Honeywell

Understand History Module Functions

L61527
LCN

TotalPlant

Notices and Trademarks

This module supports **TotalPlant** Solution (TPS) system network.

TPS is the evolution of TDC 3000X.

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INTRODUCTION

The History Module performs four main functions on the LCN:

1. Acts as an LCN network file server.
2. Provides continuous history storage and retrieval capabilities.
3. Provides event history storage and retrieval capabilities.
4. Provides automatic checkpoint control capabilities.

This course module discusses the first three functions. Checkpointing is discussed in a different course module.

MODULE OBJECTIVE

Given an LCN with a History Module, the student will be able to

1. Determine the LCN system volumes and directories present on an LCN.
2. Optimize file access performance.
3. Calculate the impact of fast continuous history on HM performance.
4. Optimize history storage and retrieval on HMs and data owners.
5. Optimize the HM for journal storage and retrieval.

THE HISTORY MODULE AS AN LCN NETWORK FILE SERVER

The history module is the online network file storage device. It acts as a file server for the LCN. The capacities of each history module depends on the types and numbers of disk drives in use.

Disk Drives

Each history module can have one or two disk drives (known as single- or dual-drive history modules). Additionally, WREN III or WDA disk drives can be redundant. HM disk redundancy is a purchasable software option. Disk drive options and drive pinning addresses are as follows:

Table 1 – History Module Disk Drive Options

Options	SCSI Address of Drive	SCSI 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 drives (same storage as two, nonredundant drives)	5 3	4 2

Redundant Disk Drives

Online Operation

HM disk redundancy provides a dual-disk approach to disk failure by maintaining two devices with the same information. If one of the devices fails, operation continues using the surviving disk device. Because a good copy of the data remains, no recovery is needed. After the failed disk is repaired, the data on the surviving disk can be copied to the repaired device without interrupting online operation.

Synchronizing Redundant Disk Drives

After HM initialization, redundant disks must be synchronized. The HM must be in the online personality when synchronizing. Once synchronized, both devices contain the same data.

When a write to the disk occurs, the data is sent to both drives in parallel to maximize performance. The caller's requests remain outstanding until both writes are complete. Read requests are issued to one of the two drives. Periodic reading of both disks is done as a background operation to verify that both devices are readable. The disks should remain synchronized until a disk or node failure occurs or a disk is taken offline.

HM Shutdown

When an HM is shut down logically, the disk is left in a synchronized state. On a reboot of the node, the software determines that the data is synchronized and proceeds to keep both disks in this state.

Any other type of node failure, such as a power failure or hardware failure, can possibly leave the disks unsynchronized or with possible EDAC errors. Upon subsequent reboot, the software will determine if the drives are synchronized; if not, one drive is chosen to be online and the other drive is left in the unsynchronized state. Synchronization to that disk drive can then be initiated.

ATTENTION It is recommended that HM nodes be logically shut down before being powered off. This ensures that the drives will be in the synchronized state and allows the HM to complete any writes to the drive that may be in progress.

Disk Redundancy Since R400

With R400 and later software, HM disk redundancy operates as follows:

- Disk redundancy is handled on a file/volume basis.
- Synchronization does not require the user to specify the drive from which to synch nor the drive to which to synch.
- Synchronization of redundant drives does not rebuild the entire disk structure; instead, volumes on both drives are checked to ensure that the same information is present.
- The drive with the volume with the most current good data serves as the data source if volumes are found to be different; consequently, synchronization is on a volume basis, rather than on a drive basis.
- If a volume exists on one drive but not another, an attempt is made (when synching) to copy the volume to the other drive. For this reason, any new drive introduced into the system must be newly formatted using the HVTS format command, or it can be initialized using the NCF from the system to which it will be introduced to ensure that the volume structure is the same.

Nonrecoverable Data Errors (R400 and later)

Redundant Drives

If a nonrecoverable data error is encountered on a redundant HM, the following occurs:

- The task that is in-process completes by using the duplicate copy of the data from the redundant disk drive.
- The bad volume/file is marked as bad/corrupted for the drive with the problem. The remaining files and volumes on the disk are still accessible.

With redundant HMs, it is possible to have nonrecoverable data errors in *multiple volumes on multiple drives*:

- As long as the the same volume is not corrupted on both drives, full HM capability is maintained.
- If the entire volume is inaccessible, the volume is marked as "corrupted."
- The HM remains available to service the remaining good volumes.

Nonredundant Drives

If a nonrecoverable data error is encountered on a nonredundant HM

- The specific file involved is marked as "degraded" and the task is aborted.
- The HM remains online and functional to support other good files in the same volume as well as other volumes.

Reassigning Bad Sectors—R400 and Later

R400 and later software supports the capability to reassign bad sectors *online*, using SMCC. The SMCC initialize/reassign sector function can be used for these drives:

- WREN III drives
- WDA drives

Depending on the nature of the error, recovery may be as simple as reassigning the bad sector online and then recopying the file from a backup source to the HM; however, some errors will require reinitialization of the drive after online bad sector reassignment has taken place.

NOTE: WREN I and WREN II drives still require HVTS to reassign a bad sector.

Errors Requiring Initialization

The HM disk drive must be initialized and fully reloaded if one of the following is true:

- The status of the affected volume is CORRUPTED on the Volume Status display.
- The bad file is in one of the following volumes:
  - Maintenance System Software
  - Journals
  - Continuous History (except CM files)
  - Checkpoint files

> REFERENCE—For more details on recovery from bad sectors, see the *HM Service Manual*.

The DRVSTS display from PERFMENU provides the status for each HM drive and its volumes. This display also provides the node pair number for the History Module.

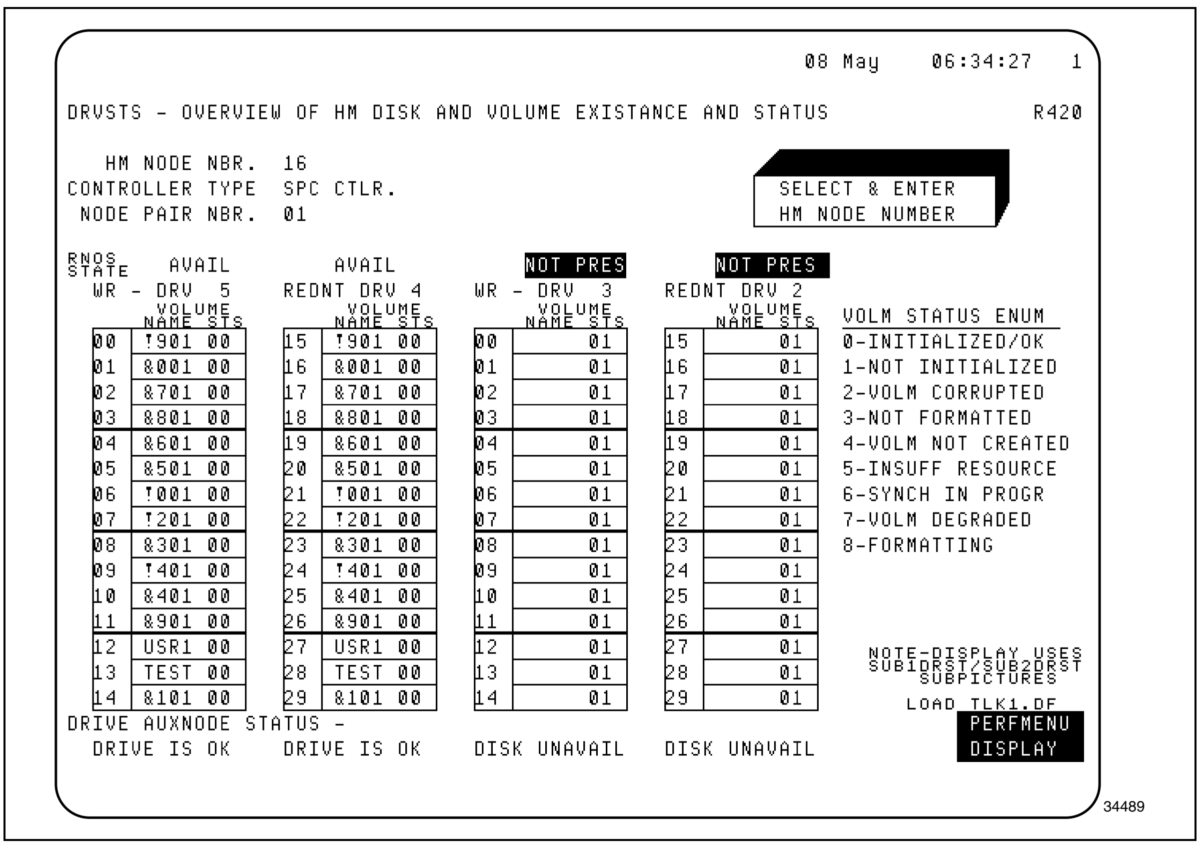

Figure 1 - DRVSTS Display—HM Drive Status

Volume/Directory Capacity

The LCN file manager supports the following volume/directory capacities:

- 15 volumes per disk drive, 30 volumes per dual-drive HM,
- 63 directories per volume,
- Volume size up to 99999 Kbytes,
- 9995 files per volume.

Figure 2 illustrates the Volume, Directory, and File relationships.

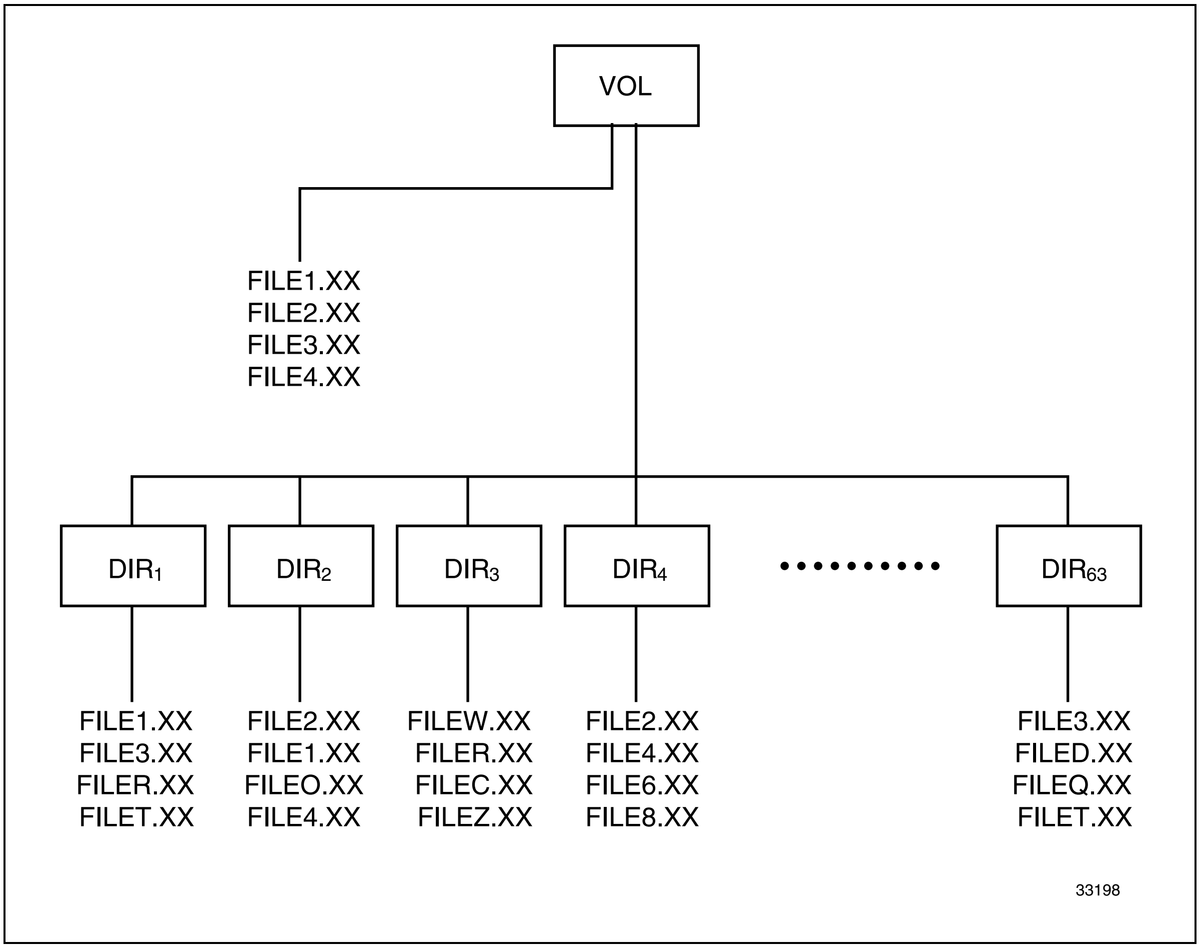

Figure 2 - Volume, Directory, and File Relationship

LCN System Volumes and Directories

As illustrated in Figure 3, there are fifteen possible system volumes on an LCN. Each system volume name includes an ampersand (&) or a "bang" (!) sign. Under each volume are some number of directories. System volumes and directories on the History Module are created upon initialization, based on information present in the volume configuration portion of the NCF.CF file.

