ANILAM

RBS-T Linear Encoder Installation Manual and Owner's Guide

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This warranty applies to all products when used in a normal industrial environment. Any unauthorized tampering, misuse or neglect will make this warranty null and void.

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Introduction

The RBS-T is the latest design of linear encoders offered by Anilam. RBS-T linear encoders have absolute reference marks. To take advantage of the absolute reference marks, a compatible Anilam DRO or CNC must be used and properly set up. A product that does not support absolute reference marks will interpret the absolute reference marks as reference marks approximately every 0.5-in. (12.70-mm). The RBS-T linear encoders are shipped pre-assembled and come with a mounting kit suitable for most installations.

This document outlines standard RBS-T encoder installation procedures for knee mills, lathes, and EDM machines. It contains specifications, maintenance information, and a troubleshooting guide for encoder owners.

For additional information, please contact your local authorized ANILAM distributor, or call us directly:

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Encoder Specifications

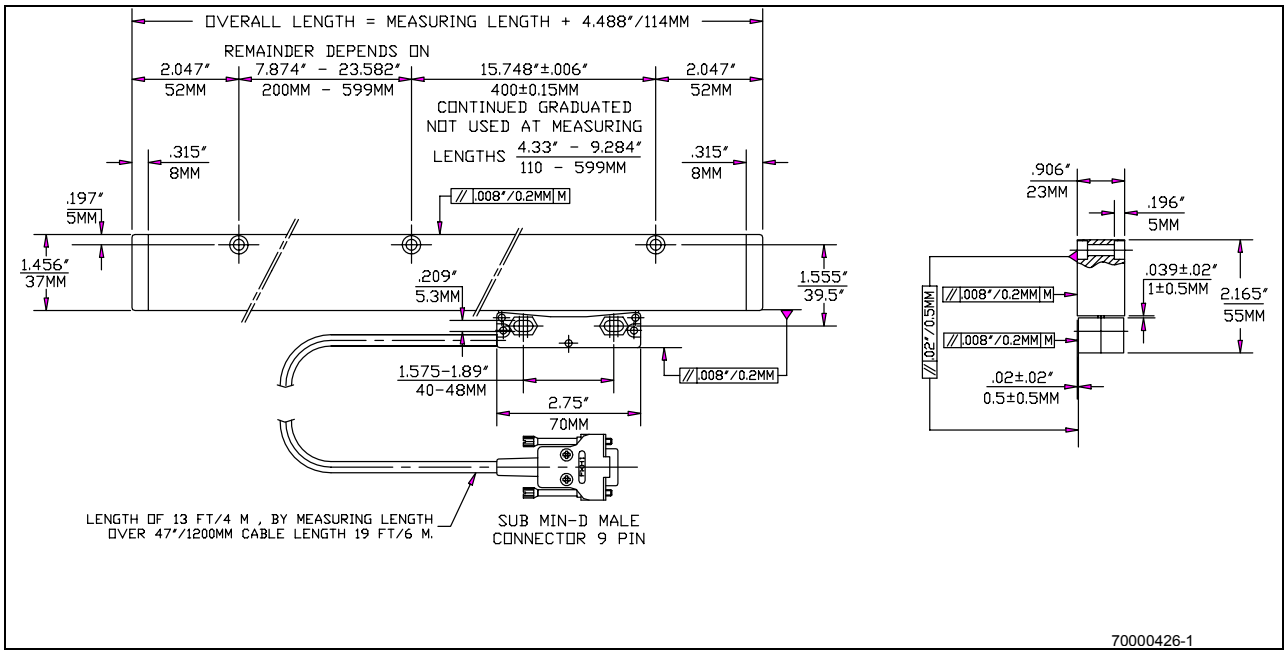

Figure 1, RBS-T Linear Encoder Mounting Dimensions

Table 1, RBS-T Linear Encoder Operating Specifications

Weight	0.335 Kg + 1.145 Kg/m	Operating Temp	0-50° C
Grating Pitch	0.02 mm	Storage Temp	-20°- 70° C
Resolution	0.005 mm / 0.001 mm	Operating Humidity	5% - 95% relative humidity.
Accuracy	+/- .005 mm/m or +/-.01 mm/m	Storage Humidity	5% - 95% relative humidity
Repeatability	1.4 µm	Required Move Force	4 N max.
Slew Rate	0.5 m/s	Coefficient of Linear Expansion	10 µm/°/m
Acceleration	5g shock, 14g @ 10 ms	CE Mark	Yes
Feed Power	5V +/- 5%, 120 mA max.	Reference Marks	Absolute reference marks or standard marks approximately every 12.70-mm (0.5 in.)
Cable Length	4m & 6m (std), 0-254m available upon order.	Light Source	Siemens LED OP 264

Table 2, ANILAM Encoder Part Number Listing

1 Micron Encoders	ANILAM Part Number
≅2"/50 mm	20501002
≅4"/100 mm	20501004
≅6"/150 mm	20501006
≅8"/200 mm	20501008
≅10"/250 mm	20501010
≅12"/300 mm	20501012
≅14"/350 mm	20501014
≅16"/400 mm	20501016
≅18"/450 mm	20501018
≅20"/500 mm	20501020
≅24"/600 mm	20501024
≅26"/650 mm	20501026
≅27"/675 mm	20501027
≅30"/750 mm	20501030
≅33"/825 mm	20501033
≅36"/900 mm	20501036
≅42"/1050 mm	20501042
≅48"/1200 mm	20501048
≅54"/1375 mm	20501054
≅60"/1525 mm	20501060
≅65"/1650 mm	20501065
≅72"/1850 mm	20501072
≅80"/2050 mm	20501080
≅90"/2300 mm	20501090
≅100"/2550 mm	20501100
≅110"/2800 mm	20501110
≅120"/3050 mm	20501120

5 Micron Encoders	ANILAM Part Number
≅2"/50 mm	20505002
≅4"/100 mm	20505004
≅6"/150 mm	20505006
≅8"/200 mm	20505008
≅10"/250 mm	20505010
≅12"/300 mm	20505012
≅14"/350 mm	20505014
≅16"/400 mm	20505016
≅18"/450 mm	20505018
≅20"/500 mm	20505020
≅24"/600 mm	20505024
≅26"/650 mm	20505026
≅30"/750 mm	20505030
≅33"/825 mm	20505033
≅36"/900 mm	20505036
≅42"/1050 mm	20505042
≅48"/1200 mm	20505048
≅54"/1375 mm	20505054
≅60"/1525 mm	20505060
≅65"/1650 mm	20505065
≅72"/1850 mm	20505072
≅80"/2050 mm	20505080
≅90"/2300 mm	20505090
≅100"/2550 mm	20505100
≅110"/2800 mm	20505110
≅120"/3050 mm	20505120

Tools & Equipment Required

- Indicator, 0.0005" resolution, with magnetic base
- Spirit (bubble) level
- Hex keys (Allen wrenches), metric sizes
- Hex keys (Allen wrenches), English sizes
- Drill, 3/8" chuck
- Taps, sized as follows: #8-32, #10-32, 1/4-20
- Drill bits, sized as follows: #29, #21, #7, and 1/4"
- Tap handle
- Transfer punches, complete set
- Ball peen hammer
- Center punch
- Safety glasses
- Combination square, 12"
- Torque wrench (set to 24 in-lbs.)

General Installation and Safety Information

Qualified personnel should only perform this installation. Read the entire procedure and become familiar with the parts before starting the installation.

Wear eye protection and follow standard shop safety practices while installing this equipment.

Encoders contain glass components that can break. Do not drop the encoder. Do not use a hammer on the encoder.

This document describes typical installations. Custom installations may require a different arrangement of mounting brackets. The following guidelines apply for every installation.

- The reader head mounting bracket must maintain the alignment set by the plastic alignment brackets. This alignment must be preserved through out the machine's entire range of travel along the encoder.
- The run out along the top of the encoder must be parallel to the machine's movement along the axis (within 0.002") over the entire range of travel.

- The run out along the face of the encoder must be parallel to the machine's movement along the axis (within 0.005") over the entire range of travel.

- The encoder should be mounted so the reader head can never come in contact with the end caps.

Mounting brackets for large custom applications can be manufactured locally. When designing custom brackets, note that excessively long or weak brackets can cause the readout display to flutter from machine vibration.

Ensure all mounting surfaces are solid.

When planning an installation, consider the routing of the cable. The cable should not be routed so it is in danger of being pinched or crushed by moving parts. Cables should not drape across any more open space than necessary.

The encoder can be installed with either side against the machine. Switching sides changes the direction that the cable feeds out of the reader head. Choose the side that permits the most convenient cable routing.

All holes should be drilled and tapped 90 degrees to the mounting surface.

RBS-T Linear Encoders are precision measuring instruments. Failure to mount the encoder properly can result in encoder damage or poor accuracy.

RBS-T Linear Encoders are optical devices. Dirt or debris blown past the lip seals into the encoder housing can affect the performance of the encoder. Install the encoder in a manner that minimizes the possibility of coolant and debris getting into the encoder body. In extreme environments consider fitting a splash shield to the encoder.

In all cases, the encoder should be installed with the lip seal and reader head down and away from a direct spray of coolant and chips.

Inventory the parts in each installation kit. Check that all of the required parts are included.

Check the machine's travel along each axis and verify that encoder sizes are correct for the machine.

Encoders contain no internal alignment mechanism. When the plastic reader head alignment brackets are removed, the reader head is floating loose inside the encoder body. The only way to position the reader head for installation is by installing the plastic alignment brackets.

The goal of the reader head alignment procedure is to preserve the alignment set by the plastic alignment brackets when the reader head is mounted to the machine.

CAUTION: Do not use an encoder that is shorter than the machine's range of travel.

Knee Mill Installations

ANILAM Kits provide all of the necessary parts and hardware for the standard knee mill installations described here.

Y Axis Installation (Side Mount) On Bridgeport Type Machines

Bridgeport X and Y Axis Knee Mill Kit, (P/N 32500108) provides mounting brackets and hardware for Y-axis encoder installations (on the side of the knee) and X axis encoder installations (on the front of the table) for Bridgeport type machines.

Install Y Axis Backer Bar

1. Position the saddle against the dead stop furthest from the column.

2. The backer bar is mounted using the existing holes on the side of the knee. Strip the paint from the area around each hole to provide solid contact between the spacers and the machine. Ensure the areas around these holes are flat and free from burrs.

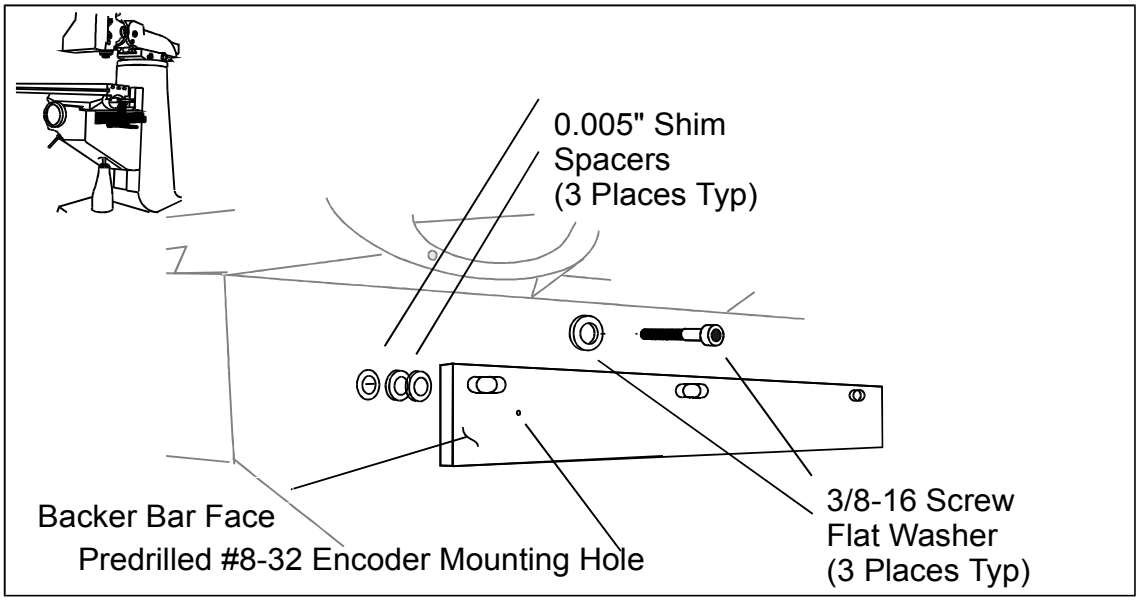

Figure 2, Bridgeport Type Backer Bar Installation

3. Refer to **Figure 2, Bridgeport Type Backer Bar Installation** and assemble the Y axis backer bar to the knee. When the backer bar is properly oriented, the elongated slots are near the top, and the predrilled #8-32 hole is away from the column. If the mounting screws are difficult to thread in, chase the threads with a tap. Tighten the screws just enough to hold the backer bar in place.

   The backer bar supports the encoder (with reader head). Use enough spacers behind the backer bar to position the reader head no more than 1/4" from the reader head mounting bracket (see **Figure 4, Reader Head Mounting Bracket Installation**).

4. Temporarily install the reader head mounting bracket and hold the encoder against the backer bar to check the backer bar spacing.

Checking Y Axis Backer Bar Alignment

1. Mount an indicator on the bottom of the saddle. Position the probe to run along the face of the backer bar.

2. Move the saddle through its range of travel while observing the indicator. The face of the backer bar should be parallel to the Y axis movement of the saddle (within 0.005") over its entire range of travel.

NOTE: If the backer bar is not correctly aligned, the reader head will not read correctly.

3. Insert 0.005" shims under the backer bar spacers to adjust the alignment to within limits. The kit contains 0.005" shims. If adding shims is not sufficient, it may be necessary to face off a spacer.

