Honeywell

Manage &ASY and NCF

L61526
LCN

TotalPlant®

Notices and Trademarks

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

TPS is the evolution of TDC 3000^{X}.

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Resources Referenced Later In This Module

Engineer's Reference Manual Binder TPS 3030-2

MODULE INTRODUCTION

When managing your LCN database, you need to be aware of the following configuration concepts discussed in this module when the &ASY volume is used. The &ASY configuration issues often faced by a user can be summarized by the following questions:

- What configuration changes affect the &ASY?
- What configuration changes affect the NCF.CF?

&ASY or NCF configuration changes can be properly implemented, with minimal or no disruption to day-to-day operations, if the underlying configuration concepts are understood. This module will help you understand them and minimize the potential for errors. This module covers what types of changes usually occur and the impact those changes can have. The module also covers principles, lists of changes, and risk factors when performing online and offline NCF configuration.

After reviewing this module, you will be able to understand what affects the NCF and &ASY. In particular, the online NCF change process will be discussed.

Begin this module by briefly reviewing terms used during &ASY or NCF configuration.

Module Objective

After studying this module, you will be able to interpret &ASY or NCF configuration tasks. This will help you minimize the potential for errors whenever you have to make a change to your existing database. Most of the focus of this module will be on the online NCF configuration process.

TERMS USED IN THIS MODULE

The following terms are used in this module in the following context. At the end of this module you should be familiar with the following terms:

&ASY — This is the name of a system volume or directory that contains the basic description files required for the startup of each node, including the network configuration file (NCF.CF). Note that the file name begins with an ampersand character (&), sometimes called an "and" character.

Installation Unit — An installation unit is all the data a particular NCF function needs. For example, the Area Names configuration in Network Configuration is considered an "installation unit." By separating NCF configuration tasks by installation units, the changes you make to your NCF will be more secure.

NCF.CF — The Network Configuration File is used by an LCN node at startup of the node. In order for an LCN node to operate on the network, it must "know" the address and types of LCN hardware on your system, the names for units, areas, consoles, and system-wide values. Ideally, each LCN node should be loaded with the same NCF.CF file.

NCF.WF — This file is created when the offline or online configuration mode is chosen. It is used as a "working file," as if it were a source file for configuration data. It is not used for system operations until it is "installed" (i.e.; an analogy to "installing" is "compiling") into the actual NCF.CF and loaded into a node.

Node administrator — A software subsystem in the Realtime Network Operating System (RNOS) residing in each LCN node. The Node Administrator is responsible for starting up an LCN node and verifying that its NCF matches the current NCF loaded into the system.

Offline — This is an NCF configuration mode where the network configuration file is being built for a system for the very first time, or being completely rebuilt for an existing system, or being built for a different system. There are configuration items (such as configuration of Network Gateway remote systems) that require the change be made offline.

Online — This is an NCF configuration mode where the network configuration file is being modified for a running system, and running nodes will be notified of the changes after the install has been completed. Always do online NCF changes on a running system.

WHAT IS AN &ASY?

The directory &ASY and the file NCF.CF are sometimes mistakenly thought of as being the same; they are not. Files other than the NCF.CF file reside in the &ASY directory. You will see in this course module that changes to any of these files can have an impact on system operations. First, we will review what files are present in an &ASY directory.

The &ASY directory contains a number of files the user needs to manage:

- custom name library files,
- virtual printer configuration file
- NCF.CF file
- PRFAIL (printer failure)
- load configuration file

Several files are accessed each time a node is loaded. The files that are accessed depend on the node type being loaded.

During the following discussion, refer to Figure 1 for an example of the &ASY directory.

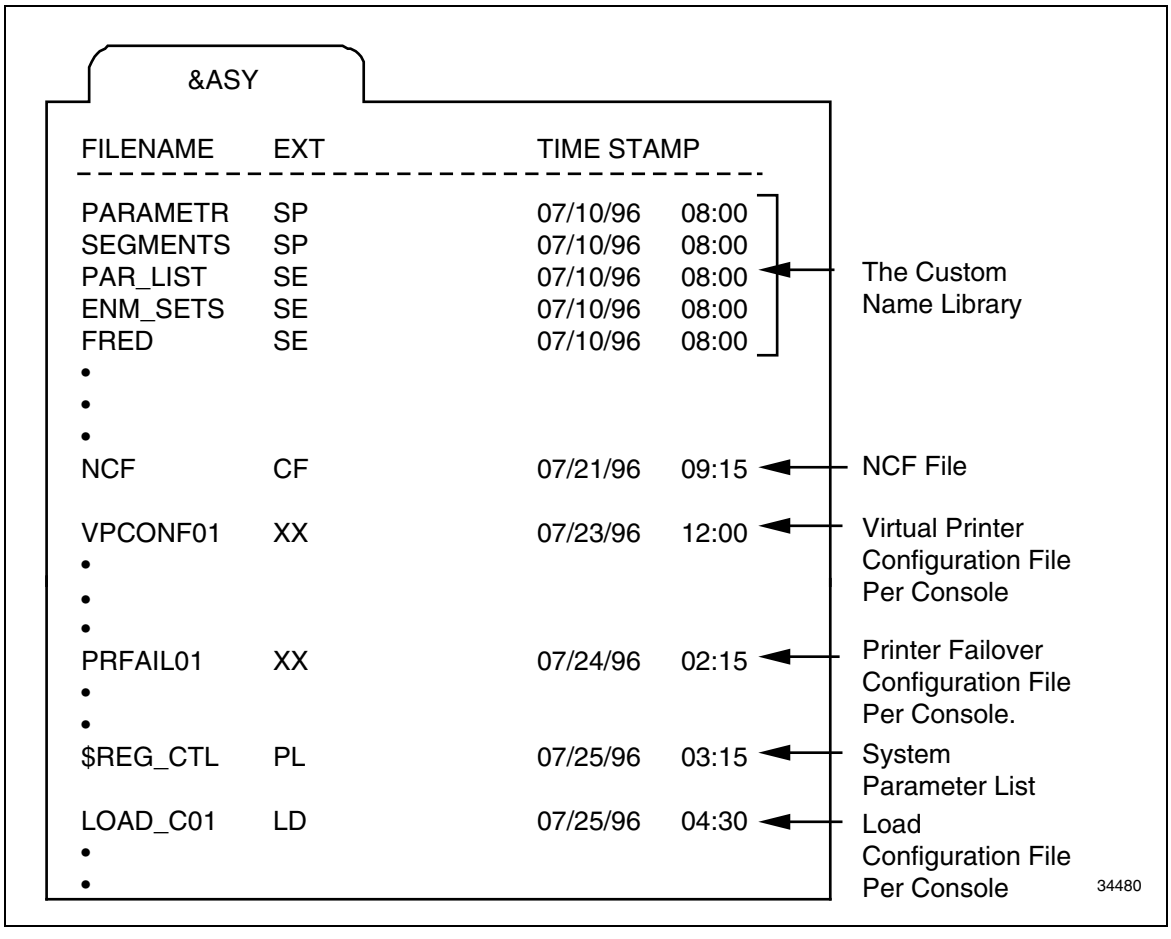


Figure 1 – Directory &ASY

CUSTOM NAME LIBRARY

Definition

The custom name library is a user-maintained set of files containing additional custom names and parameters that are not provided by Honeywell. Each LCN node that normally needs to convert custom names back and forth between ASCII and internal form contains a copy of the custom names in the node's local memory. A disk copy is maintained in the system's &ASY directory for node loading and is essentially a "checkpoint" of the custom names.

The custom name library files have a .SE or .SP suffix.

The library can be automatically updated when a user compiles any AM/CL source file containing custom parameters, enumerations, or parameter lists with a compiler option that automatically updates the custom name library (-UL). Each of the library files has a timestamped version associated with it.

In some publications, the custom name library is referred to as a set of "data access files."

File Names

The following files make up the custom name library:

- PARAMETR.SP (custom parameters)
- SEGMENTS.SP (custom segment/package names)
- PAR_LIST.SE (custom parameter lists)
- ENM_SETS.SE (custom enumeration set names)
- (user-built).SE (custom enumeration states)
- DUPLICAT.SP (duplicate custom and standard parameter names)

Nodes That Keep A Custom Name Library

Only the following nodes keep a copy of the custom name library files in their memory:

- Universal Stations or Global User Stations,
- Computer Gateways,
- Network Gateways, and
- Application Modules that have the CONV custom backplane software installed. (CONV is a special packaging of the string conversion routines, allowing nodes that normally do not do string conversion to do so.)

How Is The Library Created?

Custom names are created as an activity of the AM/CL compiler. A file associated with each custom name type is stored in the system's &ASY directory. When the user builds a Custom Data Segment (CDS), custom enumeration, or custom parameter list, then compiles it using the -UL option, the following happens:

1. As each of custom name files is updated, a revision is applied to the list (actually a reading of the LCN clock at a point in time during the update).
2. The files that make up the custom name library and their associated revisions are updated in the &ASY (as specified in the system pathname).
3. The new custom name and its associated revision are broadcast to all interested LCN nodes so that they can update their memory copy of the .SE and .SP files. The old revision is also broadcast to the nodes.
4. Before each node updates its memory copy, it checks to see if the old revision matches the current revision of the files currently loaded.

– If the revision dates match, the new custom names and new revision are applied.
– If the dates do not match (indicating that some update in the past was missed) the node re-reads the disk copy to stay synchronized with the other nodes.

Example

The following example illustrates how parameters from an AM/CL source file relate to the custom name library files. The following example is illustrative only and not necessarily typical of the one you may encounter at your plant.