In addition to the standard directories, there are other directories that the user may choose to create to support their system (see Table 2).

Table 2 – User-Created Directories to Support System Functions

Directory	Description
&DOC	Documentation Tool Queries
TFIL	Temporary files created by Documentation Tool, Picture Editor, and Command Processor.
&CUS and &CLX	External Load Modules
TLK1 and DIA1	PERFMENU and $LNMENU schematics
CDSG	Custom Data Segment Global Descriptor Files
CL	Custom Parameter Lists
&OVG	Equipment Lists
&EC	Executable Command Files

&0np	*System Volume*
DIR:	**Contents**
&ASY	NCF.CF and Support Files
&DSY	US Standards Abstracts (Displays)
&HGG	PEDs for HG Points
&NMG	PEDs for NIM Points
&NM2	PEDs for NIM
&AMG	PEDs for AM Points and HM History Group
&ARG	PEDs for Area Database + AREA00
&KFO	Key File Special Options Directory
&LDR	Boot Files (LCN Nodes)

&1np	*Personality Image (Programs)*
&OPR	US Operating Personality
&UNP	US Universal Personality
&OP1	UNP Personality Overlay 1
&HGO	Hiway Gateway Hiway Personality
&AMO	Appl. Module Control Personality
&CIO	Computer Gateway Control Personality
&NMO	NIM On-Process Personality
&NGO	Network Gateway Personality
&UCN	PM, APM, HPM, LM, and SM On-Process Personalities

&2np	*Dump Volume*
&AMD	AM Dump Files
&CGD	CG Dump Files
&HGD	HG Dump Files
&HMD	HM Dump Files
&NMD	NIM Dump Files
&NGD	NG Dump Files
&OPD	US Dump Files

&3np	*Area Database Storage*
&D##	Area Database Files *## = Area 01 through 10*

&4np	*CL/D Object (MC & AMC)*
&E##	CL/MC Program Object Files *## = Hiway No. 01 through 20*

&5np	*AM Control (AM Checkpoint)*
&F##	Checkpoint Data for Units Assigned to an AM *## = Unit Reference No. 00 through 99*
&Z##	Checkpoint MASTER Ref. Data for AM. *## = AM Hardware Node No.*

&6np	*CM Control (Checkpoint)*
&H##	Checkpoint Data for Units Assigned to a CM *## = Unit Reference No. 00 through 99*
&Z##	Checkpoint MASTER Ref. Data for CM. *## = CM Hardware Node No.*

&7np	*HG Control (Check Point)*
&I##	HG/PLCG/EPLCG Checkpoint Files *## = Hiway No. 1 through 20*

&8np	*NIM Control (Check Point)*
&I##	NIM/PM/LM/APM/HPM/SM Checkpoint Files *## = Network No. 1 through 20*

&9np	*CL/NIM Object*
&E##	CL/PM/APM/HPM Program Object Files *## = Network No. 1 through 20*

!9np	*HM Local Volume*
	HM Offline Personality HM Operating Personality HM Autoboot and Support Files HM Network Volume Configuration File (NVCF)

History and Journal Volumes

!0np	*Continuous History Volume - 1*
!A##	Continuous History Volume - 1 *## = Unit Reference No. 00 to 99*

!1np	*Continuous History Volume - 2*
!A##	Continuous History Volume - 2 *## = Unit Reference No. 00 to 99* Max. of 150 History Groups, 20 Points per Grp.

!2np	*Journal Manager Volume*
!CSY	LCN Wide System Journal (200-15,000 Events) • STATUS • ERRORS • MAINT.
!C##	Unit Point Related Journal (200-15,000 Events) • ALARMS • MESSAGES •CHANGES

!4np	*SMCC Files Volume*
!ESY	On-Process Maint. Notes and Suggestions

np =

Assigned History Module Node Pair (Software)
Number 1 through 20

34899-A

Figure 3 - LCN System Volumes and Directories

Volume/Directory Search Performance

What Affects HM Search Performance

A major component of HM file server access performance is the directory search time. When writing to a directory, the HM searches through every file entry configured in that volume (it does not matter how many files are actually there) to see if the file being written exists.

The smaller the number of files configured in the volume the faster the search.

Directory searches are a linear function of the number of files configured in a volume; for example, if the number of files configured in a volume is doubled, the directory search time is approximately doubled as well. The exception to this is the FAST user volume in R500 and later.

Fast Search User Volume —R500 and later

- **Fast search user volume improves system performance**

  In R500 and later, an HM fast search user volume (first configured 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. The 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 methodology**

  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 for 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.

- **How fast search is configured (see Figure 4)**

  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.

- **Fast search implementation**

  For maximum performance, Honeywell recommends the following:

  1) Specify fast search directories first in the search path sequence in the area database pathname catalog.
  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).
  3) Place performance-critical schematics, pictures, CLs and other critical files in the fast search volume.

  NOTE: The fast search volume is limited to 63 directories and 9995 files and file descriptors are not available if the fast access option is chosen.

File Descriptors

- **Limit the use of file descriptors**

  File descriptors on a volume degrade the directory search performance of that volume by 35 to 100 percent. Use them only on volumes that are not performance critical, and never use them on system volumes.

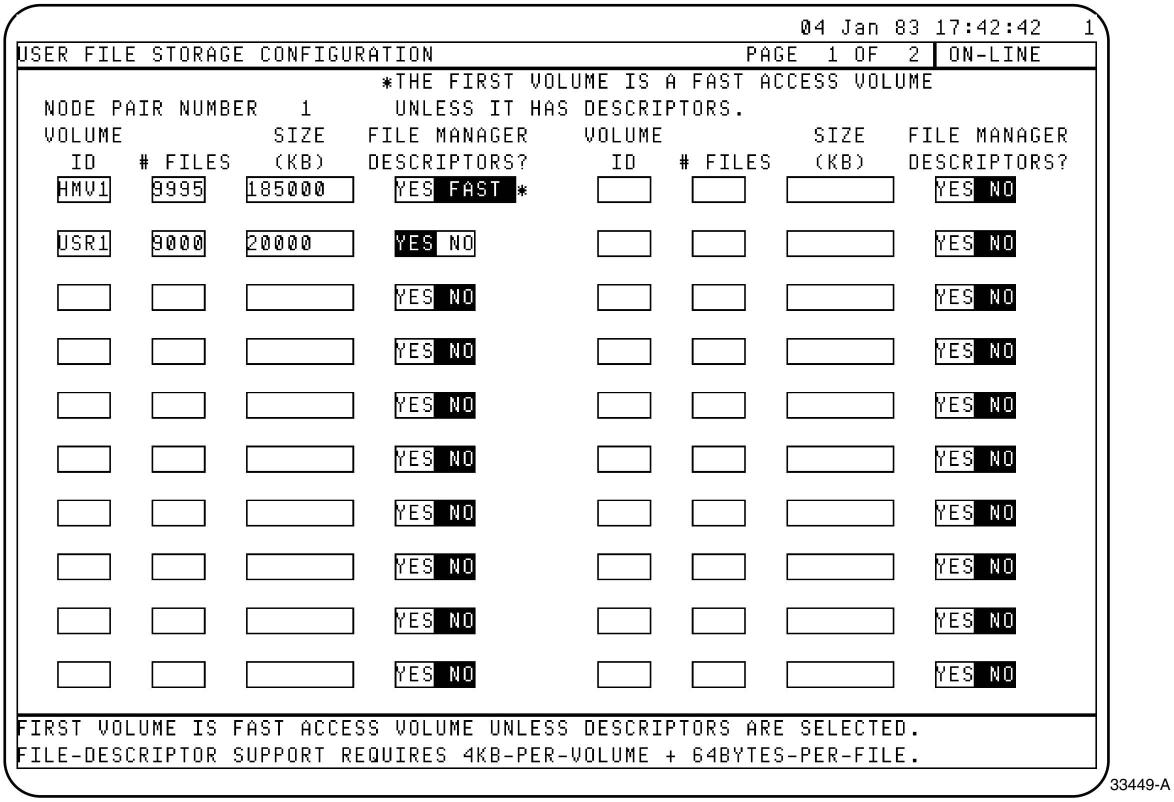

Figure 4 - User Fast Volume NCF Configuration

CONTINUOUS HISTORY STORAGE AND RETRIEVAL

How Data is Collected

Continuous history is data collected for point.parameters over a period of time. It is stored in user-configured volumes on one or more history modules. Data is collected in History Groups. Each History Group is a collection of up to 20 point.parameters.

Types of Continuous History Data

Continuous history consists of two types of data:

- snapshots
- averages

As illustrated in Figure 5, averages can be further categorized as

- user,
- hourly,
- shift,
- daily,
- monthly.

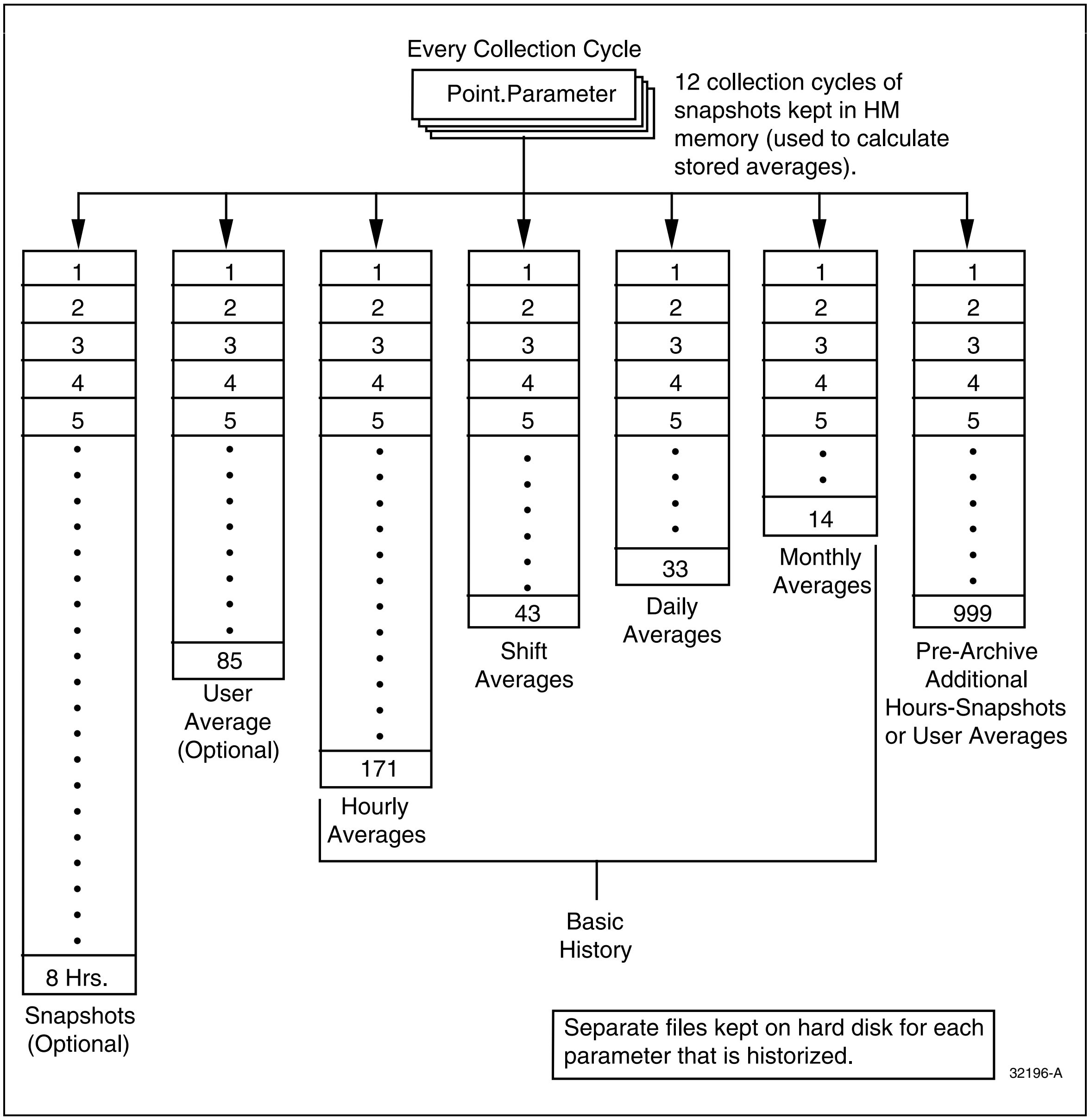

Figure 5 - Continuous History

Snapshot Data

Definition

The following definition applies to Snapshot data**:**

- Collection of Snapshot data is optional.
- Snapshots are instantaneous values of real or enumerated point.parameters.
- If the Snapshot option is chosen, a minimum of eight hours of snapshots are collected.
- Additional hours of snapshot data can be collected by configuring Prearchive hours for snapshots.
- The rate (in seconds) at which Snapshots are collected is configurable:
  - 5 seconds (12 saves per minute)
  - 10 seconds (6 saves per minute)
  - 20 seconds (3 saves per minute)
  - 60 seconds (1 save per minute)

Base Snapshot Data

Table 3 shows the number of Snapshots per hour for each save rate and the total base period of snapshots for each save rate.

