



# ***SpectraComm 521A***

## ***Data Service Unit***

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### ***Installation & Operation Manual***

*076R152-000*

*Issue 4*

*April 2002*



**General DataComm**  
*Smart Solutions for Service Providers*

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General DataComm, Inc.  
Technical Publications  
6 Rubber Avenue  
Naugatuck, Connecticut USA 06770

Telephone: 1 203 729 0271

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## Documentation

### Revision History - SpectraComm SC 521A Installation & Operation Manual

Issue Number	Date	Description of Change
1	September 1999	Initial Release
2	January 2000	Updates
3	August 2001	Added SC 521A/S model (with Simplex Current) Capable of operation as a remote to the SC 5520 DSE
4	April 2002	Updates

### Related Publications

Description	Part Number
SpectraComm/UAS Shelf and Enclosure Installation & Operation Manual	010R302-REV
SpectraComm 2000 Shelf Installation & Operation Manual	010R358-REV
Remote Access (RA 1000) Enclosure Installation & Operation Manual	010R111-REV
SpectraComm Manager Card Installation & Operation Manual	048R303-REV
TEAM 521A Operation Manual	076R154-VREF
TEAM Core Software Operation Manual	058R720-VREF

**-REV** is the hardware revision (**-000**, **-001**, etc.)

**-VREF** is the most current software version (**-V400** is Version 4.0.0.)

In addition to the publications listed above, always read Release Notes supplied with your products.

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# Preface

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## Scope of this Manual

This manual describes how to install, configure and operate the SpectraComm 521A DSU or the SpectraComm 521A/S DSU. The information contained in this manual has been carefully checked and is believed to be entirely reliable. This information is intended for installers, service technicians and users and assumes a working knowledge of data interfaces, DDS data transmission services and the Simple Network Management Protocol (SNMP).

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General DataComm, Inc.  
6 Rubber Avenue  
Naugatuck, Connecticut 06770 U.S.A.  
Tel: 1 203 729-0271      Toll Free: 1 800 523-1737

## Manual Organization

This manual is divided into the following chapters. When using the digital version of this manual, click on any link (shown in blue text) to jump to that section.

- *Chapter 1, Introduction & Specifications*  
describes the Data Service Unit, its features, and its options. This chapter contains the typical application diagrams, an equipment list and technical specifications.
- *Chapter 2, Installation & Setup*  
provides directions for installing the DSU in a SpectraComm shelf system or enclosure.
- *Chapter 3, Operation*  
describes and provides instructions on the use of the DSU front panel and the terminal interface.
- *Chapter 4, Tests*  
describes tests that can be performed on the DSU by means of its front panel push-button switch or from the terminal interface.

## Safety Information

This manual should be read in its entirety and all procedures completely understood before installing or operating the unit, including all notes, cautions and warnings (examples below). The CAUTION, WARNING, and DANGER statements that appear throughout this manual are intended to provide critical information for the safety of both the service engineer and operator. These statements also enhance equipment reliability. The following definitions and symbols for CAUTION, WARNING, and DANGER as they are used comply with ANSI Z535.2, American National Standard for Environmental and Facility Safety Signs, and ANSI Z535.4, Product Safety Signs and Labels, issued by the American National Standards Institute. .

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**Note** Indicates a note. It is something you should be particularly aware of; something not readily apparent. A note is typically used as a suggestion.

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**Important** Indicates an emphasized note. It is something you should be particularly aware of; something not readily apparent. Important is typically used to prevent equipment damage.

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**CAUTION** Indicates a potentially hazardous situation which, if not avoided, may result in minor to moderate injury. It may also be used to alert against unsafe practices.



**WARNING** indicates an imminently hazardous situation which, if not avoided, could result in death or serious injury.



**DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

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## Safety Guidelines

- Always use caution and common sense, especially when unsafe conditions or potentially hazardous voltages are present.
- Repairs must be performed by qualified service personnel only.
- To reduce the risk of electrical shock, do not operate equipment with the cover removed.
- Never install telephone jacks in a wet location unless the jack is designed for that location.
- Never touch uninsulated telephone wires or terminals unless the telephone line is disconnected at the network interface.
- Never install telephone wiring during an electrical storm.

## Antistatic Precautions

This product may contain static-sensitive devices that are easily damaged by electrostatic discharge (ESD). ESD occurs when a person whose body has built up static electricity touches a computer component. ESD can cause computer components to fail. Take proper handling, grounding and precautionary ESD measures when installing parts or cards. Keep parts and cards in antistatic packaging when not in use or during transport. If possible, use antistatic pads on floor and workbench. When handling components, always use an antistatic wrist strap connected to a grounded equipment frame or chassis. *If a wrist strap is not available, periodically touch an unpainted metal surface on the equipment.* Never use a conductive tool, like a screwdriver or a paper clip, to set switches.

## Compliance

### FCC Part 68 Compliance

Connection of data communications equipment to the public telephone network is regulated by FCC Rules and Regulations. This equipment complies with Part 68 of these regulations which require all of the following:

For single or multi-line equipment that connects to the telephone network via a plug and jack, the plug and jack must comply with the FCC Part 68 rules. This device is designed to be connected to the telephone or premises wiring, using a compatible modular jack which is Part 68 compliant.

The telephone company may discontinue your service if the unit causes harm to the telephone network. If possible, you will be notified of such an action in advance. If advance notice is not practical, you will be notified as soon as possible and will be advised of your right to file a complaint with the FCC. The telephone company may change its communication facilities, equipment, operations and procedures where reasonably required for operation. If so, the telephone company will notify you in writing. All repairs or modifications to the equipment must be performed by General DataComm. Any other repair or modification by a user voids the FCC registration and the warranty.

To connect the product to the Public Telephone Network, you are required to give the following information to the telephone company:

- FCC Registration Number: AG6USA-24046-DD-N
- Telephone Company jack type: RJ48S
- Facility Interface Codes: DDS - 04DU5-24/48/96/19/56/64
- Service Order Code: DDS- 6.0Y

### Industry Canada Notification

The Industry Canada label identifies certified equipment. This certification means that the equipment meets telecommunications network protective, operation and safety requirements as prescribed in the appropriate Terminal Equipment Technical Requirements document(s). The Department does not guarantee the equipment will operate to the user's satisfaction.

Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. The customer should be aware that compliance with the above conditions may not prevent degradation of service in some situations.

Repairs to certified equipment should be coordinated by a representative designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment.

Users should ensure for their own protection that the electrical ground connections of the power utility, telephone lines and internal metallic water pipe system, if present, are connected together. This precaution may be particularly important in rural areas.

**Caution:** Users should not attempt to make such connections themselves, but should contact the appropriate electric inspection authority, or electrician, as appropriate.

**Notice:** The Ringer Equivalence Number (REN) assigned to each terminal device provides an indication of the maximum number of terminals allowed to be connected to a telephone interface. The termination on an interface may consist of any combination of devices subject only to the requirement that the sum of the Ringer Equivalence Numbers of all the devices does not exceed 5.

### Avis D'industrie Canada

L'étiquette d'Industrie Canada identifie le matériel homologué. Cette étiquette certifie que le matériel est conforme aux normes de protection, d'exploitation et de sécurité des réseaux de télécommunications, comme le prescrivent les documents concernant les exigences techniques relatives au matériel terminal. Le Ministère n'assure toutefois pas que le matériel fonctionnera à la satisfaction de l'utilisateur.

Avant d'installer ce matériel, l'utilisateur doit s'assurer qu'il est permis de le raccorder aux installations de l'entreprise locale de télécommunication. Le matériel doit également être installé en suivant une méthode acceptée de raccordement. L'abonné ne doit pas oublier qu'il est possible que la conformité aux conditions énoncées ci-dessus n'empêche pas la dégradation du service dans certaines situations.

Les réparations de matériel homologué doivent être coordonnées par un représentant désigné par le fournisseur. L'entreprise de télécommunications peut demander à l'utilisateur de débrancher un appareil à la suite de réparations ou de modifications effectuées par l'utilisateur ou à cause de mauvais fonctionnement.

Pour sa propre protection, l'utilisateur doit s'assurer que tous les fils de mise à la terre de la source d'énergie électrique, des lignes téléphoniques et des canalisations d'eau métalliques, s'il y en a, sont raccordés ensemble. Cette précaution est particulièrement importante dans les régions rurales.

**Avertissement:** L'utilisateur ne doit pas tenter de faire ces raccordements lui-même; il doit avoir recours à un service d'inspection des installations électriques, ou à un électricien, selon le cas.

**Avis:** L'indice d'équivalence de la sonnerie (IES) assigné à chaque dispositif terminal indique le nombre maximal de terminaux qui peuvent être raccordés à une interface. La terminaison d'une interface téléphonique peut consister en une combinaison de quelques dispositifs, à la seule condition que la somme d'indices d'équivalence de la sonnerie de tous les dispositifs n'excède pas 5.

## Electromagnetic Compatibility

This Class A digital apparatus complies with Canadian ICES-003.

### La Compatibilité d'Électro-magnétique

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

## NEBS Compliance

Certified by independent labs for NEBS compliance to standards:

GR63 - Physical Protection

GR1089 - EMC and Safety



## Service Support and Training

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**VITAL Network Services World Headquarters**

6 Rubber Avenue  
Naugatuck, Connecticut 06770 USA

<http://www.vitalnetsvc.com>

Telephones:  
1 800 243 1030  
1 888 248 4825  
1 203 729 2461

Faxes:  
1 203 723 5012  
1 203 729 7611

<b>VITAL Network Services Regional Sales and Service Offices:</b>	
<p><b>North American Region Office</b> 6 Rubber Avenue Naugatuck, Connecticut 06770 USA Telephones: 1 800 243 1030 1 888 248 4825 1 203 729 2461 1 800 361 2552 (French Canadian) Training: 1 203 729 2461 Faxes: 1 203 723 5012 1 203 729 7611</p>	<p><b>Central America, Latin America</b> VITAL Network Services Periferico Sur 4225, Desp. 306 C.P. 14210, Mexico D.F., Mexico  Telephone: 52 5 645 2238 Training: 52 5 645 2238 Fax: 52 5 645 5976</p>
<p><b>Europe, Middle East, Africa</b> VITAL Network Services Molly Millars Close Molly Millars Lane Wokingham, Berkshire RG41 2QF UK  Telephone: 44 1189 657200 Training: 44 1189 657240 Fax: 44 1189 657279</p>	<p><b>Asia Pacific</b> VITAL Network Services 501 Orchard Road 05-05 Wheelock Place, Singapore 238880  Telephone: 65 735 2123 Training: 65 735 2123 Fax: 65 735 6889</p>



# Chapter 1: Introduction & Specifications

## Product Overview

The SpectraComm 521A DSU is a multi-rate data service unit capable of operating in standard DATAPHONE Digital Service (DDS), DDS with a secondary channel (DDS/SC), or 64 kbps Clear Channel mode. It can support DTE data rates of 0.6, 1.8, 2.4, 4.8, 9.6, 19.2, 56.0, and 64.0 kbps.

The SC521A DSU is a 7-inch by 9.5-inch (178 mm by 241 mm) printed circuit card that conforms to GDC SpectraComm high-density shelf/enclosure systems. The SpectraComm 2000 shelf can house two SC521A cards; SpectraComm 5000 shelf can hold up to 16 single card devices, or when configured as a dual shelf, up to 32 single card devices. The Remote Access 1000 enclosure houses one unit.

### SpectraComm 521 A/S DSU

The SC 521A/S DSU can be optioned with a Sealing/Simplex current which provides a 4mA DC current on the network interface to keep the relay path clean. The SC 521A/S front panel is identical to the SC 521A. You can distinguish the SC 521A/S by part number on the card, by version number on the Firmware Download screen, and at the TEAM Main Configuration window (version 05.00.00 or above indicates SC521A/S). In this document, all DSU functions relate to both models of the SC 521A/S, except where noted.

### Intended Use

The SC521A DSU supports full duplex operation over four-wire private lines. The unit can be software programmed to operate in the following network modes:

- DDS I (Standard DDS)
- DDS/SC (DDS with Secondary Channel)
- DDS 64 (Clear Channel)
- Wireline

The SC521A DSU is data- and diagnostics-compatible with the remote GDC NMS510 and NMS520 DSUs, and can pass data to any existing DDS-compatible DSU. The SC 521A is designed for space efficient, high density central site and remote installations. In a typical environment, the master SC521A will be located at the central site with a SpectraComm Manager (SCM) Card, while the NMS510/520 or another SC521A is located at the remote site. The SC521A DSU is also data- and diagnostics-compatible as a remote to the SC 5520 DSE. Remote units can be managed and configured via the SNMP manager via the SCM and a SC5001/SC5520 at the the central site.



## Features and Benefits

- DDS, DDS with Secondary Channel and 64 kbps Clear Channel.
- Receive, Internal or External Timing.
- Programmable RTS/CTS delays.
- Circuit Assurance and System Status.
- Synchronous rates: 64, 56, 19.2, 9.6, 4.8 and 2.4 kbps.  
Asynchronous rates: 19.2, 9.6, 4.8, 2.4 and 1.2 kbps.
- Configurable Data Rates via Network Management, VT100, or hard switch.
- Fully compatible with master SC5520 or with remote NMS510, NMS520, or SC521A.
- Inband diagnostic support with the NMS520 remotes.
- Point-to-Point, Multi-Point and LDM (wireline).
- Autodiscovery of new or existing remote units in point-to-point.
- Automatically determines remote unit type as: NMS510, NMS520, SC521A, SC521A/S.
- Virtual mapping of P, L, D in a master SC521A.
- SNMP managed via SCM Card and associated SNMP Manager.
- Capable of providing Sealing/Simplex current (SC 521A/S).
- SC521A: Standard loopbacks, Telco Loopbacks and V.54.  
SC521A/S: Same as SC521A; Can also initiate CSU loopback (current reversal).
- TIA/EIA-232-F and V.35 DTE onboard interfaces.
- EIA530 or DRA (Data Rate Adapter) plug-in options.
- DTE Interface status and alarms.
- Provides a local VT100 interface port in the SC2000 shelf without an SCM, via the craft port.
- Provides a local VT100 interface port in the SC/UAS shelf via the SCM.
- Circuit Quality Measurements for: Jitter, Receive Level, Transmit Level, Bipolar Violations and Round Trip Delay.
- May be mixed and matched with other SpectraComm Data Sets in the same shelf.
- Operates as a remote in the SC2000 shelf or RA1000 enclosure, emulating the NMS520 or NMS510.
- SC2000 Shelf power supply alarms and forward to SCM.
- Supports AutoConfig via SCM.
- SC521A Master downloadable.

## Alarm Reporting

The unit can be configured to report on any of the following alarm conditions:

No Signal	No Loop Current	Bipolar Violations
Jitter	DSR Loss	EEPROM Checksum
DTR Loss	Frame Loff	Front Panel Test Mode
DCD Loss	TX Failure	Top Power Supply Fail
TXD Loss	Line Pairs REversed	Bottom Power Supply Fail
RXD Loss	Streaming	
RX Signal Low	STC Loopback	

---

**Note** Refer to Chapter 3, *Operation* for detailed information and operating procedures.

---

## Diagnostic Testing

To help identify system faults and restore service quickly, the SC 521A or SC 521A/S provides comprehensive loopback and testing diagnostics such as: Local Test, Remote Loop, Data Loop, and Self-Test. The SC 521A/S also provides a CSU Loopback, described below. All of these tests can be used from a terminal, or from an SNMP controller.

Local and Self-Tests can be initiated from switches on the modem's front panel. A front panel Test Mode (TM) LED lights during all test modes, and indicates errors during Self Tests by flashing to display detected errors. Loopbacks and tests isolate system faults to a particular DTE, data set, or line. Diagnostic testing performed through SNMP does not require intervention by personnel at remote sites.

### CSU Loopback Test (SC 521A/S Only)

When set to Source, the sealing current direction is reversed by the local SC 521A/S in order to initiate a CSU Loopback in a remote unit. When set to Sink, the local SC 521A or SC521A/S will enter a CSU Loopback when sealing current reversal is detected.

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**Note** Refer to Chapter 4, *Tests* for detailed information and test procedures

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## Management

As an SNMP controlled device, the SC521A DSU receives the commands that set its configuration and control its functions in the form of entries in its Management Information Base (MIB) tables. SNMP interface functions between the DSU and its SNMP controller are the responsibility of the SCM card installed in the same SpectraComm Shelf (or pair of shelves) that holds the DSU. The SCM card stores and administers MIBs for compatible GDC products in its SpectraComm Shelf. The SCM card communicates with an SNMP controller, and passes commands and responses between the controller and the DSU.

The SC521A DSU can be installed in a shelf that holds other types of SCM-compatible products, with a single SCM used for the control of all the devices in the shelf. The SC521A can also be installed in a remote shelf and controlled in a management communications link to the master SC521A.

All SCM compatible products can also be managed via TEAM (Total Enterprise Access Management) software applications which use HP OpenView APIs (Application Programmer Interfaces) to integrate with HP OpenView Windows and other network management applications.

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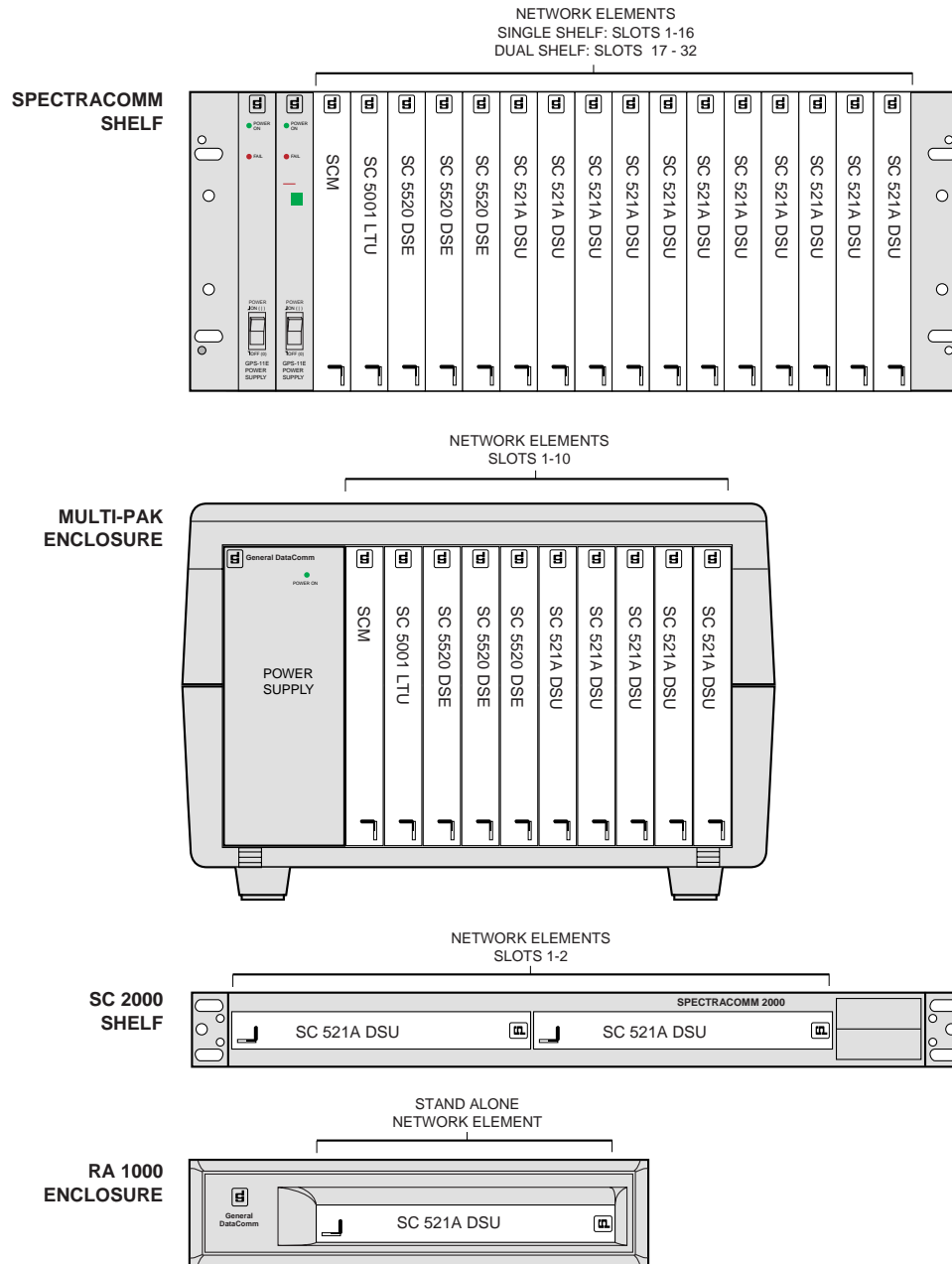
**Note**     *For detailed TEAM information, refer to the GDC TEAM Core documentation and also to the specific TEAM documentation that accompanies the individual products.*

---

## Shelf / Enclosure Options

The SC521A DSU can be installed in a shelf that holds other compatible products, with a single SCM for controlling all network elements in the shelf (*Figure 1-1*). SCM-compatible products in the GDC SpectraComm system include GDC V.F 28.8 and Dual V.34 modems, GDC data set emulators, and GDC line terminating units. The SC521A can also be installed in a remote SC 2000 shelf or RA 1000 shelf and controlled via a communications link to the master SC521A.

Refer to *Table 1-1* for shelf / enclosure descriptions and part numbers. For more information on any shelf / enclosure system, refer to its manual as listed in the cover section of this manual.



