DRO PROS LATHE

INSTALLATION MANUAL

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DRO KIT Preparation

Our installation example covers mounting a 2 axis Digital Readout kit on a LatheMaster 12 x 30 benchtop lathe. This particular installation presented several common challenges to mounting a DRO kit. First, a benchtop machine tends to be smaller in size, and therefore mounting surfaces are likewise limited. Second, the gib locks on this particular lathe are on the tail stock side of the cross slide. Third, the gib locks are immediately below the cross slide, meaning the scale must somehow be offset from the cross slide. While your particular installation may be much simpler than the challenges we faced, the concepts and challenges remain mostly the same.

Please take the time to become familiar with the following sections. The life and longevity of your DRO kit may depend on it!

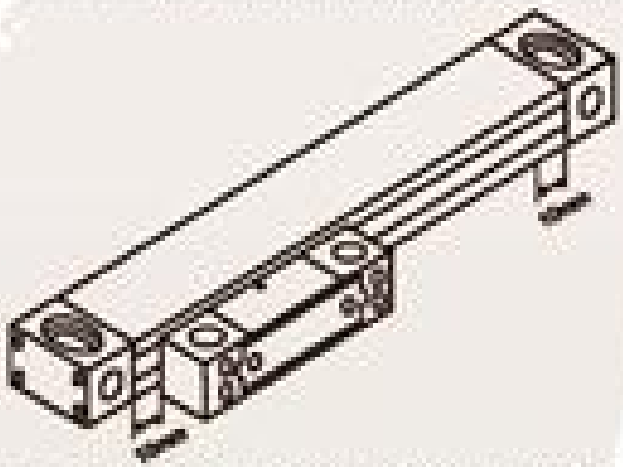
The "Blue Plastic Piece" (BPP)

Secured between the trolley and the scale body is a Blue Plastic Piece (BPP) which helps to protect the reader head during shipping. While the BPP should be removed after the installation is finished, it still remains useful during installation as it helps determine the correct offset, or distance, between the trolley and the scale body.

Note: To give the best protection, the scale should be mounted with the yellow rubber seals (lips) facing down. Note that this is not always possible. The scale performs equally well mounted in any direction. It's just that optimally, the best protection is afforded with the opening facing down, or away, from the cutting tool.

Required Travel

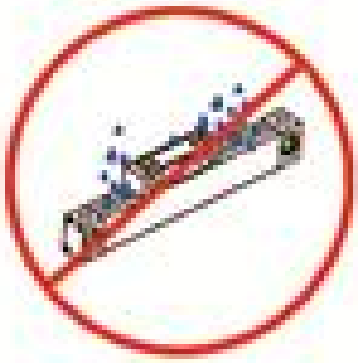
The travel length of the glass grating scale should be longer than the maximum travel of the machine. Optimally, there should be approximately 10mm clearance (approximately ½") between the ends of the glass scale and the maximum travel of the machine as shown in the following figure.

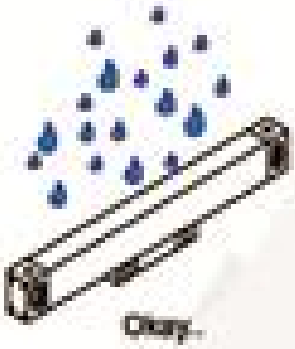


If deemed necessary, less than 10mm clearance can be considered acceptable, such as mounting the cross slide scale, where space is extremely limited and minimizing scale overall length is an important consideration. Technically, the minimum travel required is equal to the travel of your machine. How much 'extra' clearance you need is a subjective requirement the end user (you the customer) must determine individually.

Warnings and Cautions

The opening of the scale must not be installed as to be directly exposed to swarf, oil, water, dust or other foreign products. The provided protectant cover should be installed, space permitting.

