

AS420

E1 Digital Loopback (EDL) Device

34-00294.2

May 2000



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EU Declaration of Conformity

Model Number: AS420
Manufacturer's Name: Verilink Corporation
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The before mentioned products comply with the following EU directive:

89 / 336 / EEC, "Council Directive of 3 May 1989 on the approximation of the laws of Member States relating to electromagnetic compatibility"

The compliance of the above mentioned products with the Directives and with the following essential requirements is hereby confirmed:

Emissions	Immunity	Safety
EN 55022, Class A, 1995	EN 50082-1, 1992	EN 60950: 1992 / A1 + A2: 1993 / A3: 1995 / A4: 1997

The technical files and other documentation are on file with Mr. Ron Hillis, Certification Manager.

As the manufacturer we declare under our sole responsibility that the above mentioned products comply with the above named directives.



Ron Hillis,
Certification Manager, Verilink Corporation
Madison Alabama, 6 May 1999

Canadian Emissions Requirements

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

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques (de la class A) prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

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

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

Warranty

Verilink's product warranty covers repair or replacement of all equipment under normal use for a five-year period from date of shipment. Replacement products may be new or reconditioned. Any replaced or repaired product or part has a ninety (90) day warranty or the remainder of the initial warranty period, whichever is longer. Our in-house Repair Center services on a standard 10-workday-turnaround basis.

Customer Service

Verilink offers the following services:

- Customer support is available by telephone 24 hours a day, 7 days a week. To speak directly with a Verilink customer service representative, you may dial one of the following numbers:
 - Technical Support: 800-285-2755 (toll-free)
256-772-3770 (local)
 - Sales and Marketing: 800-VERILINK (837-4546)
- You can request sales and marketing information or pose a technical support question about your Verilink product by contacting us at the e-mail addresses provided below. Verilink will respond to e-mailed requests for support during regular business hours (8–5 CST, Monday–Friday).
 - Sales and Marketing: info@verilink.com
 - Technical Support: support@verilink.com
- Access the latest information about Verilink products, customer service, technical support, latest news releases and more by visiting Verilink's Internet Web site: www.verilink.com.

Returning Products

A product must be assigned a Return Materials Authorization (RMA) number before it is sent to Verilink for repair. An RMA number is issued by Verilink Customer Service at (800) 926-0085, ext. 2282.

Safety Precautions

When handling this equipment, follow these basic safety precautions to reduce the risk of electric shock and injury:

- Follow all warnings and instructions marked on the product and in the manual.
- Unplug the hardware from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a slightly damp cloth for cleaning.
- Do not place this product on an unstable cart, stand, or table. It may fall, causing serious damage to the product.
- This product should be operated only from the type of power source indicated on the marking label and manual. If you are unsure of the type of power supply you are using, consult your dealer or local power company.
- Do not allow anything to rest on the power cord. Do not locate this product where the cord interferes with the free movement of people.
- Do not overload wall outlets and extension cords, as this can result in fire or electric shock.
- Never push objects of any kind into the unit. They may touch dangerous voltage points or short out parts that could result in fire or electric shock. Never spill liquid of any kind on this equipment.
- Unplug the equipment from the wall outlet and refer servicing to qualified service personnel under the following conditions:
 - When the power supply cord or plug is damaged or frayed.
 - If liquid has been spilled into the product.
 - If the product has been exposed to rain or water.
 - If the product has been dropped or if the housing has been damaged.

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ABOUT THIS MANUAL

What is a Reference Manual?

This is a reference manual. It provides information about unit installation, configuration, testing and troubleshooting on a function-by-function basis. It is not a user's guide containing step-by-step procedures. This manual contains specific information about a command, menu field, port, etc. Unless otherwise noted, the information in this manual applies only to the Verilink AS420 (also referred to as "*the unit.*")




Where to go for Information

The chapters and appendices in this manual are arranged for quick reference. It is not necessary to read previous chapters to understand the subsequent chapters.

