

TeleLite™

Data 56K DDS Interface Card Description and Installation Guide

925W720114-04E



Contents

Chapter 1 – General Information

1.1 Publication Information	6
1.2 About this Guide	7
Related Documentation	7
Positron Products and Services	7
1.3 Service and Support	8
Technical Customer Support	8
Customer Training	8
1.4 Compliance Information	9
FCC Part 15	9
FCC Part 68	9
Laser Safety	11
Repair Service	11
1.5 TeleLite Warranty	12
Limitation of Liability	12
Cancellation and Rescheduling Charges	13

Chapter 2 – Overview

2.1 TeleLite System Introduction	14
Fiber Connectors	15
2.2 Introduction to the Data 56K DDS Interface Card	16
Applications	16
Data 56K DDS Interface Card Model Numbers	16
LED Indicator Description	17

Express Pair	18
Data 56K DDS DIP-Switch Settings	20
Loop-back Mode	22
RJ45 Pin-out Description	24
Specifications	25

Chapter 3 – Installation

3.1 Installing the Data 56K DDS Interface Card	28
3.2 Wiring and Connections	30
Equipment-side Wiring Connections	30
Fiber Facility-side wiring Connections	30
3.3 Testing	30
3.4 Troubleshooting	31

Appendix A – Acronyms

Acronyms	34
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Chapter 1

General Information

1.1 Publication Information

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**TeleLite Data 56K DDS Interface Card
Description and Installation Guide**

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1.2 About this Guide

This guide introduces you to the TeleLite Data 56K DDS Interface Card, its features and applications, and describes how to install one in a TeleLite shelf. This guide was designed to be read from beginning to end.

1.2.1 Related Documentation

For any other technical document relating this TeleLite system installation or applications cards and shelves, please refer to the Positron Web site: www.PositronPower.com.

1.2.2 Positron Products and Services

Positron engineers and manufactures insulation testing and high voltage isolation products to protect personnel and telecommunications circuits in high voltage areas that are susceptible to the effects of Ground Potential Rise (GPR).

Positron is the leader in isolation technology with its Teleline wireline products and TeleLite optical fiber wireline isolation/protection product families. Positron provides total flexibility in product configuration – from standalone units protecting a single circuit to high-capacity, multi-shelf HVI pre-configured systems.

Positron also provides a wide range of consulting, analysis and training services for communications companies, public safety and security organizations and electrical utilities.

Full details and contact information are available at www.PositronPower.com.

1.3 Service and Support

Table 1: Positron Contact Information

General information	Positron Inc. 5101 Buchan Street, Suite 220 Montreal, Quebec, Canada H4P 2R9 US and Canada: 1-888-577-5254 International: 1-514-345-2220 Fax: 514-345-2271 E-mail: info@positronpower.com Website: www.PositronPower.com
Repairs	US and Canada: 1-888-577-5254 International: 1-514-345-2220

1.3.1 Technical Customer Support

Positron is committed to providing excellent ongoing technical support to its customers. A team of specialists is always available for telephone consultations or for on-site visits to assist in the maintenance and troubleshooting of Positron equipment.

For pricing information or assistance in the planning, configuration and implementation of the installation of equipment, contact Technical Customer Service (TCS) at 1-888-577-5254 (US and Canada) or at 1-514-345-2220 (International).

1.3.2 Customer Training

Full customer training courses on High Voltage Interface (HVI) are also available. For more information, contact Positron.

1.4 Compliance Information

1.4.1 FCC Part 15

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

1.4.2 FCC Part 68

This equipment complies with Part 68 of the FCC rules and the requirements adopted by the ACTA (Administrative Council on Terminal Attachments). On the back of this equipment is a label that contains, among other information, a product identifier in the format US:AAAEQ##TXXXX. If requested, this number must be provided to the telephone company.

You are required to request service from the telephone company before you connect the unit to a network. When you request service, provide the telephone company with the following information:

Table 2: Request Service Information

Product Identifier:	PP-DDS-0
Facility Interface Code (FIC):	04DU5.56
Service Order Code (SOC):	6.0F
Universal Service Order Code (USOC) jack:	RJ48C
Network Address Code:	N
Equipment Code:	OT
REN:	Not applicable
Identification Numbers: US:	CT5OTNANPP-DDS-0

A plug and jack used to connect this equipment to the premises wiring and telephone network must comply with the applicable FCC Part 68 rules and requirements adopted by the ACTA. A compliant telephone cord and modular plug is provided with this product. It is designed to be connected to a compatible modular jack that is also compliant. For details, see installation instructions.

