An Introduction to the Instron 3367 Tensile Test Machine

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Introduction

The Instron 3367 device is a displacement controlled load frame. This means that the crosshead is raised or lowered by turning screws. A picture of the load frame is shown in Figure 1 with parts. Consider the H shaped structure to be the load frame. Below is a description of the various important parts.
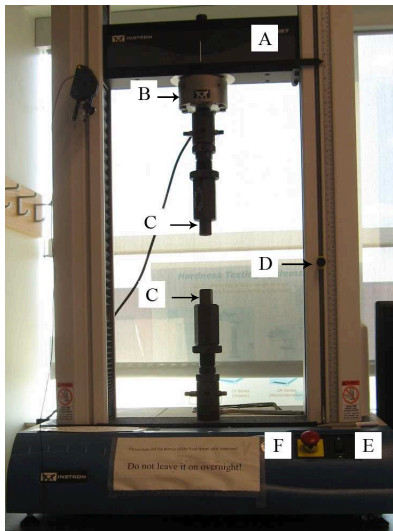

Figure 1: Labeled picture of the Instron 3367 load frame.

- (A) <u>Crosshead:</u> The part of the load frame that moves during a tensile test, or down during a compression test.

- (B) <u>Load Cell:</u> Measurement transducer for the load applied. The maximum load this cell is designed for 30 kN.

- (C) <u>Sample Grips:</u> The sample grips hold the sample during the test. These come in many shapes and sizes, from threaded (shown) to clamps, etc.

- (D) <u>Upper and Lower Crosshead Limits:</u> Trip switches for the maximum height the crosshead is allowed to travel during a test.

- (E) <u>Manual Up/Down Toggle:</u> Moves the crosshead up and down manually at the users command. The toggle only works however when the software is loaded on the computer. Using this button without the software being loaded may result in the machine locking.

- (F) <u>Emergency Stop:</u> Safety toggle, pressing will immediately shut down all machine operations.

Getting to Know Your Sample

Now that you've been introduced to the device, the next step is to become acquainted with your tensile sample. Figure 2 shows a cartoon of a tensile sample in profile. There are a parts of this sample that need consideration. The first part is the grip section. This may be threaded, but it is almost always the thickest part of your sample. This is the section where the load frame grabs the sample and applies the load. Next we have the gauge length, which is the constant diameter cylinder in the center of the sample. This will always be the thinnest section of the sample, and therefore deformation will occur here. The gauge length of the sample has a cross-sectional area that the load will be applied across, generating a stress.
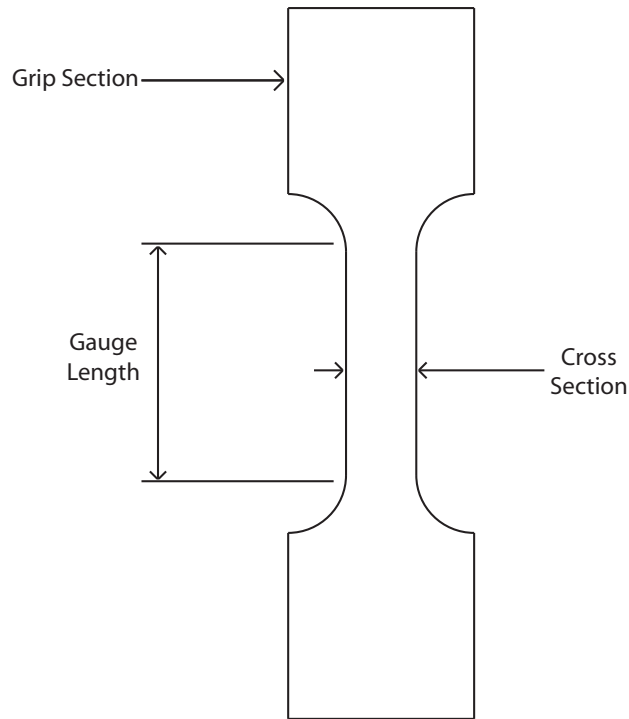

Figure 2: Schematic of a standard tensile sample

Step 1: Start the Computer and Machine

The order in which the computer and load frame are started is important. Start the computer first, and log in using an appropriate IASTATE user ID. Wait one minute, then turn the power on to the load frame. The power switch is on the right side of the base near the back (close to the computer monitor). After the power to the load frame is turned on, wait one minute, then double-click on the Series IX/s icon on the desktop. This will launch the Instron software. Give the software a minute or two download the firmware then you're ready to load your sample.

Step 2: Loading Your Sample

There are two main types of sample grips, and both methods will be discussed. The first discussed will be threaded grips. Second will be clamp-type grips.

