# LCN System Checkout

**SW20-510**

LCN Installation

# *LCN System Checkout*

SW20-510
Release 500
CE Compliant
9/95

# Copyright, Trademarks, and Notices



**Revision 01 – September 11, 1995**

# About This Publication

This publication provides instructions for use by the system hardware installation and checkout personnel. It will help you determine if the system hardware is properly installed and ready for on-line operation. Use this manual whenever the system is shut down for major repairs, upgrades (expansions) or major moves (relocation of equipment).

The user of this manual should be familiar with the contents of the *LCN Site Planning* manual or *System Site Planning* manual and the *LCN System Installation* manual.

This publication supports TDC 3000$^X$ software release 500 and CE Compliant hardware.

Any equipment designated as "CE Compliant" complies with the European Union EMC and Health and Safety Directives. All equipment shipping into European Union countries after January 1, 1996 require this type of compliance—denoted by the "CE Mark."

Change bars are used to indicate paragraphs, tables, or illustrations containing changes that have been made by Document Change Notices or an update. Pages revised only to correct minor typographical errors contain no change bars. All changes made by previous Document Change Notices have been incorporated in this update.

# Table of Contents

# Table of Contents

# INTRODUCTION
# Section 1

*This section lists all support documents and services available from Honeywell. It also lists tools and test equipment that may be needed during system checkout.*

## 1.1 PURPOSE OF THIS MANUAL

This System Checkout Guide provides instructions and references, as needed, for initial off-process checkout of TDC 3000$^X$ equipment cabinets and Universal Stations/Universal Station$^X$ stations containing modules, gateways, monitors, and peripherals. It is intended for use by trained Honeywell or customer service technicians. The checkout procedures will determine if the system components have been properly installed and are ready for system startup. This guide also serves to check out system expansions or significant modifications to existing systems.

For checkout of TDC 3000$^X$ Data Hiway BASIC equipment, Operator Stations, controllers, Process Interface Units, and related products, reference is made to applicable Data Hiway equipment checkout and service manuals.

The TDC 3000$^X$ System Post-Installation Checklist, found in Appendix D, should be used by the responsible technician to measure the progress and completeness of the checkout effort.

A selected list of operating practices and general housekeeping recommendations is found in Appendix A. Each item on the list should be acknowledged by the responsible party and action taken before and during system startup.

Please read all of this guide and scan the following referenced documents before proceeding with system checkout.

## 1.2 HONEYWELL SUPPORT SERVICES AND DOCUMENTS

Optional Power-on support, Field Services, and Technical Support are available during the on-site checkout of the TDC 3000X System equipment. The following Honeywell support documents are either required or will be of assistance during checkout and operation of the system.

| Title | Binder |
|---|---|
| TDC 3000X System Site Planning | System Site Planning - 1 |
| LCN Planning | System Site Planning - 1 |
| LCN System Installation | LCN Installation |
| LCN Guidelines - Implementation, Troubleshooting, and Service | LCN Installation |
| System Startup Guide, Cartridge Drive | Implementation/Startup & Reconfiguration - 1 |
| System Startup Guide, Floppy Drives | Implementation/Startup & Reconfiguration - 1 |
| Network Form Instructions | Implementation/Startup & Reconfiguration - 1 |
| Configuration Data Collection Guide | Implementation/Startup & Reconfiguration - 2 |
| Process Operations Manual | Operator/Process Operations |
| History Module Service | LCN Service - 2 |
| Five/Ten-Slot Module Service | LCN Service - 2 |
| Dual Node Module Service | LCN Service - 2 |
| Maintenance Test Operations | LCN Service - 2 |
| Universal Station Service | LCN Service - 1 |
| Universal StationX Service | Universal StationX |
| Universal Station (Ergonomic) Service | LCN Service - 1 |
| Universal StationX (Ergonomic) Service | Universal StationX |
| Hardware Verification Test System | LCN Service - 3 |
| LCNI Network Communications Test | LCN Service - 3 |
| Test System Executive | LCN Service - 3 |
| Core Module Test System | LCN Service - 3 |
| Universal Control Network Installation | Installation/Universal Control Network |
| Process Manager Installation | Implementation/Process Manager - 1 |
| Process Manager Checkout | Implementation/Process Manager - 1 |
| Advanced Process Manager Installation | Implementation/ Advanced Process Manager - 1 |
| Advanced Process Manager Checkout | Implementation/ Advanced Process Manager - 1 |
| Process Manager/Advanced Process Manager Service | PM/APM Service |
| Process Manager Module Test System (PMMTS) | PM/APM Service |
| Process Manager Test System (PMTS) | PM/APM Service |
| Process Manager Test Executive (PMTS) | PM/APM Service |
| PLC Gateway Control Functions | Implementation/PLC Gateway |
| PLC Gateway Parameter Reference Dictionary | Implementation/PLC Gateway |
| PLC Gateway Forms | Implementation/PLC Gateway |
| Network Gateway Site Planning and Installation | Implementation/Network Gateway |

| Title | Binder |
|---|---|
| Basic System Checkout | Basic System Summary |
| Basic System Cabling and Wiring | Basic System Summary |
| Data Hiway Subsystem Site Planning | Basic System Summary |
| PIU Installation | Basic System Summary |

## 1.3 TOOLS AND TEST EQUIPMENT

- Test Operator Control Station (i.e., Universal Station) with cartridges or floppies.
- RS-232C-compatible I/O device (TI700)
- I/O Paddle Board 51107954-100
- Test Diskettes/Cartridges (see checklist)
- Modem cable kit
- CLI Test cable 51109040-100
- CLI Test connectors 51109041-100 (two required)
- Digital Voltmeter
- Standard tool kit
- ESD ground-strap
- Extra LCN T-connectors
- Time Domain Reflectometer, TDR, Cable Tester, Tektronics 1502*, range 0 to 2000 feet, 6 inch resolution.
- Time Domain Reflectometer, TDR, Cable Tester, Tektronics 1503*, 0 to 50,000 feet, 3 foot resolution, plus:
  Selected 75 Ohm terminator (must be 75.0 + or - 0.1 ohms, i.e., 74.9 to 75.1 ohms) (select from C-KC02 or 30732052-001)
- BNC, jack-to-jack adapter or barrel splice (C-KCA04 or 30732051-001)
- Voltage Analyzer, Dranetz series 626*
- James Biddle earth-ground tester, 250200 or 250241*
- Distortion analyzer - HP 334*
- Oscilloscope—Tektronics 465 or equivalent*

*System test devices should be available as needed.

# SYSTEM EQUIPMENT CHECKOUT
# Section 2

*This section lists the major hardware items to be checked and what to look for.*

## 2.1 CHECKOUT OVERVIEW

The *System Checkout Guide* should be referenced during and after system installation to ensure that the equipment is properly installed, intercabled, and powered up. Final checkout is performed by loading and running the Hardware Verification Test System (HVTS), the Core Module Test System (CMTS), and the LCNI Network Test diskettes/cartridges from the Universal Station. Test procedures are provided in the HVTS publication listed in subsection 1.2. See 3.1 for HVTS use-scenario and 3.2 for BASIC System equipment startup.

For system startup instructions and floppy diskettes/cartridge disks required, refer to the *System Startup Guide* in the *Implementation/Startup & Reconfiguration - 1* binder.

This manual, along with those listed under 1.2 and the test diskettes/cartridges, provides all the information necessary to verify proper installation and that the system is ready for configuration and startup.

## 2.2 POWER AND GROUNDING

Check existence and adequacy of all system-power requirements, as described in the *TDC 3000X Site Planning Manual or* the *Data Hiway Subsystem Site Planning Manual*, and the *Data Hiway Cabling and Wiring Guide*. Check integrity of ac safety ground, logic ground, and Data Hiway ground.

### 2.2.1 AC Safety Ground

Visually inspect each cabinet and console to verify existence and proper connection of the ac safety-ground wire. A frame-ground service post is provided at the bottom of each cabinet and console bay for this purpose only (see Figure 2-1 and Figure 2-2.) Ensure that only the safety-ground wire from the system power-distribution panel is connected to the frame-ground service post.

