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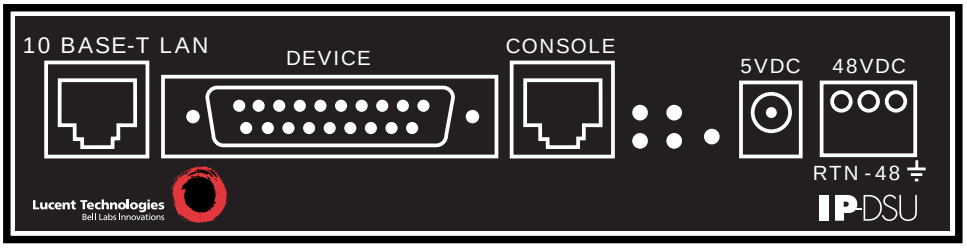

IP-DSU

SERIES 2000

Internet Protocol-Data Service Unit
User's Manual

Version 2.0

255-100-238

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IMPORTANT SAFETY INSTRUCTIONS

The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the product.

When installing, operating, or maintaining this equipment, basic safety precautions should always be followed to reduce the risk of fire, electric shock, and injury to persons, including the following:

- Read and understand all instructions.
- Follow all warnings and instructions marked on this product.
- For information on proper mounting instructions, consult the User's Manual provided with this product.
- This product should only be operated from the type of power source indicated in the User's Manual.
- This unit is intended to be powered from either –48 V dc or AC voltage sources. See User's Manual before connecting to the power source.
- The –48 V dc input terminals are only provided for installations in Restricted Access Areas locations.
- Do not use this product near water, for example, in a wet basement.
- Never touch uninsulated wiring or terminals carrying direct current or leave this wiring exposed. Protect and tape wiring and terminals to avoid risk of fire, electric shock, and injury to service personnel.
- To reduce the risk of electrical shock, do not disassemble this product. Service should be performed by trained personnel only. Opening or removing covers and/or circuit boards may expose you to dangerous voltages or other risks. Incorrect reassembly can cause electric shock when the unit is subsequently used.

For a unit intended to be powered from –48 V dc voltage sources, read and understand the following:

- This equipment must be provided with a readily accessible disconnect device as part of the building installation.
- Ensure that there is no exposed wire when the input power cables are connected to the unit.
- Installation must include an independent frame ground drop to building ground. Refer to User's Manual.

This symbol is marked on the unit, adjacent to the ground (earth) area for the connection of the ground (earth) conductor.

- This Equipment is to be Installed Only in Restricted Access Areas on Business and Customer Premises Applications in Accordance with Articles 110-16, 110-17, and 110-18 of the National Electrical Code, ANSI/NFPA No. 70. Other Installations Exempt from the Enforcement of the National Electrical Code May Be Engineered According to the Accepted Practices of the Local Telecommunications Utility.

For a unit equipped with an AC Wall Plug-In Unit, read and understand the following:

- Use only the Sceptre, Model SA-0515A5U-2 or SINO American Electronic, Model SA10-0515U (Globtek, Model TR9KA1500LCP-S) Wall Plug-In Unit shipped with this product.
- Unplug this product from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.
- Do not staple or otherwise attach the power supply cord to the building surfaces.
- Do not overload wall outlets and extension cords as this can result in the risk of fire or electric shock.
- The socket outlet shall be installed near the equipment and shall be readily accessible.
- The Wall Plug-In unit may be equipped with a three-wire grounding type plug, a plug having a third (grounding) pin. This plug is intended to fit only into a grounding type power outlet. Do not defeat the safety purpose of the grounding type plug.
- Do not allow anything to rest on the power cord. Do not locate this product where the cord may be abused by persons walking on it.

Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:

- When the powers 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 does not operate normally by following the operating instructions. Adjust only those controls that are covered by the operating instructions because improper adjustment of other controls may result in damage and will often require extensive work by qualified technician to restore the product to normal operation.
- If the product has been dropped or the cabinet has been damaged.
- If the product exhibits a distinct change in performance.

SAVE THESE INSTRUCTIONS

IP-DSU OVERVIEW

Your CO LAN and the Lucent Technologies BNS-2000 Family of Products investment is protected, now more than ever, and the future cost per network element connection has been reduced dramatically.

The Internet Protocol-Data Service Unit (IP-DSU) allows for an incremental transition from your existing network to the more flexible world of seamless interoperability that is inherent in the routed networking technology world.

The Internet Protocol-Data Service Unit (IP-DSU) can now be used as a more efficient transport vehicle for your existing BNS-2000/BNS-2000 VCS traffic, eliminating the additional investment required in facilities and DSU/CSU devices.

The Internet Protocol-Data Service Unit (IP-DSU) will help maintain network availability, reliability, and stability while allowing this transition to occur according to a prescribed budget.

WHAT IS AN IP-DSU?

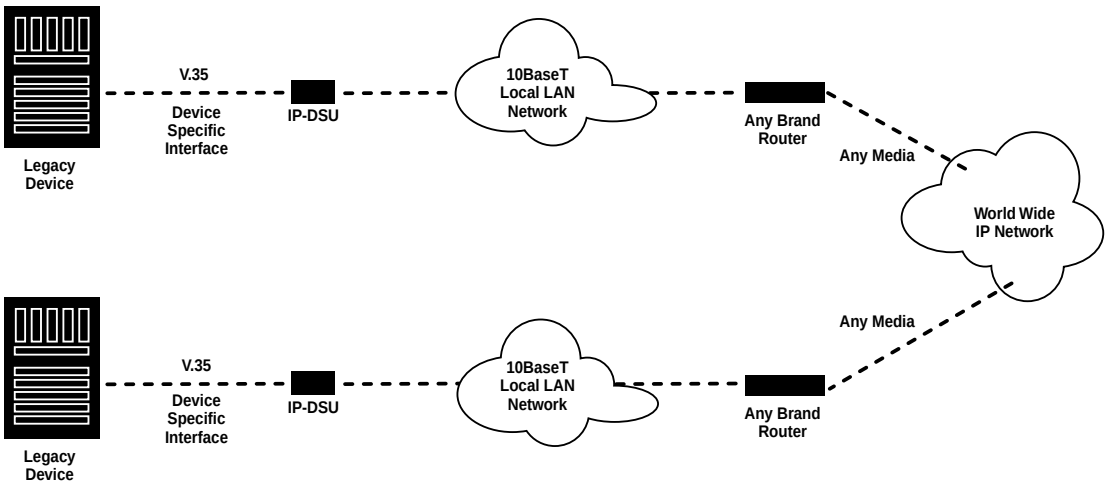
The IP-DSU allows router networks to carry both its original traffic and its new BNS-2000/BNS-2000 VCS trunk traffic simultaneously. The IP-DSU replaces an existing, conventional DSU on each end of the circuit and eliminates the interconnecting dedicated facility.

ELIMINATE DUPLICATE TRUNK FACILITIES

The IP-DSU obviates the need for duplicate trunk facilities by establishing a single network. This represents enormous savings for each trunk facility eliminated.

REUSE EXISTING CABLE

The existing cabling between the BNS-2000/BNS-2000 VCS entity and the conventional DSU can usually be reused. The opportunity to reuse existing cables and infrastructure to combine the two networks may result in large cost savings.



BUILT-IN FLEXIBILITY
The compact IP-DSU is available in both stand-alone and rack-mount versions to fit various space and configuration requirements. The IP-DSU is available as either a 115V/220V AC or 48V DC powered unit.