Threaded Grips

- Measure the gauge length and gauge diameter of your sample. Write these down somewhere. It's recommended to take 3 measurements of the gauge diameter up and down the gauge length and take an average.

- Insert the sample in the top sample grip. Screw the sample into the grip, but leave one thread outside the grip so that if the sample breaks near the grips the sample can still be removed.

- Insert the sample in the lower grip. Lift the bottom sample grip up and rotate the large nut until the sample has one thread outside the grip.

- Carefully move the crosshead down manually, ensuring that the bottom of the sample grip fits within the available hole until the steel pin can be inserted.

- Slide the steel pin through the hole at the bottom of the grips, connecting the load frame to the sample grip. Make sure to use the steel wire safety clip so that the pin is unable to violently eject from the load column.

Clamp grips

- Measure the gauge length and cross section of your sample. Write these down.

- Insert the sample in the top grip. Hold the sample vertical such that the bottom of the grip section is about 2mm outside the grip, and tighten the top clamp. Be wary when tightening to not bend your sample.

- Lower the crosshead manually until your sample is in a position where the top of the bottom grip section is about 2mm outside of the grip and tighten the bottom clamp. Again, be careful not to bend your sample during tightening.

- Ensure that both clamps are tight.

Step 3: Equip the Extensometer

The extensometer (Figure) is a device for measuring strain more accurately in your sample than crosshead displacement. The extensometer is a transducer with two knife edges attached that contact the sample. Equipping the extensometer is discussed following.

- Hold the extensometer by pressing in the two button-sized round pins. This will fix the extensometer knife edges at exactly 25mm. Keep these pressed together.

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- With two fingers, pull the two spring clips back and slide the extensometer over the gauge length of your sample. WARNING! Do NOT drag the knife edges across your sample, rather get the extensometer in place then release the spring clips. Try to keep the body of the extensometer either parallel or perpendicular to the crosshead.

- Release the two button-sized push pins.

Step 4: Software Setup

- Click on "Test" in the Series IX/s program interface.

- Enter your sample ID in the pop-up window.
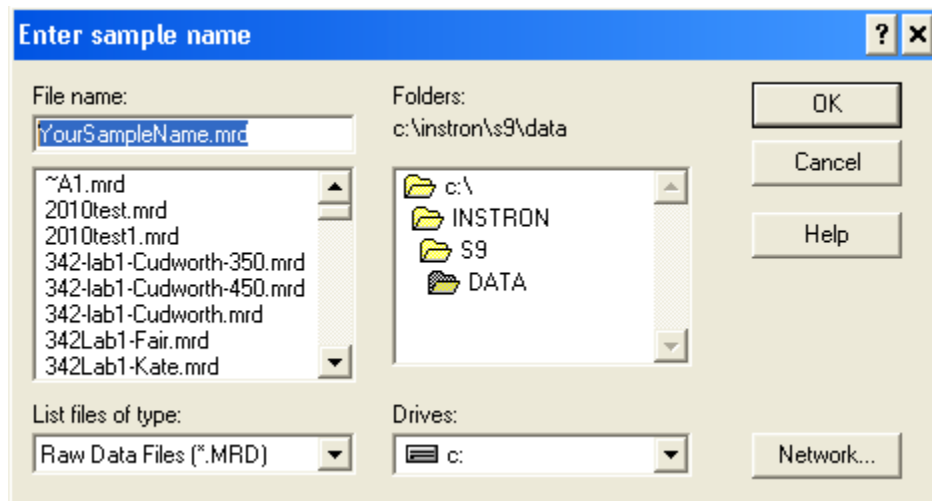
- Select the appropriate test method from the next menu, and enter your initials as the operator ID. Click OK.

- Another window will appear asking for the ASCII file name. Click OK.

- A blank graph should now be on the screen. Click on "Defaults" from the menu just above the graph. (It'll be on the far left.) Click on "Parameters" from this submenu.
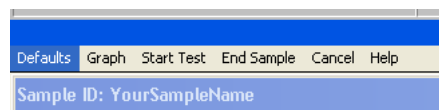
- A window with some general information should now be on the screen. Enter your gauge length and diameter (or width / thickness) into the appropriate boxes. Be sure that you do NOT enter your gauge length into the extensometer length which should remain at 25mm. Take note of the crosshead speed and data acquisition rate (pts./sec). Click OK once you're done.

