DataSMART® 500 Series Installation Guide

72552 DataSMART 552
    56/64K Plug-in DSU
72554 DataSMART 554
    T1 Plug-in DSU
72558 DataSMART 558
    T1 Plug-in Add/Drop DSU
    with Ethernet
72584 DataSMART 584
    T1 Plug-in Frame Monitoring DSU
72588 DataSMART 588
    T1 Plug-in Add/Drop
    Frame Monitoring DSU
    with Ethernet

Part #650-00164-00

KENTROX
Quality Access

Revision history

Part #	Date	Description
65-72558001	July 1997	Issue 1
65-72558002	April 1998	Issue 2
5000138	December 2001	Issue 3
650-00164-00	September 2004	Issue 4, Rebranded. Removed obsolete models 554-F and 558-F.

Safety precautions

This equipment has been designed to the highest quality standards of materials, workmanship and safety. Do not bypass any of the safety features of this equipment or operate this equipment in an improper environment.

This manual is intended to be used by qualified service personnel only.

WARNING!
Service should be performed only by trained and qualified personnel.

To avoid hazard from electrical shock and/or fire, adhere to the safety practices listed in this section and identified within the instructions of this document.

Use normal caution when installing or modifying telephone lines. Dangerous voltages may be present. It is unsafe to install telephone wiring during a lightning storm.

Always disconnect all telephone lines at the network interface, and power connections from the wall outlets before servicing or disassembling this equipment.

All wiring external to the product(s) should follow the provisions of the current edition of the National Electrical Code or any national wiring rules that apply.

The power inlet on the rear panel of the shelf is the power disconnect device. If the inlet is not easily accessible after the shelf is installed, a disconnect device must be incorporated into the installation wiriing.

WARNING!
Potentially hazardous voltages inside. Service should be performed only by qualified personnel.

AVERTISSEMENT!
Tensions Dangereuses à l'intérieur. Confier la maintenance à une personne qualifiée.

Precautionary symbols used in this document

This document uses the following symbol to denote safety precautions you should adhere to while performing the installation procedures.

This symbol alerts the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

Contents

Preface

This manual explains how to install, power up, configure, and verify the installation of DataSMART® 500 series Data Service Unit (DSU) plug-ins. Installation and service should be performed only by trained and qualified personnel.

Who should read this manual?

This manual is for the person installing DataSMART 500 series units. It contains everything the installer needs to know to install these DataSMART units and confirm that they function correctly.

Viewing this manual as a PDF file

This manual is designed to be used as both a printed book and a PDF file, and includes the following features for PDF viewing:

■ Cross-references are clickable hyperlinks that appear in blue text.

■ Chapters and section headings are represented as clickable bookmarks in the left-hand pane of the Acrobat viewer.

■ Page numbering is consistent between the printed page and the PDF file to help you easily select a range of pages for printing.

You can obtain PDF files of our manuals by visiting http://www.kentrox.com/library.

Related publications

In addition to this manual, the following are available:

■ *DataSMART 554 and 558 User's Guide* and *DataSMART 552 User's Guide*, available on the World Wide Web at http://www.kentrox.com/library

■ *Kentrox DSU/CSU MIB Reference*, available on the World Wide Web at http://www.kentrox.com/library

Who to call for assistance

If you need assistance with this product or have questions not answered by this manual, please visit our Support page on the Kentrox Web site. You are also welcome to call or send email to our Technical Assistance Center. Please have your product's software revision and hardware serial numbers available to give to the Support representative. All product returns must include a Return Authorization number, which you can obtain by calling the Technical Assistance Center.

The numbers listed below are current at the time of publication. See the Kentrox Web site for detailed contact and warranty information.

> 1-800-733-5511 (continental USA only)
> 1-503-350-6001
> email: support@kentrox.com
> http://www.kentrox.com/support

MIB source files   MIB source files are available by visiting http://www.kentrox.com/support.

About this manual   This manual contains the following information:

"Preface" (this section) explains the purpose and organization of this manual, and tells how to contact Kentrox Customer Support if you run into difficulties.

"Introduction" gives general information about DataSMART DSUs, management paths, and auto-configuration.

"Installing the 2-slot universal shelf" describes site and environmental requirements for the 2-slot universal shelf, how to mount the shelf on a rack, and how to connect and supply power to the shelf.

"Installing the 12-slot universal shelf" describes site and environmental requirements for the 12-slot universal shelf, how to mount the shelf on a rack, and how to connect and supply power to the shelf.

"Installing the DataSMART" explains how to install DataSMART 500 series plug-ins.

"Configuring DataSMART units" gives step-by-step instructions for configuring DataSMART 500 series DSUs.

"Verifying the installation of T1 plug-in units" explains how to interpret the LEDs on each T1 unit's front panel and how to troubleshoot alarms generated by DataSMART T1 DSUs.

"Verifying the installation of 56/64 kbps plug-in units" explains how to interpret the LEDs on each 56/64 kbps unit's front panel and how to troubleshoot alarms generated by DataSMART 56/64 kbps DSUs.

This manual also contains appendices and an index.

Worksheets to help you get started   This manual contains worksheets that you should fill out before configuring DataSMART T1 DSUs. These worksheets help you gather the information you'll need to configure the units and set up their management paths properly. They are contained in Appendix B.

If you are configuring a 56/64 kbps DSU, do not use the worksheets in Appendix A; see "5" for configuration instructions.

1 *Introduction*

The DataSMART 500 series data service units (DSUs) provide SNMP-managed network access. The DataSMART 552 unit provides access to digital data services (DDS) at speeds of 56 or 64 kbps, and the DataSMART 554, 584, 558, and 588 units provide access to T1 and fractional T1 lines. All DataSMART 500 series units plug into the Kentrox 2-slot and 12-slot universal shelves.

There are five DataSMART plug-in configurations:

■   The DataSMART 552 56/64 kbps DSU

■   The DataSMART 554 T1 DSU

■   The DataSMART 584 T1 Frame Monitoring DSU

■   The DataSMART 558 T1 Add/Drop DSU with an Ethernet interface

■   The DataSMART 588 T1 Add/Drop Frame Monitoring DSU with an Ethernet interface

Figure 1—DataSMART Model 500 series DSU front views

DataSMART Model
558/588

DataSMART Model
554/584

DataSMART Model
552
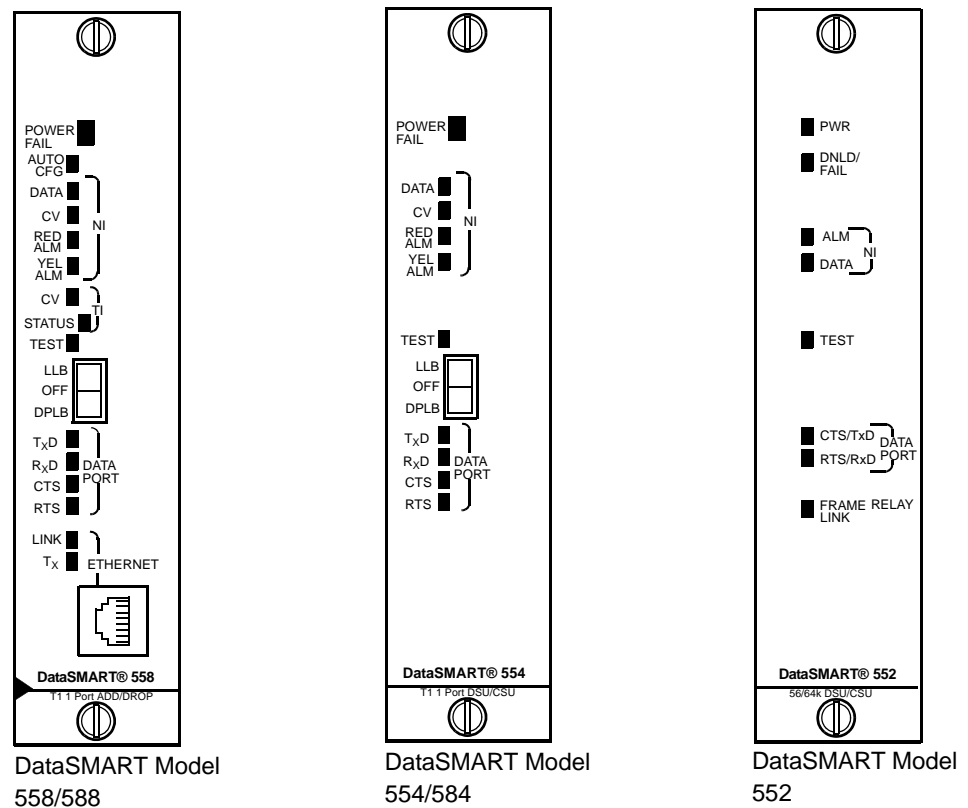
Capabilities of the DataSMART units

The DataSMART 552 DSU provides DDS network connectivity to local data terminal equipment (DTE) at speeds of 56 or 64 kbps. This unit provides simple DDS circuit monitoring and is compatible with all other shelf plug-ins.

The DataSMART 554 DSU provides T1/FT1 network connectivity to a single router, video codec, or other data customer premises equipment (CPE).

The DataSMART 558 DSU provides T1/FT1 network connectivity to a single router, video codec, or other data CPE, as well as one voice PBX. When you assign all available bandwidth to the terminal interface, the DataSMART 558 acts as an SNMP-managed CSU.

The DataSMART 584 and 588 add built-in Frame Monitoring capabilities to the 554 and 558 DSUs, respectively. Almost all the statements in this manual about the DataSMART 554 apply to the 584. In the same way, statements about the 558 also apply to the 588.

The Kentrox universal shelf with DataSMART 500 series plug-ins provides a system for managing all local and remote DSUs over a single management interface (Ethernet, SLIP, or PPP). The management interface you use depends on which plug-ins occupy the shelf.

The DataSMART 558 and 588 let you attach an Ethernet 10Base-T cable for managing plug-ins locally. You can also manage all DataSMART T1 plug-ins with the SLIP or PPP serial protocols, using the shelf's control port. The DataSMART 56/64 kbps unit supports only SLIP. If your site has several DataSMART shelves, you can daisy-chain their control ports to manage all DataSMART units at the site via the SLIP interface.

You can manage remote DataSMART T1 500 series units via SNMP over a data link on the T1 line (see). The DataSMART 552 56/64 kbps unit does not support data link management.

Optional auto-configuration

If your installation includes both DataSMART controllers and configurable plug-ins, the controller can automatically configure any downstream plug-ins.

The following settings apply to **both DDS and T1 units** during auto-configuration:

■   System configuration parameters (except name and DDS interface type)

■   Management configuration parameters

■   Advanced management parameters (except data link IP address)

The following settings apply **only to T1 units** during auto-configuration:

■   Network interface and terminal interface configuration parameters

■   Data port configuration parameters

■   Fractional configuration parameters, including channel mapping

The following setting applies **only to Frame Monitoring units** during auto-configuration:

■   Frame management configuration parameters

Using auto-configuration

To automatically configure a 552 or 554 unit, you must perform the following tasks in this order:

1 Mount the shelf and power it up.

2 Plug in the controller (the 558 or 588), and fully configure it. See Chapter 5 for configuration instructions.

3 Enable auto-configuration on the controller (this is the default).

4 Plug each configurable unit into the first available downstream slot from the controller unit.

The first time you insert a configurable plug-in into a slot downstream from the controller, the 552 or 554 sends a configuration request to the 558. The 558 then sends a configuration packet, based on its own configuration, to the 552 or 554 plug-in, which then configures itself.

Using auto-configuration with the DataSMART SPort

DataSMART 558 and 588 controllers can pass configuration data to DataSMART SPort 555 plug-ins in the shelf. Likewise, DataSMART SPort 556 controllers can send configuration information to the DataSMART 552 or 554. For further information, see the *User's Guide* for your DataSMART.

2

Installing the 2-slot universal shelf

This chapter shows you how to install the 2-slot universal shelf for use with the DataSMART plug-ins.

Topics include:

- Preparing the installation site

- Installing the shelf into a rack

- Locating the ports, switches, and connectors

- Connecting power

- Setting address switches

- Setting control port switches

- Connecting to the terminal interface (558/588)

- Connecting to data ports (all units)

- Connecting to the control port

- Cabling daisy-chained shelves

- Connecting to the T1 network interface

- Connecting to the DDS network interface

Preparing the installation site

Site/environmental requirements

The site should provide a stable thermal and electrical environment. The operating area should be clean and free from extremes of temperature, humidity, shock, and vibration.

Power supply

Power is supplied to the plug-ins via the 2-slot universal shelf. The shelf has two variations: a DC version and an AC version. The installation site should be capable of up to 15 watts of power. If an accessible outlet is not available, a readily-accessible disconnect device must be incorporated in the installation wiring.

AC-to-DC power supplies are available from Kentrox.

Temperature and humidity

DataSMART 552, 554, and 558 plug-ins operate properly in a temperature range of 0° C to 50° C (32° F to 120° F), and a humidity range of 5% to 90% RH, non-condensing.

For DataSMART 584, and 588 with the Frame Relay board, the operating temperature range is 0° C to 40° C (0° F to 104° F), and a humidity range of 5% to 90% RH, non-condensing.

Cable type

To connect to the T1 network (with the DataSMART 554, 558, 584, or 588), many carriers require AT&T Type ABAM cable or equivalent (individually-shielded twisted pair, rated at 100 ohms at 1 MHz).

To connect to the DDS network (with the DataSMART 552), use the 8-pin network cable packaged with the plug-in unit.

The requirements on the terminal interface side might be less stringent. To find the minimum cable specifications for your terminal equipment, consult the documentation for your terminal equipment.

Cable distances

The standard specifications for cable distances, as prescribed by applicable standards documents, are:

Interface	Suggested maximum cable length
V.35	50 ft. (15 m)
EIA-530	200 ft. (61 m)

Ventilation

The site should provide enough room for adequate ventilation and cable routing. Allow at least 4 in. (10 cm) at the rear of the unit for cables and air flow. Do not block any of the air vents on the unit. Allow clearance for operation and maintenance.

Electrostatic protection requirements

It is essential to protect DataSMART plug-ins from electrostatic damage. They are most vulnerable to electrostatic damage when first removed from their shipping containers.

⚠ **CAUTION!**
Wear a grounded electrostatic protection wrist strap when handling plug-ins.

Grounding requirements

Correct grounding is essential to protect DataSMART plug-ins from lightning and electro-static damage. It is also required to meet safety and electromagnetic compatibility (EMC) standards. The power cable should always be connected to the shelf before inserting plug-ins so that the plug-ins will be grounded through the shelf.

⚠ **CAUTION!**
It is essential that the shelf be connected to frame ground for lightning protection.

Taking inventory

Inspect the shipment for signs of shipment damage. If any items appear damaged, call Kentrox Customer Support as listed in

Keep all packing material in case you need to move or ship the unit in the future.

Parts List

■ 2-Slot Shelf (AC or DC)

■ AC Power Cable (AC shelf only)

■ DC Power Connector (DC shelf only)

■ Two installation guides (DataSMART and M-PATH)

■ Registration Card

■ Rack-mounting brackets

■ Screws and washers to attach brackets to shelf

■ Screws and washers to attach shelf to rack

■ Cable ties

■ Installation CD for the DataSMART Installer graphical user interface (GUI)

Installing the shelf into a rack

The 2-slot universal shelf consists of a metal frame capable of holding two plug-ins. Mounting ears (shipped with the shelf) adapt the shelf to 19-inch or 23-inch equipment racks. The shelf requires 1.75 inches of vertical rack space, or one mounting space.

Attach the ears to the shelf, as shown below, using the screws provided. You can position the ears for mid-mounting or front-mounting. Secure the shelf to the rack using the screws provided in the kit.

Figure 2—2-slot universal shelf for 19-inch or 23-inch equipment racks

19 in. rack

Use front- or mid-rack positions
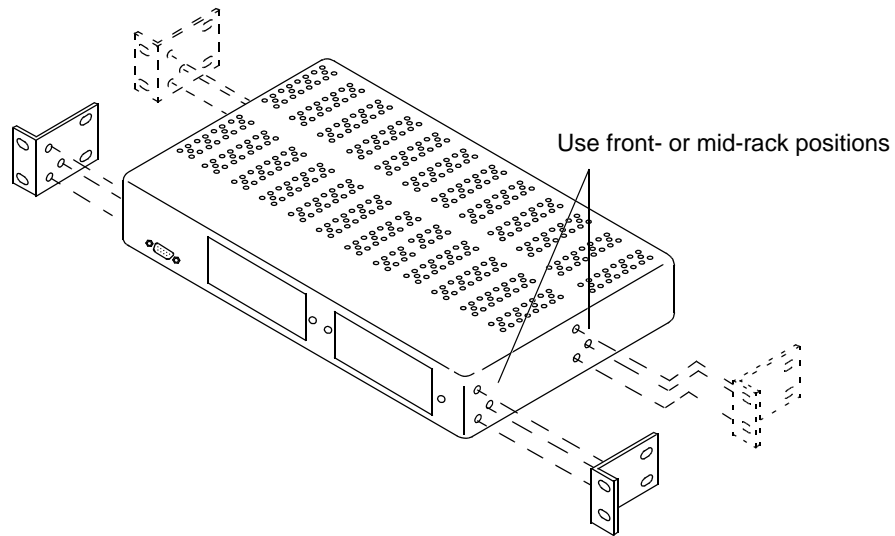
23 in. rack
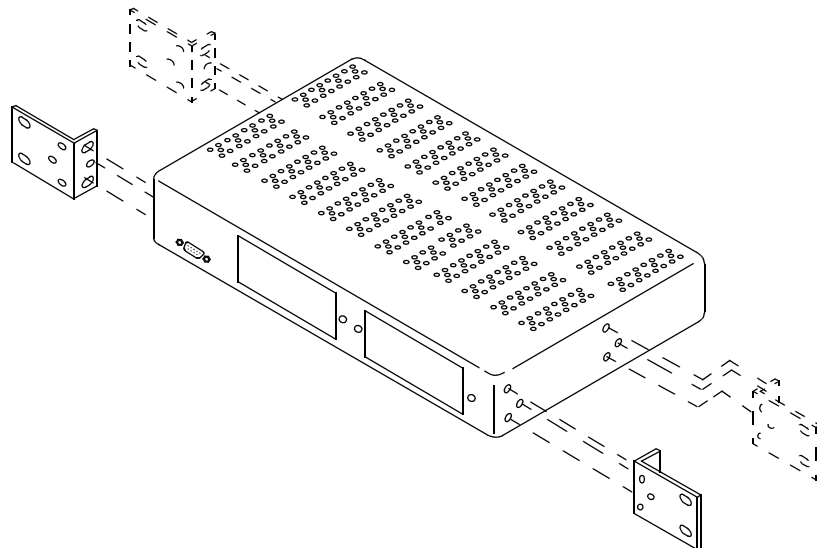
Locating the ports, switches, and connectors

Figure 3 shows the locations of connectors and controls on the rear panel of the 2-slot universal shelf.

Figure 3—Rear panel, 2-slot universal shelf, Model 78070 DC version
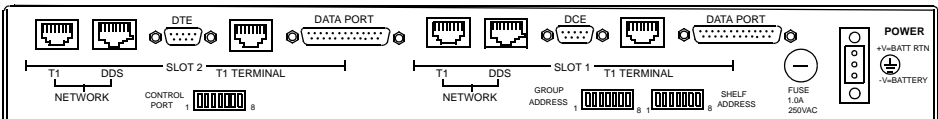
Figure 4—Rear panel, 2-slot universal shelf, Model 78075 AC version
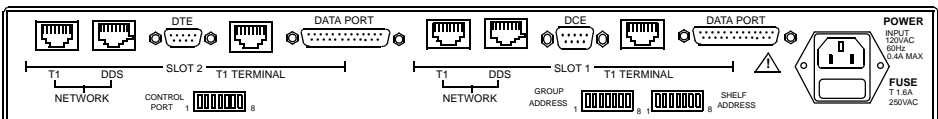
Figure 5—Front panel, 2-slot universal shelf
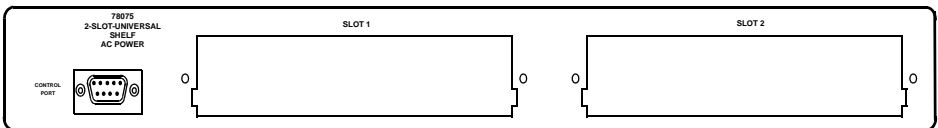
The use of switches, control ports, and data ports is application-dependent. Switches are used to set control port rates and unit addressing. Cabling to the data ports is dependent on whether the plug-in supports EIA-530 or V.35. Details should be obtained from the specific unit's User's Guide or Release Notes for the 2-Slot Universal Shelf. Two network connectors are provided: DDS and T1. The DDS connector is an RJ48S and is used for digital data services. The T1 connector is an RJ48C used for T1 services. The terminal connector is also wired as an RJ48C and is typically used in add/drop applications.

All switches are set in the DOWN position when the unit ships from the factory. The default conditions are as follows:

Control port default

Baud rate	9600
Parity	None
Data bits	8
Stop bits	1

Group Address	000

Shelf Address	00

Connecting power

The 2-slot universal shelf is available in AC-powered and DC-powered versions. The DC-powered shelf (Model 78070) has a single voltage input and accepts from 24 to 48 VDC. The AC-powered shelf (Model 78075) has a single power supply and uses an AC-to-DC converter. It accepts 120 VAC and provides 24 VDC to the plug-in cards.

DC-power shelf 78070

The DC shelf provides for a single power input. The plug-in cards accept 24 to 48 volts DC, for universal use in cellular and central-office environments.

CAUTION!

Make sure your DC power supply is OFF or unplugged before making power connections to the shelf. If the shelf is powered by a power supply capable of providing more than 10 amps, such as a centralized DC power system, the power feed fuse must be no larger than 10 amps.

Table 1 describes the power supply pin functions.

Table 1—Power supply pin functions

Pin #	Function	Shelf slots	Wire size (AWG)	Wire size (Metric)
1	+V (B)	all	20 - 14	0.81-1.63 mm
2	Frame Ground	all	14 - 12	1.63-2.05 mm
3	-V (B)	all	20 - 14	0.81-1.63 mm

Use a power supply capable of providing 6 watts per installed plug-in at a voltage between 24 and 48 VDC. You can order power supplies from Kentrox.

Connecting the power

Using 14 AWG (1.63 mm) leads or larger, (with green insulation and one or more yellow stripes), wire earth ground to the frame ground post (pin 2) to ground the unit. Using 20 AWG to 14 AWG (0.81-1.63 mm) leads, wire power to the supplied three-pin connector plug. Connect the positive voltage from your DC power supply to +V (pin 1) and the negative voltage from your DC power supply to -V (pin 3). See Figure 6.

Figure 6—Connecting DC power
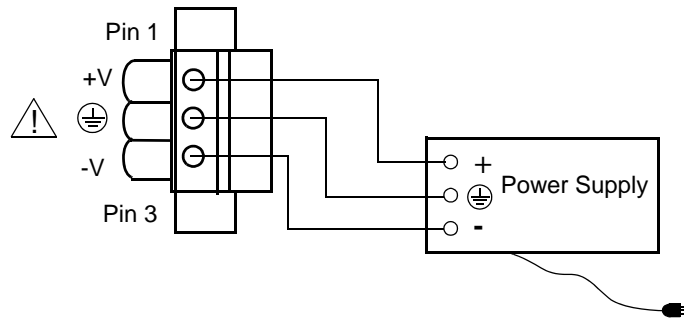
⚠

CAUTION!
Frame ground must be connected to earth ground to provide protection from excessive line voltages such as lightning or power line crossings.

Installing the rear-panel power connector

Firmly push the three-pin connector onto the power connector at the rear of the unit and secure to the back panel with the screws at either end of the connector. When the connector is attached with screws, the building wiring must provide a power disconnect device.

AC-power shelf 78075

The AC shelf provides for a single 120 VAC power input. A power converter contained within the shelf provides DC power required by the plug-in modules.

The AC inlet on the rear panel is the power disconnect device. If the inlet is not readily-accessible, a disconnect device must be incorporated in the installation wiring. The disconnect device must break the unearthed conductor (normally the AC line). In installations where the earthed neutral is not easily identifiable, the disconnect device must break both the AC line and neutral conductors.

Connecting the power

The installation site should include a grounded 120 VAC power receptacle.

The AC power outlet must be located near the shelf and must be easily accessible.

The shelf comes with an AC power cord. Plug one end into the power outlet and the other into the shelf.

Do not attach the power supply cord to building surfaces.

Figure 7 shows the AC power connector on the rear of the shelf.

Figure 7—Connecting AC power
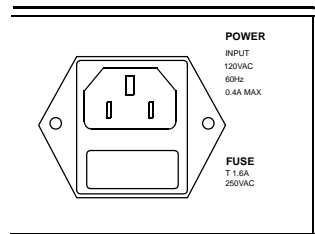
Setting address switches

Banks of switches on the rear panel of the 2-slot universal shelf control the addressing of DataSMART plug-ins. Switches 1 through 4 in the bank labeled GROUP ADDRESS determine the group address, and switches 1 through 4 in the bank labeled SHELF ADDRESS determine the shelf address.

Locating address switches

Figure 8 shows the locations and functional groupings of the banks of switches that govern addressing on the rear-panel of the 2-slot universal shelf. Switches within each bank are numbered 1 through 8.

Figure 8—2-slot universal shelf rear-panel address switches
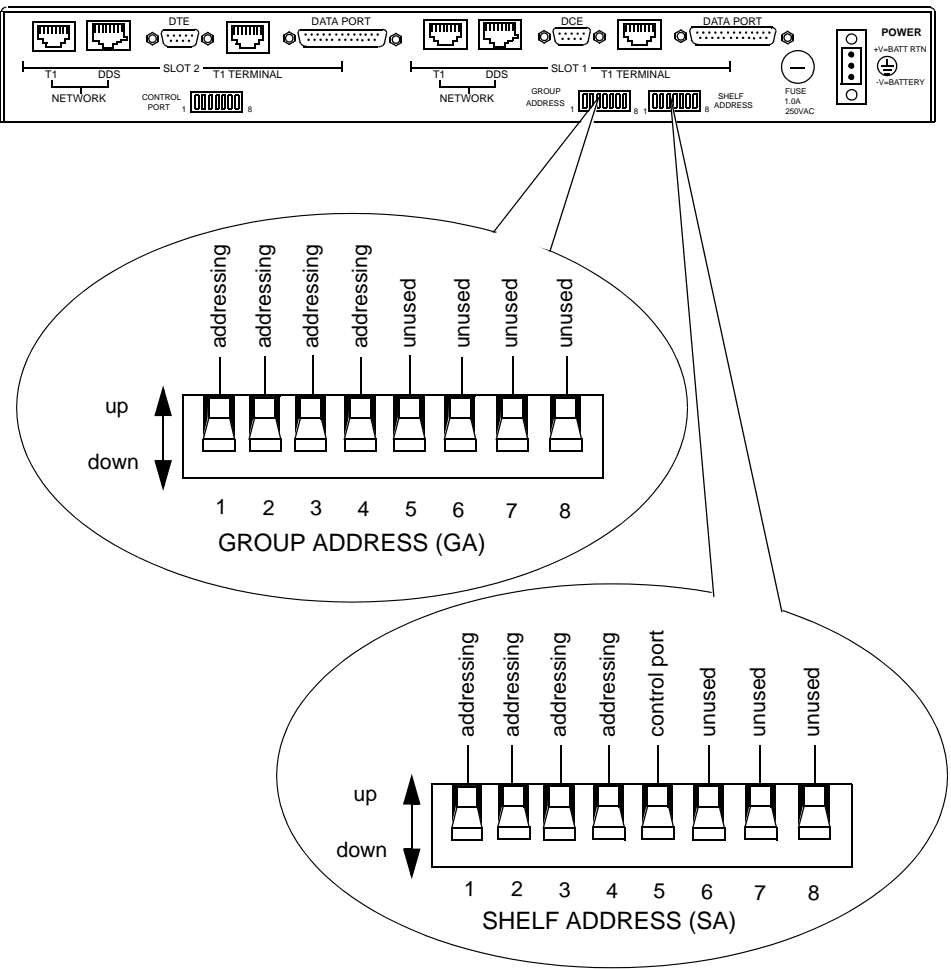
Setting physical addresses

All DataSMART plug-ins have an identifying address form of *xx:yy:**0**zz*, where *xx* denotes the slot number (01 through 02), *yy* the shelf number (00 through 15) and **0**zz the group number (000 through 015). You use the physical addresses to log into a unit (see) and also for auto-configuration.