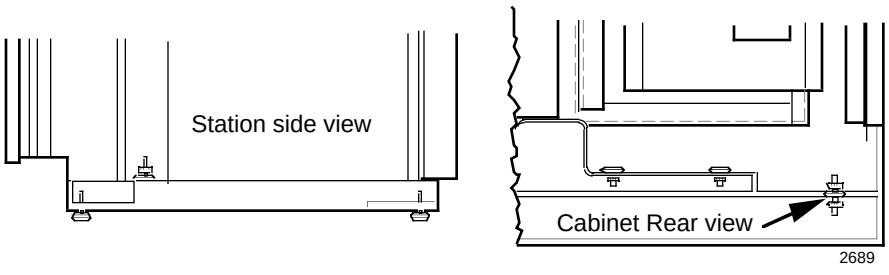



**Figure 2-1 — AC Safety Ground Service Post Location**

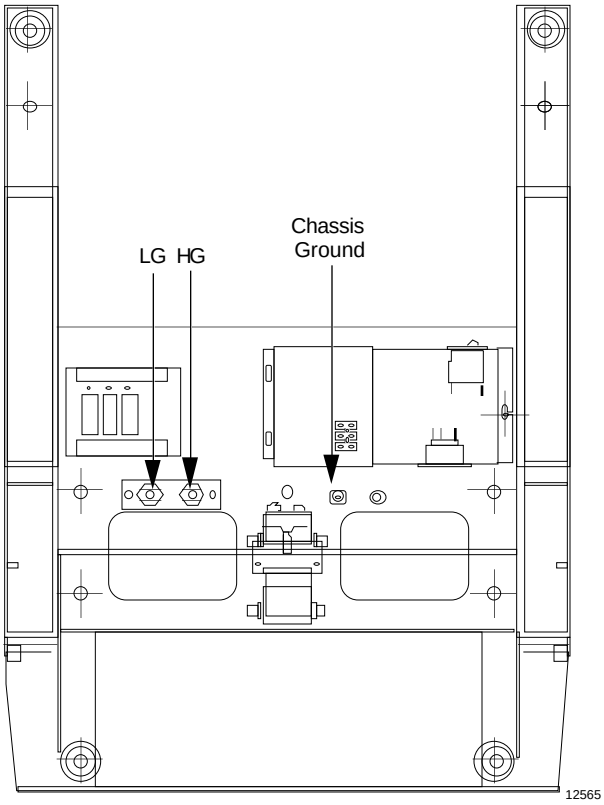



**Figure 2-2 — AC Safety Ground Service Post Location in Ergonomic Furniture**

## 2.2.2 Data Hiway Ground

If the system includes a Hiway Traffic Director (HTD), the Data Hiway cable-shield is grounded only at the HTD, as illustrated in Section 5 of the *Data Hiway Subsystem Site Planning Manual*. Also, the wires on HG terminals 11 and 13 must be disconnected and separately taped-up (with insulated electrical tape) to prevent cable shields from shorting together.

If the system does not include the HTD, the hiway cable-shield must be grounded at the primary Hiway Gateway module, as follows (also illustrated in Section 5 of *Data Hiway Subsystem Site Planning*):

- At TB1 on the Gateway I/O DHI paddle-board, ensure that terminal screws 11 and 13 are wired (with #14 AWG) to the Data Hiway (DH) service-post at the bottom of the cabinet or console. The DH service-post, must be connected to Master Reference Ground (MRG) through a #4 AWG wire. Note that the HG service post is also insulated from cabinet/console frame because it is mounted on the same phenolic block as the LG service post.

- Make sure that the Data Hiway ground is connected to only the Master Reference Ground rod.

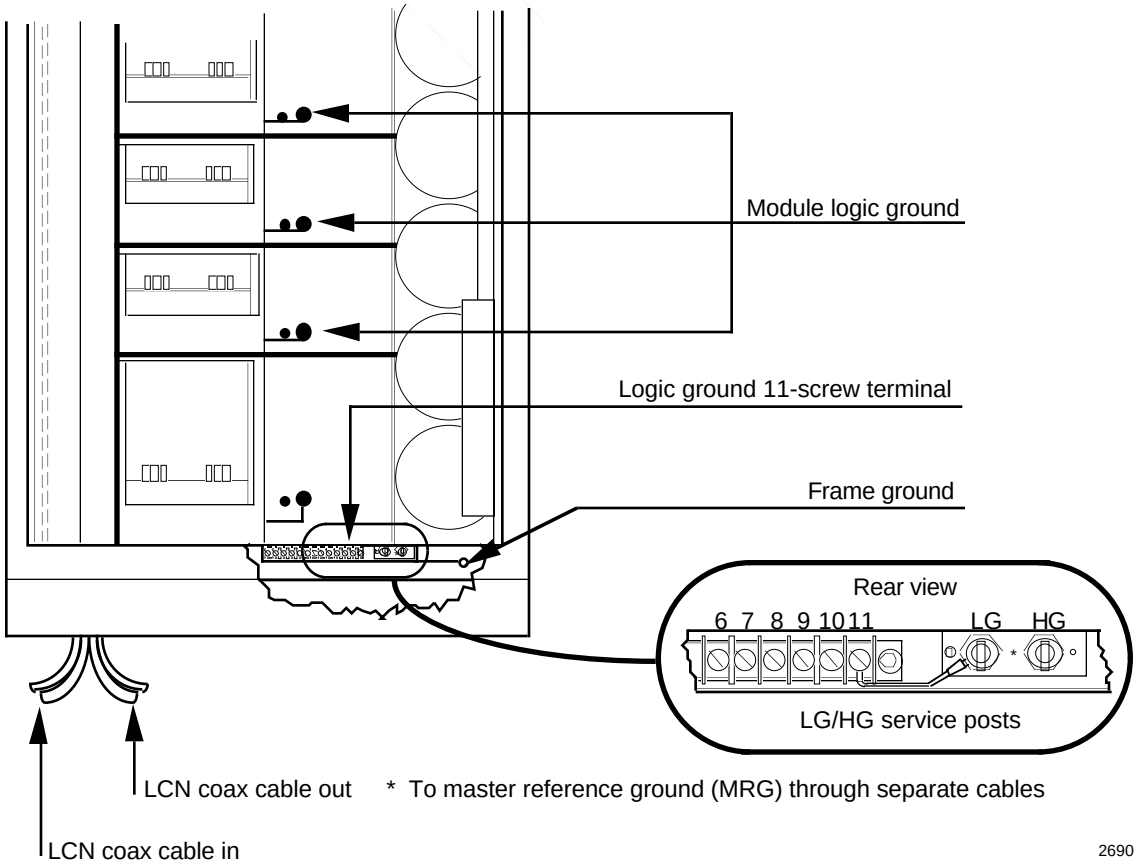



**Figure 2-3 — Cabinet Logic Ground Terminal Board**

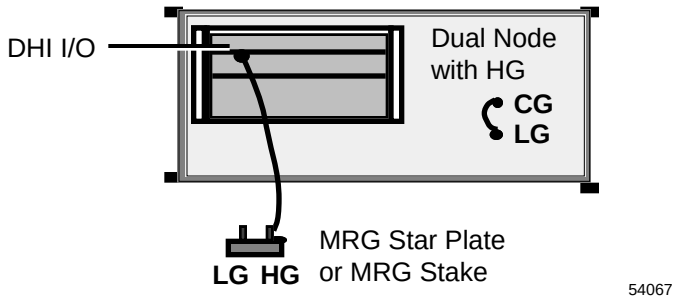



**Figure 2-4 — Logic Ground Connection for Five/Ten-Slot Modules**

## 2.3 LCN/HIWAY CABLING

If the system includes both Hiway Gateways (HG) and Basic or Enhanced Operator Station(s), with or without a Hiway Traffic director (HTD), check all preferred-access cabling for proper termination and grounding. Installation rules are presented in Section 3 of the *Data Hiway Subsystem Site Planning Manual.*

Check the following:

- Check LCN cabling for proper use of T-connectors and terminators.
- Ensure that all cables labeled "Cable A" are connected to the "A" terminal T-connectors on the I/O LCN paddle-board (P/N 51107403-100). This board is always located in slot 2 of the small-card cage or bustle of each LCN module (except in the case of Dual Node Modules).
- Ensure that all cables labeled "Cable B" are connected to only the "B" terminal T-connectors of each module.
- After power-up ( subsection 2.5), note that the TX (amber) indicator on the large LCN board in slot 2 of each module glows, indicating that the token ring is established.
- Check all Data Hiway boxes for proper use of T-connectors and terminators, and for proper routing of hiway cables A and B.
- Conduct Data Hiway cable Time Domain Reflectometer (TDR) tests, as required, before burial or before it is placed in service. TDR test procedures for the LCN cable segments are provided in Appendix C. TDR test procedures for the Data Hiway cables are found in the *BASIC System Checkout Guide.*

## 2.4 LCNE/LCNFL CABLING

If the system includes the Local Control Network Extender (LCNE) and Local Control Network Fiber-Optic Link (LCNFL) make certain that the cable "A" subsystem is the "Cable" subsystem to all nodes. Check the cable "B" subsystem for the same reason; there **must** be no crossing of cables. The cable subsystem includes all coaxial cables bus segments, fiber optic cables, LCNEs, and LCNFLs. Check for the following application requirements/ limitations:

- Up to three coaxial cable bus segments can be serially connected through LCNEs and fiber optics cables. The maximum length of the fiber optics cables (transmit and receive) is 2 km, 6562 feet.

- The LCNE circuit board can be installed in any LCN module, in any spare paddle-board slot.

- The LCNE does not have an LCN (node) address; however, it counts as one of the 40 allowable loads on a coax-cable bus segment.

- The LCNFL circuit board can be installed in any LCN module, where it replaces the standard LCN I/O paddle-board. The node's LCN address is set on the LCNFL board through jumpers, 7-bit address and odd parity (a jumper in place is a zero "0" and a jumper removed is a one "1"). Note that this is the same scheme as used when addressing the LCN I/O board. Refer to the *LCN Guidelines - Implementation, Troubleshooting, Service* in this binder.

- The real-time clock data signal is not repeated by the LCNE or LCNFL; therefore, a Clock Source/Repeater (CS/R) paddle-board is required on each LCN coax-cable bus segment (one for Cable A and one for Cable B). The CS/R is installed in the paddle-board slot behind the EMPU/HMPU/HPK2 circuit board. There are two different methods of providing clock communications, where (1) the remote bus segment is under 300 meters (984 feet), using shielded-twisted pair, (2) the remote bus segment is up to 2 kilometers (1.2 miles) from the main coax segment, using fiber optic cable. Refer to the *LCN Guidelines - Implementation, Troubleshooting, and Service* manual in this binder.

  If a remote segment has only K2LCN boards in the modules, the digital clock (5 MHz) is used and no special transmission link is needed for the clock.