**Figure 1-1** Shelf/Enclosure Configurations

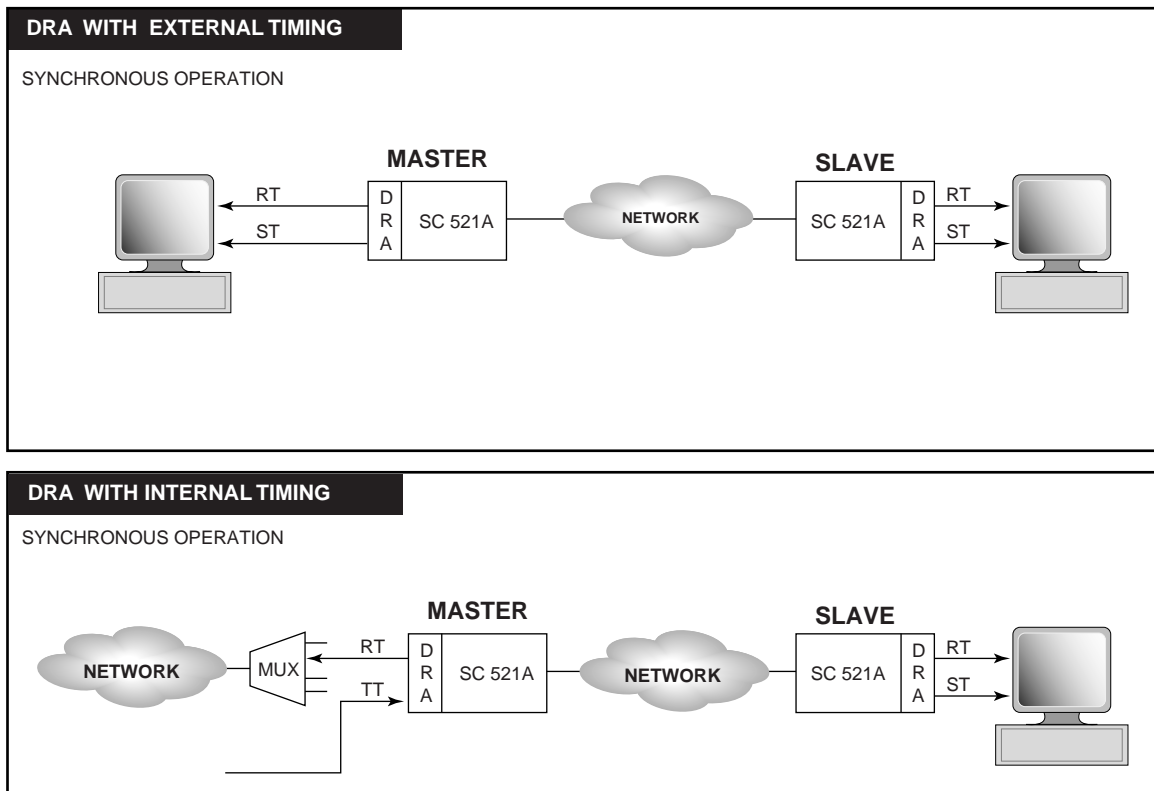
## Piggyback Cards Options

The following optional piggyback cards may be mounted on the SC521A or SC 521A/S base card:

- The 530 Interface Card supports the use of an EIA-530 DTE interface. When the 530 Interface Card is not installed, the DSU provides an TIA/EIA-232-F or V.35 interface as selected by hardware jumpers on the base card.
- The Data Rate Adapter Card is available as a factory installed option, or as a field-upgrade kit. It adapts synchronous and asynchronous DTE data transmission at speeds of 19.2 kbps and slower to an aggregate line speed of 56 or 64 kbps. Rate adaptation is provided for point-to-point and multipoint applications.

### Typical DRA Card Applications

[Figure 1-2](#) illustrates timing configurations for use when the DSU has the optional Data Rate Adapter card installed for synchronous operation. In DRA card applications, always option the DSU for Receive timing from the network. External timing (TT) sources must be accurate to within 100 PPM.



**Figure 1-2** DRA Card Application - Internal and External Timing



# Typical SC 521A Applications

The SC521A DSU supports full duplex operation over four-wire private lines and can operate in DDS modes (DDS, DDS64 or DDS/SC) or in wireline mode (Figure 1-3). DDS is offered by local and interexchange carriers for highly reliable data transmission; DDS64 provides Clear Channel; DDS/SC provides an inband, synchronous secondary channel. The SC521A can use the secondary channel for diagnostic and management communications with remote NMS 520 and NMS 510 DSUs.

In a wireline connection, the DSU is connected directly to another DSU rather than to a DDS network. Use a crossover cable that connects Send Data from one unit to Receive Data at the other.

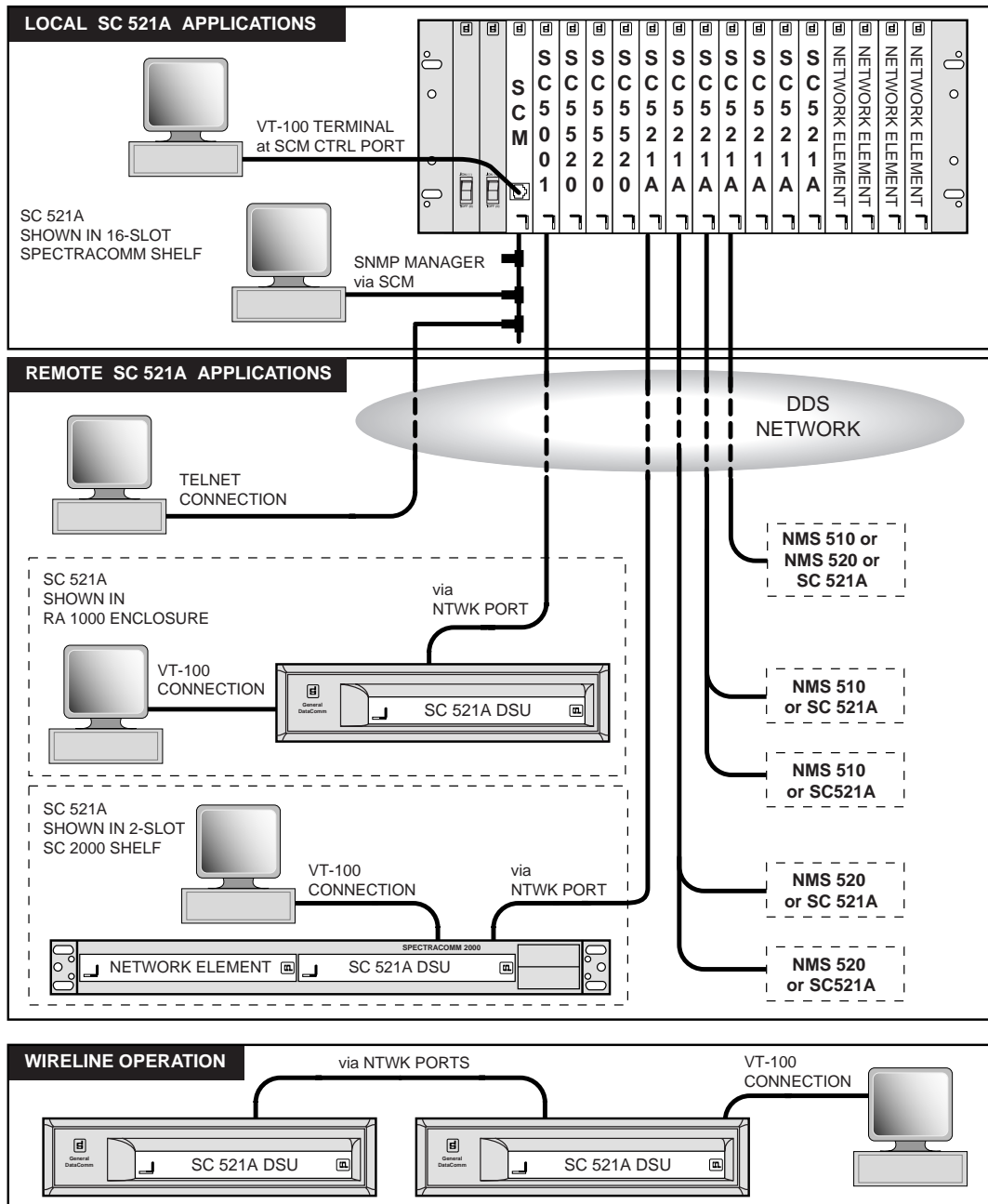


Figure 1-3 Master and Remote DSU Applications (DDS or WIRELINE Operation)

## Equipment List

[Table 1-1](#) lists the SpectraComm 521A part numbers.

**Table 1-1** Equipment List

Type	Description	GDC Part No.
SpectraComm 521A Data Service Unit	SC 521A base card with RS235/V.35 option	076P018-011
	SC 521A base card with RS530 option	076M018-011
	SC 521A base card with RA option	076M018-013
	SC 521A/S base card with Simplex/Sealing Current	076P028-001
	SC 521A/S Stand Alone base card with Simplex/Sealing Current	076A028-005
Shelves	SpectraComm Shelf MS-2 Mod. 1, Dual Modular 100/120 Vac MS-2 Shelf 100/120 Vac GPS-11 Power Supply Z1-S-16DRJ45, 8-Slot Dual RJ45 (2) Z3-S-16DB25, 16-Slot DB25 Blank Panel, Power Supply	010M054-001 010B150-001 035P034-001 010C342-001 010C339-001 010D727-001
	SpectraComm Shelf MS-2 Mod. 2, Dual Modular -48, 60 Vdc MS-2/DC Shelf -48, 60 Vdc DPS-11 Power Supply Z1-S-16DRJ45, 8-Slot Dual RJ45 (2) Z3-S-16DB25, 16-Slot DB25 Blank Panel, Power Supply	010M055-001 010B152-001 041P050-001 010C342-001 010C339-001 010D727-001
	SpectraComm Shelf MS-2 Mod. 3, Dual Modular 220/240 Vac MS-2E Ac Export Shelf 220/240 Vac GPS-11E Power Supply Z1-S-16DRJ45, 8-Slot Dual RJ45 (2) Z3-S-16DB25, 16-Slot DB25 Blank Panel, Power Supply	010M056-001 010B151-001 035P034-002 010C342-001 010C339-001 010D727-001
	SpectraComm Shelf MS-2 Mod. 4, (Mass Term) 100/120 Vac MS-2 Shelf 100/120 Vac GPS-11 Power Supply Z1-S-04H50PIN, 16-Slot 50-pos Z3-S-16DB25, 16-Slot DB25 Blank Panel, Power Supply	010M057-001 010B150-001 035P034-001 010P145-001 010C339-001 010D727-001
	SpectraComm Shelf MS-2 Mod. 5, (Mass Term) -48, 60 Vdc MS-2/DC Shelf -48, 60 Vdc DPS-11 Power Supply Z1-S-04H50PIN, 16-Slot 50-pos Z3-S-16DB25, 16-Slot DB25 Blank Panel, Power Supply	010M058-001 010B152-001 041P050-001 010P145-001 010C339-001 010D727-001
	SpectraComm Shelf MS-2 Mod. 6, (Mass Term) 220/240 Vac MS-2E AC Export Shelf 220/240 Vac GPS-11E Power Supply Z1-S-04H50PIN, 16-Slot 50-pos Z3-S-16DB25, 16-Slot DB25 Blank Panel, Power Supply	010M059-001 010B151-001 035P034-002 010P145-001 010C339-001 010D727-001
	SpectraComm Shelf MS-2 Mod. 10, Dual Modular -48, 60 Vdc (redundant P.S.) MS-2/DC Shelf -48 - 60 Vdc DPS-11 Power Supply Z1-S-16DRJ45, 8-Slot Dual RJ45 (2) Z3-S-16DB25, 16-Slot DB25	010M070-001  010B152-001 041P050-001 010C342-001 010C339-001

**Table 1-1** Equipment List (Continued)

Type	Description	GDC Part No.
Shelves (continued)	SpectraComm Shelf MS-2 Mod. 11, (Mass Term) -48, -60 Vdc (redundant P.S.)	010M071-001
	MS-2/DC Export Shelf -48, - 60 Vdc	010B152-001
	DPS-11 Power Supply (2)	041P050-001
	Z3-S-16DB25, 16-Slot DB25 (2)	010C339-001
	Z1-S-045HOPIN	010P145-001
	SpectraComm 2000 Shelf (Non-Redundant) for two cards	010B226-001
	SpectraComm 2000 Shelf (Redundant) for two cards	010B226-002
	Remote Access 1000 Stand-Alone Enclosure for one cards	101B236-001
Adapters	SCM 10 Base 2 Adapter	058B033-001
	RJ45 to DB9F Adapter	029H211-001
	DB9 female to DB25 female (pc terminal)	209-036-015
Cables	Cable Assembly 10base2	S-125H003, 004, 005-001
	Cable Assembly, 8PLG/8PLG UF, 7 feet	830-028-807
	Cable Assembly, V.35 Male-to-Male, Straight Through	027H516-XXX*
	Cable Assembly, DB25 Male/V.35 Female Adapter	209-036-025
	Cable Assembly, EIA-530/442 (25-pin male) to EIA-422/449 (37-pin female)	027H501-001
	Cable Assembly, TIA/EIA-232-F Male-to-Male, Straight Through	028H502-XXX*
	Cable Assembly, TIA/EIA-232-F Male-to-Female, Straight Through(Shielded)	028H506-XXX*
Options	EIA-530 Interface Module	048P042-001
	Data Rate Adapter (DRA) card	058P128-002

**Note** When ordering cables, the XXX in the part number designates the cable length in feet.

## Technical Specifications

The following tables describes the physical, operational, and environmental specifications for the SpectraComm 521A DSU. Conforming to these specifications ensures maximum system performance and reduces the chances of mechanical breakdown and personnel hazard.

**Table 1-2** Technical Specifications

Specification	Description	Detail
Operation	DDS, DDS/Secondary Channel	Point-to-point: full- or half-duplex
		Multi-point: full duplex
	Customer-owned	Point-to-point: full- or half-duplex
	Signal format	Serial, synchronous or asynchronous, binary
	Character format	8 - 11 bits / character
	Overspeed	1 or 2.3%
	Signal encoding	Bipolar, return to zero
	Data rates	Synchronous: 2400, 4800, 9600, 19200, 56000, or 64000 bps
		Asynchronous: 600, 1200, 1800, 2400, 4800, 9600 or 19200 bps
	Transmitter power (2400, 4800, 19200, 5600 or 64000 bps)	6.0 dBm maximum (50% duty cycle, random bipolar sequence, 135 ohm impedance)
	Transmitter power (9600 bps)	0 dBm maximum (50% duty cycle, random bipolar sequence, 135 ohm impedance)
Transmit timing	Receiver (slave/network), internal (DSU) $\pm 0.01\%$ , or external (DTE – can accept external clock up to $\pm 0.02\%$ )	
Receiver	Dynamic range: 48 dB extended range at 56 kbps	
	Acquisition time: 200 ms maximum	
	Release time: 1 second maximum	
Service	Communication line	DDS or 4-wire, nonloaded, metallic lines (19 - 26 ga)
	Terminating impedance	135 ohms $\pm 20\%$
	Range at line data rates:	Distance, using 26 ga cable: 2400 bps 11.5 mi (18.5 km) 4800 bps 8.7 mi (14 km) 9600 bps 6.1 mi (9.8 km) 19200 bps 5.0 mi (8.1 km) 56000 bps 3.6 mi (5.8 km) 64000 bps 3.2 mi (5.2 km)
DTE interface	TIA/EIA-232-F, ITU-T V.35, optional EIA-530 at line data rates:	RTS-CTS delay (synchronous)
		2400 bps 8 $\pm 0.4$ ms
		4800 bps 4 $\pm 0.2$ ms
		9600 bps 2 $\pm 0.1$ ms
		19200 bps 1.0 $\pm 0.05$ ms
		56000 bps 0.35 $\pm 0.02$ ms
64000 bps Constant carrier		
Power Dissipation	SC 521A card only	4 watts maximum

**Table 1-2** Technical Specifications (Continued)

Specification	Description	Detail
Fusing	Two 2.5 A 125V	GDC P/N 215-201-009
	One 5 A 125V	GDC P/N 215-201-021
Dimensions	SC 521A or SC 521A/S (card only)	Height: 21 mm (0.81 in) Width: 178 mm (7.0 in) Depth: 241 mm (9.5 in) Weight: 0.28 kg (10 oz) Shipping weight: 0.74 kg (1 lb 10 oz)
	SC 521A card with DRA or 530 piggyback cards	Height: 45 mm (1.75 in) Width: 178 mm (7.0 in) Depth: 241 mm (9.5 in)
Environment	Operating Temperature	0 to 50°C (32° to 122°F) (Derate by 1°C/1000 ft above sea level.)
	Non-operating Temperature	-40 to 70°C (-40° to 158°F)
	Operating Altitude	0 m to 3,047 m (0 to 10,000 ft)
	Non-perating Altitude	0 m to 12,191 m (0 to 40,000 ft)
	Operating Humidity	5% to 95% humidity (non-condensing)



# Chapter 2: Installation & Setup

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## Installation Overview

This chapter describes installation and setup procedures for the SC 521A DSU or the SC 521A/S DSU. Procedures for both units are the same except where noted. The unit is designed to install in a 16-slot SpectraComm shelf, a 10-slot MultiPak enclosure, a 2-slot SpectraComm (SC2000) shelf or a single-slot Remote Access (RA-1000) enclosure. The SC2000 shelf and the RA 1000 enclosure may be rack- or wall-mounted.

[Figure 1-1](#) identifies these shelves, enclosures and associated parts. For more information, refer to the appropriate shelf and enclosure manual listed in the cover pages of this manual.

### Unpacking the Unit

The SC 521A DSU is shipped in a protective box with packing material. The unit is pre-assembled, tested, and ready to use. Inspect the unit when you receive it and notify the shipper of any damage immediately. Keep the box and packing material in case you ever need to reship the unit.

After unpacking and inspecting the unit, perform the setup and installation procedures for the unit and its shelf/enclosure system as described in this chapter: [Installation Procedures](#). For detailed information on a particular shelf/enclosure, refer to [Table 1-1](#) and the paragraphs below.

## SpectraComm Shelf Systems

A SpectraComm 16-slot shelf can house up to 16 product cards, including the SC 521A and other SCM-compatible devices such as GDC V.F 28.8 and Dual V.34 modems, GDC data set emulators and line terminating units. The SpectraComm 16-slot shelf can contain a single SCM card, or two SCM cards installed as a primary and a backup.

This SpectraComm shelf then can be installed in 19-inch and 23-inch wide equipment racks or mounted in a Desktop EP-5 Cabinet. Each SpectraComm shelf provides a backplane that supports a management bus for the transfer of management data between an SCM card and the managed devices in the housing. The SCM card functions as an SNMP agent for the control of a variety of compatible devices. For some devices, the SCM card also provides access to the terminal interface functions. The SC 521A can pass management information to a remote unit via the secondary channel or user data channel in an interferring fashion (DDSI). DDSII is non-interferring. The SC 521A master unit determines what type of unit is connected to each remote circuit.

### Dual SpectraComm Shelf Systems

The backplanes of two 16-slot SpectraComm shelves can be linked by cables so that a total of 32 card slots function as though connected to the same backplane. In that way, one SCM can be responsible for control functions for up to 31 other devices.

---

**Note** Refer to the *SpectraComm/UAS Shelf and Enclosure Installation and Operation Manual* (GDC No. 010R302-000) for detailed information on the shelf and its back panel connectors.

---

## SC2000 and RA1000 Systems

Up to two SC521A DSUs may be housed in a SpectraComm 2000 (SC2000) Shelf. A single SC 521A or SC 521A/S can be housed in the RA 1000 enclosure. Both the shelf and enclosure can be used horizontally or mounted on a wall and provide a 8-position modular jack **TERM(-inal)** port at the back panel for each card. This interface permits local configuration via a local terminal or PC and without the aid of an SCM card. [Table 2-1](#) describes the pinouts.

When the SC521A is installed in the SC2000 shelf or the RA1000 enclosure, it functions as a full-featured DDS/DSU under SNMP control. In this mode however, the management information is obtained inband over the secondary channel or user data channel in an interfering fashion. This eliminates the need for additional network management cabling at remote sites.

**Table 2-1** Terminal Port Pin outs (Term 1 and Term 2)

Pin	Signal	Description	Direction
6	TXD	Input	Craft port data from terminal.
5	RXD	Output	Craft port data to terminal.
4	GND	Ground	-

**Note** Refer to the *SpectraComm 2000 Shelf Installation and Operation Manual* (GDC P/N 010R358-000) for detailed information on this shelf and its back panel connections.

**Note** Refer to the *RA 1000 Enclosure Installation and Operation Manual* (GDC P/N 010R111-000) for detailed information on this enclosure and its back panel connections.



## Installation Procedures

The SC 521A is intended for installation in a SpectraComm Shelf or Enclosure. For additional information on a specific shelf or enclosure, refer to its accompanying documentation.



- a. *Be sure to install shelves and power supplies as described in the SpectraComm/UAS Shelf manual. Failure to do so may result in overheating and subsequent power supply shut-down.*
- b. *A shielded cable is required to comply with FCC Class B and EN 55022 Class B EMI requirements.*

### Installation Guidelines

- Locate the shelf or enclosure in a ventilated area where the ambient temperature does not exceed 122 degrees F (50 degrees C).
- Do not install the unit directly above equipment that generates a large amount of heat (such as power supplies).

