NEXT SYSTEM

Display Extension for Haptic Evolution Kit

User Guide

evolution

HAPTIC EVALUATION KIT

Abstract

This document will help you to guide you through the first steps in exploring haptic feedback in combination with the display extension.
Connect the components and feel the difference.
This document is valid for next system HapticTouch™ with piezo elements only!
The purpose of the Haptic Evolution Kit with Display Extension is to

- Easily get a first impression on Haptics technology.
- Provide a tool which allows you to configure the haptic experience.
- Provide a reference design, which can be adapted to various applications.

Mechanical designers and engineers will obtain the basic information required to design their haptic application with M1 piezo modules in combination with a display-touch interface from this document.

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1 Components

The following chapters will give you a short overview of the components of the haptic evaluation kit and the display extension. For operating the kit a PC with a USB A and an HDMI interface is required.

1.1 Display-Touch unit

The display extension was developed to be combined with the Haptik Evolution Kit. This unit is placed directly on the 4 piezo modules after removing the mounting clips and is fixed to the actuators with magnets. This prevents the two components from slipping during operation.
The two kits can be separated from each other by lifting them slightly.
The display extension consists of a 7” display that can be controlled via HDMI and a PCAP touch sensor that is controlled via USB. A demo application is available for operating the display with haptic feedback and force sensing. The resolution of the display is 1024 x 600 pixels.
To interact with the display unit and the Haptic Evolution Kit you can use our application which is described in section 3.

1.1.1 USB Cable

For connection between computer and touch controller.
This cable has a USB-A connector and is used to connect to the user's computer.

1.1.2 HDMI Cable

For connection between computer and display controller.
This cable has an HDMI connector and is used to connect to the user's computer.

1.1.3 Power Supply

Power supply for display controller board (12V DC, 1A min)
The power supply is used to power the display and needs to be connected for operation of the display extension.

1.2 Operation of the Kit

1.2.1 Start up

	Warning Component damage possible due to electrostatic discharge Observe ESD protection measures during use.

Before starting the operation please carefully read the instructions from the manuals. You can find them by opening the box and scan the barcode in the lid of the box.

1.2.2 Operation

	Warning Electric shock possible by touching exposed contacts on the circuit board Use the enclosed glass plate
	Note Function of the haptics impaired Remove the mounting clips before operation (see chapter 3).

For the first experience with the Haptic Evolution Kit only a few steps are required. Here you can find the steps to do:

- Place the Display Kit on top of the Piezo actuators.
- Connect the HDMI cable to the display unit.
- Connect the USB cables and the HDMI cable to your PC.
- Connect the Power supply.
- Start the application “Haptic Demo Tool” and experience haptic feedback. The features of the application will be described in Chapter 2.1.

1.2.3 After operation

	Warning Cables may be damaged when closing the box Before closing the box, tie the cables together with the Velcro tape and insert them into the cable holders.

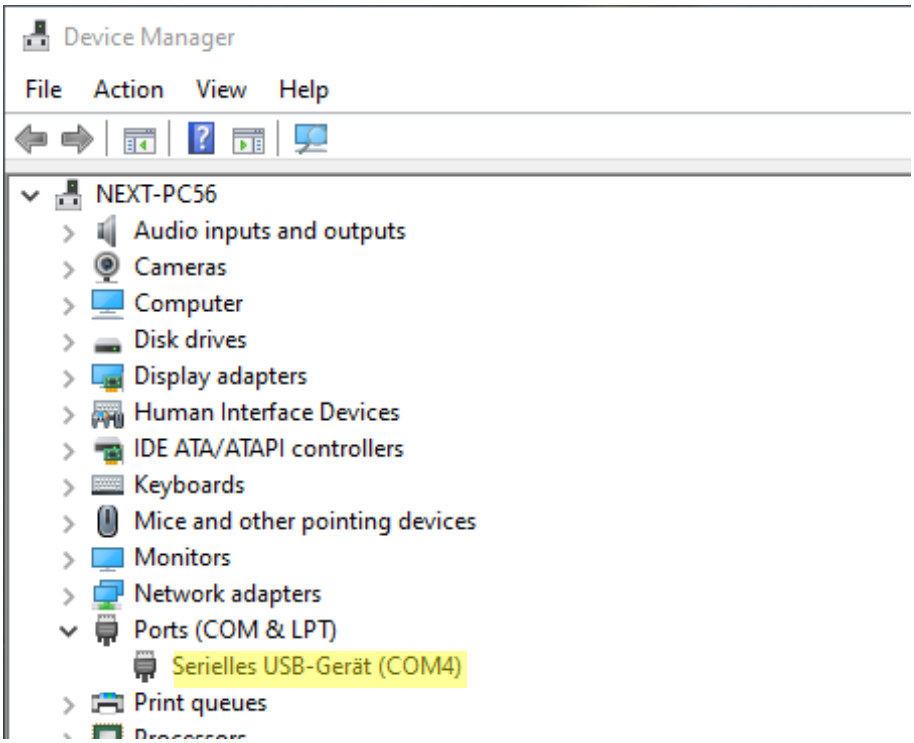
- Disconnect the Power supply and stow the cable in the cable holder provided.
- Disconnect the USB and HDMI cable from your PC and store it in the cable holders provided.
- Remove the display and put it back in its place in the packaging.
- The box can be closed.

