

Application ModuleX Troubleshooting

AX13-200

Application Module^X

Application Module^X
Troubleshooting

AX13-200
Release 200
5/96

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About This Publication

The *Application Module^X Troubleshooting* manual provides the preliminary troubleshooting information necessary to assist Honeywell and customer technical personnel to isolate a TDC 3000^X Application Module^X problem to a particular component or area. It is not intended to be a service manual—it is intended to help identify the area that requires service.

For service information, refer to *Application Module^X Service* manual in this binder.

This publication replaces publications AX13-400 and AX13-500. It supports A^XM release R200, and TDC 3000^X releases R430 and later R4xx, and R500 and later R5xx.

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Acronyms

AM	Application Module
A ^X M	Application Module ^X
CIM	Computer Integrated Manufacturing
HP-UX	.....	Hewlett-Packard version of UNIX
IWSM	.....	Industrial Work Space Manager
LAN	.....	Local Area Network
LCN	.....	Local Control Network
OpenDDA	.....	(Open) Data Definition and Access
OSF	.....	Open Systems Foundation
OSI	.....	Open Systems Interconnection
TDC	.....	Total Distributed Control
TPDG	.....	Turbo Peripheral Display Generator
UCN	.....	Universal Control Network
UNPX	.....	Universal Personality X
U ^X S	.....	Universal Station with Extensions
WSI	.....	Workstation Interface

References

Publication Title	Publication Number	Binder Title	Binder Number
<i>Application Module^X Service Manual</i>	AX13-410/510	Application Module ^X	2094/3094
<i>Five/Ten-Slot Module Service</i>	LC13-400/500	LCN Service - 1	2060-2/3060-2
<i>TDC 3000^X Application Module^X Specification and Technical Data</i>	AX03-200	Application Module ^X	2094/3094
<i>Application Module^X User Guide</i>	AX09-200	Application Module ^X	2094/3094
<i>Application Module^X System Administration Manual</i>	AX11-200	Application Module ^X	2094/3094
<i>License Installation and Administration</i>	LA20-200	Application Module ^X	680/2094/3094
<i>LCN System Installation</i>	SW20-400	LCN Installation	2025/3025

Hewlett-Packard CD-ROM Documentation—Especially the following manuals:

Solving HP-UX Problems

Networking Overview

Administering ARPA Services

Using ARPA Services

Section 1 – General Information

1.1 Overview

Introduction

The Application Module^X *Troubleshooting Guide* provides information to help you isolate an Application Module^X (A^XM) problem to a particular component or area. It is not intended to be a service manual—it is intended to help identify the area that requires service.

Intended audience

This guide is intended for technical personnel.

It is assumed that the users of this document are experienced in the installation, configuration, and usage of traditional Application Modules (AMs), have been exposed to or trained to use Application Module^X, and have a good understanding of HP-UX commands and user interfaces.

Some of the steps recommended in this guide will require the user to log in to the Application Module^X for purposes of examination and problem correction. This will require authorization to use the “root” account to perform these tasks.

What is covered

This guide covers the initial diagnosis of an Application Module^X. The goal of this diagnosis is to determine the most likely reason for a failure or problem so that corrective actions can be focused on the most probable causes.

If your initial diagnosis indicates a hardware problem, refer to *Application Module^X Service* in this binder for corrective action procedures. If you suspect a software or network problem, refer to the applicable Hewlett-Packard CD-ROM manuals—*Solving HP-UX Problems*, and the other HP manuals listed in the *References* section in this publication.

Continued on next page

1.1 Overview, Continued

Types of failures addressed

The types of failures addressed here are those that are unique to the Application Module^X and include problems related to the LCN node processor, Application Module^X coprocessor, coprocessor disk drives, and the Plant Information Network (PIN) connection. The PIN is an ethernet LAN.

Importance of skilled operation and maintenance

This guide also addresses equipment failures and problems introduced through user error. Experience has shown that many Application Module^X problems are the result of incorrect or inappropriate system configuration or operation by end users. Errors of this type can cause the software to appear to function improperly, but this should not be mistaken for “failure.” Such errors are usually recoverable; however, further damage can be done by inappropriate troubleshooting procedures. Before you take any troubleshooting action, be sure you are familiar with HP-UX system administration procedures, are aware of what “used to work,” and how or what events occurred prior to the “failure” or degradation. In extreme cases, such user error can require the reinstallation of system software. For this reason, it is important that your Application Module^X system should be maintained by experienced and trained personnel, and that appropriate file system configuration and maintenance is performed regularly to ensure timely recovery from loss of data through user error.

Using this manual

This guide is structured to provide step-by-step isolation of a failure in a Application Module^X to the failing component. The types of failures are grouped by initial appearance or behavior. For example, “Node fails” or “Personality will not load.” Once the group has been identified, the specific nature of a failure within that group can then be determined.

1.2 Application Module^X Basics

Introduction

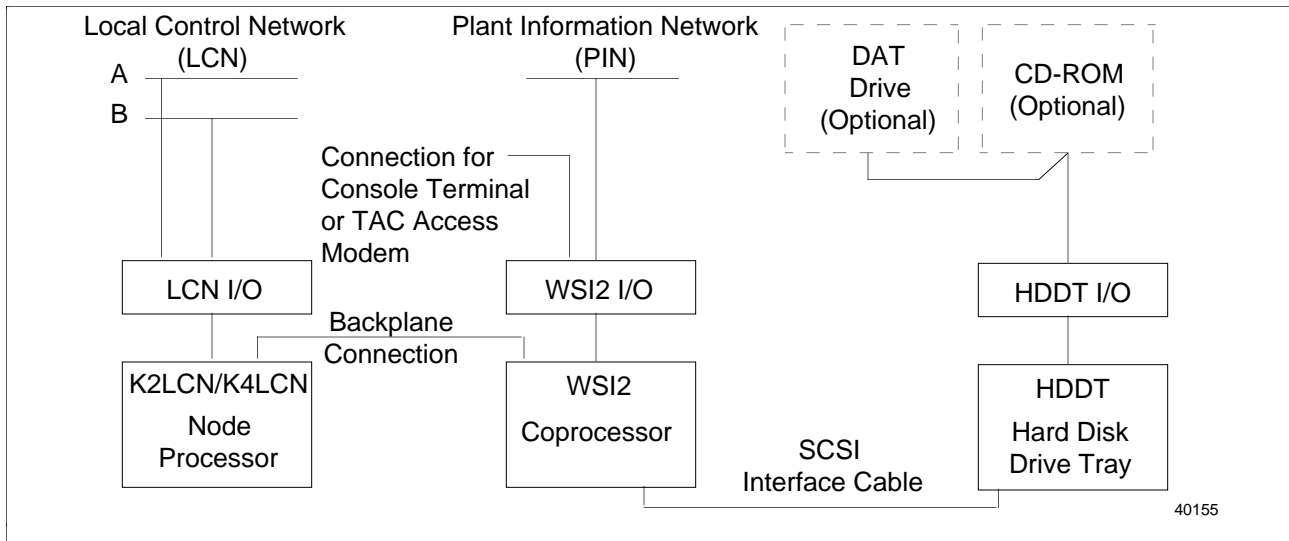
It is important that you have a fundamental understanding of the components and processes of an Application Module^X before attempting to troubleshoot the system. This subsection will describe the main functional hardware and software components of the Application Module^X and describe how these components operate and interact.

Primary functional components of an Application Module^X

The Application Module^X (A^XM) is a hybrid combination that includes both a standard Application Module and a Hewlett-Packard coprocessor running the HP-UX operating system. Two versions of the (A^XM) will be available. One uses the K2LCN or K4LCN node processor and is implemented in a standard Five-Slot Module. The other uses the HMPU node processor and is implemented in a Ten-Slot Module.

