



StretchSense™

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# LabVIEW Development VI

## INFORMATION SHEET

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VERSION 6.0 171016



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# StretchSense LabVIEW Development VI

StretchSense's LabVIEW Development VI enables you to perform advanced data processing and display of StretchSense data from within National Instruments LabVIEW Environment. This foundation VI accelerates your setup time and enables easy integration of StretchSense sensor data with data from existing laboratory instrumentation in multi-system experiments.

StretchSense provides two versions of the LabVIEW Development VI. One is configured to use a USB-Bluetooth Dongle that enables any modern PC to communicate with the StretchSense Sensor Module (SSM), and the other is configured to use the built-in Bluetooth module of your PC, if one is available. Note the USB-Bluetooth Dongle requires virtual COM port drivers to be installed to enable it to be accessed by LabVIEW. Instructions for installing the LabVIEW Development VI can be found in the Getting Started section of this information sheet.

# LabVIEW VI Descriptions

StretchSense provides two VIs for use with the StretchSense Sensor Module (SSM).

## STRETCHSENSE DEVELOPMENT VI

This VI provides a platform for developing advanced analysis and display of sensor feedback data being transmitted by the SSM. In its base configuration the VI takes care of initialising the serial connection and establishing a connection with the SSM (either via the USB-Bluetooth Dongle or the PC's built-in Bluetooth module), and provides an interface for sending commands to the SSM and receiving, transforming, graphing and logging data from the SSM.

The VI can easily be expanded by you to incorporate application specific functions, or be integrated into larger VIs used to coordinate multiple experimental systems. A detailed description of the controls and indicators is provided in the [Using the StretchSense Development VI](#) section.

### Note

Several key functions performed by this VI have been encapsulated in subVIs that must be present for the StretchSense Development VI to function correctly. In short, these VIs are:

- a. [Configure Serial Port \(Release SubVI\)](#)  
Configures the Virtual COM Port with the correct settings for communicating with the SSM.
- b. [Init USB-Bluetooth Dongle Command Mode \(Release SubVI\)](#)  
*USB-Bluetooth version only* - Configures the USB-Bluetooth Dongle in Command Mode in order to initialise Bluetooth link.
- c. [Reset USB-Bluetooth Dongle \(Release SubVI\)](#)  
*USB-Bluetooth version only* - Clears previous connections with SSM.
- d. [Connect to StretchSense Module \(Release SubVI\)](#)  
*USB-Bluetooth version only* - Establishes connection with SSM.
- e. [Feedback Processing \(Release SubVI\)](#)  
Processes and routes messages from the SSM.
- f. [ASCII to Numeric \(Release SubVI\)](#)  
Converts raw ASCII text data from the SSM into numeric data.

# Getting Started

When setting up the StretchSense Development VI for the first time it may be necessary to install additional LabVIEW and serial port drivers. For the USB-Bluetooth Development VI it is necessary to first install drivers for the supplied USB-Bluetooth Dongle and, if necessary, to find the MAC address of your SSM.

## INSTALLING NATIONAL INSTRUMENTS VISA DRIVERS (ALL VERSIONS)

Download NI-VISA is a set of drivers and function blocks for interfacing with serial instruments via the LabVIEW development environment. If you do not already have the NI-VISA drivers installed on your LabVIEW computer, please download the latest version for your operating system from the National Instruments website and install them before proceeding. This is a free download.

## INSTALLING DRIVERS FOR THE USB-BLUETOOTH DONGLE (BT233 USB-BLUETOOTH VERSION ONLY)

Installing virtual COM port drivers for the USB-Bluetooth Dongle enables LabVIEW to utilise the NI-VISA drivers to communicate with the StretchSense Module via the USB-Bluetooth Dongle. To install the necessary drivers:

- 1 Download the **CP210x USB to UART Bridge VCP Drivers** zip file available from the Silicon Labs website, and unzip the drivers to a local directory on your computer.
- 2 Navigate to the unzipped files and run the appropriate Installer for your operating system.
- 3 If prompted to do so during the installation process, restart your computer.
- 4 Plug in the USB-Bluetooth Dongle and allow the operating system to identify the USB-Bluetooth Dongle and make it ready for use.
- 5 Open National Instruments Measurement and Automation Explorer (NI-MAX), and under **My System** on the left of the NI-MAX window, expand **Devices and Interfaces**, then expand **Serial & Parallel**, and identify the COM port that has been assigned to the USB-Bluetooth Dongle.  
**Note**  
If you are unsure which COM port is new, highlight **Serial & Parallel**, unplug the USB-Bluetooth Dongle and press F5 to refresh the port list – the port assigned to the USB-Bluetooth Dongle will either disappear or a small yellow triangle will appear next to the correct port.
- 6 Make a note of the correct COM port before proceeding.