SMART NETWORK MANAGEMENT
The IP-DSU is easy to manage and provides several easy ways to configure and get status/diagnostic information. An industry standard Telnet connection to the IP-DSU gives you access to a command line based configuration application. In addition, a serial RS232-C connection gives you the same configuration capability. Finally, the IP-DSU is another network element that the StarKeeper® II NMS can administer, manage and maintain.

SNMP
The IP-DSU unit's resident SNMP agent supports a database of predefined SNMP MIB (Management Information Base) variables as well as SNMP Trap operations, Set operations and Get operations.

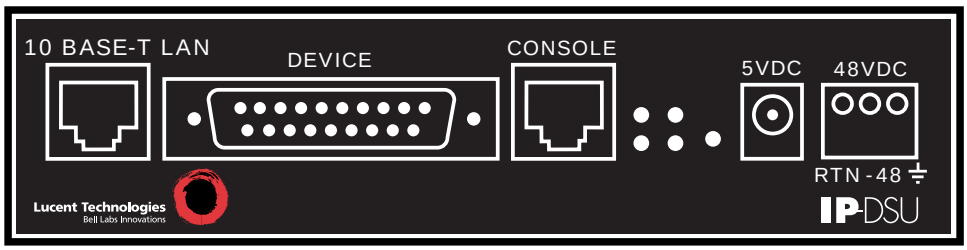
SOFTWARE UPDATE
Field software updates, which can occur from a remote location, take place while the IP-DSU is in service and transporting data. As new features and enhancements come out, you can upgrade the IP-DSU software just by upgrading to a new software release using an industry standard Telnet application or serial RS232-C connection to the IP-DSU.

EXTENSIVE INTERFACE SUPPORT
The IP-DSU supports a wide range of interface trunk types, allowing for flexible installation and the ability to reuse IP-DSU units as the network evolves.

NETWORKING SOLUTIONS FOR THE FUTURE
The IP-DSU reflects the innovation and quality expected of Lucent Technologies. It's flexible and affordable. It allows for the building of one network instead of two. It offers ease of migration. It allows new technologies and traditional products to coexist on the same network without interrupting service, thus preserving the original investment. ■

TRUNK TYPES	DESCRIPTION
BNS-2000/BNS-2000 VCS Digital Data Service (DDS) Trunks	This option supports all the trunks in the BNS-2000/BNS-2000 VCS product line that use the DDS transport protocol (SAMML, SAMSL, SAMDL, TRK-64, TRK-DDS and TRK-PQ).
BNS-2000/BNS-2000 VCS Standard Wire (SWT)Trunks	This option supports all the trunks in the BNS-2000/BNS-2000 VCS product line that use the SWT transport protocol.
BNS-2000/BNS-2000 VCS Trunk-T1 Trunks	This option supports the BNS-2000 TRK-T1 and T1-TRK modules.
Generic SDLC/HDLC	Any version of SDLC or HDLC is supported with this port configuration. Supported speeds range from 9600 bps to T1 (1.544 Mbps). Line encoding of NRZ, NRZI, and inverted NRZI are supported.

Stand-Alone IP-DSU



The IP-DSU is a set-and-forget data unit that must be placed at a location with cable access to both the BNS trunk I/O board and the local IP network. IP-DSU units are available in stand-alone and rack-mount versions. Each accepts AC or DC power input.

DEVICE INTERFACE
Through a DB25, RS530 connector the IP-DSU supports two, software selectable, device interfaces: V.35 and RS232-C. The connector is female in gender and electrically presents a data communication equipment (DCE) interface.

For V.35, a standard RS530 to V.35 adapter is available. V.35 is a 34-pin electrical interface used for connecting the BNS trunk I/O board to the IP-DSU.

The IP-DSU DB25, RS530 connector supports RS232-C directly, which, in this case, is a 25-pin electrical interface for connecting the BNS trunk I/O board to the IP-DSU.

10BASET LAN INTERFACE
This interface requires a standard RJ45 terminated Category 5, twisted pair, data cable. It connects to a 10BaseT hub or router on the local LAN segment.

CONSOLE INTERFACE
This interface requires a standard RJ45 terminated, twisted pair, data cable. It connects as a data terminating equipment (DTE) to an asynchronous device and uses RS232-C signaling. Connection to the IP-DSU console is required for any IP-DSU administration or StarKeeper® II NMS alarm collection. Otherwise, the console can be disconnected during normal operation.

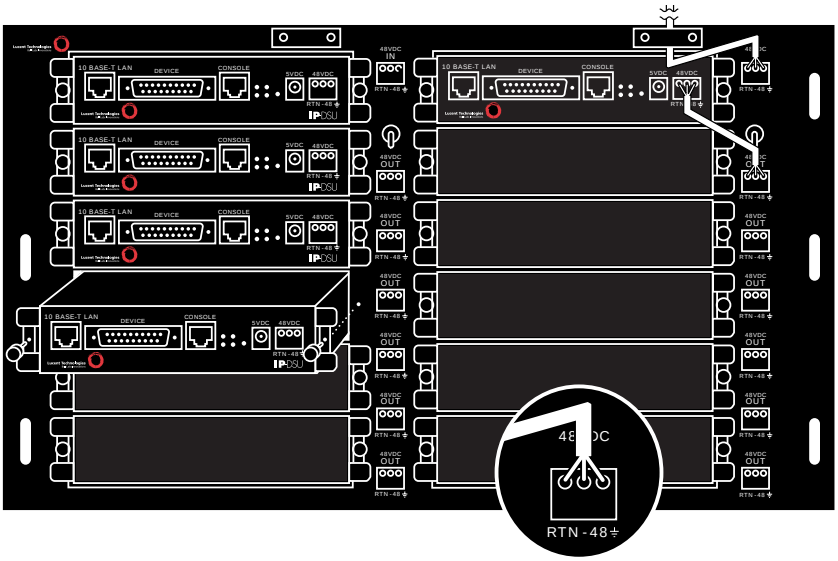
The IP-DSU also supports console access through a TCP telnet connection and makes use of the standard, telnet server port (port 23). This service is available only when the unit is in service.

RACK-MOUNT PANEL
The IP-DSU rack-mount panel contains twelve slots to accommodate that number of IP-DSU units. Each rack-mount panel fits in a 19 inch or 23 inch EIA standard equipment rack (use extension ears when mounting in a 23-inch rack). The rack-mount panel supports 1 inch, 1.75 inch and 2 inch spacing between vertical rail, mounting holes. Mounting ears for IP-DSU placements in the rack-mount panel are available.

POWER INTERFACES
Dual power interfaces are present on the IP-DSU faceplate; a circular interface labeled 5V DC mates with the barrel connector of a standard wall outlet, AC to DC power transformer for 115V AC installations. A three position (accepting return, minus and ground, power wires) terminal block labeled 48V DC is commonly used in central office installations.

The IP-DSU is factory configured for 115V AC usage. 48V DC operation requires a different jumper setting on the IP-DSU system board. (See Installation Section)

Rack-Mount IP-DSU



STAND-ALONE AC POWER
For this application, a separate AC power supply is available. The power supply has a six-foot long cable that terminates with a barrel connector. The power supply plugs into a standard 115V AC outlet. The barrel connector plugs into the circular connector labeled 5V AC on the IP-DSU faceplate.

