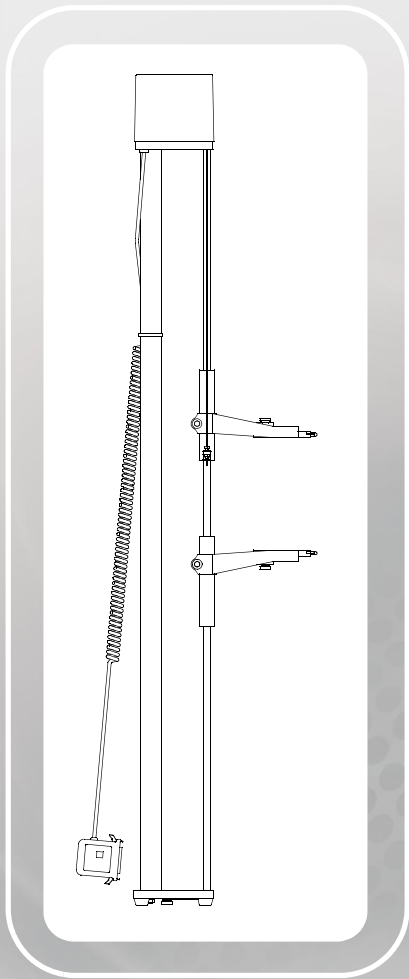


Long Travel Elastomeric Extensometers



Electromagnetic Compatibility

Where applicable, this equipment is designed to comply with International Electromagnetic Compatibility (EMC) standards.

To ensure reproduction of this EMC performance, connect this equipment to a low impedance ground connection. Typical suitable connections are a ground spike or the steel frame of a building.

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General Safety Precautions



Materials testing systems are potentially hazardous.



Materials testing involves inherent hazards from high forces, rapid motions, and stored energy. You must be aware of all moving and operating components in the testing system that are potentially hazardous, particularly force actuators or a moving crosshead.

Before operating the system, ensure you gain a thorough understanding of the equipment by:

- receiving training on the safe operation of the system.
- reading and understanding the general hazards associated with materials testing systems as detailed on pages [iv](#) to [vi](#).
- carefully reading all relevant manuals and observing all Warnings and Cautions. The term Warning is used where a hazard may lead to injury or death. The term Caution is used where a hazard may lead to damage to equipment or to loss of data.
- carrying out your own safety risk assessment on the use of the test system, test methods employed, specimen loading and specimen behavior at failure.

Instron products, to the best of its knowledge, comply with various national and international safety standards, in as much as they apply to materials and structural testing. We certify that our products comply with all relevant EU directives (CE mark).

Because of the wide range of applications with which our instruments are used, and over which we have no control, additional protection devices and operating procedures may be necessary due to specific accident prevention regulations, safety regulations, further EEA directives or locally valid regulations. The extent of our delivery regarding protective devices is defined in your initial sales quotation. We are thus free of liability in this respect.

At your request, we will gladly provide advice and quotations for additional safety devices such as protective shielding, warning signs or methods of restricting access to the equipment.

Warnings



Crush Hazard - Allow only one person to handle or operate the system at all times.

Operator injury may result if more than one person operates the system. Before working inside the hazard area between the grips or fixtures, ensure that no other personnel can operate the computer or any of the system controls.



Crush Hazard - Take care when installing or removing a specimen, assembly, structure, or load string component.

Installation or removal of a specimen, assembly, structure, or load string component involves working inside the hazard area between the grips or fixtures. Keep clear of the jaws of a grip or fixture at all times. Keep clear of the hazard area between the grips or fixtures during actuator or crosshead movement. Ensure that all actuator or crosshead movements necessary for installation or removal are slow and, where possible, at a low force setting.



Hazard - Press the Emergency Stop button whenever you consider that an unsafe condition exists.

The Emergency Stop button removes hydraulic power or electrical drive from the testing system and brings the hazardous elements of the system to a stop as quickly as possible. It does not isolate the system from electrical power, other means are provided to disconnect the electrical supply. Whenever you consider that safety may be compromised, stop the test using the Emergency Stop button. Investigate and resolve the situation that caused the use of the Emergency Stop button before you reset it.



Flying Debris Hazard - Wear eye protection and use protective shields or screens whenever any possibility exists of a hazard from the failure of a specimen, assembly or structure under test.



Wear eye protection and use protective shields or screens whenever a risk of injury to operators and observers exists from the failure of a test specimen, assembly or structure, particularly where explosive disintegration may occur. Due to the wide range of specimen materials, assemblies or structures that may be tested, any hazard resulting from the failure of a test specimen, assembly or structure is entirely the responsibility of the owner and the user of the equipment.

Warnings



Flying Debris Hazard - Make sure that test specimens are installed correctly in grips or fixtures in order to eliminate stresses that can cause breakage of grip jaws or fixture components.



Incorrect installation of test specimens creates stresses in grip jaws or fixture components that can result in breakage of these components. The high energies involved can cause the broken parts to be projected forcefully some distance from the test area. Install specimens in the center of the grip jaws in line with the load path. Insert specimens into the jaws by at least the amount recommended in your grip documentation. This amount can vary between 66% to 100% insertion depth; refer to supplied instructions for your specific grips. Use any centering and alignment devices provided.



Hazard - Protect electrical cables from damage and inadvertent disconnection.

The loss of controlling and feedback signals that can result from a disconnected or damaged cable causes an open loop condition that may drive the actuator or crosshead rapidly to its extremes of motion. Protect all electrical cables, particularly transducer cables, from damage. Never route cables across the floor without protection, nor suspend cables overhead under excessive strain. Use padding to avoid chafing where cables are routed around corners or through wall openings.



Hazard - Set appropriate limits before running waveforms, tests or loop tuning.

Operational limits are included within your testing system to suspend motion or shut off the system when upper and/or lower bounds of actuator or crosshead travel, or force or strain, are reached during testing. Correct setting of operational limits by the operator, prior to testing, will reduce the risk of damage to test article and system and associated hazard to the operator.



High/Low Temperature Hazard - Wear protective clothing when handling equipment at extremes of temperature.



Materials testing is often carried out at non-ambient temperatures using ovens, furnaces or cryogenic chambers. Extreme temperature means an operating temperature exceeding 60 °C (140 °F) or below 0 °C (32 °F). You must use protective clothing, such as gloves, when handling equipment at these temperatures. Display a warning notice concerning low or high temperature operation whenever temperature control equipment is in use. You should note that the hazard from extreme temperature can extend beyond the immediate area of the test.



Electrical Hazard - Disconnect the electrical power supply before removing the covers to electrical equipment.

Disconnect equipment from the electrical power supply before removing any electrical safety covers or replacing fuses. Do not reconnect the power source while the covers are removed. Refit covers as soon as possible. Ensure any fluids used during testing are suitably contained.

Warnings



Hazard - Do not place a testing system off-line from computer control without first ensuring that no actuator or crosshead movement will occur upon transfer to manual control.

The actuator or crosshead will immediately respond to manual control settings when the system is placed off-line from computer control. Before transferring to manual control, make sure that the control settings are such that unexpected actuator or crosshead movement cannot occur.



