

# **System Maintenance Guide**

**SW13-500**

---



**LCN Service - 1**

***System  
Maintenance Guide***

**SW13-500  
9/95**

---

# Copyright, Trademarks, and Notices

Printed in U.S.A. — © Copyright 1995 by Honeywell Inc.

Revision 01 - September 11, 1995

While this information is presented in good faith and believed to be accurate, Honeywell disclaims the implied warranties of merchantability and fitness for a particular purpose and makes no express warranties except as may be stated in its written agreement with and for its customer.

In no event is Honeywell liable to anyone for any indirect, special or consequential damages. The information and specifications in this document are subject to change without notice.

---

---

## **About This Publication**

This publication is intended to provide an introduction to the concepts and activities involved in the maintenance of TDC 3000 LCN-based systems. It also provides guidance on where to find more detailed information on system troubleshooting and repair.

This publication supports TDC 3000<sup>X</sup> software release 500.



---

# Table of Contents

---

## **1 INTRODUCTION**

- 1.1 Purpose of this Manual
- 1.2 Where to Find More Information

## **2 MAINTENANCE STRATEGY**

- 2.1 Design for Maintainability
- 2.2 Self-Diagnosis Concepts
- 2.3 Module Startup Testing
- 2.4 Normal Operation Testing
- 2.5 Failure Messages
- 2.6 Maintenance Recommendation Messages
- 2.7 On-Process Analysis
- 2.8 Universal Station Maintenance Personality
- 2.9 Other Service Tools

## **3 MAINTENANCE SCENARIO**

- 3.1 Diagnosing System Errors
- 3.2 Normal Steps to Follow When an Error Occurs
  - 3.2.1 Examination of Error Indications
  - 3.2.2 Removing Modules from Service
  - 3.2.3 Off-Process Testing
  - 3.2.4 ORU Replacement
  - 3.2.5 Return Module to Service
  - 3.2.6 Enter Corrective Action Message
- 3.3 What to Do if You are Unable to Determine the Cause of an Error
  - 3.3.1 If the System or Module Does Not Work Properly But Allows Continued Use
  - 3.3.2 If the Node Does Not Respond to the User
  - 3.3.3 If the Node Cannot Be Booted
  - 3.3.4 Reporting the Problem

## **INDEX**



## INTRODUCTION Section 1

### 1.1 PURPOSE OF THIS MANUAL

This publication provides an overview of maintenance activities for TDC 3000 LCN-based systems. It introduces the design concepts supporting TDC 3000 maintenance, discusses its built-in maintenance-related facilities, and gives a high-level example of on-process maintenance activities.

### 1.2 WHERE TO FIND MORE INFORMATION

The following provides references to other publications in the TDC 3000 BASIC and LCN System booksets that contain maintenance-related information:

#### SERVICE-RELATED MESSAGES AND DISPLAYS

- SW09-507 *Messages Directory (Implementation/Startup & Reconfiguration - 1 binder)*—Includes a section on Maintenance Recommendation messages and their interpretation.
- SW11-501 *Process Operations Manual (Process Operations binder)*—Includes information about the on-process displays that contain status information regarding LCN nodes and Hiway boxes.

#### OFF-PROCESS TESTS AND DISPLAYS

- SW11-502 *Maintenance Test Operations (LCN Service binder)*—Operating instructions for the Maintenance Personality of the Universal Station.
- SW13-211 *Hardware Verification Test System (LCN Service binder)*—Operating instructions for the Hardware Verification Test System used to test the general and node-type specific functions of one or more LCN nodes while other nodes remain on-line.
- SW13-208 *LCNI Network Communications Test (LCN Service binder)*—Free-standing off-line test of LCN communications between selected nodes.
- SW13-210 *Test System Executive (LCN Service binder)*—Includes information for the loading, setup, and execution of test and exerciser programs; key status registers referenced in test program alarm messages; EXEC data entry rules; and test network setup restrictions.
- SW13-212 *Core Module Test System (LCN Service binder)*—Free-standing off-line tests of Clock Exerciser, Local Control Network Exerciser, Common Memory Test Program, LCN Subsystem Test Program, Multi-Microprocessor Test Program, and Memory Protect and Watch Variable Test Program.

**MODULE AND HIWAY BOX SERVICE PUBLICATIONS**

LC13-500 *Five/Ten-Slot Module Service (LCN Service - 1 binder)*—Troubleshooting, service-part replacement and return to service of the basic building block of TDC 3000 LCN-based systems. Includes section on interpretation of board-edge LED displays.

US13-500 *Universal Station Service (LCN Service - 1 binder)*—Troubleshooting, service-part replacement and return to service of the Universal Station.

HM13-500 *History Module Service (LCN Service - 1 binder)*—Troubleshooting, service-part replacement and return to service of the History Module.

BASIC System Bookset (*Basic System Product Manual binder and Basic System Service binder*)—Troubleshooting, service-part replacement and return to service of Hiway-based devices.

**REFERENCE PUBLICATIONS**

LC09-510 *LCN Guidelines - Implementation, Troubleshooting, and Service (LCN Installation binder)*.

SW01-500 *Bookset Information Directory (System Summary binder)*—Directions for locating specific publications within the TDC 3000 bookset.