RACK-MOUNT AC POWER
IP-DSU rack-mount AC power is the same as in the stand-alone IP-DSU. This configuration requires one AC power supply for each IP-DSU unit. However, it is recommended that your equipment rack be outfitted with sufficient power strips to accommodate all of the AC power supplies.

STAND-ALONE DC POWER
The IP-DSU stand-alone accepts DC power input directly from a 48V DC power source and connects into the three position (accepting return, minus and ground, power wires) terminal block labeled 48V DC on the IP-DSU faceplate. The terminal block connectors accommodate 10 awg to 14 awg (American Wire Gauge) wire. A strain relief clamp is available separately for DC wire stabilization.

RACK-MOUNT DC POWER
The IP-DSU rack-mount accepts DC power input directly from a 48V DC power source and connects into a main, three position (accepting return, minus and ground, power wires) terminal block labeled 48V DC on the rack-mount panel faceplate. Power is distributed to six terminal blocks, vertically below the main terminal block where each individual terminal block powers a single IP-DSU. Each rack-mount panel accepts two 48V DC power feeds. Twelve IP-DSU units can be powered in this manner.

All terminal block connectors accommodate 10 awg to 14 awg (American Wire Gauge) wire. A strain relief clamp is available separately for DC wire stabilization. ■

LEDS
The IP-DSU faceplate contains light emitting diodes (LEDs) used to report IP-DSU activity and behavior.

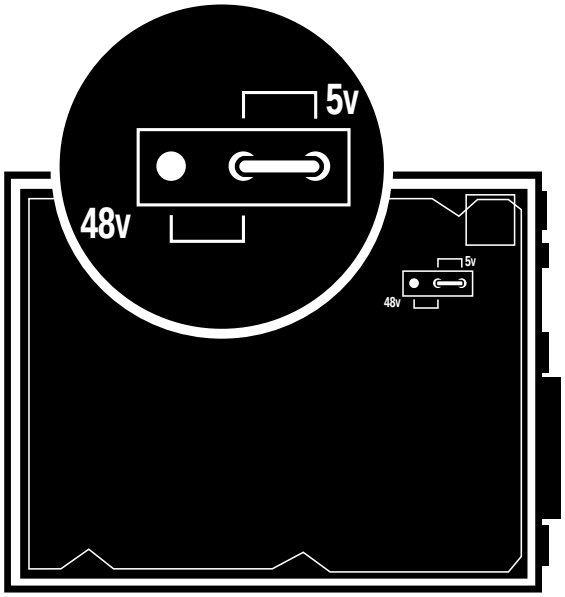
LED Function	Color	Description
Transmit (Tx)	Yellow	10Base-T Tx Packet Indicator
Receive (Rx)	Yellow	10Base-T Rx Packet Indicator
Link (LNK)	Green	10 Base-T Link Indicator
Collision (COL)	Red	10 Base-T Collision Indicator
Power (PWR)	Green	Unit Power Indicator

EQUIPMENT

Unpack and inspect the IP-DSU units and other components and have on hand a #2 phillips and medium-sized flathead screwdriver.

POWER CONFIGURATION STEPS FOR 48V DC OPERATION

The IP-DSU is factory configured for 115V AC usage. 48V DC operation requires a different jumper setting on the IP-DSU system board.



1. Disconnect any power connectors to the IP-DSU.
2. Remove the IP-DSU cover exposing the top portion of the system board.
3. Locate the jumper connector and move the jumper to the 48V setting (see adjacent figure).
4. Replace the IP-DSU cover.
5. The IP-DSU is ready for 48V DC operation

STAND-ALONE IP-DSU EQUIPMENT

If stand-alone IP-DSU units are being installed, the following items are needed.

- A minimum of two IP-DSU units.
- For AC operation a power supply for each IP-DSU (DC is directly wired into the unit).
- A V.35 or DB25 (RS-232-C) cable for each connection between the IP-DSU and the BNS trunk I/O boards. (V.35 requires a DB25 to V.35 adapter)
- An RJ45 terminated, twisted pair, data (RS232-C) cable for each connection between the IP-DSU console port and asynchronous device.
- A category 5, RJ45 terminated twisted pair, data cable for each connection between the IP-DSU and the local 10BaseT LAN hub or router.
- 10BaseT LAN hubs or routers with 10BaseT access to the Intranet or Internet.
- For DC operation, a strain relief clamp for wire stabilization

RACK-MOUNT IP-DSU EQUIPMENT

When installing IP-DSU units in a rack-mount configuration, it is necessary to gather the items listed above for stand-alone IP-DSU installation, plus the following equipment.

- An EIA standard 19-inch or 23-inch equipment rack with internal, vertical mounting rails. Hole spacing on the vertical, mounting rail may be 1 inch, 1.75 inch or 2 inch. Use the dimensions specifications in the appendix to calculate how high the rack needs to be to support a specified number of rack-mount panels. For example, seven rack-mount panels measuring 10.5 inches each will fit in a data equipment rack with internal mounting rails 75 inches in height. This configuration will support a maximum of 84 IP-DSU units.
- A rack-mount panel for each set of twelve IP-DSU units.
- A pair of mounting ears for each IP-DSU.
- Strain relief clamps for DC wire stabilization.
- Power distribution module(s) (1 for every 6 IP-DSU units)

STAND-ALONE INSTALLATION

AC ONLY

1. Attach the provided feet to the bottom of the unit.
2. Place the IP-DSU in its desired location such as a shelf in a data equipment rack.
3. Plug one end of the RJ45 terminated, category 5 twisted pair, data cable into the IP-DSU 10BaseT LAN interface and the other into a 10BaseT LAN hub or router.
4. Plug one end of the RJ45 terminated, twisted pair, data cable into the IP-DSU console interface and the other into the port of the asynchronous device that will be used to configure or manage the IP-DSU.
5. Plug one end of the V.35 (requires DB25 to V.35 adapter) or RS232-C device cable into the IP-DSU device interface and the other end into the existing trunk cable or BNS trunk I/O board.
6. Plug the power supply into a standard 115V AC outlet and the barrel connector stemming from the power supply, into the circular connector on the IP-DSU faceplate labeled 5V DC.

DC ONLY

1. Attach the provided feet to the bottom of the unit.
2. Fasten the strain relief bracket to the side of the IP-DSU.
3. Place the IP-DSU in its desired location such as a shelf in a data equipment rack.
4. Plug one end of the RJ45 terminated, category 5 twisted pair, data cable into the IP-DSU 10BaseT LAN interface and the other into a 10BaseT LAN hub or router.
5. Plug one end of the RJ45 terminated, twisted pair, data cable into the IP-DSU console interface and the other into the port of the asynchronous device that will be used to configure or manage the IP-DSU.
6. Plug one end of the V.35 (requires DB25 to V.35 adapter) or RS232-C device cable into the IP-DSU device interface and the other end into the existing trunk cable or BNS trunk I/O board.
7. Run your 48V DC (return, minus and ground) wires from a central source through the strain relief clamp for DC wire stabilization. On the IP-DSU faceplate, attach the return, minus and ground wires to the return, minus and ground connections respectively of the terminal block labeled 48V DC.

