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# DECNIS Hardware Overview

An overview of the DECNIS 500/600 hardware.

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## Abstract

This document provides an overview of the DECNIS 500/600 multiprotocol router/bridge hardware. The information in this document is aimed at helping Digital resellers, account teams and support personnel in preparing customer bids.

## Introduction

The DEC Network Integration Server (DECNIS) 500 and 600 are scalable, high performance multiprotocol bridge routers. The DECNIS 500/600 provide local and wide area multiprotocol routing, bridging, and X.25 gateway services to host systems on Local Area Networks (LANs). The DECNIS 500/600 provides routing for:

- TCP/IP hosts
- DECnet Phase IV nodes
- DECnet/OSI Phase V nodes
- OSI-compatible systems
- Novell NetWare nodes
- AppleTalk nodes

Multiprotocol routing of IP, DECnet, and OSI is implemented using the Integrated Intermediate System to Intermediate System (Integrated IS-IS) routing protocol. Routing of IP traffic is also supported using Open Shortest Path First (OSPF), Routing Information Protocol (RIP) and Exterior Gateway Protocol (EGP). Routing of Novell NetWare and AppleTalk is implemented on the LAN using native protocols and over the WAN using encapsulation within IP.

The DECNIS also supports 802.1d local and remote bridging over wide area links for protocols that can not be routed by the DECNIS.

The DECNIS can also provide X.25 gateway and relay services to connect end systems on a LAN to X.25 Data Terminal Equipment (DTE) connected directly to the DECNIS or connected over an X.25 Packet Switched Data Network (PSDN). The DECNIS is also able to provide routing over X.25 PSDNs and routing and bridging over Frame Relay networks.

The DECNIS software image is installed and configured on a host system termed the load host. MS-DOS PCs, DEC OSF/1 for Alpha AXP, Open VMS for VAX, and RISC/ULTRIX load host systems are supported. Once configured, the DECNIS software image and configuration script is loaded from the load host system to the target DECNIS unit. When loaded, the DECNIS software image can be stored in internal nonvolatile memory so that subsequent software loads can be performed without the need for loading from a load host (flash loading).

The DECNIS software is managed from any MS-DOS, DEC OSF/1 AXP, OpenVMS or ULTRIX system using the Network Command Language (NCL) command line interface. Event logging and data tracing utilities are also available

on DEC OSF/1 AXP, OpenVMS or ULTRIX systems to assist problem solving by logging network events and by tracing control messages received or sent by the DECNIS software.

The DECNIS software can also be managed from the POLYCENTER/Netview network management platform or any system supporting the Simple Network Management Protocol (SNMP). SNMP sets, gets and traps are supported for MIB-II, Bridge and FDDI MIB variables.

More information about the software functions and features of the DECNIS 500/600 products is provided in *DECNIS Software Overview*, NIPG Marketing Document Number NIPG-009A.

**DECNIS 500 and 600 Hardware Overview**

The DECNIS 500 and 600 hardware consists of the following components:

- Enclosure, either 4 slot (DECNIS 500) or 9 slot (DECNIS 600), including power supply and fan tray
- Management processor card with 8MB of dynamic RAM and 2MB of NV-RAM
- Pool memory card, either 2MB (DECNIS 500) or 8MB (DECNIS 600) of dynamic RAM
- Network interface cards

The management processor card occupies slot 1 of the enclosure and the pool memory card occupies slot 2 of the enclosure, leaving 2 free slots for network interface cards in the DECNIS 500 and 7 free slots in the DECNIS 600.

The DECNIS hardware design uses a distributed processing and buffer management architecture with a Futurebus+ backplane. The DECNIS is a multiprocessor system with support processors for high performance. Custom ASICs using sub-micron, triple layer technolgy with in excess of 100K gates were developed for the DECNIS to provide high speed IP and OSI address lookups, bridge filtering and learning in hardware.