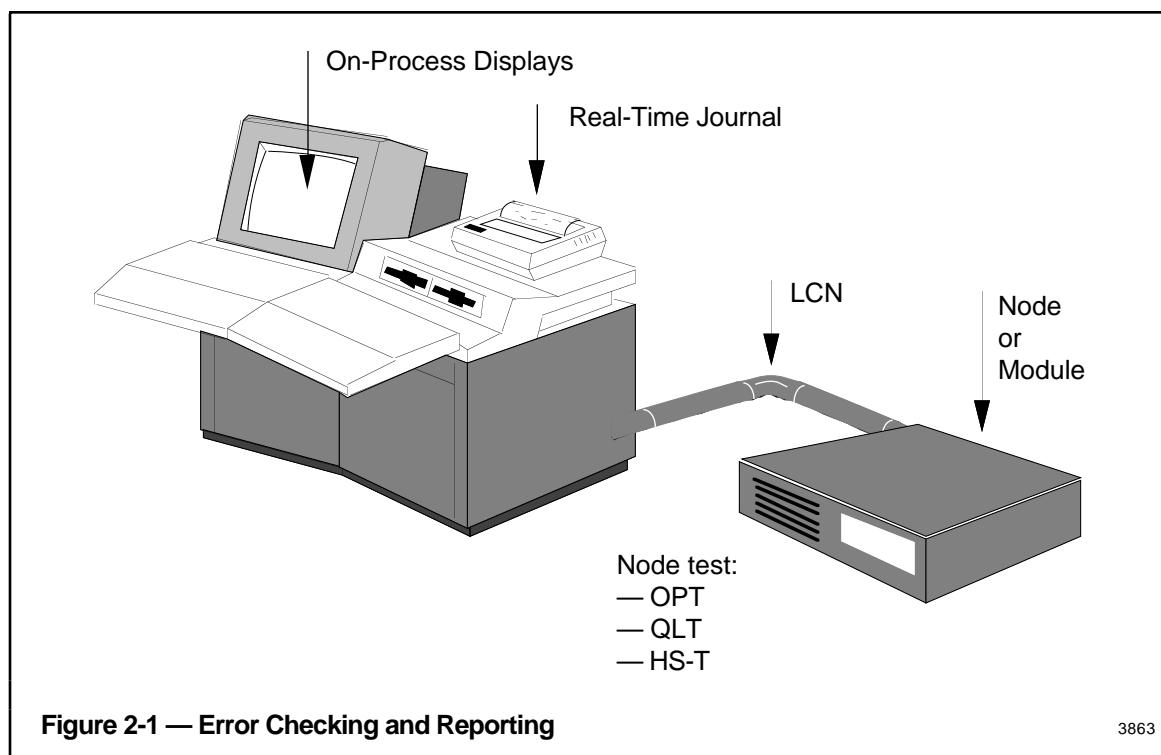
## MAINTENANCE STRATEGY Section 2

### 2.1 DESIGN FOR MAINTAINABILITY

The TDC 3000 System is - to provide dependable service in an industrial environment. Failures are infrequent and contained. Failure effects are minimized by a fault-tolerant design that also provides for optional redundancy of critical system modules. Isolation, parts replacement, and the return to operation of failed modules is speeded up by built-in hardware and software fault checks.

One of the major design goals of TDC 3000 has been to ensure a high level of system availability: first, by increasing the mean time between failures and second, by lowering the mean time to repair. The first objective has been met by the use of conservative design and the use of quality components. The second objective is met by providing a variety of built-in diagnostic tools designed to pinpoint faults to an Optimum Replacement Unit (ORU).

Several levels of tests are performed, beginning with hardware self-tests that test the module's ability to perform the minimum set of functions necessary for the loading of software. Additional checks are made during the load of "personality" software. Then during normal system operation, test software continuously checks each module's performance and issues maintenance recommendation messages when problems are detected. Figure 2-1 presents the error-checking levels and report flow from module to Universal Station.



The impact of system failures is minimized by the ability to troubleshoot and repair a failed module while the remainder of the system remains on control. Cost of repairs is minimized by quick problem resolution by technicians who are guided by the system itself. Speed of repair is enhanced by the replacement and exchange of Optimum Replacement Units (ORUs) rather than by the attempt to repair sophisticated system elements in the field.

The system design is backed up with a full complement of support services that includes training courses, on-site services and phone support from a Technical Assistance Center (TAC) staffed by maintenance specialists.