RACK-MOUNT INSTALLATION

AC ONLY

1. Prepare each IP-DSU for rack mounting by attaching the mounting ears to each side of the IP-DSU.
2. Fasten the twelve-slot rack-mount panel to a 19-inch equipment rack or use extension ears for a 23-inch rack. Slide each IP-DSU with mounting ears into one of the twelve rack-mount panel slots. Secure the IP-DSU to the rack mount panel with screws.
3. For each IP-DSU, plug one end of the RJ45 terminated, category 5, twisted pair, data cable into the IP-DSU 10BaseT LAN interface and the other end into a 10BaseT LAN hub or router.
4. For each IP-DSU, plug one end of the RJ45 terminated, twisted pair, data cable into the IP-DSU console interface and the other end into the asynchronous device.
5. For each IP-DSU, plug one end of the V.35 (requires DB25 to V.35 adapter) or RS232-C device cable into the IP-DSU device interface and the other end into the existing trunk cable or BNS trunk I/O board.
6. Plug the power supply into a standard 115V AC outlet and the barrel connector stemming from the power supply, into the circular connector on the IP-DSU faceplate labeled 5V DC.

DC ONLY

1. Prepare each IP-DSU for rack mounting by attaching the mounting ears to each side of the IP-DSU.
2. Attach the power distribution panel(s) to the rack-mount plate.
3. Make sure the rack mount panel toggle switches are set to the OFF position.
4. To the rack mount panel faceplate, fasten the strain relief clamp(s).
5. Fasten the twelve-slot rack-mount panel to a 19-inch equipment rack or use extension ears for a 23-inch rack. Slide each IP-DSU with mounting ears into one of the twelve rack-mount panel slots. Secure the IP-DSU to the rack mount panel with screws.
6. For each IP-DSU, plug one end of the RJ45 terminated, category 5, twisted pair, data cable into the IP-DSU 10BaseT LAN interface and the other end into a 10BaseT LAN hub or router.
7. For each IP-DSU, plug one end of the RJ45 terminated, twisted pair, data cable into the IP-DSU console interface and the other end into the asynchronous device.
8. For each IP-DSU, plug one end of the V.35 (requires DB25 to V.35 adapter) or RS232-C device cable into the IP-DSU device interface and the other end into the existing trunk cable or trunk module I/O board.
9. Run the 48V DC (return, minus and ground) wires from a central source through the strain relief clamp used for DC wire stabilization. On the rack mount panel, attach the return, minus and ground wires to the return, minus and ground connections to one of the main terminal blocks labeled 48 Vin. Power is distributed to six terminal blocks, vertically below the main terminal block and labeled 48 Vout. Each individual, 48 Vout terminal block below the main, 48 Vin terminal block powers a single IP-DSU. This is accomplished by jumping short, return, minus and ground wires between the panel terminal block and the IP-DSU terminal block.
   All terminal block connectors accommodate 10 awg to 14 awg wire. Strain relief clamps are used for DC wire stabilization.
10. Make sure the rack mount panel toggle switches are set to the ON position.

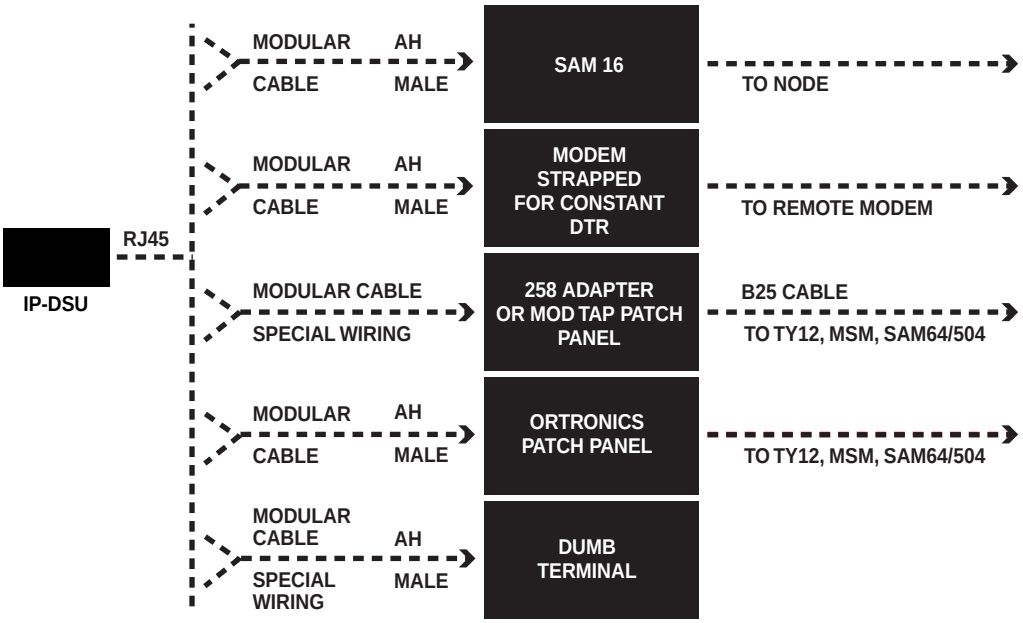
CONSOLE INSTALLATION/CONFIGURATION

The IP-DSU is managed through its console port by a terminal, PC, dial-up modem, or BNS asynchronous connection. Network administrators can access the IP-DSU console port through the StarKeeper® II NMS.

Console cables are available through Lucent and are required for console connection to TY12 and MSM modules, SAM64/504 Multiplexors and connection through an Ortronics distribution patch panel (see figure).

Specific instructions for configuration of SAM, TY12 and MSM asynchronous ports are available in the appropriate BNS-2000 module, reference guide. IP-DSU specific, configuration notes are described herein.

- Configure SAM, TY12 and MSM console connections as 9600 bps with 8 bits and no parity, and use a DCE type cable.
- Configure SAM and MSM console connections as type “host” and as a “pap” (permanently active port).
- Configure TY12 console connections as type “console”.



Cable or Adapter	Order Information
Modular Cable	ED5P055-31 G(137), G(G)
Modular Cable (Special Wiring)	Comcode 408198133
AH Male Connector	ED5P055-31 G(139)
Ortronics Patch Panel	Comcode 406485755
258 Adapter	ED5P055-31 G(155)

QUICK START

An IP-DSU that is shipped from the factory has already undergone an initial burn-in process where sample configuration data has been entered. However, the unit must be appropriately configured for operation on the local area network.

The following command sequence can be followed to quickly configure an IP-DSU for operation. The command sequence may also be performed before field installation since configuration parameters are non-volatile once entered.

The IP-DSU is pre-configured with a valid, licensed, MAC address. If the MAC address is lost, refer to the MAC address on the IP-DSU bottom label and re-enter it.

When the IP-DSU is powered, <IP-DSU> is displayed at the console. ■

Execute the following command sequence to configure the unit.

Type: login passwd=initial [RETURN]
Display: M LOGIN
USER IS LOGGED IN IP-DSU
<IP-DSU>

Type: Io ipaddr=<this unit's IP address>
submask=<this unit's
subnet mask> [RETURN]
Display: <IP-DSU>

Type: dest ipaddr=<remote unit's IP address>
[RETURN]
Display: <IP-DSU>

Type: gateway ipaddr=<gateway's IP address>
[RETURN]
Display: <IP-DSU>

Type: port type=<supported BNS trunk>
[RETURN]
Display: <IP-DSU>

Type: restore [RETURN]
Display: M RESTORE
IP-DSU RESTORED TO SERVICE

IP-DSU COMMANDS

The following is the complete IP-DSU command set. Except where noted, commands are visible only when the user is logged in to the IP-DSU.