Rotating Machinery Hazard - Disconnect power supplies before removing the covers to rotating machinery.

Disconnect equipment from all power supplies before removing any cover which gives access to rotating machinery. Do not reconnect any power supply while the covers are removed unless you are specifically instructed to do so in the manual. If the equipment needs to be operated to perform maintenance tasks with the covers removed, ensure that all loose clothing, long hair, etc. is tied back. Refit covers as soon as possible.



Hazard - Shut down the hydraulic power supply and discharge hydraulic pressure before disconnection of any hydraulic fluid coupling.

Do not disconnect any hydraulic coupling without first shutting down the hydraulic power supply and discharging stored pressure to zero. Tie down or otherwise secure all pressurized hoses to prevent movement during system operation and to prevent the hose from whipping about in the event of a rupture.



Hazard - Shut off the supply of compressed gas and discharge residual gas pressure before you disconnect any compressed gas coupling.

Do not release gas connections without first disconnecting the gas supply and discharging any residual pressure to zero.



Hazard - Ensure components of the load string are correctly pre-loaded to minimize the risk of fatigue failure.

Dynamic systems, especially where load reversals through zero are occurring, are at risk of fatigue cracks developing if components of the load string are not correctly pre-loaded to one another. Apply the specified torque to all load string fasteners and the correct setting to wedge washers or spiral washers. Visually inspect highly stressed components such as grips and threaded adapters prior to every fatigue test for signs of wear or fatigue damage.

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Chapter 1

Introduction

• About this Manual	1-1
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About this Manual

This manual documents the following Instron[®] Long Travel Extensometer catalog numbers:

- 2603-080 - 250 mm travel - for Instron twin column electromechanical testing machines.
- 2603-084 - 250 mm travel - for Instron single column electromechanical testing machines.
- 2603-085 - 750 mm travel - for Instron twin column electromechanical testing machines.
- 2603-086 - 750 mm travel - for Instron single column electromechanical testing machines.

Intended Purpose

The Long Travel Extensometer is intended to provide an accurate and reliable method of strain measurement in elastomeric and other highly extensible materials.

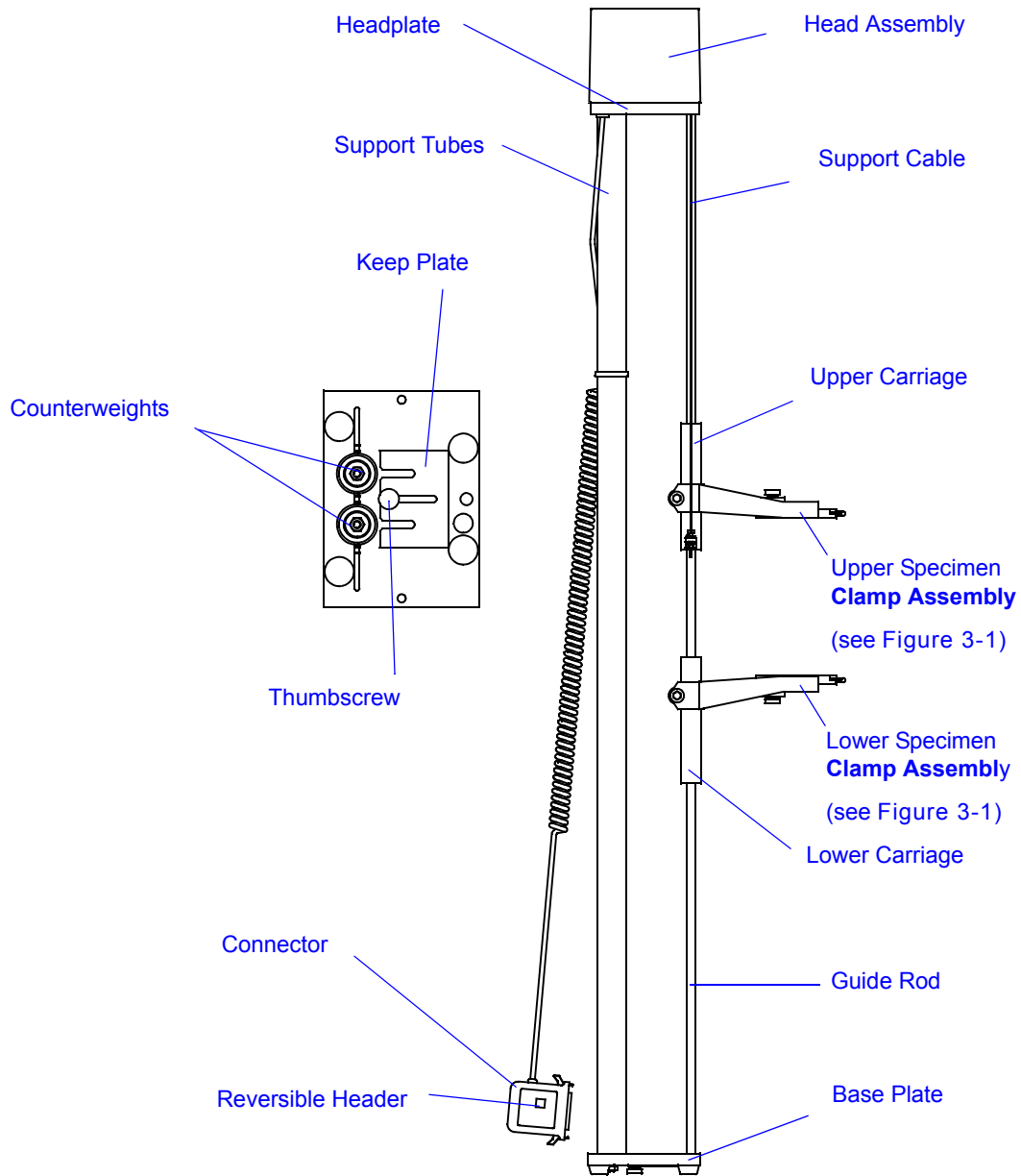


Figure 1-1. The Long Travel Elastomeric Extensometer

Description

Principle of Operation

Operation of the Long Travel Elastomeric Extensometer is based on a pair of separately counterbalanced clamp assemblies (see [Figure 1-1](#)) which attach to the specimen.

The clamp assemblies are mounted on carriages. Their vertical position on the carriages can be adjusted, with the carriages touching, to set the gauge length. The horizontal position of the clamp assemblies can also be adjusted to allow for different specimen thicknesses. The clamping force on the specimen can be varied and the clamps are designed to release at specimen break.

Cables run from each carriage over precision machined pulleys in the head of the unit and into support tubes. Inside the support tubes, weights counterbalance each clamp assembly. One pulley carries the body of a rotary potentiometer, the other pulley is fixed to the potentiometer shaft.

The carriages are guided by linear bearings on a ground and polished rod. This feature, along with careful counterbalancing of each assembly, prevents any of the extensometer's weight being applied to the specimen.

The precision, single-turn potentiometer tracks the differential movement between the two clamp assemblies. The excitation voltage, generated by the testing machine, is applied to the potentiometer. The potentiometer wiper voltage is buffered and applied to a resistor bridge. Thus the output voltage from the extensometer is proportional to the specimen extension.

