DECchip 21130 PCI Integrated Graphics and Video Accelerator Evaluation Board

User's Guide

Order Number: EC–QHV0B–TE

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About This Guide

This guide describes the DECchip 21130 PCI Integrated Graphics and Video Accelerator Evaluation Board (also called the EB130), an evaluation and development board for computing systems containing Digital's DECchip 21130 PCI Integrated Graphics and Video Accelerator (21130).

Audience

This guide is intended for software designers who are developing software to take advantage of the EB130's speed and power, and for hardware designers who are designing a PCI component using the 21130.

Scope

This guide describes the features, configuration, and functional operation of the EB130. Detailed information about the 21130 is contained in the *DECchip 21130 PCI Integrated Graphics and Video Accelerator Technical Reference Manual*.

Document Structure

This guide contains the following chapters and appendix:

- Chapter 1, Introduction, provides an introduction to the EB130.
- Chapter 2, Hardware Installation, describes the steps required to install the EB130 into a system.
- Chapter 3, Software Drivers, provides the steps required to install the software drivers for the EB130.
- Chapter 4, Utilities and Diagnostics, provides a description of the EB130 utilities and diagnostics.
- Chapter 5, Technical Information, details the technical specifications of the EB130.

- Appendix A, Technical Support and Ordering Information, provides information about technical support, ordering information, and associated literature.

Document Conventions

This section contains an explanation of the conventions used in this guide.

Addresses

All addresses listed in this guide are hexadecimal. In case of ambiguity, the address is marked as hexadecimal (for example, 800_{16}).

Byte Abbreviation

Binary kilobyte, megabyte, and gigabyte multiples are abbreviated as KB, MB, and GB respectively (for example, 512KB, 16MB, 2GB).

Caution

Caution indicates potential damage to equipment or data.

Note

Note indicates general information.

Warning

Warning indicates potential for personal injury.

1 Introduction

The DECchip 21130 PCI Integrated Graphics and Video Accelerator Evaluation Board (called the EB130) is a state-of-the-art graphics accelerator for the PCI market. It has the following features:

- DECchip 21130 PCI Integrated Graphics and Video Accelerator, with integrated RAMDACs and phase-locked loops (PLLs)
- Support for up to 4MB of memory (using 256K $\times$ 16 extended data-out [EDO] DRAMs)
- High-speed Windows graphics accelerator
- Integral VGA compatibility
- Full 256-color multimedia video and simultaneous nonshared full graphics colormap

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Hardware Installation

Installation of the EB130 is a simple process, requiring only a few steps. However, proceed with caution during the installation to prevent damage to your platform, the evaluation board, and yourself. The EB130 is designed to function properly in a PCI bus slot only. Do *not* attempt to install this board in any other slot.

Installation Instructions for Intel Based, PCI Systems

The following sequence provides you with the information needed to install the EB130 in Intel based, PCI systems:

1. Power down the computer system and unplug all power cords, including the monitor power cord to the system. Also, disconnect the video cable at the system. Remove the system cover according to the manufacturer's instructions.

Warning

If power is left on during installation, damage to the system or the board, or injury to yourself could occur.

Be sure that system power is off to the monitor before disconnecting monitor cables from the system.

Static electricity can damage the components in your computer. Ground yourself to the case of the computer to discharge any static electricity.

2. Remove any other VGA/EGA adapter in the system or disable the VGA/EGA video on the motherboard according to your system's manual. Retain the screw for later use.
3. If necessary, remove a PCI bus expansion slot cover by removing its screw and lifting out the slot cover. Retain the screw.

4. Hold the board by its top corners and slide it into an open PCI slot. Line up the card so that it fits into the slot and the slot guides. The connector pins should line up with the PCI expansion slot. Press down on the card until it is firmly seated in the expansion slot. The EB130 should be flush with the screw hole. Secure the board with the screw saved from the VGA/EGA adapter.

Warning

The EB130 is designed to function properly in a PCI bus slot. Installing it in a slot other than a PCI bus slot could cause damage to the system or the board, or injury to yourself.

5. Replace and secure the system cover.
6. Plug the monitor video connector into the 15-pin D-shaped connector on the bracket of the EB130.