LOGIN

Syntax: login passwd=<password>
(default password is: initial)

The login command is a security command required for accessing the bulk of the IP-DSU command set. It is only available when the user is logged off the IP-DSU. The password must contain between one and seven alphanumeric characters. The typed password is case insensitive.

LOGOUT

Syntax: logout

The logout command returns the IP-DSU to its logged out mode thus preventing unauthorized access.

CHANGE PASSWORD

Syntax: chgpass old=<password> new=<password>
confirm=<password>

The chgpass command allows the user to change a previously configured password. The old password is the one currently in effect. The new and confirm passwords should be identical. The password must contain between one and seven alphanumeric characters. The typed password is case insensitive. All arguments are required to complete the command.

LOCAL

Syntax: local mac=<MAC addr> ipaddr=<IP address>
submask=<submask>

The local or lo command sets the address of the IP-DSU to facilitate communication with a peer IP-DSU.

The MAC address is a fixed attribute for each unit that should be set only to the value specified at the factory. However, in cases where a spare unit is replacing a failed IP-DSU, configuring the replacement IP-DSU with the same MAC address as the failed unit will eliminate the need for address resolution.

The ipaddr is the IP address of this unit. The submask is the subnet mask of this unit with a default value of 8 bits (255.255.255.0).

DESTINATION

Syntax: dest ipaddr=<IP address> port=<dest port>

The dest or de command specifies the IP address of the remote IP-DSU. All data leaving through the IP-DSU 10Base-T LAN interface is destined for an IP-DSU with this configured IP address. Address resolution occurs when the unit is restored to service. The additional parameter, port, is for future IP-DSU releases. Ignore this parameter and the unit will default to the correct configuration.

DESTINATION TRANSPORT

UDP Transport (default setting)

Syntax: dest trans=udp ipaddr=<dest_addr>

This dest trans command requires that the UDP/IP address of the remote IP-DSU is specified. The trans=udp option specifies that UDP will be used as the Data Transport. All data leaving through the IP-DSU 10BaseT LAN interface is destined for an IP-DSU with this configured UDP/IP address.

The default UDP transport option is capable of transmission rates up to T1 (1.544 Mhz).

TCP TRANSPORT

Syntax: dest trans=tcprcv (TCP protocol call receiver)
Syntax: dest trans=tcporig ipaddr=<dest_addr>
(TCP call originator)

The dest trans command requires that you specify the TCP/IP address of the remote IP-DSU. The trans option for TCP, specifies that one unit is considered the call originator and one unit is considered the call receiver. What is critical is that both sides do not conflict. All data leaving through the IP-DSU 10BaseT LAN interface is destined for an IP-DSU with this configured TCP/IP address.

The TCP transport rate should not exceed 56 Kbps.

Why is UDP recommended over TCP?
Among the protocols encapsulated by IP are TCP and UDP. The TCP protocol formalizes a set of rules by which lost data is re-transmitted, and by which out-of-sequence data is reorganized on a per-byte basis. It is typically used for (asynchronous) terminal server connections (telnet over TCP). The UDP protocol has the exact same transport abilities but does not define the rules for which lost or out-of-sequence data is handled. That is the sole distinction between TCP and UDP.

The IP-DSU is a special purpose, modem device that was created so that a customer could replace their dedicated facilities with IP based facilities. There was no need to introduce redundant error recovery mechanisms as would happen if TCP were picked as the transport option. The IP-DSU will minimize delay, optimize throughput, and preserve the error handling methods of the facility. The IP-DSU, using UDP, transforms data intelligently while preserving these error characteristics. This means that the connected network, whether it be BNS-2000, SNA, X.25, Frame Relay, or even SMDS DXI will preserve its inherent error recovery scheme. Re-transmissions (if necessary) will continue to be performed by the end devices. There is no need to look at the IP network to see how well it is performing; the attached device has all the information.

GATEWAY

Syntax: gateway ipaddr=<IP address>
The gateway or ga command identifies the IP address of the local gateway router, if any. If the remote IP-DSU resides on a different LAN, the gateway is the first hop the data travels through to reach the remote IP-DSU.

PORT

Syntax: port type=<dev_type> phy=<phy_type>
speed=<dev_speed> enc=<dev_encoding>

The port or pt command identifies the BNS trunk I/O board interface used to connect to the IP-DSU. The command consists of four attributes: type, phy, speed and enc. The type attribute may be set to T1, SWT, DDS, or HDLC. The T1 attribute is for a BNS Trunk-T1. The SWT attribute is for a BNS SWT with an AWJ9 I/O board. The DDS attribute is for a BNS Trunk that uses DDS conventions (e.g. SAMML, SAMDL, SAMSL, etc.). The HDLC attribute is for a generic device using SDLC or HDLC framing.

The phy attribute specifies the type of physical device interface on a particular IP-DSU. Options are v35 (V.35) or 232 (RS232-C).

The speed attribute defaults to T1 rate for the Trunk-T1 and SWT Trunks. It may be changed to another value. The allowed values are T1, 768K, 512K, 256K, 128K, 56K, 38400, 19200, and 9600.

The enc attribute specifies the physical line encoding parameters. It is available for the generic HDLC interface type. It may take on the values of NRZ, INRZ, NRZI, and INRZI. These are physical line encoding parameters.

REMOVE
Syntax: remove
The remove or rm command takes the unit out of service. This command must be performed before any configuration changes can occur. It is only visible when the unit is logged in. The command has no arguments.

RESTORE
Syntax: restore
The restore or rs command returns the IP-DSU to service, and it has no arguments. If any physical attribute was changed on the unit, including the MAC address, the reboot command should be executed after the restore command.

REBOOT
Syntax: reboot
The reboot command resets the unit, which allows physical attributes to be set, and the command has no arguments. It is only visible when the unit is logged in. After reboot, the console interface returns to the logged-out mode.

SNMP
Syntax: snmp ipaddr=<Trap Mgr Addr> port=
<Trap Mgr Port>
The snmp command is used to configure the IP address of the SNMP trap manager. Since traps are unsolicited alarms, an agent can take the initiative to inform the manager of the occurrence of a predefined condition. Typical conditions include the cold-start or warm-start of equipment and a link-down or link-up condition.

A single and multiple SNMP managers can access the IP-DSU. However, only one SNMP manager can be predefined as the trap manager. By administering this command, all traps will be directed to the chosen trap manager. The port number should be configured for 162 on new configurations, which is standard practice.

VERIFY CONFIGURATION
Syntax: vcfg
The vcfg or vc command displays the current configuration of the unit and is only visible when the user is logged in. The command has no arguments.

Sample Output:
<IP-DSU> vcfg
Current Configuration:
Service State ==> In Service.
Actual Service State ==> Peer Connectivity Established.
Port Interface ==> V.35 DCE.
Port Type ==> Generic HDLC Interface.
Port Speed ==> 56K.
Port Physical Encoding ==> NRZ.
Local MAC Address ==> 0.96.29.2.48.43
Local IP Address ==> 135.17.59.241
Subnet Mask ==> 255.255.255.0
Destination IP Address ==> 135.17.59.242
Device Port 1
Gateway IP Address ==> 135.17.59.1
SNMP Trap Manager ==> Not defined.
Acquired Nhop MAC Address ==> 0.19.35.83.87.55
Loopback Status ==> Loopbacks are not enabled.
Data Encryption Status ==> Disabled.
Data Transport Protocol ==> Peer to Peer via UDP.