In Figures 2 and 3, the parameters created by the user did not already exist in the system. They were stored or "updated" in the appropriate custom name library file when the user compiled an AM or CG program with an "update library" (-UL) option.

```
SOURCE FILE   XYZ_TEMP.CL

PACKAGE

CUSTOM
PARAMETER TEMP :  $REG_CTL
END  CUSTOM

ENUMERATION  MOTOR_ST  = FORWARD/OFF/REVERSE

PARAM_LIST  EXTRAVAL
PARAMETER  SPEC_X
PARAMETER  SPEC_Y
PARAMETER  SPEC_Z
END  EXTRAVAL

END  PACKAGE
```

Figure 2 – AM/CL Package Example

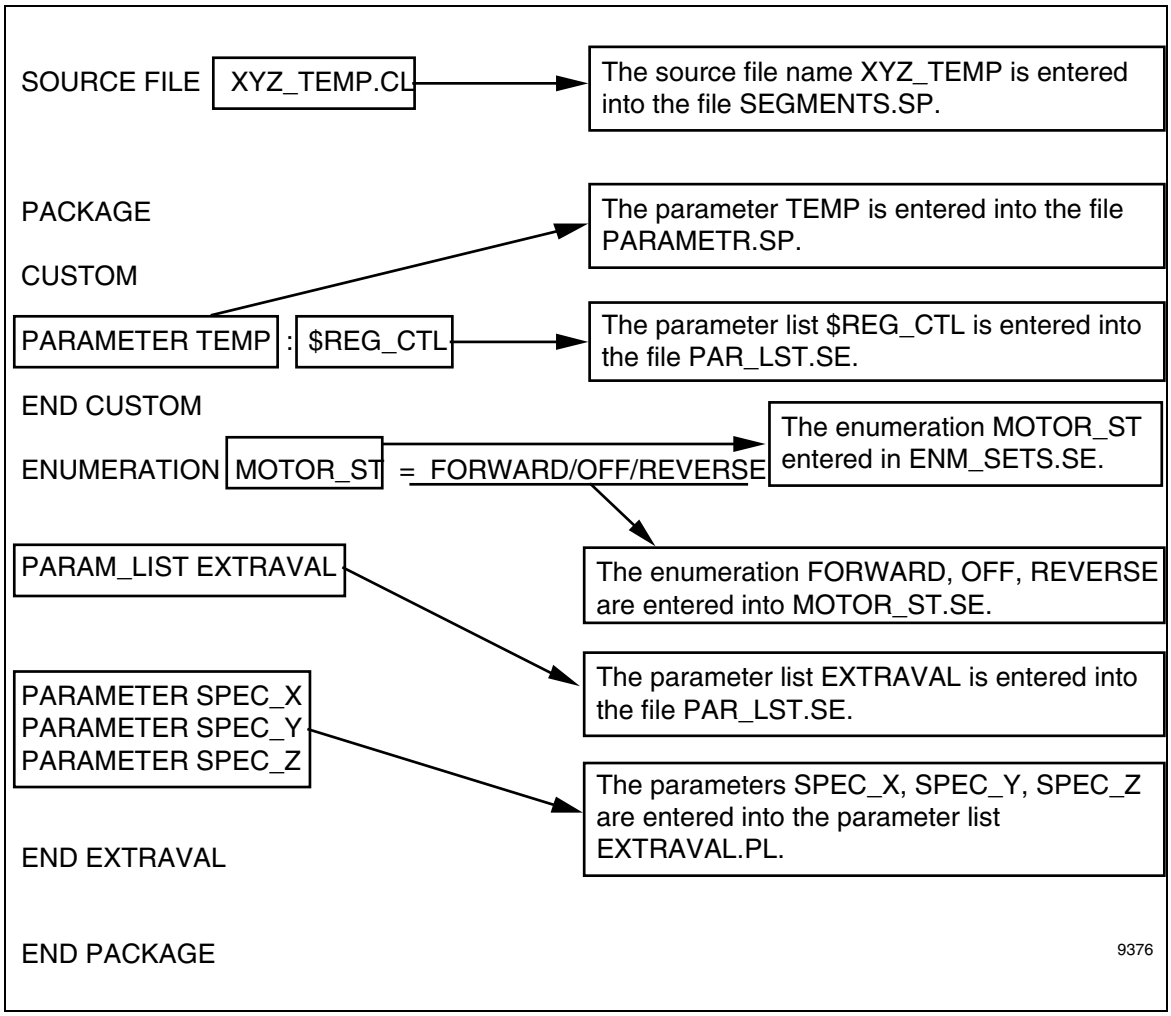


Figure 3 – Custom Library Entries from Package Example

SUMMARY

In summary, an update to the custom name library updates the following:

- the CG, NG, and US/GUS nodes that are running at the time of the update,
- any AMs containing the custom name library, and
- files in the &ASY directory specified at the time of the compilation.

WHAT HAPPENS IF MY LIBRARY IS OUT OF SYNC?

Node Loading

Ideally, the US/GUS, CG, NG, and AM nodes on the system should be loaded with the same version of the library. During a node load/startup, the custom names are read from the file copy in the &ASY directory.

Before the names are loaded, the loading node asks all the other nodes on the network to send it the revisions that they currently have to make sure that the correct files are being read:

- The first of these nodes loaded on the LCN sets the initial version of the custom name library.
- All interested node types that are subsequently loaded compare the versions of the library files with which they are attempting to load with the version of the library files in the initial node that was loaded.
- If the versions are the same, the node completes loading with the same set of library files.
- If the versions are not the same,
  - the file or files that do not match with the initial node will not be loaded into the subsequently loaded node.
  - a message appears on the node status display

Messages Concerning Custom Names

If the loaded node's custom name library is out of sync with the library that is in the other peer LCN nodes an error indication appears:

R400 and later— The WARNING indication appears on the Node Status display, with more information about the “custom names” object available on the Status Detail display.

Status Detail Display—R400 and Later

Table 1 lists some of the messages you might see on a node’s Status Detail display.
NOTE: Some of these messages are “normal.”

