

# Instron Training Notebook

Lab Manager: Dr. Perry Cheung  
MSE Fee-For-Service Facility  
Materials Science and Engineering  
University of California, Riverside

August 7, 2017 (rev. 2)

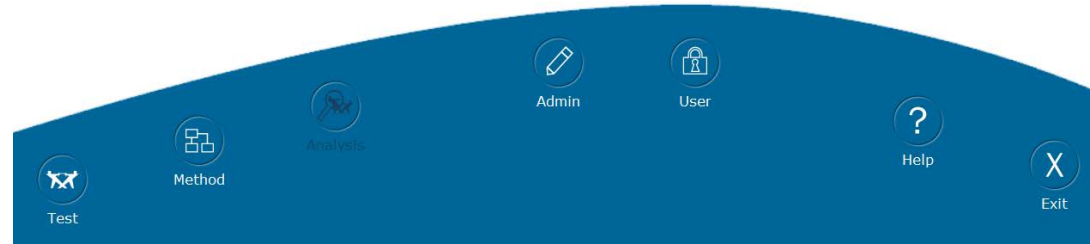
# Before you begin...

- ☐ Complete the required safety training modules on UC Learning
  - ☐ Laboratory Safety Orientation (Fundamentals) 2013
  - ☐ Hazardous Waste Management
  - ☐ Compressed Gas Safety
- ☐ Submit a copy of your Training Transcript to Lab Manager
- ☐ Review the MSE 150 250 309 Policies and Regulations
- ☐ Fill out the MSE 150 250 309 Authorization Form with PI signature
- ☐ Provide your ENGR user name to Lab Manager to set up Faces account
- ☐ Arrange a time for training with Lab Manager
- ☐ Schedule your reservation on Faces for your training

# Instron Operation

- A. GUI
- B. Control Panel
- C. Console Control
- D. Preparation
- E. Removing Load Cells
- I. Installing Load Cells
  - A. 50 kN
  - B. 500 N
  - C. 10 N (Huinan Lui Group)
- II. Tension Tests
  - A. Jaw Faces
  - B. Wedge Grips
  - C. Preloading
  - D. Specimen Loading
  - E. Extensometer (optional)
- III. Compression Tests
  - A. Top Platen
  - B. Bottom Platen
- IV. Flexure Tests
  - A. Lower Anvils
  - B. Upper Anvils
  - C. Alignment
  - D. Specimen Loading
  - E. Deflectometer (optional)
- V. Configuring Test
- VI. Running Test
- VII. Cleanup

# A. GUI – 1/2



## 1. **Test Button**



- **Start a New Sample**

- a) Starting a New Sample enables you to either select an existing test method or create a method “on the fly”
- b) Specify the name of the file the test data will be stored within and begin running tests

- **Continue a Sample**

- a) Continuing a Sample allows you to open a sample file that had been previously created and test additional samples
- b) This option will allow you to review the data from a previously created Sample

## 2. **Method Button**



- **Create a Method**
- **Choose a Method**

- a) Make changes to the test parameters and either save those changes back to the original test method file (**Save**) or to a new test file (**Save As**)

# A. GUI – 2/2

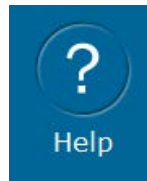


## 3. **Analysis Button**



- Choose a sample to open
- Choose a test method from which to load calculation and result parameters
- Analyze and recalculate test data in a sample

## 4. **Help Button**



- Click to open the Help system

## 5. **Exit Button**



- Click to exit the software

# B. Control Panel – 1/4

## 1. **Power** Indicator lights

- **Frame Standby** – Frame is not set to move
- **Frame Ready** – Test system is ready for operation



## 2. **Start Test** button

- Press this button **AFTER** setting test parameters to begin test
- Test in Progress indicator will be illuminated showing direction of **Crosshead** movement



## 3. **Stop Test** button

- Press this button to stop **Crosshead** during or end of test
- Test Stopped indicator will be illuminated showing test has stopped but **Crosshead** has not returned to the gauge length position



# B. Control Panel – 2/4

## 4. *Specimen Protect* button

- **On** – Protects specimen from overloads set by software
- **Off** – No protection on specimen from any possible overloads



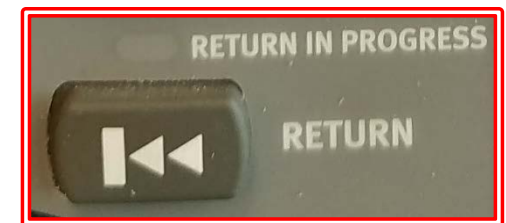
## 5. *Reset GL* button

- Press this button to set the current position of the **Crosshead** as the gauge length or zero extension position
- Pressing **Return** button afterwards will return **Crosshead** to this gauge length position



## 6. *Return* button

- Press this button to move **Crosshead** back to gauge length position
- **Return in Progress** indicator will be illuminated to show **Crosshead** is returning to gauge length position



**WARNING: DO NOT PRESS THIS BUTTON UNLESS YOU ARE READY FOR THE CROSSHEAD TO RETURN TO GAUGE LENGTH POSITION OF 0.000 INCHES!**

# B. Control Panel – 3/4

## 7. $\Delta$ *Jog Up* button

- Press this button to move the **Crosshead** upward (in tension)
- Holding the button increases the speed linearly, up to a maximum speed, until you release the button



## 8. $\nabla$ *Jog Down* button

- Press this button to move the **Crosshead** downward (in compression)
- Holding the button increases the speed linearly, up to a maximum speed, until you release the button

## 9. *Fine Jog* wheel

- Turn thumbwheel to slowly position **Crosshead**
- Use to set an accurate zero extension point
- Use to set a precise grip position for loading specimens





# B. Control Panel – 4/4

## 10. **Toggle** button

- Use to toggle between the **Soft Keys** and the **Live Displays**

## 11. **“1” – Balance Load**

- Balances load to  $\sim 0.0$  N

## 12. **“2” – Balance Strain 1**

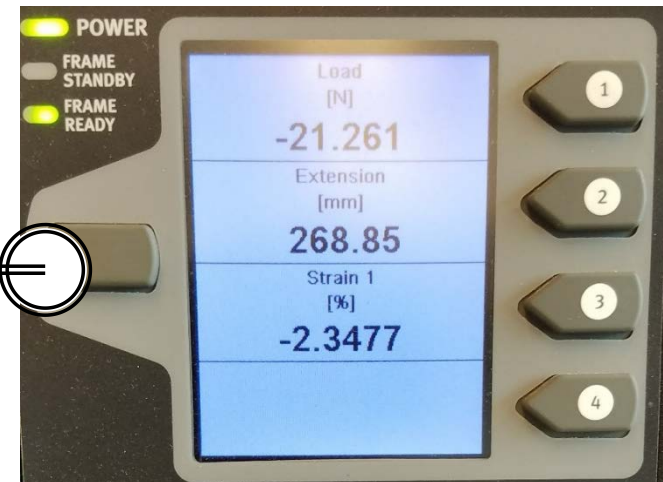
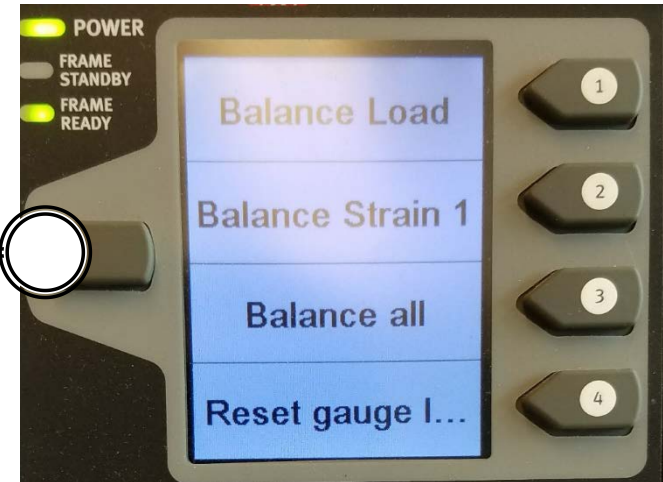
- Balances strain to  $\sim 0.0$  %
- Meaningful only when using **Extensometer**

## 13. **“3” – Balance All**

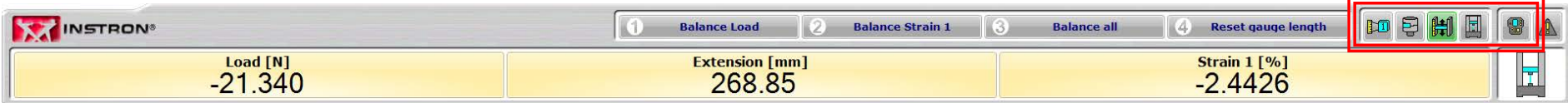
- Balances loads, strain, and resets gauge length

## 14. **“4” – Zero Extension (or Reset Gauge Length)**

- Resets extension (or gauge length) back to 0.0 mm



# C. Console Control – 1/1



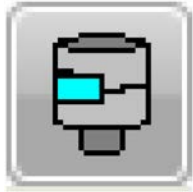
## 1. Console Settings

- Click this icon to access the control panel settings and configure the general **Live displays**, **Soft Keys**, frame settings and grips



## 2. Calibration of Transducers

- Calibration of transducers (i.e. load cell) is automatic and its settings should **NOT** be changed



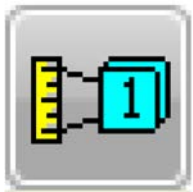
## 3. Software Limits

- Software limits are assigned to each transducer and need to be **CONFIRMED**
- These limits are separate from methods and are independently set

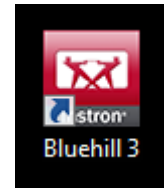


## 4. Transducer Setup for Extensometer

- Extensometer settings should **NOT** be changed and values are automatically assigned

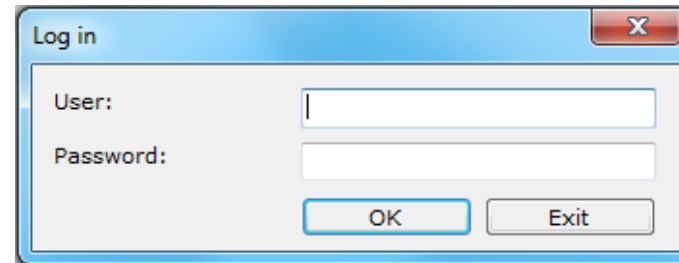


# D. Preparation – 1/4

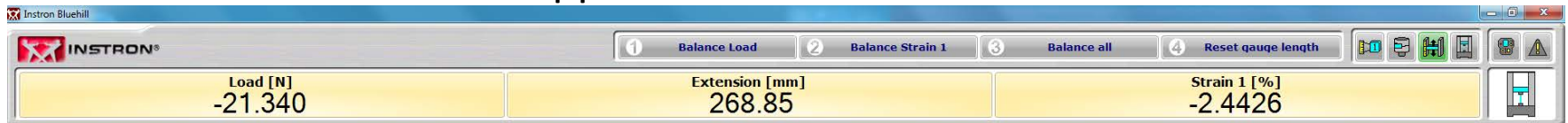


1. Double-click on the **Instron Bluehill 3** icon

2. Log in with User: **mseinstron**  
and Password: **mseffs**



3. The **Home Screen** will appear



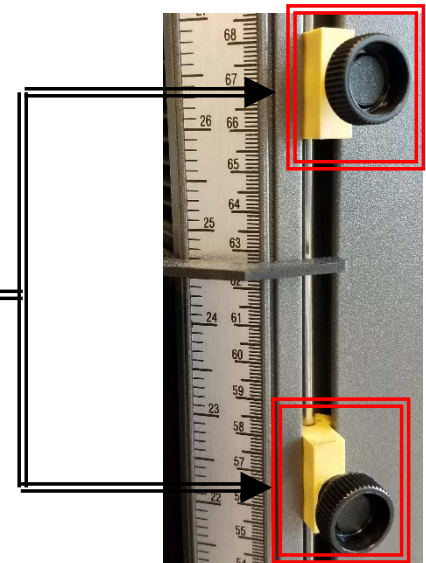
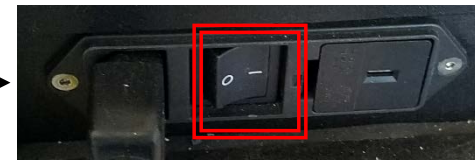
4. Click on **Method** to configure a new or existing method

5. Click on **Test** if you have a method prepared



# D. Preparation – 2/4

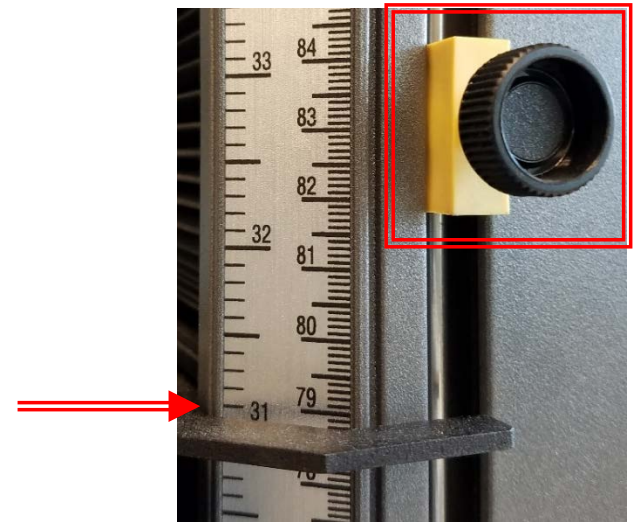
6. Check if the Instron is powered **ON** via the control panel
7. If not, turn to **ON** at the back of the Instron
8. Check if the **Crosshead** is sufficiently high enough to install the desired load cell, grips, or fixtures on measurement scale
9. Always set limits before operating the Instron and ensure appropriate limits are enabled before moving the **Crosshead**
10. Loosen and move the slides to the desired positions and tighten the thumb screws



# D. Preparation – 3/4

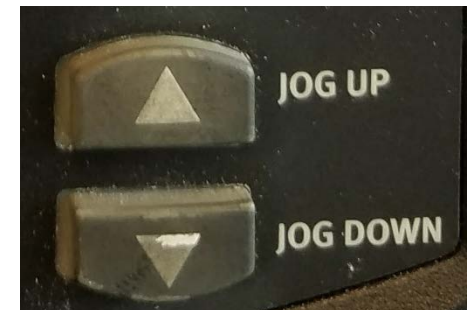
11. Raise the **Upper Limit Stop** on the measurement scale first for desired installation for:

- a) Load Cell > 16"
- b) Tension Tests > 31"
- c) Compression Tests > 22"
- d) Flexure Tests > 25"



12. Press the **Jog Up**  $\Delta$  on the control panel to raise the **Crosshead** to the appropriate height on the measurement scale for desired installation:

- a) Load Cell > 16"
- b) Tension Tests > 31"
- c) Compression Tests > 22"
- d) Flexure Tests > 25"



# D. Preparation – 4/4

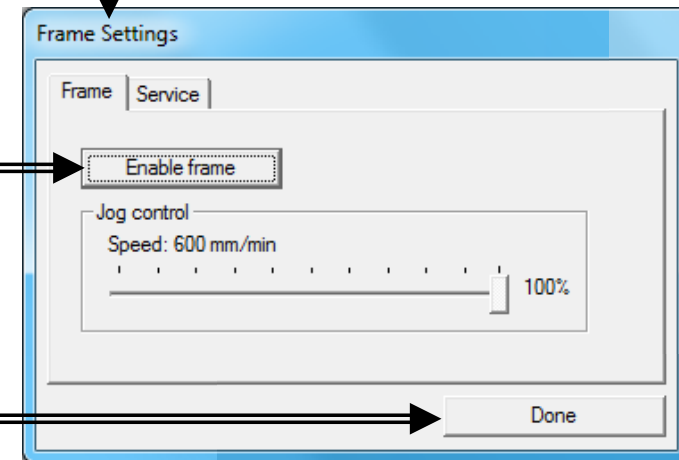
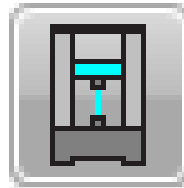
13. Press the **Emergency Stop** button to stop the test immediately when a condition develops that:

- Could affect the safety of persons operating system
- Could damage the load frame or test fixtures



14. To reset the **Emergency Stop** button and re-enable load frame:

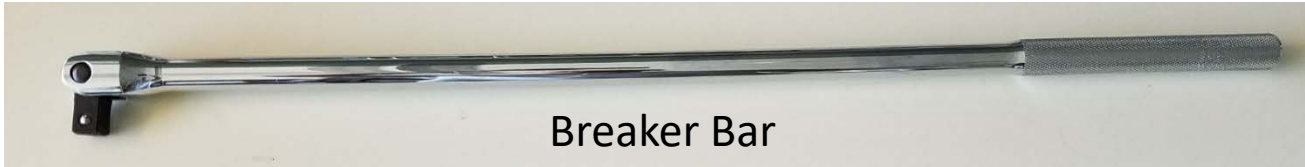
- Rotate **Emergency Stop** button **clockwise** until it resets
- Click on **Frame** button to open the **Load Frame Settings** dialog
- Click the **Frame** tab and **Enable Frame**
- Click **Done** and the **Frame Ready** light on the control panel should be illuminated





# E. Removing Load Cell – 1/2

1. Remove the installed **Load Cell** using the **Breaker Bar**



2. Install the appropriate **Hex Adapter** to **Breaker Bar** for installed **Mounting Screw**

3. Push **counter-clockwise** against the **Breaker Bar** until **Mounting Screw** “breaks” and becomes loose

50 kN



4. If necessary, spray a little of **WD-40** at top of **Mounting Screw** to provide lubrication

500 N  
and 10 N



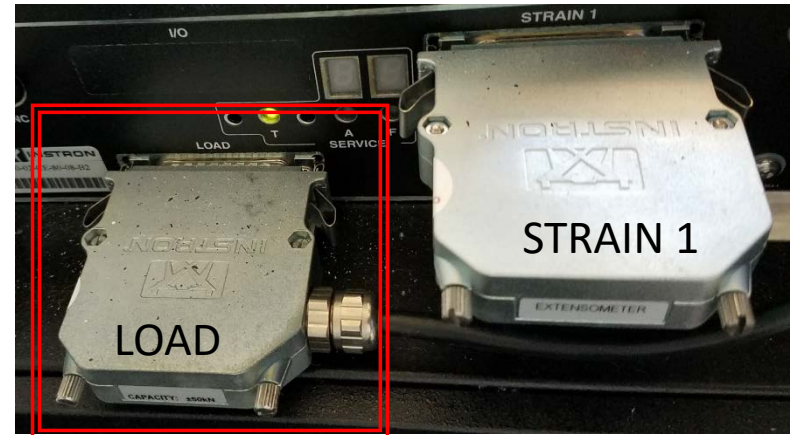
5. Remove the **Hex Adapter** from **Breaker Bar**
6. Support the **Load Cell** with one hand while unscrewing the **Mounting Screw** with your other hand

**NOTE: DO NOT LET THE LOAD CELL DROP AS YOU UNSCREW IT!**



# E. Removing Load Cell – 2/2

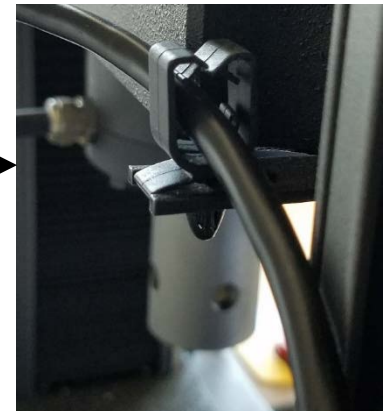
7. Carefully detach the **Load Cell Cable** from **LOAD** connector on controller



8. Remove the cable from the **Hook** on the back of frame
9. Carefully place the uninstalled **Load Cell** back in its appropriate **Storage Box**



Hook

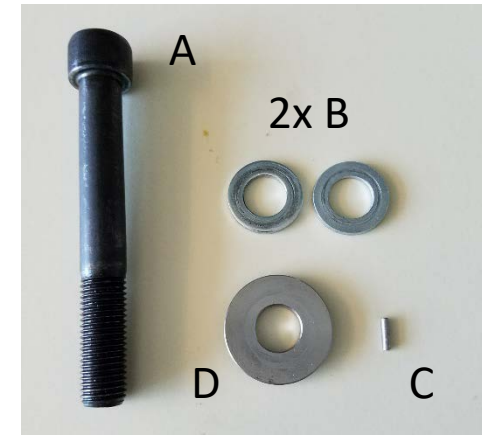




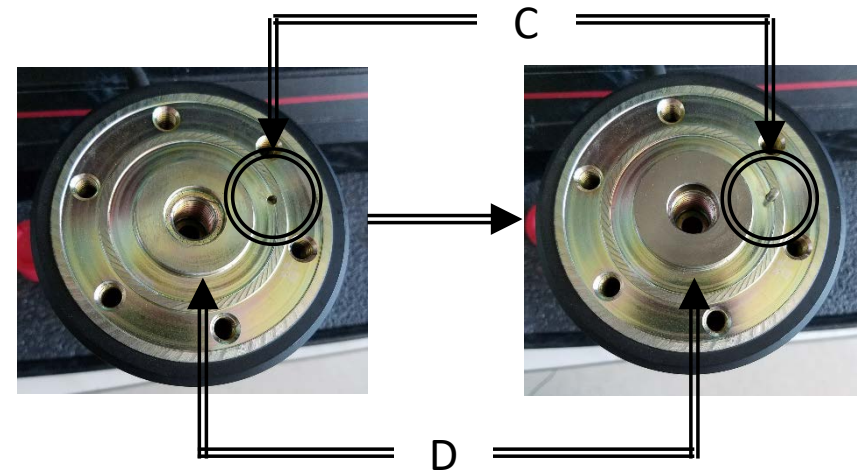
# I.A. 50 kN Load Cell – 1/4

## 1. Locate the necessary components

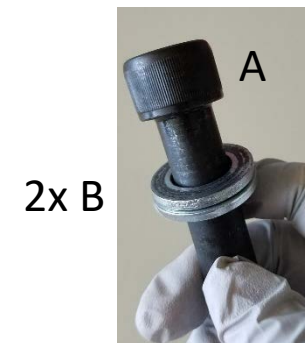
- A. Mounting Screw
- B. 2 Large Washers
- C. Anti-rotation Pin
- D. Locating Ring