Mechanical stops fitted to the pulleys prevent overtravel of the potentiometer.

Basic Features

- The upper and lower specimen clamp assemblies are accurately counter-balanced so that the extensometer applies a load of only 0.15 N (15 g) when attached to the specimen and should therefore have negligible effect on test results.
- Variable gauge length settings can be obtained. The calibration bar supplied with the extensometer provides a range of settings. See [Appendix A](#) for specification details.
- The clamp assemblies can be moved vertically on carriages and are locked at the required gauge length by knurled thumb nuts.
- The horizontal position of the clamp assemblies can be adjusted, using knurled thumbscrews, to allow for different specimen thicknesses.
- The specimen gripping force is adjustable.

- If the specimen is still extending at the end of the extensometer travel, or if specimen break occurs, the clamp rods on the clamp assemblies rotate outwards, reacting against a spring-loaded roller, to automatically release the specimen and prevent damage to the extensometer.
- The 2603-080 and 2603-084 extensometers are self-identifying, so that they can be calibrated automatically on suitably equipped machines. The 2603-085 and 2603-086 extensometers are not self identifying and require different calibration procedures depending on the load frame model and application software in use. Refer to “[Calibration](#)” on page 3-3 for details.
- The full scale travel can be set to either SI units or US Customary units. The extensometer is shipped with the SI units selected.

Chapter 2 Installation

-
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-

Unpacking, Handling and Storage

Unpacking

It is recommended that the transportation case is retained for storing the extensometer if it is removed from the testing machine.

Handling

The Long Travel Elastomeric Extensometer is a delicate precision instrument and must be handled with care at all times.

Caution

After the counterweights have been released from the keep plate, the extensometer must be kept upright at all times to prevent the support cables becoming tangled.

Caution

For 2603-085 and 2603-086, the maximum separation between the inside faces of the stops must never be greater than 780 mm (30.7 inch).

Failure to observe this restriction can result in damage to the precision potentiometer used in the long travel extensometer.

Storage

Caution

Never lay down or invert the extensometer unless the keep plate is in position.

The most common customer return is for tangled or displaced counterweight cables. The counterweights must be secured by the keep plate when the extensometer is removed from the testing machine:

1. Move the arm to the top.
2. Slacken the thumbscrew and slide the keep plate to clamp the counterweights. Retighten the thumbscrew (see [Figure 2-1](#)).

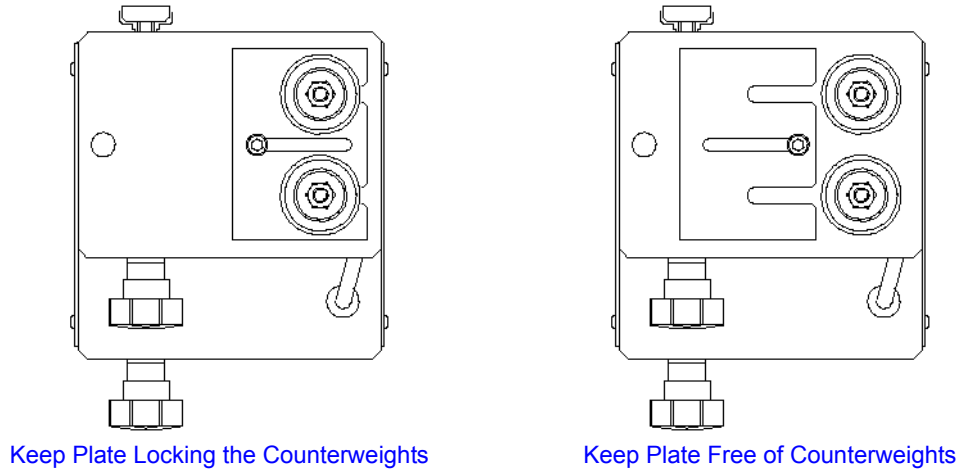


Figure 2-1. Use of Keep Plate

Installation of the 2603-080 or 2603-085

Installation of the 2603-080 or 2603-085 onto 3300, 4200, 4400, 5500, 5800 and 5900 Series Two Column Machines

The extensometer is mounted on the base platen of the machine. Figure 2-2 shows the installation.

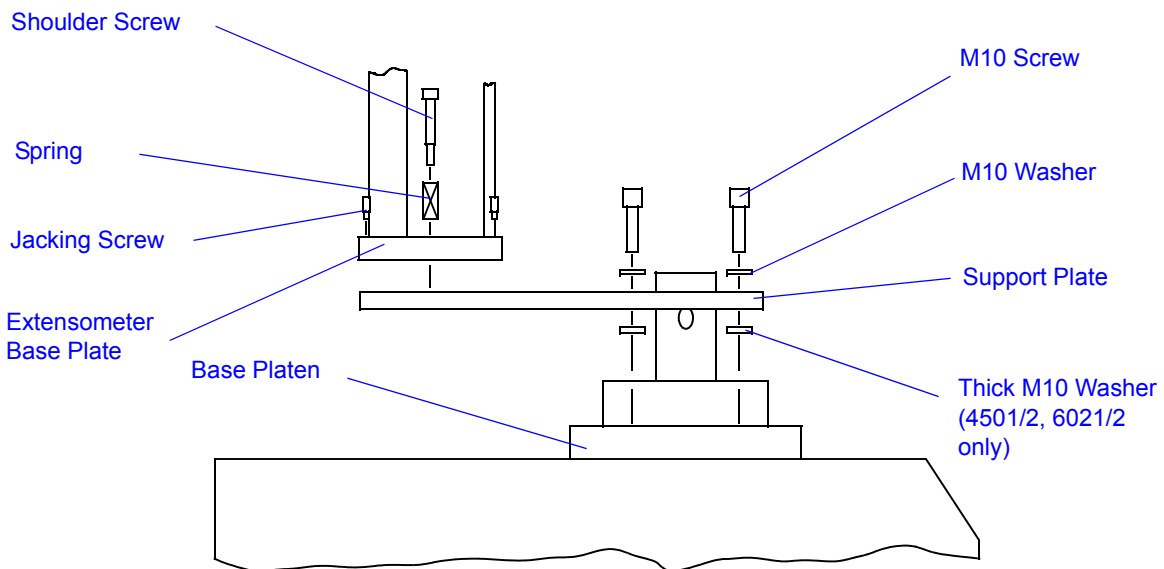
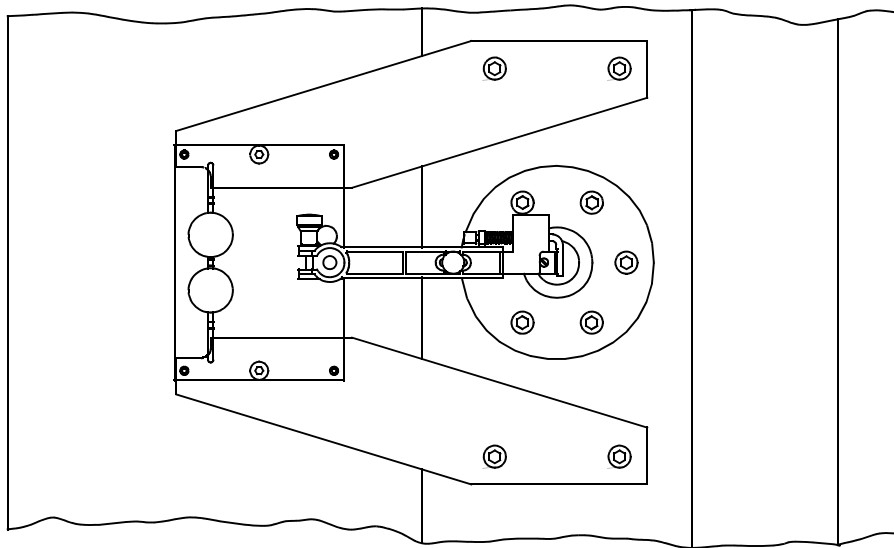