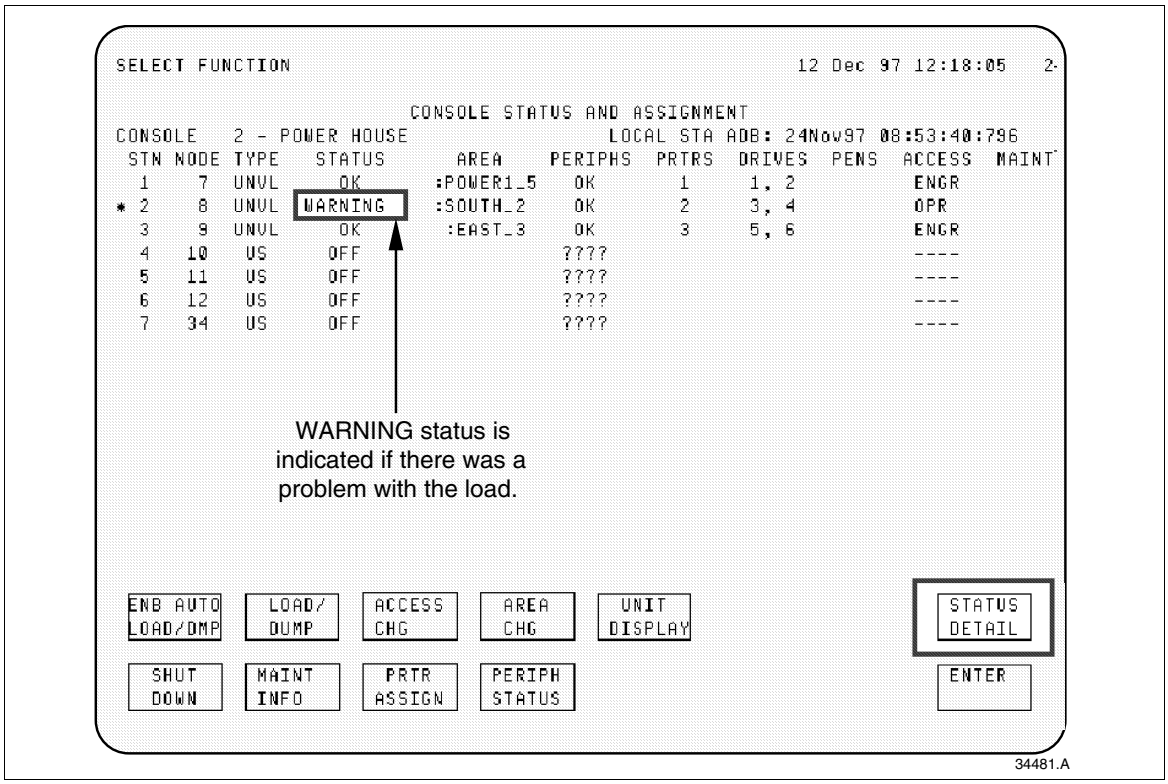


Figure 4 – Example Console Status Display

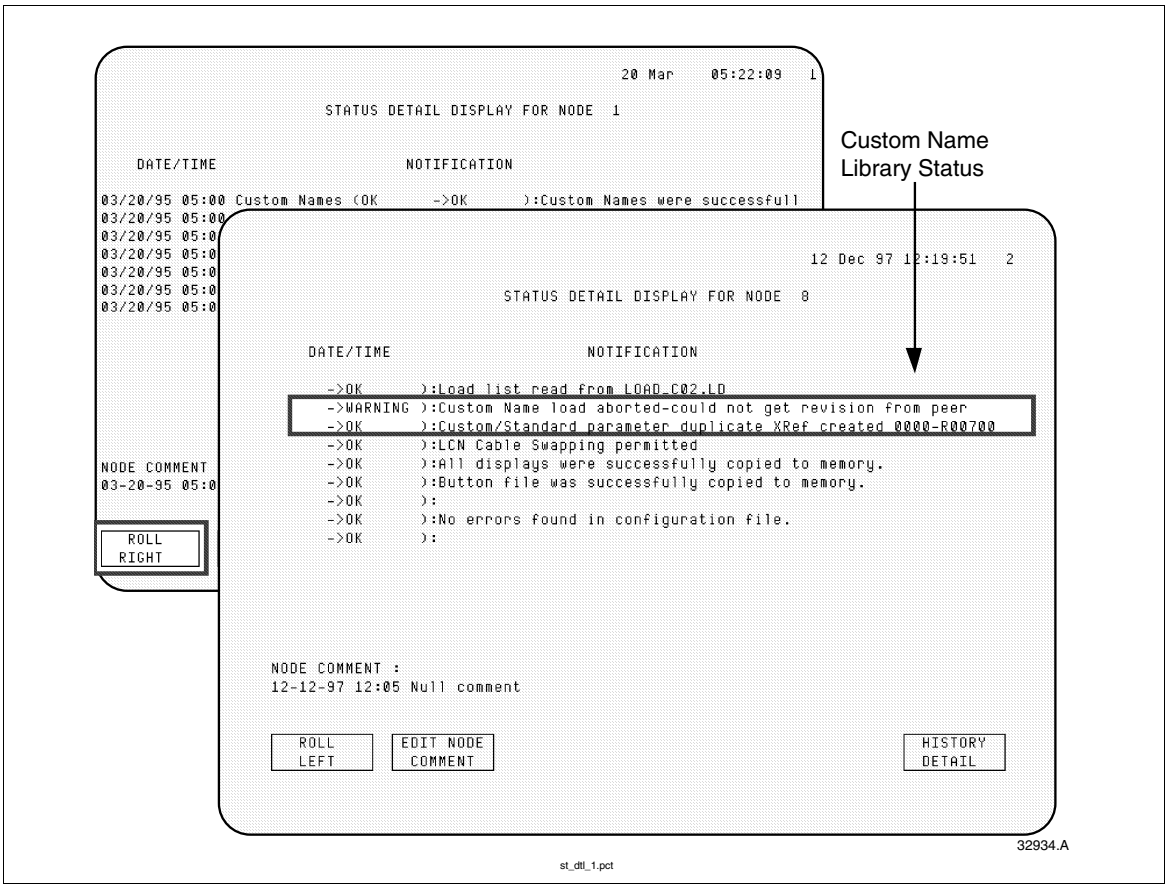


Figure 5 – Status Detail Display—Custom Name Library Status

Table 1 – Custom Names Messages

Custom Names initial load is in progress
Custom Names were successfully loaded
Custom Name load aborted could not get revision from peer
Custom Name load had a file I/O error
Custom Name load aborted-error while loading memory
Custom enumerations were not loaded—revision mismatch
Custom parameter lists were not loaded—revision mismatch
Custom parameters were not loaded—revision mismatch
Custom segments lists were not loaded—revision mismatch
Custom/Standard parameter duplicate XRef creation started
Custom/Standard parameter duplicate XRef creation failed
Not enough memory
Primary/Secondary entity names out of synchronization

Causes of Mismatch

Table 2 – Causes of Custom Name Mismatches

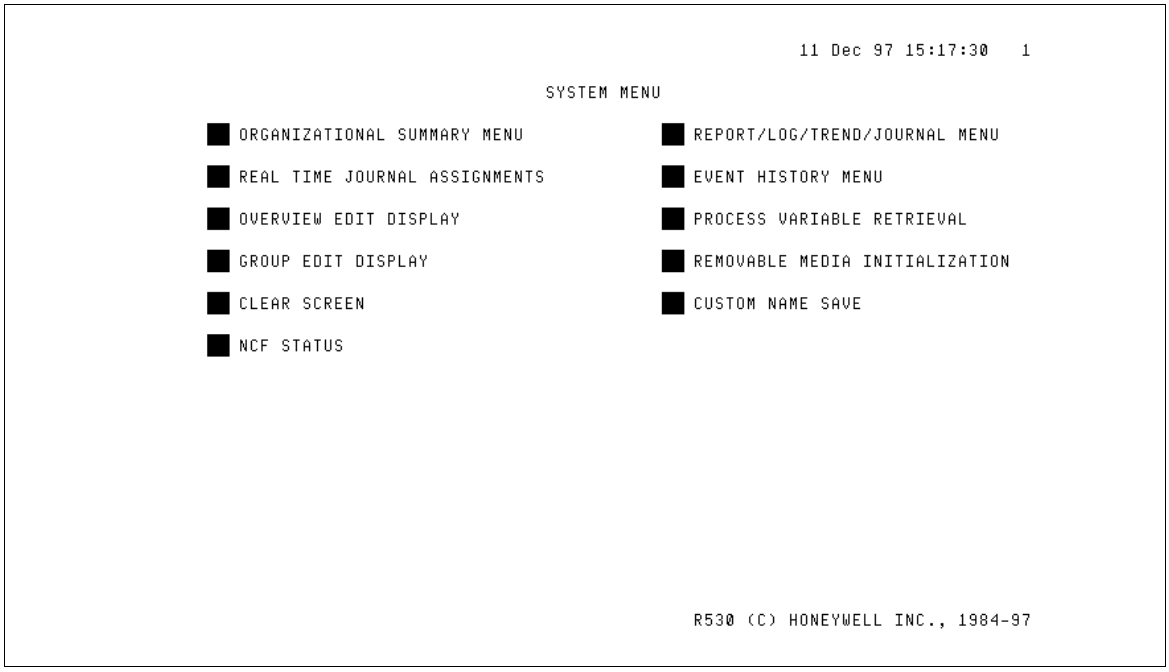
Cause	Comment
Initial station was loaded from a Fast Load cartridge.	The most frequent cause of mismatches. If the Fast Load cartridge has an old version of the custom name library, when the other nodes are loaded from the HM that has the most current files, a custom name mismatch occurs.
AM/CL was compiled with the -UL switch, but the engineering path pointed to the &ASY directory on removable media, rather than the NET; then a node requiring the custom name library was loaded from the NET.	Because the pathname pointed to removable media, the &ASY on the NET was not updated during the AM/CL compile, but the custom names of the other running US/GUS, CG, NG, and AM nodes were updated. When the node was loaded from the NET, it attempted to load with the old version of the custom names.
The custom name library is revised offsite, then copied to the HM at the plant while AM/CL work is ongoing at the plant.	What usually happens is that offsite personnel are not aware of the work being done at the plant; consequently, they visit the plant and copy their version of the custom name library onto the HM. The next node requiring the custom name library will indicate a custom names mismatch.
A node requiring the custom name library is loaded from a cartridge that does not have the .SP or .SE files.	Even if no custom names have been added to the library, the .SP and .SE files are required during node loading.
During loading of a node requiring the custom name library, the HM has a Bad Read of part of the custom name library.	Very rare.
An AM and a US/GUS are loaded at the same time.	On some software that was released before R400 only, the CNAMEREV error occurs.
During a software upgrade, the .SP and .SE files are not copied to the &ASY cartridge.	
Nodes are loaded when system problems are present.	Custom name mismatches can occur when nodes are loaded while system problems are present, such as LCN cable problems or LCN overloads caused by heavy traffic.
Node loading occurs during custom name creation.	
Multiple AMs with CONV are loaded concurrently from multiple US/GUSs.	

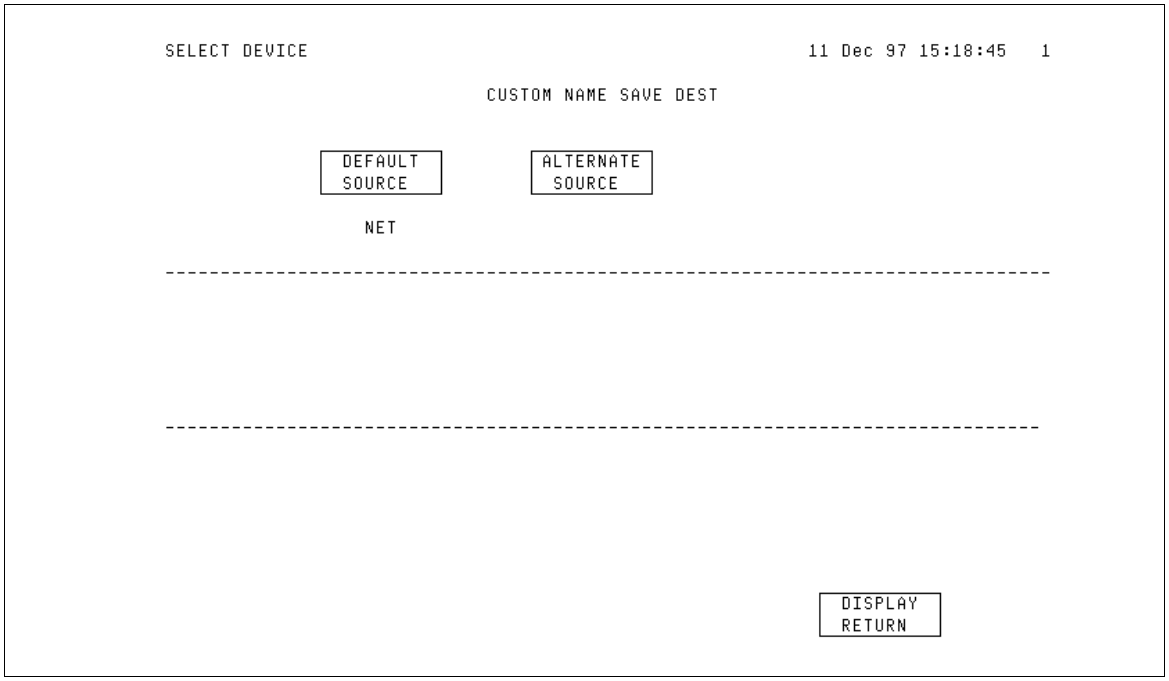
HOW CAN I RECOVER FROM CUSTOM NAME MISMATCHES?

Recovery Procedure—Custom Name Save

To get a current version of the custom name library into the &ASY directory or onto the media with which you attempted to load one or more nodes, you can request a Custom Name Save from a US/GUS loaded with the correct custom name library version of the .SE and .SP files.

Custom Name Save is found on the System Menu.





CAUTION

The Custom Name Save function should be used cautiously as it will write the currently loaded custom names files to the destination specified.

A Custom Name Save to the HM from a US/GUS that is in the OK state, but which is loaded with an "incorrect" version of custom names, will write the incorrect version to the HM.

Before doing a Custom Name Save:
Be sure you know that the initiating US/GUS contains the valid library files.

Updating Load Media

The custom name library can be directly copied to either the HM (if the library files on the network &ASY are out of revision), or to removable media (if, for example, you attempted to load from an out-of-date Fast Load cartridge).

Reloading Nodes

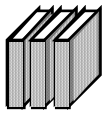
After you have ensured that the &ASY directory on the load media has the correct files, you must shut down and reload any nodes currently loaded with the wrong files and all nodes that indicate a custom names error status.

To recover, reload any nodes loaded with the wrong files from the load media until they all indicate a custom names error status. When all nodes indicate this error, there are no peer library files with which to compare. When this condition exists, if a new node is then loaded from media containing the library files, these files are assumed to be correct and the node will come up in the OK state. All nodes indicating a custom names error status can then be shut down and reloaded one-by-one.

HOW CAN I PREVENT CUSTOM NAME MISMATCHES?

Periodic Saves

Periodic saves of the custom name library to the &ASY that your system is using is your best insurance against custom name mismatches. Making sure your backup &ASY and fast load cartridge directories are updated is also part of the periodic saving process. Backup command files are already built for you on volume &EC.



REFERENCE—The *Engineer's Reference Manual* describes the backup command files on volume &EC.