Prearchive Snapshot Data

Table 4 indicates the maximum prearchive hours for snapshots allowed and the recommended prearchive hours for snapshots for each save rate. If the recommended number of hours is exceeded, this will result in very large files that could cause the HM to time out at retrieval time. These limitiations are not applicable to an HM with a 68040 processor.

> **NOTE**
>
> Because 2 hours of online data is included in each transfer to prearchive files, the number of hours of online 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 2 hours of duplicate data.

Table 3 – Total Base Period of Snapshots

Save Rate (seconds)	Snapshots per Hour	Total Base Period Snapshots
5	720	5760
10	360	2880
20	180	1440
60	60	480

Table 4 – Maximum and Recommended Prearchive Hours for Snapshots

Save Rate (seconds)	Saves per Minute (60 ÷ Rate)	Maximum Prearchive Hours for Snapshots Allowed	68020* Recommended Prearchive SS Hours	68040* Recommended Prearchive SS Hours
5	12	240	168	240
10	6	480	168	480
20	3	960	168	960
60	1	2,880	168	2,880

* 68020 processors are used on HMPU, HPK2-2, HPK2-3, and K2LCN boards. A 68040 processor is used on the K4LCN board.

User Average Data

Definition

The following definition applies to User Average data**:**

- Collection of User Average data is optional.
- User average values are calculated from the sum of samples collected over a period divided by the number of samples in the period.
- The User Average Period is configurable in the NCF file under System Wide Values.
- A minimum of 85 user averages are collected.
- Additional hours of user average data can be collected by configuring prearchiving hours for user averages.

User Average Period

The period of time covered by the 85 User Averages, depends on the NCF-configured User Average Period. The intervals (in minutes) are 3, 4, 5, 6, 10, 12, 15, 20, and 30.

Example: If the user average period is 6 minutes, then the averages cover 8.5 hours. (85 values * 6 minutes = 510 minutes = 8.5 hours).

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

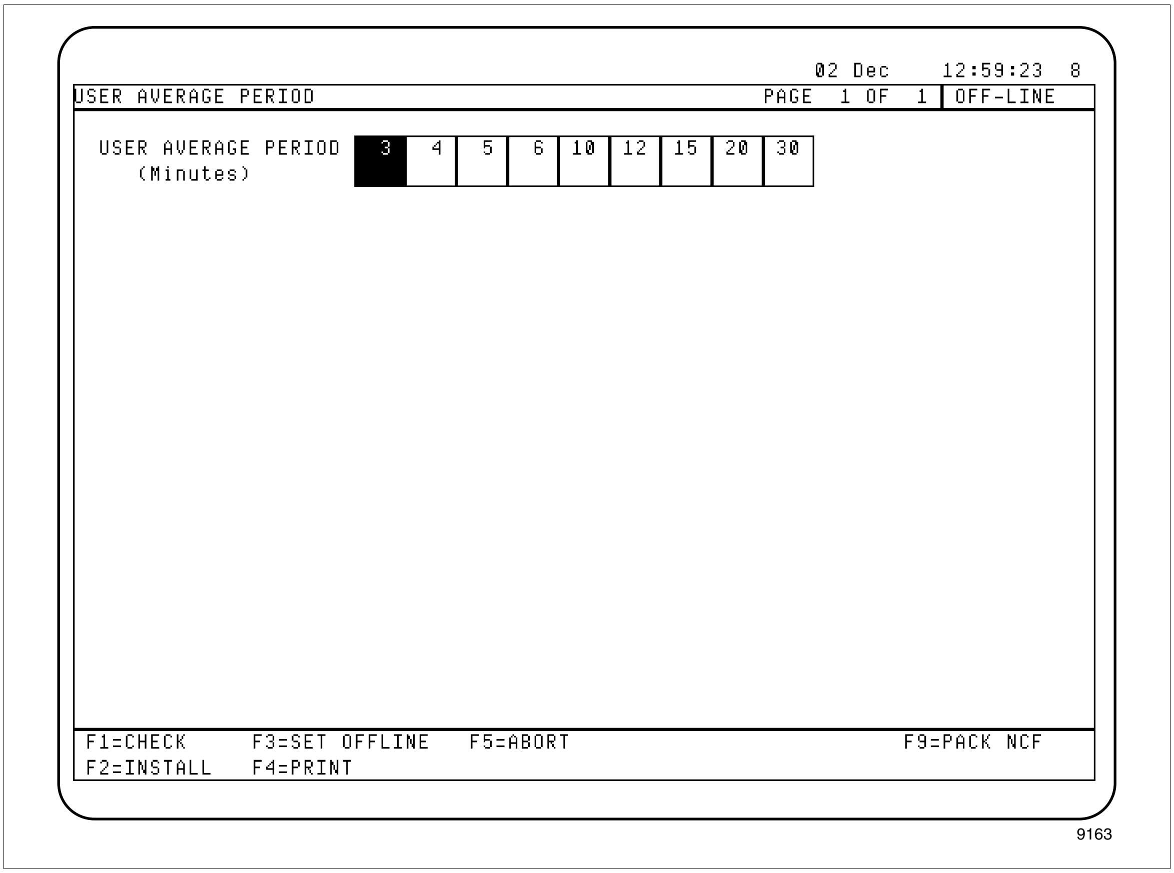

Figure 6 - User Average Period—NCF Display

Hourly, Shift, Daily, and Monthly Average Data

Definition

The following definition applies to hourly, shift, daily, and monthly average data**:**

- The averages are standard values included in the continuous history for all systems with continuous history volumes, regardless of whether Snapshots or User Averages are configured.
- The average values are 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.

Average Period

Table 5 describes the periods of time covered by the hourly, shift, daily, and monthly averages.

Table 5 – Hourly, Shift, Daily, and Monthly Average Period

Average	Description
Hourly averages	171 hourly averages are stored for each point in a History Group. This covers a week of 168 hours with a margin of 3 hours.
Shift averages	43 shift average values are stored for each point in a History Group. This covers a week of shifts as short as 4 hours with a margin of 1 shift (168/4 = 42 shifts).
Daily averages	33 daily average values are stored for each point in a History Group. This covers a month of 31 days with a 2 day margin.
Monthly averages	14 monthly averages are stored for each point in a History Group. This covers a year of 12 months with a 2 month margin.

History Collection Configuration

Configuration Process

Table 6 describes the two stage process for configuring the system to support history collection.

Table 6 – History Configuration Process

Stage	Description
1	Define the NCF file. This involves determining the following: a. What units will be available for historization? b. How many history groups per unit? c. What is the collection frequency of each group or unit? d. How many additional hours are needed for history storage for snapshot and user averages?
2	Define the History Groups. This involves specifying the point.parameter values for which history collection is desired. Ensure that the history collection configuration is within the capacity constraints of the History Module.

Continuous history is defined under volume configuration in the NCF.CF file. It is here that the user defines the units for which history will be collected and the number of groups per unit.

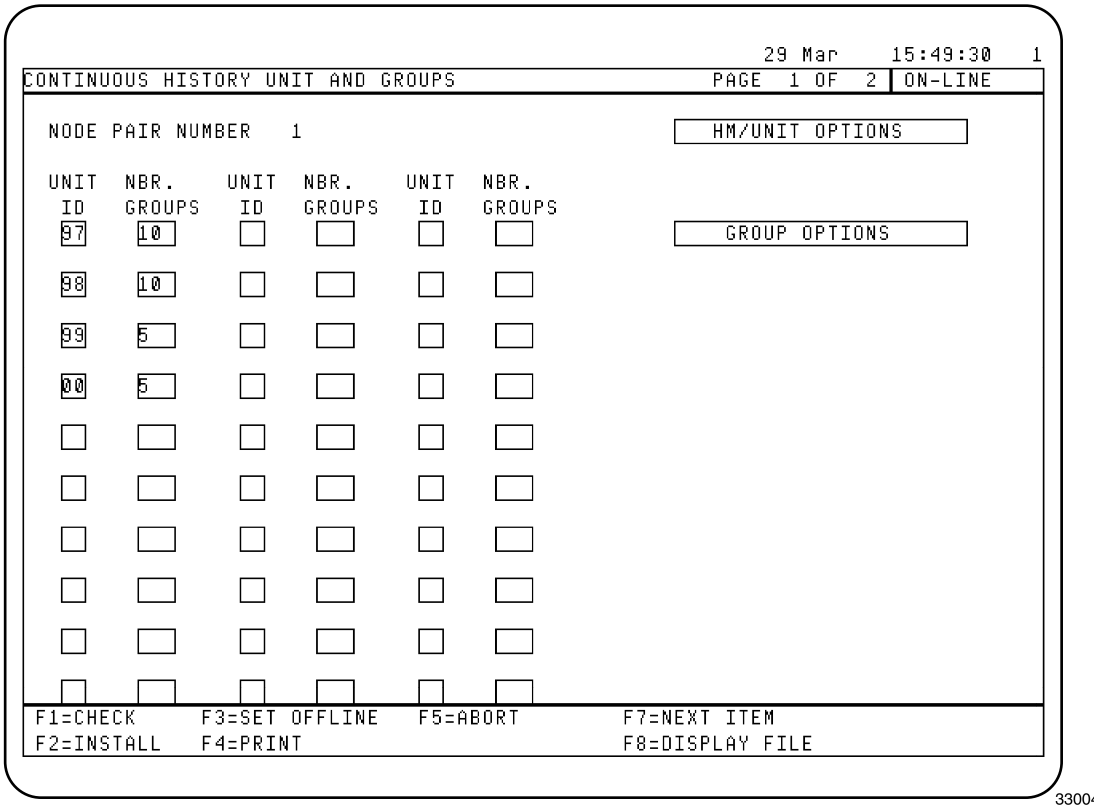

Figure 7 - Continuous History Units and Groups

NCF Configuration—HM/Unit Options

From the HM/UNIT OPTIONS target, the following selections can be made by unit or for all units, and consequently for all groups in those units:

- Save Rate,
- Save Options (snapshots and/or user averages),
- Prearchive Hours.

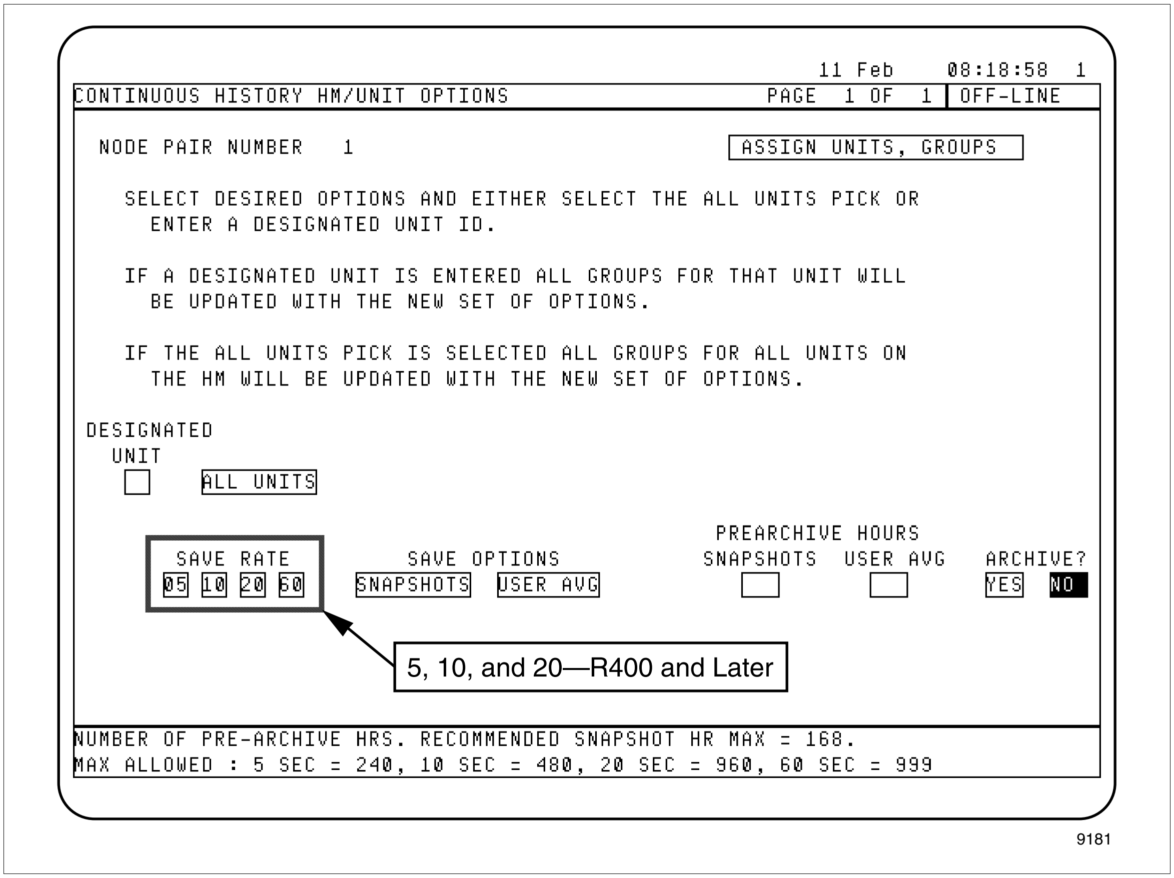

Figure 8 - HM/Unit Options—NCF Display

NCF Configuration—History Group Options

From the GROUP OPTIONS target, following selections can be made on a per group basis:

- Save Rate,
- Save Options (snapshots and/or user averages),
- Prearchive Hours.

