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# DEC WANrouter 90

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## Owner's Manual

Order Number: EK-DRT90-OM.A01

**NOTICE** – Class A Computing Device:

This equipment generates, uses, and may emit radio frequency energy. The equipment has been type tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such radio frequency interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference; in which case, measures taken to correct the interference are at the user's expense.

# DEC WANrouter 90

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## Owner's Manual

October 1992

This manual describes the DEC™ WANrouter 90 hardware unit. It provides installation instructions and troubleshooting information. It also provides reference information regarding cable structures.

Supersession/Update Information: This is a new manual.

**digital**™

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## Safety

Any warning or caution that appears in this manual is defined as follows:

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<b>Warning</b>	Contains information to prevent personal injury.
<b>Caution</b>	Contains information to prevent damage to equipment.
<b>Vorsicht</b>	Enthält Informationen, die beachtet werden müssen, um den Benutzer vor Schaden zu bewahren.
<b>Achtung</b>	Enthält Informationen, die beachtet werden müssen, um die Geräte vor Schaden zu bewahren.
<b>Danger</b>	Signale les informations destinées à prévenir les accidents corporels.
<b>Attention</b>	Signale les informations destinées à prévenir la détérioration du matériel.
<b>Aviso</b>	Contiene información para evitar daños personales.
<b>Precaución</b>	Contiene información para evitar daños al equipo.

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The warnings and cautions that must be observed for the hardware described in this manual are listed below in English, Dutch, Norwegian, Danish, German, French, Swedish, Italian, Spanish, and Hebrew. The pages on which these safety messages appear are also listed.

---

**CAUTION** 

For V.24 installations, a V24/RS-232-C adapter (12-27591-01) must be fitted between the adapter cable and the extension cable, or between the adapter cable and the modem, if the modem/eliminator has any of the following:

- A signal with a DCE source on pin 18
- Signal quality implemented on pin 21
- Data Signal Rate Selector (DCE) on pin 23

Failure to comply with this could result in damage to the interface module and modem or modem eliminator. If you are not sure what signals the modem or modem eliminator provides, contact Digital Field Service.

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**CAUTION** 

The V.24 to RS-232-C adapter must be fitted between the adapter cable (BC23V-02, BC19D-02, or BC19V-02) and the extension cable if the modem/eliminator has:

- A signal with a DCE source on pin 18
- Signal quality implemented on pin 21
- Data Signal Rate Selector (DCE) on pin 23

Failure to comply with this could result in damage to the interface module and modem or modem eliminator. If you are not sure what signals the modem or modem eliminator provides, contact Digital Field Service.

(Page A-6)

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**ATTENZIONE** 

Bij V.24–installaties moet er een V24/RS–232–C adapter (12–27591–01) worden geïnstalleerd tussen de adapter–kabel en het verlengsnoer of tussen de adapterkabel en het modem, als het modem/de eliminator voldoet aan één van de volgende voorwaarden:

- Een signaal met een DCE–bron op pen 18
- Signaalkwaliteit geïmplementeerd op pen 21
- Data Signal Rate Selector (DCE) op pen 23

Als aan geen van deze voorwaarden is voldoen, kan er schade optreden aan de interface–module en het modem of aan de modem–eliminator. Als u niet zeker weet welke signalen het modem of de modem–eliminator levert, neemt u contact op met Digital Field Service.

(Pagina 3–15)

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**ATTENZIONE** 

De V.24 naar RS–232–C adapter moet worden geïnstalleerd tussen de adapterkabel (BC23V–02, BC19D–02, of BC19V–02) en het verlengsnoer als het modem/de eliminator voldoet aan één van de volgende voorwaarden:

- Een signaal met een DCE–bron op pen 18
- Signaalkwaliteit geïmplementeerd op pen 21
- Data Signal Rate Selector (DCE) op pen 23

Als aan geen van deze voorwaarden is voldoen, kan er schade optreden aan de interface–module en het modem of aan de modem–eliminator. Als u niet zeker weet welke signalen het modem of de modem–eliminator levert, neemt u contact op met Digital Field Service.

(Pagina A–6)

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**ADVARSEL** 

På V.24-installasjoner må en V24/RS-232-C-adapter (12-27591-01) monteres mellom adapterkabelen og skjøtekabelen, eller mellom adapterkabelen og modemmet, hvis modem/eliminator har ett eller flere av følgende:

- Et signal med en DCE-kilde på pinne 18
- Implementert signalkvalitet på pinne 21
- Data Signal Rate Selector (DCE) på pinne 23

Avvik fra disse retningslinjene kan medføre skade på grensesnittmodulen og modemmet eller modemeliminatorene. Hvis du ikke er sikker på hva slags signaler modemmet eller modemeliminatorene benytter, bør du kontakte Digital.

(Side 3-15)

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**ADVARSEL** 

Adapteren for V24 til RS-232-C må plasseres mellom adapterkabelen (BC23V-02, BC19D-02 eller BC19V-02), og skjøtekabelen, hvis modem/eliminator har:

- Et signal med en DCE-kilde på pinne 18
- Implementert signalkvalitet på pinne 21
- Data Signal Rate Selector (DCE) på pinne 23

Avvik fra disse retningslinjene kan medføre skade på grensesnittmodulen og modemmet eller modemeliminatorene. Hvis du ikke er sikker på hva slags signaler modemmet eller modemeliminatorene benytter, bør du kontakte Digital.

(Side A-6)

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**ADVARSEL** 

Ved V.24 installationer skal en V24/RS-232-c adapter (12-27591-01) indføres mellem adapterkablet og forlængerkablet, eller mellem adapterkablet og modemmet, hvis kablet til modemmet/nul-modemkablet har følgende kabelkonfiguration:

- 'DCE source' på ben 18
- 'Signal quality' på ben 21
- 'Data Signal Rate Selector' på ben 23

Hvis dette ikke overholdes kan der ske skader på udstyret i begge ender af forbindelsen.

Er man ikke sikker på konfigurationen af ens modem/nul-modemkabel bedes man kontakte Digital Field service.

---

**ADVARSEL** 

En adapter V.24/RS-232-C skal anvendes mellem adapterkablet (BC23V-02, BC19D02, eller BC19V-02) og forlængerkablet, hvis kablet til modemmet/nul-modemkablet har følgende kabelkonfiguration:

- 'DCE source' på ben 18
- 'Signal quality' på ben 21
- 'Data Signal Rate Selector' på ben 23

Hvis dette ikke overholdes kan der ske skader på udstyret i begge ender af forbindelsen.

Er man ikke sikker på konfigurationen af ens modem/nul-modemkabel bedes man kontakte Digital Field service.

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**ACHTUNG** 

Bei V.24-Installation muß zwischen dem Adapterkabel und dem Verlängerungskabel bzw. zwischen dem Adapterkabel und dem Modem ein Adapter V.24/RS232-C (Best.Nr. 12-27591-01, erhältlich über die Geschäftsstellen von Digital Equipment) angebracht werden, wenn das Modem/Nullmodem folgende Bedingungen erfüllt:

- Signal mit DCE-Source an Stift 18
- Signalqualität an Stift 21
- Data Signal Rate Selector (DCE) an Stift 23

Wenn Sie diese Richtlinien nicht einhalten, können das Schnittstellenmodul und das Modem oder das Nullmodem beschädigt werden. Wenn Sie nicht wissen, mit welchen Signalen das Modem oder das Nullmodem arbeitet, wenden Sie sich an den Field Service von Digital Equipment.

(Seite 3-15)

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**ACHTUNG** 

Der Adapter V.24/RS232-C muß zwischen dem Adapterkabel (BC23V-02, BC19D-02 oder BC19V-02) und dem Verlängerungskabel angebracht werden, wenn das Modem/Nullmodem folgende Bedingungen erfüllt:

- An Stift 18 liegt ein Signal mit DCE-Source an
- Die Signalqualität an Stift 21
- Data Signal Rate Selector (DCE) an Stift 23

Wenn Sie diese Richtlinien nicht einhalten, können das Schnittstellenmodul und das Modem oder das Nullmodem beschädigt werden. Wenn Sie nicht wissen, mit welchen Signalen das Modem oder das Nullmodem arbeitet, wenden Sie sich an den Field Service von Digital Equipment.

(Seite A-6)

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**ATTENTION** 

Pour les installations V.24, un adaptateur V24/RS-232-C (12-27591-01) doit relier le câble adaptateur au câble d'extension, ou le câble adaptateur au modem, si le modem ou le simulateur de modem possède les caractéristiques suivantes :

- un signal avec une source ETCD à la broche n18;
- un détecteur de qualité du signal à la broche n21;
- un sélecteur de débit binaire (ETCD) à la broche n23.

Le non-respect de cette directive peut endommager le module et le modem ou simulateur de modem. Veuillez communiquer avec Digital, si vous ne connaissez pas les types de signaux transmis par votre modem ou simulateur de modem.

(Page 3-15)

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**ATTENTION** 

Un adaptateur V.24/RS-232-C doit relier le câble adaptateur (BC23V-02, BC19D-02, ou BC19V-02) au câble d'extension si le modem ou le simulateur de modem possède les caractéristiques suivantes :

- un signal avec une source ETCD à la broche n18;
- un détecteur de qualité du signal à la broche n21;
- un sélecteur de débit binaire (ETCD) à la broche n23.

Le non-respect de cette directive peut endommager le module et le modem ou simulateur de modem. Veuillez communiquer avec Digital si vous ne connaissez pas les types de signaux transmis par votre modem ou simulateur de modem.

(Page A-6)

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**VARNING** 

I V.24–installationer måste en adapter av typen V24/RS–232–C (12–27591–01) fästas mellan adaptersladden och förlängningssladden eller mellan adaptersladden och modemmet, om modemmet/eliminatorsnarnågotavföljande:

- En signal med en DCE–källa på stift 18
- Signalkvalitet implementerad på stift 21
- Data Signal Rate Selector (DCE) på stift 23

Underlåtelse att göra detta kan resultera i skador på gränssnittsmodulem och modemmet eller modemelinatorn. Om du är osäker på vilka signaler modemmet eller modemelinatorn ger, kontakta Digital's Kundtjänst.

(Sida 3–15)

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**VARNING** 

Adaptorn för V.24 till RS–232–C måste fästas mellan adaptersladden (BC23V–02, BC19D–02 eller BC19V–02) och förlängningssladden, om modemmet/eliminatorsn har:

- En signal med en DCE–källa på stift 18
- Signalkvalitet implementerad på stift 21
- Data Signal Rate Selector (DCE) på stift 23

Underlåtelse att göra detta kan resultera i skador på gränssnittsmodulem och på modemmet eller modemelinatorn.

Om du är osäker på vilka signaler modemmet eller modemelinatorn ger, kontakta Digital's Kundtjänst.

(Sida A–6)

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**ATTENZIONE** 

Per installazioni V.24, un adattatore V24/RS-232-C (12-27591-01) deve essere inserito tra il cavo adattatore e il cavo d'estensione o tra il cavo adattatore e il modem, se il modem/eliminator possiede le seguenti caratteristiche:

- Un segnale con sorgente DCE sul pin 18
- Qualità del segnale implementata sul pin 21
- Data Signal Rate Selector (DCE) sul pin 23

Il mancato rispetto di tali norme potrebbe causare danni al modulo d'interfaccia e al modem o al modem eliminator. Se non si è certi dei segnali che il modem o il modem eliminator fornisce, contattare il Servizio Clienti Digital.

(Pagina 3-15)

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**ATTENZIONE** 

Un adattatore V.24/RS-232-C deve essere inserito tra il cavo adattatore (BC23V-02, BC19D-02, o BC19V-02) e il cavo d'estensione se il modem/eliminator possiede le seguenti caratteristiche:

- Un segnale con sorgente DCE sul pin 18
- Qualità del segnale implementata sul pin 21
- Data Signal Rate Selector (DCE) sul pin 23

Il mancato rispetto di tali norme potrebbe causare danni al modulo d'interfaccia e al modem o al modem eliminator. Se non si è certi dei segnali che il modem o il modem eliminator fornisce, contattare il Servizio Clienti Digital.

(Pagina A-6)

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**PRECAUCIÓN** 

Para instalaciones V.24, debe fijarse un adaptador V24/RS-232-C (12-27591-01) entre el cable del adaptador y el cable extensión, o bien entre el cable del adaptador y el módem, si el módem/eliminador tiene cualquiera de las características siguientes:

- Una señal con una fuente DCE en la clavija 18
- Calidad de señal implantada en la clavija 21
- Selector de velocidad de señal de datos (DCE en la clavija 23

Si no se cumple esto, podrían resultar dañados el módulo de la interfaz y el módem o eliminador de módem. Si no está seguro de qué señales proporciona el módem o eliminador de módem, póngase en contacto con el Servicio Técnico de Digital

Página3-15)

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**PRECAUCIÓN** 

El adaptador de V.24 a RS-232-C debe fijarse entre el cable del adaptador (BC23V-02, BC19D o BC19V-02) y el cable extensión si el módem/eliminador tiene cualquiera de las características siguientes:

- Una señal con una fuente DCE en la clavija 18
- Calidad de señal implantada en la clavija 21
- Selector de velocidad de señal de datos (DCE en la clavija 23

Si no se cumple esto, podrían resultar dañados el módulo de la interfaz y el módem o eliminador de módem. Si no está seguro de qué señales proporciona el módem o eliminador de módem, póngase en contacto con el Servicio Técnico de Digital

(PáginaA-6)

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## About This Manual

This manual describes how to install, verify, and troubleshoot the DEC WANrouter 90. This manual is intended for personnel who install or replace the DEC WANrouter 90 hardware unit.

### Organization

This guide has four chapters and four appendixes, as follows:

- |            |   |
|------------|---|
| Chapter 1  | Provides introductory information about the DEC WANrouter 90 hardware, including a description of the router's features and functions, and specifications. Additionally, this chapter includes an overview of the installation process. |
| Chapter 2  | Lists the shipping contents and includes important site verification information that should be considered before installation.   |
| Chapter 3  | Provides procedures for installing the DEC WANrouter 90 and connecting devices to the unit. Also, this chapter provides instructions for testing the router hardware once it is installed.  |
| Chapter 4  | Provides guidelines for troubleshooting the DEC WANrouter 90 hardware and includes a diagnostic flowchart.  |
| Appendix A | Describes connector pins for the DEC WANrouter 90's connectors and also describes the various cables and adapters used with the router.   |
| Appendix B | Lists order codes for the DEC WANrouter 90, including optional items and cables.  |



- |            |  |
|------------|--|
| Appendix C | Describes how to use the Bootline Configuration Program (BCP) to configure the DEC Wanrouter 90 for serial line loading. |
| Appendix D | Provides information required for United Kingdom (U.K.) installations.   |

The postage-paid Reader's Comments form on the last page of this manual requests your critical evaluation to assist us in preparing future documentation.

## Related Documentation

For additional information about the DEC WANrouter 90 refer to the following manuals:

- *DEC WANrouter 90/150/250 Installation (VMS)*  
Provides instructions for down-line loading the DEC WANrouter 90 software from a VMS load host.
- *DEC WANrouter 90/150/250 Installation (ULTRIX)*  
Provides instructions for down-line loading the DEC WANrouter 90 software from an ULTRIX load host.
- *DEChub 90 Owner's Manual*  
Provides installation, configuration, and troubleshooting information about the DEChub 90 Ethernet backplane.
- *DEC WANrouter 90/150/250 Management*  
Provides information about managing the DEC WANrouter 90 using the Network Command Language (NCL). Also, this manual provides essential information about configuring the DEC WANrouter 90 software.
- *DEC WANrouter 90/150/250 X.25 Reference*  
This manual explains how to use the X.25 feature in the DEC WANrouter 90/150/250 Version 1.1 software. It contains an introduction to X.25 and packet switching, and provides information on handling X.25 security, managing an X.25 system, and solving some of the problems that might occur when using the X.25 feature.

- *Hubwatch for DECmcc MSU*  
Provides instructions for managing the DEC WANrouter 90 from a DECmcc MSU management station.
- *Hubwatch for Windows™*  
Provides instructions for managing the DEC WANrouter 90 from a 386-based PC using DOS 3.3 (or higher) and Windows™ software.
- *DECnet/OSI Routing Overview*  
Provides detailed information about DECnet/OSI routing.
- *DECconnect System Planning and Configuration*  
Contains planning requirements and guidelines for configuring DECconnect System networks and other networks that use DECconnect System products.
- *DECconnect System Facilities Cabling Installation*  
Provides procedures for properly installing ThinWire cables within a DECconnect System site.

## Conventions

This manual uses the following typographical conventions:

<b>Convention</b>	<b>Meaning</b>
<i>special type</i>	Indicates system output or user input.
<span style="border: 1px solid black; padding: 2px;">Return</span>	Press the Return key.
Ctrl/X	Indicates that you should hold down the Control key and simultaneously press the key specified by X.

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## Introduction

This chapter describes the features of the DEC WANrouter 90 and provides a summary of the installation procedure.

### 1.1 Overview

The DEC<sup>TM</sup> WANrouter 90<sup>TM</sup> is a multiprotocol router that connects an Ethernet local area network (LAN) to a wide area network (WAN) through a single serial line. The DEC WANrouter 90 serial port operates in either synchronous or asynchronous mode at speeds up to 64 Kbps. Serial line connection is provided by a 50-pin D-sub connector.

The DEC WANrouter 90 connects to the Ethernet LAN through a ThinWire<sup>TM</sup> Ethernet interface. Two interfaces are provided: one allows the router to be installed in a standalone configuration, and the other allows the unit to be inserted into a DEChub<sup>TM</sup> 90 Ethernet backplane.

### 1.1.1 Features

The DEC WANrouter 90 has the following features:

- Standalone or rack mountable in a DEChub 90 Ethernet backplane.
- Compact and easy to install.
- Can be installed in the DEChub 90 Ethernet backplane while the backplane is powered on.
- Suitable for structured and unstructured wiring environments.
- Multiprotocol functionality allowing communications between nodes in an Ethernet LAN and a wide area Open Systems Interconnection (OSI) network.
- DECnet routing (for example, message switching and best path analysis), which allows host processors more time for application tasks.
- Network management through the Simple Network Management Protocol (SNMP), Network Control Language (NCL), and Maintenance Operations Protocol (MOP).
- Console port for local hardware management and troubleshooting.
- Support for dial-in and dial-out modems.

You can install the DEC WANrouter 90 in a variety of environments, including offices and computer rooms. You can place the router on a desk or table, or mount it in a DEChub 90 Ethernet backplane.

## 1.2 Functions of the DEC WANrouter 90

The DEC WANrouter 90 allows a synchronous or asynchronous device connected to a wide area network to be connected to an Ethernet LAN. Devices that can connect to the DEC WANrouter 90 through its synchronous/asynchronous serial port include modems, personal computers, and larger host computers. For a list of supported devices, refer to the latest *DEC WANrouter 90 Software Product Description (SPD)*.

### 1.3 Supported Protocols

The personal computers and hosts connected to the DEC WANrouter 90 serial port (either directly or through a modem) must be running one of the following protocols:

- DECnet™ Phase IV
- TCP/IP
- DECnet/OSI (DECnet Phase V)
- X.25

### 1.4 Supported Interface Standards

The DEC WANrouter 90 is compliant with the following interface standards:

- EIA-232-D
- EIA-422-A
- EIA-449 (Category I signals)
- CCITT Recommendations V.11, V.24, V.28, V.35, and V.36
- CCITT Recommendation X.21 (Leased Circuit operation only)

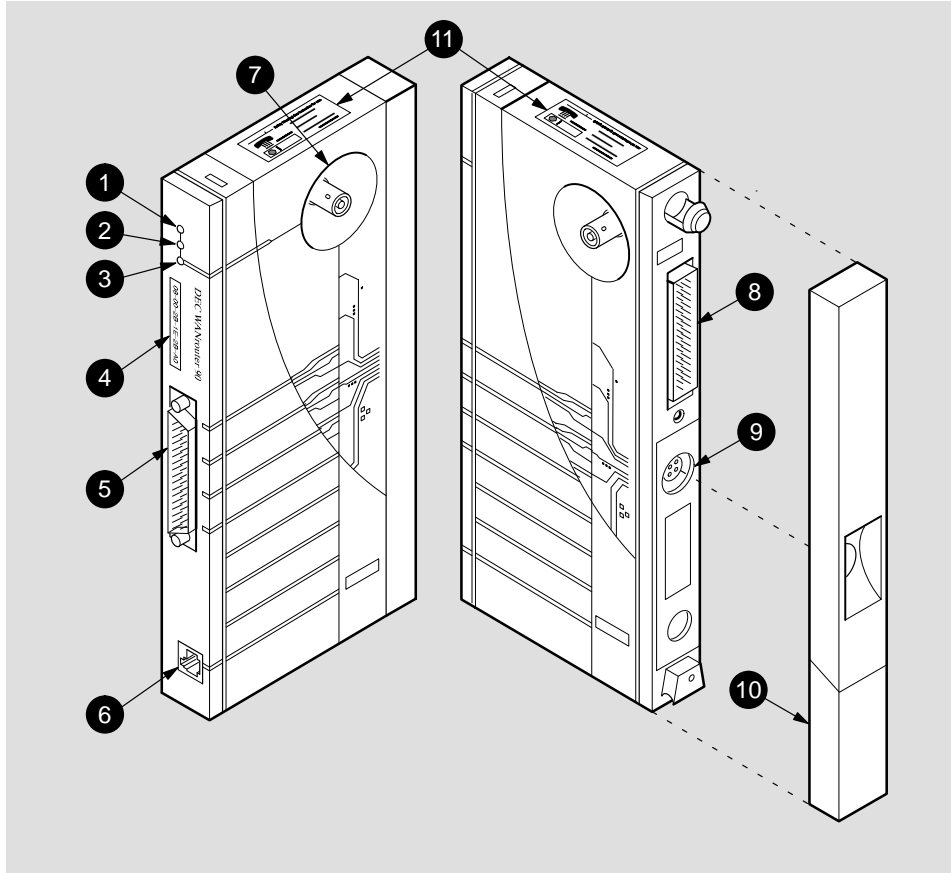
The DEC WANrouter 90 is also interface pin-compatible (and will interoperate) with equipment that complies with the following interface standards:

- EIA-423-A
- EIA-449 (Category II signals)
- CCITT Recommendation V.10
- U. K. (United Kingdom) BT Kilostream Service

## 1.5 Controls, Indicators, and Connectors

Figure 1-1 shows the DEC WANrouter 90 and calls out its controls, indicators, and connectors. The controls, indicators, and connectors are described in Table 1-1.

