Chirp Microsystems

# CH-101 SonicLink Software

Quick Start Guide

Overview

This document is a guide for installing and using the SonicLink tool in combination with the TDK/Chirp SmartSonic board. Users will gain hands-on experience with the unique ultrasonic sensing technology of the Chirp CH-101 sensor, which provides accurate range measurements in a compact, low-power device.

Requirements

1. PC with Windows OS. (Tested on Windows 8 64-bit, and Windows 10 64-bit.)
2. TDK/Chirp Microsystems SmartSonic evaluation board.
3. Two Micro USB cables.
4. Atmel Studio 7.0 IDE.
5. Internet connection (if the .NET framework and Atmel/FTDI drivers/tools are not previously installed on the target PC).

Hardware Configuration

The SmartSonic board is used with an external evaluation board as shown below. For initial hardware setup and programming of the Atmel chip, two micro USB cable connections are required but once the MCU is flashed then only the UART/USB Data connection is required. The board jumpers should be set in their default configuration as shown in the figure below.
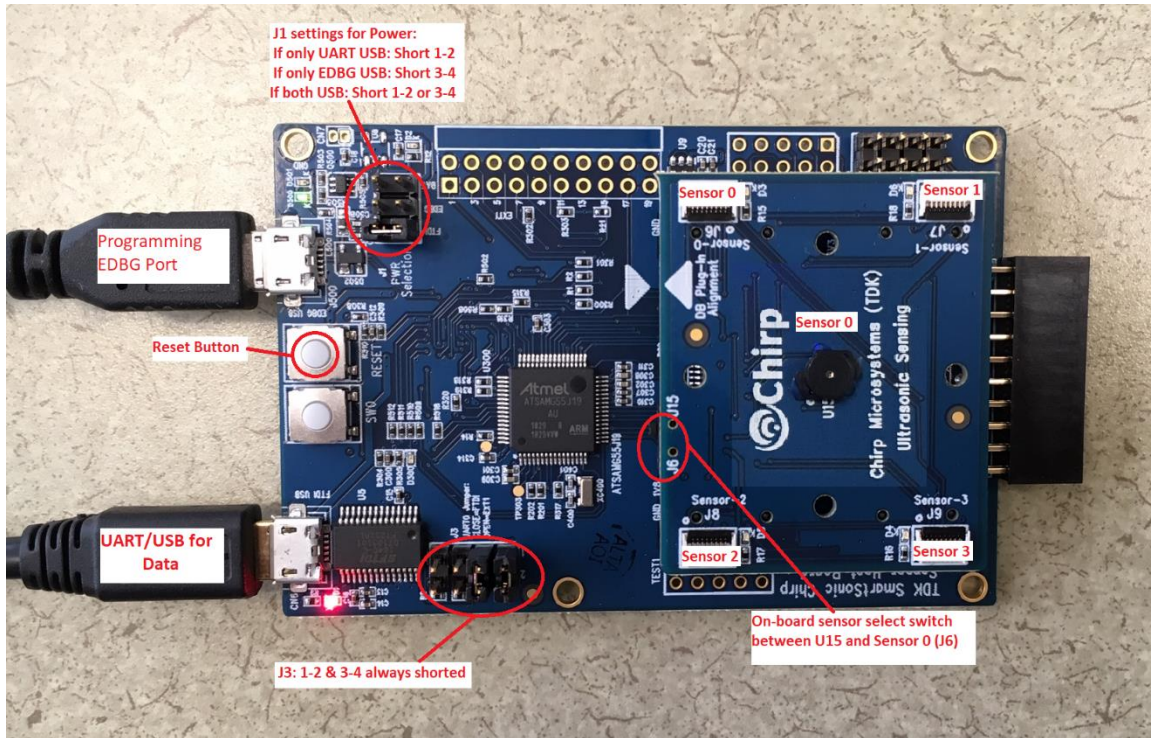

To connect an external sensor to the daughterboard, the flex cable will be inserted silver side up at the SmartSonic board and external sensor board. You can see in the pictures that the blue side of flex cable is facing downward, away from the sensor. When connected properly, an external sensor should lie flat on the work surface, facing upwards.


For best performance, external CH-101 sensor modules that have the omnidirectional housing (part number MOD_CH101-03-01) should be mounted in a flat plate of at least 100 mm (4") diameter with the sensor's acoustic housing flush with the surface of the plate. Consult the MOD_CH101 module datasheet for more information.
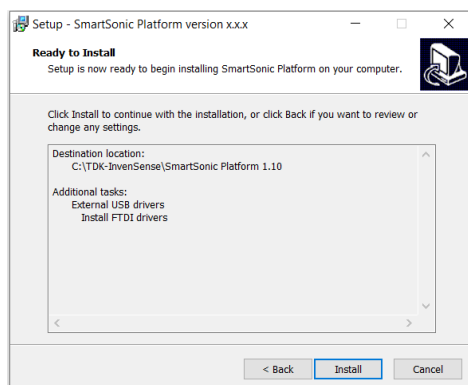
Installation