### Product Card Installation

1. Set the SC 521A or SC 521A/S base card and any option cards to the desired settings:
  - For the SC 521A, refer to [Figure 2-1](#) and related paragraphs.
  - For the SC 521A/S, refer to [Figure 2-2](#) and related paragraphs.
  - If the SC 521A or SC 521A/S is so equipped, set the DRA card switch/jumper options as desired. Refer to paragraphs in the [Data Rate Adapter Card](#) section, and to [Figure 2-3](#) and [Figure 2-4](#) for more information on this option card.
  - If the SC 521A or SC 521A/S is so equipped, set the EIA-530 card switch/jumper options as desired. Refer paragraphs in the [EIA-530 Card](#) section, and to [Figure 2-5](#) for more information on this option card.
2. Slide the base card into its shelf slot with the GDC logo on top, then slide it in until it makes contact. In a SC2000 shelf or RA1000 enclosure, the card will install horizontally with the logo on the right.
3. Pull down the insertion/ejection tab on the front panel and firmly push the card in until it seats in the rear connectors.
4. Refer to the connection information in this chapter to select the proper cables/adapters for connecting the unit to your network environment.
5. To remove a card, push down the tab to unseat the card, then use the tab to slide out the card.

## Hardware Options

### DSU Addressing (SpectraComm Shelf)

The network management system employs a slot-line-drop method of addressing. The DSU slot address is the number of the slot it occupies in the SpectraComm Shelf. In a single shelf installation, slot numbers are 1 through 16. In a two-shelf installation, the slots of the second shelf are designated 17 through 32. The setting of Shelf Address Jumper J50 on the back panel of the SpectraComm shelf selects the shelf as first or second in a two-shelf installation.

The line address for the DSU is always 1, and the DSU is drop 0 for its line. In a point-to-point circuit the single remote unit is drop 1. In a multi-point circuit the drop numbers of the remote units are selectable.

---

**Note** The SC2000 shelf and the RA1000 enclosure do not have the DSU Addressing feature.

---

### Setting SC 521A Basecard Options

[Figure 2-1](#) locates the switch and jumper options on the SC521A card. In this figure, Option switch **S6** is shown enlarged for easy viewing.

---

**Note** Switch S6 is the same on both the SC 521A and the SC 521A/S base cards. However, the location and function of jumpers on the SC 521A/S card are slightly different than on the SC 521A card. Refer to [Figure 2-2](#) and the associated paragraphs for SC 521A/S jumper information.

---

DIP switch **S6** is used for remote applications only. The configuration of this switch is set at the factory (19.2 kbps) to match your network's operation. You need to check these settings when you first install the card. You need not repeat the procedure unless you change your network. The option choices are explained below:

#### **S6-1** through **S6-6** (Data Rates)

When you use the SC521A as a remote, you can communicate with the central site without having to use the VT100 terminal to set the data rates. Switch positions 1 through 6 ON select the desired data rate. Set only one of the switches S6-1 through S6-6 to the ON position. When all switches are off (factory default), the rate is 19.2 kbps. When the SC521A is used as a master, the switch is not used to set the data rates.

#### **S6-7** (Service Type)

Set to DDS I (default) or DDS II (secondary channel) operation.

#### **S6-8** (NMS510 or NMS520/SC521A Mode)

Place the switch in the ON position for NMS510 to emulate a NMS510 environment or OFF (default) for NMS520 or 521A environment.

#### **X1** and **X2** (V.35 or TIA/EIA-232-F Interface Jumpers)

These jumpers together select the interface:

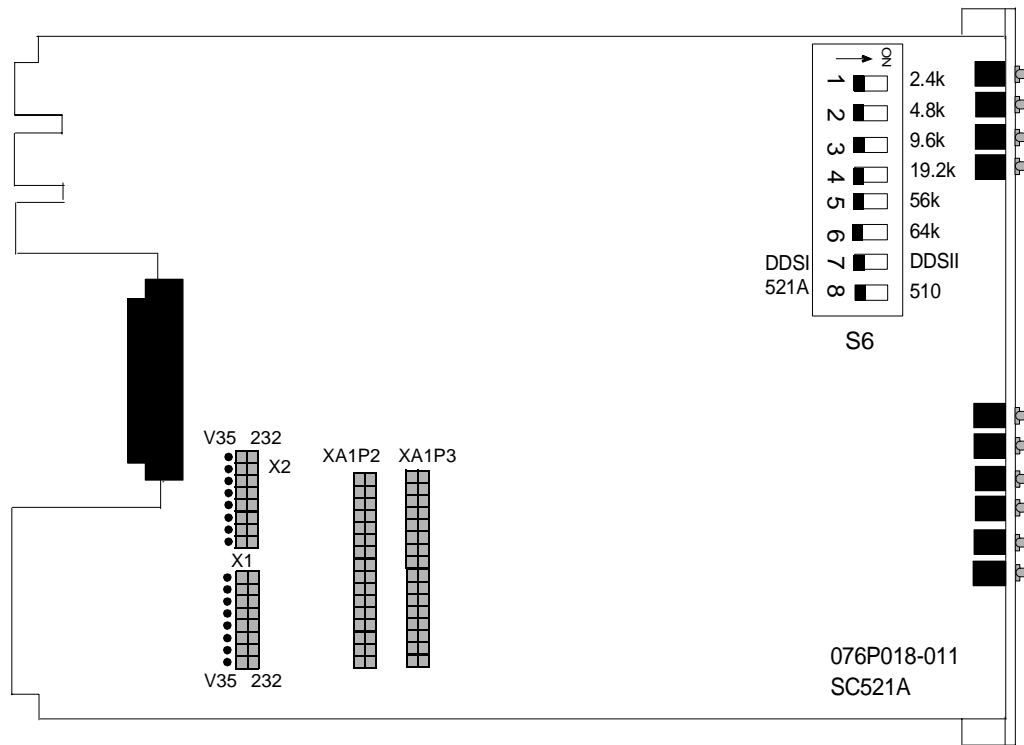
For the V.35 interface, place jumpers on center and left rows of pins.

For the EIA/TIA interface, place jumpers on center and right rows of pins.

---

**Note** [Figure 2-1](#) shows the SC 521A base card options and jumpers set for a USA deployment, as shipped from the factory.

---



Switch S6 Details	
S6-1	2.4k
S6-2	4.8k
S6-3	9.6k
S6-4	19.2k
S6-5	56k
S6-6	64k
S6-7	DDS I or DDS II
S6-8	NMS510 or NMS520/SC521A Mode

Figure 2-1 SC 521A Base Card Options

## Setting SC521A/S Basecard Options

[Figure 2-2](#) locates the switch and jumper options on the SC521A/S card.

---

**Note** *DIP Switch **S6** on the SC 521A/S base card has the same location and function as on the SC521A base card. However the location and function of Jumpers **X1**, **X2** and **X3** vary.*

---

DIP switch **S6** is used for remote applications only. The configuration of this switch is set at the factory (19.2 kbps) to match your network's operation. You need to check these settings when you first install the card. You need not repeat the procedure unless you change your network. The option choices are explained below:

**S6-1 through S6-6 (Data Rates)**

When you use the SC521A as a remote, you can communicate with the central site without having to use the VT100 terminal to set the data rates. Switch positions 1 through 6 ON select the desired data rate. Set only one of the switches S6-1 through S6-6 to the ON position. When all switches are off (factory default), the rate is 19.2 kbps. When the SC521A is used as a master, the switch is not used to set the data rates.

**S6-7 (Service Type)**

Set to DDS I (default) or DDS II (secondary channel) operation.

**S6-8 (NMS510 or NMS520/SC521A Mode)**

Place the switch in the ON position for NMS510 to emulate a NMS510 environment or OFF (default) for NMS520 or 521A environment.

**X1 (Sealing Current Jumper)**

Selects Sink or Source for the sealing current function.

**X2 and X3 (V.35 or TIA/EIA-232-F Interface Jumpers)**

These jumpers together select the interface:

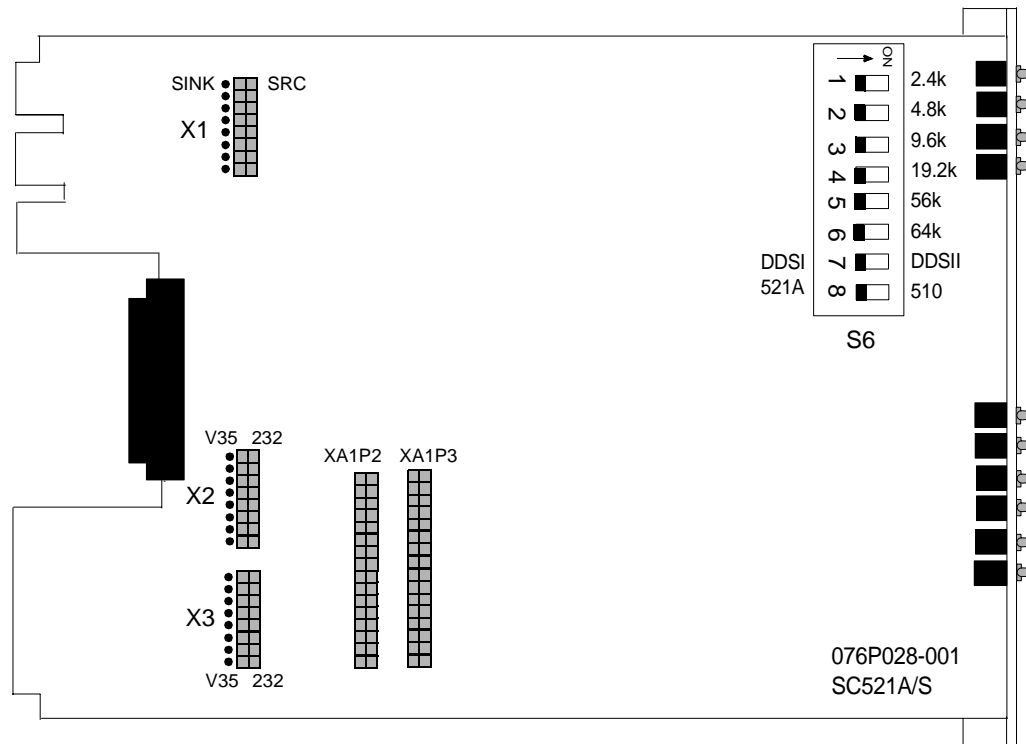
For the V.35 interface, place jumpers on center and left rows of pins.

For the EIA/TIA interface, place jumpers on center and right rows of pins.

---

**Note** *[Figure 2-2](#) shows SC 521A/S base card options and jumpers set for a USA deployment, as shipped from the factory.*

---



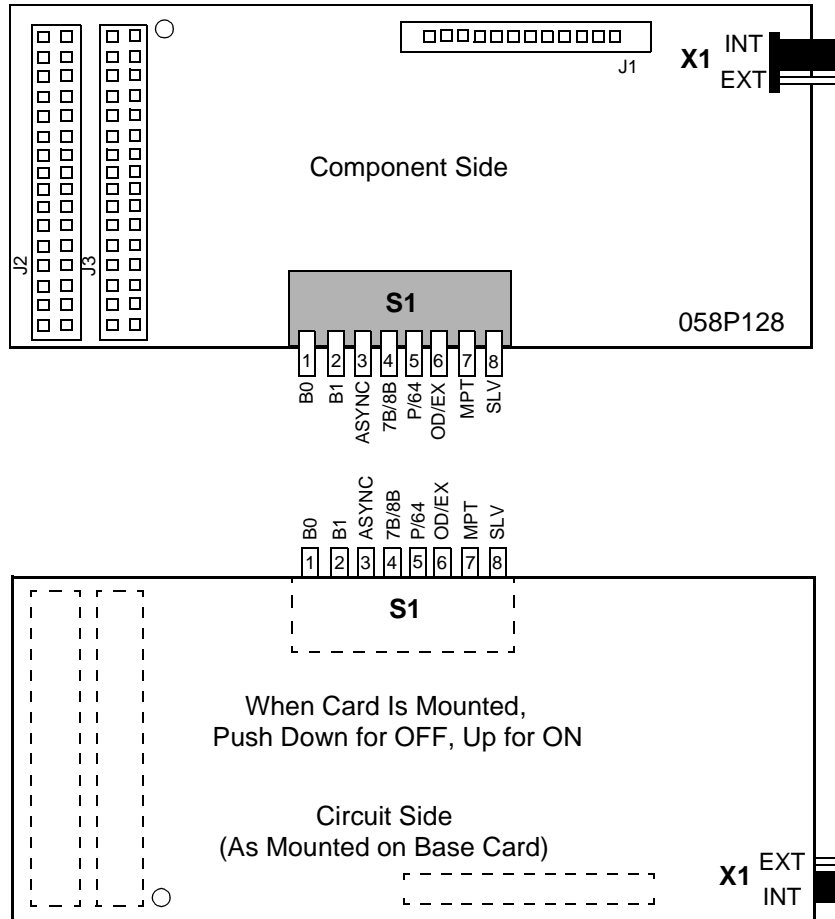
Switch S6 Details	
S6-1	2.4k
S6-2	4.8k
S6-3	9.6k
S6-4	19.2k
S6-5	56k
S6-6	64k
S6-7	DDS I or DDS II
S6-8	NMS510 or NMS520/SC521A Mode

Figure 2-2 SC 521A/S Base Card Options

### Data Rate Adapter Card

The DSU Data Rate Adapter -002 is a plug-in piggyback card available as a factory installed option, or as a field-upgrade kit. It is capable of adapting synchronous and asynchronous DTE data transmission at speeds of 19.2 kbps and slower to an aggregate line speed of 56 or 64 kbps. Rate adaptation is provided for point-to-point and multi-point applications.

[Figure 2-3](#)) and the paragraphs that follow describe and locate the card options on the 8-position switch **S1** or header **X1**.



**Figure 2-3** Data Rate Adapter Card Options

## DRA Option Switches

### x1 (EXT/INT)

*In synchronous mode only:* This option provides clock selection for internal (default) or external timing.

### s1-1, s1-2 (B0, B1)

*In synchronous or asynchronous mode,* B0 and B1 select the DTE data rates:

Mode	B0 (S1-1)	B1 (S1-2)	DTE Data Rate (bps)
Synchronous (s1-3 OFF)	OFF	OFF	2400
	ON	OFF	4800
	OFF	ON	9600
	ON	ON	19.2K
Asynchronous (s1-3 ON)	OFF	OFF	1200
	ON	OFF	2400
	OFF	ON	9600
	ON	ON	19.2K

---

**Note** *When operating in synchronous mode, send data and receive data LED's will be dimly lit when not passing data.*

---

### s1-3 (ASYNC)

When enabled (s1-3 ON), asynchronous operation is selected. In this mode, S1-4 through S1-6 selects the character format, parity, and parity type as described in the table below. When this feature is disabled (s1-3 OFF), synchronous operation is selected and s1-4 through s1-6 determines network compatibility, aggregate rate and external timing.

### s1-4 (7-Bit/8-Bit)

*For asynchronous operation only:* The OFF position selects 8 bits data per character DTE data transmission. The ON position selects 7 bits data per character DTE data transmission.

*For synchronous multi-point operation only:* The OFF position selects 5 bits data per character DTE data transmission. The ON position selects 8-bits data per character DTE data transmission.

7B/8B (S1-4) For Asynchronous	7B/8B (S1-4) For Synchronous
OFF = 8 bits data per character DTE data transmission	OFF = 5 bits data per character network data transmission
ON = 7 bits data per character DTE data transmission	ON = 8 bits data per character network data transmission

---

**Note** *Option is for sync mode Multipoint without clear channel.  
5-bit for compatibility with 058P128-001 Rev H- or later and all 058P128-002's.  
(Maximum 5 consecutive 0's to network)  
8-bit for compatibility with 058P128-001 Rev G- or older.*

---

**S1-5 (Parity/64kbps)**

*For asynchronous operation only:* The OFF position inhibits transmission of the parity bit. By selecting the ON position, parity transmission is enabled.

*For synchronous operation only:* This option provides rate adaptation to the aggregate line rate of 56 kbps (OFF) or 64 kbps (S1-5 ON).

Asynchronous	Synchronous
OFF = No Parity	OFF = 56 kbps Aggregate Line Rate
ON = Parity Enabled	ON = 64 kbps Aggregate Line Rate

**S1-6 (OD/EX)**

*In asynchronous operation only:* With switch S1-5 ON, the OFF position of this switch selects even parity. When ON, odd parity is selected. Refer to the table below:

Asynchronous	Synchronous
OFF = Even Parity	OFF = Default or Internal Timing
ON = Odd Parity	ON = External Timing

---

**Note** *The X1 EXT/INT header provides the physical clock connection and is optioned according to the selection of S1-6 for synchronous clock sources.*

---

*For synchronous operation only:* With switch S1-6 ON, external DTE timing is selected. The OFF position defaults to internal timing. This switch is used in conjunction with the X1 header to select the timing source.

---

**Note**

- 1) *The X1 EXT/INT header option must follow S1-6 selection when in synchronous operation.*
- 2) *When operating the Data Rate Adapter in an external synchronous point-to-point mode, the unit with external timing must be optioned as a multipoint master. The internal timing unit is optioned as a multipoint slave.*

---

Master Options	Slave Options
X1 EXT	X1 INT
SLV (S1-8) OFF	SLV (S1-8) ON
MPT (S1-7) ON	MPT (S1-7) ON
OD/EX (S1-6) ON	OD/EX (S1-6) OFF
7B/8B (S1-4) Selectable	7B/8B (S1-4) Selectable
B0, B1 (S1-1, - 2)	B0, B1 (S1-1, - 2) Set
Set To Ext Clock Rate	To Ext Clock Rate

**S1-7 (Multi-point)**

For point-to-point applications, the OFF position is required. For multi-point operation, the switch is optioned ON.

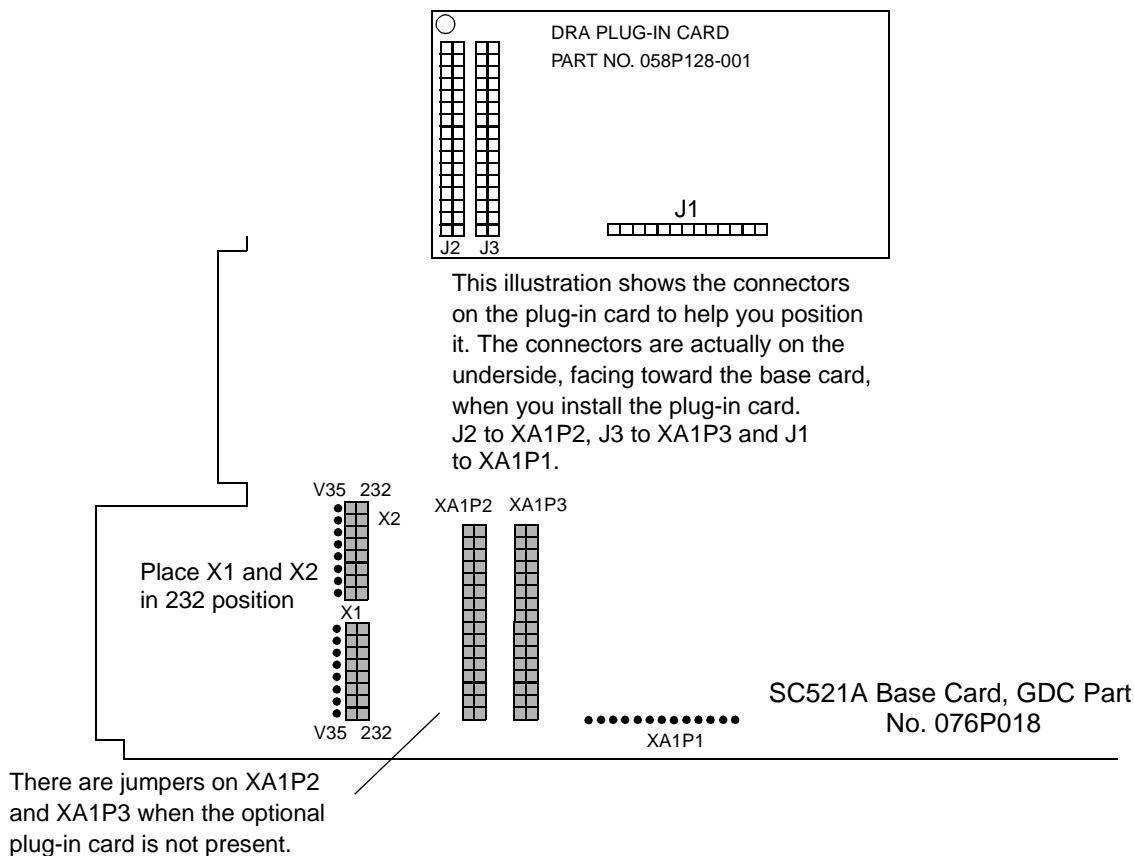
**S1-8 (Slave)**

In multi-point applications only, the OFF position options the DSU as the MASTER. When ON, the drop is optioned for SLAVE (Remote).



## Installing the Data Rate Adapter Card

The DSU Data Rate Adapter plugs into the basecard of the SC521A, in the space that would normally occupy the optional 530 interface plug-in card. See [Figure 2-4](#). Ensure that the SC521A is disconnected from service and from the main power source before proceeding with your installation.