Monitor PSDP Parameter MCREV

Each node on the LCN has a defined Processor Status Data Point (PSDP) named $PRSTSnn, where nn is the node number on the LCN. Each of these points has several parameters that provide information about the node. You can use PSDP parameters to monitor the custom name library that the nodes are currently using.

If you are interested in accessing the node parameter that maintains the Custom Name library revisions, the parameter is

```
MCREV(n)
```

where
`n` = an integer 1 through 8

The first four array items tell you the revision of the .SE and .SP files the node is currently using. The last four array items tell you what the node tried to read at startup. The parameters return both a time and date. Here is the format of the array:

Node is currently using	Node read at startup
MCREV(1)=ENM_SETS.SE timestamp	MCREV(5)=ENM_SETS.SE timestamp
MCREV(2)=PAR_LIST.SE timestamp	MCREV(6)=PAR_LIST.SE timestamp
MCREV(3)=PARAMETER.SP timestamp	MCREV(7)=PARAMETER.SP timestamp
MCREV(4)=SEGMENTS.SP timestamp	MCREV(8)=SEGMENTS.SP timestamp

On R410 and later, a PERFMENU display called CNAMEREV (see Figure 6) allows you to view and compare revisions of the .SE and .SP files for up to four nodes at a time.

If a node attempts to load a node with an out-of-revision file, that file shows a timestamp of 02-06-15

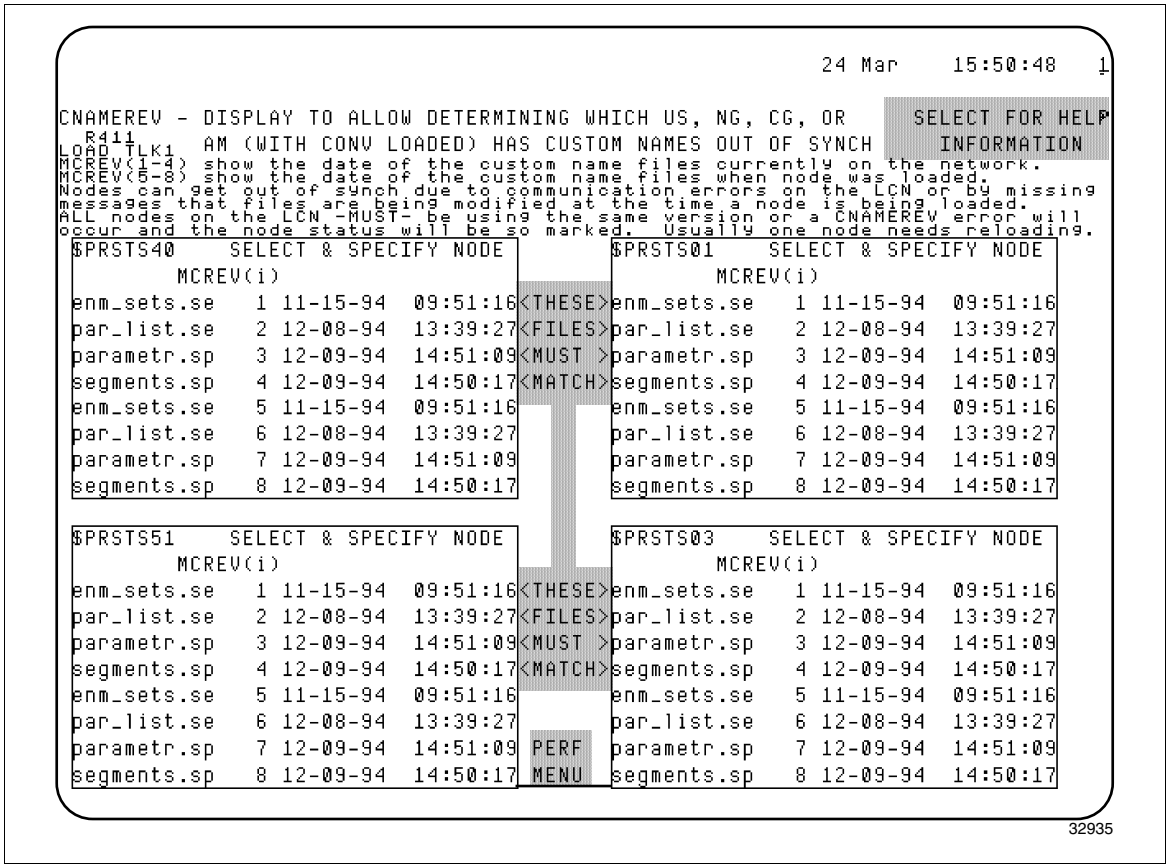


Figure 6 – CNAMEREV Display—R322, R410 and Later

WHAT IS THE VIRTUAL PRINTER CONFIGURATION FILE?

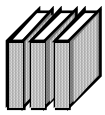
The virtual printer configuration file is used to support the R410 and later "Report-to-Output file" feature. This feature provides a means of saving reports and journals electronically to a text file. The text files are

- saved on either the History Module or on removable media, and are
- displayed or printed by using either schematics or the command processor.

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 will be handled.

If your plant decides to use this Report-to-Output file feature, this file must reside in the &ASY directory. The file name is VPCONFnn.XX (where nn is the console number).



REFERENCE—The *Engineer's Reference Manual* provides additional information about the Report-to-Output file feature.

WHAT IS A LOAD CONFIGURATION FILE? (R500 AND LATER)

The Load Configuration File is a file in which the user specifies a customized node loading sequence, based on the following:

- which nodes to load
- node loading order
- operating personality

The load configuration file is executed by selecting the LOAD CONFIG target from the R500 System Status display. The file works in conjunction with the NCF file in order to load nodes with their default personality (if not specified in the file) and default Area database.

The file is created by the user in the Text Editor. The file name must be

`LOAD_Cnn.LD`

where nn is the console number.

This file must reside in the &ASY directory.

Example

A typical load configuration file looks like this:

```
UP03 19 23
```

Format of File

The format for a line of input in the Load Configuration file is

{personality}<node number> (space) {personality}<node number>

where:

- {personality} is optional and specifies which personality to load for the node. It may be one of the following:
  - OP for Operator Personality,
  - UP for Universal Personality, or
  - blank for the default personality specified in the NCF
- <node number> is the node number of the node you want to load
- each node number is separated by a space

WHAT IS THE 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 **TotalPlant** Solution (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.

Name and Location of File

The printer failover file resides in &ASY.
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.

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

Table 3 – 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 the ninth failover device: 00 to 10

WHAT IS THE NCF?

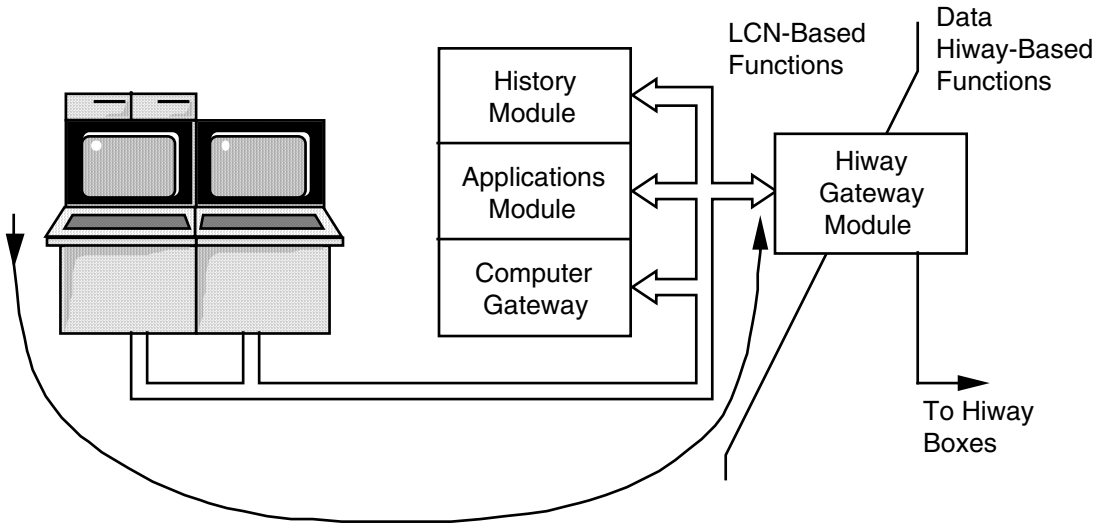
The NCF.CF is a file in directory &ASY that is used to establish network communication. This file contains a description of the LCN hardware, the unit names, area names, console names, HM volume configuration, and system wide values.

How Is The NCF Used When A Node Is Started Up?

When a node starts up, a software subsystem within RNOS, called the Node Administrator, executes. The Node Administrator accesses the network configuration file (NCF.CF) containing information about each physical node on the network. The Node Administrator uses the information to build a network skeleton for validation of "new" nodes starting up on the network.

As a physical node starts up, the Node Administrator

- validates its physical characteristics to ensure that it is running the proper personality and has adequate peripheral configuration available, and
- verifies the hardware and software revision levels to ensure consistency within the network.



The node administrator validates a node when it is restarted. It builds a copy or skeleton of what the network should look like from the NCF.CF file it has been loaded with, and compares it to the current NCF.CF version of the network. 9377

Figure 7 – Node Startup

Some relatively easy NCF data entry tasks, such as unit names and console names, are significant in NCF configuration because they create “logical nodes” for the software subsystems.

The network configuration file contains information needed to start what is called a “logical node instance.” For example, unit numbers 5, 6, and 7, assigned for control by an Application Module, represent three logical nodes within the one physical AM.

The Node Administrator's portion of the NCF file can be broken down into three parts:

1. Physical node description
2. Personality description
3. Logical node instances description

Physical Node Description

For each physical node there is one and only one physical node description. It contains

- The proper hardware configuration
- The proper customer configuration
- The redundancy attribute (if applicable)
- The physical node number of the redundant partner (if applicable)
- The US/GUS station number and console number of which it is a member (if applicable)
- The expected peripheral configuration (if applicable)

Personality Description

For each physical node one or more personality descriptions exist. Each contains

- the minimum peripheral configuration needed for the personality, and
- the software revision levels that are expected for the personality.

Logical Node Instance Startup List

For each personality description, one or more logical node instance descriptions exist. Each one contains

- the logical node instances configured for the personality, and
- the order of logical node instance startup.