4. Once the backer bar is aligned, fully tighten the mounting screws.

5. Recheck the alignment.

Installing and Aligning Y Axis Encoder

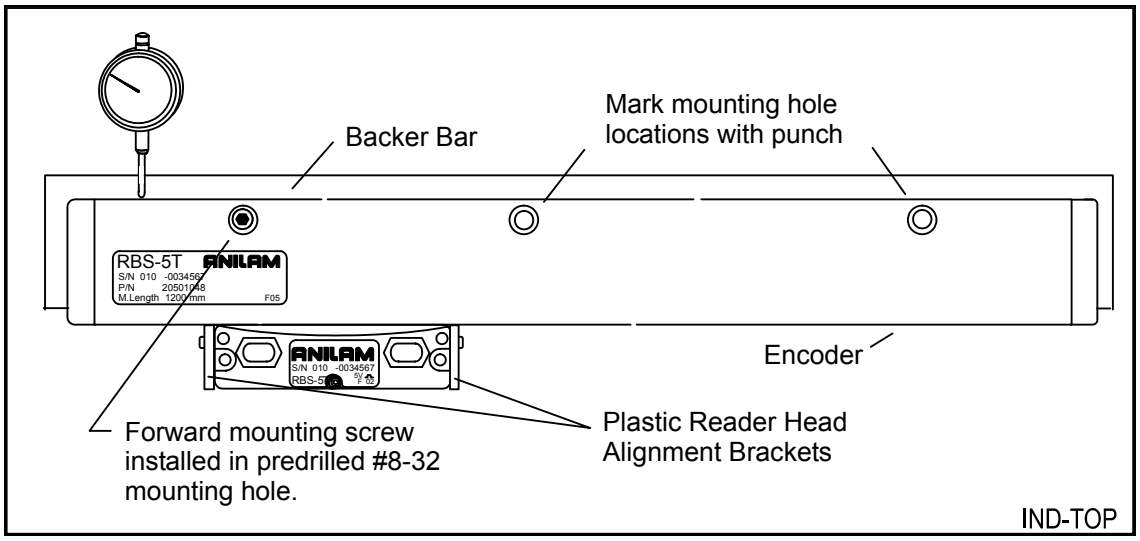

Figure 3, Aligning the Encoder

1. Before installing the encoder, remove both end caps and visually check the alignment of the reader head. Verify that the reader head is centered within the housing and is not twisted in any way. Do not reinstall the end caps at this time.

2. Break loose the two screws holding the reader head alignment brackets to the reader head. Re-tighten only enough to keep the brackets in place. The reader head alignment brackets must be installed to align the reader head. They will be removed at the end of the procedure.

3. Place the encoder against the backer bar and install the forward #8-32 mounting screw.

NOTE: On 12" and 16" installations the forward mounting screw will usually support the encoder long enough to locate the undrilled mounting holes. When installing a long encoder, mark and drill the first mounting hole near the center of the encoder. This will help balance the weight of the encoder while the holes are being located.

4. Refer to **Figure 3, Aligning the Encoder**. Mount a magnetic indicator on the saddle so the indicator probe measures the position of the top of the encoder.

5. Move the saddle through its full range of travel and observe the indicator. The top of the encoder should be parallel to the Y axis movement of the saddle (within 0.002") along its entire length. Use a transfer punch to mark the remaining holes.

6. Drill and tap the remaining #8-32 mounting holes.

7. Install the encoder using the #8-32 screws provided. Tighten the screws just enough to hold the encoder in place.

8. Re-align the encoder. Using a torque wrench, tighten the screws to 24 in-lbs. Do not overtighten the screws.

NOTE: If the encoder is not properly aligned the reader head will not read correctly.

Recheck the alignment.

Mounting and Aligning Y Axis Reader Head

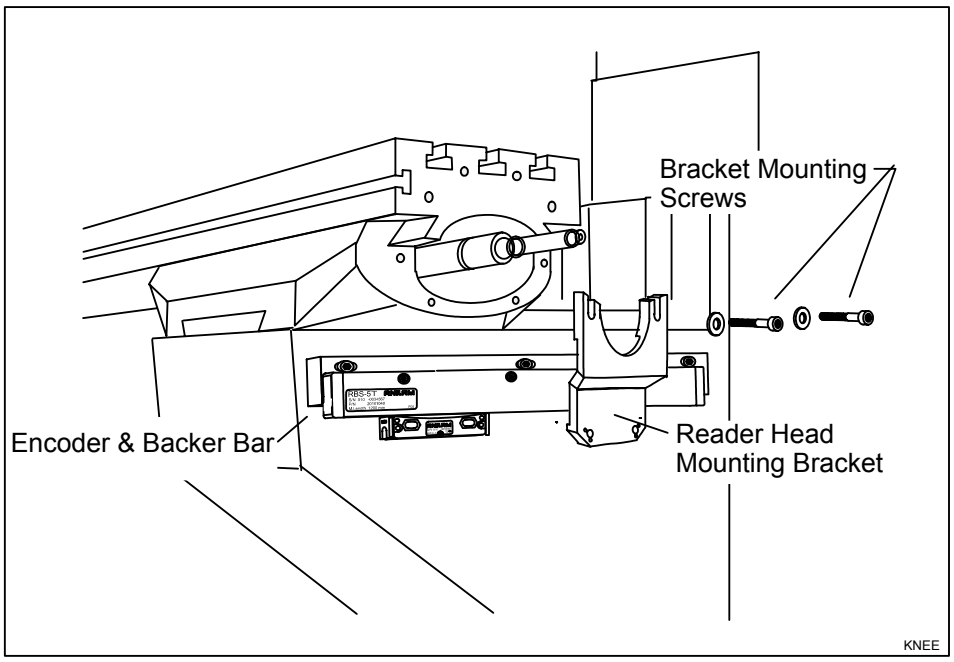

Figure 4, Reader Head Mounting Bracket Installation

1. Refer to **Figure 4, Reader Head Mounting Bracket Installation**. Loosely assemble the reader head mounting bracket to the end of saddle using the 1/4-20 bracket mounting screws and washers provided.

2. Adjust the saddle and position the reader head mounting bracket so the reader head mounting screw holes are aligned. The reader head mounting bracket should be flat against the saddle and impose no twist or strain on the reader head.

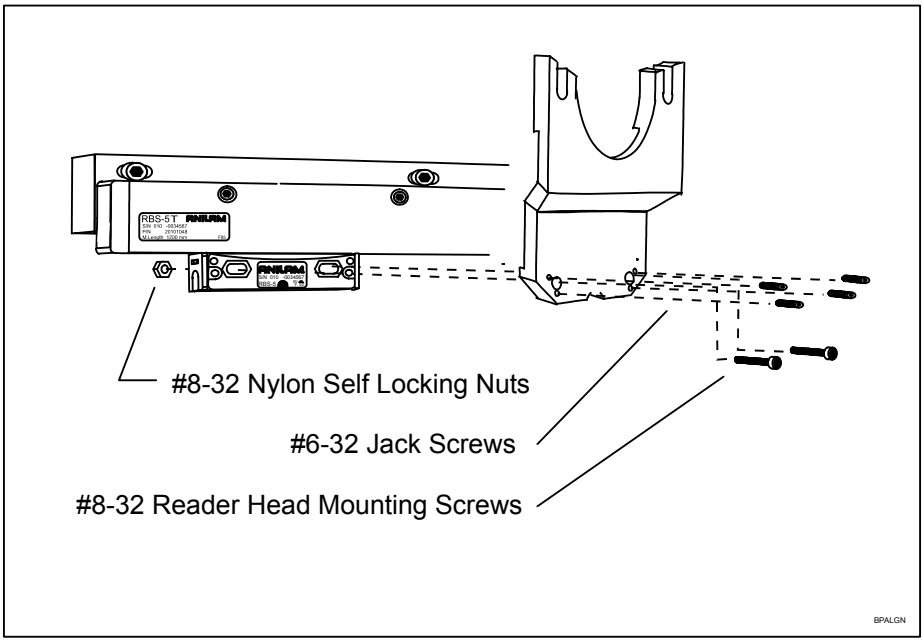

Figure 5, Reader Head Mounting Hardware

CAUTION: Do not use the reader head mounting screws to pull the reader head flush against the reader head mounting bracket. The reader head must stay aligned with the encoder body. The jack screws hold the reader head away from the reader head mounting bracket when the mounting screws are tightened.

3. Refer to **Figure 5, Reader Head Mounting Hardware.** Place the two nylon self-locking nuts in the cavities on the back side of the reader head. Start the two #8-32 cap screws into the nuts, but do not tighten. Start the four jack screws into the reader head mounting bracket.

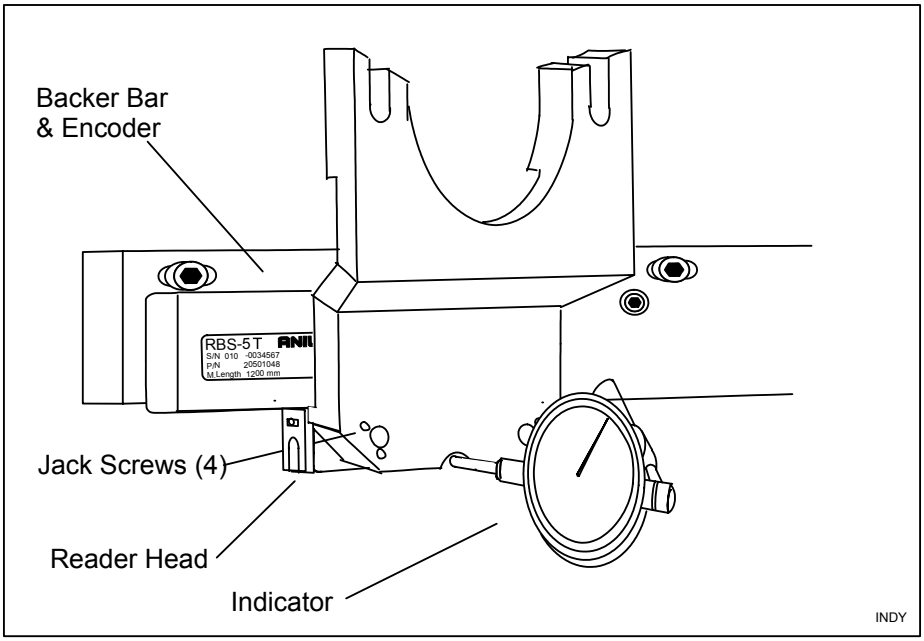

Figure 6, Indicator Positioning For Reader Head Alignment

4. Refer to **Figure 6, Indicator Positioning For Reader Head Alignment**. Set up an indicator so the probe measures the position of the front the reader head. A cutout at the bottom of the bracket provides access for the indicator probe.

   Zero the indicator. Screw in the first jack screw until it just contacts the reader head. Continue turning the jack screw until it pushes the reader head 0.001". Do this for each of the four jack screws. The reader head should be about 0.004" away from its original position.

5. Using a torque wrench, tighten the two mounting screws to 24 in-lbs. Tightening the reader head mounting screws should pull the reader head back against the jack screws taking out the 0.004" and restoring its original position.

   If the reader head does not return to within 0.001" of its original position, loosen the mounting screws and repeat the alignment procedure. When repeating the procedure, compensate the adjustments so the reader head returns to its original position when the mounting screws are tightened.

6. Remove the plastic alignment brackets from the reader head.

   NOTE: Save the plastic alignment brackets. If the encoder is ever removed from the machine, it cannot be reinstalled without the reader head alignment brackets.

7. After the installation is complete, perform a second visual inspection of the reader head and reinstall both end caps.

Y Axis Installation (Side Mount) On Lagun Type Machines

Lagun X and Y Axis Knee Mill Kit (P/N 32500073) provides mounting brackets and hardware for Y-axis encoder installations (on the side of the knee) and X axis encoder installations (on the front of the table) for Lagun type machines.

Install Y Axis Backer Bar

1. Position the saddle against the dead stop furthest from the column.

2. The backer bar is mounted using the existing holes on the side of the knee. Strip the paint from the area around each hole to provide solid contact between the spacers and the machine. Ensure the area around these holes is flat and free from burrs.

   Machines that do not have pre-existing holes, need to be drilled and tapped. The best method for locating the holes will depend on the machine. If the saddle has pre-drilled holes that can be used to attach the reader head mounting brackets, the reader head brackets can be used as a guide for positioning the encoder and backer bar.

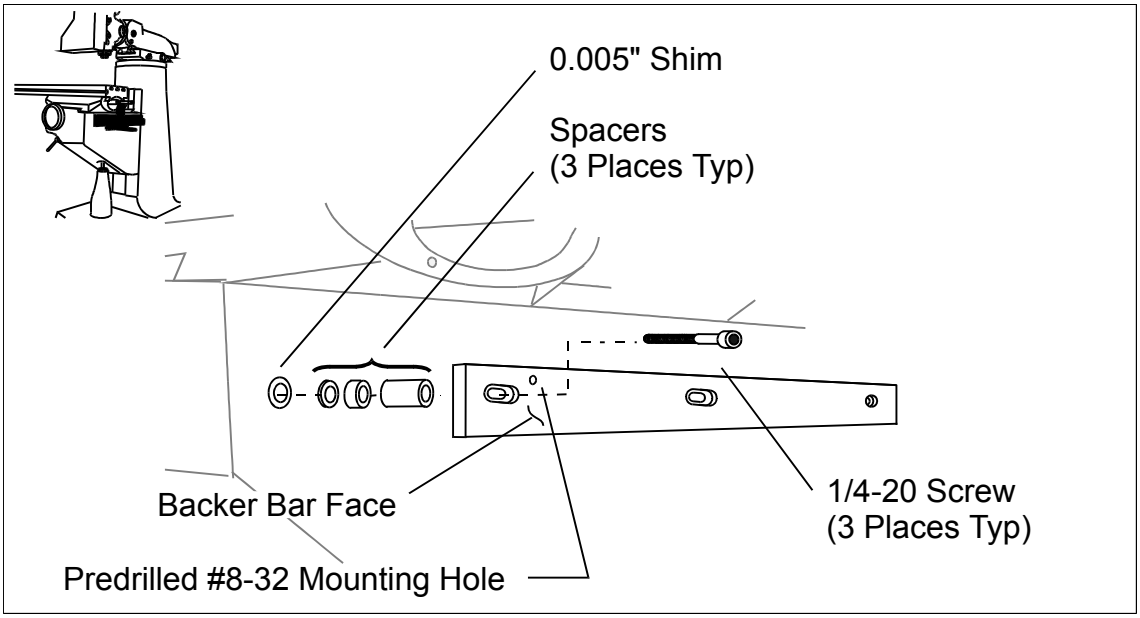

Figure 7, Lagun Type Backer Bar Installation

3. Refer to **Figure 7, Lagun Type Backer Bar Installation** and assemble the Y axis backer bar to the knee. When the backer bar is properly oriented, the elongated slots are near the top and the predrilled #8-32 mounting hole is away from the column. If the mounting screws are difficult to thread in, chase the threads with a tap. Tighten the screws just enough to hold the backer bar in place.