**Figure 1-1: DEC WANrouter 90**



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### NOTE

Pins 13 and 16 on the 50-pin connector are not present on European versions of the DEC WANrouter 90.

**Table 1–1: Controls, Indicators, and Connectors**

	<b>Item</b>	<b>Description</b>
1	Power Indicator	Turns on when +5 volts is supplied to the unit.
2	System OK Indicator	Turns on when the unit has successfully completed its diagnostics.
3	Network OK Indicator	Turns on when the unit is connected to a properly terminated network and software has been successfully downline loaded.
4	Ethernet Address	Unique physical address of the unit.
5	50-pin D-sub Connector	Connects a synchronous or asynchronous device to the router. The device connects to the port via an adapter cable and an extension cable. Refer to Appendix A for information about these cables.
6	Console Port Connector (MMJ)	Connects a terminal to the DEC WANrouter 90 for performing diagnostic procedures and setting parameters.
7	Network Connector (BNC)	Connects the unit to the Ethernet LAN. Not used when the unit is installed in the DEChub 90 Ethernet backplane.
8	Backplane Connector	Provides network and power connections to the DEC WANrouter 90 when it is installed in the DEChub 90 Ethernet backplane.
9	Power Connector	Provides +5 volts from the DEC WANrouter 90 standalone power supply. Not used when the unit is installed in the DEChub 90 Ethernet backplane.
10	Cover	Present on standalone units only. Covers the backplane connector and mounting assembly.
11	PTT Label	PTT approval label. Contains warning information for installations in the United Kingdom.

## 1.6 Models

There is only one model of the DEC WANrouter 90, but this model has several versions depending on whether the unit is intended for:

- Standalone installation or insertion into a DEChub 90 backplane
- Installation in Europe or in a non European country

The versions of the DEC WANrouter 90 are:

- DEWAR-MA— for insertion into a DEChub 90 backplane installed in any country outside of Europe.
- DEWAR-ME— for insertion into a DEChub 90 backplane installed in any European country.
- DEWAR-\*\* — for standalone configurations, where \*\* refers to the unique country code that specifies the type of external power supply and cord shipped with the DEC WANrouter 90.

Refer to Appendix B for information about DEC WANrouter 90 order codes, and for information about DEC WANrouter 90 accessories and cables.

## 1.7 Management Tools

The following tools are available for managing the DEC WANrouter 90:

- Light emitting diodes (LEDs)— Three LEDs provide status information that help in managing and troubleshooting the router. Refer to Chapters 3 and 4 for information on the DEC WANrouter 90 LEDs.
- Console port—A terminal can be attached to the router's console port for performing diagnostic functions. Generally, this port is only used by Digital Field Service personnel. However, in the event of a hardware problem, Digital Field Service may request you to collect status information from the router by connecting a terminal to this port to display informational and error messages. The informational/error messages are automatically sent to the console port by the router's firmware. Chapter 3 discusses how to connect a terminal to the console port.
- MOP—The software installer uses MOP to down-line load operational software to the DEC WANrouter 90 from a load host. Refer to the appropriate *DEC WANrouter 90/150/250 Installation* guide for further information.
- Network Control Language (NCL)—NCL can be used manage the router from a remote location. For information about using NCL to manage the DEC WANrouter 90, refer to *DEC WANrouter Management*.



- SNMP—SNMP can be used to manage the router using Hubwatch software. For information about using this tool to manage the DEC WANrouter 90, refer to *Hubwatch for DECmcc MSU* and *Hubwatch for Windows™*.

#### NOTE

Although the SNMP management manuals describe how to use both GETs and SETs, the DEC WANrouter 90 only supports GETs.

## 1.8 Software Requirements

The software requirements for installing and operating the DEC WANrouter 90 depend on the type of load host used for down-line loading the operational software:

- For a VMS™ load host, the VMS operating system V5.4 and DECnet extensions must be installed on the DEC WANrouter 90 system load host.
- For an ULTRIX™ load host, the ULTRIX operating system V4.2 and DECnet/OSI for ULTRIX must be installed on the DEC WANrouter 90 system load host.
- DEC WANrouter 90 distribution software must be installed on each DEC WANrouter 90 system load host.

The distribution software includes a router image file that is down-line loaded over the Ethernet or the serial line to the DEC WANrouter 90. The load host down-line loads the router image whenever required, and provides the router image to any number of routers. The router image, running on the DEC WANrouter 90, enables the router to perform its functions.

#### NOTE

The DEC WANrouter 90 hardware is configured at the factory for down-line loading over the Ethernet. Appendix C provides instructions for configuring the router for down-line loading over the serial line.

All software must be installed and verified before you can operate the router. For more information, refer to the appropriate *DEC WANrouter 90/150/250 Installation* guide.

## 1.9 Product Specifications

This section describes the physical, electrical and environmental specifications of the DEC WANrouter 90.

### 1.9.1 Physical Dimensions

Table 1–2 lists the physical dimensions of the DEC WANrouter 90.

**Table 1–2: Physical Dimensions**

<b>Dimension</b>	<b>Value</b>
Height	3.18 cm (1.25 in)
Width	27.31 cm (10.75 in)
Depth	12.70 cm (5.0 in)
Weight	.77 kg (1.7 lb)

### 1.9.2 Electrical Specifications

Table 1–3 lists the electrical characteristics for the DEC WANrouter 90.

**Table 1–3: Electrical Specifications**

<b>Voltage</b>	<b>Current (Ampere)</b>	<b>Power (Watts)</b>
+5.0 V	1.2 A	6.0 W

### 1.9.3 Environmental Requirements

Table 1–4 lists the environmental requirements of the DEC WANrouter 90.

**Table 1–4: Environmental Requirements**

<b>Parameter</b>	<b>Value</b>
<b>Operating Environment:</b>	
Temperature	5° C to 50° C (41° F to 122° F)
Maximum rate of change	20° C/hr (36° F/hr)
Relative humidity	10% to 95% (noncondensing)
Wet-bulb temperature	32° C (90° F)
Altitude	Sea level to 2.4 km (8000 ft)
Air flow	Convectively cooled. A minimum of 10 cm (4 in) of space must be provided on both ends of the unit for adequate air flow.
<b>Nonoperating environment:</b>	
Temperature	–40° C to 66° C (–40° F to 151° F)
Relative humidity	Up to 95% (noncondensing)
Altitude	Up to 4.9 km (16,000 ft)

### 1.9.4 Power Supply Specifications

Table 1–5 lists the electrical specifications of the DEC WANrouter 90 power supply.

**Table 1–5: Power Supply**

<b>Parameter</b>	<b>Value</b>
Voltage (Domestic)	104 Vac to 128 Vac (nominal 120 Vac)
Voltage (International)	208 Vac to 256 Vac (nominal 240 Vac)
Current at 120 V	.25 A
Current at 240 V	.125 A
Frequency	50 Hz to 60 Hz
Power Consumption	16 W
Output voltage	5.1 Vdc
Output current	1.8 A

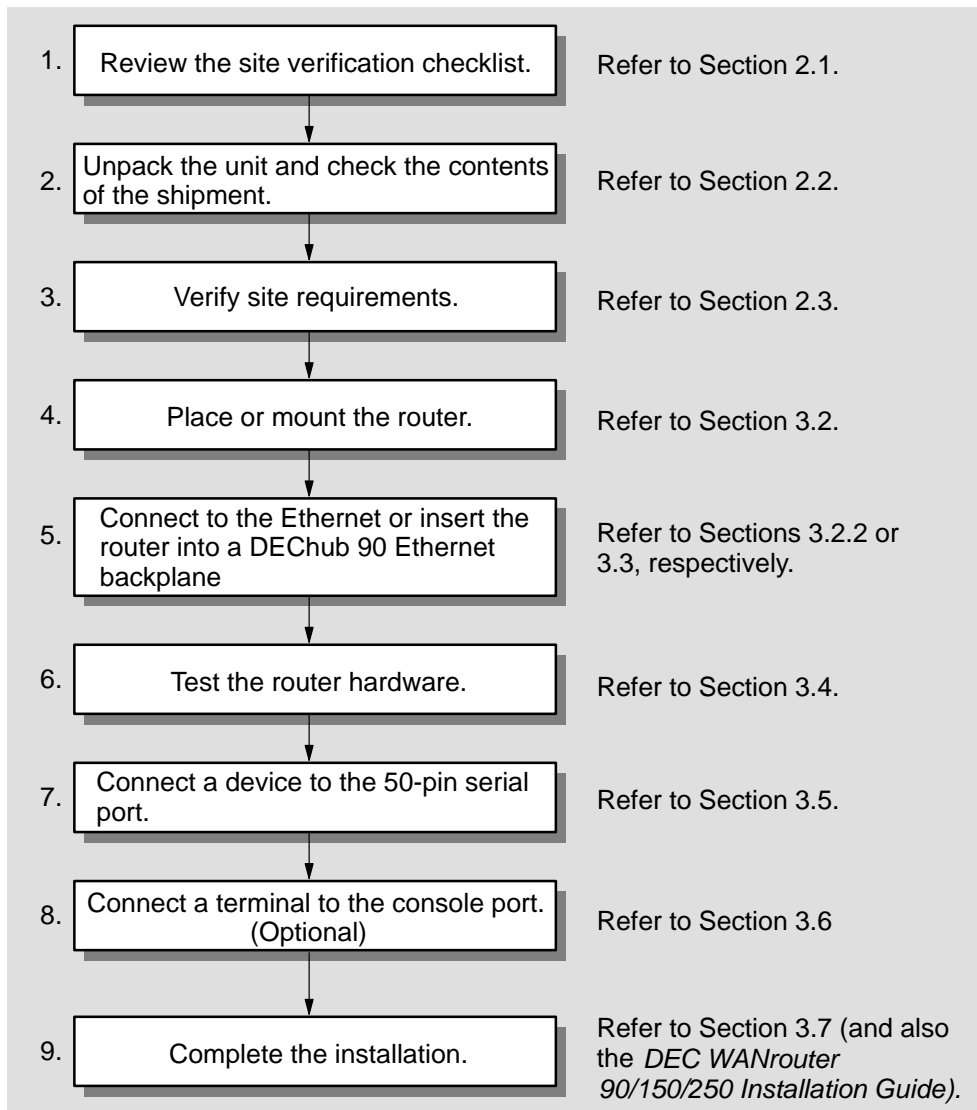
### 1.10 Installation Overview

Installing the DEC WANrouter 90 involves the following tasks:

- Preparing for the installation, including:
  - Reviewing the site verification checklist
  - Unpacking the unit and checking the contents of the shipment
  - Verifying site requirements
- Placing or mounting the router
- Connecting to the Ethernet or inserting the router into a DEChub 90 Ethernet backplane
- Testing the router hardware
- Connecting a device to the 50-pin serial port
- Connecting a terminal to the console port (optional)
- Completing the installation

Figure 1–2 lists the steps of the DEC WANrouter 90 installation and identifies where in the manual each task is described.

**Figure 1–2: DEC WANrouter Installation Overview**



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## Preparing for Installation

This chapter describes the contents of the shipment and provides important site verification information to consider before installation.

### 2.1 Site Verification Checklist

Site verification ensures that the site has been properly prepared to accept the installation with a minimum of system downtime. Use the following checklist to verify all site preparation tasks have been completed before beginning the DEC WANrouter 90 installation:

#### General

- Determine where the router will be installed.
- Ensure that the system manager is notified if you intend to shut down the system during the installation.

## Hardware

- Ensure that the ThinWire Ethernet LAN is in place and operable.
- Ensure that a DEChub 90 Ethernet backplane is installed and operable; or if this is a standalone installation, ensure that arrangements have been made to connect the router's Ethernet port to a suitable Ethernet interface device (a DEMPR, a DESPR or a ThinWire segment), and that an appropriate ac power source is within 1.6 m (5.5 ft) of the router.
- Ensure that the appropriate synchronous or asynchronous device (a modem, personal computer, or host) is ready for connection to the router's serial port.

## Electrical and Environmental Requirements

- Ensure that the electrical and environmental requirements are within the ranges described in the DEC WANrouter 90 specifications listed in Chapter 1.

## Cabling Requirements

- Ensure that the required adapter cable for connecting the synchronous or asynchronous device to the DEC WANrouter 90's 50-pin port has been obtained. Note that this cable is not included in the shipment. Refer to Appendix A for information about the type of cables to use. Refer to Appendix B for information about ordering cables.
- Ensure that appropriate types and lengths of cable are available for connection to the Ethernet (if this is a standalone installation).

## Service

- Make sure the (optional) service contracts are in place. Call your Digital sales representative for information on available hardware and software services to support the DEC WANrouter 90.

## 2.2 Unpacking and Checking the Contents of Shipment

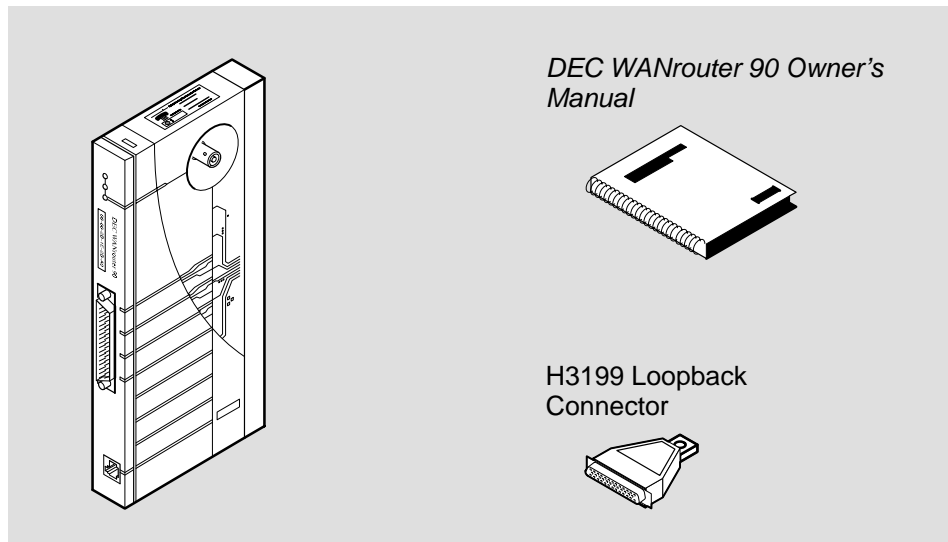
Unpack the unit and check the shipment for damage or missing parts. Figure 2–1 shows the contents of the shipment for the DEWAR-MA and DEWAR-ME versions of the the DEC WANrouter 90. For the standalone versions, the shipment also includes a power supply and power supply cord. Refer to Appendix B for a list of the items shipped with each version.

If any items are damaged or missing, immediately notify the delivery agent and the Digital sales representative.

### NOTE

Save the original packing material should you need to return the unit to Digital.

**Figure 2–1: Hardware Kit Contents (DEWAR-MA and DEWAR-ME)**



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## **2.3 Verifying Electrical, Environmental, and Cable Requirements**

The router can operate as a standalone unit in an office environment or as a module installed in a DEChub 90 Ethernet backplane. Regardless of where you install the router, verify that all of the requirements in this section are met before beginning the installation.

### **2.3.1 Electrical Requirements**

The power at the electrical outlet must match the requirements specified in Table 1–1. Refer to Chapter 1.

### **2.3.2 Environmental Requirements**

Environmental requirements for temperature and humidity must be within the ranges shown in Table 1–2. Refer to Chapter 1.

### **2.3.3 Cabling Requirements**

The cabling requirements of the router are discussed in this section. For additional information on cabling and configuring of local area networks, and using DECconnect system products, refer to the *DECconnect System Planning and Configuration Guide* (see Appendix C for information on how to order this document).

#### **2.3.3.1 Maximum Cable Lengths**

Table 2–1 shows the maximum cable lengths for a number of data rates using DEC WANrouter 90 supported line interface standards.

**Table 2–1: Maximum Cable Lengths — Router to Devices**

Line Protocol	Data Rate (b/s)	Cable Length
EIA-232-D/V.24	Up to 20 K	15 m (50 ft)
RS-423-A	Below 4.8 K	1200 m (4000 ft)
	20 K	150 m (500 ft)
	48 K	58 m (190 ft)
	64 K	25 m (80 ft)
RS-422-A	Up to 64 K	1200 m (3900 ft)
V.35	48 K	60 m (200 ft)

Table 2–1 assumes the following:

- The V.24 cable capacitance is 50 pF/ft.
- The RS-423-A cable capacitance is 15 pF/ft.
- The RS-422-A cable is 100 ohm terminated with a capacitance of 15 pF/ft.

The maximum cable length for V.35 is a recommended figure only.

### **2.3.3.2 ThinWire Ethernet Connection**

If you are installing the DEC WANrouter 90 in a standalone configuration, ensure that the following requirements are met:

- The maximum ThinWire cable segment length must not exceed 185 m (606 ft).
- There must be a 50-ohm terminator at each end of the cable segment unless the cable ends in a DEMPR or DESPR (both these devices have inbuilt 50-ohm terminators).
- There must be only one ground per cable segment.
- There must be at least 0.5 m (19 in) between T-connectors.
- The maximum number of stations, between terminators, must not exceed 30.

- ThinWire cable segments must not be configured in a loop.
- ThinWire cable segments must not have any branch segments.

## **2.4 Software Considerations**

The router software and software installation instructions are shipped separately from the DEC WANrouter 90 hardware. Before starting the installation described in the following chapter, check with the system manager to verify that the router software is ready for down-line loading over the Ethernet or serial line.

It is recommended that you install the DEC WANrouter 90 after the software is installed on the load host. This will allow you to verify the complete system installation. If you install the hardware before the software is installed, the Network OK LED will indicate an error when power is applied to the unit, as described in Section 3.4. If you install the hardware before the software is installed, the software installer is responsible for verifying the complete system installation.

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## Installing the DEC WANrouter 90

This chapter describes how to install the DEC WANrouter 90. There are two types of installations for the DEC WANrouter 90:

- As a standalone unit placed on a table or desktop, or mounted to a wall
- Inserted into a DEChub 90 Ethernet backplane

### 3.1 Overview

The DEC WANrouter 90 can be placed on a table or desktop, mounted to a wall, or inserted into a DEChub 90 Ethernet Backplane. To install the DEC WANrouter 90 as a standalone unit, refer to Section 3.2. To install the DEC WANrouter 90 in a DEChub 90 Ethernet backplane, refer to Section 3.3. Once the unit is installed, refer to Section 3.5 to connect a device to the router's 50-pin serial port.

