

OPENHAPTICS™ TOOLKIT

version 2.0

INSTALLATION GUIDE FOR WINDOWS



Open Haptics™ Toolkit

version 2.0

Copyright Notice

©1999-2005. SensAble Technologies, Inc. All rights reserved. Printed in the USA.

Except as permitted by license, no part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means electronic, mechanical, recording or otherwise, without prior written consent of SensAble Technologies.

Trademarks

3D Touch, ClayTools, FreeForm, FreeForm Concept, FreeForm Modeling, FreeForm Modeling Plus, FreeForm Mold, GHOST, HapticExtender, HapticSound, OpenHaptics, PHANTOM, PHANTOM Desktop, PHANTOM Omni, SensAble, SensAble Technologies, Inc., Splodge, Splodge design, TextureKiln, and WebTouch are trademarks or registered trademarks of SensAble Technologies, Inc. Other brand and product names are trademarks of their respective holders

Warranties and Disclaimers

SensAble Technologies does not warrant that this publication is error free. This publication could include technical or typographical errors or other inaccuracies. SensAble™ may make changes to the product described in this publication or to this publication at any time, without notice.

Questions or Comments

Visit the Developer Support Center at <http://dsc.sensable.com>. If you have an active maintenance contract and have any questions for our technical support staff, please contact support@sensable.com. You can also phone 1-888-SENSABL (U.S.A. only) or 1-781-937-8315 (International).

If you have any questions or comments about the documentation, please contact us at documentation@sensable.com.

Corporate Headquarters

SensAble Technologies, Inc.
15 Constitution Way
Woburn, MA 01801
Phone: 1-888-SENSABL (U.S.A. only)
E-mail: support@sensable.com
Internet: <http://www.sensable.com>

Preface

Resources for Learning OpenHaptics

Sensible provides the following documentation and other materials for learning OpenHaptics:

OpenHaptics Installation Guide This guide walks you through installing the toolkit and deploying your haptically enabled application. Detailed instructions for installing the PHANTOM® haptic device can be found in the *PHANTOM Device User's Guide* that came with your device. This can also be found on the OpenHaptics CD.

OpenHaptics Programmer's Guide This guide explains the OpenHaptics™ toolkit, and introduces you to the architecture of the toolkit, how it works, and what you can do with it. The guide will also introduce you to the fundamental components of creating haptic environments.

OpenHaptics API Reference This manual is meant to be used as a companion to the *OpenHaptics toolkit Programmer's Guide*. It contains reference pages to all the OpenHaptics HDAPI and HLAPI functions and types as well as appendices with tables that describe all the parameters.

Source Code Examples & Guide Several examples with source code to illustrate commonly used functionality of the HDAPI and HLAPI are installed with the toolkit. These include both console examples and graphics examples. A guide to these examples is located in <OpenHaptics Install directory>\doc.

Developer Support Center The Developer Support Center is described in more detail below.

The Developer Support Center

A more recent version of this document may be available for download from the SensAble online Developer Support Center (DSC). To access the DSC, visit the SensAble Support page at <http://www.sensable.com/support/>.

The DSC provides customers with 24 x 7 access to the most current information and forums for the OpenHaptics and GHOST® SDKs. Please note that you will be asked to create a registration profile and have your customer information authenticated before you will have access to the DSC.

Typographical Conventions

This guide uses the following typographical conventions:

Convention	Description	Example
<i>Italics</i>	First use of a new term; reference to another document or file; an argument.	See the <i>User Manual</i> .
BoldFace	Function name or parameter embedded in text.	capabilities are set using hdEnable()
Note, Warning, Important	Calls out important additional information.	Note: See table...

Installation

This chapter contains the following sections:

Section	Page
System Requirements	1
Installing the OpenHaptics Toolkit	2
Maintaining the OpenHaptics Toolkit	3
Directory Structure	4
External Modules	6
Registry Entries	6

System Requirements

IMPORTANT See the ReadMe in the <OpenHaptics Install directory> or visit www.sensable.com for the most current system requirements information.

The OpenHaptics toolkit requires certain hardware and software components in order to function properly. These requirements are listed below.

