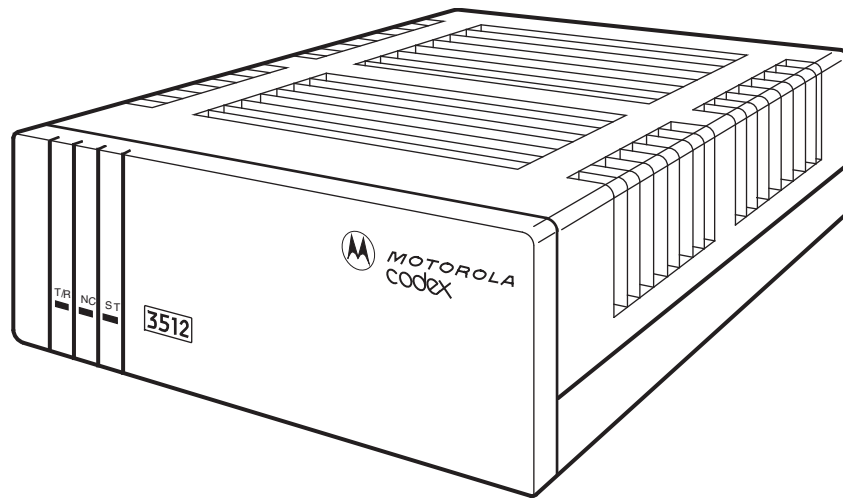


Telenetics



3512 DSU/CSU Quick Start

Notice

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Lake Forest, California 92630
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The equipment described in this document has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against interference when equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause interference to radio communications.

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This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the radio interference regulations of the Canadian Department of Communications.

Operation of this equipment in a residential area is likely to cause interference, in which case the user will be required to take adequate measures to correct the interference at his/her own expense.

This product was verified under test conditions that included use of shielded DTE cables. Use of different cables will invalidate verification and increase the risk of causing interference to radio and TV reception.

You can obtain the proper cables from Telenetics.

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Manual is current for Release 3.0 of the 3512 DSU/CSU.

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This guide enables you to install, test, configure, and start up your 3512 DSU/CSU with a minimum of documentation and detail. It presents examples of **commonly-used 3512 applications** and the parameter options they require. To set up **other applications**, refer to the *3512 DSU/CSU User's Manual*.

Get the 3512 or 3512 SDC up and running as follows.

- 1) **Physically install it** (Chapter 1 of this guide):
 - Unpack and inspect the unit
 - Connect cables
 - Run the unit's self-test
- 2) **Verify the line quality** (Chapter 2 of this guide):
 - Perform loopback tests
 - Interpret the results
- 3) **Configure for a specific application** (Chapter 3 of this guide):
 - Normal operation
 - Network-managed operation
 - External restoral operation
- 4) **Bring the unit online and begin operation.**

Special Notices

These notices emphasize certain information in the manual. Each serves a special purpose and is displayed in the format shown:

IMPORTANT: *This is used to emphasize any significant procedural information.*



Caution

This provides you with information that, if not followed, can result in damage to software, hardware, or data.



Warning

This is the most serious notice, indicating that you can be physically hurt.

Trademarks

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About This Manual (continued)

Telenetics Information Systems Group Customer Information

U.S. customers who have questions about Telenetics products or services should refer to the following list. Non-U.S. customers should contact their local Telenetics subsidiary office or distributor.

Questions about Your Product Shipment

If you have questions about whether your shipment is complete or about its condition upon receipt, please call Telenetics at (949) 455-4000.

For Technical Assistance or to Schedule Service

- 1) To have Telenetics implement your equipment, you may purchase and schedule Implementation Services by calling (949) 455-4000 (from within the U.S.). The average lead time for implementation services is 5 business days from time of call. **Please Note:** *Implementation services are not conducted over the phone. Instead, if necessary, Telenetics will dispatch a Customer Service Engineer to assist you, and work will be billed at the current listed rates.*

When you call for assistance, please have the following information ready:

<i>Information Item</i>	<i>Value or Location</i>
Model number	3512 or 3512 SDC
Serial number	Front of unit
Error message/ Problem Description	LCD display/Power failure, electrical storm, equipment relocation
Software revision	Front of unit
Parameter Settings	Up-to-date Configuration Worksheet
Site ID	Assigned to the customer site by Telenetics at first service call. Customer should store the ID, once assigned.
Application type	Async or sync communications; number of tail circuits
DDS Setup	DDS-I or DDS-II SC
Connected hardware	Type of DTE(s) attached

- 2) If you choose to implement the equipment yourself, carefully follow the instructions in these sections of this documentation set:
 - For regular installation and configuration, use this guide.
 - For detailed installation information, refer to Chapter 2 of the *3512 DSU/CSU User's Manual*.
 - For information on using the front panel, refer to Chapter 3 of the *3512 DSU/CSU User's Manual*.

Motorola Information Systems GroupCustomer Information (continued)

3) For a priority response:

<i>If:</i>	<i>And the Unit:</i>	<i>Then:</i>	<i>You will need:</i>
Unit is under warranty and/or you have a service contract	Is not performing to specifications or you are having other problems with it	Call (949) 455-4000 for assistance	Model number and serial number

4) For information on purchasing a service contract, please call (949) 455-4000.

