



***RST INSTRUMENTS*** LTD.

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# RST Tape Extensometer Instruction Manual

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# RST Tape Extensometer Instruction Manual

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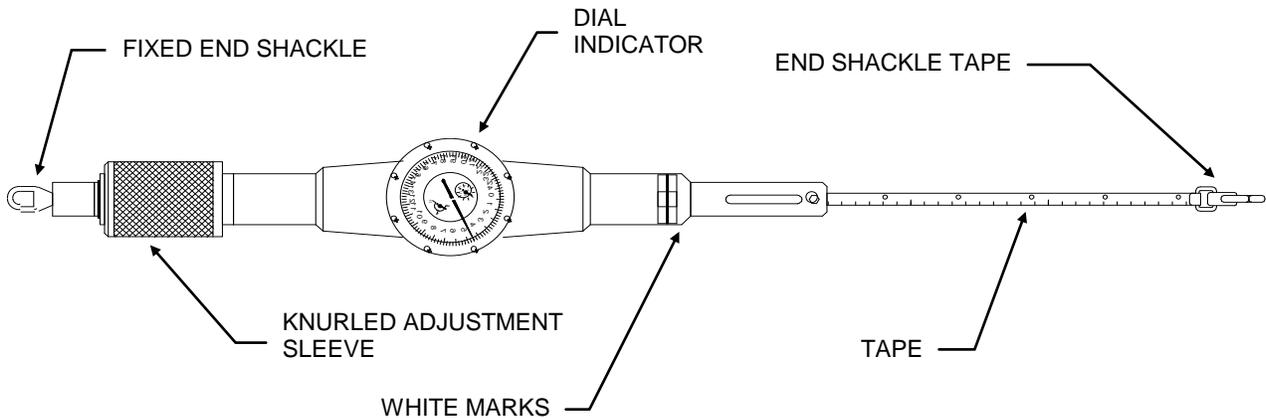
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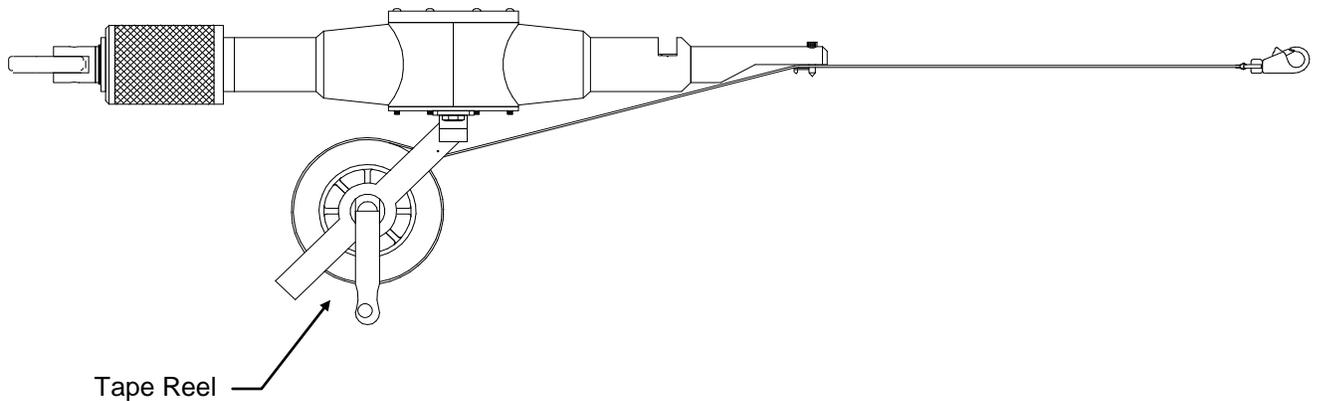
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## INTRODUCTION

The tape extensometer is comprised of an epoxy coated aluminum body, adjustment collar and a quality shockproof jeweled bearing dial indicator. The chrome-clad tape with black markings bonded to the steel is recessed beneath multiple layers of nickel and chrome that is electroplated to provide greater resistance to wear and corrosion.