Figure 2-2. Installation onto 3300, 4200, 4400, 4501/2, 5500, 5800 and 5900 Machines

1. Bolt the support plates to the base platen using M10 screws and washers. Do not tighten at this stage.
2. Slacken the thumbscrew and slide the keep plate forwards on the extensometer to release the counterweights (see [Figure 2-1](#)). Re-tighten the thumbscrew.
3. Attach the extensometer to the support plates with the shoulder screws and springs.
4. Tighten the M10 support plate screws.
5. Remove the thumb nuts, washers and bolts from the arms. Slide the arms over the top of their respective carriage, as shown in [Figure 1-1](#) and [Figure 3-1](#). Replace the thumb nuts, washers and bolts.
6. On 4200 Series machines, plug the extensometer into the socket on the end of the console extensometer cable.
7. On 3300, 4400, 5500, 5800 and 5900 machines with two T-slots on the back of the column covers, ensure that the load cell cable is secured by a cable clip in the inboard T-slot. Remove the cable tie holding the extensometer cable to the support tube and secure the cable with two cable clips in the outboard T-slot. Plug the extensometer into the 25-way extensometer socket on the testing machine.
8. On 3300, 4400, 5500, 5800 and 5900 Series machines without two T-slots on the back of the column covers, plug the extensometer into the 25-way extensometer socket on the testing machine.
9. Ensure that the spring clips on the extensometer connector are gripping the socket.
10. Insert the four M6 jacking screws into the extensometer base plate such that they just touch the support plates.

Installation of the 2603-080 or 2603-085 onto 4300 Series Two Column Machines

The extensometer is normally mounted on the base platen of the machine but it can also be fitted to the underside of the fixed crosshead. [Figure 2-3](#) shows a base mounted installation.

1. Fit the four pillars to the base platen in the two pairs of M10 holes 280 mm apart. Tighten the pillars.
2. Bolt the support plates to the pillars using M10 screws and washers. Do not tighten at this stage.
3. Slacken the thumbscrew and slide the keep plate forwards on the extensometer to release the counterweights (see [Figure 2-1](#)). Re-tighten the thumbscrew.
4. Attach the extensometer to the support plates with the shoulder screws and springs.
5. Tighten the M10 support plate screws.

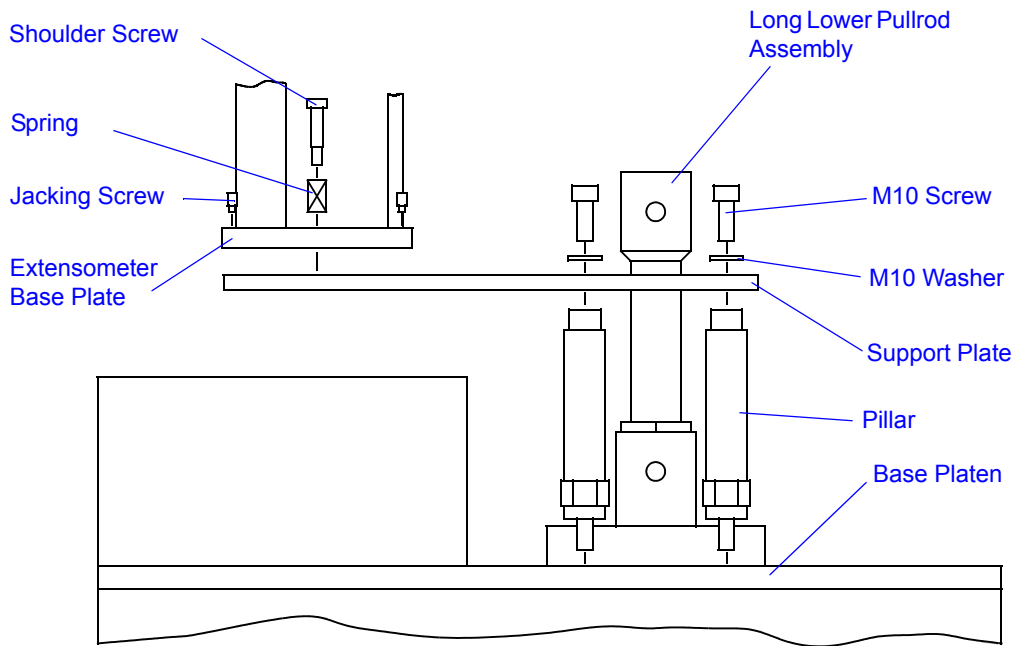
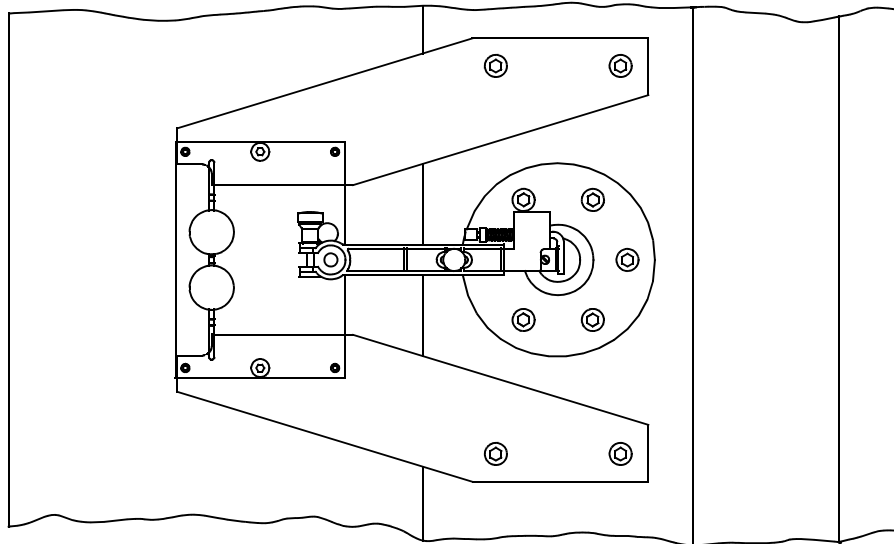


Figure 2-3. Installation onto 4300 Series Machines

6. Remove the thumb nuts, washers and bolts from the arms. Slide the arms over the top of their respective carriages, as shown in [Figure 1-1](#) and [Figure 3-1](#). Replace the thumb nuts, washers and bolts.
7. Plug the extensometer into the 25-way extensometer socket on the machine. Ensure that the spring clips on the extensometer connector are gripping the panel.
8. Insert the four M6 jacking screws into the extensometer base plate such that they just touch the support plates.
9. Install the long lower pullrod assembly.