The basic system is a master-slave design, with a management processor controlling the system and supporting the forwarding operations and intelligent network interface cards providing the packet filtering and forwarding functions. The Futurebus+ based backplane provides the basic control and data paths between the major system elements, including network interface cards for Ethernet, FDDI, 2Mbits/s WAN, and high fan-out 128Kbits/s WAN connectivity. The DECNIS can connect to T3/E3 links via the FDDI interface and a suitable

DSU/CSU. Higher speed synchronous line cards are under development for the DECNIS and will be available in the near future.

A distributed forwarding system is used by the network interface cards for Internet Protocol (IP), Novell IPX, DECnet PhaseIV, and DECnet/OSI, with other protocols (currently AppleTalk) forwarded by the management processor. The management processor controls the system, including loading and dumping of the linecards, administering the routing and bridging databases, generating routing and bridging control traffic, and network management. X.25 functionality, both for routing data and as an X.25 gateway, is also provided by the management processor. More details of the DECNIS architecture and the criteria used to provide a high performance router platform are provided in *DECNIS Architecture*, NIPG Marketing document number NIPG-007.

Performance measurements on a system configured with 14 Ethernet interfaces have demonstrated a forwarding performance of over 80,000 packets per second as a router or a bridge. The performance scales linearly with the number of interfaces. More details of the DECNIS performance are provided in *DECNIS 600 Performance*, NIPG Marketing document number NIPG-001.

**Network Interface Cards**

The DECNIS 500 supports up to two network interface cards and the DECNIS 600 supports up to seven network interface cards. The following network interface cards occupy a single slot of the DECNIS enclosure and supported by the DECNIS 500/600 hardware units:

- DEC LANcontroller 601 - Single-port Ethernet/IEEE 802.3 AUI interface.

- DEC LANcontroller 602 - Dual-port Ethernet/IEEE 802.3 AUI or Thinwire interface.

- DEC WANcontroller 614 - Four-port, low-speed serial interface supporting synchronous line speeds from 1.2 Kbits/s to 128 Kbits/s or asynchronous line speeds from 1.2 Kbits/s to 38.4 Kbits/s. This card supports X.25 gateway functions and routing only over PPP, HDLC, DDCMP and LAPB datalinks.

- DEC WANcontroller 618 - Eight-port, low-speed serial inter- face supporting synchronous line speeds from 1.2 Kbits/s to 128 Kbits/s or asynchronous line speeds from 1.2 Kbits/s to 38.4 Kbits/s. This card supports X.25 gateway functions and routing only over PPP, HDLC, DDCMP and LAPB datalinks.

- DEC WANcontroller 622 - Dual-port, high-speed serial inter- face supporting synchronous operation at line speeds from 9.6 Kbits/s to 2 Mbits/s. This card supports routing and remote bridging over PPP, HDLC, Frame Relay, LAPB and VCP datalinks.

The following network interface card occupies two slots of the DECNIS enclosure and is supported by the DECNIS 600 hardware unit only:

- DEC FDDIcontroller 621 - Single-port FDDI interface, SAS or DAS

**Physical Line Support**

The DEC WANcontroller 614, 618, and 622 serial interfaces support V.24 interchange circuits with the following electrical interfaces:

- DEC WANcontroller 614/618:
  V.28 (EIA-RS232-D/EIA-RS232-C)
  V.36/V.11 (RS449/RS422)
  V.35
- DEC WANcontroller 622:
  V.36/V.11 (RS449/RS422)
  V.35
  CCITT X.21 (Leased line services)
  British Telecom Kilostream

The number of lines supported depends on the interface and the number of these interfaces installed in the DECNIS hardware unit. The serial interfaces provide only the electrical interface of a DTE rather than a DCE, and do not provide clock signals. An external clock source (such as a modem) is required for each serial connection.

For the DEC WANcontroller 614, a multi-standard distribution panel is provided for support of RS232/V.28, RS422/V.11, and V.35 interfaces. Separate adapter cables provide the necessary interchange circuits for each serial line. Different inteface standards can be supported on each of the four available ports using adapter cables (see below).