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Comments about the Manual

To help us improve our product documentation, please complete and return, by mail or fax to (949) 455-4010, the prepaid comment card on the next page. If you prefer, simply provide your name, company, and telephone number and someone in the documentation group will contact you to discuss any comments you might have.

To Order Additional Telenetics User Documentation

If you would like to order additional copies of Telenetics user documentation, call (949) 455-4000.

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Unpacking the 3512

Every ordered standalone 3512 DSU/CSU includes the following components:

- 1-, 2- or 4-port 3512 unit, or 3-port 3512 SDC unit
- Data cable with ferrite bead or cylinder
- Power cord with wall-mount transformer
- *3512 DSU/CSU Reference Card* or *3512 DSU/CSU SDC Reference Card*
- *3512 DSU/CSU Quick Start*
- *3512 DSU/CSU User's Manual*

Optionally, your order may include:

- Single-line restoral adaptor cable
- Mini-Nest conversion back panel

If the equipment is damaged, contact the shipper. If you have further concerns about damage or missing parts, contact Telenetics:

In the United States:

Telenetics Corporation
25111 Arctic Ocean
Lake Forest, California 92630
(949) 455-4000

Outside the United States:

The nearest Telenetics distributor. Refer to the list of Telenetics Sales and Service offices in the back of the *3512 DSU/CSU User's Manual*.

The 3512 is wrapped in reusable shock-absorbent packing material. Save the carton and packing material in case you later want to ship or store it.



Caution

All 35XX devices, such as 3500s, 3512s, and 3520s, should be used in environments designed for computers and electronic equipment. **In areas susceptible to lightning, take precautions to prevent damage to electronic equipment. Contact your telco, or an electronics accessories vendor, for information on lightning protection equipment. Customers experiencing problems due to surges from lightning have eliminated such problems by installing surge suppressors on power and data lines connected to 35XX devices.**

FCC and Telephone Company Equipment, Procedures, and Requirements

In the USA and Canada, you must follow FCC and DOC regulatory requirements and telephone company procedures when connecting your DSU/CSU to telephone company-provided digital services.

For information on...

FCC and telephone company registration
numbers, codes, procedures and requirements
Telephone line cables

Refer to...

The *3512 DSU/CSU User's Manual*,
Chapter 2
The *3512 DSU/CSU User's Manual*,
Appendix A

Installing the Standalone 3512

This section provides step-by-step installation instructions. You must connect the 3512 to other equipment in the order shown in Figure 1-1, which shows *all* types of connections. **NOTE:** Figure 1-1 does *not* represent an actual configuration.

For information on ordering the cables shown here, refer to the *3512 DSU/CSU User's Manual*, Appendix A.

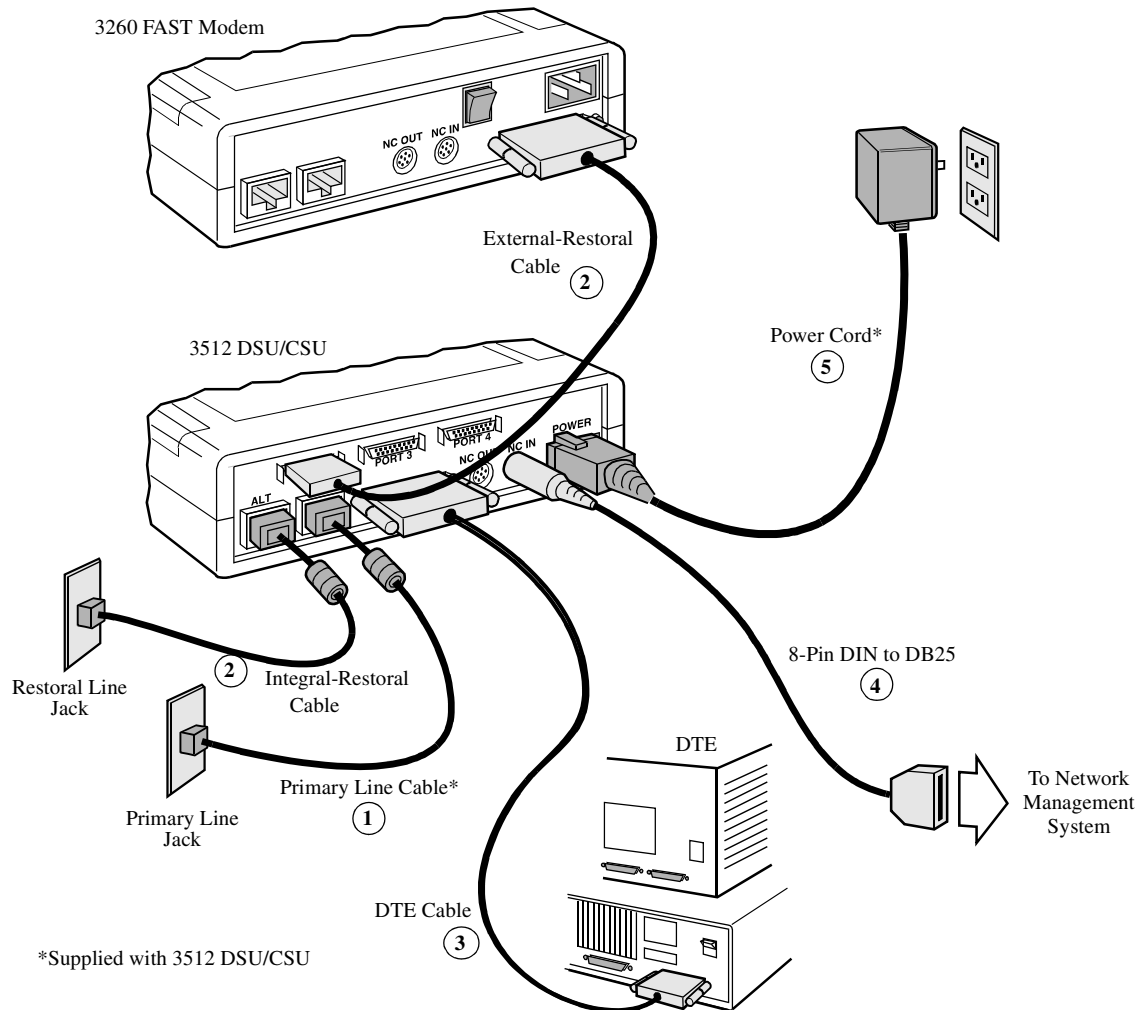
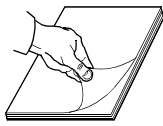
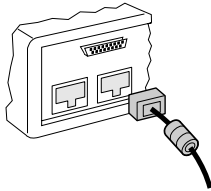