Installation of the 2603-080 or 2603-085 onto 4501 and 4502 Two Column Machines

The extensometer is normally mounted onto the base platen of the machine but it can also be fitted to the underside of the fixed crosshead. [Figure 2-2](#) shows a base mounted installation.

1. Bolt the support plates to the base platen using M10 screws and washers. Space the plates off the platen with the thick washers. Do not tighten the screws at this stage.
2. Slacken the thumbscrew and slide the keep plate forwards on the extensometer to release the counterweights (see [Figure 2-1](#)). Re-tighten the thumbscrew.
3. Attach the extensometer to the support plates with shoulder screws and springs.
4. Tighten the M10 support plate screws.
5. Remove the thumb nuts, washers and bolts from the arms. Slide the arms over the top of their respective carriages, as shown in [Figure 1-1](#) and [Figure 3-1](#). Replace the thumb nuts, washers and bolts.
6. Plug the extensometer into the 25-way extensometer socket on the machine. Ensure that the spring clips on the extensometer connector are gripping the panel.
7. Insert the four M6 jacking screws into the extensometer base plate such that they just touch the support plates.

Installation of the 2603-080 or 2603-085 onto 4505 and 4507 Machines

The extensometer is normally mounted on the underside of the fixed crosshead but, with use of the appropriate compression beam or pillars, it can also be fitted to the base platen of the machine. [Figure 2-4](#) shows the extensometer installed on the fixed crosshead.

1. Bolt the support plates onto the underside of the fixed crosshead using M10 screws and washers. If required, the plates can be spaced away from the crosshead with the pillars. Do not tighten the screws at this stage.
2. Attach the extensometer to the support plates with the shoulder screws and springs.

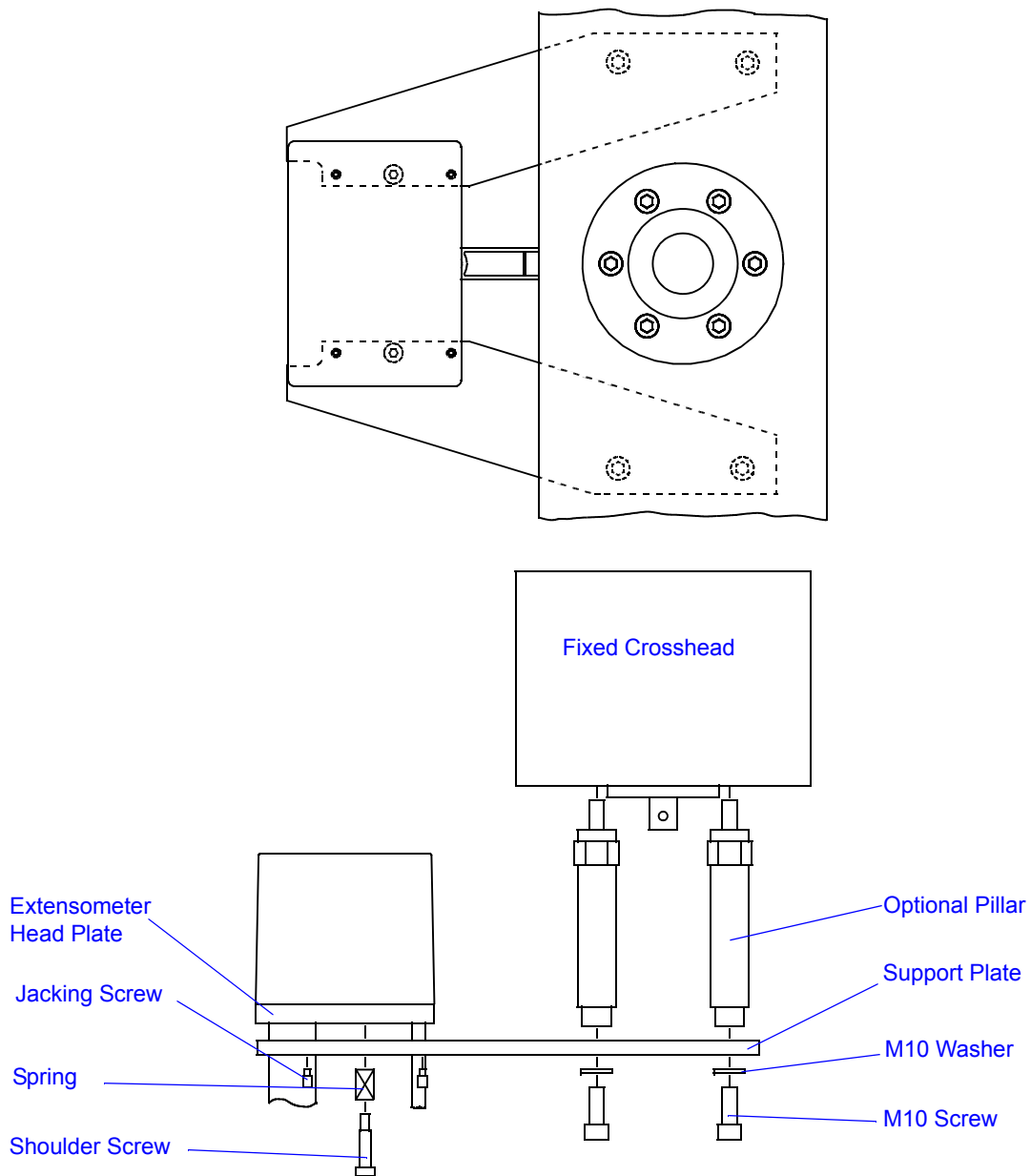


Figure 2-4. Installation onto 4505 and 4507 Machines

3. Tighten the M10 support plate screws.
4. Slacken the thumbscrew and slide the keep plate forwards on the extensometer to release the counterweights (see [Figure 2-1](#)). Re-tighten the thumbscrew.

5. Remove the thumb nuts, washers and bolts from the arms. Slide the arms over the top of their respective carriages, as shown in [Figure 1-1](#) and [Figure 3-1](#). Replace the thumb nuts, washers and bolts.
6. Plug the extensometer into the 25-way socket on the machine. Ensure that the spring clips on the extensometer are gripping the panel.
7. Insert the four M6 jacking screws into the support plates such that they just touch the extensometer head plate.

Extensometer Alignment on Two Column Machines

The vertical axis of the extensometer must to be adjusted to be parallel with that of the two column load frame. To align the extensometer:

1. Move the carriages to one end of the guide rod.
2. Check that the testing area is free from obstruction and place a straight edge on the crosshead, touching the guide rod as shown in [Figure 2-5](#).
3. Move the crosshead the maximum possible distance and check the alignment between the rod and the straight edges at the extremities of travel.
4. Adjust the jacking screws in pairs until the guide rod is aligned to within 1 mm over the full travel of the crosshead. Note that one (1) revolution of the jacking screws = 6 mm.