Slot value

The plug-in's slot location within the shelf determines the address slot value. The left slot (when facing the front of the shelf) has slot value 01, and the right slot has slot value 02.

Shelf value

All plug-ins within the same shelf have the same shelf address value, as determined by switches 1 through 4 on the SHELF ADDRESS switch bank. The address is a binary-encoded combination of switches in the shelf address bank. (See Table 2.)

If you are linking two or more shelves together, no two shelf addresses can be the same. We recommend using sequential shelf addresses as standard practice.

Group value

All plug-ins within the same shelf also have the same group address value, as determined by switches 1 through 4 on the GROUP ADDRESS switch bank. Set the group address with the switches in the group address bank, using the same encoding you used to set the shelf address (see Table 2). Typically, all shelves at a single physical location are set to the same group address, which is usually 0.

For a more complete address table, see .

Table 2—Binary table for setting shelf addresses or group addresses

Address	S1	S2	S3	S4
00 or 000	D	D	D	D
01 or 001	U	D	D	D
02 or 002	D	U	D	D
03 or 003	U	U	D	D
04 or 004	D	D	U	D

Calculating a unit's control port IP address for auto-configuration

Switch 5 of the SHELF ADDRESS switch bank determines whether the shelf's control port is DCE or DTE. See Figure 9 on page 24.

If the shelf's control port is DCE, the DataSMART controller (558 or 588) goes into slot 1 and the non-controller DataSMART (552, 554, or 584) goes into slot 2. To use multiple shelves, connect the DTE port of shelf 1 (the shelf with the controller) to the DCE port of shelf 2, and so on. (For an example, see Figure 12 on page 29.) The slot order is: slot 1, shelf 1 (controller); slot 2, shelf 1; slot 1, shelf 2; slot 2, shelf 2; and so on.

However, if the shelf's control port is DTE, the controller unit goes into slot 2 and the non-controller unit goes into slot 1. To daisy-chain shelves, connect the DCE port of shelf 1 to the DTE port of shelf 2, and so on. (For an example, see Figure 13 on page 29.) The slot order is: slot 2, shelf 1 (controller); slot 1, shelf 1; slot 2, shelf 2; slot 1, shelf 2; and so on.

IP addresses consist of a network part and a host part. The dividing line between the network part and the host part is set by the control port IP netmask (see page 74). For control port addresses, the network part is the same for the 552 or 554 and the 558, and the host part for the 552 or 554 is the same as the 558 host part **plus 1**.

▶ **NOTE**
Auto-configuration with multiple 2-slot shelves does not enforce contiguous control port IP addresses, because the unit adds 12, not 2, to the host part of the IP address for each shelf in the daisy chain. We recommend manually calculating control port IP addresses for multiple daisy-chained 2-slot shelves.

Setting control port switches

For DataSMART plug-ins, switches 1 through 8 in the CONTROL PORT bank, as well as switch 5 in the SHELF ADDRESS bank, govern the operation of the rear-panel control ports on the 2-slot universal shelf.

Locating control port switches

Figure 9 shows the locations of the control port configuration switches on the 2-slot universal shelf. Switches within each bank are numbered 1 through 8. Only switch 5 of the shelf address bank governs control port configuration.

Figure 9—2-slot universal shelf rear-panel control switches

Setting control port switches

Control port	SA5
DCE (default)	down
DTE	up

Baud setting	CP1	CP2
9600 (default)	down	down
19200 (supports 28800)	down	up
2400	up	down
38400	up	up

Parity	CP3	CP4
off (default)	down	down
on - odd	up	down
on - even	up	up

Data bits	CP5
8 data bits/character (default)	down
7 data bits/character	up
7 data bits/character	up

Stop bits	CP6
1 stop bit/character (default)	down
2 stop bits/character	up

Unused switches	CP7	CP8
Default position	down	down

Using a 14.4 or 28.8 kbps modem

If you are using a 14.4 kbps modem as a control device, set the baud rate to 9600.

If you are using a 28.8 kbps modem as a control device, set the baud rate to 19200.

Make sure you set the modem to lock the data port rate to the DTE.

Connecting to the terminal interface (558/588)

Each DataSMART 558 or 588 plug-in connects to terminal equipment through the "T1 Terminal" RJ48C 8-pin modular jack connector on the rear panel of the 2-slot universal shelf.

Figure 10—Terminal interface connectors on the 2-slot shelf
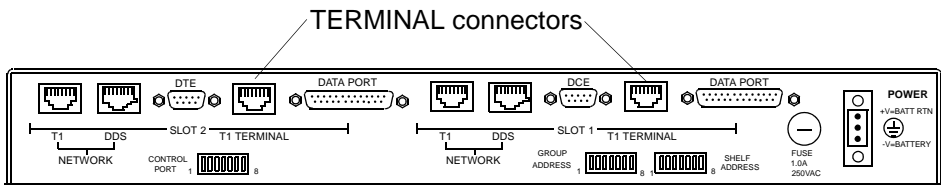
Plug one of these cables into the TERMINAL connector:

Part number	Description of cable
930*xx*141	RJ48C to RJ48C modular plug
930*xx*142	RJ48C to RJ48C modular plug crossover NI cable (required for standard installation)

xx is length in feet. Call the factory for available lengths.
P = plug (male); S = socket (female)

1 Connect one end of the cable to the T1 Terminal connector on the rear of the 2-slot universal shelf.

2 Connect the other end to terminal equipment using the manufacturer's instructions.

Pinouts

■   See Table 12 on page 105.

Data transmission diagram

■   See Figure 43 on page 106

Connecting to data ports (all units)

Each DataSMART plug-in connects to data terminal equipment (DTE) through a DB25S 25-pin socket on the rear panel of the 2-slot universal shelf. On most DataSMART plug-ins, you can configure the interface for each port as either a V.35-compatible or an EIA-530 interface. The DataSMART 552, however, supports only a V.35-compatible interface on the data port.

Figure 11—Data port connectors on the 2-slot shelf
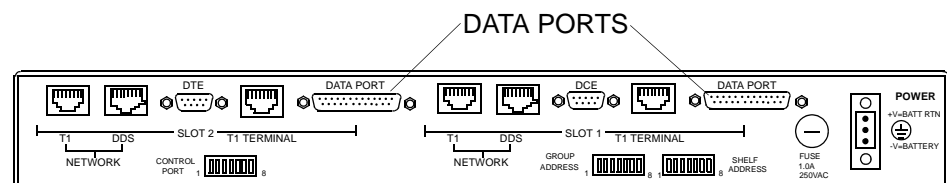
Plug one of these cables or adapters into the DATA PORT connector:

Part number	Description of cable
950xx054	Adapts from the DB25P to V.35 MRAC34P connector
950xx061	DB25P to DB25P to connect to an EIA-530 interface
950xx066	Connects DB25P to DB37P (to adapt EIA-530 to an RS449 interface)

Adapter number	Description of adapter
01-78904001	V.35, DB25P to MRAC34S
01-78901001	EIA-530/RS449, DB25P to DS37S

Also compatible:	Description
95010053	V.35, DB25P to MRAC34P, 10 ft. cable
01-78893001	V.35, DB25P to MRAC34S, 6 ft. adapter
950xx074	V.35, DB25P to MRAC34S
950xx073	Tail circuit timing V.35 interface
950xx058	DB25P to DB25P tail circuit timing EIA-530 interface

xx is length in feet. Call the factory for available lengths.
P = plug (male); S = socket (female)

1 Connect one of the above cables to the data port. Secure the connector to the panel with the screws built into the connector.

2 Connect the other end of the cable to the DTE equipment's data port according to the manufacturer's instructions.

Pinouts

See Table 13 through Table 15 in Appendix A.

Connecting to the control port

The 2-slot shelf provides three control ports:

■ **The rear-panel DCE control port** accepts an ASCII connection from a DTE device.

■ **The rear-panel DTE control port** accepts an ASCII connection from a DCE device (e.g., a modem).

■ **The front-panel DCE control port** accepts an ASCII connection from a DTE device.

You can have only one active control port. Connect to either rear-panel port or the front-panel DCE port, but do not connect to more than one.

Setting up the control port

Whichever control port you use, you must first set up the shelf control port switches to match the communication parameters for your control device. Further, if you are using the rear-panel DTE control port, you must set shelf-address switch SA5 to "up" (leave the switch set down to use the rear-panel DCE control port). See page 25 for instructions.
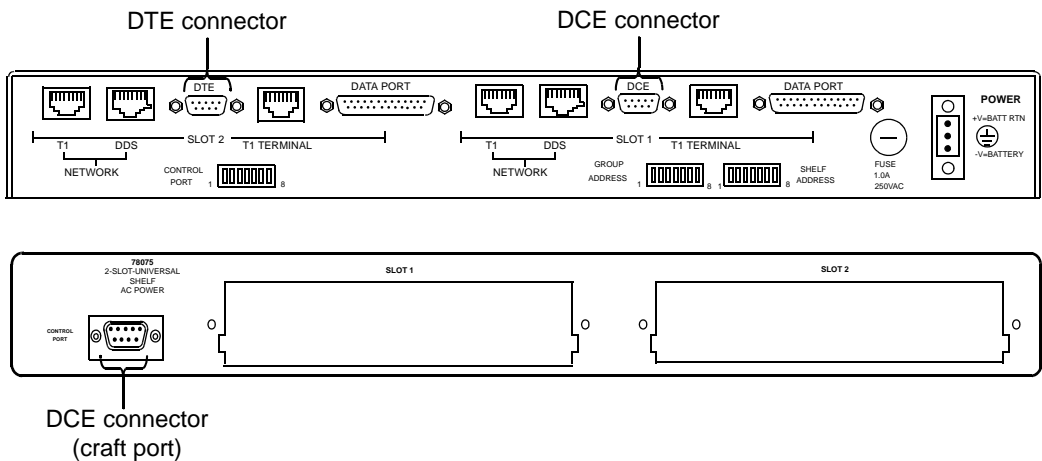
DTE connector   DCE connector

DCE connector
(craft port)

Plug one of these cables into the CONTROL PORT connectors:

Part number	Description of cable
0195006022 (6 ft.)	DE9S to DE9P, for DCE or DTE port
0195010022 (10 ft.)	DE9S to DE9P, for DCE or DTE port
0195010023 (10 ft.)	DB25P to DE9S, for DCE port only

The control port cables can connect the shelf to:

■ a PC using the AT 9-pin interface

■ a modem using the 9-pin connector

■ other shelves in a daisy chain (see "Cabling daisy-chained shelves" on page 29)

Pinout

See Table 16 on page 110 and Table 17 on page 110 in Appendix A.

Cabling daisy-chained shelves

You can connect two or three 2-slot universal shelves into a single daisy-chain by linking them up via their rear-panel DCE and DTE control ports.

Daisy-chaining two or three shelves

To link two or three universal shelves, connect the DTE port from one shelf to the DCE port of the next. Figure 12 illustrates DCE-to-DTE cabling with a local data terminal on the DCE port. "Connecting to the control port" on page 28 describes the cable.

Figure 12—Cabling daisy-chained shelves (with terminal attached)
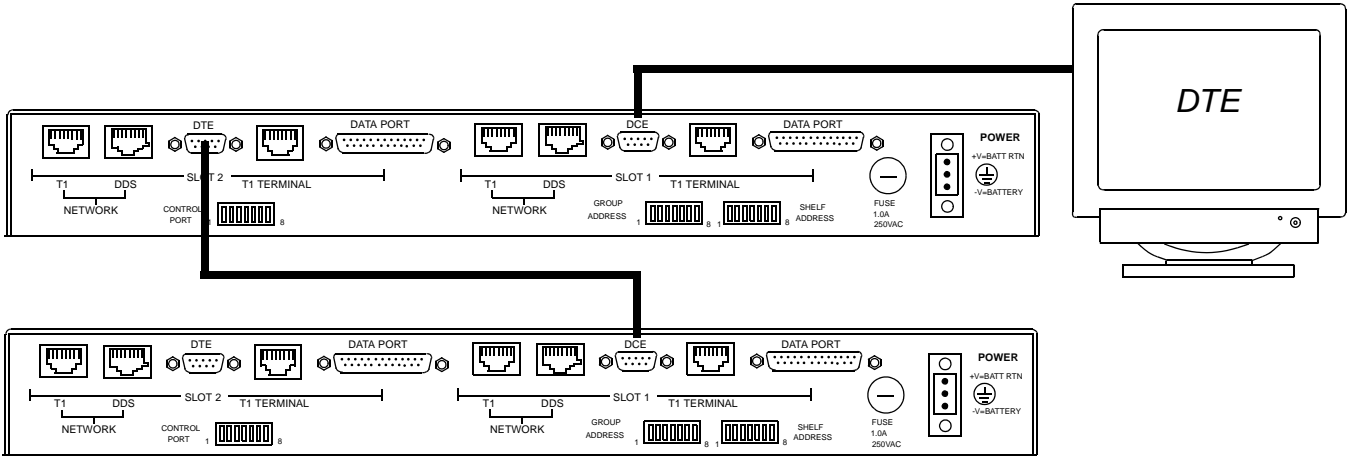
Figure 13—Cabling daisy-chained shelves (with modem attached)
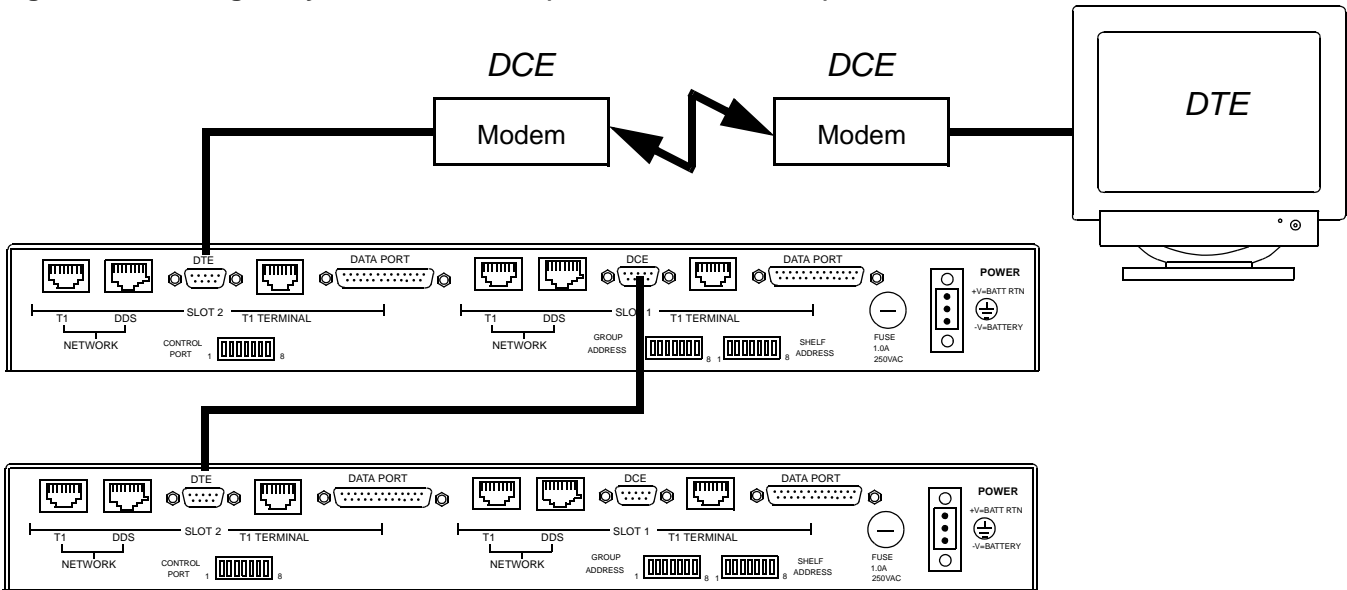
Connecting to the T1 network interface

Each DataSMART T1 plug-in connects to the network through the "Network T1" RJ48C 8-pin modular jack connector on the rear panel of the 2-slot universal shelf. If you are connecting a DataSMART 552 56/64K plug-in, see "Connecting to the DDS network interface" on page 31.

![caution triangle] **CAUTION!**
Do not connect the network to the "DDS" connector on the shelf.

Figure 14—T1 network interface connectors on the 2-slot shelf

NETWORK T1 connectors
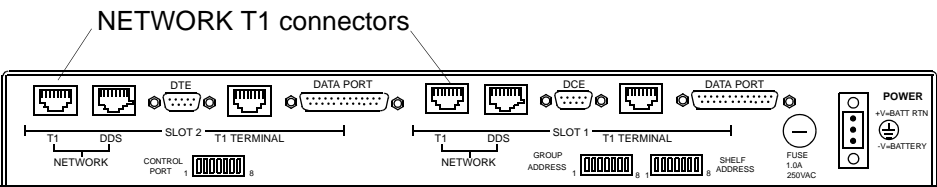
Plug one of the following cables into a T1 NETWORK connector:

Part number	Description of cable
930xx141	RJ48C to RJ48C modular plug
930xx142	RJ48C to RJ48C modular plug crossover NI cable

xx is length in feet. Call the factory for available lengths.
P = plug (male); S = socket (female)

▶ **NOTE**
FCC regulations require that the cable connection to the network be made with an RJ48C plug at the network end.

1 Connect one end of the cable to the T1 Network connector on the rear of the 2-slot universal shelf.

2 Connect the other end to the network using the Telco's instructions.

Figure 15—Location of pin 1 on an RJ48C plug
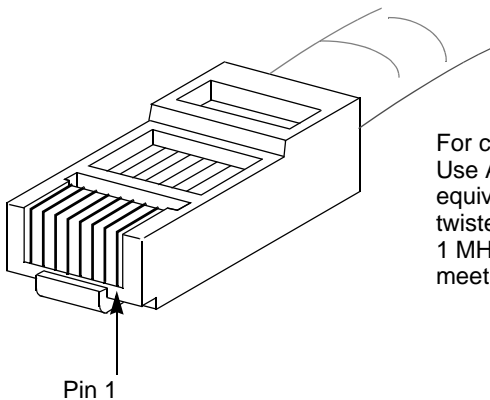
For connection to T1 network: Use AT&T Type ABAM cable or equivalent (individually-shielded twisted pair, rated at 100 ohms at 1 MHz). The cables listed above meet these specifications.

Pin 1

For more information, see Table 8 on page 102.

Connecting to the DDS network interface

Each DataSMART 552 plug-in connects to the network through the "Network DDS" RJ48S 8-pin modular jack connector on the rear panel of the 2-slot universal shelf. Use the DDS network cable shipped with your plug-in unit. If you are connecting a DataSMART T1 plug-in, see

> ⚠️ **CAUTION!**
> Do not connect the network to the "T1" connector on the shelf.

Figure 16—DDS network interface connectors on the 2-slot shelf

NETWORK DDS connectors
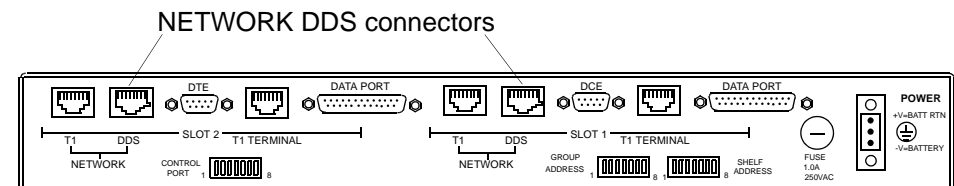
Plug the following cable into the DDS NETWORK connector

Part number	Description of cable
95xxx098*	RJ48S Plug to RJ48S Plug

xxx is length in feet. Call the factory for available lengths.
* Shipped with unit
P = plug (male); S = socket (female)

1 Connect one end of the cable to the DDS Network connector on the rear of the 2-slot universal shelf.

2 Connect the other end to the network using the Telco's instructions.

Figure 17—Location of pin 1 on an RJ48S plug (for cable 95xxx098)

For connection to a DDS network: use a keyed RJ48S cable.

Pin 1
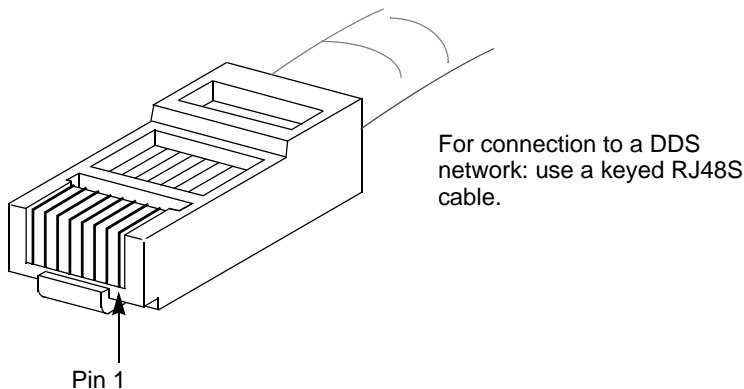
For pinout information, see .

3 *Installing the 12-slot universal shelf*

This chapter shows you how to install the 12-slot universal shelf for use with the DataSMART plug-ins.

Topics include:

- Preparing the installation site

- Installing the shelf into a rack

- Locating the ports, switches, and connectors

- Connecting power

- Setting address switches

- Setting control port switches

- Connecting to the terminal interface and data port (558/588)

- Connecting to data ports (all units)

- Connecting to the control port

- Cabling daisy-chained shelves

- Connecting to the T1 network interface

- Connecting to the DDS network interface

Preparing the installation site

Site/environmental requirements

The site should provide a stable thermal and electrical environment. The operating area should be clean and free from extremes of temperature, humidity, shock, and vibration.

Power supply

Power is supplied to the plug-ins via the 12-slot universal shelf. The installation site should include a DC power supply capable of supplying 8 watts of power to the shelf per installed DataSMART plug-in. Power supplies are available from Kentrox.

Temperature and humidity

DataSMART 552, 554, and 558 plug-ins operate properly in a temperature range of 0° C to 50° C (32° F to 120° F), and a humidity range of 5% to 90% RH, non-condensing.

For DataSMART 584 and 588 with the Frame Relay board, the operating temperature range is 0° C to 40° C (0° F to 104° F), and a humidity range of 5% to 90% RH, non-condensing.

Cable type

To connect to the T1 network (with the DataSMART 554, 558, 584, or 588), many carriers require AT&T Type ABAM cable or equivalent (individually-shielded twisted pair, rated at 100 ohms at 1 MHz).

To connect to the DDS network (with the DataSMART 552), use the 8-pin network cable and the 15-pin to 8-pin adapter packaged with the plug-in unit.

The requirements on the terminal interface side might be less stringent. To find the minimum cable specifications for your terminal equipment, consult the documentation for your terminal equipment.

Cable distances

The standard specifications for cable distances, as prescribed by applicable standards documents, are:

Interface	Suggested maximum cable length
V.35	50 ft. (15 m)
EIA-530	200 ft. (61 m)

Ventilation

The site should have enough room for adequate ventilation and cable routing. Allow at least 4 in. (10 cm) at the rear of the unit for cables and air flow. Do not block any of the air vents on the unit, including the ventilation holes at the bottom and top of the shelf. Allow at least one rack unit (2 in. or 5 cm) vertical spacing between shelves. Allow clearance for operation and maintenance.

Electrostatic protection requirements

It is essential to protect DataSMART plug-ins from electrostatic damage. They are most vulnerable to electrostatic damage when first removed from their shipping containers.

⚠️ **CAUTION!**
Wear a grounded electrostatic protection wrist strap when handling plug-ins.

Grounding requirements

Correct grounding is essential to protect DataSMART plug-ins from lightning and electrostatic damage. It is also required to meet safety and electromagnetic compatibility (EMC) standards. The power cable should always be connected to the shelf before inserting plug-ins so that the plug-ins will be grounded through the shelf.

⚠️ **CAUTION!**
It is essential that the shelf be connected to frame ground for lightning protection.

Taking inventory

Inspect the shipment for signs of shipping damage. If any items appear damaged, call Kentrox Customer Support as listed in .

Keep all packing material in case you need to move or ship the unit in the future.

Parts List

■   12-Slot Shelf

■   DC Power Connector

■   Two installation guides (DataSMART and M-PATH)

■   Registration Card

■   Rack-mounting brackets

■   Screws and washers to attach brackets to shelf

■   Screws and washers to attach shelf to rack

■   Cable ties

■   Installation CD for the DataSMART Installer graphical user interface (GUI)

Installing the shelf into a rack

The 12-slot universal shelf consists of a metal frame capable of holding twelve plug-ins. Mounting ears (shipped with the shelf) adapt the shelf to 19 inch or 23 inch equipment racks. The shelf requires 7 inches of vertical rack space, or four mounting spaces. Allow at least one rack unit (2 in. or 5 cm) vertical spacing between shelves and other equipment.

Attach the ears to the shelf, as shown below, using the screws provided. You can position the ears for mid-mounting or front-mounting. Secure the shelf to the rack using the screws provided in the kit.