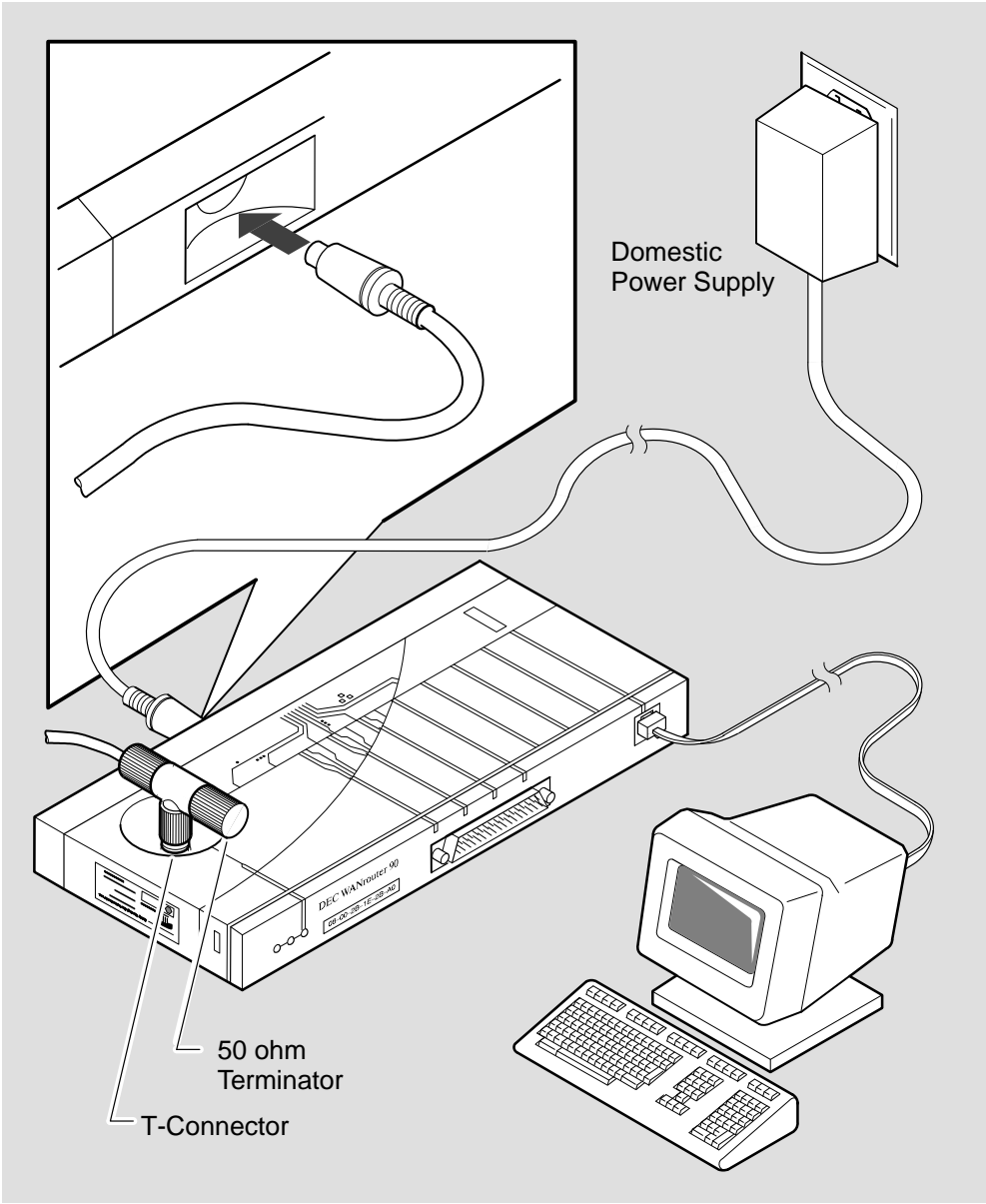
#### CAUTION

Before installing the DEC WANrouter 90 in the United Kingdom (U.K.), you must refer to Appendix D.

### 3.2 Installing in a Standalone Configuration

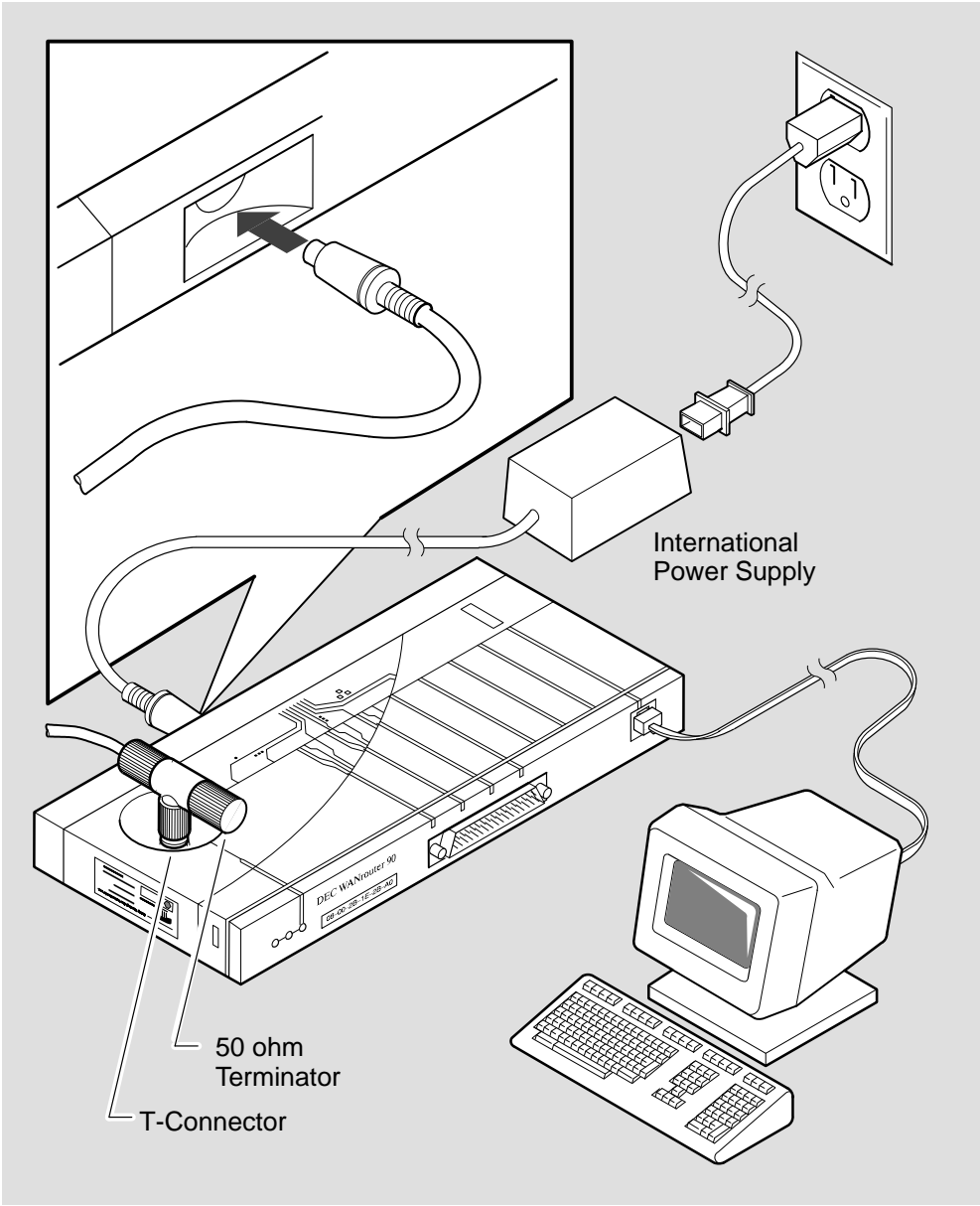
Figure 3-1 illustrates the DEC WANrouter 90 installed in a standalone configuration using a domestic power supply. Figure 3-2 illustrates the same type of configuration, except using an international power supply. Refer to these figures when performing the procedures described in this section.

**Figure 3-1: DEC WANrouter 90 Standalone Installation with Domestic Power Supply**



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**Figure 3-2: DEC WANrouter 90 Standalone Installation with International Power Supply**



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### **3.2.1 Placing or Mounting the DEC WANrouter 90**

Place or mount the DEC WANrouter 90. For desktop installation, stand the unit on end or lay the unit horizontally.

For wall mounting, remove the back cover of the unit and mount the unit on the wall, as described in the following subsections.

#### **3.2.1.1 Removing the Back Cover (for Wall Mounting)**

To remove the back cover of the DEC WANrouter 90, refer to Figure 3–3 and perform the following steps:

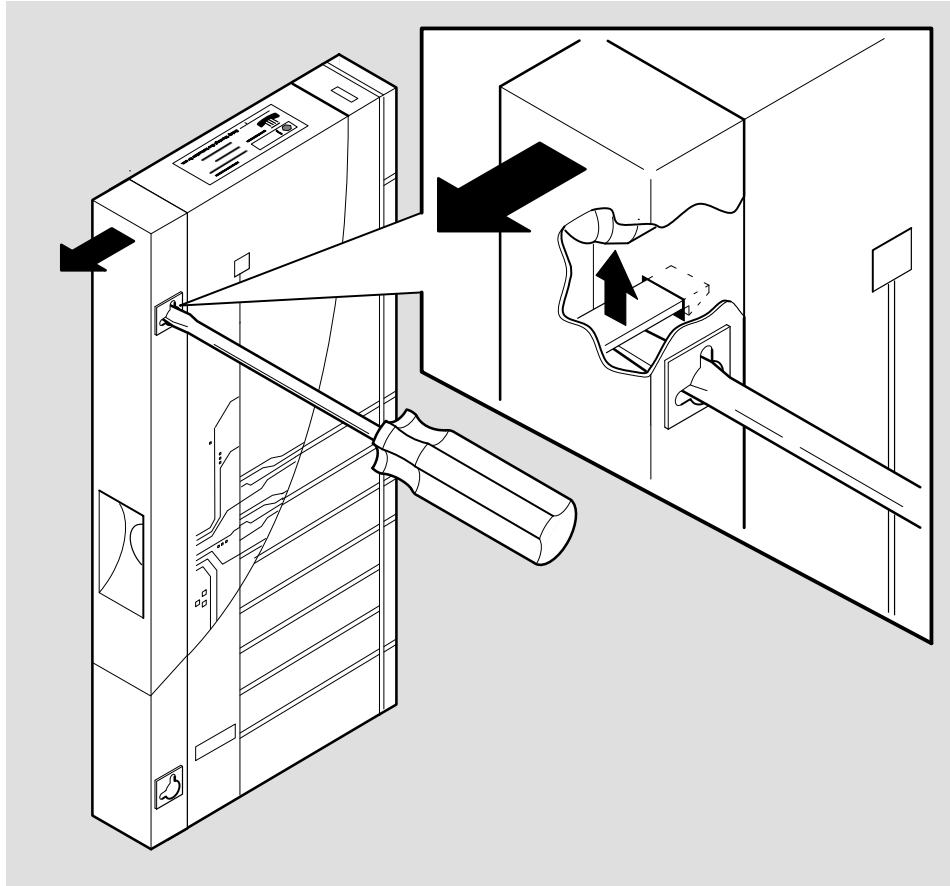
1. Insert a small screwdriver into the top mounting hole in the cover.
2. Lift up on the latch.
3. While lifting up on the latch, pull the top of the cover away from the unit and down.

#### **3.2.1.2 Wall Mounting**

Once you have removed the back cover, use the mounting holes on the cover as a template to locate the mounting screws. The screws are not supplied with the router.

After marking for the mounting screws, mount the back cover to the wall and then snap the unit into the back cover.

**Figure 3–3: Removing the Back Cover of the DEC WANrouter 90**



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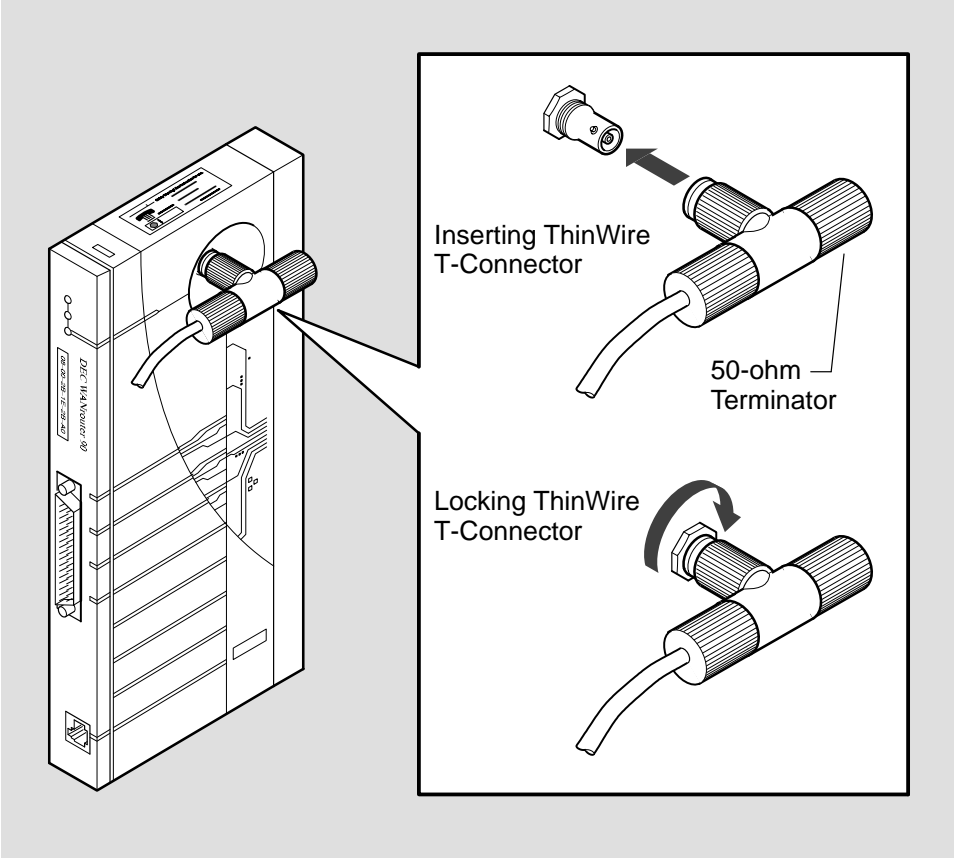
### **3.2.2 Connecting the Router to the Ethernet**

Once the unit is placed or mounted, perform the following steps to connect the router to the ThinWire Ethernet local area network:

1. Attach the Ethernet T-connector to the BNC connector on the DEC WANrouter 90, as illustrated in Figure 3–4.



**Figure 3-4: Connecting to the ThinWire Ethernet LAN**



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- 2. Turn the barrel of the connector clockwise to lock (see Figure 3-4).

## NOTE

Figure 3-4 shows the T-connector terminated using a 50-ohm terminator. The 50-ohm terminator is replaced by a cable if the router is not at the end of a cable segment. The cable segment must be terminated by 50-ohm terminators at both ends unless a DEMPR or a DESPR is used. Where a cable segment is terminated in a DEMPR or a DESPR at one end only, the opposite end needs to have a 50-ohm terminator.

### 3.2.3 Completing the Standalone Router Installation

To complete the standalone router installation, perform the following steps:

1. Connect the H3199 loopback connector to the router's 50-pin male D-connector.
2. Plug the external power supply connector into the DEC WANrouter 90's power connector.
3. Attach the power cord to the power supply (if you are using an international power supply).
4. Plug the power supply or power supply cord into a working ac outlet.
5. With the power applied to the DEC WANrouter 90, the unit's Power LED is lit and the router starts its self-test. The self-test takes approximately one minute to complete. Refer to Section 3.4 for information about running the self-test.

### 3.3 Installing in a DEChub 90 Ethernet Backplane

To install the DEC WANrouter 90 in a DEChub 90 Ethernet backplane, perform the procedures described in this section.

### 3.3.1 Removing the Back Cover (if necessary)

If there is a cover on the back of the router, you must remove it before inserting the router into the backplane. Perform the following steps to remove the back cover:

1. Insert a small screwdriver into the top mounting hole in the cover (see Figure 3–3).
2. Lift up on the latch.
3. While lifting up on the latch, pull the top of the cover away from the unit and down.

### 3.3.2 Inserting the DEC WANrouter 90 into the DEChub 90 Ethernet Backplane

Perform the following steps to insert the router in the DEChub 90:

1. Place the lower mounting tab, located on the back of the DEC WANrouter 90, into a mounting slot on the backplane, as shown in Figure 3–5. Use any slot except slot 8.

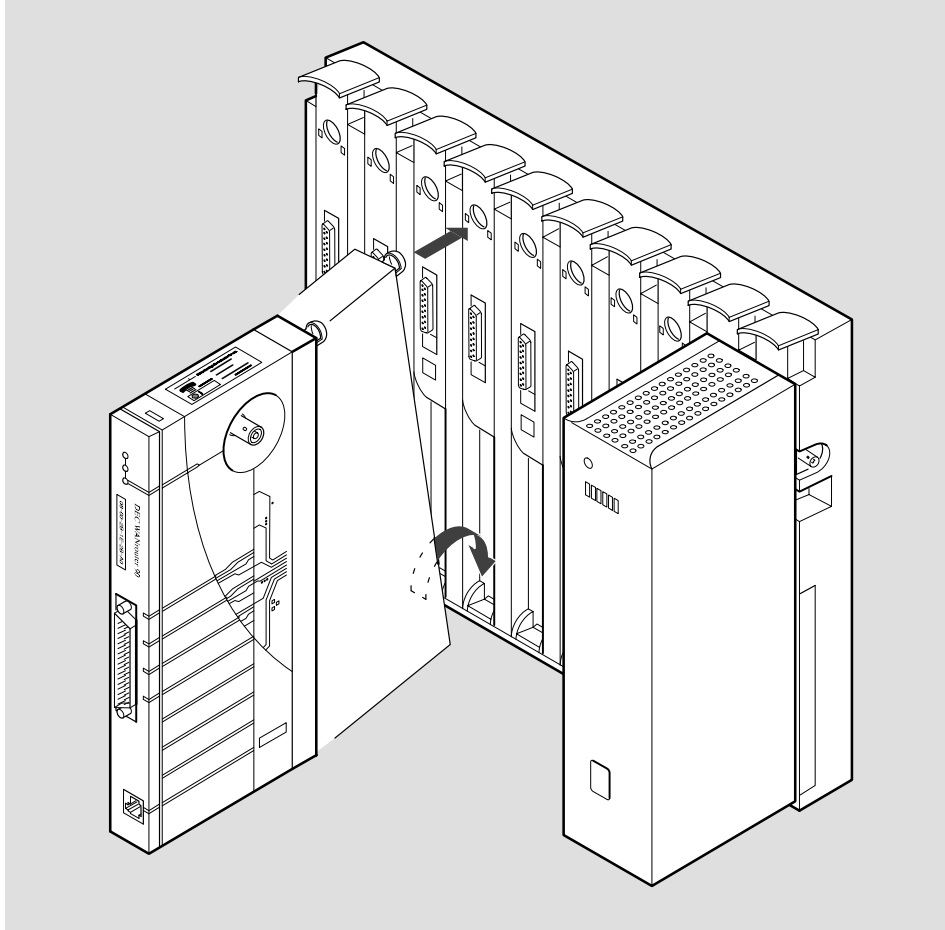
#### NOTE

The DEC WANrouter 90 can be installed in the DEChub 90 Ethernet backplane while the backplane is powered-up and connected to the network. Similarly, once the router is mounted you can replace the router (if necessary) with another router ('hot swap') without having to power down the backplane.

2. Connect the H3199 loopback connector to the 50-pin male D-connector on the router.
3. Rock the unit into place. An audible click is heard when the unit is securely latched in place.

With the power applied to the backplane, the router's Power LED is lit and the unit starts its self-test. The self-test takes approximately one minute to complete. Refer to Section 3.4 for information about running the self-test.

**Figure 3–5: DEC WANrouter 90 Backplane Installation**



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### **3.4 Testing the Router Hardware**

Plugging in the router power cord, or inserting the router into a powered-up DEChub 90 backplane, applies power directly to the router and causes the router to automatically begin its self-test. The self-test consists of diagnostic routines that test and verify the operation of the unit. Pass/fail test results are indicated by the router's LEDs.

The following sequence of events occur at power up:

1. As soon as power is applied to the unit, the green Power LED is lit.
2. Core tests are run to verify that the router's data and address registers function correctly.
3. Next, the PROM and DRAM are verified. Following these tests, the remaining logic is tested.
4. The self-test takes approximately one minute. The results of the self-test are displayed by the unit's LEDs:
  - a. If only the Power LED is lit, it indicates that the self-test failed.
  - b. If the Power LED is lit, and the System OK LED is blinking, it indicates that the self-test failed, but the core is operational.
  - c. If both the Power and System OK LEDs are lit, it indicates that the unit passed its self-test.
5. Upon successful completion of the self-test, the router attempts to down-line load the DEC WANrouter 90 software image over the Ethernet LAN, from a suitably configured load host. During this process, both the Power LED and System OK LED remain lit.
6. If the operational software is successfully loaded, the Network LED is lit and remains on, along with the Power and System OK LEDs.
7. If the software is not available (for example, if it has not been installed on the load host, or the load host is not functioning), the Network LED will blink momentarily and then extinguish.

Table 3-1 summarizes the states of the DEC WANrouter 90 LEDs.

