FlexiForce™ Sensor Characterization Kit Quick Start Guide

Introduction

The FlexiForce Sensor Characterization Kit lets you measure and record force data collected using the Tekscan FlexiForce™ sensors. It provides designers the software, hardware, and electronics that streamline mechanical load control, circuit selection, and calibration, all from one easy to use software interface. Reduce your design time and gain an understanding of the technology needed to move forward with the design confidently in your prototype, using a comprehensive characterization kit.

The assembled Desktop Loading Fixture, made up of a Load Cell, Actuator, Circuit Board, and FlexiForce Sensors, allows the user to run 3-4 tests to determine the Linearity, Hysteresis, Drift, and Repeatability of the sensors. Custom load profiles can also be user programmed, and a manual control mode is available.

COMPONENTS LIST

(1) Desktop Load Fixture
    (1) Linear Actuator / Frame Sub Assembly, with Cylinder, Load Spring, and Load Actuator (1 or 10 lbs load cell).
    (1) Fixture Board / Base Sub-Assembly, with Arduino Nano Chip.
    (2) Mounting Screws (used to attach the Linear Actuator to the Fixture Board)
(3) Interchangeable Testing Modules: (1) Voltage Divider, (1) Non-Inverting Op-Amp, and (1) Inverting Op-Amp
(4) FlexiForce Sensors (either A301-1 with 1lb load cell, or A301-25 with 10lbs load cell)
(1) 3-Foot USB Extension Cable
Software Files (**.zip** package can be downloaded at https://www.tekscan.com/fir)
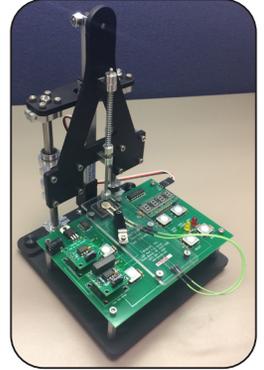
FlexiForce Desktop Load Fixture

Hardware Assembly

STEP 1. Place the "Linear Actuator" on top of, and at the back of, the "Fixture Board" so the mounting screw holes line up. Hand screw the two screws, so both Sub-Assemblies are firmly affixed to each other.

STEP 2. Connect the Linear Actuator Controls and Power on the right side of the Fixture Board, just above the Arduino Nano chip / USB connector. Note: Black ground wire plugs into "G" slot (top), red +12 volt wire plugs into "+12" slot (middle), and white data connector wire plugs into "Data" slot (bottom).

STEP 3. Place the Sensor underneath the sensor clip, so the sensel is in position on top of the Load Cell and beneath the Loading Actuator. Attach the Sensor Connector Wires to the Sensor pins. *Note: There is no polarity associated with the wires; Left or right wires can be attached to either sensor pin.*

STEP 4. The three Op-Amps are interchangeable; however, only two modules can be inserted at a time. Insert the two modules with which you wish to test the sensor: 1. Voltage Divider with Feedback Resistor, 2. Non-Inverting Op-Amp, and/or 3. Inverting Op-Amp.

Insert the first Circuit Module into Circuit Module Slot 1, ensuring the Voltage Drive (Vdrv) pin is at the top and the +5 Volts (+5) pin is at the bottom. Do the same for the second Circuit Module, installing into Slot 2.

STEP 5. Plug the mini USB connector from the Arduino Nano chip into an open USB slot on your Computer.

STEP 6. Connect the Main Power Supply to a wall socket, and connect the other end to the Power Input on the Fixture Board's left side. The Red Test LEDs will light up in sequence from right to left (red, then yellow, then green), and then both the top Module Slot 1 and Load Test LEDs will light green and stay lit. At the same time, the Reference Voltage Display will light red.
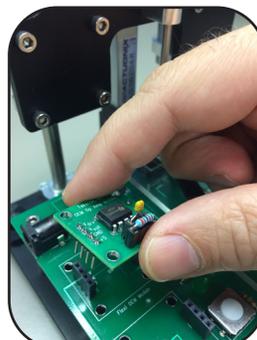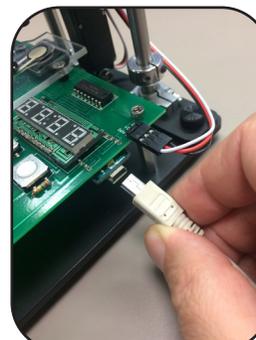
Step 1: Linear Actuator & Fixture Board Assembly
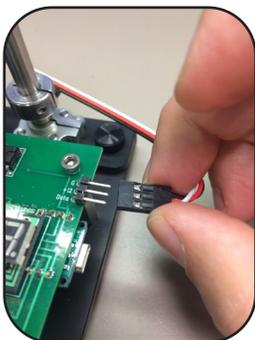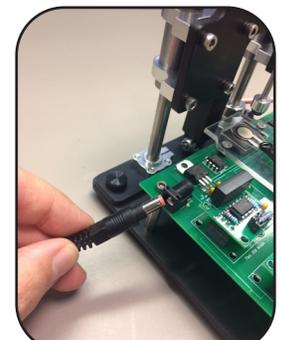
Step 2: Connecting Actuator Controls & Power

Step 3: Sensor Placement & Connection

Step 4: Inserting the Op-Amp Modules

Step 5: Plugging in the Mini USB connector

Step 6: Connecting the main Power Supply

Data Capture - Performing a Test

STEP 1. Open the **Flexi Micro Reader (.xlsm)** file in Microsoft Excel.

