



SpectraComm 500A

Data Service Unit

Installation & Operation Manual

048R302-000

Issue 5

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General DataComm
Smart Solutions for Service Providers

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Documentation

Revision History - GDC P/N 048R302-000

Issue Number	Date	Description of Change
1 - 2		Initial Release and updates
3	1997	Updated
4	February 2000	Revised format; Added V.35 and EIA-530 interface information.
5	April 2001	Updated

Related Publications

Description	Part Number
GDC SpectraComm/UAS Installation & Operation for Shelf/Enclosure	010R302-REV
GDC SpectraComm 2000 Shelf Installation and Operation	010R358-REV
GDC Remote Access 1000 Enclosure Installation and Operation	010R111-REV
Data Rate Adapter Card (GDC Part No. 058P128-002) Manual	048R162-A1

-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

Scope

This manual describes how to install and operate the SpectraComm 500A Data Service Unit. The information contained in this manual has been carefully checked and is believed to be entirely reliable. However, as General DataComm improves the reliability, function, and design of their products, it is possible that information may not be current. Contact General DataComm if you require updated information for this or any other General DataComm products.

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Manual Organization

This manual is divided into the following sections:

[Chapter 1, System Description](#)

[Chapter 2, Installation](#)

[Chapter 3, Operation](#)

[Chapter 4, Tests](#)

[Appendix A, Technical Characteristics](#)

[Appendix B, Business Equipment Interface](#)

[Appendix C, Communications Line Interfaces](#)

Safety Information

This manual should be read in its entirety and all procedures completely understood before installing or operating the unit. The notes that appear throughout this manual must be read prior to any installation or operating procedure. Examples of notes used in this manual are shown below.

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.*

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.*

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.



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.*

Safety Guidelines

Always use the following guidelines when unsafe conditions exist or when potentially hazardous voltages are present:

- Always use caution and common sense.
- 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

Electrostatic discharge (ESD) results from the buildup of static electricity and can cause computer components to fail. Electrostatic discharge occurs when a person whose body contains a static buildup touches a computer component. This product may contain static-sensitive devices that are easily damaged. Proper handling, grounding and precautionary ESD measures are essential when installing parts or cards. Keep parts and cards in antistatic packaging when not in use or during transport. If possible, use antistatic floorpads and workbench pads.

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.

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:

All connections to the telephone network must be made using standard plugs and telephone company provided jacks or equivalent. Connection of this equipment to party lines and coin telephones is prohibited. A label on the component side of the unit's printed circuit board provides the FCC Registration number for the unit. If requested, give this information to the telephone company. 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-74294-DE-N
- Facility Interface Codes: 04DU9-BN, 04DU9-DN, 04DU9-1KN, 04DU9-1SN
- Service Order Code: 6.0Y
- Telephone Company jack type: RJ48C

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.

Part 15 Compliance

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference and
2. This device must accept any interference received, including interference that may cause undesired operation.

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.

Electromagnetic Compatibility

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

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.

Preface

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.

La Compatibilité d'Électro-magnétique

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

Deutschland

Installations Anweisungen: Installieren Sie die Telefonleitungen nicht während eines Gewitters. Installieren Sie die Telefonleitungen nicht in einem feuchten Raum, außer die Dose entspricht den Vorschriften für Feuchträume. Berühren Sie unisolierte Telefonleitungen oder Einrichtungen nicht, außer diese sind vom Telefonnetz getrennt. Vorsicht bei der Installation oder Änderung von Telefonleitungen. *Achtung:* Es gibt keine durch den Benutzer zu wartende Teile im Gerät. Wartung darf nur durch qualifiziertes Personal erfolgen.

EC Declaration of Conformity

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The products to which this declaration relates are in conformity with the following relevant harmonized standards, the reference numbers of which have been published in the Official Journal of the European Communities.

Electromagnetic Compatibility

EN 55022: 1994

Specification for limits and methods of measurement of radio interference characteristics of information technology equipment.

EN 50082-1: 1992

Generic immunity standard Part 1 Residential, Commercial, and Light Industry.

Safety

EN 60950: 1995 A1 through A3

Low Voltage Directive relating to electrical equipment designed for use within certain voltage limits.

Service Support and Training

VITAL Network Services is a leading single-source, data communications organization which provides network service and support for General DataComm customers throughout the world. Vital Network Services provides the support and training required to install, manage and maintain your GDC equipment. Training courses are available at centers in the US, UK, France, Singapore and Mexico, as well as at a customer's site.

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Chapter 1: System Description

Overview

The SpectraComm 500A DSU is a universal rate Data Service Unit for central sites in digital service networks. It operates synchronously from 2.4 to 64 kbps or asynchronously from 1.2 to 19.2 kbps, supporting all standard DDS subrates, and both the 56 kbps and 64 kbps (clear channel) high speed rates.

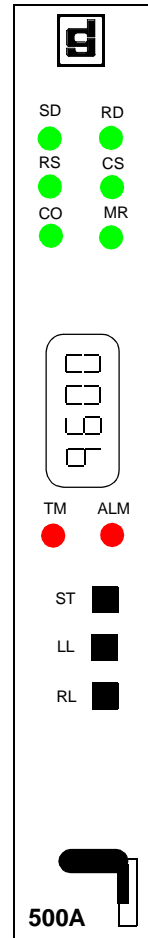
The highly reliable, feature-packed SpectraComm 500A combines superior performance with new, convenient packaging. You can install up to 16 units in a compact, 7-inch high SpectraComm Shelf, providing for high density installations at central offices or other nodes. The SpectraComm 500A is also compatible with GDC's DeskTop 500A DSU.

The SpectraComm 500A automatically selects the data rate for transparent service upgrades between subrates, as well as for upgrades from sub-rate to high speed (56/64 kbps) operation, by adjusting its rate to match that of the incoming network signal. In addition, the unit provides built-in support for EIA/TIA-232-E and CCITT V.35 business equipment interfaces. The optional Data Rate Adapter Card adapts DTE data at rates up to 19.2 kbps to an aggregate line rate of 56 or 64 kbps for point-to-point and multipoint applications. EIA-530 interface can be provided with the optional EIA-530 Interface Card.

The SpectraComm 500A includes an Extended Dynamic Range feature that assures trouble-free operation, even over lines with very low signal levels, such as unusually long subscriber loops. An anti-lockup feature protects against remote DSU or OCU lockup (a permanent loopback) on 64 kbps circuits due to data signals that look like in-band loopback command codes.

The SpectraComm 500A uses the latest VLSI and microprocessor technology, so it consumes very little power, resulting in low heat dissipation and longer component life for reliable performance.

[Table 1-1](#) lists the part numbers for the SpectraComm 500A's standard and optional equipment. [Appendix A, Technical Characteristics](#) describes the SpectraComm 500A's technical characteristics.



Features

- Supports all DATAPHONE Digital Service (DDS) speeds from 2.4 kbps to the new 64 kbps clear channel rate, as well as generic digital service, for greater applications flexibility.
- Automatic data rate selection for easy service upgrades.
- Optional Data Rate Adapter Card.
- Optional EIA-530 Interface Card.
- Extended Dynamic Range for the best performance possible.

System Description

- Anti-lockup feature for trouble-free clear channel operation.
- Powerful diagnostic tests for rapid fault isolation and system restoral.

Diagnostics

The SpectraComm 500A includes a variety of features to ensure that you can quickly isolate and resolve system faults. It has the unique ability to determine whether the network's transmit and receive pairs are transposed. Another unique ability is the Error Free Seconds (EFS) test, which you can set to run automatically (e.g., overnight). This allows you to confirm whether the service is performing to telco-guaranteed specifications. You control tests using front panel push buttons and the unit displays the results in an easy-to-read Electronic Display Window.

The SpectraComm 500A features three different Remote Loopback (RL) tests, ensuring diagnostic compatibility with many other 500-type DSUs: GDC's own Remote Loopback, as well as CCITT V.54 and PN127 Remote Loopbacks. It also provides Self-Test and a Line Loopback test, and supports the following telco Serving Test Center (STC) diagnostics: CSU Loopback (current reversal), DSU Loopback (alternating pattern) and DSU Latching Loopback at 64 kbps.

The SpectraComm 500A includes a Circuit Assurance option that turns OFF the Clear to Send lead during reception of an Out of Service code from the DDS network or during the idle state. It also provides a System Status option that turns OFF the Data Set Ready lead during reception of the Out of Service code or during a No Signal condition.

Table 1-1 Equipment List

Description	GDC Part No.
SpectraComm 500A DSU, Rackmount	048P050-001
SpectraComm 500A/DRA DSU, Rackmount	048M054-001
SpectraComm 500A/530 DSU, Rackmount	048M054-021
SpectraComm Shelf Systems	
SpectraComm Shelf MS-2 Model 1 (100/120 V ac) Includes two 8-slot, dual RJ45 Zone 1 connector panels	010M054-001
SpectraComm Shelf MS-2 Model 2 (-48 V dc) Includes two 8-slot, dual RJ45 Zone 1 connector panels	010M055-001
SpectraComm Shelf MS-2 Model 3 (220/240 V ac, international) Includes two 8-slot, dual RJ45 Zone 1 connector panels	010M056-001
SpectraComm Shelf MS-2 Model 4 (100/120 V ac) Includes one 16-slot, 50-pin/wire wrap Zone 1 connector panel	010M057-001
SpectraComm Shelf MS-2 Model 5 (-48 V dc) Includes one 16-slot, 50-pin/wire wrap Zone 1 connector panel	010M058-001
SpectraComm Shelf MS-2 Model 6 (220/240 V ac, international) Includes one 16-slot, 50-pin/wire wrap Zone 1 connector panel	010M059-001
SpectraComm Shelf MS-2 Model 10 (-48 V dc, with redundant power supplies) Includes two 8-slot, dual RJ45 Zone 1 connector panels	010M070-001
SpectraComm Shelf MS-2 Model 11 (-48 V dc, with redundant power supplies) Includes one 16-slot, 50-pin/wire wrap Zone 1 connector panel	010M071-001
Unless otherwise stated, systems include one base shelf, one power supply and one power supply blank front panel, Zone 1 connector panels as stated, one 16-slot DB25 Zone 3 connector panel, two standard mounting brackets (19-/23-inch) and assorted mounting hardware. Refer to the SpectraComm Shelf manual (P/N 048R300-000) for the complete shelf equipment list.	
* XXX = Cable length in feet	(Sheet 1 of 2)

Table 1-1 Equipment List (Continued)

Description	GDC Part No.
Optional Equipment	
Data Rate Adapter Card	058P128-002
EIA-530 Interface Card	048P042-001
VF Cable Assembly, four-wire, 20 Feet	023H101-020
Cable Assembly, 8 x 28, Modular-to-Modular	830-028-807
Cable Assembly, Modular-to-Lugs	024H122-XXX
V.35 Male-to-Male, Straight Through Cable	027H516-XXX*
EIA/TIA-232-E (25-pin male) to CCITT V.35 (34-pin female) Adapter Cable	027H572-001
EIA/TIA-232-E Male-to-Male, Straight Through Cable	028H502-XXX*
EIA/TIA-232-E Male-to-Female, Straight Through Cable (Shielded)	028H506-XXX*
* XXX = Cable length in feet	(Sheet 2 of 2)

Chapter 2: Installation

Overview

This section describes the installation of the SpectraComm 500A, including option selection.

Unpacking and Handling

Inspect the unit. If it is damaged, notify the shipper immediately. Do not discard the box and packing material; use them for shipping the unit, if necessary.

Installation Procedures

The SpectraComm 500A rackmounts in a SpectraComm Shelf. Locate the unit in a ventilated area where the ambient temperature does not exceed 122°F (50°C). Do not install the unit directly above equipment that generates a large amount of heat (such as power supplies).

Shelf Installation

To install the SpectraComm Shelf, refer to Operating and Installation Instructions for SpectraComm Shelf, GDC P/N 048R300-000.



CAUTION

Be sure to install shelves and power supplies as described in the SpectraComm Shelf manual. Failure to do so may result in overheating and subsequent power supply shut-down.

Module Installation

You can install the DSU in any unused slot in the shelf that has the Zone 1 and Zone 3 connectors required for the network and business equipment, respectively. To install the DSU in the shelf:

1. Insert the module into its slot with the GDC logo on top and slide it in until it makes contact.
2. Pull down the ejector tab and firmly push the module in until it seats in the rear connectors.