## **2.2 SELF-DIAGNOSIS CONCEPTS**

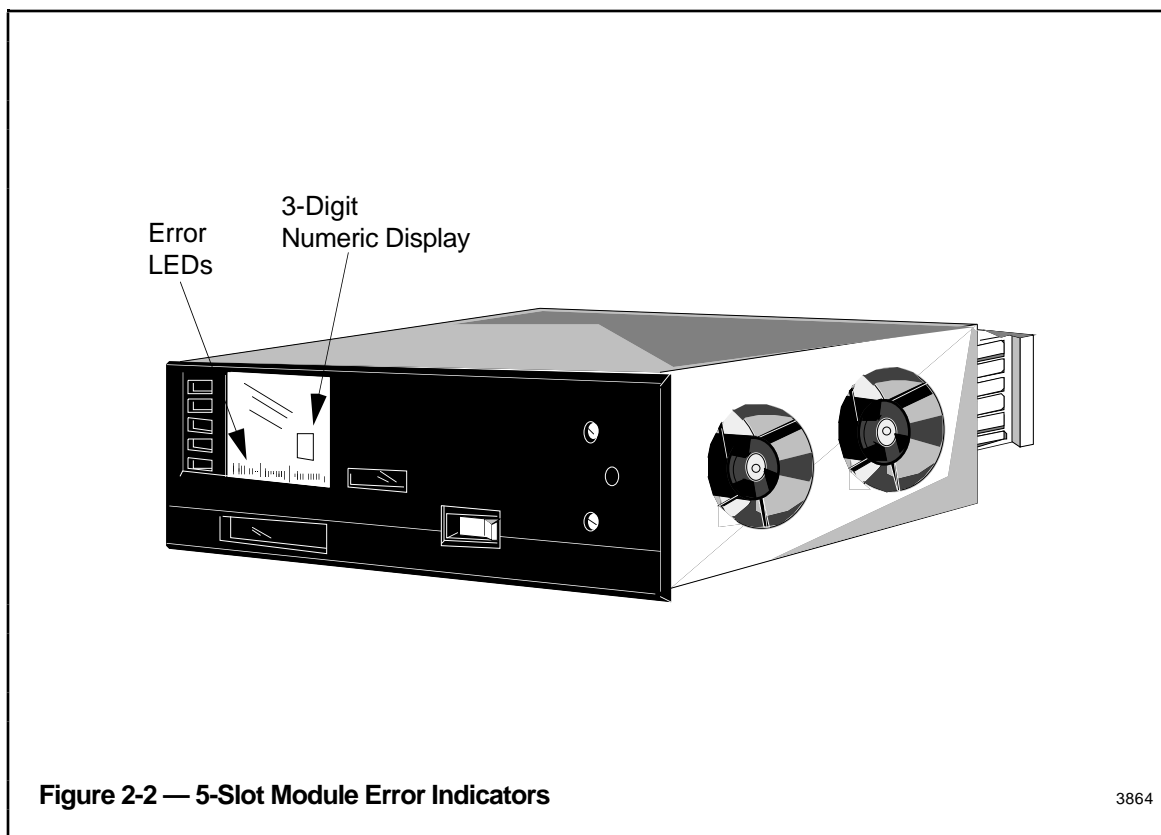
Two levels of automatic testing of system modules and gateways—Hardware Self-Test and Quality Logic Tests—ensure that each piece of the system is ready to be placed into service. Once in service, each node of the distributed system is continuously checked, both for internal problems and for errors that may occur while communicating with other devices in the system. When failures occur, the erring module automatically is removed from service and a Maintenance Recommendation Message is sent to a Universal Station printer.

Maintenance-specific modes of operation for the Universal Station provide the service technician with access to displays and tests that further aid him in the isolation of problems to a specific ORU.

## **2.3 MODULE STARTUP TESTING**

Whenever power is applied to a module—or the module reset button is pressed—diagnostic firmware determines whether the module is capable of accepting its 'personality' load over the LCN. If a failure is detected in one of the set of boards that makes up the module, the module halts with an error display in the board-edge LEDs and in the 3-window numeric display on the MCPU board (see Figure 2-2). If test results are acceptable, the module broadcasts its changed status on the LCN and awaits loading of its personality software.

The second stage of startup testing is the performance of Quality Logic Tests (QLT) as part of the personality-load process. These tests further examine the module's ability to function and leave behind status information for later examination by the on-process tests.



