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Alpha 21164 Microprocessor Evaluation Board

Read Me First

Order Number: EC-QD2VB-TE

Revision/Update Information: This document supersedes the
*Alpha 21164 Microprocessor Evaluation
Board Read Me First (EC-QD2VA-TE).*



**Digital Equipment Corporation
Maynard, Massachusetts**

July 1995

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This document was prepared using VAX DOCUMENT Version 2.1.

1 Introduction to the Alpha 21164 Microprocessor Evaluation Board Kit

The Alpha 21164 Microprocessor Evaluation Board (EB164) Kit is an evaluation and development module designed to introduce you to the Alpha 21164 microprocessor and DECchip 21171 chipset and to help you learn more about designing the chips into your products.

This document, *Alpha 21164 Microprocessor Evaluation Board Read Me First*, provides an overview of the kit contents and gives some information about how to begin using the EB164.

Note

If you purchased only the Alpha 21164 Evaluation Board Design Kit, proceed to Section 6. If you purchased the Alpha 21164 Evaluation Board Kit, continue reading.

2 EB164 Kit Contents

The Alpha 21164 Microprocessor Evaluation Board Kit contains the following:

- The Alpha 21164 Microprocessor Evaluation Board (EB164)
- The Alpha Evaluation Board Software Developer's Kit (EBSDK) on CD-ROM
- The Alpha 21164 Evaluation Board Design Kit on 3.5-inch diskettes and a 4 mm × 60 m DAT cassette
- The Alpha 21164 Windows NT 3.51 Installation Kit
- The Alpha 21164 Microprocessor Evaluation Board Documentation Set
- The Alpha 21066A/AlphaPC64 and Alpha 21164 Microprocessor Evaluation Board Accessories Kit

Note

The Windows NT 3.51 operating system is not included and must be purchased separately.

3 Documentation Provided

The following documentation is included in the EB164 Kit:

Title	Order Number
Alpha 21164 Microprocessor Documentation	
Alpha AXP Architecture Handbook	EC-QD2KA-TE
Alpha 21164 Microprocessor Data Sheet	EC-QAEPB-TE
Alpha 21164 Microprocessor Product Brief	EC-QAENB-TE
Alpha 21164 Microprocessor Hardware Reference Manual	EC-QAEQB-TE
SPICE Models for Alpha Microprocessors and Peripheral Chips: An Application Note	EC-QA4XB-TE
Alpha Microprocessors Evaluation Board Software Documentation	
PALcode for Alpha Microprocessors System Design Guide	EC-QFGLB-TE
Alpha Microprocessors Evaluation Board Debug Monitor User's Guide	EC-QHUVB-TE
Alpha Microprocessors Evaluation Board Software Design Tools User's Guide	EC-QHUWA-TE
Alpha Microprocessors SRAM Mini-Debugger User's Guide	EC-QHUXA-TE
Alpha Evaluation Boards Software Developer's Kit Read Me First	EC-QERSC-TE
Alpha Microprocessors Evaluation Board Windows NT 3.51 Installation Guide	EC-QLUAB-TE
Alpha 21164 Microprocessor Evaluation Board Documentation	
Alpha 21164 Microprocessor Evaluation Board Read Me First	EC-QD2VB-TE
Alpha 21164 Microprocessor Evaluation Board Product Brief	EC-QCZZC-TE
Alpha 21164 Microprocessor Evaluation Board User's Guide	EC-QD2UB-TE
Associated DECchip Documentation	
DECchip 21171 Core Logic Chipset Product Brief	EC-QC3EB-TE
DECchip 21171 Core Logic Chipset Technical Reference Manual	EC-QE18A-TE

4 Additional Hardware Requirements

Before turning on the power to your EB164, you must provide the following components in addition to those supplied in the kit. The components needed depend upon the intended use of the EB164 board.

- A 275-watt industry-standard PC power supply that includes a 3.3-V, 16.0-A dc output
- A terminal or a serial line connection to another system running a terminal emulation package

You may want to provide a system enclosure that will accept a full-size motherboard (optional).