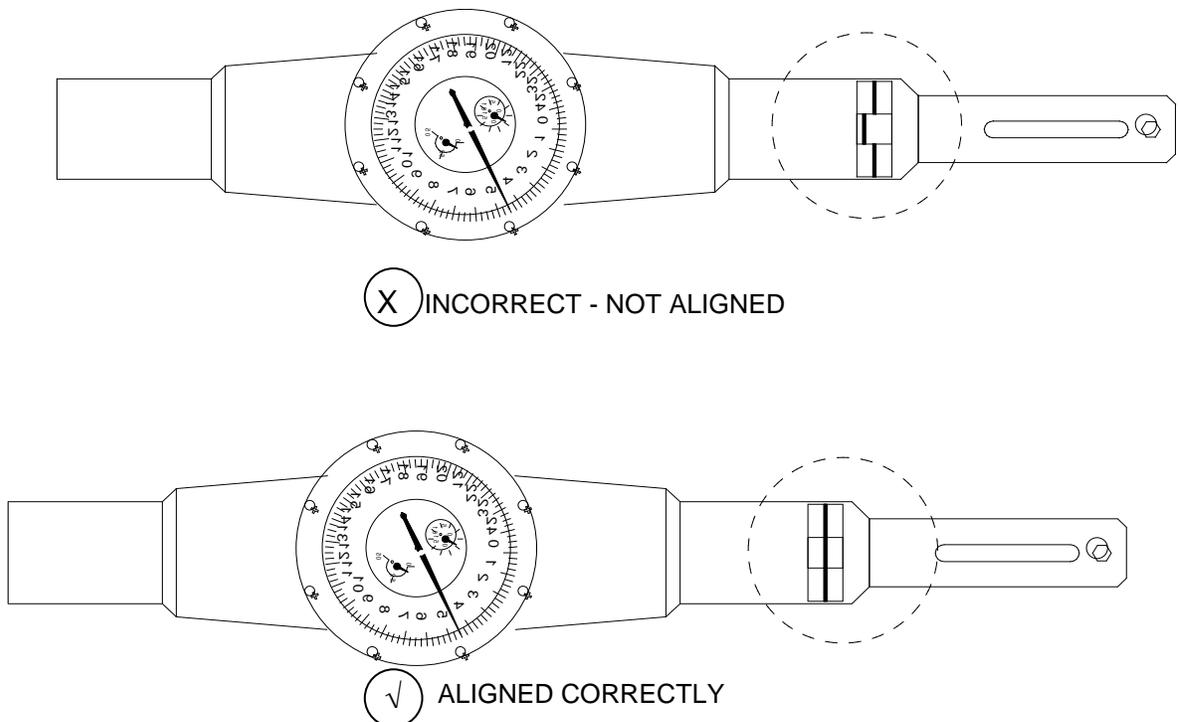
**Figure 1. Tape Extensometer – Front View**