The REN is used to determine the number of devices that may be connected to a telephone line. Excessive RENs on a telephone line may result in the devices not ringing in response to an incoming call. In most but not all areas, the sum of RENs should not exceed five (5.0). To be certain of the number of devices that may be connected to a line, as determined by the total RENs, contact the local telephone company. For products approved after July 23, 2001, the REN for this product is part of the product identifier that has the format US:AAAEQ##TXXXX. The digits represented by ## are the REN without a decimal point (for example, 03 is a REN of 0.3). For earlier products, the REN is separately shown on the label.

If this equipment causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice isn't practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

The telephone company may make changes in its facilities, equipment, operations or procedures that could affect the operation of the equipment. If this happens the telephone company will provide advance notice in order for you to make necessary modifications to maintain uninterrupted service.

If trouble is experienced with the TeleLite product, please contact Positron for repair or warranty information. If the equipment is causing harm to the telephone

network, the telephone company may request that you disconnect the equipment until the problem is resolved.

Positron Inc. located at 5101 Buchan Street, Suite 220, Montreal in Canada hereby certifies that the TeleLite bearing labeling identification numbers mentioned above complies with the Federal Communications Commission's (FCC) Rules and Regulations 47 CFR Part 68, and the Administrative Council on Terminal Attachments (ACTA)-adopted technical criteria TIA-968-A-2, Telecommunications - Telephone Terminal Equipment -Technical Requirements for Connection of Terminal Equipment To the Telephone Network, January 2004.

1.4.3 Laser Safety

This laser class 1 product complies with 21 CFR 1040.10 except for deviations pursuant to Laser Notice No. 50, dated July 26, 2001.

1.4.4 Repair Service

All warranty repairs are performed at no cost. Positron reserves the right to repair or replace any equipment that has been found to be defective.

For information about out-of-warranty repairs, contact Positron's Repair Department. Due to the varied nature of repairs, no specific turnaround can be guaranteed, but average turnaround time is 20 working days from date of receipt. In emergency situations, special arrangements can be made. All repaired items are warranted for a period of 90 days.

Before returning any items to Positron for repair, warranty repair or replacement, call the Repair department to obtain a Return Material Authorization (RMA) number. Parts returned without RMA numbers cannot be accepted. The RMA number must always be clearly marked on all boxes, crates, and shipping documents. Bulk repairs (more than five items) will require additional processing time, so please take this into consideration when requesting an RMA number.

To accelerate the repair process, whenever possible, include a report detailing the reason for return with the unit(s). Also, please include the name and phone number of a person who can be contacted should our Repair department need further information.

When packing items being returned for repair, please ensure they are properly packed to avoid further damage. Plug-in cards should never be shipped while

installed in a shelf; this will cause damage that can extend the repair period.

1.5 TeleLite Warranty

Subject to the provisions of this paragraph, Positron warrants that the equipment shall perform in accordance with Positron's specifications. The warranty remains valid for one (1) year from the date of shipment. The warranty fully covers workmanship, materials and labor. Positron shall, at its sole discretion, repair or replace the problem unit.

Freight costs to ship defective equipment to Positron are borne by the Customer, with return of replaced or repaired equipment to be at Positron's expense.

1.5.1 Limitation of Liability

Subject to anything to the contrary contained herein, Positron's sole obligation and liability and the customer's sole remedy for Positron's negligence, breach of warranty, breach of contract or for any other liability in any way connected with or arising out of, the equipment or any services performed by Positron shall be as follows:

- In all situations involving performance or non-performance of the equipment or any component thereof, the customer's sole remedy shall be, at Positron's option, the repair or replacement of the equipment or said component.
- For any other claim in any other way related to the subject matter of any order under, the customer shall be entitled to recover actual and direct damages; provided that Positron's liability for damages for any cause whatsoever, and regardless of the form of the action, whether in contract or in tort (including negligence), shall be limited to the value of the order.

Positron shall not be obligated to repair or replace any item of the equipment which has been repaired by others, abused or improperly handled, improperly stored, altered or used with third party material or equipment, which material, or equipment may be defective, of poor

quality or incompatible with the equipment supplied by Positron, and Positron shall not be obligated to repair or replace any component of the equipment which has not been installed according to Positron specifications.

IN NO EVENT SHALL POSITRON BE LIABLE FOR ANY INDIRECT, INCIDENTAL, SPECIAL, CONSEQUENTIAL, PUNITIVE, EXEMPLARY OR SIMILAR OR ADDITIONAL DAMAGES INCURRED OR SUFFERED INCLUDING LOSS OF PROFITS, LOSS OF REVENUES, LOSS OF DATA, LOSS OF BUSINESS INFORMATION, LOSS OF GOODWILL, LOSS OF EXPECTED SAVINGS OR BUSINESS INTERRUPTION ARISING OUT OF OR IN CONNECTION WITH THE EQUIPMENT, A PURCHASE ORDER SUPPLIES, MAINTENANCE SERVICES OR OTHER SERVICES FURNISHED HEREUNDER, EVEN IF POSITRON HAS BEEN ADVISED OR IS AWARE OF THE POSSIBILITY OF SUCH DAMAGES.