Figure 1-1 shows the primary functional components and their physical relationships for the K2LCN or K4LCN version of an Application Module^X.

Figure 1-1 Application Module^X Primary Functional Components (K2LCN/K4LCN Version)



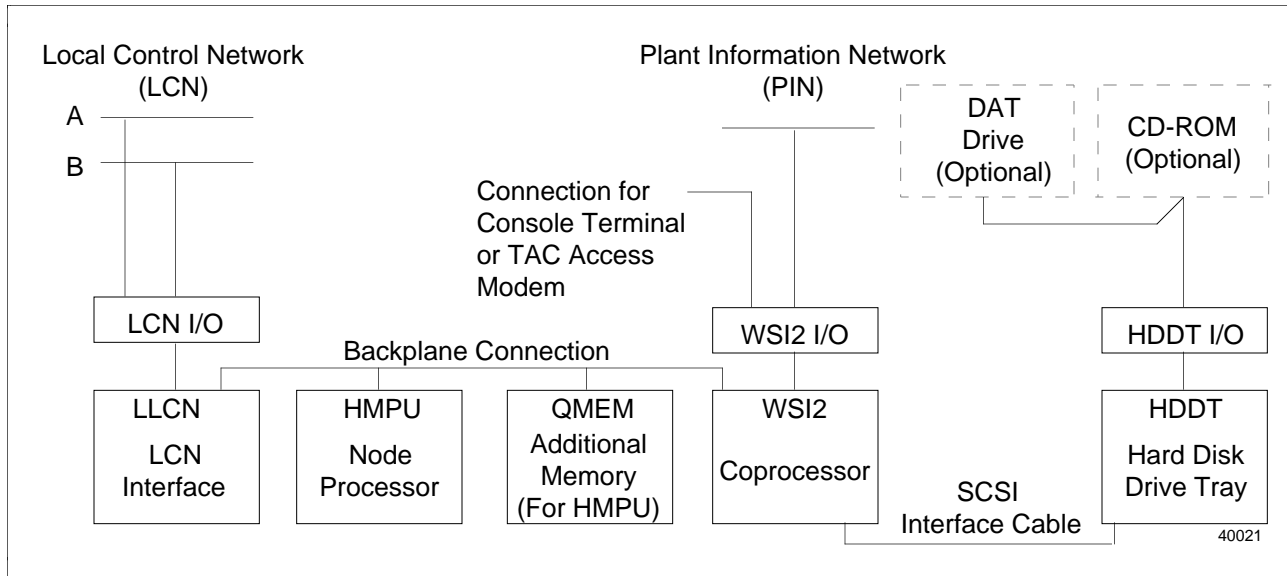
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1.2 Application Module^X Basics Continued

Primary functional components of Application Module^X, continued

Figure 1-2 shows the primary functional components and their physical relationships for the HMPU version of an Application Module^X.

Figure 1-2 Application Module^X Primary Functional Components (HMPU Version)



Additional information on A^XM hardware

The A^XM hardware and other service considerations are described in greater detail in the *Application Module^X Service* manual.

Node processor functions

The TDC 3000^X software (the Application Module^X node personality) executes in the LCN node processor. This portion of the A^XM still provides the conventional Application Module (AM) capability for the system. In addition, it has the capability of communicating with HP-UX applications in the coprocessor.

Continued on next page

1.2 Application Module^X Basics, Continued

WSI2 functions

The Hewlett-Packard coprocessor is located on the WSI2 board. The basic coprocessor internal operating speed is 64 MHz. An optional coprocessor operating at 100 MHz is available. The coprocessor uses one or two hard disk drives for program and data storage, and an IEEE 802.3 compatible Local Area Network (LAN) interface for the Plant Information Network (PIN) connection. Connecting to the LAN is a user choice. The Application Module^X is capable of operating without a LAN connection; however, the optional locally connected DAT drive is required in this case.

A connection is provided for a VT100-compatible terminal, or a U^XS, PC, or workstation running VT-100 emulation. This terminal will serve as a coprocessor console. The coprocessor console is required for initial network configuration and for troubleshooting some coprocessor-related problems. The physical connection is made on the WSI2 I/O board.

TAC access (for troubleshooting assistance) can be provided by connecting a modem to the coprocessor. The physical connection is made on the WSI2 I/O board. The modem is connected to the coprocessor console port; therefore, you cannot use the console and the modem at the same time.

Backplane interaction

The node processor and the WSI2 circuit boards are connected together by the chassis backplane wiring. The backplane provides Direct Memory Access (DMA) to the memory (RAM) on the node processor for the WSI2 board. All bus arbitration and control is provided by the node processor.

Node software

The full Application Module^X functionality involves software in both the LCN node processor and the coprocessor. The node processor provides the execution environment for the Application Module software (personality). This software includes all of the functionality of the standard Application Module (AM) software, plus additional software for the exchange of data with the coprocessor through node processor memory. The personality for a standard AM is loaded from the History Module. The personality for the AM-side of an A^XM must be loaded from the coprocessor hard disk and placed in the node processor memory by the coprocessor. Loading the A^XM personality is a licensed function that is node locked to the A^XM host ID. The load function requires that a valid license file be installed on the A^XM.

Coprocessor software

The coprocessor provides the execution environment for the HP-UX operating system, associated utilities, networking services, licensing services, applications programs, and software for access to LCN data.

Continued on next page

1.2 Application Module^X Basics, Continued

What happens when the coprocessor is not running

If you load AM personality into the node using AUTOLOAD NET, the personality that is loaded comes from the coprocessor hard drive and is specific to the A^XM. If the coprocessor is not running when you attempt to load the AM, the standard AM personality is loaded from the History Module.

If the coprocessor fails or is halted after the AM is loaded and running, the AM will continue to function as follows:

- The node status will go to WARNING.
 - CL applications that do not communicate with the X-side will continue to function normally. These will be applications that do not use the calls in the CL extension set AMCL06.
 - CL applications that do communicate with the X-side using calls from the AMCL06 set will get return statuses indicating errors. The specific actions that take place when this occurs are handled in the CL application, and therefore depend on how the application was coded.
-

What happens when the AM is not running

Shutdown or failure of the Application Module software in the LCN node processor has no direct effect on the software programs running on the coprocessor if those applications do not use OpenDDA functionality to access LCN data. Applications that do access LCN data will get bad-value data and error status indications. What happens in this case depends on how the application was programmed to handle error conditions. Communications with the PIN also remain fully functional. All communications with the LCN node processor stop and hence there is no view to the LCN.

Service information for the AM is found in the *Application Module^X Service* manual. Additional general information is available in the *Five/Ten-Slot Module Service* manual in the *LCN Service-1* binder.