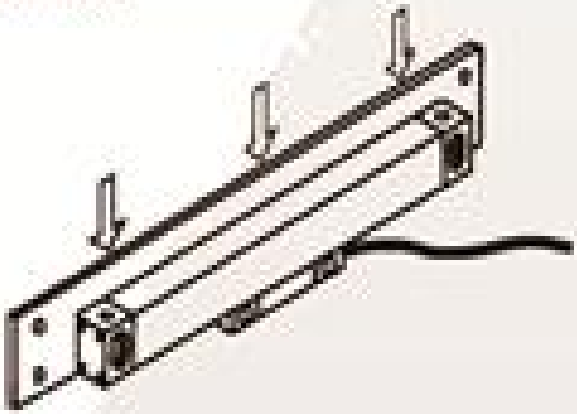




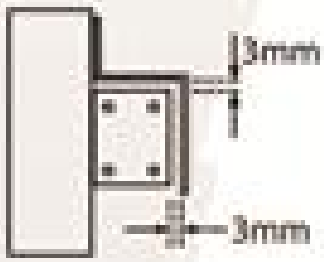
The scales should be installed on a flat, level, machined surface.

The best method for determining the proper mounting distance or clearance between the trolley and the scale body is to use the BPP. For those who insist on measuring, the clearance between the reader head and scale body must be kept between 0.8mm - 1.5mm.

In cases where machined flat surfaces are not available, an installation block or strip should be used to provide a flat datum for the installation:



There must be a clearance of at least 3.0mm between the scale and the scale cover:



All cables should be fixed, but still allow for the maximum amount of machine travel. The open side of the scale should be installed away from direct swarf and coolant.

Parts and Pieces

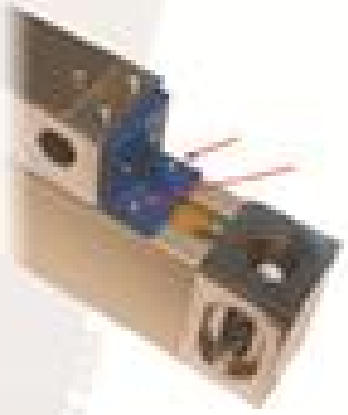
The first thing we recommend is to get familiar with the scales. First, let's go over the parts of a scale. The main housing is referred to as the scale body. The reader or readhead is actually inside of the scale, and is self-guided by five ball bearings running along tracks inside the housing. The outside piece is the "trolley" and simply pushes and pulls the readhead along the length of the scale body. The "joint" between the trolley and the readhead is a metal arm which terminates at the readhead in a kind of ball-and-socket joint. The point is that the readhead is self-aligning, meaning that the outside trolley ***does not need*** to be in perfect parallel alignment with the scale body.

When looking at a scale for the first time, the first thing that catches most peoples eyes is the BPP between the trolley and the scale body. It is intended to keep the readhead from moving during shipping, but also serves as an excellent tool for determining the offset or distance the trolley should be mounted away from the scale body. At the end of the day, it will be in the trash, but for now, don't discard it.

The first task will be to mark the scales in a way that would visually warn us if the readhead is nearing the extreme end of the scale. The arm between the trolley and the readhead is delicate, and if the scale is forcefully run into the end of the scale, it will break.

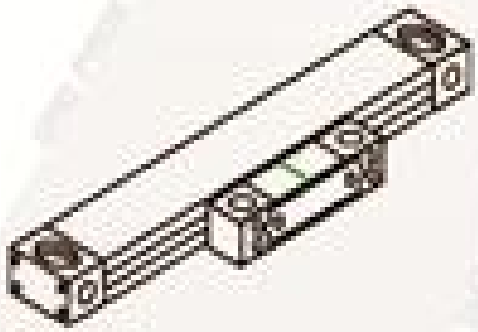
DRO KIT Preparation - Marking the Scale

First, remove the two screws holding the blue plastic piece (BPP) to the scale body.

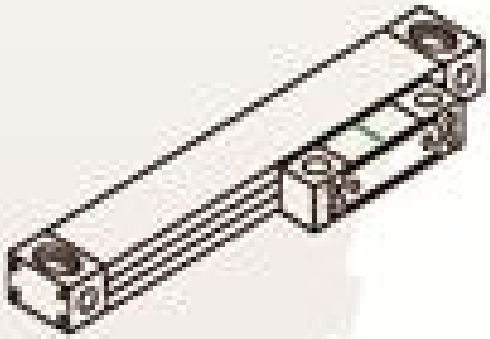


Run the trolley back and forth along the scale with the BPP still attached to the trolley. Notice the movement should be smooth and unrestricted. Now, remove the BPP.

