Digital Semiconductor 21140A 10/100BASE–TX Evaluation Board

User's Guide

Order Number: EC–QN7QC–TE

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

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 digital device pursuant to Part 15 of FCC rules, which are designed to provide reasonable protection against such radio frequency interference.

Operation of this equipment in a residential area may cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

Additional information on the need to interconnect the device with shielded (data) cables or the need for special devices, such as ferrite beads on cables, is required if such means of interference suppression was used in the qualification test for the device. This information will vary from device to device and needs to be obtained from the EMC group or product manager and is based on restrictions detailed in the FCC grant. As a rule at least one restriction applies and needs to be added to the above FCC statement.

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Preface

This document describes the Digital Semiconductor 21140A 10/100BASE–TX Evaluation Board (also referred to as the EB140A–TX), which is a sample design and development board for systems based on the Digital Semiconductor 21140A PCI Fast Ethernet LAN Controller (21140A). The EB140A–TX supports 10BASE–T and 100BASE–TX Fast Ethernet, and complies with the electrical and protocol requirements of the *PCI Local Bus Specification, Revision 2.0* and *PCI Local Bus Specification, Revision 2.1*.

Audience

This document is intended for developers who are evaluating the functionality of the 21140A, and who use the EB140A–TX to design systems based on the 21140A.

Content Overview

This manual contains the following chapters and appendix:

- **Chapter 1, Introduction** — Describes the EB140A–TX.
- **Chapter 2, System Requirements, Kit Contents, and Installation** — Lists the requirements for installing the EB140A–TX and lists the contents of the Digital Semiconductor 21140A 10/100BASE–TX Evaluation Board Kit. It also provides the procedure for installing the evaluation board.
- **Appendix A, Technical Support and Ordering Information** — Contains information about how to obtain technical support and order Digital Semiconductor products.

1
Introduction

This chapter describes the main components of the EB140A–TX. The chapter describes how to interpret the LEDs and connectors on the EB140A–TX, and it describes the bit mapping of the general-purpose port.

1.1 What is the EB140A–TX?

The EB140A–TX is a 10BASE–T and 100BASE–TX PCI bus master adapter board that demonstrates the functionality of the 21140A. With the EB140A–TX installed in a personal computer (PC), you can evaluate the hardware, PCI protocols, Ethernet controller, and autonegotiation protocols, and develop drivers for an Ethernet node.

For more information about the 21140A, refer to the *Digital Semiconductor 21140A PCI Fast Ethernet LAN Controller Data Sheet*.

1.2 EB140A–TX Features

The EB140A–TX is a universal, PCI form-factor option card that has the following features:

- Direct interface to PCI bus
- Full PCI compliance (revisions 2.0 and 2.1)
- PCI bus master operation
- Direct 10BASE–T and 100BASE–TX network connection
- Onboard, unique Ethernet address MicroWire ROM
- Onboard boot ROM
- Full JTAG support
- Full autonegotiation support
- "Jumperless" board—fully software controlled (including network bit rate selection)
- LEDs for indicating link status, transmit activity, and receive activity
- Support for 5-volt and 3.3-volt signaling environment systems
- Minimum chip count implementation
- Single 5-volt power supply
- Power-management support