1. Run the "SonicLink_X.X.X_Installer.exe" installer. It will prompt for the installation directory. Once the desired installation directory is selected, click "Next".
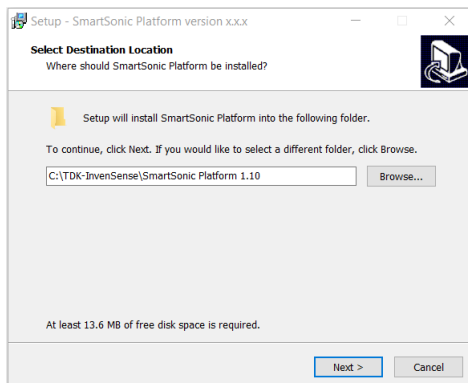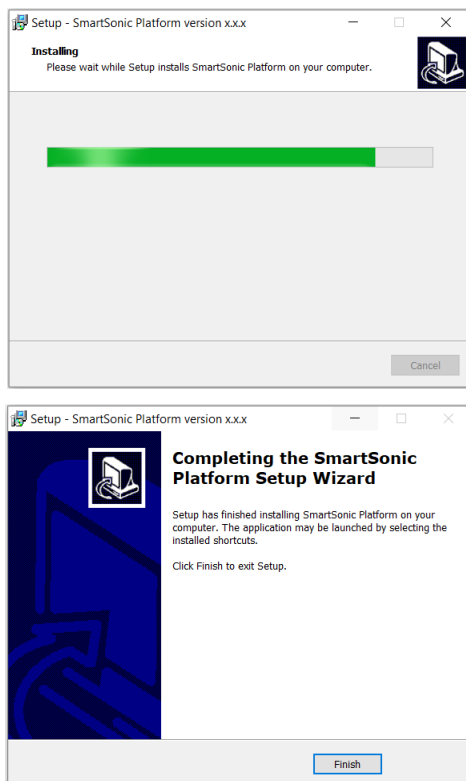

2. Check the "Install FTDI drivers" box then click "Next".
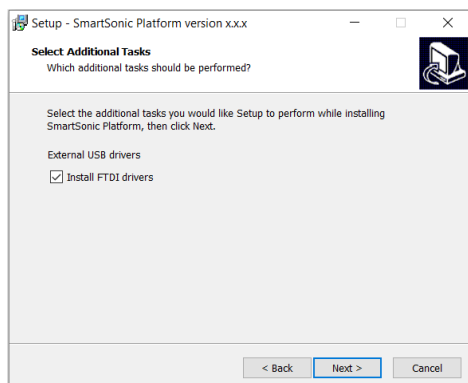
3. Verify the destination folder and start the installation by clicking on "Install".

4. Wait for the installation to complete and then click "Finish".

Installing Atmel Studio 7 and FTDI driver

Connect the SmartSonic evaluation board to the computer using the two USB ports (Note: A sensor daughter card should first be installed on the SmartSonic board.) Install the following tool to allow Flash MCU Firmware:

ATSAMG55 (web installer) If you haven't installed Atmel Studio 7, you can download the installer here: https://www.microchip.com/mplab/avr-support/atmel-studio-7

Starting the SonicLink Application

1. Navigate to the installation directory and run the "SonicLink.exe" executable or the SonicLink icon on the desktop.
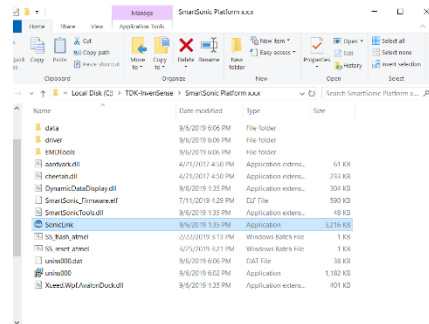

Connecting the SmartSonic Board

1. If no SmartSonic boards are connected to the USB/COM ports, the Serial Port and "Connect" button will be grayed out. If you do not observe a connected SmartSonic board in the serial port list, close and restart the SonicLink application as hardware discovery only occurs during launch of the app.
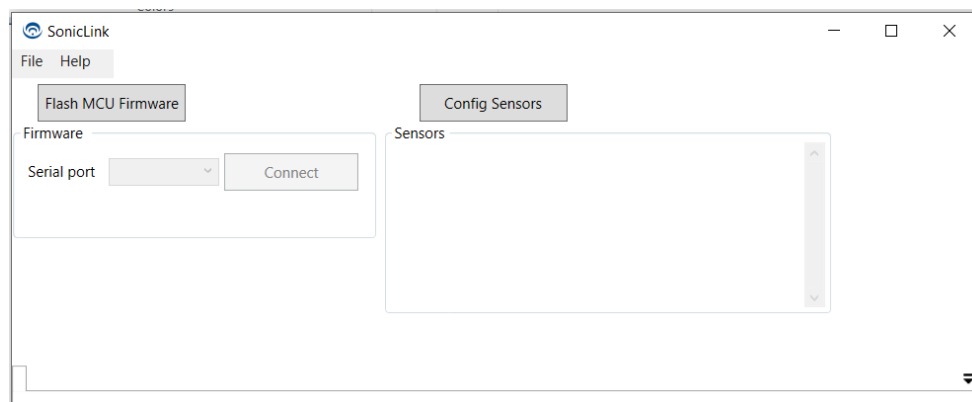