Figure 18—12 slot universal shelf for 19 in. or 23 in. equipment racks

19 in. rack

Use front- or mid-rack position

23 in. rack
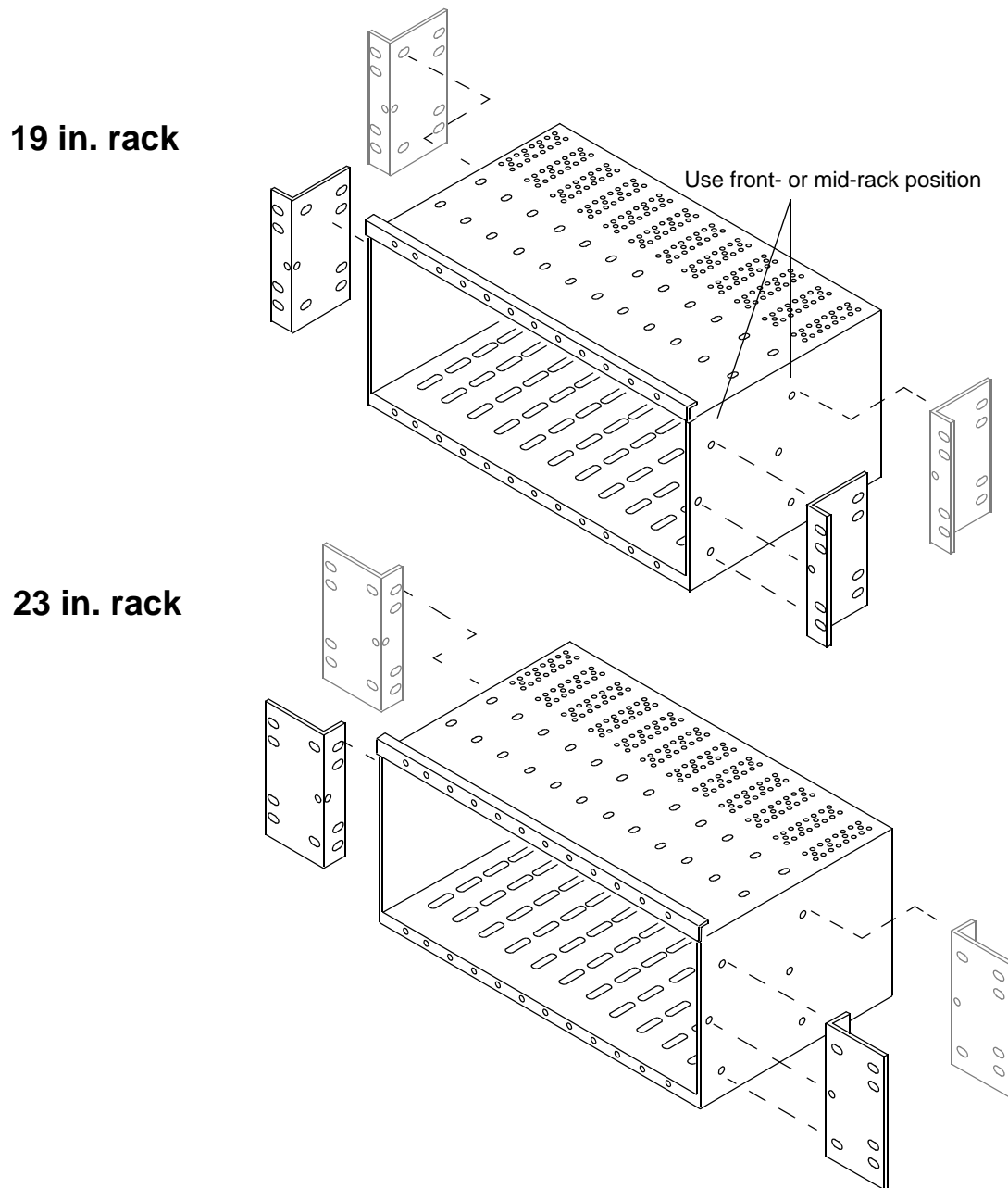
Locating the ports, switches, and connectors

Figure 19 shows the locations of connectors and controls on the rear panel of the 12-slot universal shelf.

Figure 19—Rear panel, 12-slot universal shelf
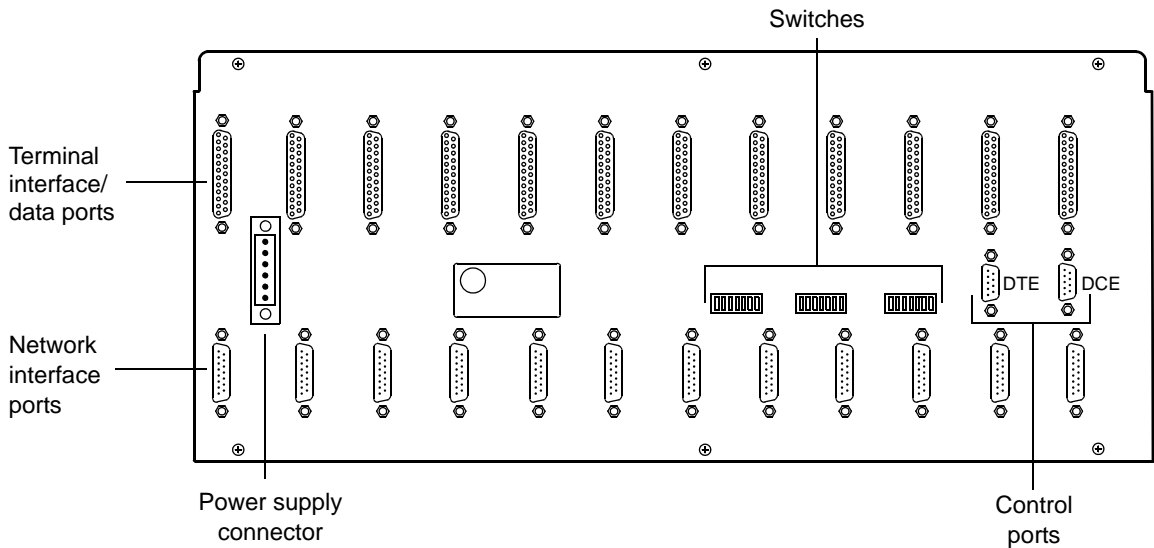
All switches are set in the DOWN position when the unit ships from the factory. The default conditions are as follows:

Control port default

Baud rate	9600
Parity	None
Data bits	8
Stop bits	1
Group Address	000
Shelf Address	00

Connecting power

The 12-slot universal shelf can use single or redundant power supplies. Table 3 describes the power supply pin functions.

⚠ **CAUTION!**

Make sure your DC power supply is OFF or unplugged before making power connections to the shelf. If the shelf is powered by a power supply capable of providing more than 10 amps, such as a centralized DC power system, the power feed fuse must be no larger than 10 amps.

Table 3—Power supply pin functions

Pin #	Function	Shelf slots	Wire size (AWG)	Wire size (Metric)
1	+V (B)	all	20 - 14	0.81-1.63 mm
2	Ground	all	14 - 12	1.63-2.05 mm
3	-V (B)	all	20 - 14	0.81-1.63 mm
4	-V (A)	all	20 - 14	0.81-1.63 mm
5	NC	NC	N/A	N/A
6	+V (A)	all	20 - 14	0.81-1.63 mm

Use a power supply capable of providing 8 watts per installed plug-in at a voltage between 24 and 48 VDC. You can order power supplies from Kentrox.

Connecting a single power supply

Using 14 AWG (1.63 mm) leads or larger (with green insulation and one or more yellow stripes), wire earth ground to the frame ground post (post 2) to ground the unit. Using 20 AWG to 14 AWG (0.81-1.63 mm) leads, wire power to the supplied six-post connector plug. Connect the positive voltage from your DC power supply to the +V post (post 6) and the negative voltage from your DC power supply to the -V post (post 3). See Figure 20.

Figure 20—Connecting a single power supply
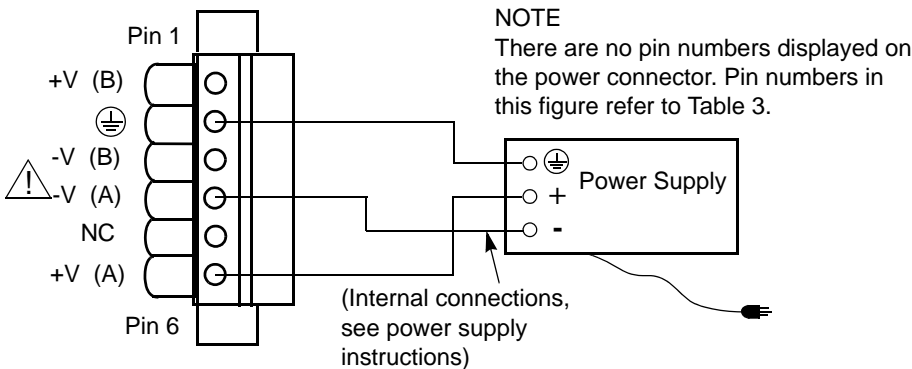
Connecting redundant power supplies

If you use redundant power supplies, make sure that either source is capable of supplying all the power required by the shelf.

Using 14 AWG (1.63 mm) leads or larger (with green insulation and one or more yellow stripes), wire earth ground to the frame ground post (post 2) to ground the unit. Using 20 AWG to 14 AWG (0.81-1.63 mm) leads, wire power to the supplied six-post connector plug. Connect the positive voltage from your first DC power supply (power B) to the +V post (post 1) and the negative voltage from your DC power supply to the -V post (post 3). Connect the negative voltage from the second power supply (power A) to the -V post (post 4) and the positive voltage to the +V post (post 6). See Figure 21.

Figure 21—Connecting redundant power supplies
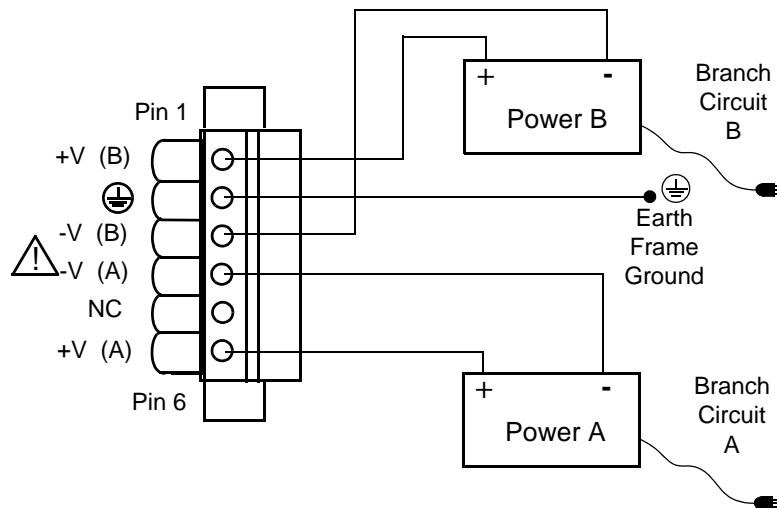
▶ **NOTE**
There are no pin numbers displayed on the power connector. Pin numbers in this figure refer to Table 3.

⚠ **CAUTION!**
Frame ground must be connected to earth ground to provide protection from excessive line voltages such as lightning or power line crossings.

Installing the rear-panel power connector

Firmly push the six-post connector onto the power connector at the rear of the unit and secure it to the back panel with the screws at either end of the connector. When the connector is attached with screws, the building wiring must provide a power disconnect device.

Setting address switches

Banks of switches on the rear panel of the 12-slot universal shelf control the addressing of DataSMART plug-ins. Switches 1 through 4 in the bank labeled GROUP ADDRESS determine the group address, and switches 1 through 4 in the bank labeled SHELF ADDRESS determine the shelf address.

Locating address switches

Figure 22 shows the locations and functional groupings of the banks of switches that govern addressing on the rear-panel of the 12-slot universal shelf. Switches within each bank are numbered 1 through 8.

Figure 22—12-slot universal shelf rear-panel address switches
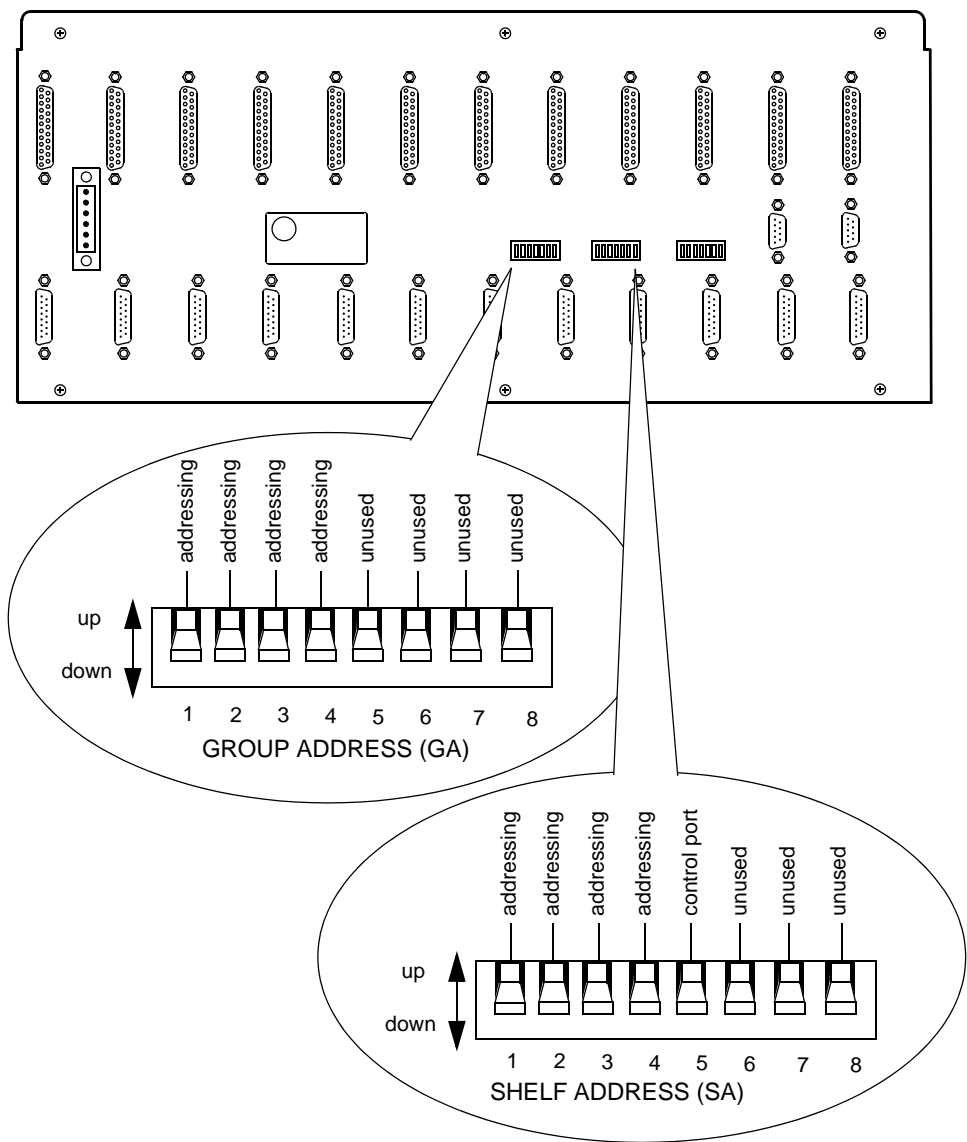
Setting physical addresses

All DataSMART plug-ins have an identifying physical address form of *xx:yy:***0***zz*, where *xx* denotes the slot number (01 through 12), *yy* the shelf number (00 through 15) and **0***zz* the group number (000 through 015). You use the physical address for logging into a unit (see) and also for auto-configuration.

Slot value

The plug-in's slot location within the shelf determines the address slot value. The slot furthest to the left (when facing the front of the shelf) has the slot value of 01, and the slot furthest to the right has the slot value of 12.

Shelf value

TIP

If there is only one shelf at the site, leave the shelf and group addresses at the default values of 00 and 000.

All plug-ins within the same shelf have the same shelf address value, as determined by switches 1 through 4 on the SHELF ADDRESS switch bank. The address is a binary-encoded combination of the switches in the shelf address bank (see Table 4).

If you are linking two or more shelves together, no two shelf addresses can be the same. We recommend using sequential shelf addresses as standard practice. The shelf addresses are required to ensure sequential IP addresses during auto-configuration.

Group value

All plug-ins within the same shelf also have the same group address value, which is determined by switches 1 through 4 on the GROUP ADDRESS switch bank. Set the group address with the switches in the group address bank, using the same encoding you use to set the shelf address (see Table 4). Typically, all shelves at a single physical location are set to the same group address, which is usually 0.

A group cannot contain more than 16 shelves. If a site has more than 16 shelves, divide the shelves into groups and assign each group a unique number. We recommend using sequential group numbers.

Table 4—Binary table for setting shelf addresses or group addresses

Address	S1	S2	S3	S4	Address	S1	S2	S3	S4
00 or 000	D	D	D	D	08 or 008	D	D	D	U
01 or 001	U	D	D	D	09 or 009	U	D	D	U
02 or 002	D	U	D	D	10 or 010	D	U	D	U
03 or 003	U	U	D	D	11 or 011	U	U	D	U
04 or 004	D	D	U	D	12 or 012	D	D	U	U
05 or 005	U	D	U	D	13 or 013	U	D	U	U
06 or 006	D	U	U	D	14 or 014	D	U	U	U
07 or 007	U	U	U	D	15 or 015	U	U	U	U

Calculating a unit's control port IP address for auto-configuration

When a controller automatically configures a plug-in, it determines the configurable unit's control port IP address using the following criteria:

■ The (DataSMART 552/554/555/584) configurable unit's slot and shelf addresses

■ The (DataSMART 558/588) controller's control port IP address, assigned by your network administrator or system administrator

■ Whether the shelf's control port is DCE or DTE, determined by switch 5 of the SHELF ADDRESS switch bank (see Figure 22 on page 40)

If the controller and configurable unit are in different shelves (see "Connecting to the control port" on page 49), the shelf address also determines the configurable unit's IP address.

Ethernet IP addresses and data link IP addresses are not auto-configured. Group addresses are not related to IP addresses.

IP addresses consist of a network part and a host part. The dividing line between the network part and the host part is set by the control port IP netmask (see page 74). The network part of the control port IP address is the same for configurable units and controllers. Only the host part varies.

▶ **NOTE**

The IP addresses in this section are examples only. Your company's network administrator or system administrator should assign IP addresses for all units that require them. Kentrox cannot assign IP addresses for you.

When using the DCE control port

Switch 5 of the SHELF ADDRESS switch bank determines whether the shelf's control port is DCE or DTE. See Figure 23 on page 44.

The controller is in slot 1 and the daisy-chain runs left-to-right in the shelf.

Calculate the configurable unit's IP address as follows:

1 Take the controller's IP address (assigned by the administrator).

2 Count downstream (left-to-right) to determine the configurable unit's IP address. For example, if the configurable unit is next to the controller, add 1 to the last part of the IP address. If it is in the second slot from the controller, add 2, and so on. See the illustration below.

downstream when using DCE

Slot 1

558 554 554

IP Address: 192.228.34.5, etc.
IP Address: 192.228.34.4
IP Address: 192.228.34.3
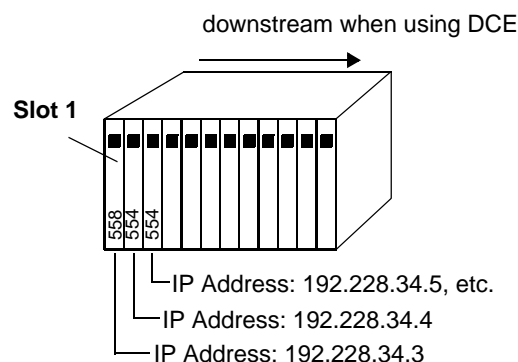
So, in this example:

■   The controller's IP address is 192.228.34.3

■   The configurable unit in slot 2 has an IP address of 192.228.34.4

■   The configurable unit in slot 3 has an IP address of 192.228.34.5, etc.

When using the DTE control port

The controller is in slot 12 and the daisy-chain runs right-to-left in the shelf.

Calculate the configurable unit's IP address as follows:

1   Take the controller's IP address (assigned by the administrator).

2   Count downstream (right-to-left) to determine the configurable unit's IP address.
         For example, if the configurable unit is next to the controller, add 1. If it is in the
         second slot from the controller, add 2, and so on. See the illustration below.

downstream when using DTE

Slot 12

IP Address: 192.228.34.7
IP Address: 192.228.34.8
IP Address: 192.228.34.9, etc.
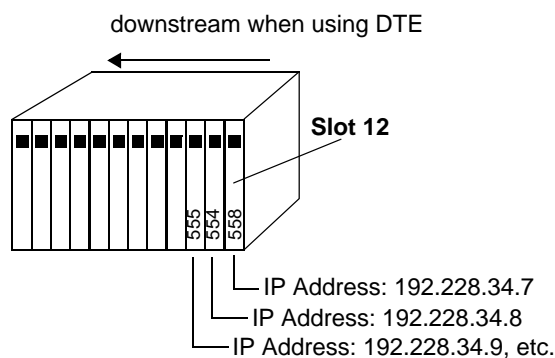
So, in this example:

■   The controller's IP address is 192.228.34.7

■   The configurable unit in slot 11 has an IP address of 192.228.34.8

■   The configurable unit in slot 10 has an IP address of 192.228.34.9, etc.

Auto-configuration with multiple shelves

With multiple shelves, calculate the IP address the same way you'd calculate it with one
shelf. For an example, see the illustration below.

IP Addresses: 192.228.34.11 through 192.228.34.22 (left-to-right)

IP Addresses: 192.228.34.23 through 192.228.34.34 (left-to-right)

IP Addresses: 192.228.34.35 through 192.228.34.46 (left-to-right)
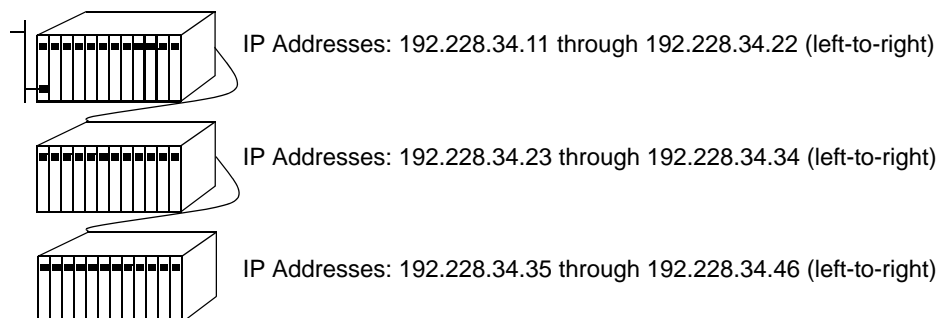
To connect multiple shelves in a daisy-chain, see
.

Setting control port switches

For DataSMART plug-ins, the bank of switches labeled CONTROL PORT
CONFIGURATION, as well as switch 5 in the SHELF ADDRESS bank, govern the oper-
ation of the rear-panel control ports on the 12-slot universal shelf.

Locating control port switches

Figure 23 shows the locations of the control port configuration switches on the
12-slot universal shelf. Switches within each bank are numbered 1 through 8. Only switch
5 of the shelf address bank governs control port configuration.

Figure 23—12-slot universal shelf rear-panel control switches

Setting control port switches

Control port	SA5
DCE (default)	down
DTE	up

Baud setting	CP1	CP2
9600 (default)	down	down
19200 (supports 28800)	down	up
2400	up	down
38400	up	up

Parity	CP3	CP4
off (default)	down	down
on - odd	up	down
on - even	up	up

Data bits	CP5
8 data bits/character (default)	down
7 data bits/character	up
7 data bits/character	up

Stop bits	CP6
1 stop bit/character (default)	down
2 stop bits/character	up

Unused switches	CP7	CP8
Default position	down	down

Selecting a control port for IP management

Even if you do not use a control device on the serial port, the control port switch setting determines whether the controller goes in slot 1 or slot 12 (see). For IP management, shelf-address switch SA5 designates which control port will be the SLIP or PPP interface: either the rear-panel DCE or DTE control port. You must connect the control device to this port.

Using a 14.4 or 28.8 kbps modem

If you are using a 14.4 kbps modem as a control device, set the baud rate to 9600.

If you are using a 28.8 kbps modem as a control device, set the baud rate to 19200.

Make sure the modem is set to lock the data port rate to the DTE.

Connecting to the terminal interface and data port (558/588)

The DataSMART 558 or 588 plug-in uses a single 25-pin socket on the rear of the 12-slot universal shelf to connect to terminal equipment and/or data terminal equipment (DTE). (To connect to the data port only, see .) You can configure each data port interface for each port as either an EIA-530 or a V.35-compatible interface.

TERMINAL/DATA PORT connectors

TI/DP CABLE
DB25 Plug
Connect to Data Port

MRAC34
or
DB25

Connect to
DTE

DA15S
or
DA15P

Connect to
Terminal
Equipment
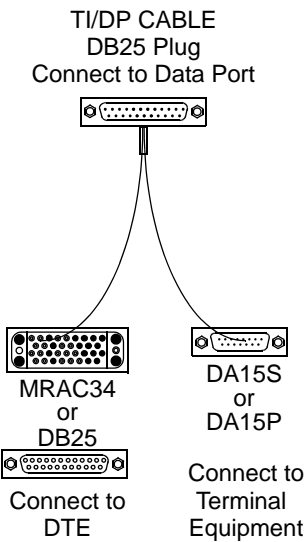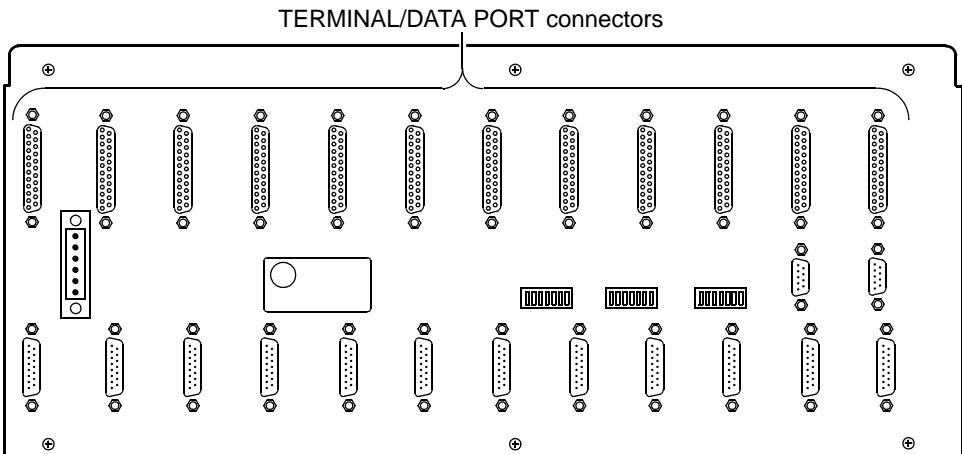
Plug one of these cables or adapters into the DATA PORT connector:

Terminal interface

Part number	Description of cable
950xx094	Cable, DB25P to RJ48C connector

Terminal equipment and DTE, Y adapter cables

Part number	Description of cable
950xx088	TI/DP EIA 530, DB25P to DB25S and DA15S
950xx089	TI/DP EIA 530, DB25P to DB25S and DA15P
950xx090	TI/DP V.35, DB25P to MRAC34S and DA15P
950xx091	TI/DP V.35, DB25P to MRAC34S and DA15S
Adapter number	Description of adapter
77891	DA15S to RJ48C jack adapter (adapts 950xx089 and 950xx090 cables)

xx is length in feet. Call the factory for available lengths.
P = Plug (male); S = Socket (female)

1 Connect one of the cables listed on page 46 to the TERMINAL/DATA PORT connector. Secure the connector to the panel with the screws built into the connector.