Hardware

- Intel® Pentium® 4 or higher
- 100 MB disk space and 256 MB RAM
- One of the supported devices from the PHANTOM® family of haptic devices:

- PHANTOM® Omni™	- PHANTOM® Premium 3.0/6DOF (Parallel Port)
- PHANTOM® Desktop™	- PHANTOM® Premium A 1.0/1.5/3DOF (Parallel Port/PCI Card)
- PHANTOM® Premium 1.5/6DOF (Parallel Port)	- PHANTOM® Premium L 3.0/3DOF (Parallel Port/PCI Card)

Software

- Windows® 2000 or XP

Compilers

- Microsoft® Visual C++ 6.0 or later. If using MicroSoft Visual Studio .Net 2003, please see the Known Issues section in the OpenHaptics ReadMe.

Drivers

- PHANTOM Device Driver v 4.2.49

Installing the OpenHaptics Toolkit

Installation Overview Installing the OpenHaptics toolkit is a two step process.

- 1 Install the required PHANTOM device drivers.
- 2 Install the software, the OpenHaptics toolkit, according to the instructions that follow.

Step 1: Install PDD

Before you can use the OpenHaptics toolkit you will need to install or update the PHANTOM Device Drivers (PDD). The device driver installation can be found on the OpenHaptics product CD or from the SensAble website. For complete installation instructions for the PDD, see the *PHANTOM <device> User's Guide* that shipped with the device.

Step 2: Install Software

After you have completed the installation of the PDD, install the toolkit as described below.

- 1 First locate the installation files:

If you are installing from CD:

- a Insert the OpenHaptics CD into your CD-ROM drive.
- b In Windows Explorer, locate the drive letter associated with your CD-ROM Drive and double-click it.
- c Double-click the **OpenHaptics toolkit** directory to open it.

If you are installing from software download:

- a Select the appropriate OpenHaptics product from the Developer Support Center.
- b Save the Zip file to your local system.
- c Locate the OpenHaptics Zip file that you saved to your local system.
- d Unzip the data file.

- 2 Double-click **setup.exe** to begin the installation.
- 3 To continue with the installation, click **Next**.
- 4 Read and then accept the license agreement. Click **Next**.
- 5 On the Setup Type window.
 - a Select the type of setup you prefer, Typical, Compact, or Custom.
 - b Select the destination folder for the install directory. The installation wizard will add a new environment variable, 3D TOUCH_BASE, which will point to the install directory.
 - c Click **Next**.
- 6 Proceed as appropriate for your installation type.
 - **Typical or Compact** - By default, GLUT is selected for install. If you do not already have GLUT installed on your computer, make sure GLUT is selected for install. These are recommended to incorporate visualizations with your haptics programs and are needed to build many of the sample programs.

- **Custom Only** - Select your components.

Examples: Installs all of the example applications

Program Files: Installs all of the necessary program files. This should generally always remain selected.

Help Files: Installs the help documentation.

External > GLUT: Installs the GLUT display libraries. These are recommended to incorporate visualizations with your haptics programs. See “External Modules” on page 6 for more information.

Click **Next**.

- 7 Install the files, by clicking **Install**. If you need to end the installation, click **Cancel**.

Note The OpenHaptics installation directory is labeled 3D Touch.

Maintaining the OpenHaptics Toolkit

If, after installing the toolkit, you find the need to modify the installation for any reason, read the following instructions.

- 1 Locate, as described in the previous section, and re-execute the OpenHaptics **setup.exe**. A maintenance window opens and you are given two options.

- 2 Choose one option:

If you want to modify, repair or uninstall your installation:

- a Select **Update the product selected below**.
- b Select **OpenHaptics toolkit** from the list.

Note The product name may vary depending on your license agreement.

- c Click **Next** and jump to step 3.

If you want to install the same product to a different location on your computer:

- a Select **Install a new copy of the product**.
- b Click **Next** and follow the instructions starting with step 3 in “Installing the OpenHaptics Toolkit” on page 2.
- c Click **Finish** when you are done.

- 3 If you choose to modify repair or uninstall, next choose your maintenance option:

Modify: Will let you select/deselect the components (as described in “Custom Only - Select your components.” on page 3). Some considerations:

- If you deselect a component that is currently installed, then that component will be uninstalled.
- If you select a component that is currently not installed, then that component will be installed.

- If you leave a component selected that is already installed, then the component will remain installed on your computer.

Repair: Attempts to retry the installation, as you specified during the first run. This is useful if you mistakenly deleted some files, or the installation procedure was corrupted in some way.