Preoperational Check

On power-up, the DSU lights all of its LEDs, displays its firmware check-sum for five seconds, and then performs a Self-Test. It displays the result of this test as either "PASS" or "FAIL." If the DSU fails the power-up self-test, contact Vital Network Services (refer to Preface).

Before changing the factory-default option selections and before connecting the DSU to the DTE or to the communications line (the network), you can give the DSU a further preoperational check by performing a Line Loopback Self-Test (refer to [Chapter 4, Tests](#)) to verify operation.

Option Selection

The field-selectable options adapt the SpectraComm 500A to a variety of configurations. Options are selected by setting DIP switches or jumpers on the SpectraComm 500A base card.

[Figure 2-1](#) shows the location of each option switch, and [Table 2-1](#) describes the function and application of each option.

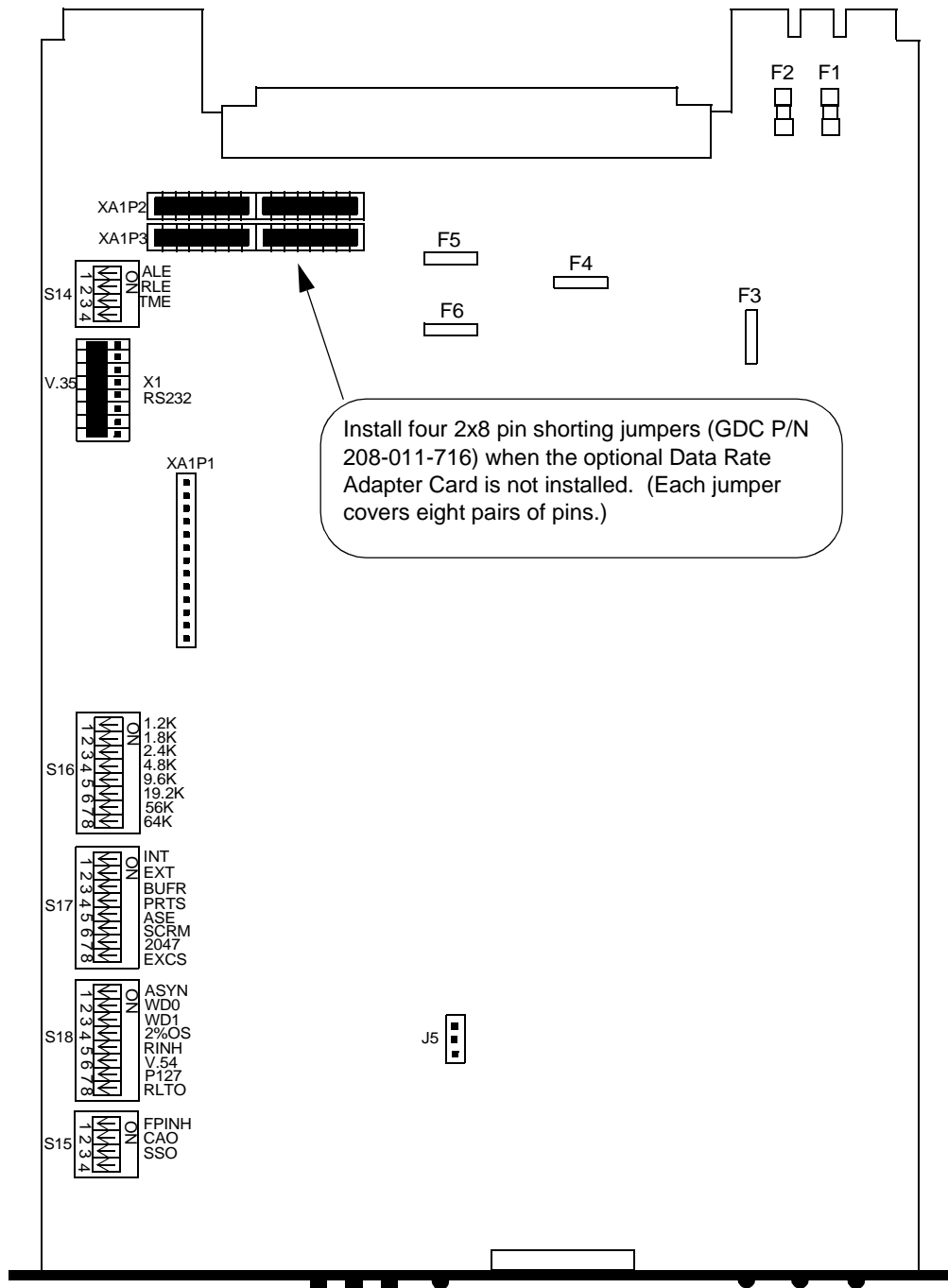


Figure 2-1 Option Location

Table 2-1 Option Application Notes (Switches and Jumpers)

Option	Switch (S) or Jumper (X)	Position (Label)	Selection	Description
DTE Control of Analog Loopback Test	S14-1	OFF *	Disabled	Prevents the DTE from controlling the Analog Loopback (AL) test.
		ON (ALE)	Enabled	Allows the DTE to control AL via pin 18 of the EIA/TIA-232-E interface.
DTE Control of Remote Loopback Test	S14-2	OFF *	Disabled	Prevents the DTE from controlling the Remote Loopback (RL) test.
		ON (RLE)	Enabled	Allows the DTE to control RL via pin 21 of the EIA/TIA-232-E interface.
DSU Control of Test Mode Indicator	S14-3	OFF *	Disabled	Prevents the DSU from controlling the Test Mode (TM) indicator.
		ON (TME)	Enabled	Allows the DSU to control the TM indicator (pin 25 of the EIA/TIA-232-E interface).
DTE Interface Type	X1	(V.35) *	CCITT V.35	The DTE interface is CCITT V.35. Normally requires a Zone 3 connector panel with 34-pin V.35 connectors.
		(RS232)	EIA/TIA-232-E	The DTE interface is EIA/TIA-232-E. Requires a Zone 3 connector panel with DB25 connectors. (When the optional Data Rate Adapter Card is installed, X1 must be in the RS232 position.)
		N/A	EIA-530	The DTE interface is EIA-530. It may require a DB25 to V.35 adapter at Zone 3. (When the optional EIA-530 Interface Card is installed in the active position, the X1 switch can be in any position. When it is installed in the bypass position, the X1 switch will determine the DTE interface).
Data Rate	S16-1 S16-2 S16-3 S16-4 S16-5 S16-6 S16-7 S16-8	(1.2K)	1.2 kbps	To select a specific data rate, turn ON one switch only.
		(1.8K)	1.8 kbps	
		(2.4K)	2.4 kbps	
		(4.8K)	4.8 kbps	
		(9.6K)	9.6 kbps	
		(19.2K)	19.2 kbps	
		(56K)	56 kbps	
		(64K)	64 kbps	
		All OFF *	Auto-Rate	The DSU automatically determines the line type and rate. For LDM applications using Auto-Rate, do not select network timing for both ends: Select internal or external timing for one end, and network timing for the other end. (Auto-Rate is applicable only from 2.4 to 64 kbps.)

* Factory default.

(Sheet 1 of 3)

Table 2-1 Option Application Notes (Switches and Jumpers) (Continued)

Option	Switch (S) or Jumper (X)	Position (Label)	Selection	Description
Transmit Timing Source	S17-1	OFF *	Slave	The network provides transmit timing.
	S17-2	OFF *		
	S17-1	ON (INT)	Internal	The DSU provides transmit timing. (For limited distance modem (LDM) applications only.)
	S17-2	OFF		
	S17-1	OFF	External	The DTE provides transmit timing. (For LDM applications only.)
	S17-2	ON (EXT)		
Transmit Buffer Clock Input	S17-3	OFF *	DSU	The DSU provides the transmit buffer clock input when transmit timing is internal or slave. (When transmit timing is external, the DTE always provides the transmit buffer clock input.)
		ON (BUFR)	DTE	The DTE provides the transmit buffer clock input.
Permanent RTS	S17-4	OFF *	Disabled	The RTS-CTS delay is determined by S17-8.
		ON (PRTS)	Enabled	Both RTS and CTS remain ON regardless of the state of the DTE (the transmitter is ON regardless of the status of RTS).
Anti-Streaming	S17-5	OFF *	Disabled	The DSU allows streaming data.
		ON (ASE)	Enabled	Anti-Streaming forces OFF (idles) the DSU transmitter when RTS remains ON for more than 20 seconds. It releases the transmitter when RTS turns OFF and remains OFF for 100 ms. (When the DSU detects a streaming condition, it blinks the TM LED, toggles the DTE TM pin and displays "AS.")
64K Scrambler	S17-6	OFF *	Disabled	The DSU passes data unaltered.
		ON (SCRM)	Enabled	The DSU inserts a scrambler and descrambler into the data path. (Applicable only at 64 kbps.)
Self-Test Pattern	S17-7	OFF *	511-bit	The DSU uses a 511-bit test pattern for Self-Tests.
		ON (2047)	2047-bit	The DSU uses a 2047-bit test pattern for Self-Tests.
RTS-CTS Delay	S17-8	OFF *	Normal	The RTS-CTS delay is normal (3-byte delay). S17-4 must be OFF.
		ON (EXCS)	Extended	The RTS-CTS delay is extended (45 ms delay). S17-4 must be OFF. Use extended delay in an application, such as an analog modem tail circuit on the far end, where data may be lost if CTS is asserted too soon.

* Factory default.

(Sheet 2 of 3)

Table 2-1 Option Application Notes (Switches and Jumpers) (Continued)

Option	Switch (S) or Jumper (X)	Position (Label)	Selection	Description		
Data Mode	S18-1	OFF *	Sync	Synchronous DTE data mode. (Applicable only from 2.4 to 64 kbps.)		
		ON (ASYN)	Async	Asynchronous DTE data mode. (Applicable only from 1.2 to 19.2 kbps.)		
Word Size	S18-2 S18-3	OFF *	10 bits	Asynchronous word size (number of bits per character). <u>Word Size</u> <u>S18-2 (WD0)</u> <u>S18-3 (WD1)</u>		
					11 bits	ON ON
					10 bits	OFF OFF
					09 bits	OFF ON
			08 bits	ON OFF		
Overspeed Correction	S18-4	OFF *	Normal	1% overspeed correction.		
		ON (2%OS)	Extended	2.3% overspeed correction.		
Remote Loopback	S18-5	OFF *	Enabled	Allows the DSU to respond to, and generate, Remote Loopback (RL) signals.		
		ON (RINH)	Disabled	The DSU does not respond to, or generate, RL signals.		
Remote Loopback Method (Make the same selection for both DSUs)	S18-6 S18-7	OFF *	GDC RL	The DSU uses GDC Remote Loopback (RL) methods. (Applicable only from 2.4 to 56 kbps.)		
		ON (V.54) OFF	V.54 RL	The DSU uses CCITT V.54 RL methods.		
		OFF ON (P127)	PN127 RL	The DSU uses PN127 RL methods.		
Remote Loopback Timeout	S18-8	OFF *	Disabled	No time-out for Remote Loopback (RL).		
		ON (RLTO)	Enabled	10-minute RL timeout.		
Front Panel Push Buttons	S15-1	OFF *	Enabled	Allows use of the front panel test push buttons.		
		ON (FPINH)	Disabled	Inhibits use of the front panel test push buttons to control diagnostics and the Force Auto-Rate feature.		
Circuit Assurance	S15-2	OFF *	Disabled	CTS operates normally when it receives Idle or Out of Service codes.		
		ON (CAO)	Enabled	The DSU forces OFF CTS when the DSU receives Idle or Out of Service codes.		
System Status	S15-3	OFF *	Disabled	DSR operates normally when the DSU receives no signal or when it receives Out of Service codes.		
		ON (SSO)	Enabled	The DSU forces OFF DSR when it receives no signal or when it receives Out of Service codes.		

* Factory default.