1.3 High-Level Diagnosis

Purpose	These procedures are intended to provide guidelines and suggestions to help isolate a problem to a specific major hardware or software area.
Determining what has failed	The first step in determining a failure cause is to locate the general area, or group of functions that are not working properly. This is accomplished by analyzing the symptoms and by visual inspection of the node hardware, including status indicators.
Analyze failure symptoms	Analyze the failure symptoms in order to determine if the failure is associated with the coprocessor only, the node processor environment only, or both. Refer to the topics “What happens when the coprocessor is not running” and “What happens when the AM is not running” in subsection 1.2 of this manual.
Visual inspection of Application Module^X	Verify the correct installation and configuration of the Application Module ^X . Ensure that all external cable connections for power, LCN, PIN, and peripheral devices (in hard disk drive tray), are properly installed. This also includes the LCN address and disk drive pinning. Refer to the <i>Application Module^X Service</i> manual. You will also find helpful information in the <i>LCN System Installation</i> manual in the <i>LCN Installation</i> binder. Both are in the TDC 3000 ^X bookset.
Visual inspection example	<p>For example, if the LCN Application Module Status display indicates that the A^XM node is OK, there is a high probability that most, if not all, of the hardware associated with the LCN node processor functions is operational.</p> <p>If the yellow “WSCPU Running” indicator on the WSI2 board is on (second indicator from the left), there is a good indication that the coprocessor software is fundamentally operational.</p>

Continued on next page

1.3 High-Level Diagnosis, Continued

Checking board status lamps

Check the status lamps on your boards. Table 1-1 shows the board indicators that should be on. All indicators listed should be in the state indicated in the table. Indicators not listed must be off. Note: The table shows standard boards that can be found in AXMs. Any given AXM will not include all of these board types.

Table 1-1 Board Indicators that Should Be On

Board	Indicator	Meaning
K2LCN/K4LCN	Green	Self-test passed
	Yellow	On or flickering —when on, indicates transmission on LCN cable
	Node address display	Displays node number—any other code preceded by a minus sign indicates an error
HMPU	Green	Self-test passed
	Node address display	Displays node number—any other code preceded by a minus sign indicates an error
LLCN	Green	Self-test passed
	Yellow	On or flickering —when on, indicates transmission on LCN cable
QMEM	Green	Self-test passed
	Yellow	On or flickering —when on, indicates transmission of data to other boards in the node (through the backplane)
WSI2	Yellow	On—indicates that HP-UX is running. Flickering—indicates possible license problem.
Coprocessor	Boot/Run	Blinks during boot, then On

For more information

The *Application Module^X Service* manual describes the use of indicators in determining component failure. This manual includes information about the status indicators on the different possible node processors and their associated boards. The indicators on the WSI2 board and coprocessor daughter board are also defined. Information about board pinning and cabling, as well as maintenance and service information on drives, is also provided.

Continued on next page

1.3 High-Level Diagnosis, Continued

Summary of initial checks

The following is a brief summary of the initial checks that you should make if this is a new installation or the node has been partially dismantled for any reason:

- Check board and cable installation
 - Check board and drive pinning
 - Check status indicators on the power supply, LCN node processor (including possible associated QMEM and LLCN boards), WSI2 board and associated coprocessor.
 - Check that the node address is properly displayed on the node processor.
-

Obtaining AXM and HP-UX software versions

There are commands that will enable you to determine the software release number of your AXM software and the software version number of your HP-UX software. You should have this information if you contact Honeywell TAC for support. All of the following commands are entered when logged into HP-UX in the AXM.

There is a file in the root directory of the AXM hard drive whose name directly correlates to the AXM release that is currently loaded on the disk. For example, presence of the file AXM_RELEASE_100.0.3 indicates that the hard drive is loaded with release R100.0.3. To view this filename, enter the command:

```
ls /AXM*
```

This file is empty—its only function is to identify the release with its name.

To get the HP-UX versions (including patches), enter the command:

```
what /hp-ux
```

To get the OpenDDA version, enter the command:

```
what /opt/DDA/bin/dda
```

Section 2 – Application Module^X Problems and Fixes

2.1 Personality Load Problems

Personality load process overview

The loading of the A^XM LCN node processor is initiated from any US (or U^XS) displaying the Application Module Status display. Selecting the

AUTOLOAD
NET

target and pressing the [ENTER] key causes the following activity in sequence:

- A “load” command is sent to the A^XM node processor.
- The Application Module status display for the loading A^XM changes from “Type = AM, Status = POWER ON” (or QUALIFIED) to the status of “Type = AM, Status = LOC LOAD.”
- The node processor sends a “load me” command to the coprocessor.

Note: If this command is issued prior to the coprocessor HP-UX software coming alive, the standard AM personality will be loaded, the type will go to AM, and the status will go to NET LOAD (the status may be TEST briefly). The yellow indicator on the WSI2 board (on) is the only visual indication that HP-UX software is alive and available to support the node processor load operation.

- The coprocessor loads QLT tests from the hard disk which are then executed by the node processor. The node status may be “Test” briefly.
- The coprocessor reads the personality software from the hard disk and loads it into the node processor memory. The coprocessor requests a license file defined by LM_LICENSE_FILE environment variable. If a license is granted, the node processor startup sequence is initiated by the coprocessor.
- The Application Module status display for the loading A^XM changes to the status of “Type = AM, Status = NET LOAD.”
- The node processor loads the current NCF from the LCN History Module (Net).

Note: The operator will be asked where to find the NCF if it cannot be located on the HM (Net).

The startup mode for the AM side of the A^XM (cold, warm, hot, or no point process) will be the default value that is configured in the NCF, unless the operator overrides this mode. See “Loading the AM Personality” in *A^XM System Administration* for the procedure to override the default startup mode.

- The Application Module status display for the loading A^XM changes from “Type = AM, Status = LOAD” to the status of “Type = AM, Status = READY.”

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2.1 Personality Load Problems, Continued

Personality load process overview, continued

- The node processor loads the CL extension files (including the special AMCL06) from the HM (Net).

Note: The node will crash during the boot process if AMCL06 is not configured in the LCN configuration (NCF) for this AXM. The node status will go to FAIL and the message “External Load Module not found: AMCL06” will be sent to the Auxiliary Node Status Journal. If the installed AMCL06 is not compatible with the installed AXM R200 personality, the node status will go to FAIL and the message “Incompatible version or revision of AMCL06” will be sent to the Auxiliary Node Status Journal.

- The node processor loads the AXM database from the HM (Net).
Note: The node will crash if the database (checkpoint) is not on the HM.
- The node processor notifies the LCN that it is in the Ready state.
- The node processor notifies the LCN that it is an AXM and is in the OK state.
- The Application Module status display for the loading AXM changes from “Type = AM, Status = READY” to the final status of “Type = AXM, Status = OK.”

2.1 Personality Load Problems, Continued

Node loading procedure

The following steps will initiate and verify the A^XM node processor loading activities.

Table 2-1 Loading A^XM Node Personality

Step	Action	Remarks
1	Select your A ^X M	The selected node number turns white.
2	Select the LOAD/ DUMP target	The load targets appear.
3	Select the AUTOLOAD NET target	The press ENTER prompt appears. The NCF default startup mode (cold, warm, etc.) is displayed. A target appears that can be used to override the default startup mode (see "Loading the AM Personality" in <i>A^XM System Administration</i>)
4	Press [ENTER]	Continue with step 5 immediately
5	Observe the displayed status of your A ^X M change through the following states: POWER ON TEST QUALIFIED LOC LOAD NET LOAD READY OK	The A ^X M is loaded and fully functional when it reaches the OK status. The test and qualified states are very short and may not be seen during every load. It depends on the timing of the load versus the screen update on the station. A status of WARNING instead of OK usually indicates a problem related to the user database and point configuration or a license failure. Use the STATUS DETAIL display for your A ^X M to get additional information. Note: The coprocessor software ceasing to be functional will also cause a WARNING status. Be aware that the LCN node processor must be loaded and functional to report this.

Continued on next page

2.1 Personality Load Problems, Continued

ATTENTION

ATTENTION—Selecting the **MANUAL LOAD** or **LOCAL LOAD** targets and answering the subsequent questions will result in loading a standard AM personality into the A^XM node processor. With standard AM functionality, the AM cannot communicate with the coprocessor.