**Figure 2-4** Data Rate Adapter Card Installed on Basecard

## Using Jumper Kit with DRA Card

The Data Rate Adapter (DRA) card can either be factory installed or added later as a kit. When the DRA card is removed, the products will be inoperable without installing the jumpers. A jumper kit (GDC P/N 010K024-001) should be used when original jumpers are not available. Place the four 2X8 jumpers over the two 2X16 connectors used by the optional DRA Card.

## Special Considerations

- The previous version -001 of the Data Rate Adapter does not support 5-bit synchronous multi-point, external timing option or dial-backup capabilities.
- The following test voltages are not supplied on the Business Equipment connector:
  - +12 V on TIA/EIA-232-F pin 9
  - -12 V on TIA/EIA-232-F pin 10
- Use of the Data Rate Adapter might impact the round-trip delays of the network in varying amounts for different data rates. Contact your Regional Sales Office for technical support.

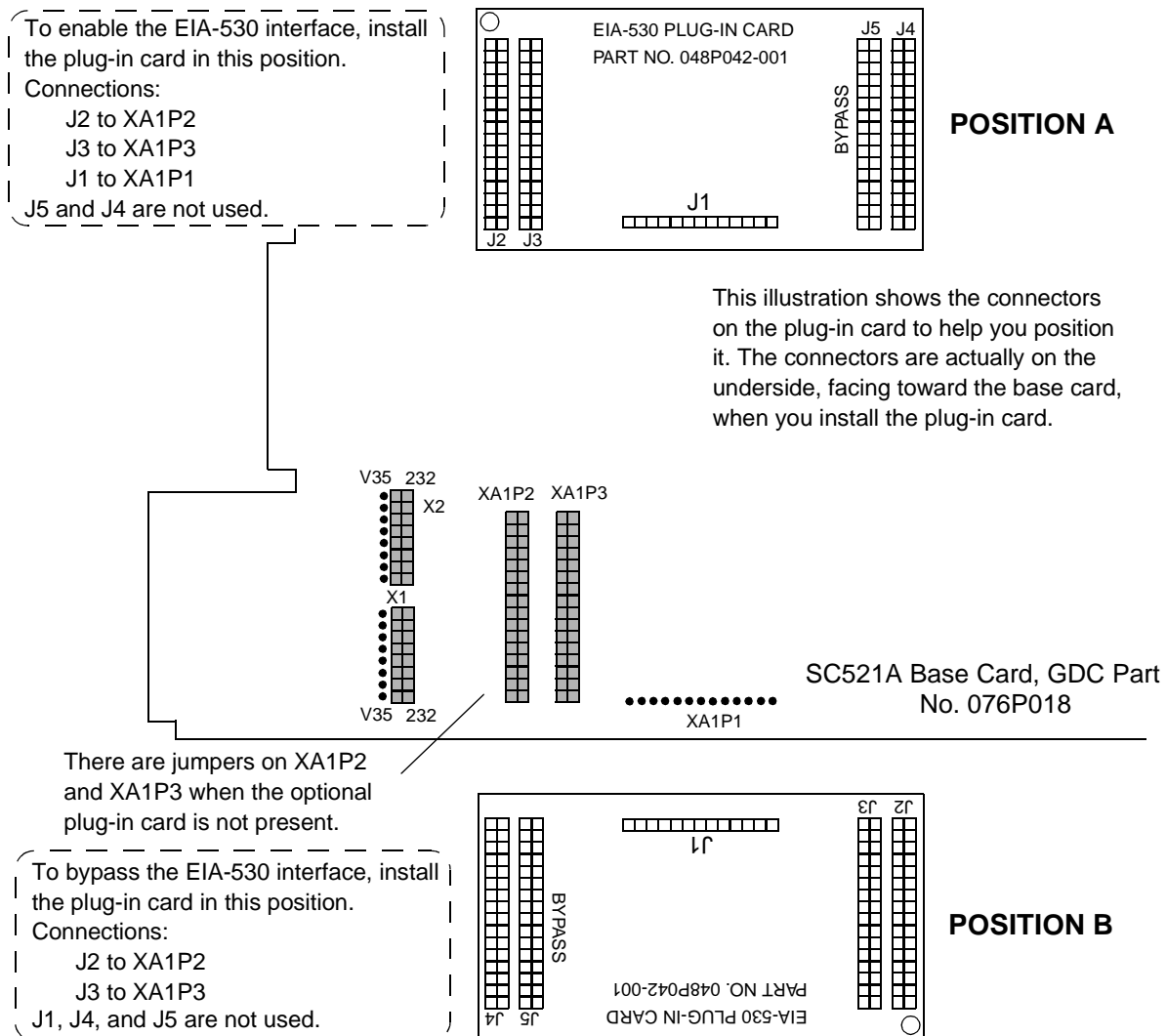
### EIA-530 Card

The EIA-530 interface requires an optional, plug-in, piggyback card. The EIA-530 card mates with the base card via connector XA1P1 and it can be oriented in either of two positions ([Figure 2-5](#)).

- In Position A ([Figure 2-5](#)): the 530 card provides an EIA-530 interface.
- In Position B ([Figure 2-5](#)): the 530 card functions as a jumper on **XA1P1** so that the TIA/EIA-232-F or V.35 interface can be selected with the plug-in card mounted.

With the 530 card removed entirely and with jumpers or a program plug placed across **XA1P2** and **XA1P3**, any non-EIA-530 unit may operate without the card.

**Note** X1 and X2 must be in V.35 position for EIA-530 card to function.



**Figure 2-5** EIA 530 Interface Optioning

## Software-Managed Options

### Timing Options

Timing options determine the clock source for the data the SC521A DSU transmits to the network. The DSU supports three timing modes:

- Receive Timing, based on the incoming signal from the network. Receive timing is the default timing option for the DSU.
- Internal Timing, provided by the oscillator incorporated in the DSU (used for wire line mode)
- External Timing, based on timing signals from the DTE

Although the SC521A DSU can occupy the same shelf as other SpectraComm system network elements, the DSU timing is completely independent from the other cards in the shelf. The SC521A DSU is not involved in the shelf timing arrangement employed by the SC 5000 system.

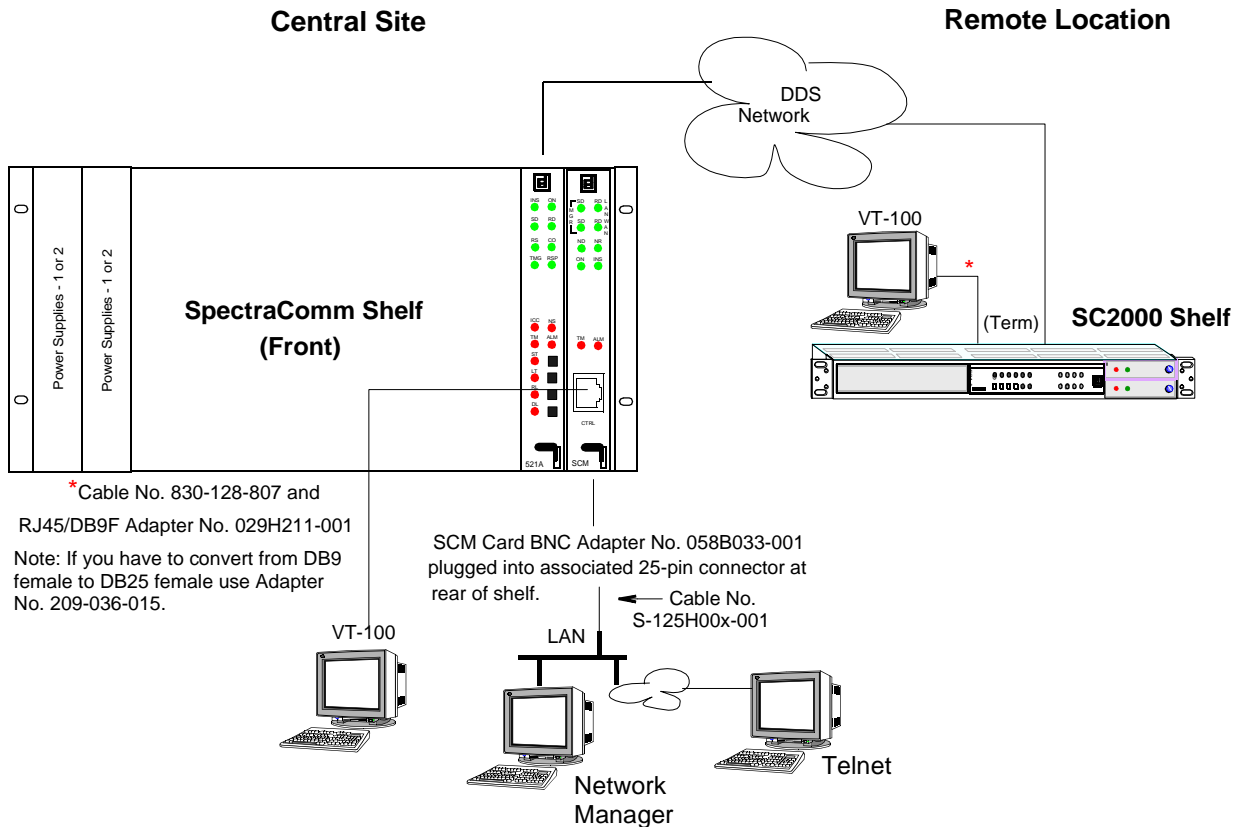
### Elastic Transmit Buffer

The SC521A DSU provides an Elastic Transmit Buffer. When enabled it places a 16-bit ( $\pm 8$ ) buffer in the transmit path to permit the use of separate timing sources at the DTE and network interfaces. The buffer can be selected by means of software as either Internal (the default condition) or External.

- When Internal is selected, the DSU bypasses the buffer and uses the selected timing mode to time data at both the DTE interface and the network interface.
- When External is selected, the DSU uses the External Timing signal provided by the DTE to force transmit data into the buffer, and DSU transmit timing to force data out of the buffer.

## Making Cable Connections

This section describes and illustrates cabling the SC521A. [Figure 2-6](#) shows a typical cabling arrangement for the SC521A in both the SpectraComm and a remote SC2000 shelf.



**Figure 2-6** Typical SC521A Cabling

## DDS Network Connection

The back panel of the SpectraComm Shelf has 16 RJ48 jacks, labeled **J17** through **J32**, for network interface connections. J17 corresponds to shelf slot 1 and J32 corresponds to shelf slot 16.

Connect the SC521A DSU to the DDS network by means of the jack associated with its slot, using a straight-through cable, terminated at each end with an 8-position modular plug. The pin assignments in the back panel connector are:

Function	Direction	Pin No.
Send Data (Ring)	From DSU - R	1
Send Data (Tip)	From DSU - T	2
Receive Data (Tip)	To DSU - TI	7
Receive Data (Ring)	To DSU - RI	8

**Note** When the SC 521A is used in a SpectraComm 2000 Shelf, refer to [Figure 2-6](#) and to the SC2000 shelf manual listed in the cover pages of this document.

## Wireline Connection

A wireline connection is one in which the DSU is connected directly to another DSU rather than to a DDS network. If you are installing the DSU in a wireline connection, you must use a crossover cable that connects Send Data from one unit to Receive Data at the other unit.

## Electrical Power Connection

The DSU obtains power directly from the SpectraComm shelf/enclosure system.

## Business Equipment Connections (DTE)

The SC521A DSU supports three business equipment interfaces: ITU-T V.35, TIA/EIA-232-F, and (optionally) EIA-530. The TIA/EIA-232-F and V.35 interface hardware resides on the base card. [Table 2-2](#), [Table 2-3](#) and [Table 2-4](#) describe the signals exchanged through each of the business equipment interfaces.

- On a SC 521A unit, the placement of jumpers on connectors **X1** and **X2** makes the selection between the TIA/EIA-232-F and the V.35 interface ( [Figure 2-1](#)). When the optional EIA-530 interface card is installed and enabled, the jumper settings at **X1** and **X2** are disregarded.
- On a SC 521A/S unit, the placement of jumpers on connectors **X2** and **X3** makes the selection between the TIA/EIA-232-F and the V.35 interface ( [Figure 2-2](#)). When the optional EIA-530 interface card is installed and enabled, the jumper settings at **X2** and **X3** are disregarded.

**Table 2-2** ITU-T V.35 DTE Interface Signals

DB25	V.35	ITU-T	EIA	Signal Description
7	B	102	AB	Establishes a common ground reference for all interface circuits except protective ground, pin A.
4	C	105	CA	Indicates to Data Set that DTE is prepared to transmit.
5	D	106	CB	Indicates to DTE that Data Set is prepared to transmit.
6	E	107	CC	Indicates to DTE that Data Set is operational.
8	F	109	CF	Indicates to DTE that Data Set is receiving data (not idle or OOS codes).
25	NN	142	TM	Indicates to DTE that Data Set is in a test mode.
2 14	P S	103 103	BA(A) BA(B)	Transfers data signals from DTE for transmission over communication line.
3 16	R T	104 104	BB(A) BB(B)	Transfers data signals received over communication line by Data Set to DTE.
24 11	U W	113 113	DA(A) DA(B)	Transfers transmitter signal timing information from DTE to Data Set.
17 9	V X	115 115	DD(A) DD(B)	Transfers receiver signal timing information from Data Set to DTE.
15 12	Y AA/a	114	DB(A) DB(B)	Transfers transmitter signal timing information from Data Set to DTE.
20	H	108/2	CD	Indicates to Data Set that DTE is prepared for data communication.
18	L	141	LL	Transfers signal from the DTE to control analog loopback test, if <b>DTE: Line Loopback Control</b> is enabled.
21	N	140	RL	Transfers signal from the DTE to control remote digital loopback test mode, if <b>DTE: Remote Loopback Control</b> is enabled. .

**Table 2-3** TIA/EIA-232-F Interface Signals

Pin	ITU-T	EIA	Signal Description
2	103	BA	Transfers data signals from DTE for transmission over communications line.
3	104	BB	Transfers data signals to DTE that were received over communications line by Data Set.
4	105	CA	Indicates to Data Set that DTE is prepared to transmit and is ready for receiving.
5	106	CB	Indicates to DTE that Data Set is prepared to transmit.
6	107	CC	Indicates to DTE that Data Set is prepared for data communications.
7	102	AB	Establishes common ground reference for all interface circuits except protective ground, pin 1.
8	109	CF	Indicates to DTE that Data Set is receiving data (not receiving idle/OOS codes).
9	—	—	+12V supply
10	—	—	- 12 V supply
15	114	DB	Transfers transmitter signal timing information from Data Set to DTE.
17	115	DD	Transfers receiver signal timing information from Data Set to DTE.
18	141	LL	Transfers signal from the DTE to control line loopback test, if <b>DTE: Line Loopback Control</b> is enabled.
20	108/2	CD	Indicates to Data Set that DTE is prepared for data communications.
21	140	RL	Transfers signal from the DTE to control remote digital loopback test mode, if <b>DTE: Remote Loopback Control</b> is enabled.
24	113	DA	Transfers transmitter signal timing information from DTE to Data Set
25	142	TM	Indicates to DTE that Data Set is in a test mode.

**Table 2-4** EIA-530 DTE Interface Signals

Pin	EIA	Signal Description
2 14	BA(A) BA(B)	Transfers data signals from DTE for transmission over communication line.
3 16	BB(A) BB(B)	Transfers data signals received over communications line by Data Set to DTE.
4 19	CA(A) CA(B)	Indicates to Data Set that DTE is prepared to transmit.
5 13	CB(A) CB(B)	Indicates to DTE that Data Set is prepared to transmit.
6 22	CC(A) CC(B)	Indicates to DTE that Data Set is operational.
20 23	CD(A) CD(B)	Indicates to Data Set that DTE is prepared for data communications.
7	AB	Establishes common ground reference for all interface circuits except protective ground.
8 10	CF(A) CF(B)	Indicates to DTE that Data Set is receiving data (not idle or OOS codes).
15 12	DB(A) DB(B)	Transfers transmitter signal timing information from Data Set to DTE.
17 9	DD(A) DD(B)	Transfers receiver signal timing information from Data Set to DTE.
24 11	DA(A) DA(B)	Transfers transmitter signal timing information from DTE to Data Set.
25	TM	Indicates whether the local DCE is in a test condition.
18	LL	Transfers signal from the DTE to control line loopback test, if <b>DTE: Line Loopback Control</b> is enabled.
21	RL	Transfers signal from the DTE to control remote digital loopback test mode, if <b>DTE: Remote Loopback Control</b> is enabled. .

## Installation Checks

For every installation of a SC 521A DSU, verify that the unit is in good working order by performing the Power-Up test and the Local Test with Self Test, described below.

### Power-Up Test

When you insert the SC521A DSU into the shelf all the front panel LEDs should light for approximately one second. If this does not occur, there is a problem with the unit. Install a spare unit if one is available.

---

**Note** *IMPORTANT! If you require assistance with a failed Power-Up test, contact your General DataComm service representative listed in the Preface of this manual. Do not attempt to repair the SC521A DSU.*

---

### Local Test/Self Test

Once the SC521A DSU has successfully powered up and before you connect it to its DTE or the network, you should perform a Local Test with Self Test to verify that the internal circuits of the DSU are capable of normal operation. For Fault Isolation details on this and other tests, refer to *Chapter 4, Tests*.

Briefly, the Local Test causes the DSU to loop transmit data back as receive data. The Self Test enables both an internal Test Pattern Generator to provide a signal for the test loop and a Test Pattern Checker to verify the signal.

1. Initiate the Local Test with Self Test by briefly pressing the front panel **LT** (Local Test) and **ST** (Self Test) switches.
2. The **LT**, **ST**, and **TM** (Test Mode) indicators are ON during the test.
3. Run the test for approximately 15 seconds.
4. The **TM** indicator blinks when an error is detected. The test should run entirely error-free.
5. If the test is successful, the **TM** indicator remains ON until you end the test by depressing the **LT** and **ST** buttons a second time.
6. If errors are detected during this test there is a problem with the unit. Install a spare unit if one is available.

---

**Note** *IMPORTANT! If you require assistance with a failed Local Test with Self Test, contact your General DataComm service representative listed in the Preface of this manual. Do not attempt to repair the SC521A DSU.*

---



# Chapter 3: Operation

## User Interface Overview

This chapter describes the controls and indicators at the SC521A DSU front panel ([Table 3-1](#)) and how to monitor, control and test DSU functions at the terminal interface.

**Table 3-1** SC 521A Front Panel Controls and Indicators

Front Panel	Switch / LED	Description
	INS	In Service: Steady ON after the DSU completes power-up sequence. Terminal interface or SNMP application can command this LED to blink as an identifier for service personnel.
	ON	Power On lights while power is applied to the DSU.
	SD	Send Data lights when the DSU is in data mode and a space is detected in the transmit data.
	RD	Receive Data lights when the DSU is in data mode and a space is detected in the receive data placed into service by the network controller.
	RS	Request To Send lights when the RTS is asserted by the DTE.
	CO	Carrier On lights when the DSU is in data mode and carrier is being received from the network. Also lights when the unit is in test mode.
	TMG	Timing lights when the DSU is designated as the source of timing for its shelf.
	RSP	Response lights while the DSU transmits a reponse to a controller command.
	ICC	Inactive Condition Code lights when the DSU network interface is experiencing an OOS (out of sync) or OOF (out of frame) condition.
	NS	No Signal lights when the DSU does not detect a network signal.
	TM	Test Mode lights when the DSU is performing any type of test.
	ALM	Alarm flashes while the DSU is experiencing an alarm condition.
	ST switch	Press Self Test switch to start the test pattern generator/checker; press again to stop test. The Self Test uses the test pattern selected during configuration.
	LT switch	Press Local Test switch to put the DSU in Local Test; press again to end test. When the DSU is configured for Line Loopback Test Points, the LT switch initiates either a unilateral local test (towards the DTE) or bilateral local loop test (transmit data looped back to the DTE, receive data looped back to the network). LED lights during test.
	RL switch	Press Remote Loop switch to send a loopback command to remote unit; press again to stop test. The RL test sends a loopback command (PN127, GDC, V.54) to any compatible remote device that recognizes the command. LED lights during test. For SC 521A/S configured as a current source, press the RL switch to initiate the CSU (current reversal) loopback, if the unit was so configured.
	DL switch	Press Data Loop switch to put the DSU in a digital loopback; press again to stop test. LED lights during test.

## Terminal Interface

Access to the SC521A DSU terminal interface takes place through a standard terminal (VT-100 or VT-100-compatible) equipped with an TIA/EIA-232-F communication interface, and connected to the SCM. One SCM supports a terminal interface for up to 15 units in a single shelf or up to 31 units in a pair of shelves. All management sessions are menu driven from selections made via on-screen menus displayed on the terminal.

### Configuring Terminal Communications

1. Set the terminal communications parameters as follows:
  - data rate = 9600 bps
  - character format: 1 start bit, 8 data bits, 1 stop bit
2. A management session is active as soon as you connect the terminal cable to the Craft port.

### Initiating a Terminal Interface Session

The first portion of a terminal interface session varies depending on whether you're using a VT100-compatible terminal connected directly to the SCM front panel **CTRL** port, a computer with a Telnet connection to the SCM **LAN** port, the SC2000 shelf **Term** port, or the RA1000 enclosure **Term** port

#### VT100-compatible Terminal

1. Connect a terminal to the SCM front panel **CTRL** port.

```
Main Menu
1. IP Address
2. Security
3. Element Access
4. Test (Factory Only)
Enter Selection:
```

2. The Main Menu appears, as shown above.  
Note that menu items **1. IP Address** and **2. Security** are SCM functions, not discussed in this manual. Refer to the SpectraComm Manager Card Installation and Operation Manual for detailed information. Note that menu item **4. Test** is for factory use only.
3. Type **3** and press the **Enter** key. The screen then displays the Shelf Inventory screen, shown in [Figure 3-1](#). To proceed, skip to the paragraphs: [Selecting a DSU](#).