## 2. Insert the **Anti-rotation Pin (C)** and **Locating Ring (D)** into top of **Load Cell**



## 3. Assemble the **Mounting Screw (A)** and **2x Washers (B)**



# I.A. 50 kN Load Cell – 2/4

4. Lubricate the **Mounting Screw** threads with **WD-40** and wipe off any excess with a towel

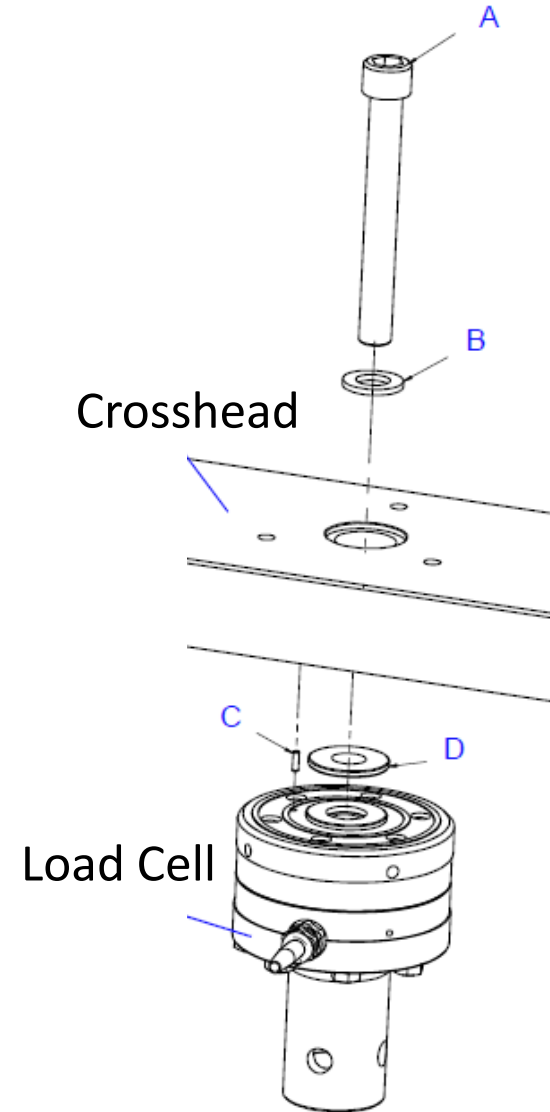
5. Place the **Load Cell** against bottom of **Crosshead**

6. Align the **Load Cell** so **Anti-rotation Pin** will fit into slot underneath **Crosshead** and cable is toward the back



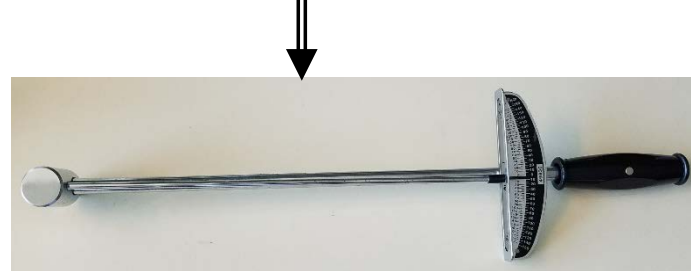
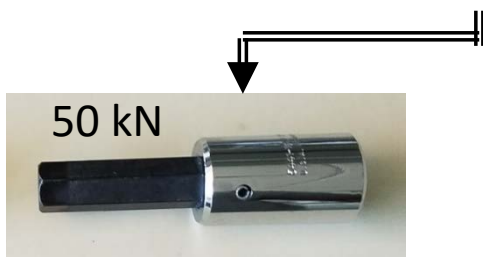
7. Ensure that **Anti-rotation Pin** and **Locating Ring** fit securely in place against **Crosshead** and **Load Cell**

8. Insert the **Mounting Screw** on to top of **Crosshead**



# I.A. 50 kN Load Cell – 3/4

9. Tighten the **Mounting Screw** by hand so that it is secure against the **Load Cell**
10. Install the appropriate **Hex Adapter** to **Torque Wrench**



9. Further tighten the **Mounting Screw** with the **Torque Wrench**
10. Torque down to 148 ft-lb (**200 N-m**) or as high as possible using the **Torque Wrench**

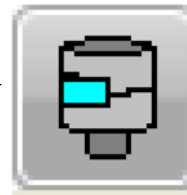


# I.A. 50 kN Load Cell – 4/4

11. Carefully attach the **Load Cell Cable** into **LOAD** connector on controller

12. Insert the cable on to the **Hook** on the back of frame

13. Click on **Transducers** icon

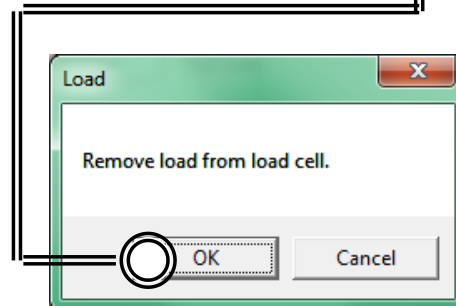
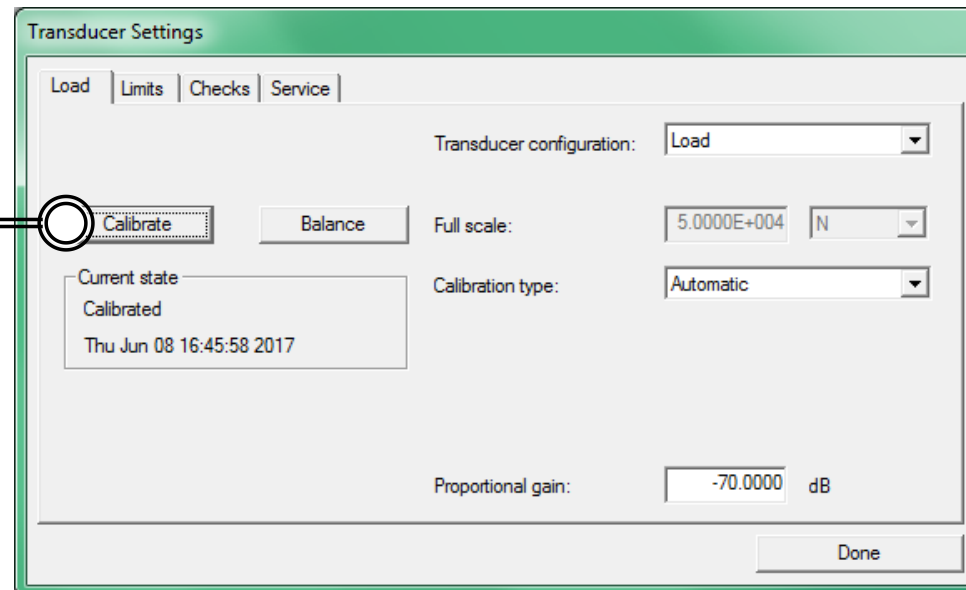


Hook



14. Click "**Calibrate**", and click "**OK**"

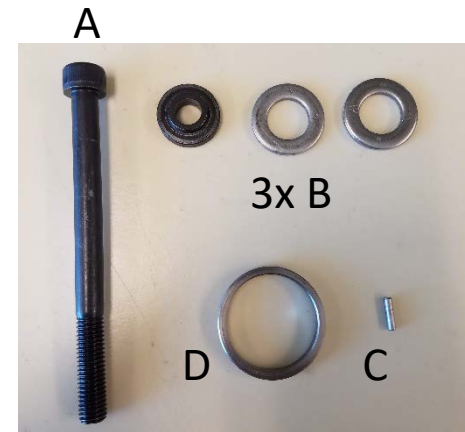
15. Wait for at least **15 MINUTES** to allow **Load Cell** to warm-up, then click "**Calibrate**", and "**OK**" again



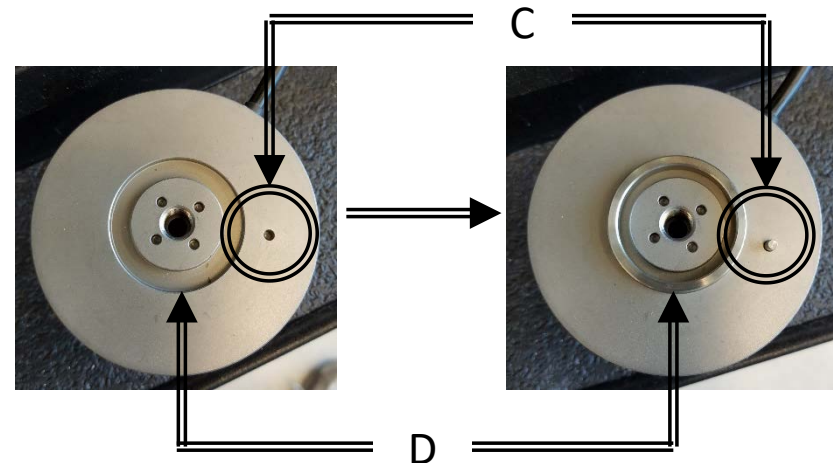
# I.B. 500 N Load Cell – 1/4

## 1. Locate the necessary components

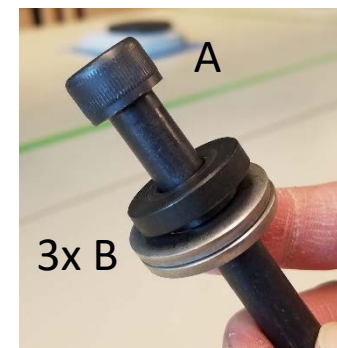
- A. Mounting Screw
- B. Small + 2 Large Washers
- C. Anti-rotation Pin
- D. Locating Ring



## 2. Insert the **Anti-rotation Pin (C)** and **Locating Ring (D)** into top of **Load Cell**



## 3. Assemble the **Mounting Screw (A)** and **2x Washers (B)**



# I.B. 500 N Load Cell – 2/4

4. Lubricate the **Mounting Screw** threads with **WD-40** and wipe off any excess with a towel

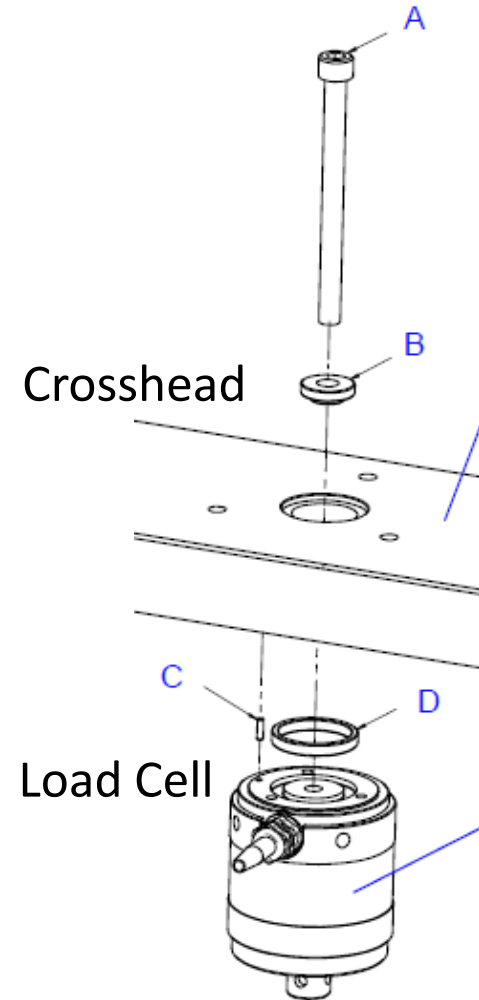
5. Place the **Load Cell** against bottom of **Crosshead**

6. Align the **Load Cell** so **Anti-rotation Pin** will fit into slot underneath **Crosshead** and cable is toward the back



7. Ensure that **Anti-rotation Pin** and **Locating Ring** fit securely in place against **Crosshead** and **Load Cell**

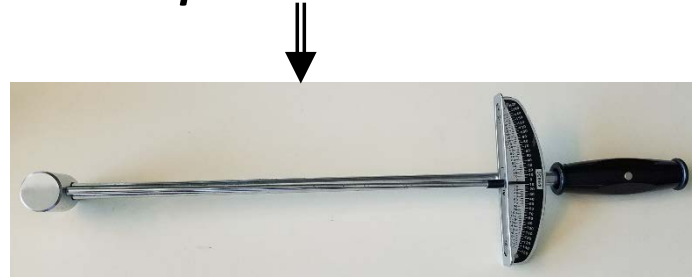
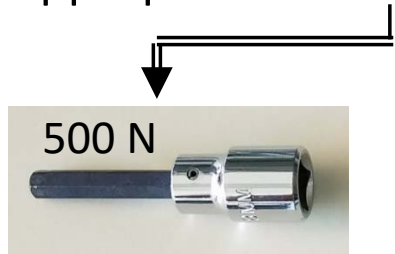
8. Insert the **Mounting Screw** on to top of **Crosshead**



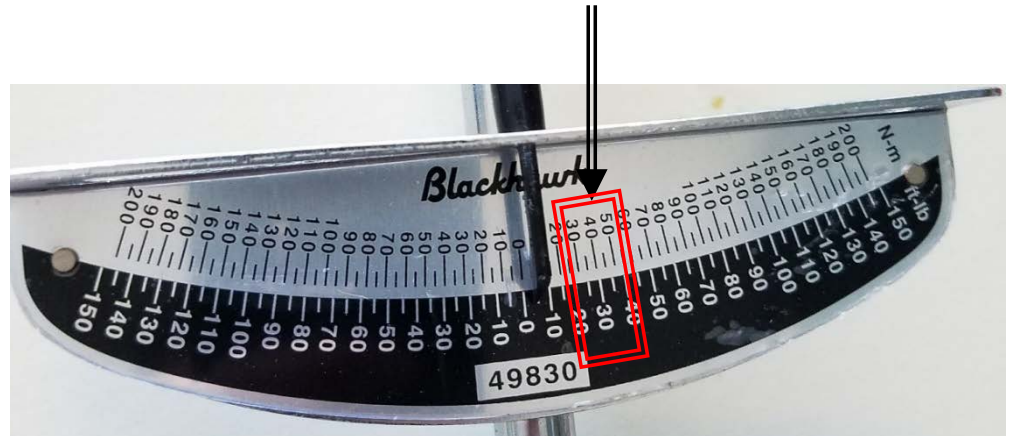


# I.B. 500 N Load Cell – 3/4

9. Tighten the **Mounting Screw** by hand so that it is secure against the **Load Cell**
10. Install the appropriate **Hex Adapter** to **Torque Wrench**



9. Further tighten the **Mounting Screw** with the **Torque Wrench**
10. Torque down to 30 ft-lb (40 N-m) using the **Torque Wrench**

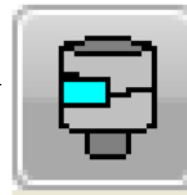


# I.B. 500 N Load Cell – 4/4

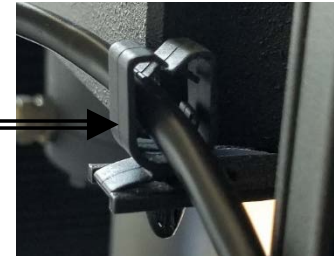
12. Carefully attach the **Load Cell Cable** into **LOAD** connector on controller

13. Insert the cable on to the **Hook** on the back of frame

14. Click on **Transducers** icon

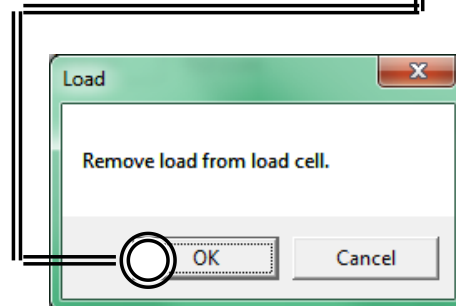
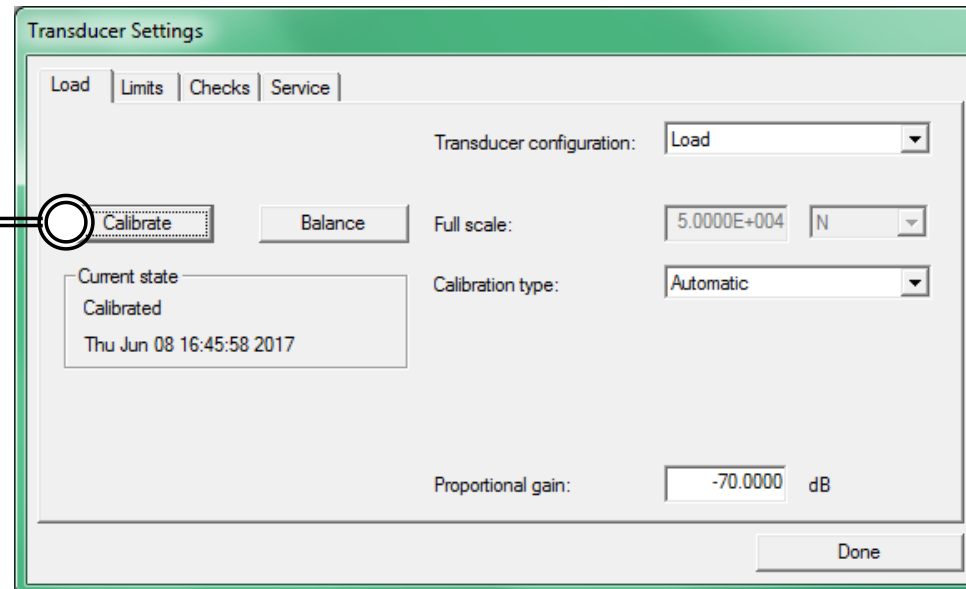


Hook



15. Click "**Calibrate**", and click "**OK**"

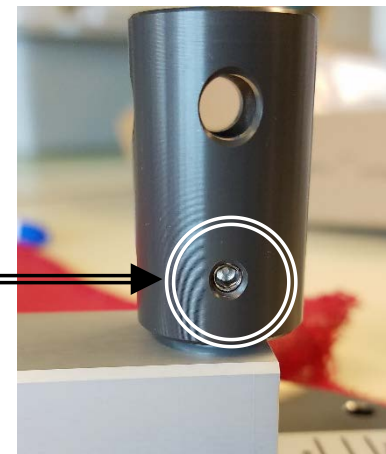
16. Wait for at least **15 MINUTES** to allow **Load Cell** to warm-up, then click "**Calibrate**", and "**OK**" again





# I.C. 10 N Load Cell – 1/5

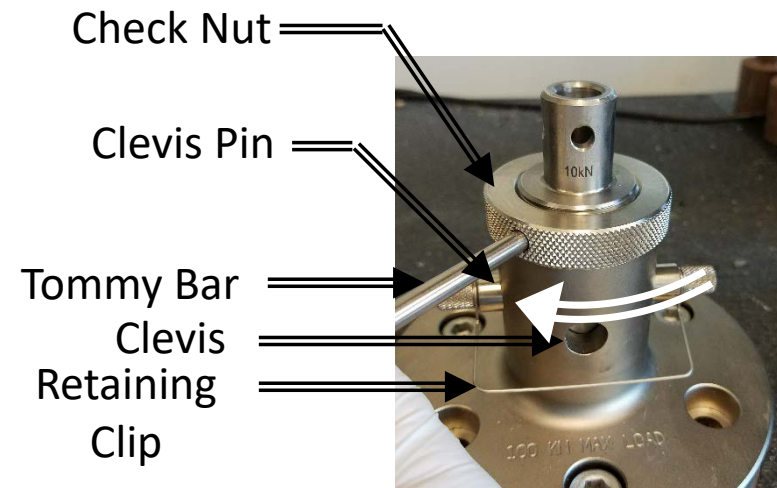
1. Before installing the **Load Cell**, ensure that the **4 Set Screws** holding the **Adapter** are securely tightened
2. Check that the **Compression Spring** is placed inside the bottom **Base Adapter**
3. Position **O Adapter Check Nut** until it is close to the top
4. Install the **O Adapter** in to **Base Adapter**
5. Align the **O Adapter Clevis** to the **Clevis** in the **Base Adapter**
6. Insert the  $\frac{1}{2}$ " **Clevis Pin** through the **Clevis** and into the **Base Adapter**
7. Attach the **Retaining Clip**
8. Hand tighten the **Check Nut** turning **clockwise** towards the **Base Adapter**
9. Use the provided **Tommy Bar** to further tighten, but **DO NOT OVERTIGHTEN!**