2 Connect the DA15 or 8-pin modular end of the cable to the terminal equipment using the manufacturer's instructions.

3 Connect the DB25 or MRAC34 (V.35) end of the cable to the DTE using the manufacturer's instructions.

4 If the service does not run as expected, or if you get an LOS alarm, first make sure you are using a cable with the proper pin connections. To find the minimum cable specifications for your terminal equipment, consult the documentation for your terminal equipment.

Interface diagram and pinouts for terminal connectors

Look on the following pages for:

■ 15-pin D plug connector (Table 11 on page 105)

■ 8-pin RJ48C connector (Table 12 on page 105)

■ Diagram of data transmission interfaces (Figure 43 on page 106)

Connecting to data ports (all units)

Each DataSMART plug-in connects to data terminal equipment (DTE) through a 25-pin socket on the rear panel of the 12-slot universal shelf. If your unit does not have a terminal interface, use the information on this page to connect your DTE to the plug-in. On most plug-ins, you can configure the interface for each port as either a V.35-compatible or an EIA-530 interface. The DataSMART 552, however, supports only a V.35-compatible interface on the data port.

DATA PORT connectors
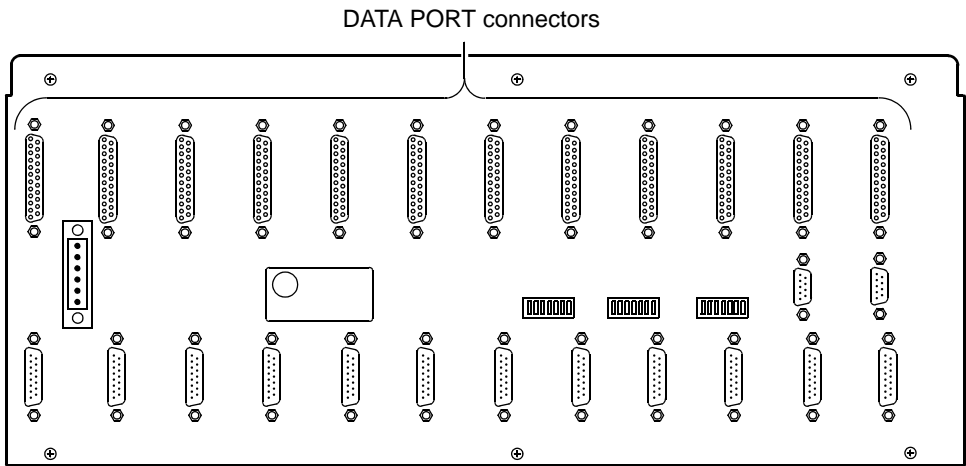
Plug one of these cables or adapters into the DATA PORT connector:

Part number	Description of cable
950xx054	Adapts from the DB25P to V.35 MRAC34P connector
950xx073	Tail circuit timing V.35 interface
950xx074	DB25P to MRAC34S
950xx058	DB25P to DB25P tail circuit timing EIA-530 interface
950xx061	DB25P to DB25P to connect to an EIA-530 interface
950xx066	Connects DB25P to DB37P (to adapt EIA-530 to an RS449 interface)

Adapter number	Description of adapter
01-78904001	V.35, DB25P to MRAC34S
01-78901001	EIA-530/RS449, DB25P to DS37S

Also compatible:	Description
95010053	V.35, DB25P to MRAC34P, 10 ft. cable
01-78893001	V.35, DB25P to MRAC34S, 6 ft. adapter

xx is length in feet. Call the factory for available lengths.
P = plug (male); S = socket (female)

1 Connect one of the cables shown in the figure to the data port. Secure the connector to the panel with the screws built into the connector.

2 Connect the other end of the cable to the DTE data port according to the manufacturer's instructions.

Pinouts

See Table 13 through Table 15 in Appendix A.

Connecting to the control port

To configure a DataSMART DSU, log in via one of the control ports on the shelf before you select and configure the IP network interface you will use to manage the unit. See "Configuring DataSMART units" on page 61 for configuration procedures.

Selecting a control port

Choose one of the control ports on the rear of the 12-slot shelf:

■ The **DCE control port** accepts an ASCII connection from a DTE device.

■ The **DTE control port** accepts an ASCII connection from a DCE device (e.g., a modem).

Setting up the control port

Whichever control port you use, you must first set up the shelf control port switches to match the communication parameters being used by your control device. Further, if you are using the DTE port, you must set shelf-address switch SA5 to "up" (leave the switch set down for the rear-panel DCE control port). See page 40 for instructions.
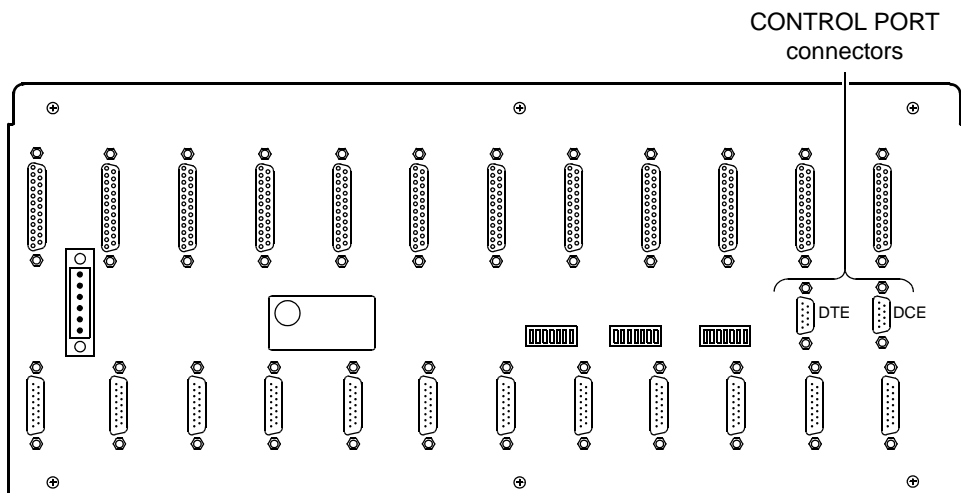
Plug one of these cables into the CONTROL PORT connectors

Part number	Description of cable
01-95006022 (6 ft.)	DE9S to DE9P, for DCE or DTE port
01-95010022 (10 ft.)	DE9S to DE9P, for DCE or DTE port
01-95010023 (10 ft.)	DE25P to DE9S, for DCE port only

The control port cables can connect the shelf to:

■ a PC using the AT 9-pin interface

■ a modem using the 9-pin connector

■ other shelves in a daisy chain (see "Cabling daisy-chained shelves" on page 50)

Pinout

See Table 16 on page 110 and Table 17 on page 110 in Appendix A.

Cabling daisy-chained shelves

You can connect two or more 12-slot universal shelves to make one continuous daisy-chain of DataSMART plug-ins. To achieve optimal management performance, we recommend these guidelines for chaining shelves together:

■   **SLIP or Ethernet access**—If each unit in the shelf has an IP data link to a remote unit, you can also have one active SLIP or Ethernet interface per shelf and up to 4 active Telnet sessions at any time.

■   **ASCII connection**—Limit the daisy chain to three shelves (36 plug-ins).

Connect shelves via their rear-panel DCE and DTE control ports. If you connect the first unit in the chain to a control device via its DCE control port, cable that unit's DTE control port to the DCE port of the next unit, and so on. If you connect the first unit to a control device via its DTE control port, reverse the shelf cabling.

Figure 24 Illustrates DCE-to-DTE cabling with a local data terminal on the DCE port.

Figure 24—Cabling daisy-chained shelves (with terminal attached)
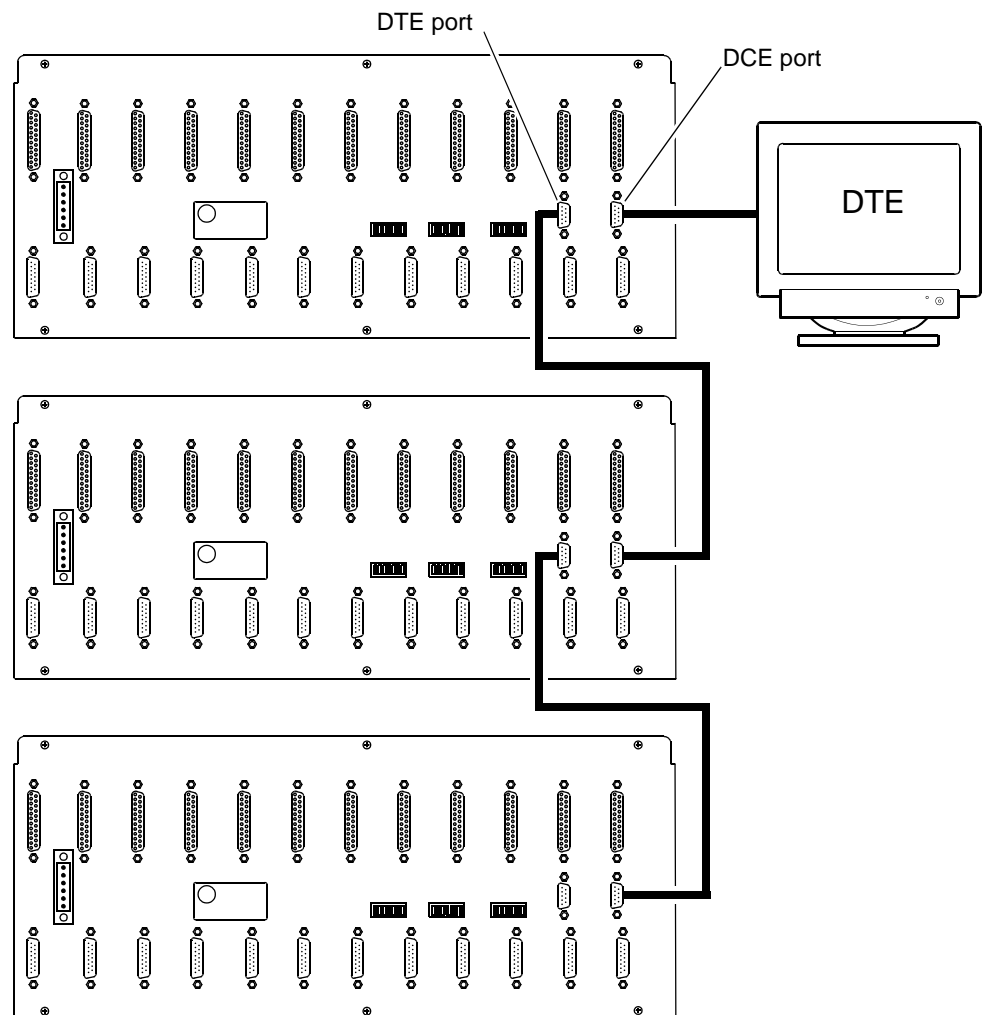
Connecting to the T1 network interface

Each DataSMART T1 plug-in connects to the network through a 15-pin D-style plug on the rear panel of the 12-slot universal shelf. If you are connecting a DataSMART 552 56/64K plug-in, see "Connecting to the DDS network interface" on page 53.

Figure 25—Network interface connectors on the 12-slot universal shelf
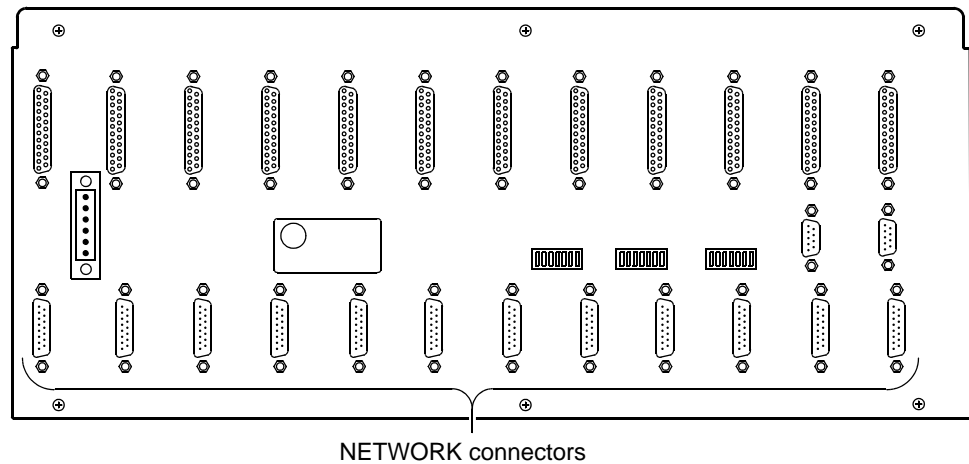
NETWORK connectors

Plug one of the following cables into a NETWORK connector:

Part number	Description of cable
930*xx*151	DA15S to RJ48C modular plug
930*xx*091	DA15S to DA15P
930*xx*111	DA15S to stub
77993004	DA15S to barrier strip adapter
77891	DA15S to RJ48C jack adapter

xx is length in feet. Call the factory for available lengths.
P = plug (male); S = socket (female)

▶ **NOTE**
FCC regulations require that the cable connection to the network be made with an RJ48C plug at the network end.

1   Connect one of the listed cables to a NETWORK connector on the bottom row of the rear panel of the 12-slot universal shelf.

2   Connect the other end of the cable to the network using the manufacturer's or Telco's instructions.

To connect to the T1 network, many carriers require AT&T Type ABAM cable or equivalent (individually-shielded twisted pair, rated at 100 ohms at 1 MHz). The cables listed above meet these specifications.

Interface diagram and pinouts for network connectors

Look on the following pages for:

■   15-pin D plug (Table 7 on page 102)

■   8-pin RJ48C connector (Table 8 on page 102)

■   Diagram of data transmission interfaces (Figure 42 on page 106)

Connecting to the DDS network interface

Each DataSMART 552 plug-in connects to the DDS network through a 15-pin D-style plug on the rear panel of the 12-slot universal shelf. Use the 15-pin to 8-pin adapter and DDS network cable shipped with your plug-in unit. If you are connecting a DataSMART T1 plug-in, see "Connecting to the T1 network interface" on page 51.

Figure 26—Network interface connectors on the 12-slot universal shelf
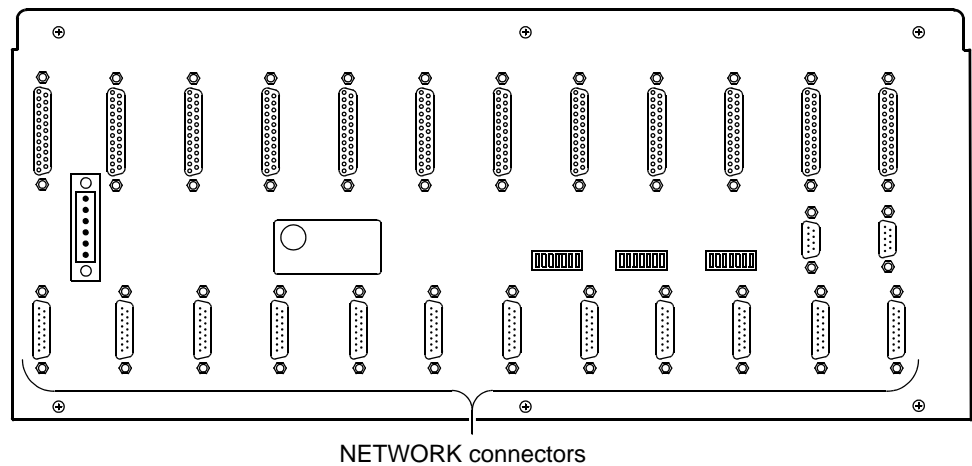
NETWORK connectors

Plug one of the following cables into a NETWORK connector:

Part number	Description of cable
95xxx098*	8-pin RJ48S connector
77894*	DA15S to RJ48S 8-pin modular jack adapter

xxx is length in feet. Call the factory for available lengths.
*Ships with unit
P = plug (male); S = socket (female)

1 Connect the 15-pin side of the adapter to a NETWORK connector on the bottom row of the rear panel of the 12-slot universal shelf.

2 Connect one end of the RJ48S network cable to the 8-pin side of the socket adapter.

3 Connect the other end of the cable to the network using the manufacturer's or Telco's instructions.

Interface diagram and pinouts for network connectors

Look on the following pages for:

■ 15-pin D plug (Table 7 on page 102)

■ 8-pin RJ48S connector (Table 9 on page 103)

■ DA15S to RJ48S modular jack adapter (Table 10 on page 103)

■ Diagram of data transmission interfaces (Figure 42 on page 106)

4 *Installing the DataSMART*

If you are installing a DataSMART 558 or 588 controller, the installation steps are as follows:

1   Insert the controller into its slot in the shelf.

2   Configure the controller (see Chapter 5).

3   For local management access via Ethernet, connect an Ethernet cable to the controller's Ethernet port.

Repeat this procedure for each controller you are installing.

Important—Install and configure controller units first!

▶ **NOTE**
If you plan to use the controller's auto-configuration capabilities, you must power up the shelf and install and configure all the controllers before installing any configurable DataSMART 552, 554, 584, or 584-F plug-ins. You can also configure DataSMART SPort 555 plug-ins from any of the controllers listed above.

Using auto-configuration

1   Power up the shelf.

2   Install and configure a controller at the head of the daisy-chain before installing any configurable plug-ins.

3   Enable auto-configuration on all units (this is the default).

4   Insert the plug-in into its slot in the shelf. The controller will send it a configuration image which it uses to configure itself.

5   Insert the next plug-in, and so on.

Alternatively, you can insert configurable plug-ins into an unpowered shelf that contains a fully configured controller and they will configure themselves when you restore power.

▶ **NOTE**
If your application requires an SNMP-managed CSU that is auto-configurable, use the M-PATH 537.

Using manual configuration

If you do not have a controller or have disabled auto-configuration, you must configure each plug-in, one at a time.

1   Power up the shelf.

2   Insert the plug-in into its slot in the shelf.

3   Log into and configure the plug-in (see Chapter 5).

4   Repeat this procedure for each unit in the shelf.

Inserting the controller or plug-in

You can install a DataSMART controller in any slot position within the shelf. However, if your site includes controllers and configurable plug-ins and you want to automatically configure the plug-ins, you must insert the controller ahead of the downstream plug-in units in the daisy chain. See .

> ⚠ **CAUTION!**
> A power source with acceptable grounding must be connected to the power receptacle of the shelf before installing a plug-in.

To insert a DataSMART controller card or plug-in card into a shelf slot:

1 Align the card's edge with the top and bottom card guides in the 12-slot shelf, or the left and right card guides in the 2-slot shelf.

2 Press the card into the slot until the card's rear-panel connectors snap into place.

3 Tighten the front-panel top and bottom screws until they are finger tight and the card is seated securely in the shelf.

When the card is installed correctly, there should be no gap between the card's front panel and the shelf.

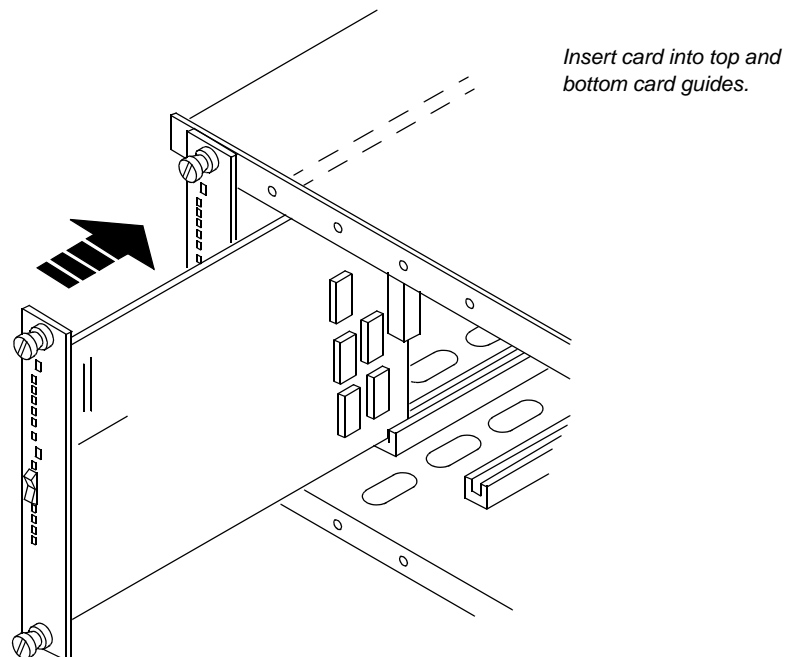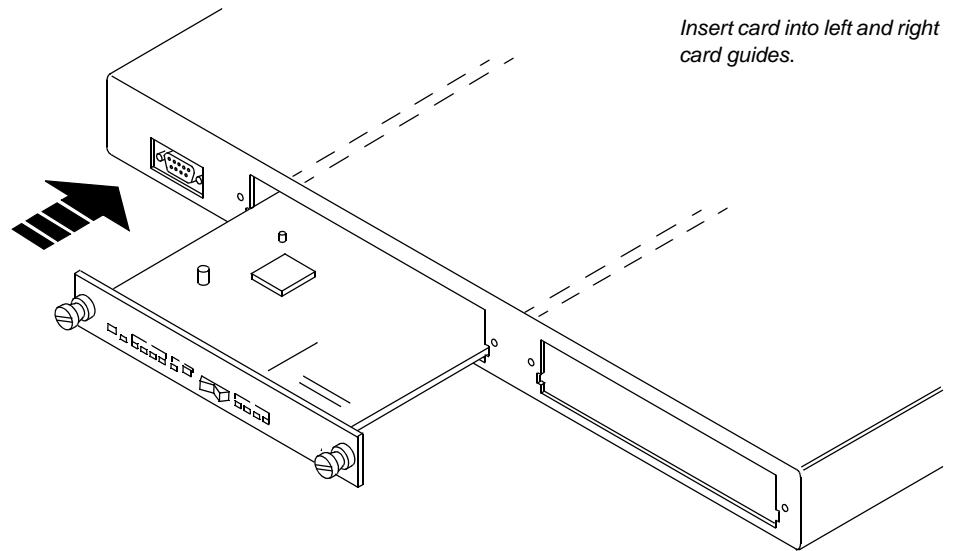**Figure 27—Inserting a DataSMART plug-in into a 12-slot universal shelf**

Insert card into top and bottom card guides.

Figure 28—Inserting a DataSMART plug-in into a 2-slot universal shelf

Insert card into left and right card guides.

Self-test

When you insert a DataSMART controller or plug-in unit into the shelf, it goes through a short self-test. The POWER/FAIL or PWR LED glows a steady red for a few seconds and then all LEDs on the front panel light up and run through a series of self-tests for about 20 seconds (during which the status of individual LEDs will vary).

If the POWER/FAIL or PWR LED eventually glows a steady green, the self-test was successful and you can continue with the installation.

If the POWER/FAIL or PWR LED glows a steady red, the self-test failed. Make note of any other LEDs on the unit's front panel that are glowing or blinking, and call Kentrox Customer Support for assistance as listed in "Who to call for assistance" on page 7.

Auto-configuration LED display

If auto-configuration is enabled (which is the default), the DataSMART plug-in sends a "request for configuration" message to the controller once the self-test has completed successfully. While this message is being sent, the plug-in's POWER/FAIL LED blinks green in a "heartbeat" rhythm (two blinks in quick succession, followed by a pause). On the DataSMART 552 plug-in, the PWR LED blinks in synchronization with the TEST LED to indicate the unit is sending the "request for configuration" message to the controller.

The LEDs continue to indicate the unit is waiting for configuration until you start to configure the unit manually (that is, you log into the configurable unit and change one or more of its parameters) or a controller responds to the configuration request.

Automatic configuration

If a controller is installed and enabled for auto-configuration (which is the default), the controller sends configuration information to the plug-in. The controller's AUTO-CFG LED glows green when auto-configuration is enabled.

If the controller has auto-configuration disabled, and downstream plug-ins are waiting for auto-configuration parameters, you can initiate auto-configuration on a downstream unit from the controller by using the **SAC** command. See "Using the SAC (Send Auto-Configure) command" on page 84 for information about using this command.

The plug-in should complete its configuration within 10 to 20 seconds. At that time, its POWER/FAIL or PWR LED glows a steady green.

Connecting to the controller's Ethernet port

If you use Ethernet to manage the controller:

1 Configure the controller's Ethernet IP interface (see Chapter 5).

2 Connect the 8-pin modular (10Base-T) connector on the controller's front panel to a 10Base-T wiring hub.

DataSMART Model
558/588
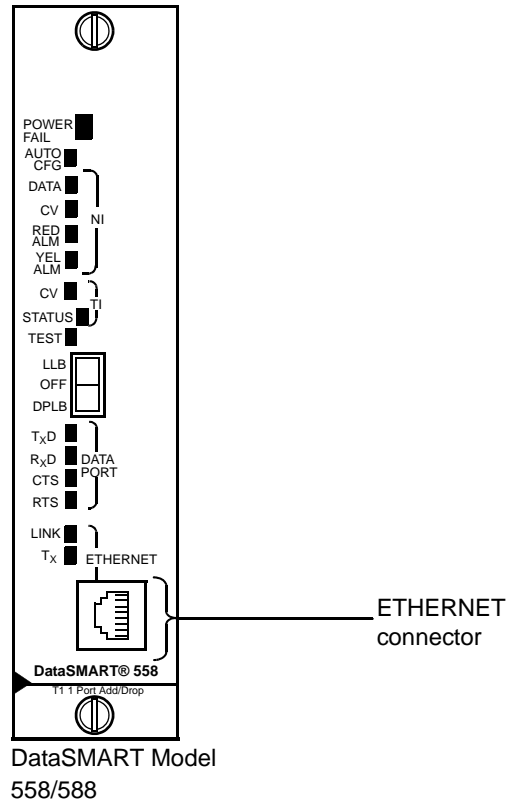
Configuring the plug-in, if not using auto-configuration

If you are not using auto-configuration, or if you want to change a specific parameter on a plug-in:

■   Log into the unit and access its command line interface.

■   **If you are configuring a T1 plug-in**, make a copy of the worksheets from Appendix B and fill them out, then see Chapter 5.

■   **If you are configuring a 56/64 kbps plug-in** (the DataSMART 552), see Chapter 5.

5 *Configuring DataSMART units*

This chapter tells you how to manually configure DataSMART units. Topics include:

■ Logging into the DataSMART unit

■ Configuring the DataSMART T1 unit (554, 558, 584, and 588)

■ Configuring the DataSMART 56/64 kbps unit (552)

■ Using the SAC (Send Auto-Configure) command

If you want to use automatic configuration, see (for the 2-slot shelf), or (for the 12-slot shelf).

The commands listed in this chapter are not an exhaustive list of commands that DataSMART units can receive. For a complete list, see the *User's Guide*.