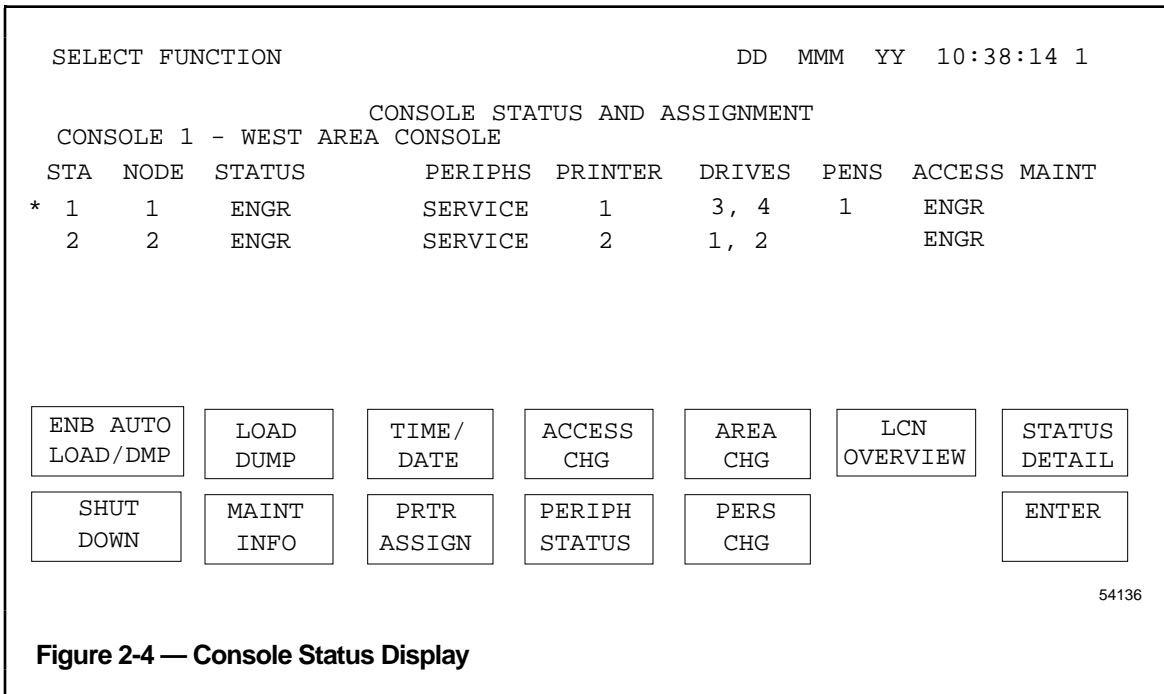
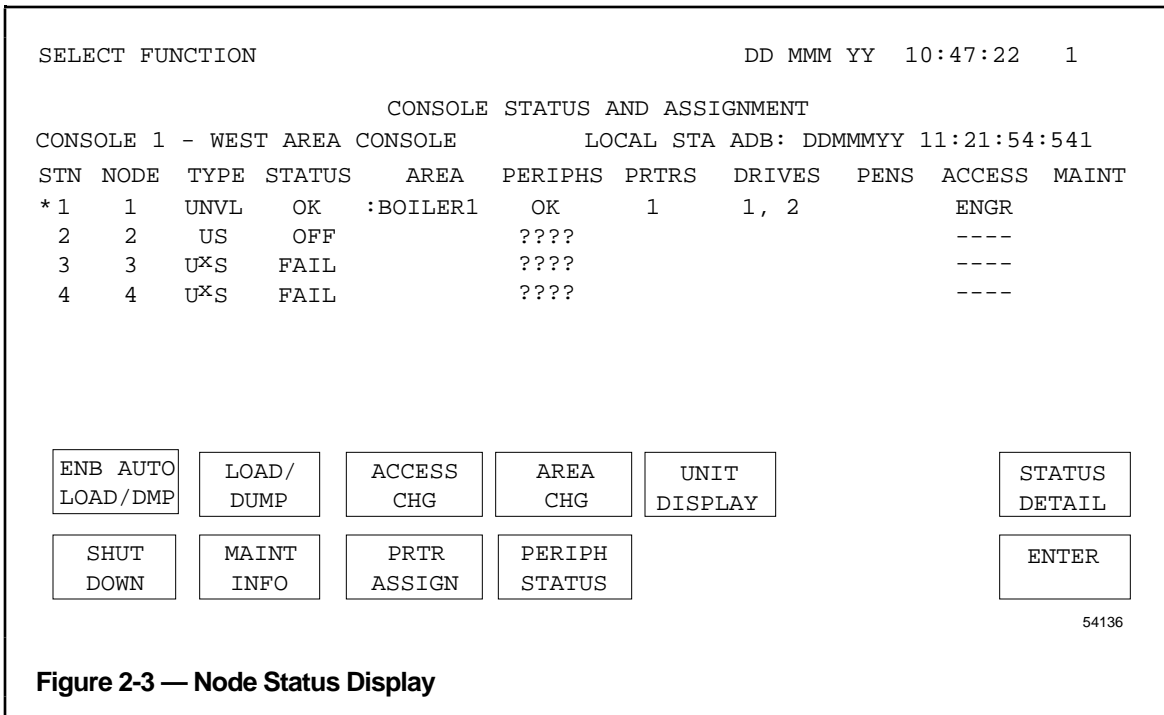
## 2.4 NORMAL OPERATION TESTING

When a personality load is completed, a check is made of status information stored by the QLT. If it is determined that problems detected by those tests prevent normal operation, the node attempts to send a Maintenance Recommendation Message, then shuts itself down.

Several types of tests are performed during normal operation: on-process tests run continuously; input-output routines check the results of communication requests; and peripheral-interface routines check on the status of connected devices such as printers, disks, etc. The Hiway Gateway also detects and alarms the existence of problems of the process-connected (Hiway) boxes.

## 2.5 FAILURE MESSAGES

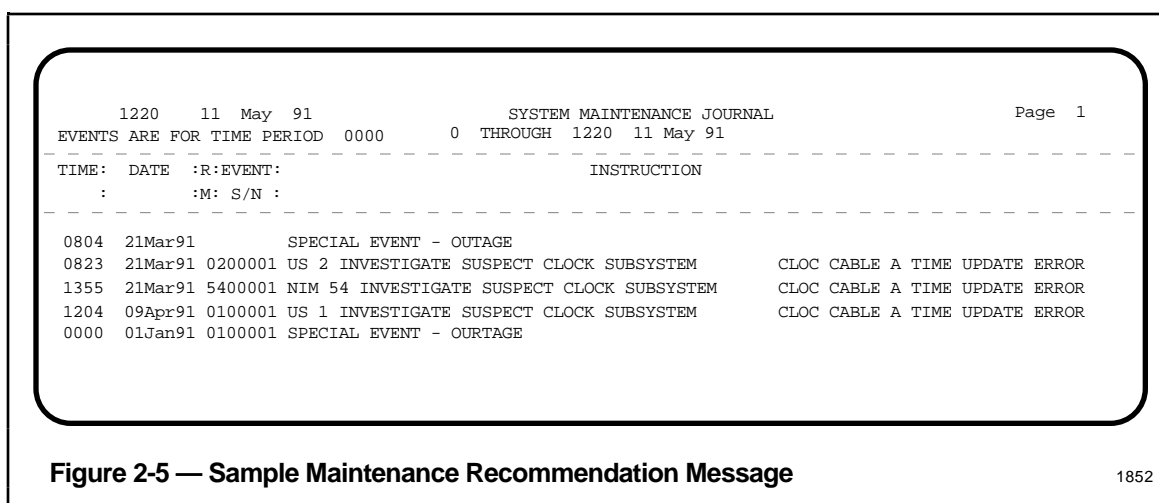
Various types of hardware error-messages can be generated by each LCN module, then annunciated and displayed or printed at the Universal Station. For example, the most recent maintenance recommendation for a module can be viewed by selecting the Maintenance Information target on the Universal Station's on-process status displays (see Figures 2-3 and 2-4 for examples of Node Status and Console Status displays, respectively).