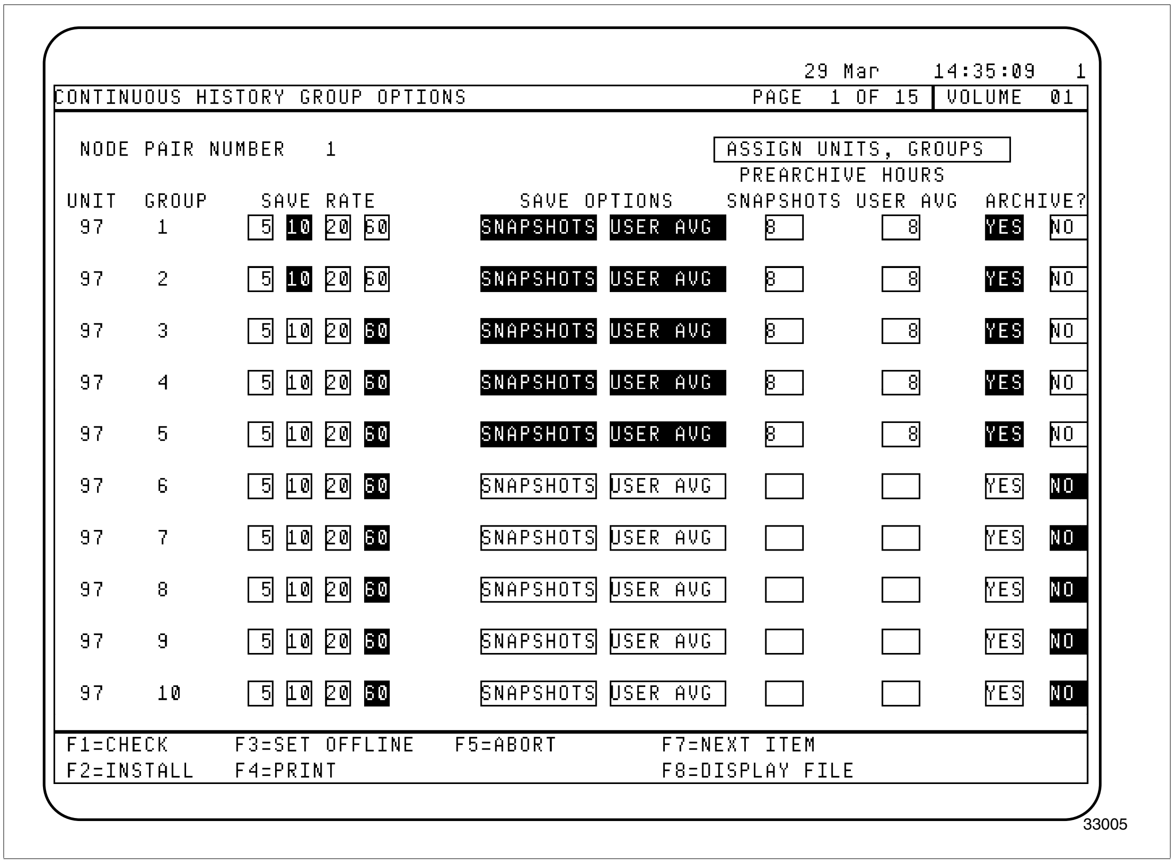

Figure 9 - History Group Options—NCF Display

History Groups Configuration

Once the History Module is initialized and its history volumes, directories, and files are created based on the NCF configuration, the next step is to define the parameters to be stored in the History Groups.

History Group definitions are stored under the continuous history volume (!0np or !1np) in the APL*.MM files.

Each History Group in each unit can historize up to 20 point.parameters.

It is important to configure only as much continuous history snapshot data as will be needed.

After the History Groups are defined and history collection is enabled, the History Module attempts to collect history on all of the History Groups, even if they are empty (not defined with point.parameters). The HM performs the same number of disk transfers and other related operations for defined History Groups as it does for empty History Groups. Remember, empty History Groups are not free.

History Group Display

History Group configuration is accessed from the HISTORY GROUPS target on the Engineering Main Menu.

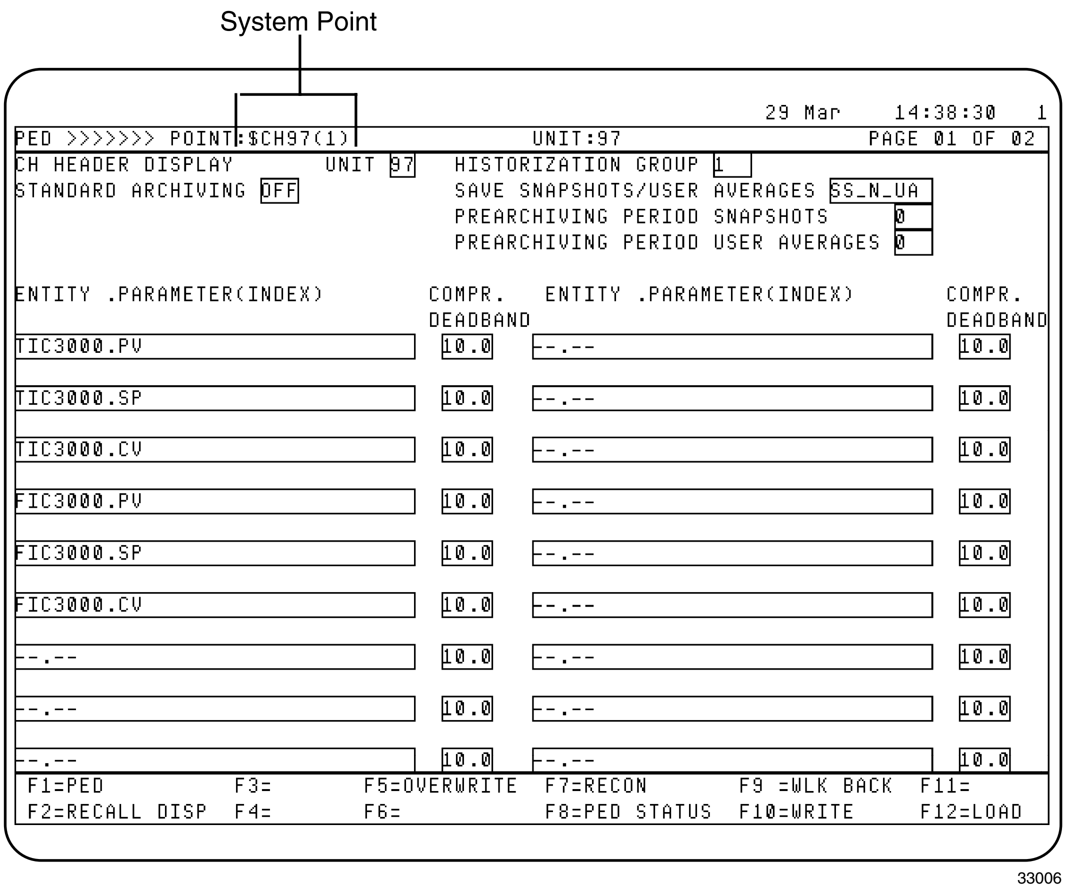

Figure 10 - History Group Display

The HISGRPS display from PERFMENU provides History Group configuration information.

The unit index is from the NCF Unit Names configuration.

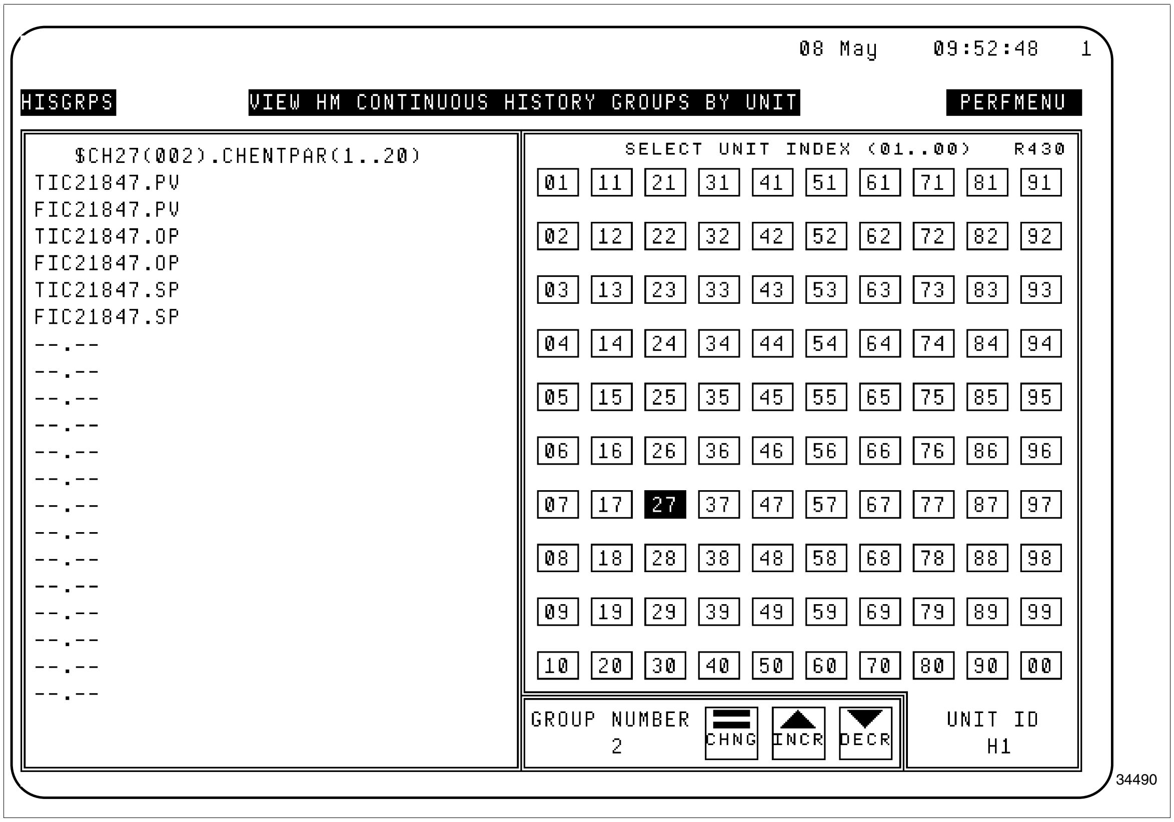

Figure 11 - HISGRPS Display—History Group Configuration

HISTORY MODULE LOADING

Parameters Per Second—Checker Limit

The NCF configuration checker imposes a 50 parameter per second limit on the configuration of collection frequencies. If this limit is exceeded, the user is prevented from installing the network configuration file until the HM load is reduced.

The NCF configurator allows the user to configure 150 History Groups. For 60 second history, 150 History Groups results in a 50 parameter per second HM load:

```
150 groups per min. * 20 parameters per group = 3000 parameters per min.
                                              = 50 parameters per sec.
```

At more frequent collection intervals, fewer groups are allowed in order to stay within a 50 parameters per second HM load limit. With fast history, the configurator will allow the user to configure 150 fast history groups, but the checker will return an error so that the NCF file cannot be installed.

Parameters Per Second—Recommended Limit

The configuration checker returns only a warning message if it detects an HM load greater than 40 parameters per second. Unless the HM has a K4LCN, and is running with R520 or later software, Honeywell strongly recommends that the HM load not exceed 40 parameters per second, ESPECIALLY if fast continuous history is configured (collection intervals less than 60 seconds).