- *Chapter 1, General* -- Introduces the unit, lists the features, and provides specifications.
- *Chapter 2, Installation and Configuration* -- Describes unit installation, port and power connections, switch settings, and firmware upload procedures.
- *Chapter 3, Testing* -- Describes the indicators, test switch, and loopbacks.
- *Chapter 4, Terminal Operation* -- Describes the terminal interface's screen structure and menu controls.

Conventions

The following table lists the conventions used throughout this manual.

Convention	Description
	<i>Notices</i> call attention to important features or instructions.
	<i>Cautions</i> alert you to personal safety risk, system damage, or data loss.
	<i>Warnings</i> alert you to the risk of severe personal injury.
<i>italics</i>	Italics denote new terms or emphasis.
underline	Default settings are underlined.

GENERAL

Introduction

The AS420 is an E1 Digital Loopback device (EDL). This device allows network management centers to remotely activate an E1 signal payload loopback to facilitate installation and troubleshooting of the E1 circuit. This EDL device responds to proprietary codes, transmitted by remote test equipment, which does not interfere with network maintenance elements that belong to local postal telegraph (PTT) authorities.

Features

- Table top packaging
- 100–240 VAC autoranging power supply
- BNC (75 ohm) and RJ-48C (120 ohm) NET and EQUIP connectors
- Compatible with fractional, full, or unframed E1 services
- LED status indicators
- DIP switch configurable
- Provides payload maintenance loop-back, towards network, on demand
- Provides DTE line loopback on demand
- Power bypass relays on EDL device to maintain E1 service to customer if the EDL device loses power. Automatically terminates bypass mode when power is restored to unit.
- SUPV port for local firmware upgrades

Specifications

Generic Interface Requirements (120 Ω and 75 Ω)

E1 Interface

Line Rate:	2.048 Mbps (\pm 32 ppm)
Framing:	ITU-T G.704 (with or without CRC-4) G.703
Line Code:	HDB3
Input Level:	E1 to 6 decibels
Pulse Width:	244 (\pm 41) nanoseconds at half amplitude
Pulse Afterkick:	10 to 30 percent of pulse peak

T1 Interface

Line Rate:	1.544 Mbps (\pm 32 ppm)
Framing:	D4 or ESF
Line Code:	AMI or B8ZS
Input Level:	0 to -36 decibels
Pulse Width:	344 (\pm 45) nanoseconds at half amplitude
Pulse Afterkick:	10 to 30 percent of pulse peak

120 Ω Termination

Interface:	RJ-48C
Impedance:	120 Ω , balanced
Output Level:	3.0 (\pm 0.3) volts (base-to-peak)

75 Ω Termination

Interface:	BNC - coax
Impedance:	75 Ω , unbalanced
Output Level:	2.37 (\pm 0.24) volts (base-to-peak)

E1 Equipment Interface

N \times 64 kbps rate...	for unframed E1: N=32; for framed E1 without CAS: N=1 to 31; for framed E1 with CAS: N=1 to 15 and 17 to 31
----------------------------	---

120 Ω Termination

Interface:	RJ-48C
Impedance:	120 Ω , balanced

75 Ω Termination

Interface: BNC - coax
Impedance: 75 Ω , unbalanced

Timing

Network

E1: 2.048 Mbps (± 50 ppm)
T1: 1.544 Mbps (± 50 ppm)

Internal

E1: 2.048 Mbps (± 32 ppm)
T1: 1.544 Mbps (± 32 ppm)

Management

DIP switches and LEDs

Mechanical

Mounting: desktop
Dimensions: 1.3" H, 8.0" W, 8.0" D
Weight: 1 pound

Power Source

External: Input: 100–240 VAC autoranging
Output: 24 VDC, 500 mA

Industry Standards

Europe

ITU-T G.703
ITU-T G.704
ITU-T G.706
ITU-T G.821
ITU-T G.823
Directive 89/336/EEC
Directive 73/23/EEC
Directive 98/13/EEC

Canada

Canadian Safety CSA C22.2, No. 950-95

US

FCC Compliance Part 15, Class A

US Safety UL 1950, 3rd Edition

Environmental

Operating Temp: 0° to 40°C (32° to 104°F)

Storage Temp: -20° to 70°C (-4° to 158°F)

Humidity: 95% maximum (non-condensing)


INSTALLATION AND CONFIGURATION

Introduction

This chapter contains information and instructions required to prepare the Verilink AS420 for use. Included are initial inspection procedures, configuration guidelines, connection, and powering information.