## 2.6 MAINTENANCE RECOMMENDATION MESSAGES

Maintenance Recommendation Messages are a special type of failure report produced by the on-process software. They are included in the Real Time (printed) Journal and can be viewed at a Universal Station running in the Maintenance Overlay. See Figure 2-5 for sample Maintenance Recommendation messages. From the SMCC main menu select SMCC/Maintenance.

The content of Maintenance Recommendation Messages varies depending on circumstances, but the intent is for each message to recommend a specific action that leads to the solution of a system-detected problem. When possible, Maintenance Recommendation Messages identify the problem at the Optimum Replacement Unit (ORU) level. In some instances, the recommendation calls for additional testing of a suspected ORU or module.



## 2.7 ON-PROCESS ANALYSIS

In systems with a History Module, an additional diagnostic function is provided as part of the On Process Personality of the HM. On Process Analysis (OPA) examines accumulated data for each module on the LCN to determine if predefined error limits have been exceeded (indicating the probability of an early failure) and issues ORU replacement recommendations. Additionally, OPA performs analysis of communications errors to identify which end of the communications set appears to be causing the errors.

OPA runs at least once each eight hours of system operation; it also automatically runs if accumulated errors reach 75 percent of error-buffer capacity. On-demand execution is accomplished through the Universal Station in its Maintenance Personality.

When OPA runs, it correlates each error by ORU, error type, and module and adds it to an error aggregate for that module. Each error aggregate is analyzed to determine if error thresholds for each ORU and error type have been exceeded. These error thresholds are established both for the error rate and for the rate at which the error rate itself is changing. Maintenance Recommendations are added to the Active Maintenance Journal, which is maintained by OPA and which can be viewed from the Universal Station in Maintenance Personality. When an OPA Maintenance Recommendation to replace an ORU is acknowledged by a Corrective Action entry, the Error Aggregate data for that ORU is placed in a buffer for printing. This error record then can be returned to the repair facility along with the replaced ORU.

OPA monitors replacement ORUs and, if similar errors persist, it issues an alternative Maintenance Recommendation. This validation period ends with the third 8-hour run of OPA following the Corrective Action entry.

## 2.8 UNIVERSAL STATION MAINTENANCE PERSONALITY

The Maintenance Personality is actually an overlay to the US's Engineering Personality or the Engineering Personality portion of the Universal Personality. The Maintenance Personality is activated by selecting the SMCC/MAINTENANCE target on the Engineering Main Menu, which causes the SMCC Main Menu Display (Figure 2-6) to appear.

MODULE MEMORY—Displays selected memory locations from an active LCN node.

SYSTEM MAINT JOURNAL—Displays history of maintenance activities. (Requires History Module.)

REV/CONFIG STATUS—Displays the revision status (hardware, firmware, and software) and operational status of each ORU in the node.

HIWAY BOX MEMORY—Displays the memory contents of a selected Data Hiway box.