To prevent the extensometer rocking after alignment, ensure that all four jacking screws are in contact with the support plates (or head plate).

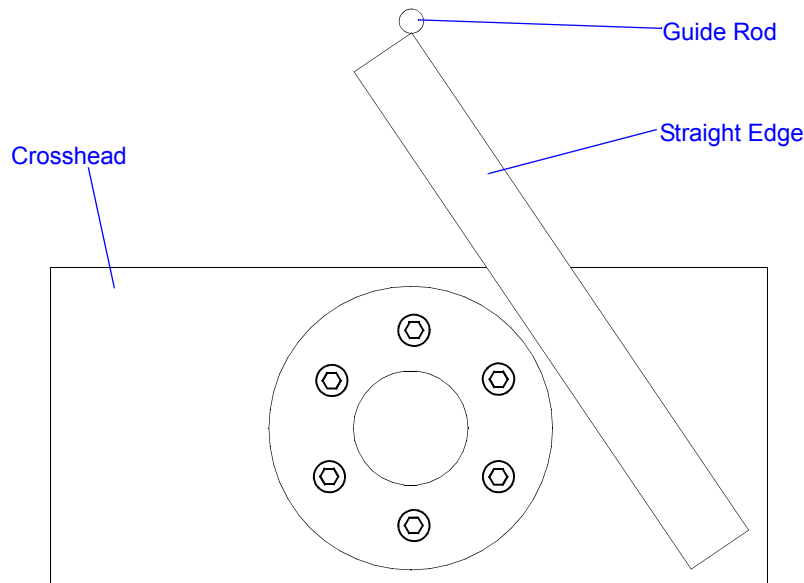


Figure 2-5. Extensometer Alignment

Installation of the 2603-084 or 2603-086

Installation of the 2603-084 or 2603-086 onto 3300, 4400, 5500 and 5900 Series Single Column Machines

1. Remove the screw located at the bottom of the front left-hand T-slot of the testing machine.
2. Position the metal T-nut at the bottom of this T-slot with the threaded hole at the top of the T-nut.
3. Replace the screw in the testing machine.
4. Press the M6 nut into the back of the plastic T-nut and position this at the top of the same T-slot.
5. Remove the keep plate from the extensometer base plate. Keep the extensometer upright once the counter-weights have been released. Re-fit the keep plate to the base plate in the operating position.
6. Secure the extensometer head plate to the upper T-nut using the longer thumbscrew and M6 nylon washer.
7. Secure the extensometer base plate to the lower T-nut using the shorter thumbscrew and M6 nylon washer.
8. Remove the thumb nuts, washers and bolts from the arms. Place the arms onto the carriages as shown. Replace the bolts, washers and thumb nuts.
9. The arms must be positioned on the carriages such that when the specimen is clamped, the carriage support cables hang vertically (parallel to the guide rod).
10. Plug the extensometer connector plug into the STRAIN socket of the testing machine.

Full Scale Travel Setting

The extensometer is shipped with the 250 mm (or 750 mm as appropriate) full scale travel setting selected. If 10 inch (or 30 inch) full scale travel is required for operating in US Customary units, the position of the header inside the connector cover will have to be reversed.

1. **Expose the PCB Header:**

- a. **2603-080 or 2603-085** - Using a small screwdriver, release the four plastic fingers holding the two halves of the cover together. Remove the half with the label on it, exposing the header.
- b. **2603-084 or 2603-086** - Remove the four screws securing the lid of the connector cover.

Remove the cable clamp by unscrewing the two screws.

Remove the two screws securing the body of the connector cover to the PCB assembly

2. Lever the header out of the PCB sockets, taking care not to bend the pins on the header or damage the tracks on the PCB.
3. Reverse the header, so that **10 INS.** (or **30 INS.**) full scale travel is visible through the window in the label. Ensure that all of the pins are lined up with the sockets and press the header home.
4. Replace the cover and snap the plastic fingers back into position.

Chapter 3 Operation

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Adjustments

Horizontal Position of the Specimen Clamp Assemblies

The horizontal position of the specimen clamp assemblies can be adjusted to suit the thickness of the specimen under test.

1. Release the thumbscrews holding the clamp blocks to the arms (see [Figure 3-1](#)).
2. Position the clamp blocks such that the knife edges are touching the rear face of the specimen.
3. Re-tighten the thumbscrews.



If you are using very large grips (wider than 119mm) and the required grip separation is less than or equal to (gauge length+52mm) you can replace the thumb screws with the supplied button head screws (part no. 204E116) to gain some space.

The minimum grip separation possible when using this extensometer is (gauge length+40mm).

Specimen Gripping Force Adjustment

The specimen clamp rods are spring-loaded. The gripping force can be altered using the adjusting nut shown in [Figure 3-1](#).

Adjust the clamping force so that:

- Applying the test force does not cause the specimen to slip on the grip, but
- Applying a sharp tug (simulating specimen break) releases the specimen from the clamp rod and knife edge.