The following additional components are required to install Windows NT 3.51 on the EB164:

- A PS/2 compatible 101-key keyboard
- A PS/2 compatible mouse
- A supported PCI or ISA bus graphics card, cables, and a compatible monitor
- A supported PCI or ISA bus SCSI controller and cables
- A SCSI CD-ROM drive
- An IDE or SCSI hard drive

For more information about hardware requirements and for the location of board connectors and jumpers, see the System Configuration and Connectors chapter in the *Alpha 21164 Microprocessor Evaluation Board User's Guide*.

Refer to the *Alpha Microprocessors Evaluation Board Windows NT 3.51 Installation Guide* provided in the Alpha 21164 Windows NT 3.51 Installation Kit and the Microsoft *Hardware Compatibility List*¹ for Windows NT 3.51 to determine which SCSI controllers and graphics cards are supported.

¹ To obtain the *Hardware Compatibility List*, contact Microsoft's Customer Service representatives at 1-800-426-9400. You can also access CompuServe Information Systems in Library 1 of the WINNT forum (GO WINNT) or Library 17 of the MSWIN32 forum (GO MSWIN32).

5 Starting Up and Using the EB164

After all the required hardware components have been assembled, connect them to the EB164 by using the module connectors. For a standard system (without Windows NT), follow the procedure listed in Section 5.1. For a system using Windows NT, perform the additional steps listed in Section 5.2. For information about the location of the module connectors, refer to the System Configuration and Connectors chapter of the *Alpha 21164 Microprocessor Evaluation Board User's Guide*.

Two firmware programs have been loaded into the EB164 1MB flash ROM. They are the debug monitor and the Windows NT ARC firmware. The debug monitor is a serial line monitor program used to perform software and hardware debug functions. The Windows NT ARC firmware is used to install and boot Windows NT 3.51. The EB164 system has been configured to start the debug monitor by default. Once the debug monitor is running, you can switch to Windows NT ARC firmware.