### 2.4.1 Operational Checkout of LCN Extenders (LCNEs)

Each fiber optic interface board (LCNE, FOCR, LCNFL) has a green LED indicator that indicates the minimum acceptable light power level is being received and a yellow indicator 6 that indicates data is being passed by the receiving board. These indicators can be used to establish that the system is operational.

1. With both of the modules (transmitting and receiving) powered on and the fiber optic cable connected, the green LED should be on. If not, refer to the *LCN Guidelines - Implementation, Troubleshooting, and Service* in this binder for troubleshooting procedures.

2. With both modules on and token-passing taking place (the yellow LED on the LCNI boards blinking), the yellow LED on the receiving boards (LCNE, FOCR, LCNFL) should be blinking. If this is not occurring, refer to the *LCN Guidelines - Implementation, Troubleshooting, and Service* in this binder for troubleshooting procedures.

3. Perform power loss measurements as described in *LCN Guidelines - Implementation, Troubleshooting, and Service* in this binder.

## 2.5 MODULE/BOX SELF-TEST

All of the Local Control Network (LCN) modules, HPN modules, and nearly all of the Data Hiway (DH) boxes will self-test upon power-up (system/unit power switch on). This requires a visual check of the LED-display status on each module/box in the system. Remove module covers to observe all LED indicators. If a failure is detected, the box or module in question has detected a hardware or firmware failure and must be serviced or replaced before running any software tests.

For the Module LED status-test-display meaning and corrective action, refer to the *Five/Ten-Slot Module Service* manual, in the *Service* binder.

If a module or box failure occurs later, when the system is on line, the operator maintenance personality logs the failure and recommends corrective action at the Optimum Replaceable Unit (ORU) level.

For the Hiway Box LED-status displays, their interpretation and corrective action, refer to the *BASIC System Service Manual, TDC 355* Troubleshooting Flow charts.

## 2.6 COLOR MONITOR CHECK

The color monitor checkout consists of a visual inspection of the power cord and color cables to ensure that they are properly installed. After the Universal Station is powered UP, press the Degauss button on the right side of the screen. Hold the button for a second or two to ensure that colors are restored. Next, adjust the Brightness and Contrast thumb wheels on right side of screen for the desired affect on the blinking character that appears on the upper-left side of the screen.

**NOTE**

If the brightness and contrast adjustments are too high, and a pattern remains on the screen too long, the screen phosphor may be etched, or worse yet, permanently burnt. The etch pattern can be removed by flooding the screen with white for an extended period of time.

Service information, including adjustments, test, and troubleshooting are found in Sections 3 thru 6 of the *Universal Station Service* manual, in the *Service* binder.

## 2.7 PRINTER SELF-TEST

### 2.7.1 ASPI-41 Printer

1. Ensure that there is ribbon and paper in the printer and that the top cover is closed.

2. Press and hold the **ON LINE** button while setting the **POWER** switch to **ON**, then release the **ON LINE** button.

3. The printer display first shows **ASPI**, then the printer begins its self-test, printing a full line of characters, time-after-time, advancing one character at the beginning of each line until the full character set is printed. The printer displays **TEST** while printing.

4. Press the **ON LINE** button again to stop printing. The printer again displays **WAIT**. If the **ON LINE** button is pressed again, the printer displays **LINE** and is on line.

### 2.7.2 ASPI-46 Printer

After installing the printer, you can test its operation by using the self-test procedure. Before beginning the self-test, verify that

1. The paper and ribbon cartridge are inserted correctly.

2. The power cable is connected.

3. The front cover is closed.

Perform the following steps:

1. Press the **ON LINE** button while powering the printer on.

   The display window says **TEST**, and a pattern is printed on the paper as shown in Figure 10-1 of *Universal Station Service*, in the *Service* binder. Note that the printer will continue to print until you press the **ON LINE** button.

2. The display window says **WAIT**.

Service information including pinning, adjustments, tests, and troubleshooting are found in the *Universal Station Service* manual.

Printer operating and customizing instructions are also found in Appendix D of the *Process Operations Manual*, in the *Process Operations* binder.

## 2.8 REMOVABLE-MEDIA DRIVE CHECK

Your system contains either high-capacity cartridge disk drives or floppy disk drives.

### 2.8.1 Cartridge Disk Drive Check

Before initial checkout, insure that the ac power cable and the I/O cable are connected. Note that ac safety ground for the cartridge disk drive frame is made (connected) when the ac cable is plugged into the power entry box (except in USs that have the Acme power supply suppling power to the cartridge drives).

- If a polystyrene insert is in the cartridge slot, remove it carefully.
- Open the rear door of the console cabinet and apply power to the Universal Station.
- Ensure that the Cartridge Disk power supply DC Status LED is lit (Dual Node Module only).
- Perform System Validation, see Section 3.

Service information including pinning, adjustments, tests, and troubleshooting are found in the *Universal Station Service* manual. See Appendix A for handling and storage of the cartridge disk. Note that instructions for changing the LCN module (node) address will be found in the *LCN System Installation Manual.*

### 2.8.2 Floppy Disk Drive Check

Before initial checkout, ensure that the ac power cable and the I/O cable are connected. Note that ac safety ground for the disk-drive chassis (frame) is made (connected) when the ac cable is plugged into the power-entry box (except in USs that have the Acme power supply suppling power to the cartridge drives).

- Before operating the 5 1/4 floppy disk drive, open the latch lever and remove the shipping insert. Do not attempt to close the latch lever without first inserting a diskette, or the shipping insert. To write protect the 5 1/4 diskette, the write tab must be taped over.
- Open the rear door of the console cabinet and apply power to the Universal Station.
- Ensure that the Disk Drive power supply DC STATUS LED is lit( Dual Node Module only).
- Perform System Validation, see Section 3.

Service information including pinning, adjustments, test, and troubleshooting are found in the *Universal Station Service* manual in the *Service* binder. See Appendix A for handling and storage of the Flexible Diskette, commonly called the "floppy disk." Note that instructions for changing the LCN module (node) address are found in the *System Installation Manual.*

## 2.9 ANNUNCIATOR TERMINAL BOARD CONNECTIONS

All Universal Stations with an Operator keyboard include the external annunciator terminal board. This board is located in the console bay below the keyboard, on the lower-right side panel.

The standard board, as shown in Figure 2-6, includes four solid-state relays, three of which can be used for switching external annunciators or indicators. The input connections to these relays are prewired so that actual determination of which relay is activated by specific alarm, event, or message priorities is made through configuration of SYSTEM WIDE VALUES. Implementation information is provided in the *Network Form Instructions*, in the *Implementation/Startup & Reconfiguration -1* binder.

Ensure that terminal board to annunciator panel wiring, see Figure 2-6 is according to user requirements.

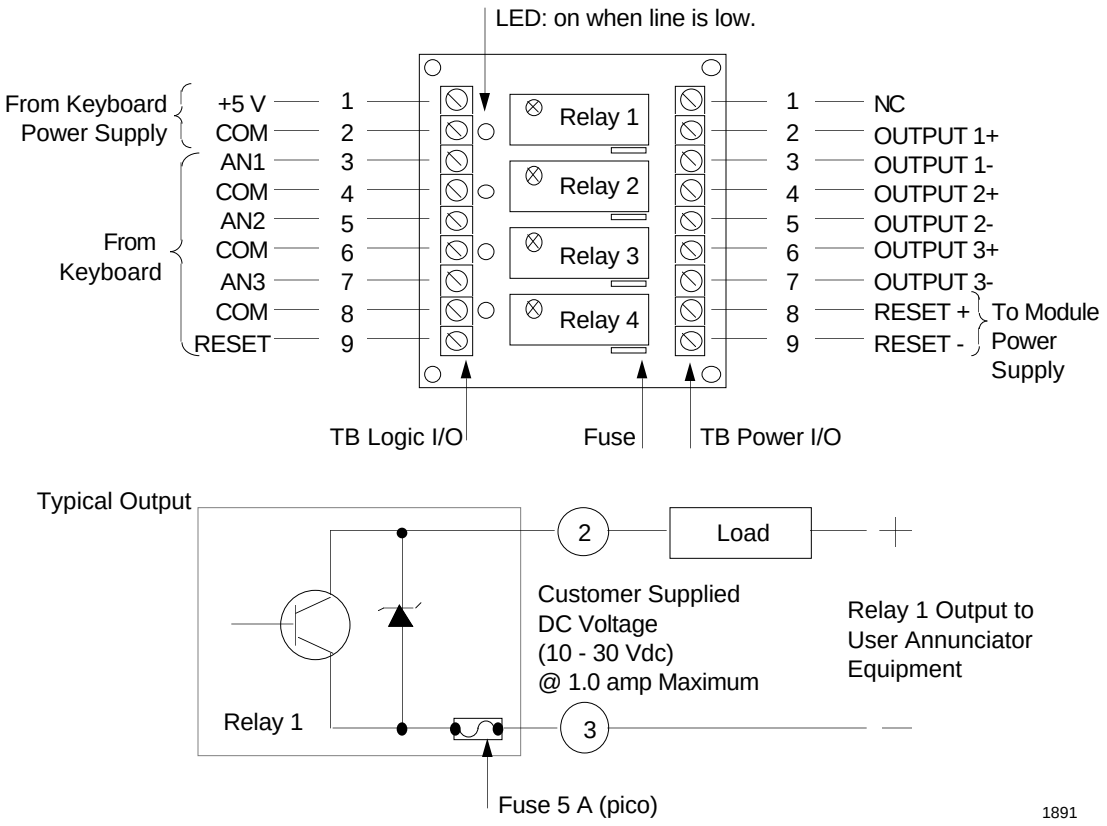



**Figure 2-6 — External Annunciator Terminal Board**

## 2.10 UXS and AXM Connection to the Network

The WSI I/O and WSI2 I/O boards connect to several different networks through different types of Media Access Unit (MAU). The MAU is mounted on the end of an adapter cable connecting to J6 on the WSI I/O board. It is important that the BNC or other connector type on the MAU does not come in contact with any conducting surface. This connection must be kept dry and not be allowed to come in contact with contaminates.