**Figure 2. Tape Extensometer – Side View**

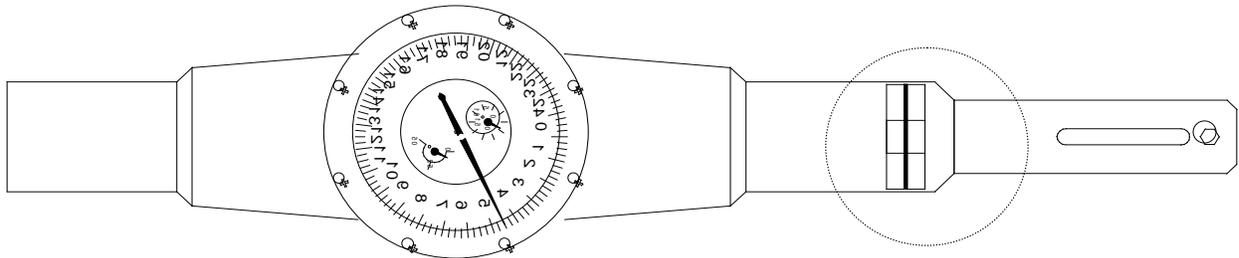
## INSTRUCTIONS FOR USE

1. Unscrew the knurled adjustment sleeve on the extensometer until the dial indicator reads zero.
2. Clip the shackle that is attached to the end of the punched tape onto the eyebolt in the reference surface (rock face or tunnel wall etc.).
3. Pull back the extensometer, allowing the punched tape to unwind, until you can clip the shackle on the body of the extensometer onto the opposite eyebolt.
4. Take the slack out of the tape by winding it on the reel and then loosen it slightly until the nearest punched hole will just engage with the pin at the tip of the extensometer.
5. Push the tape onto the pin and secure the tape into place using the swiveling latch.
6. Turn the knurled adjustment sleeve on the extensometer to take up the tension on the tape until the white reference marks are accurately aligned (see Figure 3). Accuracy of alignment affects the reading accuracy.

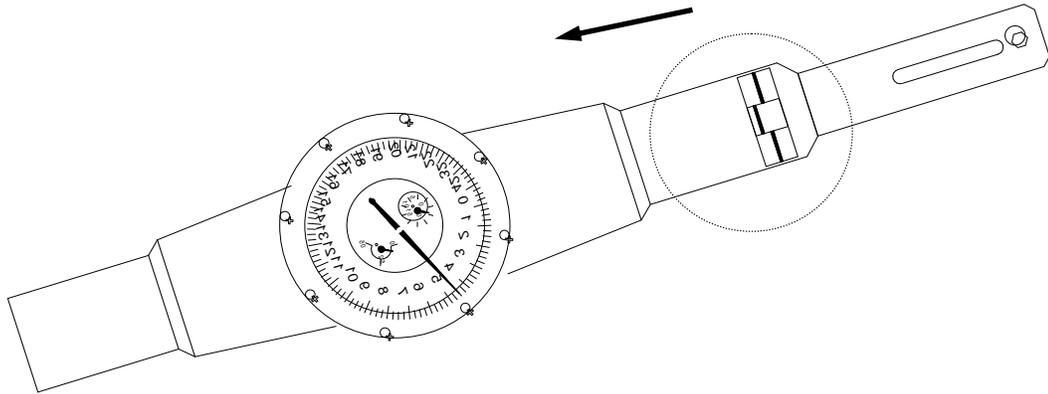


**Figure 3. Aligning Centre Mark**

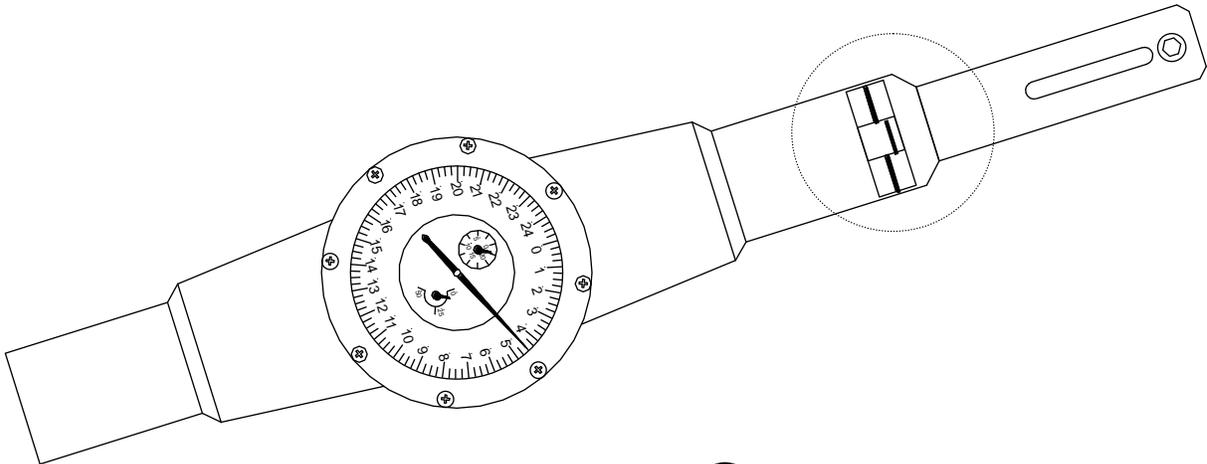
7. The extensometer, if not supported, will cause the tape to sag and therefore must be supported by the operator. It is important that the axis of the body of the extensometer is in line with the eyebolts in the walls. This is easily checked by swaying the extensometer from side to side and up or down while at the same time observing the alignment of the white marks; from the aligned position the center mark will only move away from the extensometer and never toward it. If the center mark moves toward the extensometer more tension must be applied by tightening the knurled adjustment sleeve (see Figure 4).