Note

If your analog VGA monitor has a 9-pin connector, you will need a 15-pin adapter that you can obtain from a computer equipment dealer.

Please read your monitor's documentation to verify that your monitor is configured properly for analog VGA signal. Some multifrequency monitors have a switch to select TTL or analog operation; set this switch for analog operation.

7. Plug the monitor power cable into the system, so that the monitor will power up with the system. Place the monitor ON/OFF switch in the ON position. Using this method ensures that when you power up the system, the EB130 properly identifies the monitor.

Note

If your system does not allow your monitor to be plugged into it, make sure that the system and monitor are plugged into the same power bus. If you use this method, cycle power to the monitor before the system.

8. Install software drivers and utilities.

3

Software Drivers

The EB130 kit includes a diskette containing the DECchip 21130 Windows 3.1 and Display Control Interface (DCI) drivers. The installation instructions for Windows 3.1 direct you to install the appropriate drivers for using your EB130.

Please follow the installation instructions carefully. They specify drive A as the default diskette drive and drive C as the default hard drive. If necessary, substitute the appropriate drive letters for your system.

Follow these guidelines when you install drivers for Windows 3.1:

- Make sure that the Windows 3.1 drivers and the DCI drivers have been loaded prior to installing the EB130 into the system.
- Make sure that either Windows 3.1 or Windows for Workgroups 3.11 is installed on the system

3.1 Microsoft Windows 3.1 Drivers

The installation process for Microsoft Windows 3.1 drivers includes the following steps:

1. With Windows running, install the Windows 3.1 and DCI drivers.
2. Power down the system and install the EB130 (see Chapter 2).
3. Reboot and restart Windows.
4. Install Video for Windows 1.1E run-time (only needed if using DCI).

3.1.1 Installing the Windows 3.1 Drivers

To load the drivers, perform the following steps:

Note

In examples of user input/system output, all user input is underlined. All text that is not underlined is system output.

1. Exit Windows 3.1 and return to the `C:>` prompt.
2. Locate the diskette labeled ‘‘DECchip 21130 Drivers: Windows 3.1 and DCI’’ and insert it into drive A.
3. From DOS, change the directory to C:\WINDOWS. For example:

```
C:> cd c:\windows
```

4. Run SETUP by typing SETUP. For example:

```
C:\WINDOWS> setup
```

5. From the menu, use the arrow keys to choose **Display**, then press Enter.
6. At the Display menu, use the arrow keys to choose **Other (Requires disk provided by hardware manufacturer)**, then press Enter.
7. When prompted with `Please insert the display driver diskette provided by the hardware manufacturer`, enter the drive where the diskette can be found (for example, A:). Note that you inserted the diskette in step 2.
8. Use the arrow keys to choose the appropriate driver for the resolution and number of colors you want, then press Enter.

9. Your choice of driver should now be displayed next to **Display**. Press Enter. If the driver is not displayed, return to step 5.
10. You might now be prompted with the following display:

    ```
    This driver for display is already installed on your system.
    To replace the current driver, press Esc.
    ```

    Press Escape to ensure proper installation of the new driver.
11. If you are prompted to enter the drive letter of the disk again, enter `A:` or the drive letter where the diskette is located.

At this point, Windows copies all of the files to your disk and makes changes to system files that allow the 21130 drivers to run correctly.

3.1.2 Obtaining and Installing Video for Windows 1.1E

To use the video acceleration features of the 21130, you need to install Video for Windows (VFW), Version 1.1E, which adds support for the DCI. You can obtain VFW 1.1E from the Windows multimedia forum on CompuServe (GO WINMM). The Video for Windows library contains the VFW11E.EXE file.

To load VFW 1.1E, perform the following steps:

1. Create a temporary directory called VFW11E on your PC and download the file VFW11E.EXE from CompuServe into the VFW11E directory. VFW11E.EXE is a self-extracting file.
2. While still in the directory VFW11E, extract the files by typing VFW11E at the DOS prompt:

    ```
    C:\VFW11E> vfw11e
    ```

3. From Windows, double click on SETUP.EXE in the temporary VFW11E directory. Follow the instructions provided.

4
Utilities and Diagnostics

The EB130 comes with diagnostics that test the functionality of the 21130.