Figure 1-1. 3512 Cabling Overview, Four-Port 3512

Perform the following steps:

- 1) Connect the primary-line cable to the rear panel DDS jack and to the primary line jack.
- 2) For *integral* restoral, connect the restoral cable to the rear panel ALT jack and to the restoral line jack, *OR*

For *external* restoral, connect an A/B switch crossover cable to Port 2 and to an external restoral device.



Caution

Install cables with the ferrite end adjacent to the 3512 or 3512 SDC. The ferrite bead or cylinder ensures that your unit operates in compliance with FCC RFI requirements.

- 3) **IMPORTANT:** Use the permanently attached cable connector mounting screws to secure cables to Port 1.

On a 1-port 3512, connect a DTE cable to a DTE or host computer and to Port 1.

On a 2-port 3512, connect:

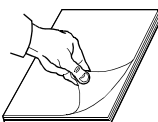
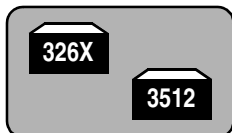
- A DB25-pin DTE cable to a DTE or host computer and to Port 1.
- A DB26-pin DTE cable from Port 2 to a DTE. You may need an adapter cable. **NOTE:** When using an adapter cable, screw the EIA 232-C/D cable connector onto the adapter cable *before* connecting to the 3512.

On a 3-port 3512 SDC, connect:

- A DB25-pin DTE cable to a DTE or host computer and to Port 1.
- DB26-pin DTE cable(s) from Ports 2 and 3 to a DTE(s). You may need an adapter cable. **NOTE:** When using an adapter cable, screw the EIA 232-C/D cable connector onto the adapter cable *before* connecting to the 3512.

On a 4-port 3512, connect:

- A DB25-pin DTE cable to a DTE or host computer and to Port 1.
- A DB26-pin DTE cable(s) from Ports 2, 3, and 4 to a DTE(s). You may need an adapter cable. **NOTE:** If you are using a Motorola Codex adapter cable, screw the standard EIA 232-C/D cable connector onto the adapter cable *before* connecting to the 3512.



IMPORTANT: 3512 ports support data rates up to 56.0 kbps (64 kbps with the 64k CC feature). At data rates greater than 19.2 kbps, Telenetics recommends that you configure the unit for the V.35 electrical interface. When using a 326XFAST Series Modem for external restoral, refer to the 326X Series Modem documentation to determine cable capacitance.

- 4) To connect *one* 3512 to an NMS, link the NMS control channel to a DB25-pin Network Adapter cable. Connect this cable (through a junction box) to an 8-pin DIN adapter cable, and the adapter cable to the 3512 NC IN connector.

To connect *multiple* 3512s (or comparable devices) to an NMS in a daisy-chain configuration, use the cabling above, plus an 8-pin DIN cable from the first 3512 NC OUT connector to the next NC IN connector, and so on. Figure 1-2 shows how to cable devices to an NMS this way.