The above has value in troubleshooting A^XM node processor load problems. A successful load of the standard AM personality verifies that the node processor hardware can successfully communicate with the LCN.

Failure of the personality load

Table 2-2 shows some of the failures that can occur during an Application Module^X Personality load and suggests corrective action for each.

Table 2-2 Correcting Application Module^X Personality Load Failures

Symptom	Possible Cause and Corrective Action
Node goes to WARNING. Page 2 of Status Detail for WS INTERFACE shows "WARNING - Workstation Interface License Failure - Retrying.	License request to load the A ^X M was denied or failed. It is important to understand that a license failure during personality load prevents establishment of communication between the X-side and LCN-side. The load function continues to retry the license request. Once the license problem is resolved, the communication is established without requiring a reload. Check the log file on the HP_UX side for the exact license error. The log file is: <code>/var/opt/TDC_Open/common/LCN_daemon.log</code> The License Installation and Administration A ^X M manual contains a list of errors and suggested actions.
Node appears to start the process (Status on display is LOC LOAD) and never progresses to NET LOAD.	Coprocessor or HP-UX not functional or WS12 interface to the node processor is not functional. First, check the node hardware indicators. If ok, resolve coprocessor or disk problem using the coprocessor console (dumb) terminal. Approach as an HP-UX software problem. Attempt to load a standard AM personality from the HM using the MANUAL LOAD target (as opposed to the Application Module ^X Personality from the hard disk). If this is successful, it is a good indication that the node processor and its interface to the LCN is functioning correctly. The node processor personality file on the hard drive could be bad. Reload the personality file from a backup source.

Continued on next page

2.1 Personality Load Problems, Continued

Failure of the personality load, continued

Table 2-2 Correcting A^XM Personality Load Failures, continued

Symptom	Possible Cause and Corrective Action
Node fails during the load as seen at the AM Status display	<p>The required software file AMCL06 may be missing from the HM or the NCF configuration for the A^XM, or an incompatible version may be specified in the NCF configuration. Correct the A^XM configuration in the NCF and reload the A^XM. See Appendix I of the <i>CL/AM Reference</i> manual for more information.</p> <p>LCN node processor not functioning properly. First, check the node hardware indicators. If OK, attempt to load a standard AM personality from the HM using the MANUAL LOAD target (as opposed to the Application Module^X Personality from the hard disk). If this fails also, the node processor and its interface to the LCN is suspect.</p> <p>Attempt to load a standard AM personality from a local Bernoulli. If this works, suspect problems between the node processor and the system HM. Make sure the node is visible on the LCN (not OFF status).</p>
The standard AM personality is loaded, rather than the A ^X M node personality	<p>The shutdown switch on the WSI2 board may be in the shutdown position rather than in the run position. Check this switch.</p> <p>The coprocessor or HP-UX is not functional or the WSI2 interface to the node processor is not functional. First, check the node hardware indicators. If ok, resolve coprocessor or disk problem using the coprocessor console (dumb) terminal. Approach as an HP-UX software problem.</p> <p>The A^XM load was initiated before HP-UX was fully functional after power on. Check the yellow indicator (on) on the WSI2 board, and when it is on, shut down the AM and retry the AUTOLOAD NET operation.</p>

2.2 Determining if HP-UX is Operational

Initial diagnostic checks There are four diagnostic steps that you should perform initially:

- Check the WSCPU Running indicator on the WSI2 board
- Check the WS INTERFACE status at a US or U^XS
- Attempt to log in from another station on the PIN
- Observe the A^XM boot process from its console terminal

Check the WSCPU Running indicator

If the yellow “WSCPU Running” indicator on the WSI2 board (second from the left) is not on, the HP-UX kernel is not running or communication with the LCN is not operational. Refer to Section 4 of the *Application Module^X Service* manual for information about the location of this indicator.

Check the WS INTERFACE status

Perform the following procedure from a US or U^XS to view the coprocessor (WS INTERFACE) status. A status of OK indicates that the AM processor (K2LCN, K4LCN, or HMPU) is communicating with the HP-UX processor, indicating that the HP-UX kernel and LCN interface software are functioning at least well enough to communicate. A status of WARNING, caused by the WS interface, indicates that a license problem exists (see description following status) or that the AM processor cannot communicate with the HP-UX processor, and HP-UX may or may not be functional. If other tests indicate that HP-UX is running, check that *lcndaemon* is running (see subsection 2.4).

Table 2-3 Checking WS INTERFACE Status

Step	Action
1	Perform the following from a US or U ^X S: Press the [SYS STATS] button
2	Select APPLICATION MODULES
3	Select the desired A ^X M node
4	Select STATUS DETAIL
5	Page forward to Page 2. The coprocessor status will be given; for example: WS INTERFACE OK

Continued on next page

2.2 Determining if HP-UX is Operational, Continued

Try a remote login

Try to do a remote login (`rlogin axmname`, where *axmname* is the Internet hostname of the A^XM). If this is not successful and the previous tests indicate that HP-UX is running, you have a network problem. See Section 3, Troubleshooting the Ethernet LAN.

Testing with an HP-UX console

The next step is to connect a console terminal directly to the coprocessor so that you can observe the boot process and use keyboard input/output, if appropriate. You can only observe the boot process from the system console. Also, if communications on the LAN are not working, the console terminal is your only means to access and view the system operation.

See the *Application Module^X Service* manual for information about connecting a console terminal (can be a U^XS, PC, or workstation with kermit or other VT-100 emulation software).

Observe the attempted boot

Turn on A^XM power to initiate the coprocessor bootload process.

Watch the console terminal and observe whether the bootload process starts, and if so, how it terminates and what error messages, if any, are reported.

A bootload, as monitored on the terminal, begins with the copyright information. This is followed by a self-test, the bootload of system software, and initiation of internal processes. A successful bootload ends with the prompt `Console Login:` on the terminal screen.

ATTENTION

ATTENTION—If there is anything suspicious about the bootload process, refer to the Hewlett-Packard manual *Solving HP-UX Problems* (on CD ROM). Chapter 5 of this manual, *System Boot-up Problems*, has a comprehensive discussion of the bootload process, including problems that can occur. This resource also includes a quick-reference troubleshooting table for bootload problems.

Also, see the topic **File system corruption** in the next subsection of this manual.

2.3 Troubleshooting if HP-UX is Not Operational

File system corruption

The most common problem affecting HP-UX's ability to boot is file system corruption, typically caused by improper shutdown or a failure of power to the coprocessor and its subsystems. If the station is improperly shut down, the latest changes to files may not have been updated to disk, resulting in file system corruption. For performance reasons, file system writes are cached, or accumulated in memory, until they can be written to the disk in an efficient manner. If the system is improperly shut down (manually, or by power failure, or crash) while disk data are cached, there will be a difference between what HP-UX "thinks" is on the disk and what is actually there. A process called "fsck" (File System Check) is run automatically at boot time to check for and correct this and other problems. Usually, this process will correct the problems automatically; however, multiple power failures occurring in a short period of time can cause this process to be interrupted. This can result in an inconsistency that cannot be corrected automatically. When this occurs, the boot process will pause in the fsck process and prompt the user to enter a choice of corrective action from the coprocessor console.

To determine if this is the reason your Application Module^X coprocessor is not functioning, attach the coprocessor console terminal as defined in Section 6 of the *Application Module^X Service* manual. Turn the A^XM power on and monitor the boot process on the coprocessor console to determine if the "fsck" process is waiting for input. If so, provide the appropriate input to allow the process to complete.