   The backer bar supports the encoder (with reader head). Use enough spacers behind the backer bar to position the reader head no more than 1/4" from the reader head mounting bracket (see **Figure 9, Vertical Block and Reader Head Bracket Installation**).

4. Temporarily install the reader head mounting brackets and hold the encoder against the backer bar to check the backer bar spacing.

Checking Y Axis Backer Bar Alignment

1. Mount an indicator on the bottom of the saddle. Position the probe to measure the position of the face of the backer bar.

2. Move the saddle through its full range of travel while observing the indicator. The face of the backer bar should be parallel to Y-axis movement of the saddle (within 0.005") over its entire range of travel.

NOTE: If the backer bar is not correctly aligned, the reader head will not read correctly.

3. Insert 0.005" shims under the backer bar spacers to adjust the alignment to within limits. The 0.005" shims are supplied in the kit. If adding shims is not sufficient, it may be necessary to face off a spacer.

4. Once the backer bar is aligned, fully tighten the mounting screws.

5. Recheck the alignment.

Installing and Aligning Y Axis Encoder

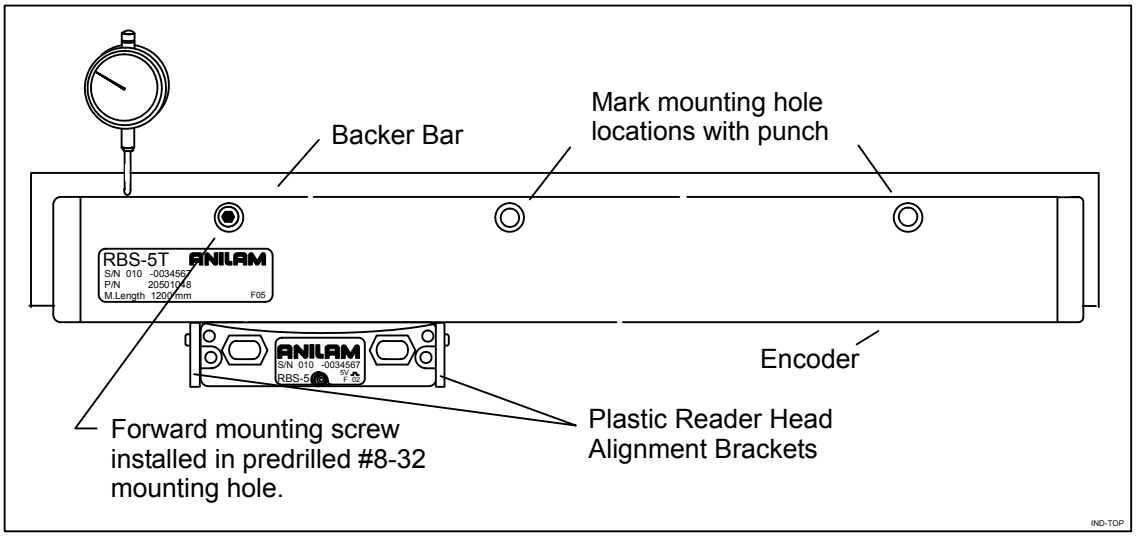

Figure 8, Aligning the Encoder

1. Before installing the encoder, remove both end caps and visually check the alignment of the reader head. Verify that the reader head is centered within the housing and is not twisted in any way. Do not reinstall the end caps at this time.

2. Break loose the two screws holding the reader head alignment brackets to the reader head. Retighten only enough to keep the brackets in place. The reader head alignment brackets must be installed to align the reader head. They will be removed at the end of the procedure.

3. Refer to **Figure 8, Aligning the Encoder**. Place the encoder against the backer bar and install the forward #8-32 mounting screw.

NOTE: On 12" and 16" installations the forward mounting screw will usually support the encoder long enough to locate the undrilled mounting holes. When installing a long encoder, mark and drill the first mounting hole near the center of the encoder. This will help balance the weight of the encoder while the holes are being located.

4. Mount a magnetic indicator on the saddle so the indicator probe measures the position of the top of the encoder.

5. Move the saddle through its full range of travel and observe the indicator. The top of the encoder should be parallel to the Y axis movement of the saddle (within 0.002") along its entire length. Use a transfer punch to mark the remaining holes.

6. Drill and tap the remaining #8-32 mounting holes.

7. Install the encoder using the #8-32 screws provided. Tighten the screws just enough to hold the encoder in place.

8. Re-align the encoder. Using a torque wrench, tighten the screws to 24 in-lbs. Do not overtighten the screws.

NOTE: If the encoder is not properly aligned the reader head will not read correctly.

9. Recheck the alignment.

Mounting and Aligning Y Axis Reader Head

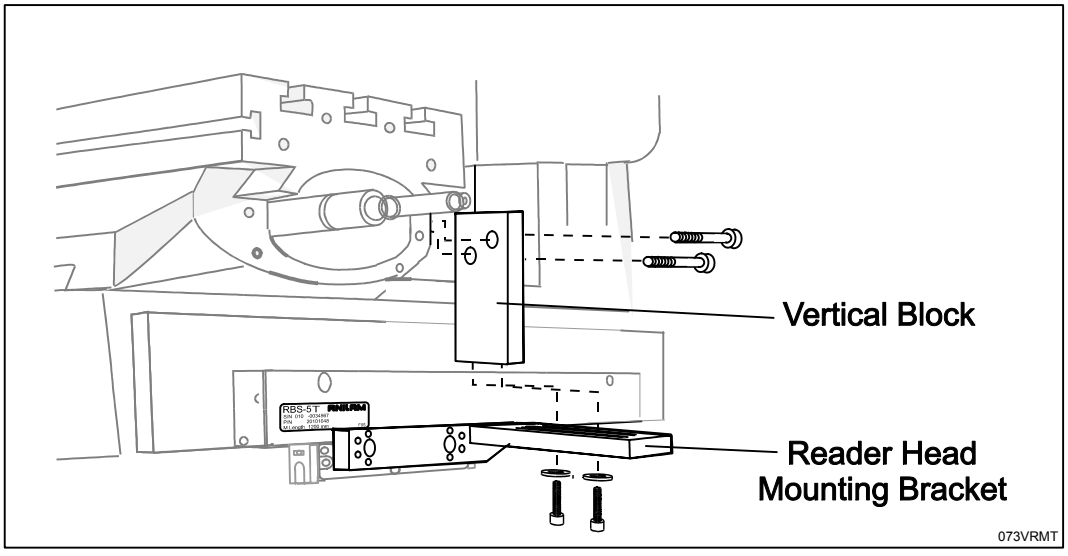

Figure 9, Vertical Block and Reader Head Bracket Installation

1. Refer to **Figure 9, Vertical Block and Reader Head Bracket Installation**. Loosely assemble the vertical block and the reader head bracket to the saddle using the 1/4-20 cap screws and washers provided.

2. Adjust the saddle and the reader head mounting brackets so that the reader head mounting screw holes are aligned.

3. Tighten the hardware holding the vertical block and the reader head bracket to the saddle.

CAUTION: Do not use the reader head mounting screws to pull the reader head flush against the reader head mounting bracket. The reader head must stay aligned with the encoder body. The jack screws hold the reader head away from the reader head mounting bracket when the mounting screws are tightened.

4. Refer to **Figure 10, Reader Head Mounting Hardware.** Place the two nylon self-locking nuts in the cavities on the back side of the reader head. Start the two #8-32 reader head mounting screws into the nuts, but do not tighten.

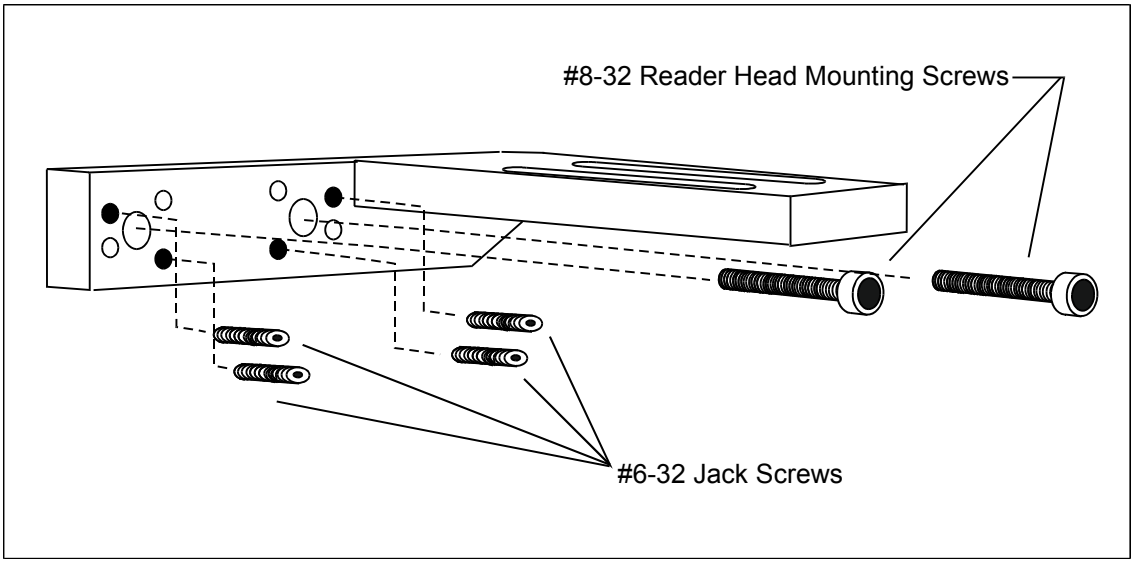

Figure 10, Reader Head Mounting Hardware

5. Start the four jack screws into the reader head mounting bracket. For a standard installation, use the screw pattern shown in **Figure 10, Reader Head Mounting Hardware**. For a custom installation, use any rectangular pattern of screws. Ensure that none of the jack screws are positioned over a cavity or screw head.

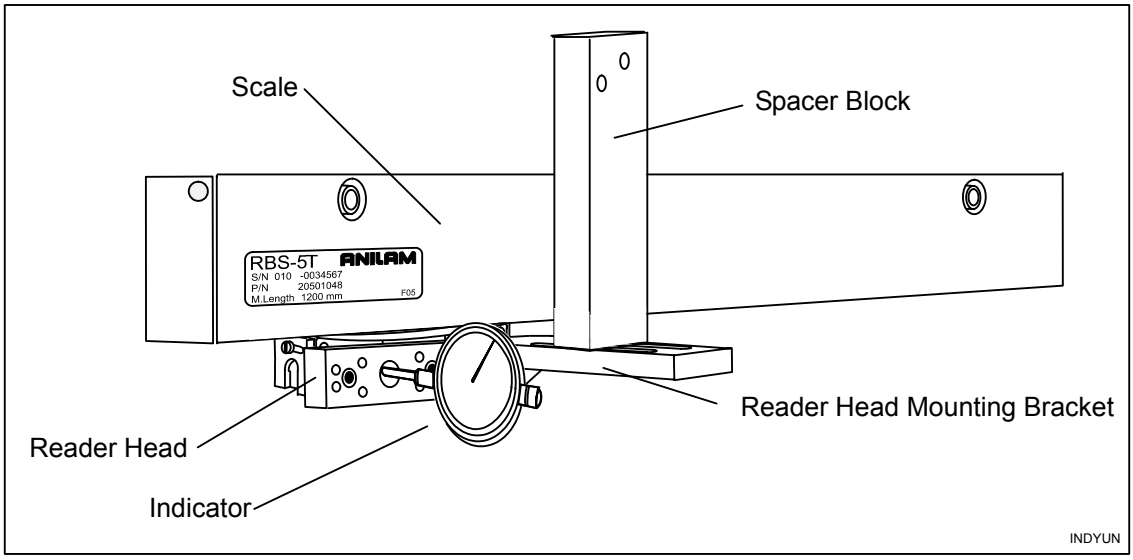

Figure 11, Indicator Setup For Reader Head Alignment

6. **Figure 11, Indicator Setup For Reader Head Alignment**. Set up an indicator to measure the position of the front the reader head.

   Zero the indicator. Screw in the first jack screw until it just contacts the reader head. Continue turning the jack screw until it pushes the reader head 0.001". Do this for each of the four jack screws. The reader head should be about 0.004" away from its original position.

7. Using a torque wrench, tighten the two mounting screws to 24 in-lbs. Tightening the reader head mounting screws should pull the reader head back against the jack screws taking out the 0.004" and restoring its original position.

   If the reader head does not return to within 0.001" of its original position, loosen the mounting screws and repeat the alignment procedure. When repeating the procedure, compensate the adjustments so the reader head returns to its original position when the mounting screws are tightened.

8. Remove the plastic alignment brackets from the reader head.

   NOTE: Save the plastic alignment brackets. If the encoder is ever removed from the machine, it cannot be reinstalled without the reader head alignment brackets.

9. After the installation is complete, perform a second visual inspection of the reader head. Reinstall both end caps.

X Axis Installation (Back Side of Table) Lagun and Bridgeport Machines

No brackets are required to perform an X-axis installation on the back side of the table for either a Bridgeport or Lagun type machine.

Installing and Aligning X Axis Encoder

In this installation, the encoder is mounted to the machined surface on the back side of the table. The reader head extends below the table and is mounted directly to the saddle. When the encoder is placed against the back surface of the table, the saddle should not interfere with the reader head's alignment (when the plastic reader head alignment brackets are installed).

1. Before installing the encoder, remove both end caps and visually check the alignment of the reader head. Verify that the reader head is centered within the housing and is not twisted in any way. Do not reinstall the end caps at this time.

2. Refer to **Figure12, X Axis Encoder Positioning**. Center the X axis encoder along the length of the rear face of the table, with the bottom of the encoder even with the table's bottom. Two bar magnets placed against the lower face of the table way make a good temporary support.