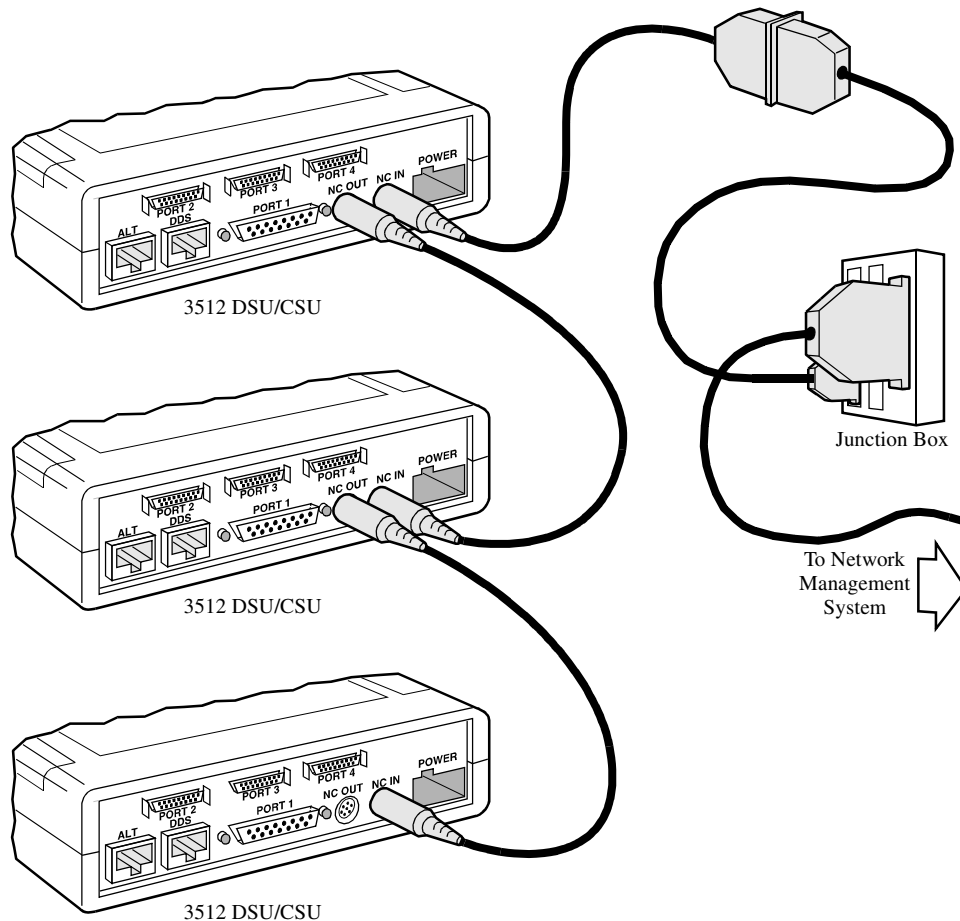


Figure 1-2. Multiple Devices in a Daisy Chain Connection to NMS

- 5) Plug in the power cord to the 3512 and the power source. The 3512 automatically runs its self-test.
- 6) View the self-test results:
 - *If the 3512 is working properly*, the default message displays.
 - *If the 3512 fails the test*, an error message displays; the unit resets itself and reruns the self-test. If it fails the test again, it may need service. Call Telenetics.

This completes the physical installation. Next, test the data line, as described in Chapter 2.

Chapter 2

Verifying Line Quality

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Verifying Line Quality

IMPORTANT:

All 3512s

MP-Mux





- 1) *Follow this procedure to verify the quality of data-communications lines **before** configuring an application and **before contacting the telephone company or Telenetics**. If tests do indicate a line problem, follow the action(s) below. Do not bring the 3512 online until you can run error-free tests.*
- 2) *On multipoint DDS-I type circuits, with MP-Mux-supported functionality, follow this procedure to between **each master-slave** pair, and **then** configure for MP-Mux operation.*

To verify line quality:

- 1) If the unit has the DualVIEW feature or is managed by a Telenetics or Motorola Network Management System (NMS), set **NC Override=On** (*MODIFY main menu, MODIFY NETWORK category).
- 2) Set all devices to **DTE Con=Normal** (*MODIFY, MODIFY PORT).
- 3) Set the **Opmode** to match the DDS service type (MODIFY DSU category).
- 4) Confirm that the line rate is correct for the application, as follows:
 - a) Set **Data Rate=Auto** (MODIFY DSU category). **NOTE:** The **Data Rate** default option is Auto.
 - b) Wait 60 seconds, then check the rate display (*STATUS main menu).
 - c) Set the line rate to match the DDS service rate (using **Data Rate**).
- 5) If the AL LED is red, check the general alarm queue (*STATUS main menu, ALARM STATUS category).








If the ST LED is not red, continue with Step 6.
- 6) Set a unique **Network Control (NC)** address for each device. (*MODIFY main menu, MODIFY NETWORK category.)
- 7) Run a line pattern loopback test to the remote device, as follows (for details on running this test, refer to the *3512 DSU/CSU User's Manual*, Chapter 8, Testing and Troubleshooting):

First, initiate a Remote Loop 2 test on the local 3512 (this test puts the remote unit into loopback; it transmits received data back towards the local 3512):

- a) Under the *TEST menu, press  until LOOPBACKS displays.
- b) Press  until **Rm Loop 2=Off** displays.
- c) Press  to select **Rm Loop 2:P1**.
- d) Press . **Rm Loop 2=P1** displays. The loopback is now active.

