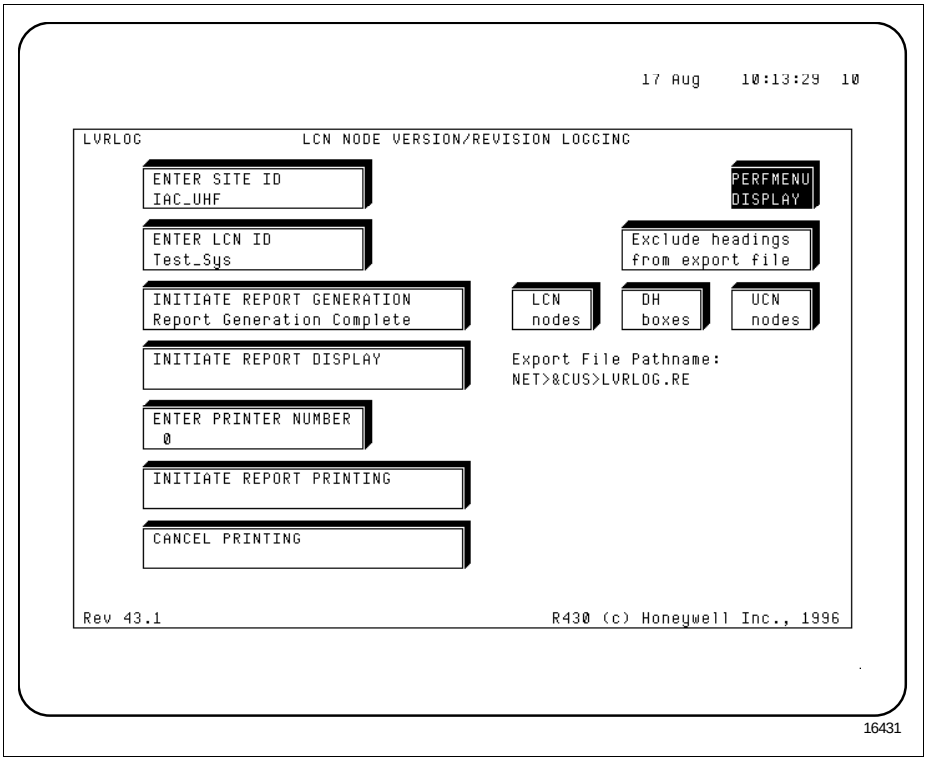
Figure 34-12 LCN Node Version/Revision Logging Display (with Report Generation In Progress)



Initiate report generation, continued

In a few minutes (more in the case of a large system), the targets will reappear on the display. In the INITIATE REPORT GENERATION target, the report generation status will be displayed. If the report was generated, the report generation status will be "Report Generation Complete." If the report was not generated, the report generation status will be "Report Generation Failure." Touch or TAB and SELECT the INITIATE REPORT DISPLAY target (see Figure 34-8) to display the generated report.

Figure 34-13 LCN Node Version/Revision Logging Display (with Report Generation Complete or Failure)



After a report has been generated (the appearance the report generation status of "Report Generation Complete appears in the INITIATE REPORT GENERATION target), the message "Export File Pathname: NET>&CUS>LVRLOG.RE" appears on the display beneath the three node/box subset targets. This informs you of the pathname of the export file, so that you can copy the file for export to another application on another system.

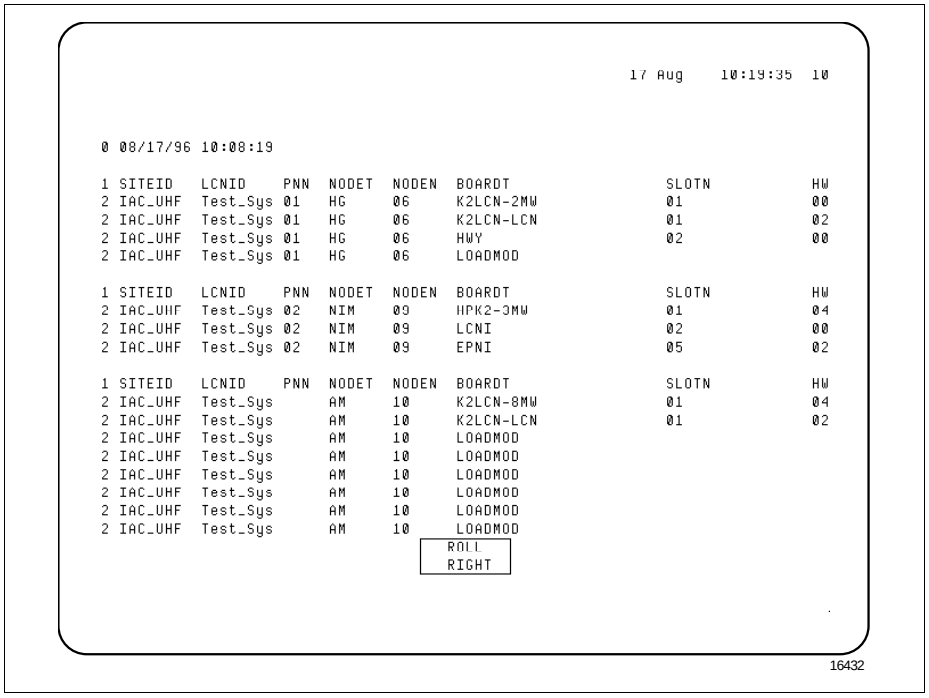
Initiate report generation, continued

The Export File Pathname is always the same pathname (and cannot be changed). The Export File Pathname is displayed for convenience.

After the report has been generated (and the report generation status of "Report Generation Complete" is indicated in the INITIATE REPORT GENERATION target), touch or TAB and SELECT the INITIATE REPORT DISPLAY target to display the report.
The LCN Node Version/Revision Logging display disappears from the Universal Station screen and is replaced by a display which shows the leftmost 80 characters of the first twenty-two records of the generated report.

Action	Result
Press the PAGE FWD key.	Review the next twenty-two records of the generated report.
Touch or TAB and SELECT the ROLL RIGHT target.	Review the rightmost eighty (80) characters for each group of twenty-two records of the generated report (see Figure 34-10).

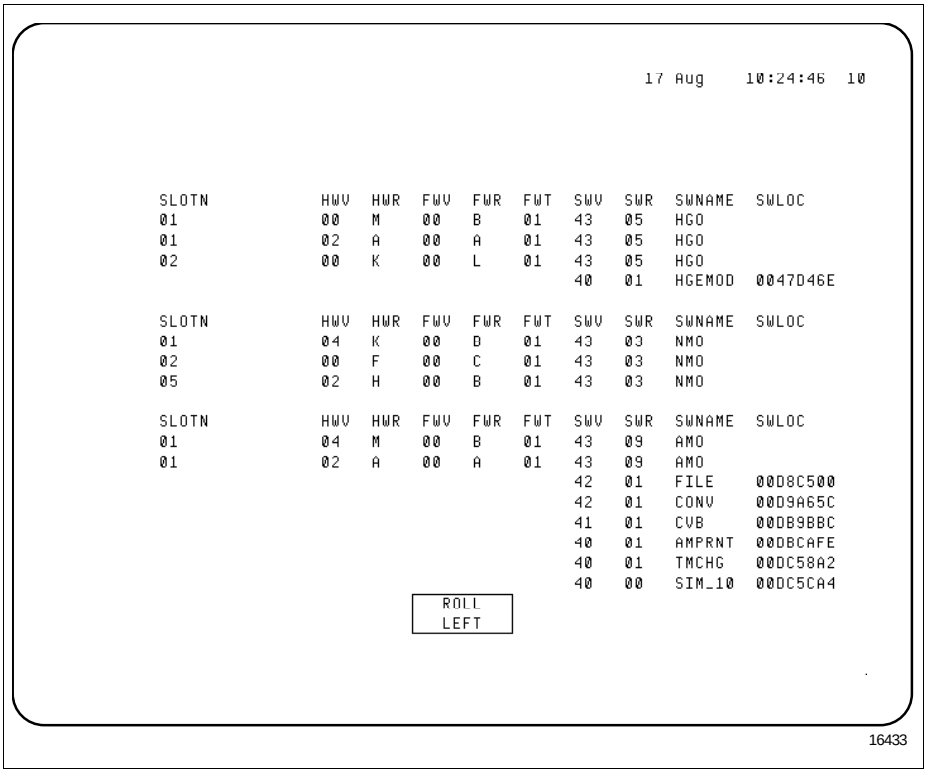
Figure 34-14 Generated Report - Leftmost 80 Characters



Initiate Report Display, continued

Action	Result
Touch or TAB and SELECT the ROLL LEFT target.	Return to the leftmost eighty (80) characters of each group of twenty-two records of the generated report (see Figure 34-9).
Press the PAGE BACK key.	Reviews a previously viewed group of twenty-two records of the generated report.
By pressing the PAGE BACK key,	it is possible to page back (up to a maximum of) four groups of twenty-two records of the generated report.
Press the PRIOR DISP key two times	to return to the first group of twenty-two records of the generated report,

Figure 34-15 Generated Report - Rightmost 80 Characters



Initiate Report Display, continued

To correlate displayed report information that exists on a single report line but cannot entirely be viewed without using the ROLL RIGHT target and ROLL LEFT target:

Action	Result
Touch or TAB and SELECT the desired line of the displayed report.	The background of the selected line of the displayed report will change color from black to blue.
Touching or TABbing and SELECTing the ROLL LEFT target and ROLL RIGHT target,	the background of the selected line will remain blue as the left and right sides of the displayed report lines are reviewed.

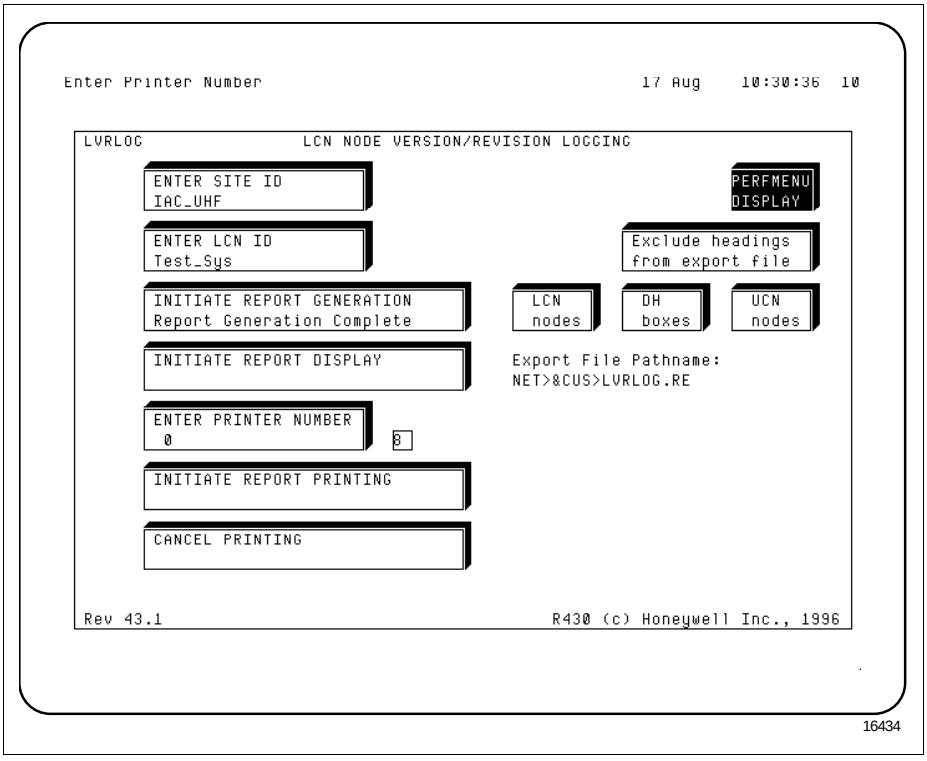
34.6 Operating the LCN Node Version/Revision Logging Function (LVRLOG), Continued

Enter Printer Number

The printer number of the printer on which the generated report is to be printed can be entered or modified by:

Step	Action
1	Touch or TAB and SELECT the ENTER PRINTER number target. The target will change color (from cyan to green) and a data entry port will open to the right of the target.
2	Enter a 1 or 2 digit Printer Number.
3	Press the <ENTER> key.

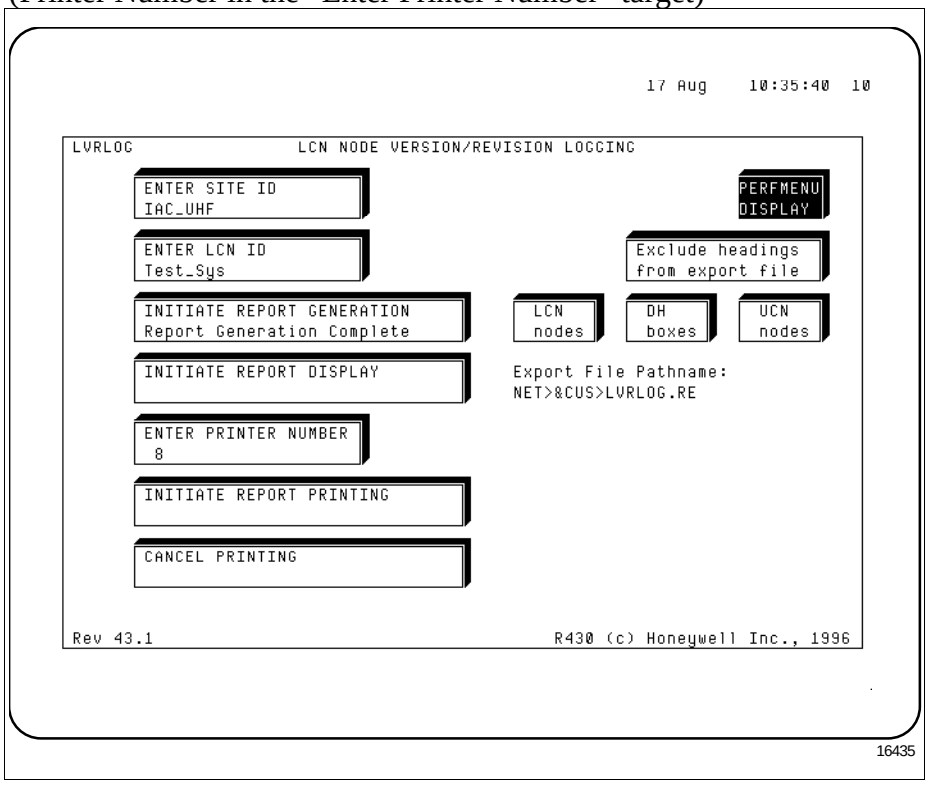
Figure 34-16 LCN Node Version/Revision Logging Display (Printer Number data entry port)



Enter Printer Number, continued

The data entry port will close, the target will change color (from green to cyan), and the printer number that was entered will now appear within the border of the target.

Figure 34-17 LCN Node Version/Revision Logging Display (Printer Number in the “Enter Printer Number” target)



Initiate Report Printing

After the report has been generated (and the report generation status of “Report Generation Complete” is indicated in the INITIATE REPORT GENERATION target), touch or TAB and SELECT the INITIATE REPORT PRINTING target to print the generated report (see Figure 34-12 above).

If the printer number is set to the number of an existing functioning Printer, the generated report will be printed. See the section entitled Display/Print File (LVRLOG.RD) for an example of the printed report.

Cancel Printing

While the generated report is being printed, touch or TAB and SELECT the CANCEL PRINTING target (see Figure 34-12). The printer on which the generated report is being printed will stop printing the generated report.

WARNING

The CANCEL PRINTING target will cancel any printing on the printer, **not** just the printing of the generated report.

34.7 Files Generated by the LCN Node Version/Revision Logging Function (LVRLOG)

Two report text files

When you touch or TAB and SELECT the INITIATE REPORT GENERATION target, the LCN Node Version/Revision Logging function generates two text files. The first text file is for display and printing. The second text file is for export to other applications.

Display/print file (LVRLOG.RD)

LCN Node Version/Revision Logging function generates a text file (LVRLOG.RD) for display and printing. This file is stored under the pathname NET>&CUS>LVRLOG.RD. Each time a Report Generation is requested, the existing LVRLOG.RD file (if existent) is deleted and a new LVRLOG.RD file is created. The date and time in the first record of the file is the date and time of the start of report generation.