✓ INITIAL POSITION - MARKS ARE ALIGNED



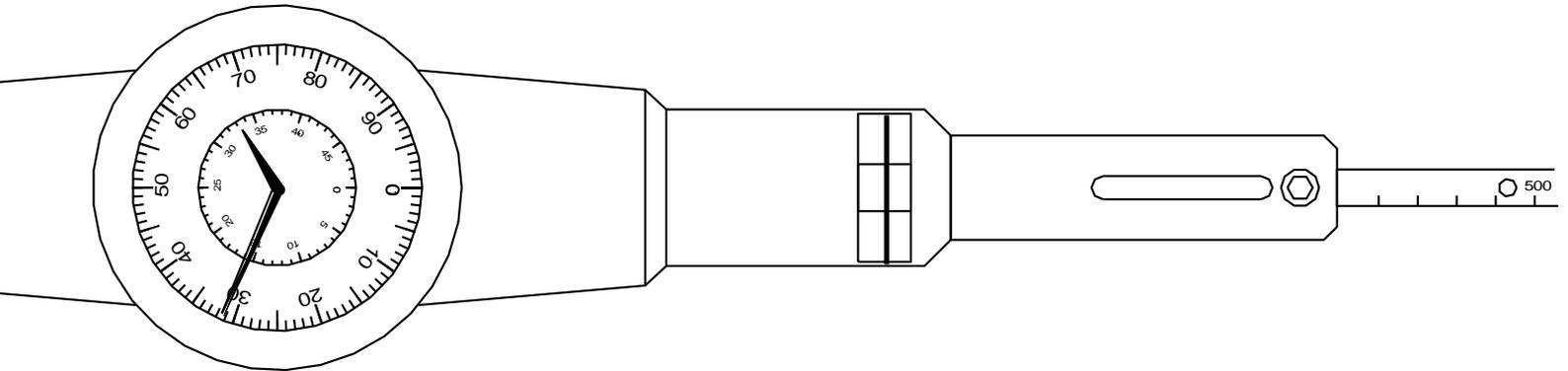
✗ INCORRECT - The center mark moves toward the dial indicator when the extensometer is swayed side to side or up and down.  
 REMEDY - Apply more tension via the knurled adjustment sleeve.



✓ CORRECT - The center mark will only move away from the dial indicator when the extensometer is swayed. The tension is now set correctly to take a reading.

**Figure 4. Correct Tension Alignment**

8. Once the tension has been set correctly, as explained in step 6, hold the extensometer such that the marks are aligned. Take a position reading by subtracting the reading of the dial indicator from the measurement of the tape at the point where it engages the punched hole.



*Example:*

Tape reads 450mm

Dial indicator reads 33.32mm

$$\begin{aligned} \text{Field Data Reading} &= 450\text{mm} - 33.32\text{mm} \\ &= 416.68\text{mm} \end{aligned}$$

The imperial and metric dial indicators currently used are shown in Figure 5 and Figure 6. For information on the previous dial indicators, which have serial numbers below TE3616 (i.e. TE3614), please contact RST Instruments for the previous version of this manual.