# SYSTEM VALIDATION
# Section 3

*This section lists all of the test programs and the initial configuration requirements.*

## 3.1 HARDWARE VERIFICATION TEST SYSTEM (HVTS) OVERVIEW

The Hardware Verification Test System is first loaded on an empty system for post-installation system checkout. Later it can be used as a troubleshooting aid on nodes physically separated from the on-process LCN. Test-system loading and set-up instructions are provided in the HVTS publications listed in subsection 1.2. Diskette/cartridge handling and loading instructions are found in Appendix C of the *Process Operations Manual*, in the *Process Operations* binder.

A successful pass through each of the following subsystem test programs ensures that the system hardware and firmware elements are functional, and that the system is ready for the operational software required for system startup:

- Local Control Network Exerciser (LCNX)
- Keyboard Subsystem Tests (KEYB)
- Operator Interface Subsystem Tests (OPIF)
- Smart Controller Magnetic Disk (SCMD)
- Winchester Disk Subsystem Tests (WINC)
- Floppy Disk Subsystem Tests (FLPY)
- Data Hiway Interface Subsystem Tests (DHIF)
- System Input/Output Subsystem Tests (SIOS)
- Memory Exerciser Module Tests (MEMX)
- Communications Line Interface Tests (CLIF)
- Data Hiway Exerciser Tests (DHEX)
- System Clock Exerciser Tests (CLKS)
- PIC/VDG Subsystem (PDGI)
- Smart Controller Magnetic Disk Tests (SCMD)
- Applications Module Redundancy Tests (AMRT)
- Process Network Interface Tests (PNIF)
- Programmable Logic Controller Interface Test (PLCT)

- Network Gateway Interface Test (NGIF)
- Process Network Interface Enhanced Test (PNIE)
- LCN Sequence of Events (LSOE)
- General Gateway Serial Interface Tests (GGSF)
- LCN US with X-Windows Workstation Tests (USXF)
- Workstation Interface Test (WSIF)
- Application Module$^{X}$ Interface Tests (XAMF)

Note that the section numbers refer to corresponding sections of the HVTS publications listed in subsection 1.2.

### 3.1.1 Configuration and Revision Information

After the HVTS program is loaded, we recommend you enter the command "CON" for “configuration” to obtain a printout of the node under test. This printout provides you with a record copy of the node hardware configuration.

An example is shown in Figure 3-1. In the example, entries made by the operator are enclosed in boxes. Also, the operator has stepped through three different nodes obtaining the configuration for each.

```
11:05 NODE  1 ALL  CON
19-SEP-1989 11:05:22 Node  1  Universal Stat
Slot  1 HPK2                    4004, 000A and 300000 Memory Words At (
Slot  2 LCNI                    4758, 05A2, 4758, 0593, 0200, 8806, 8000,
Slot  3 SPDG                    44CA, 1F02, 0098, 0099, 0200, 8400, 000E,
Slot  4 EPDG                    4442,     , 640D, F0A3, 0202,     , 0F00,

11:05 NODE  1 ALL  NODE 5
11:05 NODE  5 ALL  CON
19-SEP-1989 11:05:30 Node  5 Application Mod
Slot  1 HPK2                     4003, 0008 and 200000 Memory Words At (
Slot  2 LCNI                     4C58, 05A2, 4C58, 0591, 0200, 8C06, 010E,

11:05 NODE  5 ALL  NODE 6
11:05 NODE  6 ALL  CON
19-SEP-1989 11:05:39 Node  6  History Mod
Slot  1 HPK2                     4203, 000A and 200000 Memory Words At (
Slot  2 LCNI                     4C58, 05A2, 4C58, 0591, 0200, 8C06, 010E,
Slot  3 SPC                      43C1, 0700, 0798, 0798, 0500, 4000, 2003,
```

3018

**Figure 3-1 — CONfiguration Sample Printout**

**NOTE**

You may notice some apparent discrepancies between the printout obtained above and the physical boards actually found in the equipment. For example, software cannot tell the difference between an LCNI and an LLCN board. Although your equipment may use an LLCN, the software will report an “LCNI.” In addition, software is made to “think” a physical EPDG board occupies two board-slots. Software reports the first “slot” is occupied by an “SPDG” board and the second nonexistent “slot” contains an “EPDG.”

Incidentally, the first slot above an EPDG **cannot be physically occupied by any board** and the second slot above an EPDG may be occupied by **only certain boards.** See the *Five/Ten-Slot Module Service* manual in the *Service* binder for more detailed information.

If you enter the "REV" command, the revision of the hardware (HW) and firmware (FW) will be displayed as illustrated in Figure 3-2. Again, entries made by the operator are enclosed in boxes in this example. The operator has again stepped through three nodes, obtaining the revisions for each.

```
11:09 NODE  1 ALL ? REV
19-SEP-1989 11:09:05 Node  1  Universal Station
Slot  1 HPK2  HW Ver 4 Rev A   FW Ver 0 Rev A  Type 1 1  Lowest Acceptable
Slot  2 LCNI  HW Ver 0 Rev H   FW Ver 0 Rev C  Type 1 1   HW Ver 0 Rev F
Slot  3 SPDG  HW Ver 2 Rev E   FW Ver 1 Rev E  Type 1 1   HW Ver 0 Rev A
Slot  4 EPDG  HW Ver 2 Rev E   FW Ver 1 Rev E  Type 1 1   HW Ver 0 Rev A

11:09 NODE  1 ALL ? NODE 5
11:09 NODE  5 ALL ? REV
19-SEP-1989 11:09:14 Node  5 Application Module
Slot  1 HPK2  HW Ver 3 Rev A   FW Ver 0 Rev A  Type 1 1  Lowest Acceptable
Slot  2 LCNI  HW Ver 0 Rev H   FW Ver 0 Rev C  Type 1 1   HW Ver 0 Rev F

11:09 NODE  5 ALL ? NODE 6
11:09 NODE  6 ALL ? REV
19-SEP-1989 11:09:21 Node  6  History Module
Slot  1 HPK2  HW Ver 3 Rev C   FW Ver 0 Rev B  Type 1 1  Lowest Acceptable
Slot  2 LCNI  HW Ver 0 Rev H   FW Ver 0 Rev C  Type 1 1   HW Ver 0 Rev F
Slot  3 SPC   HW Ver 1 Rev D   FW Ver 0 Rev D  Type 1 1   Hw Ver 1 Rev A
```

3019

**Figure 3-2 — REVision Sample Printout**

## 3.2 BASIC SYSTEM TEST OVERVIEW

For checkout of the hiway-based equipment, Operator Station, Controller, PIU, UAC, UPS, and optional peripheral equipment, refer to the *TDC 3000 BASIC System Checkout Manual*, in the *BASIC System Installation* binder. This manual contains an installation checklist and an instruction guide to final preparation of the equipment before startup.

# OPERATING PRACTICES
# Appendix A

## A.1 OPERATING PRACTICES AND HOUSEKEEPING

*Listed here are some do's and don'ts pertaining to operating practices and general housekeeping that should be followed during startup and normal everyday operations.*

### A.1.1 Before Startup

1. Thoroughly clean all operating areas, subfloor areas, cable raceways, heating and air-conditioning ducts, and plenums.

2. Make sure that all control-room windows are sealed.

3. Place impregnated mats at each entrance to a control area to prevent dirt and dust from being tracked in.

4. Provide a coat rack and/or closet outside the operating area for removal of any outer clothing made of nylon or other synthetic fabrics, except where flame-retardant uniforms are mandatory at all times.

5. Make sure that the furniture and carpets are not made of materials that can combine with clothing to create static electricity.

6. Prepare a regular cleaning schedule for specific area requirements and for cleaning of consoles, cabinets, and peripheral devices where necessary. (Caution: Do not attempt to clean the printed-wiring boards themselves.)

7. Establish a “no smoking” rule in the operating area. Smoke and other fine dust particles can damage cartridge and floppy disks and their drives.

8. When swapping or handling printed-circuit cards, use a static-control device, e.g., a wrist strap, see *CIRCUIT CARD HANDLING*, Appendix A.

### A.1.2 After Startup

1. Continue your "no smoking" rule in operating areas that contain magnetic tape, floppy, cartridge or hard disk drives, or where disks and media are stored.

2. Maintain humidity levels (ideally) between 40 and 60%. (Lower humidity may cause static-discharge problems.)

3. Control humidity fluctuations to a rate-of-change less than 6% per hour.

4. Do not defeat temperature and humidity controls by opening doors and windows (e.g., to enhance operator comfort).

5. Keep traffic in the control-room operating areas to a minimum. Restrict access to authorized personnel, whose duties require control room entry.

6. Review procedures for extinguishing electrical fires and establish fire-fighting procedures. Refer to a qualified fire fighting systems contractor for assistance.

7. Plant personnel frequently use hand-held radios ("walkie-talkies"), or citizen-band radios mounted in maintenance vehicles for communications. To avoid RFI problems, review procedures for proper use of such devices as follows:

   If radio communications must take place within an operating area or input/output area, a base-station transceiver with an external antenna should be used.