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1.5.2 Cancellation and Rescheduling Charges

Should the customer cancel, prior to shipment, any part of an order, the customer agrees to pay to Positron cancellation charges, not as a penalty, which shall total all expenses, including labor expenses, incurred by Positron prior to said cancellation. Equipment that has been specially developed for the customer's specific applications shall not be subject to cancellation. Cancellation or rescheduling is not permissible after shipment of the System.

Chapter 2

Overview

2.1 TeleLite System Introduction

TeleLite provides electrical isolation between two points on a telecom landline. Its purpose is to increase electrical isolation between the CO (Central Office) side and Station side. The increase in electrical isolation is achieved by using a fiber optic link. The Station side unit is located either inside or outside the building. The CO side must be located far enough from the Station side so that the GPR does not increase above 300 V with respect to the CO.

The TeleLite system is divided into two parts: the **CO side unit** and the **Station side unit**. Each unit is composed of one shelf. Each shelf has six slots for line cards and one slot for a power connection. The shelf backplane does not provide for any telecom connection since all connections (except local power) will be made directly to the connectors, located on the front panel of each card.

The communications link between the CO side unit and the Station side unit supports single-mode or multi-mode fibers, depending on the customer installation.

NOTE

The appropriate fiber type must be used for each line card (multi-mode or single-mode).

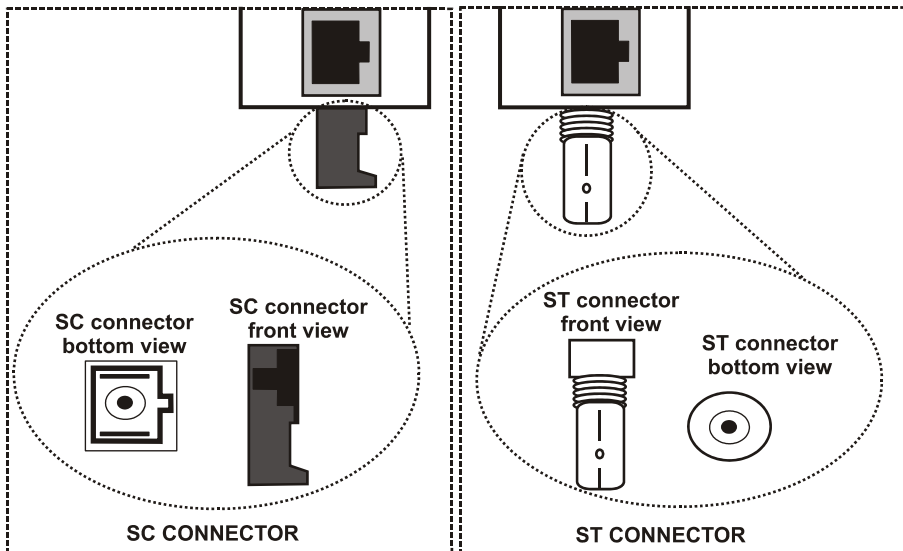
2.1.1 Fiber Connectors

The fiber interface is located on the bottom front panel of each plug-in card (except for the TeleLite Access and Power/Access interface cards). Each of these fiber interfaces will support one of two types of fiber connectors: ST or SC.

Table 3: Fiber Connectors

	Description
SC	A plastic snap-on optic connector.
ST	An optical fiber connector used to join single fibers together at interconnects, or to connect them to optical cross connects.

Figure 1: SC and ST Fiber Connector Types



2.1.1.1 Multi-mode fiber type

For short distances, less than 2 km (1.2 miles), the fiber type will be **multi-mode** using an 850 nm wavelength LED.

2.1.1.2 Single-mode fiber type

For longer distances, up to 16 km (9.9 miles), the fiber type will be **single-mode** using a 1310 nm wavelength laser.

2.2 Introduction to the Data 56K DDS Interface Card

The Data 56K DDS interface card transmits data over a switched network. It is used to dial out and to answer calls, but instead of sending voice, it sends data at different rates, from 2.4 kbps to 72 kbps.

Both **CO and Station side** Data 56K DDS interface cards use one transceiver back-to-back with a CPLD (Complex Programmable Logic Device) that does frequency adjustments and acts as a conditioning buffer for the fiber CPLD.

On the **fiber side**, the signal generated by the transceiver will be encoded on the fiber in the same manner as the T1 interface card, but at a rate that can be configured by the DIP-switch.

For Data 56K DDS Interface card DIP-switch settings, see Table 8 on page 19.