Safety Summary

This manual contains information and warnings that must be followed to ensure safe operation and retain the equipment in a safe condition.

 *This WARNING sign denotes a potential hazard to the operator. It calls attention to a procedure or practice that, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.*

Unpacking and Inspection

This unit is carefully packaged to prevent damage in shipment. Upon receipt, inspect the shipping container for damage. If the shipping container or cushioning material is damaged, notify the carrier immediately and make a notation on the delivery receipt that the container was damaged (if possible, obtain the signature and name of the person making delivery). Retain the packaging material until verifying the contents of the shipment are complete and the unit has been checked both mechanically and electrically.

If the contents of the shipment are incomplete or, if there is mechanical damage or defect, notify Verilink. If the shipping container is also damaged, or the cushioning material shows signs of stress, notify the carrier of the damage as well as Verilink. Keep the shipping materials for the carrier's inspection. Verilink will arrange for repair or replacement without waiting for claim settlement.

Supplied Materials

The AS420 is shipped from the factory with the following standard equipment.

- external AC power supply
- reference manual
- RJ-48 to RJ-48 cables
- RJ-48 to DB-15 adapters

Connections

The AS420 has BNC and RJ-48C connectors for the network and equipment interfaces, a supervisory port and a power connector. The following paragraphs describe these connections.

DTE and Network Connections

Table 2.1 shows the pinout for the RJ-48C NET and EQUIP connectors.

Table 2.1 *RJ-48C Equipment and Network Connector Pinout*

Pin	NET	EQUIP
1	Tip In	Tip Output
2	Ring In	Ring Output
4	Tip Out	Tip Input
5	Ring Out	Ring Input
3, 6–8	not used	not used

User Interface Port Connection

Table 2.2 shows the pinout for the RJ-48C User Interface port.

Table 2.2 *RJ-48C User Interface Port Pinout*

Pin	User Interface Port
1	Not used
2	RTS*
3	Chassis Ground
4	TXD
5	RXD
6	Ground
7	CTS*
8	not used

Power

Plug the connector from the power supply into the unit. Plug the transformer into an appropriate outlet. This applies power to the unit.

Configuration

This section describes the configuration of the AS420. This unit is configured using the rear panel DIP switches. Refer to Figure 2.1 for switch locations.

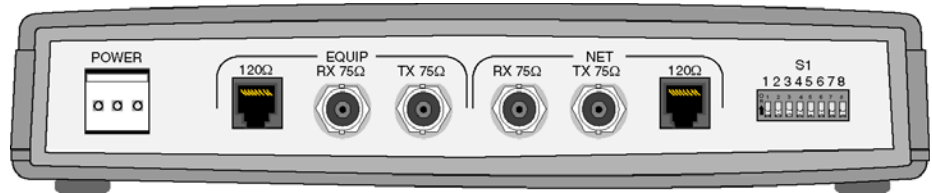


Figure 2.1 Verilink AS420

The switches are read every two seconds. Any change in the DIP switch configuration takes effect within a four-second period.

Configuration Switch S1

Switch S1 is located on the rear panel. This switch provides the following configuration parameters.

E1 Mode Settings

Framed E1. Position S1-1 sets the unit to receive and transmit framed or unframed signals. The default is Framed (Down).

CRC-4. Position S1-2 is used to enable or disable CRC4 for the equipment. The default is Disabled (Down).

CAS Signalling. Position S1-3 sets the unit to receive and transmit CAS signalling in frame 16 of a framed E1 signal. The default is Disabled (Down).

Timing Mode. Position S1-4 sets the timing mode. When Network (Down) timing is selected, the unit recovers timing from the network signal. Internal timing recovers the clock from the unit's internal circuitry.