   For other applications, radio transmitters with outputs rated as high as 5 Watts must be kept at least 3 meters (10 ft) from the TDC 3000$^X$ equipment during operation. Transmitters with outputs higher than 5 Watts must be kept as far as possible from your consoles and cabinets. (Refer to *Data Hiway Subsystem Site Planning* for distance formula.) Keep equipment doors closed.

   Other sources of RFI include generators, arcing relays, or motor contacts, etc.

8. Follow proper cleaning procedures when cleaning the operator area or the control room:

   Do not use water freely. Mop should be only dampened, not wet or dry.

   Use a lint-free, antistatic-type dust cloth to remove dust.

   Do not sweep around areas containing magnetic disk or diskette drives.

   Use vacuum cleaner on carpets—preferably one connected to an external system.

   Do not allow liquids to be placed on the Universal Station keyboards. Liquid spills will damage electronic equipment.

9. Clean the floppy disk/cartridge disk drive (if required) as outlined in the *Universal Station Service* manual in the *Service* binder, to prevent error display when loading programs.

10. Regularly clean the CRT face and touch screen, to minimize operator fatigue. Cleaning procedures are found in *Universal Station Service* manual in the *Service* binder.

11. Clean or replace cabinet/module ventilating-fan filters once a month in dirty environments, every two or three months in clean environments (e.g., a control room or operating center that does not open into a dirty area is considered a clean environment). Use only Honeywell-recommended replacement filter or equivalent. Follow filter-cleaning instructions given in the *Universal Station Service* manual in the *Service* binder.

12. Clean the printer and trend pen recorder before startup and periodically thereafter, as described in the *Universal Station Service* manual in the *Service* binder.

13. Periodically clean the operator and engineer keyboards by dampening a cloth with mild detergent and wiping the keys. Do not spray detergent solution on keys as leakage may ruin the circuits underneath.

## A.2 FLEXIBLE DISKETTE HANDLING AND STORAGE

Upon receipt of Flexible (floppy) Diskettes, inspect them for signs of shipping damage. Allow at least one hour for temperature adjustment to the computer-room environment before using.

Recommended storage is on shelves in the computer or control room. They should be kept in their protective storage envelopes at all times except when installed in the diskette drive. Store the diskettes flat (horizontal) in stacks of no more than ten.

**CAUTION**

Never touch or attempt to clean the areas exposed by the openings in the flexible-diskette jacket. Ensure that the flexible diskette is kept in its protective envelope while you write on the label.

The system diskettes are provided with labels attached to the jacket. Writing on the labels is permitted but only with a felt-tipped pen. Do not use ball point pens, lead pencils, grease pencils, or any marker that could dent the diskette jacket or leave loose contamination.

### A.2.1 Handling and Loading

- When loading a diskette, ensure that the FD drive is powered on.
- After opening the drive's door or latch lever, remove the diskette from its protective envelope. Then carefully slide the diskette into the drive until the jacket rests solidly against the stops and close the drive's door or latch lever.
- Always return the empty protective envelope to the diskette storage-box or other clean area and protect it from liquids, dust, and other contaminants.
- Replace the diskette in its protective envelope and return it to a storage box whenever it is not in use.
- Never leave a diskette partially inserted in the drive.
- Never use paper clips on a flexible diskette cartridge.
- Inspect each diskette during normal operation and remove damaged or contaminated diskettes from service.

## A.3 CIRCUIT CARD HANDLING

The circuit cards or Printed Wire Boards (PWBs) are adequately protected from damage caused by Electrostatic Discharge (ESD) only while installed in the system module or card file, or packed inside the conductive plastic bag in which they are shipped. To avoid ESD damage when the card is handled outside its enclosure, to guard against electrical overstress, and to maintain personnel safety, the following practices and procedures must be followed:

- Turn off power to the module or card file before removing or inserting the card.
- Handle the card only by its edges. Do not touch the lands, connectors, or components unless you are wearing a grounded wrist-strap and the card is on a conductive work-surface.
- When applying power to a system before installation is complete, terminate all loose wires within the cabinet or console. Make sure power is off when any wiring work is being done.
- ESD-generating materials, such as plastic, rubber, nylon, polyester, vinyl, silk, or synthetic materials or garments, should not be allowed in the area of the cards. If you are wearing clothing of such material, you must stand on a grounded floor-mat while wearing a grounded shoe-strap, or you must wear a grounded wrist-strap while handling cards. Note: take special care to always keep the cards away from the material because static charges cannot be drained off, except by discharge.
- Do not carry unprotected cards across carpeting, unless it is grounded conductive carpet such as conventional fiber with woven-in ground wire. Always keep the circuit card in its protective bag until it is actually needed.
- All test equipment and tools must be connected to the metal card-file chassis or module frame with a ground wire, before touching the card or internal wiring.
- Cards must be handled and transported to and from the job site in their protective bags (see approved material list).
- Personnel must wear an approved wrist-strap connected to the chassis before removing the card from its protective bag or card slot.
- When shipping a suspected defective card, pack it in its protective bag before placing it in the shipping carton. Note that cards must be protected against further damage so that failure analysis can be accomplished.
- Do not use standard bubble-pack mailers.
- Do not allow unprotected cards to come in contact with styrofoam packing material.

For additional ESD information, refer to the *LCN Site Planning Manual* in the *LCN Site Planning & Installation* binder.

## A.4 CARTRIDGE DISK HANDLING AND STORAGE

Upon receipt of Cartridge Disks, inspect them for signs of shipping damage. Allow at least one hour for temperature adjustment to the computer-room environment before using.

Recommended storage is on shelves in the computer or control room.

Although the cartridge protects the disk from most accidental damage, the following cartridge handling rules should be observed:

- Do not try to open the cartridge when it is outside the drive.
- Do not insert objects into the cartridge.
- Remove the cartridge from the drive after use and store in its protective jacket.
- Do not expose the cartridge to direct sunlight or moisture.
- Do not expose the cartridge to magnetic fields greater than 30 oersteds.
- Protect the cartridge from dirt, spills, and harsh environments.
- Avoid handling the front edge of the cartridge, since oils can be transferred from the hands to the cartridge disk.

### A.4.1 Loading

- Drive power must be on before the cartridge can be inserted. If power to the drive is off, the latch pin in the drive will prevent cartridge insertion.
- The cartridge is inserted into the drive, shutter first. The cartridge edge containing the shutter faces toward the stop button on the front of the drive (see Figure A-1). Interlocks in the system prevent improper cartridge insertion.

**CAUTION**

If the cartridge is difficult to insert, check its orientation and try again. Do not force the cartridge into the drive. Objects inserted into the cartridge opening in the front of the drive may cause damage to the drive. Such action will void the manufacturer's warranty.

- After loading a cartridge, the green indicator on the front of the drive next to the stop button will blink as the motor is coming up to speed. When the indicator stops blinking and stays lit, the drive is READY. See Figure A-1.

**NOTE**

The yellow LED will flash briefly as the drive reads initialization information from the disk. If the drive fails to initialize correctly, an error condition exists. If this occurs, reinsert the cartridge to ensure proper seating. If this does not correct the problem, the media may require reformatting or the drive may require service. See Figure A-1.

- To remove the cartridge, push the stop button. The green LED then begins to blink as the motor spins down. When the motor has come to a stop, the green LED turns off and the latch pin disengages. The cartridge can now be removed. See Figure A-1.

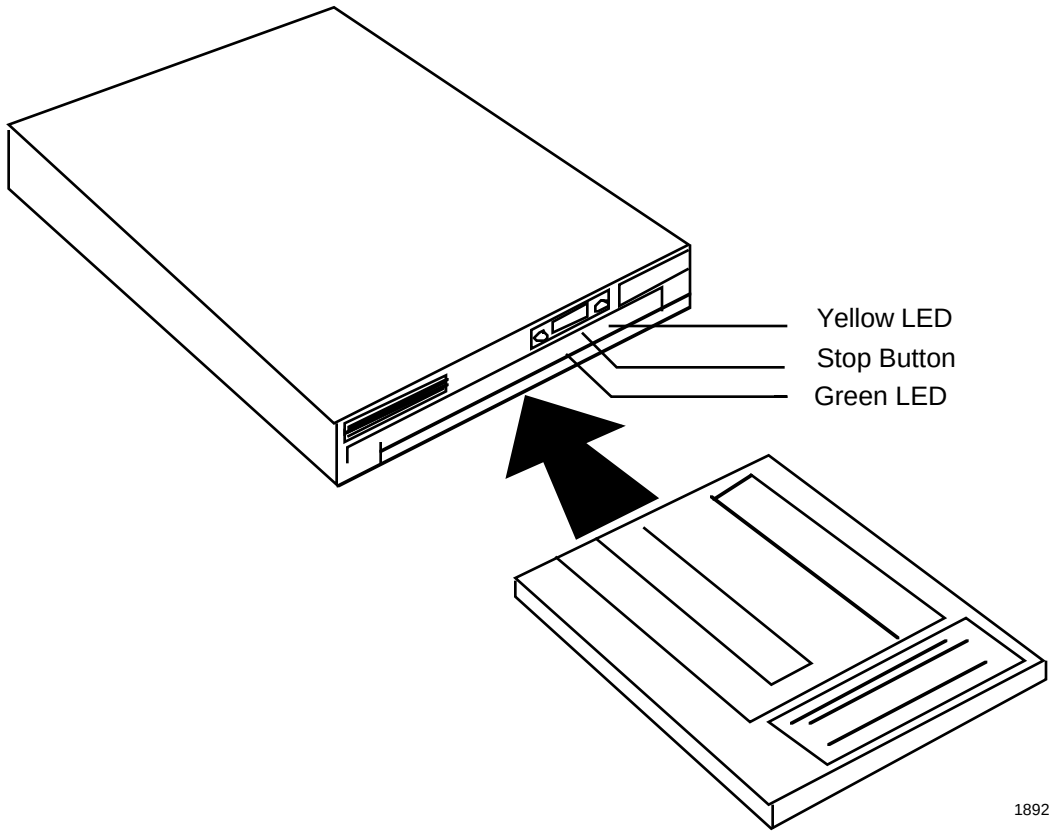



**Figure A-1 — Cartridge Insertion**

# CLIPS AND SWITCHES (SYSTEM PINNING)
# Appendix B

*All LCN modules, hiway boxes, and peripheral devices require a unique system device address.*

For system module characterization (node-address pinning) and Hiway Gateway preferred access cabling, refer to *LCN System Installation* manual, in the *LCN Installation* binder. For peripheral-equipment characterization (option selection), refer to the *Universal Station Service* manual in the *Service* binder. For Winchester Disk drive characterization and placement of the terminator DIP, refer to the *History Module Service* manual, also in the *Service* binder.

