

# Chapter 8

## Testing and Troubleshooting

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## Overview

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This chapter helps you troubleshoot problems in your 3512 DSU/CSU or data communications network. It provides tests and quick checks to solve problems that have simple causes. Step-by-step fault isolation procedures help you locate problem causes by running tests from the 3512 front panel. Table 8-1 provides a guide to these procedures.

**NOTE:** Most tests disrupt data flow; warn anyone affected at your site and the remote site before testing.

**Table 8-1.**  
**Troubleshooting and Testing Guide**

<i><b>If...</b></i>	<i><b>Do This...</b></i>
Your data communications system is not transmitting and receiving correctly	See “Troubleshooting Sequence” in this chapter; refer to Chapter 2 for instructions on running the Automatic Self-Test.
Your newly installed <b>3512</b> passes the Installation Checkout in Chapter 2 but does not operate correctly	Refer to “Quick Checks,” in this chapter.
Your newly installed <b>3512 SDC</b> passes the Installation Checkout in Chapter 2 but does not operate correctly	Refer to “Quick Checks,” in this chapter.
Your 3512 is properly installed and was satisfactorily transmitting and receiving data before symptoms appeared	Refer to “Troubleshooting Sequence” in this chapter.
Problems persist	<i>In the U. S.:</i> call the Motorola Customer Support Center. <i>Outside the U. S.:</i> contact your nearest Motorola distributor.
The Customer Support Center instructs you to return the 3512 to Motorola	Refer to “Return Procedures” at the end of this manual.

## \*TEST Main Menu

Figure 8-1 shows the \*TEST main menu.

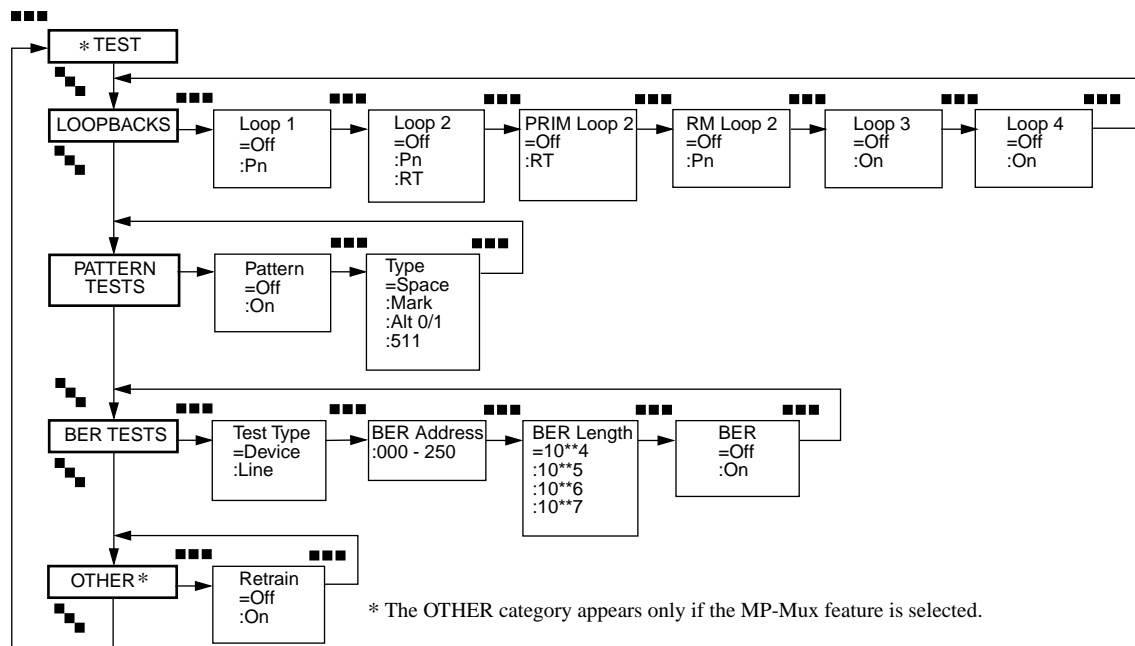


Figure 8-1. \*TEST Main Menu

## Troubleshooting Sequence

This sequence is organized to help you isolate the problem. By testing sections of your network in sequence you can eliminate areas and narrow down the problem. Begin with “Quick Checks.”