1.3 EB140A–TX Description

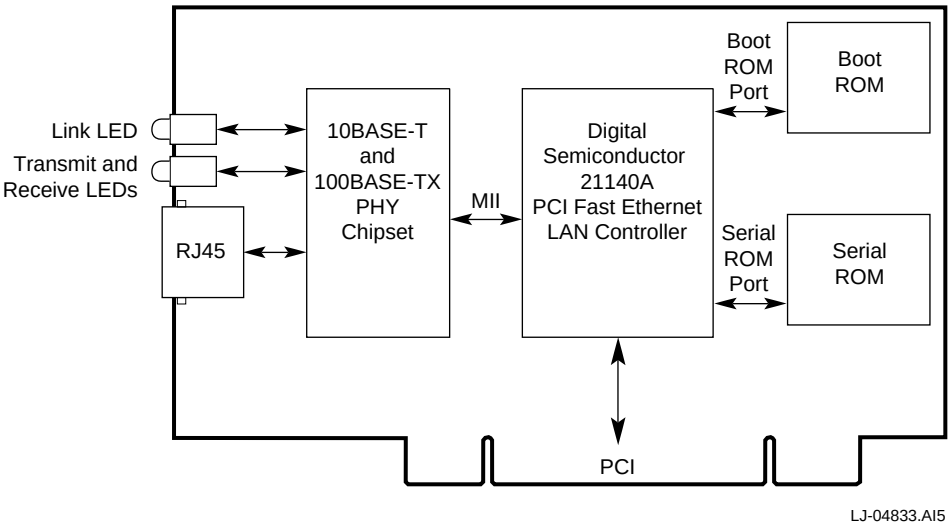
The EB140A–TX is based on the 21140A with direct connections to the PCI bus and the 10Mb/s Ethernet and 100Mb/s Fast Ethernet networks. The evaluation board is fully compliant with the PCI local bus specification, revisions 2.0 and 2.1, and is capable of PCI bus master operations working with programmable burst length. The EB140A–TX uses INTA as the primary interrupt line.

The EB140A–TX uses a 5-volt to 3.3-volt regulator to supply power for the 21140A. This enables the EB140A–TX to operate in systems that have only a 5-volt power supply. The EB140A–TX can operate in PCI systems with either a 5-volt or 3.3-volt signaling environment.

The evaluation board also provides full support for an upgradeable boot ROM (64KB to 256KB).

Figure 1–1 shows the main components of the EB140A–TX.

Figure 1–1 Main Components of the EB140A–TX



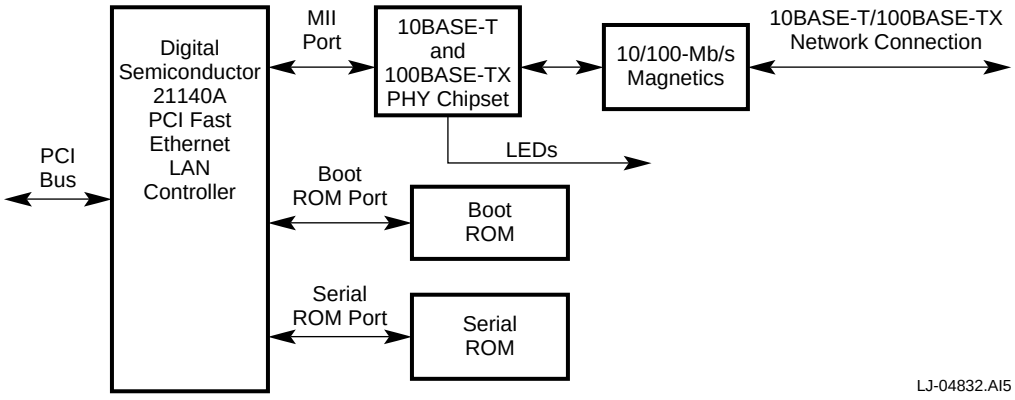
1.3.1 Block Diagram

The EB140A–TX has the following main parts:

- Digital Semiconductor 21140A for 10/100-Mb/s media access control (MAC) with MII, boot ROM, and serial ROM ports, and a PCI interface
- National DP83840 and DP83223 MII-based PHY chipset for a 10/100-Mb/s physical interface
- Pulse Engineering PE68515 module for a 10/100-Mb/s magnetic network connection
- Boot ROM interface supporting a ROM size of 64KB to 256KB ROM
- Direct MicroWire interface (4 pins) to a serial ROM port for storing the Ethernet address, and the card configuration and control data

Figure 1–2 shows a block diagram of the EB140A–TX.

Figure 1–2 EB140A–TX Block Diagram



1.4 LEDs and Connectors

Figure 1–3 shows the LEDs and connectors for the EB140A–TX, and Table 1–1 describes the components.