2.2.1 Applications

The applications of the Data 56K DDS Interface Card include the Digital data service (from 2.4 kbps through 72.0 kbps, inclusive).

2.2.2 Data 56K DDS Interface Card Model Numbers

For information consult our website: www.PositronPower.com or contact Positron customer support.

Table 4: Card Type and Model Numbers

	Model Number
Data 56K DDS Station Multi-mode ST connector	720300MST
Data 56K DDS Station Multi-mode SC connector	720301
Data 56K DDS Station Single-mode ST connector	720302
Data 56K DDS Station Single-mode SC connector	720300SSC
Data 56K DDS Central Office Multi-mode ST connector	720310MST
Data 56K DDS Central Office Multi-mode SC connector	720311
Data 56K DDS Central Office Single-mode ST connector	720312
Data 56K DDS Central Office Single-mode SC connector	720310SSC

2.2.3 LED Indicator Description

Table 5: CO Side Card Indicators

	Color	Function
Power	Red	Reset active (insufficient power)
	Amber	Loss of fiber signal
	Green	Normal (card is powered)
RJ45 Upper	Red	Loop-back mode
	Green	Normal mode
RJ45 Lower	Off	Normal mode
	Red	Loss of DDS clock (on the copper side)

Since the sealing current is too low to power the CO card, it is powered by an express pair or by local power.

Table 6: Data 56K DDS Interface Card (Station Side) Indicators

LED	Color	Function
Power	Red	Reset Active (insufficient power)
	Green	Normal (card is powered)
LOS	Off	No power
	Red	Loss of fiber signal
	Green	Synchronizer locked RX
Alarm	Off	No alarm
	Amber	Synchronizer not locked at Station RX
	Red and relay active (on access card)	Loss of station copper RX, DDS signal or CO, or reset
Remote Alarm LED and Relay	Off	No remote alarms are available on these cards
RJ45 Upper	Red	Loop-back mode
	Green	Normal mode
RJ45 Lower	Off	Normal mode
	Red	Loss of DDS clock

2.2.4 Express Pair

The express pair from the CO will provide power for one card and must be connected to the appropriate pin on the RJ11 connectors on the CO card front panel. This pair provides either -48 Vdc or -72 Vdc.

The following table provides information about the distances between the CO and the CO shelf as a function of the wire gauge voltage, and power required by the card.

Table 7: Distances between CO and CO shelf

	Maximum distance for 1W consumption	Maximum distance for 1.5W consumption
48 Vdc 24AWG	7,000 ft (2133.6 meters)	5,000 ft (1524 meters)
48 Vdc 22AWG	11,000 ft (3352.8 meters)	7,500 ft (2286 meters)
72 Vdc 24AWG	18,000 ft (5486.4 meters)	12,000 ft (3657.6 meters)
72 Vdc 22AWG	18,000 ft (5486.4 meters)	17,000 ft (5181.6 meters)

Table 8: Line Length as a Function of Bit Rate

	Line Length (mi)	Line Length (km)
2.4	12	20
3.2	10	17
4.8	10	17
3.5	9	15
6.4	8	13
7.0	8	13
14.0	6	10
19.2	5	9
25.6	5	8
28.0	5	8
38.4	4	7
51.2	4	7
56.0	4	7
64.0	4	7
72.0	4	7

NOTE

You can obtain these results using a 24 AWG PIC, no bridge taps.

2.2.5 Data 56K DDS DIP-Switch Settings

Table 9: Data 56K DDS Baud Rate DIP-Switch Settings

					BAUD RATE	LINE DATA RATES
BR 4	BR 3	BR 2	BR 1	BR 0		
OFF	OFF	OFF	OFF	OFF	2.4 kbps	2.4 kbps
OFF	OFF	OFF	OFF	ON	2.4 kbps sec ¹	3.2 kbps
OFF	OFF	OFF	ON	OFF	4.8 kbps	4.8 kbps
OFF	OFF	OFF	ON	ON	4.8 kbps sec ¹	6.4 kbps
OFF	OFF	ON	ON	OFF	19.2 kbps	19.2 kbps
OFF	OFF	ON	ON	ON	19.2 kbps sec ¹	25.6 kbps
OFF	ON	OFF	OFF	OFF	56 kbps	56 kbps
OFF	ON	OFF	OFF	ON	56 kbps sec ¹	72 kbps
OFF	ON	OFF	OFF	ON	64 kbps	72 kbps
OFF	ON	OFF	ON	OFF	3.5 kbps	3.5 kbps
OFF	ON	OFF	ON	ON	7 kbps	7 kbps
OFF	ON	ON	OFF	OFF	14 kbps	14 kbps
OFF	ON	ON	OFF	ON	28 kbps	28 kbps
ON	OFF	OFF	OFF	OFF	38.4 kbps	38.4 kbps
ON	OFF	OFF	OFF	ON	38.4 kbps sec ¹	51.2 kbps
ON	OFF	OFF	ON	OFF	64 kbps	64 kbps

Note ¹: DIP-switch setting when secondary channel is provided.