Remove: Uninstalls all of the components you have installed on your computer.

- 4 Click **Next** and follow the on screen instructions.

Directory Structure

The toolkit is broadly partitioned into the following directories: Lib, Include, Utilities, Examples, Runtime¹, and Docs.

Upon installation, the user can specify an installation directory and optionally install GLUT (see “External Modules” on page 6.) The default value of the installation directory is C:\Program Files\Sensable\3DTouch. The installation program also adds a new environment variable, **3D TOUCH_BASE**. Upon successful installation of the toolkit, the environment variable points to the install directory. All subdirectories described in this directory are relative to the 3D TOUCH_BASE directory.

- doc** Contains documents such as the API Reference, the Programmer’s Guide, this Installation Guide, and an HTML page that provides a guide and link to the source code examples.
- examples** The standard installation includes various examples including complete programs for illustrating: how to query buttons, position, velocity, the end-effector transform matrix as well as basic HLAPI rendering. Within the examples directory are three sub directories.
- bin** Contains the pre-built executables of the source code examples.
- HD** Contains console and graphics directories for the Haptic Device API examples.
- HL** Contains console and graphics directories for the Haptic Library API examples.
- Within the HD and HL directories you will find the following:
- console** Examples that only employ a windows command prompt.
- graphics** Examples that use OpenGL; most also use GLUT.
- include** Contains the header files of the 3D Touch SDK. It is the main include directory of the 3D Touch suite. It is most conveniently referenced by adding `$(3D TOUCH_BASE)\include` to the include path to your project settings.
- lib** Contains the library objects (.lib) files as well as the dynamically linked libraries (.dll) files. Note that the default runtime path is not set to include this directory, therefore the DLLs that live in this directory will not be loaded by default. We placed the DLLs in this directory to make it easier for end users to maintain multiple versions of the SDK.

1. Not included with all editions of OpenHaptics. See your license agreement.

- runtime** Contains the runtime installer that can be used for deployment of the OpenHaptics runtime components. Depending on your license agreement, this directory may not be included. The right to deploy is subject to a separate agreement, and it is not automatically granted to 3D Touch SDK developers.
- utilities** Utilities include various functions such as simple vector and matrix math, haptic workspace to camera mapping, a haptic device C++ wrapper for state, event synchronization and servo loop data logging and Haptic Mouse which allows users to use the PHANTOM device, in addition to the standard mouse, to manipulate Windows GUI objects.

These are intended to facilitate development by providing commonly used pieces of functionality to support HDAPI and HLAPI. Source code is provided for all utilities. These classes and functions are not required to use the HLAPI and HDAPI. Their interfaces are subject to change with new releases of OpenHaptics. However, they are provided as statically linked libraries so that binary compatibility of programs using HLAPI and HDAPI may be maintained even if the utilities change.

Within utilities you will find the following:

include If you want to use the facilities exposed by the utilities, you must add `$(3D TOUCH_BASE)\utilities\include` to the include path. Each utility is located in a separate subdirectory.

- GL (only if you selected to install GLUT files)
- HapticMouse
- HLU
- HDU
- SnapConstraints

lib This directory contains the .lib files for all the utilities. If you modify and rebuild the utilities source, this will update the .lib files in this directory as a post-build step.

src Like the include subdirectory, each utility library is located in a separate subdirectory.

- HapticMouse
- HLU
- HDU
- SnapConstraints

External Modules

The toolkit installation includes, as an option, the ability to install the GLUT (Graphics Library Utility Toolkit). This library is used by most of the graphics enabled examples that are included (with source code) in the SDK distribution.

The files and installation directories are:

<code>glut32.dll</code>	<i>System directory</i>
<code>glut32.lib</code>	<code>\$(3DTOUCH_BASE)\utilities\lib</code>
<code>glut.h</code>	<code>\$(3DTOUCH_BASE)\utilities\include\GL</code>

Registry Entries

Upon successful installation, the following entries are placed in the registry:

- `\HKEY_LOCAL_MACHINE\SOFTWARE\SensAble Technologies\PHANTOM Device Drivers\ MajorVersionNumber.MinorVersionNumber` (currently 4.2)
- `\HKEY_LOCAL_MACHINE\SOFTWARE\SensAble Technologies\OpenHaptics toolkit\ MajorVersionNumber.MinorVersionNumber` (currently 2.0)