Disk failure

Another potential reason for a nonfunctional HP-UX system is the failure of the local coprocessor disk drive. When the Application Module^X is powered on, the coprocessor firmware will automatically search for a boot file on all attached disk drives. This search is indicated on the coprocessor console device. If the local primary disk storage drive has failed, the system will remain in the system search mode indefinitely until appropriate action is taken.

The recommended method of recovering from a primary hard drive failure is to replace the primary coprocessor disk drive with a new formatted drive provided by Honeywell. This must be followed by a boot load from a local (or network accessed) DAT drive using a Honeywell provided tapes. Once the boot is complete and software loaded, a complete restore of disk data must be done from a "backup tape" that you previously generated. Procedures for recovery from a primary hard disk drive failure are provided in the *Application Module^X System Administration* manual.

2.4 Checking Running Processes

Overview

If the WSI2 “WSCPU Running” indicator (second from the left) indicates that HP-UX is running, but application software is not running properly, check the status of Honeywell Application Module^X support software tasks as well as other system tasks that are critical. The coprocessor console terminal connection described in subsection 2.3 of the *Application Module^X System Administration Manual* is required to ascertain this information.

Check process status

To check running tasks, perform the steps in Table 2-4.

Table 2-4 Procedure to List Running Tasks

Step	Action				
1	Connect a console terminal as described in subsection 2.3 of the <i>Application Module^X System Administration Manual</i> .				
2	At the coprocessor console device, enter the following command: <pre>ps -ef more</pre> This command will provide a listing of all running processes.				
3	Determine if the primary processes required for Application Module ^X are running. These processes are: <table style="margin-left: 40px;"> <tr> <td>lcndaemon</td> <td>The Honeywell LCN interface manager. There should be two copies of this process running.</td> </tr> <tr> <td>cdsdaemon</td> <td>There should be three or more copies of this process running. There will be only two copies if the LCN and the coprocessor are not communicating.</td> </tr> </table>	lcndaemon	The Honeywell LCN interface manager. There should be two copies of this process running.	cdsdaemon	There should be three or more copies of this process running. There will be only two copies if the LCN and the coprocessor are not communicating.
lcndaemon	The Honeywell LCN interface manager. There should be two copies of this process running.				
cdsdaemon	There should be three or more copies of this process running. There will be only two copies if the LCN and the coprocessor are not communicating.				
4	If either of the above processes is not running, there may be a problem in the startup sequence of the Application Module ^X . Check the log files for indications of why this process is not functioning properly. Note: When the system boots, the daemon log files are copied to “old” files and new logs are started. These log files are: <pre>/var/opt/TDC_Open/common/CDS_daemon.log /var/opt/TDC_Open/common/LCN_daemon.log /var/opt/TDC_Open/common/CDS_daemon.log.old /var/opt/TDC_Open/common/old.LCN_daemon.log /usr/adm/syslog (normally, only startup errors)</pre>				
5	If there has been a recent installation of a software update, inspect the file <code>/tmp/update.log</code> to determine if an error occurred during the installation.				

Continued on next page

2.4 Checking Running Processes, Continued

If a task is not running If you find that one of the required tasks is not running, we suggest that you do an orderly shutdown and restart of HP-UX and check again. You should also check the log files as covered in Table 2-4, and particularly be sure to check /tmp/update.log if you recently installed a software update.

2.5 Coprocessor Modem Connection

Purpose

A modem connection to the coprocessor can be used for remote maintenance and support by the Honeywell Technical Assistance Center (TAC). The modem connects to the same port (Serial Port 1) used for connecting the coprocessor console terminal. TAC, using compatible equipment, can access the coprocessor for in-depth troubleshooting activities when needed.

Coordinate TAC access

Access must be coordinated with TAC to ensure modem compatibility, telephone connection details, and scheduling of time. A discussion of the problem, symptoms, and history should precede a modem session. TAC initiates the session once the modem connections are made on site.

Configuration and modem connection requirements

A detailed procedure for connecting the TAC access modem is provided in the *Application Module^X Service* manual (Section 7). It includes configuration requirements for the modem to support this specific telecommunications link.

The coprocessor serial port does not require any configuration changes. The same configuration that supports the coprocessor console connection also supports the modem connection. The proper configuration for the serial port is provided by the default values in the delivered software.

Prepare ahead

It is important to verify the modem connection with TAC before trouble necessitates its use. If you anticipate using a modem for troubleshooting, perform a trial connection with TAC when the system is running (if possible) to ensure that the configuration, cable, and modem are fully configured and functioning properly.

2.6 Disk Drive Failure Recovery Scenarios

Background

The recovery activities required to recover from a hard disk drive failure are something that all users must understand. Site specific recovery plans must be thought out and put in place. The disk drives used in the A^XM are current-state-of-the-art devices with excellent longevity. However, disk drives are still electro/mechanical devices and failures, though rare, can occur. All data on the drive is lost when a drive is replaced for any reason. Data recovery must be made from a backup source such as a DAT tape.

The Primary hard disk drive (address 6) contains the HP-UX software files, plus user files. The optional second hard disk drive (address 5) provides storage for additional user files.

Backup activities

Performing coprocessor disk drive data saves (backups) to a DAT tape drive is normally the responsibility of the user. This DAT tape drive must be accessible over the Plant Information Network (PIN). The DAT tape drive is an option that is available for each U^XS, A^XM, and it is also available for HP712/60 work stations connected to the PIN.

Disk backups need only be created whenever anything is changed in the software or user files that are resident on the disk(s). Some customers may run with a fixed set of applications resident on the coprocessor subsystem. In this case, a backup made when it is placed in service is sufficient. Other customers (especially those doing solution development work) will have the need of performing backups as dictated by their development activities.

In freestanding A^XM installations (turnkey solutions with no connections to the PIN), the end user must have the A^XM DAT drive option to have the capability of performing disk backups.

Continued on next page

2.6 Disk Drive Failure Recovery Scenarios, Continued

Replacement disk drives

Honeywell logistics will stock replacement drives that will be properly formatted and ready to use on the system. They will not have any software files on them.

If the primary hard drive is replaced, a load from a Honeywell supplied tapes must be done to recover the generic software files. Subsequently, a restore from a previously generated backup media (DAT) tape is needed to restore the site specific software configuration and user files.

Procedures for drive replacement

The *Application Module^X Service* manual (Section 5) provides the procedure for replacing the hard disk drives. The *Application Module^X System Administration* manual provides hard disk drive failure recovery procedures.

Continued on next page

2.6 Disk Drive Failure Recovery Scenarios, Continued

Drives from another AXM

Site circumstances may occur where a hard drive failure will keep the AXM coprocessor down because a spare drive is not immediately available. Users with training systems (or other off-process AXMs) may attempt to move an existing drive from the “less critical system.” This must be done with a great deal of care to prevent recovery problems.

If the primary drive is replaced with a drive containing files from another system, it may have the proper files resident to allow a software boot operation. (i. e., It may have been the primary drive in the previous system.) The coprocessor will boot from this replacement drive (if the proper software files exist on it) and assume the exact configuration that existed on the previous system. After making the appropriate configuration changes to access the PIN network in the new environment (required to reach a Network DAT), a complete restore from a DAT drive backup tape (or other available source) is required to get the coprocessor file structure to reflect conditions existing prior to drive replacement. A subsequent reboot of the coprocessor will finish the recovery actions.

Replacing the primary drive with a drive that was not a primary drive in an AXM (or UXS) will require the same activity as required for a formatted spare drive with one additional step. The existing files that exist on the drive must be destroyed using the “mediainit” and “newfs” commands prior to loading the new software. The “mediainit” and “newfs” commands are used to initialize the drive.