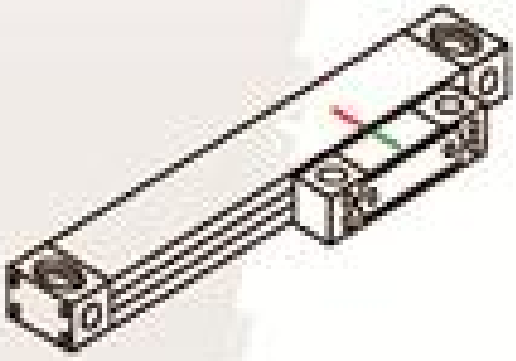
Next, make a mark on the trolley pointing towards the scale body. Exactly where is not important, but most folks choose to mark from the center of the trolley as we did.



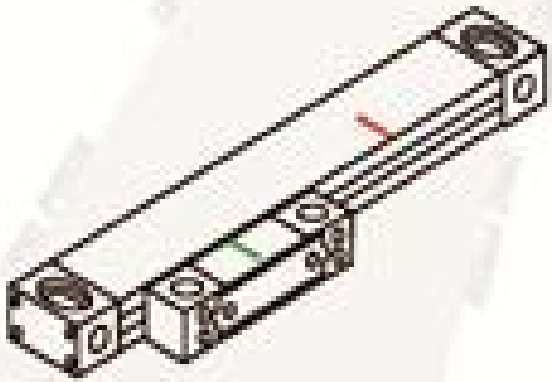
Move the trolley to the extreme end of the scale until it 'bottoms out' or hits the end. Don't worry, as long as the readhead is not forcefully struck against the end of the scale, it will not be damaged.



Now make a mark on the scale body opposite the mark on the trolley.

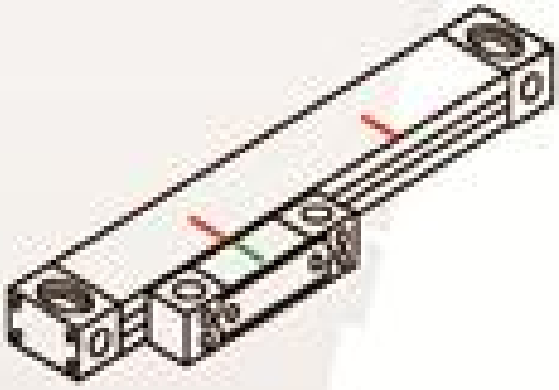


Next, move the trolley to other extreme end of the scale. Note the marks now 'split'.

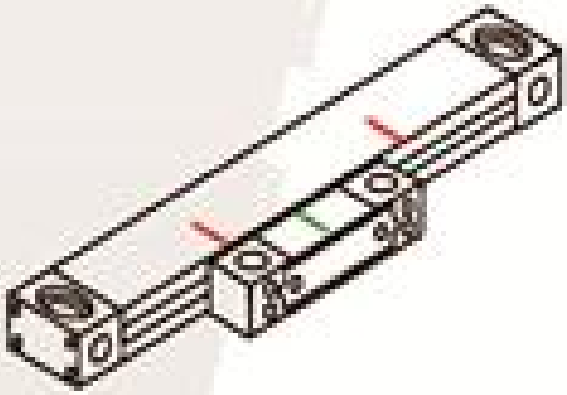


Once the trolley is bottomed out against the opposite end, make another mark on the scale body opposite the mark on the trolley.

At this point, please replace the BPP.



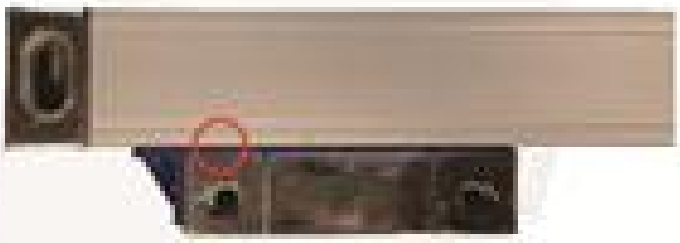
The point of this exercise is that you now have a visual backup of when the reader head would physically hit the end of the scale. After properly mounting your scales, the green mark should always stay between the red marks at all times.