LVRLOG.RD file

The three lines in bold print (and blank line following) are not a part of the LVRLOG.RD file. They have been added to indicate the character position and width of each field of each record.

```
00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000011111111111111111111111111111
00000000011111111112222222223333333334444444445555555556666666667777777777888888888899999999900000000001111111112222222212345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678
0 08/17/96 10:08:19

1 SITEID   LCNID    PNN  NODET  NODEN  BOARDT              SLOTN          HWV  HWR  FWV  FWR  FWT  SWV  SWR  SWNAME  SWLOC
2 IAC_UHF  Test_Sys 01   HG     06     K2LCN-2MW           01             00   M    00   B    01   43   05   HGO
2 IAC_UHF  Test_Sys 01   HG     06     K2LCN-LCN           01             02   A    00   A    01   43   05   HGO
2 IAC_UHF  Test_Sys 01   HG     06     HWY                 02             00   K    00   L    01   43   05   HGO
2 IAC_UHF  Test_Sys 01   HG     06     LOADMOD                                                      40   01   HGEMOD  0047D46E

1 SITEID   LCNID    PNN  NODET  NODEN  BOARDT              SLOTN          HWV  HWR  FWV  FWR  FWT  SWV  SWR  SWNAME  SWLOC
2 IAC_UHF  Test_Sys 02   NIM    09     HPK2-3MW            01             04   K    00   B    01   43   03   NMO
2 IAC_UHF  Test_Sys 02   NIM    09     LCNI                02             00   F    00   C    01   43   03   NMO
2 IAC_UHF  Test_Sys 02   NIM    09     EPNI                05             02   H    00   B    01   43   03   NMO

1 SITEID   LCNID    PNN  NODET  NODEN  BOARDT              SLOTN          HWV  HWR  FWV  FWR  FWT  SWV  SWR  SWNAME  SWLOC
2 IAC_UHF  Test_Sys      AM     10     K2LCN-8MW           01             04   M    00   B    01   43   09   AMO
2 IAC_UHF  Test_Sys      AM     10     K2LCN-LCN           01             02   A    00   A    01   43   09   AMO
2 IAC_UHF  Test_Sys      AM     10     LOADMOD                                                      42   01   FILE    00D8C500
2 IAC_UHF  Test_Sys      AM     10     LOADMOD                                                      42   01   CONV    00D9A65C
2 IAC_UHF  Test_Sys      AM     10     LOADMOD                                                      41   01   CVB     00DB9BBC
2 IAC_UHF  Test_Sys      AM     10     LOADMOD                                                      40   01   AMPRNT  00DBCAFE
2 IAC_UHF  Test_Sys      AM     10     LOADMOD                                                      40   01   TMCHG   00DC58A2
2 IAC_UHF  Test_Sys      AM     10     LOADMOD                                                      40   00   SIM_10  00DC5CA4

1 SITEID   LCNID    PNN  NODET  NODEN  BOARDT              SLOTN          HWV  HWR  FWV  FWR  FWT  SWV  SWR  SWNAME  SWLOC
2 IAC_UHF  Test_Sys      HMON   15     K2LCN-2MW           01             00   L    00   B    01   43   06   HMO
2 IAC_UHF  Test_Sys      HMON   15     K2LCN-LCN           01             02   A    00   A    01   43   06   HMO
2 IAC_UHF  Test_Sys      HMON   15     SPC                 02             01   F    00   G    01   43   06   HMO

1 SITEID   LCNID    PNN  NODET  NODEN  BOARDT              SLOTN          HWV  HWR  FWV  FWR  FWT  SWV  SWR  SWNAME  SWLOC
2 IAC_UHF  Test_Sys      HMON   16     K2LCN-2MW           01             00   M    00   B    01   43   03   HMO
2 IAC_UHF  Test_Sys      HMON   16     K2LCN-LCN           01             02   A    00   A    01   43   03   HMO
2 IAC_UHF  Test_Sys      HMON   16     SPC                 02             01   F    00   G    01   43   03   HMO
```

34.7 Files Generated by the LCN Node Version/Revision Logging Function (LVRLOG), Continued

LVRLOG.RD file,
continued

```
1 SITEID   LCNID    PNN  NODET  NODEN  BOARDT              SLOTN          HWV  HWR  FWV  FWR  FWT  SWV  SWR  SWNAME  SWLOC
2 IAC_UHF  Test_Sys      CG     20     HPK2-3MW            01             04   L    00   B    01   43   06   CIO
2 IAC_UHF  Test_Sys      CG     20     LCNI                02             00   H    00   C    01   43   06   CIO
2 IAC_UHF  Test_Sys      CG     20     LOADMOD                                                      40   06   UMIMOD  005A8F80
2 IAC_UHF  Test_Sys      CG     20     LOADMOD                                                      40   05   EMUMOD  005B1704
2 IAC_UHF  Test_Sys      CG     20     LOADMOD                                                      40   07   EIPMOD  005B8F0E
2 IAC_UHF  Test_Sys      CG     20     LOADMOD                                                      40   09   FMTMOD  005C2F44
2 IAC_UHF  Test_Sys      CG     20     LOADMOD                                                      40   05   PELMOD  005D8580
2 IAC_UHF  Test_Sys      CG     20     LOADMOD                                                      40   07   PERMOD  005EBD24
2 IAC_UHF  Test_Sys      CG     20     LOADMOD                                                      40   04   TDLMOD  005FF49A
2 IAC_UHF  Test_Sys      CG     20     LOADMOD                                                      40   06   EMMMOD  0060C330
2 IAC_UHF  Test_Sys      CG     20     LOADMOD                                                      40   03   WPBMOD  0063BC9C
2 IAC_UHF  Test_Sys      CG     20     LOADMOD                                                      40   05   EM2MOD  00643ED6
2 IAC_UHF  Test_Sys      CG     20     LOADMOD                                                      40   05   GTMMOD  00673842

1 SITEID   LCNID    PNN  NODET  NODEN  BOARDT              SLOTN          HWV  HWR  FWV  FWR  FWT  SWV  SWR  SWNAME  SWLOC
2 IAC_UHF  Test_Sys      US     25     HPK2-3MW            01             04   K    00   B    01   43   20   UP
2 IAC_UHF  Test_Sys      US     25     LCNI                02             00   J    00   D    01   43   20   UP
2 IAC_UHF  Test_Sys      US     25     FDC                 03             00   J    00   J    01   43   20   UP
2 IAC_UHF  Test_Sys      US     25     QMEM4096            04             07   B                              43   20   UP
2 IAC_UHF  Test_Sys      US     25     EPDG/SCSI           05             02   H    01   H    01   43   20   UP
2 IAC_UHF  Test_Sys      US     25     LOADMOD                                                      43   05   UPBASE  00C6490C
2 IAC_UHF  Test_Sys      US     25     LOADMOD                                                      40   02   UPCAL   00C68534
2 IAC_UHF  Test_Sys      US     25     LOADMOD                                                      40   02   CRDRDR  00C6B936
2 IAC_UHF  Test_Sys      US     25     LOADMOD                                                      40   01   UPKLCK  00C6CF38
2 IAC_UHF  Test_Sys      US     25     LOADMOD                                                      43   01   UPLVR   00C6DB22

1 SITEID   LCNID    PNN  NODET  NODEN  BOARDT              SLOTN          HWV  HWR  FWV  FWR  FWT  SWV  SWR  SWNAME  SWLOC
2 IAC_UHF  Test_Sys      UxS    27     K2LCN-8MW           01             04   J    00   B    01   43   48   UxS
2 IAC_UHF  Test_Sys      UxS    27     K2LCN-LCN           01             02   A    00   A    01   43   48   UxS
2 IAC_UHF  Test_Sys      UxS    27     WSI2                02             01   B                              43   48   UxS
2 IAC_UHF  Test_Sys      UxS    27     TPDG/SCSI           05             03   R    01   F    01   43   48   UxS
2 IAC_UHF  Test_Sys      UxS    27     LOADMOD                                                      43   05   UPBASE  00D473AA
2 IAC_UHF  Test_Sys      UxS    27     LOADMOD                                                      43   05   CSCHEM  00D4AFD2
2 IAC_UHF  Test_Sys      UxS    27     LOADMOD                                                      43   19   MSCHEM  00D4CDC2
2 IAC_UHF  Test_Sys      UxS    27     LOADMOD                                                      43   05   UPXTST  00D5C08A
2 IAC_UHF  Test_Sys      UxS    27     LOADMOD                                                      40   04   UPUPD   00D5DCB8
2 IAC_UHF  Test_Sys      UxS    27     LOADMOD                                                      40   03   UPLRGC  00D5EC5A
2 IAC_UHF  Test_Sys      UxS    27     LOADMOD                                                      40   07   UPXYPT  00D647A2
2 IAC_UHF  Test_Sys      UxS    27     LOADMOD                                                      43   01   XPDFIL  00D716E4
2 IAC_UHF  Test_Sys      UxS    27     LOADMOD                                                      40   02   UPCVRA  00D780AE

1 SITEID   LCNID    PNN  NODET  NODEN  BOARDT              SLOTN          HWV  HWR  FWV  FWR  FWT  SWV  SWR  SWNAME  SWLOC
2 IAC_UHF  Test_Sys      US     29     K2LCN-8MW           01             04   M    00   B    01   43   20   UP
2 IAC_UHF  Test_Sys      US     29     K2LCN-LCN           01             02   A    00   A    01   43   20   UP
2 IAC_UHF  Test_Sys      US     29     EPDG/SCSI           03             02   J    01   K    01   43   20   UP
2 IAC_UHF  Test_Sys      US     29     LOADMOD                                                      43   01   UPLVR   00D54F0C
2 IAC_UHF  Test_Sys      US     29     LOADMOD                                                      43   05   UPBASE  00D6200E

1 SITEID   LCNID    PNN  NODET  NODEN  BOARDT              SLOTN          HWV  HWR  FWV  FWR  FWT  SWV  SWR  SWNAME  SWLOC
2 IAC_UHF  Test_Sys      US     43     K2LCN-6MW           01             03   G    00   A    01   43   20   UP
2 IAC_UHF  Test_Sys      US     43     K2LCN-LCN           01             02   A    00   A    01   43   20   UP
2 IAC_UHF  Test_Sys      US     43     EPDG/SCSI           03             02   H    01   H    01   43   20   UP
2 IAC_UHF  Test_Sys      US     43     LOADMOD                                                      43   05   UPBASE  00A4CA3C
2 IAC_UHF  Test_Sys      US     43     LOADMOD                                                      40   07   UPXYPT  00A50664
2 IAC_UHF  Test_Sys      US     43     LOADMOD                                                      40   01   UPKLCK  00A5D5A6
2 IAC_UHF  Test_Sys      US     43     LOADMOD                                                      40   02   UPCVRA  00A5E190
2 IAC_UHF  Test_Sys      US     43     LOADMOD                                                      43   00   UP_ATB  00A5FFB6
2 IAC_UHF  Test_Sys      US     43     LOADMOD                                                      43   01   UPLVR   00A63F4E

1 SITEID   LCNID    PNN  NODET  NODEN  BOARDT              SLOTN          HWV  HWR  FWV  FWR  FWT  SWV  SWR  SWNAME  SWLOC
2 IAC_UHF  Test_Sys      US     48     K2LCN-8MW           01             04   M    00   B    01   43   20   UP
2 IAC_UHF  Test_Sys      US     48     K2LCN-LCN           01             02   A    00   A    01   43   20   UP
2 IAC_UHF  Test_Sys      US     48     EPDG/SCSI           03             02   J    01   H    01   43   20   UP
2 IAC_UHF  Test_Sys      US     48     LOADMOD                                                      43   05   UPBASE  00D4C26C
2 IAC_UHF  Test_Sys      US     48     LOADMOD                                                      40   01   UPKLCK  00D4FE94
2 IAC_UHF  Test_Sys      US     48     LOADMOD                                                      40   07   UPXYPT  00D50A7E
2 IAC_UHF  Test_Sys      US     48     LOADMOD                                                      40   02   UPCVRA  00D5D9C0
2 IAC_UHF  Test_Sys      US     48     LOADMOD                                                      43   01   UPLVR   00D5F7E6

3 SITEID   LCNID    HWY  BOXT   BOXN   CARDT               CARDN                                                  BOXSIZE
4 IAC_UHF  Test_Sys 01   HG     02
```

34.7 Files Generated by the LCN Node Version/Revision Logging Function (LVRLOG), Continued

Example of LVRLOG.RD file, continued

```
3 SITEID   LCNID    HWY  BOXT   BOXN   CARDT               CARDN                                                BOXSIZE
4 IAC_UHF  Test_Sys 01   HLPIU  05     ANALOGIN            01                                                   REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     ANALOGIN            02                                                   REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     ANALOGOT            03                                                   REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     DIGIN               04                                                   REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     DIGOUT              05                                                   REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     DIGIN               06                                                   REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     DIGIN               07                                                   REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     DIGIN               08                                                   REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     NONE                09                                                   REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     NONE                10                                                   REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     NONE                11                                                   REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     NONE                12                                                   REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     NONE                13                                                   REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     NONE                14                                                   REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     NONE                15                                                   REGULAR
4 IAC_UHF  Test_Sys 01   HLPIU  05     NONE                16                                                   REGULAR

3 SITEID   LCNID    HWY  BOXT   BOXN   CARDT               CARDN                                                BOXSIZE
4 IAC_UHF  Test_Sys 01   MC     10     ANALOGOT            01
4 IAC_UHF  Test_Sys 01   MC     10     ANALOGOT            02
4 IAC_UHF  Test_Sys 01   MC     10     DIGIN               03
4 IAC_UHF  Test_Sys 01   MC     10     DIGIN               04
4 IAC_UHF  Test_Sys 01   MC     10     DIGOUT              05
4 IAC_UHF  Test_Sys 01   MC     10     DIGOUT              06
4 IAC_UHF  Test_Sys 01   MC     10     DIGIN               07
4 IAC_UHF  Test_Sys 01   MC     10     ANALOGIN            08
4 IAC_UHF  Test_Sys 01   MC     10     FAIL                09
4 IAC_UHF  Test_Sys 01   MC     10     FAIL                10
4 IAC_UHF  Test_Sys 01   MC     10     FAIL                11
4 IAC_UHF  Test_Sys 01   MC     10     FAIL                12
4 IAC_UHF  Test_Sys 01   MC     10     FAIL                13
4 IAC_UHF  Test_Sys 01   MC     10     FAIL                14
4 IAC_UHF  Test_Sys 01   MC     10     FAIL                15
4 IAC_UHF  Test_Sys 01   MC     10     FAIL                16

5 SITEID   LCNID    UCN  NODET  NODEN  CARDT     MODN  FILEN  CARDN  FILEP        HWR       FWR       SWV  SWR  SWNAME  REDUNCY
6 IAC_UHF  Test_Sys 02   NIM    01     MODEM                                      27
6 IAC_UHF  Test_Sys 02   NIM    01     PROTOCOL                                                        00   01
6 IAC_UHF  Test_Sys 02   NIM    01     UCNLLN                                                          2A   00
6 IAC_UHF  Test_Sys 02   NIM    01     DRIVER                                                          2A   00
6 IAC_UHF  Test_Sys 02   NIM    01     TBC                                        00

5 SITEID   LCNID    UCN  NODET  NODEN  CARDT     MODN  FILEN  CARDN  FILEP        HWR       FWR       SWV  SWR  SWNAME  REDUNCY
6 IAC_UHF  Test_Sys 02   PM     09     PMMMOD          01     01     FILE_1       05                                      REDUN_2F
6 IAC_UHF  Test_Sys 02   PM     09     PMMCOM          01     02     FILE_1       0B        31        42   03   PMMCOM  REDUN_2F
6 IAC_UHF  Test_Sys 02   PM     09     PMMCOMD         01     02     FILE_1       02                                      REDUN_2F
6 IAC_UHF  Test_Sys 02   PM     09     PMMIOL          01     03     FILE_1       0C        32                            REDUN_2F
6 IAC_UHF  Test_Sys 02   PM     09     PMMCTL          01     04     FILE_1       0D        32        42   01   PMMCTL  REDUN_2F
6 IAC_UHF  Test_Sys 02   PM     09     PMMCTLD         01     04     FILE_1       02                                      REDUN_2F
6 IAC_UHF  Test_Sys 02   PM     09     NONE      01 a  01     06
6 IAC_UHF  Test_Sys 02   PM     09     HLAI      02 a  01     07                  01        3.3
6 IAC_UHF  Test_Sys 02   PM     09     HLAI      03 a  01     08                  01        3.3
6 IAC_UHF  Test_Sys 02   PM     09     DO        04 a  01     09                  04        3.6
6 IAC_UHF  Test_Sys 02   PM     09     NONE      05 a  01     10
6 IAC_UHF  Test_Sys 02   PM     09     AO        06 a  01     11                  25        3.9
6 IAC_UHF  Test_Sys 02   PM     09     DI        07 a  01     12                  23        3.3
6 IAC_UHF  Test_Sys 02   PM     09     AO        08 a  01     13                  02        3.4

5 SITEID   LCNID    UCN  NODET  NODEN  CARDT     MODN  FILEN  CARDN  FILEP        HWR       FWR       SWV  SWR  SWNAME  REDUNCY
6 IAC_UHF  Test_Sys 02   APM    13     APMMMOD         01     01     FILE_1       2A                                      REDUN_2F
6 IAC_UHF  Test_Sys 02   APM    13     APMMCOM         01     02     FILE_1       24        42        42   04   APMCOM  REDUN_2F
6 IAC_UHF  Test_Sys 02   APM    13     APMMCOMD        01     02     FILE_1       22                                      REDUN_2F
6 IAC_UHF  Test_Sys 02   APM    13     APMMIOL         01     03     FILE_1       13        41                            REDUN_2F
6 IAC_UHF  Test_Sys 02   APM    13     APMMCTL         01     04     FILE_1       26        43        42   01   APMCTL  REDUN_2F
6 IAC_UHF  Test_Sys 02   APM    13     APMMCTLD        01     04     FILE_1       00                                      REDUN_2F
6 IAC_UHF  Test_Sys 02   APM    13     APMMTBC                                    08
6 IAC_UHF  Test_Sys 02   APM    13     HLAI      01 a  01     06                  24        3.3
6 IAC_UHF  Test_Sys 02   APM    13     AO        06 a  01     11                  02        3.4
6 IAC_UHF  Test_Sys 02   APM    13     DI        07 a  01     12                  01        3.3
6 IAC_UHF  Test_Sys 02   APM    13     NONE      08 a  01     13
6 IAC_UHF  Test_Sys 02   APM    13     PI        09 a  01     14                  20        3.3
7 REPORT   COMPLETE
```

34.7 Files Generated by the LCN Node Version/Revision Logging Function (LVRLOG), Continued

Export file (LVRLOG.RE)

The LCN Node Version/Revision Logging function generates a text file (LVRLOG.RE) for export to other applications, such as Microsoft Excel. This file is stored under the pathname NET>&CUS>LVRLOG.RE. Each time a Report Generation is requested, the existing LVRLOG.RE file (if existent) is deleted and a new LVRLOG.RE file is created.
The date and time in the first record of the LVRLOG.RE file is the date and time of the start of report generation.