## Quick Checks

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The following steps may help you solve simple problems:

- 1) Check all cable connections. Review “Installing the Standalone 3512” in Chapter 2 to verify that you have installed the cables correctly.
- 2) Power down the unit and then power it back up. This initiates the self-test, which is explained in Chapter 2.

If the unit fails the test (the ST LED turns steady red, and an alarm message displays in place of the default display), check for alarm conditions under the \*STATUS menu (Chapter 5). If you cannot resolve the problem, there may be a hardware failure in the local unit. Contact Motorola Customer Support and provide the information listed under Motorola Customer Information. That section is located towards the front of this guide, following About This Manual.

- 3) Using the appropriate configuration worksheet (Appendix C) as a guide, go through the configuration menus to ensure that the 3512 or 3512 SDC is configured appropriately for the current application.
- 4) On 3512 SDCs:
  - a) Set both units to **P3=Direct**. Determine whether the units communicate. If:
    - They do not, contact Motorola Customer Support, providing information as described in Step 2.
    - They do, go on to the next step.
  - b) Set both units to **P3=Compress**; set one unit to **Compress Mode=Answer**, and the other to **Originate**. If the units do not communicate, check the alarm queue display for Link alarms:
    - If any are shown, contact Customer Support, providing information as described in Step 2.
    - If there are no Link alarms, go on to the next step.
  - c) Set both units to **P3 Format=NRZI**. If the units do not communicate:
    - Determine whether the DTEs support the port rate to which the 3512 SDCs are set (**Data Rate** parameter)
    - Determine whether the DTEs support clock stopping, which the 3512 SDCs use.
  - d) If none of these actions resolve the problem, contact Customer Support, as described in Step 2.

If these checks do not solve the problem, run the diagnostic tests below.

## Isolating Common Problems

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**IMPORTANT:** *Motorola recommends running bit error rate (BER) tests from the network manager, if one is attached. This is because received network-management polling data (used when running BER tests from the front panel in a network-managed system) may cause false error readings at 3512 units.*

For *each pair* of devices, run the BER and Loopback tests, in the following sequence:

**NOTE:** For instructions on initiating BER and Loopback tests, refer to the next section, “Running Tests.”

- 1) If you are running the test from a network-managed 3512’s front panel, set both the local and remote **NC Override** parameters to On.

- 2) Initiate a **device BER** test for each 3512.

If either unit fails, the problem is in that unit. If both units pass, go to Step 3.

- 3) Initiate a **line BER** test.

If the line fails, check that the units are configured for the correct digital service and speed. If they are, the problem is most likely with the transmission facility.

If the test is passed, go to Step 4.

- 4) Run the appropriate loopbacks (refer to “Loopback Tests”) to further isolate the problem. The problem is probably between the 3512 and the data terminal equipment (DTE).

## Running Tests

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Tests to identify operating problems can be run from the front panel or from a Network Management System (NMS) to all local and remote 3512s on the circuit.

**IMPORTANT:** *The only test supported in restoral are the service-provider-initiated local loopback and the Primary Loop 2.*

### From the Front Panel

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To start a test from the front panel, use the front panel keys as described in Table 8-2. Refer to Figure 8-1 to identify your location in the menu tree. During a test, the ST LED flashes green.