The T/R LED turns steady orange. The ST LED should flash green.






With Remote Loop 2 active, run a pattern test, as follows:

- a) Press  until PATTERN TESTS displays.
- b) Press  until **Type=Space** displays.
- c) Press  until **Type:511** displays.
- d) Press . **Type=511** displays.
- e) Press  until **Pattern=Off** displays.
- f) Press  until **Pattern:On** displays.
- g) Press . **Pattern=On** displays.

Next, the T/R LED turns steady orange. If:

- The ST LED flashes green, proceed to Step 8
- The ST LED flashes red, there may be a line problem. *Before* reporting it to the telephone company, disable the Pattern test (set **Pattern=Off**), disable the Remote Loop 2 test (set **Rm 2 Loop=Off**), and *then* run a Device Bit Error Rate (DBER) test at both units, as described in Step 8

8) Run a DBER test as follows:

- a) Under the *TEST menu, press  until BER TESTS displays.
- b) Press  until **Test Type=Device** displays.
- c) Press  until **BER=Off** displays.
- d) Press . **BER:On** displays.
- e) Press . The BER test runs.

9) Turn off the BER test (set **BER=Off**), if it is not already off.

10) Interpret the front panel display as follows:

<i>If this Displays...</i>	<i>Do This:</i>
BER Pass BER ERRORS=000	Report the problem to the telephone company
BER Fail BER ERRORS=x	Contact Telenetics
[where x equals the number of errors, up to 255]	

When the lines are verified, configure your application, as described next.

Chapter 3

Configuring Applications

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3512 System Application Examples

This chapter provides sample configurations that address the most common application requirements. For details about these and other configurations, refer to the *User's Manual*. The examples include:

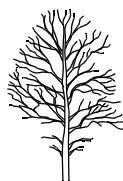
Application	Figure
Primary:	
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Configuration Method

Follow these steps to configure your 3512:

- 1) Complete the procedures in Chapters 1 and 2 of this guide.
- 2) On the *MODIFY main menu, CONFIGURATIONS category, set **Factory**=Yes, to set all parameters to the default values.
- 3) Select a configuration and set parameter options appropriately. You may set parameters from the front panel, from a remote device (using RFP) or from a network management system.

Refer to the appropriate *Reference Card*, which shows control key functions and the menu tree, to help you navigate to parameters you want to set.



Primary Applications

Single-Channel Point-to-Point Circuit (No Network Management)

A **point-to-point circuit in normal mode** is shown in Figure 3-1. “Normal” means that the **Data Rate** option equals the line rate. In this example, DDS-I type service is used; DDS-II SC and 64K Clear Channel (64K CC) are also available, with appropriate **Data Rate** and **Opmode** parameter options.

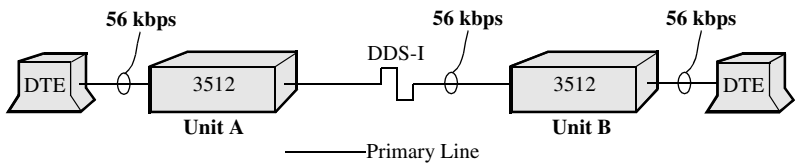


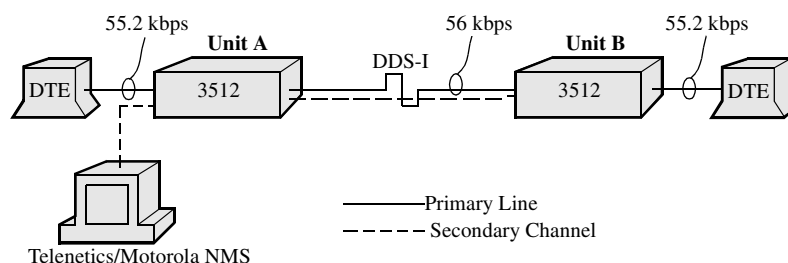
Figure 3-1. Single-Channel Point-to-Point DDS-I Circuit, Normal Mode

Parameters *not* specified below may be set to factory default options.

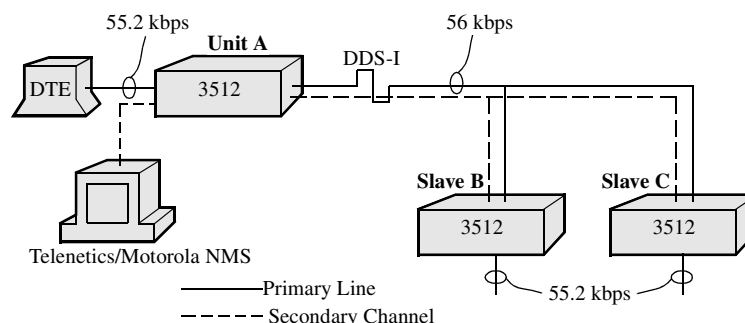
Category	Parameter	3512 Unit A	3512 Unit B
MODIFY DSU	Data Rate	56.0	56.0
MODIFY PORT	DTE Con	Normal	Normal

Point-to-Point and Multipoint Circuits (Bitstealing for Network Management)

Figure 3-2 shows **bitstealing** on point-to-point (A) and multipoint (B) circuits. If the line rate is 56.0 kbps, the DTE port is allocated 55.2 kbps; framing and control data use the remaining bandwidth. Most synchronous DTEs and devices, such as Telenetics/Motorola statistical multiplexers, can operate at these nonstandard port rates. In this configuration, the 3512s provide a non-interruptive control channel similar to that of DDS-II SC type service. Bitstealing mode is available for single-channel applications at 64.0 kbps or sub-rates.