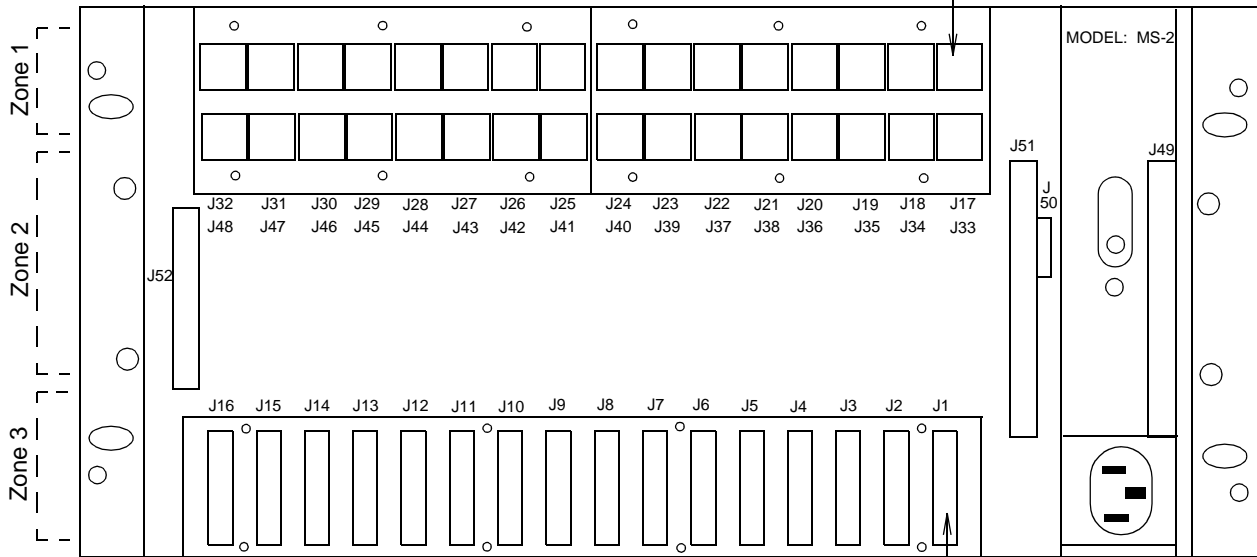
(Sheet 3 of 3)

Electrical Connections

The following paragraphs describe the business equipment (DTE) and communications line (network) connections to the SpectraComm 500A. The following figure illustrates the SpectraComm Shelf rear panel connections.

Communications Line Connectors

(use upper connectors, J17 to J32, for slots 1 to 16; lower connectors, J33 to J48, are not used with SpectraComm 500A)
Use cable P/N 024H122-XXX (modular-to-lugs) or cable P/N 830-028-807 (modular-to-modular)



Business Equipment Connectors

(Connectors J1 to J16, for slots 1 to 16)
For EIA/TIA-232-E with DB25 connector, use: cable P/N 028H502-XXX (male-to-male) or cable P/N 028H506-XXX (male-to-female).
For CCITT V.35 with 34-pin V.35 connector, use: cable P/N 027H516-XXX (male-to-male).
For CCITT V.35 with DB25 connector, use: adapter cable P/N 027H572-001 (male-to-male).
For EIA-530 with _____, use:

Figure 2-2 SpectraComm Shelf MS-2 Model 1 Rear Panel Connections

Business Equipment (DTE) Connections

The SpectraComm 500A supports three business equipment (DTE) interfaces: EIA/TIA-232-E; CCITT V.35; or EIA-530, selected with jumper X1.

Connect the business equipment to the DSU using the appropriate connector on the Zone 3 connector panel (a DB25S 25-pin female connector for an EIA/TIA-232-E device; a 34-pin female connector for a V.35 device; or _____ for an EIA-530 device, depending on which panel is installed).

[Appendix B, Business Equipment Interface](#) describes the pinouts of each of the business equipment interface types.

Communications Line Connections

For telco installations, connect the 25-pair cable to the DSU using the 50-pin telco connector on the Zone 1 connector panel. For CPE installations, connect the four-wire communications line to the DSU using the upper RJ45 modular jack on the Zone 1 connector panel.

[Appendix C, Communications Line Interfaces](#) describes the pinouts of each of the communications line interface types.

Data Rate Adapter Card

The optional Data Rate Adapter Card adapts synchronous and asynchronous DTE data at rates up to 19.2 kbps to an aggregate line rate of 56 or 64 kbps. Rate adaptation is provided for point-to-point and multipoint applications. It is available factory installed or as a field upgrade kit. The Data Rate Adapter Card plugs into the SpectraComm 500A base card, as illustrated in the figure below. For complete operating and installation instructions for the Data Rate Adapter Card, refer to publication GDC 048R162-A1.

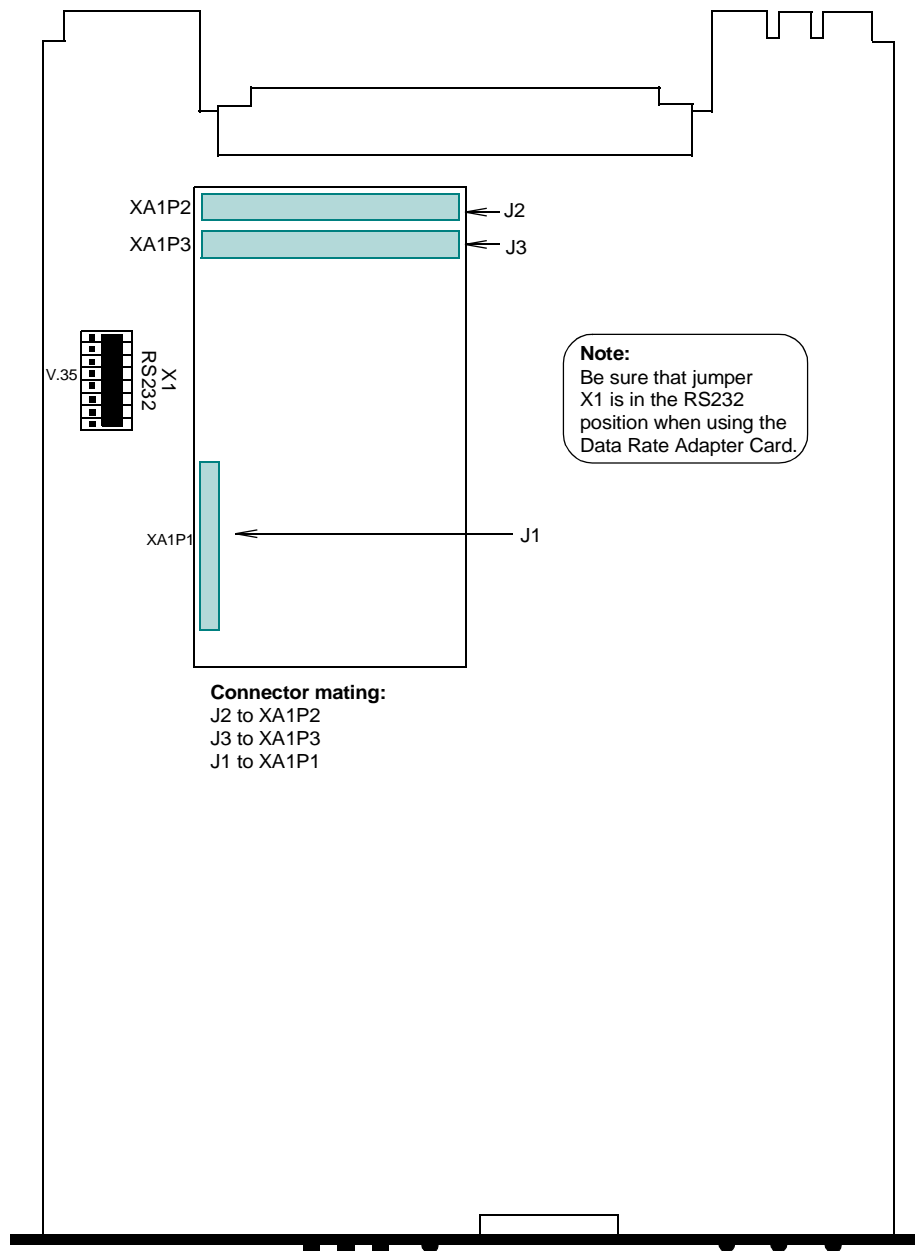


Figure 2-3 Data Rate Adapter Card Installation

EIA-530 Interface Card

The optional EIA-530 Interface Card provides an EIA-530 interface for the DTE. It is available factory installed, or as a field upgrade kit. The EIA-530 Interface Card plugs into the basecard in one of two ways, as illustrated in [Figure 2-4](#). In the active position, the card provides the EIA-530 interface, regardless of the interface selected with jumper X1. In the bypass position, the card acts as a jumper for XA1P2 and XA1P3, making the basecard interface active. (You can also remove the card and place jumpers on XA1P2 and XA1P3 to make the basecard interface active.)

To install the EIA-530 Interface Card:

1. Turn the unit OFF.
2. Remove the plug-in module from the rackmount shelf.
3. Remove the jumpers installed on connectors XA1P2 and XA1P3.
4. Plug the EIA-530 Interface Card into the basecard in either the active or the bypass position.
5. Insert the module into the shelf.
6. Turn the unit ON.

-
- Note**
- a. When the optional EIA-530 Interface Card is installed in the active position, DTE control of Remote Terminal Test and Self-Test is not supported.
 - b. You cannot install the EIA-530 Interface card and the Data Rate Adapter Card at the same time.
-

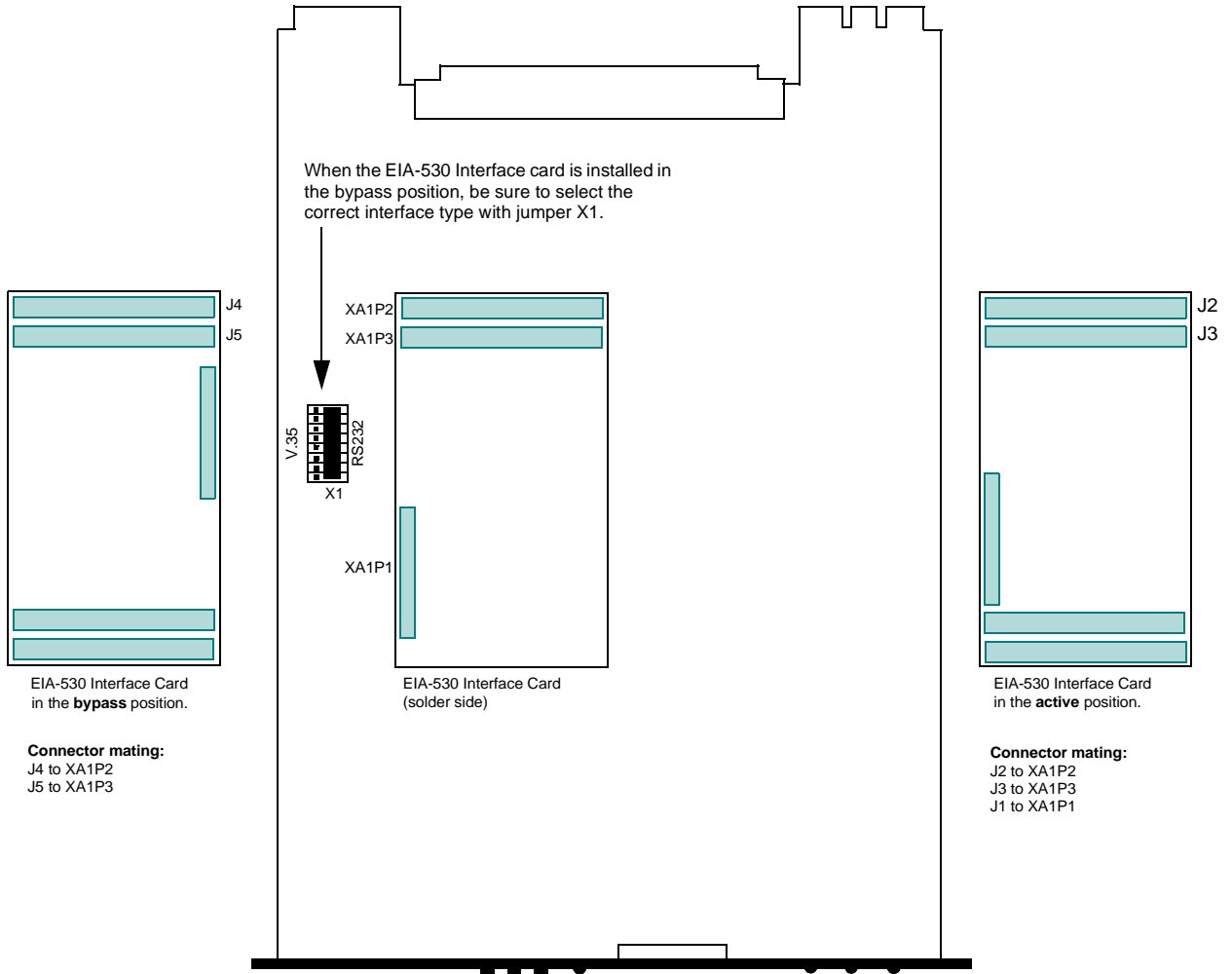


Figure 2-4 EIA-530 Interface Card Installation

Post-installation Check

If the DSU passes the preoperational check, but fails to perform data communications after installation, it is probably not at fault. There is either an error in option selection or installation, or a faulty communications line or remote installation.