Figure 1–3 EB140A–TX LEDs and Connectors

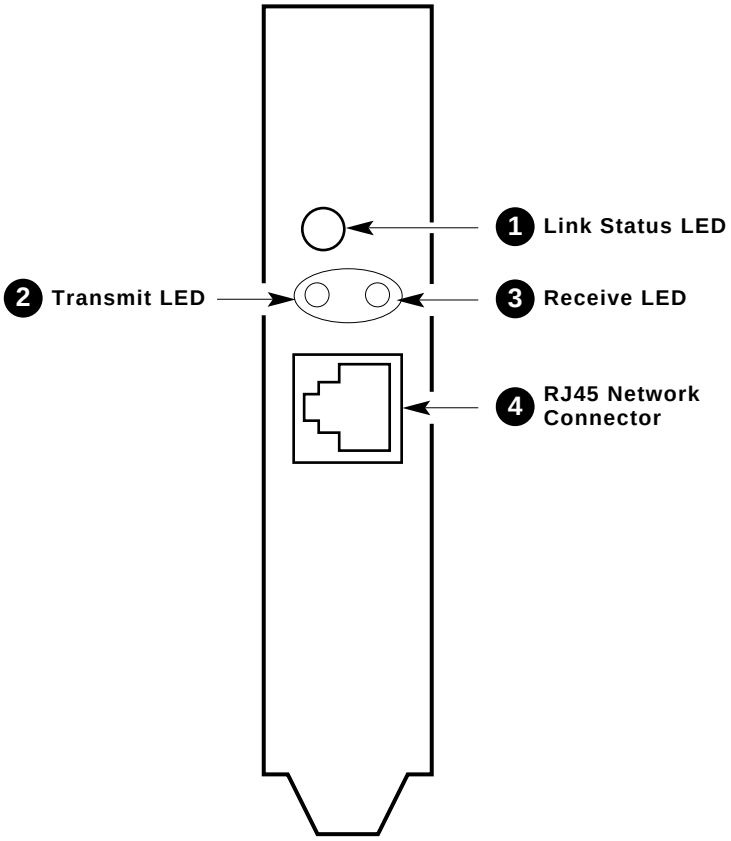


Table 1–1 EB140A–TX LED and Connector Descriptions

Reference	Component	Description
❶	Link status LED	Indicates the link status. The single green LED displays the following patterns:

LED Status	Meaning
Green on	Indicates that the PHY found a valid link on the network connection and is ready for normal operation.
Green off	Indicates that the PHY did *not* find a valid link on the network connection. Transmit and receive are not possible.

Reference	Component	Description
❷ and ❸	Transmit LED ❷	Indicates the transmit activity for the 10BASE–T and 100BASE–TX network connection.
	Receive LED ❸	Indicates the receive activity for the 10BASE–T and 100BASE–TX network connection.
		The transmit and receive LEDs function as follows:

LED Status	Meaning
Yellow on	A packet is being transmitted.
Green on	A packet is being received.

Reference	Component	Description
❹	RJ45 network connector	The RJ45 network connector requires a category 5 (CAT5) unshielded twisted-pair (UTP) 2-pair cable for a 100-Mb/s network connection or a category 3 (CAT3), or higher, UTP 2-pair cable for a 10-Mb/s network connection.

1.5 General-Purpose Port

The 21140A has an 8-bit, general-purpose port for setting the various operating modes of the EB140A–TX. CSR12 in the 21140A controls the general-purpose port.

Figure 1–4 shows the bit mapping of the general-purpose port, and Table 1–2 describes the bit operations.

For detailed information about the general-purpose port, refer to the *Digital Semiconductor 21140A PCI Fast Ethernet LAN Controller Hardware Reference Manual*.