4.1 EB130 Diagnostics

The EB130 includes the following Windows based sets of diagnostic tests:

Tests	Description
Simple mode tests	Verify the PCI protocol and access to the frame buffer.
Area fill tests	Test the graphics engine.
Line draw tests	Verify the various line-draw methods and test the transparent and opaque line modes.
Image scaling tests	Verify the multimedia pipeline within the 21130.
VGA tests	Test the VGA section of the 21130.
Special-purpose utilities	Used to verify specific functionality.

4.2 The User Interface

The diagnostic tests provide a graphical user interface (GUI) that makes it easy to run the diagnostics with your preferred parameters.

4.2.1 Program Requirements

The diagnostics requirements are:

- 250KB of available conventional memory
- Microsoft Windows 3.1, Microsoft Windows for Workgroups 3.11, or Microsoft Windows 95 Preview Release
- 21130 display driver (8, 16, or 32 bit)

4.2.2 Diagnostic Configurations

You can run the diagnostics in the following configurations:

- Standalone mode: single EB130
- Repair mode: EB130 and a PCI VGA board, such as the MGA Impression Plus Windows, Video and 3D Graphics Accelerator from Matrox, Inc. The PCI VGA board must have lower PCI slot number than the EB130.

Note

For information about other PCI VGA boards that work in the repair mode configuration, refer to the *DECchip 21130 PCI Integrated Graphics and Video Accelerator Evaluation Board Read Me First* or to the Digital Semiconductor Bulletin Board System.

4.2.2.1 Standalone Mode

Standalone mode is the normal configuration of the system, when the board is working correctly. If Windows is running with the installed device driver, the board is working correctly. In this mode, the diagnostics might be used to test the utilities that configure some of the ports on the EB130. When run in this mode, the diagnostics save the state of the cursor RAM and registers while a test is running and restore them upon completion.

4.2.2.2 Repair Mode

The repair mode configuration occurs when a PCI VGA board is installed into the system because the EB130 is not working or is suspect. Another need for this mode occurs when the EB130 BIOS does not appear on the monitor. By default, the system BIOS chooses the first PCI VGA board it sees as the graphics console. This is why the PCI VGA board must be in a lower slot number than the EB130.

4.3 Installation Procedures

Installation of the diagnostics is a very simple procedure. After the drivers have been installed (see Section 3.1), perform the following steps:

1. Locate the diskette labeled ‘‘21130 Diagnostics’’ and insert it into your default diskette drive (typically drive A).
2. Start Windows.

3. From the Program Manager window, select the Run... option from the pull-down File function. In the text-entry box labeled ‘‘Command line,’’ type `A:\SETUP` to invoke SETUP.EXE from the diskette.
4. The SETUP program asks where to install the diagnostics. Accept the default, which is C:\21130DIA.
5. Upon completion, SETUP creates a program item and a program group.

4.4 Running the Diagnostics

With Windows 3.1 running, double click on the program group labeled 21130 Diagnostics. From the displayed menu, double click on the Diagnostic Program menu item. The program opens a diagnostic window, including a pull-down menu bar with five items and three dialog boxes. Diagnostic messages are displayed in the window.

The three dialog boxes are:

Dialog Box	Description
Run Control Panel	Used to run all of the diagnostics or a specific one, to loop on a subtest, to stop a test, to get help on a test, to initialize the board, or to get configuration information.
Environment Control	Used for selecting the test environment.
Examine Registers	Used to examine individual registers.

4.4.1 Run Control Panel

The Run Control Panel dialog box has eight push buttons that allow you to perform the following functions:

Click on	To...
Run	Run all diagnostics in a continuous loop. To stop the tests, click on the Stop push button or press the Escape key on the keyboard.
Init	Initialize the EB130, using the current environmental controls.
Cnfg	Display the current board configuration.
Last	Run the last test.
Loop	Loop on the last test. Click on the Stop push button or press the Escape key to stop.
Stop	Stop the diagnostics.

Click on	To...
Help	Display the help dialog box.
Exit	Stop the diagnostics and exit the program.