Checking Option Selection

Review [Table 2-1](#) to verify that option selection is correct. If you need to restore the DSU to the factory-default option selections, set all option switches to the left (OFF) position, as illustrated in [Figure 2-1](#).

Checking the Installation and Communications Line

Check the DTE and communications line connections and, if necessary, perform the tests in [Chapter 4, Tests](#) to isolate the problem. Verify that the remote DSU is a compatible type (e.g., a DSU operating at the same data rate). Also verify that the DDS network is operating at the correct rate.

The four-wire communications line is composed of a transmit pair and a receive pair. If these pairs are transposed (crossed), the ALM LED flashes and the message "LinE" is displayed. Use of the wrong cable or mis-wiring of the telephone company-provided network interface may cause this problem and must be corrected in order to operate the DSU.

If the DSU does not check out properly, replace it with a spare and repeat the test. Do not attempt to repair the DSU. For assistance, contact VITAL Network Services (refer to Service and Support section in the Preface).

Changes In Service Rate

If the telco has changed the data rate, either force the DSU to Auto-Rate by pressing and holding front panel push buttons LL and RL simultaneously for at least five seconds or select the new rate with option switch S16.

Note *With Auto-Rate enabled, the DSU continually attempts to determine the line type and rate on power-up or when the line signal was absent for longer than 10 seconds and recovered. The DSU requires a full Auto-Rate cycle to accurately determine the line type and rate.*

Chapter 3: Operation

Overview

All operations of the SpectraComm 500A are controlled automatically after it is properly installed. It has no operating instructions (except for test procedures given in [Chapter 4, Tests](#)). This section describes the controls and indicators that are used to check the operation of the DSU.

Controls And Indicators

Controls and Indicators	Description
SD	Send Data - ON when a space bit is present in send data.
RD	Received Data - ON when a space bit is present in received data.
RS	Request to Send - ON when the DTE is ready to send data. Also ON during self-test modes or when the Permanent RTS option is enabled.
CS	Clear to Send - ON when the DSU is ready to send data. OFF during self-test modes.
CO	Carrier On - ON when the DSU is receiving data. OFF when the DSU is receiving idle or Out of Service codes.
MR	Modem Ready - ON when the DSU is ready. OFF when the SDU is receiving no signal or when it is receiving Out of Service codes when the System Status option is enabled.
TM	Test Mode - ON when the DSU is in a test mode.
ALM	Alarm - Flashes when the DSU detects an alarm state.
ST	Self-Test - Pressing this momentary-contact push button causes the local DSU's test pattern generator to generate and check a selectable test pattern. When the DSU is in a Self-Test mode, and you press and hold this push button for at least 2 seconds, the percentage of error-free seconds count is cleared (the test pattern generator is not affected).
LL	Line Loopback - Pressing this momentary-contact push button places the local DSU in Line Loopback (LL). Pressing it again terminates LL.
RL	Remote Loopback - Pressing this momentary-contact push button places the remote DSU in Remote Terminal Loopback (RL). Pressing it again terminates RL.
Digital Display	See Table 3-1 for readouts.
<i>Note</i>	<i>With Auto-Rate enabled, pressing and holding LL and RL simultaneously for at least 5 seconds forces the DSU to initiate the power-up self-test sequence and then to Auto-Rate. Before performing Auto-Rate, the DSU displays "Auto" and you can cancel Auto-Rate by releasing the push buttons.</i>

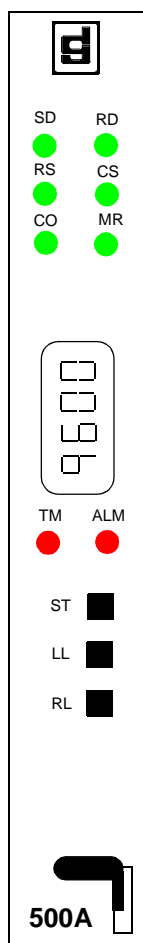


Figure 3-1 Front Panel Indicators and Controls

Table 3-1 Front Panel Display Readouts

Readout	Description
1200	Data rate is 1.2 kbps
1800	Data rate is 1.8 kbps
2400	Data rate is 2.4 kbps
4800	Data rate is 4.8 kbps
9600	Data rate is 9.6 kbps
19.2	Data rate is 19.2 kbps
56.0	Data rate is 56 kbps
64.0	Data rate is 64 kbps
PA55	Unit passed Power-up Self-Test
FA1L	Unit failed Power-up Self-Test, Line Loopback with Self-Test, V.54 RL or GDC RL
AUTO	Auto-Rate in progress; flashes for 5 seconds preceding a forced Auto-Rate
005r	Out of Service alarm (ALM LED flashes)
L1nE	DDS communication line crossed alarm (ALM LED flashes)
n5	No Signal alarm (ALM LED flashes)
RS	Streaming DTE alarm (ALM LED flashes)
d-RL	DTE-initiated Analog Loopback
LL	Line Loopback from front panel push button
[5U	Line Loopback from telco Serving Test Center (STC) current reversal
d5U	DSU Loopback test from STC codes
rL	Remote Loopback from front panel push button
L00P	Remote Loop condition (initiated from panel push button)
SELF	Power-up Self-Test
LL-5	Line Loopback with Self-Test from front panel push button
rL-5	Remote Loopback with Self-Test from front panel push button
nnnE	Percentage of error-free seconds during Self-Test mode (00.0E to 99.9E)
d-rL	DTE-initiated Remote Loopback
511	Self-Test pattern selected
2047	2047 Self-Test pattern selected
P127	PN127 RL test selected
v54	V.54 RL test selected
gdc	GDC RL test selected
c1r	Reset percentage of error-free seconds counter during Self-Test

(Sheet 1 of 2)

Table 3-1 Front Panel Display Readouts (Continued)

Readout	Description
E F 5	When alternating with nn.nE, error-free seconds are being computed; When on steady, test is 100% error free
E.F.5	18.2 hour test is finished
L.L.-.5.	18.2 hour test is finished
r.L.-.5.	18.2 hour test is finished
n n n n	Alphanumeric characters 0 to 9, A to F, during Power-up Self-Test displays firmware checksum for 5 seconds

(Sheet 2 of 2)

Overview

This section describes the tests that can be performed after installing the SpectraComm 500A or whenever you must check its operation. These tests can be used to isolate problems in the data communications system (refer to the fault-isolation sequence in [Figure 4-1](#)).

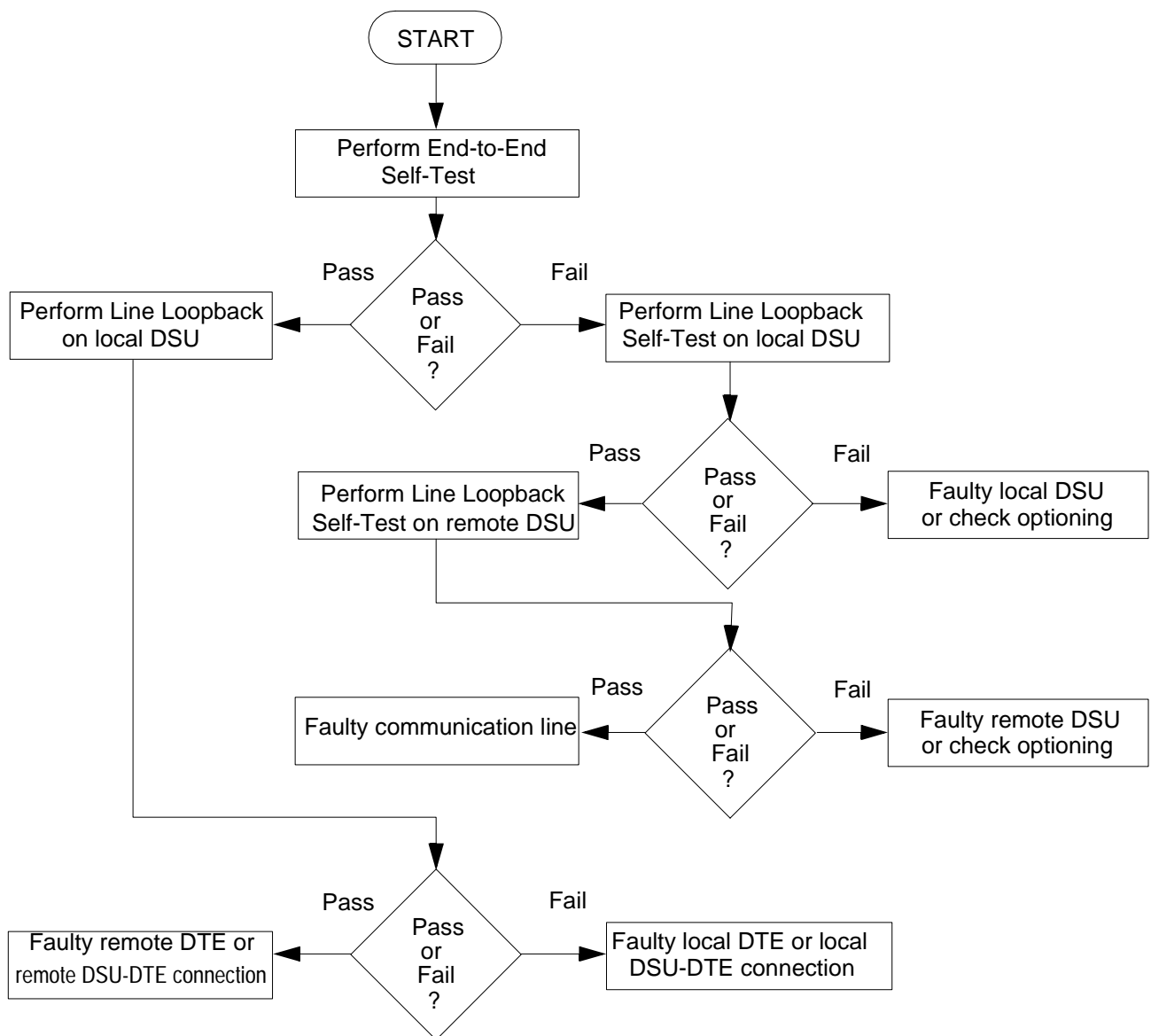


Figure 4-1 Fault-isolation Sequence

The SD and RD LEDs may appear to be ON or to flicker, depending on the data rate at which you are testing the DSU. When the DSU is operating at the higher rates (above 9600 bps), the indicators may appear to be ON steady; below that they may appear to flicker. The test descriptions and front panel indicators shown in the illustrations assume that the DSU has established its test and is operating at 9600 bps or below.