Figure 1–4 General-Purpose Port Bit Mapping

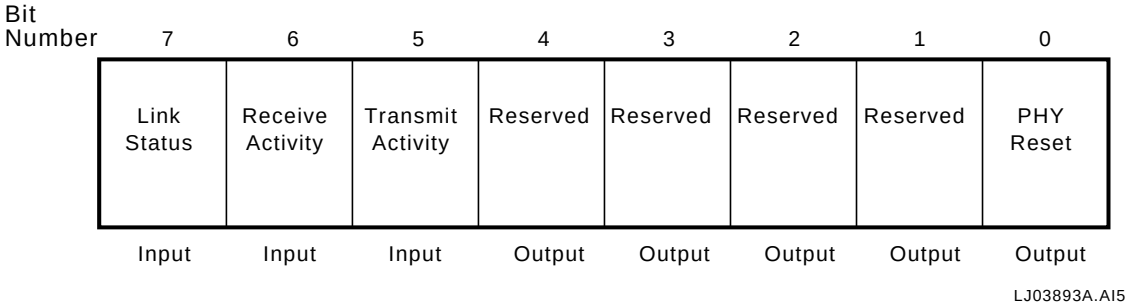


Table 1–2 General-Purpose Port Bit Descriptions

Bit	Description	21140A Operating Mode	Active Level
0	Provides reset to the DP83840.	Output	High (1)
1	Reserved.	Output	—
2	Reserved.	Output	—
3	Reserved.	Output	—
4	Reserved.	Output	—
5	DP83840 indication to the 21140A that a packet is being transmitted.	Input	Low (0)
6	DP83840 indication to the 21140A that a packet is being received.	Input	Low (0)
7	Indicates the link status of the DP83840.	Input	Low (0)

1.6 EB140A–TX Dimensions

The physical dimensions of the EB140A–TX are as follows:

Height: 8.6 cm (3.4 in)

Width: 13.9 cm (5.5 in)

2

System Requirements, Kit Contents, and Installation

This chapter describes the system requirements for using the EB140A–TX, lists the contents of the EB140A–TX kit, and describes how to install the evaluation board.

2.1 System Requirements

To use the EB140A–TX, you need the following:

- A PCI-based PC (with master mode operation allowed) that is compliant with PCI local bus specification, revisions 2.0 and 2.1
- A PCI master mode expansion slot
- A 3.5-inch, 1.44MB diskette drive
- The following cables:
  - To operate at 10-Mb/s, a CAT3 (or higher) UTP 2-pair cable
  - To operate at 100-Mb/s, a CAT5 UTP 2-pair cable

2.2 Kit Contents

The Digital Semiconductor 21140A 10/100BASE–TX Evaluation Board Kit contains the following materials. For additional drivers or software updates, contact your Digital sales representative or your local distributor.

- A Digital Semiconductor 21140A 10/100BASE–TX Evaluation Board (EB140A–TX)
- A hardware design package (on a 3.5-inch diskette) that contains the following information. Section 2.2.2 describes how to unpack the files.
  - Board schematics (including MD and UA)
  - Gerber files
  - Vendor parts list
- Driver executables, including:
  - Novell NetWare (client/server)
  - NDIS2 (DOS, OS/2)
- A twisted-pair (TP) loopback connector
- The following documents:
  - *Digital Semiconductor 21140A PCI Fast Ethernet LAN Controller Product Brief*
  - *Digital Semiconductor 21140A PCI Fast Ethernet LAN Controller Data Sheet*
  - *Digital Semiconductor 21140A PCI Fast Ethernet LAN Controller Hardware Reference Manual*
  - *Digital Semiconductor PCI Ethernet Driver Information Sheet*
  - EB140A–TX schematics (including MD and UA)
  - EB140A–TX vendor parts list
  - Warranty agreement

2.2.1 Using the Documentation

Table 2–1 provides guidelines for using the documentation to accomplish specific tasks.

Table 2–1 Guidelines for Using Documentation

If you want to...	Start with the...
Install a driver	README.TXT file on the driver diskette
Design new hardware	Digital Semiconductor 21140A PCI Fast Ethernet LAN Controller Data Sheet
	Digital Semiconductor 21140A PCI Fast Ethernet LAN Controller Hardware Reference Manual
Obtain driver sources	Digital Semiconductor PCI Ethernet Driver Information Sheet

2.2.2 Unpacking the Hardware Design Package

Table 2–2 lists the files that are on the hardware design package diskette. The files with an .EXE extension have been compressed using PKZIP, Version 2.04g, and converted to self-extracting archives using ZIP2EXE.