Compression Spring



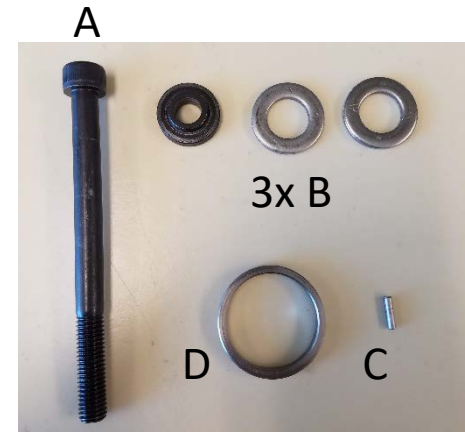
Bottom Base Adapter



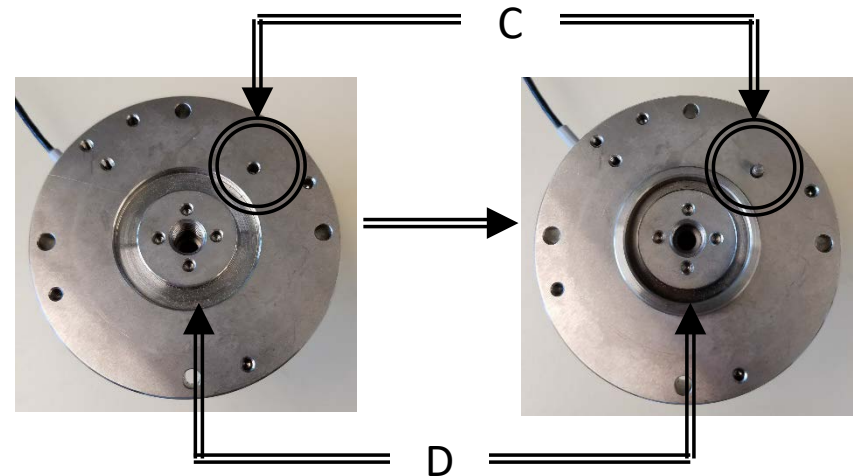
# I.C. 10 N Load Cell – 2/5

10. Locate the necessary components

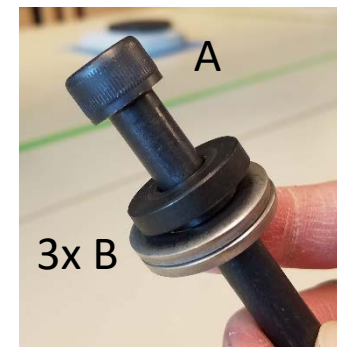
- A. Mounting Screw
- B. Large + Small Washers
- C. Anti-rotation Pin
- D. Locating Ring



11. Insert the **Anti-rotation Pin (C)** and **Locating Ring (D)** into top of **Load Cell**



12. Assemble the **Mounting Screw (A)** and **2x Washers (B)**



# I.C. 10 N Load Cell – 3/5

13. Lubricate the **Mounting Screw** threads with **WD-40** and wipe off any excess with a towel

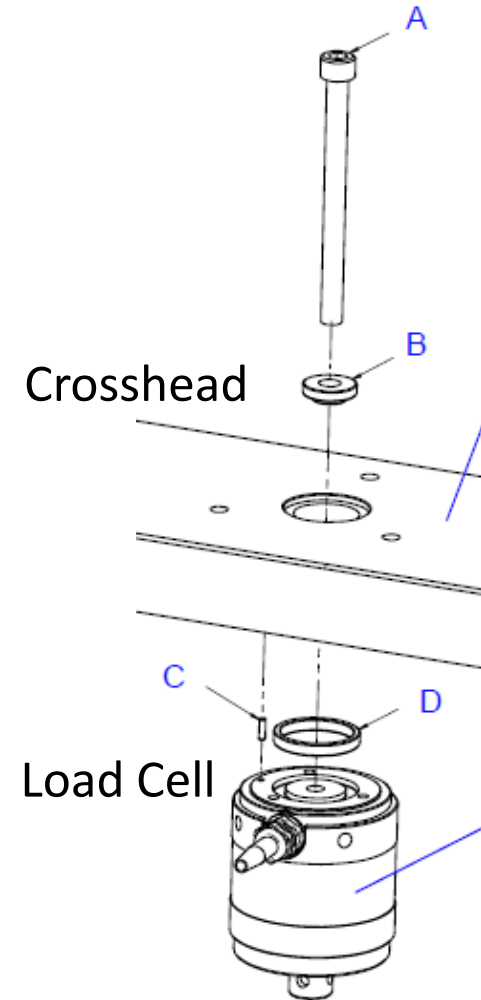
14. Place the **Load Cell** against bottom of **Crosshead**

15. Align the **Load Cell** so **Anti-rotation Pin** will fit into slot underneath **Crosshead** and cable is toward the back



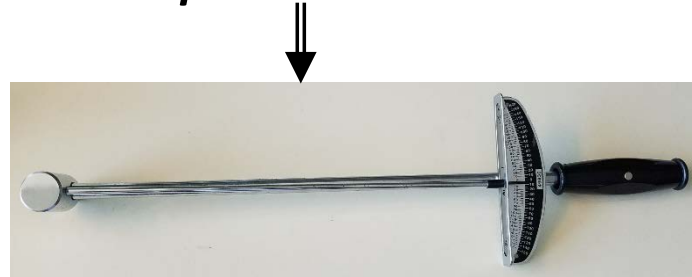
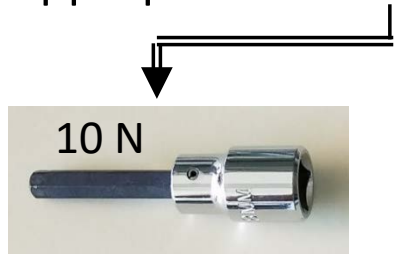
16. Ensure that **Anti-rotation Pin** and **Locating Ring** fit securely in place against **Crosshead** and **Load Cell**

17. Insert the **Mounting Screw** on to top of **Crosshead**

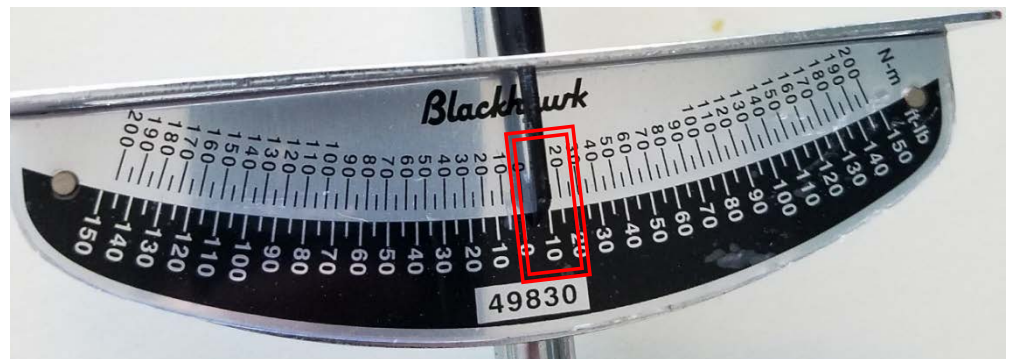


# I.C. 10 N Load Cell – 4/5

18. Tighten the **Mounting Screw** by hand so that it is secure against the **Load Cell**
19. Install the appropriate **Hex Adapter** to **Torque Wrench**



19. Further tighten the **Mounting Screw** with the **Torque Wrench**
20. Torque down to 9 ft-lb (12 N-m) using the **Torque Wrench**

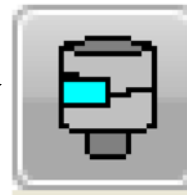


# I.C. 10 N Load Cell – 5/5

22. Carefully attach the **Load Cell Cable** into **LOAD** connector on controller

23. Insert the cable on to the **Hook** on the back of frame

24. Click on **Transducers** icon

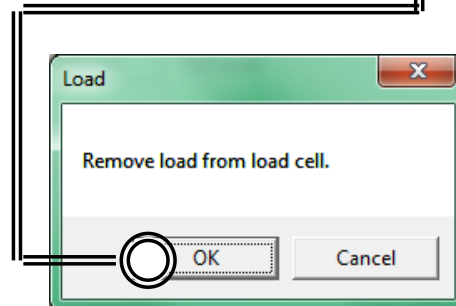
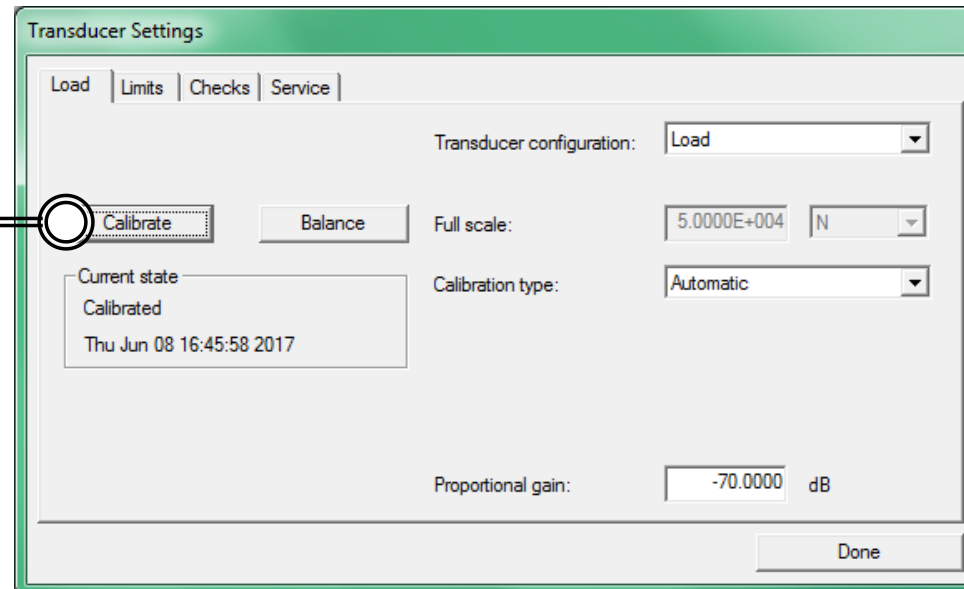


Hook



25. Click "**Calibrate**", and click "**OK**"

26. Wait for at least **15 MINUTES** to allow **Load Cell** to warm-up, then click "**Calibrate**", and "**OK**" again



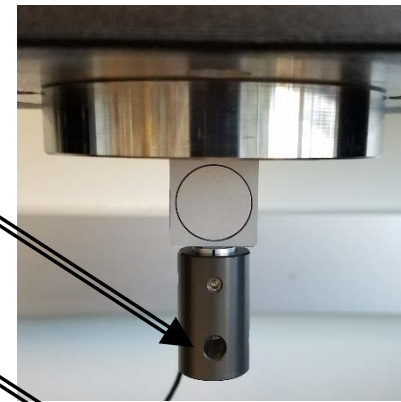


# I.C. Top Screw Grip – 1/1

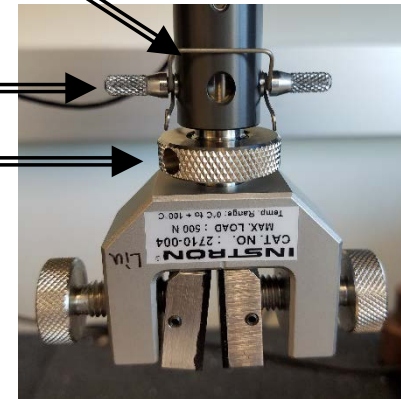
**NOTE: ALWAYS SUPPORT FIXTURE WITH HAND DURING INSTALLATION AS IMPOSED LOAD BY USER MAY BE ENOUGH TO PERMANENTLY DAMAGE LOAD CELL**

1. Position **Check Nut** until it is loose against **Grip**
2. Align the **Grip Clevis** to the **Clevis** in the **Load Cell**
3. Insert the **6 mm Clevis Pin** through the **Clevis** and into the **Load Cell**
4. Attach the **Retaining Clip**, making sure the fixture is supported at the bottom
5. Hand tighten the **Check Nut** turning **counter-clockwise** toward **Load Cell**
6. Further tighten the **Check Nut** with **Tommy Bar**, but **DO NOT OVERTIGHTEN!**

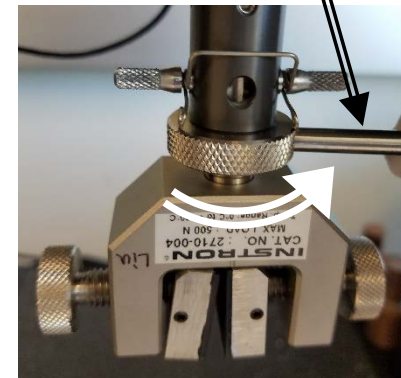
Clevis  
Retaining  
Clip



Clevis Pin  
Check Nut

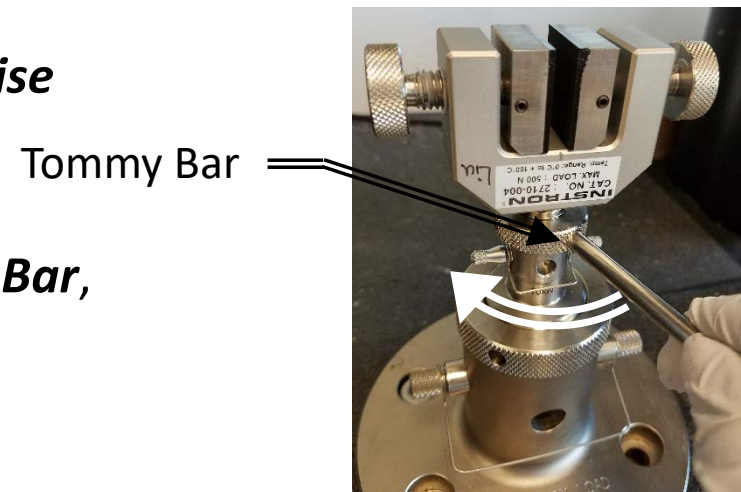
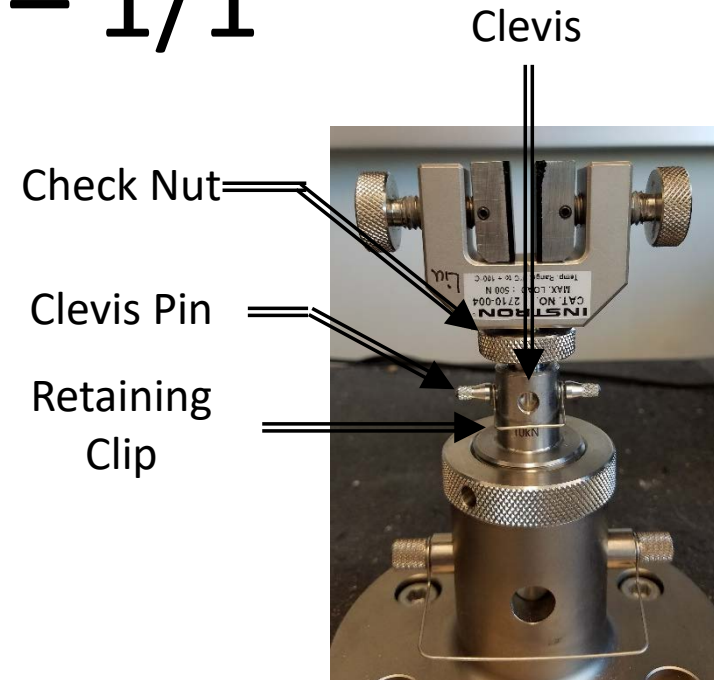


Tommy Bar



# I.C. Bottom Screw Grip – 1/1

1. Position the **Check Nut** until it is loose against **Grip**
2. Align the **Grip Clevis** to the **Clevis** in the **O Adapter**
3. Insert the **6 mm Clevis Pin** through the **Clevis** and into the **Load Cell**
4. Attach the **Retaining Clip**
5. Hand tighten the **Check Nut** turning **clockwise** toward **O Adapter**
6. Further tighten the **Check Nut** with **Tommy Bar**, but **DO NOT OVERTIGHTEN!**



# I.C. Top 2" Platen – 1/1

1. Position **Check Nut** until it is loose against **Platen**

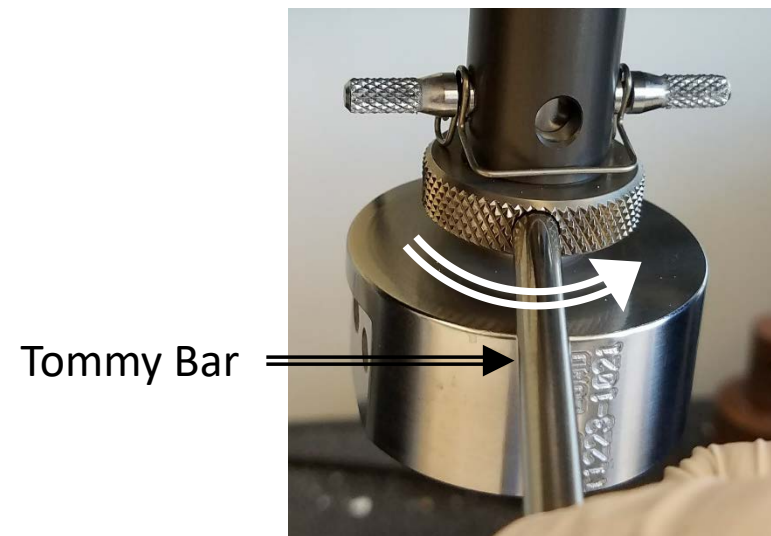
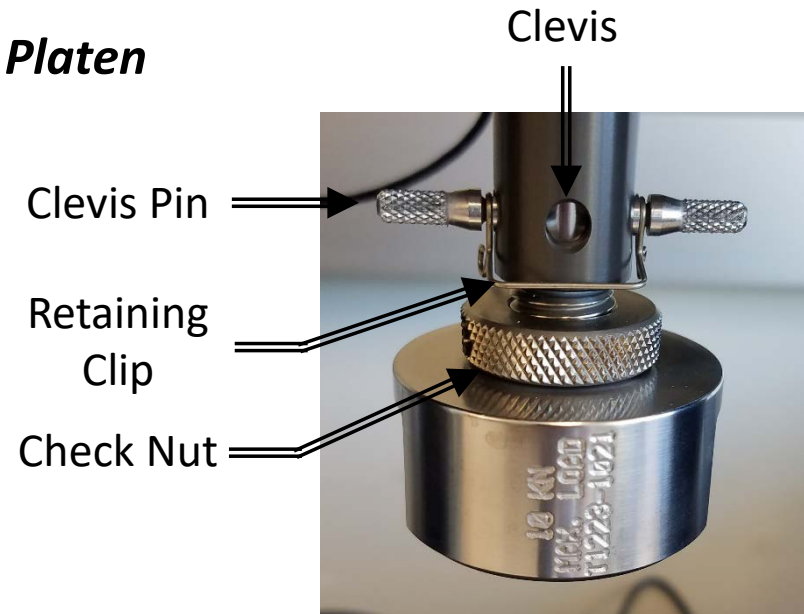
2. Align the **Platen Clevis** to the **Clevis** in the **Load Cell**

3. Insert the **6 mm Clevis Pin** through the **Clevis**

4. Attach the **Retaining Clip**

5. Hand tighten **Check Nut** turning **counter-clockwise** until it is against the **Load Cell**

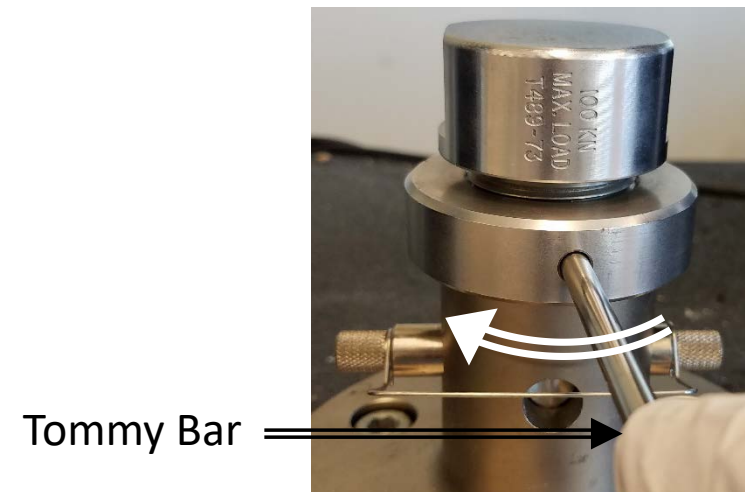
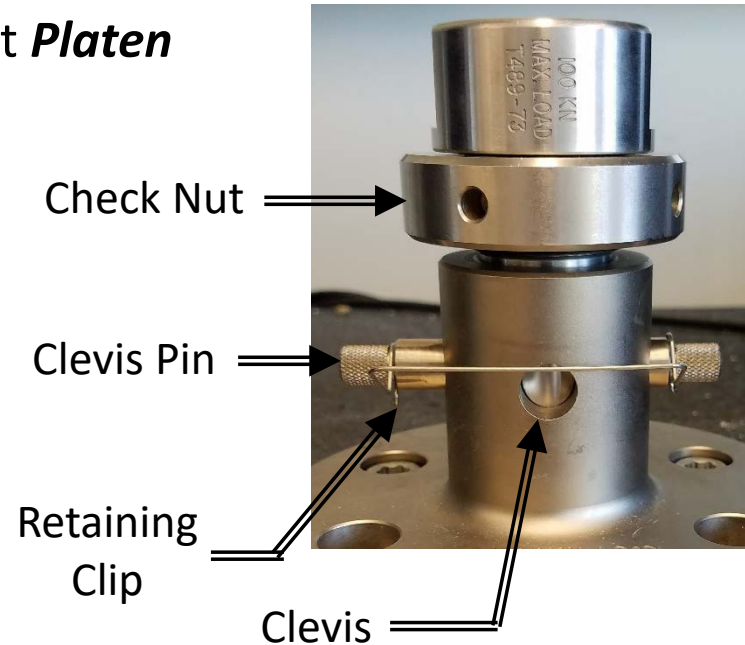
6. Use the provided **Tommy Bar** to help, but **DO NOT OVERTIGHTEN!**