Figure 2: Data 56K DDS Interface Card (Station side)

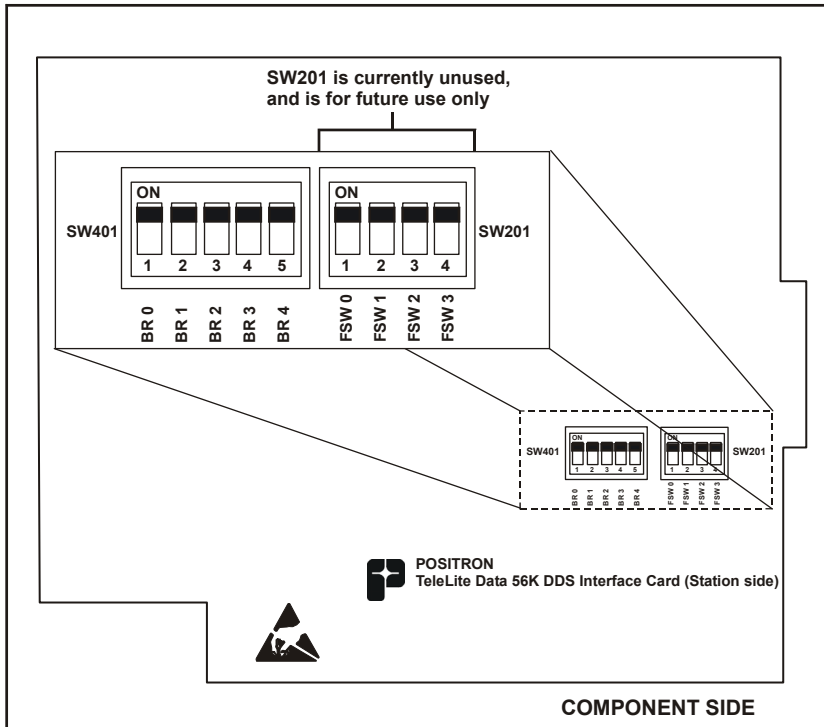
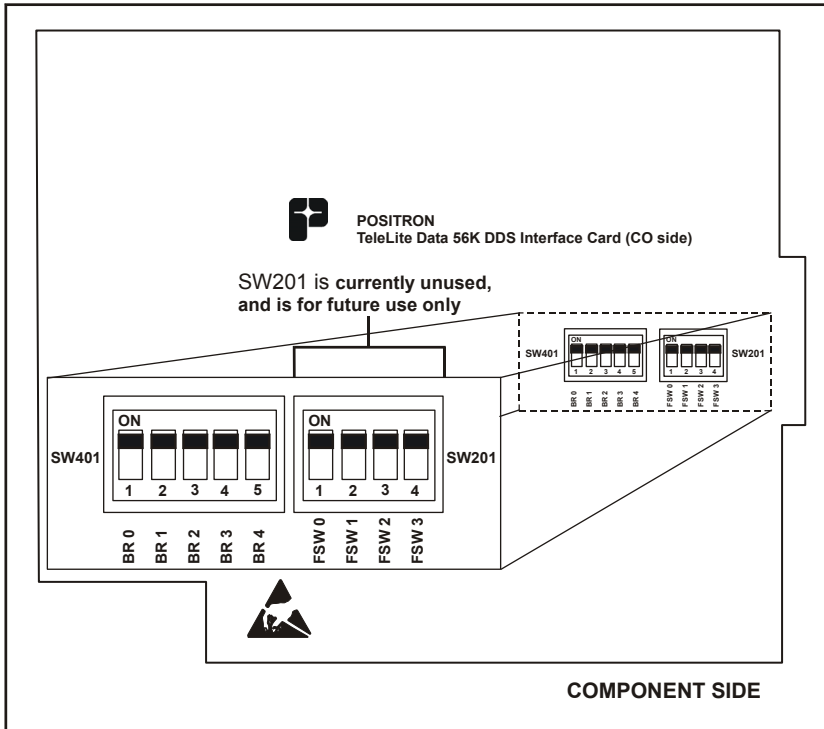