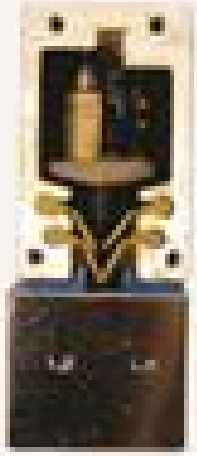
Mounting Hints

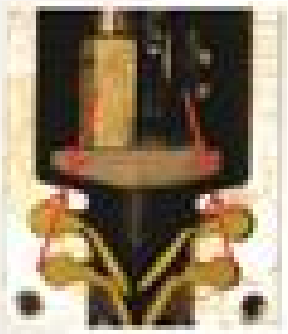
It is best to mount the scale body first. After choosing a flat surface, drill and tap the appropriate size holes. Bolt both ends of the scale into place, leaving one end just loose enough that it can be 'tapped' into parallel. Run a dial indicator along the top surface of the scale, making sure the scale does not rise or fall as the machine moves. THIS IS IMPORTANT. Make sure the scale is true BEFORE you mount the readhead/trolley assembly.

Next, mount the trolley. It is important to obtain just the right distance or spacing between the underside of the scale and the trolley. This is where the BPP comes in handy. If you mount the trolley such that the blue plastic piece is snug under the trolley, the spacing will be perfect. Note in the picture that the BPP is snug between the trolley and the body of the scale.



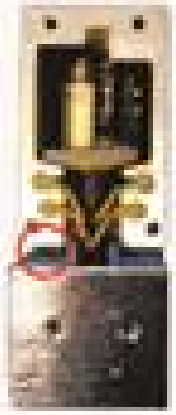
Inside the scale, this is what the readhead looks like when the scale is properly mounted. Note the underside of the readhead is not touching or 'bottoming out' on the inside of the scale body.





The following pictures illustrate an IMPROPERLY mounted scale where the trolley has been mounted too far away from the scale body. Note the gap between the BPP and the scale body.

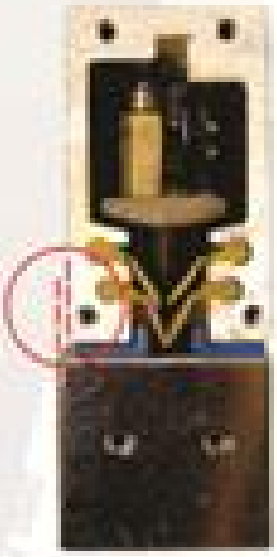
Now while we say the BPP needs to be snug, don't make it too tight. The clearances are great enough here that you really do not need to 'mic it out'. Mount the trolley with the BPP snug and all will be fine. In the photo to the right, you can clearly see the BPP is not even close to snug. It's simply laying there and would easily slide out if the scale were tilted to one end.



Inside the scale, the underside of the readhead is physically dragging along the length of the scale body. Physical failure of the scale will occur almost immediately as the readhead will be physically deformed as it drags the underside of the scale.

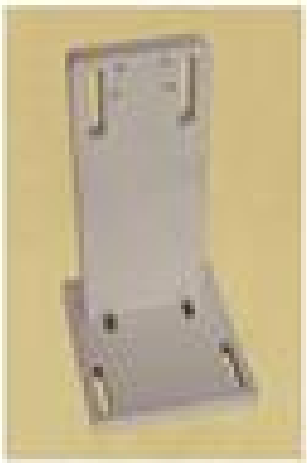
The point here, is that there is plenty of room built into the scale for movement and to not get too wrapped up with this. The only real catch here is to make sure the scale body is parallel to the machines movement, and make sure to mount the trolley so that it doesn't run into the end of the scale.

Note also that most trolleys are a bit wider than the scale on one side, meaning that if you were to mount the scale against a perfectly flat surface, the trolley would be pushed out of alignment. Note in the picture how the trolley is wider on the left side of the scale than it is the right. If the scale were forcefully mounted against a flat surface on the left, the trolley would be forced out of alignment or pushed well to the right. Forcefully pushing the trolley out of position will decrease its' life expectancy greatly!