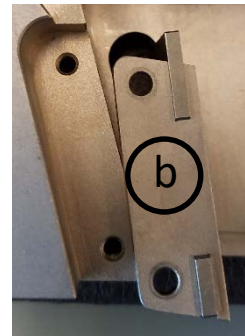
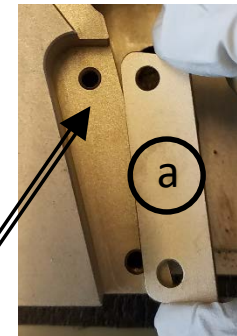
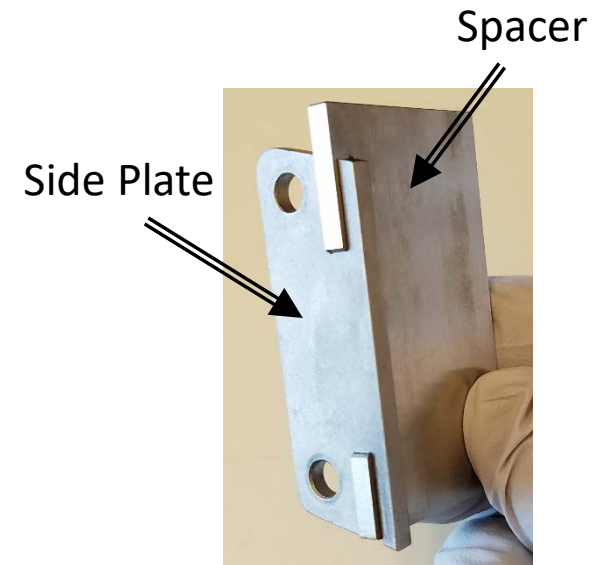
# I.C. Bottom 2" Platen – 1/1

1. Position the **Check Nut** until it is loose against **Platen**
2. Align the **Platen Clevis** to the **Clevis** in the **Base Adapter**
3. Insert the  $\frac{1}{2}$ " **Clevis Pin** through the **Clevis**
4. Attach the **Retaining Clip**
5. Hand tighten the **Check Nut** turning **clockwise** until it is against the **Base Adapter**
6. Use the provided **Tommy Bar** to help, but **DO NOT OVERTIGHTEN!**



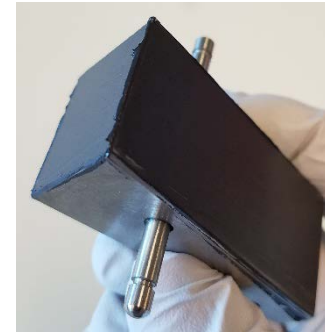
# II.A. Jaw Faces – 1/2

1. Identify the appropriate **Jaw Faces** for your test specimen size
  - a) 0 – 0.25" Jaws – requires side plate only
  - b) 0.25 – 0.5" Jaws – requires spacer + side plate
2. If desired **Jaw Face** is already installed, skip to **II.B. Wedge Grips**
3. Remove installed spacers or side plates using a **3 mm hex wrench**
4. Align the **Side Plate** so it is aligned with the two screw holes on top of the flat section
5. Rotate the handle until the **Wedge Grips** are in the fully **Open** position



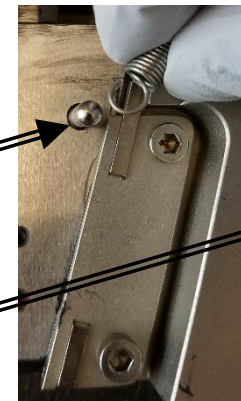
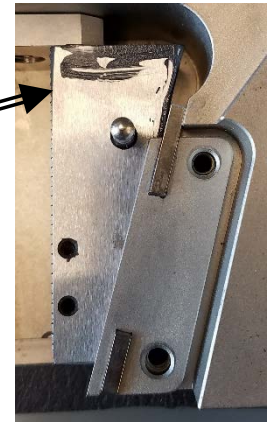
# II.A. Jaw Faces – 2/2

6. Coat the back and base of the **Jaw Face** with **Molykote g-N paste** using the applicator provided



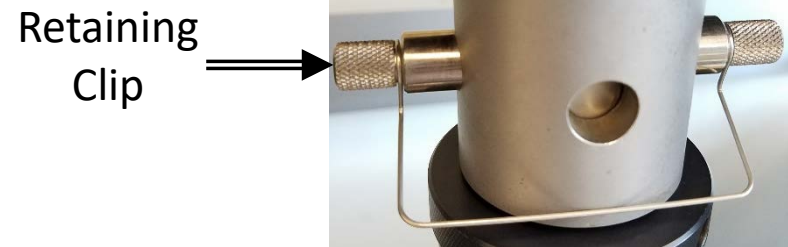
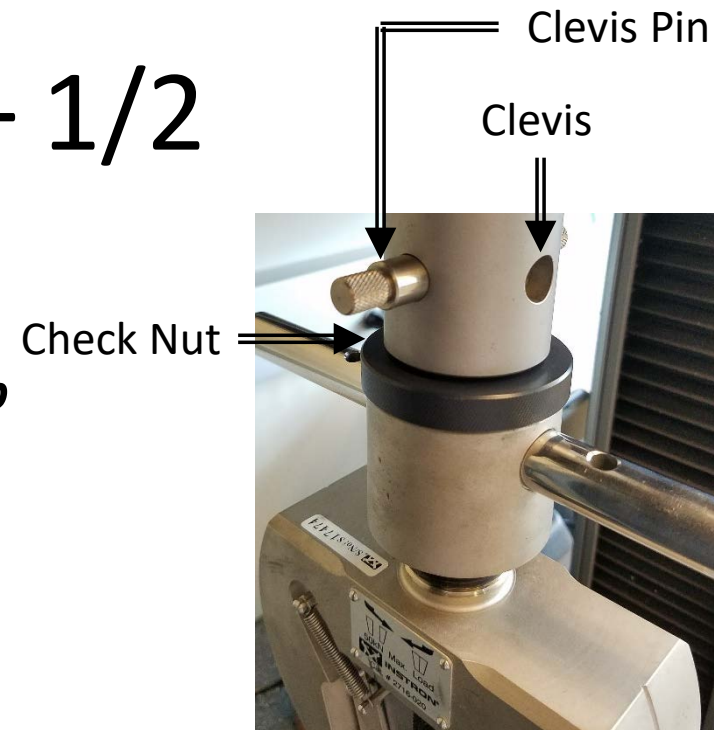
Note: Wipe down applicator + Wash hands thoroughly after using Molykote g-N paste!

6. Insert the **Jaw Face** and slide it towards the base of the **Wedge Grip**
7. Firmly secure the **Side Plates** using the **3 mm hex wrench** so the **Jaw** has no sideways movement
8. Attach the **Springs** from the spring retainer post to the post for each **Jaw Face**
9. Repeat for the back side



## II.B. Top Wedge Grips – 1/2

1. Identify the **Top Wedge Grip** from drawer first
2. Position **Check Nut** until it is loose against **Grip**
3. Orient the **Wedge Grip** to be perpendicular to the **Crosshead**
4. Align the **Wedge Grip Clevis** to the **Clevis** in the **Load Cell**
5. Insert the  $\frac{1}{2}$ " **Clevis Pin** through the **Clevis** and into the **Load Cell**
6. Attach the **Retaining Clip**
7. Confirm that the **Check Nut** is still loose between the **Load Cell** and **Wedge Grip**



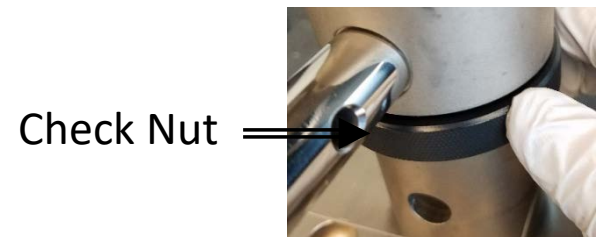
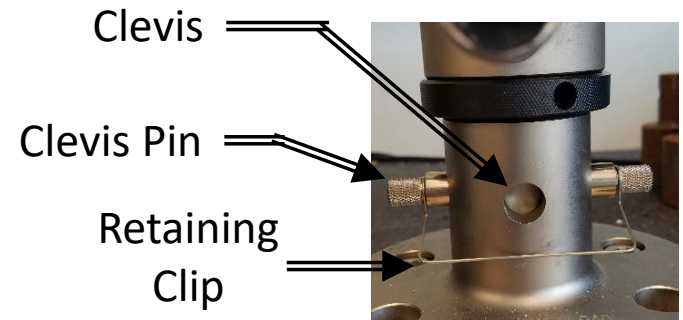
## II.B. Bottom Wedge Grips – 2/2

8. Identify the **Bottom Wedge Grip** from drawer first
9. Check that the **Compression Spring** is placed inside the bottom **Base Adapter**
10. Position **Check Nut** until it is loose against **Grip**
11. Orient the **Wedge Grip** to be perpendicular to the **Crosshead**
12. Align the **Wedge Grip Clevis** to the **Clevis** in the **Base Adapter**
13. Insert the  $\frac{1}{2}$ " **Clevis Pin** through the **Clevis** and into the **Base Adapter**
14. Attach the **Retaining Clip**
15. Confirm that the **Check Nut** is still loose between the **Base Adapter** and **Wedge Grip**

Compression  
Spring



Bottom Base  
Adapter





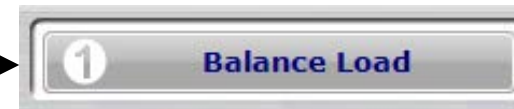
# II.C. Preloading – 1/5

Note: Preloading the load string prevents backlash and deflections which can degrade integrity of results at high load tension tests

1. Identify which ***Preloading specimen*** is appropriate for your Jaw Faces
  - a) 20 kN Maximum Load: 0 – 0.25” Jaws
  - b) 50 kN Maximum Load: 0.25 – 0.5” Jaws



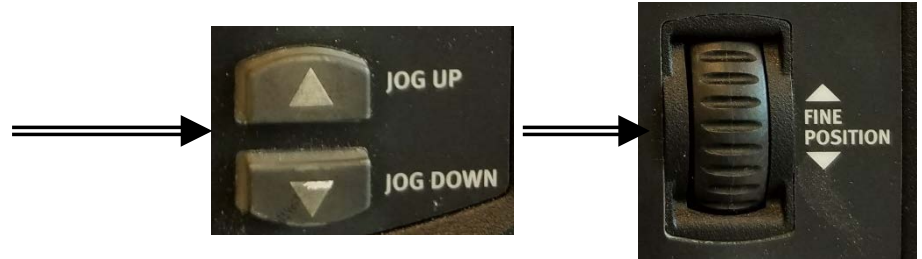
2. Before inserting ***Preloading specimen***, check the following:
  - a) Both ***Check Nuts*** are loose
  - b) Click ***Balance Load*** and check live load is near zero
  - c) Identify the ***Maximum Load*** you plan on applying for your tests and **NEVER** exceed the ***Maximum Load*** for **ANY** component in the load string



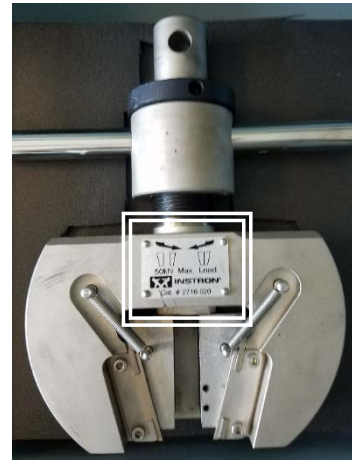
Load [N]  
.01408

## II.C. Preloading – 2/5

3. Press the **Jog Up/Down**  $\Delta \nabla$  buttons and **Fine Jog** on the control panel to adjust the **Wedge Grip** positions to an appropriate height



4. Adjust **Wedge Grip** positions until majority of Jaw Faces are engaged with the **Preloading specimen**



5. Align and center the specimen visually into the **Jaw Faces**

6. Turn handles to tighten the lower and upper grips until the **Jaw Faces** engage the specimen



## II.C. Preloading – 3/5

7. Identify a **Load Limit** that is **10-15%** greater than the highest load you will be applying for your tests
8. If unknown, check the provided table to estimate the anticipated load applied to your specimen

$$\text{Load (N)} = \text{Yield Strength or Ultimate Strength (MPa)} \times \text{Area (mm}^2\text{)}$$

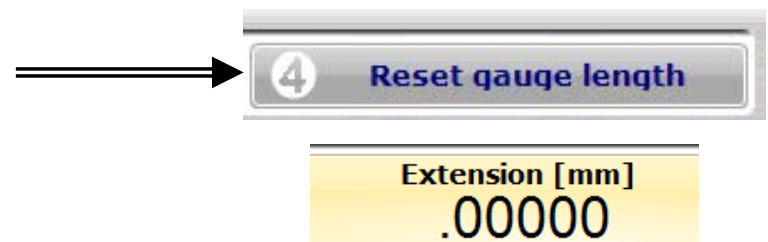
e.g. Mild Steel 1090: Yield Strength = 248 Mpa

Ultimate Strength = **841 MPa** (largest)

$$\text{Ultimate Load} = 841 \text{ MPa} \times 25 \text{ mm}^2 \approx 21,000 \text{ N or 21 kN}$$

To be safe, assume **Max Load  $\approx$  25,000 N** or 25 kN (15% greater)

9. Click on **Reset Gauge Length** to set the **Crosshead** position to zero



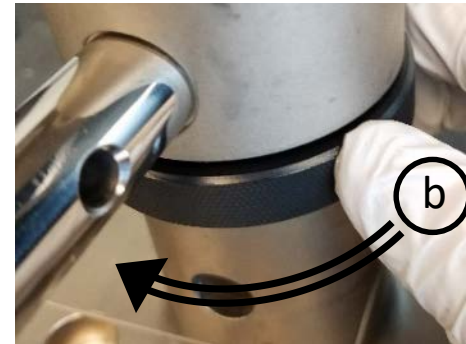
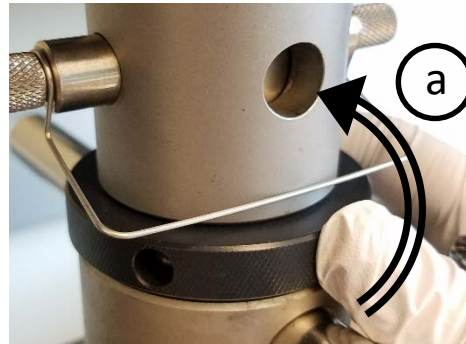


## II.C. Preloading – 4/5

10. Slowly ***Fine Jog*** up until the desired load is achieved

11. Hand tighten the ***Check Nuts*** against the ***Load Cell*** and ***Base Adapter***; respectively

- a) Top: ***Counter-clockwise***
- b) Bottom: ***Clockwise***



12. Use provided ***Spanner Wrench*** to provide additional help if necessary, but **DO NOT OVERTIGHTEN!**



13. Slowly ***Fine Jog*** back down until the load is near zero again

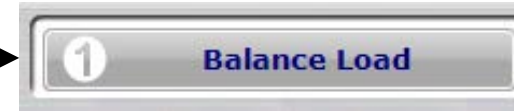
14. Unload the ***Preloading specimen*** by turning the handles on the upper and lower grips

15. You may now execute tests on your desired samples, but remember to **UNLOAD PRELOAD** before leaving!

## II.C. Preloading – 5/5

**NOTE:** Check nuts will now be **TOO TIGHT** and will require you to unload preload to remove wedge grips!

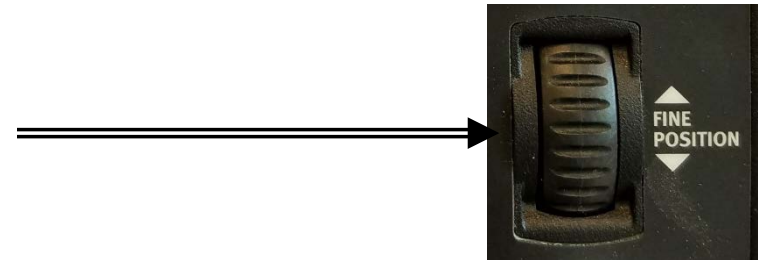
16. To unload the Preload, click **Balance Load** with nothing installed



17. Re-install the **Preloading specimen**



18. Slowly **Fine Jog** up until the previously used load is achieved again (approximately)



19. Loosen the **Check Nuts** again if possible, else slowly **Fine Jog** to increase the load until **Check Nuts** are loose again

20. If necessary, use the provided **Spanner Wrench** to help you loosen



21. Slowly **Fine Jog** back to near **Zero Load** to uninstall the **Preloading specimen**

# II.D. Specimen Loading – 1/1

**NOTE: NEVER** exceed the **Maximum Load** for **ANY** component in the load string such as Load Cell, Grips, or Fixtures!

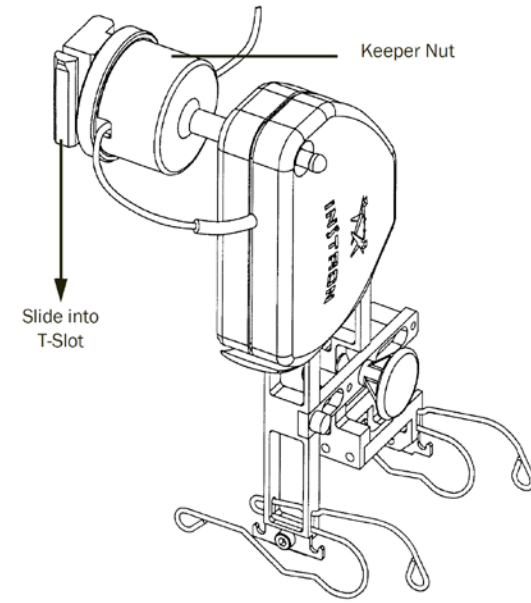
1. Adjust **Wedge Grip** height and install specimen so majority of **Jaw Faces** are engaged
2. Align and center the specimen visually into the **Jaw Faces**
3. Turn handles to tighten the lower and upper grips until the **Jaw Faces** engage the specimen
4. Continue to **II.E. Extensometer** if you require accurate Stress-Strain values prior to yielding (e.g. Young's Modulus), else skip directly to **VI. Running Test**



# II.E. Extensometer – 1/5

**Extensometer** provides a more accurate measure of **Strain** during your test compared to using the **Extension** alone from **Crosshead** position

**NOTE: Extensometer** is only rated to travel -0.1" to +1.0" for a set gauge length of 1.0" or -10% to 100% **Strain** and is only appropriate for low ductility samples like metals and NOT polymers!

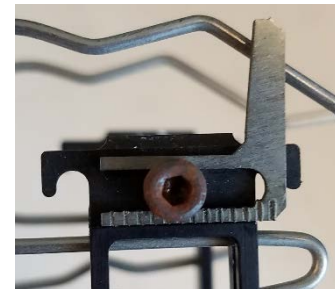
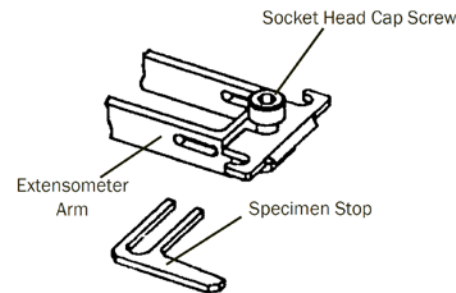
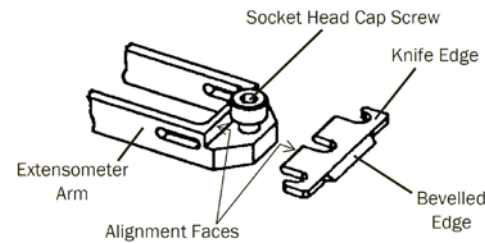
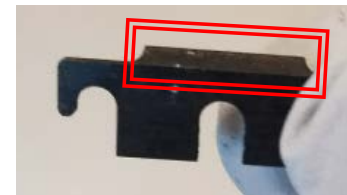
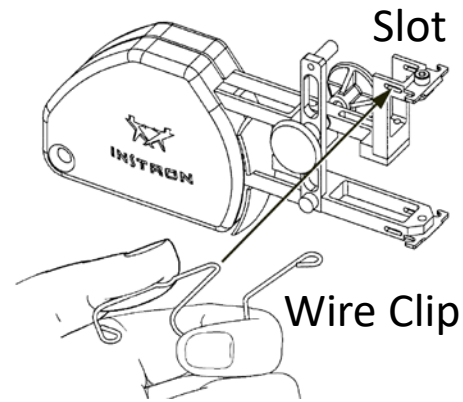


1. Identify appropriate **Wire Clip** based on specimen shape and size

Specimen Shape	A	B	C	D	E	F
Round (RO)	0 – 3 mm 0 – 0.12"	3 – 6 mm 0.12 – 0.24"	6 – 9 mm 0.24 – 0.35"	9 – 12 mm 0.35 – 0.47"	12 – 15 mm 0.47 – 0.59"	20 mm 0.79"
Rectangle (RE)	0 – 3 mm 0 – 0.12"	3 – 6 mm 0.12 – 0.24"	6 – 9 mm 0.24 – 0.35"	9 – 12 mm 0.35 – 0.47"	12 – 15 mm 0.47 – 0.59"	N/A

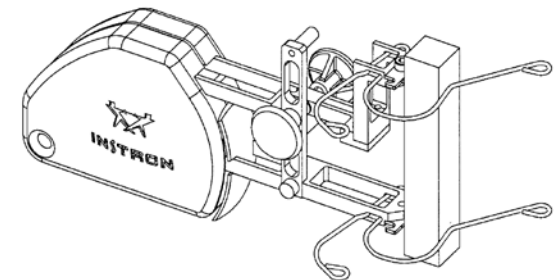
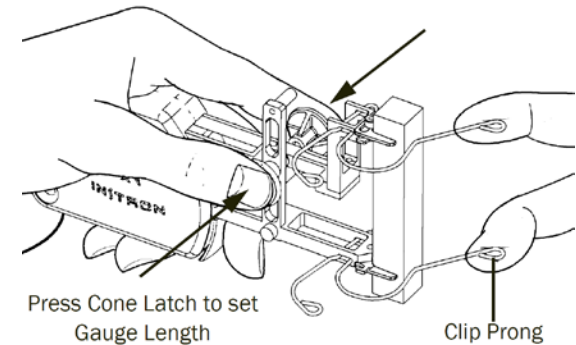
# II.E. Extensometer – 2/5