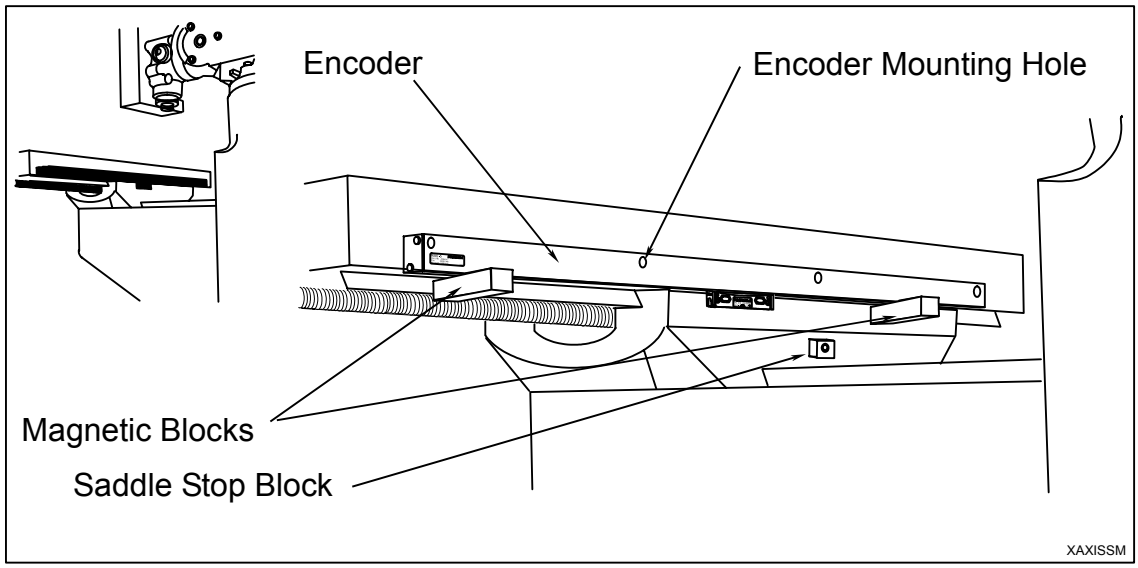

Figure12, X Axis Encoder Positioning

3. Using a transfer punch, locate the encoder mounting screw positions.

4. Drill and tap the required #8-32 X 1/2" (minimum) mounting holes.

5. Mount the encoder using the #8-32 screws provided. Tighten the screws just enough to hold the encoder in place, and still be loose enough to make alignment adjustments.

6. Mount an indicator on the knee and adjust the probe to measure the position of the top of the encoder.

7. Slowly move the X-axis through its entire range of travel while observing the indicator. The top of the encoder should be parallel to the X axis movement of the table (within 0.002") over its entire range of travel.

NOTE: If the encoder is not properly aligned the reader head will not read correctly.

8. Loosen the screws at one end of the encoder, and adjust the position up or down as required for alignment. The play in the mounting holes should provide enough movement.

9. Once aligned, fully tighten the mounting screws.

10. Recheck the alignment.

Mounting and Aligning X Axis Reader Head

1. Move the table to the dead stop position at one end of its range of travel.

2. Slide the reader head as far as it will go in the same direction.

3. Use a transfer punch to locate the position of the two reader head mounting holes on the rear face of the saddle.

4. Drill and tap two #8-32 X 1/2" (minimum) mounting screw holes.

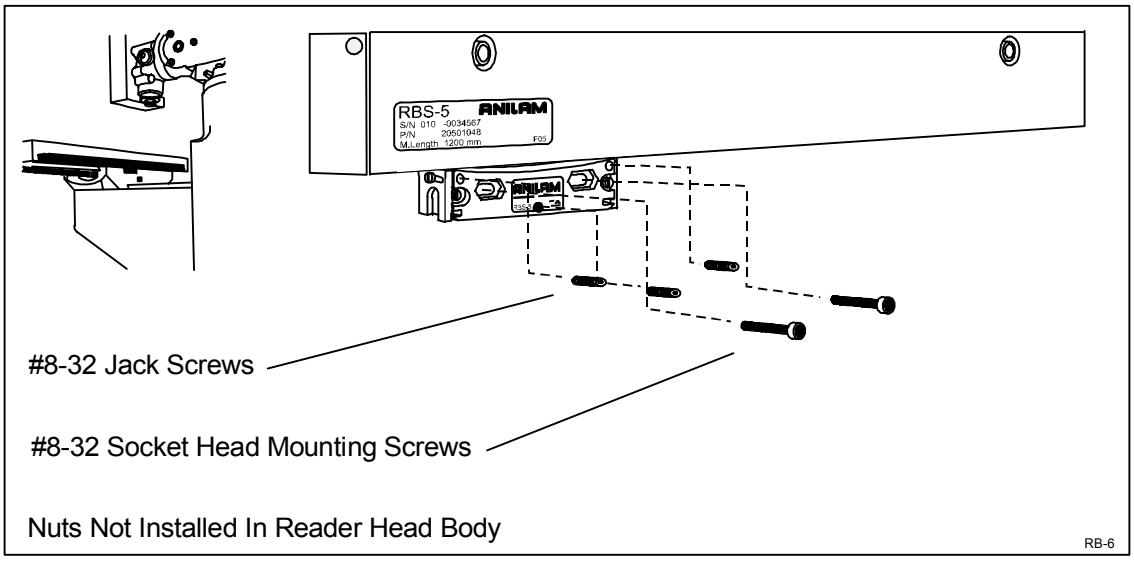

Figure 13, X Axis Back Of Table Reader Head Mount

5. Refer to **Figure 13, X Axis Back Of Table Reader Head Mount**. Set up an indicator so the probe measures the position of the front the reader head.

   Screw in the first jack screw until it just contacts the saddle. Continue turning the jack screw until it pushes the reader head 0.001". Do this for each of the three jack screws. The reader head should be about 0.004" away from its original position.

6. Using a torque wrench, tighten the two mounting screws to 24 in-lbs. Tightening the reader head mounting screws should pull the reader head back against the jack screws taking out the 0.004" and restoring its original position.

   If the reader head does not return to within 0.001" of its original position, loosen the mounting screws and repeat the alignment procedure. When repeating the procedure, compensate the adjustments so the reader head returns to its original position when the mounting screws are tightened.

7. Remove the plastic alignment brackets from the reader head.

   NOTE: Save the plastic alignment brackets. If the encoder is ever removed from the machine, it cannot be reinstalled without the reader head alignment brackets.

8. After the installation is complete, perform a second visual inspection of the reader head. Reinstall both end caps.

9. A saddle stop block should be installed to keep the encoder from accidentally being crushed between the saddle and the machine column. The stop block is a block of metal approximately 1/8" thicker than the encoder. The stop block should be bolted to some position on the rear of the saddle to stop the saddle before the encoder can come in contact with the column.

X Axis Installation (Front Side of Table) Lagun and Bridgeport Type Machines

In this procedure, the encoder is mounted to the machined surface on the forward side of the table. The reader head is bolted to a bracket attached to the front side of the saddle.

Mounting The X Axis Encoder

1. Unbolt and remove the table stop and T bolts from the front surface of the machine table.

2. Reuse the hardware from the table stop to loosely bolt the reader head bracket to the saddle.

3. Before installing the encoder, remove both end caps and visually check the alignment of the reader head, verify that the reader head is centered within the housing and is not twisted in any way. Do not reinstall the end caps at this time.

4. Refer to **Figure 14, X Axis Encoder Positioning**. Temporarily clamp the X axis encoder so it is centered along the length of the table.

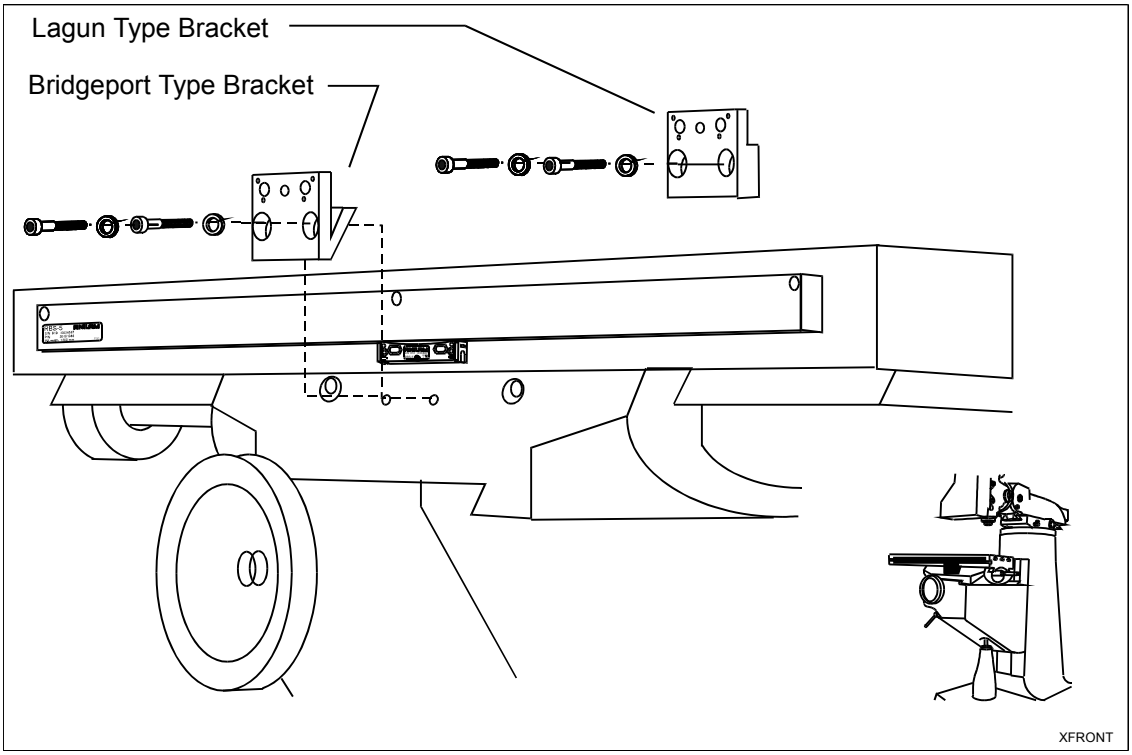

Figure 14, X Axis Encoder Positioning

5. Line up the reader head mounting bracket with the reader head (fit the #8-32 screws through to the reader head).

6. Verify that the reader head will be within 1/4" of the reader head mounting block when the encoder is installed. Adjust the position of the encoder as required for proper alignment.

NOTE: Play in the mounting screw holes only permits about 0.05" of final leveling adjustment. Position the encoder as accurately as possible before marking the mounting screws.

7. Once the encoder is centered and parallel to the table top use a punch to mark the mounting screw positions.

8. Remove the reader head bracket.

9. Drill and tap the required #8-32 X 1/2" mounting holes.

10. Place the two nylon self-locking nuts in the cavities on the back side of the reader head and mount the encoder using the #8-32 screws provided. Tighten the screws just enough to hold the encoder in place.

11. Mount an indicator on the knee and adjust the probe to measure the position of the top of the encoder.

12. Slowly move the X-axis through its entire range of travel while observing the indicator. The top of the encoder should be parallel to the X axis movement of the table (within 0.002") over its entire range of travel.

NOTE: If the encoder is not properly aligned the reader head will not read correctly.

13. Loosen the screws at one end of the encoder, and adjust the position up or down as required for alignment. The play in the mounting holes should provide enough movement.

14. Fully tighten the mounting screws once aligned.

15. Recheck the alignment.

Mounting and Aligning X Axis Reader Head

1. Re-align the reader head bracket with the reader head and bolt it to the saddle.

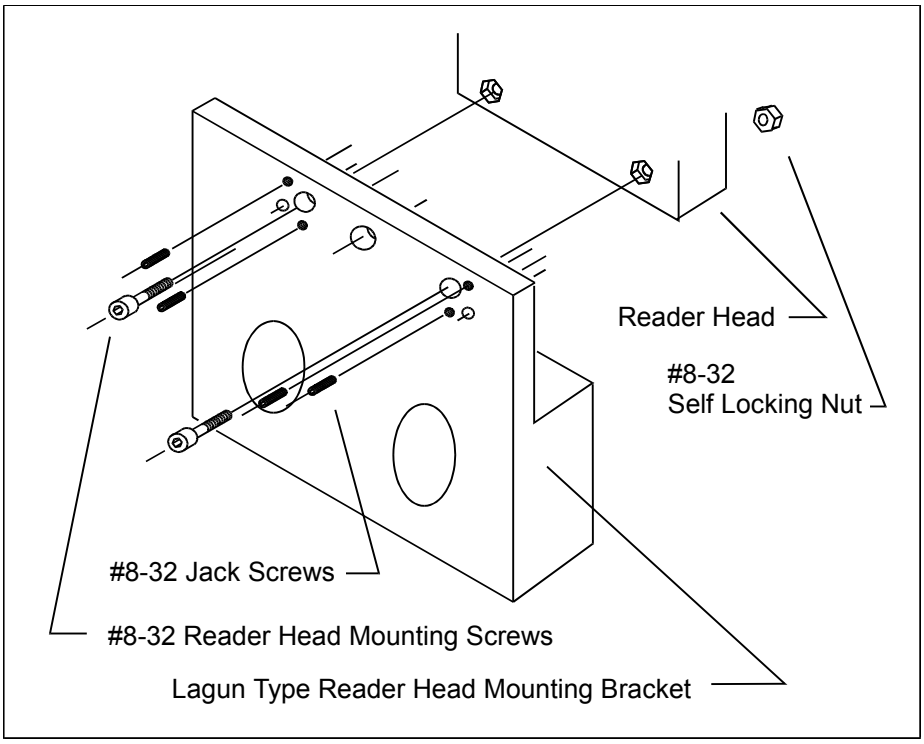

Figure 15, Reader Head Mounting Hardware

2. Refer **Figure 15, Reader Head Mounting Hardware**. Start the #8-32 reader head mounting screws, but do not tighten. Start the four jack screws.