General Information

Operator Name: Your Initials
Sample Type :   ASTM
Extensometer Gauge Length: 25.0000 mm

OK
Cancel
Help

Specimen

Diameter   6.0000 mm

Spec gauge len   60.0000 mm

Control

Crosshead Speed   1.000 mm/min

Second Speed

Third Speed

Data Rate   5.0000 pts/sec

Reduction Factor

- Balance the load on the sample by clicking on the button that looks like scale in the upper left corner of the screen. It will look like:

- Balance the extension. Click on the button that looks like:

- Balance the extensometer. Click on the left-most button in the right corner of the screen. This will bring up a window replacing the graph on the main screen. Click the button that says "Balance", then "Done". It will look like an extensometer:

- Start the test by clicking on the green "Play" button. A window will appear confirming the sample dimensions you input into the "Parameters". If nothing needs changed, click OK.

- A pop-up will appear that says: "The test will now start. The crosshead will move". Click OK, your test has started and you're taking data.
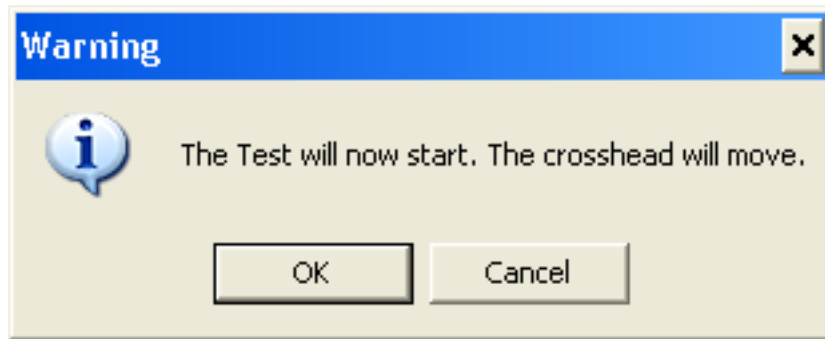

The crosshead will move at the rate specified until the failure conditions of the test are met or the test is stopped manually. If the test failure conditions are met, a pop-up window will appear that says " Manually return crosshead. Click <OK> to continue." Click OK.
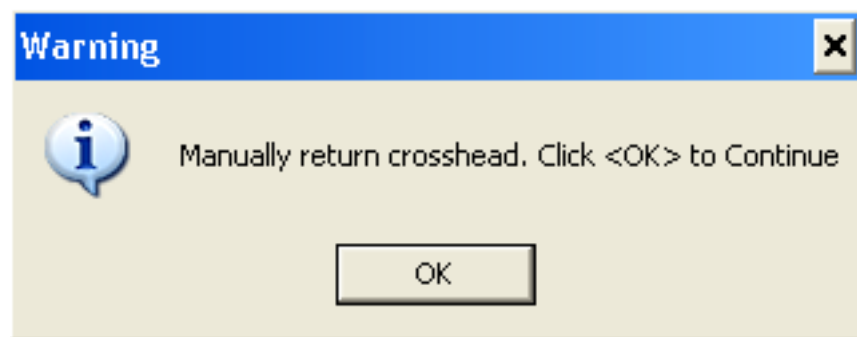
Step 5: Ending the Test

- After clicking OK on the pop-up telling you to manually return the crosshead, click "End Sample" from the menu where you previously clicked on "Defaults". A menu may show up asking you what to name a data file (depending on the standard test method used), if so, click OK on this.

- Click on "Continue" in the spot where the option "End Sample" was just a second before. A pop-up will appear asking what you would like for a report, just click OK here too.

- The program will ask you if you would like to test another sample. Click NO, and you will be returned to the main Series IX/s program menu.
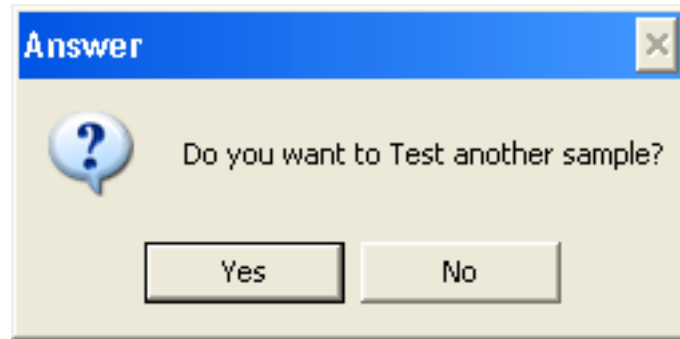
- Remove the extensometer from your sample by pulling the spring clips back.

- Manually jog the crosshead up so that you can more easily remove your sample from the grips.

- If no more tests are being completed, shut down the software by clicking "Exit", and turn off the power to the Instron device.

Step 6: Retrieving Your Data

An ASCII data file where the data is comma delimited can be found in the folder:

"C: \Instron\S9\Output\"

Email this file to yourself, and you're ready to analyze your data.