2. Insert the **Wire Clip** by squeezing and inserting into **Slot** as shown
3. Visually inspect the **Bevelled Edge** on the **Knife Edge** and contact Lab Manager if chipped or severely worn
4. Check that the **Knife Edge** is installed correctly and flush against the **Alignment Faces** using provided **2 mm Hex Key**
5. If desired, install and visually align the **Specimen Stop** to help with specimen alignment



## II.E. Extensometer – 3/5

6. Push the **Cone-Latch** together with your index finger and thumb to set **Gauge Length**
7. Use other hand to hold the **Clip Prongs** open and slip onto specimen as shown
8. Gradually release the clip prongs first and allow **Bevelled Edge** to gently touch specimen
9. Release the **Cone-Latch** to set the 1" gauge length
10. If the **Extensometer** slips, you may need to use a smaller sized **Wire Clip**



**NOTE:** Do not slide **Bevelled Edge** against the specimen as you attach to specimen as it will blunt the **Bevelled Edge** and scratch your specimen



# II.E. Extensometer – 4/5

NOTE: **Extensometer** can only be used in the elastic region of the stress-strain curve and **MUST** be removed at the **Yield Strength** or before reaching **+100% strain**

11. Protect the **Extensometer** by removing it before it gets broken!
12. Ensure that “**Remove extensometer during test**” is checked under the **Methods > Test Control > Strain** section
13. Select “**Yield (Offset 0.002 mm/mm)**” or “**Measurement event - (Strain 1 = 100%)**” as the Removal criteria
14. Select “**Pause test but suspend data capture**” as the Action during removal

**Specimen**

**Measurements**

**Calculations**

**Test Control**

**Start Test**

**Strain**

**Tensile strain (Extension)**

Primary source: Extension

☒ Remove extensometer during test

Removal criteria: Yield (Offset 0.002 mm/mm)

Action during removal: Pause test but suspend data capture

Removal criteria: Measurement event

Measurement: Strain 1

Value: 100.00000 %

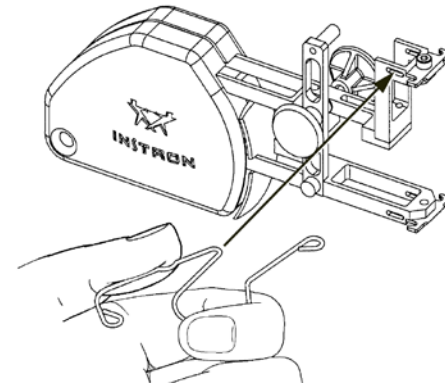
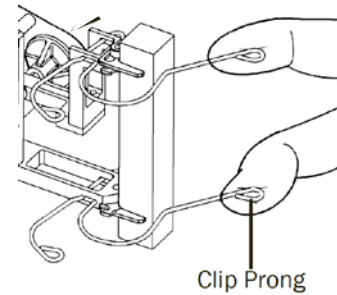
Action during removal: Pause test but suspend data capture

## II.E. Extensometer – 5/5

14. To remove, hold **Extensometer** with one hand and carefully pry the clip prongs open with other hand

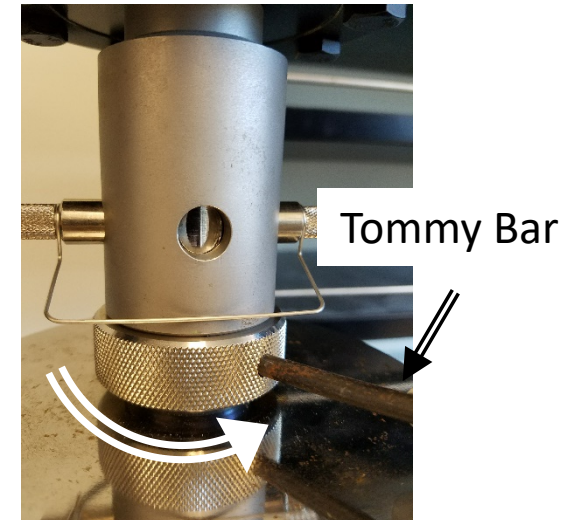
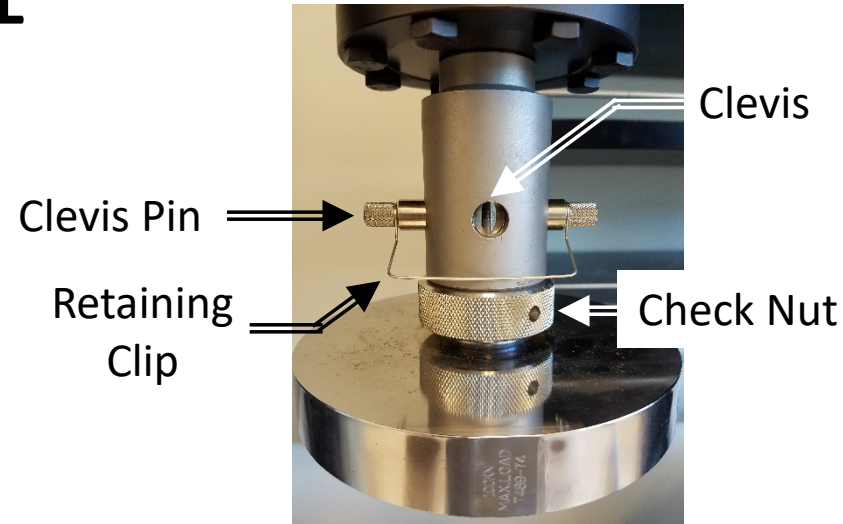
**NOTE: DO NOT PUSH THE CONE-LATCH BUTTONS TOGETHER AS THIS WILL SCRAPE THE BEVELLED EDGE AGAINST YOUR SPECIMEN BACK TO GAUGE LENGTH!**

15. Remove the **Extensometer** from the **Specimen**
16. Avoid sliding the knife edge against the specimen as you remove the **Extensometer** again to prevent damage
17. Remove the **Wire Clip** and place back into storage box
18. Place the **Extensometer** back onto its holder next to the frame



# III.A. Top Platen – 1/1

1. Position the **Check Nut** until it is loose against the **Platen**
2. Align the **Platen Clevis** to the **Clevis** in the **Load Cell**
3. Insert the  $\frac{1}{2}$ " **Clevis Pin** through the **Clevis**
4. Attach the **Retaining Clip**
5. Hand tighten **Check Nut** turning **counter-clockwise** until it is against the **Load Cell**
6. Use the provided **Tommy Bar** to help, but **DO NOT OVERTIGHTEN!**



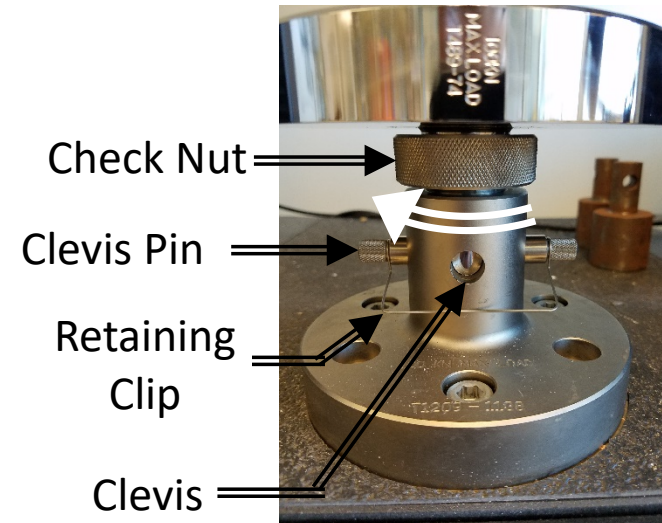
# III.B. Bottom Platen – 2/1

1. Check that the **Compression Spring** is placed inside the bottom **Base Adapter**
2. Position the **Check Nut** until it is loose against the **Platen**
3. Align the **Platen Clevis** to the **Clevis** in the **Base Adapter**
4. Insert the  $\frac{1}{2}$ " **Clevis Pin** through the **Clevis**
5. Attach the **Retaining Clip**
6. Hand tighten the **Check Nut** turning **clockwise** until it is against the **Base Adapter**
7. Use the provided **Tommy Bar** to help, but **DO NOT OVERTIGHTEN!**

Compression Spring



Bottom Base Adapter



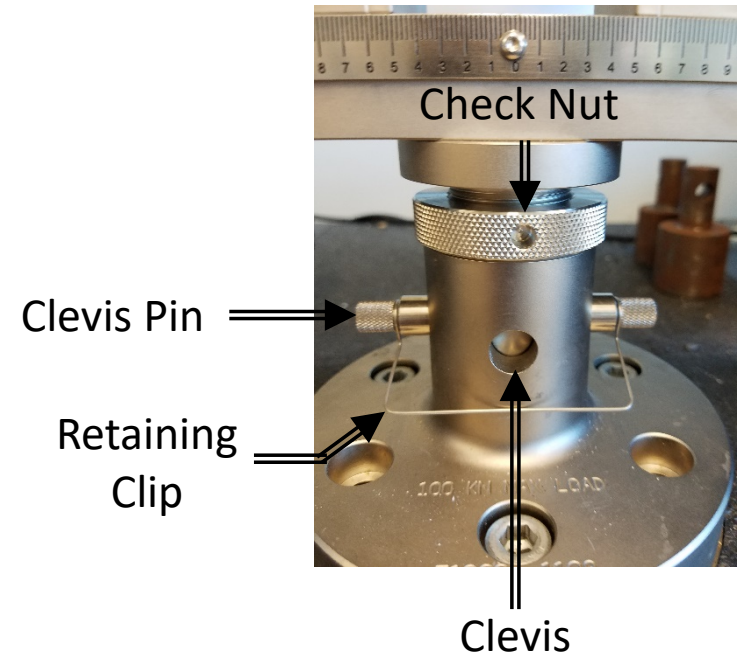
# IV.A. Lower Anvils – 1/1

1. Check that the **Compression Spring** is placed inside the bottom **Baseplate Adapter**
2. Position **Check Nut** until it is loose against **Anvil**
3. Place the **Lower Anvil** assembly into the **Baseplate Adapter**
4. Rotate the **Lower Anvil** until the scale faces the front and the **Anvil Clevis** are aligned with **Baseplate Adapter Clevis**
5. Insert the  $\frac{1}{2}$ " **Clevis Pin** into the **Baseplate Adapter**
6. Attach the **Retaining Clip**

Compression  
Spring



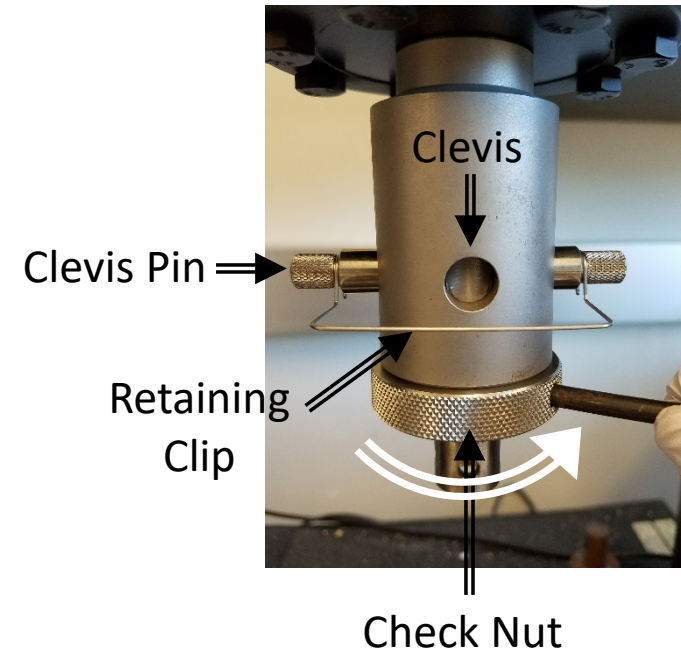
Bottom Base  
Adapter



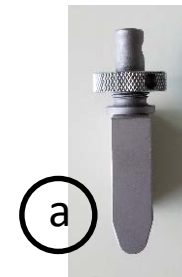


## IV.B. Upper Anvils – 1/2

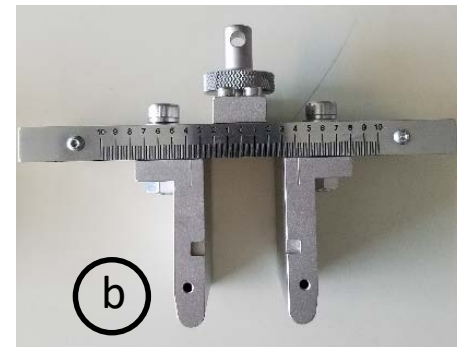
1. Position **O Adapter Check Nut** until it is loose
2. Insert the **O Adapter** into the **Load Cell**
3. Align the **O Adapter Clevis** to the **Clevis** in the **Load Cell**
4. Insert the  $\frac{1}{2}$ " **Clevis Pin** through the **Load Cell**
5. Attach the **Retaining Clip**
6. Hand tighten the **Check Nut** turning **counter-clockwise** until it is against the body of the **Load Cell**
7. Use the provided **Tommy Bar** to help, but **DO NOT OVERTIGHTEN!**
8. Select desired **Upper Anvils** to install
  - a) 3-point Flexural tests
  - b) 4-point Flexural tests



3-point



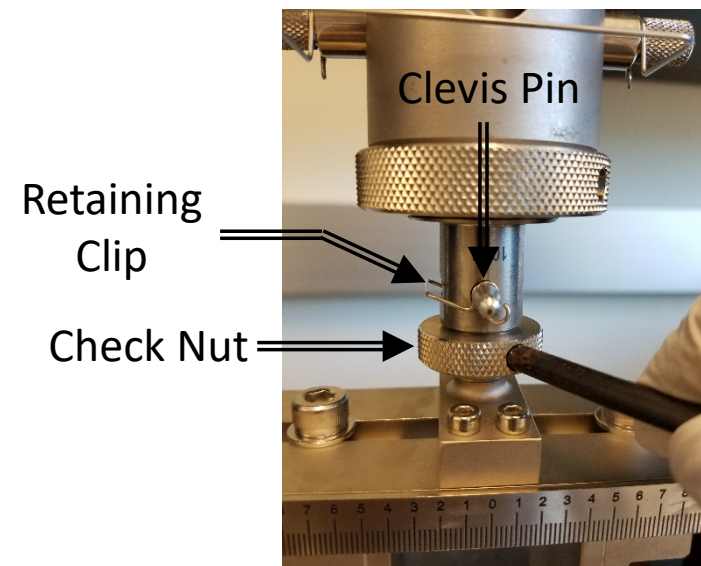
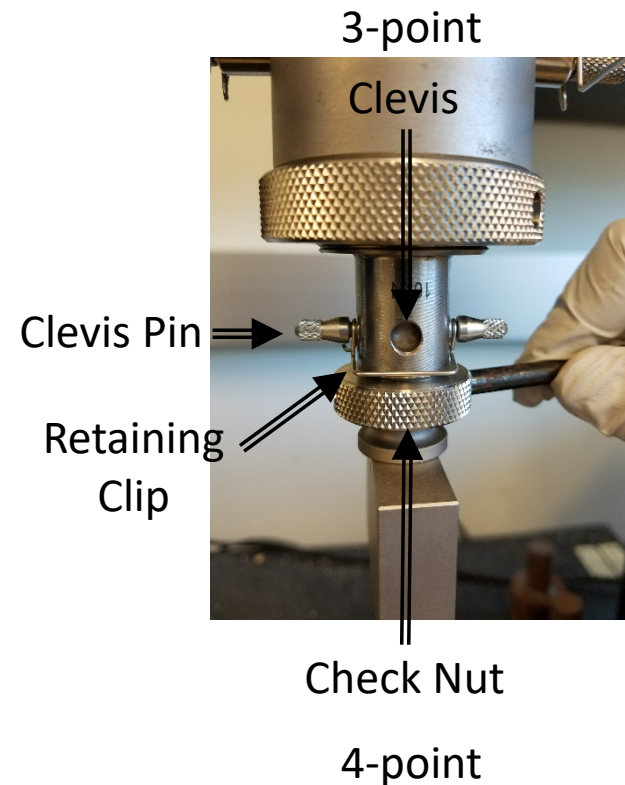
4-point





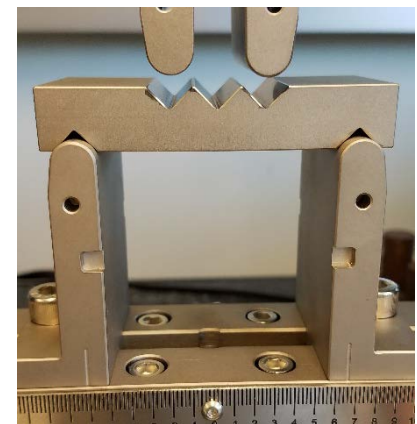
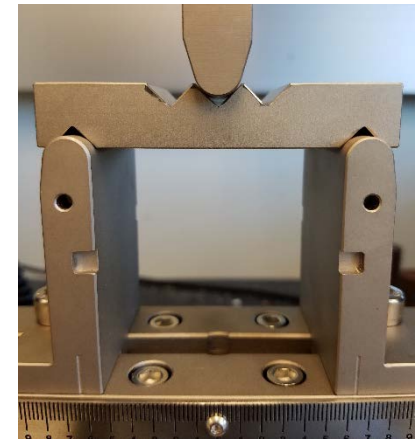
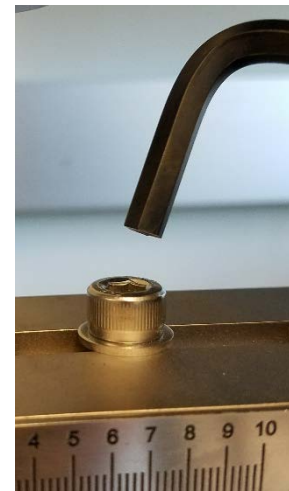
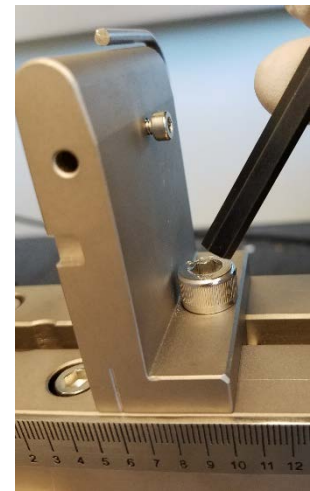
## IV.B. Upper Anvils – 2/2

9. Position **Check Nut** until it is loose against **Anvil**
10. Insert the **Upper Anvil** into the **O Adapter**
11. (3-point) Rotate the **Upper Anvil** until it is parallel with the **Lower Anvils**
12. (4-point) Rotate the **Upper Anvils** until it is parallel with the **Lower Anvils** and the scale faces the front
13. Align and insert the **6 mm Clevis Pin** into **O Adapter** clevis
14. Attach the **Retaining Clip**



## IV.C. Alignment – 1/2

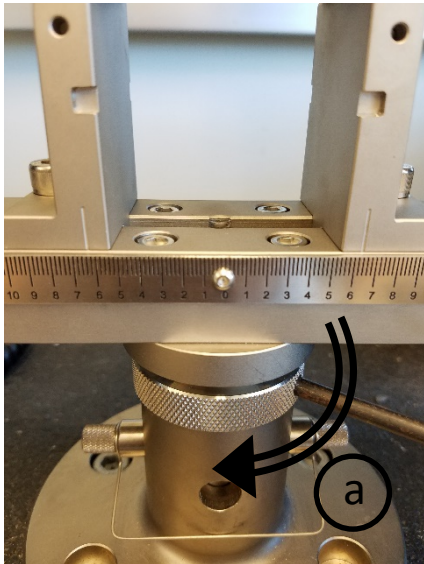
1. Loosen the cap screws with **6 mm Hex** holding the **Lower and Upper Anvils** and allow them to slide freely
2. Place the **Alignment Plate** onto the **Lower Anvils**
3. Adjust the **Lower Anvil** positions until they are both at about **6.2** on the lower front scale
4. For 3-point fixture, there is no need for adjustment of the single **Upper Anvil**
5. For 4-point fixture, adjust the **Upper Anvils** until they are both at about **2** on the upper front scale
6. Carefully lower the **Crosshead** using **Jog** and **Fine Jog** until the **Upper Anvil(s)** are just above the **Alignment Plate**



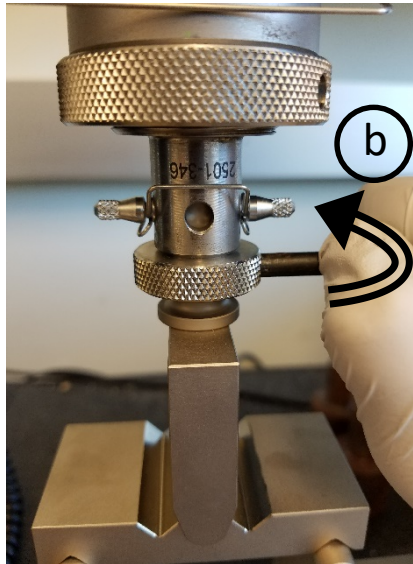
# IV.C. Alignment – 2/2

7. Adjust and align both the ***Upper and Lower Anvils*** until they **BARELY** touch
8. Hand tighten the ***Check Nuts*** on the ***Upper and Lower Anvils***
  - a) Lower Anvil: ***Clockwise***
  - b) Upper Anvils: ***Counter-clockwise***
9. Use the provided ***Tommy Bar*** to help, but **DO NOT OVERTIGHTEN!**