Front Panel Rocker. Position S1-6 enables and disables the front panel rocker switch to prevent inadvertent loopbacks. The default is Enabled (Down).

Not Used. Positions S1-5, S1-7, and S1-8 are reserved for future use.



NOTICE: Switch positions 5, 7, and 8 must remain in the default (Down) position for normal operation.

T1 Mode Settings

Framing T1. Position S1-1 sets the unit to receive and transmit D4 and ESF framed signals. The default is ESF (Down).

CRC-4. Position S1-2 is used to enable or disable CRC4 for the equipment. The default is Disabled (Down).

Signalling. Position S1-3 sets the unit to receive and transmit AMI and B8ZS signalling. The default is B8ZS (Down).

Timing Source. Position S1-4 sets the timing source. When Network (Down) timing is selected, the unit recovers timing from the network signal. Internal timing recovers the clock from the unit's internal circuitry.

Network Mode. Position S1-5 sets the network mode. When E1 (Down) mode is selected, the unit receives and transmits E1 signals. When T1 (Up) mode is selected, the unit receives and transmits T1 signals. The default is E1 (Down).

Front Panel Rocker. Position S1-6 enables and disables the front panel rocker switch to prevent inadvertent loopbacks. The default is Enabled(Down).

Not Used. Positions S1-7 and S1-8 are reserved for future use.



NOTICE: Switch positions 5, 7, and 8 must remain in the default (Down) position for normal operation.

Supervisory (SUPV) Port

The front panel supervisory port is used for local downloading of firmware updates.

The physical connection is an RJ-48 jack (electrically RS-232). The pinout is shown in Table 2.3.

Table 2.3 *Supervisory Port Pinouts*

Pin	Description
1	Not Connected
2	RTS*
3	Chassis Ground
4	TXD

Table 2.3 *Supervisory Port Pinouts*

Pin	Description
5	RXD
6	Ground
7	CTS*
8	Not Connected

Firmware Download Procedure

This port is accessed through a direct connection. Configure the terminal for VT100 emulation, 115200 bps, 8 bits, no parity, 1 stop bit.



NOTICE: *Commands to the unit are not case sensitive. When the word “enter” is used in this manual, it means to press the Return or Enter key.*

- 1 Begin the procedure by entering **AT** . The unit returns “**OK**.”



NOTICE: *The unit does not echo the typed characters.*

- 2 Put the unit into download mode by entering **AT\$Y** . The display will return “**Ready for Flash download.**”
- 3 Initiate the download or file transfer utility in your communication’s package.
- 4 Enter the desired binary file name (.BIN extension) to download. The transfer can take one or two minutes. After the unit successfully receives the file, the display will read, “**Flash download was successful.**”
- 5 After successfully downloading the binary file, reset the unit by disconnecting and reconnecting the power.
- 6 After the unit has reset, enter **ATI** to verify the new software version.

Reloading Previous Firmware

- 1 To reload the previous version of the firmware, enter **AT\$P**. The display will read, “**Processing Previous Firmware.**”
- 2 After the firmware successfully loads, the unit returns “**OK**”.
- 3 After successfully downloading the binary file, reset the unit by disconnecting and reconnecting the power.
- 4 To verify software, type **ATI**.

Power Bypass

The AS420 can operate in a power bypass mode where the AS420 passes the signal from the network to the equipment and vice versa whether in a powered state or not.

The power bypass mode is done using relays that switch the network and equipment connections. When the unit is powered and stable, the relays have the network and equipment connections switched into the AS420's internal circuitry. When the unit loses power, the relays switch the network connection to a direct connection path to the equipment connection. When power is reestablished and the unit passes self test, the relays switch the network and equipment connections back into the AS420's internal circuitry.

The AS420 powers up and remains in the power bypass mode for two minutes. This delay allows for any power glitches that may occur as power resumes after an outage. This minimizes the unit switching from power bypass to normal operation.

Introduction

This chapter describes the diagnostic and test features of the AS420. The unit is controlled manually using rear panel DIP switches (the DIP switches are discussed on page 9). The front panel indicators and switch are shown in Figure 3.1 and described below.