Because 40 parameters per second is recommended, the user should configure no more than 120 groups at 60 second history collection:

```
120 groups per min. * 20 parameters per group = 2400 parameters per min.
                                              = 40 parameters per sec.
```

In order to stay within the 40 parameter per second recommended limit, the number of allowable parameters at the different collection rates is as follows:

- 2400 parameters per 60 seconds
- 800 parameters per 20 seconds
- 400 parameters per 10 seconds
- 200 parameters per 5 seconds

Loading Example

Shown below is an example of HM configuration using fast history. It illustrates that even with only a few fast history groups, the load on the HM can be excessive.

	Number of Groups	Number of Parameters	Rate	Collections/Min	Params./min.
	5	100	5 sec	12	1200
	5	100	10 sec	6	600
	90	1800	60 sec	1	1800
Totals	**100**	**2000**			**3600**

3600 parameters/min = 60 parameters/sec >> HM capacity of 40 parameters/sec

CONTINUOUS HISTORY FILES

Intermediate Databases

At HM startup, Intermediate Databases are created for data collection. One IDB is created for every three configured groups, up to a maximum of 50 IDBs (50 * 3 = 150 history groups, the configuration limit).

Because there are 20 parameters in each history group, each IDB collects 60 values. Entities not configured have a null entity ID entry in the IDB. Each block of 5 sequential IDBs or 15 history groups, represents one super group.

Super Groups

A super group is defined as 15 configured History Groups. Thus, the number of super groups in a History Module depends on the number of configured History Groups. Super group numbers are as follows:

Super Group Numbers	Collection Rate
1 - 10	60 second collection
11 - 20	20 second collection
21 - 30	10 second collection
31 - 40	5 second collection

Files for Data Collection

Categories of Files

There are two categories of files used for history data storage (see Table 7):

- Continuous Files (see Figure 12)
  - Files created per super group (Each file is identified through the super group number.)
  - Stored under the history volume !0np or !1np
- Cyclic Files (see Figure 13)
  - Files created per super group
  - Stored under the history directory for each unit for continuous history (!Auu).

Files for Each History Group

For every configured history group there will be the following cyclic files:

- Five snapshot files*
- Five prearchive snapshot files*
- One user average file*
- One prearchive user average file*
- One hourly average file
- One shift average file
- One daily average file
- One monthly average file

* If configured

Table 7 - Categories of Continuous History Files

Category	Vol/Dir	Description	File Names
Continuous Files[1]	!0np or !1np	Set of four RIRO files per super group	ARA001.MM - ARA040.MM ARB001.MM - ARB040.MM ARC001.MM - ARC040.MM ARD001.MM - ARD040.MM
		Work file per super group	AW0001.MM - AW0040.MM
		User average running total file (if the user average option is selected)	ATU001.MM - ATU040.MM
		Set of running total standard average files	ATH001.MM - ATH040.MM for hourly averages ATS001.MM - ATS040.MM for shift averages ATM001.MM - ATM040.MM for monthly averages ATD001.MM - ATD040.MM for daily averages
Cyclic Files[2]	!Auu	Snapshots	AAxxxxuu.CM
		User Averages	ABxxxxuu.CM
		Hourly Averages	ACxxxxuu.CM
		Shift Averages	ADxxxxuu.CM
		Daily Averages	AExxxxuu.CM
		Monthly Averages	AFxxxxuu.CM
		Prearchive Snapshots	AGxxxxuu.CM
		Prearchive User Averages	AHxxxxuu.CM

NOTES:

1. Continuous History File Names—The last number is the super group number.
2. Cyclic History File Names:
   —The first A is the continuous history category.
   —The second letter is the subcategory (such as snapshots).
   —The next four letters are the file number within the subcategory.
   —The last two numbers are the unit index number.

```
                                                                   30 Mar    19:11:13   1
                                                           USER PATH :  NET>TEST>
LS NET>!001

NET>!001>*.* 03/30/95 19:11:07

 DEVICE  DIR  FILENAME EXT TYP P VER  TIME STAMP   # RECS RECSIZ #BLKS BLKSIZ ST
-------- ---- -------- --   -  - -- -------------- ------ ------ ------ ---- ---
NET      !001 AMSTR005 MM   C    -- 08/25/94 10:35 ------ ------     10 ----
NET      !001 APL00001 MM   C     1 08/25/94 10:35 ------ ------    150 ----
NET      !001 APL00002 MM   C     1 08/25/94 10:35 ------ ------     32 ----
NET      !001 ARA021   MM   C    -- 08/25/94 10:35 ------ ------     72 ----
NET      !001 ARB021   MM   C    -- 08/25/94 10:35 ------ ------     72 ----
NET      !001 ARC021   MM   C    -- 08/25/94 10:35 ------ ------     72 ----
NET      !001 ARD021   MM   C    -- 08/25/94 10:35 ------ ------     72 ----
NET      !001 AW0021   MM   C    -- 08/25/94 10:35 ------ ------     20 ----
NET      !001 ATU021   MM   C    -- 08/25/94 10:35 ------ ------     20 ----
NET      !001 ATH021   MM   C    -- 08/25/94 10:35 ------ ------     20 ----
NET      !001 ATS021   MM   C    -- 08/25/94 10:35 ------ ------     20 ----
NET      !001 ATD021   MM   C    -- 08/25/94 10:35 ------ ------     20 ----
NET      !001 ATM021   MM   C    -- 08/25/94 10:35 ------ ------     20 ----
NET      !001 AMSTR006 MM   C    -- 08/25/94 10:35 ------ ------     10 ----
FILES LISTED:     14


Catalog Complete
```

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Figure 12 - Example List—Continuous Files

```
                                                      30 Mar    19:12:09   1
                                                 USER PATH :  NET>TEST>
LS NET>!A97

NET>!A97>*.* 03/30/95 19:11:34

 DEVICE  DIR  FILENAME EXT TYP P VER  TIME STAMP    # RECS RECSIZ #BLKS BLKSIZ ST
-------- ---- -------- --   -  - -- -------------- ------ ------ ------ ---- ---
NET      !A97 AA000097 CM   C    -- 08/25/94 10:35 ------ ------    253 ----
NET      !A97 AA000197 CM   C    -- 08/25/94 10:35 ------ ------    253 ----
NET      !A97 AA000297 CM   C    -- 08/25/94 10:35 ------ ------    253 ----
NET      !A97 AA000397 CM   C    -- 08/25/94 10:35 ------ ------    253 ----
NET      !A97 AA000497 CM   C    -- 08/25/94 10:35 ------ ------    253 ----
NET      !A97 AA000597 CM   C    -- 08/25/94 10:35 ------ ------    253 ----
NET      !A97 AA000697 CM   C    -- 08/25/94 10:35 ------ ------    253 ----
NET      !A97 AA000797 CM   C    -- 08/25/94 10:35 ------ ------    253 ----
NET      !A97 AA000897 CM   C    -- 08/25/94 10:35 ------ ------    253 ----
NET      !A97 AA000997 CM   C    -- 08/25/94 10:35 ------ ------    253 ----
NET      !A97 AB000097 CM   C    -- 08/25/94 10:35 ------ ------     86 ----
NET      !A97 AB000197 CM   C    -- 08/25/94 10:35 ------ ------     86 ----
NET      !A97 AC000097 CM   C    -- 08/25/94 10:35 ------ ------    172 ----
NET      !A97 AC000197 CM   C    -- 08/25/94 10:35 ------ ------    172 ----
NET      !A97 AD000097 CM   C    -- 08/25/94 10:35 ------ ------     44 ----
NET      !A97 AD000197 CM   C    -- 08/25/94 10:35 ------ ------     44 ----
NET      !A97 AE000097 CM   C    -- 08/25/94 10:35 ------ ------     34 ----
NET      !A97 AE000197 CM   C    -- 08/25/94 10:35 ------ ------     34 ----
```

```
                                                      30 Mar    19:13:10   1
                                                 USER PATH :  NET>TEST>
NET      !A97 AA000097 CM   C    -- 08/25/94 10:35 ------ ------    253 ----
NET      !A97 AA000197 CM   C    -- 08/25/94 10:35 ------ ------    253 ----
NET      !A97 AA000297 CM   C    -- 08/25/94 10:35 ------ ------    253 ----
NET      !A97 AA000397 CM   C    -- 08/25/94 10:35 ------ ------    253 ----
NET      !A97 AA000497 CM   C    -- 08/25/94 10:35 ------ ------    253 ----
NET      !A97 AA000597 CM   C    -- 08/25/94 10:35 ------ ------    253 ----
NET      !A97 AA000697 CM   C    -- 08/25/94 10:35 ------ ------    253 ----
NET      !A97 AA000797 CM   C    -- 08/25/94 10:35 ------ ------    253 ----
NET      !A97 AA000897 CM   C    -- 08/25/94 10:35 ------ ------    253 ----
NET      !A97 AA000997 CM   C    -- 08/25/94 10:35 ------ ------    253 ----
NET      !A97 AB000097 CM   C    -- 08/25/94 10:35 ------ ------     86 ----
NET      !A97 AB000197 CM   C    -- 08/25/94 10:35 ------ ------     86 ----
NET      !A97 AC000097 CM   C    -- 08/25/94 10:35 ------ ------    172 ----
NET      !A97 AC000197 CM   C    -- 08/25/94 10:35 ------ ------    172 ----
NET      !A97 AD000097 CM   C    -- 08/25/94 10:35 ------ ------     44 ----
NET      !A97 AD000197 CM   C    -- 08/25/94 10:35 ------ ------     44 ----
NET      !A97 AE000097 CM   C    -- 08/25/94 10:35 ------ ------     34 ----
NET      !A97 AE000197 CM   C    -- 08/25/94 10:35 ------ ------     34 ----
NET      !A97 AF000097 CM   C    -- 08/25/94 10:35 ------ ------     15 ----
NET      !A97 AF000197 CM   C    -- 08/25/94 10:35 ------ ------     15 ----
FILES LISTED:     20


Catalog Complete
```

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Figure 13 - Example List—Cyclic Files

Example

Figure 9 is the History Group Options display for unit index number 97. It is configured to have 10 History Groups. The first five History Groups are configured for Snapshots and User Averages.

Figures 14 illustrates the continuous and cyclic history files that would exist for the example configuration.

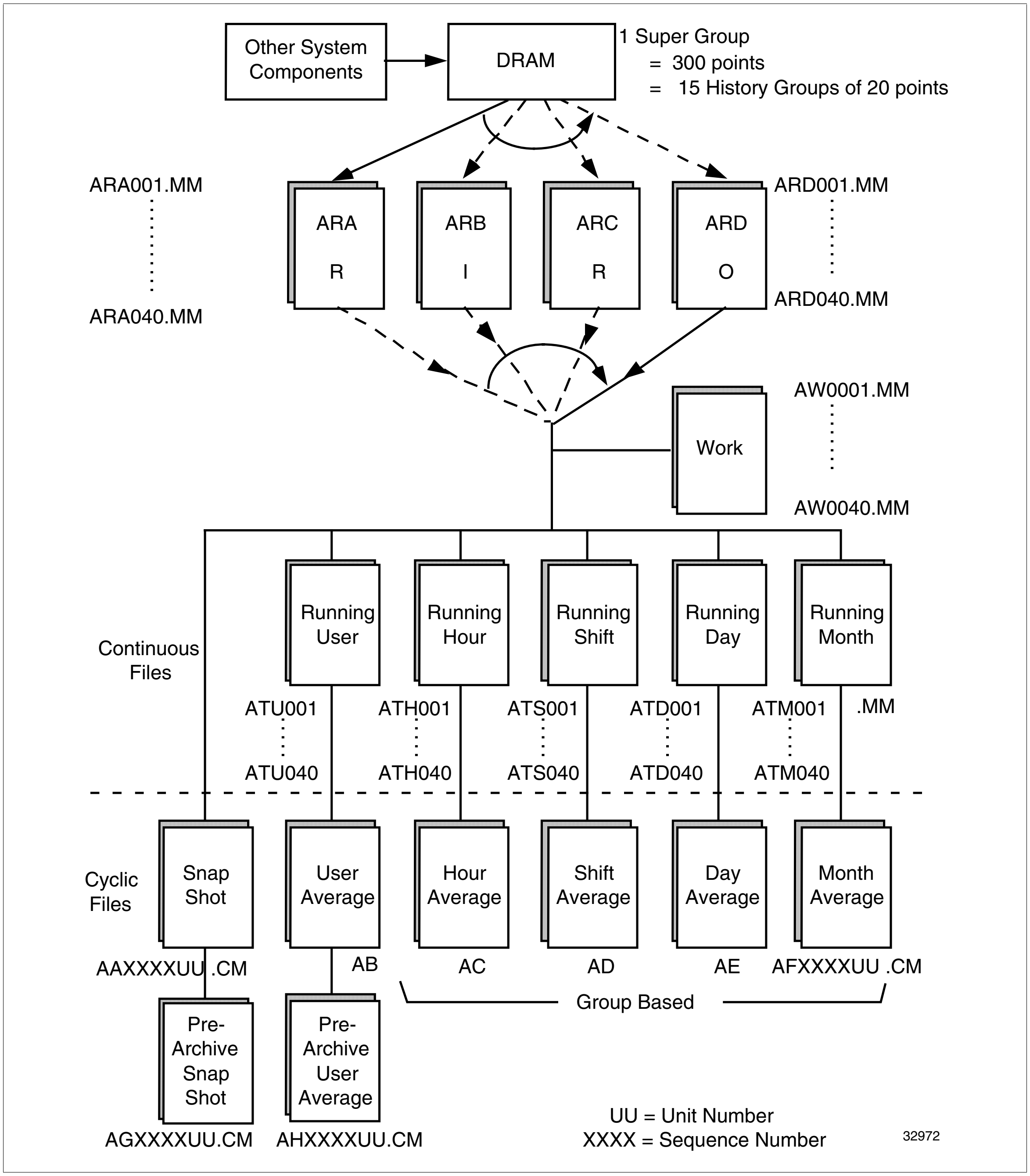

Figure 14 - History Files Diagram—Example Configuration

HOW HISTORY COLLECTION WORKS

Data Collection Sequence of Events

Data is collected at each collection interval in super group order. Within each super group, the IDBs associated with that super group are collected one at a time. The sequence of events is as follows:

Event	Description
1	Data is requested for an IDB.
2	The task waits for completion, then the data is collected from the IDB and stored sequentially in a memory buffer.
3	When all data has been collected for a super group, it is written to a RIRO (Read In Read Out) file designated for that super group.
4	The next super group is then processed until all super groups have been processed for that cycle.
5	Every twelve collection cycles (when a RIRO becomes full), the completed RIRO is closed and marked ready for fanning of data, and a new RIRO is set active.

Data Transfer

Priority Order

Data is fanned from RIRO files to the various history files in the following priority order:

1. user averages
2. snapshots
3. hourly averages
4. shift averages
5. daily averages
6. monthly averages

Phases

Within each history file type, fanning is done in phases. Each phase encompasses the fanning of data for all configured groups (up to 10 RIROs).

If any phase is interrupted for any reason (such as a node failure), that phase is restarted.

Data can be fanned whenever an RIRO is closed after 12 collection cycles, following a time change, or following a restart condition.

Fanning of User Average Data

Fanning of user average data requires one or more iterations of a 2-phase process depending on the configured averaging period:

IF User Average Period is…	THEN …
Less than 12 minutes	The fanning of data is broken up by each averaging period in the RIRO. Example: If the user averaging period was 3 minutes, then the fanning of user data requires four iterations of the 2-phase process.

Figure 15 illustrates the files used in the process of fanning user average data. The 2-phase process is described below.

Phase	Description
1	For each super group, the user average running total file is copied into the work file. The data in the RIRO files is added to the running totals in the work file.
2	The data in the work file is copied to the user average running total file. The data in the user average running total file is fanned to the cyclic user average file at the end of the averaging period. Data in the user average files is fanned to the corresponding prearchive cyclic history files at approximately two hour intervals for only those groups configured for prearchiving.

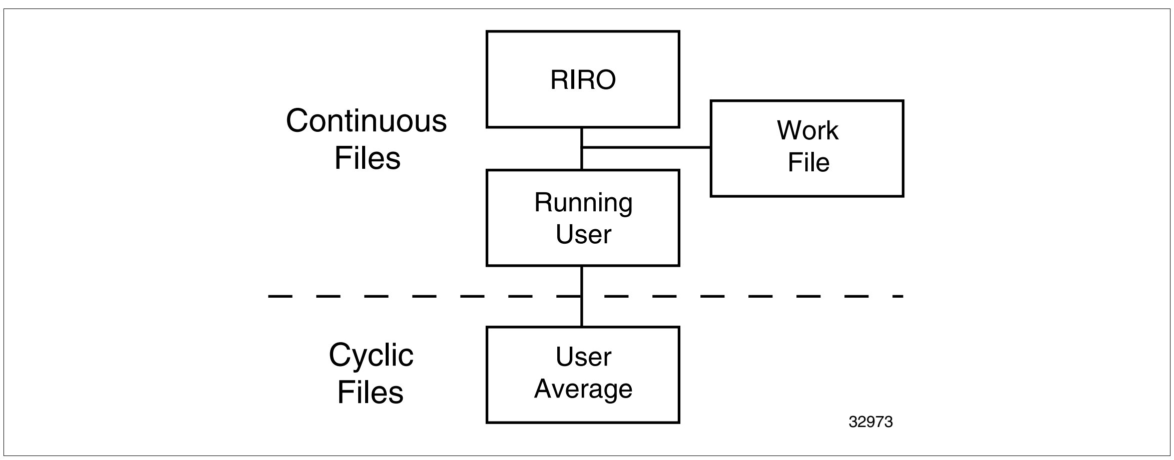

Figure 15 - Files Used In Fanning User Average Data

Fanning of Snapshot Data

As illustrated in Figure 16, fanning of snapshot data requires only one phase. Data is transferred directly from the RIRO files to the cyclic Snapshot files for those groups configured for snapshots.

Data in the snapshot files is fanned to the corresponding prearchive cyclic history files at approximately 2-hour intervals for only those groups configured for prearchiving.

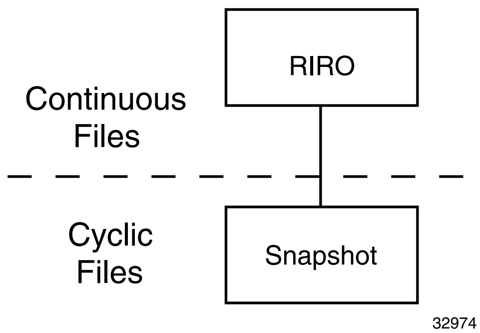

Figure 16 - Files Used In Fanning Snapshot Data

Fanning of Hourly, Shift, Daily, and Monthly Averages

As illustrated in Figure 17, fanning of hourly, shift, daily, and monthly averages requires two phases. The 2-phase process is described below.

Phase	Description
1	For each super group, the running total file for that averaging period is copied into the work file. The data in the RIRO files is added to the running totals in the work file.
2	The data in the work file is copied back to the corresponding running total file. At the end of each averaging period, data in the user, hourly, shift, daily, and monthly running total files is fanned to the corresponding cyclic history files at the end of the associated averaging period.

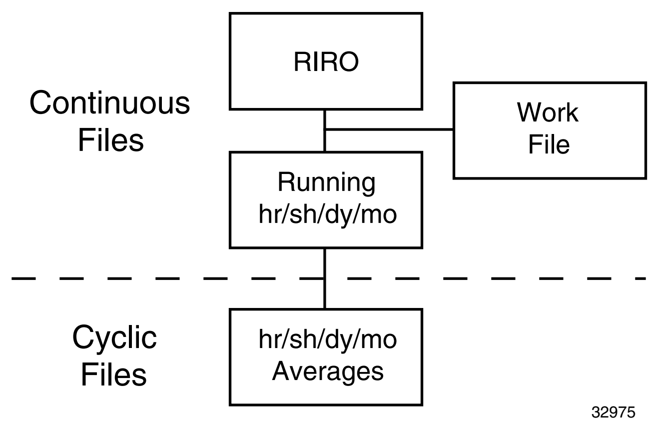

Figure 17 - Files Used In Fanning Standard Average Data

ALLOCATING HM FUNCTIONS ON THE NETWORK

Combining History With Other Functions On One HM

When deciding which functions should reside on which History Module, remember that the Continuous History function is a very heavy file system user, but is given no special priority by the file manager.

Unfortunately, there is no magic formula for determining how many History Groups can coexist with other functions. (Such as checkpointing, journally, schematic access, etc.) It is partially dependent on the number of History Groups that have snapshots configured, because snapshots take up the greatest amount of processing and file management time.

HM Overload

If your History Module is overloaded, or nearly so, the following messages may occur:

Maintenance Message:

```
RECNFG HM OVRLD HISTORY MODULE
```

Status Message (HM Status Detail display and Status Notification Event Journal):

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

The following situations may cause the above messages to occur:

Situation 1

HM overload occurs when file use is heavy and the HM cannot unload its temporary files as fast as it is filling them up. If HM requests to the file manager are often blocked, the HM stops collecting data while it clears out its temporary files.

A maintenance message is sent out when the HM begins to clear out its temporary files. If the HM takes more than the remainder of the minute to finish the task, a second message of the same type is generated, as the HM encounters the second situation.

Situation 2

The second situation is when the HM cannot finish its entire collection cycle in the time that is allowed. The cycle is always completed, but if it has overrun the time allowed the HM sends out the above maintenance message and one or two minutes of data are lost.

The loss of data appears as an outage in the history files on that HM. It can occur if the HM load is too heavy or if the load on the data owners prevents quick response to the HM's request for data.

Determining Cause of Overload Message

If the maintenance message is received regularly, either your History Module is overloaded, or other nodes on your LCN are slowing it down by heavy file usage or because their own load prevents them from answering HM requests in a reasonable amount of time.

Table 8 lists some rules of thumb for determining if the HM is over- or under-utilized:

Table 8 - HM Loading Rules of Thumb

HM Parameter	Rule of Thumb
Average CPUFREE	If below 40%, the HM should be considered fully loaded. If below 35%, the user should give some serious thought to reducing the HM load.
Average number of 60 second DISK TRANSFERS	If transfers exceed 800 -900, the HM should be considered fully loaded. If transfers exceed 1000, the user should seriously consider reducing the HM load.
Number of continuous history parameters per second	A full 40 parameters per second cause the following load: Single collection rate—adds CPU load (approximately 11% for 68020 and 4% for 68040) and 3.5 disk transfers per second. Mixed collection rates—add CPU load (approximately 17% for 68020 and 6% for 68040) and 5 disk transfers per second.

Table 9 - HM PSDP Parameters for Disk Transfers

Parameter	Description
HMSYINFR(1)	Primary drive 20 second transfers
HMSYINFR(2)	Secondary drive 20 second transfers
HMSYINFR(3)	Primary drive 60 second transfers
HMSYINFR(4)	Secondary drive 60 second transfers

How to Track HM Usage

To track the HM's average CPUFREE and DISK TRANSFERS, historize these values by using AM points.

Monitoring History Collection

Table 10 lists additional PSDP parameters that may be helpful for monitoring HM history collection. These parameters are available for all collection intervals and can be viewed from the HMDETAIL display (see Figure 18), accessed from the PERFMENU display.

Table 10 – HM PSDP Parameters

Parameter	Description
CHCYCAV	Indicates the *average* continuous history collection *cycle time* in seconds per type of history for the last hour. The time for all nodes to respond to the history request.
CHCYCMN	Indicates the *minimum* continuous history collection *cycle time* in seconds per type of history for the last hour. The time for all nodes to respond to the history request.
CHCYCMX	Indicates the *maximum* continuous history collection *cycle time* in seconds per type of history for the last hour. The time for all nodes to respond to the history request.
CHWATAV	Indicates the *average* continuous history *wait time* in seconds for each type of collection interval for the last hour. Indicates the amount of free time the continuous history function has each collection interval. Result of the following calculation: Collection Interval - (Average Continuous History Collection Time + Time to Process History) The number could be negative if the time required to process history is longer than the collection interval.
CHWATMN	Indicates the *minimum* continuous history *wait time* in seconds for each type of collection interval for the last hour. Indicates the amount of free time the continuous history function has each collection interval. The value may be negative.
CHWATMX	Indicates the *maximum* continuous history *wait time* in seconds for each type of collection interval for the last hour. Indicates the amount of free time the continuous history function has each collection interval. This value may be negative.