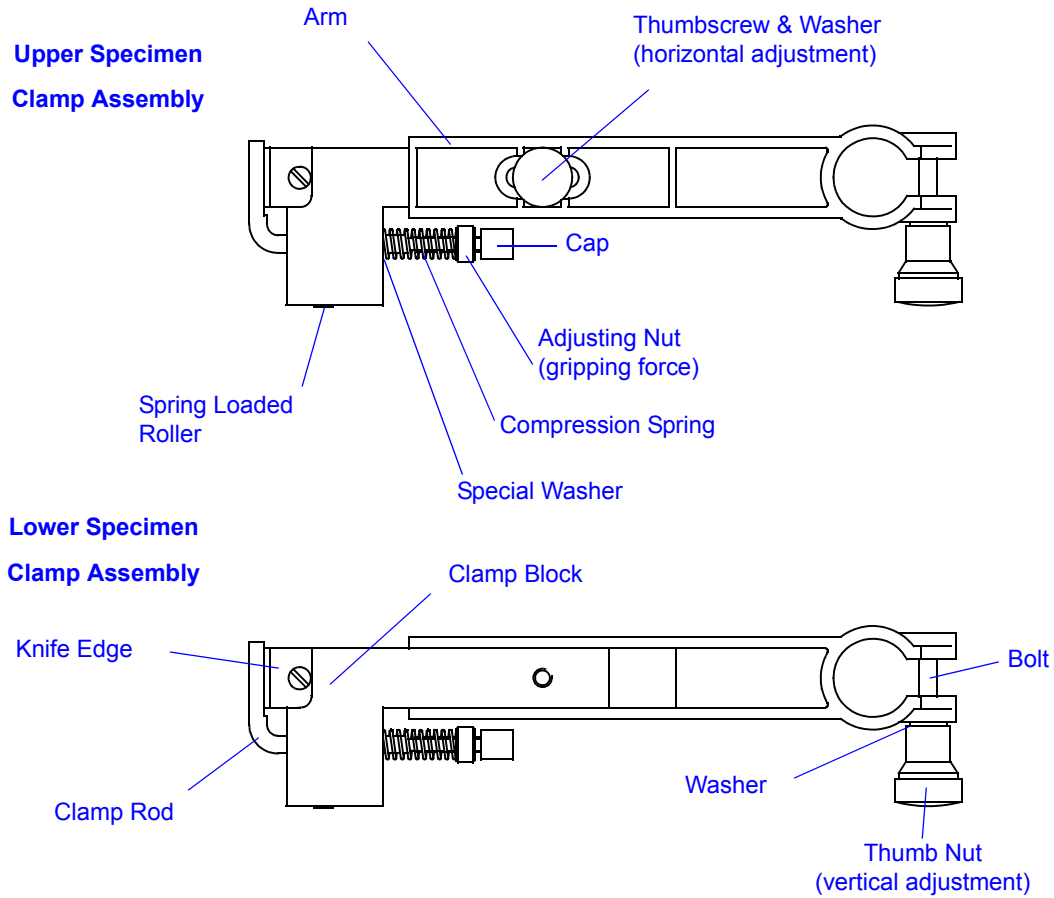


Figure 3-1. Specimen Clamp Assemblies

Gauge Length Setting (Vertical Adjustment)

2603-080 - The calibration bar supplied provides gauge length settings of 10, 20, 25, 50, 100 and 200 mm, and 0.5, 1.0, 2.0, and 5.0 inch.

2603-084 - The calibration bar supplied provides gauge length settings of 10, 20, 25, 50, and 100 mm, and 0.5, 1.0, and 2.0 inch.

2603-085 - The calibration bar supplied provides gauge length settings of 10, 20, 25, 50 and 100 mm, and 0.5, 1.0 and 2.0 inch.

2603-086 - The calibration bar supplied provides gauge length settings of 10, 20, 25, 50 and 100 mm, and 0.5, 1.0 and 2.0 inch.

1. Mount the calibration bar in the lower grip only.
2. Locate the lower knife edge in the lower gauge length notch in the calibration bar.

3. Bring the carriages together until they just touch.
4. Hold both carriages in position whilst releasing the upper arm by slackening the (vertical adjustment) thumb nut at the rear of the arm.



The carriages and clamp assemblies are each counter-balanced by weights mounted inside the support tubes. When the arms are released during the gauge length procedure, the counter-balance arrangement is temporarily upset, so to prevent the carriages from flying away - hold them with one hand whilst positioning and securing the clamp arms with the other hand.

When setting small gauge lengths, ensure that the lower arm does not bridge across the carriages.

5. Position the upper knife edge in the upper gauge length notch in the calibration bar. Tighten the thumb nut.
6. Check that the carriages are just touching and that the arms are parallel, and not bending either towards or away from each other. If necessary, repeat the above procedure.

Calibration

Calibration of the long travel extensometer depends on the test machine, controller and software being used:

5800 Controller

1. Plug in the extensometer.
2. Set the gauge length using the calibration bar supplied (see [page 3-2](#)).
3. Use the Console software calibration wizard.



*The long travel extensometer is a variable gauge length device and as a consequence Console reverts to AC High Input. For correct calibration, configure the extensometer as **AC Low input**.*

Refer to the Console Operating Instructions or the online help for more details.

3300, 5500 and 5900 Machines with 2603-080 or 2603-084

Use the Automatic Electrical Calibration method provided by the Merlin, Bluehill2 or Bluehill3 (whichever is appropriate for your setup).

1. Plug in the extensometer.
2. Set the gauge length using the calibration bar supplied (see [page 3-2](#)).
3. In the calibration dialog box:
 - a. Specify the gauge length already set.
 - b. Click **Calibrate**.

The system auto-calibrates.

Refer to the Operating Instructions or online help for more details.

3300, 5500 and 5900 Machines with 2603-085 or 2603-086

Calibration Using Bluehill2

1. Plug in the extensometer (usually STRAIN 1).
2. Set the gauge length using the calibration bar supplied (see [page 3-2](#)).
3. In Bluehill2, open the transducer properties dialog box.
4. Enter the details of the fields as follows:
 - **Full scale** 750.00
 - **Calibration type** Automatic
 - **Gauge length** Same as set with the calibration bar
 - **Cal point** 750.00
5. Click **Calibrate**.

The system auto-calibrates.

Refer to the Operating Instructions or online help for more details.

Calibration Using Bluehill3

1. Plug in the extensometer (usually STRAIN 1).



As the 2603-084 and 2603-085 extensometers have an identity resistor code of zero, the software assumes it is a used defined transducer and displays the LVDT symbol in the STRAIN 1 channel.

2. In Bluehill3, open **Admin > Configuration > Transducers**.
3. Move the **User Defined** transducer from the left hand pane (Available transducer types) to the right hand pane (Transducers), and enter the details of the fields as follows:
 - **Transducer configuration:** Rename the transducer (e.g 750 mm long travel extensometer)
 - **Units group:** strain
 - **Connector:** 3 labelled as Strain 1
 - **Identify transducer using:** Resistor codes
 - **Resistor codes:** 0,0
4. Exit Bluehill3 and restart it.
5. Set the gauge length using the calibration bar supplied (see [page 3-2](#)).
6. Open the Transducer Settings dialog box of the 'LVDT' icon and enter the details of the fields as follows:
 - **Transducer configuration** As previously named in step 3.
 - **Full scale** Calculated as follows:
 Example using a gauge length of 20 mm; $\frac{750}{20} \times 100 = 3750.00\%$
 - **Gauge Length** As set in step 5.
 - **Cal point** Same as Full scale value
7. Click **Calibrate**. and when calibration is complete, close the dialog box. Open **Method > Measurements**
8. Move the 'User Defined' transducer to right hand pane and from the **Transducer configuration:** drop-down list, select the name given in step 3.

The extensometer is now configured for use in the Bluehill3 test method.

Refer to the Operating Instructions or online help for more details.

4200, 4300 and 4400 Machines



In order to calibrate in US Customary units (10 inch or 30 inch full-scale travel and 1 inch gauge length), 4200 and 4300 machines needs a CPU Card (PROM part numbers must be A474-717 or greater).

You cannot use Bluehill to calibrate the long travel elastomeric extensometer because it is a variable gauge length extensometer and Bluehill cannot read the gauge length.

Bluehill can read the calibration from the load frame console, so you must calibrate using the load frame console as follows:

1. Disable the GPIB communications by pressing the **IEEE** button. The LED extinguishes.
2. Plug in the extensometer.
3. Set the gauge length using the calibration Bar supplied (see [page 3-2](#)).

Leave the extensometer arms at the gauge length for the whole calibration process.

4. Press **STRAIN BAL** key.
5. Press **ENTER** key.
6. Press **STRAIN CAL** key.
7. Press **0** on the numeric keypad.
8. Press **ENTER** key.
9. Press **STRAIN CAL** key.
10. Enter the **full scale** value of the extensometer on the numeric keypad in %, based on the gauge length setting and the travel:

For SI units, if travel = 250 mm:

For a GL of 20 mm, then full scale and cal point = 1250%

For a GL of 25 mm, then full scale and cal point = 1000%

For a GL of 50 mm, then full scale and cal point = 500%

For US Customary units if travel = 10 in:

For a GL of 0.5 inch, then full scale and cal point = 2000%

For a GL of 1 inch, then full scale and cal point = 1000%

For a GL of 2 inch, then full scale and cal point = 500%

11. Press **ENTER** key.

12. Enter the **Calibration point** value of the extensometer on the numeric keypad in % (this is the same as the full scale value).
13. Press **ENTER** key.
14. Press **STRAIN BAL** key.
15. Press **ENTER** key.
16. Press the **IEEE** button to enable GPIB communications. The LED illuminates.