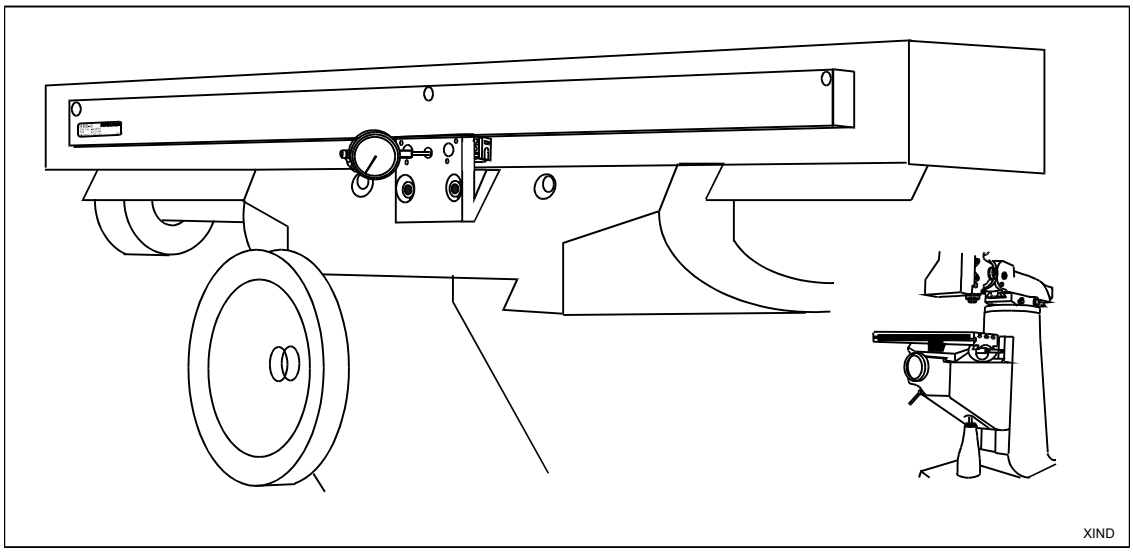

Figure 16, Indicator Setup for Reader Head Alignment

CAUTION: Do not use the reader head mounting screws to pull the reader head flush against the reader head mounting bracket. The reader head must stay aligned with the encoder body. The jack screws hold the reader head away from the reader head mounting bracket when the mounting screws are tightened.

3. Refer to **Figure 16, Indicator Setup for Reader Head Alignment**. Set up an indicator so the probe measures the position of the front the reader head. A hole is drilled in the center of the bracket to provide access for the indicator probe.

   Zero the indicator. Screw in the first jack screw until it just contacts the reader head. Continue turning the jack screw until it pushes the reader head 0.001". Do this for each of the four jack screws. Do not push the reader head more than 0.004" from its original position.

4. Using a torque wrench, tighten the two mounting screws to 24 in-lbs. Tightening the reader head mounting screws should pull the reader head back against the jack screws taking out the 0.004" and restoring its original position.

   If the reader head does not return to within 0.001" of its original position, loosen the mounting screws and repeat the alignment procedure. When repeating the procedure, compensate the adjustments so the reader head returns to its original position when the mounting screws are tightened.

5. Remove the plastic alignment brackets from the reader head.

   NOTE: Save the plastic alignment brackets. If the encoder is ever removed from the machine, it cannot be reinstalled without the reader head alignment brackets.

6. After the installation is complete, perform a second visual inspection of the reader head. Reinstall both end caps.

Lathe Installations

The following kits are required to perform lathe installations:

- Universal Reader Head Mounting Kit (P/N 32500030)
- Lathe Z Axis Backer Bar Kits (P/Ns 32500274, 32500275, 32500276) are Z axis backer bar kits for 95"-120", 65"-90", 42"-60" lathe installations
- Lathe X Axis (Cross Slide) Kit (P/N 32500174) is a standard cross slide installation kit for standard size 12" encoders

Cross Slide (X Axis) Installation

Installation on any specific machine may require custom brackets and some deviation from the steps outlined here.

Regardless of the machine, the encoder must be mounted so the total runout along the face of the encoder never exceeds 0.005". The total runout along the top of the encoder should never exceed 0.002". The encoder should also be mounted so motion within the full range of travel never brings the reader head in contact with the end caps.

All custom brackets should be designed so as not to interfere with any machine accessory that may not be in place at the time of installation.

If possible, the encoder should be mounted away from the head stock.

In a cross slide installation, the backer bar (and encoder) move with the cross slide and the reader head is mounted to a bracket on the carriage.

It is acceptable to cut the backer bar down to fit a specific installation.

Mounting the Backer Bar

1. Refer to **Figure 17, Locating Backer Bar Position.** Move the cross slide to the dead stop position at the front of the machine.
2. Slide the reader head as far as possible to the opposite end of the encoder.
3. Line the forward mounting hole on the encoder with the predrilled #8-32 hole on the backer bar. Hold the backer bar and encoder against the cross slide and determine the best mounting position for the backer bar. Use a punch to mark the location of the backer bar mounting screws.
4. Drill and tap the mounting holes for the #10-32 cap screws.
5. Mount the backer bar using the #10-32 cap screws provided.
6. Mount an indicator so the probe runs along the face of the backer bar.

7. Check that the face of the backer bar is parallel to the cross slide's motion (within 0.005") over its full range of travel. Add shims the backer bar if required.

8. Tighten the backer bar mounting screws.

9. Perform a final check of the backer bar's alignment.

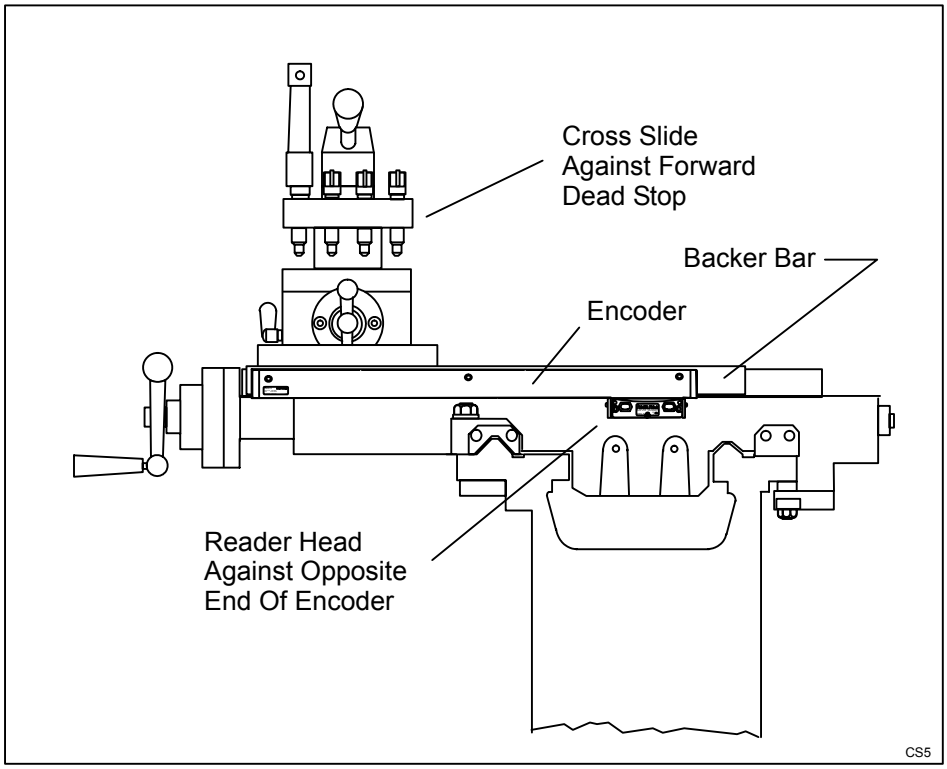

Figure17, Locating Backer Bar Position

Mounting the Encoder

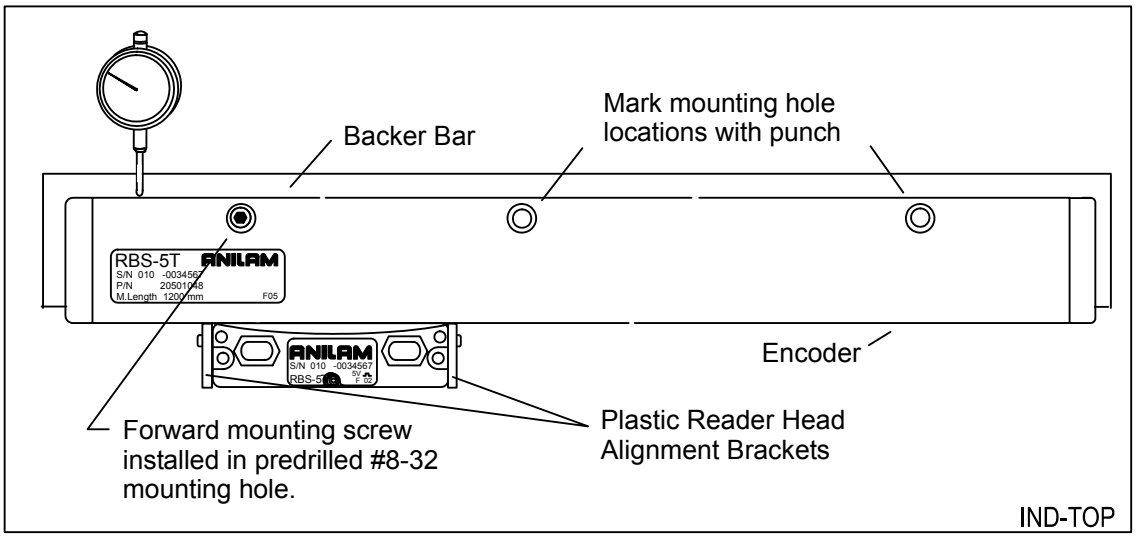

Figure 18, Aligning the Encoder to the Top of the Backer Bar.

1. Refer to **Figure 18, Aligning the Encoder to the Top of the Backer Bar**. Before installing the encoder, remove both end caps and visually check the alignment of the reader head. Verify that the reader head is centered within the housing and is not twisted in any way. Do not reinstall the end caps at this time.

2. Break loose the two screws holding the reader head alignment brackets to the reader head. Re-tighten only enough to keep the brackets in place. They will be removed at the end of the procedure.

3. Place the encoder against the backer bar and install the forward #8-32 mounting screw.

4. Mount a magnetic indicator on the carriage so the indicator probe measures the position of the top of the encoder.

5. Move the cross slide through its full range of travel and observe the indicator. The top of the encoder should be parallel to the movement of the cross slide saddle (within 0.002") along its entire length. Use a transfer punch to mark the remaining holes.

6. Drill and tap the remaining #8-32 mounting holes.

7. Install the encoder using the #8-32 screws provided. Tighten the screws just enough to hold the encoder in place.

8. Re-align the encoder. Using a torque wrench, tighten the screws to 24 in-lbs. Do not overtighten the screws.

NOTE: If the encoder is not properly aligned the reader head will not read correctly.

9. Recheck the alignment.

Mounting the Reader Head

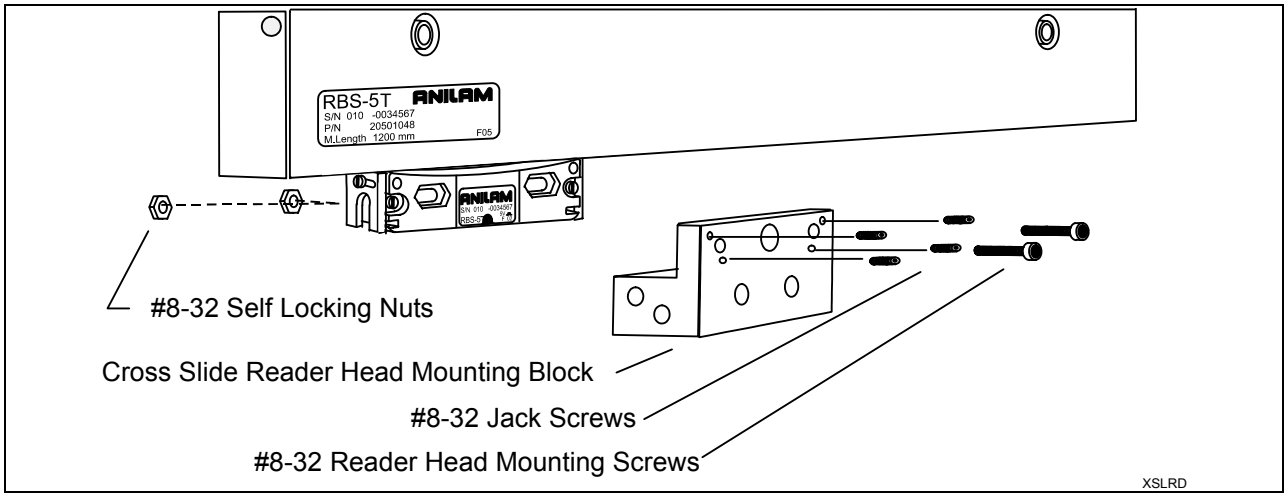

Figure 19, Cross Slide Reader Head Mounting Bracket

The cross slide reader head mounting block can be mounted directly on the carriage or to a spacer block that is mounted to the carriage. The reader head mounting block is drilled to provide two sets of mounting holes. Use the mounting holes best suited for the installation at hand.

The reader head bracket should be at least roughly parallel to cross slide movement along the top and front face. The reader head bracket should be mounted to within 1/4" of the reader head.

CAUTION: The reader head mounting bracket and any additional mounting blocks should provide for proper alignment with the reader head. The reader head mounting brackets should not impose any twisting or pulling load on the reader head.

1. Refer to **Figure 19, Cross Slide Reader Head Mounting Bracket**. Mount the reader head bracket to the carriage (or a spacer block) using the 1/4 in. cap screws provided.

2. Start the #8-32 reader head mounting screws, but do not tighten. Start the four jack screws.

CAUTION: Do not use the reader head mounting screws to pull the reader head flush against the reader head mounting bracket. The reader head must stay aligned with the encoder body. The jack screws hold the reader head away from the reader head mounting bracket when the mounting screws are tightened.