(A) Point-to-Point Circuit, 3512 in Bitsteal Mode



(B) Multipoint Circuit, 3512 in Bitsteal Mode

Figure 3-2. DDS-I Derived Secondary Channel Using Bitstealing

Parameters *not* specified below may be set to factory default options.

Category	Parameter	Unit A	Slave B	Slave C
Point-to-Point Circuit, Figure 3-2(A):				
MODIFY DSU	Data Rate	56.0	56.0	56.0
MODIFY PORT	DTE Con	BitSteal	BitSteal	BitSteal
Multipoint Circuit, Figure 3-2(B):				
MODIFY DSU	Data Rate	56.0	56.0	56.0
MODIFY PORT	DTE Con	MPM-BitSteal	MPS-BitSteal	MPS-BitSteal
MODIFY NETWORK	NC Address	x*	y*	z*
MODIFY SLV ADDR	Slv-A Addr	y*		
	Slv-B Addr	z*		

*Where x, y, and z are valid addresses

Point-to-Point and Multipoint Circuits (Multiplexing for Network Management)

Figure 3-3 shows the **derived secondary channel obtained with Muxed mode** on point-to-point (A) and multipoint (B) circuits. Ports can be configured as channel sharing or time division multiplexing (TDM).

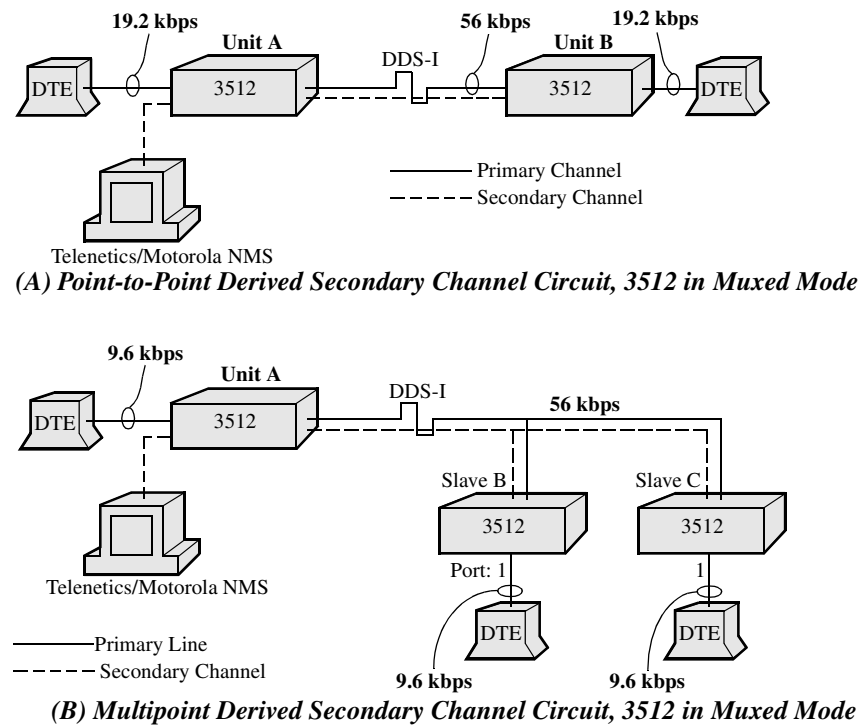


Figure 3-3. DDS-I Derived Secondary Channel Using Multiplexing

Parameters *not* specified below may be set to factory default options.

Category	Parameter	Unit A	Slave B	Slave C
Point-to-Point Circuit, Figure 3-3 (A):				
MODIFY DSU	Data Rate	56.0	56.0	56.0
	Ch1 Rate	19.2	19.2	19.2
MODIFY PORT	DTE Con			
Multipoint Circuit, Figure 3-3 (B):				
MODIFY DSU	Data Rate	56.0	56.0	56.0
	Ch1 Rate	9.6	9.6	9.6
MODIFY PORT	DTE Con	MPM-Mux	MPS-Mux	MPS-Mux
MODIFY NETWORK	NC Address	x*	y*	z*
MODIFY SLV ADDR	Slv-B Addr	y*		
	Slv-C Addr	z*		

*Where x, y, and z are valid addresses

Multiple-Channel Multipoint Circuit with MP-Mux

Figure 3-4 shows a **multiple-channel** multipoint circuit that uses **multipoint-multiplexing (MP-Mux)** for network-management signals. This example also shows **mixed time-division multiplexing (TDM) - channel sharing**, with four applications, **P, Q, R, and S**:

- **P**, a multipoint application extending to Remote Sites 1 and 2, uses Channel 1
 - At Site 1, DTEs on Ports 1 and 2 share Channel 1
 - At Site 2, a DTE is on 3512 Port 3
- **Q**, a point-to-point application extending to Remote Site 1, uses Channel 2
- **R**, a multipoint application extending to Remote Sites 2 and 3, uses Channel 3
 - At Site 2, DTEs on Ports 1 and 2 share Channel 3
 - At Site 3, DTEs on Ports 1 and 2 share Channel 3
- **S**, a multipoint application extending to Sites 1 and 2, uses Channel 4
 - At Site 1, a DTE is on Port 4
 - At Site 2, a DTE is on Port 4

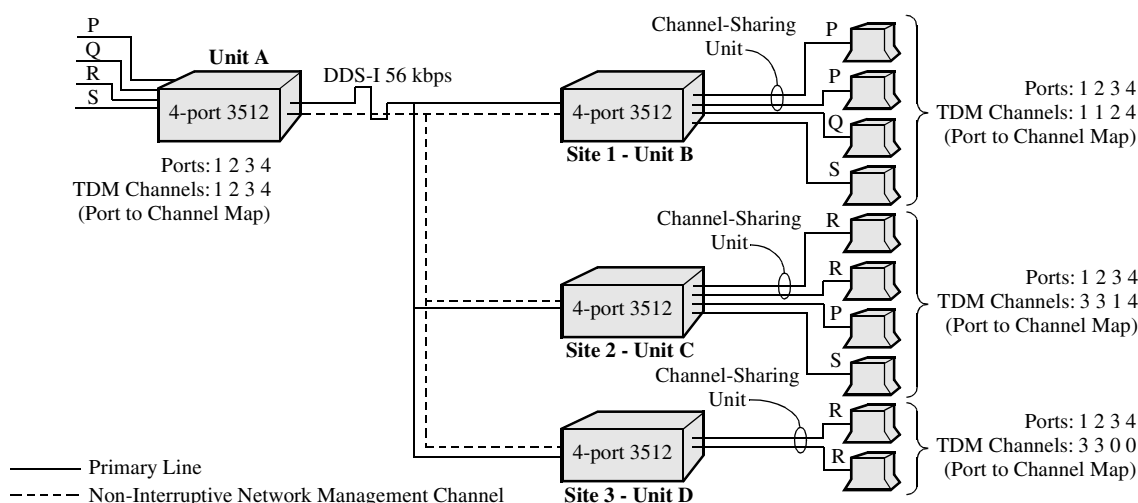


Figure 3-4. MP-Mux for Mixed TDM-Channel Sharing Applications

Parameters *not* specified below may be set to factory default options.

Category	Parameter	Unit A	Slave B	Slave C	Slave D
MODIFY DSU	Data Rate	56.0	56.0	56.0	56.0
	Chn Rate	As needed	As needed	As needed	As needed
MODIFY PORT	DTE Con	MPM-Mux	MPS-Mux	MPS-Mux	MPS-Mux
	P-to-CH	[shown in figure]			
MODIFY NETWORK	NC Address		x	y	z
MODIFY SLV ADDR	Slv-A Addr	x			
	Slv-B-Addr	y			
	Slv-C Addr	z			

Point-to-Point Circuit With Data Compression Between Routers

A digital point-to-point link between two routers is shown in Figure 3-5.

In this example, two 3512s with the **Synchronous Data Compression (SDC)** feature use **data compression, also known as bandwidth expansion, to increase throughput**. Any synchronous HDLC point-to-point data application is a candidate for SDC; for example, the Telenetics/Motorola 6500 Series data concentrator offers an ideal application for SDC over DDS links. Such a configuration allows applications that require fractional T1 throughput of up to 256 kbps to operate over much less-expensive standard 56 kbps DDS leased lines.

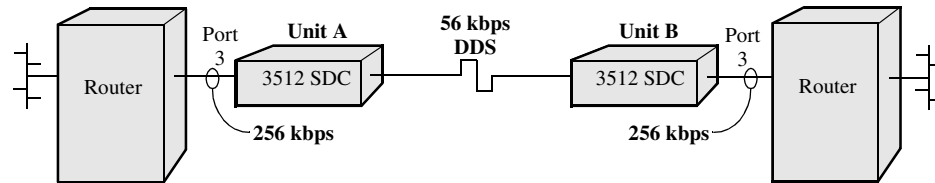


Figure 3-5. SDC Compression Link Between Routers

Parameters *not* specified below may be set to factory default options.

Category	Parameter	Unit A	Unit B
MODIFY DSU	Data Rate	56.0	56.0
MODIFY NETWORK	NC Address	001	002
COMPRESS CONFIG	Compress Mode		Ans

Alternate (Restoral) Applications

Integral Single-Line Restoral (SLR) Circuit

A point-to-point **digital circuit with integral SLR in a standalone 3512** is shown in Figure 3-6. Normal operation is over the 56 kbps circuit; SLR uses a 14.4 kbps dial line. An NMS and a NetView manage the system over a secondary channel.