DISPLAY MEASUREMENTS

Syntax: dmeas

The dmeas or dm command displays the current measurements of the unit and is only visible when the user is logged in. The command has no arguments.

Sample Output:

<IP-DSU> dmeas
M Display Measurements
Current Measurements:
Ethernet Packets Received ==> 30411
Ethernet Packets Transmitted ==> 5137
DEVICE Frames Received ==> 5136
DEVICE Frames Transmitted ==> 30410
<IP-DSU>

The base measurements, shown above, are always displayed whether zero or nonzero while error counters are only displayed if they become nonzero.

VERSION

Syntax: ver

The version or ver command displays the current software and database revisions of the unit and is only visible when the user is logged in. The command has no arguments.

Sample Output:

<IP-DSU> ver
M version
IP-DSU – Build 6 made on Fri Jan 23 18:50:37 Est. 1998.
Software Version 1.0.1
DB version: V.1

LIST OF IP-DSU MEASUREMENTS

BASE MEASUREMENTS

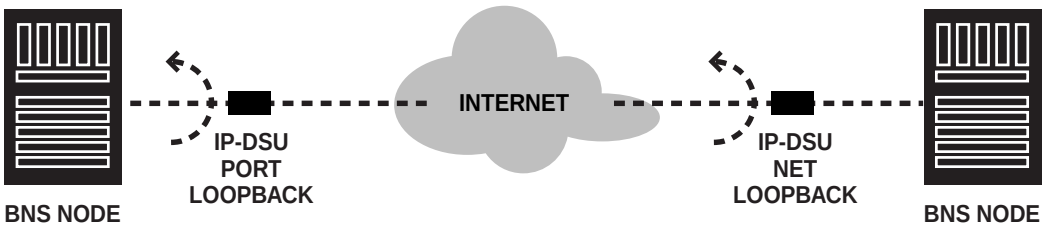
Ethernet Packets Received
Ethernet Packets Transmitted
DEVICE Frames Received
DEVICE Frames Transmitted

ERROR COUNTERS

Ethernet Discards (Resource)
DEVICE Port Discards (Resource)
Late Collisions (Ethernet Tx)
Underrun (Ethernet Tx)
Retry Limit Exceeded (Ethernet Tx) Rx
Carrier Sense Lost (Ethernet Tx)
Frame Collisions (Ethernet Rx)
Rx Overruns (Ethernet Rx)
Rx CRC Errors (Ethernet Rx)
Short Frame Errors (Ethernet Rx)
Non-Aligned Frame Errors (Ethernet Rx)
Frame Length Violations (Ethernet Rx)
Frames aborted by CTS lost (Port Tx)
Frames Underrun (Port Tx)
Frames aborted by CD lost (Port Rx)
Rx Overruns (Port Rx)
Rx CRC Errors (Port Rx)
Rx Aborts (Port Rx)
Parity Errors (Port Rx)
Non-Aligned Frame Errors (Port Rx)
Frame Length Violations (Port Rx)
Frame DPLL Errors (Port Rx)
Unsupported Protocol Frames Received
Invalid UDP Frames Received
Rx Frames w/IP Header Checksum Errors
Rx Frames w/ICMP
Checksum Errors
Rx Frames from Non-Peer Entity

CLEAR MEASUREMENTS
Syntax: clear
The clear or clr command sets all the measurement and error counters to zero and is only visible when the user is logged in. The command has no arguments.

LOOPBACK DIAGRAM



LOOPBACK
Syntax: loopback [off | net | port | both]
The loopback command enables or disables loopbacks. The command has a single argument indicating which type of loopback command is requested: net, port, both, off. The command is only visible when the user is logged in. The net option enables a network loopback. It is the equivalent of a remote loopback between two modems. Any data arriving from the peer IP-DSU will be sent back to the originator until loopbacks are cancelled.

The port option enables a DEVICE loopback. It is the equivalent of a local loopback between two modems. Any data arriving from the device is sent back to the device until loopbacks are cancelled.

The both option enables both network and device loopbacks. It is the aggregate of the net and port loopback options.

The off option disables any loopback that may be in effect. Loopback options are cumulative until an off is specified. If a network loopback was enabled, and subsequently, a device loopback was enabled, the net effect is the same as if both were enabled. Using the off option disables all loopbacks.

Loopbacks are transient conditions. A loopback may only be specified while the unit is in-service, and does

not survive a reset. Should the unit be reset for any reason (power outage, manual reset, etc.), the IP-DSU will revert to a normal no loopback mode of operation.

DATA ENCRYPTION
Syntax: encrypt <on/off>
The encrypt or enc command indicates if data is to be encrypted between peer IP-DSU units over the IP

Intranet or Internet. It is only visible when the unit is logged in. The command has a single argument. The on option enables a data encryption between peer IP-DSU units. The off option disables data encryption between peer IP-DSU units.

HELP
Syntax: help
The help or ? command without arguments displays the entire IP-DSU command set and command syntax for the mode (logged out or logged in) the unit is currently in.

Individual command syntax is available when the help command is followed by the command name. ■

SNMP

The IP-DSU SNMP V1 agent supports a multitude of SNMP MIB variables, SNMP trap operations, set operations and gets.

SNMP VERSION 1 COMMANDS

Command	Operational Result
Get	Requests the values of one or more Management Information Base (MIB) variables.
GetNext	Enables MIB variables to be read sequentially, one variable at a time.
Set	Permits one or more MIB values to be updated.
GetResponse	Used to respond to a Get, GetNext, or Set.
Trap	Indicates the occurrence of a predefined condition.

IP-DSU SNMP MIB VARIABLE DATABASE

RO = Read Only Variable
R/W = Read Variable / Write Variable
SIV = Storage is Volatile