### Telnet Connection

1. To establish a Telnet connection to the SCM **LAN** port, refer to the The SpectraComm Manager Card Installation and Operation Manual (GDC Publication Number 048R303-000).
2. Make the terminal connection to the SC 521A DSU.

When the DSU is installed in an SC2000 shelf and the other slot is empty, you must connect the terminal to the back panel **Term** connector for the occupied slot.

When there are cards in both slots of an SC2000 shelf, you can connect the terminal to either **Term** connector on the back panel.

3. When connection is made, the following screen appears.

```
Copyright (c) 1999 General DataComm Industries Inc.  
All rights reserved  
SCM Application Version 3.32A  
  
login:
```

4. Enter the login password (**scmadmin**). The screen displays the Shelf Inventory screen, shown in [Figure 3-1](#).

---

**Note** *There is a 10-minute timeout programmed at the telnet interface. If you allow 10 minutes to pass with no activity, that is without pressing any key on the keyboard, the DSU terminates the session. At that point the display returns to the SCM login screen.*

---

5. To proceed, skip to the paragraphs: [Selecting a DSU](#).

### Shelf Inventory Screen

From this point, procedures are the same for Telnet or terminal connections. The Shelf Inventory screen shown below demonstrates a two-shelf installation in which both shelves are filled with SC521A DSUs. The column for Slots 17 through 32 will not appear when there is only one shelf.

**Note** An asterisk ( \* ) next to a slot number denotes a remote associated with the unit in that slot.  
 An **Alarm** tag next to a unit name indicates an alarm condition is detected at the unit in that slot.

```

                SHELF INVENTORY
            Slot  Card  Slot  Card
-----
            [1]   SCM           [17]  SC521A
            [2]  SC521A         [18]  SC521A
            [3]  SC521A         [19]  SC521A
            [4]  SC521A         [20]  SC521A
            [5]  SC521A         [21]  SC521A
            *[6]  SC521A         [22]  SC521A
            [7]  SC521A         [23]  SC521A
            [8]  SC521A         [24]  SC521A
            [9]  SC521A         [25]  SC521A
            [10] SC521A         [26]  SC521A
            [11] SC521A         [27]  SC521A
            [12] SC521A         [28]  SC521A
            [13] SC521A         [29]  SC521A
            [14] SC521A         [30]  SC521A
            [15] SC521A (alarm) [31]  SC521A
            [16] SC521A         [32]  SC521A

            [0]   Close Session [C]Circuit Identification

    Enter slot number: [ ]
    
```

**Figure 3-1** Shelf Inventory Screen (Not Used for SC2000 Term Port)

## Selecting a DSU

1. Type the slot number of the desired unit then press the **Enter** key. The DSU displays the SC521A Main Menu as shown below:

```

                                SC521A
                                SHELF SLOT = 12

[1] Configuration      [2] Diagnostics
[3] Alarm Configuration [4] Monitor/Alarms
[5] Maintenance       [6] Line Statistics

Select: [ ]

```

2. Select a DSU function by typing the corresponding menu item number.
3. If the slot has an asterisk indicating it has a remote DSU, the following screen will appear:

```

                                SLOT 6: DROP INVENTORY

                                DROP      Card
-----
[0]      MASTER SC521A
[1]      REMOTE SC521A

[S]      GO TO -> SHELF INVENTORY [D] DELETE REMOTE

Enter Drop: [ ]

```

- Select **[0]** to advance to the SC521A Main Menu where you can select the function you wish to perform.
- Selecting **[1]** will result in the following error message and return to the SC521A Main Menu:

**Error: slot 6 line 1 drop 1 does not support this user interface (press Enter)**

- Selecting **[S]** to advance to the Shelf Inventory screen.
- Select **[D]** to delete the remote.

## Configuration

The Configuration screen, shown below, is a list of configuration options at their current settings. Configuration procedures are described following the screen illustration. Refer to [Table 3-2](#) for a detailed description of each configuration option.

```

                                SC521A Configuration

[1] Network: Circuit Type:           Multipoint DDS - 1
[2]   Carrier:                     TX Switch RX Switch
[3]   Data Rate:                    19.2 kbps - Sync
[4] Circuit: TX Clock Source:       Receive
[5]   Buffer Clock:                  Internal
[6]   Zero Encoding:                Disable
[7]   Remote Unit Type:             NMS 520
[8]   Sentry Timer (pt to pt):      60 Minutes
[9]   Remote Response Interval:     10 Seconds
[A]   Alarm Hysteresis:             10 Seconds
[B]   Circuit Assurance:            Disable
[C]   System Status:                Disable
[D] DTE Control: AAS:              Disable
[E]   Constant DSR:                 Enable
[F]   CTS Delay:                    Fixed 3 Char
[G]   HDLC Invert:                  Disable
[H] Async: Character Size:          11 Bits
[I]   Overspeed:                    1%
[J]   Suppression:                  Disable
[K]   Rate Adaption:                Disable
[0] Return to Main Menu           [S] Save & Update Unit
      Select: [ ]

```

**Figure 3-2** Configuration Screen, with Default Settings

### Configuration Procedure

1. Type the selection number or letter of the option you intend to change, then press **Enter**. A Highlight appears on the current setting field for the corresponding option.
2. Use the arrow keys to toggle the highlighted field through its potential settings.
3. When the field displays the desired setting, press the **Enter** key again. The highlight returns to the Select field.
4. Repeat steps 1 through 3 for each option you need to change.
5. After you've made all required changes, type selection **S: Save & Update Unit**, then press **Enter**. The following confirmation response appears: **ARE YOU SURE (Y/N)?**
6. If changes are correct, type **Y** and press **Enter** to put the new configuration into effect. Otherwise, type **N** and press **Enter** to make further changes or dismiss the screen.
7. To dismiss the Configuration screen, type **0, Return to Main Menu** and press **Enter**. If there are no unsaved changes, the SC521A Main Menu appears and configuration is complete. If there are unsaved changes, a confirmation prompt appears as follows: **Pending Edits, Exit without saving (Y/N)?**

Type **Y** and press **Enter** to dismiss the screen and discard the unsaved changes. Otherwise, type **N** and press **Enter** to make further changes to the Configuration screen.

**Table 3-2** SC521A Configuration Option Settings

Option	Settings - Default in <b>BOLD</b> (M/R) = Master and Remote)	Description
[0] Return to Main Menu		Returns to the Main Menu.
[1] Network: Circuit Type	Point to Point DDS-1 Point to Point DDS-SC Point to Point Clear Channel <b>Multipoint DDS-1 (M/R)</b> Multipoint DDS-SC	DDS-1 is a conventional DDS line. DDS-SC is a DDS line with secondary channel. Clear Channel indicates that the line type is 64K Clear Channel.
[2] Carrier	TX Constant, RX Constant TX Constant, RX Switched TX Switched, RX Constant (M/R) <b>TX Switched, RX Switched</b>	The Transmit and Receive Carrier option allows the DTE equipment to directly control the transmitter carrier via signals on the RTS circuit and the operation of DCD. In point-to-point applications, it is typically set to TXConstant RXConstant. In multidrop applications it is set to TXConstant RXSwitched. When the value of the SC521A DataRate option is sync 64000, the value of this option is TXConstant RXConstant. When this option is TXConstant RXConstant, RTS and CTS are forced on internally.
[3] Data Rate	64 kbps Synchronous 56 kbps Synchronous <b>19.2 kbps Synchronous</b> 9.6 kbps Synchronous 4.8 kbps Synchronous 2.4 kbps Synchronous 19.2 kbps Asynchronous (M/R) 9.6 kbps Asynchronous 4.8 kbps Asynchronous 2.4 kbps Asynchronous	This option selects the operational data rate of the DSU.
[4] Circuit: TX Clock Source	<b>Receive</b> (M/R) External Internal	This is the selection for the transmitter timing clock source. If connecting to a DDS circuit the value of receive must be selected.
[5] Buffer Clock:	<b>Internal</b> (M/R) External	An optional elastic transmit buffer is inserted into the data path when a value of external is selected. This elastic buffer maintains network synchronization when an external frequency locked clock source is driven into the external transmit clock input on the DTE interface. Opposing phase relationships between the external transmit clock and network clock are compensated for by this buffer. No buffering is performed when this object is internal. If the transmitter timing is set to external, this object must be set to external.
[6] Zero Encoding:	Enable (M/R) <b>Disable</b>	This option, for point to point 56k DDS secondary channel circuits, allows the DTE equipment to transmit all '0' octets without violating the ones density requirements of DDS. This option is a GDC only feature and must be set to disable when coexisting with DSU equipment from other providers. Both local and remote DSU's must be set to the same value. The zero encoding feature is not applicable for any of the other data rates or line types.

(Sheet 1 of 3)

**Table 3-2** SC521A Configuration Option Settings (Continued)

Option	Settings - Default in <b>BOLD</b> (M/R) = Master and Remote)	Description
[7] Remote Unit Type:	NMS 510 <b>NMS 520</b> (M/R)	This option allows the SC521A to behave in a manner compatible with that of the NMS510 or the NMS520. If this has the value NMS510, then the device can be used in conjunction with an NMS510. A value of NMS520 implies that the device is not backwardly compatible with the NMS510. <i>Note: Be especially careful in setting the Remote Unit Type. If set incorrectly, the DSU may not be able to recognize the type of communication link between itself and its remote unit.</i>
[8] Sentry Timer (pt to pt):	1 – 5 Minutes (1-minute increments) 10 Minutes 15 Minutes 30 Minutes 45 Minutes <b>60 Minutes</b> (M/R) 90 Minutes 120 Minutes Disable	This option controls the amount of time between unsolicited alarm responses from a remote unit in a point to point application when there are no alarm conditions to report. This unsolicited response maintains the management link between the two units. These alarm responses are intrusive to data. This option is not applicable when the SC521A Remote Unit Type option is set to NMS510. The range is from 1 minute to 120 minutes, with 60 minutes being the default value. Disable will disable remote alarm sentry reporting.
[9] Remote Response Interval:	<b>10</b> (M/R) – 120 Seconds (10-second increments)  Disable	This option controls the amount of time between unsolicited alarm responses from a remote unit in a multipoint applications when there are no alarm conditions to report. This unsolicited response maintains the management link between the two units. This option is not applicable when the SC521A Remote Unit Type option is set to NMS510. The range is from 1 second to 120 seconds with 10 seconds being the default value. The Disable setting disables remote alarm sentry reporting. All remotes in a multipoint application must be set the same. These alarm responses are non-intrusive to data.
[A] Circuit Assurance:	Enable <b>Disable</b> (M/R)	The Enable setting configures the DSU to clamp CTS upon receiving the following network codes:  1. IDLE (no DCD) 2. Out of Service Code (OOS) 3. Abnormal Station Code (ASC) 4. No Signal (not a network code) 5. other Inactive Channel Codes (ICC)  The Disable setting ignores any of the above network conditions.
[B] System Status:	Enable <b>Disable</b> (M/R)	The Enable setting configures the DSU to clamp DSR upon receiving the following Network codes:  1. Out of Service Code (OOS) 2. Abnormal Station Code (ASC) 3. No Signal (not a network code) 4. other Inactive Channel Codes (ICC)  The Disable setting ignores any of the above network conditions.

(Sheet 2 of 3)



**Table 3-2** SC521A Configuration Option Settings (Continued)

Option	Settings - Default in <b>BOLD</b> (M/R) = Master and Remote)	Description
[C] DTE Control: AAS:	<b>Disable</b> (M/R) 45 Seconds 30 Seconds 10 Seconds 5 Seconds	The DTE Auto-Anti Streaming option monitors and times RTS. If RTS remains On for more than the selected time, the DSU forces Off its primary channel transmitter and turns off CTS.
[D] Constant DSR:	<b>Enable</b> (M/R) Disable (follows DTR)	This option controls the operation of DSR. When the Enable setting is selected, DSR is normally on, if set for follows DTR (disable) then DSR is on only when DTR is on.
[E] CTS Delay:	CTS On (M/R) 0 msec <b>Fixed 3 Char</b> 30 msec 60 msec 90 msec	CTS On forces both RTS and CTS On regardless of the state of the attached business equipment (the transmitter is On regardless of the status of the RTS interface lead). CTS 0msec provides zero bits of delay between active RTS and CTS being set to active. CTS Fixed 3 Char provides three character bits of delay between active RTS and CTS being set to active. 30, 60, or 90 msec provides 30, 60, or 90 msec of delay between active RTS and CTS being set to active.
[F] HDLC Invert	Enable <b>Disable</b> (M/R)	Primary data invert option. The Enable setting will enhance the quality of data when network does not provide B8Z5. Primarily used with DDS II 56k.
[G] Async: Character Size	<b>11 bits</b> (M/R) 10 bits 9 bits 8 bits	Selects the Asynchronous word size, including start and stop bits. 11 bits/character 10 bits/character 9 bits/character 8 bits/character
[H] Overspeed	<b>1%</b> (M/R) 2.3%	This option is used to determine the amount of asynchronous overspeed the DSU tolerates. 1% indicates that the DSU will accept incoming async data that is up to 1% faster than the configured data rate. The 2.3% will allow up to 2.3% of DTE overspeed.
[I] Suppression	RX + TX EOT TX EOT RX EOT <b>Disable</b> (M/R)	Suppresses or enables EOT on receive or transmit signal. In RX+TX EOT, the DSU inserts EOT at the end of transmissions and deletes it from the end of received signals. In TX EOT, the DSU inserts EOT at the end of transmissions; it does not delete it from the end of received signals. In RX EOT, the DSU deletes EOT from the end of received signals; it does not insert EOT at the end of transmission. In Disable, the DSU does not insert EOT at the end of transmissions, and does not delete it from the end of received signals.
[J] Rate Adaption	<b>Disable</b> (M/R) 1200 600 1800 to 2400	Specifies the DTE interface operating rate when it is below that of the DDS circuit. Valid only when Data Rate in the Network Options Screen is set to 2.4 kbps Async.

(Sheet 3 of 3)

## Diagnostics

The terminal interface SC521A Diagnostics screen, shown below, combines configuration and command functions. Detailed instructions for setting its configuration options follow the illustration. Instructions for using the screen to perform tests appear in *Chapter 4, Tests*, together with descriptions of the diagnostic functions.

```

                                SC521A Diagnostics

Diagnostic Options
[1] DTE: Line Loopback Control:      Disable
[2]   Remote Loopback Control:      Disable
[3]   Data Set Ready:                Normal
[4] Network: Line Loopback Test Pts: DTE Only
[5]   Telco Latching Loopbk Rsp:    Enable
[6]   Customer Remote Loop Rsp:     Enable
[7]   Remote Loop Auto Timeout:     Disable
[8]   Remote Loop Initiation Seq.:  V.54
[9]   Self Test Pattern:             511

      T E S T S:
[A] Line Loopback:                   Idle
[B] Line Loopback & Self Test:       Idle
[C] Remote Loopback:                 Idle
[D] Remote Loopback & Self Test:     Idle
[E] Digital Loopback:                Idle
[F] Self Test:                       Idle

                                Test Results:

[0] Return to Main Menu      [S] Save [1] - [9] & Update Unit
    Select: [ ]

```

**Figure 3-3** Diagnostics Screen

### Special Considerations for DSU Diagnostics

- Selections 1 through 9 are configuration options that affect DSU diagnostic functionality.
- Changes to the options don't go into effect until you save them to the unit. Once saved, they remain in effect until new changes are made and saved.
- Selections A through F are command fields by which you can begin and end test procedures.
- The Test Results field at the bottom of the screen displays the results of tests that employ Self Test. If no errors are detected, the Test Results field displays **Passed**. If errors are detected, the Test Results field displays the number of RX Errors.

## DSU Diagnostics Procedures

1. Type the selection number of the option you intend to change, and press the **Enter** key. Highlighting appears on the current setting field for the corresponding option.
2. Use the arrow keys to toggle the highlighted field through its potential settings.
3. When the field displays the desired setting, press the **Enter** key again. The highlight returns to the Select field.
4. Repeat steps 1 through 3 for each option you need to change.
5. After you've made all required changes, type selection **S: Save 1 - 9 & Update Unit** and press the **Enter** key.
6. If you are certain that your changes are correct, type **Y** and press the **Enter** key to put the changed configuration into effect in the DSU. You can now perform diagnostic tests.

---

**Note** For instructions on performing tests, consult Chapter 4: Tests.

---

If you decide not to put your changes into effect, type **N** and press the **Enter** key to make further changes. Save the changes as described above.

7. To dismiss the Diagnostics screen, type **0, Return to Main Menu**, and then press the **Enter** key.
8. If there are no unsaved changes the display returns to the SC521A Main Menu and the procedure is complete.
9. If there are unsaved changes, a confirmation prompt appears as follows:

**Pending Edits, Exit without saving (Y/N)?**

Type **Y** and press the **Enter** key to dismiss the screen and discard the unsaved changes. Otherwise, type **N** and press the **Enter** key to make further changes to the Diagnostics screen.

10. When all desired diagnostics options have been selected and saved, type **0: Return to Main Menu**, and press the **Enter** key. If there are no unsaved diagnostic configuration changes, the display returns to the SC521A Main Menu and the procedure is complete.

**Table 3-3** SC521A Diagnostic Configuration Option Settings

Option	Settings - Default in Bold	Description
[1] DTE: Line Loopback Control:	<b>Disable</b> Enable	The LT EIA test control lead option. This option either allows or blocks EIA initiated test inputs from the DTE interface. LT (or Analoop) can be either a bilateral or unilateral loopback depending on option DDS DTE Termaloop.
[2] Remote Loopback Control:	<b>Disable</b> Enable	The Remote Loop (RL) EIA test control lead option. This option either allows or blocks EIA initiated test inputs from the DTE interface. The remote unit must support V.54 or PN127 remote loop.
[3] Data Set Ready (this option is valid only when Configuration option Constant DSR is Disabled)	<b>Normal</b> (DSR Off during DL and ST)  Off During LT Test (DSR Off during LT, DL, and ST)	The DSR in Line Loopback (Analoop) option controls DSR operation during a Line Loopback test. When Line Loopback is active and this object is set to off During Test, a DSR off indication is output to the DTE interface. When this object is set to normal, the state of DSR responds in accordance with the SC521A Local DSR.
[4] Network Line Loopback Test Pts	<b>DTE Only</b> Network & DTE	The Network Loopback Test Mode. DTE Only stops the DSU from looping the DDS network interface while a local loopback is in progress. When the value Network & DTE the DDS network service is looped back to itself during a local loopback test.
[5] Telco Latching Loopback Rsp	<b>Enable</b> Disable	Disables or enables a unit from going into a latching loopback when requested by Telco.
[6] Customer Remote Loop Rsp	<b>Enable</b> Disable	Disables or enables a unit from going into remote loop when requested by the far end.
[7] Remote Loop Auto Timeout	<b>Disable</b> 10 minute	Disables or enables a 10 minute remote loop test timer. When enabled the remote loop test will be terminated 10 minutes after being initiated. If inhibited the unit will remain in remote loop test indefinitely.
[8] Remote Loop Initiation Seq.	GDC <b>V.54</b> PN 127  CSU (SC 521A/S in current source mode only)	The value will select the pattern used to initiate a remote loopback test on point to point links. The V.54 and PN 127 remote loop commands are industry standards, compatible with correctly configured units from other manufacturers. GDC loop command is compatible with a remote NMS520 DSU or NMS510 DSU. The SC521A DSU must have Revision B- or higher firmware to be configured for the GDC loop command. CSU current reversal loop is available in the SC 521A/S only.
[9] Self Test Pattern	<b>511</b> 15 bit 2047	The value will select the pattern used to initiate a local loopback test.

## Alarm Configuration

Alarm Configuration screen, shown below, provides configuration options that determine which alarms the DSU is to report. Unit and DTE alarms can be individually designated either to be reported when they occur or to be masked (not reported). Each option on the Alarm Configuration screen is identified by a selection number or letter, and displays its current setting.

---

**Note** For Alarm condition definitions, consult the Monitor/Alarms screen ([Figure 3-5](#)).

---

```

SC521A Alarm Configuration

UNIT                                DTE
[1] No Signal                       : Masked [A] DCD Loss           : Masked
[2] Line Pairs Reversed              : Masked [B] DSR Loss           : Masked
[3] STC Loopback                     : Masked [C] DTR Loss           : Masked
[4] Front Panel Test                 : Masked [D] RXD Loss           : Masked
[5] No Loop Current                  : Masked [E] TXD Loss           : Masked
[6] EEPROM Checksum                  : Masked [F] Streaming           : Masked
[7] Transmitter Failure              : Masked
[8] Power Supply - Top                : Masked
[9] Power Supply - Bottom            : Masked

                                NETWORK
[G] Alarm Interval                   : 15 Minutes
[H] BPV Threshold                    : Masked
[I] Jitter Threshold                 : Masked
[J] Frame Loss Threshold              : Masked
[K] RX Sig Low Threshold             : Masked

[R] Report All Alarms                [N] Report None

[0] Return to Main Menu              [S] Save & Update Unit
    Select: [ ]

```

**Figure 3-4** Alarm Configuration Screen, with Default Settings

---

### Special Considerations for Network Alarms

Network Alarms, when they are to be reported, are determined by means of an interval and a threshold. The configured Alarm Interval is the time span against which thresholds are evaluated for all four network alarms. Each type of Network Alarm can also be configured as Masked.