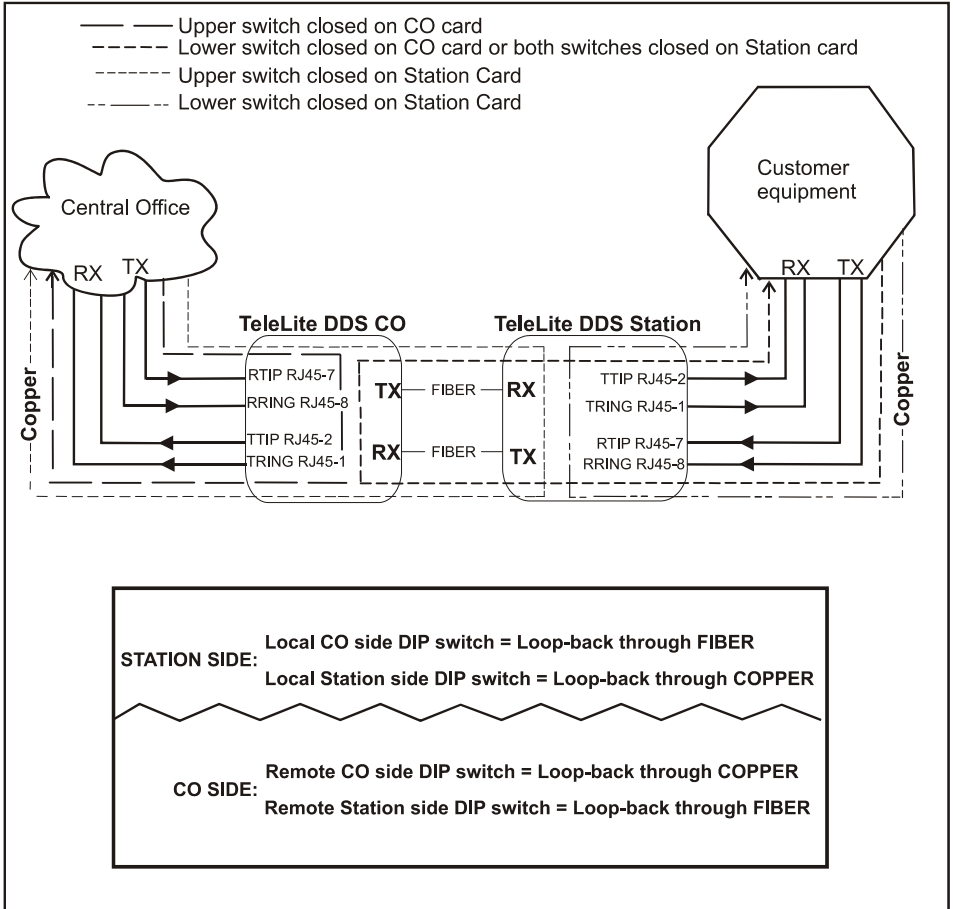
Figure 3: Data 56K DDS Interface Card (CO side)



2.2.6 Loop-back Mode

Local and remote loop-back provide testing capabilities for the CO and CPE. 56K/DDS signal loop-back is propagated through the card and encoded in the fiber transmission symbol. The loop-back command is a reversal of the sealing current between the RX and TX pair. The card does not need to know that a CO to CPE loop-back is in progress, it merely needs to reflect the sealing current polarity on the line.

Figure 4: Data 56K DDS Interface Card Set-up



2.2.7 RJ45 Pin-out Description

Figure 5: RJ45 Pin-out for Data 56K DDS Interface Card

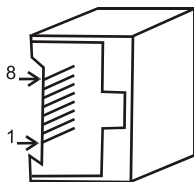


Table 10: RJ45 Pin-out Assignments

	Signal (CO side)	Signal (Station side)
1	TRING	TRING
2	TTIP	TTIP
3	NC	NC
4	Express Pair	NC
5	Express Pair	NC
6	NC	NC
7	RTIP	RTIP
8	RRING	RRING

2.2.8 Specifications

Table 11: Data 56K DDS Interface Electrical Specifications

	Specification
CO side power consumption	1.2 Watts maximum
Line coding	AMI
Bit rate	2.4 kbps , 3.2 kbps, 3.5 kbps, 4.8 kbps , 5.4 kbps, 7.0 kbps, 14.0 kbps, 19.2 kbps , 25.6 kbps, 28.8 kbps, 38.4 kbps , 51.2 kbps, 56.0 kbps , 64.0 kbps , 72.0 kbps
Rates in BOLD represent the ATIS T1.410 requirement	
Line length CO side	For CO side line length settings, see Table 8 on page 19.
Line length Station side	For Station side line length settings, see Table 8 on page 19.
Fiber optic interface	ST/SC type connector
Transceiver wavelength	850 nm or 1310 nm
Fiber optic type	Multi-mode fiber: 62.5/125 μm Single-mode fiber: 9/125 μm
Fiber span distance maximum	Multi-mode: (850 nm) 2 km (1.2 miles) Single-mode: (1310 nm) 16 km (9.9 miles)