2 Software

The haptics can be controlled actively via computer and the provided program "Haptic Test Tool" or can be used passively. the haptic test tool can be requested from next system via the following link: https://www.nextsystem.at/haptics/?lang=en/#HapticsForm

In the case of passive, no computer is required. The haptics are only triggered by the force measurement value pre-set in the haptics controller or use the external trigger input to play a pre-set haptic sentence. These features are available on request.

When the controller is connected to the computer, a COM driver is being installed.
A new COM port appears in the device driver.



2.1 Haptic Demo Tool

This application is designed to demonstrate, configure, and test our haptic hardware. It features a user-friendly interface divided into three distinct views:

1. **Buttons View:** The first and main screen, this view contains buttons that trigger specific haptic profiles, allowing users to experience the feedback of their selections.
2. **Sliders View:** Positioned to the right, this area is equipped with sliders that demonstrate the feeling of different haptic profiles while sliding on the screen.
3. **Configuration and Testing View:** Located above, this section provides various parameters for configuration and testing of different press and release thresholds as well as different haptic profiles.

Navigation: Transition between these views by simply touching the arrows displayed on the screen. This intuitive navigation makes it easy to switch perspectives as you explore the capabilities of our technology.

Automatic Connection: Upon starting the application, it will automatically search for the COM port specified in the documentation. The system checks each COM port sequentially until it locates the one connected to the haptic controller, at which point it establishes a connection automatically.

Closing the application: To exit the application simply navigate to the **Configuration and Testing View** and double tap on the NEXTSYSTEM logo.

Following requirements must be met to run the application:
Operating systems supported:

- **Windows:** The application is compatible with Windows environments. It requires Microsoft Visual C++, which, if not already installed, will be prompted for installation during the application setup. Note that installing Microsoft Visual C++ might require administrator permissions.
- **Linux/Embedded Linux:** The application can also run on Linux and embedded Linux systems, provided that Qt5 is installed on the machine.

System Requirements:

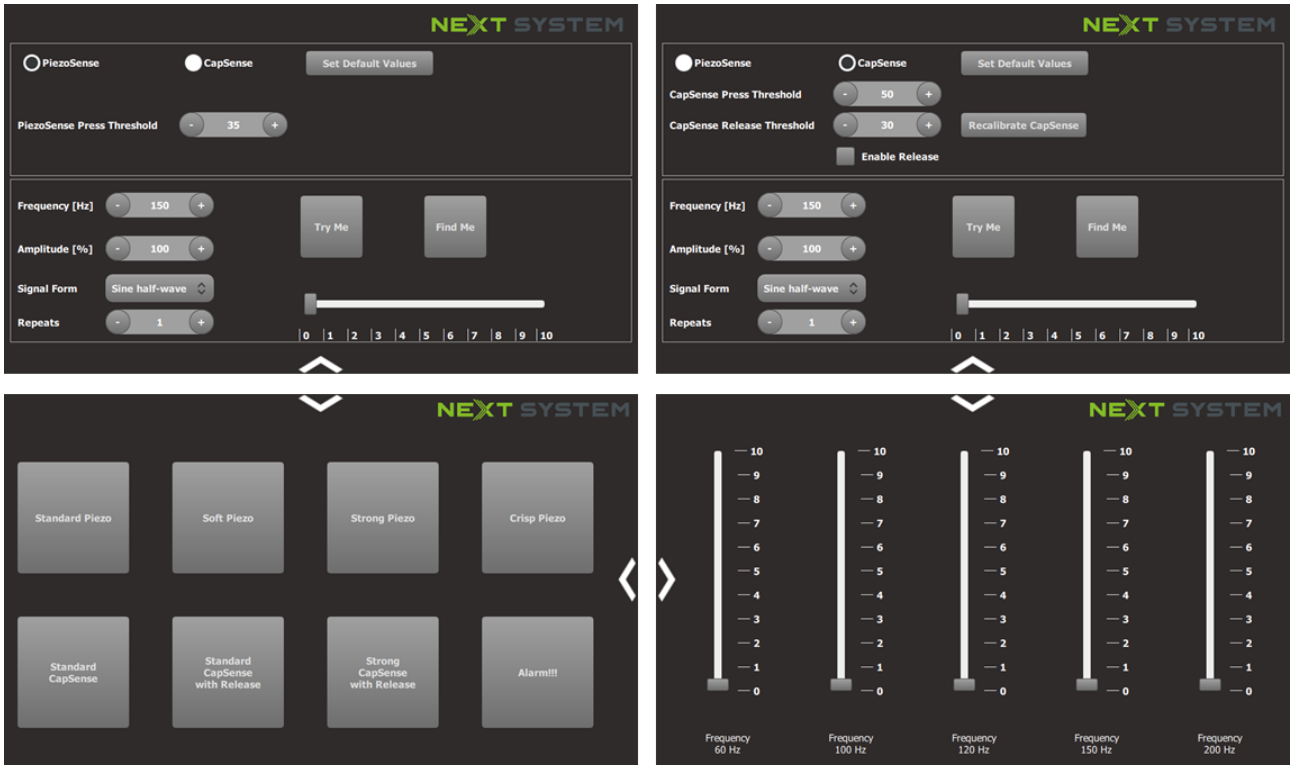
- For Windows, ensure that your system can run Windows 8.1 or later.
- For Linux and Embedded Linux, a compatible distribution that supports Qt5 is necessary.

Dependencies:

- On Windows, Microsoft Visual C++ 2015 or later Redistributable is required.
- On Linux-based systems, Qt5 must be pre-installed.

The following settings must be made in the operating system to ensure that the application is displayed correctly under Windows:

- The display settings for the 7” display must be set to extended
- The Windows taskbar should be hidden automatically



2.1.1 Demo Buttons View

In this View there are 8 buttons in total. All buttons in the upper row are using PiezoSensing for the force measurement. The thresholds and haptic feedback configuration are as follows:

- Standard Piezo:
  - Press Threshold: 40
  - Frequency: 100 Hz
  - Amplitude: 100 %
  - Signal form: Half–Sinus
- Soft Piezo:
  - Press Threshold: 40
  - Frequency: 75 Hz
  - Amplitude: 75 %
  - Signal form: Half–Sinus
- Strong Piezo:
  - Press Threshold: 30
  - Frequency: 200 Hz
  - Amplitude: 100 %
  - Signal form: Half–Sinus
- Crisp Piezo:
  - Press Threshold: 50
  - Frequency: 200 Hz
  - Amplitude: 100 %
  - Signal form: Trapeze

All buttons in the lower row are using CapSense. The thresholds and haptic feedback configuration are as follows:

- Standard CapSense:
  - Press Threshold: 30
  - Release Threshold: 20
  - Frequency: 100 Hz
  - Amplitude: 100 %
  - Signal form: Half–Sinus

- Standard CapSense with Release:
  - Press Threshold: 30
  - Release Threshold: 20
  - Frequency: 100 Hz
  - Amplitude: 100 %
  - Signal form: Half–Sinus

- Strong CapSense with Release:
  - Press Threshold: 50
  - Release Threshold: 30

- Frequency: 200 Hz
- Amplitude: 100 %
- Signal form: Half–Sinus
- Alarm:
- Press Threshold: 50
- Release Threshold: 30
- Frequency: 50 Hz
- Amplitude: 100 %
- Signal form: Half–Sinus
- Repeats: 10