- Note**
- a. *Diagnostics may be controlled from the front panel push buttons, the DTE interfaces or from the telco's Serving Test Center (STC), depending on the specific test.*
 - b. *You can option the DSU to permit the DTE to control Analog Loopback Test and Remote Loopback (refer to [Table 2-1](#)).*
 - c. *[Table 4-1](#) describes the diagnostic test priorities.*
 - d. *To force the DSU to Auto-Rate and determine the line type and rate, press and hold front panel push buttons LL and RL simultaneously for at least five seconds. (Before performing Auto-Rate, the DSU displays "Auto" and you can cancel Auto-Rate by releasing the push buttons.) When Auto-Rate is complete, the DSU displays the line rate. If it is not the expected rate, contact the telco.*

Table 4-1 Diagnostic Test Priorities

Priority	Test	Means of Activation	Display
1	CSU Loopback	STC (current reversal)	CSU
2	LL/LL-ST	Front Panel	LL/LL-S
3	DSU Loopback	STC (Codes) (if activated first, has priority over LL/LL-ST)	dSU
4	RL/RL-ST	Front Panel	rL/rL-S
5	AL	DTE (if activated first, has priority over DSU Loopback)	d-AL
6	RL	DTE	d-rL
7	ST	Front Panel	EFS
8	RT (Remote)	(from remote RL)	LOOP

Line Loopback Test

Line Loopback (LL) checks the performance of the DSU and its associated DTE. The DSU disconnects its DTE interface transmitter and receiver from the communications line, then connects them together, creating a circuit similar to an Analog Loopback circuit that loops signals from the transmitter through the receiver. It also connects the transmit and receive pairs together, creating a circuit (the Line Loopback circuit) that loops received signals back over the communications line to the remote DSU. [Figure 4-2](#) illustrates LL.

While the local DSU is performing Line Loopback, the remote DSU can send a Self-Test pattern to the local DSU, which loops the test pattern back to the remote DSU for verification. This test checks the performance of the remote DSU and the communications line. To perform this test, make arrangements with the remote site personnel before initiating Line Loopback locally.

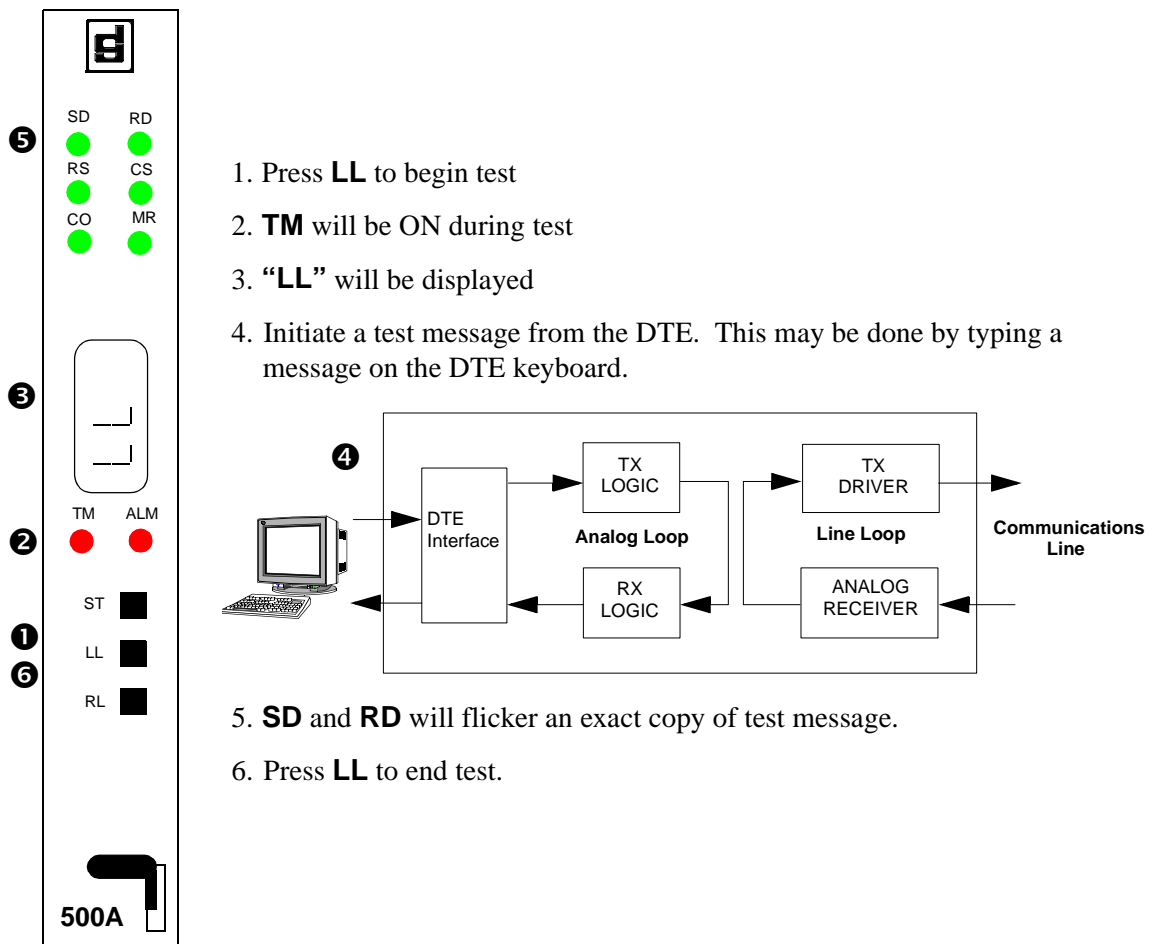


Figure 4-2 Line Loopback Test

Remote Loopback Test

Remote Loopback checks the performance of the local and remote DSUs, the local DTE, and the communications line. When you initiate this test, the remote DSU enters the RT Loopback condition. The remote DSU disconnects its DTE transmitter and receiver from the DTE interface, then connects them together, creating a circuit that loops the receiver's digital output signals to the transmitter's input. [Figure 4-3](#) illustrates RL.

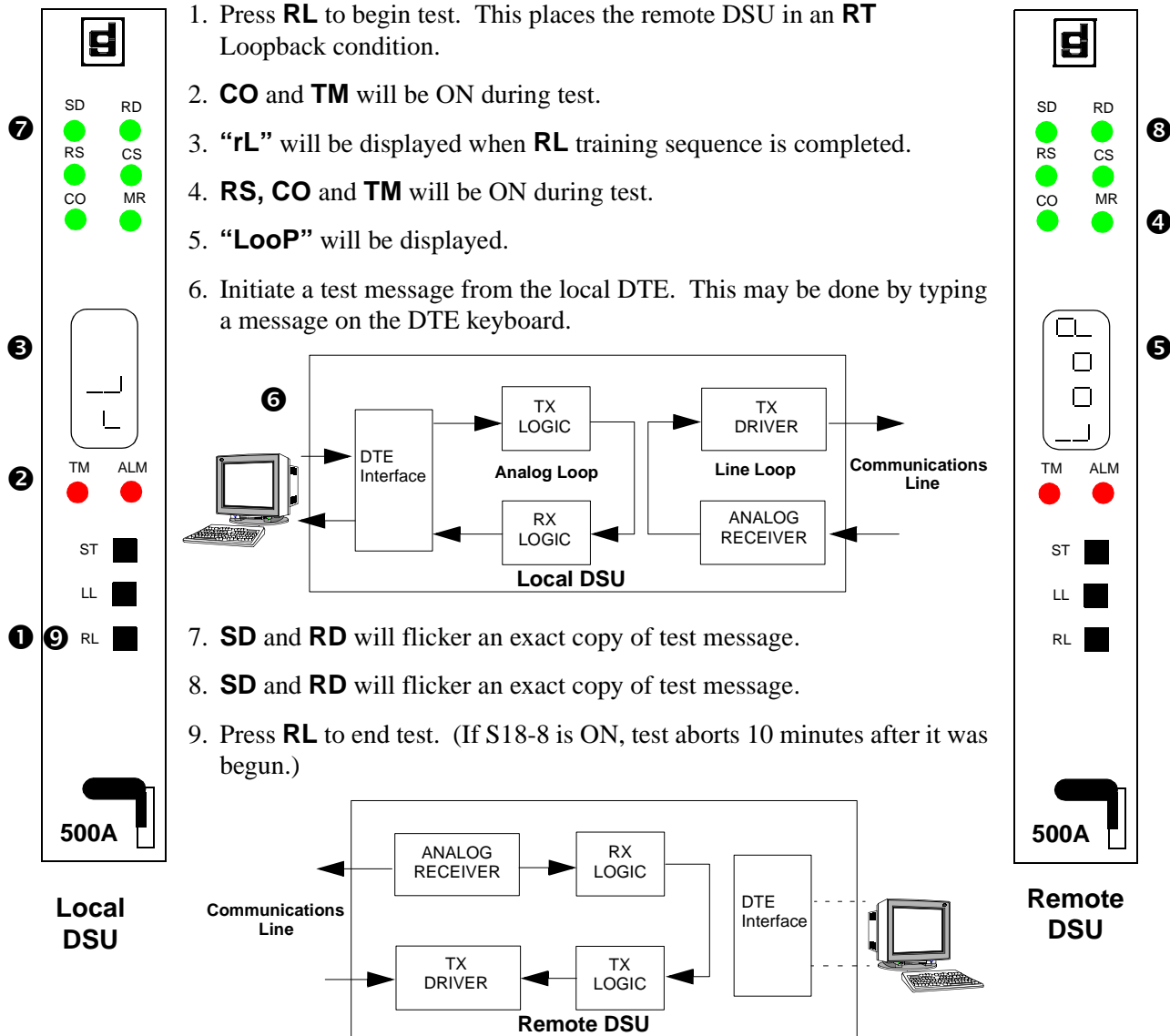


Figure 4-3 Remote Loopback Test

Self-Tests

The Self-Test function causes the DSU to generate a test pattern and monitor the received signal for errors in the received test pattern. Option switch S17-7 selects either a 511- or 2047-bit test pattern for the pattern generator and error detector. [Figure 4-4](#), [Figure 4-5](#) and [Figure 4-6](#) illustrate Self-Test. If the DSU detects any errors, the front panel displays the percentage of error-free seconds. You can use Self-Test in place of DTE-generated test messages for the Line Loopback and Remote Loopback tests, described below as Line Loopback Self-Test and Remote Loopback Self-Test.

Self-Test computes the percentage of error-free seconds for up to 18.2 hours. At the end of this time, the DSU no longer up-dates the percentage of error-free seconds, although the Self-Test circuitry continues to function. (All of the decimal points in the display light when the maximum Self-Test time is reached.)

During Self-Test, if you press the Self-Test push button and hold it for at least two seconds, the DSU resets or clears the percentage of error-free seconds counter.