If the optional second drive is replaced with a drive containing files from another system, the existing files must be discarded by initializing the drive. The “mediainit” and “newfs” commands are used to initialize the drive. This initialization must be done prior to issuing the “mount” command which puts the drive under system control. A restore operation from DAT drive backup tape (or other available source) must now be done to place the required data on the new drive. The commands mentioned in this paragraph are documented in the HP-UX documentation. It can be accessed on CD-ROM over the PIN or through the “MAN PAGES” resident on the coprocessor disk drive.

Other backup options

Users with “mission critical” AXM applications can consider implementing, or acquiring third-party solutions for automated network backups. Solutions can be very sophisticated and include options such as disk mirroring, which facilitate switchover to replacement drives. Honeywell does not recommend any specific solution at this time, but users should be aware that such solutions do exist.

Other Honeywell services

Preinstallation planning, installation, startup services, file system management services, and update services for sophisticated implementations are available from the Honeywell **TotalPlant** Applications Center (TPAC).

2.7 Coprocessor Hardware Replacement

Background

Each coprocessor daughter board (mounted on the WSI2 board assembly) has a unique software visible hardware identification number manufactured into the board. This hardware identification number is tied directly to the user Kinet software license. Only users requiring DECnet communications support will have Kinet software installed on their coprocessor system.

Honeywell provides the appropriate Kinet license key (correlated to the coprocessor hardware identification number) to the customer with the Kinet software at the time of shipment. The customer must enter this license key into the configuration data for the Kinet software.

Replacement of a WSI2 board assembly due to failure (or any other reason) also changes the hardware identification number. This makes the existing Kinet license key (if originally provided) unusable. A new Kinet license key (if Kinet is installed) must be obtained when the WSI2 board is changed.

The Honeywell license key information (correlated to the Internet Protocol IP address) is obtained from Honeywell prior to system installation. The customer creates a license file based on this information. This license file is not affected by replacement of a WSI2 board assembly.

Continued on next page

2.7 Coprocessor Hardware Replacement, Continued

Obtaining replacement Kinet license and address

The steps required for obtaining a replacement Kinet license key are provided in the following table:

Table 2-5 Obtaining a Replacement Kinet License and Address

Step	Action
1	Install the new WSI2 board assembly as outlined in the replacement procedure provided in the Application Module ^X Service manual.
2	Power on the node and allow the coprocessor to complete its software boot.
3	Sign on as a user. This can be accomplished from any HP-UX compatible device on the PIN (Workstation or U ^X S), or the coprocessor console.
4	Enter the command <code>/etc/lanscan</code> . The last 12 characters after "Ox" under Station Address is the new coprocessor hardware identification number.
5	Having obtained the new hardware identification number, call the Honeywell Technical Assistance Center (TAC) at telephone number 800-822-7673. Inform them that you have changed your Application Module ^X coprocessor hardware and give them the new hardware identification number.
6	Honeywell will, in turn, provide a new Kinet license key which must be entered into the Kinet software configuration data of your system. To do this, you must reinstall the Kinet software.

Section 3 — Troubleshooting the Ethernet LAN

3.1 Local Area Networking (LAN) Overview

Related publications The Hewlett-Packard publications covering ARPA, NFS, and NS Services detail the use and configuration of networking services available on the TCP/IP Local Area Network (LAN).

The publications of interest are:

Networking Overview

Using ARPA Services

Administering ARPA Services —(Chapter 8 is on troubleshooting)

ARPA/Berkeley Reference Pages

Installing and Administering NFS Services

Installing and Administering Network Services

Network standards The International Standards Organizations (ISO) has developed the Open System Interconnection (OSI) model. The design allows computers from different vendors to exchange data regardless of their operating systems and processor hardware. The model divides the communications system into its functional components and specifies a layered structure in which each layer connects only to the layer above and below it. This design structure allows an ethernet cable to carry multiple protocols simultaneously.

IEEE 802 standard The Institute of Electrical and Electronic Engineers established standards that specify interface and protocol specifications for various LAN topologies. The 802 standard corresponds with the Physical and Data Link layers of the OSI model and provides a common interface to the higher layers of software over networks with differing topologies, protocols, and media.

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3.1 Local Area Networking (LAN) Overview, Continued

How TCP/IP fits OSI

The TCP/IP protocol suite’s relationship to the ISO-OSI model and IEEE’s 802 standard is shown below. The software utilities and their test programs perform discreet functions corresponding to each OSI layer.

ISO-OSI MODEL	IEEE 802 STANDARDS	TCP/IP PROTOCOLS	TCP/IP TESTS
APPLICATION LAYER #7		FTP	ftp -d
PRESENTATION LAYER #6		TELNET	telnet with trpt
SESSION LAYER #5			netstat mbd
TRANSPORT LAYER #4		TCP UDP	
NETWORK LAYER #3		IP	
DATA LINK LAYER #2	802.2 802.3		ping
PHYSICAL LAYER #1	802.4 802.5		

13226

Layer 7 — This layer consists of application programs and serves as the window, or network interface, through which all exchange of data occurs between communication users.

Layer 6 — This layer performs data conversions and ensures that data is exchanged in an understandable format.

Layer 5 — This layer sets up and terminates communications on the network and manages the dialogue between users and systems.

Layer 4 — This layer controls the quality of data transmission. It is mainly implemented by communications software protocols such as TCP.

Layer 3 — This layer determines the path that the data will take through the network. Packets of information contain routing information that aid passage through the network.

Layer 2 — This level packages data for transmission and unpackages it for receipt.

Layer 1 — This layer defines the physical connection (connector and pin assignments, voltage levels, and the initial cable connections) between a computer and network, and also controls the transmission of information.

3.2 TCP/IP Overview

Standard protocol

The Transmission Control Protocol (TCP) and the Internet Protocol (IP), referred to as TCP/IP, provide services allowing dissimilar computer systems to communicate and exchange data.

The original TCP/IP development by the Defense Advanced Research Projects Agency (DARPA) has received widespread support from computer manufacturers of all types.

Protocol vs. physical device

TCP/IP protocols were designed to provide communications services over a variety of physical networks—from computer networks to radio networks. The protocols define how to send and receive messages, but not what the physical device must do to send or receive messages. This enables vendors to create device drivers specific to the hardware.

TCP/IP utilities

The utilities provided through TCP/IP are:

- `telnet`—provides communications using the Telnet Protocol.
 - `ftp`—File Transfer Protocol transfers files to/from a remote site.
 - `lpr`—Remote Line Printer queues and prints files to shared printers.
 - `rcp`—Remote Copy of files between machines.
 - `rexec`—Execution of commands on a remote system.
 - `rlogin`—Login to a remote host.
 - `remsh`—Execute a shell command on a remote host.
-

Hosts, gateways, bridges, and routers

Computers that use the TCP/IP protocols to communicate are called TCP/IP hosts. A host can also be a gateway, bridge, or router to another network.

Gateways connect two incompatible networks providing a physical link that is transparent to the users. Communications between users on separate networks is “routed” through the gateway that provides translation of all seven OSI protocol layers. For example, a gateway must translate the protocols and the physical interface connections when joining TCP/IP over Ethernet to Apple Computer’s AppleTalk protocol over LocalTalk cabling.

Bridges connect two similar networks allowing each to function independently. Traffic addressed to users on the remote network is routed across the bridge connection, yet local traffic is isolated to its respective network.

Routers connect networks with different protocols but similar cabling systems. The router provides protocol translation only.