2. If a SmartSonic board is connected through a COM port it will appear in the "Serial port" list. Select the SmartSonic board from the list and click "Connect".
   If the board needs to be initialized with firmware click "Flash MCU Firmware" to program the MCU. Otherwise go to the next step.

3. Add a configuration to match the sensor(s) by clicking "Config Sensors". Configure the sensor(s) in the following order.
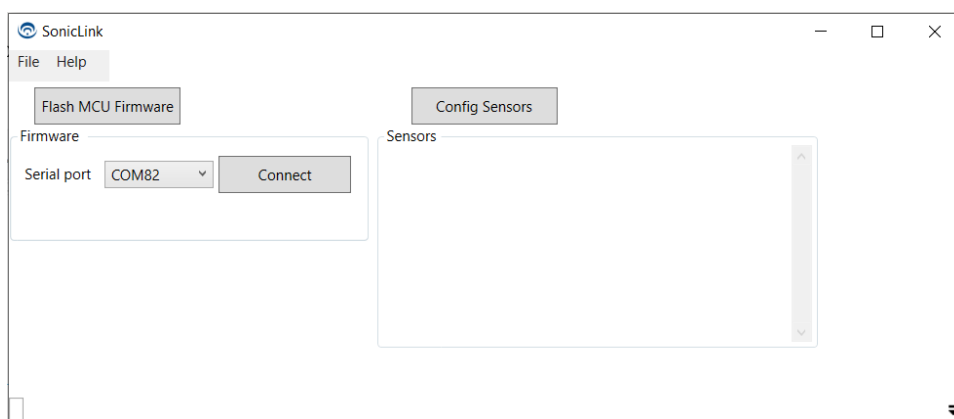
1) First select "Sensor Type"
   a. CH-101
2) Select Normal or Short Range operating mode under "Sensor Mode"
   a. Normal mode – allows detection of targets from 10 cm to 120 cm
   b. Short-Range mode – allows detection of targets from 4 cm to 25 cm
3) Select the full-scale range in millimeters, "FSR (mm)"
4) Select "Sample Rate"
5) Select "Sensor 0" through "Sensor 3" configuration settings from the following
   a. Not Selected: sensor not used
   b. Tx_Rx: Transmit and Receive Mode
   c. Rx Only: Receive Only Mode
6) Optional selections can be made by checking the box for the following features
   a. Static Target Rejection (STR)
      i. The STR mode is used to reject echoes from stationary objects that are in the sensor's field of view. In this mode, only the range of moving targets will be reported in the sensor's range output. This feature is useful when the CH-101 sensor must operate in a cluttered environment.
   b. Amplitude-scan (A-scan)
      i. Sample Rates are limited to 30 S/s for CH-101 when A-scan is enabled. This limitation is due to the additional time required to read the A-scan data from each measurement over the I2C bus.