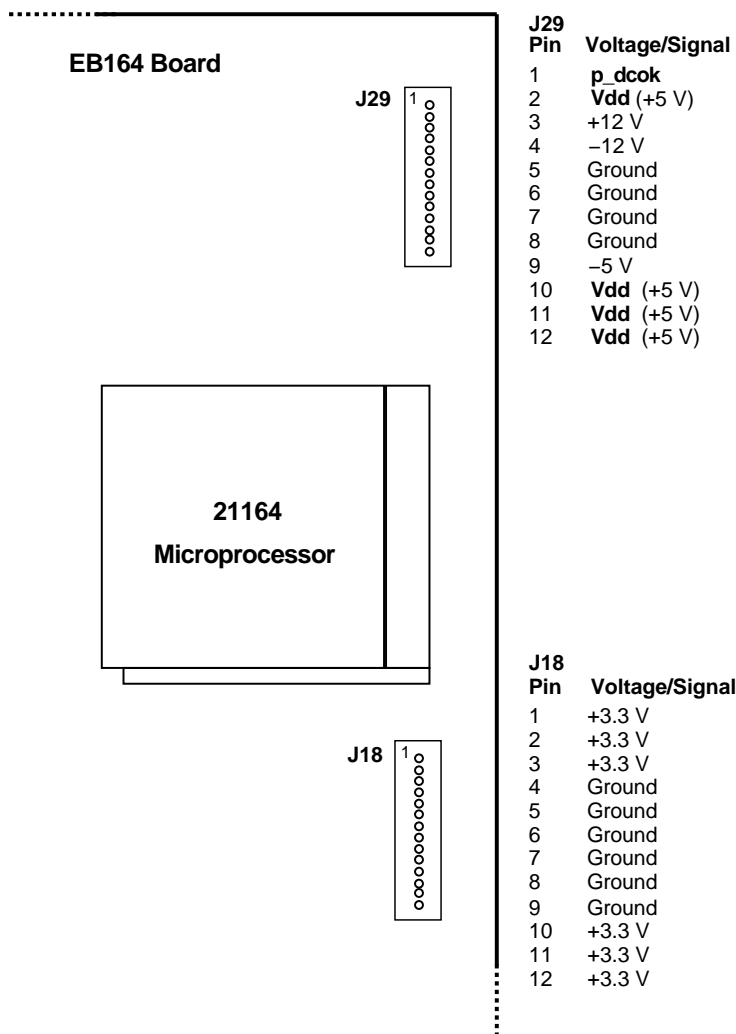
5.1 Starting the Debug Monitor

To start the debug monitor on your EB164, follow this procedure:

1. Connect the 9-pin serial port adapter cable, provided in the kit, to the COM1 connector at J27. Insert the connector in the proper orientation, so that pin 1 on the cable matches pin 1 on the board header (as indicated on the module).
2. Connect your terminal to the COM1 port, using a cable arrangement appropriate to your terminal. Set the terminal to 9600 baud, 8 data bits, 1 stop bit, no parity.
3. Connect the power supply to the EB164 board, as shown in Figure 1, with standard power to J29, and with 3.3-V dc power to J18.
4. Connect the supplied 3.5-inch diskette drive. The 34-pin diskette drive cable goes from connector J31 on your EB164 to the diskette drive. The drive should be connected at the very end of the cable closest to the twist in the cable. Attach a power connector to the drive. Again, make sure to insert the connector in the proper orientation so that pin 1 on the cable matches pin 1 on the board header (as indicated on the module).
5. If you plan to use your EB164 on a network, install the Ethernet controller board (DE435) in one of the PCI connectors as outlined in the DE435 documentation.
6. Turn on the power to your terminal and to the EB164.
7. Observe the debug monitor messages that immediately follow when the EB164 is turned on. These messages describe your system configuration, version dates, and memory size, and conclude with the EB164> system prompt.
8. Verify the memory size and system configuration information displayed.
9. If you do not see the debug monitor messages, turn off the power to the EB164. Verify that the previous steps were performed correctly, verify the seating of the memory SIMMs, and check that all the jumpers are in their default positions. Then repeat steps 6 through 8.

The EB164 is ready to be used. Refer to the *Alpha Microprocessors Evaluation Board Debug Monitor User's Guide* for a complete list of commands.

Figure 1 EB164 Power Connectors



MK-2306-28

5.2 Starting Windows NT ARC Firmware

If you plan to install Windows NT 3.51 on your EB164, turn off the power to the EB164, and proceed with the following hardware configuration procedure:

1. Connect the keyboard cable to connector J32.
2. Connect the mouse cable to connector J34.
3. Install the SCSI controller in a free PCI or ISA connector and attach the CD-ROM drive. If you will be using a SCSI hard drive, install the hard drive now. Refer to the manufacturer's instructions for installing these devices. Verify that a unique SCSI ID is assigned to each device you attach to the SCSI bus.
4. If you will be using an IDE hard drive, attach your IDE cable to connector J28 in the proper orientation and install your hard drive. The disk should be configured as the primary device on the IDE bus. Refer to the manufacturer's instructions for setting up the hard drive.
5. Install the graphics card into either a PCI or ISA connector, depending on the card you are using. Connect the graphics card to a compatible monitor following the graphics card manufacturer's instructions.
6. Verify that the jumper from J14-2 to J14-3 is inserted, allowing the flash ROM to be written. If the Windows NT ARC firmware is unable to write to flash ROM, it prints the device error message and stops.
7. Turn on the power to the EB164, and verify that the debug monitor configuration messages displayed are accurate. If the debug monitor does not start or if a configuration problem is noted, review your hardware configuration and then proceed to the next step.

8. The firmware contained in the serial ROM on your EB164 determines which firmware image is loaded from the flash ROM at power-up. At this point, you want the serial ROM to load the Windows NT ARC firmware so you can proceed with installing Windows NT on your EB164.