LVRLOG.RE file with target deselected

The example of the LVRLOG.RE file below was generated with the "Exclude headings from export file" target **deselected**.
The three lines in bold print (and blank line following) are not a part of the LVRLOG.RE file. They have been added to indicate the character position and width of each field of each record.

```
00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000011111111111111111111111111111
00000000011111111112222222222333333333444444444455555555566666666677777777778888888888999999999900000000011111111112222222312
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234560

0,08/17/96,10:08:19,    ,      ,      ,      ,      ,       ,       ,      ,      ,      ,      ,      ,      ,      ,      ,      ,
1,SITEID  ,LCNID   ,PNN ,NODET ,NODEN ,BOARDT   ,      ,       ,SLOTN ,       ,HWV ,HWR ,FWV ,FWR ,FWT ,SWV ,SWR ,SWNAME ,SWLOC   ,
2,IAC_UHF ,Test_Sys,01  ,HG    ,06    ,K2LCN-2MW,     ,       ,01    ,       ,00  ,M   ,00  ,B   ,01  ,43  ,05  ,HGO    ,        ,
2,IAC_UHF ,Test_Sys,01  ,HG    ,06    ,K2LCN-LCN,     ,       ,01    ,       ,02  ,A   ,00  ,A   ,01  ,43  ,05  ,HGO    ,        ,
2,IAC_UHF ,Test_Sys,01  ,HG    ,06    ,HWY       ,    ,       ,02    ,       ,00  ,K   ,00  ,L   ,01  ,43  ,05  ,HGO    ,        ,
2,IAC_UHF ,Test_Sys,01  ,HG    ,06    ,LOADMOD  ,     ,       ,      ,       ,    ,    ,    ,    ,    ,    ,40  ,01  ,HGEMOD ,0047D46E,
1,SITEID  ,LCNID   ,PNN ,NODET ,NODEN ,BOARDT   ,      ,       ,SLOTN ,       ,HWV ,HWR ,FWV ,FWR ,FWT ,SWV ,SWR ,SWNAME ,SWLOC   ,
2,IAC_UHF ,Test_Sys,02  ,NIM   ,09    ,HPK2-3MW ,     ,       ,01    ,       ,04  ,K   ,00  ,B   ,01  ,43  ,03  ,NMO    ,        ,
2,IAC_UHF ,Test_Sys,02  ,NIM   ,09    ,LCNI     ,     ,       ,02    ,       ,00  ,F   ,00  ,C   ,01  ,43  ,03  ,NMO    ,        ,
2,IAC_UHF ,Test_Sys,02  ,NIM   ,09    ,EPNI     ,     ,       ,05    ,       ,02  ,H   ,00  ,B   ,01  ,43  ,03  ,NMO    ,        ,
1,SITEID  ,LCNID   ,PNN ,NODET ,NODEN ,BOARDT   ,      ,       ,SLOTN ,       ,HWV ,HWR ,FWV ,FWR ,FWT ,SWV ,SWR ,SWNAME ,SWLOC   ,
2,IAC_UHF ,Test_Sys,    ,AM    ,10    ,K2LCN-8MW,     ,       ,01    ,       ,04  ,M   ,00  ,B   ,01  ,43  ,09  ,AMO    ,        ,
2,IAC_UHF ,Test_Sys,    ,AM    ,10    ,K2LCN-LCN,     ,       ,01    ,       ,02  ,A   ,00  ,A   ,01  ,43  ,09  ,AMO    ,        ,
2,IAC_UHF ,Test_Sys,    ,AM    ,10    ,LOADMOD  ,     ,       ,      ,       ,    ,    ,    ,    ,    ,42  ,01  ,FILE   ,00D8C500,
2,IAC_UHF ,Test_Sys,    ,HMON  ,16    ,SPC      ,     ,       ,02    ,       ,01  ,F   ,00  ,G   ,01  ,43  ,03  ,FILE   ,00D8C500,
2,IAC_UHF ,Test_Sys,    ,AM    ,10    ,LOADMOD  ,     ,       ,      ,       ,    ,    ,    ,    ,    ,42  ,01  ,CONV   ,00D9A65C,
2,IAC_UHF ,Test_Sys,    ,AM    ,10    ,LOADMOD  ,     ,       ,      ,       ,    ,    ,    ,    ,    ,41  ,01  ,CVB    ,00DB9BBC,
2,IAC_UHF ,Test_Sys,    ,AM    ,10    ,LOADMOD  ,     ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,01  ,AMPRNT ,00DBCAFE,
2,IAC_UHF ,Test_Sys,    ,AM    ,10    ,LOADMOD  ,     ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,01  ,TMCHG  ,00DC58A2,
2,IAC_UHF ,Test_Sys,    ,AM    ,10    ,LOADMOD  ,     ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,00  ,SIM_10 ,00DC5CA4,
1,SITEID  ,LCNID   ,PNN ,NODET ,NODEN ,BOARDT   ,      ,       ,SLOTN ,       ,HWV ,HWR ,FWV ,FWR ,FWT ,SWV ,SWR ,SWNAME ,SWLOC   ,
2,IAC_UHF ,Test_Sys,    ,HMON  ,15    ,K2LCN-2MW,     ,       ,01    ,       ,00  ,L   ,00  ,B   ,01  ,43  ,06  ,HMO    ,        ,
2,IAC_UHF ,Test_Sys,    ,HMON  ,15    ,K2LCN-LCN,     ,       ,01    ,       ,02  ,A   ,00  ,A   ,01  ,43  ,06  ,HMO    ,        ,
2,IAC_UHF ,Test_Sys,    ,HMON  ,15    ,SPC      ,     ,       ,02    ,       ,01  ,F   ,00  ,G   ,01  ,43  ,06  ,HMO    ,        ,
1,SITEID  ,LCNID   ,PNN ,NODET ,NODEN ,BOARDT   ,      ,       ,SLOTN ,       ,HWV ,HWR ,FWV ,FWR ,FWT ,SWV ,SWR ,SWNAME ,SWLOC   ,
2,IAC_UHF ,Test_Sys,    ,HMON  ,16    ,K2LCN-2MW,     ,       ,01    ,       ,00  ,M   ,00  ,B   ,01  ,43  ,03  ,HMO    ,        ,
2,IAC_UHF ,Test_Sys,    ,HMON  ,16    ,K2LCN-LCN,     ,       ,01    ,       ,02  ,A   ,00  ,A   ,01  ,43  ,03  ,HMO    ,        ,
1,SITEID  ,LCNID   ,PNN ,NODET ,NODEN ,BOARDT   ,      ,       ,SLOTN ,       ,HWV ,HWR ,FWV ,FWR ,FWT ,SWV ,SWR ,SWNAME ,SWLOC   ,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,HPK2-3MW ,     ,       ,01    ,       ,04  ,L   ,00  ,B   ,01  ,43  ,06  ,CIO    ,        ,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LCNI     ,     ,       ,02    ,       ,00  ,H   ,00  ,C   ,01  ,43  ,06  ,CIO    ,        ,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,     ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,06  ,UMIMOD ,005A8F80,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,     ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,05  ,EMUMOD ,005B1704,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,     ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,07  ,EIPMOD ,005B8F0E,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,     ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,09  ,FMTMOD ,005C2F44,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,     ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,05  ,PELMOD ,005D8580,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,     ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,07  ,PERMOD ,005EBD24,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,     ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,04  ,TDLMOD ,005FF49A,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,     ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,06  ,EMMMOD ,0060C330,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,     ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,03  ,WPBMOD ,0063BC9C,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,     ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,05  ,EM2MOD ,00643ED6,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,     ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,05  ,GTMMOD ,00673842,
1,SITEID  ,LCNID   ,PNN ,NODET ,NODEN ,BOARDT   ,      ,       ,SLOTN ,       ,HWV ,HWR ,FWV ,FWR ,FWT ,SWV ,SWR ,SWNAME ,SWLOC   ,
2,IAC_UHF ,Test_Sys,    ,US    ,25    ,HPK2-3MW ,     ,       ,01    ,       ,04  ,K   ,00  ,B   ,01  ,43  ,20  ,UP     ,        ,
2,IAC_UHF ,Test_Sys,    ,US    ,25    ,LCNI     ,     ,       ,02    ,       ,00  ,J   ,00  ,D   ,01  ,43  ,20  ,UP     ,        ,
2,IAC_UHF ,Test_Sys,    ,US    ,25    ,FDC      ,     ,       ,03    ,       ,00  ,J   ,00  ,J   ,01  ,43  ,20  ,UP     ,        ,
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34.7 Files Generated by the LCN Node Version/Revision Logging Function (LVRLOG), Continued

LVRLOG.RE file generated with target deselected, continued

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2,IAC_UHF ,Test_Sys,    ,US    ,25    ,QMEM4096 ,    ,       ,04    ,       ,07  ,B   ,    ,    ,    ,43  ,20  ,UP    ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,25    ,EPDG/SCSI,    ,       ,05    ,       ,02  ,H   ,01  ,H   ,01  ,43  ,20  ,UP    ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,25    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,43  ,05  ,UPBASE ,00C6490C,
2,IAC_UHF ,Test_Sys,    ,US    ,25    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,02  ,UPCAL  ,00C68534,
2,IAC_UHF ,Test_Sys,    ,US    ,25    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,02  ,CRDRDR ,00C6B936,
2,IAC_UHF ,Test_Sys,    ,US    ,25    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,01  ,UPKLCK ,00C6CF38,
2,IAC_UHF ,Test_Sys,    ,US    ,25    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,43  ,01  ,UPLVR  ,00C6DB22,
1,SITEID  ,LCNID   ,PNN ,NODET ,NODEN ,BOARDT   ,    ,       ,SLOTN ,       ,HWV ,HWR ,FWV ,FWR ,FWT ,SWV ,SWR ,SWNAME ,SWLOC   ,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,K2LCN-8MW,    ,       ,01    ,       ,04  ,J   ,00  ,B   ,01  ,43  ,48  ,UxS    ,       ,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,K2LCN-LCN,    ,       ,01    ,       ,02  ,A   ,00  ,A   ,01  ,43  ,48  ,UxS    ,       ,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,WSI2     ,    ,       ,02    ,       ,01  ,B   ,    ,    ,    ,43  ,48  ,UxS    ,       ,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,TPDG/SCSI,    ,       ,05    ,       ,03  ,R   ,01  ,F   ,01  ,43  ,48  ,UxS    ,       ,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,43  ,05  ,UPBASE ,00D473AA,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,43  ,05  ,CSCHEM ,00D4AFD2,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,43  ,19  ,MSCHEM ,00D4CDC2,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,43  ,05  ,UPXTST ,00D5C08A,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,04  ,UPUPD  ,00D5DCB8,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,03  ,UPLRGC ,00D5EC5A,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,07  ,UPXYPT ,00D647A2,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,43  ,01  ,XPDFIL ,00D716E4,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,02  ,UPCVRA ,00D780AE,
1,SITEID  ,LCNID   ,PNN ,NODET ,NODEN ,BOARDT   ,    ,       ,SLOTN ,       ,HWV ,HWR ,FWV ,FWR ,FWT ,SWV ,SWR ,SWNAME ,SWLOC   ,
2,IAC_UHF ,Test_Sys,    ,US    ,29    ,K2LCN-8MW,    ,       ,01    ,       ,04  ,M   ,00  ,B   ,01  ,43  ,20  ,UP    ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,29    ,K2LCN-LCN,    ,       ,01    ,       ,02  ,A   ,00  ,A   ,01  ,43  ,20  ,UP    ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,29    ,EPDG/SCSI,    ,       ,03    ,       ,02  ,J   ,01  ,K   ,01  ,43  ,20  ,UP    ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,29    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,43  ,01  ,UPLVR  ,00D54F0C,
2,IAC_UHF ,Test_Sys,    ,US    ,29    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,43  ,05  ,UPBASE ,00D6200E,
1,SITEID  ,LCNID   ,PNN ,NODET ,NODEN ,BOARDT   ,    ,       ,SLOTN ,       ,HWV ,HWR ,FWV ,FWR ,FWT ,SWV ,SWR ,SWNAME ,SWLOC   ,
2,IAC_UHF ,Test_Sys,    ,US    ,43    ,K2LCN-6MW,    ,       ,01    ,       ,03  ,G   ,00  ,A   ,01  ,43  ,20  ,UP    ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,43    ,K2LCN-LCN,    ,       ,01    ,       ,02  ,A   ,00  ,A   ,01  ,43  ,20  ,UP    ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,43    ,EPDG/SCSI,    ,       ,03    ,       ,02  ,H   ,01  ,H   ,01  ,43  ,20  ,UP    ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,43    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,43  ,05  ,UPBASE ,00A4CA3C,
2,IAC_UHF ,Test_Sys,    ,US    ,43    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,07  ,UPXYPT ,00A50664,
2,IAC_UHF ,Test_Sys,    ,US    ,43    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,01  ,UPKLCK ,00A5D5A6,
2,IAC_UHF ,Test_Sys,    ,US    ,43    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,02  ,UPCVRA ,00A5E190,
2,IAC_UHF ,Test_Sys,    ,US    ,43    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,43  ,00  ,UP_ATB ,00A5FFB6,
2,IAC_UHF ,Test_Sys,    ,US    ,43    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,43  ,01  ,UPLVR  ,00A63F4E,
1,SITEID  ,LCNID   ,PNN ,NODET ,NODEN ,BOARDT   ,    ,       ,SLOTN ,       ,HWV ,HWR ,FWV ,FWR ,FWT ,SWV ,SWR ,SWNAME ,SWLOC   ,
2,IAC_UHF ,Test_Sys,    ,US    ,48    ,K2LCN-8MW,    ,       ,01    ,       ,04  ,M   ,00  ,B   ,01  ,43  ,20  ,UP    ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,48    ,K2LCN-LCN,    ,       ,01    ,       ,02  ,A   ,00  ,A   ,01  ,43  ,20  ,UP    ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,48    ,EPDG/SCSI,    ,       ,03    ,       ,02  ,J   ,01  ,H   ,01  ,43  ,20  ,UP    ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,48    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,43  ,05  ,UPBASE ,00D4C26C,
2,IAC_UHF ,Test_Sys,    ,US    ,48    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,01  ,UPKLCK ,00D4FE94,
2,IAC_UHF ,Test_Sys,    ,US    ,48    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,07  ,UPXYPT ,00D50A7E,
2,IAC_UHF ,Test_Sys,    ,US    ,48    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,40  ,02  ,UPCVRA ,00D5D9C0,
2,IAC_UHF ,Test_Sys,    ,US    ,48    ,LOADMOD  ,    ,       ,      ,       ,    ,    ,    ,    ,    ,43  ,01  ,UPLVR  ,00D5F7E6,
3,SITEID  ,LCNID   ,HWY ,BOXT  ,BOXN  ,CARDT    ,    ,       ,CARDN ,       ,    ,    ,    ,    ,    ,    ,    ,       ,BOXSIZE ,
4,IAC_UHF ,Test_Sys,01  ,HG    ,02    ,         ,    ,       ,      ,       ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
3,SITEID  ,LCNID   ,HWY ,BOXT  ,BOXN  ,CARDT    ,    ,       ,CARDN ,       ,    ,    ,    ,    ,    ,    ,    ,       ,BOXSIZE ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,ANALOGIN ,    ,       ,01    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,ANALOGIN ,    ,       ,02    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,ANALOGOT ,    ,       ,03    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,DIGIN    ,    ,       ,04    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,DIGOUT   ,    ,       ,05    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,DIGIN    ,    ,       ,06    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,DIGIN    ,    ,       ,07    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,DIGIN    ,    ,       ,08    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,NONE     ,    ,       ,09    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,NONE     ,    ,       ,10    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,NONE     ,    ,       ,11    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,NONE     ,    ,       ,12    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,NONE     ,    ,       ,13    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,NONE     ,    ,       ,14    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,NONE     ,    ,       ,15    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,NONE     ,    ,       ,16    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
3,SITEID  ,LCNID   ,HWY ,BOXT  ,BOXN  ,CARDT    ,    ,       ,CARDN ,       ,    ,    ,    ,    ,    ,    ,    ,       ,BOXSIZE ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,ANALOGOT ,    ,       ,01    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,ANALOGOT ,    ,       ,02    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,DIGIN    ,    ,       ,03    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,DIGIN    ,    ,       ,04    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,DIGOUT   ,    ,       ,05    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,DIGOUT   ,    ,       ,06    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,DIGIN    ,    ,       ,07    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,ANALOGIN ,    ,       ,08    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,FAIL     ,    ,       ,09    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,FAIL     ,    ,       ,10    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,FAIL     ,    ,       ,11    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,FAIL     ,    ,       ,12    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,FAIL     ,    ,       ,13    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,FAIL     ,    ,       ,14    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,FAIL     ,    ,       ,15    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,FAIL     ,    ,       ,16    ,       ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
5,SITEID  ,LCNID   ,UCN ,NODET ,NODEN ,CARDT    ,MODN, FILEN ,CARDN ,FILEP   ,    ,HWR ,    ,FWR ,    ,SWV ,SWR ,SWNAME ,REDUNCY ,
6,IAC_UHF ,Test_Sys,02  ,NIM   ,01    ,MODEM    ,    ,       ,      ,       ,    ,27  ,    ,    ,    ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,NIM   ,01    ,PROTOCOL ,    ,       ,      ,       ,    ,    ,    ,    ,    ,00  ,01  ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,NIM   ,01    ,UCNLLN   ,    ,       ,      ,       ,    ,    ,    ,    ,    ,2A  ,00  ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,NIM   ,01    ,DRIVER   ,    ,       ,      ,       ,    ,    ,    ,    ,    ,2A  ,00  ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,NIM   ,01    ,TBC      ,    ,       ,      ,       ,    ,00  ,    ,    ,    ,    ,    ,       ,        ,
5,SITEID  ,LCNID   ,UCN ,NODET ,NODEN ,CARDT    ,MODN, FILEN ,CARDN ,FILEP   ,    ,HWR ,    ,FWR ,    ,SWV ,SWR ,SWNAME ,REDUNCY ,
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34.7 Files Generated by the LCN Node Version/Revision Logging Function (LVRLOG), Continued

LVRLOG.RE file generated with target deselected, continued

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6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,PMMMOD   ,    , 01    ,01    ,FILE_1  ,    ,05  ,    ,    ,    ,  ,       ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,PMMCOM   ,    , 01    ,02    ,FILE_1  ,    ,0B  ,    ,31  ,    ,42  ,03  ,PMMCOM ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,PMMCOMD  ,    , 01    ,02    ,FILE_1  ,    ,02  ,    ,    ,    ,    ,       ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,PMMIOL   ,    , 01    ,03    ,FILE_1  ,    ,0C  ,    ,32  ,    ,    ,       ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,PMMCTL   ,    , 01    ,04    ,FILE_1  ,    ,0D  ,    ,32  ,    ,42  ,01  ,PMMCTL ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,PMMCTLD  ,    , 01    ,04    ,FILE_1  ,    ,02  ,    ,    ,    ,    ,       ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,NONE     ,01 a, 01    ,06    ,        ,    ,    ,    ,    ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,HLAI     ,02 a, 01    ,07    ,        ,    ,01  ,    ,3.3 ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,HLAI     ,03 a, 01    ,08    ,        ,    ,01  ,    ,3.3 ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,DO       ,04 a, 01    ,09    ,        ,    ,04  ,    ,3.6 ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,NONE     ,05 a, 01    ,10    ,        ,    ,    ,    ,    ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,AO       ,06 a, 01    ,11    ,        ,    ,25  ,    ,3.9 ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,DI       ,07 a, 01    ,12    ,        ,    ,23  ,    ,3.3 ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,AO       ,08 a, 01    ,13    ,        ,    ,02  ,    ,3.4 ,    ,    ,       ,        ,
5,SITEID  ,LCNID   ,UCN ,NODET ,NODEN ,CARDT    ,MODN, FILEN ,CARDN ,FILEP   ,    ,HWR ,    ,FWR ,    ,SWV ,SWR ,SWNAME ,REDUNCY ,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,APMMMOD  ,    , 01    ,01    ,FILE_1  ,    ,2A  ,    ,    ,    ,    ,    ,       ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,APMMCOM  ,    , 01    ,02    ,FILE_1  ,    ,24  ,    ,42  ,    ,42  ,04  ,APMCOM ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,APMMCOMD ,    , 01    ,02    ,FILE_1  ,    ,22  ,    ,    ,    ,    ,       ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,APMMIOL  ,    , 01    ,03    ,FILE_1  ,    ,13  ,    ,41  ,    ,    ,       ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,APMMCTL  ,    , 01    ,04    ,FILE_1  ,    ,26  ,    ,43  ,    ,42  ,01  ,APMCTL ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,APMMCTLD ,    , 01    ,04    ,FILE_1  ,    ,00  ,    ,    ,    ,    ,       ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,APMMTBC  ,    ,       ,      ,        ,    ,08  ,    ,    ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,HLAI     ,01 a, 01    ,06    ,        ,    ,24  ,    ,3.3 ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,AO       ,06 a, 01    ,11    ,        ,    ,02  ,    ,3.4 ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,DI       ,07 a, 01    ,12    ,        ,    ,01  ,    ,3.3 ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,NONE     ,08 a, 01    ,13    ,        ,    ,    ,    ,    ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,PI       ,09 a, 01    ,14    ,        ,    ,20  ,    ,3.3 ,    ,    ,       ,        ,
7,REPORT  ,COMPLETE,    ,      ,      ,         ,    ,       ,      ,        ,    ,    ,    ,    ,    ,    ,       ,        ,
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34.7 Files Generated by the LCN Node Version/Revision Logging Function (LVRLOG), Continued

LVRLOG.RE file generated with target selected, continued

The example of the LVRLOG.RE file below was generated with the "Exclude headings from export file" target **selected**.
The three lines in bold print (and blank line following) are not a part of the LVRLOG.RE file. They have been added to indicate the character position and width of each field of each record.