Bracket Alignment

The brackets are designed to align with the four tapped holes on the underside of the trolley, not the two hexagonal shaped holes on the side. Of course, if your particular installation calls for something different, go for it! Bear in mind that individual circumstances and creativity always determines what is "best" for a particular installation. Modifications are encouraged! Take a look at the following pictures:



DRO Kit Installation - Installing the Cross Slide (X) Scale

Our installation entails fitting a digital readout kit to a benchtop lathe. In general, the larger your lathe, the easier it will be to mount your DRO kit. This particular model was chosen based on the numerous challenges presented. In general, benchtop lathes tend to be smaller, with less room on the cross slide to mount a scale. Further, the gib locks are fairly prominent, and prevent mounting a scale directly to the cross slide. Fortunately, all DRO PROS lathe kits include SlimLine scales for the cross slide (at no extra cost), making installation much easier!

In general, it's preferred to mount the cross slide scale on the right side of the apron. The left side is more exposed to swarf and contaminants, and it's also more prone to damage from dropped parts.

Looking closely at the left side of the cross slide, we see the mounting surface is obstructed by the "follow rest" mounting bolts. Not wanting to sacrifice utility, we conclude the left side of the saddle is not a good choice to mount our scale.

Looking at the right side of the cross slide, we see that the gib adjusting screws and table lock mechanism present a challenging, but not impossible area, to mount our cross slide scale.

Mounting the scale in an upright position with the trolley below the scale generally provides the best protection against contaminants. However, when mounting a scale on the cross slide of a lathe, this is often times not possible. Here you can see that mounting the scale upright would result in the top slide interfering with the top of the scale.

In comparison, mounting the scale sideways provides ample room for the top slide to pass over the top of the scale.

The only remaining obstacle is the gib adjustment screws. Mounting the scale above them resulted in the scale interfering with the top slide handwheel. The solution here is to offset the scale away from the cross slide with the top of the scale in the same plane as the top of the cross slide.

The supplied backer bar is typically used to provide a level mounting surface for installing the scale. In this case, however, we need to offset the scale from the cross slide. Please note that if we didn't need to "clear" the gib screws (as on the case of a larger lathe) we wouldn't use the backer bar at all - we'd simply bolt the scale directly onto the cross slide.

This photo shows the modified backer bar after we've reduced the length and cut out access holes for the gib screws.

Next, drill and tap holes for the two mounting bolts. Note that we've drilled the holes to line up with the scale endcap mounting holes - the backer bar will be "sandwiched" between the cross slide and the scale.

Next, fasten the scale to the cross slide with the backer bar "sandwiched" between the two of them.

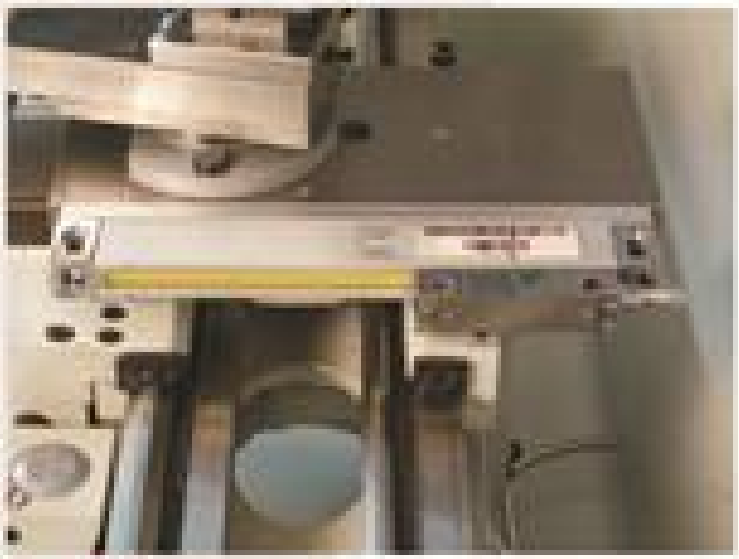
Setup a dial indicator to "run" across the top of the scale. Moving side to side, check to ensure the scale is level.