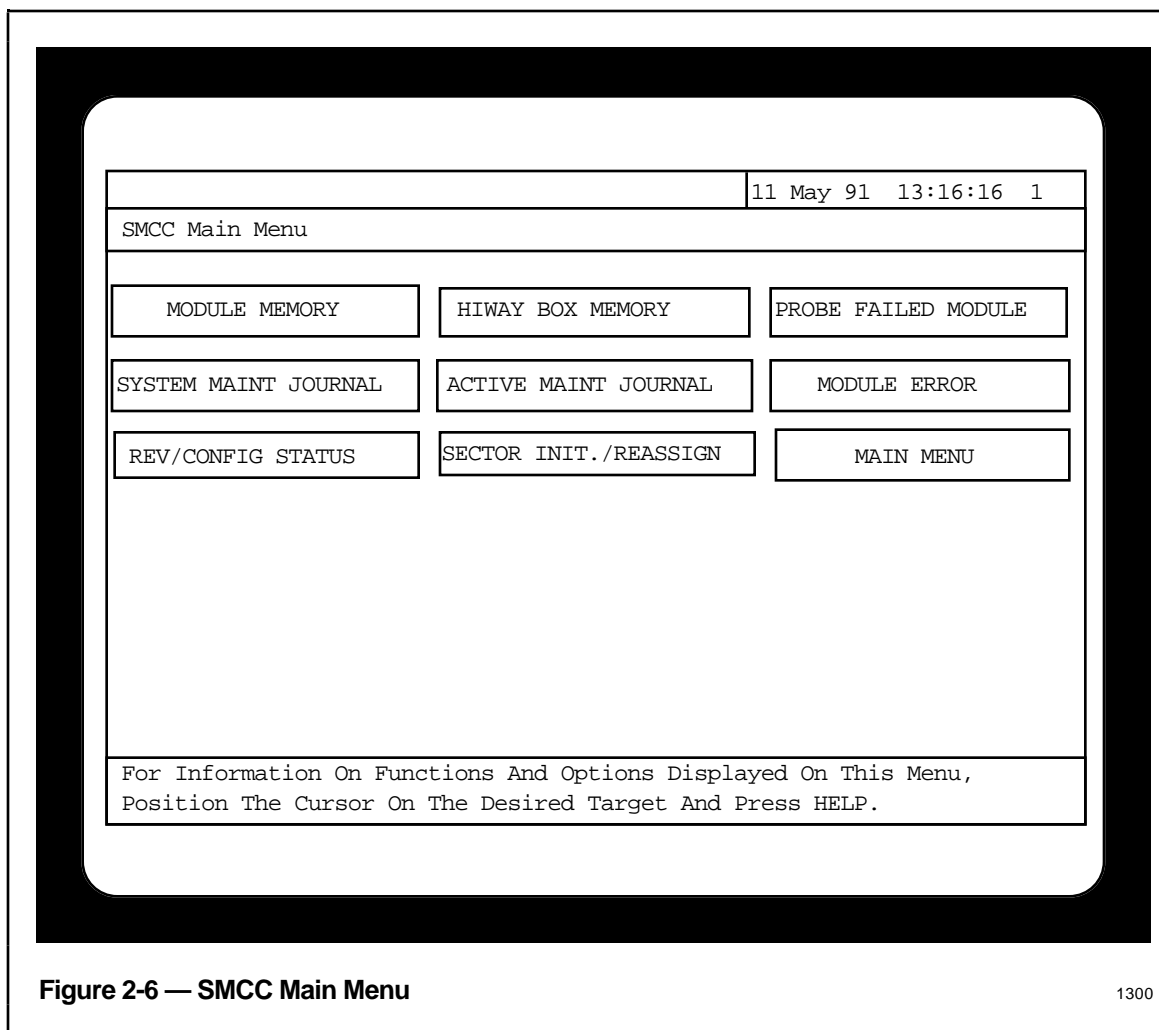
SELECT INIT./REASSIGN—For initializing or reassigning a corrupted sector on a SCSI disk drive.

ACTIVE MAINT JOURNAL—Displays the currently outstanding recommendations and provides for the recording of actions taken. Also provides on-demand running of OPA and related log functions. (Requires History Module.)

PROBE A FAILED MODULE—Displays selected memory locations from a module not in "running" state.

MODULE ERROR—Displays the stored error history for the selected module, both at summary and detail levels.

MAIN MENU—Returns to the Engineering Personality Main Menu display.



## 2.9 OTHER SERVICE TOOLS

For those instances where the on-process tests and Maintenance Personality functions are unable to isolate the offending ORU, specialized off-line test programs are provided. These tests include the Hardware Verification Test System (HVTS) that can test several modules simultaneously and free-standing programs that are used to test a module's MCPU, or its memory, or LCN communications between several modules.

HVTS is a collection of test programs, each concerned with a specific subsystem that may be common to several nodes on the Local Control Network. These test programs are subdivided into individual tests that are designed to exercise specific functions within the subsystem. The free-standing tests have only single-function test capabilities.

Use of HVTS requires that nodes to be tested and one Universal Station (used for test loading and control) must be removed from service. The free-standing tests additionally require that all nodes to be tested must be physically disconnected from the on-line LCN.



## MAINTENANCE SCENARIO Section 3

### 3.1 DIAGNOSING SYSTEM ERRORS

If a hardware error occurs in one of the TDC 3000 modules or Hiway boxes, examination of the resulting error messages and/or module LEDs and numeric window display will normally enable you to pinpoint and resolve the problem by following the six major steps discussed under subsection 3.2 below. However, in the event of an error whose cause is not apparent from the information presented, you should use the procedure outlined under subsection 3.3.

**It is important to capture as much relevant data as possible immediately following detection of a problem. Should you become uncertain at any point about how to proceed, Honeywell's Technical Assistance Center (TAC) is available to help. See subsection 3.3.4 Reporting the Problem.**

### 3.2 NORMAL STEPS TO FOLLOW WHEN AN ERROR OCCURS

The six major steps of error detection and correction are summarized in Table 3-1 along with references to the documents that provide necessary details of operation. Subsequent paragraphs discuss some highlights of each step.

**Table 3-1—Troubleshooting and Repair Summary**

Actions to be Taken	Publication References*
1. EXAMINE ERROR INDICATIONS <ul style="list-style-type: none"> <li>• Board-mounted LED Indicators</li> <li>• Universal Station Displays</li> <li>• Real-Time Journal</li> <li>• System &amp; Console Status Displays</li> <li>• SMCC Maintenance Displays</li> </ul>	<ul style="list-style-type: none"> <li>• <i>5/10-Slot Module Service</i></li> <li>• <i>Messages Directory</i></li> <li>• <i>Messages Directory</i></li> <li>• <i>Process Operations Manual</i></li> <li>• <i>Maintenance Test Operations</i></li> </ul>
2. REMOVE MODULE(S) FROM SERVICE	<ul style="list-style-type: none"> <li>• <i>Process Operations Manual</i></li> </ul>
3. TEST QUESTIONABLE MODULE(S)	<ul style="list-style-type: none"> <li>• <i>Hardware Verification Test System</i></li> <li>• <i>Core Module Test System</i></li> <li>• <i>LCNI Network Comm. Test</i></li> </ul>
4. REPLACE FAILED ORU	<ul style="list-style-type: none"> <li>• <i>5/10-Slot Module Service</i></li> <li>• <i>Universal Station Service</i></li> <li>• <i>History Module Service</i></li> </ul>
5. RETURN MODULE(S) TO SERVICE	<ul style="list-style-type: none"> <li>• <i>Process Operations Manual</i></li> </ul>
6. ENTER CORRECTIVE ACTION MESSAGE	<ul style="list-style-type: none"> <li>• <i>Maintenance Test Operations</i></li> </ul>
<p>* See the Bookset <i>Information Directory</i> to find directions for the locating of specific publications within the TDC-3000 bookset. The Bookset <i>Information Directory</i> itself is found in the <i>System Summary</i> binder.</p>	