**Figure 5. Imperial Dial Indicator Face**



**Figure 6. Metric Dial Indicator Face**

**Note:**

- IMPERIAL:** The long sweep hand of the dial indicator reads in .001 inch and the short sweep hand reads in .100 inch graduations.  
(Total range of indicator is 2.00 inch)  
Notice that the imperial dials have large numbers increasing in the clockwise direction (from 0 to 2), and small numbers increasing in the counterclockwise direction. Generally, only use the large numbers. Also, notice that on the small dial the whole number is omitted. Thus, both 0.3" and 1.3" are indicated by .3 only. Thus, the 1" must be added when the small needle is between 1 and 2.
- METRIC:** The long sweep hand of the dial indicator reads in 0.01mm and the short sweep hand reads in 1mm graduations.  
(Total range of dial indicator is 50.0mm)

**Note:**

The hole spacing on the tape is 50mm (metric) and 2 inches (imperial). If the dial gauge is approaching the end of its range on a set of readings, it is recommended that the tape extensometer be read with the pin in one hole of the tape and then again with the pin in the next hole in the tape (keeping the same setup). This will allow measurements of movements of any magnitude to be made without a break in the dataset.

## How To Read The Dial Gauge (50mm range)

### Dial A: Outside Dial

The outside, large dial reads 1mm with each full revolution and is graduated into 10 labeled main segments. Each of the 50 main segments on the outside dial is equal to 0.1mm (10 segments x 0.1mm = 1mm). For example: An indication of 15 on the outside dial is equal to 0.15mm.

### Dial B: Top Inner Dial

The small inner dial in the face reads 50mm with each full revolution of its dial and it is graduated in 10 labeled main segments. Each of the 10 labeled segments is equal to 5mm and the hash marks between each labeled segments indicates 1mm. As the outside large dial travels one full revolution, the small inner dial in the face will move one hash mark indicating 1mm. For example: An indication of 20 on the small center dial is equal to 20mm measured (20 revolutions on the outer dial 20 x 1mm = 20mm).

Sample Reading (example): **Measurement = Large Outer Dial + Small Inner Dial**

Small Inner Dial Indicates between 22 and 23 (indicates 22mm)

Large Outer Dial - Indicates 17 (indicates 0.17mm)

**Reading is 22mm+0.17mm = 22.17mm**

Therefore the gauge in the diagram is measuring 22.17mm

**Note:**

1 revolution of the Outside Dial = a single 1mm segment of the Small Inner Dial

The reading of the imperial dial gauge is analogous except that the units of measurement are different.

## Temperature Compensation

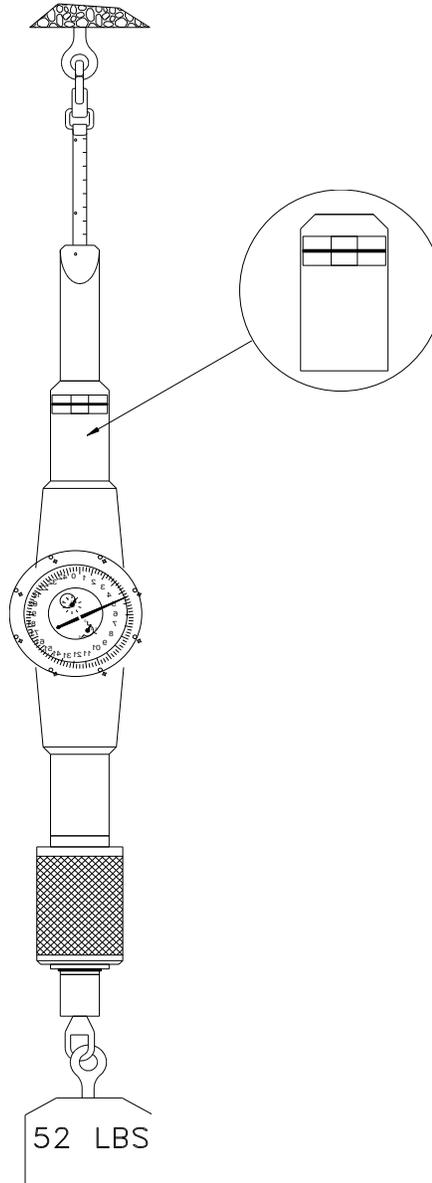
The Steel Tape has a Temperature Compensation Coefficient of  $11.6 \times 10^{-6}$  units/ $^{\circ}\text{C}$ , or  $6.45 \times 10^{-6}$  units/ $^{\circ}\text{F}$  @  $68^{\circ}\text{F}$  or  $20^{\circ}\text{C}$  respectively. Thus a tape that is extended 25m @  $78^{\circ}\text{F}$  would be compensated  $+ 1.61 \times 10^{-3}$  m =  $[6.45 \times 10^{-6}$  units/ $^{\circ}\text{F}$  x  $(78-68^{\circ}\text{F})$  x 25m].