Next, we're going to give ourselves a visual indication of when the readhead **inside the scale** approaches the end of the scale. **These steps are important as it protects your equipment!**

Make a mark on the midpoint of the trolley.

Next, move the trolley to the end of the scale until it "bumps" into the end of the scale. Note the BPP (Blue Plastic Piece) has been removed. This allows the readhead to truly 'bump' the end of the scale.

Mark the scale directly across from the mark on the trolley.



Next, move the trolley to the other extreme end of the scale. Note how the marks now 'split'.

With the trolley touching the opposite end of the scale, make another mark on the scale body opposite the mark on the trolley.

The point of this exercise is that you now have a visual backup of when the trolley would physically hit the end of the scale. When choosing a mounting point for your trolley, make sure the green mark always stays between the red marks at all times.

Before continuing, please place the BPP (Blue Plastic Piece) back between the trolley and the scale.

Now that the scale body is mounted, we need to fabricate a mounting bracket for the trolley.

Please don't forget to replace the BPP (Blue Plastic Piece) back between the trolley and the scale!

Next, we drill and tap a hole on the right side of the apron to secure the right side of the trolley mounting bar.

Rather than drilling more holes in the apron, we'll use the existing bolt on the left to hold the left side of the trolley bracket.

The trolley bracket.

Here, we're test fitting the trolley mounting bracket to the underside of the trolley.

Once we're certain the bracket fits correctly, we fasten the trolley bracket to the apron.

The cross slide scale is now installed!

Installing the Carriage (Z) Scale

For mounting the carriage scale, we've got several considerations to think about. For starters, we want the scale to fit within the confines of the splash guard. Second, the surface is irregular (note the protruded casting to the right of the apron) and the scale will most likely need to be "spaced" away from the bed.

First, we drill and tap a mounting hole for the left side of the scale. Note the existing hole to the left for the splash guard.

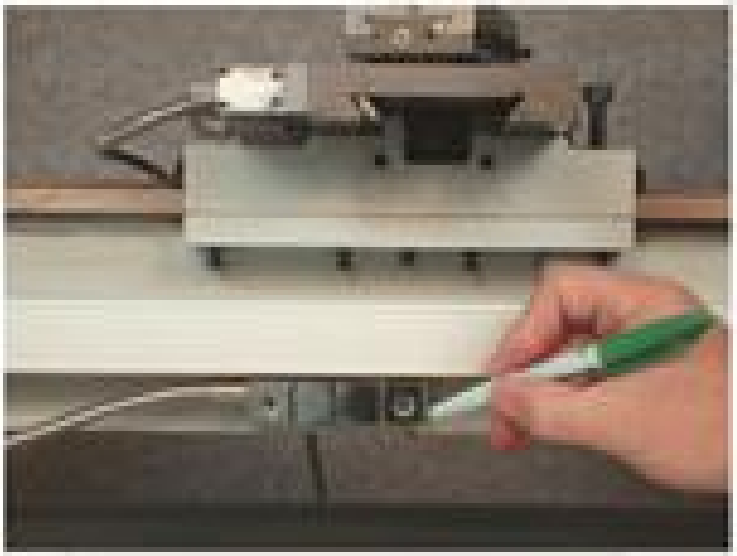
Next, we drill and tap a hole for the right side of the scale.

Here is a close up of the spacers we used to offset the scale away from the bed. Note how the spacers fit entirely within the slotted endcap - perfect!

Just as we did for the cross slide scale, set a dial indicator to ensure the carriage scale is running parallel and true to the bed.

Make sure to run the entire length of the scale. Don't forget to check both sides of the scale - Not just the top, but the backside as well.

As we did for the cross slide scale, we're going to give ourselves a visual indication of when the readhead **inside the scale** approaches the end of the scale. **These steps are important as it protects your equipment!**



First, make a mark on the trolley. We suggest marking to the side of the trolley, not in the middle. This is because the trolley bracket will cover most of the backside of the trolley when installed, and you need to see the mark to ensure the readhead does not hit the end.