```
00000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000000011111111111111111111111111111111
00000000011111111112222222222333333333444444444455555555566666666667777777777888888888899999999990000000000111111111122222222
12345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678
2,IAC_UHF ,Test_Sys,01  ,HG    ,06    ,K2LCN-2MW,    ,      ,01    ,       ,00  ,M   ,00  ,B   ,01  ,43  ,05  ,HGO    ,       ,
2,IAC_UHF ,Test_Sys,01  ,HG    ,06    ,K2LCN-LCN,    ,      ,01    ,       ,02  ,A   ,00  ,A   ,01  ,43  ,05  ,HGO    ,       ,
2,IAC_UHF ,Test_Sys,01  ,HG    ,06    ,HWY     ,    ,      ,02    ,       ,00  ,K   ,00  ,L   ,01  ,43  ,05  ,HGO    ,       ,
2,IAC_UHF ,Test_Sys,01  ,HG    ,06    ,LOADMOD  ,   ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,01  ,HGEMOD ,0047D46E,
2,IAC_UHF ,Test_Sys,02  ,NIM   ,09    ,HPK2-3MW ,   ,      ,01    ,       ,04  ,K   ,00  ,B   ,01  ,43  ,03  ,NMO    ,       ,
2,IAC_UHF ,Test_Sys,02  ,NIM   ,09    ,LCNI     ,   ,      ,02    ,       ,00  ,F   ,00  ,C   ,01  ,43  ,03  ,NMO    ,       ,
2,IAC_UHF ,Test_Sys,02  ,NIM   ,09    ,EPNI     ,   ,      ,05    ,       ,02  ,H   ,00  ,B   ,01  ,43  ,03  ,NMO    ,       ,
2,IAC_UHF ,Test_Sys,    ,AM    ,10    ,K2LCN-8MW,    ,      ,01    ,       ,04  ,M   ,00  ,B   ,01  ,43  ,09  ,AMO    ,       ,
2,IAC_UHF ,Test_Sys,    ,AM    ,10    ,K2LCN-LCN,    ,      ,01    ,       ,02  ,A   ,00  ,A   ,01  ,43  ,09  ,AMO    ,       ,
2,IAC_UHF ,Test_Sys,    ,AM    ,10    ,LOADMOD  ,    ,      ,      ,       ,    ,    ,    ,    ,    ,42  ,01  ,FILE   ,00D8C500,
2,IAC_UHF ,Test_Sys,    ,AM    ,10    ,LOADMOD  ,    ,      ,      ,       ,    ,    ,    ,    ,    ,42  ,01  ,CONV   ,00D9A65C,
2,IAC_UHF ,Test_Sys,    ,AM    ,10    ,LOADMOD  ,    ,      ,      ,       ,    ,    ,    ,    ,    ,41  ,01  ,CVB    ,00DB9BBC,
2,IAC_UHF ,Test_Sys,    ,AM    ,10    ,LOADMOD  ,    ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,01  ,AMPRNT ,00DBCAFE,
2,IAC_UHF ,Test_Sys,    ,AM    ,10    ,LOADMOD  ,    ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,01  ,TMCHG  ,00DC58A2,
2,IAC_UHF ,Test_Sys,    ,AM    ,10    ,LOADMOD  ,    ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,00  ,SIM_10 ,00DC5CA4,
2,IAC_UHF ,Test_Sys,    ,HMON  ,15    ,K2LCN-2MW,    ,      ,01    ,       ,00  ,L   ,00  ,B   ,01  ,43  ,06  ,HMO    ,       ,
2,IAC_UHF ,Test_Sys,    ,HMON  ,15    ,K2LCN-LCN,    ,      ,01    ,       ,02  ,A   ,00  ,A   ,01  ,43  ,06  ,HMO    ,       ,
2,IAC_UHF ,Test_Sys,    ,HMON  ,15    ,SPC     ,     ,      ,02    ,       ,01  ,F   ,00  ,G   ,01  ,43  ,06  ,HMO    ,       ,
2,IAC_UHF ,Test_Sys,    ,HMON  ,16    ,K2LCN-2MW,    ,      ,01    ,       ,00  ,M   ,00  ,B   ,01  ,43  ,03  ,HMO    ,       ,
2,IAC_UHF ,Test_Sys,    ,HMON  ,16    ,K2LCN-LCN,    ,      ,01    ,       ,02  ,A   ,00  ,A   ,01  ,43  ,03  ,HMO    ,       ,
2,IAC_UHF ,Test_Sys,    ,HMON  ,16    ,SPC     ,     ,      ,02    ,       ,01  ,F   ,00  ,G   ,01  ,43  ,03  ,HMO    ,       ,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,HPK2-3MW ,   ,      ,01    ,       ,04  ,L   ,00  ,B   ,01  ,43  ,06  ,CIO    ,       ,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LCNI     ,   ,      ,02    ,       ,00  ,H   ,00  ,C   ,01  ,43  ,06  ,CIO    ,       ,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,   ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,06  ,UMIMOD ,005A8F80,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,   ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,05  ,EMUMOD ,005B1704,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,   ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,07  ,EIPMOD ,005B8F0E,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,   ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,09  ,FMTMOD ,005C2F44,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,   ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,05  ,PELMOD ,005D8580,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,   ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,07  ,PERMOD ,005EBD24,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,   ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,04  ,TDLMOD ,005FF49A,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,   ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,06  ,EMMMOD ,0060C330,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,   ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,03  ,WPBMOD ,0063BC9C,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,   ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,05  ,EM2MOD ,00643ED6,
2,IAC_UHF ,Test_Sys,    ,CG    ,20    ,LOADMOD  ,   ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,05  ,GTMMOD ,00673842,
2,IAC_UHF ,Test_Sys,    ,US    ,25    ,HPK2-3MW ,   ,      ,01    ,       ,04  ,K   ,00  ,B   ,01  ,43  ,20  ,UP     ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,25    ,LCNI     ,   ,      ,02    ,       ,00  ,J   ,00  ,D   ,01  ,43  ,20  ,UP     ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,25    ,FDC      ,   ,      ,03    ,       ,00  ,J   ,00  ,J   ,01  ,43  ,20  ,UP     ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,25    ,QMEM4096 ,   ,      ,04    ,       ,07  ,B   ,    ,    ,    ,43  ,20  ,UP     ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,25    ,EPDG/SCSI,   ,      ,05    ,       ,02  ,H   ,01  ,H   ,01  ,43  ,20  ,UP     ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,25    ,LOADMOD  ,   ,      ,      ,       ,    ,    ,    ,    ,    ,43  ,05  ,UPBASE ,00C6490C,
2,IAC_UHF ,Test_Sys,    ,US    ,25    ,LOADMOD  ,   ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,02  ,UPCAL  ,00C68534,
2,IAC_UHF ,Test_Sys,    ,US    ,25    ,LOADMOD  ,   ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,02  ,CRDRDR ,00C6B936,
2,IAC_UHF ,Test_Sys,    ,US    ,25    ,LOADMOD  ,   ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,01  ,UPKLCK ,00C6CF38,
2,IAC_UHF ,Test_Sys,    ,US    ,25    ,LOADMOD  ,   ,      ,      ,       ,    ,    ,    ,    ,    ,43  ,01  ,UPLVR  ,00C6DB22,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,K2LCN-8MW,    ,      ,01    ,       ,04  ,J   ,00  ,B   ,01  ,43  ,48  ,UxS    ,       ,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,K2LCN-LCN,    ,      ,01    ,       ,02  ,A   ,00  ,A   ,01  ,43  ,48  ,UxS    ,       ,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,WSI2     ,    ,      ,02    ,       ,01  ,B   ,    ,    ,    ,43  ,48  ,UxS    ,       ,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,TPDG/SCSI,    ,      ,05    ,       ,03  ,R   ,01  ,F   ,01  ,43  ,48  ,UxS    ,       ,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,LOADMOD  ,    ,      ,      ,       ,    ,    ,    ,    ,    ,43  ,05  ,UPBASE ,00D473AA,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,LOADMOD  ,    ,      ,      ,       ,    ,    ,    ,    ,    ,43  ,05  ,CSCHEM ,00D4AFD2,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,LOADMOD  ,    ,      ,      ,       ,    ,    ,    ,    ,    ,43  ,19  ,MSCHEM ,00D4CDC2,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,LOADMOD  ,    ,      ,      ,       ,    ,    ,    ,    ,    ,43  ,05  ,UPXTST ,00D5C08A,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,LOADMOD  ,    ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,04  ,UPUPD  ,00D5DCB8,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,LOADMOD  ,    ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,03  ,UPLRGC ,00D5EC5A,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,LOADMOD  ,    ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,07  ,UPXYPT ,00D647A2,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,LOADMOD  ,    ,      ,      ,       ,    ,    ,    ,    ,    ,43  ,01  ,XPDFIL ,00D716E4,
2,IAC_UHF ,Test_Sys,    ,UxS   ,27    ,LOADMOD  ,    ,      ,      ,       ,    ,    ,    ,    ,    ,40  ,02  ,UPCVRA ,00D780AE,
2,IAC_UHF ,Test_Sys,    ,US    ,29    ,K2LCN-8MW,    ,      ,01    ,       ,04  ,M   ,00  ,B   ,01  ,43  ,20  ,UP     ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,29    ,K2LCN-LCN,    ,      ,01    ,       ,02  ,A   ,00  ,A   ,01  ,43  ,20  ,UP     ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,29    ,EPDG/SCSI,    ,      ,03    ,       ,02  ,J   ,01  ,K   ,01  ,43  ,20  ,UP     ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,29    ,LOADMOD  ,    ,      ,      ,       ,    ,    ,    ,    ,    ,43  ,01  ,UPLVR  ,00D54F0C,
2,IAC_UHF ,Test_Sys,    ,US    ,29    ,LOADMOD  ,    ,      ,      ,       ,    ,    ,    ,    ,    ,43  ,05  ,UPBASE ,00D6200E,
2,IAC_UHF ,Test_Sys,    ,US    ,43    ,K2LCN-6MW,    ,      ,01    ,       ,03  ,G   ,00  ,A   ,01  ,43  ,20  ,UP     ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,43    ,K2LCN-LCN,    ,      ,01    ,       ,02  ,A   ,00  ,A   ,01  ,43  ,20  ,UP     ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,43    ,EPDG/SCSI,    ,      ,03    ,       ,02  ,H   ,01  ,H   ,01  ,43  ,20  ,UP     ,       ,
2,IAC_UHF ,Test_Sys,    ,US    ,43    ,LOADMOD  ,    ,      ,      ,       ,    ,    ,    ,    ,    ,43  ,05  ,UPBASE ,00A4CA3C,
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34.7 Files Generated by the LCN Node Version/Revision Logging Function (LVRLOG), Continued

LVRLOG.RE file generated with target selected, continued

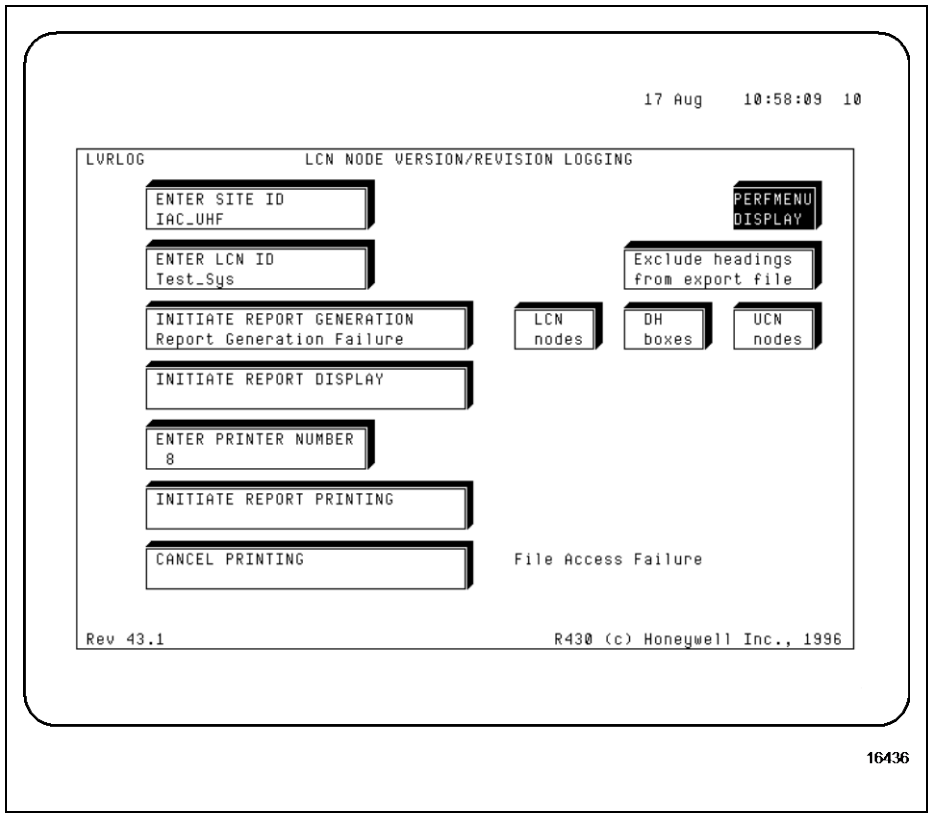
```
2,IAC_UHF ,Test_Sys,    ,US    ,43    ,LOADMOD  ,    ,       ,      ,        ,    ,    ,    ,    ,    ,40  ,07  ,UPXYPT ,00A50664,
2,IAC_UHF ,Test_Sys,    ,US    ,43    ,LOADMOD  ,    ,       ,      ,        ,    ,    ,    ,    ,    ,40  ,01  ,UPKLCK ,00A5D5A6,
2,IAC_UHF ,Test_Sys,    ,US    ,43    ,LOADMOD  ,    ,       ,      ,        ,    ,    ,    ,    ,    ,40  ,02  ,UPCVRA ,00A5E190,
2,IAC_UHF ,Test_Sys,    ,US    ,43    ,LOADMOD  ,    ,       ,      ,        ,    ,    ,    ,    ,    ,43  ,00  ,UP_ATB ,00A5FFB6,
2,IAC_UHF ,Test_Sys,    ,US    ,43    ,LOADMOD  ,    ,       ,      ,        ,    ,    ,    ,    ,    ,43  ,01  ,UPLVR  ,00A63F4E,
2,IAC_UHF ,Test_Sys,    ,US    ,48    ,K2LCN-8MW,    ,       ,01    ,        ,04  ,M   ,00  ,B   ,01  ,43  ,20  ,UP     ,        ,
2,IAC_UHF ,Test_Sys,    ,US    ,48    ,K2LCN-LCN,    ,       ,01    ,        ,02  ,A   ,00  ,A   ,01  ,43  ,20  ,UP     ,        ,
2,IAC_UHF ,Test_Sys,    ,US    ,48    ,EPDG/SCSI,    ,       ,03    ,        ,02  ,J   ,01  ,H   ,01  ,43  ,20  ,UP     ,        ,
2,IAC_UHF ,Test_Sys,    ,US    ,48    ,LOADMOD  ,    ,       ,      ,        ,    ,    ,    ,    ,    ,43  ,05  ,UPBASE ,00D4C26C,
2,IAC_UHF ,Test_Sys,    ,US    ,48    ,LOADMOD  ,    ,       ,      ,        ,    ,    ,    ,    ,    ,40  ,01  ,UPKLCK ,00D4FE94,
2,IAC_UHF ,Test_Sys,    ,US    ,48    ,LOADMOD  ,    ,       ,      ,        ,    ,    ,    ,    ,    ,40  ,07  ,UPXYPT ,00D50A7E,
2,IAC_UHF ,Test_Sys,    ,US    ,48    ,LOADMOD  ,    ,       ,      ,        ,    ,    ,    ,    ,    ,40  ,02  ,UPCVRA ,00D5D9C0,
2,IAC_UHF ,Test_Sys,    ,US    ,48    ,LOADMOD  ,    ,       ,      ,        ,    ,    ,    ,    ,    ,43  ,01  ,UPLVR  ,00D5F7E6,
4,IAC_UHF ,Test_Sys,01  ,HG    ,02    ,         ,    ,       ,      ,        ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,ANALOGIN ,    ,       ,01    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,ANALOGIN ,    ,       ,02    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,ANALOGOT ,    ,       ,03    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,DIGIN    ,    ,       ,04    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,DIGOUT   ,    ,       ,05    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,DIGIN    ,    ,       ,06    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,DIGIN    ,    ,       ,07    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,DIGIN    ,    ,       ,08    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,NONE     ,    ,       ,09    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,NONE     ,    ,       ,10    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,NONE     ,    ,       ,11    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,NONE     ,    ,       ,12    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,NONE     ,    ,       ,13    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,NONE     ,    ,       ,14    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,NONE     ,    ,       ,15    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,HLPIU ,05    ,NONE     ,    ,       ,16    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,REGULAR ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,ANALOGOT ,    ,       ,01    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,ANALOGOT ,    ,       ,02    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,DIGIN    ,    ,       ,03    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,DIGIN    ,    ,       ,04    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,DIGOUT   ,    ,       ,05    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,DIGOUT   ,    ,       ,06    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,DIGIN    ,    ,       ,07    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,ANALOGIN ,    ,       ,08    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,FAIL     ,    ,       ,09    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,FAIL     ,    ,       ,10    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,FAIL     ,    ,       ,11    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,FAIL     ,    ,       ,12    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,FAIL     ,    ,       ,13    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,FAIL     ,    ,       ,14    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,FAIL     ,    ,       ,15    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
4,IAC_UHF ,Test_Sys,01  ,MC    ,10    ,FAIL     ,    ,       ,16    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,NIM   ,01    ,MODEM    ,    ,       ,      ,        ,    ,27  ,    ,    ,    ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,NIM   ,01    ,PROTOCOL ,    ,       ,      ,        ,    ,    ,    ,    ,    ,00  ,01  ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,NIM   ,01    ,UCNLLN   ,    ,       ,      ,        ,    ,    ,    ,    ,    ,2A  ,00  ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,NIM   ,01    ,DRIVER   ,    ,       ,      ,        ,    ,    ,    ,    ,    ,2A  ,00  ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,NIM   ,01    ,TBC      ,    ,       ,      ,        ,    ,00  ,    ,    ,    ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,PMMMOD   ,    , 01   ,01    ,FILE_1  ,    ,05  ,    ,    ,    ,    ,    ,       ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,PMMCOM   ,    , 01   ,02    ,FILE_1  ,    ,0B  ,    ,31  ,    ,42  ,03  ,PMMCOM ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,PMMCOMD  ,    , 01   ,02    ,FILE_1  ,    ,02  ,    ,    ,    ,    ,    ,       ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,PMMIOL   ,    , 01   ,03    ,FILE_1  ,    ,0C  ,    ,32  ,    ,    ,    ,       ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,PMMCTL   ,    , 01   ,04    ,FILE_1  ,    ,0D  ,    ,32  ,    ,42  ,01  ,PMMCTL ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,PMMCTLD  ,    , 01   ,04    ,FILE_1  ,    ,02  ,    ,    ,    ,    ,    ,       ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,NONE     ,01 a, 01   ,06    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,HLAI     ,02 a, 01   ,07    ,        ,    ,01  ,    ,3.3 ,    ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,HLAI     ,03 a, 01   ,08    ,        ,    ,01  ,    ,3.3 ,    ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,DO       ,04 a, 01   ,09    ,        ,    ,04  ,    ,3.6 ,    ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,NONE     ,05 a, 01   ,10    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,AO       ,06 a, 01   ,11    ,        ,    ,25  ,    ,3.9 ,    ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,DI       ,07 a, 01   ,12    ,        ,    ,23  ,    ,3.3 ,    ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,PM    ,09    ,AO       ,08 a, 01   ,13    ,        ,    ,02  ,    ,3.4 ,    ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,APMMMOD  ,    , 01   ,01    ,FILE_1  ,    ,2A  ,    ,    ,    ,    ,    ,       ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,APMMCOM  ,    , 01   ,02    ,FILE_1  ,    ,24  ,    ,42  ,    ,42  ,04  ,APMCOM ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,APMMCOMD ,    , 01   ,02    ,FILE_1  ,    ,22  ,    ,    ,    ,    ,    ,       ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,APMMIOL  ,    , 01   ,03    ,FILE_1  ,    ,13  ,    ,41  ,    ,    ,    ,       ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,APMMCTL  ,    , 01   ,04    ,FILE_1  ,    ,26  ,    ,43  ,    ,42  ,01  ,APMCTL ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,APMMCTLD ,    , 01   ,04    ,FILE_1  ,    ,00  ,    ,    ,    ,    ,    ,       ,REDUN_2F,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,APMMTBC  ,    ,       ,      ,        ,    ,08  ,    ,    ,    ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,HLAI     ,01 a, 01   ,06    ,        ,    ,24  ,    ,3.3 ,    ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,AO       ,06 a, 01   ,11    ,        ,    ,02  ,    ,3.4 ,    ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,DI       ,07 a, 01   ,12    ,        ,    ,01  ,    ,3.3 ,    ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,NONE     ,08 a, 01   ,13    ,        ,    ,    ,    ,    ,    ,    ,    ,       ,        ,
6,IAC_UHF ,Test_Sys,02  ,APM   ,13    ,PI       ,09 a, 01   ,14    ,        ,    ,20  ,    ,3.3 ,    ,    ,    ,       ,        ,
```