**Table 3–1: States of the DEC WANrouter 90 LEDs**

<b>Power LED</b>	<b>System OK</b>	<b>Network LED</b>	<b>Meaning</b>
Off	Off	Off	No power.
On	Off	Off	Self-test failed.
On	Blinking	Off	Self-test failed, but core is operational.
On	On	On	Self-test passed and software image successfully loaded.
On	On	Off	Self-test passed. Router is attempting to find the load host.
On	On	Blinking	Self-test passed but could not find the software image.

### **3.4.1 Evaluating Test Results**

Upon completion of the self-test, examine the state of the DEC WANrouter 90 LEDs to evaluate the test results.

#### **3.4.1.1 Self-Test Successful and Network LED Remains Lit**

If the DEC WANrouter 90 successfully completes its self-test, and the Network LED remains lit (indicating the software has been successfully loaded), perform the following steps:

1. Remove the H3199 loopback connector from the 50-pin port connector.
2. Proceed to connect a device to the serial port, as described in Section 3.5.

#### **3.4.1.2 Self-Test Fails**

If the DEC WANrouter 90 fails its self-test (for example, both the Power and System OK LEDs do *not* remain lit), refer to Chapter 4.

### 3.4.1.3 Self-Test Successful But Network LED Not Lit

If the Network LED is not lit or blinks (indicating that the DEC WANrouter 90 software has not been down-line loaded to the router), check with the system manager to:

- Determine if the DEC WANrouter 90 software has been installed on the load host.
- Determine whether the software will be down-line loaded over the Ethernet or over the serial line.

If the router software is not installed on the load host, notify the system manager that the software needs to be installed in order to complete the router installation.

If the system manager informs you that the router software has already been installed on the load host, and must be down-line loaded over the serial line, perform the following steps:

1. Remove the H3199 loopback connector from the 50-pin port connector.
2. Connect a device to the serial port, as described in Section 3.5.
3. Connect a terminal to router's console port connector, as described in Section 3.6.
4. Configure the serial port for down-line loading, as described in Appendix C.
5. After completing these steps, examine the state of the Network LED. At this point, the Network LED should remain lit. If it is not lit, notify the system manager.

## 3.5 Connecting a Device to the 50-Pin Device Port

To connect a device to the router's serial port, you need an adapter cable (and, if necessary, an extension cable). Appendix A provides detailed information about which adapter cable and extension cable to use, depending on the type of device you are connecting.

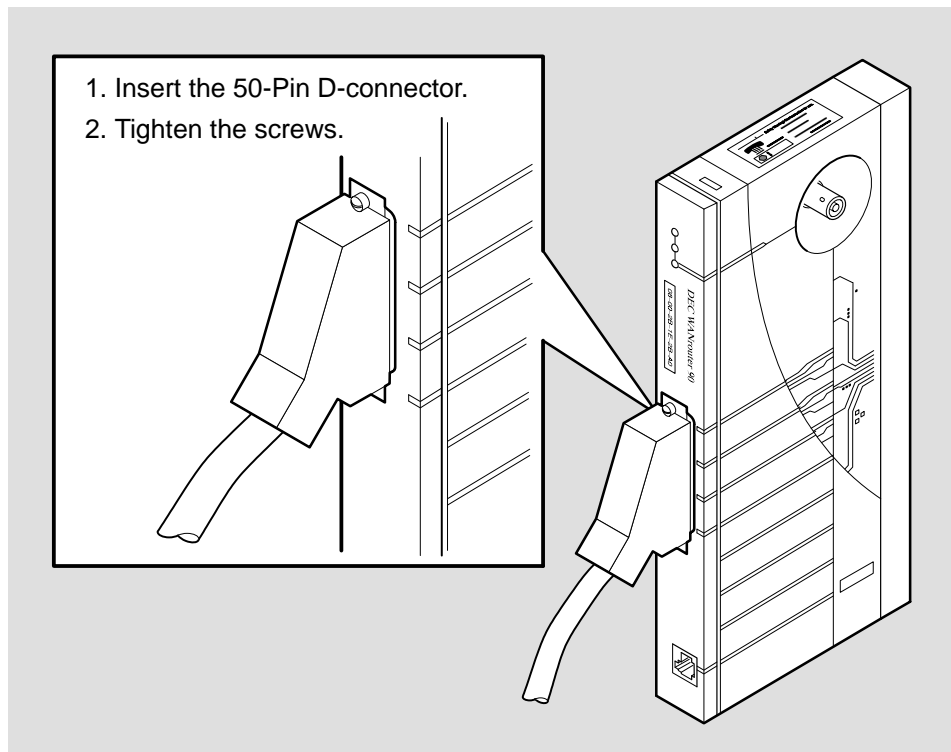
## NOTE

Since the DEC WANrouter 90 is typically used to connect an Ethernet LAN to a wide area network through a modem, this section uses the example of connecting a modem to the 50-pin port.

To connect a device to the router's serial port, perform the following steps:

1. Connect the 50-pin female D-connector of the adapter cable to 50-pin male D-connector on the router (see Figure 3-6).

**Figure 3-6: Connecting to the 50-Pin D-Connector**

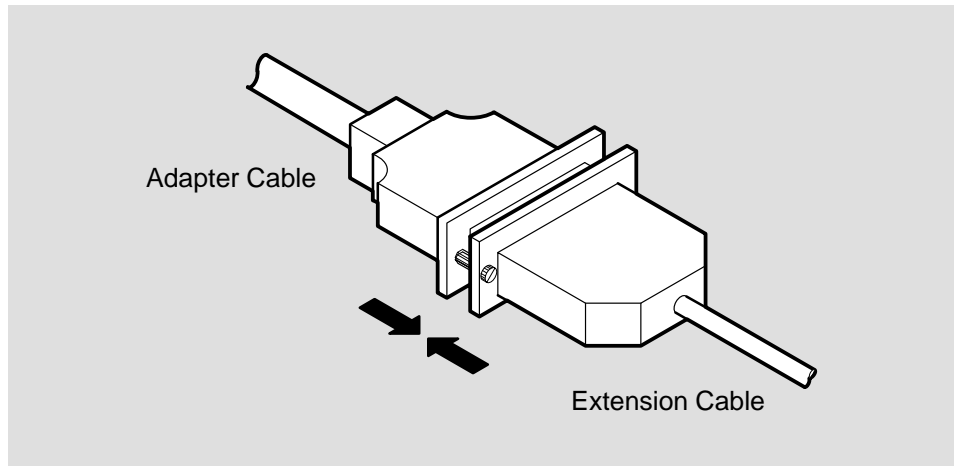


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2. If necessary, connect the adapter cable to an extension cable (see Figure 3-7).

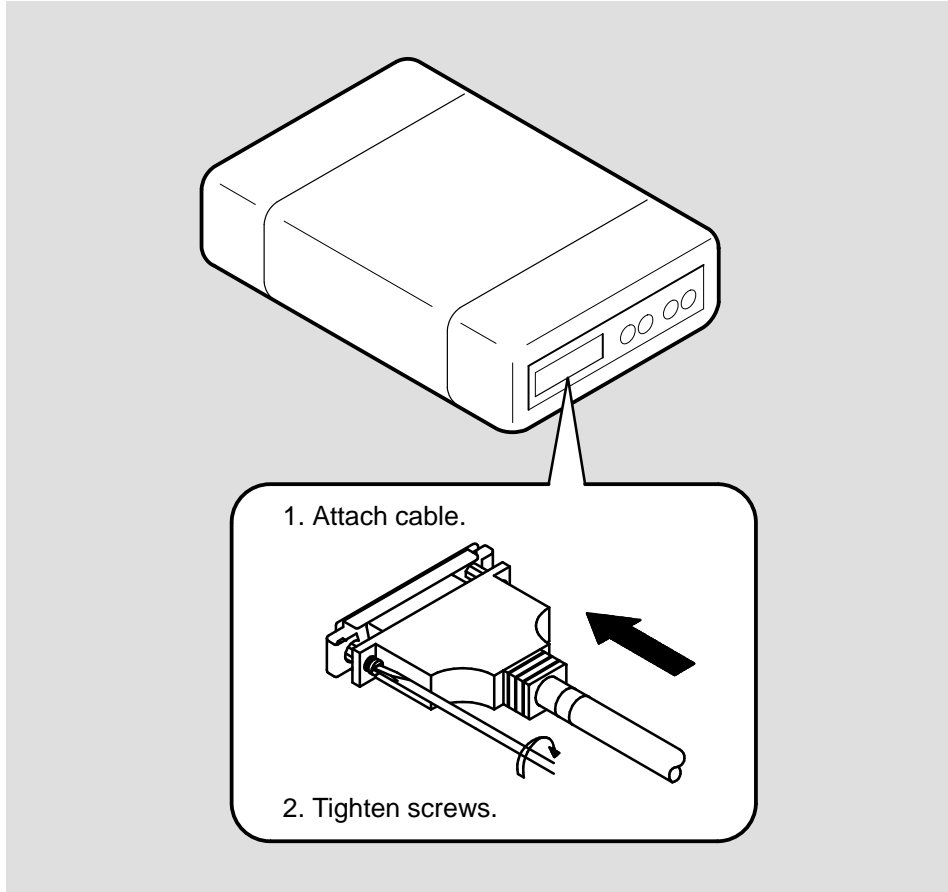
**Figure 3-7: Connecting an Adapter Cable to an Extension Cable**



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3. Connect the adapter cable or extension cable to the device. Figure 3-8 illustrates how the adapter or extension cable is connected to a modem.

**Figure 3–8: Connecting to the Modem**



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**CAUTION**

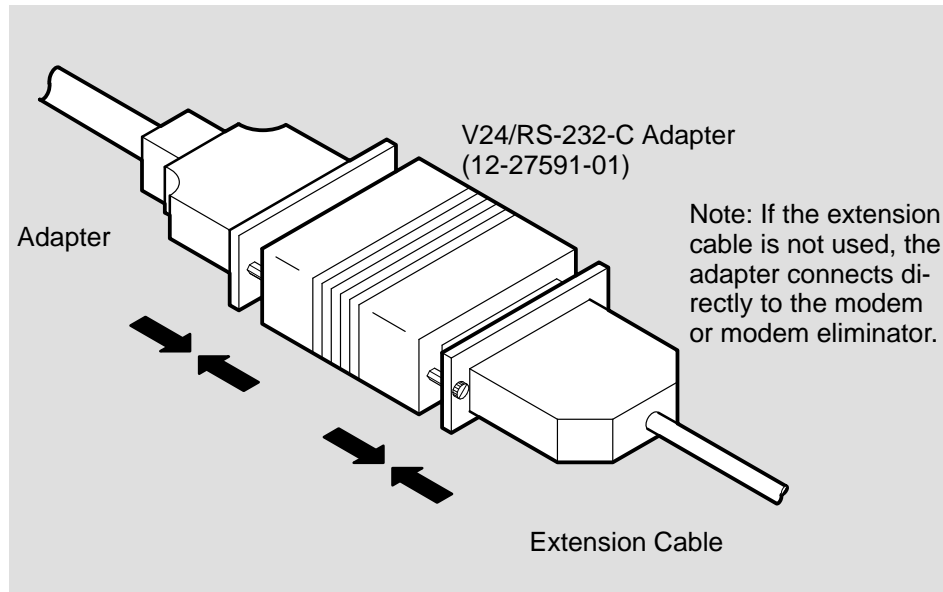
For V.24 installations, a V24/RS-232-C adapter (12-27591-01) must be fitted between the adapter cable and the extension cable, or between the adapter cable and the modem (refer to Figure 3–9), if the modem/eliminator has any of the following:

- A signal with a DCE source on pin 18
- Signal quality implemented on pin 21

- Data Signal Rate Selector (DCE) on pin 23

Failure to comply with this could result in damage to the interface module and modem or modem eliminator. If you are not sure what signals the modem or modem eliminator provides, contact Digital Field Service.

**Figure 3–9: Connecting an Adapter Cable, a V24/RS-232-C Adapter, and an Extension Cable**



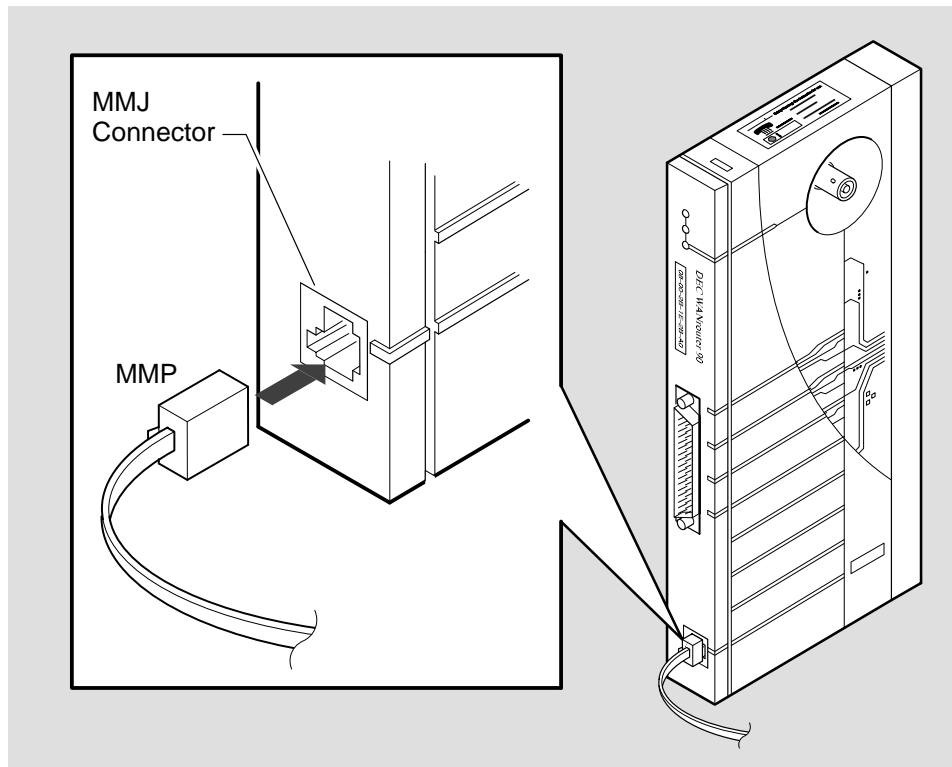
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### 3.6 Connecting a Terminal to the Console Port Connector

To connect a terminal to the console port connector, do the following:

1. Insert the cable's modified modular plug (MMP) into the router's modified modular jack (MMJ) connector, as shown in Figure 3–10.

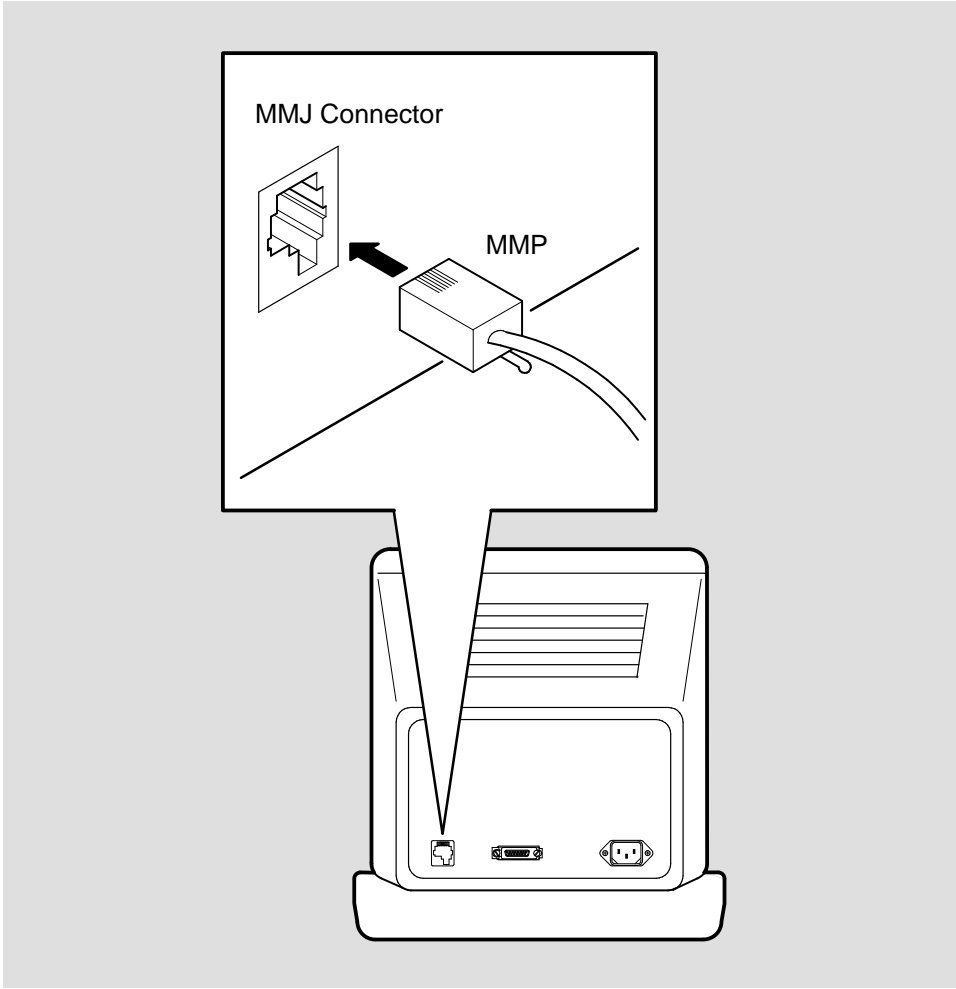
**Figure 3–10: Connecting to the Console Port Connector**



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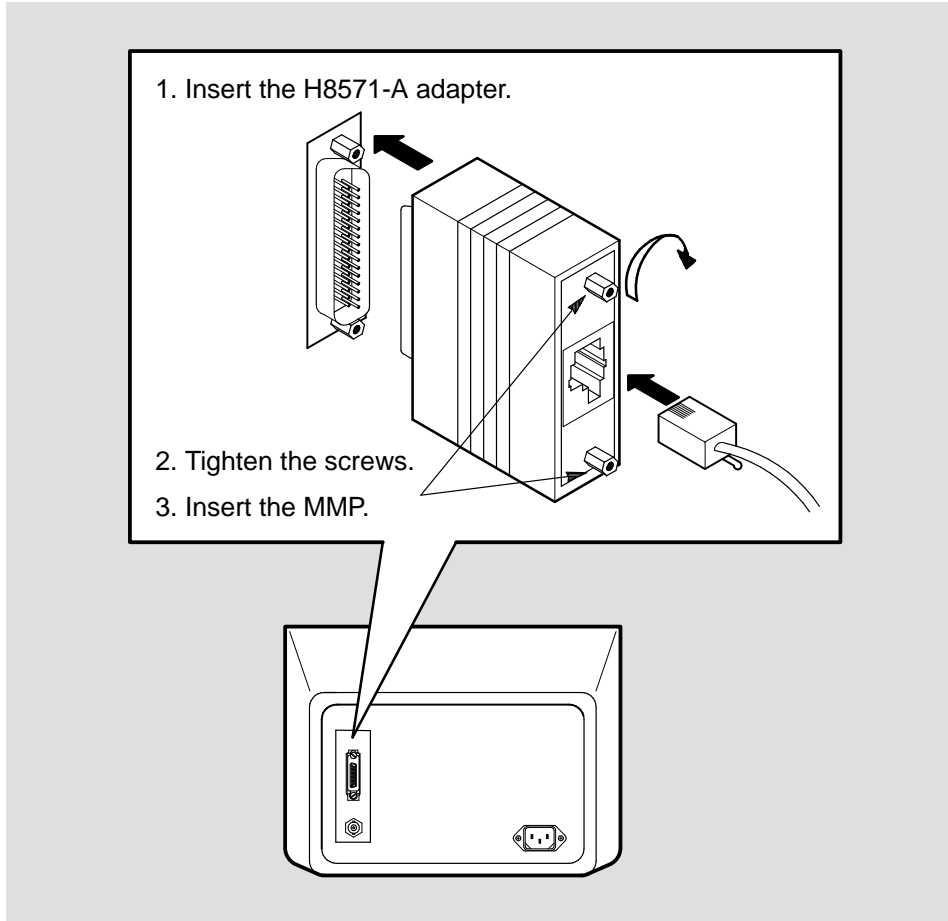
2. Insert the cable's modified modular plug (MMP) into the modified modular jack (MMJ) connector on the terminal, as shown in Figure 3–11. If the terminal has a 25-pin D-connector, use an H8571-A adapter (see Figure 3–12).

Figure 3-11: Connecting to the Terminal



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**Figure 3–12: Connecting to 25-Pin D-Connector Terminal**



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3. Power up the terminal.
4. Configure the terminal to operate with a speed of 9600 bits/s and with a character size of 8 bits (no parity). Refer to the specific terminal user's guide if you need help setting the terminal parameters.

### **3.7 Completing the Router System Installation**

After you install and test the DEC WANrouter 90 hardware, inform the system manager that the router installation is complete.