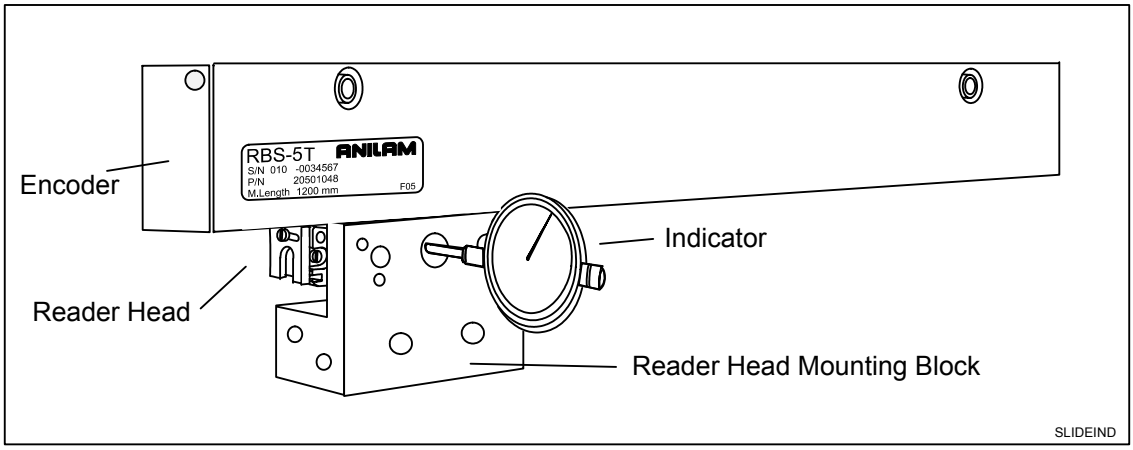

Figure 20, Indicator Setup for Cross Slide Reader Head Alignment

3. Refer to **Figure 20, Indicator Setup for Cross Slide Reader Head Alignment**. Set up an indicator so the probe measures the position of the front the reader head. A hole is drilled in the center of the bracket to provide access for the indicator probe.

   Zero the indicator. Screw in the first jack screw until it just contacts the reader head. Continue turning the jack screw until it pushes the reader head 0.001". Do this for each of the four jack screws. The reader head should be about 0.004" away from its original position.

4. Using a torque wrench, tighten the two mounting screws to 24 in-lbs. Tightening the reader head mounting screws should pull the reader head back against the jack screws taking out the 0.004" and restoring its original position.

   If the reader head does not return to within 0.001" of its original position, loosen the mounting screws and repeat the alignment procedure. When repeating the procedure, compensate the adjustments so the reader head returns to its original position when the mounting screws are tightened.

5. Remove the plastic alignment brackets from the reader head.

   Note: Save the plastic alignment brackets. If the encoder is ever removed from the machine, it cannot be reinstalled without the reader head alignment brackets.

6. After the installation is complete, perform a second visual inspection of the reader head. Reinstall both end caps.

Z Axis Installation

On the Z-axis of the lathe, the backer bar (and encoder) are usually mounted on the back side of the bed. The reader head is mounted to a bracket fixed on the saddle.

This procedure outlines the installation of a Z-axis encoder using one of the optional lathe Z-axis backer bar kits.

On most installations, the bed of the lathe is not a machined surface. To compensate for surface unevenness a backer bar is used. The backer bar is drilled and tapped to accept regularly spaced 1/4-20 internal wrenching jack screws. The backer bar is supported away from the lathe bed on the jack screws. The backer bar mounting bolts oppose the jack screws and hold the backer bar against lathe bed.

When properly installed, the face of the backer bar should be parallel to the Z axis movement of the saddle (within 0.005") along its entire range of movement. Additionally, the face of the backer bar should lie in a single plane (no twisting).

A universal reader head mounting bracket (found in the universal reader head mounting kit) is used with a spacer block to mount the reader head. The backer bar should be mounted so the holes in the reader head will line up with the mounting holes in the reader head mounting bracket when the encoder is installed.

CAUTION: The encoder and reader head should never be positioned so it is possible for the machine to drive the reader head beyond the encoder's range of travel.

Installing and Aligning the Backer Bar

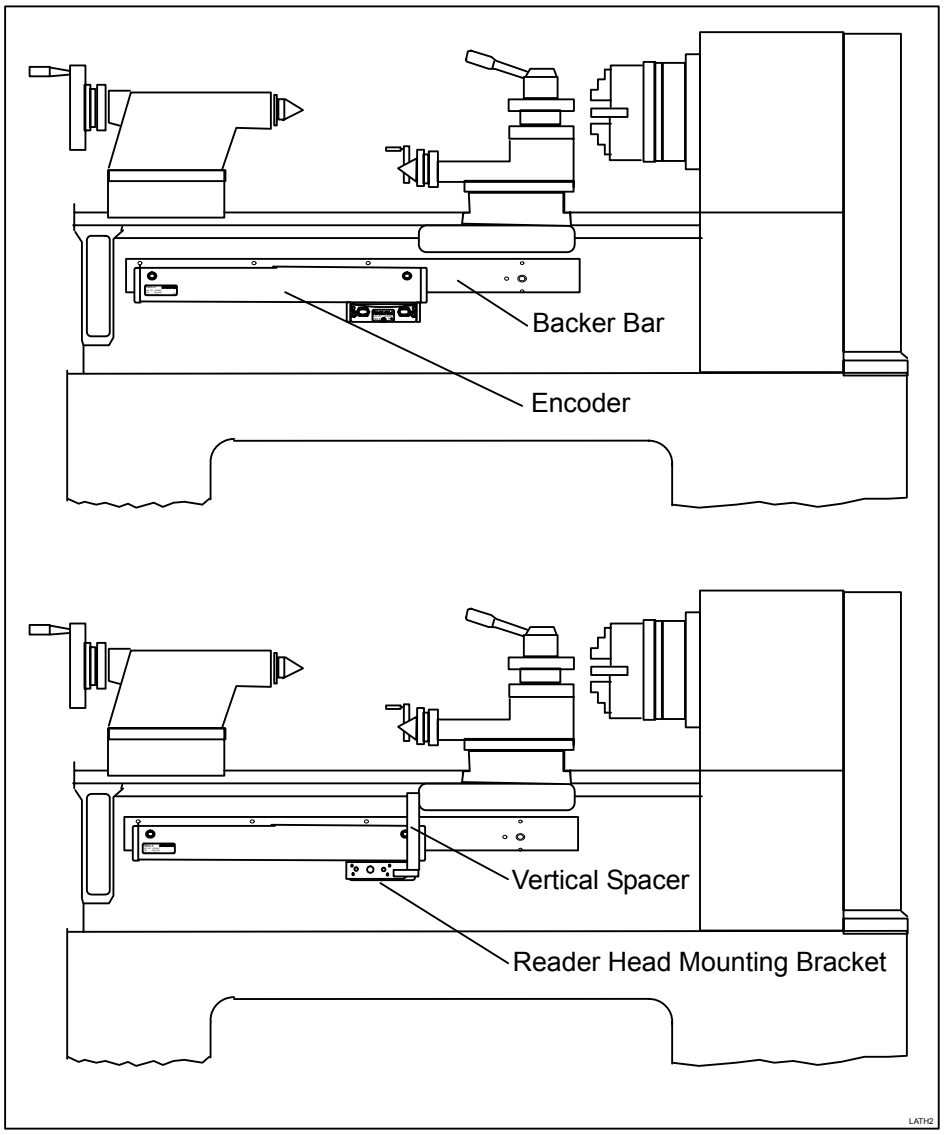

Figure 21, Backer Bar, Encoder, and Reader Head Mount Positioning

Refer to **Figure 21, Backer Bar, Encoder, and Reader Head Mount Positioning**. The backer bar is properly oriented when the mounting bolt counterbore is away from the machine and the pre-drilled #8-32 screw is above the backer bar centerline.

1. Move the carriage to the dead stop closest to the head stock.

2. Slide the reader head as far as possible to the same end of the encoder.

3. Line the forward mounting hole on the encoder with the pre-drilled #8-32 hole on the backer bar. Hold the backer bar and encoder against the back side of the lathe bed and find a backer bar location that will support the reader head will be within reach of the reader head mounting bracket, when it is installed.

4. Use a punch to mark the location of the center backer bar mounting hole. The center is chosen to help balance the weight of the bar.

5. Drill and tap the first 1/4-20 backer bar mounting hole.

6. Install the 1/4-20 set screws and temporarily bolt the backer bar to the lathe. Only snug the mounting hole enough to hold the backer bar in place.

7. Using a bubble level, level the backer bar.

8. Adjust the jack screws so the face of the backer bar is parallel to the Z axis travel of the saddle, within 0.005, along its full length. Ensure the backer bar is not twisted.

9. Use a punch to mark the position of the remaining mounting holes.

10. Drill and tap the remaining 1/4-20 backer bar mounting holes.

11. Remount the backer bar and use the indicator to realign the face of the backer bar.

12. Install and tighten the remaining mounting bolts and jack screws. Adjust the jack screws as required to preserve the alignment of the backer bar.

13. Recheck the alignment.

Installing and Aligning the Encoder

1. Before installing the encoder, remove both end caps and visually check the alignment of the reader head. Verify that the reader head is centered within the housing and is not twisted in any way. Do not reinstall the end caps at this time.

2. Break loose the two screws holding the reader head alignment brackets to the reader head. Retighten only enough to keep the brackets in place. They will be removed at the end of the procedure.

3. Place the encoder against the backer bar and install the forward #8-32 mounting screw.

NOTE: On 12" and 16" installations the forward mounting screw will usually support the encoder long enough to locate the undrilled mounting holes. When installing a long encoder, mark and drill the first mounting hole near the center of the encoder. This will help balance the weight of the encoder while the holes are being located.

4. Mount a magnetic indicator on the carriage so the indicator probe measures the position of the top of the encoder.

5. Move the carriage through its full range of travel and observe the indicator. The top of the encoder should be parallel to the Z axis movement of the carriage (within 0.002") along its entire length. Use a transfer punch to mark the remaining holes.

6. Drill and tap the remaining #8-32 mounting holes.

7. Install the encoder using the #8-32 screws provided. Tighten the screws just enough to hold the encoder in place.

8. Re-align the encoder. Using a torque wrench, tighten the screws to 24 in-lbs. Do not overtighten the screws.

NOTE: If the encoder is not properly aligned the reader head will not read correctly.

9. Recheck the alignment.

Installing and Aligning the Reader Head

Refer to **Figure 22, Universal Reader Head Mounting Bracket.** The universal reader head mounting bracket is packaged with a spacer block. The spacer block must be drilled and bolted to the saddle so the reader head mounting bracket aligns within 1/4" of the reader head.

The bracket can be positioned in front or in back of the reader head. The bracket can also be positioned the right or to the left of the of the spacer block.

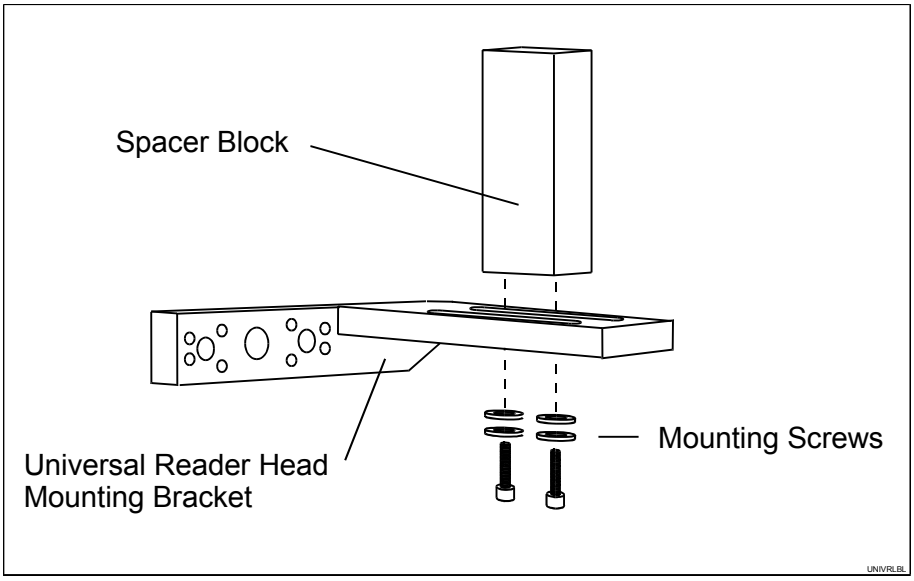

Figure 22, Universal Reader Head Mounting Bracket

When the reader mounting bracket is installed the mounting screw holes should be aligned and within 1/4" of the front or back face of the reader head.

CAUTION: The reader head mounting bracket and any additional mounting blocks should provide for proper alignment with the reader head. The reader head mounting brackets should not impose any twisting or pulling load of any kind on the reader head.

1. Mount the spacer block to the saddle.

2. Mount the reader head bracket to the spacer block using the 1/4-in. mounting screws provided.

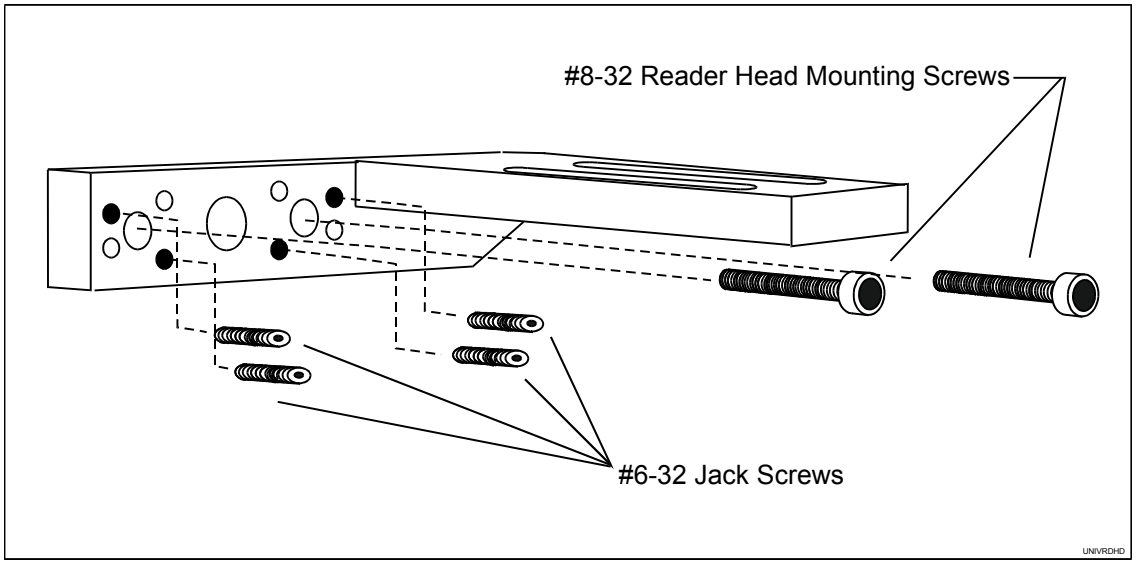

Figure 23, Reader Head Installation Hardware

3. Refer to **Figure 23, Reader Head Installation Hardware**. Start the #8-32 reader head mounting screws, but do not tighten.