Once you have the connected sensor(s) configured appropriately, click "Done".
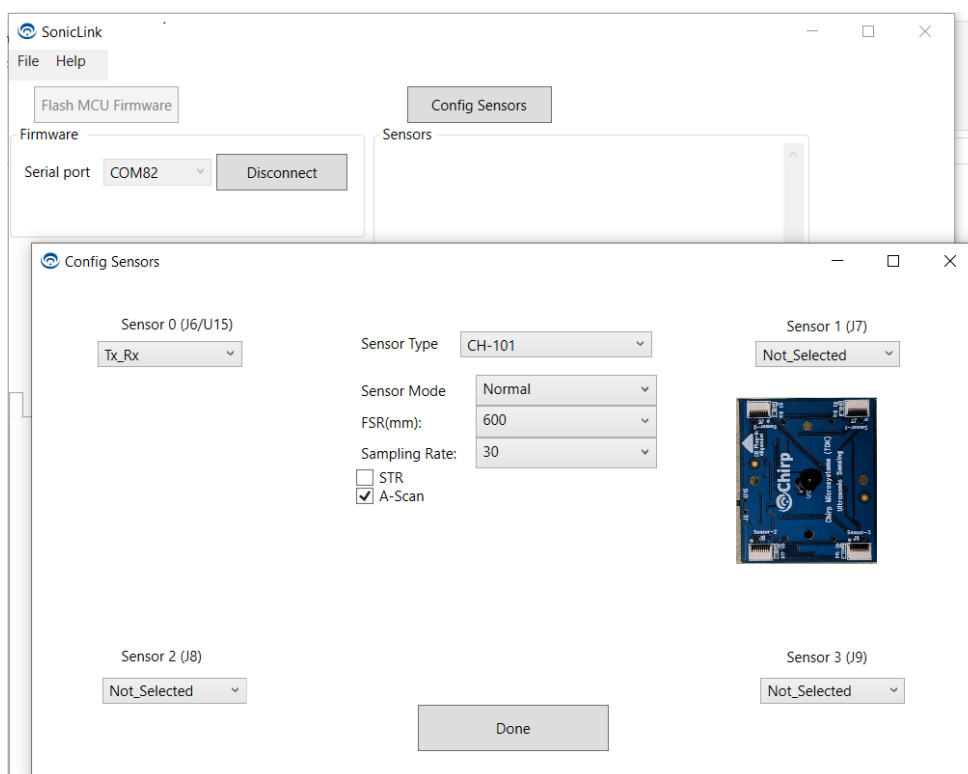
4. To remove a sensor configuration, click the ✖ button.
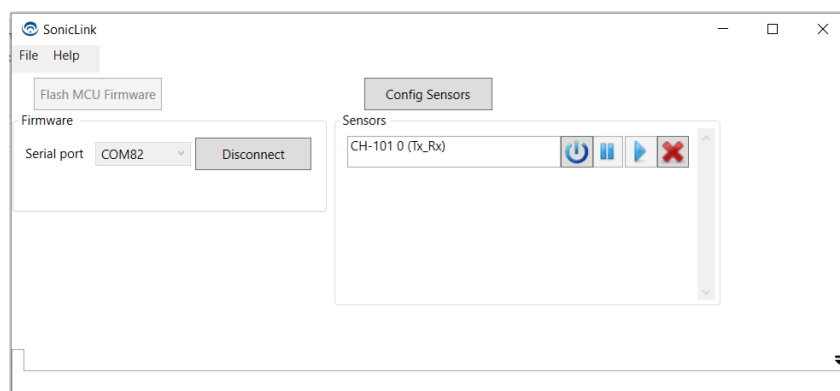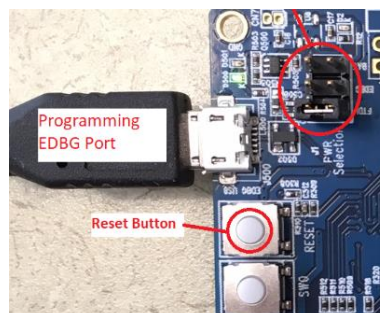
Adding Sensors to the Configuration

1. To add sensor(s) to an existing configuration, press the [X] button in the main sensors window to remove any current configurations.
2. Next, press "Disconnect" to end the serial port connection and allow the board to be reset and firmware loaded to the new sensors connected to the SmartSonic board.
3. Additional sensors can be connected to the daughterboard using flex cables
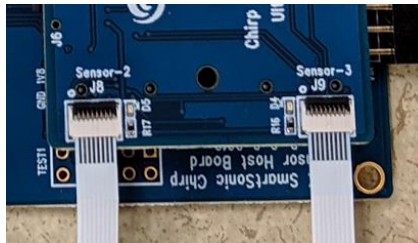
   1) The on-board sensor U15 shares the same bus with Sensor 0 at connector J6. To use an off-board sensor that is connected to the flex connector Sensor 0 / J6 then you will need to select J6 using the switch on the edge of the daughterboard, as shown circled in red below.
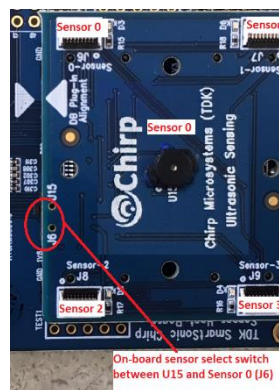

4. Next press the physical "Reset" button on the SmartSonic host board to clear the configurations.

5. Click "Connect" on the SonicLink GUI
6. Add a configuration to match the sensor(s) by clicking "Config Sensors".
7. Once you have the sensor(s) connected to the SmartSonic board configured appropriately, click "Done".