NETWORK CONFIGURATION OVERVIEW

Installation Units

The unshaded areas of Figure 8 (Engineering Main Menu) represent tasks that are considered part of Network Configuration. Each of these tasks is considered to be an "installation unit."

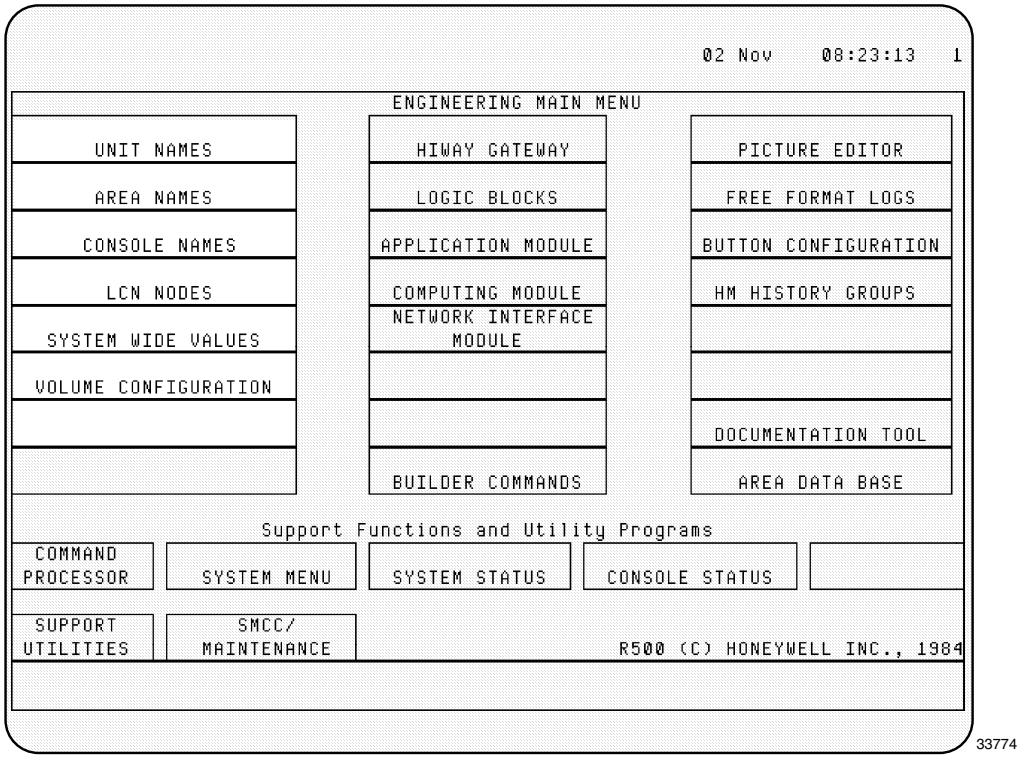


Figure 8 – Engineering Main Menu

NCF.CF and NCF.WF

The configuration tasks highlighted in Figure 8 ultimately build the network configuration file (NCF.CF), the file that each node uses to establish communication on the LCN. Selecting the target for any of these tasks creates an NCF.WF work file. After completing the configuration, you install the NCF changes. During installation, the NCF.WF work file converts to a new NCF.CF configuration file and if the installation is being performed in the online mode, a backup NCF.CF file is written to removable media.

Node Loading and NCF.CF

The NCF.CF file resides in each LCN node's memory; therefore, for the nodes to communicate with each other you must load them with the same revision NCF.CF file. If you try to load a node with a different version of the NCF.CF file than the other LCN nodes are currently using, or that they know about, the node will not load.

How to Determine if an NCF Mismatch Occurred

Earlier in this course module you learned that if an attempt was made to load a node with an NCF that did not have the same revision (time stamp) as the NCF on which the network was currently running, the node would fail to start up. You would see this annunciated in the processor's LEDs as "-190". This code indicates an illogical condition and an illogical condition will always cause a node to crash on startup.

An illogical condition could have a number of causes. If you wanted to verify that an NCF mismatch was indeed the cause of a node failure, you could call up the error block of the failed node from the SMCC (System Maintenance Control Center). It can be determined from the displayed error codes that an NCF mismatch occurred on node startup. The Detailed Module Error display indicating the error codes will be similar to Figure 9.

You can always determine that an NCF mismatch has occurred when you see the task name $$NODE_ADMIN appear along with a detectors code of 44, an offenders code of 6, and a Data1 entry of 1. In R430 and later, this message appears in the error block informing you of the NCF mismatch: `NCF FILE REVISION ERROR`.

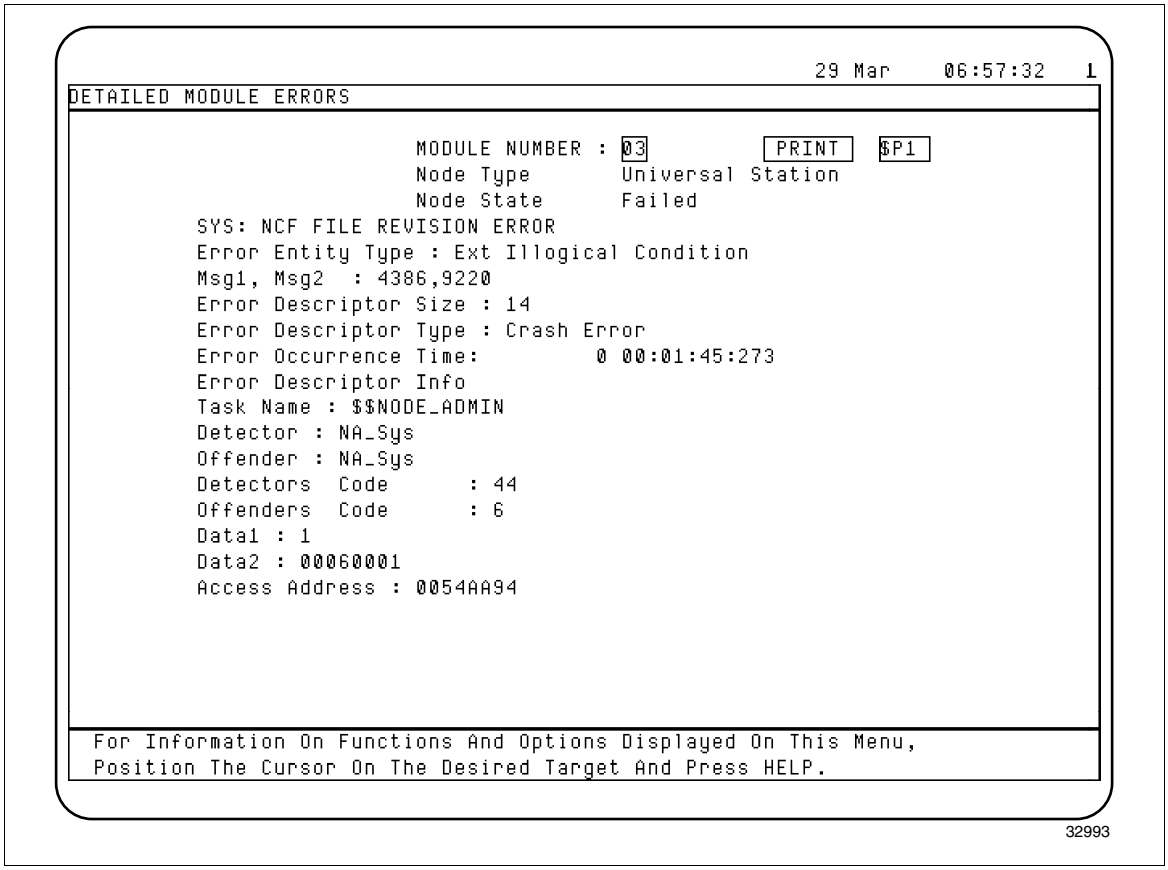


Figure 9 – SMCC Display

WHAT IS MEANT BY OFFLINE AND ONLINE NCF RECONFIGURATION?

Now that you know that the NCF is a collection of records and is used by the Node Administrator during a node startup, the next issue focuses on the changes that can be made to the system. Your choice in making those changes is whether to make the NCF changes offline or online. Let's review the NCF definition of offline and online:

Offline—This NCF configuration mode is one where the network configuration file is being built for a system for the very first time, is being completely rebuilt for an existing system, is being built for a different system, or is being modified to support NG Remote System changes or to make some other necessary off-line change. These changes should always be made to cartridge. Some NCF configuration items require an offline installation if the change will impact system operations. An offline configuration change is not broadcast to all LCN nodes when it is installed. For an existing system to use the NCF.CF file built in this mode, *all* nodes on the LCN network would have to be shut down or reset and then each reloaded with the new NCF.CF file

Online—This is a NCF configuration mode where the network configuration file is being modified for an existing system. These changes should always be made to the history module. This mode of configuration allows you to reconfigure your network without having to do a complete shutdown and restart. When an online change is installed the new revision (timestamp) is communicated to all the other nodes on the LCN. Because the types of online changes that you can make range from simple to complex, some impact to system performance can occur. Always make online NCF changes on your system when possible.

You can see that to make a change, you must also determine whether the change can be made online or offline. In an operating system, your preference would be to make online changes, but that is not always possible. Thus you need to know what changes can be made online or offline.

Summary of Online and Offline Changes

Table 4 summarizes the NCF changes that can be performed offline or online. Note that any online change can be performed offline.

ATTENTION

Table 3 summarizes offline versus online changes. The impact of an online change can be from low to high. Additionally, changes in one installation unit may require changes in another. Be sure to follow the prompts in the NCF configurator display for the appropriate action to take.