**Table 8-2.**  
**Test Sequence**

<i>Press...</i>	<i>Until this Displays:</i>
■ ■ ■	*TEST
■ ■ ■	LOOPBACKS, PATTERN TESTS, or BER TESTS
■ ■ ■	TEST SELECTED=Off
⊕	TEST SELECTED:On
⊙	TEST SELECTED=On

**NOTE:** Configuration changes cannot be made while a test is running.

To stop a test:

- 1) Display TEST SELECTED=On.
- 2) Press ⊕ to display TEST SELECTED:Off
- 3) Press ⊙.

### From the Network Management System (NMS)

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When the 3512 DSU/CSU is operating under network control, tests *must* be initiated from the NMS. If you attempt to initiate a test from the front panel, the message

NC ATTACHED

displays.

To disable network control, set **NC Override=On** at *both* the local and remote units (\*MODIFY main menu, MODIFY NETWORK category). The tests can then be run from the 3512 front panel. After testing, restore network management control by setting **NC Override=Off**.

# Loopback Tests

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This section describes the loopback tests available for the 3512 (Figure 8-1). Loopback tests can be initiated from the 3512 front panel or from an NMS.

## NOTES:

- 1) Disable **System Status** and **Circuit Assurance** when running loopback tests. Loopback conditions can cause Idle signals to be received at one end of the circuit, thereby activating the System Status or Circuit Assurance functions and inhibiting data from passing once the loopback is terminated.
- 2) The local unit is the one that initiates the loopback test.

From the \*TEST menu, press **■** so LOOPBACKS displays. Press **■** to select the loopback tests described next.

## Terminal Loopback/Loop 1

---

### Loop 1

#### Default:

Off

#### Options:

Off, Pn (n = port number)

#### Description:

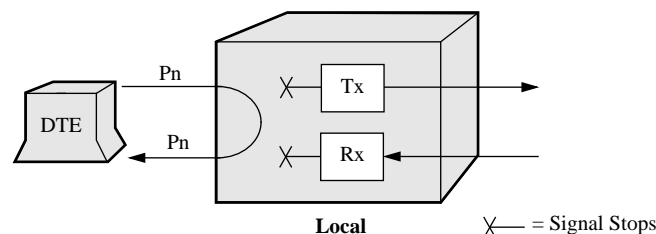
Initiated by a local 3512 or 3512 SDC, this command loops data from its DTE back to the DTE (Figure 8-2) *without* passing it through the 3512's transmit and receive circuitry. P1 through P4 specifies the DTE port.

Terminal loopback examines the EIA interface between the 3512 and DTE. The local DTE must be transmitting data during this test.

When operating in any Muxed mode, this test interrupts data only on the port under test. When operating in Multipoint Muxed mode:

- If the loopback is initiated on a *master* device port, the multipoint application on all slaves for that port is affected.
- If the loopback is initiated on a *slave* device port, only the application running on that slave is affected; other slaves can respond to the master.

The ST LED flashes green during this test.



**Figure 8-2. Terminal Loopback/Loop 1**

## Digital Loopback/Loop 2

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### Loop 2 (displays as PRIM Loop 2 when in restoral)

#### Default:

Off

#### Options:

Off, Pn, RT ( $n$  = port number)

#### Description:

This command initiates a digital loopback test.

Loop 2 display: Initiated by the local 3512, Loop 2 disconnects the 3512 from its DTE. Data from the remote DTE is passed through the local 3512's receive and transmit circuitry and looped back to the transmission facility and the remote DTE (Figure 8-3).

PRIM Loop 2 display: When the device is operating on the restoral line, this mode lets the device execute an RT loop on the primary line without disrupting restoral-line data.