Starting the Data Capture

1. After a configuration has been added, click on the ⏻ button to initialize the board and sensor you want to launch. After the initialization completes, a set of tabs will open in the main window, and data collection will begin as shown below. Click on the ⏻ button for each sensor you want to collect data from. You will note that each sensor initialized will light a blue LED next to the corresponding connector on the daughterboard. In the example below, sensor 0 and sensor 2 have been initialized. The Blue LED next to J6 will illuminate when the onboard sensor is initialized.
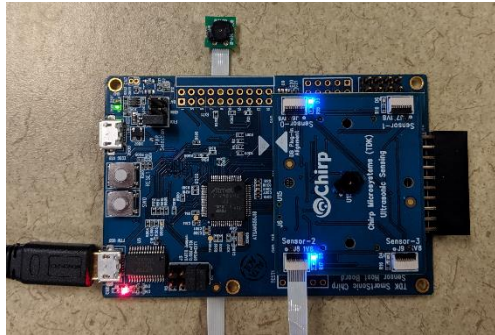
As the sensor module receives echoes from a target, the table displays the target's range and the echo amplitude. Depending on how many sensors are connected to the evaluation kit board (1 to 4) the software will generate the corresponding range data table and graph tabs.
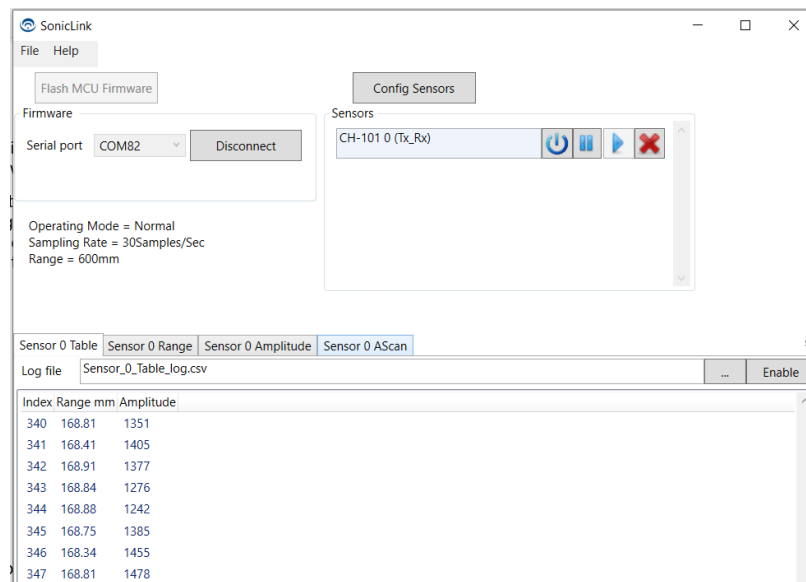
Viewing the Data

1. Once the data capture has started, click on the tabs to view the data from the sensor. Each tab is labeled with the corresponding sensor number (sensor 0 through 3). The following shows an example with one CH-101 sensor connected as sensor 0.

   1) The "Sensor 0 Table" tab shows the live range (in mm) and amplitude values as they are returned from sensor 0. You can choose to log the captured range and amplitude data to a text file – see "Storing the Data" in the next section.
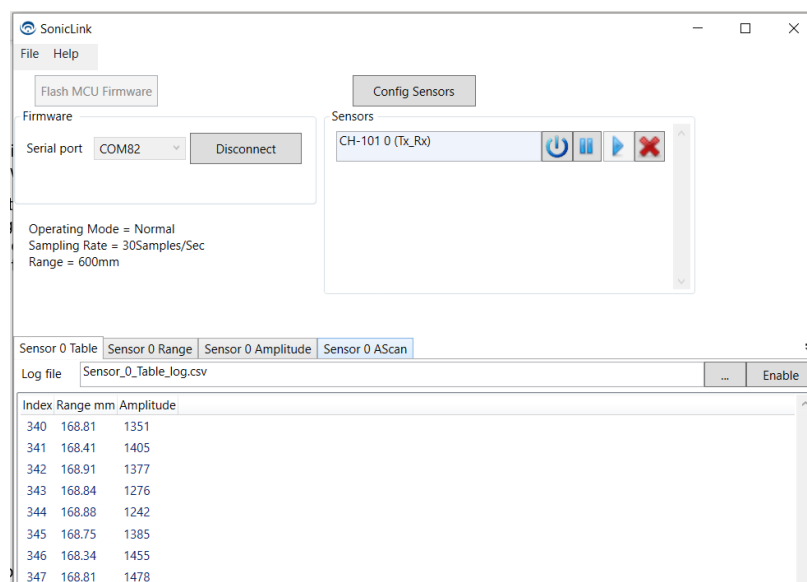
2) The "Sensor 0 Range" shows live range data in a graphical representation.
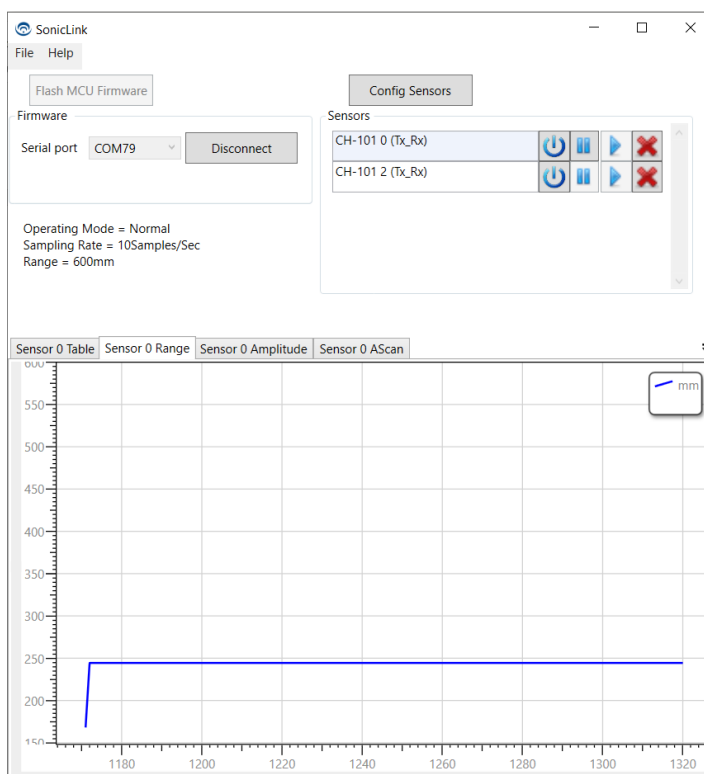
The chart displays the measured range to the closest target over time. Depending on how many sensors are connected to the evaluation kit board (1 to 4), the software will generate the corresponding range display windows.