34.8 LVRLOG Error Conditions

Non-recoverable errors

If a non-recoverable error occurs during the generation of the report, a failure status appears (in red) in the lower right corner of the LCN NODE VERSION/REVISION LOGGING display, and the report generation status is set to “Report Generation Failure.” The report generation status is displayed in the INITIATE REPORT GENERATION target.

Figure 34-18 LCN Node Version/Revision Logging Display (with a failure status)



Non-recoverable errors, continued

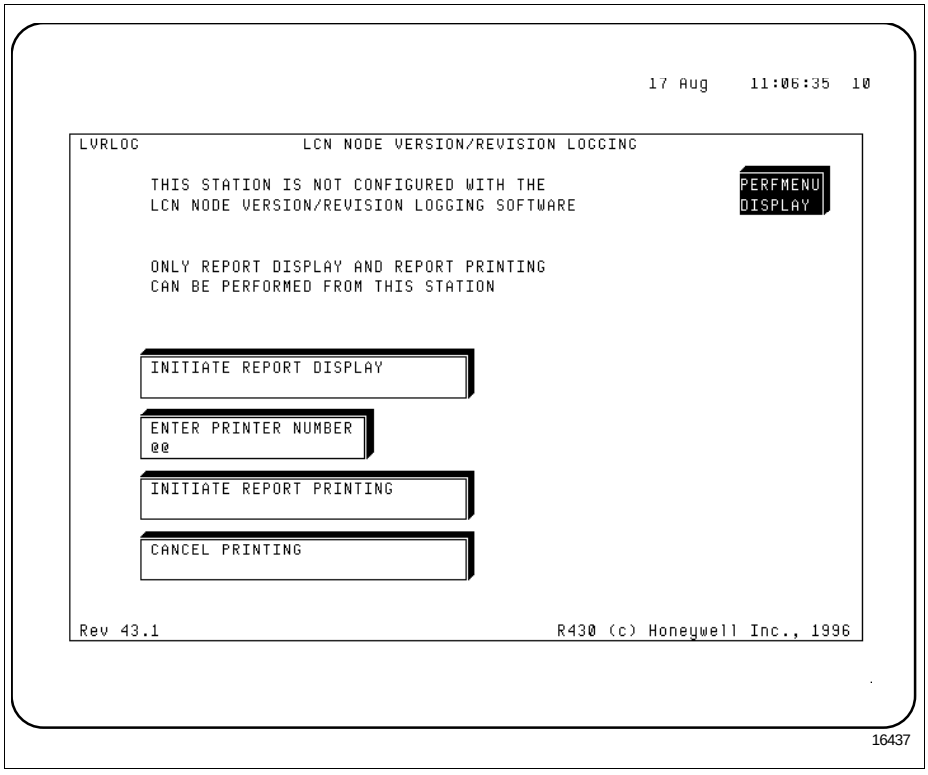
The following non-recoverable errors are detected and displayed:

Failure Status	Meaning
File Access Failure	The LCN Node Version/Revision Logging function is unable to complete file accesses calls to create the text files (LVRLOG.RD and LVRLOG.RE), because of a non-recoverable file creation error.
WARNING—Because the function generates only two files (LVRLOG.RD and LVRLOG.RE), a File Access Failure will occur if: an attempt is made to generate a report at one Universal Station while displaying or printing a previously generated report at another Universal Station.	
File Access Error	The LCN Node Version/Revision Logging function is unable to complete file access calls to write a record to one of the text files (LVRLOG.RD or LVRLOG.RE), because of a non-recoverable write file record error.
File Access Error – FF	The LCN Node Version/Revision Logging function is unable to complete file access calls to write a free format record to one of the text files (LVRLOG.RD or LVRLOG.RE), because of a non-recoverable write file record error.

Recoverable Errors

If you call up the LCN NODE VERSION/REVISION LOGGING display at a Universal Station which has not been configured and loaded with the LCN Node Version/Revision Logging software, the display will appear as follows:

Table 34-19 LCN Node Version/Revision Logging Display



The existing targets can be utilized to display, print, or cancel printing of a previously generated report. However, if you wish to generate a report, the LCN NODE VERSION/REVISION LOGGING display must be called up on a Universal Station that has the LCN Node Version/Revision Logging software configured and loaded.

34.9 Importing LVRLOG Report File into Spreadsheet

Converting LCN Format File to PC Format File

The text files (with pathnames of NET>&CUS>LVRLOG.RD and NET>&CUS>LVRLOG.RE) generated by the LCN Node Version/Revision Logging function are LCN format files. In order to import these text files into personal computer applications (such as Microsoft Excel), these LCN format files must first be converted to PC text file format.
Several software tools with which the user can perform this required conversion are available from Honeywell. Probably the simplest and easiest to use transform mechanism is the "File Transfer for DOS" package. With the "File Transfer for DOS" package the user can convert an LCN format text file on a removable disk to a PC format text file on a floppy disk.

Importing PC Format File into Microsoft Excel

The LVRLOG.RE file is formatted in such a way that it is easily imported by Microsoft Excel (Rev. 5.0). After the LVRLOG.RE file has been converted to PC text file format, with Microsoft Excel, OPEN the converted LVRLOG.RE text file. Next, follow the Microsoft Excel "Text Import Wizard" choosing the following options:

File Type	**Delimited**
Start Import at Row	**1**
File Origin	**Windows (ANSI)**
Delimiters	**Comma**
Text Qualifier	**None**
Column Data Format	**Text for all Columns**

After the data from the text file has been imported, adjust the "cell" widths as required.

ATTENTION

The converted LVRLOG.RE text file can also be imported by the Microsoft Access relational database software (Rev. 2.0).

Section 35 – R530 Trend and Operating Display Functions

35.0 Overview

Description of Configurable Access Levels on Parameters

The **Configurable Access Level on Parameters** R530 function provides the ability to configure in the NCF, an access level needed to make modifications to alarm limits, control limits, range limits, and tuning parameters on the Point Detail Display.

Description of One Key Call Up of a Point Trend

The **One Key Call Up of Point Trend** R530 function expands the use of the TREND key on the operator's keyboard by invoking a trend of a point's parameters by using one keystroke. Pressing the TREND key after selecting a point invokes a default trend display of a point's SP, PV, and OP. This function also provides the ability to replace the default trend display with any custom schematic desired.

Description of Save/Restore Trend Data

An additional R530 function, **Save/Restore Trend Data**, provides a method to save a specific set of trend settings from a custom schematic trend and a method to read saved trend settings through two actors TR_SAVE and TR_RSTR (see *Actors Manual*).

Description of Detail Display Navigation

The R530 **Detail Display Navigation** function provides the ability to track the flow of point connections from display to display without having to enter point names.

Description of SP/OP Tolerance Check

The R530 **SP/OP Tolerance Check** function is described as the maximum delta value by which the setpoint or output of a process point can be manually changed in either a plus or minus direction without causing a violation warning.

35.1 Configurable Access Levels on Parameters

Introduction

The Configurable Access Level on Parameters R530 function provides the ability to configure in the NCF, an access level needed to make modifications to four different categories of parameters:

- Alarm Limits
- Control Limits
- Range Limits
- Tuning Parameters

Each of these four category of parameters can be configured to one of four access levels: Operator, Supervisor, Engineer, or Defaulted. Defaulted means to use the access level as described in the *Parameter Reference Dictionary* "Access Lock" (see *Engineer's Reference Manual* (this manual) "Parameter Information," and *Network Form Instructions* for more information).

The function allows you to specify the access level needed to make modifications to parameters in the Point Detail Display and from a Custom Schematic.

Description

On R530 systems, the default value for each category is "DEFAULT." "DEFAULT" says that the parameter under each category has the value specified in the *Parameter Reference Dictionary*. To use an access level other than the default, the NCF System Wide Values, Console Data, Page 5 must be modified. After making modifications, install them and reload the US nodes indicated at install time.

Parameter change request

Parameter change requests are made from the Point Detail Display or a Custom Schematic. Range Limits and Alarm Limits are located on the FIRST PAGE of the Point Detail Display. The Control Limits and Tuning Parameters are located on the CTL ALGO PAGE of the Point Detail Display.

Access Level Configurable Options

In R530, the NCF provides, for each of the four categories, an option of using either the access level as defined in the *Parameter Reference Dictionary* "Access Lock" or an NCF-configured access level.

Access Level	Meaning
ENGR	Every parameter, that is not "Read Only" can be modified only when the Key lock is **ENGR**.
SUPER	Every parameter, that is not "Read Only" can be modified only when the Key lock is either **SUPER** or **ENGR**.
OPER	Every parameter that is not "Read Only" can be modified when the Key lock is **OPER**, **SUPER**, or **ENGR**.
DEFAULT	The key level necessary for modification is the access level defined in the *Parameter Reference Dictionary* "Access Lock."

NOTE: If the Group/Detail Display has been configured to something other than OPER, and "CONFIGURABLE ACCESS LEVEL ON PARAMETERS" has also been configured, the more restrictive level configured will be honored.

Parameter Access Level Revision Differences

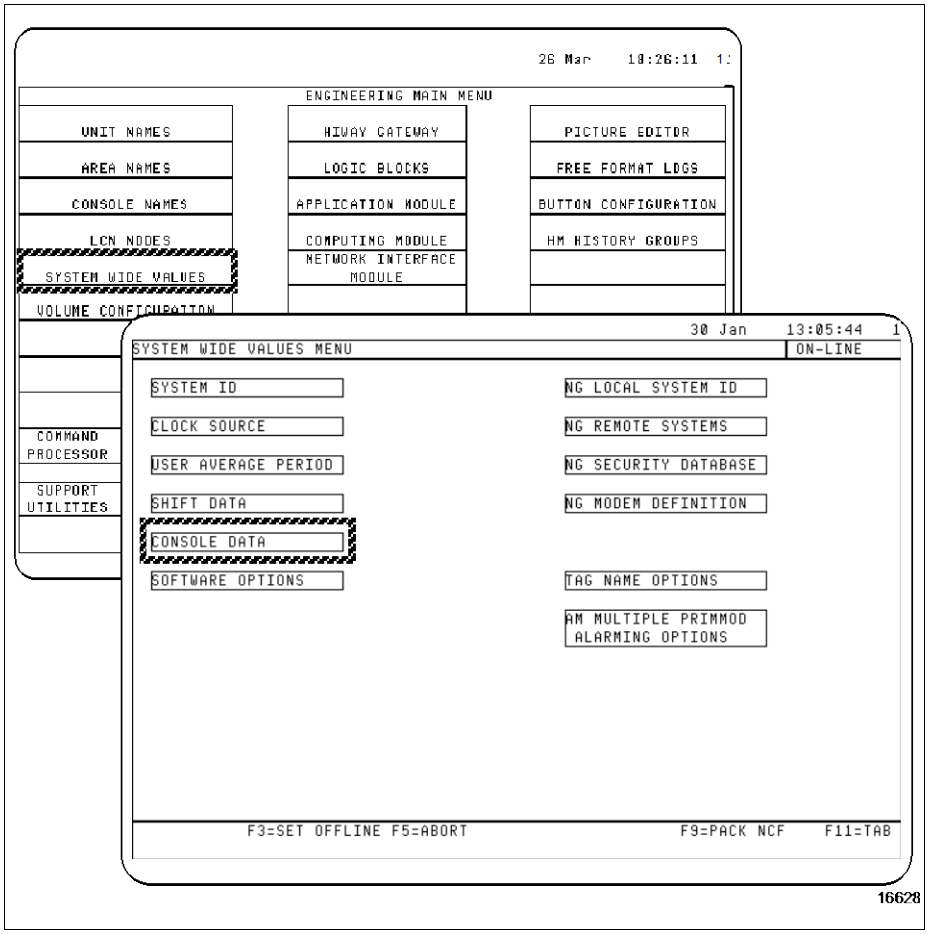
R530 access level of parameter differences are listed below:

Prior to R530...	R530 or later...
Access level for Alarm Limits, Range Limits, and Tuning Parameters CANNOT be configured. The access level is the level specified in the *Parameter Reference Dictionary* "Access Lock."	For each parameter fitting into the categories Alarm Limits, Control Limits, Range Limits, and Tuning Parameter, the NCF default value will be "DEFAULT." Result: Nothing special is required if the System Wide Values Console Data Page Five has NOT been modified.
There is an NCF option to control parameter access on the Detail and Group Displays that can be configured to OPER, SUPER, or ENGR.	There are FOUR categories of parameters that can be configured to either DEFAULT, OPER, SUPER, or ENGR. There is an NCF option to control parameter access on the Detail and Group Displays.
The Data Owner determines whether a parameter can be changed.	Parameters that fall into the four categories will use the information from the NCF to determine if changes to that parameter can be made.

System Wide Values, Console Data

Modify parameter access levels in the NCF on the Console Data screen. From the Engineering Main Menu shown below, select System Wide Values and then Console Data.