Continued on next page

3.2 TCP/IP Overview, Continued

Host names

The Internet Protocol's ability to correlate alias names (host names) to address numbers, allows users to reference systems on the LAN by a name assigned on the basis of the computer's function or location (for example, `Inventory` vs. `Unit1_Station3`). This "hostname" is aliased to the internet address by its entry in the `/etc/hosts` file.

How `/etc/hosts` is used

At boot time, each computer on the network must have a minimum host file on its local disk to initialize the hostname-to-internet address mapping. If the host is configured to use a name server, the server is used to resolve hostname to Internet protocol requests.

A minimum `/etc/hosts` file contains the following entries:

```
# The form for each entry is:
# <internet address> <official hostname> <aliases>
#
# See the hosts(4) manual page for more information.
# Note: The entries cannot be preceded by a space.
#
# To use subnet masking uncomment the defaultmask entry
# and enter the desired value (e.g. 255.255.255.0).
#
# 255.255.255.0    defaultmask
127.0.0.1         localhost        loopback
127.0.0.2         unknown
###.###.###.###  hostname        alias_for_hostname
```

Where the `hostname` entry will resemble this:

```
123.45.114.211    axml.iac.honeywell.com    axml
```

Name servers

The Internet Protocol defines services to simplify `/etc/hosts` file maintenance on large networks. The Berkeley Internet Name Domain (BIND) service is often referred to as the "name server." The configuration and troubleshooting of the domain name service is covered by Hewlett-Packard's publication "Administering ARPA Services."

Overview of BIND

With BIND service, the `/etc/hosts` file is maintained on one system (the primary or master) that provides host-to-internet address mapping for the other systems on the LAN.

The master system is configured with the IP daemon named to resolve host-to-address requests. Flexibility in configuration can provide continuous operation by secondary name servers should the primary fail or be shutdown for maintenance. Updating the master's `/etc/hosts` file initiates a transfer of the update information to all secondary servers and gateways.

Continued on next page

3.2 TCP/IP Overview, Continued

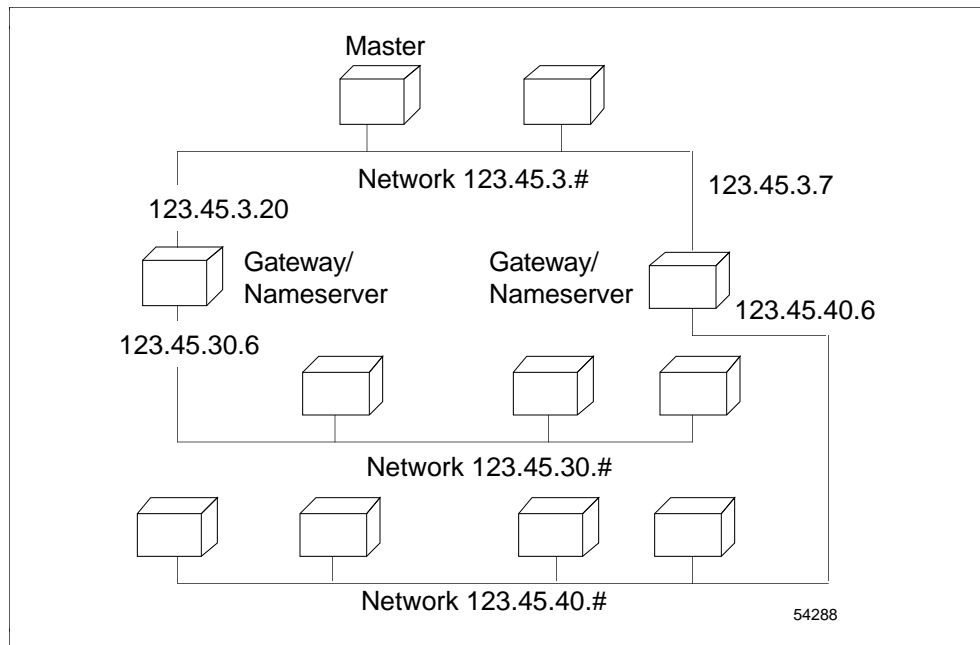
Overview of BIND, continued

Using the name service eliminates problems caused by incorrect or missing `/etc/hosts` entries. Problems are eliminated by supplying the address from the master server's `/etc/hosts` file when starting a communications session. Communication tasks can be automated without fear of future address changes requiring any alteration to the scripts. Referencing the system by hostname ensures the address is looked up each time the script is executed.

Typical name server architecture

Figure 3-1 shows a typical configuration of the name server in a workstation environment. The name service is run on each internet segment's gateway node to reduce traffic on the main segment and provide secondary servers in case of server node failure. Each system has a minimum `/etc/hosts` file and a `/etc/resolv.conf` file to configure the host to query the appropriate name server.

Figure 3-1 Network Example



3.3 TCP/IP Services and Processes

Use of daemons

Daemons provide the server processes necessary to provide TCP/IP services. These processes are run in the background (transparent to user) on TCP/IP hosts.

The daemons provide the following:

- Control user access to network resources
 - Respond to requests for data
 - Record statistics concerning health of the network
 - Control external communication pathways outside the local network.
-

TCP/IP daemons

Daemons used to provide TCP/IP services are:

- `routed` — dynamically maintains network routing tables. It starts at boot time on all nodes, but is stopped on host nodes after “`routed`” initializes the local routing table. Gateway nodes run this daemon continuously.
 - `inetd` — this is a single process started by `/etc/rc` at boot and serves as a “super daemon,” invoking the appropriate Internet servers as services are requested. The `inetd` process must be running to use the servers `ftpd`, `telnetd`, `rexecd`, `rlogind`, `remshd` or `tftpd`.
 - `ftpd` — this server daemon is run by `inetd`, as requests for File Transfer Protocol (FTP) services are received.
 - `telnetd` — this server daemon is run by `inetd`, as requests for Telnet services are received.
 - `rexecd` — this server daemon is run by `inetd`, as requests from hosts to execute HP-UX commands remotely are received. `rexecd` must receive a valid user ID and password from `rexec`.
 - `rlogind` — this server daemon is run by `inetd`, as requests from hosts for remote logins are received. Users can login on any host running `remshd` and if the remote host is listed in `/etc/hosts.equiv`, no password is required to connect.
 - `remshd` — this server daemon is run by `inetd` when another host requests remote execution through the `rcp` or `remsh` or the `rcmd` function. If the remote host is listed in `/etc/hosts.equiv`, no password is required to connect.
 - `tftpd` — this server daemon is run on-demand by `inetd`, as requests for Trivial File Transfer Protocol (TFTP) are received.
-

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3.3 TCP/IP Services and Processes, Continued

TCP/IP daemons, continued

- `rwhod` — this daemon is run by the `/etc/rc` file at boot time and provides an Internet system status server. `rwhod` maintains a database of status information used by the `rwho` and `ruptime` programs.
 - `gated` — this routing daemon uses Routing Information Protocol (RIP) and HELLO protocol to collect information from within one network and the Exterior Gateway Protocol (EGP) to announce its routes to another system.
-

TCP/IP daemons vs. processes

System operation consists of individual applications providing a portion of the system functionality as it is needed. Network services require various daemons to enable the communication protocols and complete the logical connection between operating systems.

Boot sequence

The communication daemons providing the network services are initialized during the HP-UX boot process. The system “run commands” file `/etc/rc` is executed at boot time to initialize the daemon processes that provide system services. These processes continue to execute (listening for requests) as long as the coprocessor is operational and powered ON. They are said to be “background processes or daemons” and are not directly visible to the network users. They remain executing as users log in. During network operations `/etc/inetd` appears to respond to your telnet requests. However, the user’s original telnet request is redirected by the daemon process `/etc/inetd`, which creates a new daemon process `/etc/telnetd` assigned to interpret the user’s internet commands. This process will die at completion of the logout sequence.