### 3.2.1 Examination of Error Indications

The starting point to determine which ORU needs replacement varies, depending on the type of failure. For a significant number of hard failures, the board-mounted LED displays provide all the necessary data. Operator Personality displays and messages provide other starting points.

The SMCC displays obtained by loading a Universal Station with the Maintenance Personality provide both current and historical error information, in addition to providing access to all current Maintenance Recommendations.

### 3.2.2 Removing Modules from Service

Before attempting any testing or other manipulation of the questioned module(s) they should be removed from service through the shut-down target at the node's on-process status display. This ensures that there will be no conflicts—such as unnecessary alarming—with the remaining on-process modules.

### 3.2.3 Off-Process Testing

If further testing is required, the module(s) in question can now be loaded with the appropriate off-line test software. In some instances, this requires the physical isolation of the test module(s) from the on-process LCN.

### 3.2.4 ORU Replacement

Module disassembly and ORU installation steps are detailed in individual service publications. As required, these publications discuss troubleshooting and replacement down to the defined service-parts level for each module type.

### 3.2.5 Return Module to Service

Once the individual module(s) are powered back and visual status checks are made, they can be returned to operational status and their operating personalities reloaded through the on-process node-status displays.

### 3.2.6 Enter Corrective Action Message

Entry of a Corrective Action message is required to clear the current Maintenance Recommendation and restart error accumulations for the indicated ORU.

## 3.3 WHAT TO DO IF YOU ARE UNABLE TO DETERMINE THE CAUSE OF AN ERROR

### 3.3.1 If the System or Module Does Not Work Properly But Allows Continued Use

1. Record all symptoms of the failure and all user actions immediately before the failure. This should include notes about the type of operations being performed on the system, e.g., Area Data Base configuration, point building, trend graphic display, etc.
2. Record which personalities were being used, e.g., Engineering, Operator, History Module, Application Module, etc.
3. Record the system software release number, e.g., 130-C3. This number can be found on many of the system floppy disks supplied by Honeywell.

4. Record any error messages in their entirety. Real Time Journal or Event History Retrieval printouts during the time of the error should be saved.
5. If custom graphic displays or user-written CL programs are involved, copies of all schematics, related subpictures, or CL programs should be saved for transmittal to TAC.
6. If the problem is related to particular points, IDFs or exception-build files should be submitted to TAC.

### **3.3.2 If the Node Does Not Respond to the User**

- 1-6. Same steps as above.
7. Record the state of the LEDs on the module boards. If a board has failed, a red LED is lit. Record all the lights that are red on the MCPU board.
8. Record the number displayed in the 3-digit display on the MCPU board. In normal operation this is the assigned node number. A negative number signifies that there has been a failure.
9. Use the Engineering Personality maintenance function to display all the Detailed Module Errors for the failed node. Press the CTL and CLR ENT buttons (= PRT SCN) on the Engineering Keyboard to print a copy of the display for transmittal to TAC.
10. Dump the contents of the node's memory to the dump volume on an HM (volume &2np, where "np" is the HM node number) or to floppies (see 3.3.2.1).
11. Supply a copy of at least the last two pages of the Real Time Journal that showed the failure (should contain all system error messages). If the Real Time Journal printout is not available, print the Event History Retrieval for all system errors immediately before and during the time of the failure, and submit the printout along with the above dump to TAC.
12. If a hardware error is suspected, run the appropriate Hardware Verification Test System (HVTS) software.
13. If the failed node is a Hiway Gateway, and if the LED display shows either -189 or -195, use the Engineering Personality maintenance functions to display all the error blocks in the redundant HG. Obtain a screen printout of this information.

### 3.3.2.1 How to Dump the Node's Memory

The node is dumped if, when you load the node from a US (or another US if this node is a US), the enable dump status on the Node Status Display or Console Status Display is ENABLE. To enable a node dump, select the ENABLE LD/DUMP pick on the status display and then select the ENABLE DUMP pick. Then, when you initiate a load, this message appears:

PRESS ENTER TO DUMP OR OVERRIDE TO LOAD

#### NOTE

In this software release, the Enable LD/Dump target is not used as it is not functional.

Press ENTER and follow the prompts to select the dump destination and to initiate the dump. When the dump is complete, follow the prompts to initiate the load (see Sections 13 and 15 in *Process Operations*).