Table 2–2 Hardware Design Package Files

File Name	Contents	Comments
README.TXT	Provides a general description of the diskette contents.	You do not have to extract this file.
GERBER.EXE	Contains the gerber files.	To extract this file, enter **GERBER** at the system prompt.
TX_VPL.TXT	Contains a vendor parts list for the EB140A–TX.	You do not have to extract this file.
TX_SCHEM.EXE	Contains the schematics, mechanical drawings, and unit assembly drawings.	This file is scaled to print on 8½" x 11" paper. To extract this file, enter **TX_SCHEM** at the system prompt.

2.3 Installation Procedure

To install the EB140A–TX and load the drivers, do the following:

1. From the diskette that contains the driver you are loading, read the README.TXT file. It provides information about how to configure the EB140A–TX.
2. Turn off the power to the PC.
3. Remove the PC system box cover.
4. Insert the card edge of the EB140A–TX into an available master PCI option slot in the PC.
5. Connect the 10BASE–T or 100BASE–TX communications media to the RJ45 network connector (Figure 1–3).

   The driver and PHY will automatically change speed to match the communications media speed.
6. Replace the PC system box cover.
7. Remove any diskettes from the PC disk drive.
8. Turn on the power to the PC. The link status LED is green if the PHY found a valid link. If the LED remains off, contact the Digital Semiconductor Information Line (Appendix A).
9. Load the driver for your operating system. Each driver is stored in its own subdirectory on the shipped diskettes. For installation and release information, refer to the README.TXT file on the driver diskette.

   For information about additional drivers and software updates, see Section A.5.

A

Technical Support and Ordering Information

A.1 Obtaining Technical Support

If you need technical support or help deciding which literature best meets your needs, call the Digital Semiconductor Information Line or visit the Digital Semiconductor World-Wide Web Internet site:

United States and Canada	**1–800–332–2717**
Outside North America	**+1–508–628–4760**
World-Wide Web Internet site	**http://www.digital.com/info/semiconductor**

A.2 Ordering Digital Semiconductor Products

To order the Digital Semiconductor 21140A PCI Fast Ethernet LAN Controller and evaluation board, contact your local distributor.

You can order the following semiconductor products from Digital:

Product	Order Number
Digital Semiconductor 21140A PCI Fast Ethernet LAN Controller	21140–AC
Digital Semiconductor 21140A 10/100BASE–TX Evaluation Board Kit	21A40–TX

A.3 Ordering Digital Semiconductor Literature

The following table lists some of the available Digital Semiconductor literature. For a complete list, contact the Digital Semiconductor Information Line.

Title	Order Number
Digital Semiconductor 21140A PCI Fast Ethernet LAN Controller Product Brief	EC–QN7MB–TE
Digital Semiconductor 21140A PCI Fast Ethernet LAN Controller Data Sheet	EC–QN7PB–TE
Digital Semiconductor 21140A PCI Fast Ethernet LAN Controller Hardware Reference Manual	EC–QN7NC–TE

A.4 Ordering Third-Party Literature

You can order the following third-party literature directly from the vendor:

Title	Vendor
PCI Local Bus Specification, Revisions 2.0 and 2.1	PCI Special Interest Group 1–800–433–5177 (U.S.) 1–503–797–4207 (International) 1–503–234–6762 (FAX)
PCI BIOS Specification, Revision 2.1	

A.5 Obtaining Drivers and Software Updates

Additional drivers and software updates are available on a regular basis. To register your evaluation board and be notified of these updates, complete the customer reply card included in the kit, or send the following information to Digital:

Name
Address
Telephone number
FAX number
Product purchased
Serial number
Date purchased

Mail the information to:

Digital Equipment Corporation
Attn: Marketing/Product Updates
77 Reed Road, HLO2-2/M9
Hudson, MA 01749
USA

To order additional drivers or software updates, contact your Digital sales representative or your local distributor.