3) The "Sensor 0 Amplitude" shows the live Amplitude data in graphical format.
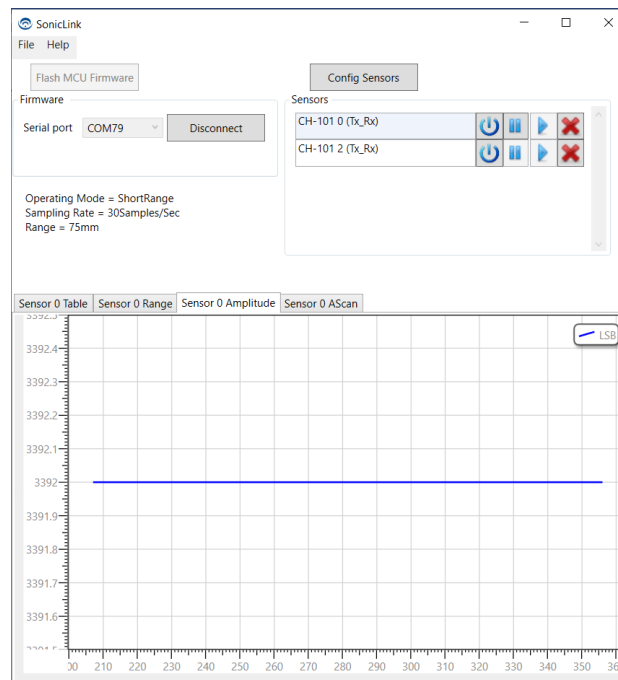
The Amplitude tab shows amplitude of the received echo over time. The units of this display are least-significant bits (LSBs) of the sensor's on-chip ADC. The full-scale value is 32,768. The amplitude varies based on the object's size, surface texture and shape. As the object moves further away from the sensor the amplitude diminishes.

4) The "Sensor 0 A-scan" tab shows the live Amplitude scan (A-scan) data in graphical representation.
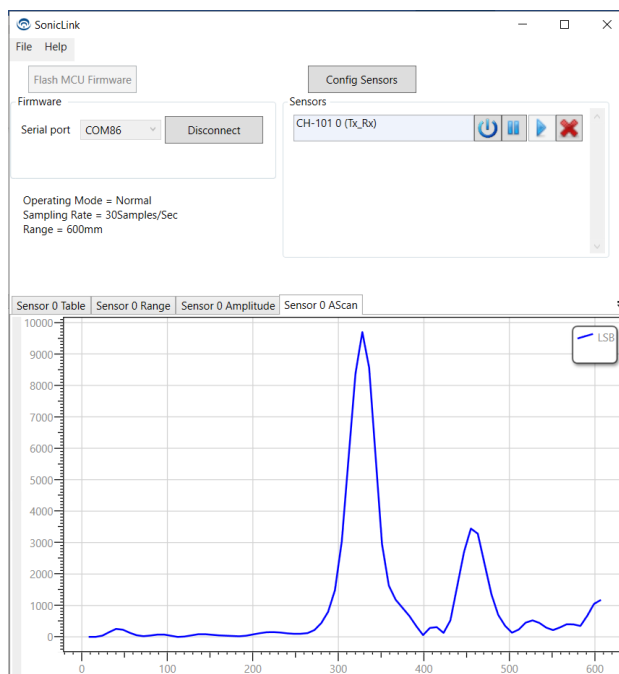
While the range and amplitude tabs display the range and amplitude of the nearest target, the A-scan tab displays the ultrasound amplitude at all range points for the current pulse-echo measurement, commonly known as an A-scan. In this plot, the vertical axis represents the echo (received signal) amplitude (in LSBs) and the horizontal axis represents the range in mm. The distance to a given object can be determined by the position of the corresponding echo on the horizontal range axis. The size, orientation, and surface texture of the object will affect the echo's amplitude.