MIB VARIABLE

Number	Name	MIB	Console Equivalent	Access	Notes
1.3.6.1.2.1.1.1.0	SysDescr	MIB-II	Banner Message	RO	
1.3.6.1.2.1.1.2.0	SysObjectID	MIB-II	None	RO	
1.3.6.1.2.1.1.3.0	SysUpTime	MIB-II	None	RO	
1.3.6.1.2.1.1.4.0	SysContact	MIB-II	None	R/W	SIV
1.3.6.1.2.1.1.5.0	SysName	MIB-II	None	R/W	SIV
1.3.6.1.2.1.1.6.0	SysLocation	MIB-II	None	R/W	SIV
1.3.6.1.2.1.1.7.0	SysServices	MIB-II	None	RO	
1.3.6.1.2.1.4.1.0	IpForwarding	MIB-II	None	RO	
1.3.6.1.2.1.4.2.0	IpDefaultTTL	MIB-II	None	RO	
1.3.6.1.2.1.4.3.0	IpInReceives	MIB-II	Number of Ethernet Pkts Rcvd	RO	
1.3.6.1.2.1.4.4.0	IpInHdrErrors	MIB-II	Nbr of Packets w/Header Errs	RO	
1.3.6.1.2.1.4.5.0	IpInAddrErrors	MIB-II	Nbr Rx Packets w/Wrong Addr	RO	
1.3.6.1.2.1.4.6.0	IpForwDatagrams	MIB-II	None	RO	
1.3.6.1.2.1.4.7.0	IpInUnknownProtos	MIB-II	Nbr of Packets w/Unk Protocol	RO	
1.3.6.1.2.1.4.8.0	IpInDiscards	MIB-II	Nbr of Packets Disc due to Resource	RO	
1.3.6.1.2.1.4.9.0	IpInDelivers	MIB-II	Inferred from DMEAS counters	RO	
1.3.6.1.2.1.4.10.0	IpOutRequests	MIB-II	Number of Device Frames Transmitted	RO	
1.3.6.1.2.1.4.11.0	IpOutDiscards	MIB-II	Nbr of Port frames Disc due to Resource	RO	
1.3.6.1.2.1.4.12.0	IpOutNoRoutes	MIB-II	None	RO	
1.3.6.1.2.1.4.13.0	IpReasmTimeout	MIB-II	None	RO	
1.3.6.1.2.1.4.14.0	IpReasmReqds	MIB-II	None	RO	
1.3.6.1.2.1.4.15.0	IpReasmOKs	MIB-II	None	RO	
1.3.6.1.2.1.4.16.0	IpReasmFails	MIB-II	None	RO	
1.3.6.1.2.1.4.17.0	IpFragOKs	MIB-II	None	RO	
1.3.6.1.2.1.4.18.0	IpFragFails	MIB-II	None	RO	
1.3.6.1.2.1.4.19.0	IpFragCreates	MIB-II	None	RO	
1.3.6.1.2.1.4.21.0	IpRoutingDiscards	MIB-II	None	RO	

MIB VARIABLE

Number	Name	MIB	Console Equivalent	Access	Notes
1.3.6.1.2.1.5.1.0	IcmpInMsgs	MIB-II	None	RO	
1.3.6.1.2.1.5.2.0	IcmpInErrors	MIB-II	ICMP Errors	RO	
1.3.6.1.2.1.5.3.0	IcmpInDestUnreach	MIB-II	None	RO	
1.3.6.1.2.1.5.8.0	IcmpInEchos	MIB-II	Nbr of Pings	RO	
1.3.6.1.2.1.5.9.0	IcmpInEchoReps	MIB-II	None	RO	
1.3.6.1.2.1.6.1.0	TcpRtoAlgorithm	MIB-II	None	RO	
1.3.6.1.2.1.6.2.0	TcpRtoMin	MIB-II	None	RO	
1.3.6.1.2.1.6.3.0	TcpRtoMax	MIB-II	None	RO	
1.3.6.1.2.1.6.4.0	TcpMaxConn	MIB-II	None	RO	
1.3.6.1.2.1.6.5.0	TcpActiveOpens	MIB-II	None	RO	
1.3.6.1.2.1.6.6.0	TcpPassiveOpens	MIB-II	None	RO	
1.3.6.1.2.1.6.7.0	TcpAttemptFails	MIB-II	None	RO	
1.3.6.1.2.1.6.8.0	TcpEstabResets	MIB-II	None	RO	
1.3.6.1.2.1.6.9.0	TcpCurrEstab	MIB-II	None	RO	
1.3.6.1.2.1.6.10.0	TcpInSegs	MIB-II	None	RO	
1.3.6.1.2.1.6.11.0	TcpOutSegs	MIB-II	None	RO	
1.3.6.1.2.1.6.12.0	TcpRetransSegs	MIB-II	None	RO	
1.3.6.1.2.1.6.13.X	TcpConnTable Entries	MIB-II	None	RO	
1.3.6.1.2.1.6.14.0	TcpInErrs	MIB-II	None	RO	
1.3.6.1.2.1.6.15.0	TcpOutRsts	MIB-II	None	RO	
1.3.6.1.2.1.7.1.0	UdpInDatagrams	MIB-II	Derived from other Counts.	RO	
1.3.6.1.2.1.7.2.0	UdpNoPorts	MIB-II	Non-Peer and Spurious UDP errors	RO	
1.3.6.1.2.1.7.3.0	UdpInErrors	MIB-II	Frame Errors	RO	
1.3.6.1.2.1.7.4.0	UdpOutDatagrams	MIB-II	Frames Sent, Keep Alives sent, etc.	RO	
1.3.6.1.2.1.7.5.X	udpEntry Table	MIB-II	None	RO	
1.3.6.1.2.1.11.1.0	SnmpInPkts	MIB-II	None	RO	
1.3.6.1.2.1.11.3.0	SnmpInBadVersions	MIB-II	None	RO	
1.3.6.1.2.1.11.4.0	SnmpInBadCommunityNames		MIB-II	None	RO
1.3.6.1.2.1.11.5.0	SnmpInBadCommunityUses		MIB-II	None	RO
1.3.6.1.2.1.11.6.0	SnmpInASNParseErrs	MIB-II	None	RO	
1.3.6.1.2.1.11.30.0	SnmpEnableAuthenTraps		MIB-II	None	R/W SIV
1.3.6.1.2.1.11.31.0	SnmpSilentDrops	MIB-II	None	RO	
1.3.6.1.2.1.11.32.0	SnmpProxyDrops	MIB-II	None	RO	

SUPPORTED TRAPS

Alarm Text	Severity	Trap Type	Notes
None	N/A	ColdStart	Generated when the unit starts up
Lost Connectivity to Peer IP-DSU	Minor	LinkDown	DCD & CTS is dropped
Peer Connectivity Established	Info	LinkUp	DCD & CTS is asserted
None	N/A	AuthFail	SNMP Authorization Failure

ALARMS

The following table reflects new alarm types generated by the IP-DSU. Alarms are visible at the console and by StarKeeper® II NMS.

Alarm Text	Severity	Notes
NONE	N/A	Cold Start trap alarm generated when the unit starts up
Tx Error on 10BaseT. Check Physical Connection.	Major	Problem with 10BaseT physical connection
Lost Connectivity to Peer IP-DSU	Minor	Generated when Peer Connectivity is lost; DCD & CTS is dropped
Peer Connectivity Established	Info	Generated when Peer Connectivity is established; DCD & CTS is asserted
User Requested Reboot in Progress	Info	Due to manual reboot
Invalid Login Attempt	Minor	Error in login syntax
Invalid Password Change Attempt	Minor	Use of invalid password
Gateway Connectivity Established	Info	ARP Level Connectivity to Router
ICMP Destination Unreachable Msg Received	Minor	ICMP Destination Unreachable
None	N/A	Trap alarm for SNMP Authorization Failure
SNMP Trap Manager not reachable (ICMP)	Info	ICMP Destination unreachable on a Trap

TROUBLESHOOTING

Troubleshooting an IP-DSU configuration is often a simple correlation of symptom and cause. When armed with a few basic troubleshooting techniques, determining the source of a problem should be easy.

It will be necessary to observe problem indicators and take appropriate actions to localize the cause of problems. Problem indicators typically include nonzero error counters displayed to the console, the inability to communicate between IP-DSU units, and the inability to communicate between the IP-DSU and BNS nodes. Problems may require the gathering of measurements or running of diagnostic tests from the IP-DSU console as well.

Become familiar with the IP-DSU loopback diagnostic command. The loopback command is essential for failed communications between the IP-DSU and the BNS Node.

The ping application is used in IP networks to test readability of IP destinations by sending them an ICMP echo request and waiting for a reply. It is essential for failed communications between peer IP-DSU units.