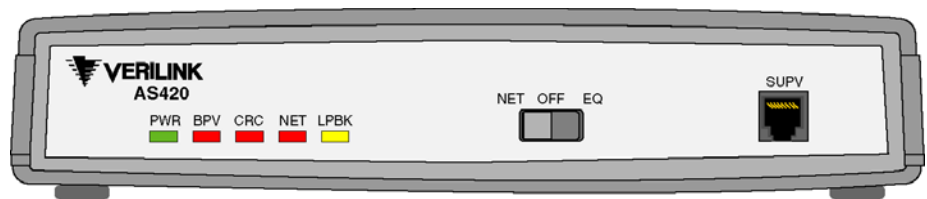


Figure 3.1 AS420 Front Panel

Indicators

The front panel indicators shown in Figure 3.1 convey major alarm conditions and looping status.

Table 3.1 AS420 Front Panel Indicators

LED	Condition	Description
PWR	Off	Power off.
	Solid	Power is applied to the unit.
BPV	Off	No errors.
	Flashing Red	Intermittent BPV errors.
	Solid Red	Continuous BPV errors.
CRC	Off	No errors.
	Flashing Red	Intermittent CRC-4 errors.
	Solid Red	Continuous CRC-4 errors.

Table 3.1 *AS420 Front Panel Indicators*

LED	Condition	Description
NET	Off	No errors.
	Flashing Red	RAI/AIS detected.
	Solid Red	Loss of signal.
LPBK	Off	No loopback active.
	Flashing Yellow	Equipment loopback active.
	Solid Yellow	Payload loopback active.

Loopbacks

The AS420 responds to remote loopup and loopdown codes from any channel in the framed E1 data stream. The resulting payload loopback occurs on all channels in the framed E1 data stream. Loopbacks are initiated after receiving the loopback code for five seconds and remain until the time limit expires or the loopdown code is received.

Loopback commands received from the far end must be initiated from test equipment that sends data without packet protocols. This allows the AS420 to detect loop-up and loop-down streams without stripping headers, footers, or flags. The loop codes with their descriptions are provided in Table 3.2.

Table 3.2 *Framed E1 Loops and Loop Codes*

Description	Code
Loop network traffic for 30 minutes.	00000111
Loop network traffic for 60 minutes.	00111000
Loop network traffic for 72 hours.	00010100
Cancel loop in progress.	00110010

For unframed E1 data, the unit responds to five seconds of a 1-in-5 (10000) pattern by looping the entire E1 datastream until receiving a 1-in-3 (100) pattern for three seconds.

In both framed and unframed E1 data payload loopback, the equipment receives an all 1's pattern.

Front Panel Rocker Switch

The front panel switch activates and deactivates a network or equipment payload loopback. This switch can be overridden by disabling its functionality with position S1-6. The loops requested default to a 72-hour loop and remain in loopback until meeting one of three conditions: the switch is moved to the middle position, the 72-hour clock expires, or a loopdown code is received from the network.

Network

Setting the front panel rocker switch to NET activates a payload loopback where every frame of the E1 datastream received is looped back to the network. The equipment receives unframed 1's.

Deactivate the loopback one of three ways: setting the rocker switch to the middle position, allowing the 72-hour timer to expire, or receiving a loopdown code from the network.

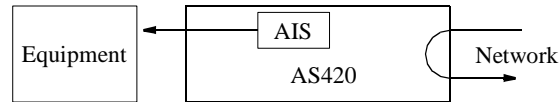


Figure 3.2 *Payload Loopback*

Equipment

Setting the front panel rocker switch to EQ activates an equipment loopback where every frame received of the E1 datastream is looped back to the device. The network receives all 1's.

Deactivate the loopback one of three ways: setting the rocker switch to the middle position, allowing the 72-hour timer to expire, or receiving a loopdown code from the network.

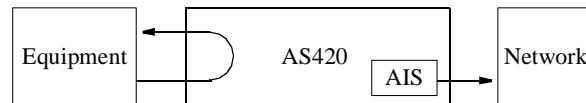


Figure 3.3 *Equipment Loopback*

TERMINAL OPERATION

Terminal Interface

This chapter describes the screens structure and menu controls for the Verilink AS420 terminal interface. The interface is a firmware application embedded inside the unit.