Table 12: Regulatory Specifications

Parameter	Specification
Network Protections:	FCC part 68
Emissions	FCC part 15, Class A
Electrostatic Discharge	IEC 61000-4-2, Telecordia GR-1089-CORE
Immunity to electrical fast transients	IEC 61000-4-4
Immunity to surge	IEC 61000-4-5
Drop Test	Telecordia GR-63-CORE, Section 4.3

Table 13: Environmental Specifications

	Specification
Card operating temperature	-40°C to 85°C (-40°F to 149°F)
Cabinet operating temperature	-40°C to 75°C (-40°F to 167°F)
Storage temperature	-40°C to 85°C (-40°F to 185°F)
Humidity (non-condensing)	20% to 80%
Altitude	-60m to 3050 m (-200 ft to 10,000 ft) above sea level

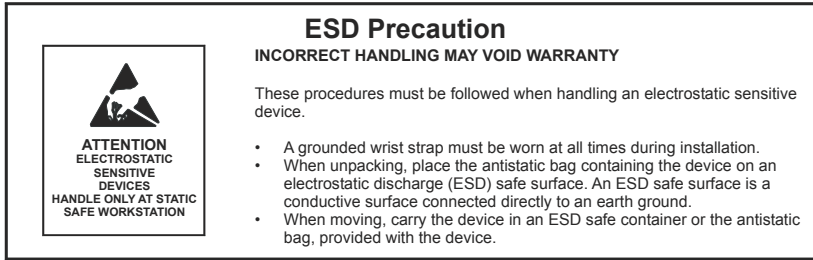
Chapter 3

Installation

3.1 Installing the Data 56K DDS Interface Card

Follow the ESD precautions shown below.

Figure 6: ESD Precautions



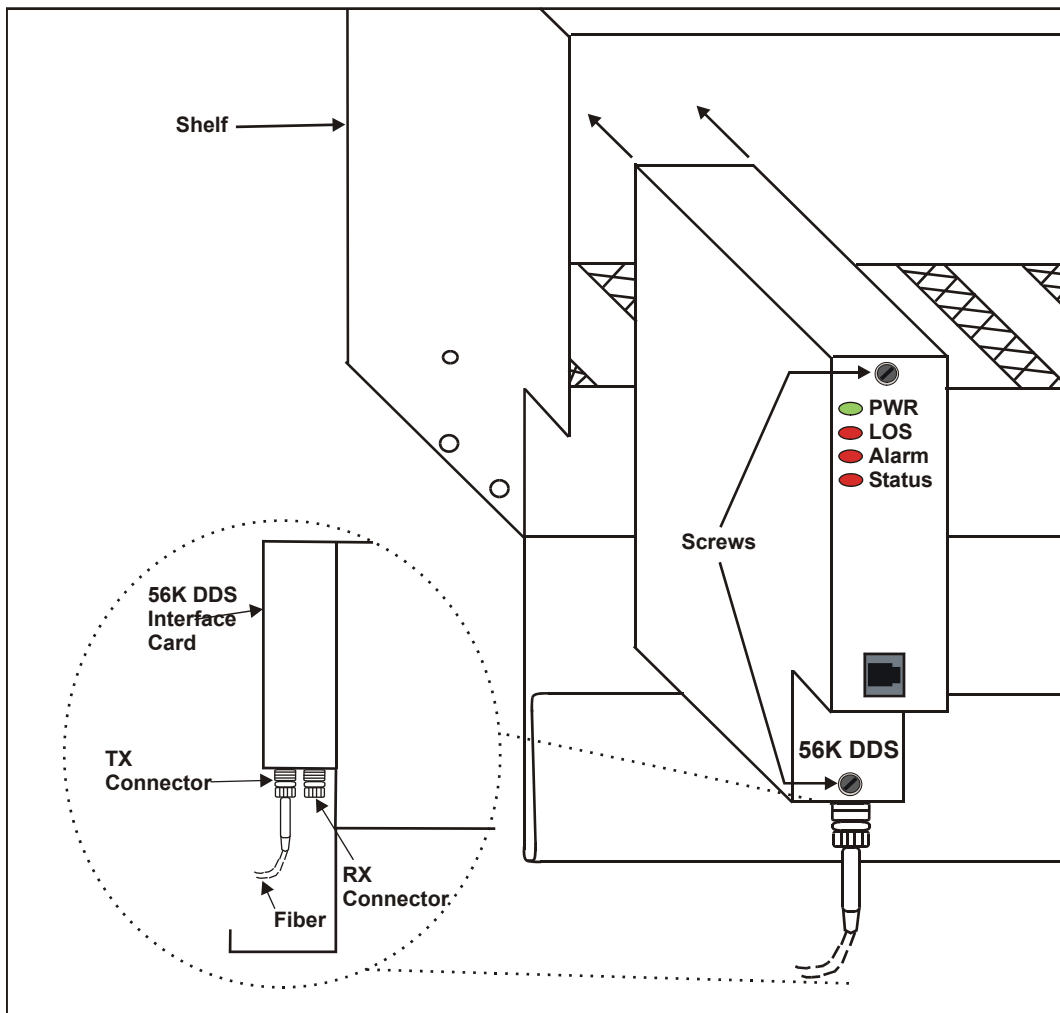
► To Install a Data 56K DDS Interface Card in a Shelf