   If the reader head mounting bracket is mounted in front of the reader head, start the four jack screws into the reader head mounting bracket.

   If the reader head mounting bracket is positioned behind the reader head, ensure the jack screws in the reader head are installed so there is access to the Allen sockets.

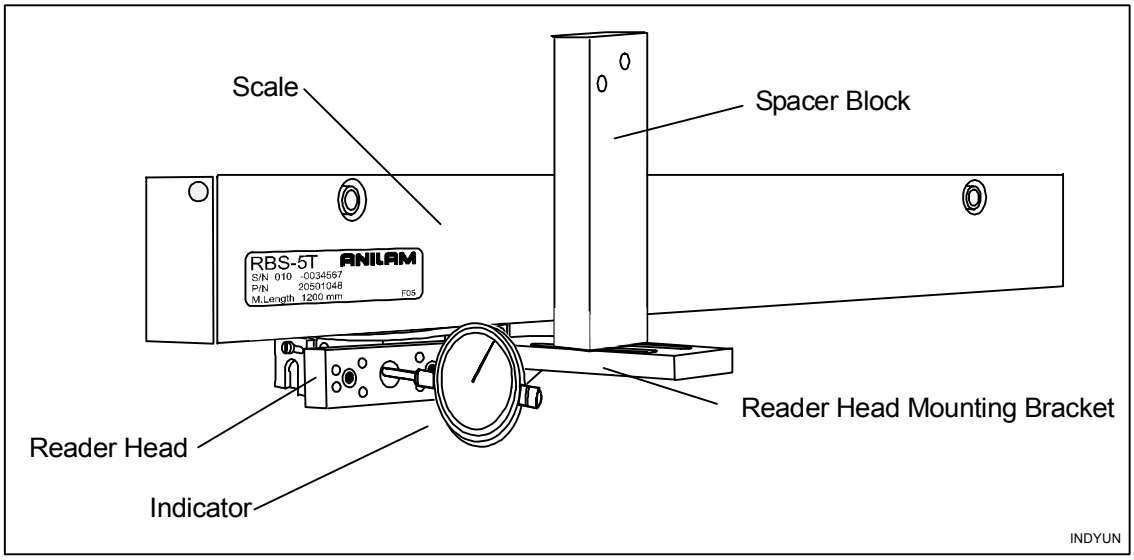

Figure 24, Universal Reader Head Indicator Setup

CAUTION: Do not use the reader head mounting screws to pull the reader head flush against the reader head mounting bracket. The reader head must stay aligned with the encoder body. The jack screws hold the reader head away from the reader head mounting bracket when the mounting screws are tightened.

4. Refer to **Figure 24, Universal Reader Head Indicator Setup**. Set up an indicator so the probe measures the position of the front the reader head. A hole is drilled in the center of the bracket to provide access for the indicator probe.

   Zero the indicator. Screw in the first jack screw until it just contacts the reader head. Continue turning the jack screw until it pushes the reader head 0.001". Do this for each of the four jack screws. The reader head should be about 0.004" away from its original position.

5. Using a torque wrench, tighten the two mounting screws to 24 in-lbs. Tightening the reader head mounting screws should pull the reader head back against the jack screws taking out the 0.004" and restoring its original position.

   If the reader head does not return to within 0.001" of its original position, loosen the mounting screws and repeat the alignment procedure. When repeating the procedure, compensate the adjustments so the reader head returns to its original position when the mounting screws are tightened.

6. Remove the plastic alignment brackets from the reader head.

   NOTE: Save the plastic alignment brackets. If the encoder is ever removed from the machine, it cannot be reinstalled without the reader head alignment brackets.

7. After the installation is complete, perform a second visual inspection of the reader head. Reinstall both end caps.

EDM Installations

The XY axes of many EDM machines are constructed similar to those of a knee mill. The same bracket kits designed for knee mills will work well with an EDM.

Refer to the various knee mill installations described in this document and use the bracket kit and procedures and that best suits the EDM installation. The alignment specifications of all RBS-T encoders and reader heads are the same regardless of the type equipment on which it is installed.

Optical Comparator Installations

The XY axes of many optical comparators are constructed similar to those of a knee mill. The same bracket kits designed for knee mills will work well with an optical comparator.

Refer to the various knee mill installations described in this document and use the bracket kit and procedures and that best suits the comparator in question. The alignment specifications of all RBS-T encoders and reader heads are the same regardless of the type equipment on which it is installed.

Connecting the Linear Encoder

The X and Y-axis cable connectors are both keyed the same way. Be sure to connect each cable to the correct connector (connectors on the back of the DRO are marked with raised letters). Plug the connector into the port and tighten both the thumbscrews until secure. Perform this procedure when also connecting the Computer Numerical Control (CNC).

When routing each cable, position the machine so the reader head is as far away from the Digital Read Out (DRO) as possible. Each cable should be neatly tie-wrapped so enough slack remains to prevent tension anywhere along the cable. Arrange the cable so it cannot be pinched or crushed by any moving parts. Do not drape the cable across open spaces any more than necessary. Avoid putting any sharp bends or kinks in the cable.

CAUTION: Be sure sufficient slack is left in the cables to permit the full range of up and down knee travel.

Testing the Encoder

1. Connect the encoders to an active DRO.
2. Move the table (or saddle) to the dead stop position closest to the machine column.
3. Set the indicator to measure the position of the rear face of the table (or saddle).
4. Set the DRO and the indicator to "0".
5. Cycle the table (or saddle) through its full range of travel and back to the original position as determined by the indicator.
6. Verify the DRO and indicator both read "0" again.
7. Repeat this procedure for the other axis.

NOTE: This procedure can be applied to check encoder accuracy with many setup variations. When checking the encoders, always approach the "0" position from the same direction. This prevents reversal errors. Position errors are usually caused by encoder or head misalignment.

Maintenance and Cleaning

Encoders are precision optoelectronic devices that should be cleaned every 6 to 9 months. A buildup of dirt and debris on the glass can cause the reader head to misread the markings. Clean the glass inside the encoder as follows:

CAUTION: Never insert any metal object or into the encoder body. Never attempt to use any type of abrasive cleaner on the glass inside the encoder.

1. Remove the encoder end caps.
2. Slide the reader head away from the area being cleaned.
3. Using a soft swab soaked in isopropyl alcohol, gently wipe any dirt and debris from both sides of the glass.
4. Reinstall the encoder end caps.

Troubleshooting Guide

All encoders sold by ANILAM are laser checked for accuracy and repeatability prior to shipment. If an encoder fails to operate properly it may be for one of the following reasons.

Problem	Possible Cause	Corrective Action
1. Distance measured is not accurate, but DRO does repeat to zero.	Excessive torque on mounting bolts. Excessive weight on table causing yaw or pitch. Using resolution 0.002 mm or less in uncontrolled temp environment. Lead screw worn. Reader head alignment brackets are still installed.	Verify reader head brackets were removed. Verify encoder and reader head is secure, reinstall plastic alignment brackets and remount, if necessary.
2. DRO does not repeat to zero	All causes listed in 1. – or – Machine gibs are loose. Reader head mounting bracket and / or reader head loose. Faulty reader head.	Verify encoder and reader head is secure. Reinstall plastic alignment brackets and remount, if necessary. Verify machine gibs are properly adjusted. Swap cable connections at DRO to see if problem moves to other axis, replace failed reader head.
3. DRO shows no movement in a specific area of the encoder	All causes listed in 1. – or – Loose encoder mount. Glass inside encoder dirty. Glass inside of encoder scratched.	Verify encoder and reader head is secure. Reinstall plastic alignment brackets and remount, if necessary. Clean glass inside encoder; refer to the "Maintenance and Cleaning" section.
4. DRO shows no movement. Display or fluctuates between 0 and resolution setting.	Reader head over torqued or improperly aligned. Reader head alignment brackets not removed. Cable damaged.	Verify encoder and reader head is secure. Reinstall plastic alignment brackets and remount, if necessary. Swap cable connections at DRO to see if problem moves to other axis, replace failed reader head.
5. DRO only counts in one direction.	Failed reader head.	Replace reader head.

Encoder Replacement Parts

Occasionally a runaway machine overextends its range of travel. This, in turn, causes the reader head to break through the encoder end cap. If the glass inside the encoder is not broken the encoder can be reused. No attempt should be made to force a damaged reader head back on the glass after an accident. Doing so may break the glass. The reader head and encoder end cap must usually be replaced after this type of accident.

The encoder reader head (with cable attached) and the encoder end caps are available as replacement parts. Refer to **Table 3, Reader Head Replacements.**

NOTE: An ANILAM Service Technician should be consulted before replacing the reader head because of a suspected electrical fault.

Table 3, Reader Head Replacements

Replacement Reader Head & Cable Assembly	ANILAM Part Number
1 Micron Reader Head - 4 Meter Cable	19020135
1 Micron Reader Head - 6 Meter Cable	19020136
5 Micron Reader Head - 4 Meter Cable	19020137
5 Micron Reader Head - 6 Meter Cable	19020138

NOTE: Reader heads with custom cable lengths are available as special order items.

Replacing A Reader Head

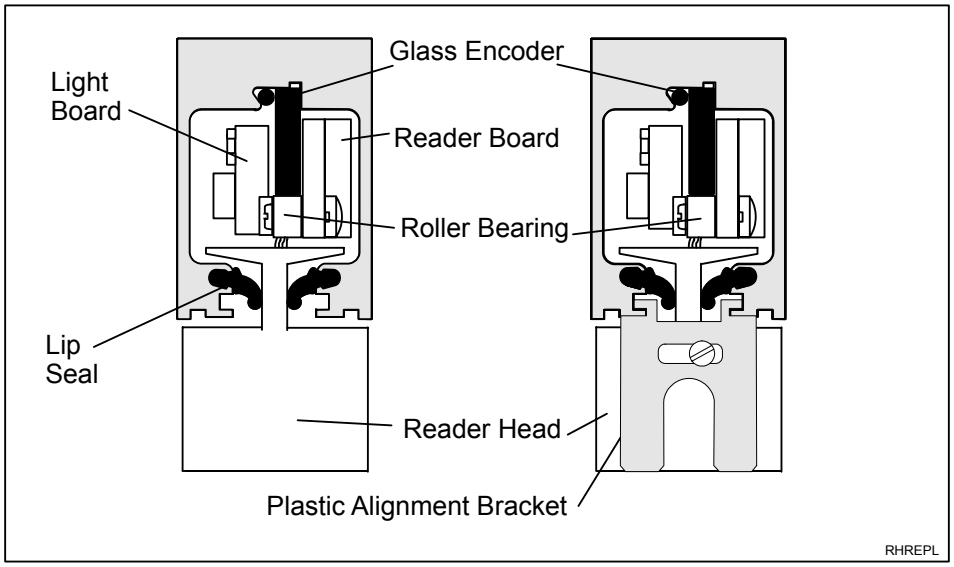

Figure 25, Reader Head and Encoder Cross Section View

When replacing a reader head, perform the following steps:

1. Turn console power off.
2. Reinstall the two plastic reader head alignment brackets using the screws that came with the encoder.
3. Remove the reader head mounting bolts (head should slide freely along the encoder).
4. Remove one encoder end cap.
5. Slide reader head out (with alignment brackets attached).
6. Refer to **Figure 25, Reader Head and Encoder Cross Section View**. Carefully install the new reader head (with plastic alignment brackets attached) as shown. If the new reader head hangs up on the way in, do not force it. Gently correct the alignment until the reader head glides into the encoder body.
7. Align the reader head as described in the appropriate installation procedure.
8. Remove and store reader head alignment brackets.
9. Replace end cap.