If you have installed the router hardware without the router software installed on the load host, it is the system manager's responsibility to verify the total system installation after installing the software. Instructions for verifying the total system installation are provided in the *DEC WANrouter 90/150/250 Installation* guide.

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## Troubleshooting

This chapter describes how to troubleshoot the DEC WANrouter 90 hardware.

### 4.1 General Information

The troubleshooting information in this chapter helps you identify and correct problems you may encounter during the installation of the DEC WANrouter 90 hardware. These troubleshooting procedures are for diagnosing and correcting hardware-related problems only. Notify the network manager if the troubleshooting procedures indicate the problem is software related or if the procedures do not correct the problem.

### 4.2 Troubleshooting Guidelines

Refer to the following guidelines when troubleshooting the DEC WANrouter 90 hardware:

- Always check for loose cable connections before commencing extensive troubleshooting.
- Consider possible environmental problems, such as power fluctuations or high ambient temperatures.
- When corrective action is indicated (such as checking for loose cables, and so on) power down the system before performing those actions.



- If the DEC WANrouter 90 has been functioning for a while without any problems, but now indicates a fault, it is possible that the fault is in a related device, for example, the DEChub 90 Ethernet backplane, the Ethernet segment, the device connected to the router's serial port, or the device cables.
- When the fault is isolated to a malfunction of a connected device or cable, replace the device or cable or refer to their associated documents for troubleshooting information.
- When the fault is isolated to the DEC WANrouter 90, contact your Digital Sales Representative to make arrangements for a replacement unit.

### 4.3 Troubleshooting Tools

The self-test diagnostic program and the DEC WANrouter 90 LEDs are the primary diagnostic tools used for troubleshooting the router hardware. Pass or fail test results are indicated by the combined states of the router's LEDs. Table 4-1 lists the various states of the LEDs.

Also, you can connect a terminal to the console port connector (as described in Chapter 3) and monitor any error messages that are sent to the console port by the router firmware.

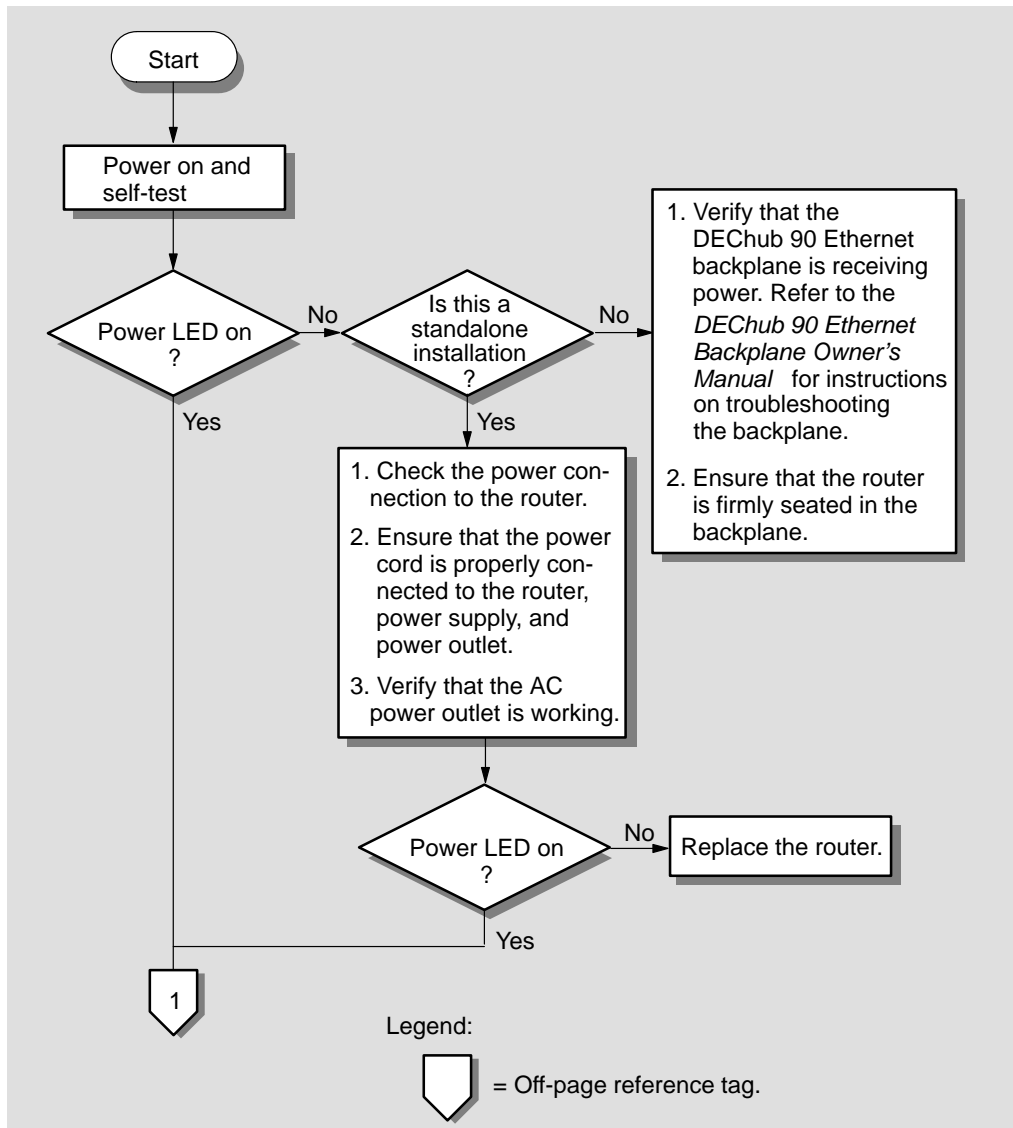
**Table 4–1: States of the DEC WANrouter 90 LEDs**

<b>Power LED</b>	<b>System OK</b>	<b>Network LED</b>	<b>Meaning</b>
Off	Off	Off	No power.
On	Off	Off	Self-test failed.
On	Blinking	Off	Self-test failed, but core is operational.
On	On	On	Self-test passed and software image successfully loaded.
On	On	Off	Self-test passed. Router is attempting to find the load host.
On	On	Blinking	Self-test passed but could not find the software image.

#### **4.4 Troubleshooting Procedure**

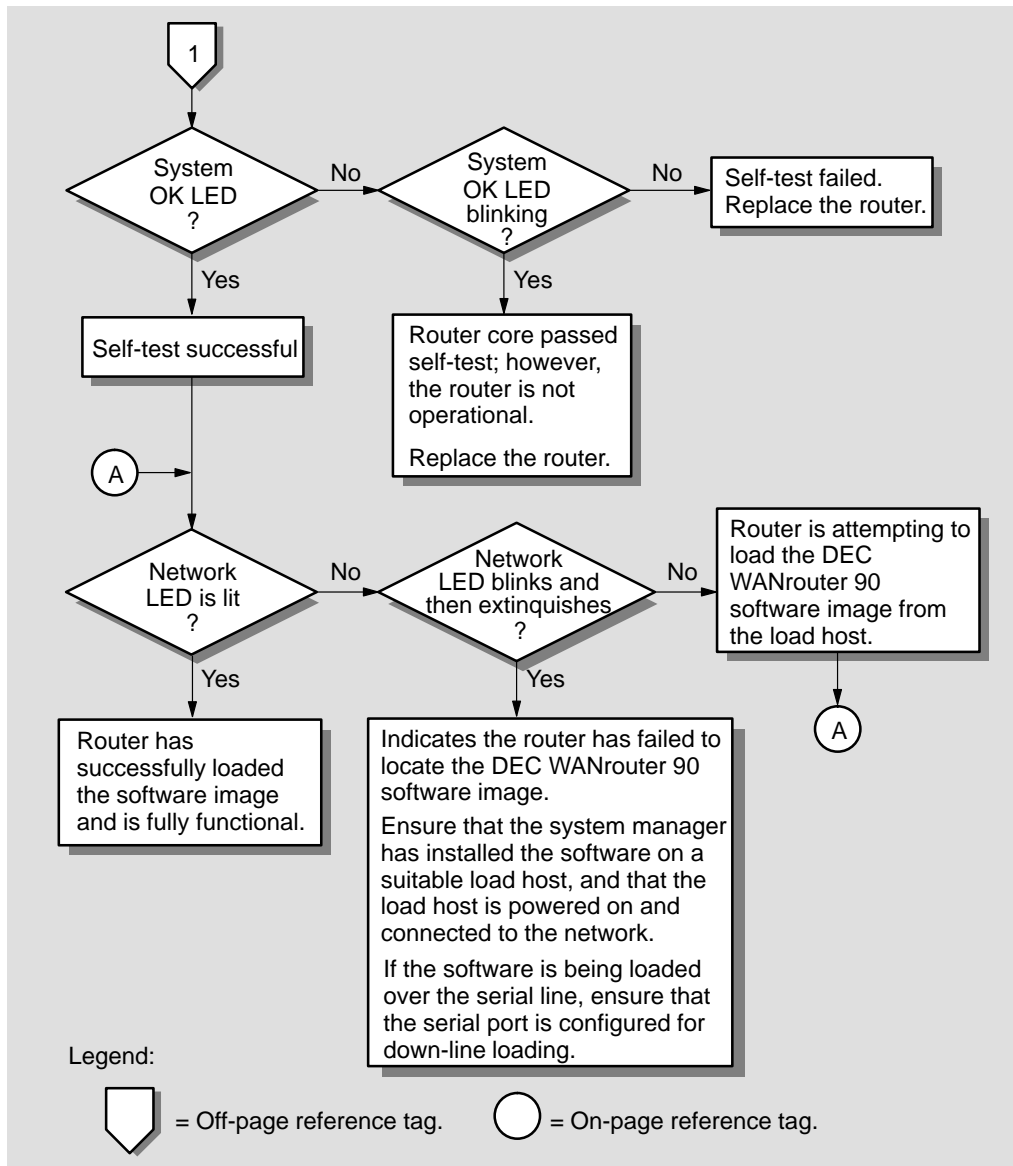
To troubleshoot the DEC WANrouter 90 hardware, refer to Table 4–1 and to the diagnostic flow chart in Figure 4–1.

Figure 4-1: Diagnostic Flowchart



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Figure 4-1 (Cont.): Diagnostic Flowchart



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## Connector and Cable Pin Descriptions

This appendix describes the pins of the DEC WANrouter 90 hardware connectors and the cables used to interface to the DEC WANrouter 90 hardware. Wiring diagrams of the individual cables are included to help you in troubleshooting and cable building.

### A.1 Connector Pin Descriptions

This section describes the pins for the following DEC WANrouter 90 connectors:

- ThinWire Ethernet connector
- Device port connector
- Console port connector

#### A.1.1 Ethernet Transceiver Interface

The DEC WANrouter 90 unit has a ThinWire Ethernet connector that is used when the unit is installed in a standalone configuration. The ThinWire Ethernet connector is a 50-ohm, RG58 type, BNC connector with one pin and a shield.

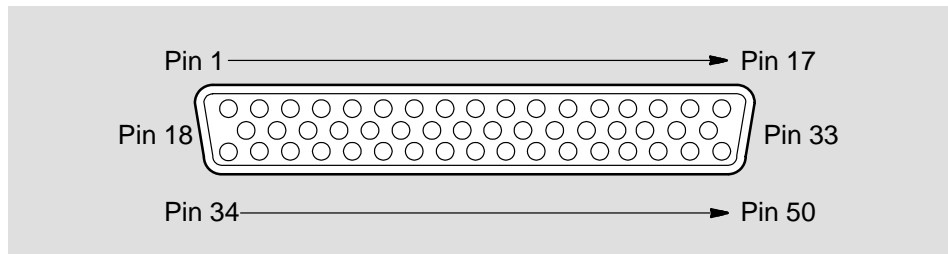
### A.1.2 Device Port Connector

The 50-pin D-connector is used to connect a synchronous or asynchronous device (modem, personal computer, and so forth) to the router. The device must support one of the following standards:

- EIA-232-D/V.24/V.28
- RS-449,RS-423-A/V.10
- RS-449,RS-422-A/V.11
- V.35
- V.36
- X.21 Leased Circuit
- BT Kilostream Service

Figure A-1 shows how the pins are numbered and Table A-1 describes the signals on each pin.

**Figure A-1: Pin Numbers for 50-Pin D-Connector**



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#### NOTE

A separate adapter cable is required for each standard. Section A.2.1 provides information on the correct adapter cables to use.

**Table A-1 : Pin Descriptions for 50-Pin D-Connector**

Pin	Signal Description	Signal Name	EIA-232-D	V.24	RS-423	RS-422	V.35	X.21	BT
1	Code Gnd								
2	Code 0 *								
3	Code 1 *								
4	Code 2 *								
5	Code 3 *								
6	Transmitted data A	TXD A				SD		T	T
7	Transmitted data B	TXD B				SD		T	T
8	Transmitted data	TXD	BA	103	SD				
9	Request to send A	RTS A				RS		C	
10	Request to send B	RTS B				RS		C	
11	Received data A	RXD A	BB	104	RD	RD		R	R
12	Received data B	RXD B	earth	earth	RD	RD		R	R
13	Local Loop	LOC LPBK	LL	141	LL	LL			
14	Data signal rate selector (DCE)	SMI	CI	112					
15	Test indicator	TEST IND	TM	142	TM	TM			
16	Remote loopback	REM LPBK	RL	140	RL	RL			
17	Ring indicator	RI	CE	125	IC	IC			
18	Receiver signal element timing (DCE) A	RXCLK A	DD	115	RT	RT		B	
19	Receiver signal element timing (DCE) B	RXCLK B	earth	earth	RT	RT		B	
20	Transmit signal element timing (DCE) A	TXCLK A	DB	114	ST	ST		S	S
21	Transmit signal element timing (DCE) B	TXCLK B	earth	earth	ST	ST		S	S
22	Transmit signal element timing (DTE)	CLK	DA	113	TT				
23	V35 Transmit signal element timing (DCE) A	V35 TXCLK A					114		
24	V35 Transmit signal element timing (DCE) B	V35 TXCLK B					114		
25	V35 Transmit signal element timing (DTE) A	V35 CLK A					113		
26	V35 Transmit signal element timing (DTE) B	V35 CLK B					113		

\* Code <0:3> identifies the adapter cable that is attached to the 50-pin connector.

**NOTE**

Pins 13 and 16 are not present on the European versions of the DEC WANrouter 90.

**Table A-1 : Pin Descriptions for 50-Pin D-Connector (Cont.)**

Pin	Signal Description	Signal Name	EIA-232-D	V.24	RS-423	RS-422	V.35	X.21	BT
27	V35 RXD A	V35 RXD A					104		
28	V35 RXD B	V35 RXD B					104		
29	V35 TXD A	V35 TXD A					103		
30	V35 TXD B	V35 TXDB					103		
31	V35 Receiver signal element timing (DCE)	V35 RXCLK A					115		
32	A V35 Receiver signal element timing (DCE) B	V35 RXCLK B					115		
33	Data terminal ready	DTR	CD	108/2	TR				
34	Data set ready A	DSR A	CC	107	DM	DM	107		
35	Data set ready B	DSR B	earth	earth	DM	DM	earth		
36	Request to send	RTS	CA	105	RS		105		
37	Data channel received line signal detector A	DCD A	CF	109	RR	RR	109	I	
38	Data channel received line signal detector B	DCD B	earth	earth	RR	RR	earth	I	
39	Clear to send send A	CTS A	CB	106	CS	CS	106		
40	Clear to send B	CTS B	earth	earth	CS	CS	earth		
41	DCE ground	DCE GND	earth	earth	RC	RC	earth		
42	Test transmit data	TEST TXD	**	**					
43	Test RTS	TEST RTS	**	**					
44	DTE ground	DTE GND	AB	102	SC	SC	102	Ga	
45	Data terminal ready A	DTR A				TR			
46	Data terminal ready B	DTR B				TR			
47	Terminal Timing A	CLOCK A				TT			
48	Terminal Timing B	CLOCK B				TT			
49	Test transmit clock	TEST TXCLK	**	**					
50	Data signal rate selector	DSRS	CH	111	SR	SR			

\*\* These three pins are used for testing.

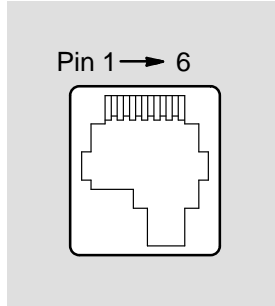
### A.1.3 Console Port Connector

The console port connector on the DEC WANrouter 90 is a modified modular jack (MMJ). The MMJ supports DEC 423 Data Leads Only connections.

Figure A-2 shows how the pins are numbered on an MMJ connector and Table A-2 lists the signals on the pins.



**Figure A-2: Pin Numbers for the Console Port Connector**



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**Table A-2 : Pin Descriptions for Console Port Connector**

Pin Number	Signal Name
1	Tied to VCC via 150-ohm resistor
2	Txdata
3	Txcommon
4	(N.C.)
5	Rxdata
6	Tied to GND via 3K-ohm resistor

## A.2 Cable Structure

This section describes the cable structures that are compatible with the device port and console port on the DEC WANrouter 90. Wiring diagrams of individual cables are provided for use in troubleshooting and cable building.

### NOTE

For the European versions of the DEC WANrouter 90, ignore the connections for pins 13 and 16 shown in the cable wiring diagrams in this section. These pins are not present on the European versions of the DEC WANrouter 90.

### A.2.1 Device Cables and Loopback Connectors for the Serial Communication 50-Pin D-Connector

You use an adapter cable and extension cable (see Section A.2.2 for information on extension cables) to connect a device to the 50-pin D-connector. Choose an adapter cable, to match the standard of the device you wish to connect, from the following list:

- BC19B-02 — Connects DEC WANrouter 90 to RS-422-A devices
- BC19E-02 — Connects DEC WANrouter 90 to RS-423-A devices
- BC19F-02 — Connects DEC WANrouter 90 to V.35 devices
- BC23V-02 — Connects DEC WANrouter 90 to V.24/RS-232 devices
- BC19D-02 — Connects DEC WANrouter 90 to V.24/RS-232 devices
- BC19V-02 — Connects the standalone version of the DEC WANrouter 90 to V.24/RS-232 devices
- BC22x-02 — Connects DEC WANrouter 90 to BT Kilostream Service (U.K.)
- BC19C-02 — Connects DEC WANrouter 90 to X.21 leased lines

#### CAUTION

The V.24 to RS-232-C adapter must be fitted between the adapter cable (BC23V-02, BC19D-02, or BC19V-02) and the extension cable if the modem/eliminator has:

- A signal with a DCE source on pin 18
- Signal quality implemented on pin 21
- Data signal rate selector (DCE) on pin 21

Failure to comply with this could result in damage to the interface module and modem or eliminator. If you are not sure what signals the modem or eliminator provides, contact Digital Field Service.

Use any of the following loopback connectors from the following list, that match your adapter cable combination:

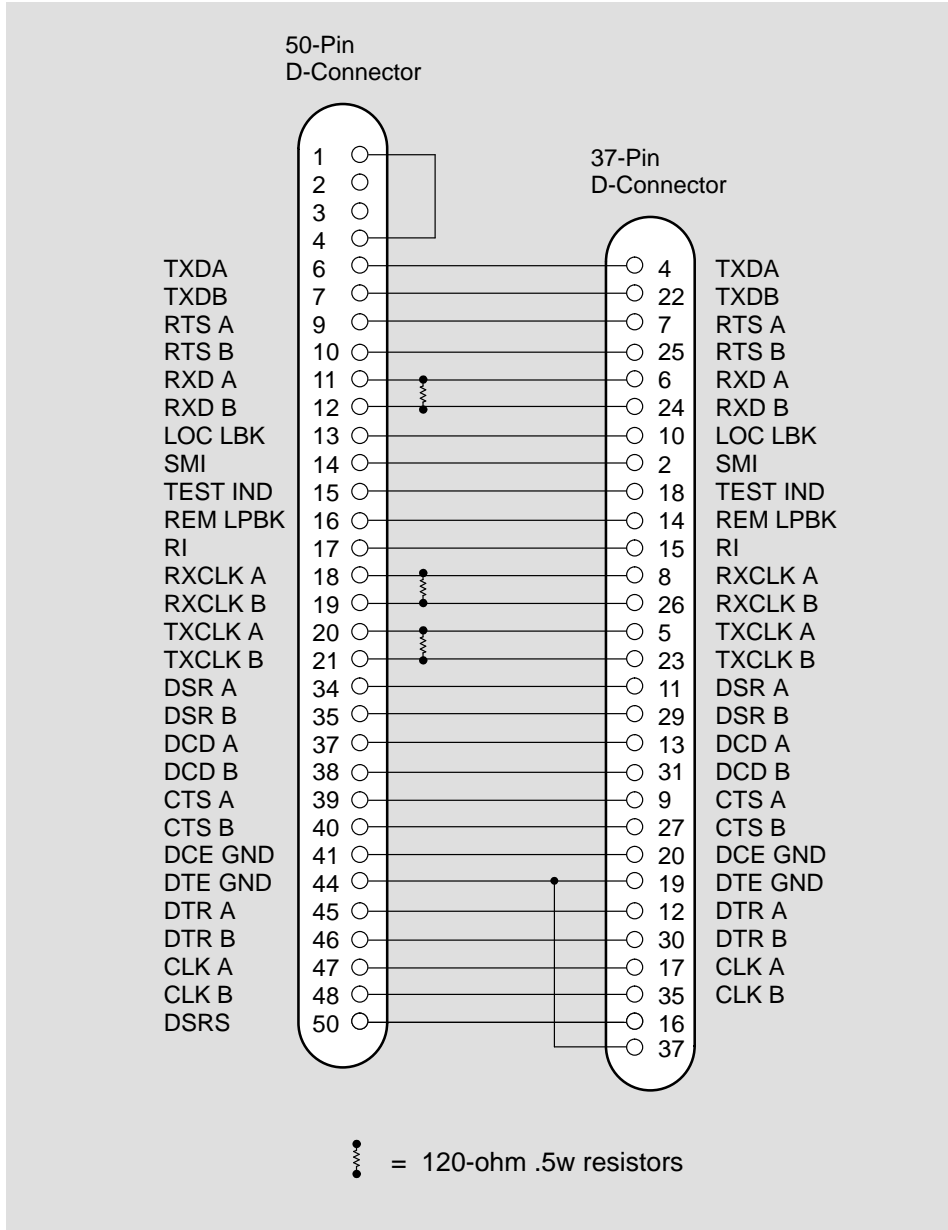
- H3199 — Universal 50-pin
- H3198 — Synchronous line loopback (RS-423-A and RS-422-A)
- H3250 — Synchronous line loopback (V.35)
- H3266 — Synchronous line loopback (EIA-232-D)

Sections A.2.1.1 through A.2.1.9 contain more information on these adapters and connectors.