## PAIRING THE SSM WITH YOUR PC (BUILT-IN BLUETOOTH ONLY)

- 1 Turn the SSM on.
- 2 Use your PC's built-in Bluetooth control panel to pair the SSM with your PC. Accept the passkey/code that appears during the pairing process.
- 3 Upon pairing, the PC will assign a static COM port to the SSM using the Bluetooth Serial Port Profile (SPP) a.k.a. Standard Serial over Bluetooth Link.

### Note

To discover the COM port number, open National Instruments Measurement and Automation Explorer (NI-MAX), and under **My System** on the left of the NI-MAX window, expand **Devices and Interfaces**, then expand **Serial & Parallel**, and identify the COM port that has been assigned to the SSM. Please contact StretchSense if you require further assistance.

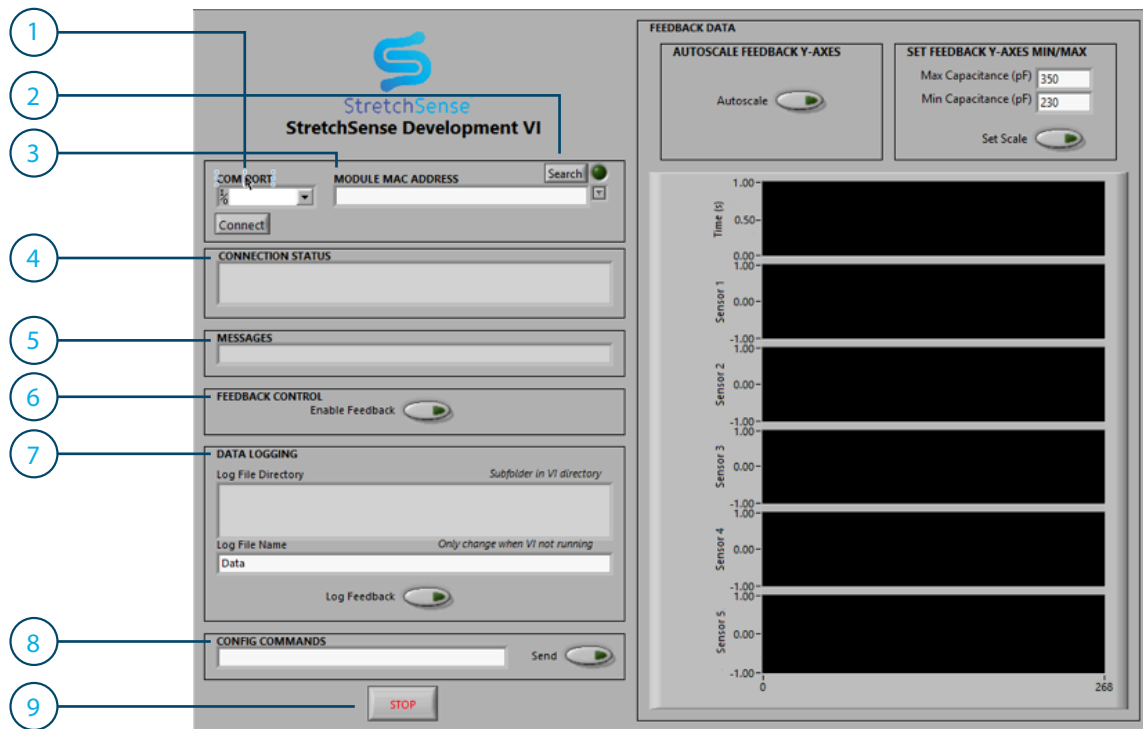
## INSTALLING THE STRETCHSENSE LABVIEW DEVELOPMENT VI (ALL VERSIONS)

Before running the StretchSense LabVIEW Development VI, copy StretchSense Labview Development VI.vi and the SubVI folder (containing the SubVIs required for operation) to a local folder of your LabVIEW computer.