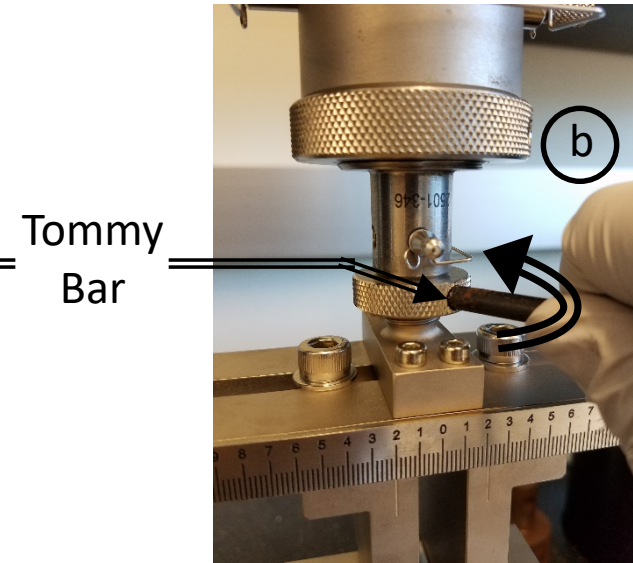
Lower Anvil



Upper Anvil

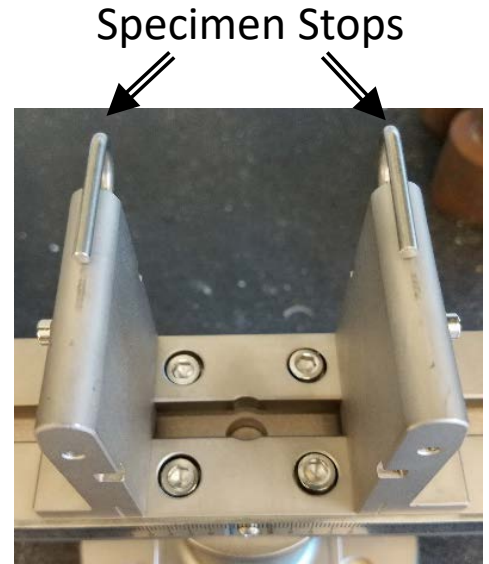


Upper Anvil



# IV.D. Specimen Loading – 1/1

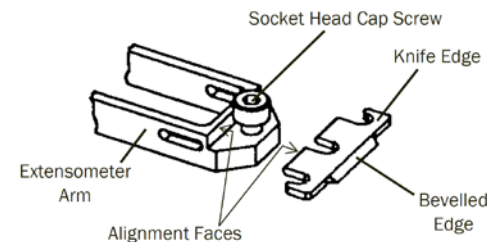
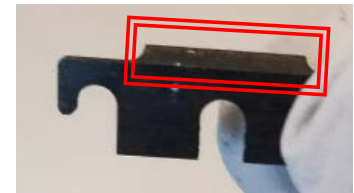
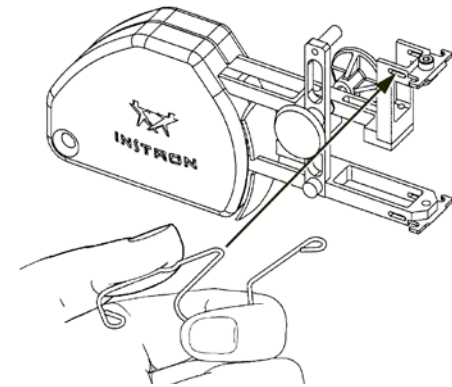
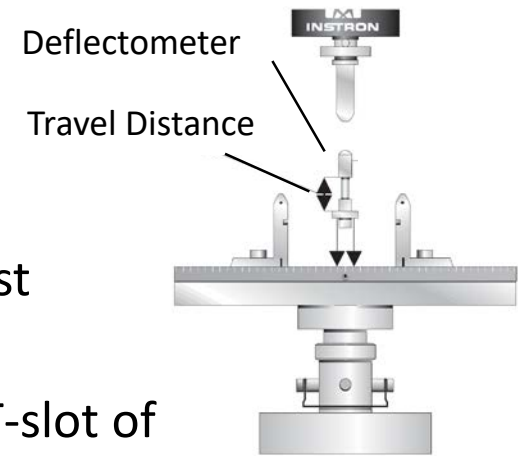
1. For 3-point fixture, set the span of the **Lower Anvils** to an appropriate spacing for your specimen
2. For 4-point fixture, set the span of both the **Upper and Lower Anvils** to an appropriate spacing for your specimen
3. Slightly raise the **Crosshead** to allow room for your specimen
4. Install **Specimen Stops** to ensure that each specimen is consistently in the same position on the fixture
5. Slide each specimen stop through the hole on the back (or front) of each **Lower Anvil**
6. Secure **Specimen Stops** in the desired position with the **2.5 mm Cap Screws** located on the side of each **Lower Anvil**





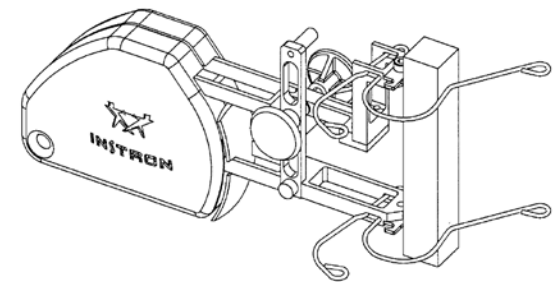
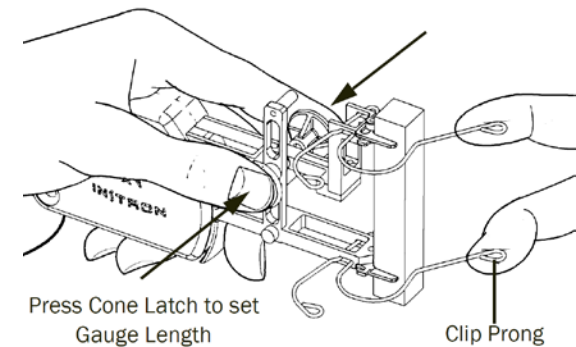
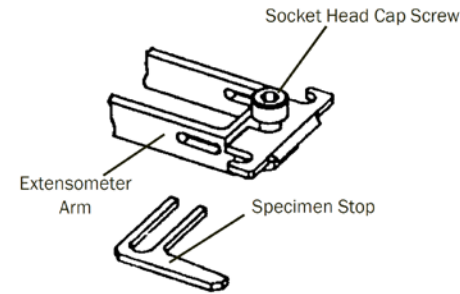
# IV.E. Deflectometer – 1/4

1. Install **Deflectometer** and **Extensometer** to accurately measure deflection of the specimen during a flexure test
2. Place **Deflectometer** in the center hole, located in the T-slot of **Anvil**
3. Choose **Wire Clip RO D 9 - 12 mm** and insert the **Wire Clip** by squeezing and inserting into slot as shown
4. Visually inspect the **Bevelled Edge** on the **Knife Edge** and contact Lab Manager if chipped or severely worn
5. Check that the **Knife Edge** is installed correctly and flush against the **Alignment Faces** using provided **2 mm Hex Key**



# IV.E. Deflectometer – 2/4

6. If desired, install and visually align the **Specimen Stop** to help with specimen alignment
7. Push the **Cone-Latch** together with your index finger and thumb to set gauge length
8. Use other hand to hold the **Clip Prongs** open and slip onto **Deflectometer**
9. Gradually release the clip prongs first and allow **Bevelled Edge** to gently touch **Deflectometer**
10. Release the **Cone-Latch** to set the 1" gauge length
11. If the **Extensometer** slips, you may need to use a smaller sized **Wire Clip**



**NOTE:** Do not slide **Bevelled Edge** against the **Deflectometer** as it will blunt the **Bevelled Edge** and scratch **Deflectometer** surface



# IV.E. Deflectometer – 3/4

**NOTE: EXTENSOMETER MUST BE REMOVED BEFORE REACHING -10% STRAIN**

12. Protect the **Extensometer** by removing it before it gets broken!
13. Ensure that “**Remove extensometer during test**” is checked under the **Methods > Test Control > Strain** section
14. Select “**Measurement event**” as the Removal criteria
15. Select “**Strain 1**” as Measurement and “**-10%**” as Value
16. Select “**Pause test but suspend data capture**” as the Action during removal

The screenshot shows a software interface with a left-hand navigation menu and a main content area. The navigation menu includes options: General, Sample, Specimen, Measurements, Calculations, and Test Control. The Test Control section is expanded, showing Start Test, Strain (highlighted with an orange dot), Pre-Test, and Test. The main content area is titled 'Set the parameters for tensile strain' and includes a subtitle: 'The method uses this strain measurement for some calculations, such as modulus and energy.' Below this, the 'Tensile strain (Extension)' section contains several settings. A red box highlights the 'Remove extensometer during test' checkbox, which is checked. Another red box highlights the 'Removal criteria' dropdown menu, which is set to 'Measurement event'. A third red box highlights the 'Measurement' dropdown menu, which is set to 'Strain 1'. The 'Value' field is set to '-10.00000' with a '%' unit selector. The 'Action during removal' dropdown menu is set to 'Pause test but suspend data capture'.

**General**

**Sample**

**Specimen**

**Measurements**

**Calculations**

**Test Control**

**Start Test**

**Strain**

**Pre-Test**

**Test**

**Set the parameters for tensile strain**

The method uses this strain measurement for some calculations, such as modulus and energy.

**Tensile strain (Extension)**

Primary source: Extension

☒ Remove extensometer during test

Removal criteria: Measurement event

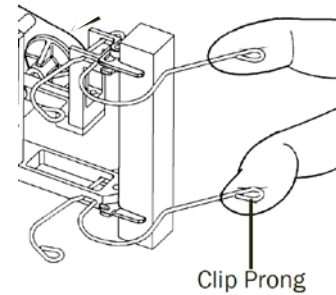
Measurement: Strain 1

Value: -10.00000 %

Action during removal: Pause test but suspend data capture

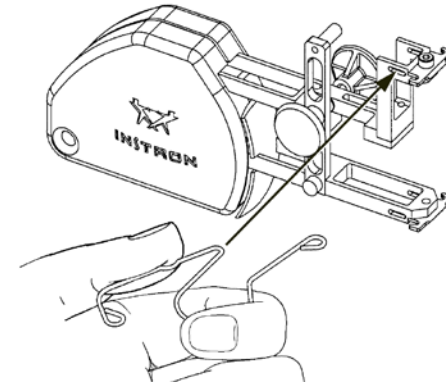
# IV.E. Deflectometer – 4/4

17. Hold the **Extensometer** with one hand and carefully pry the **Clip Prongs** open with your other hand



**NOTE: DO NOT PUSH THE CONE-LATCH BUTTONS TOGETHER AS THIS WILL SCRAPE THE BEVELLED EDGE AGAINST DEFLECTOMETER BACK TO GAUGE LENGTH!**

18. Remove the **Extensometer** from the **Deflectometer**
19. Avoid sliding the knife edge against the **Deflectometer** as you remove the **Extensometer** again to prevent damage
20. Remove the **Wire Clip** and place back into storage box
21. Place the **Extensometer** back onto its holder next to the frame



# V. Configuring Test – 1/22

1. The following questions should be answered prior to creating or executing a test procedure:
  - a) What is the test going to do?
  - b) What starts and stops the test?
  - c) What speed or speeds should the test run?
  - d) What is the shape and dimensions of the test specimen?
  - e) What data is collected and at what rate?
  - f) What output (graphs, reports) are required?
  - g) What answers from the test do you require?
  - h) What information is going to be supplied by the operator?
2. Click **Method > Open Method > Create Method**
3. Choose the appropriate **Test Type** and click **Next**
  - **Tension method**
  - **Compression method**
  - **Flexure method**



# V. Configuring Test – 2/22

4. Select **General** parameters for your test such as:
- System of units: (SI, Metric, US, or All) – Recommend “**All**”

**General**

**Method**

Sample

Specimen

Measurements

Calculations

### Set the general parameters for the test method

General parameters include:

- The units that the system uses as the default for all unit fields in the method.
- How the system assigns default settings for added specimens.
- A description of the method that displays in the preview area when you select a test method.

Test type: Tension

System of units: All

Assign specimen parameters from: Method default

5. Select **Sample > Notes** to create any sample description or notes
- Sample description is stored with all samples created with this test method
  - Sample notes are available for display when notes are included with sample

**General**

**Sample**

**Notes**

Number Inputs

Text Inputs

Specimen

Measurements

### Create the sample description and sample notes

The sample description is stored with all samples created with this test method and displays in the

Sample description:

Sample note 1:

# V. Configuring Test – 3/22

6. Click ***Specimen > Properties*** to specify the specimen default properties for each specimen
  - Geometry and default dimensions are important for the software calculations

The screenshot shows a software interface for configuring specimen properties. On the left is a vertical sidebar with icons and labels for different sections: General, Sample, Specimen, Properties, Notes, Number Inputs, Text Inputs, Choice Inputs, Measurements, Calculations, Test Control, Console, and Workspace. The 'Specimen' section is currently selected, and within it, the 'Properties' sub-section is active. The main area of the interface is titled 'Set the specimen properties and the default values' and includes a subtitle: 'Dimensions are used to calculate stress and strain. Specimen label is an option in the legend settings for a graph.' Below this, there are two main sections: 'Specimen properties' and 'Geometry and default dimensions'. The 'Specimen properties' section has a 'Specimen label' text input field. The 'Geometry and default dimensions' section contains several input fields for dimensions, each with a unit dropdown menu set to 'mm'. A red rectangular box highlights the 'Geometry' dropdown menu (set to 'Rectangular') and the 'Width', 'Thickness', and 'Length' input fields. To the right of these fields is a 3D diagram of a rectangular specimen with arrows indicating 'width' and 'thickness'. At the bottom of the diagram are icons for 'view', 'copy', and 'paste'.

**Set the specimen properties and the default values**  
Dimensions are used to calculate stress and strain. Specimen label is an option in the legend settings for a graph.

**Specimen properties**  
Specimen label:

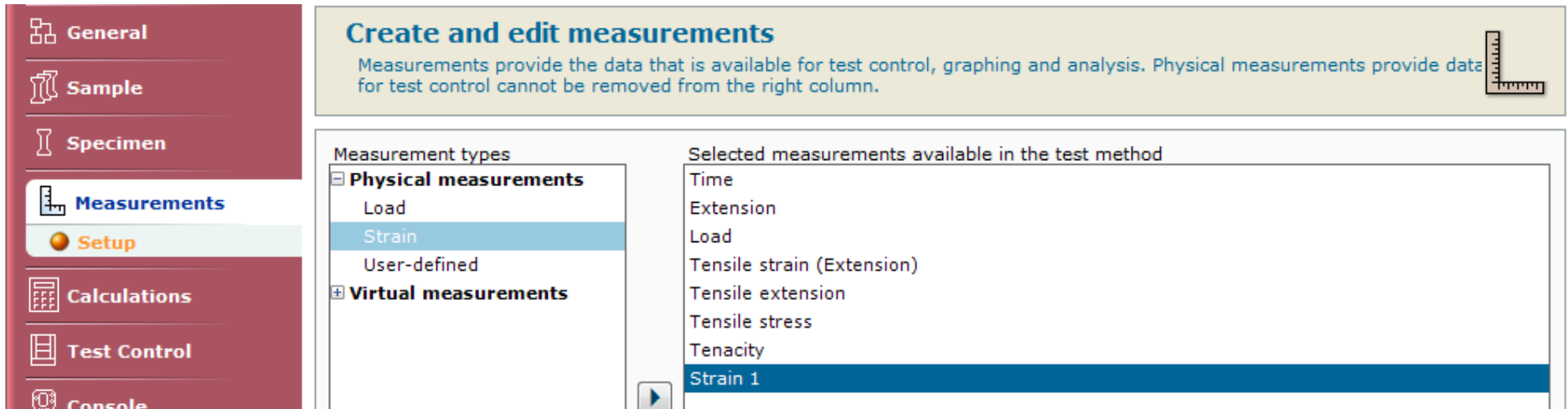
**Geometry and default dimensions**

Geometry:	Rectangular	
Width:	12.70000	mm
Thickness:	6.00000	mm
Length:	25.40000	mm
Final width:	12.70000	mm
Final thickness:	6.00000	mm
Final length:	25.40000	mm

Diagram illustrating specimen dimensions: width and thickness.

# V. Configuring Test – 4/22

7. Click **Measurements > Setup** to specify the data that is available for the test control, data analysis and live display



8. Physical Measurements directly measured from physical transducer include:
- Time
  - Extension (determined based on **Crosshead** location)
  - Load
  - Strain 1 (only when using the **Extensometer**)
9. Virtual Measurements are calculated from one or more physical measurements include:
- Strain (compressive, tensile, or flexure)
  - Stress (compressive, tensile, or flexure)



# V. Configuring Test – 5/22

10. Click **Calculations > Setup** to identify desired calculations that will be performed during or after the test is run
11. Use of **Extensometer** with Tension tests, will require calculation of the **Yield (Offset 0.2%)**

**Select and edit calculations**  
The system performs the selected calculations using data from the select

Available calculations	Selected calculations
n-value	Area under curve
Peak first	Modulus (Automatic)
Peak local	Yield (Offset 0.2 %)
Peak maximum/minimum	
Poisson's ratio	
Preset point	
r-value	
Seam slippage	
Slack correction	
Slope	
Tensile strength	
User calculation	
Yield	

**Yield**

Description: Yield (Offset 0.2 %)

Type: Offset

Domain: "Ramp 1"UNTIL"End of Data"

Parent calculation: Modulus (Automatic)

Search measurement: Tensile strain (Extension)

Value: 0.200 %

# V. Configuring Test – 6/22

12. Click **Test Control > Start Test** and choose **Start button** (default)
13. Click **Test Control > Strain** to specify primary source of data for strain measurements
  - Choose “**Extension**” as the Primary source using the **Crosshead** location
14. If using **Extensometer**, you **MUST** check “**Remove extensometer during test**”
  - Choose “**Yield (Offset 0.002 mm/mm)**” or “**Measurement event - (Strain 1 = 100%)**” as the Removal criteria
  - Choose “**Pause test but suspend data capture**” as the Action during removal

**Specimen**

**Measurements**

**Calculations**

**Test Control**

**Start Test**

**Strain**

**Pre-Test**

**Test**

**Tensile strain (Extension)**

Primary source: Extension

☒ Remove extensometer during test

Removal criteria: Yield (Offset 0.002 mm/mm)

Action during removal: Pause test but suspend data capture

Removal criteria: Measurement event

Measurement: Strain 1

Value: 100.00000 %

Action during removal: Pause test but suspend data capture

# V. Configuring Test – 7/22

15. Click **Test Control > Pre-Test** to assign a preload, auto balance, or precycling
- **Preload** – used to remove slack from test fixtures that requires specifying the control measurement, preload rate, target measurement, and target value
  - **Auto balance** – used to automatically balance transducers associated with selected measurements after preload or precycling
  - **Precycling** – may be required for some tests and not available in every testing type

**Set the pre-test parameters for the test**  
Pre-test parameters include pilable for test control modes.

☒ **Preload**  
Preload can remove slack in a specimen or remove compressive load on the specimen caused by the test fixture.

Control mode: Extension

Rate: 0.00000 mm/min

Changeover criteria: Measurement event

Measurement: Load

Value: 0.00000 N

☒ **Auto balance**  
Automatically balance selected measurements after preload and before the test starts.

Available measurements	Selected measurements
Load	Tensile strain (Extension)

# V. Configuring Test – 8/22

16. Click **Test Control > Test** to identify parameters specific to the test type such as the speed of the test and the number of speeds
- Specify a default or initial speed with **Ramp 1** control
  - Choose a **Ramp 2** control to separate a slow speed in elastic region (**Ramp 1**) and a faster speed in the plastic region (**Ramp 2**)
  - Choose a **Changeover (1 to 2)** criteria such as **Yield (Offset 0.002 mm/mm)**

The screenshot displays the 'Test Control' software interface. On the left is a vertical sidebar with a red header and a light blue footer. The sidebar contains the following menu items: 'General' (with a grid icon), 'Sample' (with a sample icon), 'Specimen' (with a specimen icon), 'Measurements' (with a bar chart icon), 'Calculations' (with a calculator icon), and 'Test Control' (with a document icon). Under 'Test Control', there are sub-items: 'Start Test', 'Strain', 'Pre-Test', 'Test' (highlighted with an orange circle), 'End of Test', and 'Data'. The main panel has a title bar 'Set the control parameters for the test' and a subtitle 'The control mode and rate determine the frame movement. Only physical measureme'. A small graph icon is in the top right. The main panel is divided into two sections, 'Ramp 1' and 'Ramp 2', both enclosed in red rectangular boxes. 'Ramp 1' has a checked checkbox, 'Control mode 1:' set to 'Extension', and 'Rate 1:' set to '10.00000' mm/min. 'Ramp 2' has a checked checkbox, 'Control mode 2:' set to 'Extension', 'Rate 2:' set to '0.00000' mm/min, 'Changeover (1 to 2):' set to 'Yield (Offset 0.002 mm/mm)', and 'Changeover override:' set to '0.00100' mm/mm.