When the GPIB is enabled, Bluehill will automatically set up the strain channel in software.

Calibration Verification

The achievable ISO or ASTM classification is given on page [A-3](#). Certification of the strain measurement system which includes the extensometer, conditioning electronics and readout to the international standards should be arranged through accredited calibration services. Your local Instron area office will be able to arrange verification.



It is advisable to check the accuracy of the automatic/manual electrical calibration at least once a year.

Appendix A Specifications

- General A-1
- System Classification A-3
- Machine Compatibility A-4

General

	2603-080	2603-084	2603-085	2603-086
Full scale travel:	250 mm (10 inch)		750 mm (30. inch)	
Extension resolution:	100 μ m (0.004 inch)		250 μ m (0.01 inch)	
Extension accuracy (extensometer only):	\pm 200 μ m (\pm 0.008 in) or \pm 0.75% of extension (whichever is greater)		\pm 0.5 mm (\pm 0.02 in) or \pm 1% of extension (whichever is greater)	
Gauge length:	Adjustable, 10 to 200 mm (0.4 to 7.87 inch)	Adjustable, 10 to 100 mm (0.4 to 3.9 inch)	Adjustable, 10 to 100 mm (0.4 to 3.9 inch)	
Gauge length setting:	Graduated bar with marks at 10, 20, 25, 50, 100, 200 mm and 0.5, 1.0, 2.0, 5.0 inch to allow setting of gauge length	Graduated bar with marks at 10, 20, 25, 50, 100 mm and 0.5, 1.0, 2.0 inch to allow setting of gauge length	Graduated bar with marks at 10, 20, 25, 50, 100 mm and 0.5, 1.0, 2.0 inch to allow setting of gauge length	
Gauge length accuracy:	\pm 250 μ m (\pm 0.01 inch) at 20°C		\pm 0.250 mm (\pm 0.01 in) at 20°C	
Maximum specimen width:	20 mm (0.75 inch)		20 mm (0.75 inch)	
Maximum specimen thickness:	12.7 mm (0.5 inch)		12.7 mm (0.5 inch)	
Specimen gripping force:	Adjustable. Nominally 5 to 15 N (500 to 1500 g) for thin specimens, 15 N (1500 g) for thick specimens		Adjustable. Nominally 5 to 15 N (500 to 1500 g) for thin specimens, 15 N (1500 g) for thick specimens	
Operating force:	0.15 N (15 g)		0.15 N (15 g)	

Appendix: Specifications

	2603-080	2603-084	2603-085	2603-086
Maximum common-mode travel:	850 mm (33.5 inch)	820 mm (32.2 inch)	850 mm (33.5 inch)	820 mm (32.2 inch)
Overtravel protection:	Mechanical limits stops, rotating clamp rods			
Bridge resistance:	350 Ω (nominal)		350 Ω (nominal)	
Excitation:	5 Vrms, 375 to 5000 Hz		5 Vrms, 375 to 5000 Hz	
FS Sensitivity:	2.5 mV/V ±4%		2.5 mV/V ±4%	
Balance:	<±10% FS		<±10% FS	
Temperature range:	Ambient - 10 to 38°C (40 to 90°F)		Ambient - 10 to 38°C (40 to 90°F)	
Frequency response:	Static applications only		Static applications only	
Weight of extensometer:	5.2 kg(11.4 lb)	5.0 kg (11 lb)	5.2 kg(11.4 lb)	5.0 kg (11 lb)
Total weight (including case):	18 kg (40 lb) max		18 kg (40 lb) max	
Overall height:	1270 mm (50 inch)	1125 mm (44.3 inch)	1270 mm (50 inch)	1125 mm (44.3 inch)
Overall length:	280 mm (11 in)		280 mm (11 in)	
Width:	171 mm (6.75 inch)	130 mm (5.1 inch)	171 mm (6.75 inch)	130 mm (5.1 inch)
Reach of arms:	Adjustable. 157 to 167 mm (6.2 to 6.6 inch) [164 mm (6.5 inch) nominal] from centre of guide rod]		Adjustable. 157 to 167 mm (6.2 to 6.6 inch) [164 mm (6.5 inch) nominal] from centre of guide rod]	

System Classification

When the extensometer is used with one of the following testing machines and the specified readout device, the classifications given below can be expected.

Table A-1. Classification Equipment

Testing Machine	Readout Device
1100 Series (2603-080 only)	Instron chart recorder, Computer via DSA
4200/4300 Series (2603-080 only)	Front Panel Display, Computer via IEEE
4400 Series	Front Panel Display, Computer via IEEE
4500 Series	Front Panel Display, Computer via IEEE
3300, 5500, 5800, 5900 Series	Display Screen

Table A-2. ISO 9513 Classification

Catalog Number	GAUGE LENGTH	TRAVEL	CLASS
2603-080 and 2603-084	≥ 25 mm	≥ 20 mm	1
	≥ 25 mm	≥ 10 mm, <20 mm	2
	≥ 12.5 mm, <25 mm	≥ 10 mm	2
2603-085 and 2603-086	No Classification ^a		

a. 2603-085 and -086 cannot be classified to ISO9513, but may be classified to ISO5893. Contact your local Instron representative for details.

Table A-3. ASTM E83 Classification

Catalog Number	GAUGE LENGTH	TRAVEL	CLASS
2603-080 and 2603-084	< 1 inch	-	No Classification
	≥ 1 inch	≥ 0.8 inch	C
	≥ 1 inch	< 0.8 inch	D
2603-085 and 2603-086	≤ 1 inch	-	No classification
	< 2 inch	Any	E
	> 2 inch	Any	D

Machine Compatibility

The Long Travel Elastomeric Extensometers are compatible with the following machines, when they are fitted with a Strain Conditioning Unit.

Table A-4. Testing Machine/Strain Conditioning Unit

Testing Machine	Strain Conditioning Unit	Extensometer	
1100 Series	2210-749	2603-080	
3300 Series - Two column machines	2210-869	2603-080	
3343, 3344, 3345 - Single column machines	2210-869	2603-084	
4200 Series - Two column machines	2210-827	2603-080	
4300 Series - Two column machines	2210-832	2603-080	
4400 Series - Two column machines	2210-863	2603-080	
4443, 4444 - Single column machines	2210-865	2603-084	
4500 Series - Two column machines	2210-847/856	2603-080	
5500 Series - Two column machines	2210-860	2603-080	
5543, 5544 - Single column machines	2210-860	2603-084	
5800 Series - Two column machines	2210-875	2603-080	
5900 Series - Two column machines		2603-080	
5943, 5944 - Single column machine		2603-084	



Product Support: www.instron.com