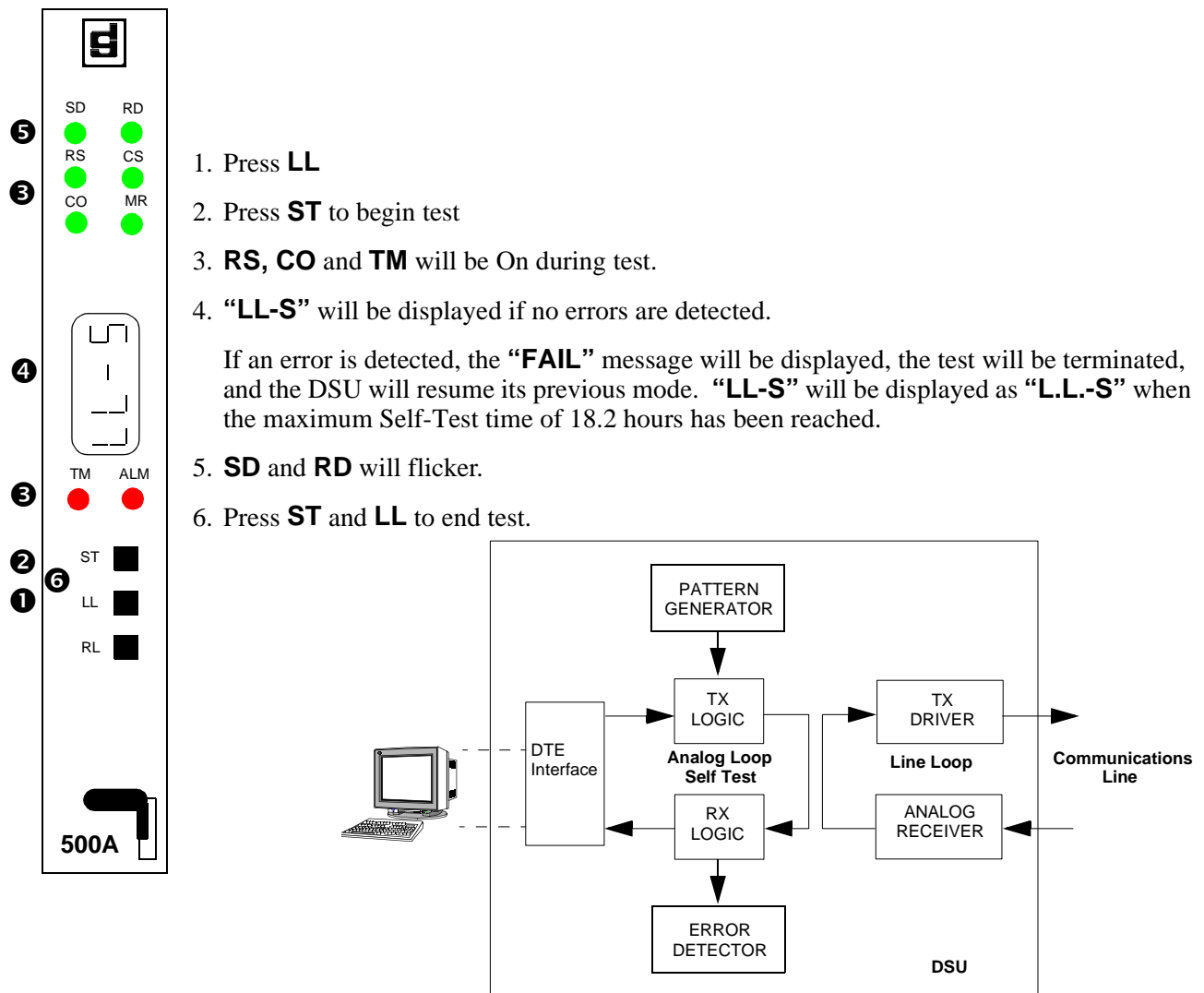


Figure 4-4 Line Loopback Self-test

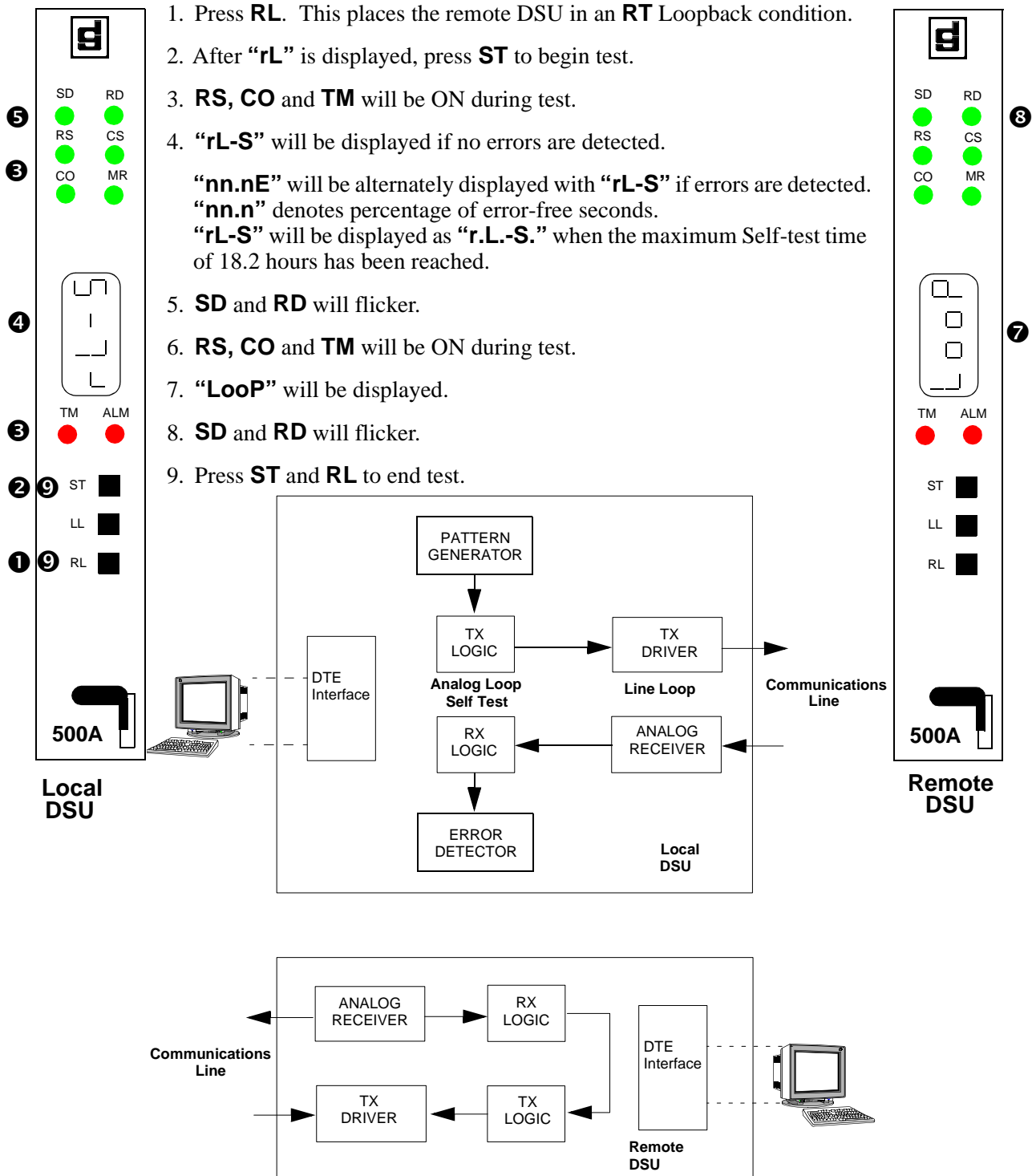
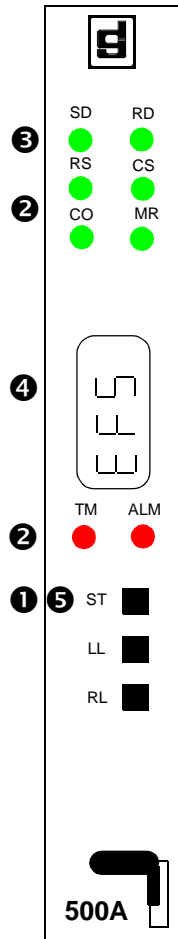


Figure 4-5 Remote Loopback Self-test

End-to-End Self-Test

In addition to using the Self-Test function in conjunction with other test features, you can Self-Test independently. In End-to-End Self-Test, the local and remote DSUs exchange Self-Test patterns to check the performance of the communications line and the local and remote DSUs (not including the DSUs' DTE interfaces). Option switch S17-7 selects either a 511- or 2047-bit test pattern for the pattern generator and error detector. [Figure 4-6](#) illustrates End-to-End Self-Test.



1. Press **ST** on local DSU. Direct attendant at remote DSU to press **ST** on remote DSU.
2. **RS**, **CO** and **TM** will be ON during test.
3. **SD** and **RD** will flicker.
4. “EFS” will be displayed if no errors are detected.
 “nn.nE” will be alternately displayed with “EFS” if errors are detected.
 “nn.n” denotes percentage of error-free seconds.
 “EFS” will be displayed as “E.F.S.” when the maximum Self-test time of 18.2 hours has been reached.
5. When **ST** is pressed and held for at least 2 seconds, the percentage of error-free seconds counter is cleared (the test pattern generator is not affected).
6. Press **ST** to end test.

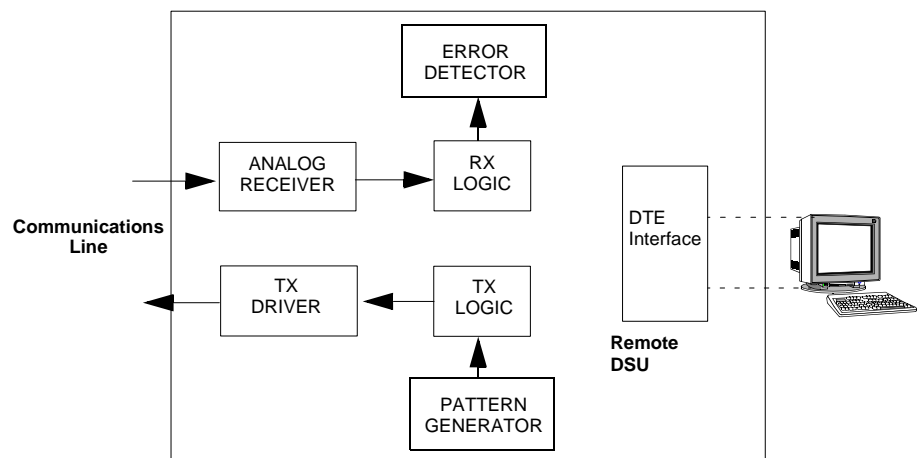
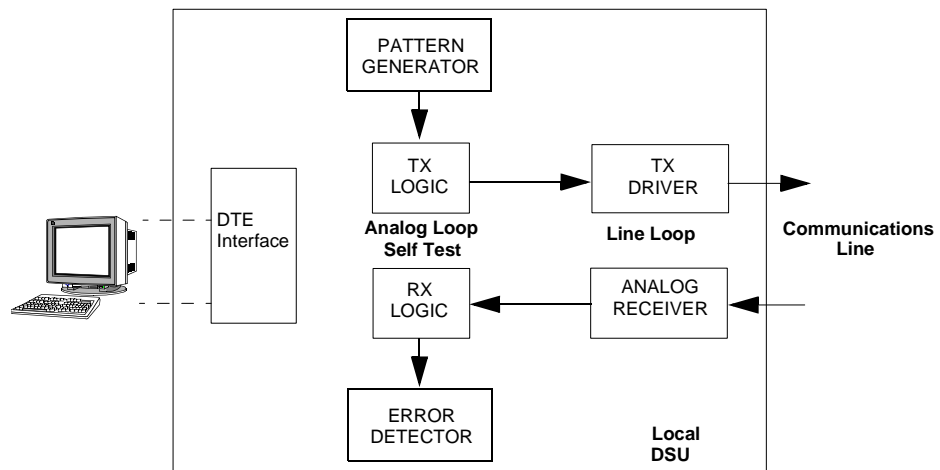


Figure 4-6 End-to-End Self-Test

CSU Loopback Test

The CSU Loopback test is controlled by the STC, which reverses the polarity of the sealing current. When the DSU detects the reversed current, it disconnects its communications line transmitter and receiver from the communications line and connects them together. It also connects the transmit and receive pairs together, creating a circuit (the Line Loopback circuit) that loops received signals back over the communications line to the STC. [Figure 4-7](#) illustrates CSU Loopback.

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

While the DSU is in CSU Loopback, you can send a test message from the local DTE through the local DSU, which loops the message back to the DTE for verification. This test checks the performance of the local DSU, DTE and DSU-DTE interconnections.