A window opens. The "Baud Rate" is always **9600**. However, you will have to open up your **Device Manager** (in the Computer's **Control Panel**) to obtain the "Port" number. This is the Port number for the USB connection to your computer, and is located under the **Tekscan Sensor Device** or **Ports** sub-heading. In this example, it is the **USB Serial Port (Com3)**.

Double-click the selection to open up the device's Properties window, where the Port is listed. In this case, "**3**". Once this is entered, click the **Connect** button to connect to the computer. You can now move this window off to the side, and perform your tests.

STEP 2. Ensure the correct Circuit Module is in Slot 1 or Slot 2, and press the **Module Select** Button to the right of the Module you want to use for the test.

STEP 3. Select the desired test using the Test Select button (see **Sensor In-Circuit Property Tests** below). The Reference Voltage Display shows a default **2.500** Volts. Start with this as a reference.

STEP 4. Press the **Test Run** button.

STEP 4A. If you are performing the Linearity, Linearity and Hysteresis, or Drift tests, the Actuator engages and the Load Actuator presses down on the Sensor and Load Cell. Depending on the test, several cycles or a period of time will pass before the test is complete. As the test is being performed, data for the test is displayed dynamically in the Excel software.

STEP 4B. If you are performing the Repeatability test, the Actuator engages and the Load Actuator presses down on the sensor. The "Reference Voltage Display" changes to show you the number **5**. This indicates the number of load cycles on the sensor. If desired, decrease or increase the cycle number using the Reference Voltage Decrease / Increase buttons below the display. Starting with 5 cycles is recommended.

Press the **Test Run** button again to start the test. The Load Actuator cycles through the different sensor loads, performing 5 steps up / 4 steps down, for each cycle.

STEP 4C. Once the test is complete, the software displays a measurement profile of the sensor's in-circuit property. Go to **File > Save** to save the data as an **Excel (.xlsx)** file. *Note: Sample Data can be found in the User Manual included with your software download.*
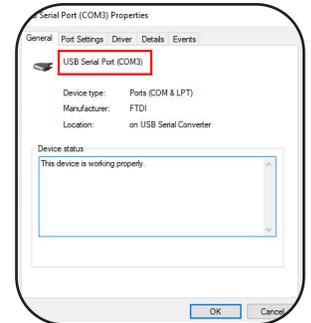
Note: If you have completed a test and wish to run another, it is recommended you save the previous test as an Excel (.xlsx) file. As soon as the *Test Run* button is pressed for the new test, all data from the previous test is deleted and cannot be retrieved.
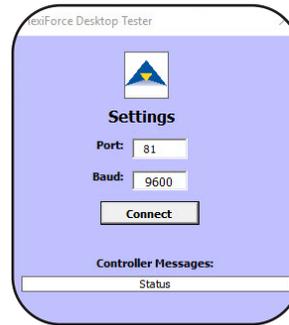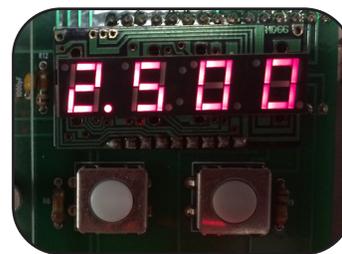

Step 1a: Software Connection Window
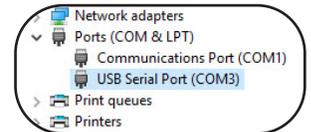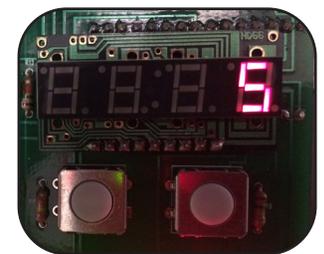

Step 1b: The USB Port in the Device Manager

Step 1c: The Device's Properties window

Step 2: Module Slot Selection

Step 3: Reference Voltage Display

Step 4b: Number of Load Cycles to be performed

Sensor In-Circuit Property Tests

Linearity Test

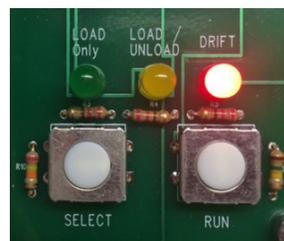**Select Button:** Green "Load Only" LED light on.

Load Profile: 5 steps up @ 20% / 40% / 60% / 80% / 100% of load.

Linearity & Hysteresis Test
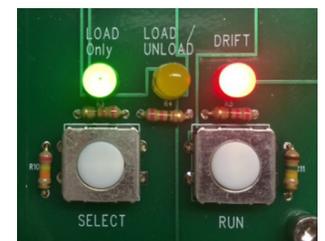
Select Button: Yellow "Load/Unload" LED light on.

Load Profile: 5 steps up @ 20% / 40% / 60% / 80% / 100% of load, then 4 steps down @ 80% / 60% / 40% / 20% of load..

Drift Test

Select Button: Red "Drift" LED light on.

Load Profile: Static 50% of load for a duration of 60 seconds..

Repeatability Test

Select Button: Greem "Load Only" and Red "Drift" LED lights on.

Load Profile: Runs the "Linearity and Hysteresis" test for a consecutive number of iterations specified by the user.