Installation Kit Parts

Lagun X and Y Axis Knee Mill Kit (P/N 32500073)

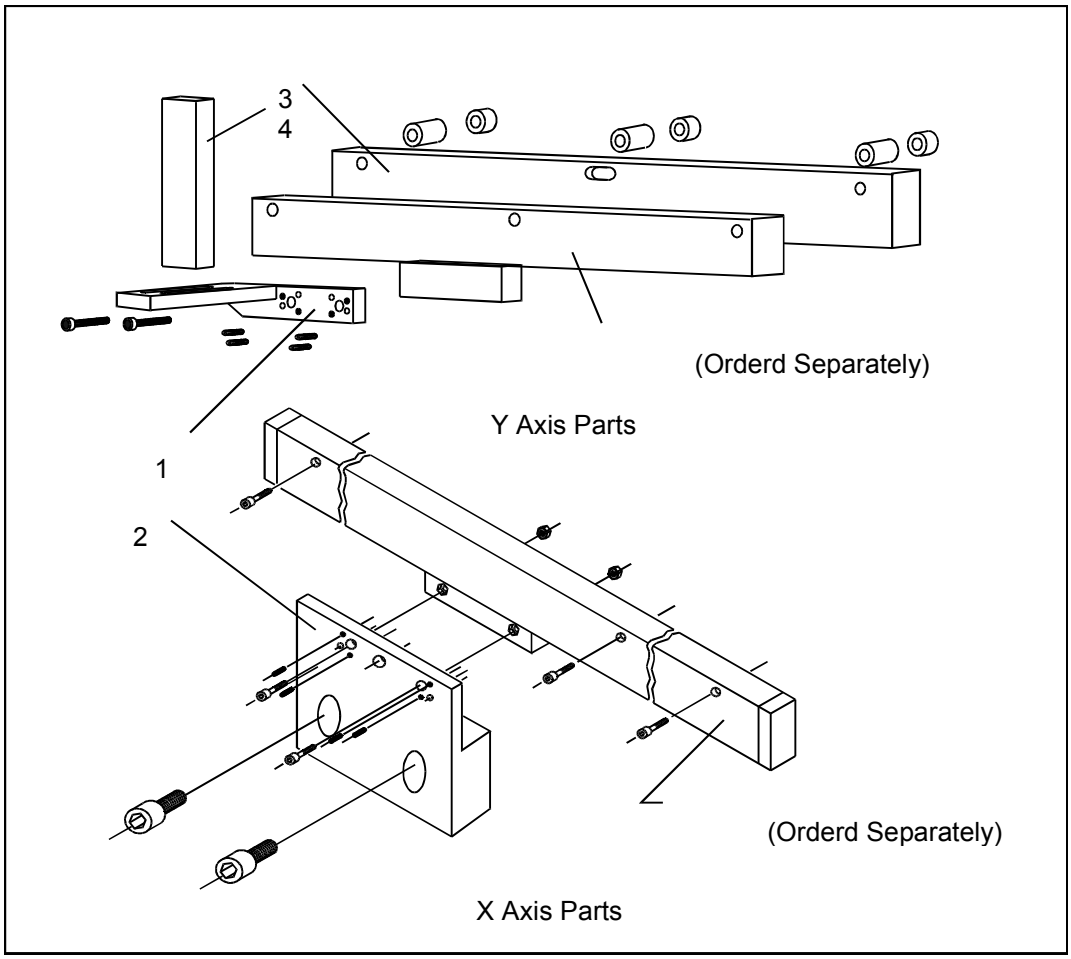

Figure 26, Lagun Type Encoder Mounting Kit

Table 4, Lagun Type Encoder Mounting Kit Parts

Item No.	Description	Kit Quantify
23 -		
1	Bracket, Y axis reader head	1
2	Bracket, X axis reader head	1
3	Bar, backer, 16"	1
4	Spacer block	
	* Hardware not listed.	

Bridgeport X and Y Axis Knee Mill Kit (P/N 32500108)

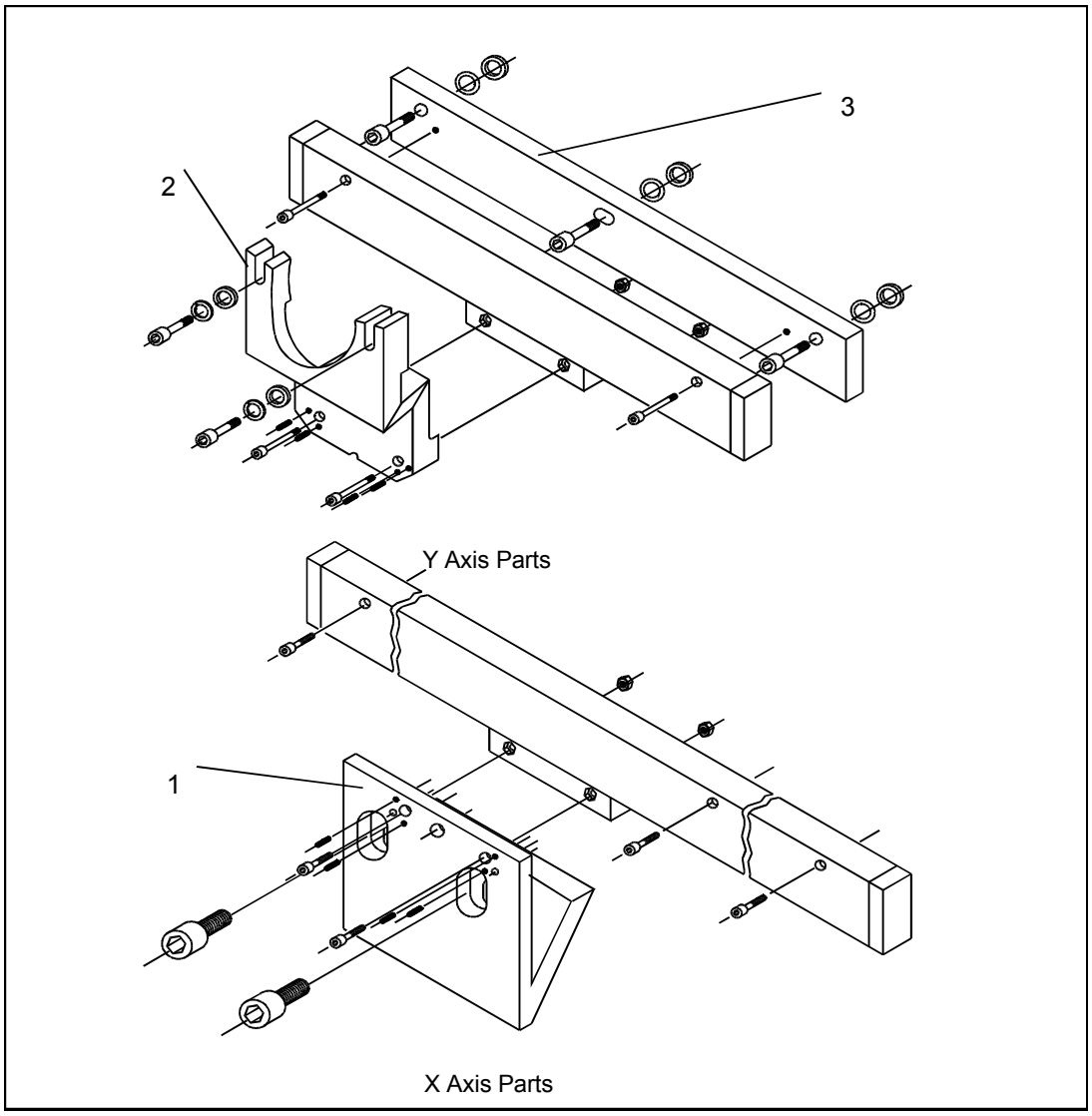

Figure 27, Bridgeport Type Encoder Mounting Kit

Table 5, Bridgeport Type Encoder Mounting Kit Parts Listing

Item No.	Description	Kit Quantify
24 -		
1	Bracket, X axis reader head	1
2	Bracket, Y axis reader head	1
3	Bar, backer, 16"	1
	* hardware not listed.	

Lathe X Axis (Cross Slide) Kit (P/N 32500174)

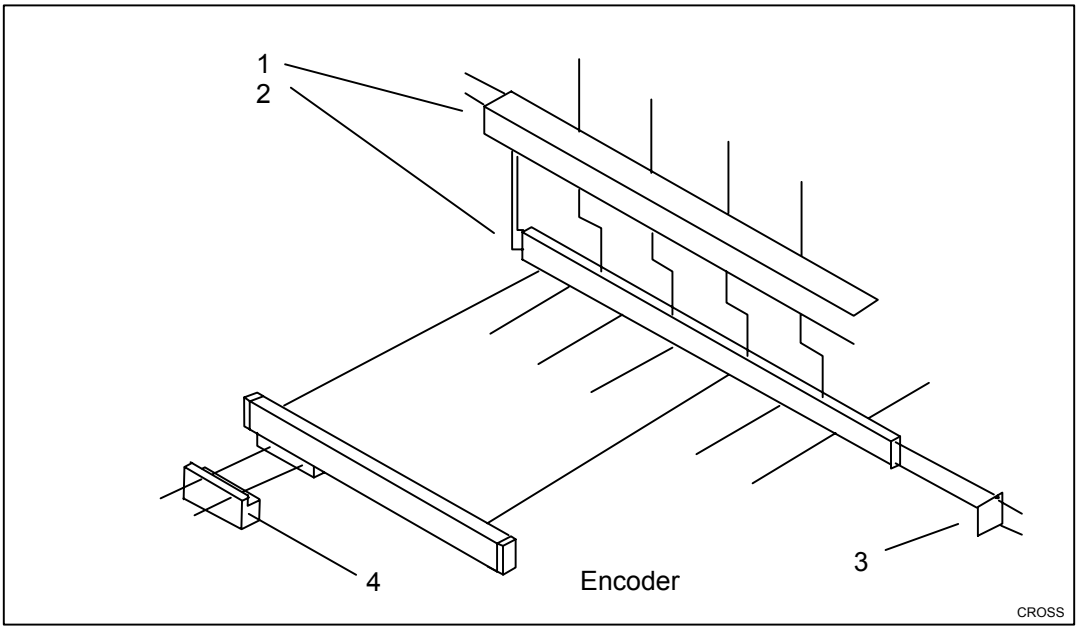

Figure 28, Lathe Cross Slide Mounting Kit

Table 6, Lathe Cross Slide Encoder Mounting Kit Parts Listing

Item No.	Description	Kit Quantify
1	Cover	1
2	Bar, backer	1
3	Cap, end	1
4	Bracket, X axis reader head	
	* hardware not listed.	

Lathe Z Axis Backer Bar Kits
(42"- 60"P/N 32500276, 65"- 90"P/N 32500275, 95"- 120" P/N 32500274)

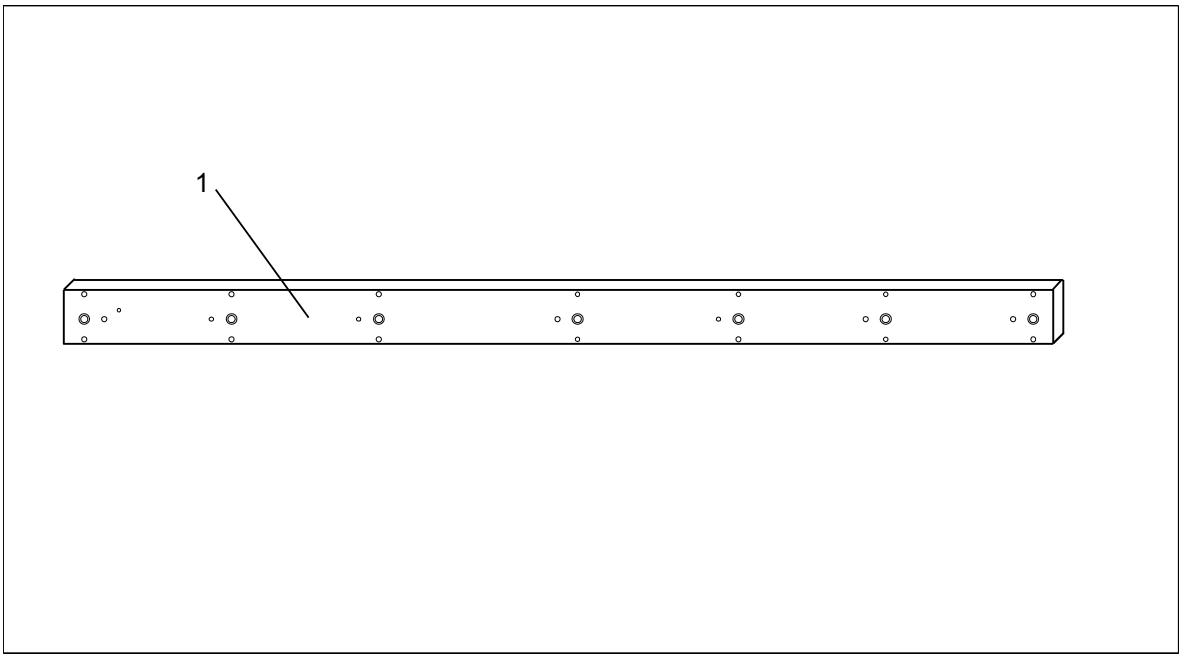

Figure 29, Lathe Z Axis Backer Bar Kit

Table 7, Lathe Z Axis Backer Bar Kit Parts Listing

Item No.	Description	Kit Quantify
1	Bar, backer * hardware not listed.	1

Universal Reader Head Mounting Kit (P/N 32500030)

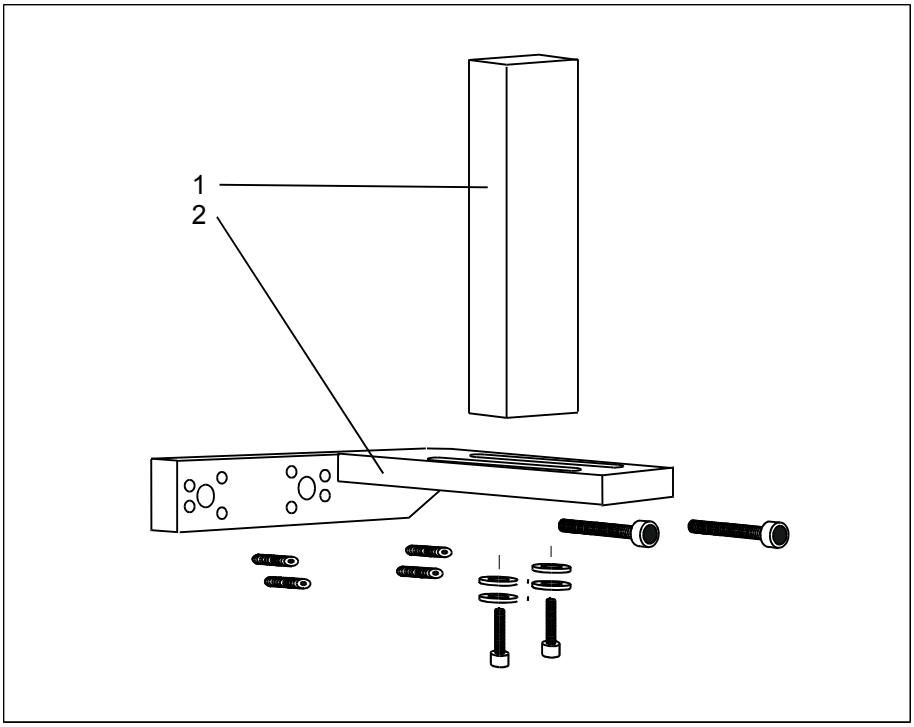

Figure 30, Universal Reader Head Mounting Kit

Table 8, Universal Reader Head Bracket Kit Parts Listing

Item No.	Description	Kit Quantify
1	Block, spacer	1
2	Bracket, universal, reader head	1
	* hardware not listed.	

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