Table 4 – Summary of Online and Offline NCF Changes

		Online	Offline
Unit Names	• Unit ID • Unit Descriptors	Add *	* *
Area Names	• Area Names • Area Descriptors	* *	* *
Console Names	• Console Descriptors	*	*
LCN Nodes	• Page 1 of NCF (see note 1) • Page 2/3 of NCF (see notes 2 and 3)	Add, Delete *	Add, Delete *
System Wide Values	• System Descriptor • System ID • Clock Source (see note 4) • User Average Period (see note 6) • Shift Data (see notes 5 and 6) • Console Data • Software Options • Network Gateway – Local System ID – Remote Systems – NG Security Database – NG Modem Definition • Tagname Options • Alarm Acknowledge	* * Add, Change Change Change Change * Add Add Add, Change Add, Change * *	* * Add, Change Add, Change Add, Change Add, Change * * * * * * *
Volume Configuration[6]	• Node Pair Configuration • Program Image • Area • Checkpoint • Continuous History • Journals • CL Storage • User File Storage • File Manager Descriptions	Change * * * * * * * Add	Change * * * * * * * *

* Add, Change, Delete

1. Existing node must be deleted, then added, if a configuration change is made on Page 1 of the NCF display. The target "Modify Node" applies to only Page(s) 2 (and 3) of the NCF display. The AM and US are exceptions to the rule. Changes in page 1 of the AM, including startup mode and addition/deletion of units, are allowed through the use of the "Modify Nodes" target. Except for console and station number, all changes on page 1 of the US are allowed.
2. The target "Modify Node" on Page 1 applies to only Page(s) 2 (and 3) of the NCF display.
3. For the AM, Page 2 of the NCF is the User Memory Allocation and Page 3 of the NCF is the External Load Module Names. For other nodes, Page 2 of the NCF is the External Load Module.
4. Two clock sources must be defined, so "Delete" does not apply here.
5. In some cases, system default entries are used if no entry is made, so "Delete" does not apply here.
6. HM initialization must be performed for online changes to have effect.

HOW TO DETERMINE IMPACT OF ONLINE NCF CHANGE TO SYSTEM

CHECK Before INSTALL

After you make an online NCF change, some impact to system operations may occur. Depending on the change, the nodes may or may not be able to fully communicate with each other and the NCF change will not be implemented until the nodes that are impacted by the change are shut down and reloaded with the newest NCF.

By reviewing the impact before installing your NCF through the NCF CHECKER, you can back out of an NCF change, or at least plan for an orderly transition. Additionally, there are ways to monitor an NCF impact.

NCF Status Display

The NCF Status display is accessed from System Menu. It can help you make an orderly transition to the next NCF release, as a result of an online NCF change, by providing you with information about

1. What nodes were impacted.
2. The degree of impact of the NCF change to the nodes.
3. The NCF versions running in each node on the LCN.

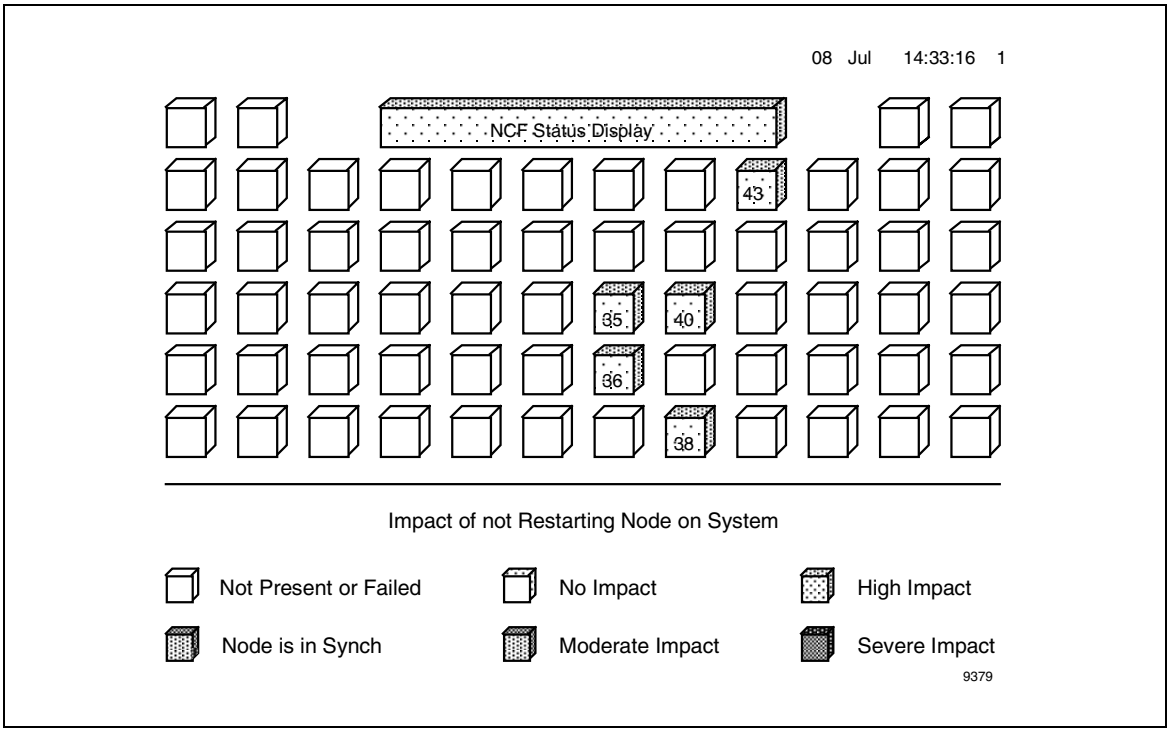


Figure 10 – NCF Status Display

There are six status indications that can appear in the NCF status display:

Node Status Indication	Description
 An empty cube with blue outline	The node is not present in your system or has been shut down or has failed.
 A green cube.	“Node in Sync” The node is in sync with the rest of the network and has been loaded with the same or most current NCF.
 A white cube.	“No Impact” The node was not loaded with the most recent NCF, but there is no impact on system operations.
 A light blue (cyan) cube.	“Moderate Impact” The node does not have the most recent NCF loaded, there is moderate impact on system operations and the node should eventually be loaded.
 A yellow cube.	“High Impact” The node does not have the most recent NCF loaded and is out of sync with the rest of the LCN, and there is high impact on system operations. It should be reloaded as soon as possible.
 A red blinking cube.	“Severe Impact” The node does not have the most recent NCF loaded and is out of sync with the rest of the LCN, and there is severe impact on system operations. Reload immediately.

ATTENTION

Any node with an impact of moderate or higher should be restarted or re-initialized as soon as possible.

What Causes An Impact?

To summarize, an online NCF change to an Installation Unit causes an impact. Impacts are summarized in Table 5. This table should be used only as a reference. During online NCF configuration, an NCF check must be run. After the NCF check is run, you will be more informed as to which nodes are affected and the level of impact to those nodes as a result of this NCF change.

The screen prompt instructions will inform you how to resolve the impact of the NCF. This involves reloading the nodes that indicate a moderate impact level or higher with the "new" NCF.

What Are The Effects Of An Impact?

The effects of the impact, as seen from the NCF Status display, can vary from "no impact" to "severe impact." Depending on the type of online change and consequently the level of impact, system operations can be affected.

Most of the online NCF changes that you can make will have a moderate or lower impact.

Table 5 – Summary of NCF Impacts

Installation Unit	Impact	Action
Unit	High (US/GUS, CM, & AM)	Restart
Area	Moderate (US/GUS)	Restart
Console	Moderate (US/GUS)	Restart
Add LCN Node	Moderate (US/GUS)	Restart
Delete LCN Node	Moderate (US/GUS)	Restart
System Wide Values (Console Data)	Moderate (US/GUS)	Restart
Modify LCN Node	High (Node being modified)	Restart
History Retrieval	Moderate (US/GUS, AM, CM, HG)	Restart
Update NCF	None	No action
Volume Configuration	High (HM being configured)	Re-Init
System ID	None	No action
Clock Source	Severe	Reload all
User Average Period	High (HMs with user averages) High (HMs with prearchive user averages)	Restart HM Init
Shift Data	Moderate (US/GUS) High (HMs with continuous history)	Restart Restart affected HMs
Software Options	Depends on the option: Moderate None	 Restart affected nodes No action

What NCF Version is Running?

Each LCN node on the NCF Status display is a target. Selecting a node target displays two timestamps:

Timestamp	Corresponding PSDP Parameter
The timestamp of the NCF with which the node was loaded.	$PRSTSnn.CUR_NCF
The timestamp that the network recognizes as the latest valid NCF timestamp	$PRSTSnn.NEW_NCF

When a node is loaded, CUR_NCF and NEW_NCF are the same.

When an online NCF change is installed, the new NCF time stamp is broadcast to all LCN nodes and stored in their NEW_NCF parameter.

CUR_NCF does not change until the node is reloaded with a more recently installed NCF.

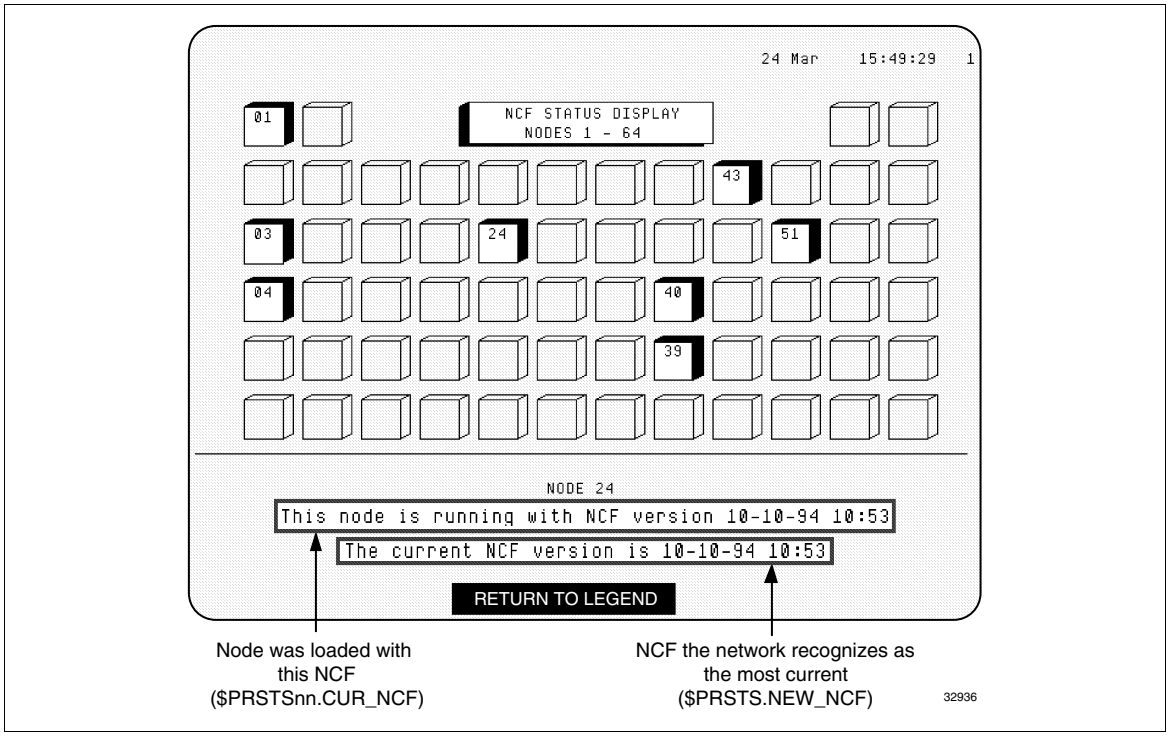


Figure 11 – NCF Status Display

NCF Guidelines

This section contains guidelines to help you plan and manage your database. Some of the choices that you make during NCF configuration must be "unique." These are checked and tested during the NCF configuration process, and the configurator will ensure that your NCF definition meets the requirements of the following list. Knowing this information will help you plan and manage your database. The NCF configurator checks for the following requirements:

- Unit names (IDs) must not be duplicated.
- Area names must not be duplicated.
- Station numbers for one console must be unique.
- Floppy disk numbers and cartridge disk numbers for one console must be unique.
- Printer numbers for one console must be unique.
- Trend pen module numbers for one console must be unique.
- Units can be assigned to only one Application Module[1].
- Units can be assigned to only one Computing Module[1].
- Each process network can be assigned to only one gateway pair (NIM, HG). If the same physical process network is physically connected to two gateway pairs, that process network must be given a different process network number.
- Only one History Module can be assigned to a node pair.
- There must be no more than one system volume.
- Assignment of nodes for checkpointing must not be duplicated.
- Assignment of nodes for load and dump must not be duplicated in more than one History Module.