$$\text{Compensation} = \text{Coefficient} \times \Delta \text{ in Temp.} \times \text{Distance Tape is Extended}$$

## Appendix A

### Testing the Tensioning Spring

1. Clip the shackle that is attached to the end of the punched tape onto an overhanging eyebolt.
2. Secure the tape onto the pin using the swiveling latch.
3. Attach a 23.5 KG/52 LB weight onto the other end of the tape extensometer.
4. Make sure the Center Marking is aligned correctly (Figure 3 and Figure 7).

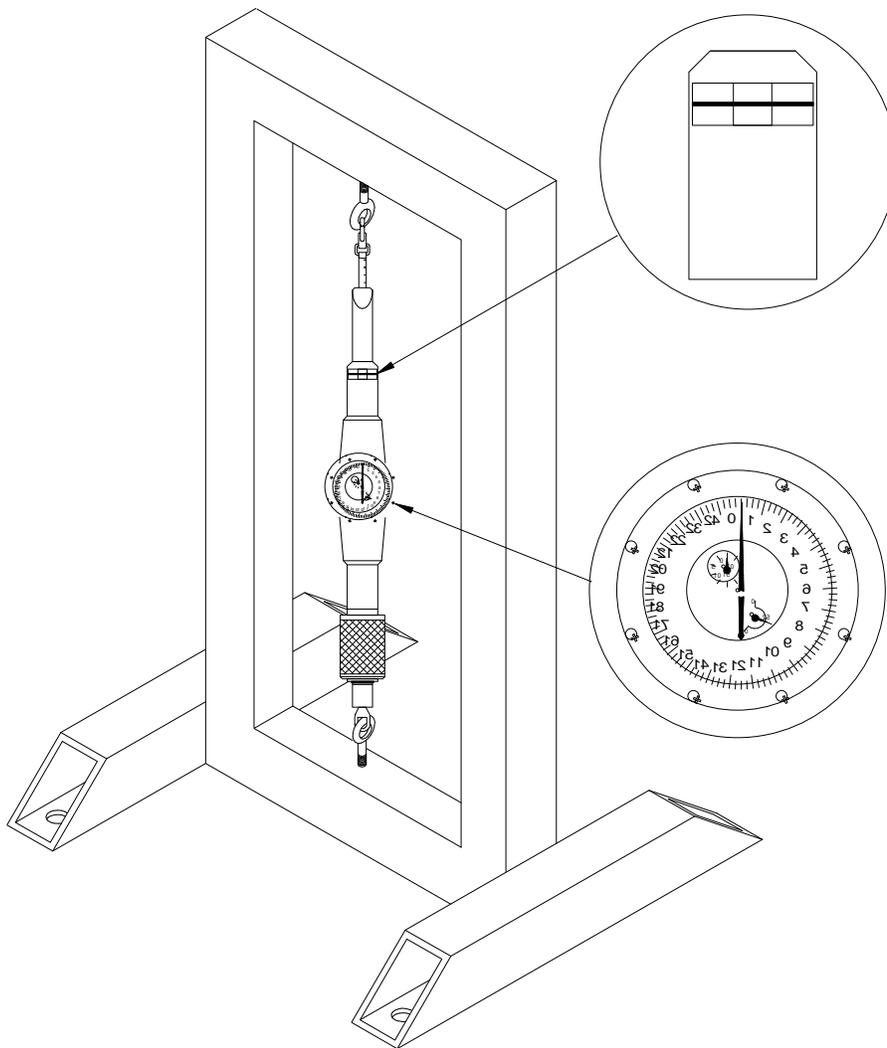


**Figure 7. Setup for Testing the Tape Extensometer**

## APPENDIX B

### Using the Calibration Frame

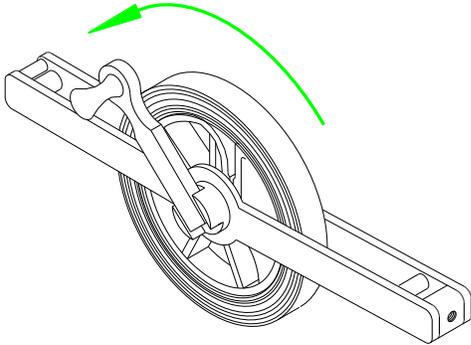
1. Clip the shackle that is attached to the end of the punched tape onto the top eyebolt.
2. Secure the tape onto the pin using the swiveling latch.
3. Clip the other shackle onto the bottom eyebolt.