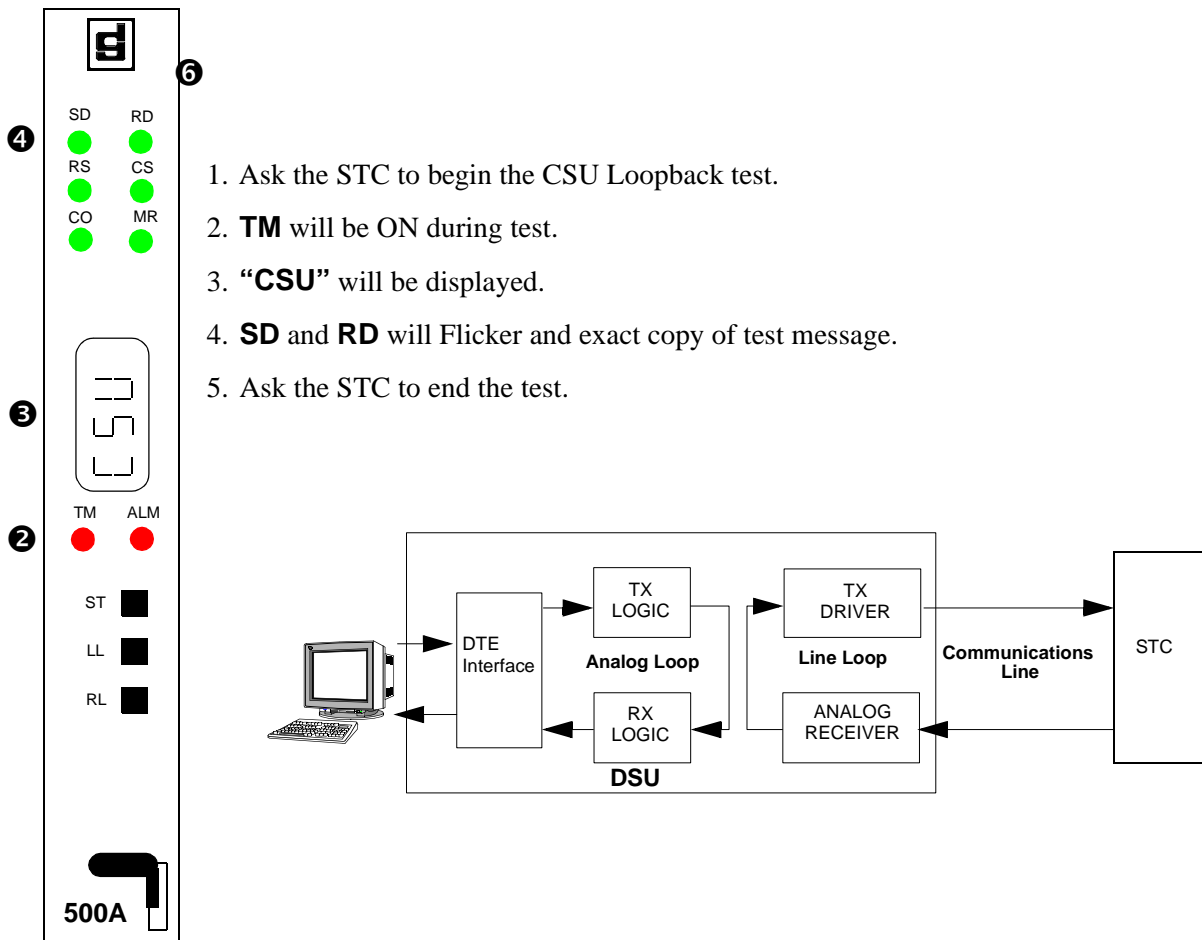


Figure 4-7 CSU Loopback Test

DSU Loopback Test

The DSU Loopback test is controlled by the STC, which sends network codes. When the DSU detects the codes, it disconnects its communications line transmitter and receiver from the communications line, then connects them together, creating a circuit that loops the receiver's digital out-put signals to the transmitter's input. [Figure 4-8](#) illustrates DSU Loopback.

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

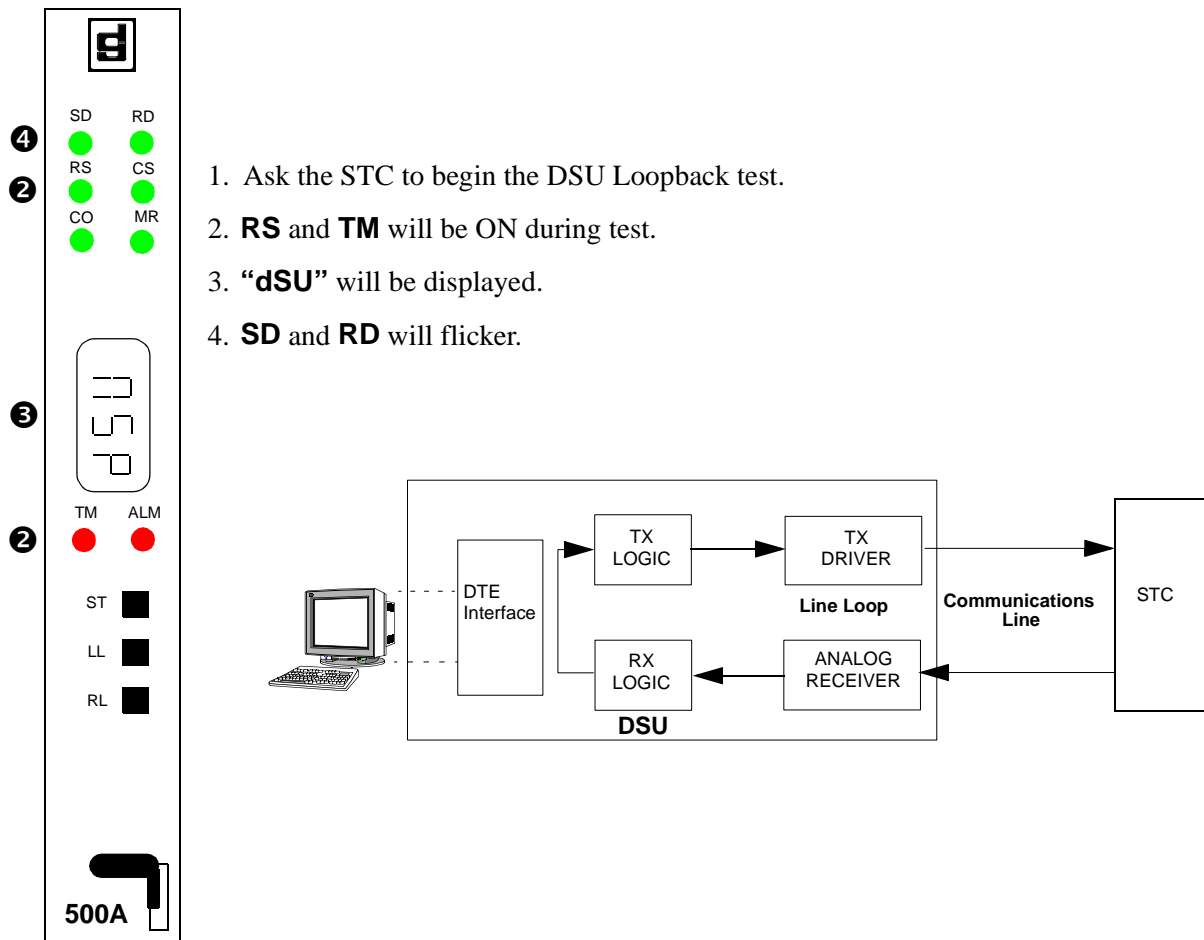


Figure 4-8 DSU Loopback Test

Appendix A: Technical Characteristics

Item	Specifications
Physical	
Plug-in module	
Height	0.81 in. (21 mm)
Width	7.0 in. (178 mm)
Depth	9.5 in. (241 mm)
Weight	10 oz (0.28 kg)
Shipping weight	1 lb 10 oz (0.74 kg)
Environmental	
Temperature	
Operating	32x to 122xF (0x to 50xC)
Non-operating	-40x to 185xF (-40x to 85xC)
Humidity, operating	5% to 95% without condensation
Altitude	
Operating	0 ft to 10,000 ft (0 m to 3,047 m). Derate by 1xC/1000 ft above sea level.
Non-operating	0 ft to 40,000 ft (0 m to 12,191 m)
Electrical	
Power requirements	Rated: ± 12 V dc, +5 V dc, 10 W maximum per card edge
Internal on-board power supply	22 V ac, 60 Hz, 24 VA
Power dissipation	6 W maximum, each
Voltage/frequency	See SpectraComm Shelf manual for requirements
Fusing	See SpectraComm Shelf manual for requirements
Safety protection	UL listed and CSA approved
Compatibility	Fully compliant with Bell Pub. 62310 and ANSI T1.410 standards
Operating mode	
Conventional DDS	Full duplex, point-to-point/multipoint
64 kbps DDS	Full duplex, point-to-point
Data encoding	Bipolar, return-to-zero
Data format	
Synchronous	Binary, serial
Asynchronous	Binary, serial; 8-11 bits/character (CCITT V.14 compliant)
Data rate	
Synchronous	2.4, 4.8, 9.6, 19.2, 56 or 64 kbps
Asynchronous	1.2, 1.8, 2.4, 4.8, 9.6 or 19.2 kbps

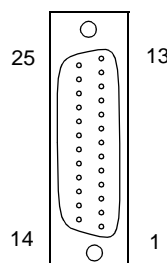
Technical Characteristics

Item	Specifications
Overspeed correction	1 or 2.3%
Line requirement	Four-wire, non-loaded metallic circuit (19-26 ga)
Line impedance	135 ohms $\pm 20\%$ (nominal)
Range	
Line data rate	Maximum mileage with 26 ga cable
2.4 kbps	11.5 mi (18.5 km)
4.8 kbps	8.7 mi (14 km)
9.6 kbps	6.1 mi (9.8 km)
19.2 kbps	5.0 mi (8.1 km)
56 kbps	3.6 mi (5.8 km)
64 kbps	3.2 mi (5.2 km)
Receiver	
Dynamic range	48 dB extended range at 56 kbps
Acquisition time	350 ms maximum
Release time	1 sec nominal
Transmit power	
1.2, 1.8, 2.4, 4.8, 19.2, 56 and 64 kbps	6.0 dBm maximum (50% duty cycle, random bipolar sequence, 135-ohm impedance)
9.6 kbps	0 dBm maximum (50% duty cycle, random bipolar sequence, 135-ohm impedance)
Transmitter timing	Receiver (slave/network), internal (DSU) $\pm 0.01\%$, or external (DTE) $\pm 0.02\%$
Business equipment (DTE) interface	EIA/TIA-232-E or CCITT V.35
RTS-CTS delay	
2.4 kbps	8 ms nominal
4.8 kbps	4 ms nominal
9.6 kbps	2 ms nominal
19.2 kbps	1.0 ms nominal
56 kbps	0.35 ms nominal
64 kbps	n/a
Extended RTS-CTS delay	45 ms nominal

Appendix B: Business Equipment Interface

Table B-1 EIA/TIA-232-E, CCITT V.24 Business Equipment Interface

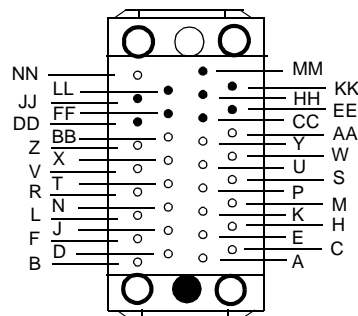
Pin	Circuit		Name	Function	Description
	232-E	V.24			
2	BA	103	SD	Transmitted data	Transfers data signals from DTE for modulation and transmission over communications line.
3	BB	104	RD	Received data	Transfers data signals to DTE that were received over communications line and demodulated by DSU.
4	CA	105	RS	Request to send	Indicates to DSU that DTE is prepared to transmit.
5	CB	106	CS	Clear to send	Indicates to DTE that DSU is prepared to transmit.
6	CC	107	DSR	Data set ready	Indicates to DTE that DSU is prepared for data communications.
7	AB	102	SIG GND	Signal ground	Establishes a common ground reference for all interface circuits except protective ground.
8	CF	109	CO	Received line signal detector	Indicates to DTE that DSU is receiving data (not receiving idle or OOS codes).
9			+12 V	+12 volts	+12 V supply
10			-12 V	-12 volts	-12 V supply
15	DB	114	SC	DCE transmitter signal element timing	Transfers transmitter signal timing information from DSU to DTE.
17	DD	115	RC	Receiver signal element timing	Transfers receiver signal timing information from DSU to DTE.
18	LL		ALE	Analog Loopback enable	Transfers signal from DTE to control Analog Loopback test if option switch S14-1 is ON.
20	CD	108.2	TR	Data terminal ready	Indicates to DSU that DTE is prepared for data communications.
21	RL		RLE	Remote Digital Loopback enable	Transfers signal from DTE to control Remote Digital Loopback test mode if option switch S14-2 is ON.
24	DA	113	TC	DTE transmitter signal element timing	Transfers transmitter signal timing information from DTE to DSU (external clock).
25	TM		TME	Test mode indicator	Indicates to DTE that DSU is in a test mode if option switch S14-3 is ON.



