

Application Note 132 TSD105A and SS12LA Variable Force Transducers

Overview

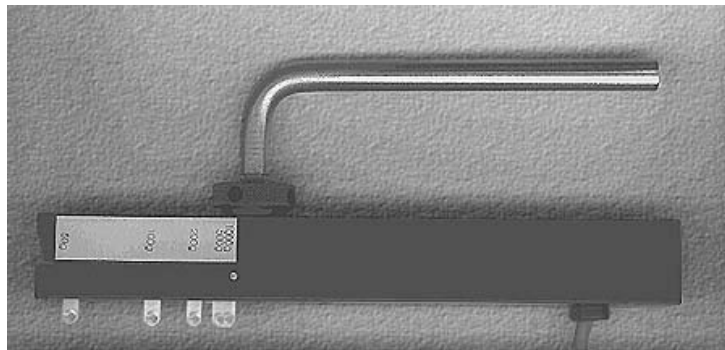
This Application Note details the setup and calibration of the BIOPAC TSD105A and SS12LA Force Transducers. The TSD105A is used with the DA100C amplifier and *AcqKnowledge* 4.x software. The SS12LA is functionally identical to the TSD105A, but interfaces with the MP36/35 System for *AcqKnowledge* 4.x and BSL 4.x software.

Force transducers are devices capable of transforming a force into a proportional electrical signal. The TSD105A/SS12LA force transducer element is a cantilever beam load cell incorporating a thin-film strain gauge. Because the strain elements have been photolithographically etched directly on the strain beam, these transducers are rugged while maintaining low non-linearity and hysteresis. Drift with time and temperature is also minimized, because the strain elements track extremely well, due to the deposition method and the elements' close physical proximity. The TSD105A/SS12LA also incorporates impact and drop shock protection to insure against rough laboratory handling.

Forces are transmitted back to the beam via a lever arm to insure accurate force measurements. Changing the attachment point changes the full scale range of the force transducer from 50 g to 1000 g. The beam and lever arm are mounted in a sealed aluminum enclosure which includes a 3/8" diameter mounting rod for holding the transducer in a large variety of orientations. The TSD105A comes equipped with a 2 meter cable and plugs directly into the DA100C amplifier. The SS12LA is also provided with a 2 meter cable for direct connection to the MP36/35 four channel Data Acquisition Unit.

The TSD105A/SS12LA mounting rod can be screwed into the transducer body in three different locations, two on the top and one on the end surfaces of the transducer. The mounting rod can be placed in any angle relative to the transducer orientation. The TSD105A/SS12LA can be used in any axis and can be easily mounted in any standard measurement fixturing, including pharmacological setups, muscle tissue baths and organ chambers.

The TSD105A/SS12LA has five different attachment points which determine the effective range of the force transducer. These ranges are 50 g, 100 g, 200 g, 500 g and 1000 g. The point closest to the end is the 50 g attachment point, while the point closest to the middle is the 1000 g attachment point.



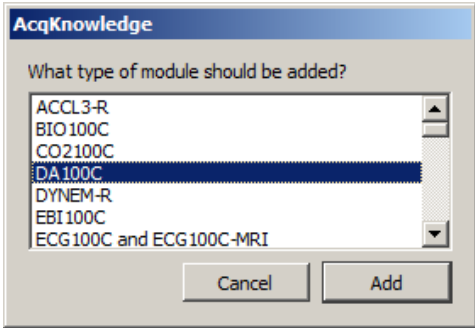
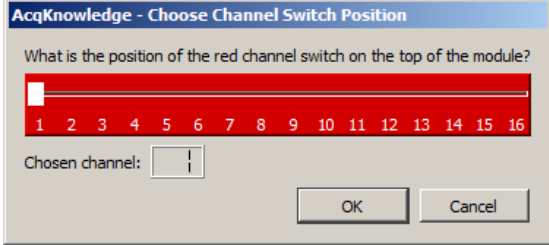
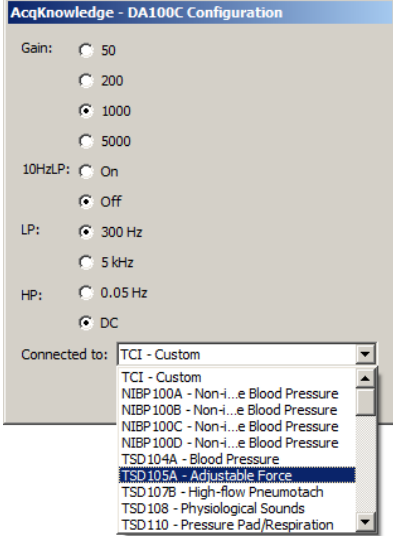
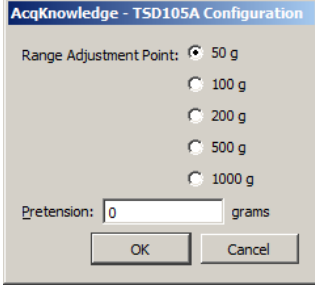
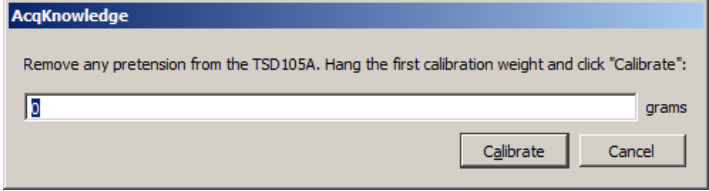
The TSD105A/SS12LA is provided with two hooks, one with a .051" diameter wire and the other with a .032" diameter wire. The beefier hook is intended for the 500 g and 1000 g ranges while the smaller hook is to be used for the 50 g, 100 g and 200 g ranges.