# TDC 3000X LCN CABLE TESTING
# Appendix C

## C.1 PREPARATION

First, read all of this procedure and have all of the test equipment and material available, see subsection 1.3 TOOLS AND TEST EQUIPMENT.

Cable sections of less than 3 feet must be tested with the Model 1502 tester. The 1503 tester has a minimum resolution of 3 feet.

## C.2 SETUP

Set up the TDR Cable Tester as follows:

| | | | | |
|---|---|---|---|---|
| POWER | | : | ON or OUT | |
| RETURN LOSS (0 dB to 60) | | : | 0 dB | (or SENSITIVITY) |
| RETURN LOSS (FINE) | | : | 0 dB | (or SENSITIVITY) |
| FEET/DIV (RED) (X10/X100) | | : | X10 | |
| FEET/DIV (50 to .5) | | : | .5 | |
| NOISE FILTER | | : | OUT | |
| POSITION & FINE | | : | BASE LINE IN CENTER | |
| INTENSITY | | : | AS REQUIRED | |
| FOCUS | | : | AS REQUIRED | |
| DISTANCE | | : | 000 | |
| IMPEDANCE | 50 Ohms | : | OUT | |
| IMPEDANCE | 75 Ohms | : | IN | |
| IMPULSE WIDTH | 10 ns | : | IN | (or SHORT PULSE) |
| IMPULSE WIDTH | 100 ns | : | OUT | (or MEDIUM PULSE) |
| IMPULSE WIDTH | 1000 ns | : | OUT | (or LONG PULSE) |
| CABLE DIELECTRIC | SOLID POLY | : | OUT | |
| CABLE DIELECTRIC | FOAM POLY | : | IN | (or .79 DISTANCE CAL) |
| CABLE DIELECTRIC | VAR | : | AS IS | |
| ZERO REF (SET) | | : | Put First Pulse on Left of Screen | |
| 0 dB SET | | : | AS IS | |

## C.3 TEST PROCEDURE

**NOTE**

This test procedure does NOT work with multiple pieces of COAX cable connected together.

Test each length of cable, one at a time, as follows:

1. With no COAX connected, the TDR screen should look like Figure C-1.

2. Connect the COAX to be tested to the Cable Jack on the TDR, do not terminate the other end. The screen should look like Figure C-2 or C-3.

3. Using both the ZERO REF and DISTANCE controls, position the second pulse with its peak on the vertical center line on the screen. Use POSITION to center the horizontal base line.

4. The cable terminator can be put on or taken off several times to verify that it is the "returned" pulse and not the "transmitted" pulse that is in the center of the screen.

5. With the terminator off and using the "RETURN LOSS fine" (and if necessary, "0 dB SET"), adjust the return pulse to three divisions high while keeping the base line on the horizontal center line of the screen.

6. The screen should look like Figure C-4 or Figure C-7.

7. Connect the "Selected Terminator" (not just any terminator), using the "jack-to-jack" adapter or barrel splice, to the free end of the COAX.

8. The screen should look like Figure C-5 or Figure C-8.

9. Take note of the RETURN LOSS (dB) settings, add 34 dB of gain to the setting and then adjust the RETURN LOSS (dB) knobs to the new calculated setting.

   Example 1: 0 on main, 0 on fine; readjust to 30 on main, 4 on fine.
   Example 2: 0 on main, 5 on fine; readjust to 30 on main, 9 on fine.

10. Adjust POSITION and FINE controls until the left and right base lines are on the center line of the screen as in Figure C-6 or Figure C-9.

11. If any part of the return pulse (the same width as the unterminated pulse) is three or more divisions from the base line (in either direction), the COAX is REJECTED, as in Figure C-10. If the return pulse is less than + or - three divisions, the COAX is ACCEPTED, as in Figure C-11.

    If any part of the trace between the transmitted pulse and the returned pulse is three or more divisions (+ or -) from the base line, REJECT the COAX under test.

    Both ends of every coax must be tested. If either end measures 3 or more divisions from the base line, the COAX is REJECTED.

12. Tag all REJECTED COAX and take necessary steps to replace them.

**NOTE**

If Steps 1 through 10 are done very carefully, Step 11 can be repeated many times (for the same length of COAX) without any adjustments, and changing only the "COAX under test," for assembly line type testing.

## C.4 TEST COMMENTS/CONDITIONS

A. Keep batteries on the 1503 TDR Cable Tester fully charged.

B. Do not compromise (cheat) on the accuracy of the terminator. This whole procedure to ACCEPT or REJECT the coax depends on the delta or difference between the SELECTED TERMINATOR and the COAX UNDER TEST. Paint or identify the SELECTED terminator because it is hard to find in a normal distribution of terminators.

   Terminator specifications allow a 2% variation, i.e., +/-1.5 ohms or 73.5 to 76.5 ohms. The selected terminator must be within 0.1 ohm, i.e., 74.9 to 75.1 ohms. Several years ago, some terminators were mistakenly made with inductive resistors that measure ok on an ohmmeter, but show up as a sideways "s" on the TDR, see Figure C-12. Do not use such terminators on the LCN or Data Hiway.

C. If absolutely necessary, you can use a "T-connector" instead of the "Splice" to connect the COAX to the terminator; however, the "T-connector" must not have the 1-ohm resistor in series or the 56 k ohm resistor to the case of the "T-connector."

D. Workmanship. The BNC connectors must be installed on the COAX with the correct tools. If the connection was made using PLIERS, CHANNEL-LOCKS, or VICE GRIPS, REJECT the COAX. Look for folds or kinks in the COAX, or if the minimum bend radius has been exceeded.

E. When the COAX and TERMINATOR match each other, the returned pulse is very small or very flat on the base line. Figures C-6, or C-9, or C-11 would look almost flat at the return pulse.

F. When the two "dB" values are mentioned, the first refers to the main setting; i.e., 0, 10, 20, 30, 40, 50, or 60 dB. The second value refers to the variable or fine setting; i.e., 0 to 18 dB. Example: 30 dB and 8 dB means 30 on the main setting and 8 on the variable setting for a total gain of 38 dB.

G. The *BASIC System Checkout Manual, (*4/84 or later), has a "Data Hiway" TDR Cable Acceptance Test. Using + or -3 ohms (or 2.03%) this test can be used to check the middle of LCN cables.

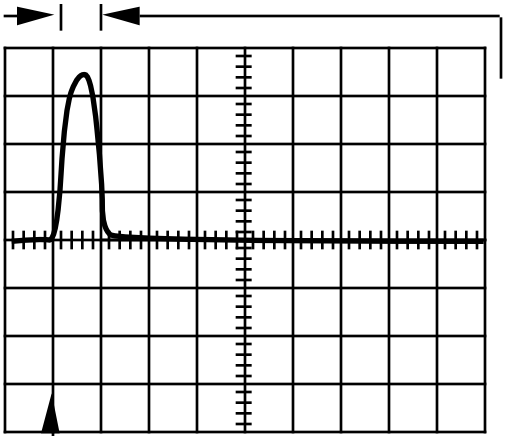



**Figure C-1**

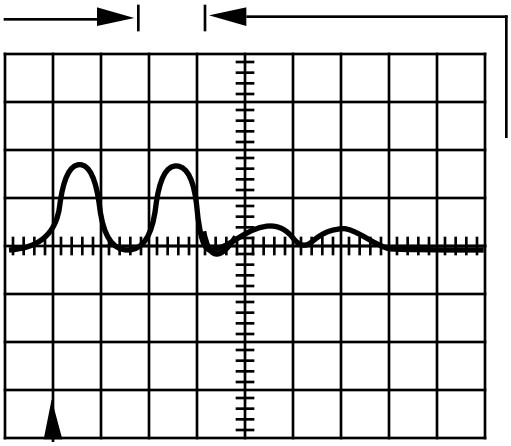



**Figure C-2**

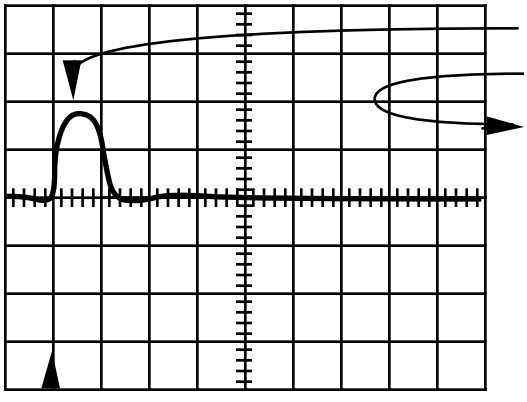
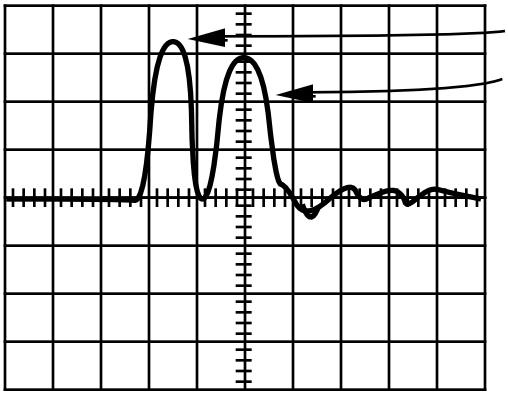