For the DEC WANcontroller 618, separate distribution panels are required for support of RS232/V.28, RS422/V.11, and V.35 interfaces. For use with British Telecom Kilostream services, an extra adapter cable is used in conjunction with the RS422/V.11 distribution panel.

For the DEC WANcontroller 622, separate adapter cables provide the necessary interchange circuits for each serial line.

**T1 and G.703 Services**

When connecting the DEC WANcontroller 622 to a T1 or G.703 circuit, a CSU/DSU converter is required. Please contact your local Digital office for a list of compatible CSU/DSU converters available in your country.

When used with T1 or G.703 lines, the following are additional requirements:

- Connection to a T1 or G.703 line requires a V.35/RS422 to T1/G.703 DSU/CSU converter to provide framing to meet CCITT G.704. The DEC WANcontroller 622 does not provide either T1 framing pulses or separate channels for 64 Kbits/s control data for G.703.

- The DEC WANcontroller 622 does not guarantee line density. T1 links can offer only 1.536 Mbits/s or 1.344 Mbits/s rates. 1.536 Mbits/s rates require the DSU/CSU converter to offer B8ZS and the line to accept bipolar violations. 1.334 Mbits/s rates require the DSU/CSU converter to offer B7.

- Transmit clocking should be provided by the DCE, CCITT 114. The DEC WANcontroller 622 uses CCITT 114 to clock data out of the DTE and will source a CCITT 113 transmit clock. CCITT 113 should be used by the DCE to receive the transmit data. The DEC WANcontroller 622 implements CCITT 113 as a buffered version of CCITT 114. This clocking scheme ensures both network synchronization and minimized skew between the clock and data for a range of cable lengths and parameters.

If the above transmit clocking mechanism is not provided by the DCE, this DCE must provide a method of adjusting the phase of the clock used to sample the data with respect to that supplied to the DTE. This requires that the DCE provide test points to allow analysis of the clock and data waveforms and that this adjustment be performed on installation and after any subsequent alteration of the connection cable. This alternative method is also required for DCEs utilizing the X.21 interface.

**Adapter Cables**

The DEC WANcontroller 614 and 622 require adapter cables to provide the necessary interchange circuits at the appropriate electrical interfaces and ISO

standard connections for each serial line. One of these cables is needed for each line used.

When connecting to the British Telecom Kilostream service, the DEC WANcontroller 618 requires a special adapter cable to connect to the V.11/RS422 distribution panel. For all other services, only a modem connection cable is required to con- nect the appropriate DEC WANcontroller 618 distribution panel. When connecting to the BT[R] Kilostream service using the DEC WANcontroller 614 or 622, the CCITT X.21 adapter cable should be used.

The following table shows the cable numbers for each of the electrical in- terface types. The serial interfaces provide only the electrical interface of a DTE rather than a DCE, and do not provide clock signals. An external clock source (such as a modem) is required for each serial connection.

| Electrical Interface Type | Adapter Cable | Connector Pinout |
|---|---|---|
| CCITT V.28/V.24<br>EIA-RS232-C/D | BS23V-02[1] | ISO 2110 |
| CCITT V.36/X.27<br>V.11, EIA-RS422/449 | BC19B-02 | ISO 4902 |
| CCITT V.35 | BC19F-02 | ISO 2593 |
| CCITT X.21 (1980)<br>leased services | BC19C-02[2] | ISO 4903 |
| BT Kilostream<br>(W614, W622) | BC19C-02[2] | ISO 4903 |
| BT Kilostream<br>(W618 only) | BC21G-02[2] | ISO 4903 |

Notes:

1. This should be ordered as part BS23V-02, which contains not only the BC23V-02 adapter cable to provide the V.28/V.24 (RS232-D) interface, but also an adapter that allows it to be used for RS232-C as well. It is only supported with the DEC WANcontroller 614; it is not supported for use with the DEC WANcontroller 622.