#### **A.2.1.1 BC19B-02 Synchronous Line Adapter Cable**

Use the BC19B-02 synchronous line adapter cable to connect the DEC WANrouter 90 50-pin D-connector to RS-422-A devices. The BC19B-02 is 28-wire cable with a 50-pin, female, D-connector on one end and a 37-pin, male, D-connector on the other end. Figure A-3 shows the wiring diagram.

**Figure A-3: Wiring Diagram for BC19B-02 Synchronous Line Adapter Cable**

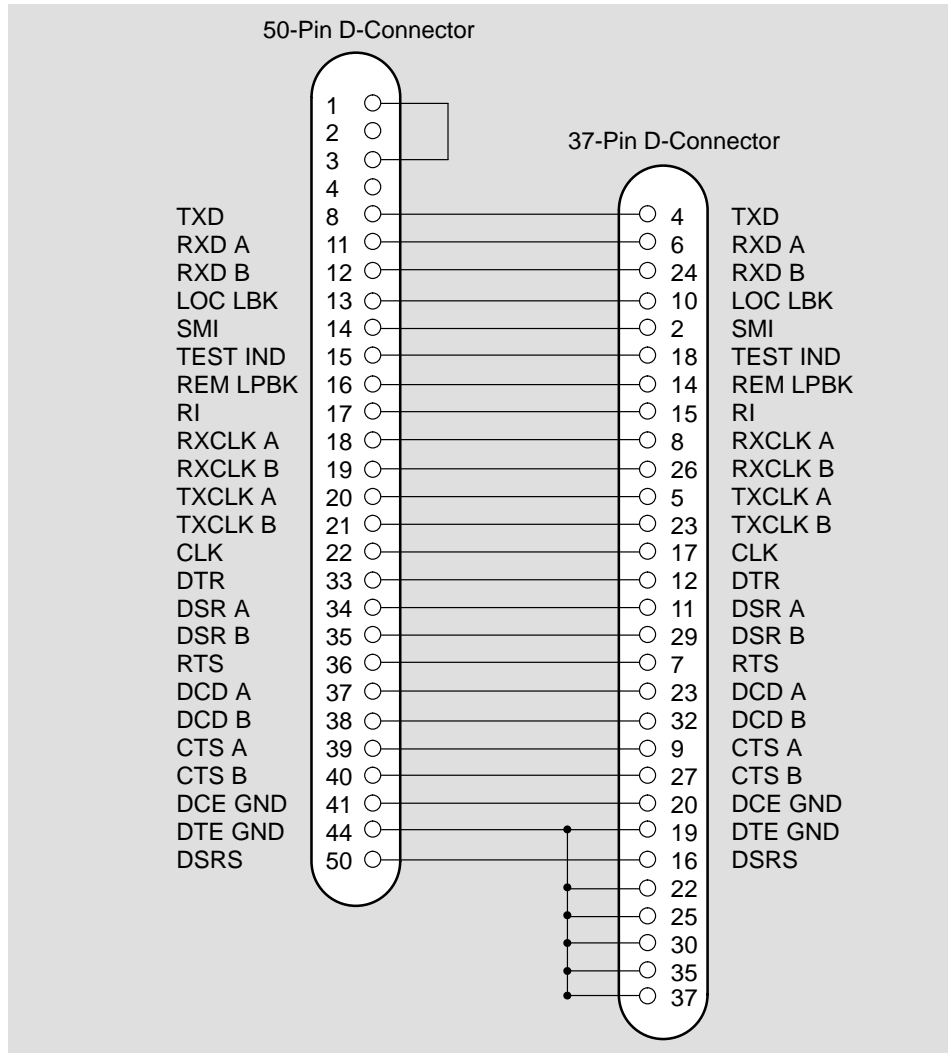


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### A.2.1.2 BC19E-02 Synchronous Line Adapter Cable

Use the BC19E-02 synchronous line adapter cable to connect the DEC WANrouter 90, 50-pin, D-connector to RS-423-A devices. The BC19E-02 is 24-wire cable with a 50-pin, female, D-connector on one end and a 37-pin, male, D-connector on the other end. Figure A-4 shows the wiring diagram.

**Figure A-4: Wiring Diagram for BC19E-02 Synchronous Line Adapter Cable**

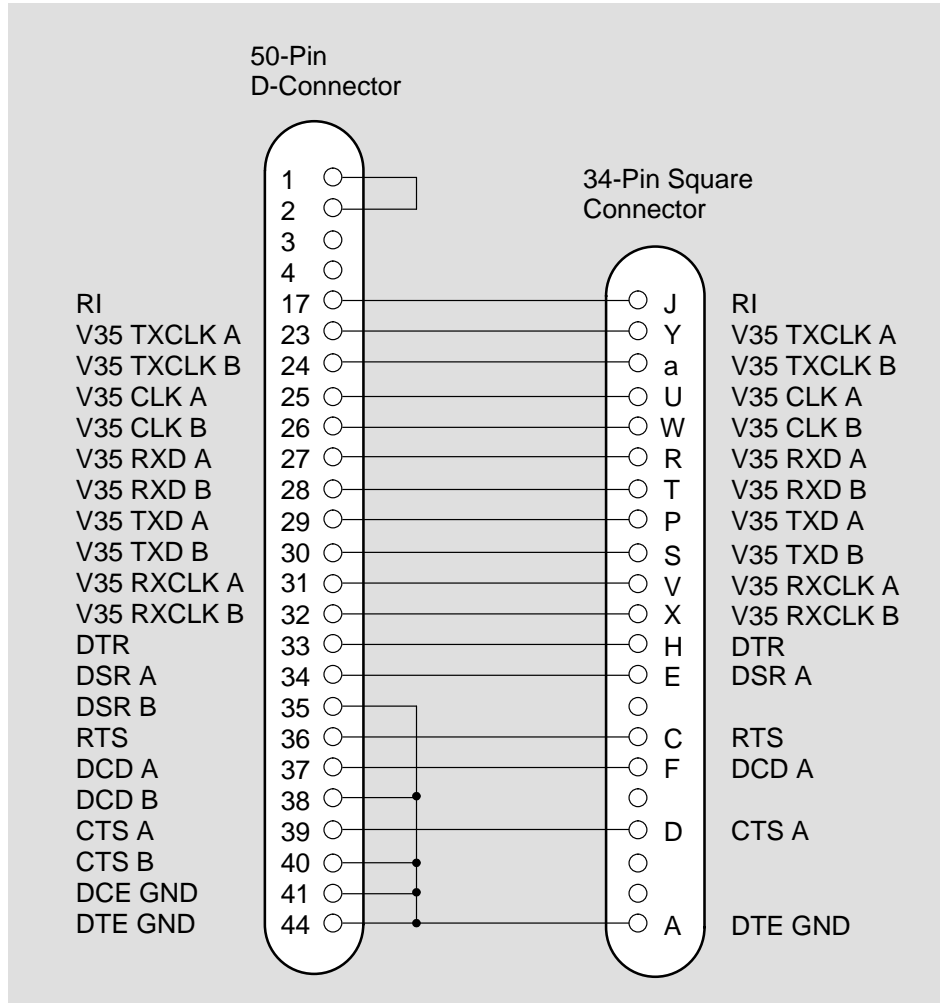


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### A.2.1.3 BC19F-02 Synchronous Line Adapter Cable

Use the BC19F-02 synchronous line adapter cable to connect the DEC WANrouter 90, 50-pin, D-connector to V.35 devices. The BC19F-02 is 16-wire cable with a 50-pin, female, D-connector on one end and a 34-pin, male, square connector on the other end. Figure A-5 shows the wiring diagram.

**Figure A-5: Wiring Diagram for BC19F-02 Synchronous Line Adapter Cable**



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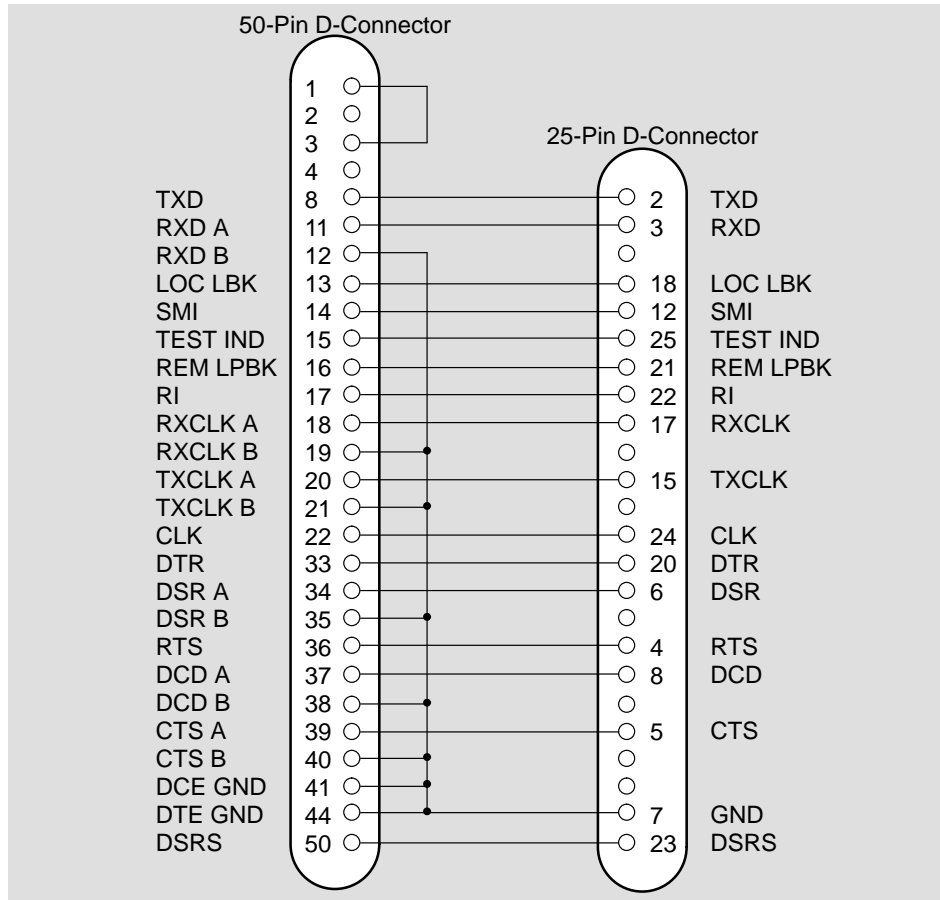
### A.2.1.4 BC23V-02, BC19V-02 and BC19D-02 Synchronous Line Adapter Cables

Use the BC23V-02, BC19V-02, or BC19D-02 synchronous line adapter cable to connect the DEC WANrouter 90, 50-pin, D-connector to V.24 devices. These cables are 16-wire cables with a 50-pin, female, D-connector on one end and a 25-pin, male, D-connector on the other end. Figure A-6 shows the wiring diagram.

#### NOTE

The BC19V-02 adapter cable can only be used in a standalone router configuration.

**Figure A-6: Wiring Diagram for BC23V-02, BC19V/D-02 Cables**

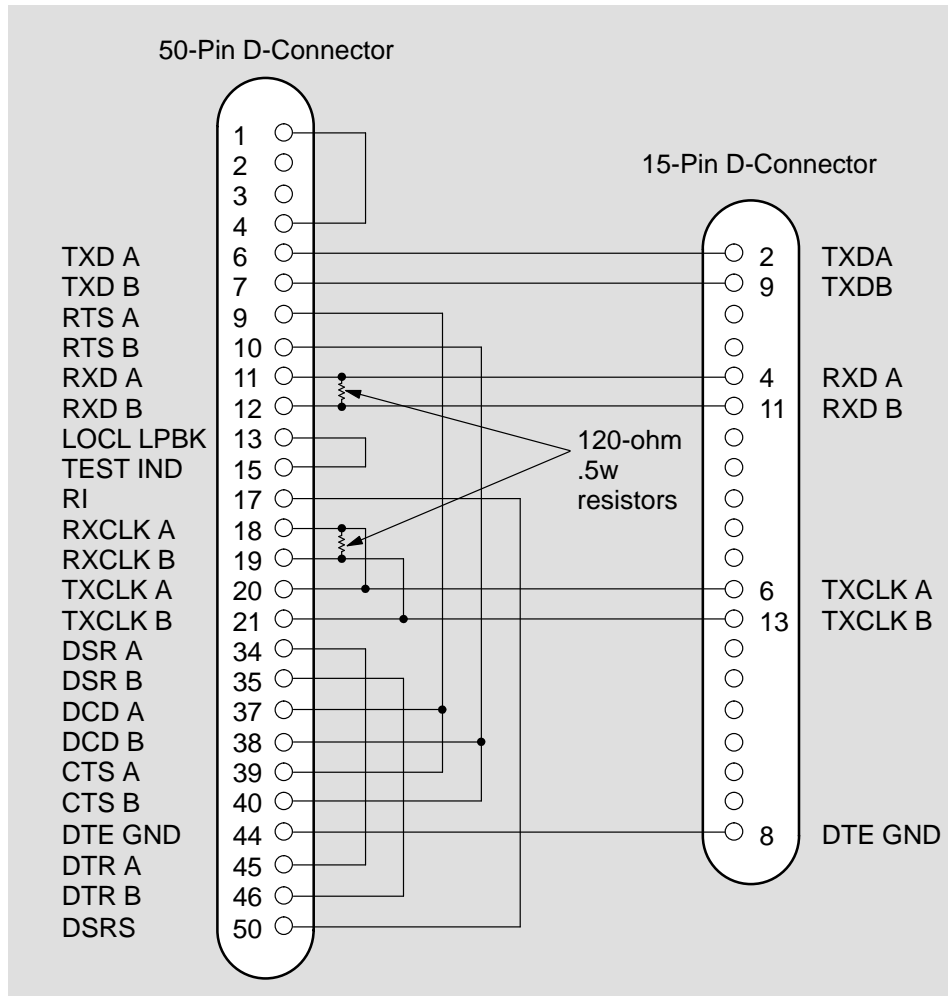


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### A.2.1.5 BC22X-02 BT Kilostream Adapter Cable (U.K. Only)

Use the BC22X-02 BT Kilostream adapter cable to connect the DEC WANrouter 90, 50-pin, D-connector to British Telecom's Kilostream service (through the BC22Z-xx extension cable and the 64k bit/s, X.21 interface). The BC22X-02 is 7-wire cable with a 50-pin, female, D-connector on one end and a 15-pin, male, D-connector on the other end. Figure A-7 shows the wiring diagram.

**Figure A-7: Wiring Diagram for BC22X-02 BT Kilostream Adapter Cable**



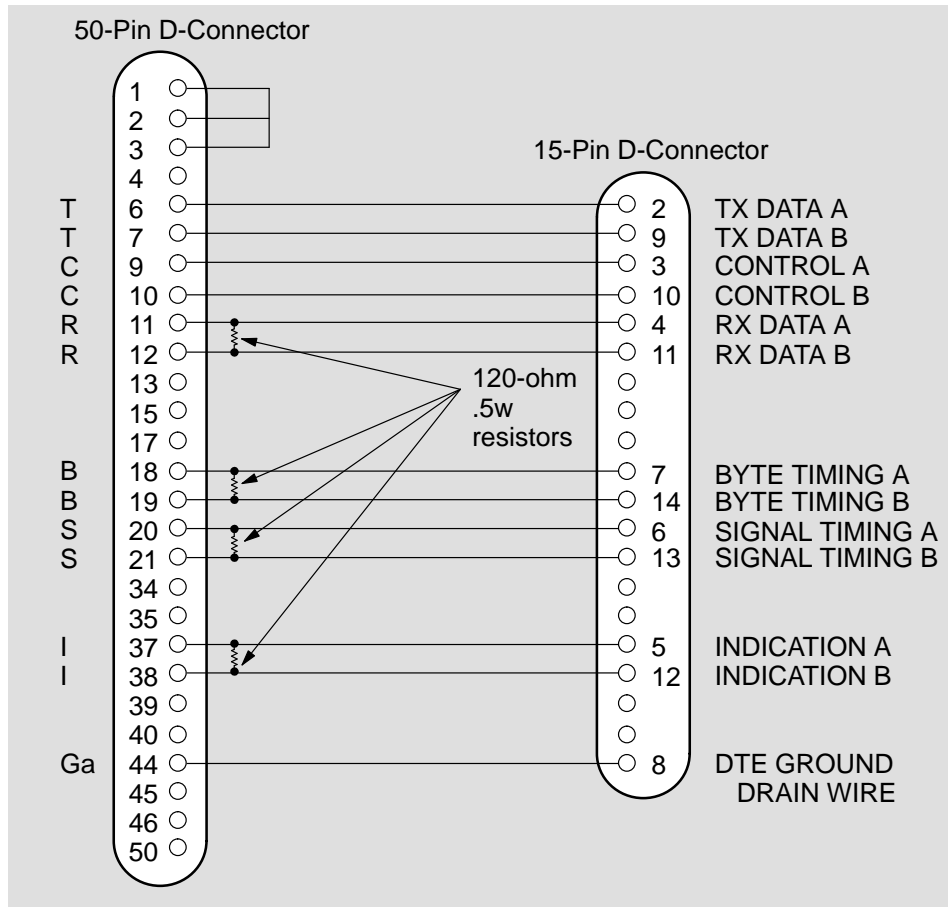
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### A.2.1.6 BC19C-02 Synchronous Line Adapter Cable

Use the BC19C-02 adapter cable to connect the DEC WANrouter 90, 50-pin, D-connector to X.21 leased lines. The BC19C-02 is 7-wire cable with a 50-pin, female, D-connector on one end and a 15-pin, male, D-connector on the other end. Figure A-8 shows the wiring diagram.