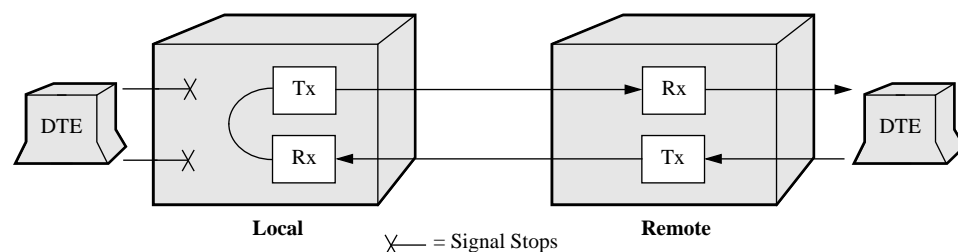
Both displays: in any Muxed mode, this test interrupts data only on the port under test. In Multipoint Muxed mode:

- If the loopback is initiated on a *master* device port, the multipoint application on all slaves for that port is affected.
- If the loopback is initiated on a *slave* device port, only the application running on that slave is affected; other slaves can respond to the master.

**Pn:** Activates the Loop 2 test for the specified port only. Other data, such as framing or the secondary channel, is unaffected. (This option does not display when the parameter display is PRIM Loop 2.)

**RT** (Remote Terminal): Performs the Loop 2 test for all received data. This setting is not recommended in MP-Muxed configurations, because it affects all ports and thus all applications. This test is similar to AT&T-specified RT (also known as DSU) loopback tests.

The ST LED flashes green during this test.



**Figure 8-3. Digital Loopback/Loop 2**



## Remote Loopback/Loop 2

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### Rm Loop 2

#### Default:

Off

#### Options:

Off, Pn (*n* = port number)

#### Description:

This command initiates a remote digital loopback test.

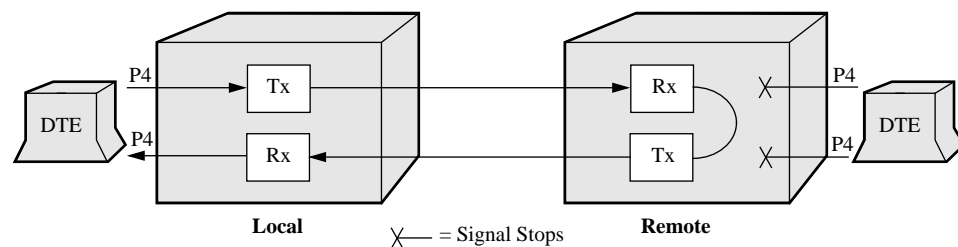
Initiated by the local 3512, this command disconnects the remote unit from its DTE. During this test, data from the local 3512 is passed to the transmission facility, through the remote unit's receive and transmit circuitry, and looped back to the local unit (Figure 8-4). In this example, Port 4 on the local and remote units is under test.

**Pn:** This option activates the Loop 2 test for the specified port only. Other data, such as framing or the secondary channel, is unaffected.

The ST LED flashes green during this test.

#### NOTES:

- 1) Remote Loop 2 is not supported in multipoint environments. In multipoint or multi-tier environments, additional devices may receive the loopback signaling and go into loopback.
- 2) Set **Timing**=Network (MODIFY DSU) *before* running this test.
- 3) To run the pattern test in conjunction with the Remote Loop 2 test, initiate the Remote Loop 2 test *before* the pattern test. This lets the signaling that initiates and terminates loopback reach the remote unit undisturbed by the pattern test data. When finished testing, terminate the pattern test *before* terminating Remote Loop 2.



**Figure 8-4. Remote Loop 2**

## DSU Check/Loop 3

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### Loop 3

#### *Default:*

Off

#### *Options:*

Off, On

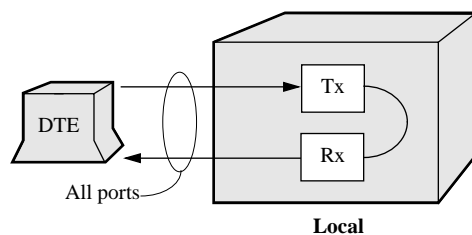
#### *Description:*

Initiated by the local 3512, this command directs the local 3512 to loop data from its DTE through the 3512 and back to the DTE (Figure 8-5). The line connection is maintained, but the transmit signal level is set to 0.