The StarKeeper® II NMS supports the ping application and can be used to test IP-DSU 10BaseT functionality. From the StarKeeper console, you can execute the following.

e.g. /etc/ping <ip address> [return]

where <ip address> is the address associated with the IP-DSU LAN port.

Further information on command parameters can be obtained by running the Unix® man command for ping.

e.g. man ping [return]

Installation of faulty hardware is always a possible cause of problems. Having spare parts, including spare cable and an additional IP-DSU, available can significantly reduce start-up time and communication outages.

TROUBLESHOOTING STRATEGY

A basic troubleshooting strategy can help pinpoint faults in the IP-DSU network. The IP-DSU installation may vary between installation sites. One case may involve substituting IP-DSU units into a functional DSU configuration. Another case may involve installing IP-DSU units in a new network of BNS nodes and IP devices. In either case, installation errors may cause and extended service outage.

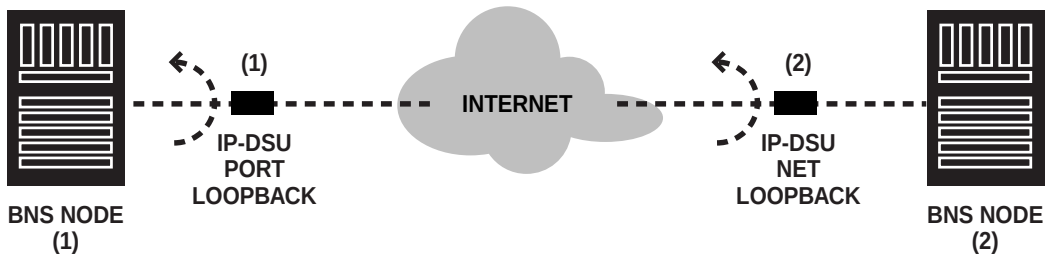
Consider executing any or all of the following tests to localize the point or points of failure in the IP-DSU network.

Examine the IP-DSU and BNS node console output.

Example: Observing nonzero IP-DSU error counters such as Ethernet Tx indicates carrier sense lost. This may be an integrity problem with the 10BaseT connection and the LAN cable and hub should be checked for proper operation.

Example: On the BNS node console, observing Loss of Frame alarms coming from the BNS trunk module connected to the IP-DSU, usually points to a clocking mismatch between the BNS trunk and the IP-DSU. Make sure they are the same.

LOOPBACK DIAGRAM



With the IP-DSU loopback command and ping application, trace the complete circuit between BNS nodes. Start tracing from either end of the circuit, not the middle. A failed trace test points to the set of interfaces, cables and facilities that make up the failed circuit.

CIRCUIT TRACING STEPS

Most of the following diagnostics can be done from a central location such as from a StarKeeper® II NMS.

Step 1: Set IP-DSU (1) in port loopback mode. This instructs the IP-DSU to return any data it receives at its device interface.

From BNS node (1) run a remote loopback test from the trunk module to IP-DSU (1).
- If the test passes, move to step two.
- If the test fails, check the facility between the two devices.

Step 2: Set IP-DSU (2) to net loopback mode. This instructs the IP-DSU to return any data it receives at its 10BaseT LAN interface.
From BNS node (1) run a remote loopback test from the trunk module to IP-DSU (2).
- If the test passes, move to step seven.
- If the test fails, move to step three.

Step 3: Ping IP-DSU (1) from a device (e.g. router) on the same LAN segment.
- If the test passes, move to step four.
- If the test fails, a problem exists on this LAN segment.

Step 4: Ping IP-DSU (1) from a device (e.g. router) on the same LAN segment as IP-DSU (2).
- If the test passes, move to step five.
- If the test fails, a problem exists between the two LAN segments.

Step 5: Ping IP-DSU (2) from a device (e.g. router) on the same LAN segment.
- If the test passes, move to step six.
- If the test fails, a problem exists on this LAN segment.

Step 6: Ping IP-DSU (2) from a device (e.g. router) on the same LAN segment as IP-DSU (1).
- If the test passes, move to step seven.
- If the test fails, a problem exists between the two LAN segments.

Step 7: Set IP-DSU (2) in port loopback mode. This instructs the IP-DSU to return any data it receives at its device interface.

From BNS node (2) run a remote loopback test from the trunk module to IP-DSU (2).
- If the test passes, go back to step one and test the circuit again.
- If the test fails, check the facility between the two devices.

The above troubleshooting strategy should help you localize and remedy most of your network problems. However, if problems are still unresolved after these recommended troubleshooting procedures, contact your customer support at 1-800-WE2CARE. ■

IP-DSU SPECIFICATIONS

DEVICE INTERFACES

CCITT V.35 DEVICE
A standard interface used for interface and trunk modules. The V.35 interface uses a 34-pin connector and operates at data rates up to 2.048Mbps.

EIA RS232-C DEVICE
A standard interface that uses binary data interchange between DTE and DCE. The RS232-C interface uses a 25-pin (DB25) connector and up to 21 signal leads, and operates at data rates from 75 to 19200 bits per second (bps).

The IP-DSU RS232-C device interface has been tested to run at rates up to 56 Kbps.

10BASET LAN
Eight-pin, 10BaseT modular connector for a 10 Mbps baseband CSMA/CD local area network.

EIA RS232-C CONSOLE
A standard interface that uses binary data interchange between DTE and DCE. The RS232-C interface uses an RJ45 connector and operates at 9600 bits per second (bps).

PHYSICAL DIMENSIONS
IP-DSU:
L=6.0" x W=1.4" x D=7.5"
Rack-mount Panel:
L=19" x W=10.5" D=. 125"
Stand-alone AC/DC Power:
L=3.5" x W=1.75" x D=2.5"
Power distribution Panel:
L=10.4" x W=. 8" x D=. 823"

ENVIRONMENTAL OPERATING RANGE
Operating Temperature: 5° to 40°C (41°F to 104°F)
Operating Humidity: 5% to 85%
Altitude: From 60M (197) below sea level to 1800 m (5905 ft.) above sea level

POWER REQUIREMENTS
IP-DSU Operating Voltage:
5V @ 800 mA Nominal

Stand-alone AC to DC power supply:
115V @ 48mA Nominal
115V @ 90 mA Maximum

Stand-alone DC power supply:
48V @ 104 mA Nominal
48V @ 195 mA Maximum

Rack-mount DC (six units):
48V @ 624 mA Nominal
48V @ 1.17 A Maximum

REGULATORY INFORMATION
IP-DSU Stand-Alone
Safety: UL, CSA, VDE, GS
EMC: FCC Part 15B Class A, ICES-003 Class A
European EMC: CE
NEBS

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

NOTE

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

WARNING

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

SPECIAL ACCESSORIES NOTE

In order to comply with the limits for Class A, Radio Frequency Devices, Subpart B- Unintentional Radiators (digital devices) Part 15 Rules, the user must use the cables available with this product, a RJ45 terminated shielded console cable and a DB25 to V.35 shielded adapter.

WARRANTY

The warranty for this product is as specified in customer's written agreement with Lucent Technologies Inc. or in Lucent Technologies' order acknowledgment form. If no warranty period is stated therein, the warranty period for hardware shall be one year from the date of delivery, and the warranty for software shall be 90 days from the date of delivery. Replacements and repairs are guaranteed for the longer of the remaining original warranty period or 90 days.

This product is Year 2000 compliant.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