A key concept to remember in any database-building task is that an internal system link, or "binding," occurs. For the NCF, this means that a database entity you have built will be bound or linked to another subsequent database entity that you build. The rule to remember is subsequent database building tasks have a dependency (linking or binding) to earlier database tasks.

[1] The same unit number can be shared between an Application Module and Computing Module, but cannot be shared between peer nodes.

NCF Relationships To Other Database Tasks

Since some NCF configuration tasks have a relationship (binding) to other tasks, it may be helpful to review how those tasks are related. Figure 12 illustrates the relationship of the NCF data to the rest of the system. For example, assume that you are adding a Unit name that is required in an Application Module. What relationship does it have to other data in the system? The NCF database is the foundation upon which other configuration tasks depend.

You will recall that your database building had various interdependent tasks. Certain database entities had to be defined before other entities could be defined. Because of this, certain entities became "bound" to one another. Figure 12 illustrates this concept, showing that database entities at the top of the figure normally have to be completed before those at the bottom of the figure are completed.

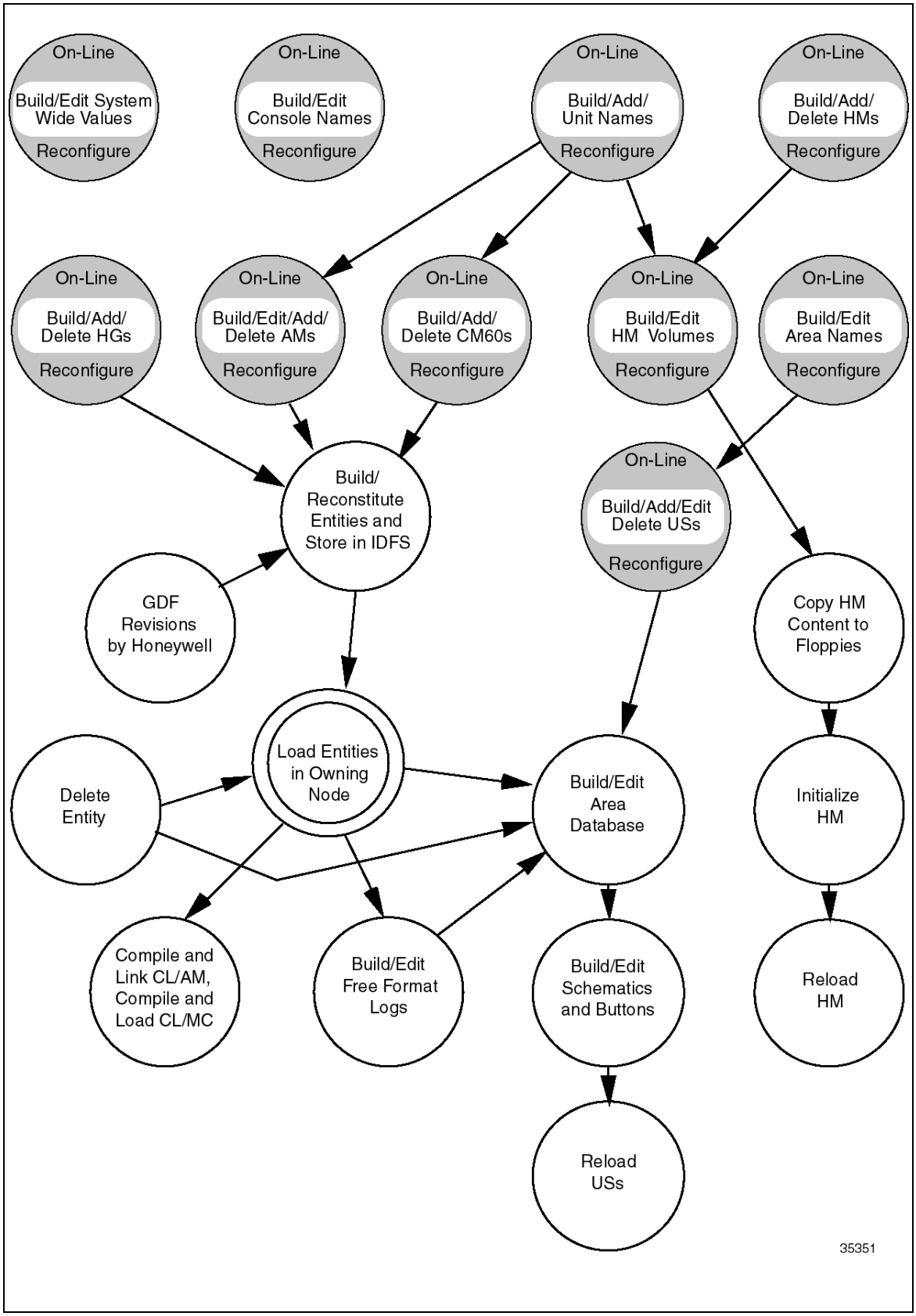


Figure 12 – NCF Relationships

The Significance of Unit Names

As explained in the previous section, NCF database tasks have a binding relationship to one another. If you were to ask, "Which of these is the most significant to remember?", it would be the database task of unit names.

As you may have experienced, the data entry of unit names (unit id) is very easy. The significance of the unit names is sometimes overlooked. The unit name or unit id should be thought of as a "named permanent partitioning of point processing data points." With that in mind, you can see that you are establishing a foundation for your other database building tasks when you define units.

Earlier in this course module it was mentioned that when the unit is assigned to the AM or CM, the Node Administrator treats it as if it were a logical node. This helps explain why an AM or CM has to be shut down, modified (for an AM) or deleted and then added again(for a CM) if more units are added. It also helps explain why an HM needs to be initialized for additional checkpointing volumes, because checkpoint volumes for the AM and CM are unit (or "logical node") based.

Adding a Process Unit

Units are the foundation of most of your database. This perhaps may raise the question, what if a process unit needs to be added to the network?

Depending on the online change you have made, other NCF configuration tasks (that is, installation units) may be required. You saw earlier in Figure 12 that unit names configuration had a number of dependencies upon it.

For example, to add a unit you have to

1. Shut down the node.
2. Modify or delete and re-add the node. This would be true if that unit was required for an AM or CM.
3. Edit volume configuration. To support the unit, the HM would be initialized to change continuous history and process journals. Also checkpoint files for the AM are by unit number.
4. Build points referencing the desired unit.
5. Build HM History groups by unit position.
6. Configure Area database functions such as the Unit Assignment Display, Unit Summary Display, and Process Journals that required unit parameters.

Notice that these steps may not be required. If the unit is not used by the AM or CG, and historization is not required, the unit can be added with less impact.

If you rearrange units in an AM or CG, the entire database in the data owner must be loaded with the NULL DB and all entities loaded, CL recompiled and linked, Area database rebuilt, and so forth.

In other words, *never change unit names.* Always *add* unit names to the end of UNIT NAMES and add the unit at the end of an AM or CG.

HOW THE HM USES NCF DATA

When the HM is initialized, a Network Volume Configuration File is created in the local volume:

```
NET>!9np>Lnp_NVCF.mm
```

where `np` = node pair number

The NVCF file is based on the volume configuration portion of the NCF.CF file.

Installing an NCF.WF file that contains changes modifies the NCF.CF file. When the changes are to HM volume configuration, the changes are not effective until the HM is reinitialized. Reinitialization creates a new NVCF file reflecting the new volume configuration. If an HM is reloaded or autobooted for any reason before it has been reinitialized, the information in the NVCF file (in the local volume) and the volume configuration data (in the NCF.CF file) that is being used by the system does not match, and the HM will fail.

HM Startup

When any node starts up, the Node Administrator imports a view of the network from any other running node. This view is used to determine the number of HMs that need to be searched for the NCF. The Node Administrator calls the file manager to do this searching. If the node being loaded is an HM, its local disk will also be searched for the NCF file.

If the node being loaded is an HM, the following are possible results of the search:

- The NCF is found locally and not on the network—the HM will start up.
- The NCF is found on the network and not locally—the HM will start up.
- The NCF is not found locally or on the net—the HM will not start up.
- The NCF is found on both the net and local disk and the NCF on the local disk is a different version than the version running in the nodes—the HM is not allowed to start up (crashes).

When no NCF exists on the network (such as when no other nodes are up), AND the HM being autobooted has no NCF, the Node Administrator retries two or three times with a 5-minute timeout to wait for the HM with the NCF to come up. If it does not get a response after the retries, the HM crashes.

If the HM is loaded across the net from another node and the NCF is not found on the net or locally, the Node Administrator in the HM will prompt for the NCF from removable media.

ADDING A SOFTWARE UPGRADE

Before upgrading to a new software release, the NCF is often "translated" to support the new release. In migrating to the new release, the LOAD SFW UPGRADE target is used to load NIMs or HGs; later on, the node can be enabled from the US/GUS to become a full primary and assume the above functions.