The serial ROM firmware uses a value stored in the nonvolatile RAM of the realtime clock to determine which firmware image to load.

Use the following debug monitor commands to select Windows NT ARC firmware and to verify the selection:

```
EB164> bootopt nt
O/S type selected: "The Windows NT Operating System"
...Firmware type: "Windows NT Firmware"

EB164> bootopt
Predefined bootoptions are...
  "0" "Alpha Evaluation Board Debug Monitor" "DBM"
  "1" "The Windows NT Operating System" "NT"
  "2" "OpenVMS" "VMS"
  "3" "Digital UNIX" "UNIX"

O/S type selected: "The Windows NT Operating System"
...Firmware type: "Windows NT Firmware"

EB164>
```

The presence of a jumper at J1-25/26 (see CONF11 on the module) forces the serial ROM firmware to load the alternate image selected by the value in the nonvolatile RAM. Turn off the power to the EB164 and install the jumper at J1-25/26. (The absence of this jumper overrides the value stored in the nonvolatile RAM.)

9. Turn on the power to the EB164. After the power-up diagnostics are run, the ARC console boot menu appears on the graphics display.

If the ARC console boot menu does not appear, check the output of COM1 for error messages and review your hardware configuration.

You are ready for software installation. Refer to the *Alpha Microprocessors Evaluation Board Windows NT 3.51 Installation Guide* for instructions.

5.3 Returning from Windows NT ARC Firmware to the Debug Monitor

You may use either of these two methods to return to the debug monitor after the Windows NT ARC firmware has been selected:

1. Turn off the power to the EB164, remove the jumper from J1-25/26 (CONF11 on the module), then turn on the power to the EB164.
2. Use the ARC firmware menus to choose the debug monitor.
 - a. At the Boot menu, choose **Supplementary menu...**
 - b. At the Supplementary menu, choose **Setup the system...**
 - c. At the Setup the system menu, choose **Machine specific setup...**
 - d. At the Machine specific setup menu, choose **Debug Monitor**.
 - e. Turn off the power to the EB164, then turn the power back on.

6 EB164 Evaluation Board Design Database

This section lists the EB164 Evaluation Board Design Kit contents, and it describes how to copy and unpack the EB164 evaluation board design database from DAT cassette and diskettes.

6.1 EB164 Evaluation Board Design Kit

The EB164 Evaluation Board Design Kit contains the following:

- EB164 Evaluation Board Documentation Set (see Section 3)
- EB164 Evaluation Board Design Database provided on 3.5-inch diskettes and a 40 mm × 60 m DAT cassette
- SPICE models for Alpha microprocessors and peripheral chips

The SPICE model applicable to the EB164 evaluation board is the 21164 SPICE model. The *SPICE Models for Alpha Microprocessors and Peripheral Chips: An Application Note* is included; it provides information for design engineers who conduct Level 3 SPICE simulations. The application note contains a pin-to-model reference table for the 21164 microprocessor.

The EB164 Design Database media includes:

- Example files
- Vendor's parts list
- Schematics in PostScript files
- Gerber files
- ABEL source files (including PLD equations)

Note

Regardless of how you access the design database, you must have a Viewlogic Powerview 5.1 (or later) license to use it.

6.2 Copying and Unpacking the Hardware Design Database from the DAT Cassette

The hardware design database provided on DAT cassette is in a tar file called `eb164_db.tar`.

To copy and unpack the tar file, follow this procedure:

1. Enter the following command to copy eb164_db.tar from the DAT cassette to the current directory on your system:

```
tar xv eb164_db.tar
```

2. Enter the following command to unpack the tar file:

```
tar xvf eb164_db.tar
```

This command creates an archive area and unpacks all the files in the correct places for Viewlogic operation.