During DSU Check, data from the DTE passes through the 3512's transmit and receive circuitry and back through the EIA interface to the DTE.

The ST LED flashes green during this test.

**NOTE:** This test interrupts user data. When the 3512 is in a Muxed mode, all Muxed ports are affected.



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**Figure 8-5. DSU Check/Loop 3**

## Local Loopback/Loop 4

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### Loop 4

#### *Default:*

Off

#### *Options:*

Off, On

#### *Description:*

Initiated by the local 3512, this command disconnects the local 3512 from its DTE.

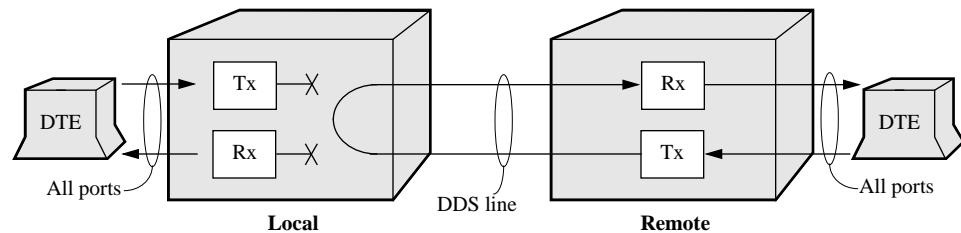
During the test, the local 3512 receives data from the remote 3512 and loops it back without passing it through the local 3512's transmit and receive circuitry (Figure 8-6). This process examines the transmission facility, the remote 3512's circuitry, and the remote EIA interface.

The Loop 4 test is not supported in Multipoint Muxed, DDS-II SC, or 64k CC modes. (To run a Loop 4, first put the master and slave in Normal mode. Since the loop tests the line as well as the device hardware, the results of the test are valid regardless of the operating mode selected.)

This test is similar to AT&T-specified LL (also known as CSU) loopback tests.

The ST LED flashes green during this test.

**NOTE:** Set **Timing**=Network (MODIFY DSU) *before* running this test.



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**Figure 8-6. Local Loopback/Loop 4**

## Service-Provider (Telco)-Initiated Loopback Tests

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Service provider-initiated loopback tests are performed at circuit installation or when trouble is reported to the provider.

### CSU Loopback Test

The provider initiates the CSU (also known as LL) loopback test by reversing the direction of the local loop sealing current on the 3512 or 3512 SDC.

In Multipoint Muxed modes:

- When the *master* device is in the LL loop, the LL loopback test interrupts data on all ports. The slaves lose synchronization, shut down their ports, and transmit idle characters. When the loopback is removed, the master initiates a retrain sequence with each slave.
- If the loopback is initiated on a *slave*, only the data for that slave is interrupted. The master detects that the slave is not responding, attempts to initiate a retrain, and if unsuccessful, drops that slave from its active list of slaves. Communication with other slaves is still possible. When the loopback is removed, the slave signals the master to retrain it.

**NOTE:** This loop is supported in restoral. The 3512 transmits on the dial line while the test is in process. Since this test is non-disruptive, it is preferable to an RT test.

### DSU (RT) Non-Latching Loopback Test

The provider initiates the DSU (RT) Loopback test by sending a special alternating loopback sequence to the 3512 or 3512 SDC. This test is available with DDS-I, DDS-II SC, and SW 56 services.

In Multipoint Muxed modes:

- On a *master* device, an RT loopback interrupts data on all ports. Slaves lose synchronization and transmit idle characters. When the loopback is removed, the master initiates a retrain sequence with all slave devices.
- On a *slave* device, only the data for that slave is interrupted. The master detects that the slave is not responding, attempts to initiate a retrain, and if unsuccessful, drops the slave from its active list of slaves. Communication with other slaves, however, is still possible. When the loopback is removed, the slave signals the master to retrain it.