Conventions used in this chapter

This chapter employs the following conventions when explaining command line syntax:

Literals	Bold type identifies commands and syntax elements that must be entered exactly as shown in the text.
Variables	Italic type indicates command line items for which you substitute an appropriate value, such as a number or a string of characters.
x/y	A vertical line between elements means that the elements are mutually exclusive; you can select one and only one of the elements.
[ ]	Brackets indicate items that are optional.
^x	A caret (^) followed by a letter indicates that you press the Ctrl key and type the letter simultaneously.

Logging into the DataSMART unit

You must connect a terminal or PC to the control port and log into a DataSMART unit via ASCII before you can configure the unit. The login command syntax is:

^Dxx:yy:**0**zz**^E**

where

^D, ^E	Press the Ctrl and D (or Ctrl and E) keys simultaneously.
xx	The unit's slot location, 01 through 12. 01 is the slot furthest to the left (as viewed from the front of the shelf) and 12 (or 02 for the 2-slot shelf) is the slot furthest to the right. Enter both digits.
yy	The shelf number, 00 through 15, as specified by the SHELF ADDRESS switches on the shelf rear panel. Enter both digits.
0zz	The group number, 000 through 015, as specified by the GROUP ADDRESS switches on the shelf rear panel. Enter all three digits.

For example, to log into a unit at slot 1, shelf 1, group 1, use the command:

^D01:01:001^E

The login command is not echoed as you type it. Commands you type after you log in, however, are echoed.

Viewing the Main Menu screen

Once you have logged into a DataSMART unit, its green POWER/FAIL or PWR LED starts blinking, and a display similar to that shown below appears on your terminal screen:

```
DataSMART 5nn Version 1.40 Copyright (c) 1997 Kentrox
                    ADDRESS: 01:01:001      NAME: PORTLAND,OR


MM                                      - Main Menu
SS                                      - System Status and Remote Menu
R                                       - Reports Menu

LM                                      - Local Maintenance Menu
RM                                      - Remote Maintenance Menu

AC                                      - Alarm Configuration Menu
CC                                      - Control Port Configuration Menu
DC                                      - Data Port Configuration Menu
FC                                      - Fractional T1 Configuration Menu
FMC                                     - Frame Management Configuration Menu
MC                                      - Management Configuration Menu
NC                                      - NI Configuration Menu
PC                                      - Password Entry and Configuration Menu
SC                                      - System Configuration Menu
TC                                      - TI Configuration Menu

^D                                      - Logout
^D<xx>:<yy>:<zzz>^E                     - Address Another Unit
```

T1 units only — (pointing to DC, FC)
Frame Monitoring units only — (pointing to FMC)
T1 units only — (pointing to NC)
Add/drop units only — (pointing to TC)

You are now ready to enter commands to configure the unit.

Configuring the DataSMART T1 unit

This section applies only to DataSMART T1 units (554, 558, 584, and 588). If you are configuring a 56/64 kbps unit (552), see "Configuring the DataSMART 56/64 kbps unit" on page 78.

Use the commands in this section after you have filled out a DataSMART T1 Configuration Worksheet (Appendix B) and you have determined channel assignments, IP network interface configurations, and IP addresses for each DataSMART unit to be configured. The worksheet and the typical applications listed in this section are easy to follow and should lead you through most installations without any trouble. Use the worksheet and this section together.

Setting the system date and time

1   Set the system date by entering the following command:

SD:*mm*,*dd*,*yy*

mm   Set the month. You can enter the three-letter abbreviation, or the number of the month.

dd   Set the day of month. The DataSMART checks the entered value to see if the day is valid for the given month and year.

yy   Set the last two digits of the year.

2   Set the system time by entering the following command:

ST:*hh*,*mm*

hh   Set the hour. The time is specified in 24-hour format, where 12:00 is noon and 00:00 is midnight. Allowable values are 0 to 23, inclusive.

mm   Specify the minutes. Allowable values are 0 to 59, inclusive.

Setting up network interface and terminal interface

Refer to questions 1 and 2 of the DataSMART Configuration Worksheet.

Set the NI framing format

3   Set the network interface framing format by entering one of these commands:

NESF   Extended super frame (default)

NSF   Super frame

NERC   Ericsson-modified super frame (used by some L. M. Ericsson switches in the cellular service)

Set the NI line coding

4   Set the network interface line coding by entering one of these commands:

NB8   B8ZS line coding (default)

NAMI   AMI line coding

Set the transmit line build out (attenuation) parameter

5 Set the network interface line build out (attenuation) by entering one of the following commands:

NL0	0.0 dB line attenuation (default)
NL1	7.5 dB line attenuation
NL2	15.0 dB line attenuation

Set the TI framing format (add/drop units only)

6 Set the terminal interface framing format by entering one of these commands:

TESF	Extended super frame (default)
TSF	Super frame
TERC	Ericsson-modified super frame (used by some L. M. Ericsson switches in the cellular service)

Set the TI line coding (add/drop units only)

7 Set the terminal interface line coding by entering one of the following commands:

TB8	B8ZS line coding (default)
TAMI	AMI line coding

Setting timing and data port interface

Set the system timing signal source

See question 3 of the DataSMART Configuration Worksheet.

8 Set the DataSMART source clock by entering the following command:

CLK:*src*

src	Specify the clock source:
	L (loop timing; the default)
	I (internal master timing)
	1 (data port timing, also known as "tail circuit timing")
	C (CSU through timing; add/drop units only)
	T (terminal interface receive timing; add/drop units only)

For most applications, the DataSMART derives its source clock from the network receive signal (Loop Timing). This is the most common timing setup and should be used if your T1 service provider supplies timing. If your T1 service provider does not supply timing, you will need to select an alternate timing source.

Set the data port interface type

See question 4 of the DataSMART Configuration Worksheet.

9 Set the data port interface type by entering the following command:

INTF1:*cmd*

|	
cmd	**V** (V.35, cable compatible with DataSMART 72000 series units). This is the default, and is recommended for all new installations.
	D (V.35, cable compatible with DataSMART 78000 series units).
	E (EIA-530. If you have an add/drop unit and want to use all functions of the EIA-530 interface, see "Using the EIA-530 interface with add/drop units" described below. If you configure an add/drop unit to operate with the EIA-530 interface, it will no longer work as an add/drop DSU but as a DSU only.

Using the EIA-530 interface with add/drop units

If you have a DataSMART 558 or 588 unit, jumpers on the plug-in card can determine whether the unit functions as an add/drop DSU or as a DSU only with a fully functional EIA-530 interface. The default setting for these four jumpers (labeled J301, J302, J303, and J305) is shown in Figure 29, where the plug-in is set as an add/drop unit.

If you want to use all the functions of an EIA-530 interface (including the data set ready, test mode, and local loopback circuits), position the jumpers over pins 2 and 3 on all four jumper headers. Your unit will then operate as a DSU only (no add/drop functions) with an EIA-530 interface.

Figure 29—Jumpers on DataSMART 558 and 588 units, set for add/drop
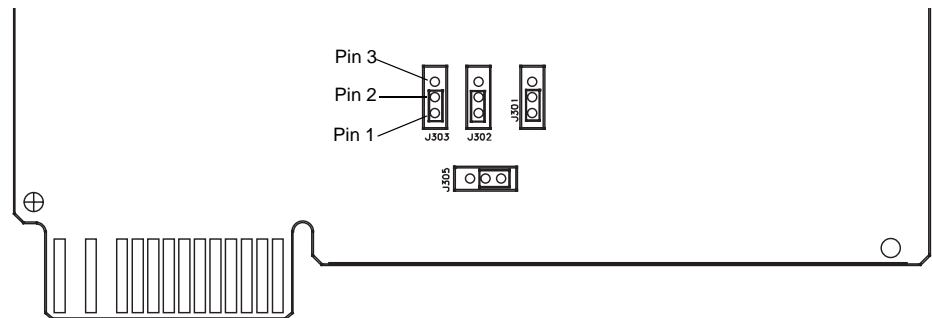
If you are using the DTE-activated data port loopback function (on pin K of the V.35 connector), position jumper J305 over pins 2 and 3. See the *User's Guide* for more information about enabling data loopback activation on pin K.

Assigning network interface channels

The rest of this section contains network interface channel assignments for five typical DataSMART applications, as well as background on setting up a custom channel assignment. Record typical applications on question 5 of the DataSMART Configuration Worksheet, and put custom applications on question 6. Use the procedure that applies to your application:

■ All 24 channels, full rate DSU application at 1536 kbps (24 x 64 kbps): see page 67.

■ Fractional T1 DSU at 256 kbps (4 x 64 kbps): see page 68.

■ Channels 1-23, CSU/DSU using Robbed Bit Signaling; Channel 24, Data Port 1 at 56 kbps: see page 69.

■ All 24 channels, CSU using Robbed Bit Signaling; also called A-B bit or A-B-C-D bit signaling or Channel-Associated Signaling (CAS): see page 70.

■ All 24 channels, CSU using Common Channel Signaling (CCS); also used for ISDN PRI or data equipment on terminal interface: see page 71.

■ None of the above: see the *User's Guide*.

▶ **NOTE**
*When entering commands, be careful to distinguish between uppercase I and numeric 1. To see the syntax for these commands, enter the **FC** command.*

24-channel Full Rate DSU, 1536 kbps

This application assigns all 24 channels to the data port. All channels are set to 64 kbps for a total of 1536 kbps at the data port.

Sample application

DataSMART unit in shelf
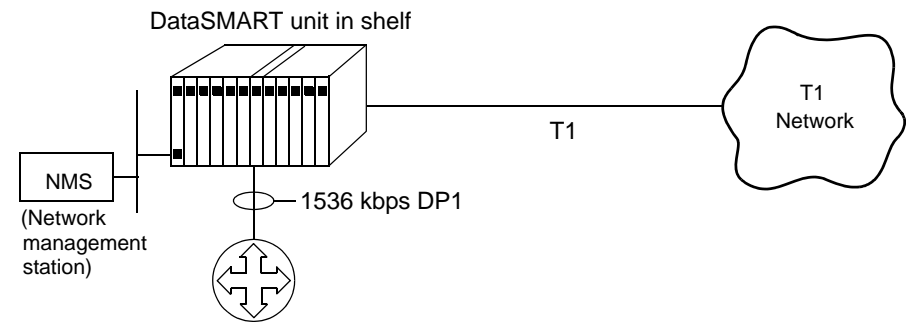
1   Enter the **ADP1:64,1-24** command to set all channels in Table A to the data port.

2   Load the contents of Table A and execute it by entering the **LXA** command.

3   View the current configuration by entering the **TXV** command.

```
        VIEW TABLE X OF THE FRACTIONAL T1 CONFIGURATION
MAP    RATE   TOTAL  NI CHANNELS
----   ----   -----  -----------------------------------------------
TI      -      -
DP1     64    1536    1, 2, 3, 4, 5, 6, 7, 8, 9,10,11,12,13,14,15,16,
                     17,18,19,20,21,22,23,24
IDLE    -      -
NI MAP   NI MAP  NI MAP  NI MAP  NI MAP  NI MAP  NI MAP  NI MAP
-------  ------- ------- ------- ------- ------- ------- -------
 1:DP1    2:DP1   3:DP1   4:DP1   5:DP1   6:DP1   7:DP1   8:DP1
 9:DP1   10:DP1  11:DP1  12:DP1  13:DP1  14:DP1  15:DP1  16:DP1
17:DP1   18:DP1  19:DP1  20:DP1  21:DP1  22:DP1  23:DP1  24:DP1
```

Fractional T1 DSU, 256 kbps

This application assigns network interface (NI) channels 1-4 to the data port. Each data port channel is set to 64 kbps for a total of 256 kbps at the data port. All other channels are idle.

The near-end and far-end DSUs must have identical NI channel assignments.

Sample application

DataSMART unit in shelf

1 Enter the **ANI1-24:I** command to set all channels in Table A to idle.

2 Enter the **ADP1:64,1-4** command to set channels 1-4 in Table A to the data port.

3 Load the contents of Table A and execute it by entering the **LXA** command.

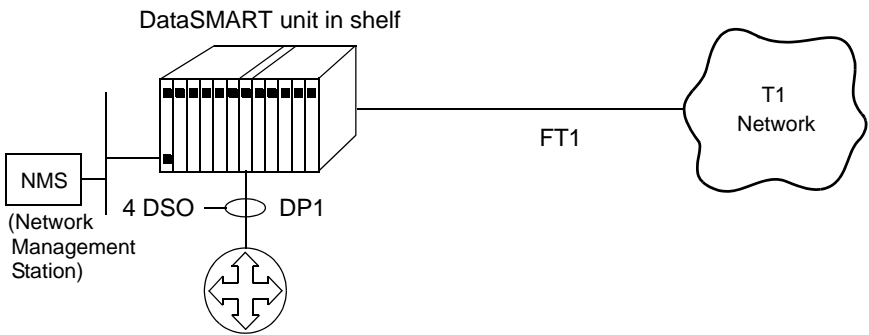4 View the current configuration by entering the **TXV** command.

```
        VIEW TABLE X OF THE FRACTIONAL T1 CONFIGURATION
MAP    RATE   TOTAL  NI CHANNELS
----   ----   -----  -----------------------------------------------
TI      -       -
DP1     64     256   1, 2, 3, 4
IDLE    -       -    5, 6, 7, 8, 9,10,11,12,13,14,15,16,17,18,19,20,
                     21,22,23,24
NI MAP  NI MAP  NI MAP  NI MAP  NI MAP  NI MAP  NI MAP  NI MAP
-------  -------  -------  -------  -------  -------  -------  -------
 1:DP1    2:DP1    3:DP1    4:DP1    5:IDLE   6:IDLE   7:IDLE   8:IDLE
 9:IDLE  10:IDLE  11:IDLE  12:IDLE  13:IDLE  14:IDLE  15:IDLE  16:IDLE
17:IDLE  18:IDLE  19:IDLE  20:IDLE  21:IDLE  22:IDLE  23:IDLE  24:IDLE
```

23-channel CSU/DSU, robbed-bit signaling, 56 kbps data port (add/drop only)

This application sets 23 NI channels to the terminal interface (voice-type channels) and assigns channel 24 to the DataSMART data port at 56 kbps. Use it if your terminal equipment requires the signaling bits used in SF or ESF framing. The **V** option ensures that the signaling bits remain frame-aligned.

This application can support data-link management to a remote site over channel 24 using 8 kbps.

Sample application

1   Enter the **ANI1-23:V** command.

2   Enter the **ADP1:56,24** command.

3   Load the contents of Table A and execute it by entering the **LXA** command.

4   View the current configuration by entering the **TXV** command.
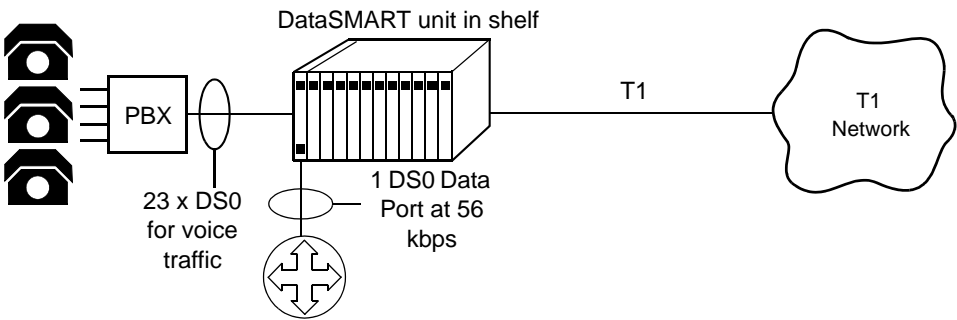
```
       VIEW TABLE X OF THE FRACTIONAL T1 CONFIGURATION
MAP    RATE   TOTAL  NI CHANNELS
----   ----   -----  ------------------------------------------------
TI      -      -     1, 2, 3, 4, 5, 6, 7, 8, 9,10,11,12,13,14,15,16,
                    17,18,19,20,21,22,23
DP1     56     56    24
IDLE    -      -
NI MAP   NI MAP   NI MAP   NI MAP   NI MAP   NI MAP   NI MAP   NI MAP
-------  -------  -------  -------  -------  -------  -------  -------
 1:TI V   2:TI V   3:TI V   4:TI V   5:TI V   6:TI V   7:TI V   8:TI V
 9:TI V  10:TI V  11:TI V  12:TI V  13:TI V  14:TI V  15:TI V  16:TI V
17:TI V  18:TI V  19:TI V  20:TI V  21:TI V  22:TI V  23:TI V  24:DP1
```

24-channel CSU, robbed-bit signaling (add/drop only)

This application sets all 24 channels to the terminal interface (voice-type channels). Use it if your terminal equipment requires the signaling bits used in SF or ESF framing. The **V** option ensures that the signaling bits remain frame-aligned.

Because all 24 channels are assigned to the terminal interface, this application cannot support a data link over a DS0. It can support a facility data link (FDL) under ESF only if the application supports ESF framing end-to-end.

Sample application

DataSMART 558 in shelf

1   Edit network interface Table A by entering the **ANI1-24:V** command. (This assigns NI channels 1-24 to the terminal interface, voice-type channels.)

2   Load the contents of Table A and execute it by entering the **LXA** command.

3   View the current configuration by entering the **TXV** command.
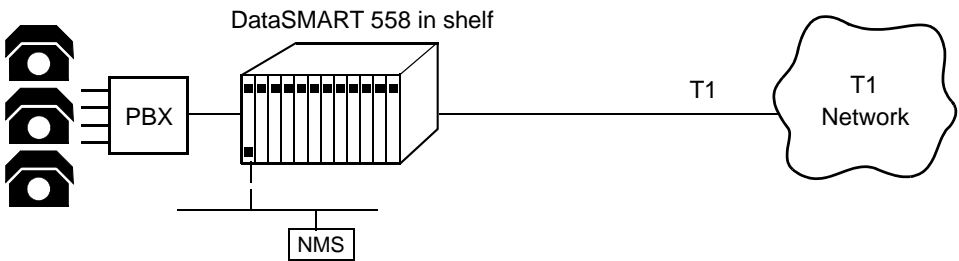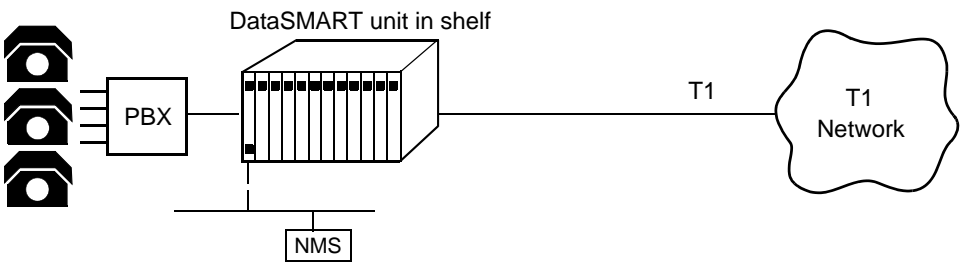
```
       VIEW TABLE X OF THE FRACTIONAL T1 CONFIGURATION
MAP    RATE   TOTAL  NI CHANNELS
----   ----   -----  -----------------------------------------------
TI      -       -     1, 2, 3, 4, 5, 6, 7, 8, 9,10,11,12,13,14,15,16,
                     17,18,19,20,21,22,23,24
DP1     64       0
IDLE    -       -
NI MAP  NI MAP  NI MAP  NI MAP  NI MAP  NI MAP  NI MAP  NI MAP
-------  -------  -------  -------  -------  -------  -------  -------
 1:TI V   2:TI V   3:TI V   4:TI V   5:TI V   6:TI V   7:TI V   8:TI V
 9:TI V  10:TI V  11:TI V  12:TI V  13:TI V  14:TI V  15:TI V  16:TI V
17:TI V  18:TI V  19:TI V  20:TI V  21:TI V  22:TI V  23:TI V  24:TI V
```

24-channel CSU, common channel signaling (add/drop only)

This application sets all 24 NI channels to the terminal interface (data-type channels). Use it for Common Channel Signaling (CCS) or ISDN PRI applications, if you have data equipment on the terminal interface, or if a clear channel is required. Because all 24 channels are assigned to the terminal interface, this application can not support a data link over a DS0. The **D** option does not support signaling bits.

Sample application

DataSMART unit in shelf

1   Enter the **ANI1-24:D** command. (This assigns NI channels 1-24 to the terminal interface, data-type channels.)

2   Load the contents of Table A and execute it by entering the **LXA** command.

3   View the current configuration by entering the **TXV** command.

```
     VIEW TABLE X OF THE FRACTIONAL T1 CONFIGURATION
MAP    RATE   TOTAL  NI CHANNELS
----   ----   -----  ------------------------------------------------
TI      -      -      1, 2, 3, 4, 5, 6, 7, 8, 9,10,11,12,13,14,15,16,
                     17,18,19,20,21,22,23,24
DP1     64      0
IDLE    -      -
NI MAP  NI MAP  NI MAP  NI MAP  NI MAP  NI MAP  NI MAP  NI MAP
-------  -------  -------  -------  -------  -------  -------  -------
 1:TI D   2:TI D   3:TI D   4:TI D   5:TI D   6:TI D   7:TI D   8:TI D
 9:TI D  10:TI D  11:TI D  12:TI D  13:TI D  14:TI D  15:TI D  16:TI D
17:TI D  18:TI D  19:TI D  20:TI D  21:TI D  22:TI D  23:TI D  24:TI D
```

Specifying a custom network interface channel assignment

See question 6 of the System Configuration Worksheet in Appendix B.

1 Set up network interface Table A by using the following commands:

ADP1:*rate*[,*nicn*]

rate   Set the channel base rate: 56 kbps or 64 kbps.

nicn   Assign NI channel number(s) to the data port. These numbers can be from 1 to 24, inclusive. You can specify a single channel number, several channel numbers separated by commas, or a range of contiguous channel numbers separated by a hyphen.

ANI*nicn*: *intf*

nicn   Specify the range as you would for the **ADP1** command.

intf   Assign NI channel number(s) to voice-type terminal interface channels (**V**), data-type terminal interface channels (**D**), or idle (**I**).

2 Load the contents of Table A and execute it by entering the **LXA** command.

3 View the current configuration by entering the **TXV** command.

Configuring for IP management

If you are not using IP management, use the default setting (**NETIF:N**) and skip the rest of this section. All units in the shelf must use **NETIF:N** because you cannot mix IP-managed and non-IP-managed units in a shelf.

The rest of this chapter tells you how to set up your DataSMART unit for IP management using one or more of the following interfaces:

■   The facility data link (FDL) or a DS0 T1 data link on the T1 line (554 and 558 only)

■   In-band via T1/FT1 Frame service (584 and 588 only)

■   Ethernet (558 and 588 only)

■   SLIP (any 500-series DataSMART unit)

■   PPP (any 500-series DataSMART unit installed in the controller's position in the shelf, i.e., slot 1 for a shelf using the DCE control port and slot 12 for a shelf using DTE)

Specifying a custom IP interface and protocol

About the IP management data link

The IP management data link is available on any unit that does not do Frame monitoring. It uses the T1 FDL (if your network interface frame format is ESF) or one of the DS0 channels on the T1.

The data link speed is 4 kbps over the FDL or 8 kbps over a DS0 time slot that has been assigned to the data port. If the data link uses an idle DS0 time slot, it runs at 56 kbps or 64 kbps as specified with the **ADP1** command.

Determine whether you will manage units over the T1 data link.

■ If the answer is **yes**, answer question 7 of the DataSMART Configuration Worksheet in Appendix B. Do not answer question 8. Then go to step 1 below.

■ If the answer is **no**, answer question 8 of the DataSMART Configuration Worksheet in Appendix B. Do not answer question 7. Then go directly to step 2 below.

If your IP interface includes the data link (DataSMART 554 and 558 only)

1 Specify the IP interface and protocol by entering the following command:

NETIF:*c, n,* [*r*]

c	Specify the protocol: **D** (Data Link) **SD** (SLIP and Data Link) **ED** (Ethernet and Data Link; 558 only) **ESD** (Ethernet, SLIP and Data Link; 558 only) **PSD** (PPP, SLIP and Data Link)
n	Enter **F** to use the FDL (if available) or a value from 1 to 24 to select a DS0 time slot.
r	Enter **56** or **64** (the DS0 time slot's data rate in kbps) only if you selected a DS0 time slot. Omit the number if you selected the FDL (**F**).

▶ **NOTE**
*If you select **D**, the plug-in you are configuring will be able to receive configuration information over the data link. However, if you select any combination that includes D (**SD**, **ED**, **ESD**, or **PSD**), the plug-in can send configuration information via the data link to a remote unit, but cannot be configured over the data link. For this reason, when two DataSMART plug-ins will be connected via data link, one must be configured as **D** and the other as **SD**, **ED**, **ESD**, or **PSD**.*

Go directly to Step 3.

If your IP interface does not include the data link

2 Specify the IP interface and protocol by entering the following command:

NETIF:*c*

c	Specify the protocol: **S** (SLIP) **E** (Ethernet; 558 and 588 only) **PS** (PPP and SLIP) **ES** (Ethernet and SLIP; 558 and 588 only) **I** (Frame In-band; available in Frame Monitoring units only) **N** (none)

▶ **NOTE**

*In a point-to-point configuration with two Frame in-band-managed units, both units must be configured as **I**. For more information, see the User's Guide.*

Setting IP parameters

Set the IP address(es)

You need to enter a separate IP address for each IP interface you are using. See question 9 of the DataSMART Configuration Worksheet in Appendix B.

1 Set all the IP addresses for the plug-in, using the following command:

IPA:*p,ipa*

p	**C** assigns the IP address to the control port interface for SLIP or PPP, and to the local unit for data link communications.
	E assigns the IP address to the Ethernet interface. The IP address must be on a different subnet from the control port or data link IP address.
	I assigns the IP address to the Frame in-band interface (available only in Frame Monitoring units).
	D assigns the IP address for data link communications. The use of D depends on the way NETIF is set. When NETIF is set to SD, ED, ESD, or PSD, then IPA:D sets the **remote** unit's data link IP address. When NETIF is set to D, then IPA:D sets the data link IP address of the **local** unit that you are currently configuring.
ipa	Enter the IP address using the format *nnn.nnn.nnn.nnn*, where *nnn* can be any number from 0 to 255, inclusive. An IP address of 0.0.0.0 is not valid.

The control port and data link IP addresses for all units in the same shelf, or units that are data-linked to that shelf, must be in the same subnet. The Ethernet IP address for the shelf controller must be in a different subnet from the control port and data link IP addresses.

Set the IP netmask

The control port IP interface and data link IP interface use the same netmask (because the control port and data link IP addresses must be on the same subnet). However, the Ethernet IP netmask and Frame in-band netmask, if used, must be entered separately.

The Ethernet netmask applies only to the DataSMART 558, and 588. The Frame in-band netmask applies only to the DataSMART 584 and 588. When configuring a controller plug-in to use the Ethernet interface, you should specify both a control port IP netmask and an Ethernet IP netmask.

See question 9 of the DataSMART Configuration Worksheet in Appendix B.