4.4.2 Environment Control

The Environment Control dialog box has five check buttons and a slider, allowing you to control the diagnostic environment. The following controls can be turned on or off:

Click on	To...
Composite Video	Enable/disable composite video.
Mem Clock External	Select the clock input as internal (off) or external (on).
Pix Clock External	Select the pixel clock as internal (off) or external (on).
Test Pin=Mem Clk	Bring the clock output to the test pin.
8 Bit [332] Visual	Select the current frame buffer depth as 8, 16, or 32 bits.

The Memory Clock Value slider adjusts the memory clock value to the desired frequency.

Note

When the diagnostics are running in standalone mode, the environment controls are disabled. Changing them corrupts the driver.

4.4.3 Examine Registers

The Examine Registers dialog box has a text-entry box that allows you to specify a register. The contents of that register are displayed. For more detailed information on the registers, click on Help in the menu bar.

5
Technical Information

5.1 Technical Specifications

Table 5–1 provides technical information for the EB130.

Table 5–1 EB130 Technical Information

Parameter	Specification[1]
Max. current consumption	1 A
Operating temperature range	0°C–55°C
Storage temperature range	0°C–55°C
Max. operation voltage	5.25 V
Max./min. pixel clock	135 MHz/8 MHz
Max./min. memory clock	66 MHz/40 MHz
Max./min. PCI clock	33 MHz/25 MHz
Video Signals	
Noncomposite signals	0.714 V ±10% when terminated with 75 Ω ±2%
Separate composite sync signal	Negative-going TTL
Separate sync signals	Negative- or positive-going TTL
Composite green signal amplitude	1.0 V ±10% when terminated with 75 Ω ±2%
Green signal sync amplitude	Between 27% and 33% of the total peak-to-peak voltage

[1]Specifications are subject to change without notice.

(continued on next page)

5.1 Technical Specifications

Table 5–1 (Cont.) EB130 Technical Information

Parameter	Specification[1]
	Sync Signals
Level	TTL I_{oh} maximum $\leq$ 2 mA @ +5.25 V I_{ol} maximum ≥ -6 mA @ 0.0 V V_{ol} maximum $\leq$ 0.4 V @ 6 mA V_{oh} minimum $\geq$ 2.4 V @ -2 mA
Polarity	Programmable
Impedance	>2-kΩ pull-down resistors

[1]Specifications are subject to change without notice.

5.2 Board Layout

Figure 5–1 shows the EB130.

Figure 5–1 EB130 Board Layout

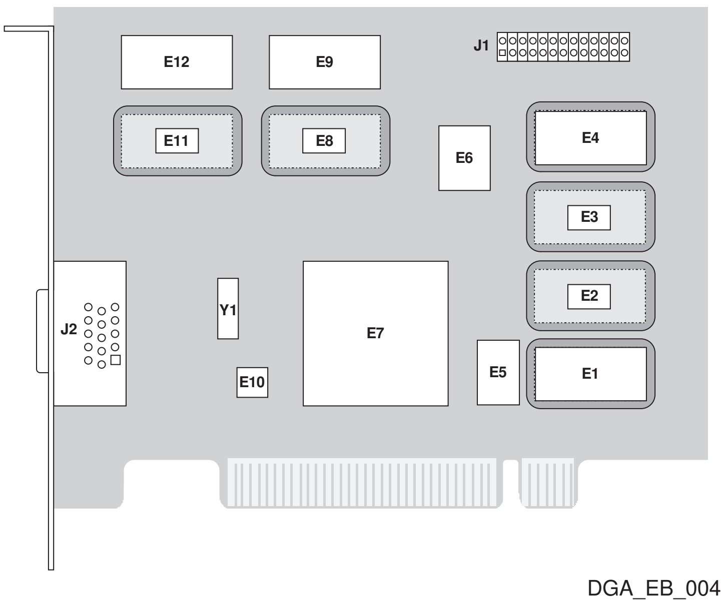


Table 5–2 lists the EB130 components.

Table 5–2 EB130 Components

Component	Description
E7	DECchip 21130 chip
E5	Feature connector data buffer
E6	Flash ROM, containing VGA BIOS
E10	1.2-V voltage reference
E9, E12	EDO DRAMs
E1, E4	EDO DRAMs in sockets[1]
E2, E3, E8, E11	Sockets for optional EDO DRAMs
J1	VGA feature connector
J2	DB-15 analog monitor connector
Y1	14.318-MHz crystal

[1]Some early EB130 boards do not have sockets for E1 and E4. These have revision A etch.