It requires an ANSI-compatible VT100 terminal (ASCII), or a computer running an ANSI terminal emulation program. The terminal interface uses ASCII break and escape functions, which are implemented differently with the various terminal emulation programs.

Screen Components

Terminal interface screens have components common to all screens (Figure 4.1).

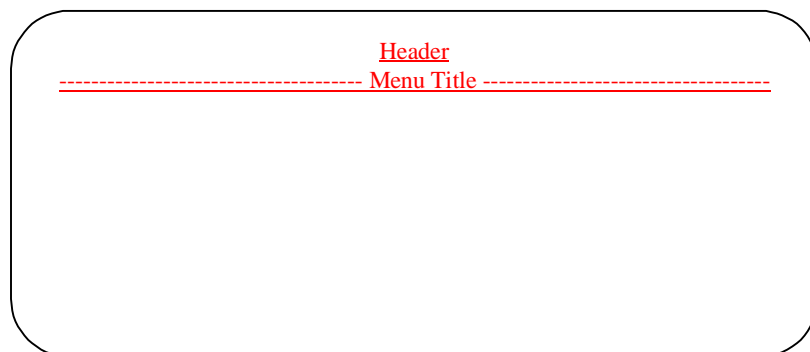


Figure 4.1 *Figure 4-1 Terminal Interface Layout*

Header

The header contains the name of the device, which is “AS420.”

Main Title

The main title (third line, center) denotes the general classification of functions currently accessible by the user (such as MAIN or PERFORMANCE).

Cursor Controls

The terminal interface utilizes a highlighted cursor to make selections from menus and select fields within the screens to be operated on. The cursor is moved in different ways, depending on the terminal emulation program used. Most programs allow use of the TAB and SHIFT+TAB keys. Others allow use of the arrow keys. Once a field is highlighted, it is manipulated as described in the section Field Types.

For keyboards that do not have these standard keys or have only some of them, an alternate set of cursor commands is provided. Each command is performed by pressing a letter key while holding down the CONTROL key. Alternate commands may be freely mixed with the keyboard commands at your discretion. Table 4-A shows the keyboard and equivalent commands.

Table 4.1 *Keyboard and Alternate Commands*

Keyboard Command	Alternate Command
left arrow	CONTROL+S
right arrow	CONTROL+D
up arrow	CONTROL+E
down arrow	CONTROL+X
backspace	CONTROL+H
delete	CONTROL+Z

Field Types

Each screen is made up of fields. The two basic types are user-selectable and display-only. If the highlighted cursor can be moved to a field, it is a user-selectable field. All other fields are for display only. User-selectable fields allow for changes to be made or commands to be executed.

Fields without brackets or parenthesis are display-only. They cannot be changed on the screen. Most user-selectable fields are enclosed in brackets or parenthesis and are described in the following paragraphs.

Fields enclosed in brackets [] offer a list of selections from which to choose. The selections may be toggled by pressing the spacebar. Each time it is pressed, a new item appears. When the appropriate choice is displayed, press ENTER to select it.

Fields enclosed in parenthesis () are manipulated by one of the following methods:

- 1** Pressing ENTER on such fields as (Reset) and (Start Test) simply executes the function.
- 2** The most common type of field in parenthesis accepts typed input in the form of letters and/or numbers. Typing characters when the field is highlighted causes the current entry to be replaced with the new characters. To edit an existing entry rather than replace it, press the right arrow key to move the cursor to the point that needs editing. Characters may then be inserted or deleted. Typed data is always inserted rather than typed over. If the field is full, though, at least one character must be deleted to add another.
- 3** Many fields of this type may also be toggled by pressing the spacebar. Other fields are range checked, where the user is not allowed to exit with an illegal value set.



NOTICE: *Any screen may be redisplayed or refreshed by pressing CONTROL+U. Any changes to fields on a screen that has not been activated by pressing ENTER are discarded.*