- For BPV (bipolar violation) and Frame Loss alarms, the interval is the length of time during which a configured number of events must occur in order to cause an alarm.
- For Jitter and Rx Signal Low alarms the interval is how long the condition must persist at the configured level of severity in order to cause an alarm.

## Alarm Configuration Procedure

You may want to begin with the **Report All** or the **Report None** command, depending on how you intend to set the majority of alarm options **G** through **J**. Go to step 6 if you don't need to change any alarm options individually. Otherwise, follow steps 2 through 5.

1. Type **R** then press the **Enter** key to set previously masked options from Masked to their last saved values. **T**

---

**Note** *The **Report All** and **Report None** selections have no effect on **Alarm Interval** (option **F**).*

---

2. Type the selection number or letter of the option you intend to change. A highlight appears on the current setting field for the corresponding option.
3. Use the arrow keys to toggle the highlighted field through its potential settings. Consult [Table 3-4](#) for the potential settings available to each option.
4. When the field displays the desired setting, press the **Enter** key. The highlight returns to the Select field.
5. Repeat steps 2 through 4 for each option you need to change.
6. After you've made all required changes, type **S: Save & Update Unit** and press the **Enter** key. The following confirmation message appears:

**ARE YOU SURE (Y/N)?**

7. If you are certain that your changes are correct, type **Y** and press the **Enter** key to put the changed configuration into effect in the DSU.

If you decide not to put your changes into effect, type **N** and press the **Enter** key to make further changes. Save the changes as described above.

8. To dismiss the Alarms screen, type **0, Return to Main Menu**, and then press the **Enter** key.
9. If there are no unsaved changes the display returns to the SC521A Main Menu and the procedure is complete.
10. If there are unsaved changes, a confirmation prompt appears as follows:

**Pending Edits, Exit without saving (Y/N)?**

Type **Y** and press the **Enter** key to dismiss the screen and discard the unsaved changes. Otherwise, type **N** and press the **Enter** key to make further changes to the Alarms screen.

11. When all desired Alarms options have been selected and saved, type **0: Return to Main Menu**, and press the **Enter** key. If there are no unsaved Alarms configuration changes, the display returns to the SC521A Main Menu and the procedure is complete.

**Table 3-4** SC521A Alarm Configuration Option Settings

Option	Settings - Default in <b>Bo1d</b>	Description
[1] Unit: No Signal	<b>Masked</b> or Report	Indicates loss of signal at network interface.
[2 ]Line Pairs Reversed	<b>Masked</b> or Report	Indicates line pairs reversed at network interface.
[3] STC Loopback	<b>Masked</b> or Report	Indicates the DSU has been commanded into a test mode by the Telco Serving Test Center (STC) or by a Remote Digital Loop command from it's remote DSU.
[4] Front Panel Test	<b>Masked</b> or Report	Indicates the DSU has been commanded into a test mode by means of it's front panel switch.
[5] No Loop Current	<b>Masked</b> or Report	Indicates no current network interface.
[6] EEPROM Checksum	<b>Masked</b> or Report	Indicates detection of an error in the Configuration Checksum.
[7] Transmitter Failure	<b>Masked</b> or Report	Indicates that the DSU has failed to transmit data.
[8] Power Supply - Top [9] Power Supply - Bottom	<b>Masked</b> or Report	Indicates status of the top or bottom power supply in the SC2000 shelf.
[A] DCD Loss	<b>Masked</b> or Report	Indicates loss of Data Carrier Detect.
[B] DSR Loss	<b>Masked</b> or Report	Indicates loss of Data Set Ready.
[C] DTR Loss	<b>Masked</b> or Report	Indicates loss of Data Terminal Ready signal from DTE.
[D] RXD Loss	<b>Masked</b> or Report	Indicates no receive data from remote DSU.
[E] TXD Loss	<b>Masked</b> or Report	Indicates no transmit data from DTE.
[F] Streaming	<b>Masked</b> or Report	Indicates constant RTS condition.
[G] Network: Alarm Interval	1 to <b>15</b> min	Determines the timespan for threshold evaluation.
[H] BPV Threshold	<b>Masked</b> 0 to 99 (initially 10 when set to Report)	A network BPV occurs when the received signal at it's network interface does not alternate between signal levels as required for Alternate Mark Inversion (AMI) or Bipolar with 8 Zero Substitution (B8ZS) data encoding.
[I] Jitter Threshold	<b>Masked</b> 0 to 99% (initially 10% when set to Report)	Occurs when the percent of jitter in the received signal remains above the selected threshold for at least one Alarm Interval.
[J] Frame Loss Threshold	<b>Masked</b> 0 to 99 (initially 10 when set to Report)	Occurs when the number of lost frames in the received signal during one Alarm Interval exceeds the selected threshold.
[K] RX Signal Low Threshold	<b>Masked</b> -50 to 6 dB (initially -30 dB when set to Report)	The alarm occurs when the strength of the received signal remains below the selected threshold for at least one Alarm Interval.

## Reporting Remote Alarms

The SC521A and the SC 521A/S have four different modes of operation. Each mode of operation has a specific way of reporting remote alarms, as described below.

---

*Note* For all modes, the SC 521A/S reports in the same manner as the SC 521A, except where noted.

---

### DDSI in NMS520 Mode

In this mode, the remote unit is either a NMS520, a SC521A in NMS 520 mode or a SC 521A/S in NMS 520 mode. The Alarm reporting scheme is as follows:

- Unsolicited Alarm Reporting: The Master SC521A or SC 521A/S sends remote alarm conditions to the SCM when they occur. These alarm traps can be viewed in the OpenView All Events Browser.
- When an alarm occurs, the remote icon on the TEAM application changes colors to indicate the severity of the alarm.
- When the TEAM Alarm Detail window is opened, the TEAM interrogates the remote unit for its alarm status. This is INTRUSIVE and data traffic is interrupted. If the TEAM Alarm Detail window Auto Poll option is enabled in this mode, the application will send alarm status request commands to the remote at the specified interval. If Auto Poll is invoked, Alarm status is INTRUSIVE and will interrupt data traffic.
- If the Remote does not respond, a **Get** error will be displayed in the TEAM window. The Alarm Status will NOT be updated.
- If you **Quit** the Alarm Detail window, the polling will stop. Auto Poll is only active if the window is open or minimized.

### DDSI in NMS520 Mode

In this mode, the remote unit is either a NMS520, a SC521A in NMS 520 mode or a SC 521A/S in NMS 520 mode. The Alarm reporting scheme is as follows:

- No unsolicited Alarm Reporting. These alarm traps can be viewed in the OpenView All Events Browser.
- The Alarm conditions of the remote can only be forwarded to the application when the Alarm Detail window is opened.
- When the TEAM Alarm Detail window is opened, the TEAM interrogates the remote unit for its alarm status. This is NOT INTRUSIVE. If Auto Poll is invoked, the TEAM application will be able to get Alarm status at the specified interval.
- If the Remote does not respond, a **Get** error will be displayed in the TEAM window. The Alarm Status will NOT be updated.
- If you Quit the Alarm Detail window, the polling will stop. Auto Poll is only active if the window is open or minimized.



### DDSI in NMS510 Mode

In this mode, the remote unit is either a NMS510, a SC521A in NMS510 mode or a SC 521A/S in NMS 510 mode. The Alarm reporting scheme is as follows:

- No unsolicited Alarm Reporting.
- When the TEAM Alarm Detail window is opened, the TEAM application interrogates the remote unit for its alarm status. This is INTRUSIVE and data traffic will be interrupted. The Alarm Detail window has an option to Auto Poll the remote. It is defaulted to off. If it is enabled in this mode, the application will send alarm status commands to the remote at the interval specified. If Auto Poll is invoked, Alarm status is INTRUSIVE and will interrupt data traffic.
- If the Remote does not respond, a **Get** error will be displayed in the TEAM window. The Alarm Status will NOT be updated.
- If you Quit the Alarm Detail window, the polling will stop. Auto Poll is only active if the window is open or minimized.

### DDSII in NMS510 Mode

In this mode, the remote unit is either an NMS510, a SC521A in NMS510 mode or a SC 521A/S in NMS 510 mode. The Alarm reporting scheme is as follows:

- No unsolicited Alarm Reporting.
- The Alarm conditions of the remote can only be forwarded to the application when the Alarm Detail window is opened.
- When the TEAM Alarm Detail window is opened, the TEAM application interrogates the remote unit for its alarm status. This is NOT INTRUSIVE. If Auto Poll is invoked, the TEAM application will be able to get Alarm status at the specified interval.
- If the Remote does not respond, a **Get** error will be displayed in the TEAM window. The Alarm Status will NOT be updated.
- If you **Quit** the Alarm Detail window, the polling will stop. Auto Poll is only active if the window is opened or minimized.

## Monitor/Alarms

The terminal interface SC521A Monitor/Alarms screen displays status information concerning DTE interface signals and alarm conditions. The screen, shown below, groups alarms into three categories: Major, Minor or Informational, as described in the paragraphs following [Figure 3-5](#).

```

SC521A Monitor/Alarms

DTE Status
TXD: OFF          RXD: OFF          DCD: OFF
TXC: TRANS       DTR: OFF          DSR: ON
RTS: ON           CTS: ON

Alarm Status
Major:
EEPROM Chksum:   MASKED
No Signal:       MASKED
DCD Loss:        MASKED
Streaming:       MASKED
Frame Loss:      MASKED
Line Reversed:   MASKED
TX Failure:      MASKED
Top Power Supply Failed : MASKED
Bottom Power Supply Failed: MASKED

Minor:
RXD Loss:        MASKED
Bipolor Violation: MASKED
Jitter:          MASKED
RX Signal Low:   MASKED
No Loop Current: MASKED

Informational:
Fr. Pan. Test:  MASKED
DTR Loss:       MASKED
STC Loopback:   MASKED
TXD Loss:       MASKED
DSR Loss:       MASKED

[0] Return to Main Menu

Select: [ ]

```

**Figure 3-5** Monitor/Alarms Screen

### Special Considerations

- The DTE Status portion of the screen displays the current status of eight DTE interface signals as **OFF**, **ON**, or **TRANS**. **TRANS** indicates that the signal is transitioning, as opposed to being in a prolonged **On** or **Off** condition.
- The Alarm Status portion of the screen displays **ACTIVE**, **INACTIVE**, **NO** or **MASKED** for each alarm condition to indicate whether or not the condition currently exists, or is masked.
- When you are done viewing the Monitor/Alarms screen, type **0** and press the **Enter** key to return to the Main Menu.

## Major Alarms

EEPROM Checksum – indicates that the non-volatile memory that stores the DSU configuration is incorrect

No Signal – indicates loss of signal at the network interface

DCD Loss – indicates loss of incoming data (this alarm is not valid when Data Rate is configured for 64 kbps Synchronous)

Streaming – indicates constant RTS condition

Frame Loss – indicates out of frame condition at the network interface

Line Reversed – indicates the DDS line was incorrectly installed at the network interface

TX Failure – indicates loss of signal to network

Top Power Supply Failed - the top power supply in the SpectraCom 2000 (SC2000) shelf has failed (only valid for SC521A or SC 521A/S installed in SC2000 Shelf).

Bottom Power Supply Failed - the bottom power supply in the SpectraCom 2000 (SC2000) shelf has failed (only valid for SC521A or SC 521A/S installed in SC2000 Shelf).

## Minor Alarms

RXD Loss – indicates reception of valid carrier without data: for constant RX Carrier, indicates at least one minute without RXD transitions; for switched RX Carrier, indicates at least five consecutive polls without data

Bipolar Violation – indicates failure of consecutive ones to alternate states in the signal being received

Jitter – indicates excessive jitter (phase shift) in the signal being received

RX Signal Low – indicates low signal level being received at the network interface

No Loop Current – indicates absence of dc current at the network interface

## Informational Alarms

Front Panel Test – indicates the DSU has been commanded into a test by means of its front panel switches

DTR Loss – indicates the DSU is not receiving Data Terminal Ready from the DTE

STC Loopback – indicates the DSU has been commanded into a test by the Telco Serving Test Center (STC)

TXD Loss – indicates DTE asserted RTS without providing Transmit Data; for constant TX Carrier, indicates at least one minute without TXD transitions

DSR Loss – indicates the DSU is not outputting Data Set Ready to the DTE

## Maintenance

The terminal interface Maintenance screen displays information about the unit and provides three specialized control functions: Front Panel Switches enable/disable, Soft Reset, and Reset to Factory Defaults. [Figure 3-6](#) illustrates the Maintenance screen.

```
SC521A Maintenance

General Datacomm.
SpectraComm 521A Data Service Unit

Firmware/Boot Revision:  C-
Serial Number:           0076000102030405
DTE Interface Type:      rs232
Interface Adapter:       none

[1] Front Panel Switches: Enabled
[2] Front Panel LED Test: Off

      Reset Options:
[3] Soft Reset             * WARNING * Disrupts communications
[4] Reset to Factory Defaults * WARNING * Disrupts communications

[5] Firmware Down Load.

[0] Return to Main Menu

      Select: [ ]
```

**Figure 3-6** Maintenance Screen

### Maintenance Screen Fields

The information field identifies the unit, its firmware revision level, the type of DTE interface selected, and its serial number.

The **DTE Interface Type** field can display **rs 232** or **v.35** depending on the setting of hardware jumpers on the SC521A card.

**Interface Adapter** field displays either **none** or **installed** depending on whether the EIA 530 Interface Adapter Card is installed. When the adapter card is present, **DTE Interface Type** is invalid.

### Maintenance Command Selections

[1] **Front Panel Switches** permits you to enable or disable the hardware switches on the front panel of the SC521A DSU.

[2] **Front Panel LED Test**: When set to ON, turns all LEDs ON on unit. When set to OFF, LEDs are in normal operating mode.

[3] **Soft Reset** causes the DSU to perform a reset and resume operation using its current configuration when you type 2 and press the Enter key.

[4] **Reset to Factory Defaults** causes all options in the DSU to return to their factory default settings when you type 3 and press the **Enter** key.

[5] **Firmware Down Load** invokes the download function. Refer to [Figure 3-7](#) and associated paragraphs.

### Maintenance Procedures

1. Type the selection number and press the **Enter** key. A highlight appears on the setting field.
2. Use the arrow keys to toggle the highlighted field between its two values:

**Enabled/Disabled**  
**On/Off.**

3. When the field displays the desired setting, press the **Enter** key. The highlight returns to the Select field. The new setting goes into effect immediately.
4. When you are done with the Maintenance screen, type 0 and press the **Enter** key to return to the Main Menu.

## Firmware Download

The terminal interface Firmware Download function enables you to load new operating firmware into the DSU. Loading of firmware is typically required when GDC makes changes to improve performance or to include new features. See [Figure 3-7](#).

The SC521A DSU can store two versions of operating firmware, designated as the Active Revision and the Standby Revision. You can have newly downloaded firmware immediately serve as the Active Revision, or you can store it as the Standby Revision. You can switch between Active and Standby Revisions as needed.

```

SC521A Firmware Download

Active Firmware Revision:    01.00.00
Standby Firmware Revision:  01.00.00
Standby Firmware Status:    VALID- OK
Download Mode:              DISABLE ALL DOWNLOADS
Download Status:            Idle

[1] SWITCH TO STANDBY FIRMWARE NOW
[2] DISABLE ALL DOWNLOADS
[3] ENABLE DOWNLOADS AND STORE ZIPPED
[4] ENABLE DOWNLOADS, UNZIP AND EXECUTE

[0] Return to SC521A Maintenance

Select: [ ]

```

**Figure 3-7** Firmware Download Screen

### Firmware Download Read-only Information

**Active Firmware Revision** – displays the version and revision number of firmware that is currently operating in the DSU.

**Standby Firmware Revision** – displays the version and revision number of inactive firmware that the DSU has stored in zipped (compressed) format.

**Standby Firmware Status** – displays one of five status indications:

- Invalid- Blank – new DSU with no standby firmware loaded
- Valid- OK – standby firmware loaded and ready for use
- Invalid- Checksum Failed – standby firmware corrupted during download
- Invalid- Download Aborted – download aborted in progress by SCM
- Invalid- Unzip Failed – problem occurred during unzip of standby firmware

**Download Mode** – displays the DSU’s selected response to a download of new firmware, (*See the Firmware Download commands for the potential modes.*)

**Download Status** – displays one of five status indications:

- Idle – no current activity
- Active – transfer currently taking place
- Calculating Checksum – approximately 40 seconds following completion of transfer
- Checksum GOOD – indicates successful completion of transfer
- Checksum BAD – indicates failure of transfer

## Firmware Download Commands

Firmware commands are described below. Command [2], [3], and [4] are configuration options which determine the Download Mode for the DSU. Download Mode determines how the DSU responds to an imminent firmware download. The selected Download Mode is displayed on-screen and remains in effect until it is changed.

**[1] Switch to Standby Firmware Now** – commands the DSU to unzip (decompress) the stored, inactive firmware and place it into service as the current operating firmware; at the same time the DSU zips and stores the firmware that it had been operating with.

**[2] Disable All Downloads** – commands the DSU not to accept download of firmware; appears in the Download Mode display when selected.

**[3] Enable Downloads and Store Zipped** – commands the DSU to accept download of firmware, storing the newly downloaded code as the zipped and inactive Standby Firmware until it is placed into service by the Switch to Standby Firmware Now command; appears in the Download Mode display when selected.

**[4] Enable Downloads, Unzip and Execute** – commands the DSU to accept download of firmware, immediately unzipping the newly downloaded code and placing it into operation, while storing the former operating code as zipped and inactive Standby Firmware; appears in the Download Mode display when selected.

**[0] Return to SC521A Maintenance** – dismisses the Firmware Download screen

## Firmware Download Procedure

You perform the actual firmware download procedure by means of Trivial File Transfer Protocol.

1. Open a second window in which to perform the TFTP functions. Keep the Firmware Download screen on display in order to monitor the Download Status.
2. Initiate a TFTP session to the SCM.
3. At the TFTP prompt, type **bin** and then press the **Enter** key. This causes the transfer to take place in binary mode.
4. Type **put** [*firmware filename*] [*address & product code*] and then press the **Enter** key to initiate the actual transfer.

The [*firmware filename*] is provided with the firmware that is to be downloaded. The address portion of the [*address & product code*] is the slot/line/drop address when you are downloading to a single unit. There is also a broadcast code that enables you to send new firmware simultaneously to all the SC521A DSUs in a shelf (or pair of shelves). [Figure 3-8](#) provides further definitions of the [*filename*] and [*address*] formats.

---

**Note** *The product code for the SC 521A/S is the same as that of a SC 521A..  
Firmware for SC521A must be lower than version V050000v.118.  
Firmware for SC521A/S must be version V050000v.118 or higher.  
Broadcast downloading of firmware can only be done if the shelf contains only one type of unit (ie: All SC521A's or all SC521A/S's). Broadcast downloads cannot be done if the shelf contains a mixture of units.*

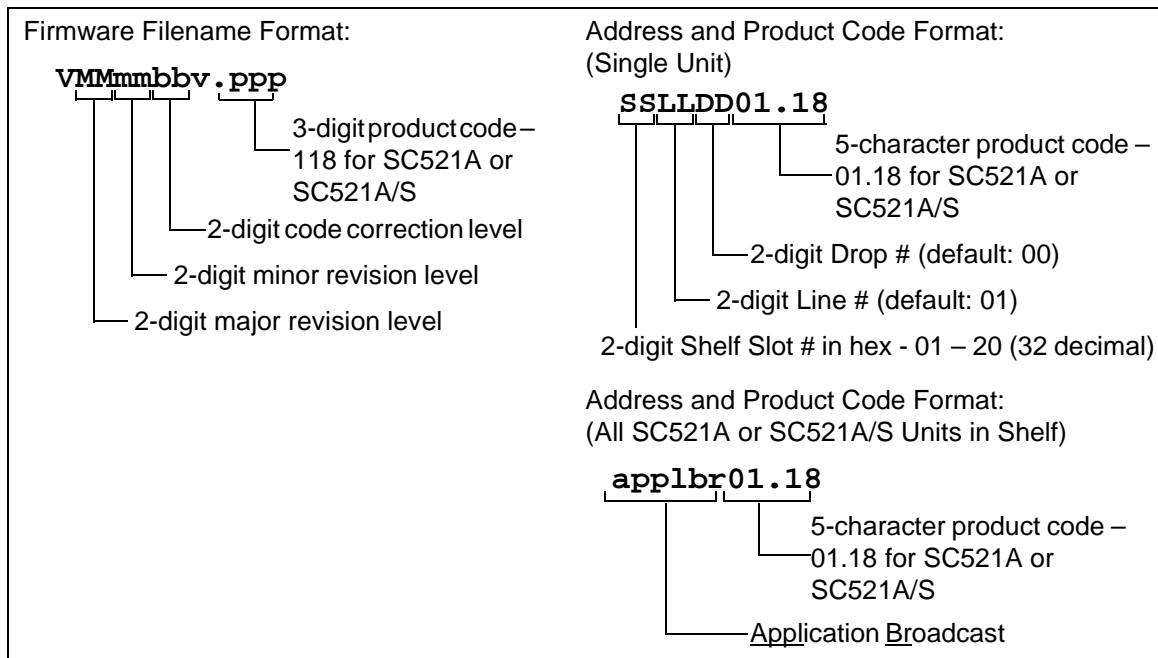
---

5. While the download is in progress, the Download Status line of the Firmware Download screen displays **Active** and then displays **Calculating Checksum** for approximately 40 seconds. When the calculation is complete, the status line displays either **Checksum GOOD** or **Checksum BAD**. When downloading to a single unit, its **RSP** LED flashes during the download. When downloading all units in a shelf, their **RSP** LEDs remain Off.
6. If the selected Download Mode is **[3] Enable Downloads and Store Zipped**, the procedure is complete once the checksum is calculated. The DSU stores the newly loaded firmware as its standby firmware until you put it into service by means of the Switch to Standby Firmware Now command.  
If the selected Download Mode is **[4] Enable Downloads, Unzip and Execute**, the DSU continues with the process of placing the new firmware into service as described below.