1. Take the card out from its protective packaging.
2. Make sure the card is right-side up, align the card with the appropriate slot of the shelf and slide it in as shown in see Table 7 on page 29.
3. Hand-tighten the top and bottom screws, to secure the card in place.

Further information on connecting TX and RX fibers, can be obtained on our website: www.PositronPower.com.

4. Connect the phone line to the RJ45 connectors found on the face panel.

Figure 7: Installing a Data 56K DDS Interface Card in a Shelf



3.2 Wiring and Connections

3.2.1 Equipment-side Wiring Connections

Wiring to and from the equipment side (customer/network) is made through the RJ45 modular jacks located on the front panel of the card. After making the connections to the RJ45 modular jacks, dress the cables through the cable notch on the right side of the shelf and secure the cable using a cable tie.

3.2.2 Fiber Facility-side wiring Connections

Wiring to and from the facility side is made through the SC or ST type connection located on the bottom front panel of each card. After making the connections, dress the cables through the cable notch on the right side of the shelf and secure the cable using a cable tie.

3.3 Testing

► To test the installation (Station Side Only)

1. Use a DC Volt meter to measure the voltage of the card, to verify the power (-48 Vdc) at the power supply terminal block at the front of the Access card, and to check the polarity settings.

Make sure that the LEDs have the following status:

- **PWR:** Green (normal mode)
- **LOS:** Green (normal mode)
- **Alarm:** Off (normal mode)

3.4 Troubleshooting

Before calling customer service:

- 1. Verify that both cards are properly powered. The power LED on both sides should be steady green. Power is obtained through the shelf's associated Access or Power Access card.
- 2. Verify that on the Station side, the RTIP/RRING copper pair from the TeleLite RJ connector (pins 1 & 2) is connected to the CSU/DSU Transmit pair T1/R1 (pins 7 & 8) and that the Station side TTIP/TRING copper pair from the RJ connector (pins 7 & 8) is connected to the CSU/DSU Receive pair T/R (pins 1 & 2).
- 3. Verify that on the CO side, the RTIP/RRING copper pair from the TeleLite RJ connector (pins 1 & 2) is connected to the network T1/R1 (pins 1 & 2) and that the CO side TTIP/TRING copper pair from the TeleLite RJ connector (pins 7 & 8) is connected to the network T/R (pins 7 & 8).
- 4. Verify that the TX and RX fibers are not swapped between the CO and Station sides.
- 5. Verify that when the cards are powered and the copper and fiber connections are established, the TeleLite CO card's POWER LED is green. If the LED is amber, then the fiber signal from the Station card is not being received by the CO card.
- 6. Verify that when the cards are powered and the copper and fiber connections are established, the TeleLite Station card's LOS LED is green. If the LED is red, then the fiber signal from the CO card is not being received by the Station card.
- 7. Verify that when the cards are powered and the copper and fiber connections are established, the TeleLite CO card's lower LED on the RJ connector is OFF. If the LED is red, then the copper signal from the network is not being received by the CO card or the bit rate is not set properly and the card cannot synchronize.
- 8. Verify that when the cards are powered and the copper and fiber connections are established, the TeleLite Station card's lower LED on the RJ connector is OFF. If the LED is red, then the copper signal from the CSU/DSU is not being received by the Station card or the bit rate is not set properly and the card cannot synchronize.

Appendix A

Acronyms

A 1 Acronyms

AMI	Alternate Mark Inversion coding
ATIS	Association for Telecommunications Industry Solutions
CO	Central Office
CPE	Customer Premises Equipment
CPLD	Complex Programmable Logic Device
DC	Direct Current
DDS	Digital Data Service
DIP	Dual In-line Package
ESD	Electro-Static Discharge
FXO	Foreign Exchange Originating
FXS	Foreign Exchange Subscriber
GPR	Ground Potential Rise
HVI	High Voltage Interface
kbps	Kilobits per second
LED	Light-emitting Diode
LOS	Loss of Signal
NC	No Connection
PBX	Private Branch Exchange
POTS	Plain Old Telephone Service
PWR	Power

RRING	Receive Ring
RTIP	Receive Tip
RMA	Return Material Authorization
RTN	Return
RX	Receive
TRING	Transmit Ring
TTIP	Transmit Tip
TX	Transmit