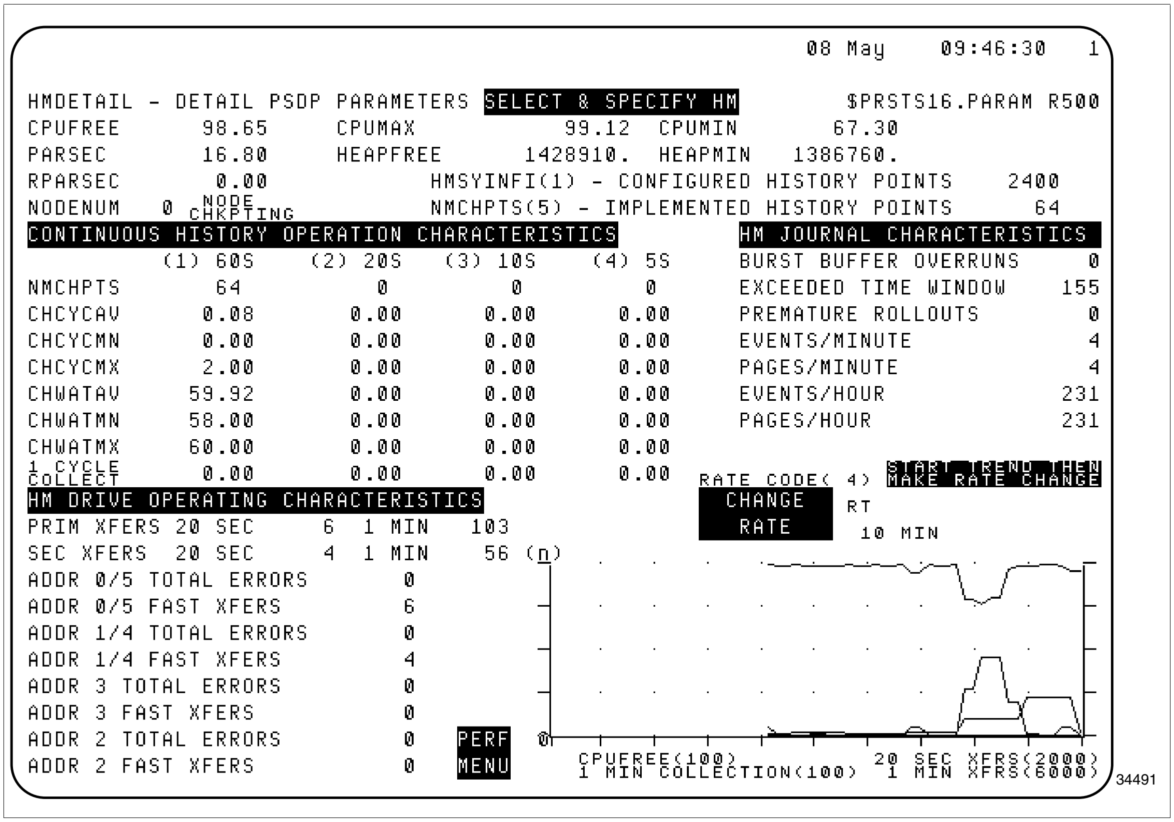

Figure 18 - HMDETAIL Display

ASSIGNING UNITS TO HISTORY MODULES

Table 11 describes additional guidelines for the HMs.

Table 11 - More HM Guidelines

Guideline	Comment
Distribute the load among HMs.	This means the data owners (AMs, HGs, and NIMs) that are heavily loaded should not all be historized by the same HM. Distribute the load as much as possible. Having points from a data owner historized by more than one HM provides the following advantages: • Prevents bombarding the data owner with large requests for data at one time. • Reduces the chance of any one HM having an overrun caused by a busy data owner. NOTE: Remember that a single unit cannot be assigned to more than one HM for historization.
Whenever possible, ask for more data less often.	Tremendous overhead is involved per point in setting up each history request. Once this overhead is done, however, the amount of data retrieved for each point has very little effect on the time it takes to service the request. For example, it is more efficient for the HM to wait six hours for snapshot data and then request the last six hours' worth of data for each point, than to request data every hour.
Schedule background functions so as not to overload the HM.	Schedule background functions such as logs, history retrieval, journal retrieval, checkpoints, prints to virtual printers so that the HM is not overloaded with requests all at once, especially during its continuous history marshalling and average calculation cycles. One approach is to stagger the timing of the background requests. The marshalling cycles occur every twelve intervals. For 60 second history collection, this is every twelve minutes. For 20 second collection, this is every four minutes, and so on. The idea is to load level the HM.

THE EFFECTS OF TIME CHANGE ON PROCESS HISTORY

History Collection Example

When continuous history is collected by the History Module:

- The history is saved in cyclic files.
- Each value is saved contiguously within the file.
- When the file is full, then the oldest value is replaced with the most current value.

Example:

If we are collecting 60-second snapshot values for the process variable of a given point, every minute the point.parameter values in that file will be updated. Each entry to this file is placed preceding the previous entry.

Time Change Example

As illustrated in Figure 19, during seasonal time changes when the time is set back one hour, the cyclic history file will have two entries with the same time stamp.

Example:

Suppose we are collecting history and it is 2:00 A.M. At this time, we set the clock back to 1:00 A.M. Entries in the file already exist for 1:00 through 2:00 A.M. New entries for 1:00 and 2:00 A.M. will be placed preceding the previous entries.

When retrieving history, if we ask for the data with a stop time of 2:00, we retrieve only the first set of data. Once the search finds the stop time, it no longer searches the file.

If we ask for a stop time of 2:01, the search will find not only the first set of data but also the second set with that same time stamp. The system reports both sets of data.

By requesting the data in this manner, we force the search to find the second set of entries before it can find the requested stop time.

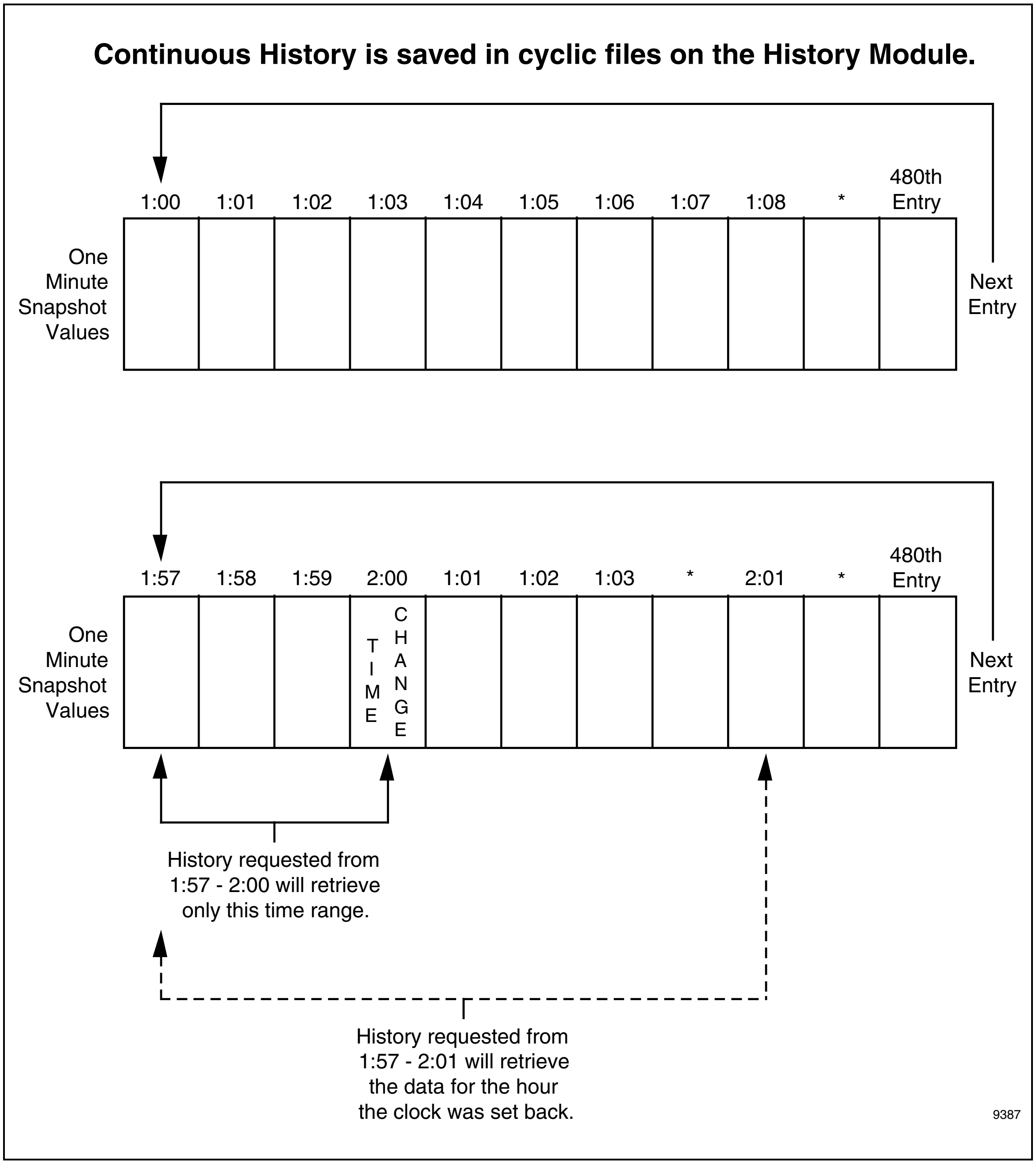

Figure 19 - Effects of Time Change on Process History

What Happens To The Files

As shown in Figure 20, the operating system resynchronizes the cyclic tasks beginning with the first interval following the time change.

Example:

Assume the current time is 13:37:23 and the time is changed to 14:37:00. The 60-second collection would have completed its collection of data at 13:37:00, and would not be reactivated until 14:38:00. At 14:38:00, a time change record is stored into the history collection files in lieu of a collected value. At 14:39:00, data is again collected and saved in the history collection files. This results in a loss of collected data for approximately two minutes.

The 5-, 10-, and 20-second history data must always contain a uniform number of collections between clock minutes. The 5-, 10- and 20-second history collection tasks must synchronize with the 60-second history collection task to ensure that all four tasks identify the time change at the same clock interval.

In our example, A100 is assigned to a 5-second group and A200 is assigned to a 60-second group. When the time change occurs, the 5-second collection would have data at 13:37:20. It would be reactivated at 14:37:05, which is the first scheduled 5-second collection interval after the time change. At this time, it would detect that a time change has occurred and would "fill" that minute out with data-not-collected records. It would then wait for the 60-second collection task to detect the time change, at which time it would acknowledge the time change also and would store a time change record for 14:38:00. It then would resume normal data collections at 14:38:05. This results in a loss of 5-second collected data for approximately one minute.

```
Minute Snapshots (Avg.")                                                   HH MM DD MMM YY
LOG 3                          AREA 1  LOG 3
LEGEND: '=Calculated time ~=Time changed "=HG data *=Less than expected # samples

DATE/                      A100                                   A200
TIME                      PIDNORM                                  DAS

MM/DD/YY
13:37:00      203.7 (collected value)        300.0 (collected value)
13:37:05      203.8 (collected value)        ????????? (fast collect not config )
13:37:10      203.9 (collected value)        ????????? (fast collect not config )
13:37:15      204.0 (collected value)        ????????? (fast collect not config )
13:37:20      203.9 (collected value)        ????????? (fast collect not config )
13:37:25      ????????? (data not coll.)     ????????? (fast collect not config )
13:37:30      ????????? (data not coll.)     ????????? (fast collect not config )
13:37:35      ????????? (data not coll.)     ????????? (fast collect not config )
13:37:40      ????????? (data not coll.)     ????????? (fast collect not config )
13:37:45      ????????? (data not coll.)     ????????? (fast collect not config )
13:37:50      ????????? (data not coll.)     ????????? (fast collect not config )
13:37:55      ????????? (data not coll.)     ????????? (fast collect not config )
14:38:00      ????????? (time change)        ????????? (time change )
14:38:05      204.1 (collected value)        ????????? (fast collect not config )
14:38:10      204.1 (collected value)        ????????? (fast collect not config )
14:38:15      204.1 (collected value)        ????????? (fast collect not config )
14:38:20      204.1 (collected value)        ????????? (fast collect not config )
14:38:25      204.1 (collected value)        ????????? (fast collect not config )
14:38:30      203.7 (collected value)        ????????? (fast collect not config )
14:38:35      203.6 (collected value)        ????????? (fast collect not config )
14:38:40      203.5 (collected value)        ????????? (fast collect not config )
14:38:45      203.7 (collected value)        ????????? (fast collect not config )
14:38:50      203.9 (collected value)        ????????? (fast collect not config )
14:38:55      204.1 (collected value)        ????????? (fast collect not config )
14:39:00      204.1 (collected value)        305.0 (collected value)
```

Figure 20 - Effects of Time Change—Log Example

EVENT HISTORY STORAGE AND RETRIEVAL

Number of Events Per Journal

There are seven types of journals that can be configured on a history module to provide for the storage and retrieval of events. Their types and the maximum number of events for which they can be configured are as follows:

Journal Type	Number of Events
Process Alarms	15,000
Process Changes	10,000
Operator Messages	5,000
Sequence of Events	15,000
System Status	12,500
System Error	15,000
System Maintenance	15,000

There is no priority among the journals. There can be up to 36 units configured in the NCF file for journaling per history module.

The History Module can handle process alarm bursts of 250 events or a 2 events per second steady state load.