**Figure A-8: Wiring Diagram for BC19C-02 Synchronous Line Adapter Cable**

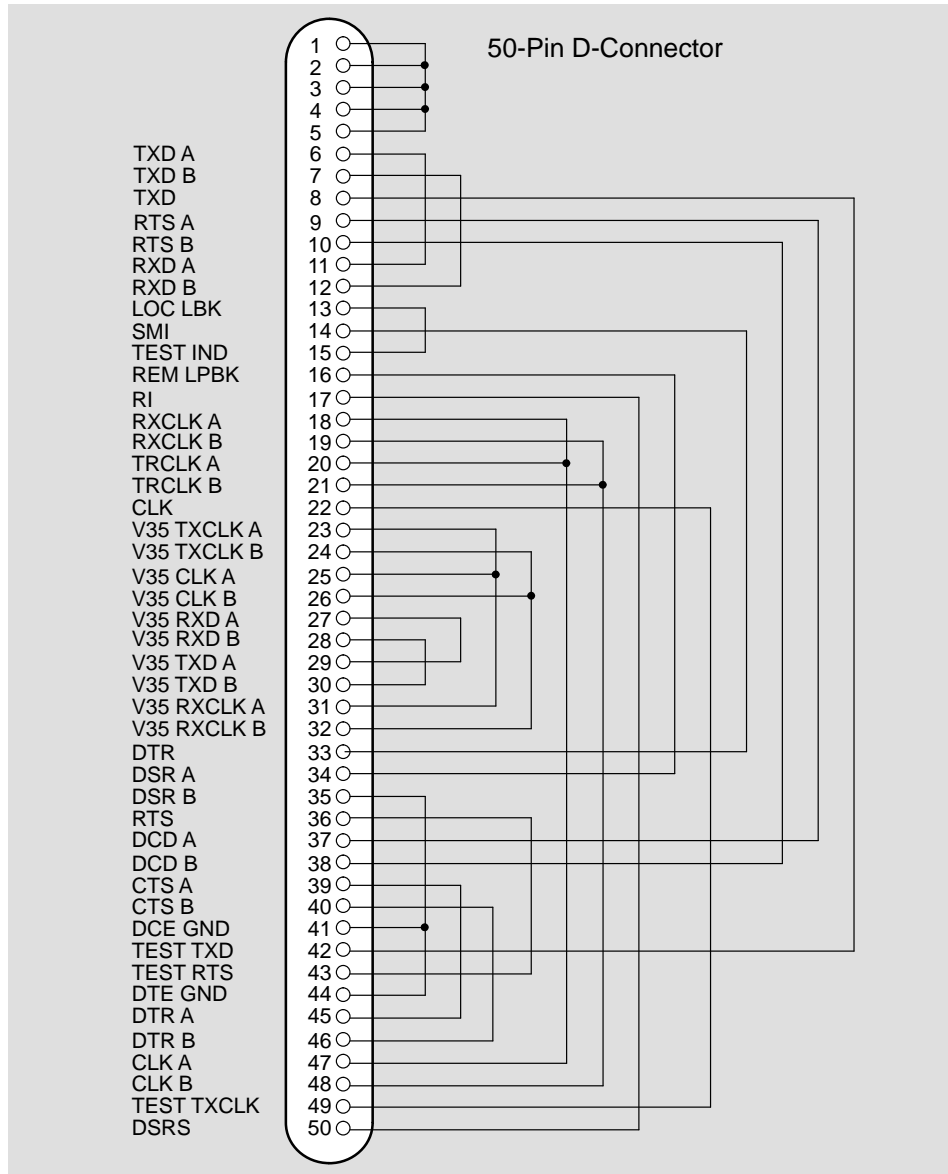


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### A.2.1.7 H3199 Universal, 50-Pin, Loopback Connector

Use the H3199 universal, 50-pin, loopback connector to test the 50-pin D-connector driver and receiver circuits. Figure A-9 shows the wiring diagram.

**Figure A-9: Wiring Diagram for H3199 Universal Loopback Connector**



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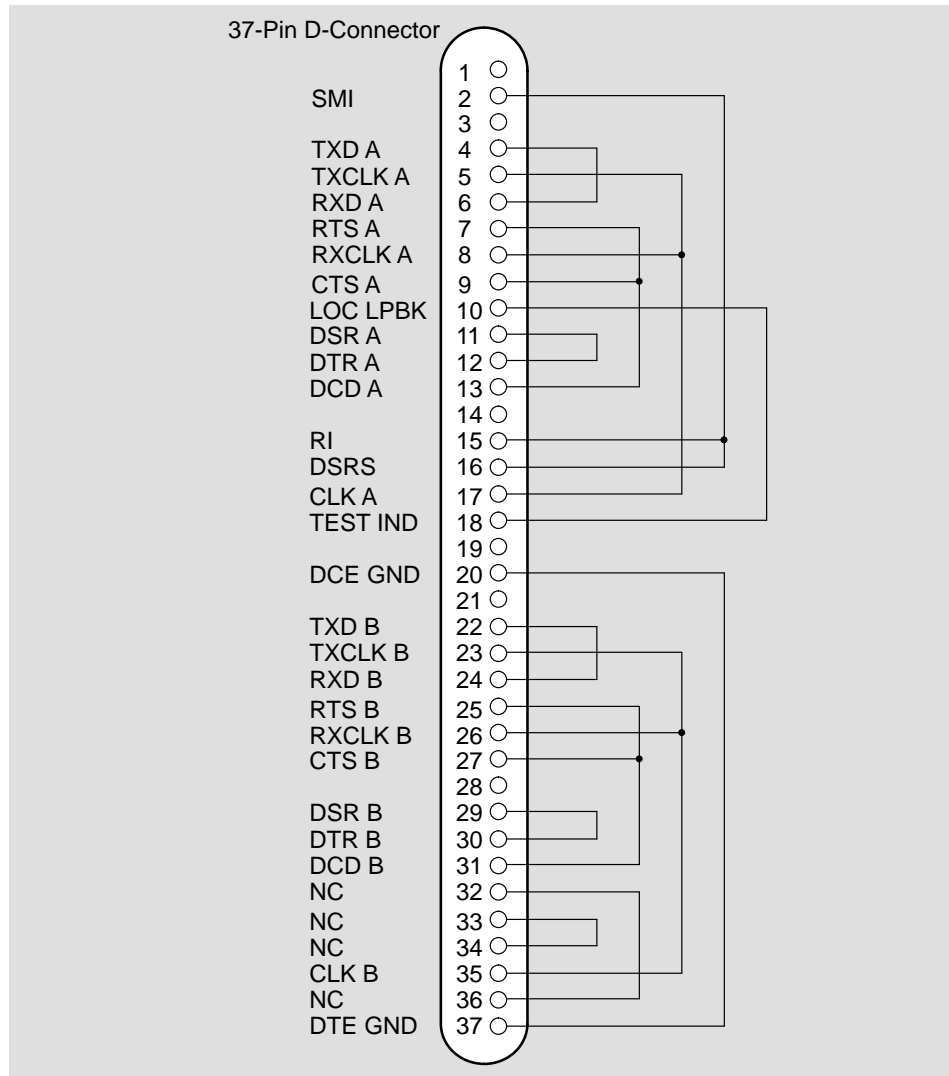
**A.2.1.8 H3198, 37-Pin, Loopback Connector**

Use the H3198, 37-pin, loopback connector to test the following:

- RS-422-A and the RS-423-A interfaces on the 50-pin D-connector
- RS-422-A and RS-423-A adapter cables

Figure A–10 shows the wiring diagram for the H3198 loopback connector.

**Figure A–10: H3198, 37-Pin, Loopback Connector**

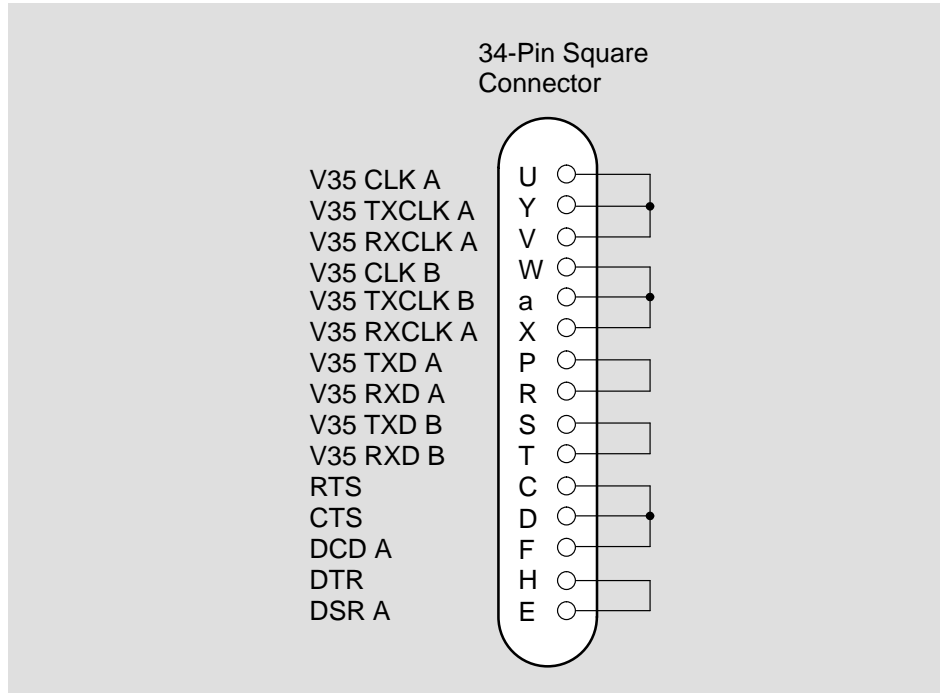


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### A.2.1.9 H3250, 34-Pin, Loopback Connector

Use the H3250, 34-pin, loopback connector to test the V.35 interface on the 50-pin, D-connector and the BC19F-02 adapter cable. Figure A-11 shows the wiring diagram of the H3250, 34-pin, loopback connector.

**Figure A-11: Wiring Diagram for H3250, 34-Pin, Loopback Connector**



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## A.2.2 Synchronous Line Extension Cables for Serial Communication

Use the cables in Table A-3 with the appropriate line adapter cables.

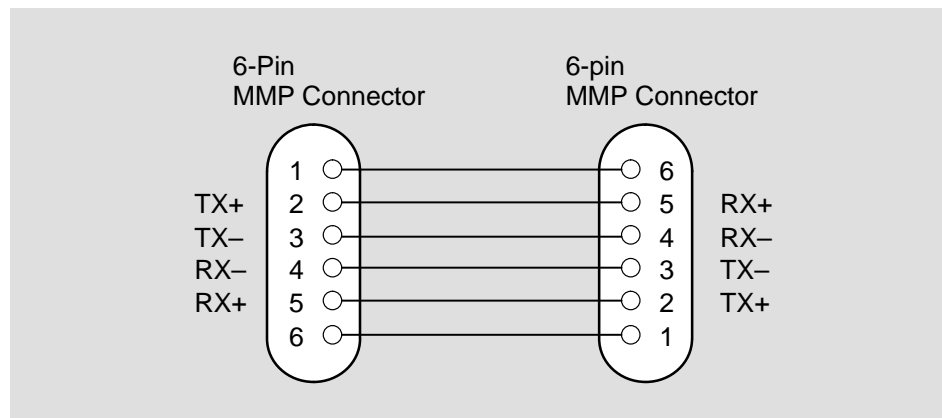
**Table A-3 : Synchronous Line Extension Cables**

Type	Description
BC55D-XX	Extends BC19B-02 line adapter cable (RS-422/V.36)
BC22F-YY	Extends BC19V-02 line adapter cable (V.2 4)
BC55D-XX	Extends BC19E-02 line adapter cable (RS-423-A)
BC19L-XX	Extends BC19F-02 line adapter cable (V.35)
BC22Z-XX	Extends BC22X-02 BT KiloStream Adapter Cable

## A.2.3 BC16E-xx 6-Conductor DEC Office Cable

Use the BC16E cable to connect a terminal to the console port. The BC16E is an unshielded 6-conductor flat cable. This cable is terminated at both ends with an MMP. Figure A-12 shows a wiring diagram of the BC16E-xx.

**Figure A-12: Wiring Diagram for BC16E-xx Cable**



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## How to Order Hardware

This appendix lists order codes for the DEC WANrouter 90, including optional items and cables. See your Digital sales representative to purchase equipment.

For a listing of software options, see the DEC WANrouter 90 *Software Product Description*.

### **B.1 DEC WANrouter 90, for Inclusion in DEChub 90 Ethernet Backplane**

As a minimum, the DEC WANrouter 90 hardware shipment consists of the following:

- DEC WANrouter 90 (without a back cover)
- *DEC WANrouter 90 Owner's Manual*
- H3199 loopback connector

The order number for this option is DEWAR-ME for European countries, and DEWAR-MA for all other countries.

## B.2 DEC WANrouter 90, for Standalone Use

When ordering a DEC WANrouter 90 for standalone use, the hardware shipment consists of the following:

- DEC WANrouter 90, including snap-on back cover
- *DEC WANrouter 90 Owner's Manual*
- H3199 loopback connector
- External power supply and cord

Table B-1 gives the order codes for this shipment.

**Table B-1: DEC WANrouter 90**

<b>Country</b>	<b>Order Code</b>
United States, Canada, Japan	DEWAR-AA
Finland, Belgium, France, Germany, Holland, Norway, Sweden, Spain, Austria	DEWAR-AX
Italy	DEWAR-AI
Israel	DEWAR-AT
Australia, New Zealand	DEWAR-AZ
Switzerland	DEWAR-AK
United Kingdom, Ireland	DEWAR-AE
India, South Africa	DEWAR-BJ
Denmark	DEWAR-AD

### B.3 How to Order Multiple Units

To order quantities of 24 units, prefix the order code with DL. For example, to order 24 units for inclusion into multiple DEChub 90 Ethernet backplanes installed in the United States (or any other country outside of Europe), use the following order code:

DL-DEWAR-MA

Similarly, to order 24 standalone units for use in Germany, France, Finland, Austria and so on, use the following order code:

DL-DEWAR-AX

### B.4 DEC WANrouter 90 Accessories

Table B-2 describes the routers accessories and gives their order codes. Generally, you would only order these accessories when switching from a DEChub 90 backplane configuration to a standalone configuration.

**Table B-2: DEC WANrouter 90 Accessories**

Description	Order Code
Back cover — used for standalone installations only	H3042-AA
External power supply — used for standalone installations only. There are two versions:	
• 120V power supply with integral power connector	H7082-AA
• 240V power supply with IEC connection	H7082-AB

### B.5 DEC WANrouter 90 Device Cables and Adapters

Table B-3 shows the cables and adapters available to connect devices (modems, personal computers, and hosts) to the DEC WANrouter 90.

#### NOTE

The RS-232-C/EIA-232-D adapter, Digital part number 12-27591-01, can be obtained by contacting your local Digital service office.



**Table B-3: DEC WANrouter 90 Device Cables and Adapters**

Description	Order Code
Null modem cable, 6-wire, fully shielded EIA-232-C/V.28	BC22D-YY *
Null modem cable, 10-wire, fully shielded EIA-232-C/V.28	BC17D-YY*
Full, EIA-232-C/V.28, modem cable, 25-wire, fully shielded	BC22F-YY *
Synchronous line adapter cable, DEC WANrouter 90 to RS-422/V36	BC19B-02
Synchronous line adapter cable kit, DEC WANrouter 90 to V.24	BS23V-02 #
Synchronous line adapter cable kit, DEC WANrouter 90 to V.24	BS19V-02 ##
Synchronous line adapter cable kit, DEC WANrouter 90 to V.24	BS19D-02
Synchronous line adapter cable, DEC WANrouter 90 to RS-423	BC19E-02
Synchronous line adapter cable, DEC WANrouter 90 to V.35	BC19F-02
BT Kilostream adapter cable, DEC WANrouter 90 to BT Kilostream	BC22X-02
Synchronous line extension cable, RS-422/RS-423/V.36	BC55D-XX **
Synchronous line extension cable, V.35	BC19L-XX **
X.21 modem extension cable, BT Kilostream service	BC22Z-XX **
Synchronous line extension cable, RS-232/V.24	BC22F-XX
Universal 50-pin loopback connector	H3199
Console port loopback connector	H3103
RS-232 loopback connector	H3248
Synchronous line loopback connector (RS-423/RS-422)	H3198
Synchronous line loopback connector (V.35)	H3250
25-pin, male to MMJ (modified modular jack), adapter	H8571-A
25-pin, female to MMJ (modified modular jack), adapter	H8571-B
X.21 line adapter cable	BC19C-02

---

* YY represents one of:	** XX represent one of:
10            10 ft (3.1 m)	25            25 ft (7.6 m)
25            25 ft (7.6 m)	50            50 ft (15.2 m)
35            35 ft (10.7 m)	75            75 ft (22.9 m)
50            50 ft (15.2 m)	A0            100 ft (30.5 m)

# Includes BC23V-02 cable and 12-27591-01 adapter    ## Use with standalone version only  
Note: For U.K. installations, the total length of V.28 and V.35 cables must not exceed 27 ft, comprising 2 ft for the adapter cable and 25 ft for the extension cable.

---

## **B.6 DEC WANrouter 90 Field Replacement Unit (FRU)**

Use the following order code to order a replacement unit in the event the router is found to be defective:

- DEWAR-M (for all DEWAR-MA and DEWAR-AA units)
- DEWAR-E (for all other units)

The replacement unit (FRU) consists of a single DEC WANrouter 90. It does not include an owner's manual, rear cover, loopback connectors, or external power supply. For information about ordering accessories, refer to Section B.4.

---

## Bootline Configuration Program

This chapter describes how to use the Bootline Configuration Program (BCP) to configure the DEC WANrouter 90 for serial line loading.

### C.1 Introduction

The Bootline Configuration Program (BCP) allows you to configure the DEC WANrouter 90 serial port so that software can be down-line loaded to the router over a serial line. You can also use BCP to examine the current parameters of the serial port and to test the attached modem and cable.

BCP supports the following commands:

- **CONFIGURE** — Sets the parameters for the serial port. It can also be used to change the load protocol.
- **SHOW** — Displays the current parameters of the serial port, or displays the selected load protocol.
- **TEST** — Performs loopback testing on the serial port and its associated cable and modem.
- **CONTINUE** — Returns the router to firmware control.

The DEC WANrouter 90 is factory preset for down-line loading over the Ethernet. However, when the serial port is configured for down-line loading, software can no longer be down-line loaded through the router's Ethernet interface. To enable the DEC WANrouter 90 Ethernet interface for down-line loading, you use BCP to change the load protocol to BOOTP/TFTP, as described in Section C.5.5. When BOOTP/TFTP is selected, serial port down-line loading is automatically disabled.

## C.2 Howto Enter BCP

Enter BCP by pressing Ctrl/B under one of the following conditions:

- When the router passes its self-test and is attempting to load using MOP.

The terminal attached to the router's console port will show one of the following messages:

```
Init -1101- Attempting to locate load host, [IS08802]
Init -1101- Attempting to locate load host, [ETHERNET]
Init -1100- Requesting load on serial line
Init -1103- Router will retry operation in n seconds
```

- When the router passes the self-test and is attempting to load using BOOTP/TFTP.

Only when the terminal displays the following message can BCP be entered using Ctrl/B:

```
Init -1314- Router will retry operation in n seconds
```

- When prompted by the screen display:

```
Init -1004- Enter Ctrl/B to enter BCP
```

This prompt occurs when neither the serial port or Ethernet interface have been enabled to load the software, or the enabled port has failed self-test.

- When prompted by the screen display:

```
Init -1003- Enter Ctrl/P to repeat self-test or enter Ctrl/B to enter BCP
```

This prompt occurs when the Ethernet port has been enabled to load the software but fails self-test and the serial port is not available for loading.

If the router is trying to load over the serial line, when you type Ctrl/B, there is a delay of approximately five seconds and the following message is displayed:

```
Init -1122- Entering BCP, please wait
```

### **C.3 BCP Commands**

The following subsections describe the BCP commands and the last subsection describes how to abort a command.

#### **C.3.1 CONFIGURE Command**

Use the CONFIGURE command to:

- Select MOP or BOOTP/TFTP for downline loading.

If BOOTP/TFTP is selected, then the router only attempts to load over the Ethernet.

- Enable/disable downline load over the Ethernet.

If downline loading over the Ethernet is disabled, the BCP program will inform the firmware and the firmware will only attempt to downline load through the serial port.

- Set the node password for the router.

This password is used by the router to accept or reject information. This password is set by the network manager.

- Set the serial port parameters.

Table C-1 shows the serial port parameters.

**Table C–1: Serial Port Parameters**

Parameter	Possible Values
Line State	Enable or disable (downline load)
Modem Control/ Data Leads Only	Modem control or data leads only
Protocol Type	Digital Data Communications Message Protocol (DDCMP) or High-level Data Link Control (HDLC)
Mode	Synchronous or asynchronous
Modem Control/ Data Leads Only	Data leads only
Speed <sup>1</sup>	300, 600, 1200, 2400, 4800, 9600, 19200, or 38400 baud

<sup>1</sup> You can set speed in asynchronous mode only.

### C.3.2 SHOW Command

Use the SHOW command to:

- Display the selected load protocol.
- Display the current parameters of the serial port. See Table C–1 for a list of the serial port parameters.
- Display the node parameters for the router. The node parameters are the router password, Ethernet down-line loading (enabled or disabled), and the router address.

### C.3.3 TEST Command

Use the TEST command to perform loopback testing on the serial port and its associated cable and modem. The test command has four modes:

- Internal loop — Use this mode to run the self-test loopback tests. The port connector and its internal wiring are not checked during this test.
- External loop — Use this mode to test:

- A port connector and its internal wiring. You must terminate the port with an H3199 loopback connector.
- The port connector, its internal wiring, and associated cables. You must terminate the cables with a loopback connector.
- Local loop — Use this mode to test as far as the local modem. This test assumes that the modem recognizes the local loop modem signal.
- Remote loop — Use this mode to test as far as the remote modem. This test assumes that the remote modem recognizes the remote loop modem signal.