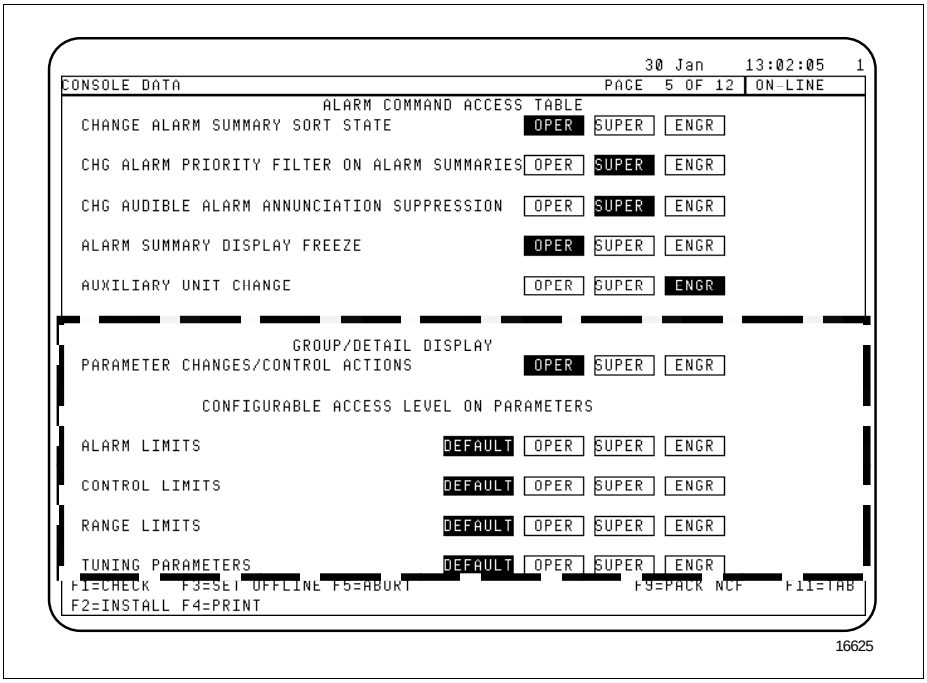
Figure 35-1 System Wide Value, Console Data Selection



Console Data PAGE 5

The System Wide Values Console Data PAGE 5, shown below, contains the new R530 Configurable Access Level on Parameters function information. The Group/Detail Display information was moved from Page 8 of the Console Data page because it has data relating to this function. Page 4 of the Console Data page contains the LCN Cable Swap Inhibit information moved from the previous Page 5 of the Console Data page to allow space for the new R530 access level function.

Figure 35-2 System Wide Values, NCF Console Data PAGE 5 with Configurable Access Level on Parameters Information



Help Messages

A help message is added behind the “DEFAULT” target in the Configurable Access Level on Parameters in the Console Data page that says:

```
SELECT DEFAULT FOR THE ACCESS LEVEL AS DEFINED
IN THE PARAMETER REFERENCE DICTIONARY
```

The message behind “OPER,” “SUPER,” and “ENGR” is the same message that is behind similar targets that say:

```
SELECT THE LOWEST ACCESS LEVEL WHICH IS TO BE
NECESSARY TO ACTIVATE EACH OF THE INDICATED
OPERATIONS
```

References

Refer to the publications listed below for more information on R530 Configurable Access Levels on Parameters.

- *System Control Functions*
- *Network Form Instructions*
- *Network Forms*

35.2 One Key Call Up of Point Trend

TREND invocation - Default trend display

With the One Key Call Up of Point Trend R530 function, the default trend display of a point can be invoked by executing the TREND key from the operator's keyboard when

- the point is in Detail display.
- the point is selected in a standard display (excluding the Group display). See "standard display" definition below.
- the point name is entered into the point id prompt when neither of the above applies.

The default trend display trends the parameters PV, SP, and OP of the point specified when the TREND key is executed. This display can also be invoked by selecting the TREND target (new in R530) from the FIRST page menu of the Detail display. The PV, SP, and OP of the point currently in Detail will be trended in the default trend display.

NOTE: Execution of the TREND key or the TREND target is interchangeable in the Detail display. (See *Process Operations Manual* for more trend display information.)

Standard Display

The definition for standard display is any display (excluding custom schematics) from which a point name can be selected, which includes:

- the Alarm Summary display
- the Organizational Summary displays
- the Slot Summary display
- the Trend Pen display
- the standard CHANGE ZONE subpicture (the point in the change zone is considered "selected"
- the various pages of the Detail display

TREND invocation - Custom schematic display

Invocation of the custom schematic display is the same as the default trend display, except that the default trend display will require to be "replaced" with the custom schematic display desired.

"Replace" the Default trend display

To "replace" the default trend display, copy the custom schematic object file to the &DSY directory with the name, $PT_CTRD.DO. After copying the display, initiate an area change for the Universal Station. The area change will load the appropriate display in the &DSY directory into the Universal Station memory. After this change, the custom schematic will now always appear when trend is requested until another "replace" is initiated.

If the custom schematic display requires access to the point name from which the TREND key was executed, the custom schematic display will need to obtain the point name from the new global DDB, $TR_ENTY.

Collectors

Five new collectors have been added with the implementation of this R530 "One Key Call up of Point Trend" function. See the *Picture Editor Reference Manual* for more information on these collectors.

Missing Default and Custom display error messages/Error Handling

If the default ($PT_TRND) and/or custom ($PT_CTRD) display in the &DSY directory is not found during an area change or node startup, the US status will transition to a SEVERE state and messages will be logged through the status detail.
NOTE: An area change can clean up the SEVERE state after restoring either the schematic in &DSY or the $PT_TRND and $PT_CTRD.

Toolkit (TLK2)

The TLK2 directory contains the source file for the default trend display. This source file can be customized using the Picture Editor to "replace" the default trend display.

References

Refer to the publications listed below for more information on R530 function "One Key Call Up of a Point Trend."

- *Operator's Digest*
- *Picture Editor Reference Manual*
- *Process Operations Manual*

35.3 Save/Restore Trend Data

Trend Setting Elements Saved

The trend setting elements saved with the R530 “Save Trend Data” function include

- the trend’s current Time Base
- the trend’s Y-Scale range
- up to four point ids (Point.Parameter)
- each point id’s associated trend display range
- each point id’s associated Data Source
- each Point Parameter’s trend trace color

Currently, trend settings that are not saved or displayed when using the new TR_SAVE or TR_RSTR actors are the Scroll Counter and aspects of Hair Line or Center Line trend graph mode. Those aspects include the Center Line or the Hair Line Cursor and the ability to move the Hair Line Cursor.

Save Trend Data into Save/Restore Trend DataCustom Schematics

To use the R530 “Save Trend Data” functionality, you are required to incorporate the actors, TR_SAVE and TR_RSTR, into existing or new schematics. Build two targets by using the Picture Editor and configure the actors as the action to perform when the target is selected. When the target associated with the save operation is selected, the TR_SAVE actor will be initiated and the trend settings for a specified trend graph will be stored into a specified .SS file on the HM or removable media.

NOTE: Only one trend graph can be saved to one .SS file. To save multiple graphs, multiple files must be used.

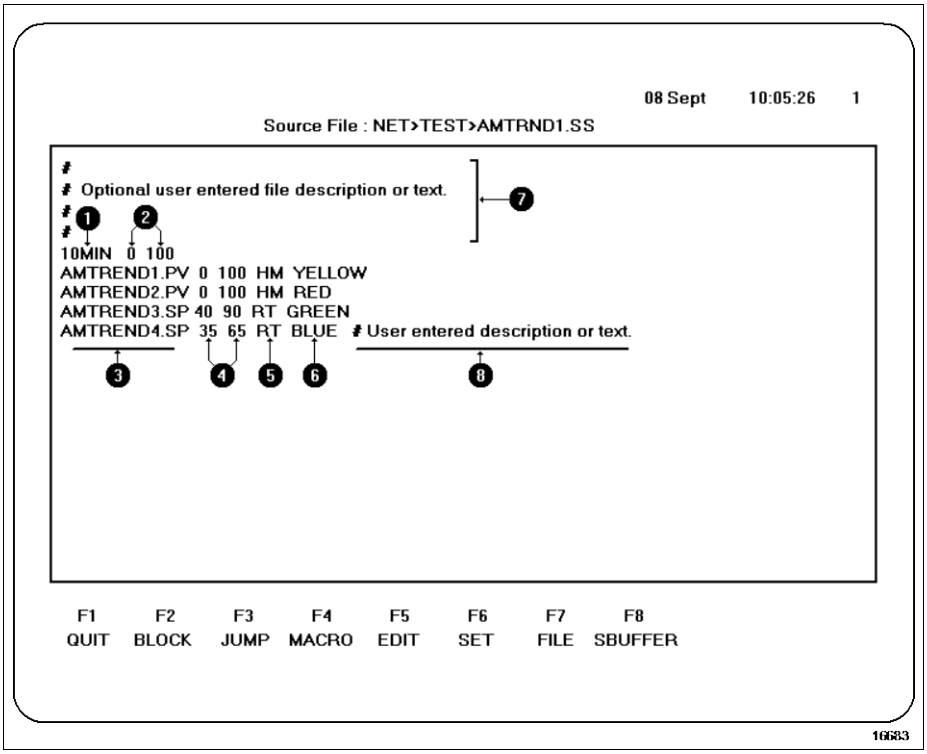
When the target associated with a restore operation is selected, the TR_RSTR actor will be initiated and the saved trend settings from a specified file will be incorporated into the specified trend graph.

The TR_SAVE or TR_RSTR actors treat the set of trend settings as a single entity. This means that regardless of the trend functionality incorporated into the current schematic, the actors will save or display values for all trend settings identified above.

Save Trend Data into ASCII files

In order to allow greater flexibility and accessibility to the new functionality, the files containing the saved trend settings are ASCII files and can be edited by using the Text Editor. The trend settings contained in the file will be position-dependent and in ASCII format (see SAMPLE below). This provides you with greater flexibility for incorporating this functionality within existing schematics.

Figure 35-3 Saved Trend Data File



The figure above identifies a SAMPLE Saved Trend Data File named AMTRND1.SS. This file contains, in text format, all trend settings saved for a trend graph. The file also contains information generated by the "Save/Restore Trend Data" functionality, as well as optional comments added into the file. The file contains three line types, a trend graph settings line, trended parameter settings lines, and comment lines. The trend graph settings and trended parameter settings are delimited by the space character.

Save/RestoreTrend Data into ASCII files, continued

Each line in the Saved Trend Data File in Figure 36-1 is explained below:

1, 2	The first two lines of data contain information related to a trend graph (time base and high/low Y-scale displayed range).
3,4,5,6	These lines contain information relative to a specific trended parameter (the variable id, the high/low display range, the data source and the trend graph's trace color).
7, 8	These are comment lines signified by the "#" character. Comment lines cannot be intermixed between trend settings on the same line.

Any of the trend settings can be modified by replacing the current setting with the desired setting. The desired setting must be valid and reasonable. In addition, because the file is formatted, the replaced setting must be placed in the correct position within the line.

NOTE: If an error occurs within the Saved Trend Data File, action stops and does not continue to the following line.

Trend Graphs and Trend Ids

On custom schematics, trend graph placement and the associated Trend_Id numbers are completely user-specified. When a schematic is created containing multiple trend graphs, each trend graph must be given a specific Trend_Id number between 1 and 12. All trend actors use the Trend_Ids to identify the target trend graph for its operation. The two actors also use the Trend_Id to identify a specific trend graph. Care should be observed when creating schematics with multiple trend graphs such that, if needed, each trend graph's Trend_Id can be determined by the end user.

Different implementation methods using differing levels of trending functionality can be used. Among them are

1. Create two targets, "SAVE" and "RESTORE," to perform the tasks of saving and restoring trend settings for all the trend graphs within a new or existing custom schematic.
2. Create two sets of targets to perform the tasks of saving and restoring trend settings for each trend graph within a new or existing custom schematic. The actors can be implemented using hard-coded parameter information allowing you to preset the Trend_Id and target filename, thus requiring no additional interaction during schematic execution.
3. Use the Define Initial and Define Final Picture Editor commands (see *Picture Editor*). These commands allow you to define actions that occur when a schematic is invoked or as it is being terminated. You can create a custom schematic that automatically invokes the TR_RSTR actor during schematic invocation. Additionally, you can invoke the TR_SAVE actor when exiting a custom schematic by using the Define Final Picture Editor command.

NOTE: Any of the implementation methods described above or any combination of methods that satisfies your requirements can be used. In all implementations, regardless of trend functionality existing on the custom schematic, the set of trend settings saved or restored is the same.

Error Handling

Errors messages can be generated from four basic sources: parameter validation, file access, file content, and runtime execution.

1. Parameter validation error messages are generated if the actors encounter a problem processing TREND_ID and PATHNAME input parameters:

Error Message	Meaning...
PARAMETER OUT OF RANGE	Identifies an invalid number or a number greater than the number of trend graphs within the custom schematic (<1 or >12).
INVALID DATA	Displayed if the PATHNAME parameter is invalid because of invalid characters, invalid path structure, and missing or wrong file extension.

2. File access error messages identify problems encountered when the actors attempt to access the Saved Trend Setting file specified by the PATHNAME. During a save operation, the TR_SAVE actor is responsible for finding, creating (if necessary), and writing the set of trend settings to the specified file. The possible error messages that can be displayed during this operation are:

Error Message	Meaning...
SAVE NOT DONE - BAD PATH	The supplied path is invalid.
SAVE NOT DONE - CREATE BAD	The creation of the specified file fails.
SAVE NOT DONE – WRITE FAIL	When writing the data to the file fails.

Error Handling, continued

3. During a display saved operation the TR_RSTR actor is responsible for finding and reading the set of trend settings from a specified file. Possible error messages during this operation are:

Error Message	Meaning...
`FILE DOES NOT EXIST`	The path/filename does not exist.
`ERROR READING SAVED DATA`	Displayed if the file read operation fails.

Because a Saved Trend Data file can be edited by using the Text Editor, errors can result. If the data is incorrect information, incorrect format, or invalid information, the following error may occur:

Error Message	Meaning...
`BAD DATA FOUND IN FILE`	The file contains invalid or corrupted trend settings.

References

Refer to the publications listed below for more information on R530 function "Save/Restore Trend Data."

- *Actors Manual*
- *Process Operations Manual*

35.4 Detail Display Navigation

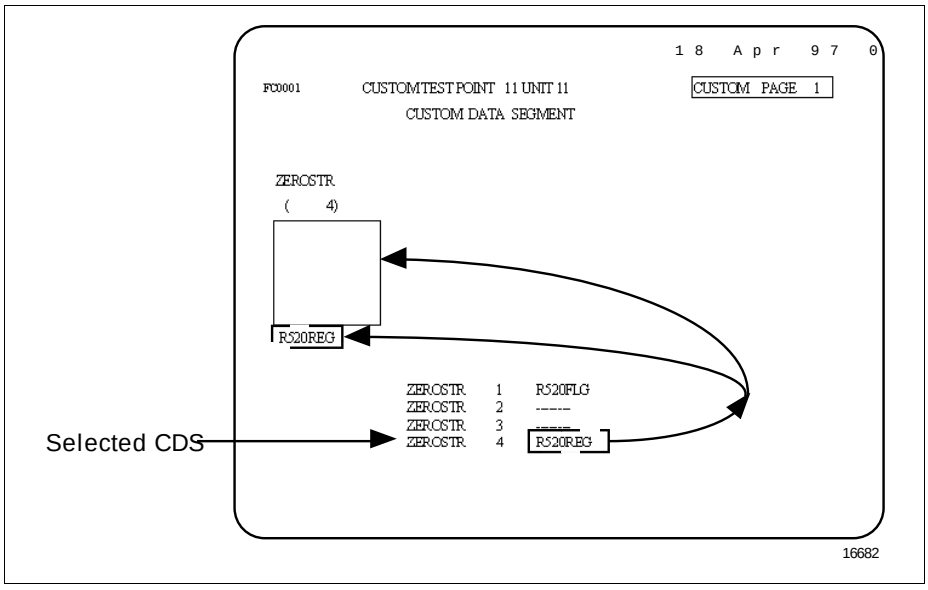
Selected Point Navigation

Invisible targets added behind the point id connections allow the selection of the point id. When the point is selected, the selected point is shown on the top line of the screen display. The TREND, GROUP, ASSOC DISP, DETAIL, or CLEAR ENT (to deselect the selected point) keys can now be depressed to acquire those displays.

Custom Data Segments

The CUSTOM page has new target functionality behind the custom data segment targets. When a Custom Data Segment is selected on a CUSTOM PAGE of the detail display, a text input port opens up and the selected CDS is displayed below the port as shown in the figure below.

Figure 35-4 Connection Page in Detail Display with Connection Point Selected



Another CDS can now be entered or one of the four keys mentioned above can be pressed (the CLEAR ENT key will clear the text input port). If the CDS is a point id, the appropriate schematic will be invoked.

References

Refer to the *Process Operations Manual* for more information on R530 function “Detail Display Navigation.”

35.5 SP/OP Tolerance Check

Tolerance Check

Tolerance Limit is described as the maximum delta value by which the setpoint or output of a process point can be manually changed in either a plus or minus direction without causing a violation warning.

Two new parameters, $SPTOL and $OPTOL, in the R530 function "Setpoint /Output Tolerance Check," will check to see if the tolerance is violated in either a negative or positive direction from the current value of the SP or OP. The operator is alerted by a beep from the keyboard and a warning message on the second line of the screen in an operating display. If there is a violation, operator confirmation is required before the value is stored (see *Process Operations Manual)*. Manually entered tolerance values require a key access of ENGR.

Tolerance checks are made in the Detail/Group displays and the RS_SYS, CHG_ZONE, and USER_CZ actors in schematics. A value of 0.0 disables this check. Default values for $SPTOL and $OPTOL are zero. A NaN or negative value is not allowed.

DEB configuration

The Data Entity Builder supports configuration of the $SPTOL and $OPTOL parameters in the following sections of the builder.

$SPTOL
- AM (RegCtl) Reg Setpoint Display
- HG (RegCtl) Operating Configuration
- NIM (RegCtl) Setpoint Display Regulatory Control

$OPTOL
- AM (RegCtl) Reg Ctrl Output Connections
- HG (RegCtl, AO, AC) Operating Configuration
- NIM (RegCtl) Output Configuration Regulatory Control
- NIM (AO) Operating Configuration Analog Output

Points checked

Manually entered SP and OP values for the following points are tolerance-checked against the engineer-specified tolerance value:
- SP and OP values for the AM, HG, and NIM RegCtl points
- OP values for HG and NIM Analog Output points
- OP values for HG Analog Composite points

Error Handling

Error condition notifications occur as follows:

From the Data Entity Builder:

Error Condition	Error Message
Entering an out of range value	LMT OR RANGE ERROR
Entering a value of NaN	VALUE ERR

From the Detail and Schematic Display:

Entering an out of range value	LMT OR RANGE ERROR
Entering a value of NaN	VALUE ERR
Attempting to enter a value when the key is in any position other than ENGR	ACCESS LEVEL ERR

References

Refer to the publications listed below for more information on R530 function "SP/OP Tolerance Check."