### NOTES:

- 1) A 3512 running BER, Pattern, or Loop 3 tests does not respond to an RT request. Terminate tests in progress before you execute loops.
- 2) An RT loopback test on the restoral line disrupts primary-line data. (An RT on the primary line does *not* disrupt restoral-line data.)

## DSU (LLB) Latching Loopback Test

The provider initiates the LLB Loopback test by sending a special loopback sequence to the 3512 or 3512 SDC. This test is available with 64k CC service.

In Multipoint Muxed modes:

- On a *master* device, an RT loopback interrupts data on all ports. Slaves lose synchronization and transmit idle characters. When the loopback is removed, the master initiates a retrain sequence with all slave devices.
- On a *slave* device, only the data for that slave is interrupted. The master detects that the slave is not responding, attempts to initiate a retrain, and if unsuccessful, drops the slave from its active list of slaves. Communication with other slaves, however, is still possible. When the loopback is removed, the slave signals the master to retrain it.

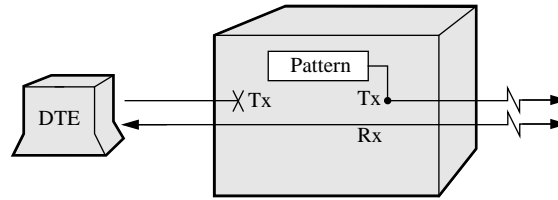
### NOTES:

- 1) The 3512 does not respond to LLBs on the inactive line while it is transmitting data on the active line. Refer to the **RT [or] LTCH DSU** parameter description in Chapter 4 for important details.
- 2) If a 3512 is running BER, Pattern, or Loop 3 tests, it does not respond to an LLB request. Terminate tests in progress before you execute loops.
- 3) Latching loops, which continue looping until explicitly stopped, prevent your applications from operating on the network. **Scrambler** is designed to prevent the inadvertent transmission of data patterns that match loopback-triggering patterns in 64k CC mode. Refer to the **Scrambler** parameter description in Chapter 4 for important details.

## Pattern Tests

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Pattern test options let you to specify the data pattern in loopbacks; a DTE, test device on a DTE port, or internal pattern generator supply the data (Figure 8-7).



**Figure 8-7. Pattern Test**

The pattern test is an aggregate level test: even if **DTE Config**=BitSteal or Muxed, the 3512 sends the pattern over the entire DDS main channel, at the full main channel port rate. An Out of Sync alarm occurs at the remote unit that is *not* in pattern test if its **DTE Config**=BitSteal or Muxed. **NOTE:** To run the pattern test in conjunction with the Remote Loop 2, initiate the Remote Loop 2 *before* the pattern test. This lets the loopback signaling reach the remote unit undisturbed by the pattern data. after the test, terminate the pattern test *before* terminating Remote Loop 2.

To run pattern tests:

- 1) Display the \*TEST menu.
- 2) Press **■** until PATTERN TESTS displays. Use **■** to display parameters.

### Pattern

#### Default:

Off

#### Options:

Off, On

#### Description:

When set to On, the selected pattern type is transmitted in place of DTE data, and the receive data is monitored for the pattern. Each time an error in the pattern is detected, the ST LED flashes red.

### Type

#### Default:

Space

#### Options:

Space, Mark, ALT 0/1, 511

#### Description:

This parameter specifies the pattern to be transmitted and received.

**Space:** Only Spaces are transmitted.

**Mark:** Only Marks are transmitted.

**ALT 0/1:** An alternating Mark/Space pattern is transmitted.

**511:** Pseudo-random 511 Bit Pattern is transmitted.

## Bit Error Rate (BER) Tests

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There are two BER performance tests available for the 3512 DSU/CSU:

- Line BER tests the line
- Device BER tests the 3512's internal circuitry

**NOTE:** BER tests interrupt user data.

### Line BER

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Line BER is an end-to-end pattern test between local and remote 3512s. The number of outbound (local to remote) and inbound (remote to local) errors is reported.