2. The BC19C-02 adapter cable is used with a 50-way D-type connector with the DEC WANcontroller 614 when connecting to the BT Kilostream service or with the DEC WANcontroller 622 when connecting to the BT Kilostream service or CCITT X.21 leased line services. When connecting the DEC

WANcontroller 618 to use the BT Kilostream service, the BC21G-02 should be used in conjunction with the V.11/RS422 distribution panel.

**Physical Information**

The following table show the physical dimensions and weight of the DECNIS 500/600 and components.

DECNIS 500 and 600 physical information

| Specification | DECNIS 500 | DECNIS 600 |
|---|---|---|
| Height | 20.7 cm (8.1 in) | 55.4 cm (21.8 in) |
| Width | 48.2 cm (19 in) | 48.2 cm (19 in) |
| Depth | 35.5 cm (14 in) | 35.5 cm (18.6 in) |
| Weight:<br>without interface cards:<br>with interface cards: | <br>16 Kg (35.2 lb)<br>12 Kg (26.4 lb) | <br>40 Kg (88 lb)<br>33 Kg (72 lb) |

**Electrical Information**

The following tables show the power requirements of the DECNIS 500 and 600. Note that the DECNIS 500 and 600 use autoranging to determine the voltage level available.

DECNIS 500 electrical information:

| Voltage | 120V | 240V |
|---|---|---|
| Nominal voltage range | 100-120Vrms | 200-240Vrms |
| Line frequency range | 50-60Hz | 50-60Hz |
| Power consumption | 287W | 287W |
| Maximum leakage current | 0.45 mA at 60Hz | 0.9 mA at 50Hz |

DECNIS 600 electrical information:

| Voltage | 120V | 240V |
|---|---|---|
| Nominal voltage range | 100-120Vrms | 200-240Vrms |
| Line frequency range | 50-60Hz | 50-60Hz |
| Power factor | 0.95 | 0.85 |
| Inrush current | 90A | 90A |
| Maximum input power | 929VA | 1038VA |
| Maximum power available | 600W | 600W |
| Maximum power dissipation | 883W | 883W |
| Maximum leakage current | 1 mA at 264 Vrms | |

## Environmental Information

The following tables show the environmental information for the DECNIS 500 and 600 and components.

DECNIS 500 and 600 environmental information:

| Specification | Operating | Non operating |
|---|---|---|
| Maximum altitude | 2438m or 8000ft | 4877m or 16000ft |
| Atmospheric pressure | 750 mbar at 2438m | 548mbar at 4877m |
| Temperature range[1] | 10 to 40°C<br>50 to 104°F | Note 2 |
| Relative Humidity[3] | 5% to 95% | 5% to 95% |

Notes:

1. The maximum temperature specification should be reduced by 1.8°C for each 1000m (1°F for each 1000ft) above sea level.

2. For longer than 60 days, the DECNIS should be stored in conditions which meet the operating specification. For less than 60 days, the DECNIS should be stored in conditions between -40°C (-40°F) and 66°C (151°F) with relative humidity below 95%.

3. During the operation or storage of the DECNIS, the environment must be **noncondensing**.

## Ventilation

To provide an adequate airflow for the DECNIS 500, an area of 152 $cm^2$ (60 $in^2$) must be provided above and below the unit.

To provide an adequate airflow for the DECNIS 600, at least 5 cm (5 in) clearance must be provided below the unit.

All inlet air vents at the top, bottom and on the sides of the DECNIS 500 and 600 units must not be blocked.

## Acoustics

The declared values for the DECNIS 500 and 600 acoustics in accordance with ISO 9296 and ISO 7779 are shown in the following table.

DECNIS 500 and 600 acoustic information:

| Idle/operating | $L_{WAd}$ | $L_{pAm}$ (bystander) |
|---|---|---|
| DECNIS 500 | 5.5 bels | 40 dBA |
| DECNIS 600 | 5.8 bels | 43 dBA |

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