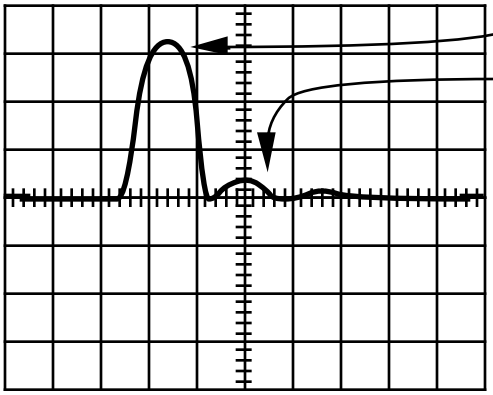

**Figure C-3**



Transmitted Pulse
Returned pulse
2 meter/6.5 ft example
X10 & .5 ft/Div setting
0 dB & 4 dB loss setting
No TERMINATOR

1897

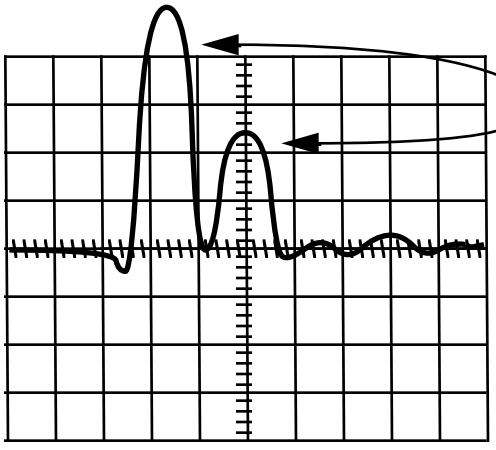
**Figure C-4**



Transmitted Pulse
Returned pulse
2 meter/6.5 ft example
X10 & .5 ft/Div setting
0 dB & 4 dB loss setting
Selected TERMINATOR connected
NOTE: Returned pulse is (almost) gone.

1898

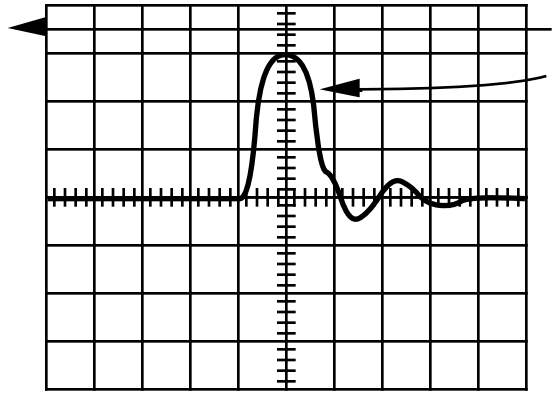
**Figure C-5**



Transmitted Pulse
Returned pulse
2 meter/6.5 ft example
X10 & .5 ft/Div setting
30 dB & 8 dB loss setting
Selected TERMINATOR connected
NOTE: This is 34 dB greater than the initial loss of 4 dB.(4 dB + 34 dB = 38 dB).

1899

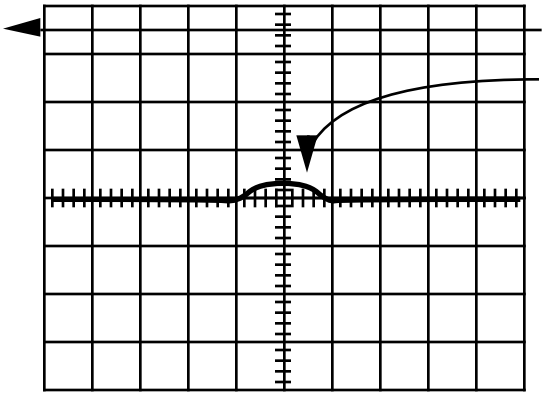
**Figure C-6**



Transmitted Pulse is off screen
Returned pulse
15 meter/50 ft example
X10 & .5 ft/Div setting
0 dB & 5 dB loss setting
No TERMINATOR

1900

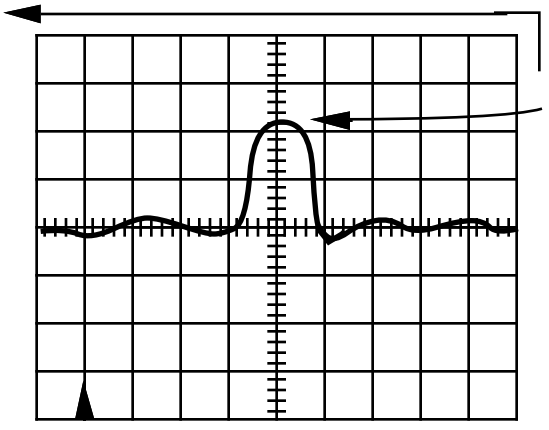
**Figure C-7**



Transmitted Pulse is off screen
Returned pulse
15 meter/50 ft example
X10 & .5 ft/Div setting
0 dB & 5 dB loss setting
Selected TERMINATOR connected
NOTE: Return pulse is (almost) gone.

1901

**Figure C-8**



Transmitted Pulse is off screen
Returned pulse
15 meter/50 ft example
X10 & .5 ft/Div setting
30 dB & 9 dB loss setting
Selected TERMINATOR connected
NOTE: This is 34 dB greater than the initial loss of 5 dB (5 dB + 34 dB = 39 dB).

1902

**Figure C-9**

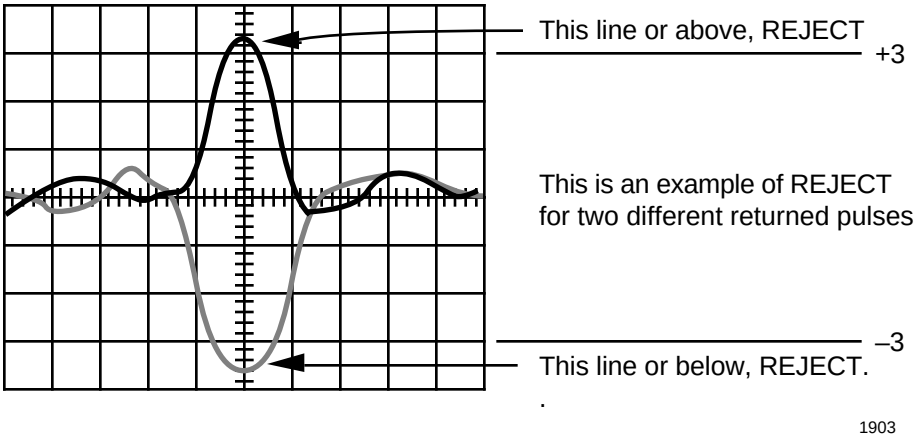



**Figure C-10**

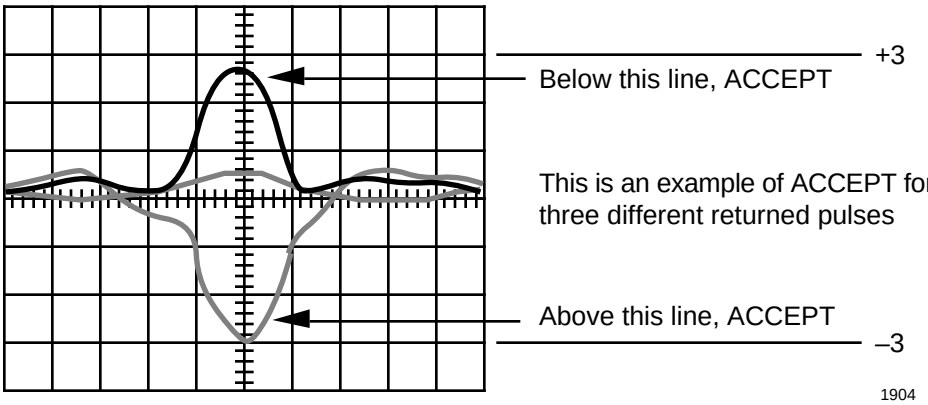



**Figure C-11**

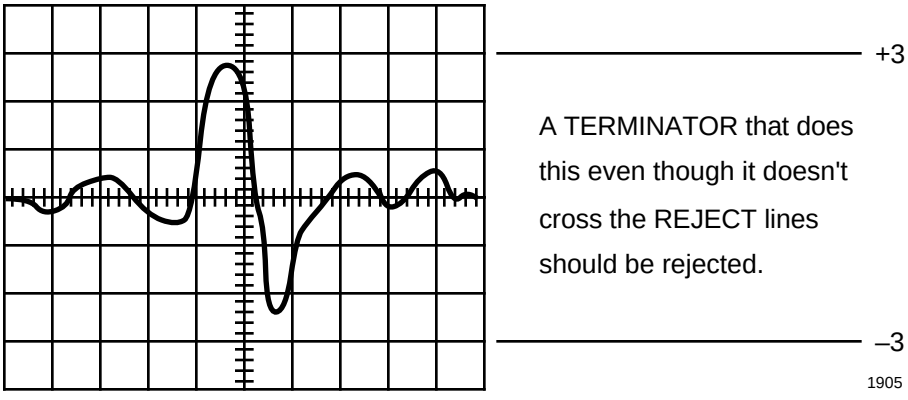



**Figure C-12**

## C.5 EQUATIONS AND SAMPLE CALCULATIONS

### EQUATIONS:

Reflection Coefficient = Greek Letter "RHO," shown here as the letter "p"