Viewing Multiple Data Windows

1. You have the option to open multiple window tabs to view in either horizontal or vertical tabs as shown in example below. To open a second data tab either horizontally or vertically, right click your mouse cursor on the tab you wish to tile and a drop-down menu will open. Select either "New Horizontal Tab Group" or "New Vertical Tab Group".
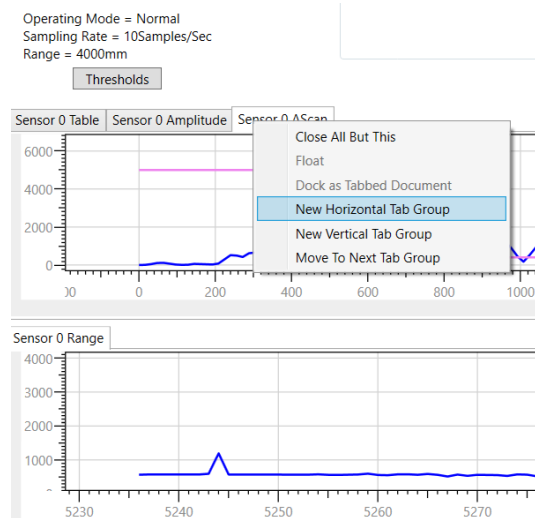
Example of Vertical Tab Group for Range and A-scan
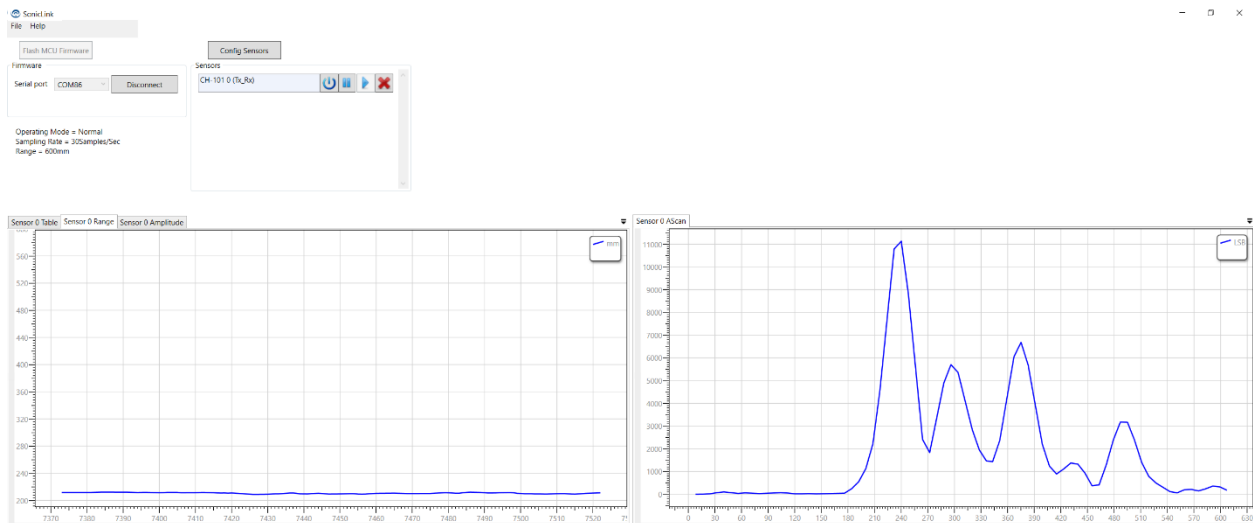
Example of Horizontal Tab Group for Range and A-scan
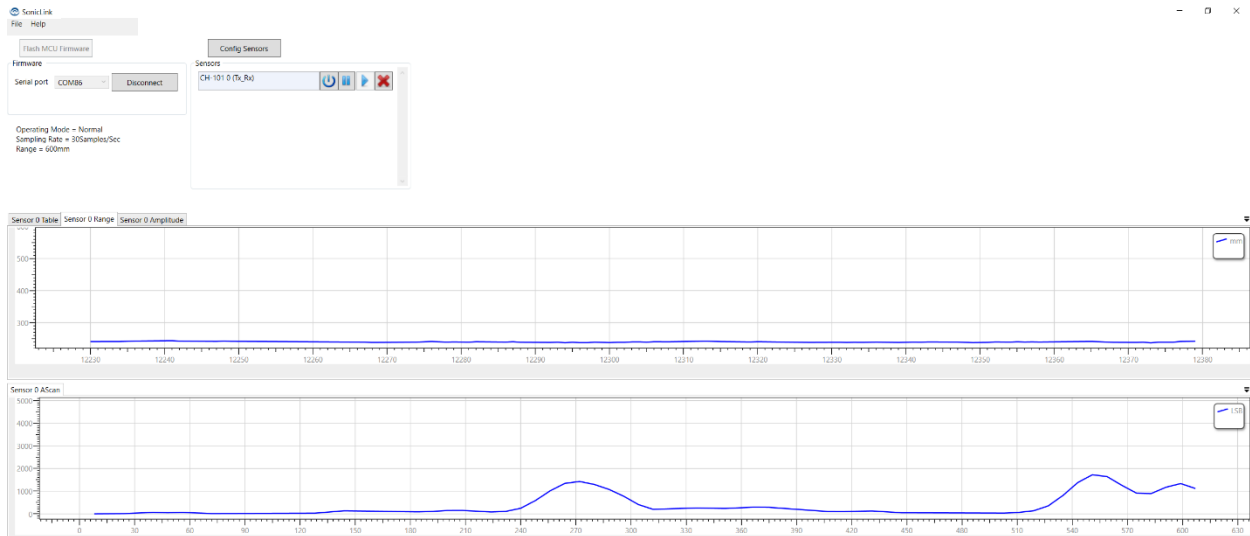
Storing the Data