## FINDING THE MAC ADDRESS OF YOUR SSM (USB-BLUETOOTH VERSION ONLY)

- 1 Ensure the USB-Bluetooth Dongle is plugged in and is recognised by your computer's operating system.
- 2 Turn on the SSM.
- 3 Select the BT233 USB-Bluetooth dongle COM Port from the any SSMs that are in range.  
**Note**  
The complete discovery process takes 11 seconds to complete.
- 4 Use the drop down box list to select your **Device MAC / Module MAC Address** control in the **StretchSense LabVIEW Development VI**.

# Using the StretchSense Development VI - Part A



## 1. COM PORT

Enter the COM port associated with the SSM (Built-in Bluetooth), or USB-Bluetooth Dongle (USB-Bluetooth).

## 2. SEARCH

USB-Bluetooth Version Only – Scan for nearby SSM available for connection.

## 3. MODULE MAC ADDRESS\*

USB-Bluetooth Version Only – Drop down box to select the SSM MAC address from after search operation completes.

## 4. CONNECTION STATUS

Feedback text messages indicating the status of the connection between the host computer and the SSM.

## 5. MESSAGES

Messages from the SSM in response to commands sent by the host computer are displayed here.

## 6. FEEDBACK CONTROL

Once a connection has been established with the SSM, click Enable Feedback to begin transmission of the sensor data from the SSM to the host computer. Click Enable Feedback again to stop the transmission of sensor data.

## 7. DATA LOGGING

Indicates the location of the StretchSense Logs directory on the host computer where data logs will be saved to, and the name of the log file. Note: The name of the log file can only be changed when the VI is NOT running.

## 8. CONFIG COMMAND

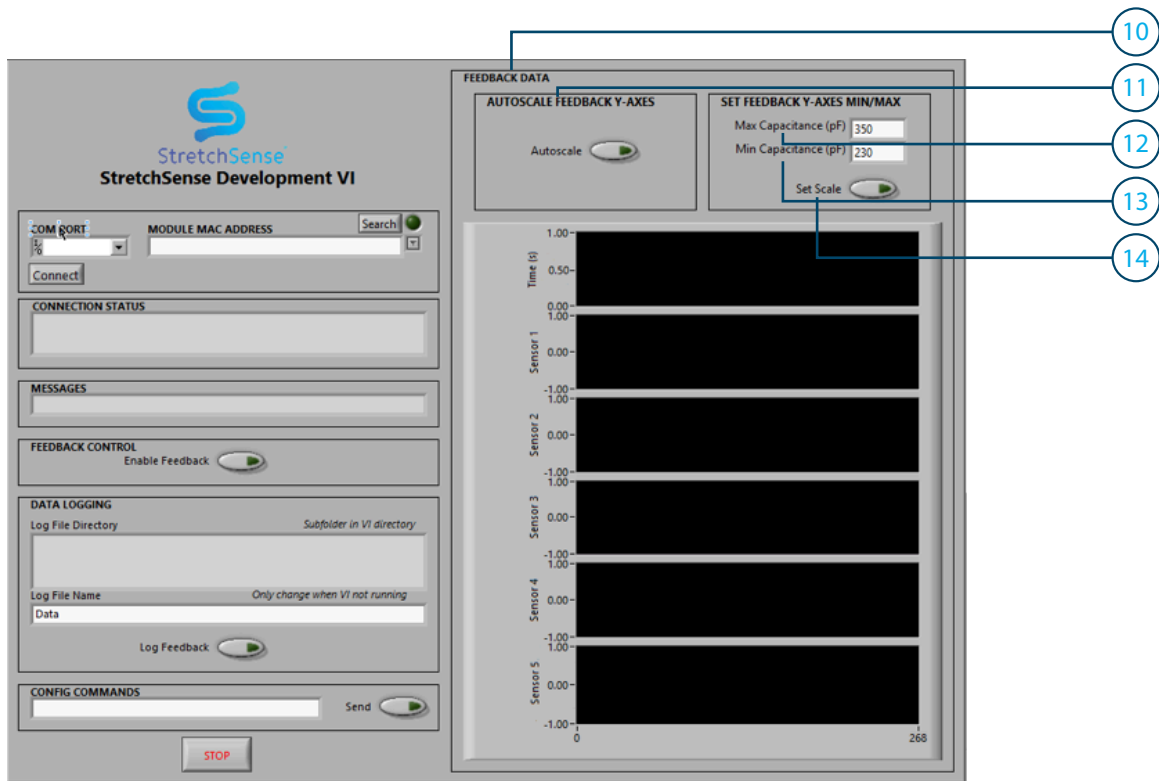
Configuration commands typed in the text box are sent to the SSM when the Send Command button is clicked. See the Configuration Commands section for more details.