#### **C.3.4 CONTINUE Command**

Use the CONTINUE command to exit BCP.

#### **C.3.5 How to Abort a Command Within BCP**

To abort a CONFIGURE/SHOW/TEST command, press the Escape key.

### **C.4 BCP Messages**

This section describes the BCP messages that may appear on the console terminal.

#### **C.4.1 CONFIGURE Command Messages**

BCP displays the following messages if you make an error configuring the node password:

Init -1200- Password too long – enter 8 byte password  
 Init -1201- Invalid password – enter hexadecimal number

BCP displays the following messages if it finds a checksum error when you configure/show the node password:

Init -1206- Checksum error found in maintenance password section  
 Init -1207- Factory defaults applied to this section

BCP displays the following messages if it finds a checksum error when you configure/show the serial port parameters:

Init -1204- Checksum error found in line parameters section  
 Init -1207- Factory defaults applied to this section

BCP displays the following messages if it finds a checksum error when you enable/disable/show the Ethernet port:

Init -1205- Checksum error found in NI parameters section  
Init -1207- Factory defaults applied to this section

BCP displays the following messages if it finds a checksum error when you configure/show the load protocol:

Init -1209- Checksum error found in Load Protocol section  
Init -1207- Factory defaults applied to this section

#### **C.4.2 TEST Command Messages**

BCP displays the following message if the router fails the specified test:

Init -1202- Test failed

BCP displays the following message if the router passes the specified test:

Init -1208- Test passed

#### **C.4.3 General Messages**

BCP displays the following message if you make a mistake entering command keywords:

Init -1203- Unrecognised or ambiguous keyword

### **C.5 Configuring the Serial Port Parameters, Node Parameters, and Load Protocol**

This section describes how to configure the serial port parameters, node parameters, and load protocol using the CONFIGURE command. For the factory set parameter values, refer to Section C.8.



## NOTE

In the following procedures, default values are shown in square brackets. In the case of the CONFIGURE command, the default value is the value that the parameter was set to during the previous use of the command. For the sake of explanation, it is assumed that the default values used in the following examples apply.

You should also note that the BCP program refers to ports as lines.

### C.5.1 How to Configure Serial Port Parameters

Perform the following steps to configure the serial port parameters:

1. Enter CONF at the BCP command prompt as follows:

```
BCP>CONF 
```

The terminal displays:

```
(LINE, NODE, LOAD_PROTOCOL) [LINE]:
```

2. To select LINE, press Return.

The terminal displays:

```
[1]:
```

3. Press Return.

The terminal displays:

```
(ENABLE, DISABLE) [ENABLE]:
```

4. To enable the port for down-line loading, press Return.

The terminal displays:

```
(MODEM_CONTROL, DATA_LEADS_ONLY) [DATA_LEADS_ONLY]:
```

5. To enable the port for modem control, enter MODEM\_CONTROL at the prompt as follows:

```
(MODEM_CONTROL,DATA_LEADS_ONLY)  
[DATA_LEADS_ONLY]:MODEM_CONTROL 
```

The terminal displays:

(LINE PROTOCOL) [DDCMP]:

6. To select DDCMP, press Return.

Alternatively, you can type HDLC to select the High-level Data Link Control protocol (HDLC).

The terminal displays:

(SYNC ASYNC) [SYNC]:

7. To select ASYNC, enter ASYNC at the prompt as follows:

(SYNC ASYNC) [SYNC]:ASYNC

If you choose SYNC, no further prompting is required as the speed is set by the external clock.

The terminal displays:

(300, 600, 1200, 2400,  
4800, 9600, 19200, 38400) [300]:

8. To select 19200, enter 19200 at the prompt:

(300, 600, 1200, 2400,  
4800, 9600, 19200, 38400) [300]:19200

You have now configured the serial port for down-line loading, using DDCMP protocol, asynchronously, at a speed of 19200 bits/s. The terminal displays:

BCP>

9. To return command of the router to the firmware, type:

BCP>CONTINUE

The following example shows how to enable the serial port and configure it for DDCMP, ASYNC, 9600 baud.

```

BCP>CONF 
(LINE, NODE, LOAD_PROTOCOL) [LINE]: 
[1]: 
(ENABLE, DISABLE) [DISABLE]:ENABLE 
(MODEM_CONTROL, DATA_LEADS_ONLY) [DATA_LEADS_ONLY]:
MODEM_CONTROL 
(LINE PROTOCOL) [DDCMP]: 
(SYNC, ASYNC) [ASYNC]: 
(300, 600, 1200, 2400, 4800, 9600, 19200, 38400) [4800]:9600 
BCP>CONTINUE 

```

### C.5.2 How to Configure Node Parameters

The following subsections describe how to configure the node parameters of the router.

### C.5.3 How to Enable/Disable Ethernet Down-line Load

To enable/disable Ethernet downline load, use the following procedure:

1. Enter CONF at the BCP command prompt:

```
BCP>CONF 
```

The terminal displays:

```
(LINE, NODE, LOAD_PROTOCOL) [LINE]:
```

2. To select NODE, enter NODE and press Return. The terminal displays:

```
(NI, SERVICE_PASSWORD) [NI]:
```

3. To select NI, press Return.

The terminal displays:

```
(NI_ENABLED, NI_DISABLED) [NI_ENABLED]:
```

4. To disable downline loading on the Ethernet, enter:

```
NI_DISABLE 
```

5. To return control of the router to the firmware, type CONTINUE at the BCP command prompt and press Return:

```
BCP>CONTINUE 
```

#### **C.5.4 How to Set the Router Password**

To set the router password, use the following procedure:

1. Enter CONF at the BCP command prompt:

```
BCP>CONF 
```

The terminal displays:

```
(LINE, NODE, LOAD_PROTOCOL) [LINE]:
```

2. To select NODE, enter NODE and press Return. The terminal displays:

```
(NI, SERVICE_PASSWORD) [NI]:
```

3. To set the password, enter:

```
SERVICE_PASSWORD 
```

The terminal displays:

```
Enter New Service Password:
```

4. Enter a new service password, for example:

```
Enter New Service Password>:fa0a5a 
```

5. To return control of the router to the firmware, type CONTINUE at the BCP command prompt and press Return:

```
BCP>CONTINUE 
```

#### **C.5.5 How to Configure the Load Protocol**

To configure the load protocol, use the following procedure:

1. Enter CONF at the BCP command prompt:

```
BCP>CONF 
```

The terminal displays:

(LINE, NODE, LOAD\_PROTOCOL) [LINE]:

2. To select LOAD\_PROTOCOL, type LOAD\_PROTOCOL and press Return.

The terminal displays:

(MOP, BOOTP/TFTP) [MOP]:

3. To select BOOTP/TFTP, enter BOOTP/TFTP and press Return; otherwise just press Return to accept the default.
4. To return control of the router to the firmware, type CONTINUE at the BCP command prompt and press Return:

```
BCP>CONTINUE 
```

#### NOTE

When the load protocol is BOOTP/TFTP, none of the other configuration parameters are applicable. All other parameters apply only when MOP is the selected protocol. It is therefore not possible to configure these when BOOTP/TFTP is the selected load protocol.

## C.6 Checking Serial Port Parameters and Node Parameters

This section describes how to check the serial port parameters and node parameters using the SHOW command.

### C.6.1 How to Check Serial Port Parameters

To check the serial port parameters, use the following procedure:

1. Enter SHOW at the BCP command prompt:

```
BCP>SHOW 
```

The terminal displays:

(LINE, NODE, LOAD\_PROTOCOL) [LINE]:

2. Press Return.

The terminal displays:

[1]:

3. Press Return. The terminal displays the parameters, for example:

Protocol Type	:[DDCMP]
Mode	:[ASYNC]
Speed	:[19200]
Modem Control	:[MODEM_CONTROL]
Loading enabled or disabled	:[ENABLED]

### C.6.2 How to Check Node Parameters

To check node parameters, use the following procedure.

1. Enter SHOW at the BCP command prompt:

```
BCP>SHOW 
```

The terminal displays:

(LINE, NODE, LOAD\_PROTOCOL) [LINE]:

2. Type NODE and press Return. The terminal displays the node parameters, for example:

```
NI is ENABLED  
Units maintenance password is:0000000000FA0A5A  
Units Station address:08-00-2B-12-34-56
```

### C.6.3 How to Check the Selected Load Protocol

To check the selected load protocol, use the following procedure:

1. Enter SHOW at the BCP command prompt:

```
BCP>SHOW 
```

The terminal displays:

(LINE, NODE, LOAD\_PROTOCOL) [LINE]:

2. Type `LOAD_PROTOCOL` and press Return. The terminal displays the selected load protocol, for example:

The Load Protocol enabled is MOP

## C.7 Testing the Serial Port, Cable and Modem

This section describes how to test the serial port, cable and modem using the `TEST` command.

### C.7.1 How to Test the Serial Port

To test the serial port, use the following procedure:

1. Enter `TEST` at the BCP command prompt:

```
BCP>TEST 
```

The terminal displays:

```
[1]:
```

2. Press Return. The terminal displays:

```
(LOCAL_LOOP REMOTE_LOOP EXTERNAL_LOOP  
INTERNAL_LOOP) [LOCAL_LOOP]:
```

3. To test the serial port, enter the following at the prompt

```
INTERNAL_LOOP 
```

The test is now started. If the test is successful, the terminal displays:

```
Init -1208- Test passed
```

### C.7.2 How to Test the Serial Port Using a Loopback Connector

To test the serial port with a loopback connector, connect the H3199 loopback connector to the serial port and perform the following steps:

1. Enter `TEST` at the BCP command prompt:

```
BCP>TEST 
```

The terminal displays:

[1]:

2. Press Return. The terminal displays:

```
(LOCAL_LOOP REMOTE_LOOP EXTERNAL_LOOP  
INTERNAL_LOOP) [LOCAL_LOOP]:
```

3. To test the serial line using a loopback connector, enter the following at the prompt:

```
EXTERNAL_LOOP 
```

The test is now started. If the test is successful, the terminal displays:

```
Init -1208- Test passed
```

### C.7.3 How to Test the Serial Port and Cable

To test the serial port and its cables, terminate the cable with a loopback connector, and perform the following steps:

1. Enter TEST at the BCP command prompt:

```
BCP>TEST 
```

The terminal displays:

[1]:

2. Press Return. The terminal displays:

```
(LOCAL_LOOP REMOTE_LOOP EXTERNAL_LOOP  
INTERNAL_LOOP) [LOCAL_LOOP]:
```

3. To test the serial line and cable using a loopback connector attached to the cable, enter the following at the prompt:

```
EXTERNAL_LOOP 
```

The test is now started. If the test is successful, the terminal displays:

```
Init -1208- Test passed
```



#### C.7.4 How to Test the Serial Port, Its Cable, and Its Local Modem

To test the serial port, its cable, and its local modem, use the following procedure:

1. Enter TEST at the BCP command prompt:

```
BCP>TEST 
```

The terminal displays:

```
[1]:
```

2. Press Return. The terminal displays:

```
(LOCAL_LOOP REMOTE_LOOP EXTERNAL_LOOP  
INTERNAL_LOOP) [LOCAL_LOOP]:
```

3. To test the serial line using a loopback connector, enter the following at the prompt:

```
LOCAL_LOOP 
```

The test is now started. If the test is successful, the terminal displays:

```
Init -1208- Test passed
```

#### C.7.5 How to Test the Serial Port, Its Cables, Its Local Modem, Its Modem Line, and Remote Modem

To test the serial port, its cables, its local modem, its modem line and remote modem, use the following procedure:

1. Enter TEST at the BCP command prompt:

```
BCP>TEST 
```

The terminal displays:

```
[1]:
```

2. Press Return. The terminal displays:

```
(LOCAL_LOOP REMOTE_LOOP EXTERNAL_LOOP  
INTERNAL_LOOP) [LOCAL_LOOP]:
```

3. To test the serial line using a loopback connector, enter the following at the prompt:

```
REMOTE_LOOP 
```

The test is now started. If the test is successful, the terminal displays:

```
Init -1208- Test passed
```

## C.8 Factory Set Parameters

Table C-2 shows the factory set parameter values.

**Table C-2: Factory Set Parameters**

Parameter	Value
Load Protocol	MOP
Router password	0
Ethernet	Enabled
Line State	Enabled (downline load)
Modem Control/ Data Leads Only	Data leads only
Protocol Type	DDCMP
Mode	Synchronous
Speed	9600 bits/s

---

## U.K. Required Information

This appendix provides important information required for all installations in the United Kingdom (U.K.). If you are installing the DEC WANrouter 90 in the U.K., you must refer to this appendix before starting the installation.

### D.1 Safety Warning for United Kingdom Installations

As required by the British PTT authority (BABT), the DEC WANrouter 90 includes a safety label. The safety label states:

**SAFETY WARNING.** See instructions for use before making any connection to this module.

Before installing the DEC WANrouter 90 in the U.K., you must read the following warning message:

### **WARNING**

The DEC WANrouter ports indicated in Figure D-1 do not provide isolation sufficient to satisfy the requirements of the relevant parts of BS6301. Therefore, any apparatus connected to these ports must comply with one of the following:

- The apparatus is covered by OFTEL's General Approval NS/G/1234/J/100003. (All products supplied by Digital comply with this General Approval.)
- The apparatus has been approved to BS6301.
- The apparatus has been evaluated against British Telecom (Post Office) Technical Guides 2 or 26 and has been given permission to attach.

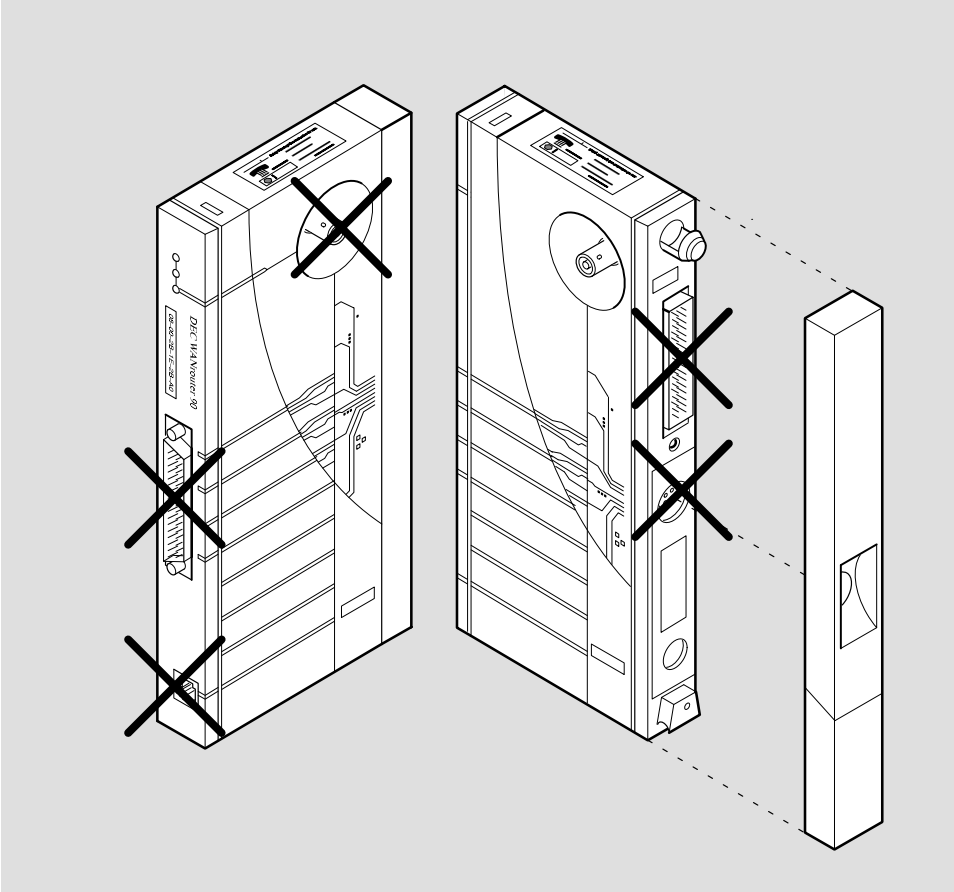
Other usage will invalidate any approval given to this apparatus.

Connecting the router's ports to the ports on another device, whether directly or by way of another apparatus, may produce hazardous conditions on the network. Advice should be obtained from a competent engineer before such a connection is made.

#### **D.1.1 Connection of Power Supply**

For standalone installations only, this apparatus is intended for use when powered by the H7082-AB external power supply unit. Other usage will invalidate any approval given to this apparatus if as a result it ceases to comply with the edition of BS6301 to which it was approved.

**Figure D-1: Ports Affected by U.K. Safety Warning**



LKG-6722-92

**D.2 Service Categories**

Table D-1 provides information about the service categories supported by the DEC WANrouter 90.

**Table D-1: Service Categories**

Service Category	Interface Type	Data Rate	PTO			Service Requirements																	
			BT	Hull	MCL	Physical	Electrical																
1	CCITT Recommendation X.21bis	2.4 Kbps	Yes	Yes	Yes	ISO 2110 BS 6623: Part 1 1985	V.24/V.28 Cables: BC19D-02 BC19V-02 BC22F-25																
		4.8 Kbps	Yes	Yes	Yes																		
		9.6 Kbps	Yes	Yes	Yes																		
		19.2 Kbps	No	No	Yes																		
2	CCITT Recommendation X.21bis	48 Kbps	Yes	Yes	Yes	ISO 2593 BS 6623: Part 4 1986	V.35 Cables: BC19F-02 BC19X-02 BC19L-25																
		56 Kbps	Yes	No	Yes																		
		64 Kbps	No	No	Yes																		
<p>PTO – Public Telecommunications Operators            BT – British Telecommunications plc            Hull – Kingston Communications (Hull) plc            MCL – Mercury Communications Limited</p> <p>The total length of cable used must not exceed 27 feet, comprising:</p> <table> <tr> <td>Cat 1</td> <td>V.24</td> <td>2 ft for adapter</td> <td>BC19D-02/BC19V-02</td> </tr> <tr> <td></td> <td></td> <td>25 ft for extension</td> <td>BC22F-25</td> </tr> <tr> <td>Cat 1</td> <td>V.35</td> <td>2 ft for adapter</td> <td>BC19F-02/BC19X-02</td> </tr> <tr> <td></td> <td></td> <td>25 ft for extension</td> <td>BC19L-25</td> </tr> </table> <p>Where two adapter cables are shown, they are electrically identical. The only difference is the angle at which the cable is projected off of the 50-way connector.</p>								Cat 1	V.24	2 ft for adapter	BC19D-02/BC19V-02			25 ft for extension	BC22F-25	Cat 1	V.35	2 ft for adapter	BC19F-02/BC19X-02			25 ft for extension	BC19L-25
Cat 1	V.24	2 ft for adapter	BC19D-02/BC19V-02																				
		25 ft for extension	BC22F-25																				
Cat 1	V.35	2 ft for adapter	BC19F-02/BC19X-02																				
		25 ft for extension	BC19L-25																				

### D.3 Cables

Cables are not included with the DEC WANrouter 90. Any DEC WANrouter 90 installed in the United Kingdom must use only cables which meet OFTEL's General Approval NS/G/1235/100009 and any other special requirements.

## D.4 Module Isolation

Except at the connector that plugs into the host, clearance and creepage distances of Xmm and Ymm, as listed in Table D–2, must be maintained between the approved module and other parts of the host, including expansion cards. Clearance is the shortest distance in air between two points. Creepage is the shortest distance along a continuous surface between those same two points.

**Table D–2: Clearance and Creepage Distances**

Clearance Xmm	Creepage Ymm	Vrms or Vdc
2.0	2.4 (3.8)	Up to 50
2.6	3.0 (4.8)	Up to 125
4.0	5.0 (8.0)	Up to 250
4.0	6.4 (10.0)	Up to 300

### NOTE

The distances shown in parentheses apply in an uncontrolled environment where heat, humidity, and temperature may fluctuate.

## D.5 Equipment Between the Approved Module and a Digital Circuit

If any other equipment, including cables or wiring, is to be connected between the approved module and the point of connection to any particular digital circuit, that equipment must conform as follows:

- The overall transmission characteristics of all other equipment must not have any material effect on the electrical conditions between the equipment and the digital circuit.
- All other equipment must comprise only the following:
  1. Approved equipment, which may be subject to limitations on its use, for the purpose of connection between it and a particular digital circuit.
  2. Cable or wiring that complies with a code of practice for the installation of equipment covered by this standard or other requirements that may be applicable.

---

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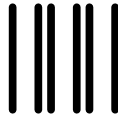
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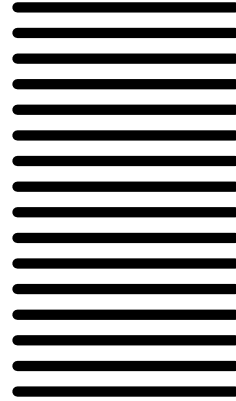
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