2   Set the plug-in's IP netmask by entering the following command:

   IPM:*c,ipa*

   c   **C** or **D** assigns the IP netmask to the control port (SLIP, PPP, Data link) interface.

                    I assigns the IP netmask to the Frame in-band IP interface.

                    E assigns the IP netmask to the Ethernet interface.

   ipa   Specify the IP netmask using the format *nnn.nnn.nnn.nnn,* where *nnn* can be any number from 0 to 255, inclusive. The default Ethernet IP netmask is 255.255.255.0.

Set the default router address

The default router address allows a DataSMART unit using the Ethernet or control port IP interface to send IP traffic to a device on a different IP subnet from the DataSMART unit. Generally, the default router is the closest IP host. The DataSMART sends the traffic to the address of its default router, and the router (if correctly configured) sends the traffic to its destination. If a default router has not been defined, the traffic is discarded.

In applications where the controller is managed via Ethernet, the controller and the units connected to it have different default router addresses. The controller's default router must be a host in the same subnet as the controller's Ethernet IP address. (Generally, the controller and default router are connected to the same Ethernet hub.) For all other units that are in the shelf or connected to it via data link, the default router address is the same as the controller's control port IP address.

In applications where the controller is managed via SLIP or PPP, all units use the same default router address, which belongs to the IP host connected directly to the control port. The default router address must be in the same subnet as the control port IP addresses for all units.

See question 9 of the DataSMART Configuration Worksheet.

3   Set the plug-in's default router IP address by entering the following command:

   IPR:*ipa*

   ipa   Enter the IP default router address using the format *nnn.nnn.nnn.nnn,* where *nnn* can be any number from 0 to 255, inclusive. An IP address of 0.0.0.0 is not valid.

If **NETIF** has been configured to **I**, **D**, or **N**, do not set a default router address. If you are using any other IP network interface, always set the address of the default router.

Rules for setting the default router address are on page 6 of the Configuration Worksheet in Appendix B.

▶ **NOTE**

Add the DataSMART unit's control port IP address to the default router's static route table, so the default router can successfully route messages to the DataSMART.

Set the Telnet password

See question 10 of the DataSMART Configuration Worksheet.

If you are accessing a remote DataSMART unit via Telnet and log out while a local administrator or installer is configuring a unit, ending the Telnet session can cause the configuration changes to take effect before the other user is finished configuring the unit. This can make configuration impossible to complete, so you should not Telnet into a unit that is being configured.

4   Set the Telnet password by entering the following command:

TPW:*str*

str   Enter the Telnet password. The password can be up to 15 characters long including spaces. Spaces are not allowed at the beginning of the password, but they are allowed in the middle of the password. Trailing spaces are not truncated. Telnet passwords are case-sensitive. A null password (no characters) disables Telnet.

Pings

When the Telnet password and IP addressing are enabled, DataSMART units respond to ICMP (Internet Control Message Protocol) pings. However, on some hosts, it is possible to adjust the number of bytes in outgoing pings. DataSMART units will not respond to pings larger than 1500 bytes.

SNMP configuration

You can omit these steps if you do not intend to manage the unit with an SNMP manager.

Enable the SNMP agent

5   Enable the SNMP agent by entering the command: **ESNMP**.

Set the SNMP community strings

6   Set the read, write, and trap community strings, using the following commands:

RCS:*str*   Sets the Read community string. (The default is **public**.)

WCS:*str*   Sets the Write community string. (The default is **private**.)

TCS:*str*   Sets the Trap community string. (The default is **snmptrap**.)

str   Enter the appropriate community string. Community strings can have from 1 to 15 characters (inclusive). Community strings can contain spaces, but it is not a good practice to include them, because other SNMP managers in the network may not allow them. DataSMART units use industry-standard defaults for SNMP community strings. If you change these defaults, make sure you change the community strings on your SNMP managers as well.

Disable any unwanted SNMP traps

7   Disable any unwanted SNMP traps using the TRAP commands. (If the SNMP agent is enabled, all four SNMP trap types are enabled by default.) For more information on which SNMP traps your DataSMART unit supports, see the *User's Guide*.

TRAP:**D**,*d*

d   Specify the trap type to be disabled: **S** for start traps; **L** for link traps; **A** for authentication traps; and **E** for enterprise traps. If you want to enable or disable more than one trap type, you must use the **TRAP** command multiple times.

Configuring the DataSMART 56/64 kbps unit

This section applies only to the DataSMART 56/64 kbps unit (552). If you are configuring a T1 unit (554, 558, 584, or 588), see .

Setting the system date and time

1 Set the system date by entering the following command:

SD:*mm,dd,yy*

mm	Set the month. You can enter the three-letter abbreviation, or the number of the month.
dd	Set the day of month. The DataSMART checks the entered value to see if the day is valid for the given month and year.
yy	Set the last two digits of the year.

2 Set the system time by entering the following command:

ST:*hh,mm*

hh	Set the hour. The time is specified in 24-hour format, where 12:00 is noon and 00:00 is midnight. Allowable values are 0 to 23, inclusive.
mm	Specify the minutes. Allowable values are 0 to 59, inclusive.

Setting the system timing signal source

3 Set the DataSMART source clock by entering the following command:

CLK:*src*

src	Specify the clock source: **L** for loop timing (the default); **I** for internal master timing.

In most applications, select **L** because the DataSMART will derive its source clock from the network receive signal (Loop Timing). This is the most commonly-used setting.

However, in a point-to-point campus environment where your service provider does not supply timing, you will need to select internal master timing (uppercase **I**) on the unit that provides your master clock and **L** on the unit that is receiving the timing signal. See the *User's Guide* for more information on timing sources.

Setting the DDS interface (data rate)

4 Set the DDS interface by entering one of the following commands:

E56	Sets the interface to 56 kbps with no secondary channel. This is the default.
E64CC	Sets the interface to 64-kbps clear channel service.

Setting IP parameters

If you are not using IP management, use the default setting (**NETIF:N**) and skip the rest of this section. All units in the shelf must use **NETIF:N** because you cannot mix IP-managed and non-IP-managed units in a shelf.

The rest of this section tells you how to set up your DataSMART unit for IP management. You can configure the DataSMART 552 units to work in a shelf with a controller (558 or 588), or you can have a shelf fully loaded with 552 plug-ins. For an example application using IP management, see "Setting up IP management over Ethernet and SLIP" on page 81. If you are not using a controller, you must configure the plug-ins individually.

Set the IP address

5 Set the IP address by entering the following command:

IPA:*p,ipa*

p	Enter **C** to set the control port (SLIP) IP address.
ipa	Enter the IP address using the format *nnn.nnn.nnn.nnn*, where *nnn* can be any number from 0 to 255, inclusive. An IP address of 0.0.0.0 is not valid. **The default IP address of 192.0.2.2. is also not valid.**

TIP

If you do not know what your IP address and IP netmask should be, ask your network administrator or system administrator. If you do not have a network or system administrator, obtain a set of valid IP addresses from your Internet service provider. ***Kentrox cannot issue IP addresses.***

Set the IP netmask

6 Set the IP netmask by entering the following command:

IPM: *p, mask*

p	Enter **C** to set the control port (SLIP) IP netmask.
mask	The IP netmask. It takes the form *nnn.nnn.nnn.nnn*, where *nnn* can be any number from 0 to 255, inclusive. The default is 255.255.255.0.

Set the Telnet password

If you are accessing a remote DataSMART unit via Telnet and log out while a local administrator or installer is configuring a unit, ending the Telnet session can cause the configuration changes to take effect before the other user is finished configuring the unit. This can make configuration impossible to complete, so you should not Telnet into a unit that is being configured.

TIP

You must assign a Telnet password to the DataSMART in order to log into the unit using Telnet. If you do not assign a Telnet password, you will not be able to log in.

7 Set the Telnet password by entering the following command:

TPW:*str*

str	Enter the Telnet password. The password can be up to 15 characters long including spaces. Spaces are not allowed at the beginning of the password, but they are allowed in the middle of the password. Trailing spaces are not truncated. Telnet passwords are case-sensitive. A null password (no characters) disables Telnet.

Pings

When the Telnet password and IP addressing are enabled, DataSMART units respond to ICMP (Internet Control Message Protocol) pings. However, on some hosts, it is possible to adjust the number of bytes in outgoing pings. DataSMART units will not respond to pings larger than 1500 bytes.

Select an IP interface

8   Specify the IP management interface and protocol by entering one of the following commands:

NETIF:S   Sets the IP network interface to SLIP. If you are using SLIP, see for an example of a typical application.

NETIF:N   Sets the IP network interface to None. (This is the default.) If you select None, you will be able to configure and manage the unit only through an ASCII connection.

SNMP configuration

You can omit these steps if you do not intend to manage the unit with an SNMP manager.

Set the SNMP community strings

9   Set the read, write, and trap community strings, using the following commands:

RCS:*str*   Sets the Read community string. (The default is **public**.)

WCS:*str*   Sets the Write community string. (The default is **private**.)

TCS:*str*   Sets the Trap community string. (The default is **snmptrap**.)

str   Enter the appropriate community string. Community strings can have from 1 to 15 characters (inclusive). Community strings can contain spaces, but it is not a good practice to include them, because other SNMP managers in the network may not allow them. DataSMART units use industry-standard defaults for SNMP community strings. If you change these defaults, make sure you change the community strings on your SNMP managers as well.

Enable any wanted SNMP traps

10   Enable any SNMP traps you want to use using the TRAP commands. All four SNMP trap types are disabled by default. For more information on which SNMP traps your DataSMART unit supports, see the *User's Guide*.

TRAP:**E***,d*

d   Specify the trap type to be enabled: **S** for start traps; **L** for link traps; **A** for authentication traps; and **E** for enterprise traps. If you want to enable or disable more than one trap type, you must use the **TRAP** command multiple times.
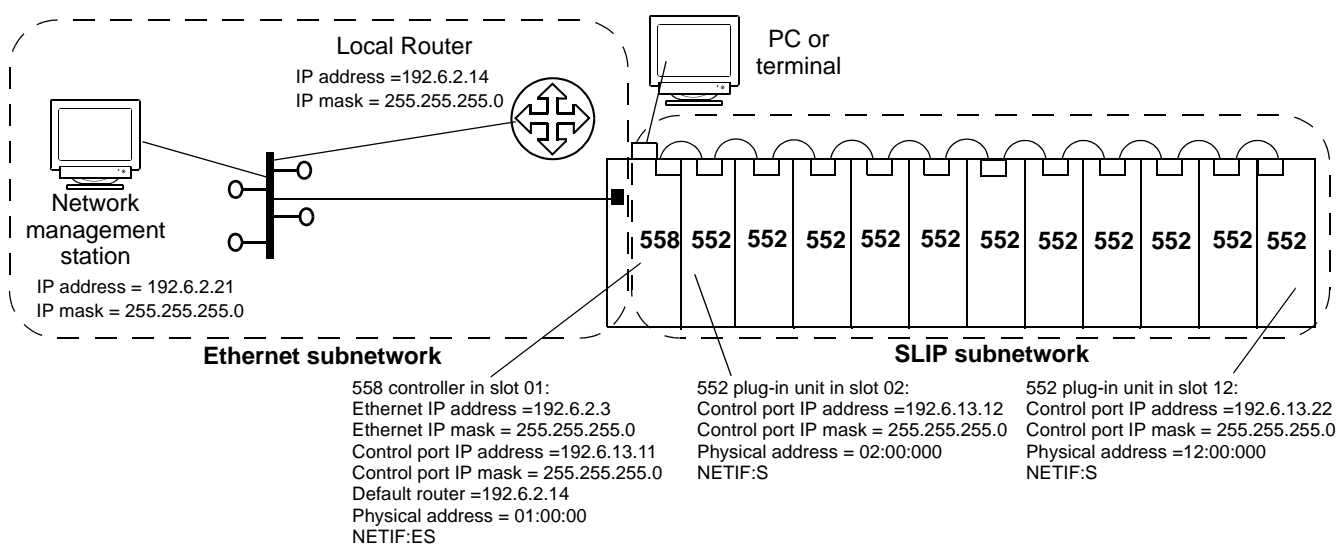
Setting up IP management over Ethernet and SLIP

This section describes a sample application of IP management using Ethernet on a controller plug-in and SLIP for the other plug-ins. You can also use SLIP to manage a shelf filled entirely with 552 plug-ins (and no controller), if you have an appropriate SLIP connection available (e.g., a PC connected through a router to the shelf). For additional information about using IP management, please see the *User's Guide*.

Figure 30 shows how to set up IP management in a shelf containing a DataSMART 558 controller communicating with DataSMART 552 plug-ins via SLIP (Serial Line Internet Protocol).

Do not use the IP addresses shown in Figure 30; you need to obtain your own IP addresses for all DSUs and CSUs. If you do not know your IP addresses, see your system administrator.

Figure 30—Sample configuration with 558 controller and 552 plug-ins

Local Router
IP address =192.6.2.14
IP mask = 255.255.255.0

PC or terminal

Network management station
IP address = 192.6.2.21
IP mask = 255.255.255.0

558 552 552 552 552 552 552 552 552 552 552 552

Ethernet subnetwork

SLIP subnetwork

558 controller in slot 01:
Ethernet IP address =192.6.2.3
Ethernet IP mask = 255.255.255.0
Control port IP address =192.6.13.11
Control port IP mask = 255.255.255.0
Default router =192.6.2.14
Physical address = 01:00:00
NETIF:ES

552 plug-in unit in slot 02:
Control port IP address =192.6.13.12
Control port IP mask = 255.255.255.0
Physical address = 02:00:000
NETIF:S

552 plug-in unit in slot 12:
Control port IP address =192.6.13.22
Control port IP mask = 255.255.255.0
Physical address = 12:00:000
NETIF:S

Configure chained units first

Make sure you know all the addresses and netmasks for each unit before proceeding. See for more information about IP configuration.

Always configure the unit farthest from the controller first and work toward the controller. Configure the controller last. ASCII terminal communications to some units on the shelf may not work if there is a unit set to use SLIP between the controller and the unit you want to configure. The default setting of NETIF:N allows ASCII communications, but not SLIP.

1   Log into the 552 unit at the end of the chain.

2   At the prompt, type **IPA:C,** *address* to set the unit's control port IP address. After each command, the following message appears:

```
WARNING: THIS COMMAND TAKES EFFECT AFTER LOGOUT
```

3   Type **IPM:C,** *netmask* to set the control port IP netmask.

4   Type **TPW:** *password* to set the Telnet password.

5   Type **NETIF:S** to set up the SLIP IP interface on the control port. You see:

```
WARNING: THIS COMMAND TAKES EFFECT AFTER LOGOUT
USER INPUT MUST MATCH THIS SETTING TO RETAIN COMMUNICATION
```

6   Type **MCV** to check your entries.

7   If you made a mistake entering any parameters, re-enter them at the prompt.

8   Log out by typing **^D**.

The unit's IP network interface changes to SLIP when you log out. When all the units in the shelf are set up to use SLIP, you can ping a unit or Telnet to it. However, you cannot communicate with it using an ASCII terminal or PC.

9   Repeat steps 1 through 9 for the next 552 unit, and so on, but not the controller.

Configure the controller for Ethernet-SLIP

1   Log into the controller.

2   At the prompt, type **IPA:E,** *address* to set the unit's Ethernet IP address.

3   Type **IPM:E,** *netmask* to set the Ethernet IP netmask.

4   Type **IPA:C,** *address* to set the unit's control port IP address (used for SLIP).

5   Type **IPM:C,** *netmask* to set the control port IP netmask.

6   Type **IPR:** *address* to identify the controller's default router.

7   Type **TPW:** *password* to set the Telnet password.

8   Type **NETIF:ES** to set the IP management interfaces.

9   Type **MCV** to check the parameters you entered.

10   If you made a mistake entering any parameters, re-enter them at the prompt.

11   Log out of the controller by typing **^D**.

To recover from a mistake, or if you cannot communicate with a plug-in

If you discover that you cannot communicate with one or more units in the shelf, try reset-ting the unit's IP network interface back to ASCII (None) and starting over. You might need to configure a static route in your local router to the control port IP address of the controller plug-in.

1 From the PC or terminal, enter: ***DSLIP:***address* (where address is the control port IP address of the unit you can't communicate with), then press Enter. All letters must be uppercase. Do not include spaces. Characters are not echoed to the screen as you type, so you might want to enter this command more than once.

2 Log into the unit using its physical address (slot:shelf:group).

3 If you cannot log into the unit, you may have to reset the IP network interface of all units in the shelf to None (ASCII). Type:***DSLIP:255.255.255.255** and press Enter. Repeat step 2 to log into the unit.

4 At the prompt, type **MCV** to view the unit's IP addresses and netmasks.

5 Re-enter any wrong addresses or netmasks using the commands on .

6 Type **NETIF:S** (on a 552 unit) or **NETIF:ES** (on the controller) to set up the IP management interfaces again. If you reset the IP network interface of all units as described in step 3, you have to enter a **NETIF** command for each unit in the shelf.

7 Log out of each unit by typing **^D**.

Test the configuration

1 Turn off the terminal or exit the PC terminal program.

2 From the NMS (network management station), ping the controller's Ethernet IP address.

3 Ping each DSU's control port IP address.

4 If all the pings are successful, you have established IP connectivity and you can now use IP management with your DataSMART units.

Using the SAC (Send Auto-Configure) command

The following section describes an alternative way to initiate auto-configuration of downstream plug-ins if auto-configuration is disabled on the controller. Normally, auto-configuration is enabled on both the controller and the non-controller units, and the downstream units are configured as you plug them into the shelf. For more information on using auto-configuration with units you are installing for the first time, see .

If your controller is fully configured but auto-configuration is disabled, you can use the **SAC** command to quickly reconfigure downstream plug-ins that are waiting for auto-configuration parameters. Downstream units can be in the same shelf as the controller or in a daisy-chained shelf.

When a T1 plug-in unit is waiting for automatic configuration parameters, the POWER/FAIL LED blinks in a "heartbeat" pattern: two blinks and a pause. On the DataSMART 552 unit, the PWR LED blinks in synchronization with the TEST LED when the unit is waiting for automatic configuration parameters. If your plug-in is not in one of the states of requesting auto-configuration, verify that auto-configuration is enabled on that plug-in.

If you want to specify one plug-in to automatically reconfigure with the **SAC** command, use its physical address. It will not work with IP addresses.

TIP

Make sure the controller's system and IP configuration is complete and correct before you initiate automatic reconfiguration of downstream units.

To configure a specified single unit that is waiting for auto-configuration parameters, log into the shelf's controller and enter the following command:

SAC:*slot,shelf,group*

slot	Specify the plug-in's two-digit slot number.
shelf	Specify the plug-in's two-digit shelf address.
group	Specify the plug-in's three-digit group address.

To configure all downstream units that are waiting for auto-configuration parameters, log into the shelf's controller and enter the following command:

SAC:*

6 *Verifying the installation of T1 plug-in units*

When you complete installation and configuration for each plug-in, you should observe:

■ The network interface data LED is green, meaning that there is valid data on the network T1 line.

■ The Data Port CTS LED is yellow, meaning that the DataSMART plug-in is ready to receive data from the DTE.

■ The Data Port RTS LED is yellow, meaning that the DTE is ready to send data to the DataSMART plug-in.

■ The TI Status LED is green (if present, and if any channels are mapped to the terminal interface).

■ The application begins to work, for example, the PBX can make calls, the DTE starts passing data, etc.

If the application does not work, the DataSMART alarms and indicators will help identify the source of the problem: the carrier, the terminal equipment, the connections, or the unit itself.

If you cannot verify that the installation was correct, refer to the "Troubleshooting tree" on page 90. For a more detailed discussion, see the "Troubleshooting" chapter in the *User's Guide* for your plug-in.

▶ **NOTE**

*If you are connecting to a Cisco router, set each DataSMART unit's data port clocking to external, using the **SCLK1:E** command.*

Interpreting the front-panel LEDs

Figure 31—LEDs when conditions are NORMAL

Green: power-on
Blinking green: user is logged on
Flashing red-to-green: software
download in progress

Green "heartbeat" blink
(plug-in only): unit has sent
auto-configuration request

Green: valid data at NI

Off

Off

Off

Off

Yellow or blinking yellow:
tests being run
Off: no active tests

Yellow: transmit (TxD) or
receive (RxD) data flow

Yellow CTS LED: status of
"clear to send"

Yellow RTS LED: status of
DTR and/or RTS

POWER
FAIL

AUTO
CFG

DATA

CV

RED
ALM

YEL
ALM

NI

CV

STATUS

TI

TEST

LLB

OFF

DPLB

T$_X$D

R$_X$D

CTS

RTS

DATA
PORT

LINK

T$_X$

ETHERNET

DataSMART® 558

T1 1 Port ADD/DROP

Green: auto-configuration is
enabled
Off: auto-configuration is
not enabled

Green: valid data at TI,
no alarms
Off: TI disabled
(add/drop units only)

Yellow: Ethernet link can receive
data (controllers only)

Green: Ethernet link is
transmitting data (controllers
only)

Figure 32—LEDs when conditions are ABNORMAL

Red: equipment failure (EQF)
Off: power loss

Red: NI LOS
Fast-blinking red: NI OOF
Slow-blinking red: NI AIS

Yellow: incoming NI Yellow Alarm

Red: LOS, OOF, AIS, or Yellow
Alarm on terminal interface
(558 0nly)

Off: no data flow

Off: either an NI alarm is active, a
test is active, or the data port was
not programmed

Blinking yellow: BPV or CRC
on network interface

Blinking yellow: BPV or CRC
on terminal interface
(add/drop units only)

Off: DTE not ready to send data

POWER FAIL
AUTO CFG
DATA
CV
RED ALM
YEL ALM
CV
STATUS
TEST
LLB
OFF
DPLB
T$_X$D
R$_X$D
CTS
RTS
LINK
T$_X$
NI
TI
DATA PORT
ETHERNET

DataSMART® 558

T1 1 Port ADD/DROP

Table 5—LED indicators and their meanings

LED	Indicator	Condition
Power/Fail	Green	Power is on, self-test successful.
	Green, blinking steadily	A user is logged into the DataSMART plug-in.
	Green, "heartbeat" blink (two blinks, then pause)	The plug-in is requesting configuration.
	Red-to-green, flashing	Software program is being downloaded.
	Red	Power is on, self-test failed.
	Off	No power is being received.
AUTO CFG	Green	Auto-configuration has been enabled.
NI Data	Green	Valid framed signal is being received at the network interface.
NI CV	Yellow, blinking	Code violation (such as a CRC or BPV) at the network interface.
NI RED Alarm	Red	LOS alarm. The T1 signal has been lost at the network interface.
	Blinking fast (5 times per second)	OOF alarm. The T1 signal is out-of-frame at the network interface. Some or all of the DS1 framing bits have been lost.
	Blinking slow (about once per second)	Incoming AIS alarm. The equipment on the other end is in test or alarm state.
NI YEL Alarm	Yellow	The equipment on the other end of the circuit is in OOF or LOS alarm.
TI CV (add/drop units only)	Yellow, blinking	Code violation (such as a CRC or BPV) at the terminal interface.
TI Status (add/drop units only)	Red	Alarm (LOS, OOF, AIS, or Yellow) at the terminal interface.
	Green	Valid framed signal is being received at the terminal interface.
Data Port TxD	Yellow	Data is being transmitted (input) at the data port. Note that under normal conditions this LED may fluctuate in intensity.
	Extended "off"	Zeroes[1] are being received at the data port. The spaces are transmitted to the network if RTS and CTS are high.

Table 5—LED indicators and their meanings (continued)

LED	Indicator	Condition
Data Port RxD	Yellow	Data is being received (output) at the data port. Note that under normal conditions this LED may fluctuate in intensity.
	Off	Zeroes[1] are being output at the data port if RTS and CTS are on.
Data Port CTS	Yellow	Channels are assigned and the NI is not in alarm. The DataSMART is ready to exchange data with the DTE.
	Off	This LED is off when it is not possible to transmit data out the data port. This may be because an NI alarm is present, the data port is not programmed, no channel is assigned, or a test is active.
Data Port RTS	Yellow	Request to send is asserted. The DTE is ready to send data to the DataSMART, according to the conditions established by the DPLOS command.
	Off	The DTE is not ready to send data (per the conditions configured by the DPLOS command) or is not connected.
Ethernet Link (controllers only)	Yellow	The unit is successfully receiving link integrity signals via Ethernet.
Ethernet Tx (controllers only)	Green	The unit is successfully transmitting data via Ethernet.

[1] In Frame Monitoring units, flag characters (7E hex) are transmitted and received instead of zeroes.

Troubleshooting tree

The following is a quick guide to the alarms generated by DataSMART plug-ins and to the pages in this chapter that provide appropriate troubleshooting procedures for the alarms. The alarms are prioritized high to low. Always deal with high-priority alarms first.

▶ **NOTE**
All terminal interface alarms in this section are generated by add/drop units only.

For more information, see the "Troubleshooting" chapter in the *User's Guide*.

Figure 33—Troubleshooting the DataSMART

NI LOS (page 90)
TI LOS (page 91)
ECF (page 91)   } High Priority
NI OOF (page 91)
NI AIS (page 91)

TI OOF (page 92)
DP LOS (page 92)
NI EER (page 92)   } Medium Priority
TI YEL (page 93)
NI YEL (page 93)

TI EER (page 93)
TI AIS (page 94)   } Low Priority
BPV (page 94)
CRC (page 94)
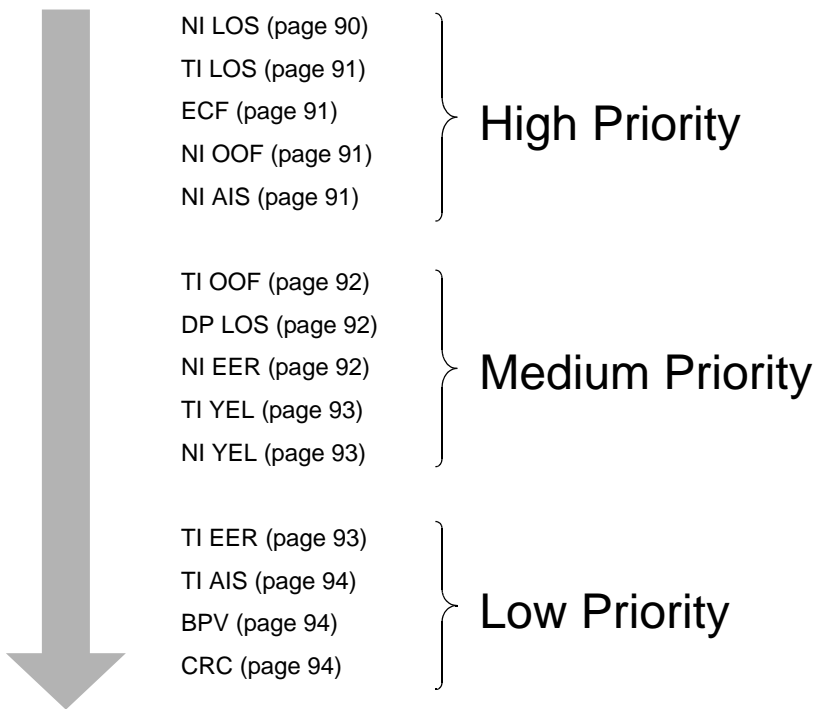
NI LOS—high priority

The plug-in receives a loss-of-signal condition at the network interface

An NI LOS condition occurs when the DataSMART cannot detect a signal at its network interface. To troubleshoot for this condition:

■ Make sure that you have correctly connected the cable between the DataSMART network interface and your T1 service provider's equipment.