3. Set the archive area as the current default work area.
4. Include the following Viewlogic library areas in the search path:
 - builtin
 - dio (this is available with the ViewPLD option)

6.3 Copying and Unpacking the Hardware Design Database from the Diskettes

The four 3.5-inch diskettes that contain the hardware design database files were archived using a public-domain compression utility. Each zip archive includes a category of design database files, which are described in the table in the following section. You can access and read these files on an industry-standard personal computer with a 3.5-inch diskette drive. Use UNZIP.EXE (included on the diskettes) to unpack the files in each archive.

Files on the Diskettes

The hardware design database diskettes contain the following files:

Archive Name	Archive Contents	Comments
Disk 1		
unzip.exe	Utility used to decompress the ZIP files.	This file does not need to be unpacked.
t1_read.me	Provides a general description of the diskette contents.	This file does not need to be unpacked.
eb164ps1.zip	Contains all the layer plots, soldermask plots, silk-screen plots and solderpaste plots necessary to manufacture the EB164.	These files are B-size (11 in x 17 in) PostScript files.

Archive Name	Archive Contents	Comments
Disk 2		
unzip.exe	Utility used to decompress the ZIP files.	This file does not need to be unpacked.
t2_read.me	Provides a general description of the diskette contents.	This file does not need to be unpacked.
eb164ps2.zip	Contains the unit assembly drawings for the EB164.	The assembly drawings provide a pictorial representation of the EB164, with component designations for each device.
eb164brd.zip	Contains all the necessary files to have the EB164 printed circuit board fabricated.	—
eb164bom.zip	Contains the EB164 parts list.	This file references Digital part numbers.
venbom.zip	Contains the EB164 parts list.	This file references vendor part numbers.
Disk 3		
unzip.exe	Utility used to decompress the ZIP files.	This file does not need to be unpacked.
t3_read.me	Provides a general description of the diskette contents.	This file does not need to be unpacked.
eb164ps.zip	Contains the PostScript file of the EB164 board-level schematics.	These files are provided for information. You can create the same files by using the database provided.

Archive Name	Archive Contents	Comments
Disk 4		
unzip.exe	Utility used to decompress the ZIP files.	This file does not need to be unpacked.
t4_read.me	Provides a general description of the diskette contents. These files were generated with Powerview Version 5.1.1.	This file does not need to be unpacked.
eb164pal.zip	Contains the industry-standard JEDEC files that were used to program all the PAL components and MACH devices.	These files are not needed to simulate and are included only to provide you with the ability to re-create all of the programmable devices on the module.
eb164sch.zip	Contains schematic files for the EB164 Viewlogic schematic database.	Copy this file to the /SCH Viewlogic database subdirectory.
eb164sym.zip	Contains symbol files for the EB164 Viewlogic schematic database.	Copy this file to the /SYM Viewlogic database subdirectory.
eb164xrf.zip	Contains the cross-reference file for the EB164 Viewlogic schematic database.	—
eb164wir.zip	Contains all the wirelist files.	Copy this file to the /WIR Viewlogic database subdirectory.

7 Alpha Evaluation Boards Software Developer's Kit

The Alpha Evaluation Boards Software Developers Kit is supplied on CD-ROM and includes the following:

- Software tools for use with an Alpha Windows NT or Digital UNIX host system
- Debug monitor source files
- Sample PALcode source files
- SRROM power-up code source files

The following documentation is provided as part of the kit.

- *Alpha Microprocessors Evaluation Board Debug Monitor User's Guide*
- *Alpha Microprocessors Evaluation Board Software Design Tools User's Guide*
- *Alpha Microprocessors SRROM Mini-Debugger User's Guide*
- *Alpha Evaluation Boards Software Developer's Kit Read Me First*
- *PALcode for Alpha Microprocessors System Design Guide*

Refer to the *Alpha Evaluation Boards Software Developer's Kit Read Me First* for installation instructions.

8 Registration Card

To register your evaluation board and be notified of changes, and updates, as well as new kits and products available from Digital Equipment Corporation, please complete the registration card included in the kit, or send the following information to the address listed below:

Name
Company
Address
Phone number
FAX number
Product purchased
Serial number
Date purchased

Mail the previous information to:

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