1. You can choose to save the time-stamped Range and Amplitude data by entering a path/filename in the "Log file" field. You may set the directory for the log file by clicking the [...] button and browsing for the desired directory. Once the file and directory settings are correct, click "Enable" to begin logging the data to the file.
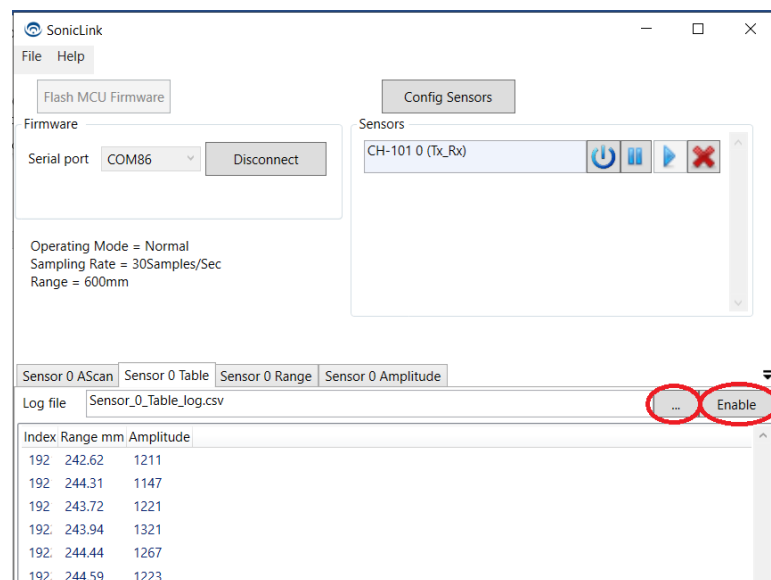
2. To stop saving the data to a file, press the "Disable" button.
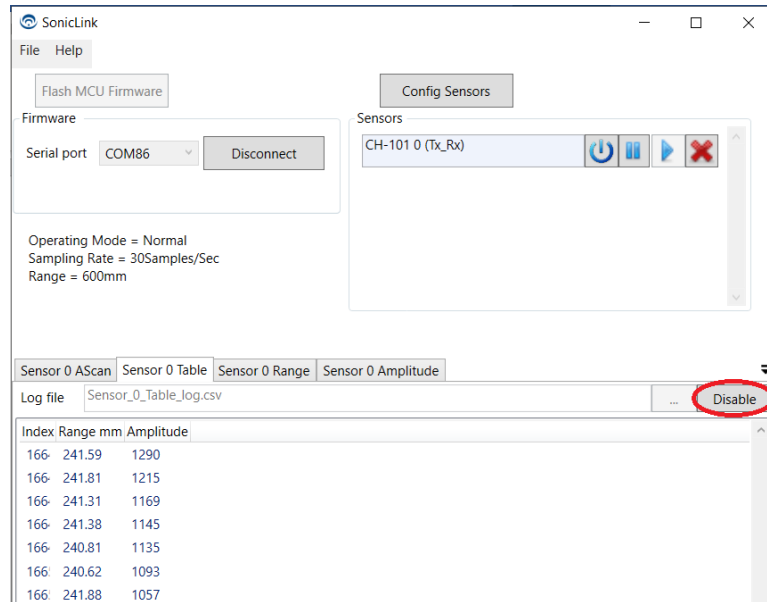
Pausing or Resume the Data Capture

1. To Pause the data capture for a given sensor, press the [ ] button in the main Sensors Window

2. To Resume the data capture for a given sensor, press the [ ] button in the main Sensors Window.

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REVISION HISTORY

Revision Date	Revision	Description
9/5/2019	1.0	Updated SW reference
9/27/2019	1.1	Add module mount information

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