■ If you built the cable on-site, check the cable connectors. A reversal of the transmit and receive pairs, or an open receive pair, can cause this condition.

■ If the above appear to be okay, ask your T1 service provider to test your T1 line and correct any problems found.

TI LOS—high priority (add/drop units only)

The plug-in receives a loss-of-signal condition at the terminal interface

A TI LOS condition occurs when the DataSMART cannot detect a signal at its terminal interface. To troubleshoot for this condition:

■ Make sure that you have correctly connected the cable between the DataSMART terminal interface/data port and your CPE equipment.

■ If you built the cable on-site, recheck the cable connectors. Reversed transmit and receive pairs, or an open transmit pair (CPE-to-DataSMART), can cause this condition.

▶ **NOTE**
If you assign channels to the terminal interface but do not connect equipment to it, the unit will generate the TI LOS alarm.

ECF—high priority

The plug-in receives an external clock failure (ECF) alarm

An ECF alarm occurs when the DataSMART is configured for data port timing, but it cannot detect a clock signal at the data port, either because the signal is not present or because the signal is significantly out of timing. To troubleshoot this condition:

■ Verify whether or not the DataSMART should really be set to data port timing. You should only use this timing option if a timing source is not provided by the T1 service and if the equipment connected to the data port is the master timing source. Controlled slips may occur if you set the DataSMART to data port timing when a network clock is present.

■ Check the cable connection between the data port and your connected equipment.

NI OOF—high priority

The incoming signal at the network interface is out-of-frame

An out-of-frame condition occurs when the framing type you have configured for the network interface does not match the framing type of the incoming T1 signal. Allowed framing types are ESF, SF, or Ericsson. To troubleshoot this condition:

■ Change the framing type of the network interface (see the *User's Guide*), or

■ Ask your T1 service provider to change the framing type of your T1 line.

A highly errored incoming signal can also cause an OOF condition.

NI AIS—high priority

An alarm indication signal (AIS) is detected at the network interface

An incoming AIS at the network interface indicates a problem with remote equipment on the T1 circuit. For example, the far-end equipment may not be connected or configured properly or is in a test mode, or the network interface unit (i.e., NIU or smart jack) may be in loopback, or your service provider may not have enabled your circuit yet. To troubleshoot this condition:

■ Ask your T1 service provider to trace the source of the AIS signal.

TI OOF—medium priority (add/drop units only)

The incoming signal at the terminal interface is out-of-frame

An out-of-frame condition occurs when the framing type you have configured for the terminal interface does not match the framing type of the signal being received at the terminal interface. Allowed framing types are ESF, SF, or Ericsson. To troubleshoot this condition:

■ Change the framing type of the terminal interface (see the *User's Guide*) or

■ Change the framing type of the attached CPE equipment.

Note that a highly errored incoming signal can also cause an OOF condition. Check the description of TI EER.

DP LOS—medium priority

The plug-in receives a loss-of-signal indication at the data port

A DP LOS condition occurs when the DataSMART is not able to handshake as expected with an attached DTE device.

The DataSMART can monitor two handshake lines on each data port: DTR and RTS. You can configure your DataSMART to use DTR, RTS, both lines, or neither line as the DP LOS criteria (see the *User's Guide*). When the specified line goes low, the DataSMART assumes that the DTE equipment has been disconnected or has failed. To troubleshoot this condition:

■ Check the cable connection between the DataSMART data port and the DTE.

■ Verify that the cable is connected to the correct port at each end.

■ Verify that you are using the correct cable for your application.

■ Make sure that the DTE is powered up and that its serial port is activated.

Refer to Chapter 2 or Chapter 3 for instructions on how to properly connect cables.

NI EER—medium priority

An excessive error rate is detected at the network interface

The errors may be BPVs, CRC6 errors, or framing errors. There are several potential causes of an excessive error rate at the network interface. To troubleshoot this condition:

■ Make sure you haven't set too low a threshold for detecting errored seconds or unavailable seconds. A low setting increases error sensitivity. You might want to use the factory default threshold setting. (See the *User's Guide*.)

■ Make sure that you have correctly connected the cable between the DataSMART network interface and your T1 service provider's equipment. (Refer to Chapter 2 or Chapter 3 for instructions on how to properly connect the cable.)

■ If you built the cable on-site, recheck the cable connectors. Loose or intermittent connections can cause an excessive error condition.

■ Make sure that you have configured the line coding of the network interface to match the line coding of your T1 line: either AMI or B8ZS. (See the *User's Guide*.)

■ Make sure the system clock is configured correctly.

■ If all the above appear to be okay, ask your T1 service provider to test your T1 line and correct any problems found.

TI YEL—medium priority (add/drop units only)

Incoming yellow alarm is detected at the terminal interface

An incoming yellow alarm at the terminal interface indicates that the CPE equipment attached to the interface is having a problem with the signal it is receiving from the DataSMART. Most often, it is getting no signal at all. To troubleshoot this condition:

■ Check for an open, short, or wiring error in the cable between the DataSMART terminal interface port and the CPE equipment. An open receive pair (DataSMART TI port output to CPE input) can cause this condition.

NI YEL—medium priority

Incoming yellow is detected at the network interface

An incoming yellow condition at the network interface indicates that the far end equipment has a problem with the signal it is receiving from the DataSMART. To troubleshoot this condition:

■ Check for an open, short, or wiring error in the cable between the DataSMART network interface port and your T1 service provider's network interface unit (i.e., NIU or smart jack). An open transmit pair can cause this condition.

■ If your application uses SF framing, and all 24 channels are used for data transmission, the actual data content can sometimes cause a "false yellow" condition. ESF framing is recommended for such applications. Other work-arounds may also be possible, depending upon your application.

TI EER—low priority (add/drop units only)

An excessive error rate is detected at the terminal interface

The errors may be BPVs, CRC6 errors, or framing errors. There are several potential causes of an excessive error rate at the terminal interface. To troubleshoot this condition:

■ Make sure you haven't set too low a threshold for detecting errored seconds or unavailable seconds. A low setting increases error sensitivity. You might want to use the factory default threshold setting (see the *User's Guide*).

■ Make sure that you have correctly connected the cable between the DataSMART terminal interface/data port and your CPE equipment. (Refer to Chapter 2 or Chapter 3 for instructions on how to properly connect the cable.)

■ If you built the cable on-site, recheck the cable connectors. Loose or intermittent connections can cause an excessive error condition.

■ Make sure that you have configured the line coding of the terminal interface to match the line coding of your CPE equipment: either AMI or B8ZS. (See the *User's Guide*.)

■ Make sure the system clock is configured correctly.

TI AIS—low priority (add/drop units only)

An alarm indication signal (AIS) is detected at the terminal interface

An incoming AIS at the terminal interface may indicate that the CPE equipment attached to the terminal interface is not operational. To troubleshoot this condition:

■ Check the programming of the CPE and make sure that its TI port is enabled.

■ Check the wiring between the DataSMART TI port and the CPE.

■ Make sure that the framing type of the CPE matches the framing type configured for the terminal interface. Allowed framing types are ESF, SF, and Ericsson. (See the *User's Guide*.)

BPV—low priority

Bipolar violations (BPVs) are detected at the network interface or the terminal interface

A bipolar violation is an error in the normal polarity of received pulses. A bipolar violation occurs when two or more pulses of the same polarity appear in a row.

Bipolar violations are often caused by local problems with your T1 line. To troubleshoot this condition:

■ Make sure that your T1 wiring consists of only *individually-shielded* twisted pairs.

■ Check that all cable connections are secure and connected to the correct terminals. Refer to Chapter 2 or Chapter 3 for instructions on how to properly connect cables.

■ Make sure that you've set the line coding of the NI or TI interface to match the line coding of the T1 circuit: either AMI or B8ZS. A mismatch in line coding can often result in BPV errors.

■ Make sure the system clock is configured correctly.

CRC—low priority

CRC6 (6-bit cyclic redundancy check) errors are detected at the network interface or the terminal interface

CRC6 errors relate to ESF framing only. A CRC6 error indicates that bits were received in error in the previous extended superframe.

CRC6 errors are often caused by remote problems with your T1 line. To troubleshoot these types of errors:

■ Make sure that you've set the line coding of the NI or TI interface to match the line coding of the T1 circuit: either AMI or B8ZS. This line code should be maintained throughout the connected circuit. A mismatch in line coding can often result in CRC6 errors.

■ If the errors show up on the NI port, ask your T1 service provider to monitor the receive side of your line for CRC6 errors.

■ If the errors show up on the TI port, check the configuration of the CPE.

■ Make sure the system clock is configured correctly.

7 *Verifying the installation of 56/64 kbps plug-in units*

When you complete installation and configuration for each plug-in, you should observe:

■   The PWR LED is green, meaning that the DataSMART is powered up correctly.

■   The NI DATA LED is green, meaning that there is valid data on the network DDS line.

■   The DATA PORT CTS/TxD LED is yellow, meaning that the DataSMART plug-in is ready to receive data from the DTE.

■   The DATA PORT RTS/RxD LED is yellow, meaning that the DTE is ready to send data to the DataSMART plug-in.

■   The application begins to work; for example, the DTE starts passing data.

If the application does not work, the DataSMART alarms and indicators will help identify the source of the problem: the carrier, the terminal equipment, the connections, or the unit itself.

If you cannot verify that the installation was correct, refer to the "Troubleshooting tree" on page 99. For a more detailed discussion, see the "Troubleshooting" chapter in the *User's Guide* for your plug-in.

▶   **NOTE**
*If you are connecting to a Cisco router, set each DataSMART unit's data port clocking to "external" using the **DPCLK:E** command.*

Interpreting the front-panel LEDs

Figure 34—LEDs when conditions are NORMAL

Green: power-on, self-test successful.

Blinking green: A user is logged in. If the TEST LED is blinking in synchronization with the PWR LED, the unit is waiting to receive configuration information from the shelf controller.

PWR

DNLD/ FAIL

Off: Unit has passed self-test.

Blinking red: Unit is downloading software.

Off: The network interface is not in an alarm condition and can send and receive data.

ALM

NI

DATA

Green: Valid signal is being transmitted or received at the network interface.

TEST

Yellow: The unit is sending or receiving test codes or loopback, or doing a BERT test.
Blinking yellow: If blinking in synchronization with the Power LED, unit is waiting to receive configuration information from the shelf controller.
Off: No active tests.

The Clear to Send (CTS) signal is asserted. The DataSMART is ready to exchange data with the DTE.

CTS/TxD

DATA PORT

RTS/RxD

Request to Send (RTS) is asserted or DPLOS is set to NONE or DTR. The DTE is ready to send data to the DataSMART.

Future

FRAME RELAY LINK

DataSMART® 552

56/64k DSU/CSU

Figure 35—LEDs when conditions are ABNORMAL

Off: Power is off. ———————————— PWR

Red: Unit has failed self-test. ———— DNLD/FAIL

Red: One or more of these alarm conditions are present on the network interface: LOS, OOF, DDS control code. ———— ALM — NI

Off: Network interface is in an alarm condition. ———— DATA

A loopback has been set locally or remotely, the unit is sending or receiving test code, or the unit is conducting a BERT test. ———— TEST

Off: CTS is deasserted ———————— CTS/TxD — DATA PORT

Off: RTS is deasserted and DPLOS is set to BOTH or RTS. The DTE is not ready to send data or is not connected. ———— RTS/RxD

Future. ———— FRAME RELAY LINK

DataSMART® 552

56/64k DSU/CSU

Table 6—LED indicators and their meanings

LED	Indicator	Condition
PWR	Green	Power is on; self-test successful.
	Blinking green	A user is logged into the DataSMART plug-in. If the TEST LED is blinking in synchronization with the PWR LED, the unit is waiting to receive configuration information from the shelf controller.
	Off	Power is off.
DNLD/FAIL	Off	Unit has passed self-test.
	Red	Unit has failed self-test.
	Blinking red	Unit is downloading new software.
NI ALM	Red	One or more of these alarm conditions are present on the network interface: LOS, OOF, DDS control code.
	Off	The network interface is not in an alarm condition and can send and receive data.
NI DATA	Green	Valid signal is being transmitted or received at the network interface.
	Off	Network interface is in an alarm condition.
TEST	Yellow	A loopback has been set locally or remotely, the unit is sending or receiving test code, or the unit is conducting a BERT test.
	Blinking yellow	If the TEST LED is blinking in synchronization with the Power LED, the unit is waiting to receive configuration information from the shelf controller.
	Off	Unit is not sending test codes and is not waiting for configuration information.
DATA PORT CTS/ TxD	Yellow	The Clear to Send (CTS) signal is asserted. The DataSMART is ready to exchange data with the DTE.
	Off	CTS is deasserted.
DATA PORT RTS/ RxD	Yellow	Request to Send (RTS) is asserted or DPLOS is set to NONE or DTR. The DTE is ready to send data to the DataSMART.
	Off	RTS is deasserted and DPLOS is set to BOTH or RTS. The DTE is not ready to send data or is not connected.
FRAME RELAY LINK		Future.

Troubleshooting tree

The following is a quick guide to the alarms generated by DataSMART plug-ins and to the pages in this chapter that provide appropriate troubleshooting procedures for the alarms.

The alarms are prioritized high to low. Always deal with high-priority alarms first.

Figure 36—Troubleshooting the DataSMART

LOS *(page 99)*

OOF *(page 100)* High Priority

DDS code *(page 100)*

BPV *(page 100)* Low Priority
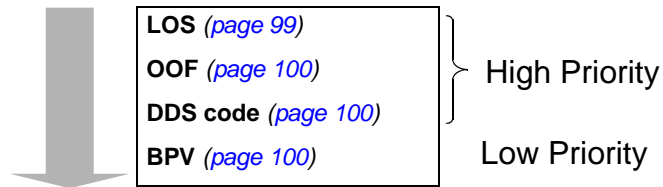
Troubleshooting alarms

The best troubleshooting method is to start with the highest priority alarm, find its cause and fix it, and then turn to the next highest priority. The following alarm list is arranged from high to low priority. You may also want to use some of the diagnostic tools described later in this chapter.

▶ **NOTE**

In this manual, high-priority alarms tend to arise from more basic problems than low-priority alarms. Often, fixing a high-priority alarm will also automatically correct alarms of lower priority. Network management systems use the words "critical," "major," and "minor" to rank alarms in terms of seriousness. These two rankings are similar, but not always identical.

LOS—high priority

The plug-in receives a loss-of-signal condition at the network interface

An LOS condition occurs when the DataSMART cannot detect a signal at its network interface. To troubleshoot for this condition:

■ Make sure that you have correctly connected the cable between the DataSMART network interface and your service provider's equipment. A loose or insufficiently mated cable connection can cause an LOS or OOF condition.

■ If you built the cable on-site, check the cable connectors. A reversal of the transmit and receive pairs, or an open receive pair, can cause this condition.

■ If the above appear to be okay, ask your service provider to test your DDS line and correct any problems found.

OOF—high priority

The incoming signal at the network interface is out-of-frame

An out-of-frame condition occurs when five consecutive Frame Alignment Word sequences are in error. The condition clears after frame alignment has been determined. OOF alarms are valid only when the unit is in 64-kbps clear channel mode. To troubleshoot this condition:

■ Make sure that you have correctly connected the cable between the DataSMART network interface and your service provider's equipment. A loose or insufficiently mated cable connection can cause an LOS or OOF condition.

■ Make sure all DataSMART 552 units in the network are using the same line rate: 56-kbps primary or 64-kbps clear channel.

■ Make sure there is only one timing source in the network.

A highly errored incoming signal can cause an OOF condition.

DDS—high priority

A DDS control code is detected at the network interface

A DDS control code indicates that equipment at the carrier's central office is either out of service or has gone idle. In either case, the central office equipment continuously transmits a code. DDS alarms are valid only when the unit is in 56-kbps DDS primary mode.

If the equipment in the network is functioning correctly, but no data is being transmitted, flag characters (not DDS idle codes) are sent to the DataSMART. Flag characters do not cause alarms.

■ DDS code alarms are sent by the carrier's central office equipment. If you have questions, call your carrier.

BPV—low priority

Bipolar violations (BPVs) are detected at the network interface or the terminal interface

A bipolar violation is an error in the normal polarity of received pulses. A bipolar violation occurs when two or more pulses of the same polarity appear in a row.

Bipolar violations are often caused by local problems with your DDS line. To troubleshoot this condition:

■ Make sure that your network interface wiring consists of only *individually-shielded* twisted pairs.

■ Check that all cable connections are secure and connected to the correct terminals. Refer to "Connecting to the DDS network interface" on page 31 (for the 2-slot shelf), or "Connecting to the DDS network interface" on page 53 (for the 12-slot shelf) for instructions on how to properly connect cables.

■ Make sure the system clock is configured correctly.

A *Connector pinouts*

This appendix describes the pinouts for the various connectors, including:

■ T1 network interface pinouts

■ DDS network interface pinouts

■ Terminal interface pinouts

■ Terminal interface/data port pinouts—V.35, EIA-530

■ Control port pinouts

■ Ethernet controller pinout

T1 network interface pinouts

Table 7—Network interface pinout for the DA15 plug (12-slot shelf)

Pin number	Circuit name
1	TxD data (T)
9	TxD data (R)
3	RxD data (T1)
11	RxD data (R1)
2	Frame ground
4	Frame ground
5, 6, 7, 8, 10, 12, 13, 14, 15	Not used

Table 8—NI pinout for the 8-pin RJ48C connector (2-slot shelf)

Pin number	Circuit name	
1	RxD data (T1)	INPUT
2	RxD data (R1)	INPUT
4	TxD data (T)	OUTPUT
5	TxD data (R)	OUTPUT
7, 8	Optional shield	
3, 6	No connection	

Figure 37—Location of pin 1 on an RJ48C plug

For connection to T1 network: Use AT&T Type ABAM cable or equivalent (individually-shielded twisted pair, rated at 100 ohms at 1 MHz).

Pin 1
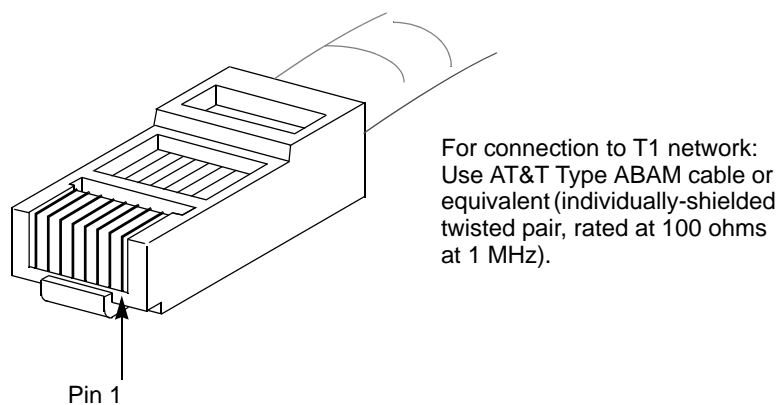
DDS network interface pinouts

Table 9—Network interface pinout for the RJ48S plug (cable 95xxx098)

Pin number	Circuit name	
1	TxD data (R)	OUTPUT
2	TxD data (T)	OUTPUT
7	RxD data (T)	INPUT
8	RxD data (R)	INPUT
3, 4, 5, 6	Not used	

Table 10—Network interface pinout for the DA15S to RJ48S socket adapter (adapter 77894—used only with 12-slot shelf)

Adapter pin number (DA15S side)	Circuit name	Adapter pin number (RJ48S side)
1	TxD data (R)	1
9	TxD data (T)	2
3	RxD data (T)	7
11	RxD data (R)	8

Figure 38—Location of pin 1 on an RJ48S plug (for cable 95xx098)

For connection to a DDS network: use a keyed RJ48S cable.

Pin 1
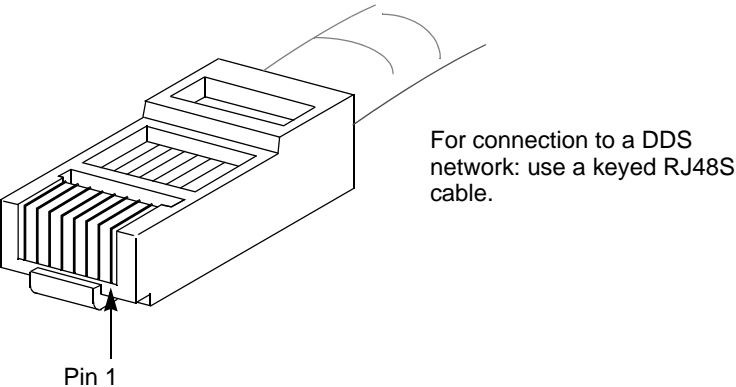
Figure 39—Location of pins on DS15S socket (for adapter 77894)

Pin 3   Pin 1

For connection to a DDS network from the 12-slot shelf: use a DA15S to RJ48S socket adapter plugged into the network interface port on the back of the shelf.

Pin 11   Pin 9
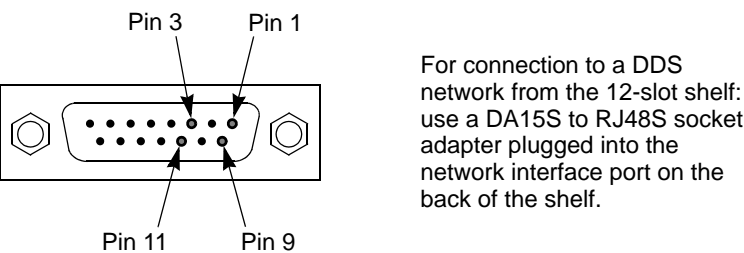
Figure 40—DDS network interface pinouts (12-slot shelf)

12-slot shelf

RJ48S   RJ48S
1   1   1
2   2   77894 adapter: 9
                              RJ48S to DA15
               95xxx098 cable (included with   NI connector
               (included with unit) unit)
7   7   3
8   8   11
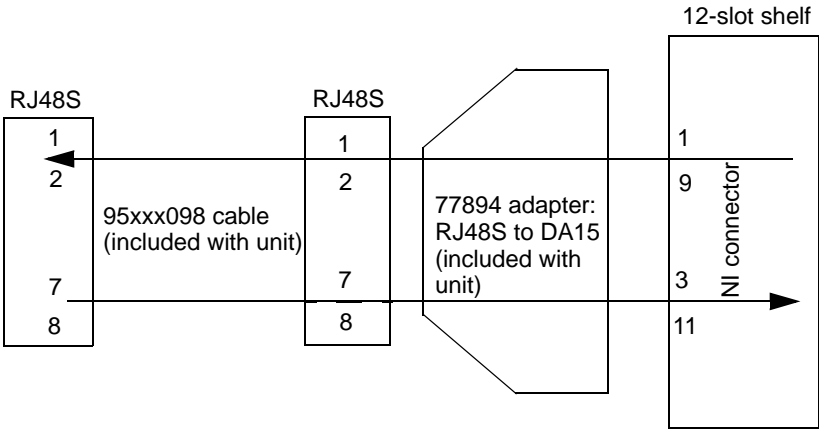
Figure 41—DDS network interface pinouts (2-slot shelf)

2-slot shelf

RJ48S   RJ48S
1   1   1
2   2   2
               95xxx098 cable   NI connector
               (included with unit)
7   7   7
8   8   8
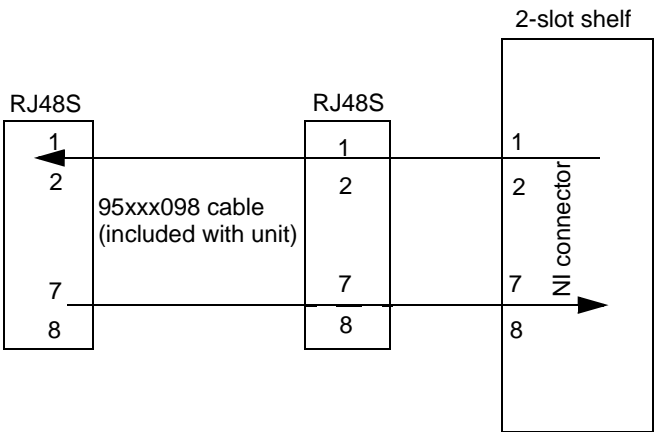
Terminal interface pinouts

Table 11—TI pinout for the DA15 connector (cables 950xx088 - 950xx091)

Pin number	Circuit name
1	TxD data (T1)
9	TxD data (R1)
3	RxD data (T)
11	RxD data (R)
2	Frame ground
4	Frame ground
5, 6, 7, 8, 10, 12, 13, 14, 15	Not used

Table 12—TI pinout for the 8-pin RJ48C connector (2-slot shelf)

Pin number	Circuit name	
1	RxD data (T1)	INPUT
2	RxD data (R1)	INPUT
4	TxD data (T)	OUTPUT
5	TxD data (R)	OUTPUT
7,8	Optional shield	
3, 6	No connection	