The LOAD SFW UPGRADE target causes the following to occur:

- the RNOS loader passes a parameter to the node being loaded. This parameter indicates that the node is coming up in an upgrade mode.
- The node being loaded then examines this data and does not do some of the functions that a primary typically would do, such as
  - enabling alarms,
  - HTD functions (configured), and
  - Hiway security functions.
- When the Gateway status display is invoked it queries the HG or NIM to determine if that node is in an upgrade state; if it is, the Gateway status display indicates UPGRADE as the status rather than OK.

LAB TIME •60 Minutes

Use your US

Take with you:
- This course module

LAB EXERCISE 1—ONLINE NCF CHANGE

In this lab, you will perform an online NCF change in order to add a new node to the LCN. The NCF Status Display will be called up to observe the impact to the current network configuration.

Prepare Backup NCF Media

1. Create an &ASY directory on removable media.

2. Call up the Modify Default Pathname display (`SP` [set pathname] from Command Processor).

   In the entry port for the NCF BACKUP PATH type in the pathname to your &ASY on removable media:

   `$Fn>&ASY>`

   Press [ENTER].

   Later, when you enter online NCF configuration changes, a backup of the NCF.CF file will be created at the above specified path.

3. Ensure that the NETWORK CONFIG path is set to `NET>&ASY>`

   Later, your online NCF changes will be installed to the NCF.CF file at the above specified path.

4. Call up the Engineering Main Menu.

Configure New Node in NCF

5. From the Engineering Main Menu, select the LCN NODES target.

6. Ask your course manager for the configuration information about the node to be added.

_____

_____

_____

7. Configure the new node. (Ask your course manager for assistance, if necessary.)

8. Run the configuration checker. [CTL] [F1]

   When displayed on the screen, record the existing LCN nodes that will be impacted by your change:

   _____

9. Install the configuration change. [CTL] [F2]

View the Impact of the NCF Change

10. From the System Menu, call up the NCF Status display.

    Note that the color indications may include white, cyan, yellow, and red, depending on the impact of the change to the node.

    Record the impacts of the NCF change:

    _____

11. Select the target box of one of the nodes.

    As indicated at the bottom of the screen, the timestamp of the NCF running in the node is different than that of the current NCF.

Reload Node

12. Shut down and reload a node with moderate or higher impact.

13. Check the timestamps again. Now the timestamps match and the color of the node target box is green.

End of Lab Exercise 1

LAB EXERCISE 2—CUSTOM NAME REVISION MISMATCH

You will need at least two USs for this exercise.

1. At a US, callup the CNAMREV display for US/GUS, AM, CG, or NG nodes.

   Verify that they are all loaded with the same version of the library files.

2. Unprotect NET>&ASY>PARAMETR.SP and copy a different version of the file out to &ASY on the HM.

3. Shutdown and load a US from the NET.

4. Monitor its status from the CNAMEREV display (note the timestamp) and any messages from the US's Status Detail display.

5. After verifying that a different US has the correct files loaded in its memory, perform a custom name save to restore the correct PARAMETR. SP file to the &ASY directory on the HM.

6 Shutdown and reload the US that is out of revision. Call up the CNAMEREV display to verify that it is now loaded with the same files as its peers.

End of Optional Lab Exercise 2

Optional Lab Exercise 3—Offline NCF Change

In this lab exercise, you will make an offline change to your NCF residing on removable media, then try to start a node with it, and observe that the node fails to start up. You will then call up the resulting error displays and indications.

1. Make an offline change to your NCF.

2. Try to restart a node with your "new" NCF, and observe the corresponding LED errors and SMCC error codes.

3. After you are satisfied in interpreting the errors, restart the node with the current NCF the network is using.

End of Optional Lab Exercise 3

APPENDIX A

Adding a Node to The LCN

Adding a NEW Node to the LCN

One of the most common online NCF changes is to add a new node to the system. This Appendix outlines two methods to physically add the node after completing the NCF configuration. A new node, with the power turned off, can be connected to the cables of a running LCN if care is taken to prevent misconnecting the cables. At least one of the two redundant LCN cables must continue to operate through the entire installation procedure, ensuring that there is no disruption of LCN communications that could cause nodes on the network to go isolated. While the LCN is communicating on one cable, you would connect the new node to the "inactive" cable—the cable on which the node is not communicating.

Before the new node can function, it must be configured into the network configuration file (NCF.CF), and software must be loaded into it. A new LCN node can be physically connected to the LCN before or after you have made the necessary online NCF configuration change. Recall that the NCF change would be performed through the LCN NODES target on the Engineering Main Menu.

A node that has been added to the NCF.CF file, but is not physically present or is not operating, is represented by an OFF in its node status.

The following text describes two possible methods for physically connecting a new node to the LCN cables.

Method 1

Method 1 Procedure

The Method 1 procedure is as follows:

1. Ensure that the new node does not have power on!
2. Force an LCN cable to have an error and eventually have a “suspect” status by removing the LCN Tee from one cable. You have 10 minutes before it tries to swap to the running cable.

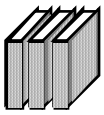
   RESULT: While the cable is in the “suspect” status, the LCN communicates on the other “good” LCN cable.

3. Connect the new node to the “suspect” cable.

4. Manually switch the LCN from the “good” cable to the “suspect” cable.

   RESULT: If no errors occur when communicating on the “suspect” cable, the cable will return to a good status

5. Repeat the same steps to connect the node to the other LCN cable.



REFERENCE—The *LCN Guidelines manual* fully describes this method.

Disadvantage

The disadvantage of this method is that a suspect cable alarm is annunciated. The operator could possibly be distracted by the alarm and respond inappropriately by selecting the suspect cable target, forcing the LCN to communicate on the LCN cable that is disconnected and possibly causing your nodes to go ISOLATED and cause a loss of view or control to the process.

Method 2

Method 2 Summary

In Method 2

1. Hook up the new node (with its power off) on one cable while the network is communicating on the other cable.

2. When the LCN switches back to the original cable, hook up the new node to the opposite cable.

Method 2 Advantage

The advantage of Method 2 is that the cable is not forced to the suspect state.

Method 2 Procedure

The Method 2 procedure is as follows:

1. Prepare the new node to be connected, ensure that its power is off, and have its cables and Tee-connectors ready.

2. Check the System Status display (refer to Figure 13) and verify that both cables are operating with no errors. Do not proceed if there are errors.

3. If there are no errors, wait for the LCN to swap to cable B, or manually select the CABLE B target.

   RESULT: After the swap, CABLE B will appear solid green, indicating that the LCN is communicating over Cable B.

4. Have your partner manually select cable B every 15 seconds or so until you have completed the installation of your node on cable B.

5. Observe the cable status in the System Status display for a few minutes to make sure there are no errors. Observe that the cables continue to switch.

6. After you are satisfied that no errors exist, wait for the LCN cable to swap to LCN cable A, or manually select the CABLE A target.

   RESULT: After the swap, CABLE A will appear solid green.

7. Have your partner manually select cable A every 15 seconds or so until you have completed installation of your node on cable A.

8. Observe the cable status in the System Status display for a few minutes to make sure no errors exist. Observe that the cables continue to switch.

9. After you have determined that there are no cable errors, switch on power to the node.

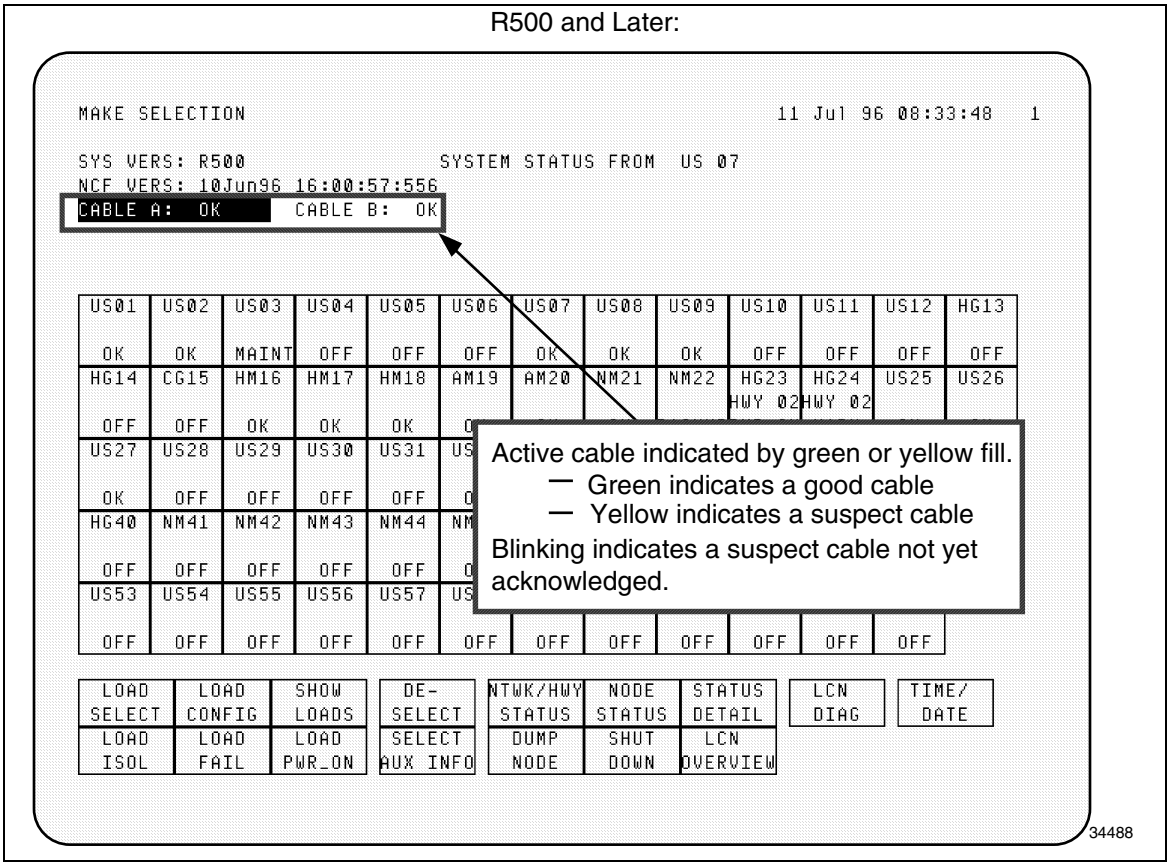


Figure 13 – System Status Display

LAST PAGE