- *AM Control Functions & Algorithms*
- *AM Forms*
- *AM Parameter Reference Dictionary*
- *APM Configuration Forms*
- *APM Control Functions & Algorithms*
- *PM Family Parameter Reference Dictionary*
- *Data Hiway, Bx/Slt, Data Pt Forms*
- *Engineer's Reference Manual*
- *HG Control Functions & Algorithms*
- *HG Parameter Reference Dictionary*
- *HPM Configuration Forms*
- *HPM Control Functions & Algorithms*
- *HPM Family Parameter Reference Dictionary*
- *PM Configuration Forms*
- *PM Control Functions & Algorithms*
- *PM Family Parameter Reference Dictionary*
- Process Operations Manual

Section 36 – R610 Periodic Pre-Defined Documentation Tool Query

36.0 Overview

Overview

This function provides the ability to trigger and cancel pre-defined Documentation Tool queries through CL or scheduled ECs and have the query results output to a file or printer automatically.

Refer to *Command Processor Operation* for a discussion of Documentation Tool Query commands.

Target Platforms

Nodes affected are the UNP, OPR and GUS Native LCN Window.

AM, CG, NIM and HG are indirectly affected in that CL hosted by these nodes or by control processors on their control networks have new pre-defined keywords and associated values in CL SEND statements.

CL Send Statement

You can automatically trigger or cancel a pre-built Doc Tool query on a periodic basis. The query runs in background mode.

This is accomplished through a CL SEND message that specifies the US node on which to run the query, the pre-build query descriptor, and the destination for the results. The destination can be either a printer ID or a pathname to a file. For the AM/CL, the query can be made periodic by configuring the point to which the CL is linked to be processed on a specified cycle. For Process Network node (NIM and HG boxes), the query can be made periodic by writing a CL program which executes periodically.

ATTENTION

The AM CL commands – QFILE, QPRINT and QCANCEL – cannot be used for invoking prebuilt queries with historized journal access.

36.1 Implementation

Command examples

There are three new keywords added to invoke a pre-defined query from CL using a specially formatted "SEND" message. They are used as follows:

SEND:"$QFILE <Node Number> <Descriptor> <Pathname> <XX>
SEND:"$QPRINT <Node Number> <Descriptor> $P<n> <XX>
SEND:"$QCANCEL <Node Number> <YY>

Where:

$QFILE	This is the keyword to specify a query whose result is to be output to a file.
$QPRINT	This is a keyword to specify a query whose result is to be output to a printer.
$QCANCEL	This is a keyword to cancel the running query being executed by a Doc Tool background task.
<Node Number>	This is a required field, and specifies the LCN US node, which is to process the request.
<Descriptor>	This is a required field, and specifies the name of the pre-defined query (maximum of 16 characters and no spaces).
<Pathname>	This is a required field, and specifies the path to the file to which the result should be output.
$P<n>	This is a required field, and specifies the printer ID on which to query results are to be printed.

Where:

<XX> and **<YY>**	These are option fields which can take the values given below: **XX [$BYPASS | $SORT | $BYSORT | $SORTF | $BYSORTF | $NSORT | $BYNSORT]** **YY [$BYPASS]** If specified, they achieve the following: **$BYPASS** Allows you to specify that the CL Send message itself is not to be output to the Real Time Journal nor put into the Operator Message Summary Display (the message will still go into Event History on the HM). **$SORT** Sorts the Query Result by the Entity Name. **$BYSORT** Facilitates both **$SORTF** and **$BYPASS** operations (**$BYPASS** + **$SORT**). **$SORTF** Sorts the Query Result by the user specified first field. **$BYSORTF** Facilitates both **$SORTF** and **$BYPASS** operations (**$BYPASS** + **$SORTF**). **$NSORT** Explicitly does not sort the Query Result. **$BYNSORT** Facilitates both **$SORT** and **$BYPASS** operations (**$BYPASS** + **$SORT**). Global values may not be selected for the QRYSORT PSDP. This is because the global value in the QRYSORT PSDEP overrides the sort directive in the send message.

NOTES:

1. In xPM and MC CL, the content of a SEND message has a limitation of 7 fields of 8 characters each, therefore a SEND message for $QFILE is constructed as follows.
   $QFILE [node #] [descriptor 1…8] [descriptor 9…16] [pathname 17…24]
   When a field is used for the XX or YY option, then the descriptor is limited to 8 characters.
   The same limitation applies to the messages initiated by the ACPs from CM50s, which are connected to the CG. This message length limitation is 72 characters. If the destination is "CRT only", the message limitation is 60 characters.

2. All the above mentioned sort operations will be over ridden if the QRYSORT PSDP value has been set to Node Global type.

3. The QRYSORT functionality for CL programs and the Command Processor (CP) is extended to support the schematics, therefore schematics that use the query actors can use the sort capabilities. The query results will be sorted or not sorted depending on the value of the QRYSORT parameter. The possible modes are as follows in the table on following page.

4. If there is a CL problem, try QFILE from the Command Processor.

5. A problem occurs if a CL program tries to do two or more queries consecutively. There is contention on the SYSQRY.EC file. Delay the CL program at least 10 seconds between queries.

QRYSORT functions

TYPE	QRYSORT Value	Definition
Temporary	0	"No Sort." The Sort Directive in the CL/CP (Command Processor) query will override this option.
	1	"Sort by Entity Name." Automatically reset to 'No Sort' at completion of Query. The Sort Directive in the CL/CP will override this option.
	2	"Sort by user specified first field." Automatically reset to 'No Sort' at completion of Query. The Sort Directive in the CL/CP will override this option.
Node Global	3	"No Sort." This option overrides the CL/CP Sort Directive. This value is not automatically reset. Once set, this option can only be changed to another Node Global type or Reset.
	4	"Sort by Entity Name." This option overrides the CL/CP Sort Directive. This value is not automatically reset. Once set, this option can only be changed to another Node Global type or Reset.
	5	"Sort by first user specified field." This option overrides the CL/CP Sort Directive. This value is not automatically reset. Once set, this option can only be changed to another Node Global type or Reset.
Reset	6	Used to Reset the Node Global options. Once a Node Global option is set, it can be changed to a temporary type only by setting this option. Setting this option, resets the PSDP value to 0.

Notes on QRYSORT results

1. Global values can only be changed to another global value or reset (6).
2. Reset (Value of 6, as in the above table) clears out the value (global or temporary).
3. Temporary value can be changed to another temporary value.
4. Temporary value cannot change a global value.
5. CL/CP Sort Directive is treated like a temporary value.
6. CL/CP Command with no specific sort directive switch and Schematic actor access are equivalent (PSDP rules).
7. If Query occurs with a temporary value, the value is reset after the query completes.
8. If Query occurs with a Node Global value, the value is not reset after the query completes.
9. The sort mode will be initialized to temporary "No_Sort" at system startup.

Individual versus node global sorts

You may use the sort option on an individual query basis (by setting to temporary type) or on a node global basis as follows:

Sort mode set to temporary value

- The CL/CP query commands can use an optional sort switch when a sort is desired.
- If the Sort option is set to temporary type (through Schematic actors or by writing to the PSDP directly, or by any means), and a CLCP desires "No Sort" then the NSORT switch must be used in the command.
- Users with schematics that use query actors and want them to operate just like the CL and CP commands can do so by adding a line of code that sets the sort mode to one of the temporary values. This setting must be made in each schematic in which they want the query results to be sorted.

Sort mode set on a node global type

- The sort mode value must be set. You must specify the desired value of the QRYSORT PSDP because it is initialized to zero (0) at node startup.
- When the QRYSORT parameter is in a node global mode, it overrides sort switches in CL/CP commands. In this case, no matter what Sort Directive is used in the CL/CP command, the sort operation on all query requests from CL/CP would operate in the same manner.
- When a node global mode has to be changed to a node local mode, the mode must first be Reset. Then the desired temporary value can be selected.

Note: When sort by “first user specified field” is selected and the first user specified field does not exist, the query results are sorted by the point name

---

Query actor status check

The program can interrogate the station's PSDP parameters QSTS(1), QSTS(2), and QSTS(3). Because this is an array of strings, the AM/CL program must run in the background.

QSTS(1) contains the name of the last query initiated.
QSTS(2) contains the status of that query.
QSTS(3) contains the invocation date/time of the last requested query.

The status strings contained in QSTS(2) are as follows:
"query in progress"
"query complete"
"query complete but not displayable"
"printer failure - printout aborted"
"canceled"
"device unavailable"
"fatal error occured"
"no match found"
"printing results"
"multiple errors ocurred"
"_____" blanks, when no query has yet been initiated

A problem occurs

36.2 Periodic Pre-Defined Query Scenarios

Specify node CL send message

Scenario 1
To invoke a pre-defined query from CL, a user must specify the node number where the query is to run, the descriptor of the pre-built query and the pathname or printer number. For example, if the pre-built query, HGPOINTS is to be run on node (US) 35 with the result being output into file hgpoints.xx, the command is as follows.

AM CL:

SEND:"$QFILE 35 HGPOINTS NET>TEMP>HGPOINTS.XX $BYPASS"

xPM/MC CL:

SEND:" $QFILE 35 HGPOINTS NET>TEMP>HGPOINTS.XX $BYPASS"
Notice that the query descriptor and pathname for xPM/MC CL are split into eight characters per word.

AM/CL with Custom Data Segments:

SEND: "$QFILE 35",str1(1),str3(25),"$BYPASS"
Where,

str1(1) has the string value of HGPOINTS,
STR3(25) has the string value of NET>TEMP>HGPOINTS.XX

The optional keyword "$BYPASS" is used to prevent this CL message from going to the Operator Message Summary display and the RTJ printer.

Scenario 2
To request the same query as above but direct the results to be output on printer $P2, the CL command is:

SEND: "$QPRINT 35 HGPOINTS $P2 $BYPASS"

Scenario 3
To cancel the query being executed by the background task on node 35, the C: command is: **SEND: "$QCANCEL 35"**

Scenario 4
To invoke the sort query results, any of the optional Sort Directives may be used, as follows:

Specify node CL send message, continued

To sort the Query Result by point name

- **SEND: "$QFILE 35 HGPOINTS NET>TEMP>HGPOINTS.XX $SORT"**
- **SEND: "$QFILE 35 HGPOINTS NET>TEMP>HGPOINTS.XX $BYSORT"**
- **SEND: "$QPRINT 35 HGPOINTS $P2 $SORT"**
- **SEND: "$QPRINT 35 HGPOINTS $P2 $BYSORT"**

To sort the Query Result by user specified first field

- **SEND: "$QFILE 35 HGPOINTS NET>TEMP>HGPOINTS.XX $SORTF"**
- **SEND: "$QFILE 35 HGPOINTS NET>TEMP>HGPOINTS.XX $BYSORTF"**
- **SEND: "$QPRINT 35 HGPOINTS $P2 $SORTF"**
- **SEND: "$QPRINT 35 HGPOINTS $P2 $BYSORTF"**

To Not sort the Query Result

- **SEND: "$QFILE 35 HGPOINTS NET>TEMP>HGPOINTS.XX $NSORT"**
- **SEND: "$QFILE 35 HGPOINTS NET>TEMP>HGPOINTS.XX $BYNSORT"**
- **SEND: "$QPRINT 35 HGPOINTS $P2 $NSORT"**
- **SEND: "$QPRINT 35 HGPOINTS $P2 $BYNSORT"**

Notice the following about the above cases:

1. In all of them, the query results depends on the Sort Directive used; however, if the node global sort value is set in the QRYSORT PSDP, it overrides the Sort Directive set in the query initiated from the CL Send Messages.

2. When a combination of $BYPASS and Sort Directive is used in CL Send Message Query, then the query results will be sorted/not sorted based on the Sort Directive, and the message will not be sent to the Operator Message Summary display and the RTJ printer.

3. In order to make an AM/CL initiated pre-defined query run on a periodic basis, the following steps need to be taken.

- Include the CL Send message in a CL program
- Attach the CL program to a process point
- Configure the CL program to a process point
- Configure the processing rate of the process point to the periodic rate desired for the pre-defined query
- Load the process point and set it active

SEND MESSAGES

The format of the SEND MESSAGE (initiated by ACPs from upper level processors (CM50s) connected to the CG) will be the same as the Message sent by the CL SEND messages. That is, the same keywords used in the CL SEND messages will be used here.

FORTRAN call for Send Message example

```
return_status = CM50_STOREMSG
                (%REF(msg).
                msg_len,
                confirm,
                timeout,
                dest)
```

PASCAL call for Send Message example

```
return_status = CM50_STOREMSG
                (msg.
                msg_len,
                confirm,
                timeout,
                dest)
```

"C" call for Send Message example

```
return_status = cm50_storemsg
                (msg.
                &msg_len,
                &confirm,
                &timeout,
                &dest)
```

Where,

msg = "QFILE 35 HGPOINTS NET>TEMP>HGPOINTS.XX $BYPASS"

msg_len = 47

confirm = 1

timeout = 180

dest = 2

Section 37 – R660 Finding Point Interconnections

37.0 Overview

Introduction

With TPN R660, an optional feature added to a Universal Station can search the system database within standard operating displays for connection references to a selected point. Although this feature uses the Find Names function, not many Find Names options are available and the operator does not see the Find Names interfaces.

The Finding Point Interconnections function is similar to the Find Names function available through the Command Processor in that they both search for point interconnections in checkpoint files. However, the Command Processor Find Names function has an engineer keylock, and the Operator Find Names function has an operator keylock.

The Finding Point Interconnections function allows the engineer to use the Documentation Tool FNM Query to narrow the operator's search parameters to only the checkpoints of concern.

ATTENTION

Beginning with TPN R688.5, for an EHPM Controller with HART IOPs (HART and HART AO_16 modules), will display "HLAI-H" for a HART HLAI module and "AO_16-H" for a HART AO_16 module, in the Find Names output.

MEDIA	UCNCP	NODE	MODULE	SLOT	ENTITY
NET>&I01	1	57	HLAI-H1	14	N1B57HLAI14
NET>&I01	1	57	HLAI-H1	15	N1B57HLAI15
NET>&I01	1	57	HLAI-H1	16	N1B57HLAI16
NET>&I01	1	57	AO_16-H4	1	N1B57HAO1
NET>&I01	1	57	AO_16-H4	2	N1B57HAO2
NET>&I01	1	57	AO_16-H1	3	N1B57HAO3

Using the predefined queries and the $INTRCON schematic, an operator can find data points that are interconnected with AM, HG, and UCN data points and associated CL programs and sequences in the control strategy.

The $INTRCON schematic is an electronic form. Using this page the operator can start a point interconnections search, cancel a search that is in progress, see the status of a request in progress, or see the

search results as the search is in progress.

The point interconnection option uses Universal Station memory and processor resources to perform checkpoint searches for references. This section describes the engineer's implementation of the optional OPFNAM (operator personality) and UPFNAM (universal / GUS personality) external load module to support this feature.

37.1 Implementation

Introduction

Implementing the Operator Find Names function consists of:

- Modifying the NCF to include the Operator Find Names external load module.
- Using the Documentation Tool to build predefined queries that can be entered into the $INTRCON schematic by the operator to search for point interconnections.

Modifying the NCF to include the Operator Find Names external load module

The procedure for modifying the NCF is contained in Table 37-1.

Table 37-1 Modifying the NCF

Step	Action
1	From the Modify Volume Paths display in the Engineer or Universal Personality, set the NCF Backup Path to a removable media pathname. $Fx>&ASY> where x = drive number Insert a backup &ASY disk in the removable media drive.
2	From the Engineering Main Menu, select the LCN NODES target. The LCN Nodes display appears.
3	Verify that the NCF configurator is in the ON-LINE mode as shown in the upper right corner of the display.
4	Select the target for the node number of the Universal Station that is to be loaded with the OPFNAM and/or UPFNAM external load modules. Use the PAGE FWD key to display the desired US node number
5	Select the MODIFY NODE target.
6	Page 2 allows you to configure the external load modules on the selected US. This display contains 24 entry ports for Module Names, and 24 entry ports for Personality Types. NOTE: It is important that you do not use the ENTER key until instructed. Use the TAB keys to move from port to port, or use the touchscreen.

Modifying the NCF to include the Find Names external load module, continued

Table 37-1 Modifying the NCF, continued

Step	Action
7	If the US being configured is always in the Operator personality, key in the name and personality type for the Operator personality. In this case, the Universal personality module does not have to be configured.If the Finding Point Interconnections feature is to be enabled in the US, the names of the following external load module must be entered as described in step 8: **Module** **Type** **Station Personality** OPFNAM OPR Operator UPFNAM UP Universal
8	Key in the required External Load Module Names and the required Personality Types (in the entry ports for the Associated Personality Type), but— **do not press the ENTER key**. Select the NO target as the answer for USE DEFAULT PERSONALITY TYPE?.
9	Press the [ENTER] key.
10	The network configuration file will determine the total size of the software defined for each personality configured. The network configuration file will show the size for each personality configured next to the TOTAL (MODULES PLUS ADDITIONAL MEMORY) line. Round-off each of the size numbers up to the next 1K. Add 2K to the rounded-off numbers. Key in the totals into the associated boxes next to the MAXIMUM EXTERNAL MODULE MEMORY (WORDS) line. For R660 and later versions, add 4,000 words for future expansion. This extra memory allows for possible future maintenance or upgrade releases to be loaded without requiring an NCF change.
11	Press the [ENTER] key.

Table 37-1 Modifying the NCF, continued

Step	Action
12	Press the CTL key and the 1 key at the same time to check the revised NCF to ensure that the HM is not at 100% capacity.
13	Press the CTL key and the 2 key at the same time to install the revised NCF.
14	Restart the US or GUS to ensure that it is reloaded with the revised NCF.

Using the Documentation Tool to build predefined (FNM) Finding Point Interconnections queries

Use the Documentation Tool to build predefined queries that can be used by the operator to search for point interconnections.

Refer to the *Documentation Tool* manual for the procedure to build predefined FNM (Finding Point Interconnections) queries.

Sizing and Performance

The external load modules (OPFNAM and UPFNAM) for the Finding Point Interconnections function use 130,000 words of US memory space. They are approximately 126,000 words in size and 4,000 spare words that provide space for possible changes. The configuration provides 130,000 word sizes in the NCF. This sizing is adequate to run in the minimum size Operator Personality, but may conflict with US nodes that have existing external load modules configured.

The Universal Personality runs on the LCNP-4 GUS native window when the LCN node was configured to have UPBASE, MSCHEM, CSCHEM, YGOCX, GUSALA, GUSALG, and UPFNAM load modules. In this case, the extra memory was set to 30,000, the total memory was 270,645, and the maximum was set at 280,000.