Default values in the controller are as follows:

- PiezoSense Press Threshold: 35
- PiezoSense Release Threshold: 0
- CapSense Press Threshold: 100
- CapSense Release Threshold: 80
- Frequency: 120 Hz
- Amplitude: 100 %
- Signal form: Half–Sinus
- Repeats: 1

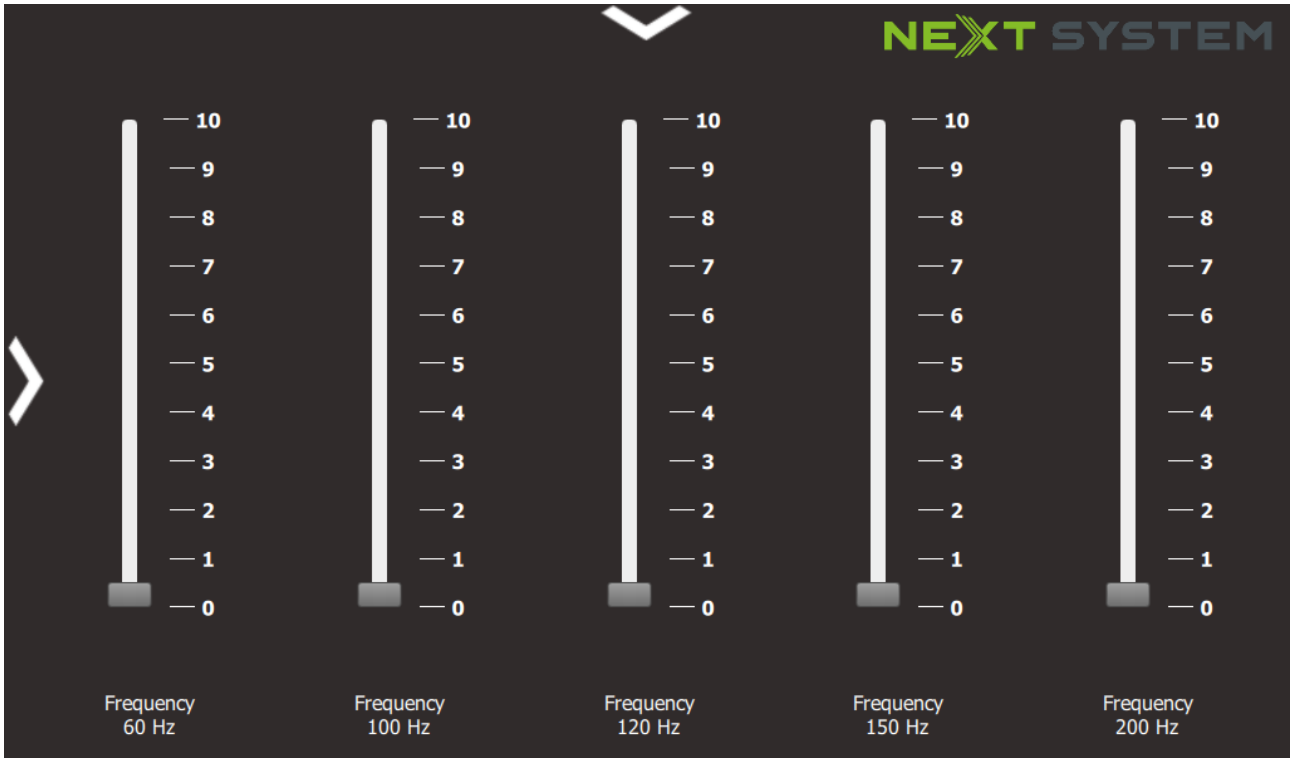
Default values as set by the application:

- PiezoSense Press Threshold: 35
- PiezoSense Release Threshold: 0
- CapSense Press Threshold: 50
- CapSense Release Threshold: 30
- Frequency: 150 Hz
- Amplitude: 100 %
- Signal form: Half–Sinus
- Repeats: 1

When a button is touched its border should light up. When a button is pressed its brightness will decrease. While using PiezoSense the buttons are quickly released, whereas while using CapSense, the buttons will stay pressed until the Release Threshold is met.