#### NOTES:

- 1) In Multipoint Muxed mode, initiate this test *only* at the master device. Slaves not in test stop transmitting until they receive a retrain signal from the master.
- 2) Disable **System Status** and **Circuit Assurance** (\*MODIFY main menu, MODIFY PORT category) before running line BER tests. These tests can activate those functions.
- 3) Line BER tests are not supported when **Opmode**=64k CC and **DTE Con**=Normal.
- 4) When running a Line Bit Error Rate (LBER) test initiated from a network manager, do not run a 10<sup>7</sup>b LBER if the 3512 is operating at 2.4 kbps.
- 5) When running LBER tests between a 3512 and 3500 DSU/CSUs with revision 3.2 software:
  - *Front-panel initiated* tests function properly only when initiated from the 3500
  - *Network-management initiated* tests function properly from either device, but for DDS line rates of 19.2 kbps and below, limit the length to 10<sup>5</sup>b.

**IMPORTANT:** *Motorola recommends running BER tests from the network manager, if one is attached, because received network-management polling data may cause false error readings at 3512 units.*












### Device BER

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The device BER test places only the local unit in loopback. It loops a test pattern through the transmit and receive circuitry of the unit, and checks the pattern for errors. The line connection is maintained; however, the transmit signal level is set to 0. **NOTE:** In MP-Mux mode, a DBER functions as a DSU Check, Loop 3 does.

## Initiating a Line or Device BER Test

To begin a BER test (refer to Figure 8-1):

- 1) From the \*TEST main menu, press  until BER TESTS displays.
- 2) Press  until Test Type displays. Press  to select Line or Device.
- 3) When initiating a device BER test, skip this step. For a line BER test, press  until **BER Address** displays. Use the numeric-entry procedure (Chapter 3) to identify the unit's BER Address (on a remote unit, the NC Address). Press .
- 4) Press  until BER Length=10\*\*4 displays. 10\*\*4 represents 10<sup>4</sup> (10,000) bits. Press  to select the number of bits to test. Press . **NOTE:** The number of bits selected and the data rate determine the test duration (Table 8-3).
- 5) Press  until BER=Off displays. Press  so that BER:On displays.
- 6) Press  to initiate the test.

**Table 8-3.**  
**BER Test Duration**

<b>Data Rate (kbps)</b>	<b>BER Length Parameter Option</b>			
	<b>10**4</b>	<b>10**5</b>	<b>10**6</b>	<b>10**7</b>
2.4	4 sec	42 sec	6 min 56 sec	69 min 40 sec
4.8	2 sec	21 sec	3 min 28 sec	34 min 43 sec
9.6	1 sec	10 sec	1 min 44 sec	17 min 22 sec
19.2	0.5 sec	5 sec	52 sec	8 min 41 sec
56.0	0.2 sec	2 sec	18 sec	2 min 58 sec

**NOTE:** For line BER tests, allow an additional 30 seconds for initiation and termination of the test.

Table 8-4 shows the BER messages that can display.

**Table 8-4.**  
**BER Messages**

<b>LCD Display</b>	<b>Definition</b>
BER PASS	Unit passed test
BER FAIL	Unit failed test
BER TEST RUNNING	Test is running
BER SETUP FAIL	Test failed to run
In =xxx	Test detected xxx inbound errors
Out=xxx	Test detected xxx outbound errors



## Retrain Test

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The OTHER category contains the **Retrain** parameter (Figure 8-1). OTHER displays only when **DTE Con=MP<sub>x</sub> Muxed** (where *x* = M [master] or S [slave]).

### Retrain

*Default:*  
Off

*Options:*  
On, Off

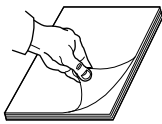
### *Description:*

This test initiates a retrain sequence. If initiated at the master device, the master initiates training. If initiated at the slave, the slave signals the master to initiate training.