EIA/TIA-232-E, CCITT V.24 Female Connector (Shelf Rear View)

Table B-2 CCITT V.35 Business Equipment Interface

DB25 Pin	V.35 Pin	Ckt.	Name	Function	Description
7	B	102		Signal ground	Establishes a common ground reference for all interface circuits except protective ground.
4	C	105	RS	Request to send	Indicates to DSU that DTE is prepared to transmit.
5	D	106	CS	Clear to send	Indicates to DTE that DSU is prepared to transmit.
6	E	107	DSR	Data set ready	Indicates to DTE that DSU is prepared for data communications.
8	F	109	CO	Receive line signal detect	Indicates to DTE that DSU is receiving data (not receiving idle or OOS codes).
20	H	108.2	TR	Data terminal ready	Indicates to DSU that DTE is prepared for data communications.
25	NN	142	TM	Test mode	Indicates to DTE that DSU is in a test mode if option switch S14-3 is ON.
18	L	141	ALE	Analog Loopback enable	Transfers signal from DTE to control Analog Loopback test if option switch S14-1 is ON.
2 14	P S	103 103	SD-A SD-B	Transmitted data	Transfers data signals from DTE for modulation and transmission over communications line.
3 16	R T	104 104	RD-A RD-B	Received data	Transfers data signals to DTE that were received over communications line and demodulated by DSU.
24 11	U W	113 113	TT-A TT-B	Terminal timing	Transfers transmitter signal timing information from DTE to DSU (external clock).
17 9	V X	115 115	RT-A RT-B	Receive timing	Transfers receiver signal timing information from DSU to DTE.
15 12	Y AA/a	114 114	ST-A ST-B	Transmit timing	Transfers transmitter signal timing information from DSU to DTE.
21	N	140	RLE	Remote Digital Loopback enable	Transfers signal from DTE to control Remote Digital Loopback test mode if option switch S14-2 is ON.



CCITT V.35 Female Connector (Shelf Rear View)

Table B-3 EIA-530 Business Equipment Interface

P1 Pin No.	EIA Circuit Designation	Signal	Description
2 14	BA(A) BA(B)	Transmitted data	Transfers data signals from DTE for modulation and transmission over communications lines.
3 16	BB(A) BB(B)	Received data	Transfers data signals to DTE that were received over communications line and demodulated by DSU.
4 19	CA(A) CA(B)	Request to send	Indicates to DSU that DTE is prepared to transmit.
5 13	CB(A) CB(B)	Clear to send	Indicates to DTE that DSU is prepared to transmit.
6 22	CC(A) CC(B)	Data set ready	Indicates to DTE that DSU is prepared for data communications.
20 23	CD(A) CD(B)	Data terminal ready	Indicates to DSU that DTE is prepared for data communications.
7	AB	Signal ground	Establishes a common ground reference for interface circuits except protective ground.
8 10	CF(A) CF(B)	Received line signal detector	Indicates to DTE that DSU is receiving data (not receiving idle or OOS codes).
15 12	DB(A) DB(B)	Transmitter signal element timing	Transfers transmitter signal timing information from DSU to DTE.
17 9	DD(A) DD(B)	Receiver signal element timing	Transfers receiver signal timing information from DSU to DTE.
18	LL	Analog Loopback enable	Transfers signal from DTE to control Analog Loopback test if option switch S14-1 is ON.
21	RL	Remote Digital Loopback enable	Transfers signal from DTE to control Remote Digital Loopback test if option switch S14-2 is ON.
24 11	DA(A) DA(B)	Transmitter signal element timing (External Clock)	Transfers transmitter signal timing information from DTE to DSU.
25	TM	Test mode indicator	Indicates to DTE that DSU is in test mode if option switch S14-3 is ON.

Appendix C: Communications Line Interfaces

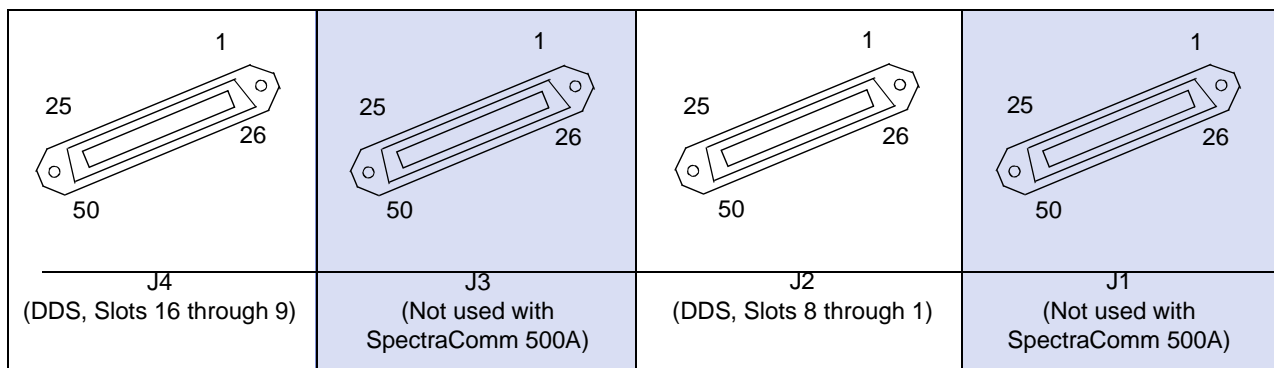
Table C-1 50-PIN Connector Functions (Shaded areas do not apply)

Pin	Function			Connector and Slot	
	S/N (RJ27X)	P/L(JM25X, RJ2GX)	DDS	Conn. J1 (S/N)	Conn. J3 (S/N)
				Conn. J2 (DDS)	Conn. J4 (DDS)
26	T	T	T	1	9
1	R	R	R		
27	PC	T1	T1		
2	PR	R1	R1		
28	MI	TEK 5/E	-		
3	MIC	TEK 6/M	-		
29	T	T	T	2	10
4	R	R	R		
30	PC	T1	T1		
5	PR	R1	R1		
31	MI	TEK 5/E	-		
6	MIC	TEK 6/M	-		
32	T	T	T	3	11
7	R	R	R		
33	PC	T1	T1		
8	PR	R1	R1		
34	MI	TEK 5/E	-		
9	MIC	TEK 6/M	-		
35	T	T	T	4	12
10	R	R	R		
36	PC	T1	T1		
11	PR	R1	R1		
37	MI	TEK 5/E	-		
12	MIC	TEK 6/M	-		
38	T	T	T	5	13
13	R	R	R		
39	PC	T1	T1		
14	PR	R1	R1		
40	MI	TEK 5/E	-		
15	MIC	TEK 6/M	-		

Communications Line Interfaces

Table C-1 50-PIN Connector Functions (Shaded areas do not apply)

Pin	Function			Connector and Slot	
	S/N (RJ27X)	P/L(JM25X, RJ2GX)	DDS	Conn. J1 (S/N)	Conn. J3 (S/N)
				Conn. J2 (DDS)	Conn. J4 (DDS)
41	T	T	T	6	14
16	R	R	R		
42	PC	T1	T1		
17	PR	R1	R1		
43	MI	TEK 5/E	-		
18	MIC	TEK 6/M	-		
44	T	T	T	7	15
19	R	R	R		
45	PC	T1	T1		
20	PR	R1	R1		
46	MI	TEK 5/E	-		
21	MIC	TEK 6/M	-		
47	T	T	T	8	16
22	R	R	R		
48	PC	T1	T1		
23	PR	R1	R1		
49	MI	TEK 5/E	-		
24	MIC	TEK 6/M	-		
50	unassigned	unassigned	unassigned	-	-
25	unassigned	unassigned	unassigned	-	-



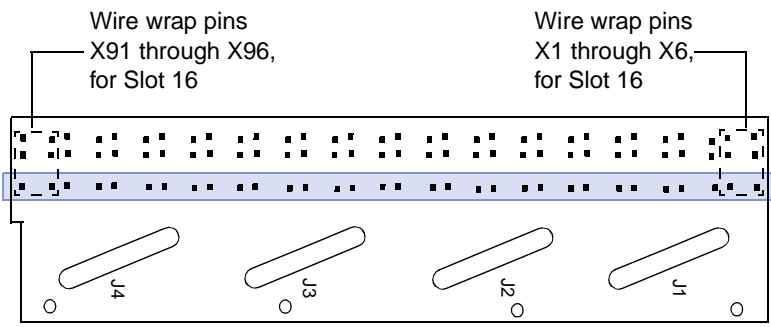
50-PIN Female Connectors (Shelf Rear View)

Table C-2 Wire Wrap Pin Functions (Shaded areas do not apply)

Function						Slot
S/N (RJ27X)		P/L (JM25X, RJ2GX)		DDS		
T	X6	T	X3	T	X3	1
R	X5	R	X1	R	X1	
		T1	X4	T1	X4	
		R1	X2	R1	X2	
T	X12	T	X9	T	X9	2
R	X11	R	X7	R	X7	
		T1	X10	T1	X10	
		R1	X8	R1	X8	
T	X18	T	X15	T	X15	3
R	X17	R	X13	R	X13	
		T1	X16	T1	X16	
		R1	X14	R1	X14	
T	X24	T	X21	T	X21	4
R	X23	R	X19	R	X19	
		T1	X22	T1	X22	
		R1	X20	R1	X20	
T	X30	T	X27	T	X27	5
R	X29	R	X25	R	X25	
		T1	X28	T1	X28	
		R1	X26	R1	X26	
T	X36	T	X33	T	X33	6
R	X35	R	X31	R	X31	
		T1	X34	T1	X34	
		R1	X32	R1	X32	
T	X42	T	X39	T	X39	7
R	X41	R	X37	R	X37	
		T1	X40	T1	X40	
		R1	X38	R1	X38	
T	X48	T	X45	T	X45	8
R	X47	R	X43	R	X43	
		T1	X46	T1	X46	
		R1	X44	R1	X44	
T	X54	T	X51	T	X51	9
R	X53	R	X49	R	X49	
		T1	X52	T1	X52	
		R1	X50	R1	X50	

Table C-2 Wire Wrap Pin Functions (Shaded areas do not apply) (Continued)

Function						Slot
S/N (RJ27X)		P/L (JM25X, RJ2GX)		DDS		
T	X60	T	X57	T	X57	10
R	X59	R	X55	R	X55	
		T1	X58	T1	X58	
		R1	X56	R1	X56	
T	X66	T	X63	T	X63	11
R	X65	R	X61	R	X61	
		T1	X64	T1	X64	
		R1	X62	R1	X62	
T	X72	T	X69	T	X69	12
R	X71	R	X67	R	X67	
		T1	X70	T1	X70	
		R1	X68	R1	X68	
T	X78	T	X75	T	X75	13
R	X77	R	X73	R	X73	
		T1	X76	T1	X76	
		R1	X74	R1	X74	
T	X84	T	X81	T	X81	14
R	X83	R	X79	R	X79	
		T1	X82	T1	X82	
		R1	X80	R1	X80	
T	X90	T	X87	T	X87	15
R	X89	R	X85	R	X85	
		T1	X88	T1	X88	
		R1	X86	R1	X86	
T	X96	T	X93	T	X93	16
R	X95	R	X91	R	X91	
		T1	X94	T1	X94	
		R1	X92	R1	X92	



Wire Wrap Pins (Shelf Rear View)

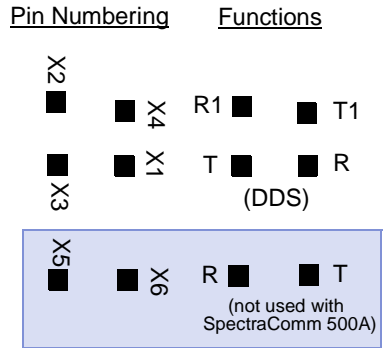
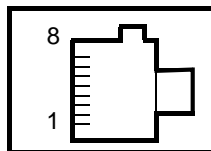
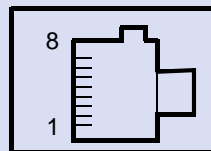


Table C-3 RJ45 Jack - Communications Line Interface (Shaded areas do not apply)

Pin	Function			
	Lower Jacks	Upper Jacks		
	S/N Prog. (RJ45S)	DDS (RJ48S)	T1.5 (RJ48C/X)	EIA, P/L, TBS-18 (JM-8)
1	-	R	R1	R
2	-	T	T1	T
3	MI	-	-	TEK 5/E
4	R	-	R	-
5	T	-	T	-
6	MIC	-	-	TEK 6/M
7	PR	T1	-	T1
8	PC	R1	-	R1



Upper jacks
J17 to J32
(DDS)



Upper jacks
J17 to J32
(Not used with SpectraComm 500A)

RJ45 8-Position Modular Jacks (Shelf Rear View)



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