### Executing Downloaded Firmware

You can monitor DSU as it unzips and begins to execute firmware by observing its Front Panel **LEDs**. The sequence is the same whether the activity occurs in response to either: Command **[1] Switch to Standby Firmware Now** or as the last part of a download with the Download Mode selected as: **[2] Enable Downloads, Unzip and Execute**.

1. As the process begins, all Front panel LEDs light momentarily.
2. During the unzip process, the four test function LEDs flash in sequence: (**ST**, **LT**, **RL**, **DL**).
3. When the unzip process is complete, all LEDs light as the DSU performs a reset.
4. The Test Mode (**TM**) LED lights while the DSU performs its power-on self test.
5. The LEDs return to their normal operating states as the DSU resumes operation using the newly activated firmware.



**Figure 3-8** Filename and Address Coding



## Line Statistics

The terminal interface SC521A Line Statistics function displays information detailing conditions at the network interface during the past 15 minutes. Each of the 15 lines in the display represents one minute of operation, with Line 1 displaying the most recently completed minute. ([Table 3-5](#)).

While the screen is displayed, it refreshes with new data every five seconds. To dismiss the Line Statistics screen, type **0** and then press the **Enter** key to return to the Main Menu.

SC521A Line Statistics (Last 15 Minutes)							
Minute Interval	Status	Transmit Level	Receive Level	Phase Jitter	BPV Count	Frame Loss	Signal Quality
1	No Signal	06 dB	n/a	n/a	n/a	n/a	n/a
2	No Signal	06 dB	n/a	n/a	n/a	n/a	n/a
3	No Signal	06 dB	n/a	n/a	n/a	n/a	n/a
4	No Signal	06 dB	n/a	n/a	n/a	n/a	n/a
5	No Signal	06 dB	n/a	n/a	n/a	n/a	n/a
6	No Signal	06 dB	n/a	n/a	n/a	n/a	n/a
7	No Signal	06 dB	n/a	n/a	n/a	n/a	n/a
8	No Signal	06 dB	n/a	n/a	n/a	n/a	n/a
9	No Signal	06 dB	n/a	n/a	n/a	n/a	n/a
10	No Signal	06 dB	n/a	n/a	n/a	n/a	n/a
11	No Signal	06 dB	n/a	n/a	n/a	n/a	n/a
12	No Signal	06 dB	n/a	n/a	n/a	n/a	n/a
13	No Signal	06 dB	n/a	n/a	n/a	n/a	n/a
14	No Signal	06 dB	n/a	n/a	n/a	n/a	n/a
15	No Signal	06 dB	n/a	n/a	n/a	n/a	n/a

[0] Return to Main Menu

Select: [ ]

**Table 3-5** Line Statistics Screen

Statistics Field	Description
Status	Normal – signal is present; No Signal – either signal is not detected or no line is connected; Not Available – DSU has been operating less than 15 minutes so there are no statistics for the corresponding one-minute period
Transmit Level	average strength, in dBm, of signal output by the DSU during the one-minute period
Receive Level	average strength, in dBm, of signal received by the DSU during the one-minute period; displays n/a when Status is No Signal
Phase Jitter	amount of jitter, expressed as a percentage, in signal received by the DSU during the one-minute period; displays n/a when Status is No Signal
BPV Count	number of bipolar violations in signal received by the DSU during the one-minute period; displays n/a when Status is No Signal
Frame Loss	number of lost frames that occurred in signal received by the DSU during the one-minute period; displays n/a when Status is No Signal
Signal Quality	Good, Fair, or Bad based on the amount of jitter measured in the AMI pulse; displays n/a when Status is No Signal



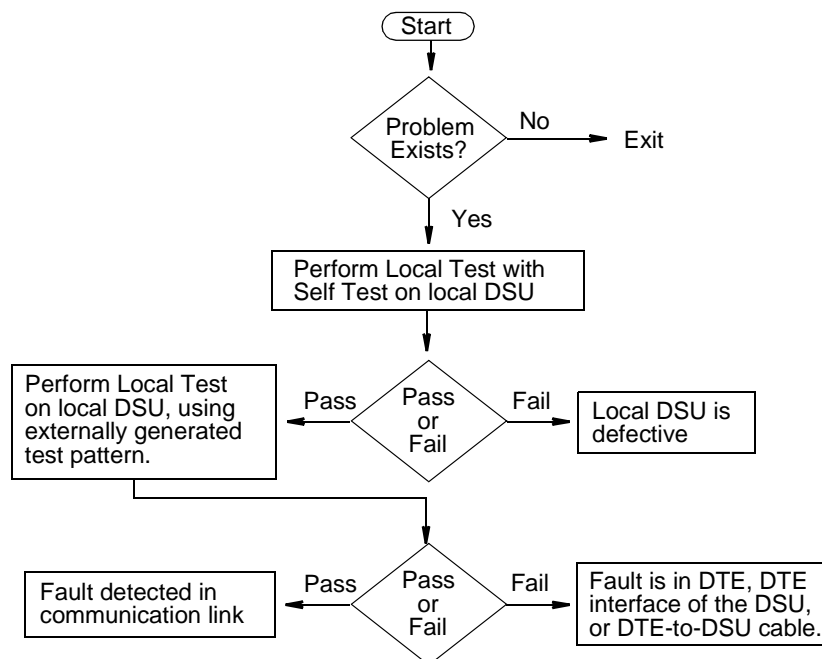
# Chapter 4: Tests

## Overview

This chapter describes the tests you can perform on the SC521A or SC 521A/S DSU from the front panel and from the terminal interface. It also describes tests that the service provider can perform from a Serving Test Center (STC).

You should test the equipment when it is first installed to verify correct installation. After the equipment is in service, you can use the tests to diagnose any problems that occur in the operation of the DSU or the data communications system. See [Figure 4-1](#).

**Note** *The DSU may be performance tested in five ways: by tests performed from an SNMP controller; by tests initiated from the DSU front panel using the ST, LT, RL, and DL switches; by tests initiated from the DSU terminal interface; by tests initiated from the DTE using the EIA Remote Loop and EIA Line Loop leads; and by tests initiated from the Telco Serving Test Center (STC). This chapter of the manual deals with the front panel, terminal interface, and STC tests. Consult controller documentation for information on testing the DSU from an SNMP controller.*



**Figure 4-1** Fault Isolation Procedure

## Terminal Interface Diagnostics Screen

The terminal interface SC521A Diagnostics screen combines configuration and command functions. Selections **A** through **F** are the command fields by which you can begin and end test procedures. The Test Results field at the bottom of the screen displays the results of tests that employ Self Test. The result field displays the number of RX Errors, if any, or displays **Passed** if no errors are detected.

[Figure 4-2](#) illustrates the Diagnostics screen. Basic instructions for performing any tests and detailed proecures for each specific test are provided below.

```

SC521A Diagnostics

Diagnostic Options
[1] DTE: Line Loopback Control:      Disable
[2] Remote Loopback Control:        Disable
[3] Data Set Ready:                  Normal
[4] Network: Line Loopback Test Pts: DTE Only
[5] Telco Latching Loopbk Rsp:      Enable
[6] Customer Remote Loop Rsp:       Enable
[7] Remote Loop Auto Timeout:        Disable
[8] Remote Loop Initiation Seq.:     V.54
[9] Self Test Pattern:               511

      T E S T S:
[A] Line Loopback:                   Idle
[B] Line Loopback & Self Test:       Idle
[C] Remote Loopback:                 Idle
[D] Remote Loopback & Self Test:     Idle
[E] Digital Loopback:                Idle
[F] Self Test:                       Idle

      Test Results:

[0] Return to Main Menu      [S] Save [1] - [9] & Update Unit
      Select: [ ]

```

**Figure 4-2** Diagnostics Screen

### Diagnostic Test Procedure Basics

1. Type the selection letter of the test you intend to perform and press the **Enter** key. Highlighting appears on the status field for the corresponding test, which displays **Idle** at this point.
2. Use the arrow keys to toggle the highlighted field so that it displays **Active**. The DSU begins the selected test.
3. To end the test, use the arrow keys again to toggle the highlighted field so that it again displays **Idle** then press the **Enter** key. The DSU ends the test and the highlighting returns to the Select field. If the test employed Self Test, the screen displays the number of RX Errors (if any) in the Test Results field.
4. To dismiss the screen, type selection **0: Return to Main Menu**, and press the **Enter** key.

## Local Test

The Local Test loopback condition isolates the DSU from the network by connecting the transmit logic circuits to the receive logic circuits. The loopback provides a path through the DSU for an externally generated test signal, as shown in [Figure 4-3](#).

If the Diagnostic Option Line Loopback Test Points is configured for Network & DTE, the DSU also loops its receive data back to the network during Local Test. The default condition is DTE Only (no loopback to the network).

During Local Test:

- The DTE interface remains active.
- The DSU loops transmit data from the DTE back as receive data.
- Either the DTE or a bit error rate tester (BERT) connected to the DTE interface can supply and check a test signal.
- The device supplying the test signal is responsible for error detection and reporting.
- If Network & DTE is selected for Line Loopback Test Points, receive data is returned to the network interface as transmit data so that tests performed from the remote DSU can check everything in the circuit except the DSU.

There are four ways to control the Local Test function:

- briefly press the LT switch on the front panel to initiate the loopback; press the switch again to end the loopback.
- select [A] Line Loopback from the terminal interface Diagnostics screen
- assert a signal from the DTE on the LT lead (Pin 18) of the DTE interface to initiate the loopback; turn the signal Off to end the loopback.
- transmit commands from an SNMP controller to initiate and end the loopback.

---

**Note** *Tests cannot be performed by means of front panel switches when the front panel has been inhibited by an SNMP controller or the terminal interface. Front panel enabled is the default condition.*

*The DTE interface LT lead can only command Local Test if Line Loopback Control has been enabled by an SNMP controller. The default condition is Line Loopback Control disabled.*

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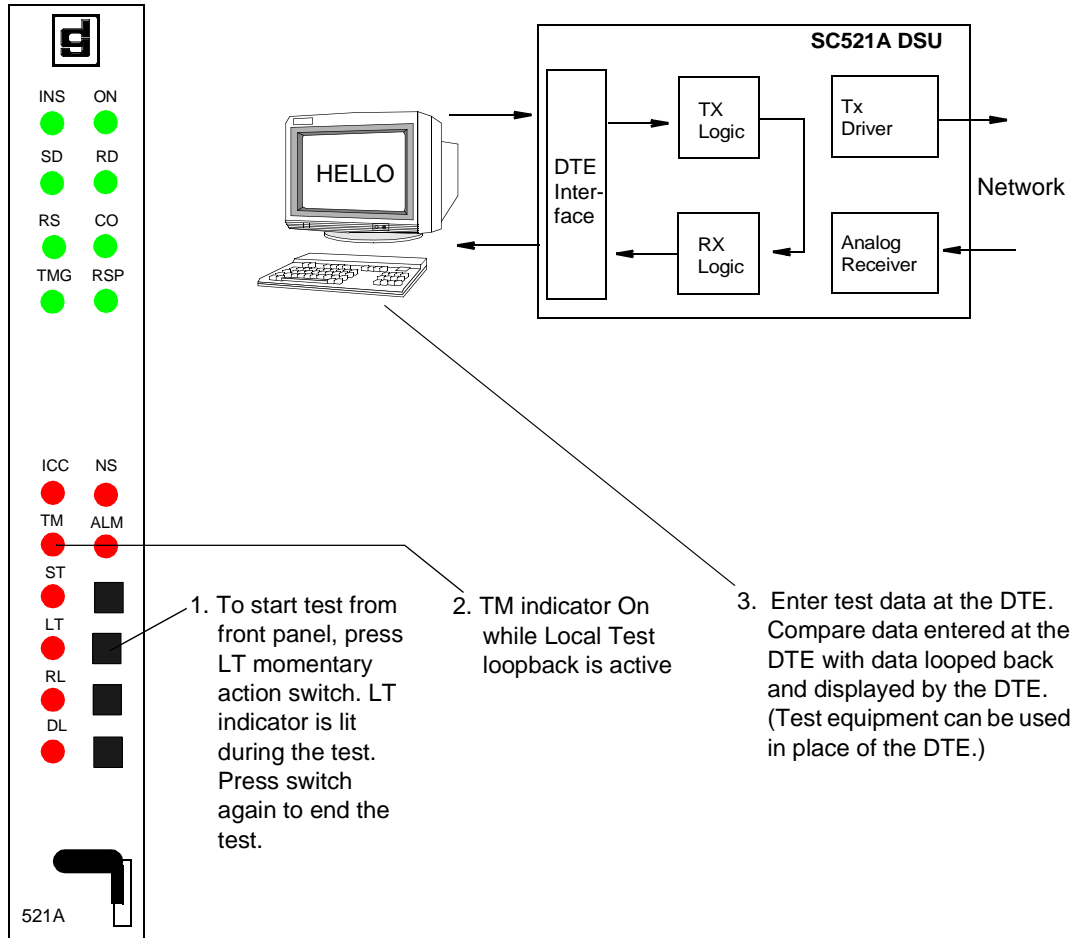


Figure 4-3 Local Test

## Local Test with Self-Test

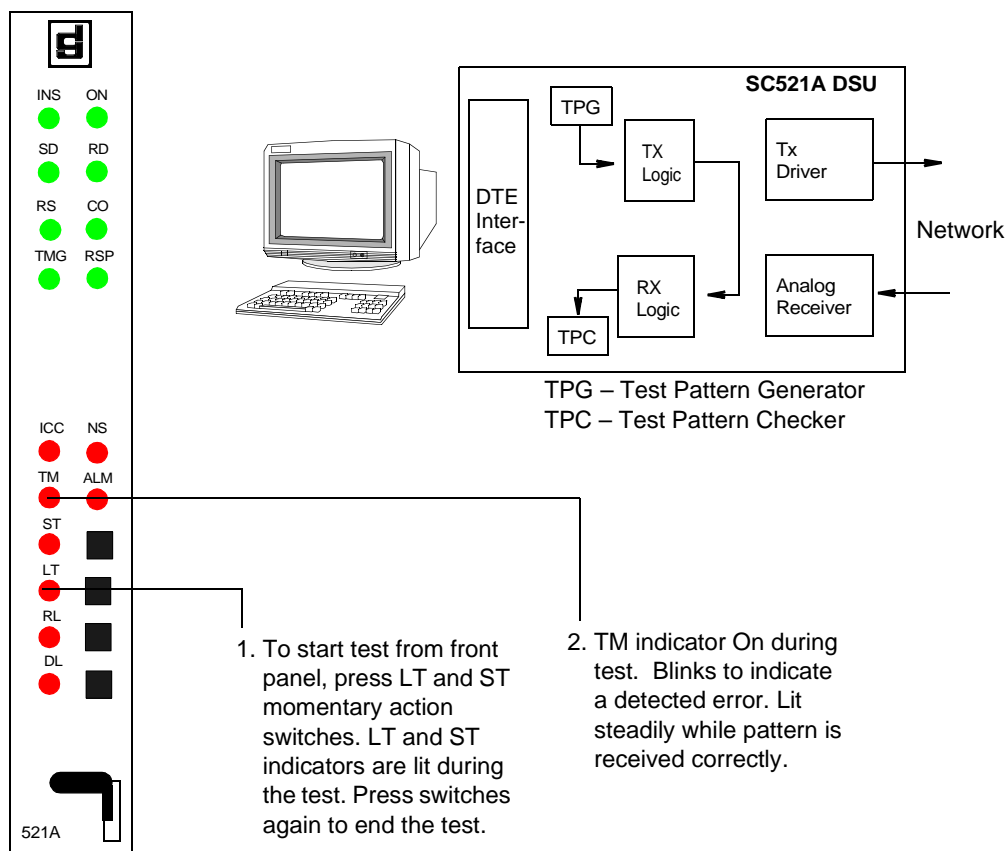
Local Test with Self-Test [Figure 4-4](#) checks the internal circuits of the local DSU, isolated from both the DTE and the network. The test procedure involves two functions:

- Local Test — the DSU loops transmit data back as receive data. If the Diagnostic Option Line Loopback Test Points is configured for Network & DTE, the DSU also loops its receive data back to the network.
- Self-Test — the DSU enables its internal Test Pattern Generator to provide the signal for the Local Test loop and enables its Test Pattern Checker to verify the signal. The DSU is configurable to use a 511, 2047, or 15 bit test pattern. The DSU is isolated from its DTE while the Test Pattern Generator and Checker are enabled.

The LT, ST, and TM indicators are On during the test. The Test Mode (TM) indicator remains On as long as the test pattern is received without errors and blinks when an error is detected.

There are three ways to control the Local Test with Self-Test function:

- briefly press the LT and ST switches on the front panel to initiate the test; press the switches again to end the test.
- select [B] Line Loopback & Self Test from the terminal interface Diagnostics screen
- transmit commands from an SNMP controller to initiate and end the test.



**Figure 4-4** Local Test with Self-Test

## Remote Loop (or CSU Loopback)

In the Remote Loop test function the local DSU transmits an inband command to its remote DSU, directing the remote to loop received signals back onto the network. The DSU is configurable to send (and accept) any of three remote loop commands: GDC (proprietary), V.54, or PN 127. The remote DSU must be configured to accept the same command the DSU transmits.

For the SC 521A/S in source mode and configured for **CSU** (Remote Loop Initiation Sequence), the direction of the sealing current is reversed in order to initiate a CSU loopback in a remote unit. When the SC 521A/S is in sink mode, the detection of the sealing current reversal shall cause the local unit to enter a CSU loopback.

---

*Note* CSU Loopback Initiation is only available on SC 521A/S units.

---

The Remote Loop Timeout option determines whether or not the DSU ends this test automatically. When the option is enabled the DSU ends the test after ten minutes. When the option is disabled, the DSU runs the test until it is terminated manually.

---

*Note* The Remote Loop function is for use only on point to point links. The V.54 and PN 127 remote loop commands are industry standards, compatible with correctly configured units from other manufacturers. When the Remote Loop function is configured for the GDC loop command, it is only compatible with a remote GDC NMS 520 DSU or GDC NMS 510 DSU. The SC521A DSU must have Revision B- or higher firmware to be configured for the GDC loop command.

---

The remote loopback provides a path through the DSU, the network, and the remote DSU for an externally generated test signal, as shown in [Figure 4-5](#). Remote Loop checks the local DSU, a portion of the remote unit, and the T1 line. During Remote Loop:

- The DSU transmits the in-band loop-up command to its remote DSU.
- In response to the command, the remote unit performs a digital loopback and loops the receive signal back to its transmit path.
- The DTE and backplane interfaces of the local DSU remain active.
- A test signal can be supplied and checked either by the DTE or by a bit error rate tester (BERT) connected to the DTE interface.
- The device supplying the test signal is responsible for error detection and reporting.
- The loopback remains in effect until the DSU transmits a loop down code for five seconds, commanding the remote unit to release the loopback. The DSU does this automatically after ten minutes when the Remote Loop Timeout option is enabled.

There are four ways to control the Remote Loop or CSU Loopback (SC521A/S only) function:

- briefly press the RL switch on the front panel to initiate the loopback; press the switch again to end the loopback.
- select **[C] Remote Loopback** from the terminal interface Diagnostics screen
- assert a signal from the DTE on the RL lead (Pin 21) of the DTE interface to initiate the loopback; turn the signal Off to end the loopback.



- transmit commands from an SNMP controller to initiate and end the loopback.

**Note** Tests cannot be performed by means of front panel switches when the front panel has been inhibited by an SNMP controller or the terminal interface. Front panel enabled is the default condition. The DTE interface RL lead can only command Remote Loop if Remote Loopback Control has been enabled by an SNMP controller. The default condition is Remote Loopback Control disabled.