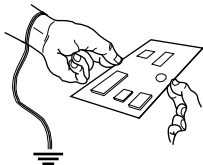
## Correcting Port Interference Problems

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If equipment connected to your 3512 that drives Pins 14 or 23 in EIA 232 operation causes electrical interference, you can correct the problem by isolating those pins from one another. You do this by adjusting the 3512's internal Mux option card Dual Inline Package (DIP) switches. **NOTE:** DIP switches are set to On at the factory, and must be On to support V.35 operation. To change DIP switches:

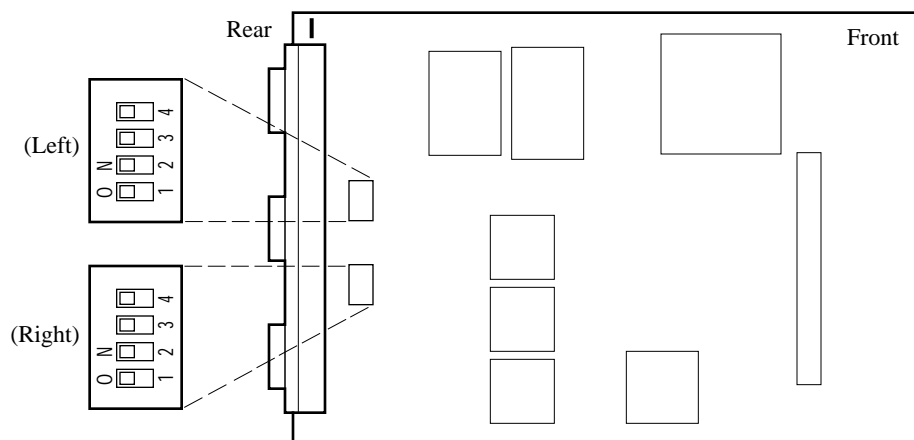


- 1) Remove the 3512 enclosure cover, as described in Chapter 2, and set it aside. Note the DIP switches at the rear of the option card in two groups of four (Figure 8-8).



### Caution

Components used in the 3512 DSU/CSU are sensitive to static electricity discharge, which can damage the 3512's internal components. Use proper handling and grounding precautions when handling the 3512 card or components.



**Figure 8-8. EIA 232 V.35 DIP Switches**

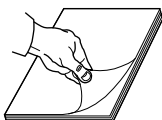
Facing the rear of the 3512, from left to right, the switches are as follows:

<b>Switch No.</b>	<b>Port</b>	<b>Switch ON Connects...</b>	<b>Switch OFF Isolates...</b>
4 in <b>left</b> group	None		
3 in <b>left</b> group	None		
2 in <b>left</b> group*	2	Pin 2 to Pin 14	Pin 2 from Pin 14
1 in <b>left</b> group*	2	Pin 23 to Pin 24	Pin 23 from Pin 24
4 in <b>right</b> group*	3	Pin 2 to Pin 14	Pin 2 from Pin 14
3 in <b>right</b> group*	3	Pin 23 to Pin 24	Pin 23 from Pin 24
2 in <b>right</b> group*	4	Pin 2 to Pin 14	Pin 2 from Pin 14
1 in <b>right</b> group*	4	Pin 23 to Pin 24	Pin 23 from Pin 24

\* V.35 operation requires that the port's DIP switch is set to ON.

- 2) Set the appropriate switches OFF. For example, to correct interference on Port 4, set switches 1 and 2 on the right bank OFF.
- 3) Replace the 3512 enclosure cover.
- 4) Replace the cables on the rear panel.

## If You Cannot Isolate the Fault



If you are unable to resolve the problem and need technical assistance, contact the Motorola Customer Support Center or distributor. The telephone numbers are listed under Motorola Customer Information, which follows About This Manual. Also in that section is the information to provide when calling so the representative can assist you promptly. If you are advised to return the unit to Motorola, refer to the Return Procedures section towards the end of this guide.