## 9. STOP

Disconnects the host computer and the SSM and resets the Bluetooth interface.

\* To save this setting after configuring it for the first time, go to the Edit menu in LabVIEW, then select Make Current Values Default, then save the StretchSense Development VI.

# Using the StretchSense Development VI – Part B



## 10. STACKED FEEDBACK PLOTS

Displays the data stream from the SSM – the top plot is the timestamp sent by the SSM, followed sequentially by the sensor capacitance data for channels 1 to 5.

## 11. AUTOSCALE

Click this button to enable Autoscale on the Y-axes of the capacitance feedback plots. Enabling Autoscale causes the Y-axes of each of the capacitance feedback plots to continuously dynamically adjust to fit the range of the signal waveform.

## 12. MAX CAPACITANCE (PF)

Specifies the maximum value on the Y-axis of each sensor's capacitance plot.

Note: Individual plots can be adjusted independently by double left-clicking on the maximum value of the Y-axis and typing a new value.

## 13. MIN CAPACITANCE (PF)

Specifies the minimum value on the Y-axis of each sensor's capacitance plot.

Note: Individual plots can be adjusted independently by double left-clicking on the minimum value of the Y-axis and typing a new value.

## 14. SET SCALE

Clicking this button sets the range of the Y-axis of all 5 capacitance feedback channels to go between the Min Capacitance and the Max Capacitance.

Note: Clicking Set Scale disables Autoscale on the Y-axes of the capacitance feedback data.



# Configuration Commands (ALL VERSIONS)

The rate at which sensor feedback samples are sent to the host computer and the degree of filtering applied to the raw sensor data by the SSM can be adjusted temporarily through the use of configuration commands.

## Note

1. Any changes to the sample rate and the filter order are lost when the SSM is powered off.
2. An active connection to the SSM must be established before any configuration commands can be sent.

## ADJUSTING THE SAMPLE TRANSMISSION RATE OF SENSOR FEEDBACK

By default, a packet of data containing a time stamp and the capacitance of each of the 5 sensor channels is transmitted from the SSM to the host computer every 10ms. This rate can be adjusted by entering #p xxxx, where xxxx is a number between 10 and 1000 and represents the number of milliseconds between each packet of data transmitted, into the CONFIG COMMAND control of the StretchSense LabVIEW Development VI and clicking Send Command.

DEFAULT VALUE AT POWER ON	10
MINIMUM VALUE	10
MAXIMUM VALUE	1000

### FOR EXAMPLE

To change the delay between consecutive packets of data send by the SSM to be 250ms, enter #p 250 into CONFIG COMMAND, and click Send Command. The SSM will respond with the Message Sample Period: 250 sec.

## ADJUSTING THE NUMBER OF SAMPLES IN THE SSM AVERAGING FILTER

The SSM calculates the capacitance on each sensor channel at 100Hz. By default, a 4-point moving average is applied to this data and it is the result of this averaging that is reported in the packets of data transmitted to the host computer. The averaging can adjusted by entering #f yyyy, where yyyy is a number between 4 and 1000 and represents the number of samples in the moving average, into the CONFIG COMMAND control of the StretchSense LabVIEW Development VI and clicking Send Command.

DEFAULT VALUE AT POWER ON	4
MINIMUM VALUE	1
MAXIMUM VALUE	250

### FOR EXAMPLE

To increase the number of samples in the moving average to be 100 samples, enter #f 100 into CONFIG COMMAND, and click Send Command. The SSM will respond with the Message N-Filter: 100 samples.