CapSense is a static measurement and allows the finger to dwell on the actuator when pressed. PiezoSense only detects dynamic/rapid changes.

2.1.2 Demo Sliders View



In this view there are five sliders. When a slider is moved haptic feedback is played on each step. The difference in the haptic profile is in the Frequency. At the end of each slider, the haptic profile has 3 repeats instead of only one.

2.1.3 Configuration View

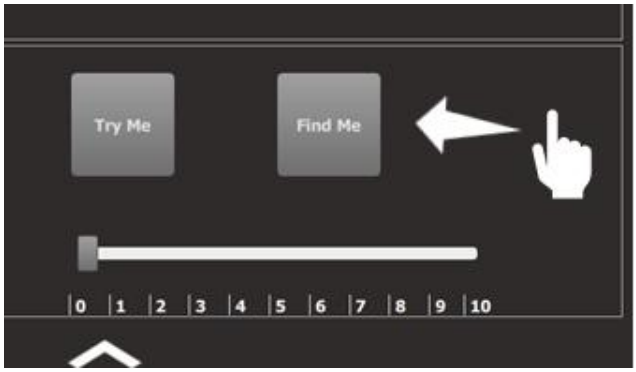
The Configuration View consists of two sections or panels:

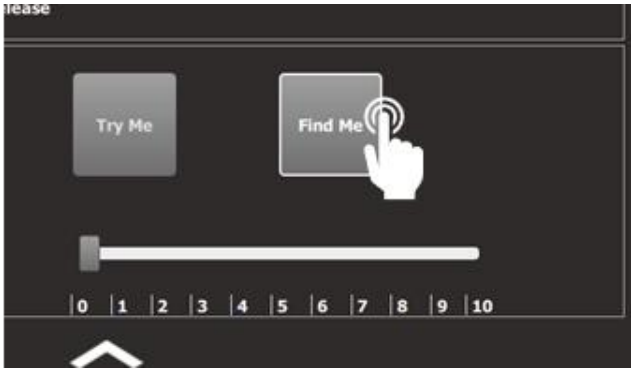
- The top panel handles the sensing methods. Use the radio buttons to select either PiezoSense or CapSense. Each sensing method offers adjustable parameters and displays the current sensing values. Every time the threshold value is changed, the application will send the new configuration automatically to the haptic controller.
- In the bottom panel, you can adjust feedback signal parameters and perform tests.

For PiezoSense, only the "press threshold" parameter can be adjusted. In the case of CapSense, both the "press" and "release thresholds" are adjustable. Additionally, CapSense includes a recalibration method and an “Enable Release" checkbox. When this checkbox is selected, it activates release feedback; otherwise, only press feedback is generated.
The haptic profile of the feedback signal can be any combination of values within range of the following parameters:

- **Frequency:** number in range of 20 to 1000 (Hz)
- **Amplitude:** number in range of 0 to 100 %. 100% means 120V output.

- **Signal form:** defines the used signal form for haptic impulse, the signal form has impact on haptic impression but also influences the generated audible sound.
  - Half sine
  - Trapeze
  - Sawtooth
- **Repeats:** defines how often a haptic pulse will be repeated, 1 means a single pulse.
- Once the signal parameters are adjusted there are three options:
- Press the **Try me** button and feel the haptic feedback or
- Use the slider and feel the haptics on each step or Touch the screen anywhere and slide the finger on the **Find Me** button and feel the haptic as you “find” the button; you can also press and feel the same haptics. If the **Find Me button** is touched first no haptic will be played.





2.2 API

The API can be used to control the haptics in your own application.
For details, please check Application Interface Description of the Haptics Controller.

3 Best practice

For getting a better feeling of the performance we suggest following steps:

- Check out the Demo Buttons and Sliders In the Configuration View
- Try different values for frequencies.
- Change of the amplitude
- Choosing Half Sine as signal form generates a pleasant sound.

CapSense is a static measurement and allows the finger to dwell on the actuator when pressed. PiezoSense only detects dynamic/rapid changes.

Revision History

Document version	Date of release	Description of changes
0.1	2024-05-08	Documentation created
1.0	2025-09-08	Document changed to new design

Important Notice and Disclaimer

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