5.3 VESA Super VGA BIOS Programming

Table 5–3 specifies the supported VESA modes.

Table 5–3 Supported VESA Modes

Graphics			Text	
Mode	**Resolution**	**bpp**	**Mode**	**Resolution**
101_{16}	640 ×480	8	109_{16}	132×25 characters
102_{16}	800×600	4	$10A_{16}$	132×43 characters
103_{16}	800×600	8		
104_{16}	1024×768	4		

The DECchip 21130 video BIOS conforms to the *VESA Super VGA BIOS Extension (VBE) Version 1.2*.

5.4 DB-15 Analog Monitor Pinout

Figure 5–2 shows the DB-15 analog monitor connector.

Figure 5–2 DB-15 Analog Monitor Connector

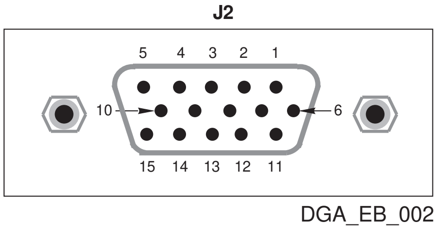


Table 5–4 shows the pin connections for the DB-15 analog monitor connector.

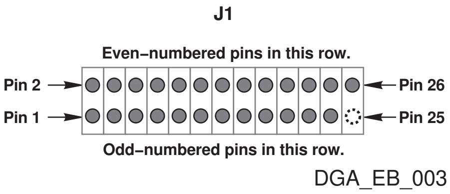
Table 5–4 DB-15 Pin Connections

Pin	Signal	Pin	Signal	Pin	Signal
1	Red	6	Red ground	11	No connection
2	Green	7	Green ground	12	DDC data
3	Blue	8	Blue ground	13	Horizontal sync
4	No connection	9	No connection	14	Vertical sync
5	Ground	10	Sync ground	15	DDC clock

5.5 VGA Feature Connector

Figure 5–3 shows the VGA feature connector.

Figure 5–3 VGA Feature Connector



5.6 Monitor Settings and Timing Parameters

Table 5–5 provides the monitor parameters that are supported in the Windows 3.1 drivers for the EB130.

Table 5–5 Monitor Parameters

	Monitors			
Specification (Unit)	**640×480 IBM VGA**	**640×480 Digital VRC16**	**640×480 Digital VRC20**	**640×480 VESA 75 Hz**
Resolution (pixels)	640×480	640×480	640×480	640×480
Pixel rate (MHz)	25.175	25.175	31.5	31.5
Horiz. frequency (kHz)	31.4688	31.4688	37.8606	37.5
Vertical frequency (Hz)	59.9405	59.9405	72.8088	75.0
Horiz. period (pixels)	800	800	832	840
Horiz. blanking (pixels)	160	160	192	200
Horiz. sync delay (pixels)	16	20	24	16
Horiz. sync width (pixels)	96	96	40	64
Interlaced (Y/N)	N	N	N	N
Vertical period (lines)	525	525	520	500
Vertical blanking (lines)	45	45	40	20
Vertical sync delay (lines)	10	11	9	1
Vertical sync width (lines)	2	2	3	3

(continued on next page)

5.6 Monitor Settings and Timing Parameters

Table 5–5 (Cont.) Monitor Parameters

Specification (Unit)	Monitors			
	800×600 VESA 56 Hz	**800×600 VESA 60 Hz**	**800×600 VESA 72 Hz**	**800×600 VESA 75 Hz**
Resolution (pixels)	800×600	800×600	800×600	800×600
Pixel rate (MHz)	36.0	40.0	50.0	49.5
Horiz. frequency (kHz)	35.1563	37.8788	48.0679	46.8750
Vertical frequency (Hz)	56.2500	60.3165	72.1876	75.0000
Horiz. period (pixels)	1024	1056	1040	1056
Horiz. blanking (pixels)	224	256	240	256
Horiz. sync delay (pixels)	24	40	56	16
Horiz. sync width (pixels)	72	128	120	80
Interlaced (Y/N)	N	N	N	N
Vertical period (lines)	625	628	666	625
Vertical blanking (lines)	25	28	66	25
Vertical sync delay (lines)	1	1	37	1
Vertical sync width (lines)	2	4	6	3