If the Real Time Journal (RTJ) is enabled during the dump operation, error messages as in this example may occur (several spaces are omitted from this example):

```
15:24:53  US 10  $$DUMP  SOFTWARE  025504C  00255AEE  0255B60  DUMP  5  26
```

If the dump continues to completion you can ignore such messages, except that where they are consistent and numerous they may indicate problems with the storage medium, device, or controller.

### 3.3.3 If a US Node Cannot Be Booted

1. If the ">" prompt does not appear on the screen after the RESET button is pressed, ensure that the reset line is connected. If it is, check the LEDs and display codes as described above.
2. If the US node failed after the LOAD button is pressed, check to ensure that the floppy is properly seated in the drive, that the floppy inserted in the drive is the personality image, and that the correct drive number was entered.

### 3.3.4 Reporting the Problem

Before contacting Honeywell regarding the problem, make certain you know the 3-letter System Identification ("SID") assigned to the system by Honeywell. Also have available the complete shipping address for any floppies, documentation, or parts that may subsequently be provided from Honeywell.

The telephone number for the Honeywell Technical Assistance Center (TAC) is:

**1-800-822-7673**  
**313-5558** (Arizona callers)

The mailing address for sending documented evidence is:

**Honeywell IAC**  
**16404 N. Black Canyon Highway**  
**Phoenix, AZ 85023**  
**Attention: Technical Assistance Center, 1S1**



---

# Index

---

Topic	Section Heading
Console Status Display	Fig. 2-4
Design for Maintainability	2.1
Diagnosing System Errors	3.1
Display	
Console Status	Fig. 2-4
Error Checking and Reporting	Fig. 2-1
Module Error Indicators	Fig. 2-2
Node Status Display	Fig. 2-3
Sample Maintenance Recommendation Message	Fig. 2-5
SMCC Menu	Fig. 2-6
Dump a Node's Memory	3.3.2.1
Enter Corrective Action Message	3.2.6
Error Checking and Reporting	Fig. 2-1
Examination of Error Indications	3.2.1
Failure Messages	2.5
If the Node Cannot Be Booted	3.3.3
If the Node Does Not Respond to the User	3.3.2
If the System or Module Does Not Work Properly But Allows Continued Use	3.3.1
Initializing a disk	2.8
Introduction	1
Maintenance Recommendation Messages	2.6
Maintenance Strategy	2
Maintenance Scenario	3
Module Startup Testing	2.3
Node Dump	3.3.2.1
Normal Operation Testing	2.4
Normal Steps to Follow When an Error Occurs	3.2
Off-Process Testing	3.2.3
On-Process Analysis	2.7
ORU Replacement	3.2.4
Other Service Tools	2.9
Purpose of this Manual	1.1
Reassigning bad disk sectors	2.8
Removing Modules from Service	3.2.2
Reporting the Problem	3.3.4
Return Module to Service	3.2.5
Sample Maintenance Recommendation Message Display	Fig. 2-5
Self-Diagnosis Concepts	2.2
SMCC Main Menu	Fig. 2-6
Troubleshoot and Repair Summary	Table 3-1
Universal Station Maintenance Personality	2.8
What to Do if You are Unable to Determine the Cause of an Error	3.3
Where to Find More Information	1.2



## READER COMMENTS

Honeywell IAC Automation College welcomes your comments and suggestions to improve future editions of this and other publications.

You can communicate your thoughts to us by fax, mail, or toll-free telephone call. We would like to acknowledge your comments; please include your complete name and address

**BY FAX:** Use this form; and fax to us at (602) 313-4108

**BY TELEPHONE:** In the U.S.A. use our toll-free number 1\*800-822-7673 (available in the 48 contiguous states except Arizona; in Arizona dial 1-602-313-5558).

**BY MAIL:** Use this form; detach, fold, tape closed, and mail to us.

Title of Publication: **System Maintenance Guide** Issue Date: **9/95**

Publication Number: **SW13-500**

Writer: **David Downey**

**COMMENTS:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**RECOMMENDATIONS:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

NAME \_\_\_\_\_ DATE \_\_\_\_\_

TITLE \_\_\_\_\_

COMPANY \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

TELEPHONE \_\_\_\_\_ FAX \_\_\_\_\_

(If returning by mail, please tape closed; Postal regulations prohibit use of staples.)

Communications concerning technical publications should be directed to:

Automation College  
Industrial Automation and Control  
Honeywell Inc.  
2820 West Kelton Lane  
Phoenix, Arizona 85023-3028

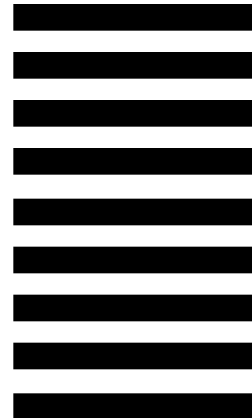
FOLD

FOLD

From: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



NO POSTAGE  
NECESSARY  
IF MAILED  
IN THE USA



Cut Along Line

**BUSINESS REPLY MAIL**  
FIRST CLASS      PERMIT NO. 4332      PHOENIX, ARIZONA

POSTAGE WILL BE PAID BY ....

**Honeywell**

Industrial Automation and Control  
2820 West Kelton Lane  
Phoenix, Arizona 85023-3028

Attention: Manager, Quality

FOLD

FOLD

Additional Comments:



**Honeywell**

---

**Industrial Automation and Control**  
Honeywell Inc.  
16404 North Black Canyon Highway  
Phoenix, Arizona 85023-3033

*Helping You Control Your World*