Figure 42—T1 data transmission interfaces (12-slot shelf)
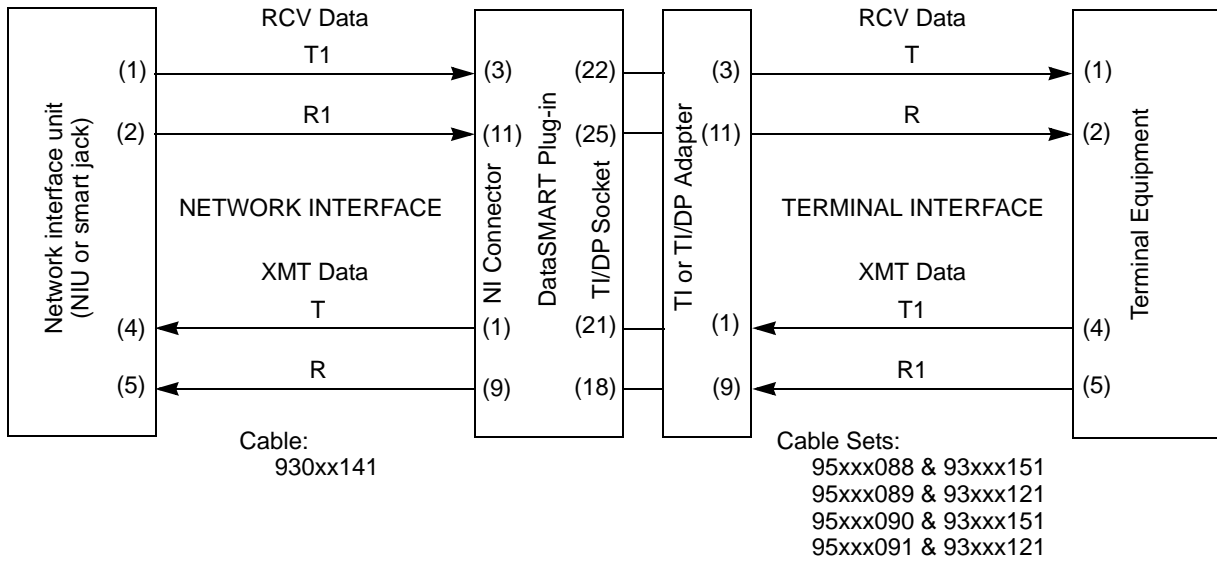
Figure 43—T1 data transmission interfaces (2-slot shelf)
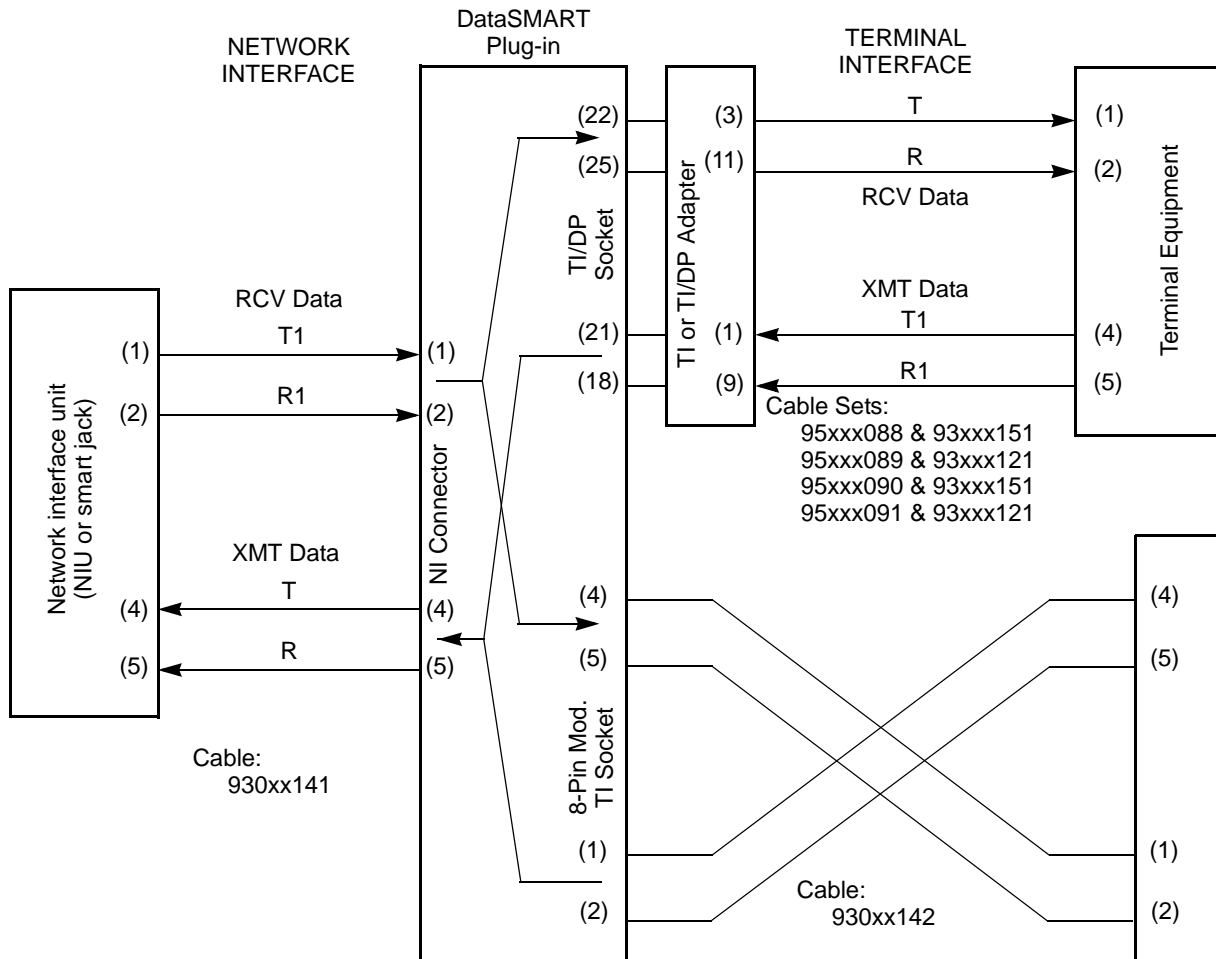
Terminal interface/data port pinouts—V.35, EIA-530

Table 13 and Table 14 apply to the 12-slot shelf only.

Table 13—DB25 connector pin assignments for V.35 and terminal interface

Shelf Pin	34-Pin Conn.	ITU	Circuit name	Source
1	A		Protective GND	
2	P	(a) 103	Tx Data A	DTE
14	S	(b) 103	Tx Data B	DTE
3	R	(a) 104	Rx Data A	DCE
16	T	(b) 104	Rx Data B	DCE
4	C	105	RTS	DTE
5	D	106	CTS	DCE
6	E	107	DSR	DCE
20	H	108.2	DTR	DTE
8	F	109	Rec Line Sig Det (DCD)	DCE
7	B	102	Signal GND	
24	U	(a) 113	External Clk A	DTE
11	W	(b) 113	External Clk B	DTE
17	V	(a) 115	Rx Signal Timing A	DCE
9	X	(b) 115	Rx Signal Timing B	DCE
15	Y	(a) 114	Tx Signal Timing A	DCE
12	AA	(b) 114	Tx Signal Timing B	DCE
10, 13, 19, 23			Not used by V.35	
Shelf Pin	**15-Pin Conn.**	**T1**	**Circuit name**	**Source**
22	3	T	Terminal Interface transmit side	Term. I/F
25	11	R	Terminal Interface transmit side	Term. I/F
21	1	T1	Terminal Interface receive side	External
18	9	R1	Terminal Interface receive side	External

This table applies to Kentrox cables 950xx090 and 950xx091. The V.35-specific information (top section) also applies to adapter 78904 and cables 950xx073 (for tail circuit timing only), 950xx074, and 950xx054.

This table is valid when the data port is configured for V.35 (the default), DataSMART 72000 series cable compatibility.

The following table applies to Kentrox cables 950xx088 and 950xx089.

Table 14—DB25 connector pin assignments for EIA-530, terminal interface

Shelf Pin	ITU/EIA	Circuit name	Source
1	—	Shield	—
2	(a) 103/BA	BA (A), Transmitted Data	DTE
14	(b) 103/BA	BA (B), Transmitted Data	DTE
3	(a) 104/BB	BB (A), Received Data A	DCE
16	(b) 104/BB	BB (B), Received Data	DCE
4	(a) 105/CA	CA (A), Request To Send A (RTS)	DTE
19	(b) 105/CA	CA (B), Request To Send	DTE
5	(a) 106/CB	CB (A), Clear To Send A (CTS)	DCE
13	(b) 106/CB	CB (B), Clear To Send	DCE
6	(a) 107/CC	CC (A), DCE Ready (DSR)	DCE
22[1]	(b) 107/CC	CC (B), DCE Ready	DCE
7	102/AB	AB, Signal Ground	—
8	(a) 109/CF	CF (A), Received Line Signal Detector	DCE
10	(b) 109/CF	CF (B), Received Line Signal Detector	DCE
17	(a) 115/DD	DD (A), Receiver Signal Element Timing	DCE
9	(b) 115/DD	DD (B), Receiver Signal Element Timing	DCE
24	(a)113/DA	DA (A), Transmit Signal Element Timing	DTE
11	(b) 113/DA	DA (B), Transmit Signal Element Timing	DTE
15	(a) 114/DB	DB (A), Transmit Signal Element Timing	DCE
12	(b) 114/DB	DB (B), Transmit Signal Element Timing	DCE
20	(a) 108.2/CD	CD (A), DTE Ready	DTE
23	(b) 108.2/CD	CD (B), DTE Ready	DTE
18, 21, 25		Not supported for EIA-530	

ShelfPin	T1/15-Pin Conn.	Circuit name	Source
22	T (Pin 3)	Terminal Interface transmit side	Term. I/F
25	R (Pin 11)	Terminal Interface transmit side	Term. I/F
21	T1 (Pin 1)	Terminal Interface receive side	External
18	R1 (Pin 9)	Terminal Interface receive side	External

[1] Cables 950xx088 and 950xx089 connect pin 22 at the shelf end to pin 7 at the DTE end.

The following table applies to Kentrox cable 950xx042.

Table 15—DB25S connector to RS449, 37-pin connector adapter cable

RS449 DB37 Pins	Circuit name
—	Protective ground
4	Tx data A
22	Tx data B
6	Rx data A
24	Rx data B
7	RTS
25	RTS
9	CTS
27	CTS
11	DSR
29	DSR
12	DTR
30	DTR
19	Signal GND
13	Rec line sig det (DCD)
31	Rec line sig det (DCD)
5	Tx signal timing A
23	Tx signal timing B
8	Rx signal timing A
26	Rx signal timing B
17	External clk A (DTE source)
35	External clk B (DTE source)
10	Not Supported
14	Not Supported
18	Not Supported

Control port pinouts

The 12-slot shelf and the 2-slot shelf both have separate 9-pin DCE and DTE control ports on the back of the shelf.

The 2-slot shelf also provides control port access from the front of the shelf. This port operates in parallel with the DCE port on the rear.

▶ **NOTE**

You can connect to either the rear or front-panel DCE port, but not both at once.

Table 16—9-pin DE-9S (DCE) shelf front or rear panel connector

Signal	DE-9 Pin Number	DB-25 Equivalent	Direction
Rec Sig Det	1	8	OUTPUT
Received Data	2	3	OUTPUT
Transmit Data	3	2	INPUT
DTE Ready (DTR)	4	20	INPUT
Signal Ground	5	7	—
Data Set Ready (DSR)	6	6	Not supported
Request to Send (RTS)	7	4	INPUT
Clear to Send (CTS)	8	5	OUTPUT
RI	9	22	Not used

Table 17—9-pin DE-9P (DTE) shelf rear-panel connector

Signal	DE-9 Pin Number	DB-25 Equivalent	Direction
Rec Sig Det	1	8	INPUT
Received Data	2	3	INPUT
Transmit Data	3	2	OUTPUT
DTE Ready (DTR)	4	20	OUTPUT
Signal Ground	5	7	—
Data Set Ready (DSR)	6	6	Not supported
Request to Send (RTS)	7	4	OUTPUT
Clear to Send (CTS)	8	5	INPUT
RI	9	22	Not used

Ethernet controller pinout

The 10BaseT system uses four pins of the 8-pin modular connector on the DataSMART 558 or 588 front panel.

Table 18—Ethernet 10BaseT pinout

Pin Number	Signal
1	TD+
2	TD-
3	RD+
6	RD-
4	Not used
5	Not used
7	Not used
8	Not used

B *Configuration worksheet for T1 units*

This appendix contains a blank configuration worksheet that you can fill out prior to configuring your DataSMART T1 units. If you are configuring a DataSMART 552 56/64 kbps unit, you do not need to use these worksheets; see page 78 for configuration instructions.

The worksheet in this appendix will make your configuration task easier, because you will have gathered all the information you need for the task before starting to configure the unit.

The configuration procedure in this guide does not configure every one of the DataSMART parameters, but it will set up a working configuration that you or your network administrator can manage or change remotely or on-site, as convenient.

The configuration process depends on whether your application includes both a controller and plug-in units or just one kind of plug-in unit:

If your application has a controller and one or more plug-in units to be connected to it:

1 Fill out a DataSMART Configuration Worksheet for the controller.

2 Insert the controller, log in and configure it, using the procedures in this chapter.

3 Insert the plug-in units, filling the slots closest to the controller first. The controller will automatically configure the plug-ins as you insert them.

4 If your application includes daisy-chained 2-slot shelves, you might need to check the control port IP addresses and correct them manually, if necessary.

If your application has only one kind of DataSMART unit:

1 Fill out a DataSMART Configuration Worksheet for each unit.

2 Insert each unit, log in and configure it, using the procedures described in Chapter 5.

3 Continue until all units are configured and working.

You may freely photocopy the worksheet.

After filling out the worksheets, turn to Chapter 5 for step-by-step instructions for configuring the unit(s).

DataSMART Configuration Worksheet, Page 1

1. What network interface setup will you use?

NI framing format:

❍ Extended super frame (default)

❍ Super frame

❍ Ericsson-modified super frame

NI line coding:

❍ B8ZS line coding (default)

❍ AMI line coding

Set the DataSMART unit to the framing format and line coding specified by your service provider. The facility data link (see Question 8) is available only if the network interface framing format is extended super frame. The Ericsson-modified super frame format is used by some L. M. Ericsson switches in cellular service.

Transmit line build-out (also called LBO or attenuation):

❍ 0.0 dB line attenuation (default)

❍ 7.5 dB line attenuation

❍ 15.0 dB line attenuation

Set the DataSMART unit to the LBO requested by your service provider.

2. What terminal interface setup will you use? (add/drop units only)

TI framing format:

❍ Extended super frame (default)

❍ Super frame

❍ Ericsson-modified super frame

TI line coding:

❍ B8ZS line coding (default)

❍ AMI line coding

Set the DataSMART unit to the framing format and line coding specified by your service provider. The Ericsson-modified super frame format is used by some L. M. Ericsson switches in cellular service.

3. Where will the system get its timing signal?

❍ Loop timing (default)—uses timing signal from network for all outputs

❍ Internal master timing—uses the unit's internal clock to time all outputs

❍ Data port timing (a.k.a. "tail circuit timing")—uses timing signal from DTE for all outputs

❍ CSU Through timing (add/drop)—uses network timing signal for outputs to TI and terminal equipment timing signal for outputs to NI. **Do not use unless all channels map to TI.**

❍ TI receive timing (add/drop)—uses timing signal from CPE for all outputs

For most applications, the DataSMART unit derives its source clock from the network receive signal (Loop Timing). This is the most common timing setup, and should be used if your T1 service provider supplies timing. If your T1 service provider does not supply timing, you will need to select an alternate timing source.

4. Which data port interface will be used?

❍ V.35, cable compatible with DataSMART 72000 series (default)

❍ V.35, cable compatible with DataSMART 78000 series

❍ EIA-530

Data ports on DataSMART units can support either V.35 or EIA-530. The V.35 72nnn port configuration is compatible with V.35 cables for the DataSMART MAX and SPort. However, if you are replacing DataSMART 78000 series units, select the "V.35 DataSMART 78xxx" configuration and reuse your existing V.35 cables.

5. Do you have one of these typical applications?

❍ Channels 1-24, full rate DSU at 1536 kbps (24 x 64 kbps; steps on page 67)

❍ Fractional T1 DSU at 256 kbps (4 x 64 kbps; steps on page 68)

❍ Channels 1-23, CSU/DSU using Robbed Bit Signaling; Channel 24, Data Port 1 @ 56 kbps (add/drop only; steps on page 69)

❍ Channels 1-24, CSU using Robbed Bit Signaling (add/drop only; steps on page 70).
   Also called A-B bit or A-B-C-D bit signaling, Channel Associated Signaling (CAS).

❍ Channels 1-24, CSU using Common Channel Signaling (CCS) (add/drop only; steps on page 71). Also used for ISDN PRI or Data Equipment on terminal interface.

❍ None of the above — see Question 6

If you selected any of the typical applications, go directly to Question 7.

DataSMART Configuration Worksheet, Page 3

6. What is your custom network interface channel assignment?

Assign NI channels 1 through 24 to the data port, terminal interface, or idle.

All channels assigned to the data port run at the same base rate: either 56 kbps or 64 kbps per channel.

If you're using a DS0 channel for the Data Link (see Question 7), the corresponding NI channel must be assigned to the data port or idle. **You cannot configure a Data Link on a channel assigned to the terminal interface.**

If your terminal equipment requires the SF or ESF signaling bits, set the TI channel type to V (Voice).
If your terminal equipment requires a clear channel, set the TI channel type to D (Data).
(TI selections apply to add/drop units only.)

Channel	TI (Voice)	TI (Data)	Idle	Data Port	Data Port Base Rate (All DP Channels):
1	_____	_____	_____	_____	
2	_____	_____	_____	_____	
3	_____	_____	_____	_____	❍56 kbps ❍64 kbps
4	_____	_____	_____	_____	
5	_____	_____	_____	_____	
6	_____	_____	_____	_____	
7	_____	_____	_____	_____	
8	_____	_____	_____	_____	
9	_____	_____	_____	_____	
10	_____	_____	_____	_____	
11	_____	_____	_____	_____	
12	_____	_____	_____	_____	
13	_____	_____	_____	_____	
14	_____	_____	_____	_____	
15	_____	_____	_____	_____	
16	_____	_____	_____	_____	
17	_____	_____	_____	_____	
18	_____	_____	_____	_____	
19	_____	_____	_____	_____	
20	_____	_____	_____	_____	
21	_____	_____	_____	_____	
22	_____	_____	_____	_____	
23	_____	_____	_____	_____	
24	_____	_____	_____	_____	

DataSMART Configuration Worksheet, Page 4

7. Which IP network interface will you use? (DataSMART 554 and 558 only)

Check one of the IP network interface options on this page. The decision table below can help you.
To use the table, read line 7a and follow the appropriate directions for either Response 1 or Response 2.
DON'T ANSWER ANY QUESTION UNLESS YOU HAVE BEEN DIRECTED TO GO TO THAT LINE.

When you choose a NETIF option, stop. Check the option below and turn to Question 7 or 9 as directed.
Ethernet is available on controllers (558 and 588) only.
If you have a Frame Monitoring unit (584 and 588), don't use this page. Go directly to Question 8.

Line	Question	Response 1	Response 2
7a	Are you managing this unit using Telnet or SNMP?	Yes: go to line 7b	No: Choose **NETIF:N**
7b	Are you at a central site (connected to a network management system) or a remote site?	Central: go to line 7c	Remote: go to line 7n
7c	Is Ethernet available for management at the central site?	Yes: go to line 7d	No: go to line 7i
7d	Is this unit a single unit or is it shelf-mounted or daisy-chained with other DataSMART units?	Single: go to 7e	Shelf or daisy-chain: go to 7f
7e	Will you use an IP data link to manage the far-end unit?	Yes: Choose **NETIF:ED**	No: Choose **NETIF:E**
7f	Is this unit at the head, middle, or end of the daisy chain or shelf?	Head: go to line 7g	Middle/end: go to line 7h
7g	Will you use an IP data link to manage the far-end unit?	Yes: Choose **NETIF:ESD**	No: Choose **NETIF:ES**
7h	Will you use an IP data link to manage the far-end unit?	Yes: Choose **NETIF:SD**	No: Choose **NETIF:S**
7i	Will you use PPP or SLIP to manage DataSMART units?	PPP: go to line 7j	SLIP: go to line 7m
7j	Is this unit a single unit or is it shelf-mounted or daisy-chained with other DataSMART units?	Single: go to 7l	Shelf or daisy-chain: go to 7k
7k	Is this unit at the head, middle, or end of the daisy chain or shelf?	Head: go to line 7l	Middle/end: go to line 7m
7l	Will you use an IP data link to manage the far-end unit?	Yes: Choose **NETIF:PSD**	No: Choose **NETIF:PS**
7m	Will you use an IP data link to manage the far-end unit?	Yes: Choose **NETIF:SD**	No: Choose **NETIF:S**
7n	Is this remote unit managed using the IP data link?	Yes: Choose **NETIF:D**	No: go to line 7o
7o	Is Ethernet available for management at this site?	Yes: Choose **NETIF:E**	No: go to line 7i
7p	Is this unit at the head, middle, or end of the daisy chain or shelf?	Head: Choose **NETIF:PS**	Middle/end: Choose **NETIF:S**

Choose a NETIF option (IP network interface)

❍ ES (Ethernet/SLIP)—Turn to Question 10.   ❍ D (Data Link)—Turn to Question 8.

❍ E (Ethernet)—Turn to Question 10.   ❍ SD (SLIP/Data Link)—Turn to Question 8.

❍ S (SLIP)—Turn to Question 10.   ❍ PSD (PPP/SLIP/Data Link)—Turn to Question 8

❍ PS (PPP/SLIP)—Turn to Question 10.   ❍ ESD (Ethernet/SLIP/Data Link)—Turn to Question 8.

❍ N (None)—You are finished configuring.   ❍ ED (Ethernet/Data Link)—Turn to Question 8.

DataSMART Configuration Worksheet, Page 5

8. How will you set up the IP Data Link? (DataSMART 554 and 558 only; selected IP network interface includes Data Link)

If you select FDL (facility data link), do not enter a channel number or select a data port rate. The unit's network interface frame format must be extended super frame (ESF; see Question 1).

If your data link runs in a DS0 channel, enter the channel number (between 1 and 24) and select a data port rate (56 or 64 kbps; copy the answer from Question 6). Do not select FDL.

If you are connecting two units with a data link, one unit must be configured as SD, ED, ESD, or PSD. The other must be configured as D. FDL, channel number, and data port rate must be the same for both units.

The ED and ESD options are available on controllers (558 or 588) only.

Specify the data link parameters for your IP interface.

	FDL	Channel Number	Data Port Rate
❍ D (Data Link)	❍		❍ 56 kbps ❍ 64 kbps
❍ SD (SLIP/Data Link)	❍		❍ 56 kbps ❍ 64 kbps
❍ PSD (PPP/SLIP/Data Link)	❍		❍ 56 kbps ❍ 64 kbps
❍ ESD (Ethernet/SLIP/Data Link)	❍		❍ 56 kbps ❍ 64 kbps
❍ ED (Ethernet/Data Link)	❍		❍ 56 kbps ❍ 64 kbps

If your data link runs in an active DS0 channel (see Questions 5 and 6), it will run at 8 kbps. Otherwise, it runs at the selected data port rate (56 or 64 kbps).

DataSMART Configuration Worksheet, Page 6

9. Which IP network interface channel assignment will you use?

(DataSMART 584 and 588 only)

Check one of the IP network interface options on this page. The decision table below can help you.
To use the table, read line 9a and follow the appropriate directions for either Response 1 or Response 2.
DON'T ANSWER ANY QUESTION UNLESS YOU HAVE BEEN DIRECTED TO GO TO THAT LINE.

When you choose a NETIF option, stop. Check the option below and turn to Question 9.

Ethernet is available on controllers (558 or 588) only.

If you have a DataSMART 554 or 558, don't use this page. Go back to Question 6.

Line	Question	Response 1	Response 2
9a	Are you managing this unit using Telnet or SNMP?	Yes: go to line 9b	No: Choose **NETIF:N**
9b	Is the unit a DataSMART 588?	Yes: go to line 9c	No: go to line 9f
9c	Is Ethernet available for management at the site?	Yes: go to line 9d	No: go to line 9f
9d	Is this unit a single unit or is it shelf-mounted or daisy-chained with other DataSMART units?	Single: Choose **NETIF:E**	Shelf or daisy-chain: go to line 9e
9e	Is this unit at the head, middle, or end of the daisy chain or shelf?	Head: Choose **NETIF:ES**	Middle/end: Choose **NETIF:S**
9f	Will you manage the unit in-band via Frame Relay?	Yes: Choose **NETIF:I**	No: go to line 9g
9g	Will you use PPP or SLIP to manage DataSMART units?	PPP: go to line 9h	SLIP: Choose **NETIF:S**
9h	Is this unit a single unit or is it shelf-mounted or daisy-chained with other DataSMART units?	Single: Choose **NETIF:PS**	Shelf or daisy-chain: go to 9i
9i	Is this unit at the head, middle, or end of the daisy chain or shelf?	Head: Choose **NETIF:PS**	Middle/end: Choose **NETIF:S**

Choose a NETIF option (IP network interface)

❍ ES (Ethernet/SLIP)—Turn to Question 10.

❍ E (Ethernet)—Turn to Question 10.

❍ I (In-band)—Turn to Question 10.

❍ PS (PPP/SLIP)—Turn to Question 10.

❍ S (SLIP)—Turn to Question 10.

❍ N (None)—You are finished configuring.

10. What IP addresses and netmasks will your network interface(s) require?

Find the required IP addresses and netmasks for the network interface you selected in Question 7 or Question 9.
N/A in the table indicates the address or netmask is not needed for that network interface.
If a network or system administrator is responsible for issuing these IDs, get them from him or her.

	Ethernet IP Address	Ethernet IP Netmask	Data Link IP Address	Control Port IP Address	Data Link/ Control Port IP Netmask	Default Router Address	In-Band IP Address	In-Band IP Netmask
○ D (Data Link)	N/A	N/A		N/A		N/A	N/A	N/A
○ SD (SLIP/Data Link)	N/A	N/A					N/A	N/A
○ PSD (PPP/SLIP/ Data Link)	N/A	N/A					N/A	N/A
○ ESD (Ethernet/SLIP/ Data Link)							N/A	N/A
○ ED (Ethernet/ Data Link)				N/A			N/A	N/A
○ ES (Ethernet/SLIP)			N/A				N/A	N/A
○ E (Ethernet)			N/A	N/A	N/A		N/A	N/A
○ S (SLIP)	N/A	N/A	N/A				N/A	N/A
○ PS (PPP/SLIP)	N/A	N/A	N/A				N/A	N/A
○ I (Frame in-band)	N/A	N/A	N/A	N/A	N/A	N/A		
○ N (None)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

You must change the IP addresses from the default. However, you may use a default netmask if it works for you.

Ethernet IP Address: _____

Ethernet IP Netmask: _____
DEFAULT 255.255.255.0

Frame In-Band IP Address: _____

Frame In-Band IP Netmask: _____
DEFAULT 255.255.255.0

Data Link IP Address: _____

Control Port IP Address: _____

Data Link/Control Port IP Netmask: _____
DEFAULT 255.255.255.0

Default Router Address: _____
DEFAULT 192.0.2.2

The notes for Question 8 tell you how to specify Data Link IP addresses.
Page 8 of this worksheet contains more information about the default router.

Continued on next page

More information about the default router address

*You do not need a default router address if the IP network interface is In-Band (**I**), Data Link only (**D**) or None (**N**). The unit uses this address to send a packet to a host on a different subnet. Your default router's static route table should contain the addresses of all packets that it is expected to route. To edit the table, see your router manual.*

In applications where the controller is managed via Ethernet, the controller and the units connected to it have different default router addresses. For the controller, the default router and the Ethernet IP address must be in the same subnet. All other units in the shelf or connected via data link use the controller's Control Port IP address.

In applications where the controller is managed via PPP or SLIP, the default router address must be the same for all units in the daisy chain or connected via data link. Its Control Port IP address must be in the same subnet as these units.

11. Will you use Telnet to access the unit?

❍ No: Leave the Telnet password blank.
❍ Yes: Enter a Telnet password (up to 15 characters): _____

Index

Numerics