Burst Buffer

The burst buffer is not a buffer but is actually a file:

```
NET> !2np>BB000000.CM
```

This file is used for temporary storage of events before they are passed on to the journal event sorting and distribution functions.

It is a good idea to configure the Burst Buffer for three times the maximum event burst that you expect, or size it for 7500, the maximum number of events for which it can be configured. Note that the burst buffer is sized to hold process alarms and will only hold about a third as many operator messages (which are the largest event).

The HMDETAIL display from PERFMENU indicates the Journal Manager total count of events during the last minute and hour. See Figure 18.

The HM sorts events chronologically (when the events are received in the HM sorting task), within 10 seconds of their occurrence. Events that are received in the HM sorting task outside of this 10-second window are written directly out to the disk without being sorted. The event is not lost; it is just out of time order. The user may have to search the files an hour ahead or behind to see the event. The *Exceeded Time Window* parameter on the HM Detail display increments when this occurs.

Note that this is not a problem with Sequence of Events. In R410 and later, SOE events are always post-sorted on retrieval; therefore, they are always displayed in the proper time order.

Journal Retrieval

Journals can be retrieved from Universal Stations, background logs, and the Computer Gateway. Retrieval is based on a number of different parameters including

- Point Name
- Module Name
- LCN Node Number
- Hiway Number
- UCN Number
- Box Number

The History Module has three journal servers that can process up to three requests in parallel. There are three request classes:

- Operator interactive (requests displayed at a US)
- Operator background (requests forwarded to a virtual printer)
- Advanced function (requests initiated at a CG)

REFERENCE—For information concerning the History Module, refer to the *Engineer Reference Manual*:
Section 7 (HM Configuration and Use)
Section 23, Subsection 23.6 (HM Performance Hints and Rules of Thumb).

LAB TIME Use your assigned US Take with you: • This module	•60 Minutes

LAB EXERCISE

LAB EXERCISE 1

This lab offers practice in identifying and evaluating History Module status, maintenance recommendations, and error codes.

For this lab, use only course-manager-approved equipment. Check with your course manager before beginning.

1. Using the course-manager-approved History Module (HM) that is configured for redundant drives, remove the power from one of the drive chassis.

2. Call up the System Status display and notice the SEVERE indication on the History Module target.

3. Select the History Module target, then select the NODE STATUS target.
   Record the HM status.
   Status: ____

4. Is a maintenance message displayed? Yes No
   If yes, record the maintenance recommendation:
   ____
   ____

5. Use the Command Processor to call up the status list of the HM. Use the following format:

   STA PN:##

   where ## is the HM LCN node address

6. Notice that the drive you powered down does not appear on the display.

7. Restore power to the drive.

8. Recall the status list for that HM. (it may take several seconds to see the status on the second drive.) Note and record the the status of the Wren drives. Note: The status list display does not update; you must recall this list to see the current condition.

   Status:____

9. Synchronize the offline drive using the following format:

   SYNCH PN:##

   where ## = HM LCN node address

10. Recall the status list for that HM and notice the SYN_IP status. This status indicates that the synchronization is in progress.

    If you are using R400 or later,

    - Invoke the HM Status display,
    - Select your HM,
    - Select the [STATUS DETAIL] target,
    - Select a drive,
    - Select the [VIEW OBJECT DETAIL] target.

    From this display, you can monitor the synchronization process by volume.

11. Monitor synchronization from the DRVSTS display on Perfmenu.

End of Lab Exercise

LAB EXERCISE 2

1. Using the Command Processor, list the files under the !0np or !1np directories of your assigned HM, and the !Auu directory for your assigned unit.

2. Identify the kinds of continuous and cyclic files that are present.

   ____

   ____

   ____

3. How many History Groups are configured for your assigned unit? ____________

   How fast is history being collected? ____________

   Approximately how many history groups are on the HM? (Hint: Check the

   super group number). ____________

End of Lab Exercise

LAB EXERCISE 3

1. From the PERFMENU schematic, call up the HMDETAIL display for your assigned HM.

2. How long it is taking this HM to collect history for the different save rate?

   ____

   ____

3. Is there any indication that the HM may have overruns because it cannot collect history in time? If so, what is the indication?

   ____

4. What is the 60-second disk transfer rate for this HM?

   ____

5. Is the transfer rate within the desired range of 800 to 900? ___________________

6. How many events per minute and events per hour is the HM experiencing? _____

End of Lab Exercise

LAB EXERCISE 4

1 From the PERFMENU schematic, call up the DRVSTS display.
What is the status of the HMs drives?
What is the node pair number of the HM?

2. From the PERFMENU schematic, call up the HISGRPS display.
What point.parameters are being collected in your assigned history group?

End of Lab Exercise

APPENDIX A

Recommendations For Continuous History Retrieval From a Computer Gateway

Continuous History Retrieval

LCN nodes that can initiate continuous history retrieval include the following:

- Universal Station
- Computer Gateway
- Application Module
- Archive Replay Module

There are eight separate history server tasks in the History Module that can operate in parallel. This parallel operation maximizes the HM resource usage; however, the user needs to be concerned that the HM is not overburdened with history requests, especially from a Computer Gateway. The following are some considerations:

Setting Up DDTs In An Upper Level Processor

General Rule

The CG can request history data from the LCN through the use of history Data Definition Tables (DDTs). DDTs contain lists of up to 24 point.parameters. Because the HM does not throttle its work load very well, it is important to limit the number of requests that are sent from the upper level processor (ULP) to avoid overloading the HM.

As a general rule, never send more than two requests at a time to a single HM. Violating this rule could interfere with the operator interactive functions and the operator background functions, such as report generation. It may also interfere with the collection of data.

Number of Units per HM per DDT

Requests to the History Module are organized by unit. For example, if a DDT contains points belonging to three units, all of which are being historized by the same HM, that HM will receive three separate history requests. This could possibly cause a performance reduction on the HM.

Total number of ACPs placing requests on a single HM

As illustrated in Figure 21, if more than one Advanced Control Program (ACP) is making a request at any given time, the history requests should be directed to different HMs. This is more efficient because each HM can be responding to its request in parallel with the other HMs. In addition, each ACP's DDT should contain points from no more than two units on that HM. In this way, two requests to the HM will be generated for each DDT on an ACP.

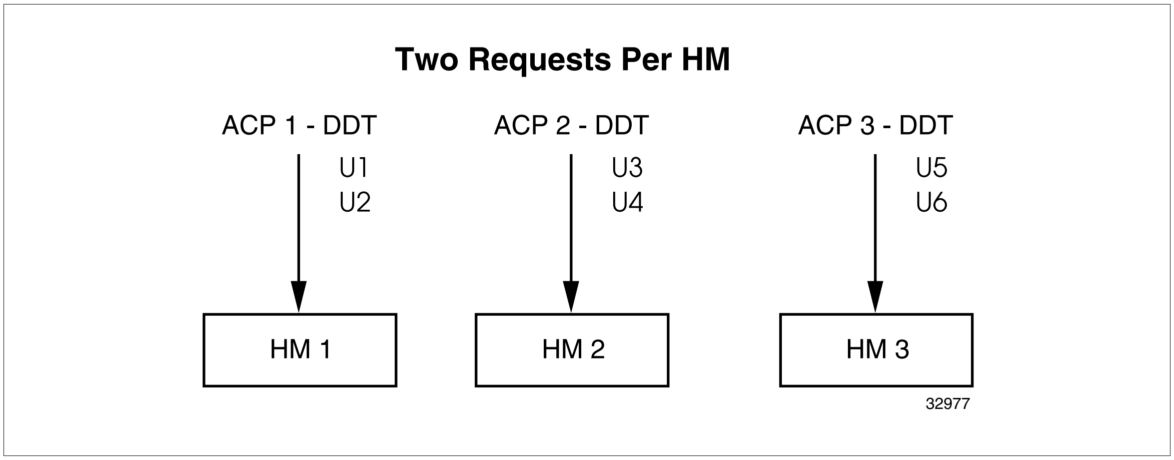

Figure 21 - Directing ACP Requests To Different HMs

As illustrated in Figure 22, if multiple requests from different ACPs are made to the same HM, more than two requests to the HM could result at a given time, impeding HM performance or causing requests to be queued up to wait for processing.

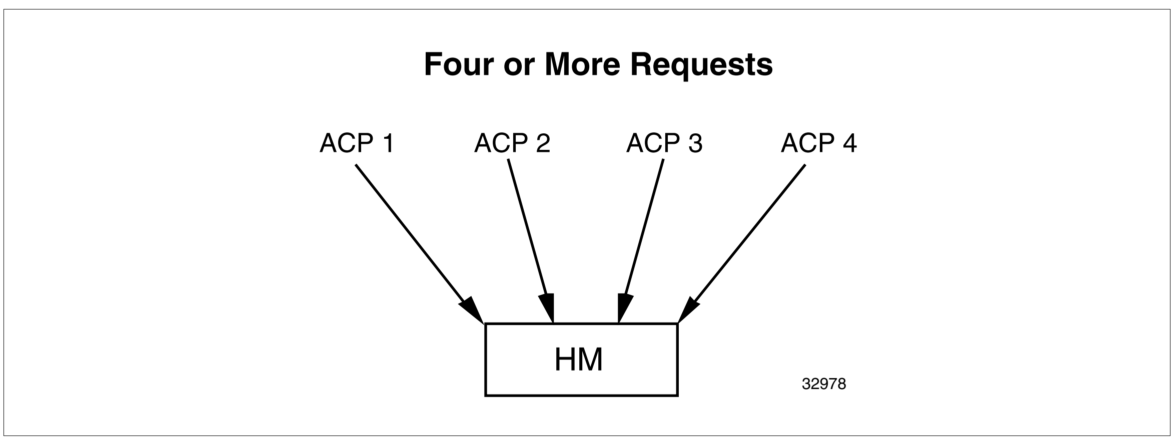

Figure 22 - Directing ACP Requests To One HM

How to Control the Number of Requests

The number of requests to the HM from the ULP can be controlled by

- The number of units per HM per DDT.
- The total number of Advanced Control Programs (ACPs) placing requests on a single HM at any point in time.

Two possible ways to control the number of requests are described below:

- 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 that HM. This way, two requests to the HM will be generated for every DDT for this ACP (see Figure 21).
- Run just one ACP to collect history from the LCN (see Figure 23).
  Each DDT for this ACP should contain points from multiple HMs, but limit the number of units represented to two per HM per DDT.

Other combinations of these two methods are possible, but remember that if there is more than one ACP accessing the same HM, or more than two units per HM in a DDT, you may be generating more than two history requests per HM, thus reducing HM performance.

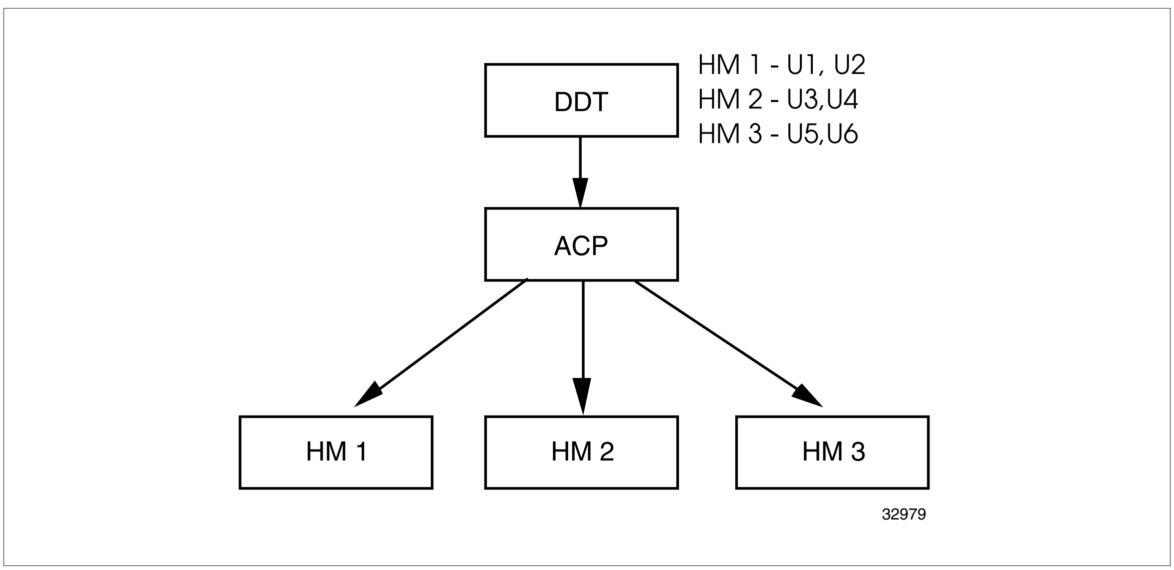

Figure 23 - Controlling The Number Of Requests

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