4. Turn the knurl adjustment sleeve until the reference mark lines up and take note of the reading on the dial indicator. When the tape extensometer is used next, another reading should be taken and compared to the previous reading. This will insure that the extensometer is within acceptable repeatability margins.



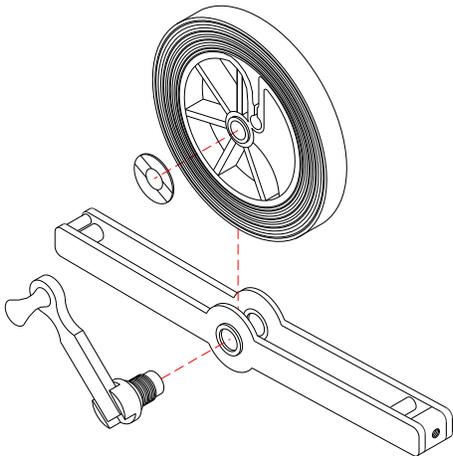
**Figure 8. Using the Calibration Frame**

## APPENDIX C – Replacing the Tape

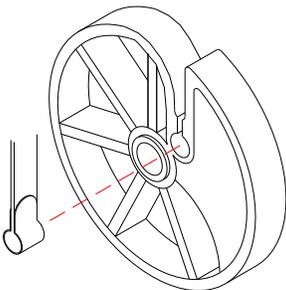
1. Prevent the reel from turning and then turn the handle counterclockwise, to remove it.



2. Pull out the reel.

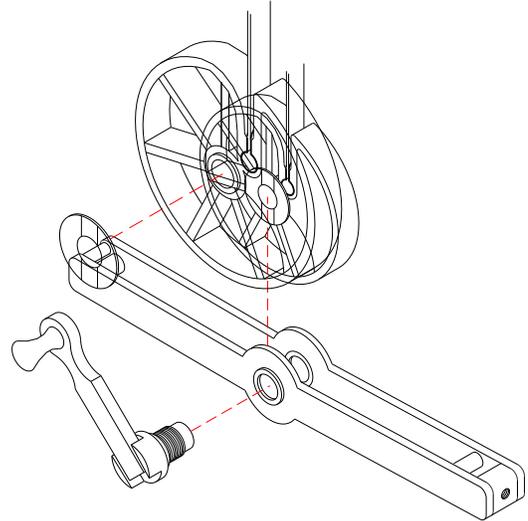


3. Remove the old tape from the reel.
4. Slide the new tape clip on to reel.



5. Push spring washer on to the grooved side of the reel.

6. Orient the spring washer as shown in the diagram below, so that the washer does not slip off while inserting the reel onto the frame.
7. Insert the reel onto the frame



8. Turning clockwise, thread the handle on to the reel.
9. Continue to turn clockwise to wind the tape on to the reel.