1. $p = \frac{E\ return}{E\ transmitted}$

2. $p = \frac{(Z\ test - Z\ ref)}{(Z\ test + Z\ ref)}$

3. $Z\ test = Z\ ref\ \frac{(1 + p)}{(1 - p)}$

4. $|p| = 10 - \frac{(RETURN\ LOSS\ dB)}{(20)}$

5. $RETURN\ LOSS_{dB} = 20\ LOG|p|$ $\quad$ |p| means absolute value of (p)

**SAMPLE CALCULATIONS WHEN THE TERMINATOR VARIES:**

| | (COAX) Z ref | (TERMINATOR) Z test | (PULSE) polarity | p | % | RETURN LOSS dB |
|---|---|---|---|---|---|---|
| NG | 75 | INF | + | 1.0000 | 100.000 | 0.0000 |
| NG | 75 | 1.0 Meg | + | 0.9998 | 99.985 | -0.0013 |
| NG | 75 | 1.0 k | + | 0.8604 | 86.046 | -1.3053 |
| NG | 75 | 225.0 | + | 0.5000 | 50.000 | -6.0205 |
| NG | 75 | 100.0 | + | 0.1428 | 14.285 | -16.9019 |
| OKAY | 75 | 78.12 | + | 0.0203 | 2.037 | -33.8175 |
| OKAY | 75 | 75.10 | + | 0.0006 | 0.066 | -63.5276 |
| OKAY | 75 | 75.00 | None | 0.0000 | 0.000 | -INF |
| OKAY | 75 | 74.90 | - | 0.0006 | 0.066 | -63.5160 |
| OKAY | 75 | 72.00 | - | 0.0204 | 2.040 | -33.8036 |
| NG | 75 | 50.0 | - | 0.2000 | 20.000 | -13.9794 |
| NG | 75 | 25.0 | - | 0.5000 | 50.000 | -6.0205 |
| NG | 75 | 0.0 | - | 1.0000 | 100.000 | 0.0000 |

**SAMPLE CALCULATIONS WHEN THE COAX VARIES**:

| | | | | | | |
|---|---|---|---|---|---|---|
| OKAY | 78.12 | 75 | - | 0.0203 | 2.037 | -33.8175 |
| OKAY | 75.10 | 75 | - | 0.0006 | 0.066 | -63.5276 |
| OKAY | 75.00 | 75 | None | 0.0000 | 0.000 | -INF |
| OKAY | 74.90 | 75 | + | 0.0006 | 0.066 | -63.5160 |
| OKAY | 72.00 | 75 | + | 0.0204 | 2.040 | -33.8039 |

Notice: in both sets of SAMPLE CALCULATIONS that the pulse is positive if the TERMINATOR is GREATER than the COAX and that the pulse is negative if the TERMINATOR is LESS than the COAX.

# TDC 3000X SYSTEM POST-INSTALLATION CHECKLIST
# APPENDIX D

Customer_____SID_____Date(delivery)_____Date(Start up)_____

POWER OFF CHECKS*

A. Grounding Checks (power off). ☐
AC Safety Ground.
Master Reference Ground (MRG).
Reference *TDC 3000X System Site Planning Manual, SY-09-03 (Basic System Check-Out Manual), SY-20-04 (DH Site Planning Manual),* and *Process Manager Site Planning.*

B. Hiway/LCN Cable Separation Rules. ☐
Insure that cable A is cable "A" to all boxes/nodes, also that cable B is "B" to all boxes/nodes, see item G, next sheet.
Reference *SY-20-04 (DH Site Planning Manual)* and *HO-20-01 (DH Cabling, Wiring and Interconnection).*

C. Conduct Time Domain Reflectometer tests on the Data Hiway (DH) and Local Control Network (LCN) cables, as required. See Appendix C for LCN cables. ☐
Reference *SY-09-03 (Basic System Check-Out Manual)* for the Data Hiway cables, and *Process Manager Checkout* for UCN cables.

D. Hiway/LCN TEEs and Terminators. ☐
Check for proper installation and type. TEEs are not interchangeable.
Reference *SY-20-04 (DH Site Planning Manual), PI-09-01 (PIU Installation Manual), Process Manager Installation,* and *LCN System Installation Manual.*

E. Preferred Access Cable Wiring. ☐
Check cabling between preferred-access device and HTD for proper shield ground and addressing priority.
Reference *SY-20-04 (DH Site Planning Manual)* and *PI-09-01 (PIU Installation Manual).*

F. Check isolation of intrinsically safe wiring. ☐
Reference *SY-20-04 (DH Site Planning Manual)* and *PI-09-01 (PIU Installation Manual).*

POWER ON CHECKS*

A. Verify operation of all cabinet/module fans. ☐
Reference *SY-09-03 (Basic System Check-Out Manual), PM Service Manual,* and *Five/Ten-Slot Module Service*.

B. Verify proper dc-voltage levels on all Basic/PIU power supplies, including bulk supplies and power-regulator cards. ☐
Reference applicable service manual(s).

*See subsection 1.2 for list of support/reference documents.

Customer_____SID_____Date(delivery)_____Date(Start up)_____

C. Check ac-line levels and stability using an ac-line analyzer to record incoming voltage spikes, sags, frequency disturbances, and durations of same. ☐
Reference *SY-09-03 (Basic System Check-Out Manual)* .

D. Check file/module for proper power-up LED display. ☐
Reference *SY-09-03 (Basic System Check-Out Manual)* , *PM Service Manual,* and *Five/Ten-Slot Module Service* in the *Service* binder.

E. Verify hiway-device addressing and polling response. ☐
Reference *SY-09-03 (Basic System Check-Out Manual), HLPIU-M (HL PIU Maintenance Manual),* and *Hardware Verification Test System.*

SYSTEM OPERATIONAL CHECKS

A. OP Station Diagnostic Checkout (if present). ☐
Shake and tap Hiway TEEs with test running.
Reference *SY-09-03 (Basic System Check-Out Manual).*

B. Check operation of all optional BASIC equipment and peripherals (if present). Reference *SY-09-03 (Basic System Check-Out Manual).* ☐

C. Run Universal Station serial-printer unit diagnostic. ☐
Reference *Universal Station Service* manual in the *Service* binder.

D. Check operation of Trend Pen Recorder. ☐
Reference *RO-02-00 (Recorder Service Data)* in *Universal Station Service* Addendum.

E. CMTS (P/N 51150354). ☐
Reference *Core Module Test System*.

F. LCNI Network Communications Test (P/N 51150328). ☐
Reference *LCNI Network Communications Test*. This test can be used to verify that LCN cables are not crossed at any nodes.

Customer_____SID_____Date(delivery)_____Date(Start up)_____

G. Hardware Verification Test System (HVTS). ☐
Refer to subsection 1.2 (P/N 51105670).

_____ LCNX LCN Exerciser
_____ DHEX Data Hiway Exerciser
_____ DHIF Data Hiway Interface Subsystem tests*
_____ FLPY Floppy Disk Subsystem tests
_____ KEYB Keyboard Subsystem tests
_____ MEMX Memory Exerciser Module tests
_____ OPIF Operator Interface Subsystem tests
_____ SIOS Status I/O Subsystem tests
_____ CLKS Clock Subsystem tests
_____ CLIF Communications Line Interface tests
_____ PDGI Pick/VDG Subsystem tests
_____ SCMD Smart Controller Magnetic Disk tests (limit test to read only)
_____ AMRT Application Module Redundancy tests
_____ PNIF Process Network Interface tests
_____ PLCG Programmable Logic Controller Interface tests
_____ CNIF Communications Network Interface tests
_____ NGIF Network Gateway Interface tests
_____ PNIE Process Network Enhanced tests
_____ LSOE LCN Sequence of Events test
_____ GGSF Generic Gateway Serial Interface test
_____ USXF LCN US with X-Windows Workstation tests ($U^{X}S$ only)
_____ WSIF Workstation Interface test ($U^{X}S$ only)

H. Verify LCN Node and Data Hiway Box addresses (see Appendix B). ☐
Develop Hiway/LCN box address/location map

I. If a communication network is connected to one of the following node types, the contractor that designed and installed the network should check out the network. ☐

*Do not run the DHIF test on an ON-LINE Hiway or with the HLPIU or CB connected to the process.

# 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 complet 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: **LCN System Checkout** Issue Date: **9/95**

Publication Number: **SW20-510**

Writer: **D. 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

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

Cut Along Line

Additional Comments:

**Honeywell**

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

*Helping You Control Your World*