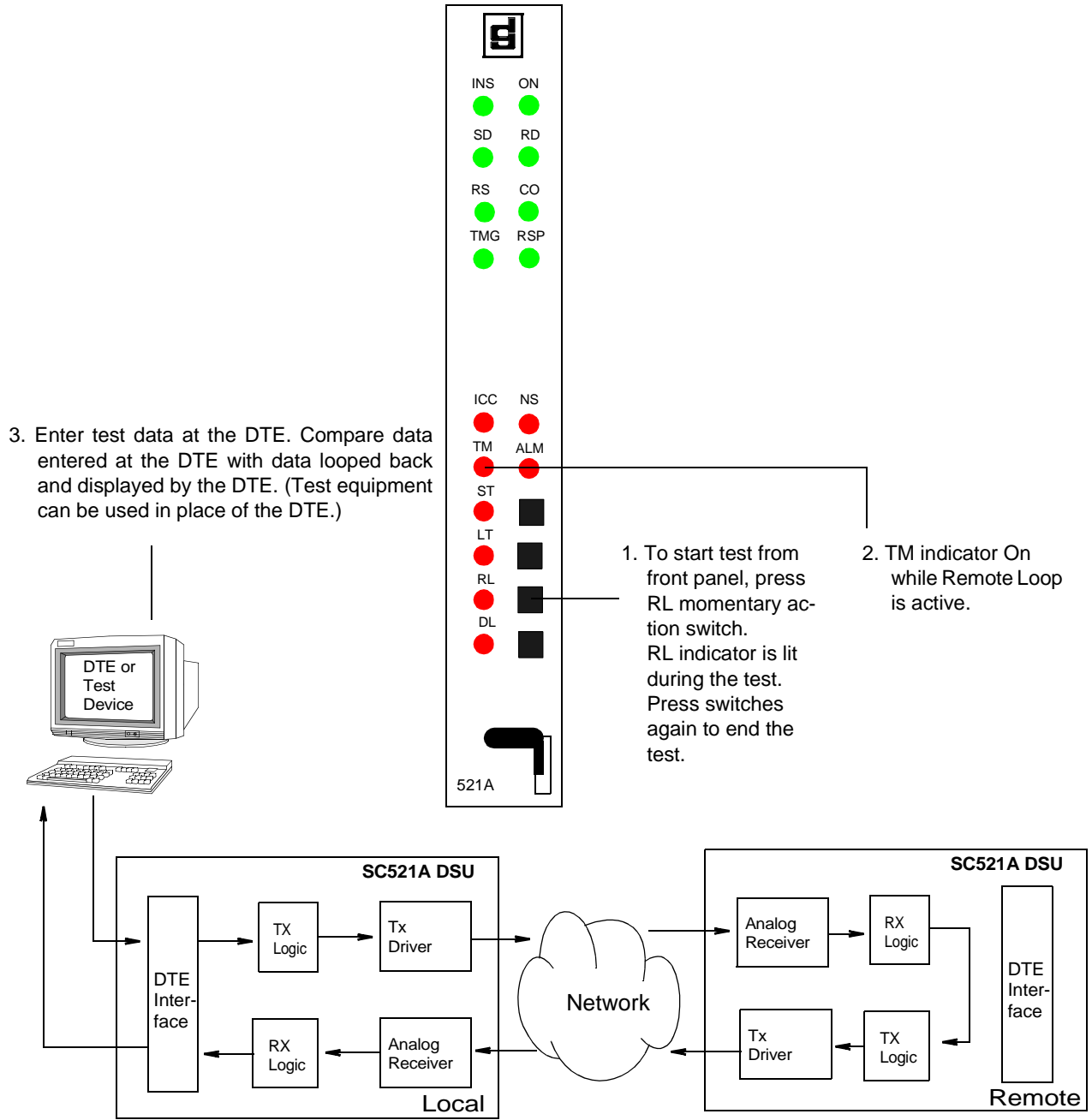


Figure 4-5 Remote Loop

## Remote Loop (or CSU Loopback) with Self-Test

Remote Loop with Self-Test, shown in [Figure 4-6](#), isolates the local DSU from the DTE and checks the DSU internal circuits, the network link, and the remote DSU. The test procedure involves two functions:

In the Remote Loop test function, the local DSU transmits an inband command to its remote DSU, directing the remote to loop received signals back onto the network. The DSU is configurable to send (and accept) any of three remote loop commands: GDC (proprietary), V.54, or PN 127. The remote DSU must be configured to accept the same command the DSU transmits.

For the SC 521A/S in source mode and configured for **CSU** (Remote Loop Initiation Sequence), the direction of the sealing current is reversed in order to initiate a CSU loopback in a remote unit. When the SC 521A/S is in sink mode, the detection of the sealing current reversal shall cause the local unit to enter a CSU loopback.

---

**Note** *CSU Loopback Initiation with Self-Test is only available on SC 521A/S units.*

---

In the Self-Test function, the DSU enables its internal Test Pattern Generator to provide the signal for the Remote Loop and enables its Test Pattern Checker to verify the signal. The DSU is configurable to use a 511, 2047, or 15 bit test pattern. The DSU is isolated from its DTE while the Test Pattern Generator and Checker are enabled.

The Remote Loop Timeout option determines whether or not the DSU ends this test automatically. When the option is enabled the test DSU ends the test after ten minutes. When the option is disabled the DSU runs the test until it is terminated manually.

---

**Note** *The Remote Loop function is for use only on point to point links.*

*The V.54 and PN 127 remote loop commands are industry standards, compatible with correctly configured units from other manufacturers.*

*When the Remote Loop function is configured for the GDC loop command, it is only compatible with a remote GDC NMS 520 DSU or GDC NMS 510 DSU. The SC521A DSU must have Revision B- or higher firmware to be configured for the GDC loop command.*

---

The RL, ST, and TM indicators are On during the test. The Test Mode (TM) indicator remains On as long as the test pattern is received without errors and blinks when an error is detected.

There are three ways to control the Remote Loop or CSU Loopback (SC521A/S only) with Self-Test function:

- briefly press the RL and ST switches on the front panel to initiate the test; press the switches again to end the test. Test ends automatically after ten minutes if Remote Loop Timeout is enabled.
- select [D] Remote Loopback & Self Test from the terminal interface Diagnostics screen
- transmit commands from an SNMP controller to initiate and end the test. Test ends automatically after ten minutes if Remote Loop Timeout is enabled.

---

**Note** *Tests cannot be performed by means of front panel switches when the front panel has been inhibited by an SNMP controller or the terminal interface. Front panel enabled is the default condition.*

---

## CSU Loopback with Self Test

For the SC 521A/S in source mode and configured for **CSU** (Remote Loop Initiation Sequence), the direction of the sealing current is reversed in order to initiate a CSU loopback in a remote unit. When the SC 521A/S is in sink mode, the detection of the sealing current reversal shall cause the local unit to enter a CSU loopback.

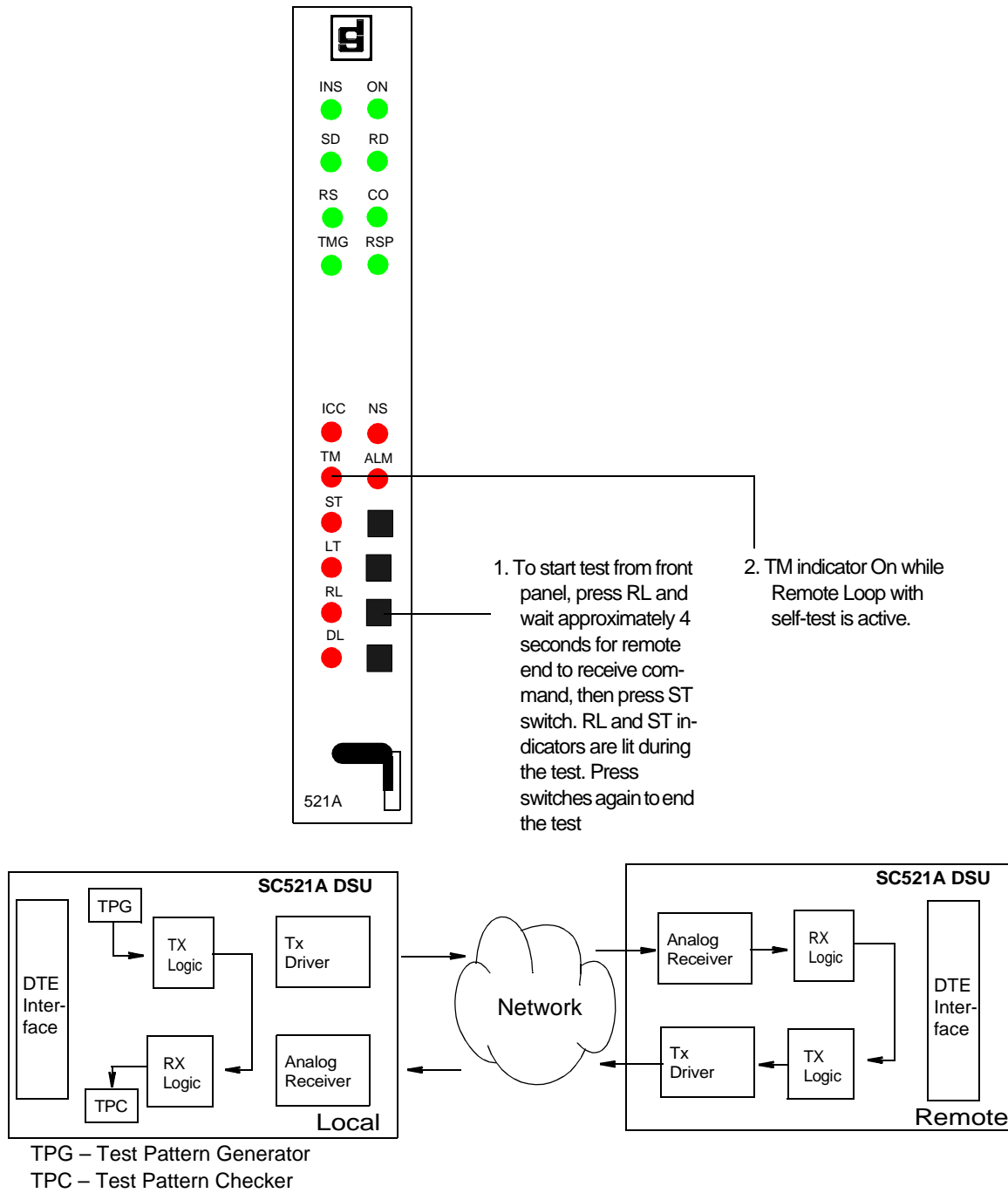


Figure 4-6 Remote Loop with Self-Test

## Data Loop

The Data Loop loopback condition, shown in [Figure 4-7](#), isolates the DSU from the DTE by connecting the receive logic circuits to the transmit logic circuits. The loopback provides a path through the receive and transmit circuits of the DSU for a test signal from a remote site. Equipment at the remote site is responsible for generating and checking the test signal.

There are three ways to control the Data Loop function:

- briefly press the DL switch on the front panel to initiate the test; press the switch again to end the test.
- select [E] Digital Loopback from the terminal interface Diagnostics screen
- transmit commands from an SNMP controller to initiate and end the test.

---

**Note** *Tests cannot be performed by means of front panel switches when the front panel has been inhibited by an SNMP controller or the terminal interface. Front panel enabled is the default condition.*

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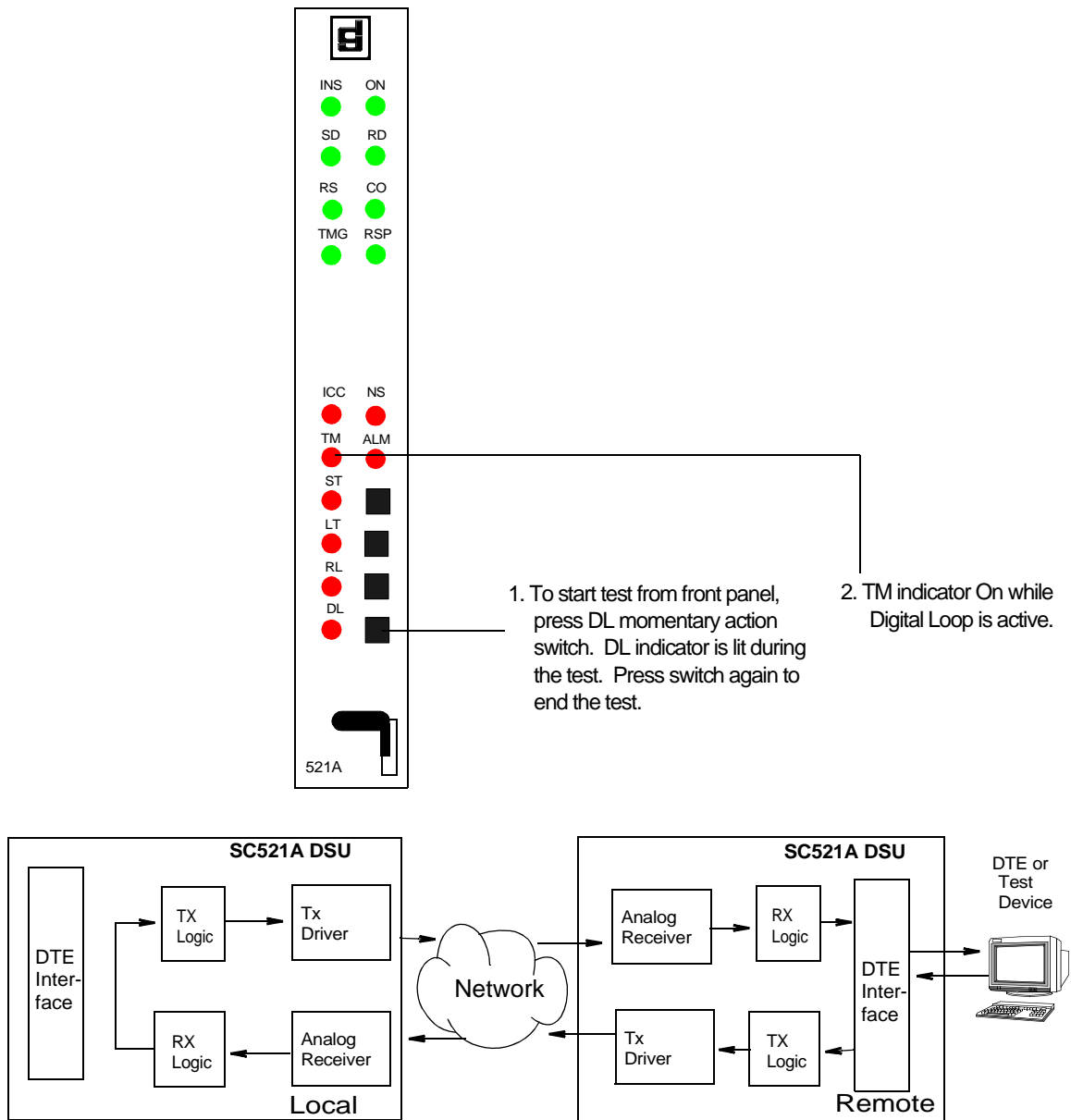


Figure 4-7 Data Loop

## CSU Loopback Test (STC Controlled)

The CSU Loopback test is a remotely controlled diagnostic that is initiated by a code sent from a Serving Test Center (STC).

During the test the DSU establishes two loopbacks:

- It connects its receiver input and transmitter output to create a circuit that loops received signals back to the network. The STC transmits a test signal to the DSU and then checks it for errors after it has returned through the loopback.
- It connects its transmit and receive logic circuits to loop data back to the DTE interface. This loopback permits the use of a test signal from the DTE to check cabling, the DTE interface, and the transmit and receive logic circuits while the STC is conducting its test.

[Figure 4-8](#) illustrates the CSU Loopbacks. When it is necessary to isolate a problem, contact the STC and ask them to initiate the CSU Loopback test. The test results should be used in conjunction with the fault isolation sequence ([Figure 4-1](#)) to pinpoint a problem, if any.

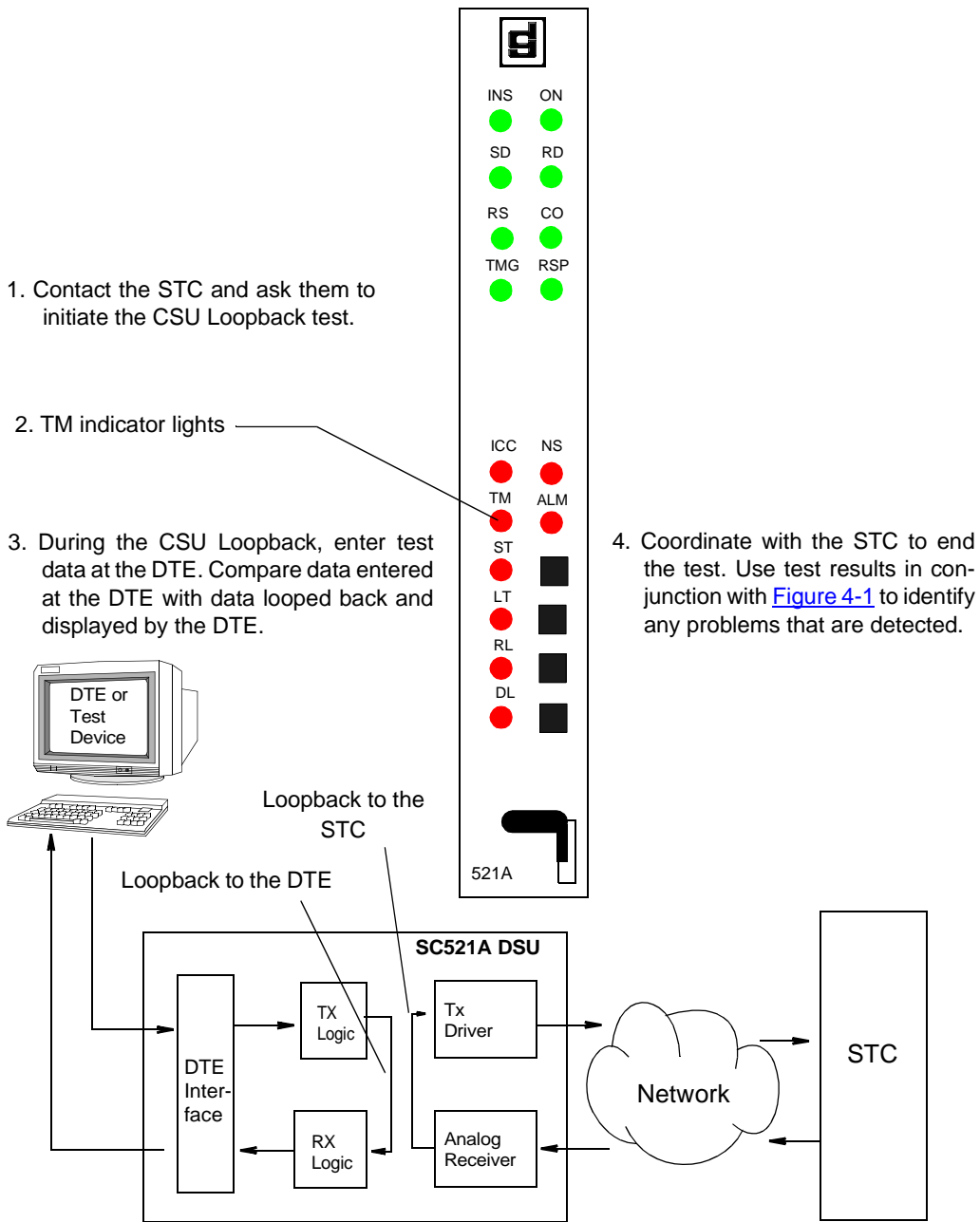


Figure 4-8 CSU Loopback Test



## DSU Loopback Test (STC Controlled)

The DSU Loopback test is a remotely controlled diagnostic, initiated by either of two codes sent from a Serving Test Center (STC). During the test the DSU connects its receive logic and transmit logic circuits to loop received signals back to the network. The STC transmits a test signal to the DSU and then checks it for errors after it has returned through the loopback. [Figure 4-9](#) illustrates the DSU Loopback.

The two codes by which the STC can command the test are classified as latching and non-latching:

- The latching loopback code commands the unit to initiate the test condition, which it remains in until the STC sends a terminating code to end the test.
- The non-latching loopback code commands the unit into the test condition as long as the code is being received; when the STC stops sending the non-latching code the unit ends the DSU Loopback.

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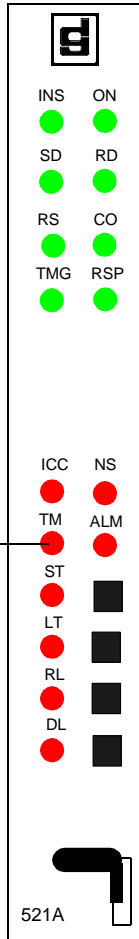
**Note** *The Telco Latching Loop option, configurable in the DSU from an SNMP controller, can be set to Disable, which causes the unit to disregard the latching loopback code. The default setting of the option is Enable. When the option is set to Disable, the STC can still command a non-latching DSU Loopback.*

---

When it is necessary to isolate a problem, contact the STC and ask them to initiate the DSU Loopback test. The test results should be used in conjunction with the fault isolation sequence ([Figure 4-1](#)) to pinpoint a problem, if any.

1. Contact the STC and ask them to initiate the DSU Loopback test.

2. TM indicator lights



3. Coordinate with the STC to end the test. Use test results in conjunction with [Figure 4-1](#) to identify any problems that are detected.

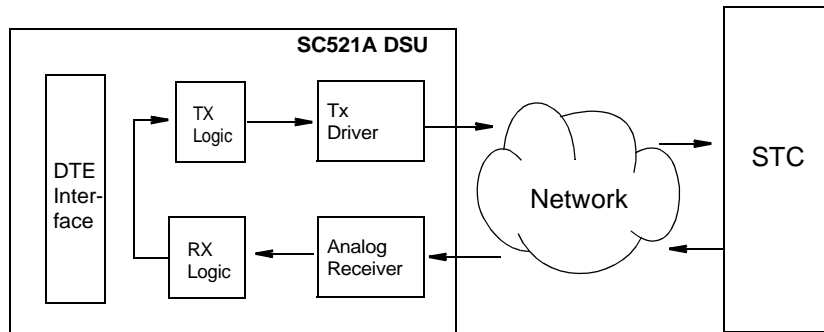


Figure 4-9 DSU Loopback Test





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