**Set the control parameters for the test**  
The control mode and rate determine the frame movement. Only physical measureme

☒ **Ramp 1**

Control mode 1: Extension

Rate 1: 10.00000 mm/min

☒ **Ramp 2**

Control mode 2: Extension

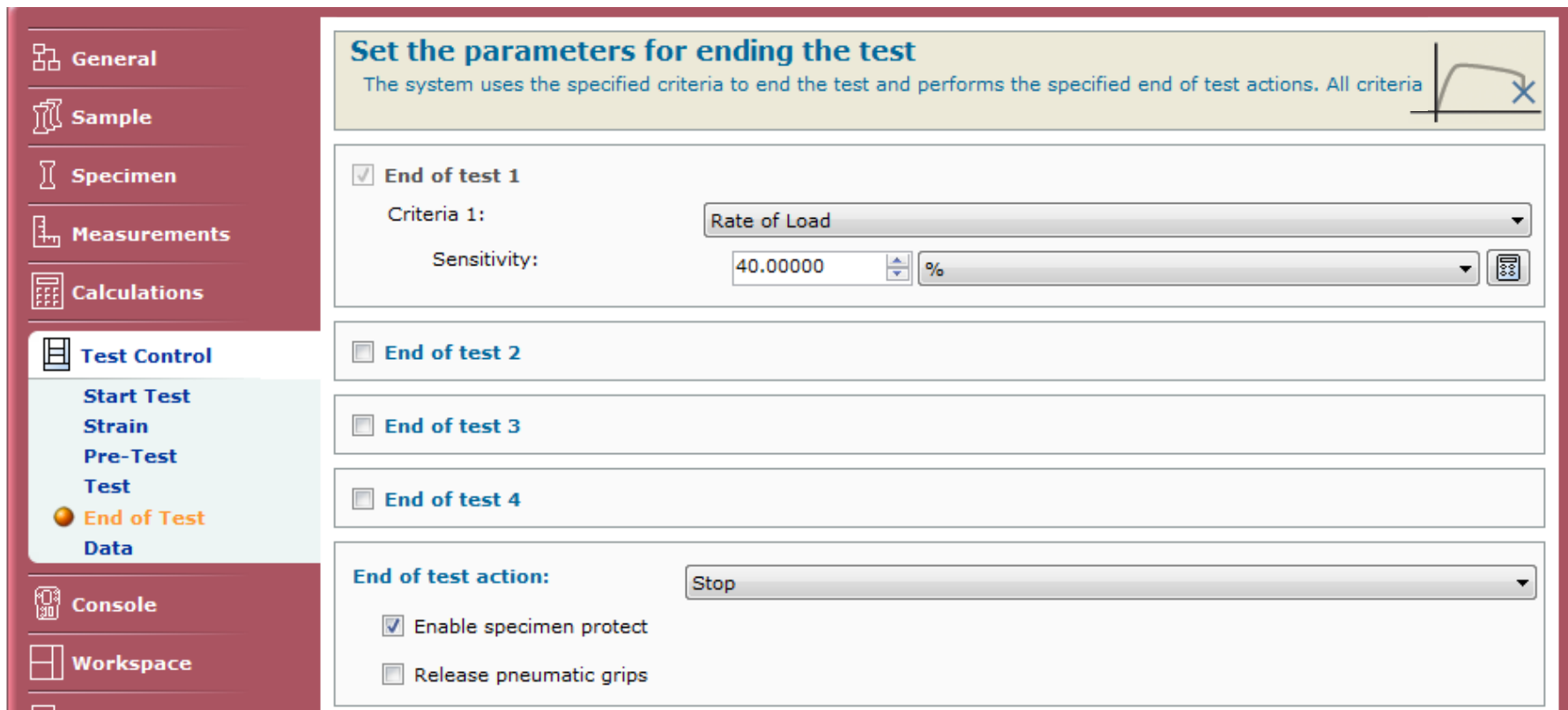
Rate 2: 0.00000 mm/min

Changeover (1 to 2): Yield (Offset 0.002 mm/mm)

Changeover override: 0.00100 mm/mm

# V. Configuring Test – 9/22

17. Click **Test Control > End of Test** to set up to 4 criteria for ending the test and the actions that the system performs when one of the end of test criteria is satisfied



**Set the parameters for ending the test**

The system uses the specified criteria to end the test and performs the specified end of test actions. All criteria

☒ **End of test 1**

Criteria 1: Rate of Load

Sensitivity: 40.00000 %

☐ **End of test 2**

☐ **End of test 3**

☐ **End of test 4**

**End of test action:** Stop

☒ Enable specimen protect

☐ Release pneumatic grips

# V. Configuring Test – 10/22

18. Select the appropriate **End of Test Criteria**:

- **Rate of load** – test ends when load drops by Sensitivity value within 100 ms time period
- **Load threshold** – test ends when load falls to **Load drops to value**, but is only active when load attains a value of 1.5 x **Load drops to value** first
- **Load with delay** – detector is inactive for the **Delay period** specified and ends when load falls to the **Load drops to value**
- **% Peak Load** – detector is inactive until **Load threshold** field is exceeded and ends test when load drops by specified **% Peak Load**
- **Measurement Event** – transition occurs when system detects a specified measurement criteria being satisfied such as **Extension** value or **Load** value

19. Select the appropriate **End of Test action**:

- **Stop** – the **Crosshead** stops (good default)
- **Return** – the **Crosshead** stops and returns to gauge length (**NEVER SELECT!**)
- **Stop, then Return** – **Crosshead** stops, prompt to remove specimen first then return to gauge length (good for multiple specimens)



# V. Configuring Test – 11/22

20. Click **Test Control > Data** to determine the number of data sets stored in the test data file
- **Automatic (default)** – default data capture criteria captures 10 points/sec and whenever load changes 0.25% of load capacity
  - **Manual** – set up to three separate data logging criteria to tailor data logging to application needs

**Set the data capture parameters for the test**  
Specify how often the system captures test data. All criteria operate independently and the system captures c

Data capture: Manual

☒ **Criteria 1**  
Measurement 1: Time  
Interval 1: 50.00000 ms

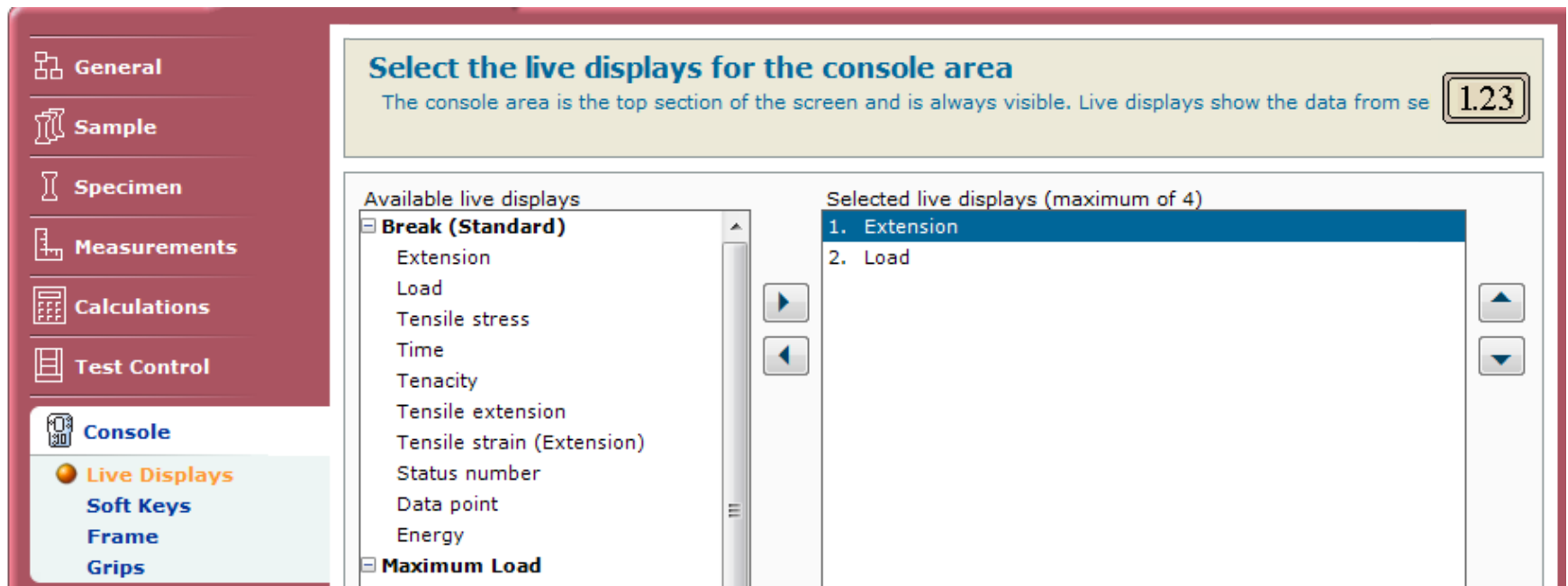
☐ **Criteria 2**

☐ **Criteria 3**

☐ **Record with TestCam**

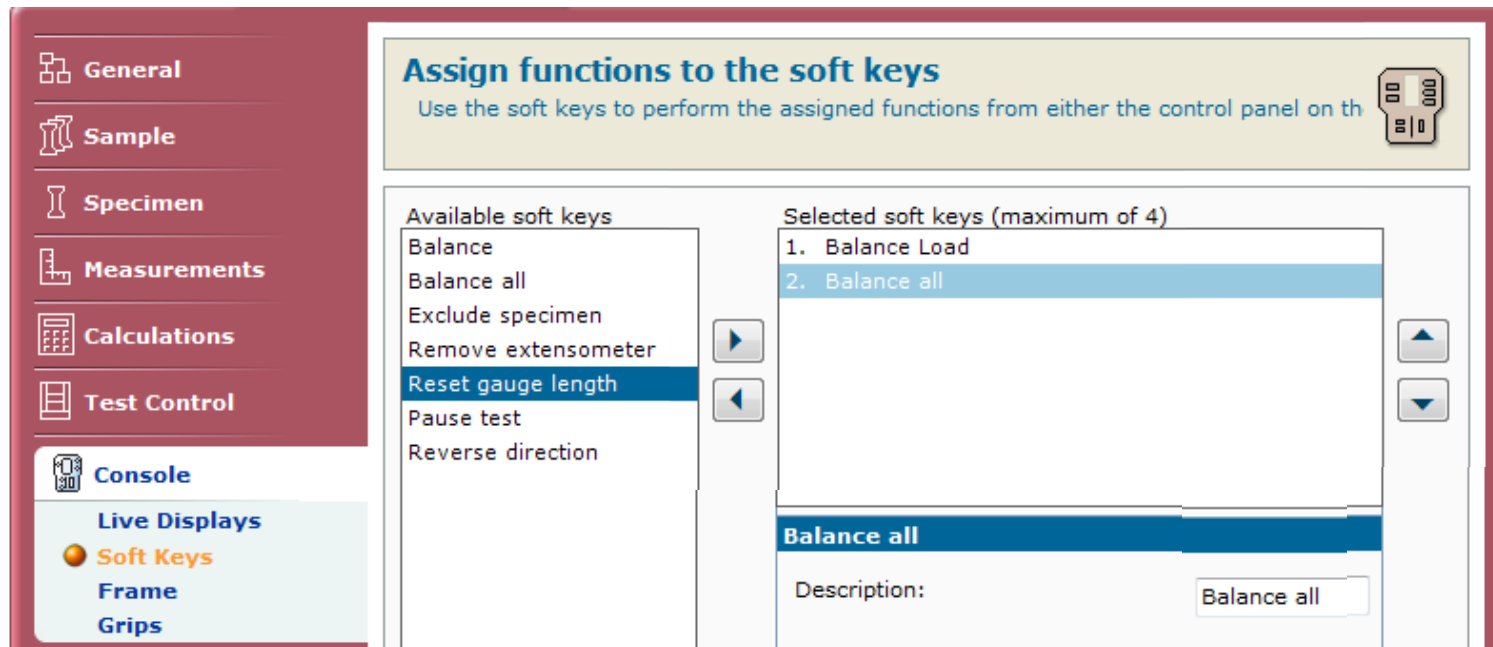
# V. Configuring Test – 12/22

21. Click **Console > Live Displays** to customize up to 4 live displays on the console (if desired)
22. Recommended **Live Displays** are:
  - **Load** (N)
  - **Extension** (mm)
  - **Strain 1** (%) – if using **Extensometer**



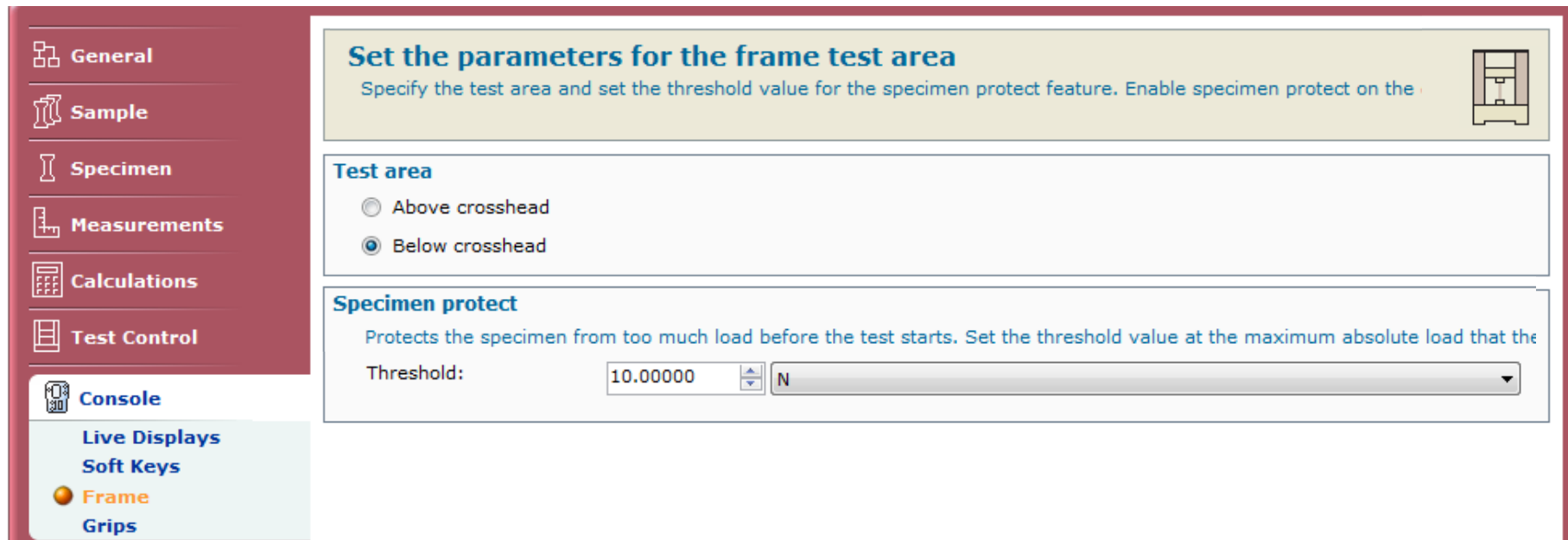
# V. Configuring Test – 13/22

23. Click **Console** > **Soft Keys** to selectively program up to 4 functions on the control panel
24. Recommended **Soft Keys** are:
- **Balance Load**
  - **Balance Strain 1** – if using **Extensometer**
  - **Balance all**
  - **Reset gauge length**



# V. Configuring Test – 14/22

25. Click **Console > Frame** to specify the test area to be **Below crosshead**
26. Specify the maximum absolute load that the specimen can experience without damage under the **Threshold** value for **Specimen protect**



The screenshot displays the software interface for configuring a test. On the left is a vertical sidebar with a red header and a light blue footer. The sidebar contains the following menu items: 'General' (with a square icon), 'Sample' (with a cylinder icon), 'Specimen' (with a vertical bar icon), 'Measurements' (with a bar chart icon), 'Calculations' (with a calculator icon), 'Test Control' (with a document icon), and 'Console' (with a monitor icon). Below the 'Console' item are three sub-items: 'Live Displays', 'Soft Keys', and 'Frame' (which is highlighted with an orange circle). The 'Frame' sub-item has a 'Grips' sub-item below it. The main area of the interface has a red border and a light beige background. It features a title bar 'Set the parameters for the frame test area' with a small diagram of a test frame on the right. Below the title bar is a section titled 'Test area' with two radio buttons: 'Above crosshead' and 'Below crosshead' (which is selected). Below this is a section titled 'Specimen protect' with a description: 'Protects the specimen from too much load before the test starts. Set the threshold value at the maximum absolute load that the'. Below the description is a 'Threshold:' label followed by a text input field containing '10.00000' and a unit dropdown menu set to 'N'.

**General**

**Sample**

**Specimen**

**Measurements**

**Calculations**

**Test Control**

**Console**

Live Displays

Soft Keys

**Frame**

Grips

**Set the parameters for the frame test area**

Specify the test area and set the threshold value for the specimen protect feature. Enable specimen protect on the

**Test area**

☐ Above crosshead

☒ Below crosshead

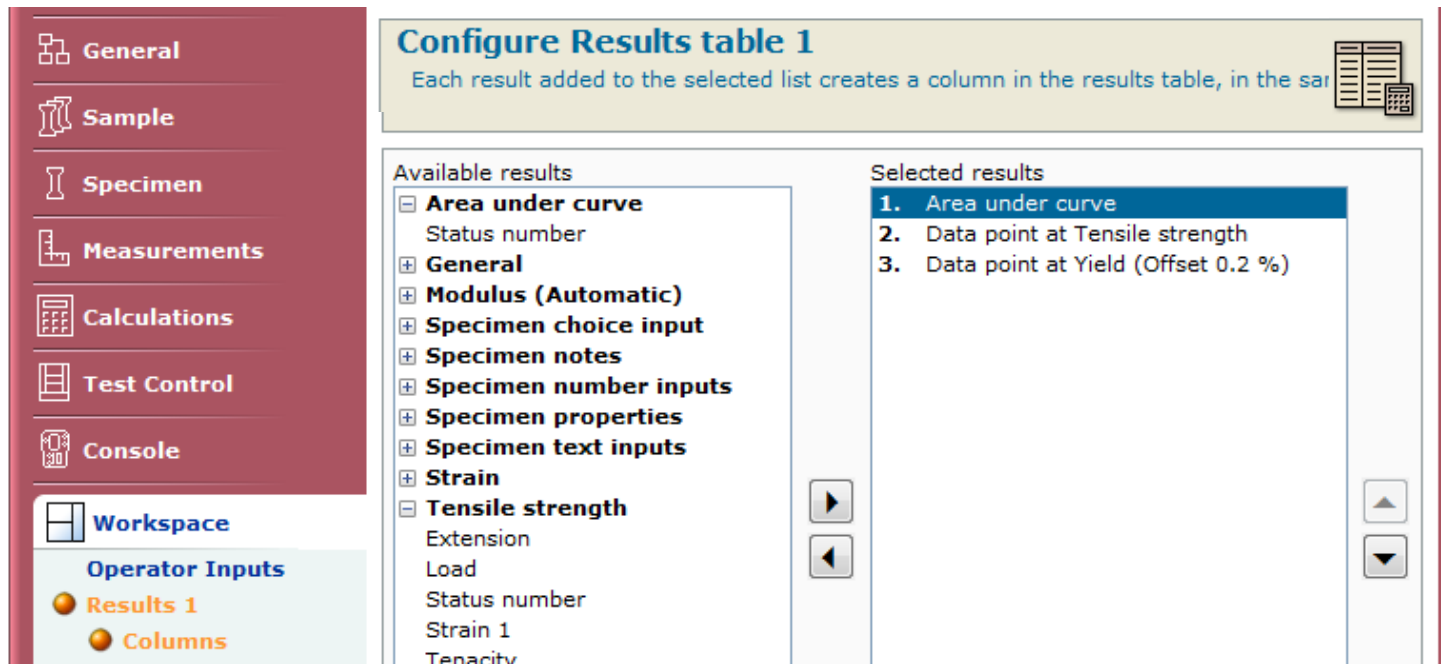
**Specimen protect**

Protects the specimen from too much load before the test starts. Set the threshold value at the maximum absolute load that the

Threshold: 10.00000 N

# V. Configuring Test – 15/22

27. Click **Workspace > Results 1 & 2 > Column** to add specified calculation to be added into results table in the report



28. Click **Workspace > Results 1 & 2 > Statistics** to add specified statistics to a row in results table
29. Click **Workspace > Results 1 & 2 > Format** to select how the results table appears in the test workspace and in the report

# V. Configuring Test – 16/22

30. Click **Workspace > Graph 1 & 2** to select the graphics for this method in the test workspace and in a report
31. Click **Workspace > Graph 1 & 2 > X & Y-Data** to choose axes variables

General

Sample

Specimen

Measurements

Calculations

Test Control

Console

Workspace

- Operator Inputs
- Results 1
- Results 2
- Graph 1**
  - Type**
  - X-Data
  - Y-Data
  - Advanced

Select the type of graph and basic format for graph 1

The graph format determines how the graph appears in the test workspace and in the report. To include the graph in the r

Select a graph type

☒ Multi-specimen

☐ Double Y-axis

☐ Multi-measurement

A multi-specimen graph can display up to 25 specimen curves on each graph.