If the DDS line runs at:

- Up to 9.6 kbps, SLR can restore the entire bandwidth
- More than 9.6 kbps, SLR can restore a maximum bandwidth of 14.4 kbps

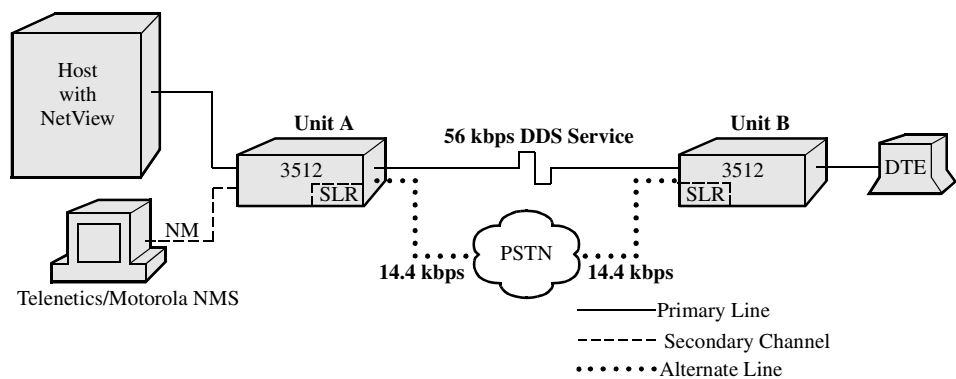


Figure 3-6. Point-to-Point Circuit, Integral SLR, Standalone 3512

Restoral parameters *not* specified below may be set to factory default options.

Category	Parameter	Unit A	Unit B
AUTO ANSWER	Answer		Enable
RESTORAL CONFIG	Timing		Loopback
PHONE NUMBER	Enter Phone#	[phone number]	

External Restoral Circuit Through 326XFAST Modems

Figure 3-7 shows a point-to-point application with **manually-initiated external analog restoral**. In this example:

- Units A and B are running at 56 kbps in DDS-I, with **DTE Config=Normal**
- The operator designates unit A as the originate-only unit
- The operator designates unit B as the answer unit
- Restoral is initiated and terminated manually at a data rate of 24.0 kbps

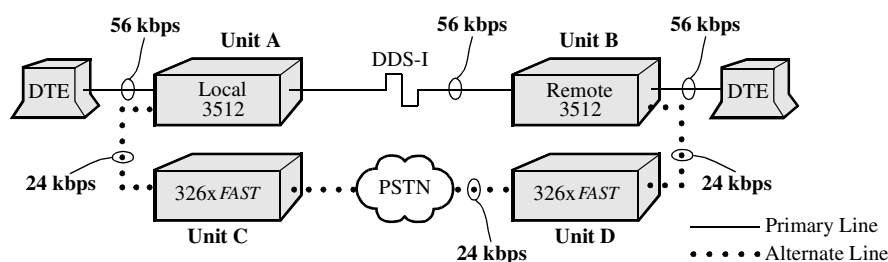


Figure 3-7. Point-to-Point, Analog External Restoral

Restoral parameters *not* specified below may be set to factory default values.

Category	Parameter	Unit A	Unit B
AUTO ANSWER	Answer		Enable
RESTORAL CONFIG	Timing		Ext P2
	Rest Rate	24	24

Mixed Integral/External Restoral Circuit With Switched Digital Data Service

Figure 3-8 shows a point-to-point restoral circuit with **integral Switched-56 kbps (SW 56) service at one end and A/B restoral at the other**. Normal operation is over a leased circuit. A 3512 with the SW 56 feature can initiate or receive a call from the remote SW 56 device to restore a broken connection. **NOTE:** The SW 56 device may run on either a 2-wire or 4-wire service.

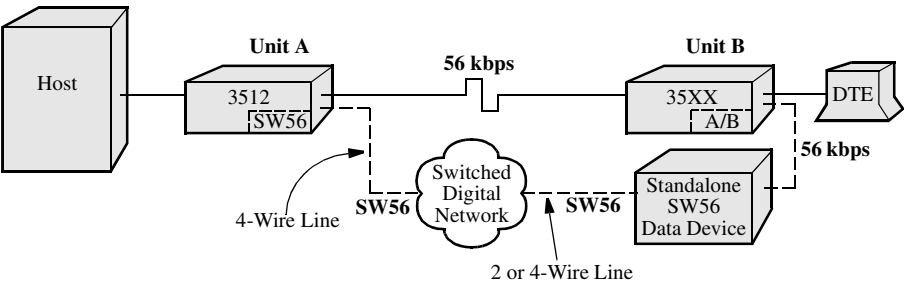


Figure 3-8. Switched Digital Point-to-Point Circuit, Mixed Restoral

Restoral parameters *not* specified below may be set to factory default options.

Category	Parameter	Unit A	Unit B
PHONE NUMBER	Enter Phone #	[phone number]	
RESTORAL CONFIG	Rest Type		Digital

As noted above, the *User's Manual* provides more application examples, and details on 3512 features and configuration concepts such as:

- MP-Mux
- Channel sharing
- Port-to-channel mapping
- Restoral, analog and digital
- Limited-distance modems and tail circuits
- Timing

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