(continued on next page)

5.6 Monitor Settings and Timing Parameters

Table 5–5 (Cont.) Monitor Parameters

	Monitors			
Specification (Unit)	**1024×768 VESA 60 Hz**	**1024×768 VESA 70 Hz**	**1024×768 72 Hz**	**1024×768 VESA 75 Hz**
Resolution (pixels)	1024×768	1024×768	1024×768	1024×768
Pixel rate (MHz)	65.0	75.0	74.370	78.750
Horiz. frequency (kHz)	48.3631	56.4759	57.3843	60.0229
Vertical frequency (Hz)	60.0038	70.0694	72.0003	75.0286
Horiz. period (pixels)	1344	1328	1296	1312
Horiz. blanking (pixels)	320	304	272	288
Horiz. sync delay (pixels)	24	24	16	16
Horiz. sync width (pixels)	136	136	128	96
Interlaced (Y/N)	N	N	N	N
Vertical period (lines)	806	806	797	800
Vertical blanking (lines)	38	38	29	32
Vertical sync delay (lines)	3	3	1	1
Vertical sync width (lines)	6	6	6	3

(continued on next page)

5.6 Monitor Settings and Timing Parameters

Table 5–5 (Cont.) Monitor Parameters

	Monitors	
Specification (Unit)	**1280×1024 72 Hz**	**1280×1024 VESA 75 Hz**
Resolution (pixels)	1280×1024	1280×1024
Pixel rate (MHz)	130.8085	135.0
Horiz. frequency (kHz)	77.1277	79.9763
Vertical frequency (Hz)	72.5566	75.0247
Horiz. period (pixels)	1696	1688
Horiz. blanking (pixels)	416	408
Horiz. sync delay (pixels)	32	16
Horiz. sync width (pixels)	160	144
Interlaced (Y/N)	N	N
Vertical period (pixels)	1064	1066
Vertical blanking (lines)	39	42
Vertical sync delay (lines)	3	1
Vertical sync width (lines)	3	3

5.7 DRAM Vendors

Table 5–6 lists the approved DRAM vendors.

Table 5–6 Approved DRAM Vendors

Company Name	Period	Part Number
Micron	60 ns	MT4C16270DJ-6
Samsung	70 ns	KM416C254BJ-7
NEC	60 ns	424210A-60
Mosel Vitelic	50 ns	V53C16258HK50

A
Technical Support and Ordering Information

A.1 Technical Support

If you need technical support or help deciding which literature best meets your needs, call the Digital Semiconductor Information Line:

United States and Canada	**1–800–332–2717**
TTY (United States only)	**1–800–332–2515**
Outside North America	**+1–508–568–6868**

A.2 Ordering Digital Semiconductor Products

To order the DECchip 21130 PCI Integrated Graphics and Video Accelerator Evaluation Board, contact your local distributor.

You can order the following semiconductor products from Digital:

Product	Order Number
DECchip 21130 PCI Integrated Graphics and Video Accelerator	21130-AA

A.3 Ordering Associated 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
Alpha Architecture Reference Manual[1]	EY–L520E–DP–YCH
DECchip 21130 PCI Integrated Graphics and Video Accelerator Product Brief	EC–QD2NA–TE
DECchip 21130 PCI Integrated Graphics and Video Accelerator Technical Reference Manual	EC–QD2QB–TE
DECchip 21130 PCI Integrated Graphics and Video Accelerator Evaluation Board Read Me First	EC–QHV1B–TE

[1]To order and purchase the *Alpha Architecture Reference Manual*, call **1–800–DIGITAL** from the U.S. or Canada, or contact your local Digital office, or technical or reference bookstore where Digital Press books are distributed by Prentice Hall.

A.4 Ordering Third-Party Literature

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

Title	Vendor
PCI Local Bus Specification, Revision 2.0	PCI Special Interest Group N/S HH3–15A 5200 NE Elam Young Pkwy Hillsboro OR 97124–6497 503–696–2000
VESA Super VGA BIOS Extension (VBE) Version 1.2	Video Electronics Standards Association 2150 North First St Suite 360 San Jose CA 95131–2020 408–435–0333 408–435–8225 (FAX)

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