Graph title:

Specimen %n to %m

Domain:

"Start of Data" UNTIL "End of Data"

Curves per graph:

4

Offset each curve by:

Auto

☒ Show excluded specimens

☐ Enable data point selector

Spe

24

22

20

▲ Marker Style



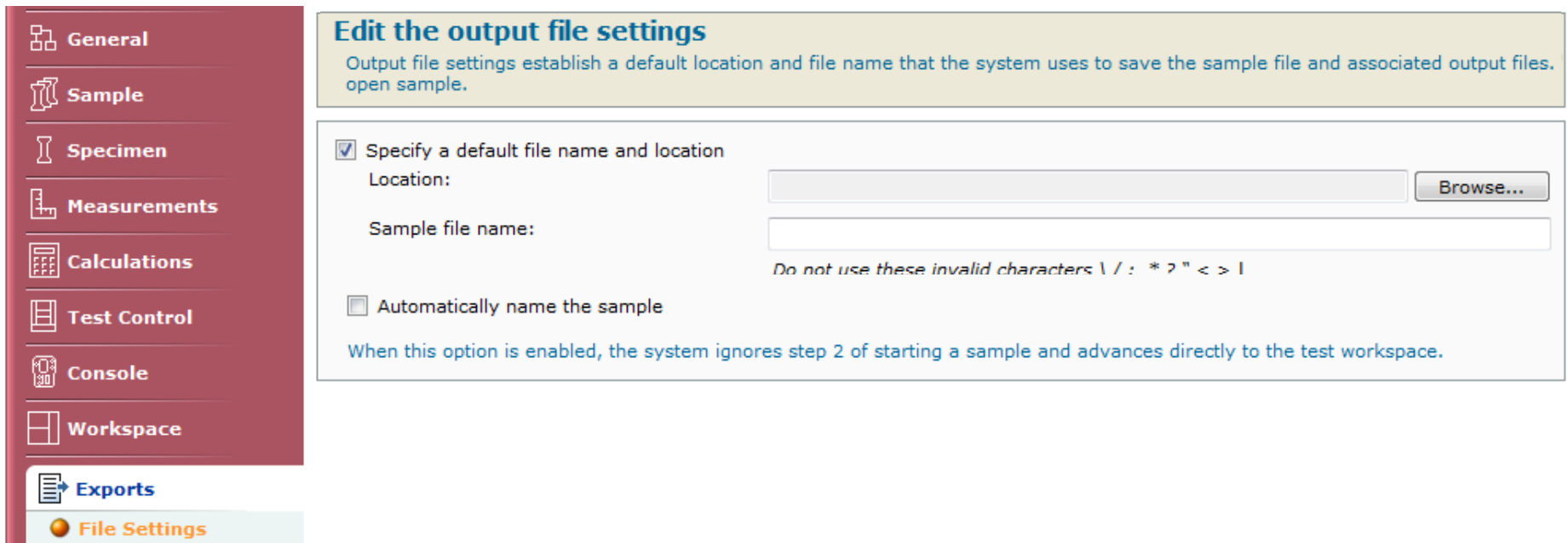
# V. Configuring Test – 17/22

- 32. Click **Workspace > Raw Data** to set up the content for the raw data table
- 33. Click **Workspace > Raw Data > Columns** to arrange the order
- 34. Click **Workspace > Layout** to set up what is displayed on the test workspace

The screenshot shows a software interface for configuring a raw data table. On the left is a vertical sidebar with a red header and a light blue footer. The red header contains icons and labels for 'General', 'Sample', 'Specimen', 'Measurements', 'Calculations', 'Test Control', and 'Console'. The light blue footer contains a 'Workspace' section with a grid icon, and a list of items: 'Operator Inputs', 'Results 1', 'Results 2', 'Graph 1', 'Graph 2', 'Raw Data' (highlighted with an orange circle), and 'Columns' (highlighted with an orange circle). The main area has a yellow header bar with the title 'Create a table to display raw data on the workspace' and a subtitle 'Each measurement added to the selected list creates a column in the raw data table, in the same order as they appear in the list.' Below the header are two panels: 'Available measurements' on the left and 'Selected measurements' on the right. The 'Available measurements' panel lists: 'PIP count', 'Tenacity' (highlighted in blue), 'Tensile extension', 'Tensile strain (Extension)', and 'Tensile stress'. The 'Selected measurements' panel lists: '1. Time', '2. Extension', '3. Load', and '4. Strain 1' (highlighted in blue). Between the panels are two arrow buttons (right and left). To the right of the 'Selected measurements' panel are two arrow buttons (up and down).

# V. Configuring Test – 18/22

35. Click **Exports > File Settings** to set a default file name and location for all your output files such as Reports, Results, and Raw Data
36. Click **Exports > Reports** to determine how the system produces the report when it generates output for a sample



The screenshot shows a software interface with a sidebar on the left and a main content area. The sidebar contains a list of menu items: General, Sample, Specimen, Measurements, Calculations, Test Control, Console, and Workspace. Below these is a section for 'Exports' with a sub-item 'File Settings' highlighted in orange. The main content area displays the 'Edit the output file settings' dialog box. This dialog has a title bar and a description: 'Output file settings establish a default location and file name that the system uses to save the sample file and associated output files. open sample.' It contains two main sections. The first section is titled 'Specify a default file name and location' and is checked. It includes a 'Location:' label with a text input field and a 'Browse...' button. Below this is a 'Sample file name:' label with a text input field. A warning note states: 'Do not use these invalid characters \ / : \* ? " < > |'. The second section is titled 'Automatically name the sample' and is unchecked. A note below it states: 'When this option is enabled, the system ignores step 2 of starting a sample and advances directly to the test workspace.'

**General**

**Sample**

**Specimen**

**Measurements**

**Calculations**

**Test Control**

**Console**

**Workspace**

**Exports**

**File Settings**

### Edit the output file settings

Output file settings establish a default location and file name that the system uses to save the sample file and associated output files. open sample.

☒ Specify a default file name and location

Location:

Sample file name:

*Do not use these invalid characters \ / : \* ? " < > |*

☐ Automatically name the sample

When this option is enabled, the system ignores step 2 of starting a sample and advances directly to the test workspace.

# V. Configuring Test – 19/22

37. Click **Exports > Export Results** to export results tables to .CSV file that the system generates
38. Click **Exports > Export Raw Data** to export raw data and determine the additional content in the raw data output file that the system generates

**Edit the raw data export settings**

If enabled, the system saves the raw data table to a separate file for each specimen when you finish a sample. :

**Export raw data**

☒ Export raw data

**Include additional specimen information**

Available results	Selected results
<input checked="" type="checkbox"/> <b>Area under curve</b> Status number	<b>Modulus (Automatic):</b> Modulus (Automatic)
<input checked="" type="checkbox"/> <b>General</b> End date Excluded Specimen number (included) Start date Unique identifier User	<b>Area under curve:</b> Area under curve
<input checked="" type="checkbox"/> <b>Modulus (Automatic)</b> Energy to X-intercept Status number X-intercept	

# V. Configuring Test – 20/22

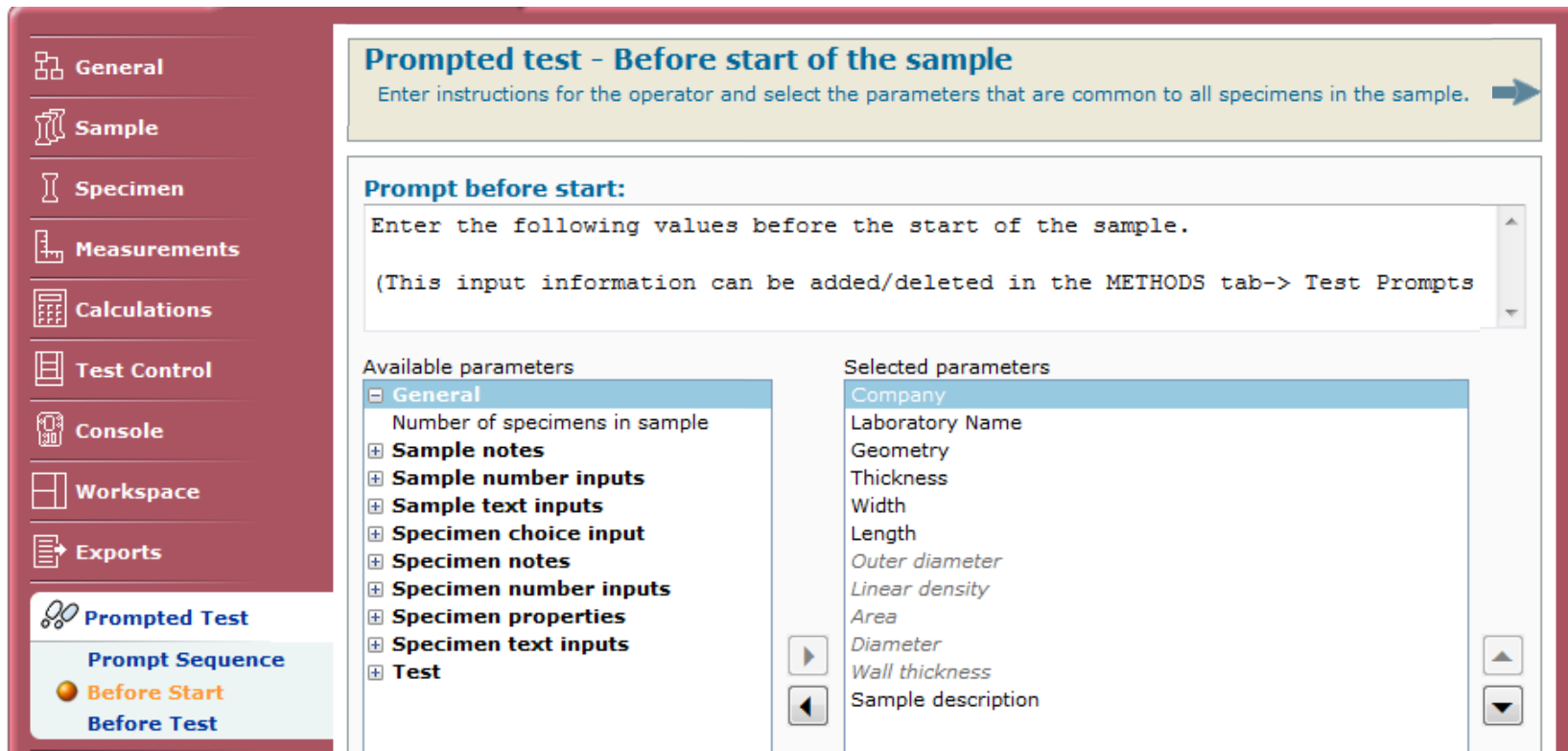
39. Click **Prompted Test > Prompt Sequence** to specify if the test would proceed with or without a sequence of prompts
40. Select which **Prompts** to be included in the test

The screenshot shows the 'Create a prompted test sequence' configuration window. On the left is a sidebar with navigation options: General, Sample, Specimen, Measurements, Calculations, Test Control, Console, Workspace, Exports, and Prompted Test. The 'Prompted Test' section is expanded, showing 'Prompt Sequence' as the active option, with sub-options 'Before Start' and 'Before Test'. The main panel is titled 'Create a prompted test sequence' and includes a descriptive text: 'A prompted test provides a series of steps that overlay the test workspace'. Below this is a visual sequence of icons representing the test steps: a specimen icon, a timer icon, a test icon, a workspace icon, a timer icon, and a test icon. The configuration options are as follows:

- ☒ Run as a prompted test
- Number of specimens in sample: 10 (with a dropdown and edit icon)
- ☒ Prompt before start
- ☐ Prompt before specimen
- ☒ Prompt before test
- ☐ Show workspace after test
- ☐ Prompt before calculations
- ☒ Show workspace after calculations
- ☐ Prompt after specimen
- ☐ Prompt at finish

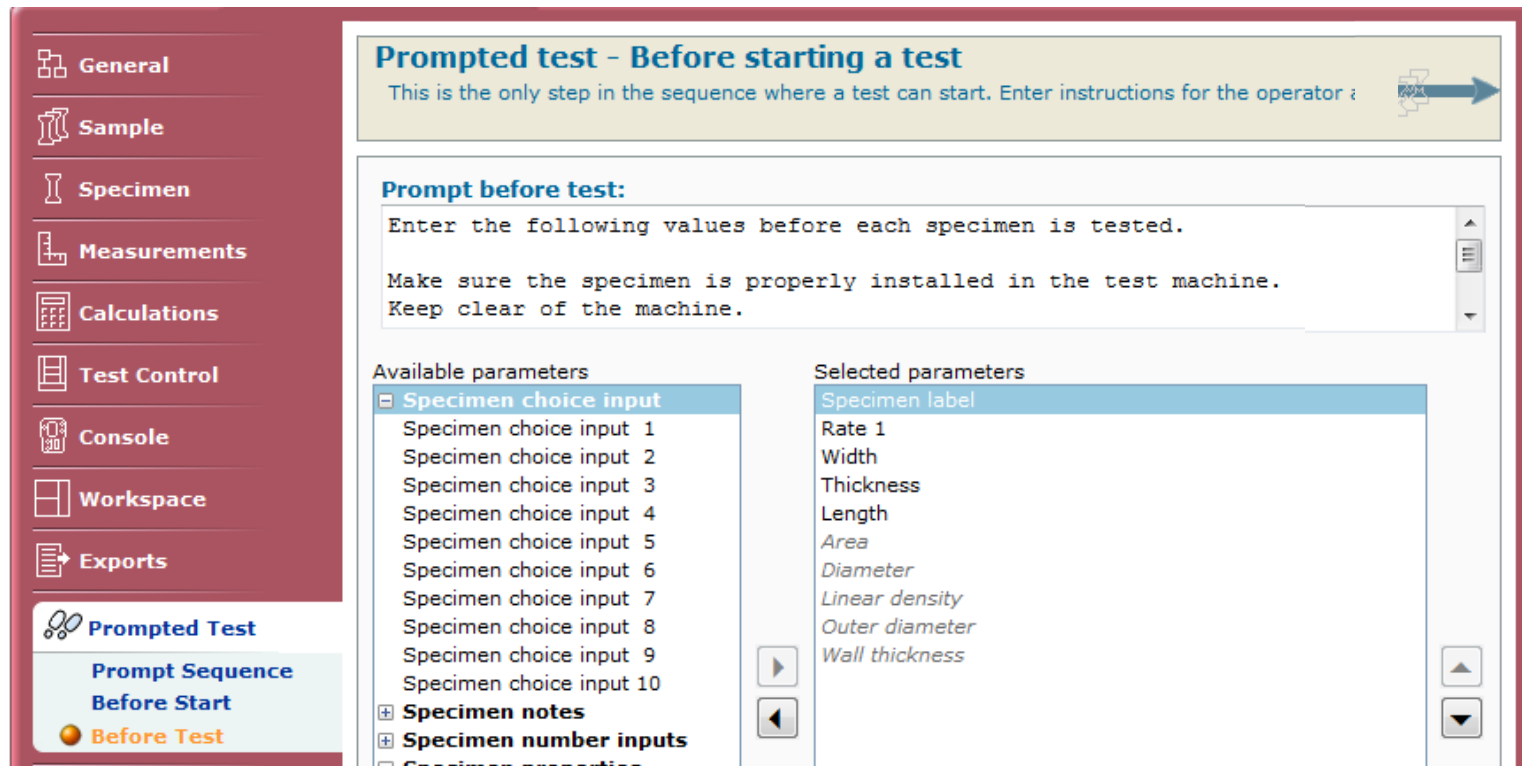
# V. Configuring Test – 21/22

41. Click **Prompted Test > Before start of the sample** to enter instructions for the operator and select the parameters that are common to all specimens



# V. Configuring Test – 22/22

42. Click **Prompted Test > Before test** to enter instructions for the operator and select the parameters that required before each specimen is tested



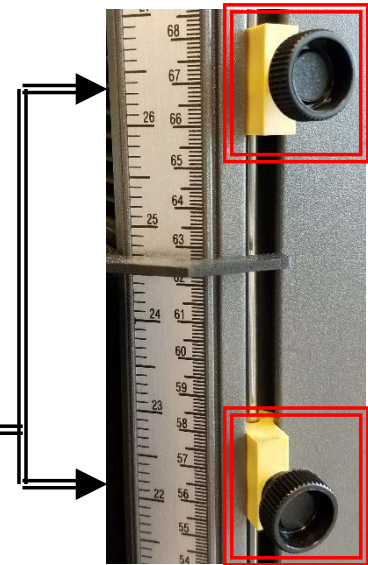


# VI. Running Test – 1/3

1. Always set **Upper and Lower Limits** before operating the Instron and ensure appropriate limits are enabled before moving the **Crosshead**
2. Loosen and move the slides to the desired positions and tighten the thumb screws
3. Position the **Crosshead** to its starting position for the test using **Jog  $\Delta \nabla$**  and **Fine Jog** controls

**NOTE: ALWAYS RESET EXTENSION GAUGE LENGTH AFTER JOGGING OR MANUALLY CHANGING POSITION OF CROSSHEAD BEFORE STARTING TEST**

4. Determine how you would like to measure strain (if applicable)
  - a) “Extension” is determined by the location of the **Cross Head** (default)
  - b) “Strain 1” is determined by **Extensometer** via the knife edge distance



# VI. Running Test – 2/3

5. Collect all ***Specimens*** together that will make up your sample and identify each ***Specimen*** (e.g. with markings) by 1, 2, 3....
6. Load your ***Specimen*** appropriately into installed fixture or grip and close door
7. Click “***Balance All***” or if desired, click on individual measurements to be balanced (e.g. ***Load, Strain, Gauge Length***)



8. Click ***Test*** on the ***Home screen***



10. Click ***New Sample > Select Method*** in the navigation bar
11. Click ***Browse...*** to find desired test method file, click ***Open***
12. Input desired ***Sample Name*** and determine the location to save the file in ***Location*** field, click ***Next***

# VI. Running Test – 3/3

13. Click on **Start** button to start your test



14. Your test will begin and will end automatically based on your chosen “**End Test**” criteria

15. If your test does not trigger the “**End Test**” criteria, you can stop the test yourself by clicking on the **Stop** button



16. Safely remove your sample

17. If you press the Return button, it will return your crosshead back to the Zero extension value



18. Clicking on **Save** or **Save As** to continue your test later



19. Load your next sample (if any) or click on **Finish** will end all your tests and generate your report and raw files

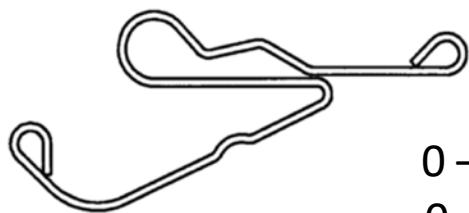


# VII. Cleanup – 1/1

1. Remove ***Specimen*** from the installed grip or fixtures
2. Remove the ***Preload*** if performing Tension tests, see ***II.C. Preloading***
3. Remove any installed grip or fixtures
4. Return all components back to their respective storage drawers and boxes
5. Clean up any broken or specimen debris around the Instron
6. Turn off the software by clicking on the ***Exit*** button
7. Sign-out of your ***ENGR account***

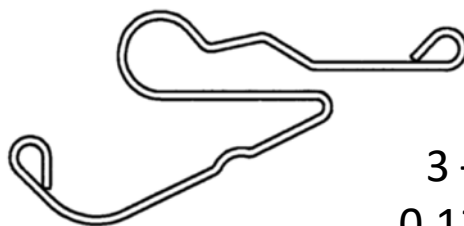


Round A



0 – 3 mm  
0 – 0.12"

Round B



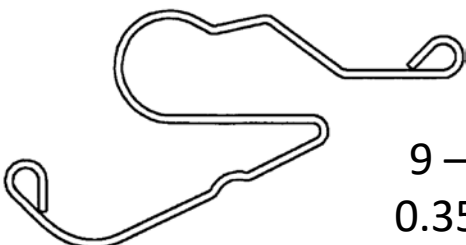
3 – 6 mm  
0.12 – 0.24"

Round C



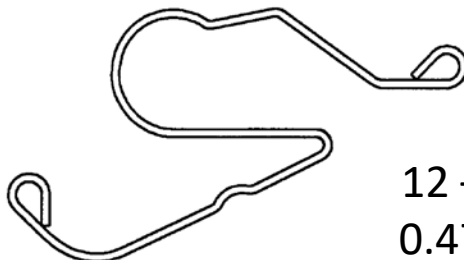
6 – 9 mm  
0.24 – 0.35"

Round D



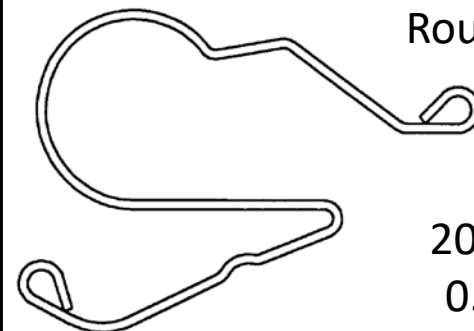
9 – 12 mm  
0.35 – 0.47"

Round E



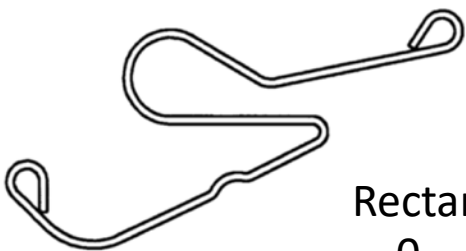
12 – 15 mm  
0.47 – 0.59"

Round F



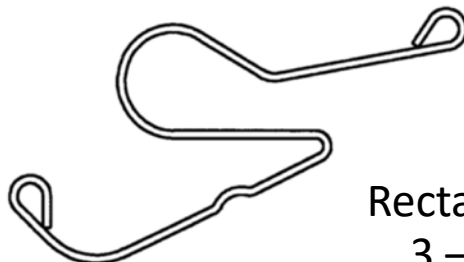
20 mm  
0.79"

Rectangular A



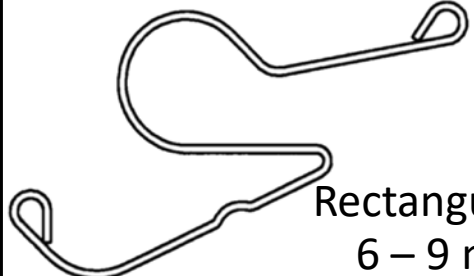
0 – 3 mm  
0 – 0.12"

Rectangular B



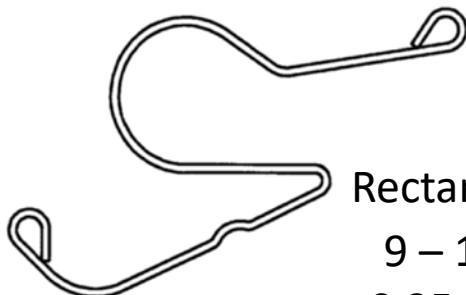
3 – 6 mm  
0.12 – 0.24"

Rectangular C



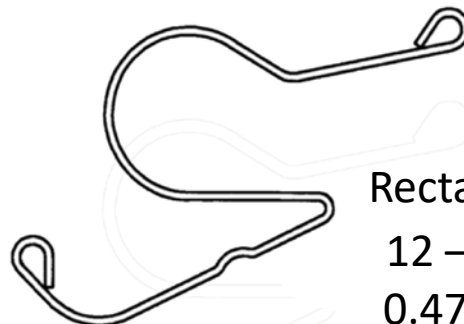
6 – 9 mm  
0.24 – 0.35"

Rectangular D



9 – 12 mm  
0.35 – 0.47"

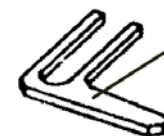
Rectangular E



12 – 15 mm  
0.47 – 0.59"



2 mm Hex Key



Specimen Stop