Calibration Procedures

The transducer is easily calibrated using weights of known mass. Ideally, calibration should be performed with weights which encompass the range of the forces expected during measurement. Ideally, the calibration range should cover at least 20% of the full scale range of the transducer. When calibrating for maximum range on the force transducer, use weights which correspond to 10% and 90% of the full scale range for best overall performance.

Calibrating the TSD105A in AcqKnowledge 4.1 and above

<ol style="list-style-type: none"> 1. Select “Set Up Data Acquisition > Channels” and choose “Add New Module.” 2. Select DA100C from the module type list and click “Add.” 	
<ol style="list-style-type: none"> 3. Select the channel position to match the channel switch setting on top of the DA100C module. (This will also select the analog channel to be used in the AcqKnowledge software.) 	
<ol style="list-style-type: none"> 4. Set the gain and filter settings to match the physical settings on the DA100C module and choose TSD105A from the “Connected to” menu. 	
<ol style="list-style-type: none"> 5. Choose the range adjustment matching the transducer attachment point being used and click OK. (50 g used in this example.) 	
<ol style="list-style-type: none"> 6. Remove any physical pretension from the transducer and hang the first weight. 7. Click Calibrate. 8. Remove any physical pretension from the transducer and hang the second weight. 9. Click Calibrate. This completes the two-point calibration procedure. 	

Calibrating the TSD105A in AcqKnowledge 4.0

1. Select **Setup Channels** from the **MP150** menu.
2. Select the source analog channel and enable **Acquire** and **Plot**.
3. Click the **Setup > Scaling** button. Hang the first known weight from the appropriate attachment point.
4. Enter the first weight value in the **Cal 1** Map value box, then click the **Cal 1** button.
5. Hang the second weight from the same attachment point, enter the weight value in the **Cal 2** Map value box and click the **Cal 2** button.
6. Be sure to change the default units labeling from “volts” to “grams”.

AcqKnowledge - Scaling analog channel		
Channel A1 scaling:		
	Input volts	Map value
Cal 1	0.3891	20
Cal 2	0.8532	50
Units label:		grams

Channel scaling box with 20 g and 50 g scaling values

Calibrating the SS12LA in Biopac Student Lab 4.x or AcqKnowledge 4.x

To optimize gain and calibrate the SS12LA transducer:

1. Choose MP3x > **Set Up Data Acquisition > Channels**.
2. Select the source analog channel and enable **Acquire** and **Plot**.
3. Click the **Preset** menu button and select the appropriate **Force** preset. (50 g is used in this example.)
4. Click the **Setup > Scaling** button. Hang the first known weight from the appropriate attachment point.
5. Enter the first weight value in the **Cal 1** Map value box, then click the **Cal 1** button.
6. Hang the second weight from the same attachment point, enter the weight value in the **Cal 2** Map value box and click the **Cal 2** button.

Biopac Student Lab - Scaling analog channel		
CH1, Force		
Channel A1 scaling:		
	Input millivolts	Map value
Cal 1	0.3891	20
Cal 2	0.8532	50
Units label:		grams

For full transducer specifications, see the [TSD105A/SS12LA Product Sheet](#).

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