The Finding Point Interconnections external load module operator runtime uses approximately 122,000 words of heap memory (HEAPFREE) with typical AM/NM/HG checkpoint databases (116,000 was measured on a GUS).

The Finding Point Interconnections runtime on the operator can use up to 60 percent of the available CPU time (CPUFREE) (40 percent measured on the GUS), but runs at a lower priority than existing US functions. When an existing US function is running at the same time as the $INTRCON search, the existing US function has the priority over CPU resources and the $INTRCON search takes longer.

Setup and Restart

The Finding Point Interconnections function uses interfaces that are available to the engineer but are not available in operator mode of use. This includes configuring the external load module in the US (NCF), building search Fnm query parameters (Documentation Tool), viewing and deleting point interconnection file output (Command Processor) and entering the Fnm query names used with $INTRCON Default query point type options ($PICQRYA, $PICQRYU, $PICQRYH).

The engineer performs the network configuration to implement this function on a US. The engineer may add TPN changes through a custom schematic or AM/CL program to allow the operator to initiate the remaining actions.

The default Fnm query names ($PICQRYA, $PICQRYU, $PICQRYH) are set to a ‘NULL’ value whenever the US is reloaded.

37.2 Operation

Introduction

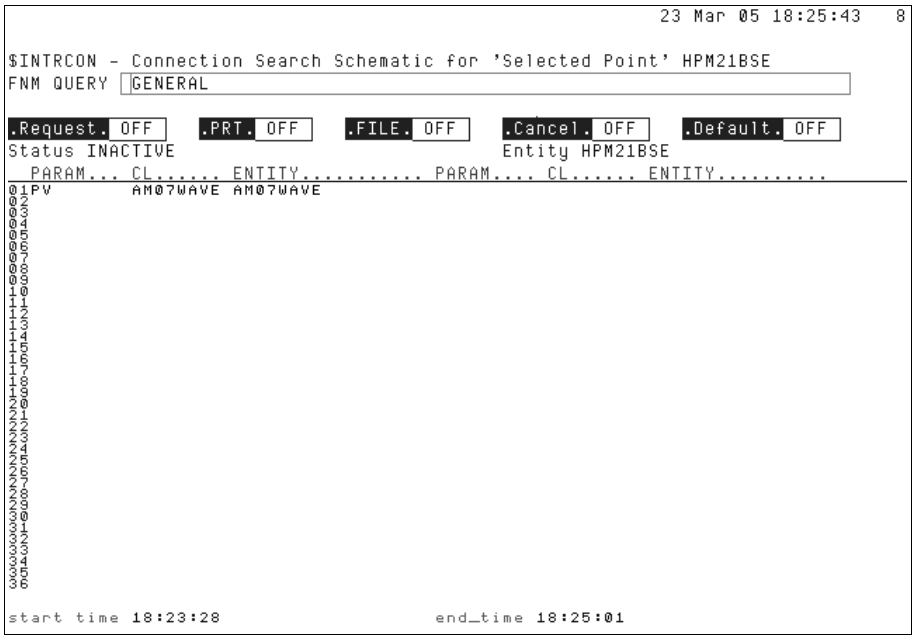
This section contains a brief description of how to initiate interconnection searches using the Finding Interconnection Points function.

Refer to the *Process Operations Manual*, section 3.2, for more information about the use of the $INTRCON Schematic.

Finding point connections

The operator uses the $INTRCON schematic shown in Figure 37-1 to initiate searches for interconnected points.

Figure 37-1 $INTRCON Schematic



Finding point connections, *continued*

The $INTRCON schematic is an electronic form. The schematic can be accessed by the operator using any one of the following methods:

- From a group display, select a point name. Press the SCHEM key, enter $INTRCON, and press the ENTER key. The $INTRCON schematic shown in Figure 37-1 appears.
- From a point detail display, press the $INTRCON page target and the $INTRCON schematic appears.

NOTE: When the Status value is INACT (Inactive) the operator can select the Request target and press ENTER to initiate a search of the NET AM/UCN/HG checkpoints for references to the selected point. These results are shown in the bottom portion of the $INTRCON schematic.

To use the PRT/FILE/FNM Query/Default options the engineer needs to configure documentation tool FNM query descriptors and supply the values to the operator. FNM Query descriptors could then be used by the operator as follows:

- Select the FNM Query target and enter the descriptor name (to remove a FNM Query name enter the value (—) or NULL)

- If the named FNM Query provides a valid printer ID and/or file name, the operator can select the PRT and/or the File target, press ENTER and the next search request output is sent to the printer and/or file along with the results shown on the bottom of the screen.

- If the engineer has built FNM queries to specify a default for AM/UCN/HG selected point types (parameters $PICQRYA, $PICQRYU, $PICQRYH) then the operator may select the Default target and press ENTER to use the search parameters based on the defaults.

The operator can then enter a descriptor which can be from 1 to 64 characters in length in the FNM Query descriptor entry port of the $INTRCON schematic.

The descriptor is the name of the Finding Interconnection Points query that was assigned to the query it was built by an engineer using the Documentation Tool. It contains the interconnection search limits.

Finding point connections, *continued*

The engineer can establish a default query for AM, HG, and UCN points by using PSDP parameters. The defaults are implemented using three PSDP parameters ($PICQRYA, $PICQRYH, and $PICQRYU) for AM, HG, and UCN points, respectively. This can be accomplished through the DATACHNG schematics or through AM/CL write operations. These defaults are used by the operator when the $INTRCON schematic Default target is set to ON.

NOTE: The default values are temporary values and must be re-entered each time after the US/GUS node is restarted.

$

$$NODE, *306*
$INTRCON, 692
$LNMENU, *269*
$QCANCEL, 678
$QFILE, 678
$QPRINT, 678

&

&ASY
  backup copy, *32*
  maintaining backup copies, *34*
  two versions, *33*
&CUS, *572*, *576*
&OVG, *576*

“

“C” call for Send Message, 686

A

Actors
  In Process Control, *287*
  use of, *287*
  what they do, *287*
Alarm Summary Enhancements (R610), 180
Alarm Summary Enhancements (R681), 181
Alias, *299*
ALTCBLA, *216*
ALTCBLB, *216*
AMCLDBUG, *198*
AMCLDSPL, *198*
AMDETAIL, *198*
AMTREND, *198*
Area Change
  CAUTION, *600*
Area Database, *266*
Assigning Units to an Area, *268*
Autoboot, *299*
automatically trigger or cancel a pre-built Doc Tool, 677

B

Back up
  &ASY, *32*
  HM, *23*
Bind, *299*
Binding
  Data in CL Programs, *284*
  Entities & Schematics into the Area Database, *285*
  Entity Data in the Data Entity Builder, *281*
  HM Local NVCF Data, *280*
  NCF Data, *279*
  Schematic Data, *283*
  Unit, Area, and Console Names, *277*
Bootload, *300*
Box/slot verification, *201*
BREAK key, *321*
Build, *300*
Button LED Control, *598*
  Area Change, *599*
  Area Change, CAUTION, *601*
  Bypass Option, *599*
  CL SEND statement, *598*
    Example, *598*
  Error handling, *600*
  RED/YEL keywords, *599*
Button Primmod Assignment, *596*
  Actor
    GET PRIMMOD, *597*
  Button Name File, *597*
  CL SEND statement, *596*
    Example, *596*
  Error handling, *600*
  Node Startup, *597*

C

CANCEL, 678
CHANINFO, *198*
Channel Information Display Description (R651), *219*, *222*, *232*, *239*, *242*, *243*, *245*, *246*, *247*, *248*, *249*, *252*
Checker Target, *197*
Checkpoint, *300*, (checkpointing)
  rules, *294*
Checkpoint Time, *201*
CHKPTIME, *201*
CL Send Messages, 684
CL SEND statement, *596*, *598*
CLOKCABL, *202*
CLOKCABL, *216*
CLOKMODE, *202*
CLOKSYNC, *202*
CLOKTRAN, *202*
CLSNODE, *198*
Compile, *300*
Conceptual organization, *5*
Configurable Access Level on Parameters, *657*
  Access Level Configurable Options, *659*
  Help Messages, *663*
  Parameter Access Level Revision Differences, *660*
  Parameter change requests, *659*
  System Wide Values, Console Data, *661*
Configurable Access Level on Parameters:, *3*, *658*
Configuration checks during startup, *32*
Console defined, *40*
Continuous history, 64
Copy a floppy or cartridge, *23*
Copy files, *23*
CPUCHKR, *200*
CPUFREE, *205*

Crash, *300*
Crossed cables, *216*
Current Display Parameter, *197*
Custom Software
Backplane, *571*
Directory, *573*

D

Database Composition, *266*
DATACHNG, *197*
Definitions of CHANINFO display items, *220*
Delete files, *23*
Detail Display Navigation, *657*
Custom Data Segments, *673*
DIGSYNCH, *202*, *217*
Directories, *21*
Directory, *300*, *301*
Displaying the channel information for a node, *220*
Documentation Tool, 677
Drives, *51*

E

Engineering Personality
Generic Overlays, *576*
Requirements, *43*
Entity, *301*
Error, *301*
Establish, *301*
Event-Initiated Reports
Area, *560*
Error Handling, *569*
History, *563*
Implementation, *594*
Message-Source Considerations, *559*, *595*
Operation, *568*
Exception Build, *301*

F

Fast-Load
Feature, *37*, *309*
Guidelines, *313*
Implementation, *313*
Scenario, *309*
Fast-Load Cartridge
contents, *316*, *317*, *324*
Maintenance, *316*, *317*
File access on startup, *32*
File-system
abbreviations, *22*
commands, *22*
files cannot be found, *36*
File-system, *22*
Format, *301*
FORTRAN call for Send Message, 686

G

Generic Overlays, *576*
Guidelines and Warnings, *293*

H

Heap displays, *200*
HEAPCHKR, *201*
HEAPFRAG, *204*
HEAPFRAG2, *204*
HEAPFREE, *204*
HEAPMIN, *201*, *204*
HM
Assigning Units, *60*
Configuring History Groups, *61*
Configuring Redundant Disk Drives, *114*
Continuous History
configuration, *64*
saving/restoring, *120*
Estimating volume sizes, *73*
Fragmentation, *132*
Initialization, *118*
Load, *301*
Setting a Disk Drive Off Line, *116*
Types of Data, *53*
Volume Configuration Example, 79
Volumes required, *56*
HMDETAIL, *198*
HMTREND, *198*

I

IDF. (Intermediate Data File)
IDF, *302*
Initialize, *302*
Intermediate Data File, *302*
Invoke, *302*
invoke pre-defined query form CL, 684

K

KB, *302*
keywords to invoke pre-defined query, 678
Kilobyte, *302*

L

LCN
cable diagnostics, *200*
crossed cables, *216*
LCN (Local Control Network), *302*
LCN Node Version/Revision Logging function, *12*, *601*
Call Up Display, *627*
Directory, Find a, *620*
Distributed Files, *619*
Errors,non-recoverable, *652*
Errors,recoverable, *654*
Export File Format Option, *632*
Export File LVRLOG.RE, *647*
Field Descriptors, *604*
Installation,Initial, *621*
LCN ID,Enter, *630*

Performance Displays Menu
LVRLOG, *197*
Printer number, Enter, *641*
Printing, Cancel
WARNING, *643*
Report Display,Initiate, *638*
Report Format, *603*
Report Generation,Initiate, *634*
Requirements
Hardware, *617*
Memory, *617*
Software, *617*
Site ID, Enter, *628*
Universal Station Configuration, *622*
LCN Node Version/Revision Logging function:, *620*
LCNPERF, *198*
LDID (Logical Device Identifier), *302*
Link, *302*
List files, *22*
Load, *303*
LOAD FAIL message
Clearing a, *307*
Local Volume, 53
Logical Device Identifier, *302*
LVRLOG, 607, 611, 613

M

MB, *303*
Megabyte, *303*
Megaword, *303*
Mw, *303*

N

NCF, *303*
NET, *17*
Network Configuration File
Purpose, *46*
NGDETAIL, *198*
NGTREND, *198*
Node, *303*
Node Loading Failures, *306*
NODEPERF, *198*, *204*
Node-related displays, *198*
NONTRNS, *202*
Not sort the Query Result, 685
NOTSYNC, *202*
np, *303*

O

On-Line Reconfiguration, *304*
Overlays
Generic, *576*
Owning Node, *304*

P

PARCHKR, *198*
PARSEC, *206*
PASCAL call for Send Message, 686
Pathname, *16*
PED (Parameter Entry Display), *304*
PERFMENU, *186*
Performance cluster, 55
Performance Displays Menu, *192*
Personality, *304*
Picks, *7*
Picture Editor
reference, *36*
tips, *254*
point connections, 692
PRECREF, *202*
pre-defined Documentation Tool, 13, 677
Preparation for use, *29*
PRIMMOD, 163
Printer availability, *40*
Processor free-time, *200*
Processor Status Data Point, *203*
PSDP parameters
Application Module, *369*
Application Processing Platform (APP) Node, *468*, *470*
Computer Gateway, *390*
History Module, *395*
Hiway Gateway, *399*
HM60, *438*
Network Gateway, *411*
Network InterfaceModule, *449*
Overview, *353*
Parameters on every point in the system, *472*
PSDP Parameters in all nodes, *357*
Purpose of PSDPs, *354*
Remote User Link Adaptor, *448*
Universal Station, *419*
Purchased Options
Hardware, *532*
Application Module, *533*

Q

QCANCEL, 678
QFILE, 678
QPRINT, 678
QRYSORT parameter, 680
Quick Trend, *200*
QUIKTRND, *200*, *208*

R

Reconfigure, *304*
Reconstitute, *304*
Redundant drives, 51

Release
What is it?, *517*
Release 530 Functions, *12*
Configurable Access Levels on Parameters, *657*
Detail Display Navigation, *657*
One Key Call Up of a Point Trend, *657*, *677*
Save/Restore Trend Data, *657*
SP/OP Tolerance Check, *657*
Removable Media, *304*
Report to Output File, *577*
Configuration, *580*
Displaying Reports, *584*
Error Handling, *588*
Error logic, *581*
FailOver, *582*
File descriptors, *583*
Printer Assignments, *578*
Purging Files, *591*
REPORT_MEDIA, *585*
Status and error messages, *585*
VP CONFIG, *585*
Writing Reports, *582*
`Restore files`, *23*
ROF. (see Report to Output File)
RPARSEC, *206*

S

SEND MESSAGE, 686
send pre-defined query, 678
Setpoint/Output Tolerance Check
$SPTOL,$OPTOL parameters, *674*
DEB configuration, *674*
Error Handling, *675*
Points checked, *674*
Tolerance Check, *674*
SEVERE status, *586*
SEVERE WARNING status, *52*
SLTCONFG, *201*
Snapshots and User Averages, *68*
Software Upgrade
Process, *519*
Sort mode set on a node global type, 683
Sort mode set to temporary value, 682
sort Query Result by user specified first field, 685
sort the Query Result by point name, 685
SP/OP Tolerance Check, *657*
SPARSEC, *206*
Startup
&ASY, two versions, *33*
&ASY's Role;, *32*
after HM configuration, *114*
after power failure, history collection loss, *72*
configuration checks during, *32*
denied if mismatch of critical data, *297*
file access on, *32*
filename consistency, *262*
HM, *52*
HM autoboot, *119*, *299*
HM initialization, *118*
HM overload message, *71*
of node prevented, *296*
Option
Enhanced Hiway Gateway, *538*
HG Point Display Ranges, *526*
Redundant disk drives, *112*, *113*, *115*, *116*, *117*
Schematics loaded at, *259*
Sequence, *294*
Use of NCF, *45*
Station number, *40*
SUBSYNCH, *202*
SYStem error, *588*
System Volumes, *21*

T

TLK. (see Toolkit)
Toolkit, *185*
TREND
Save/Restore Trend Data, *657*
Trends
One Key Call Up of Point Trend, *657*
Collectors, *665*
Missing Default and Custom display error messages/Error Handling, *665*
Standard Display, *664*
Toolkit (TLK2), *665*
TREND invocation - Custom schematic display, *664*
TREND invocation - Default trend display, *664*
One Key Call Up of Point Trend:, *665*
Save/Restore Trend Data
Custom Schematics, *667*
Error Handling, *671*
Save Trend Data into ASCII files, *668*
Trend Graphs and Trend Ids, *670*
trend setting elements, *667*
TRNSLTR, *202*, *217*

U

Universal personality
Fast load, *37*
Generic overlays, *576*
Successful backup, *33*
Universal Personality
Calling functions, *7*
Definition, *304*
Memory requirement, *7*
Universal Station configuration, *622*
Universal Work Station configuration, *43*
Upgrades
AM, *533*
CG to PLNM, *536*
USER error, *588*

V

Value Change, *197*
Virtual printer. (see Report to Output File)
Volume, *304*

configuration, *79*
estimating sizes, *73*
required on HM, *56*
system, *21*
Volume and directory, *17*
access, *19*
Back up files, *23*
Copy files, *23*
Delete a file, *23*
hierarchy, *18*
List, *22*
List files if names are not known, *23*
Restore files, *23*
suffixes, *25*
usage, *17*

W

WARNING status, *52*, *586*
WDA. (see winchester drives)
Where to begin, *3*
Why a node fails or crashes, *306*
Winchester drives, *50*
Wren, *74*, *79*

Z

Zip Disk
&ASY Directories, 47
Access Name (LDID), 302
Adding a Pathname, 271
Alternative Name in Early Releases, 299
Autoload Targets, 310
Backup .GD Files, 261
Configuration Terms, 300, 301
Content of Fast Load Cartridge, 316, 317, 324
Copying a disk, 23
Copying Files to an HM, 270
Demand Checkpointing Caution, 337
Distributed Files, 619
Dump failures, 328, 329
Estimated Number To Fill HM, 74
Fast Access User Volume, 83
Fast Load Feature, 309
Fast-Load Scenario, 312
Format Command, 22
HM Backup Tool, 131
Improving Subpicture Performance", 257
Initializing, 22
List File Command, 22
Node Dumps, 328
Node Loading and Dumps, 305
Part Numbers, 28
Preparation for use, 28
Preparing Fast-Load Zip Disk, 319, 320
Restoring HM Group Config, 126
Separate Files and Subpictures, 258
System software, 1
Volume and Directories, 17
Volume vs. Directory, 304
Zip drive
HM Upgrades, 548
Zip Drive
Engineering Function Efficiency, 43
Identification, 17
Part Numbers, 28
Upgrading To, 539, 540
US hardware recommendations, 4
Using Two Zip Drives, 262

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