3.4 Troubleshooting Steps

Overview of troubleshooting process

The Local Area Network (LAN) administrator will be a valuable resource when troubleshooting coprocessor LAN communication problems. Honeywell terminology frequently refers to the LAN as the Plant Information Network (PIN). The goal of the troubleshooting process is to identify the problem node or the break in the network cable.

Documentation of the network's design and layout is extremely important, as are any changes you may make as a result of the corrective actions. Inform the network administrator of any changes including descriptions of the problems: indication, suspected component(s), and the resolution or work around with printed copies of configuration changes.

Initial tests

It is important during the initial tests to locate the suspect node (and if possible, the protocol layer) before proceeding to the detailed software testing. The initial procedures test the physical hardware and will quickly identify a problem node. Specific tests are performed at the suspect node to confirm the fault and determine the corrective action.

The software tests produce a significant amount of data and require time to interpret. Always test on the principal of "from the local to the remote." Confirm local communications (with yourself through software loopback connection) and progress in steps to the big picture. Tests of communications with hosts located across components such as LAN router or gateway nodes may identify problems with other resources. Again, an accurate network diagram will help direct your troubleshooting efforts.

Detailed protocol tests

Communication failures caused by software problems are generally easy to identify. They often show the physical hardware connections to be functional. The node's ability to communicate with other Internet hosts depends on many processes possibly executing on computers outside of your area of operations. For example, assume the domain name server is located/administered at the corporate headquarters and it has not been updated with the latest network changes. In these cases, you must consult your network administrator and follow local procedures concerning the updating/testing of these remote resources.

It is suggested that you check the TCP/IP software on each host and gateway involved. For example, ensure that the `/etc/inetd` daemon is running and does start the `/etc/telnetd` process when `telnet` is invoked.

The TCP/IP error messages identify the common problems and point you toward the node or software layer most likely to contain the fault.

Continued on next page

3.4 Troubleshooting Steps, Continued

Detailed protocol tests, continued

If the error message doesn't readily identify the problem, the network troubleshooting utilities will be needed to observe each protocol's function and interaction with the other protocols. The most frequently used tools provided for this are `ping`, `lndiag`, and `netstat`.

The `netstat` tool provides network status information used to locate problems at the network layer. The `ping` tool verifies a remote system to be active and available on the network and secondarily confirms a functional path (physical layer) between the systems.

Listing the current processes

To list all currently running processes, use the process status command (`ps`) and arguments to help confirm proper process activity. Determine the daemon(s) that should be running and check the process status. Remember many daemons are only active when a connection is open.

To list full information on all processes, viewed one page at a time, type:

```
ps -ef | more<RETURN>
```

to produce this output :

UID	PID	PPID	C	STIME	TTY	TIME	COMMAND
root	0	0	0	Dec 31	?	0:05	swapper
root	1	0	0	14:53:05	?	0:00	init
root	2	0	0	14:53:04	?	0:00	vhand
.....							
.....							

To locate a specific process, type:

```
ps -ef | grep ProcessName <RETURN>
```

Continued on next page

3.4 Troubleshooting Steps, Continued

Determine the nameserver

To make sure the administrative node is running, find out which node the host or gateway is using to resolve addresses. There are several methods to determine the nameserver node used by a host to provide (resolve) the TCP/IP address from the hostname query.

Using the nslookup method

The first method attempts the `nslookup` command of NS-ARPA Services (Network Services-) to resolve an address query, where the nameserver will respond with the query result and identify itself by hostname and TCP/IP address. This command exercises network communications and will identify hosts that are not registered with the name service.

nslookup example

```
nslookup ac_usx2 <RETURN>
```

Returns this response from the nameserver:

```
Name Server:  fishery.honeywell.com
Addresses:    123.45.3.16
```

```
Name:         ac_usx2.iac.honeywell.com
Addresses:    123.45.114.22
```

Using the look for server link method

The second method is to list the `/etc` directory and look for a link to the `/etc/hosts` file. The link shows the hostname of the administrative node.

```
Type ll /etc <RETURN>
```

Look for this link indication:

```
hosts -> //tcp_admin/etc/hosts
tcp_admin -> //admin_host
```

Where `admin_host` will be the hostname of the administrative node.

Continued on next page

3.4 Troubleshooting Steps, Continued

Check the administrative nameserver

Now see if the name server administrative node is operational.

Type `ping admin_host [packet_size] [count] <RETURN>`

where `admin_host` is the hostname of the administrative node.

The administrative node response should resemble this example.

```
PING admin_host: 64 byte packets
64 bytes from 123.45.114.2: icmp_seq=0. time=0. ms
64 bytes from 123.45.114.2: icmp_seq=1. time=0. ms
64 bytes from 123.45.114.2: icmp_seq=2. time=0. ms
64 bytes from 123.45.114.2: icmp_seq=3. time=0. ms
64 bytes from 123.45.114.2: icmp_seq=4. time=0. ms

----admin_host PING Statistics----
5 packets transmitted, 5 packets received, 0% packet loss
round-trip (ms)  min/avg/max = 0/0/0
```

If there is packet loss noted, but it is less than 100%, several possibilities should be investigated. The node's processor loading may prevent a timely response to the `ping` command or there may be a crashed node generating noise on the LAN network through its Ethernet interface.

If the packet loss is 100%, the most likely problem is an open cable segment on the Ethernet LAN.

3.5 Check the Software Loopback

Check configuration of local host

TCP/IP provides a software loopback interface to troubleshoot the local software from the network layer up. Use the software loopback interface to check local TCP/IP software operation. This is done by sending a message to internet address 127.0.0.1 which, by convention, is assigned the host name localhost. This address and host name should be included in the networks `/etc/hosts` file and the `localhost` line should be uncommented in the file `/etc/netlinkrc` as shown in bold below:

```
case $NODENAME in
  $ROOTSERVER)
    /etc/ifconfig lan0 inet 129.30.255.255 netmask 255.255.255.0 up
    /etc/lanconfig lan0
    ;;
  *) /etc/ifconfig lan0 inet `hostname` up
    /etc/lanconfig lan0 ether ieee
    ;;
esac
/etc/ifconfig lo0 inet 127.0.0.1 up
```

Check operation of the local host

Use the software loopback interface to check local TCP/IP software operation. This is done by sending a message to internet address 127.0.0.1 which, by convention, is assigned the host name localhost. Sending to this software loopback is equivalent to sending to your own address. The IP protocol command `ping` uses only the `/etc/inetd` daemon process for communications. Under normal conditions, the `/etc/inetd` daemon is active on all coprocessors awaiting network traffic from the LAN connection.

To use `ping`, type:

```
ping hostname [packet_size] [count] <RETURN>
```

Where `count`=number of ICMP requests (use 3-10 to limit network traffic)

As an alternative, use the following options:

```
/etc/ping option hostname [packet_size] [count] <RETURN>
```

- d Displays debugging information
- r Send direct without route information if node is on same network
- v Verbose output. Lists ICMP packets other than ECHO RESPONSE

See the man pages about `ping` for more information.

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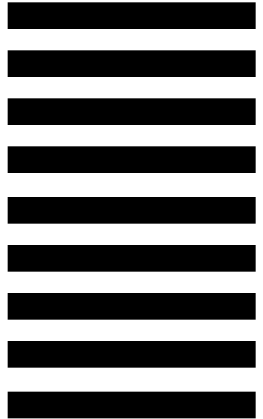
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