Next, move the trolley to the end of the scale until it "bumps" into the end of the scale. Note the BPP (Blue Plastic Piece) has been removed. This allows the readhead to truly 'bump' the end of the scale.

Mark the scale directly across from the mark on the trolley.

Next, move the trolley to the other extreme end of the scale. Note how the marks now 'split'.

With the trolley touching the opposite end of the scale, make another mark on the scale body opposite the mark on the trolley.

The point of this exercise is that you now have a visual backup of when the trolley would physically hit the end of the scale. When choosing a mounting point for your trolley, make sure the green mark always stays between the red marks at all times.

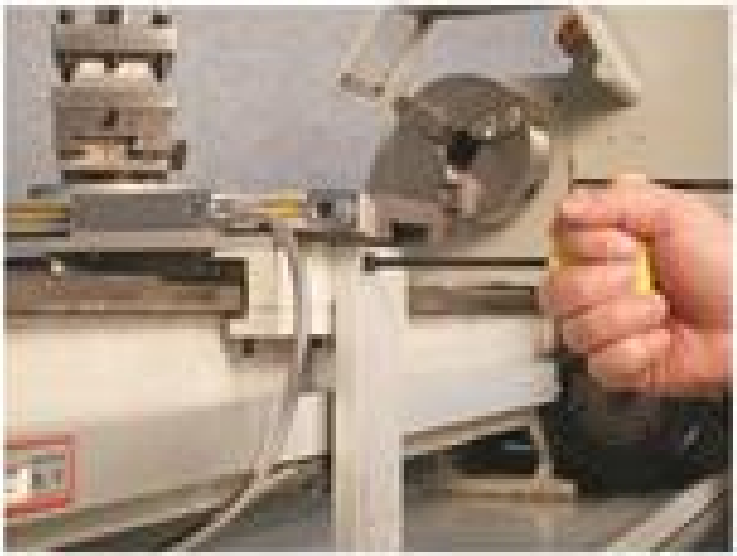
Note in the picture how the trolley is very close to the end of the scale, but because we've marked the end of the travel, we know the readhead is safe.

Before continuing, please place the BPP (Blue Plastic Piece) back between the trolley and the scale.

Next, we need to fasten a bracket to support the carriage trolley.

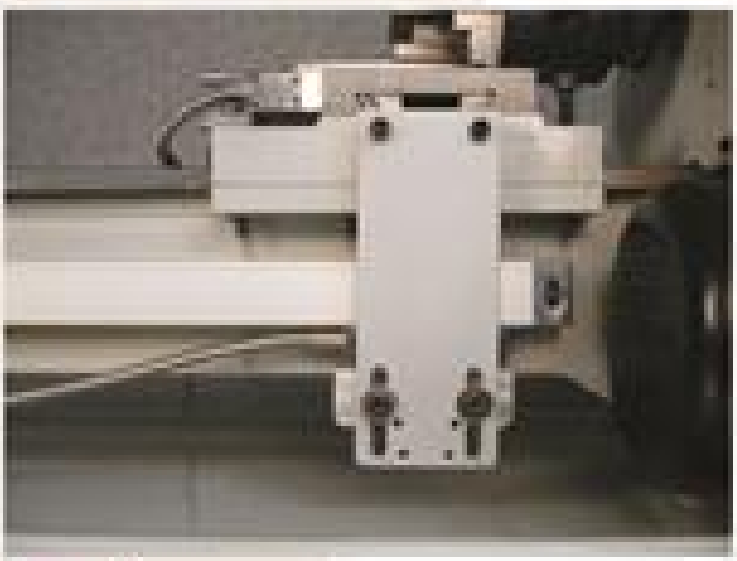
First, drill and tap two holes in the apron.

Fasten the bracket to the back of the apron.



Secure a right angle bracket to support the carriage trolley. Note the bracket slots are designed to fit the four smaller holes on the underside of the trolley, not the two larger holes on the side of the trolley.

Next, move the carriage towards the headstock.

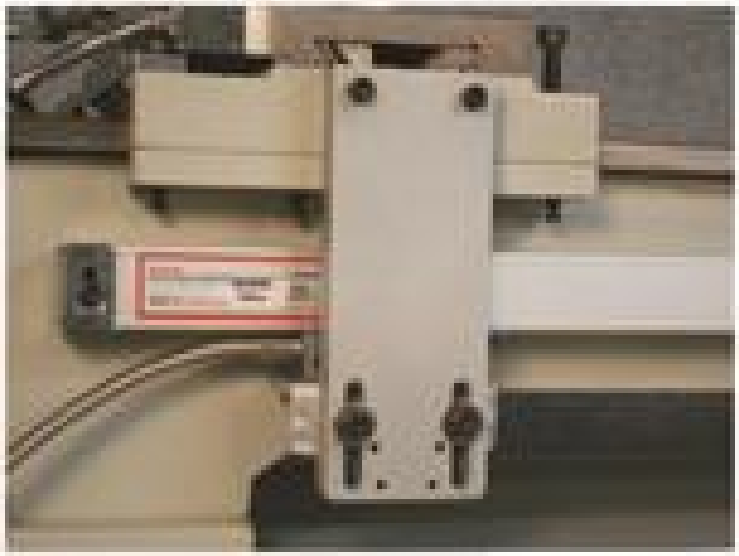


As you do, watch the BPP closely to make sure it does not "gap". If it does, stop and readjust the spacing accordingly. The BPP must not gap!

Note in the picture the BPP remains firmly snug between the trolley and the readhead.

Next, move the carriage towards the tailstock.

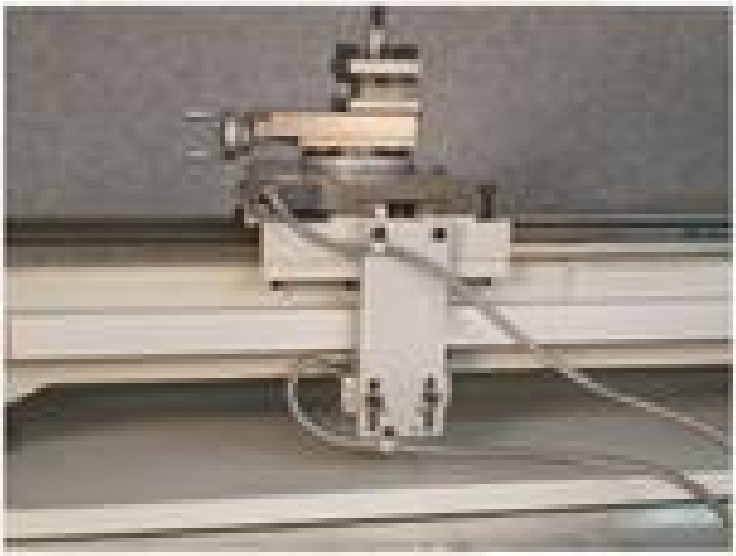
Again, watch the BPP closely to make sure it does not "gap". It is imperative to keep the BPP snug along the full travel of the scale. At no point should the BPP bind or become loose.



In this picture, the BPP is snug and all is well.

In this picture, the BPP has "gapped" - note the black space between the BPP and the scale body. Inside the scale, the readhead is in danger of scraping the housing. Loosen the scale end bolt and adjust the scale as needed. For more information, see page 9 of this manual.

Once you are certain the trolley is correctly "gapped", take a few moments and secure the armored cables to the brackets with the provided clips.



The next step is to choose where to mount the display arm. Although the electrical housing (note the yellow warning sticker) was probably suitable, we decided the back of the gearbox housing was sturdier and better suited to the task.

We first drilled two holes for an extension bracket.

Fasten the extension bar to the cabinet, and then the display arm to the extension bar. Next, mount the display to the display arm and tightened it down. Last, plug the scale connectors into the back of the display and plug it in!

Congratulations, your DRO is installed. Now don't forget to remove the BPP's from the scales!

Scale "Read Direction"

It makes no difference which way the scale initially reads. Scale 'read direction' can be easily changed in the parameters menu after installation. Mount the scale in the position / direction which makes the most sense. In most cases, mount the scale with the cable exiting to the rear of the machine. Please keep in mind every installation is unique, so there is no one "correct way" to mount scales. Please make sure and reference the Customer installation photos at www.dropros.com on the "Installation" page.