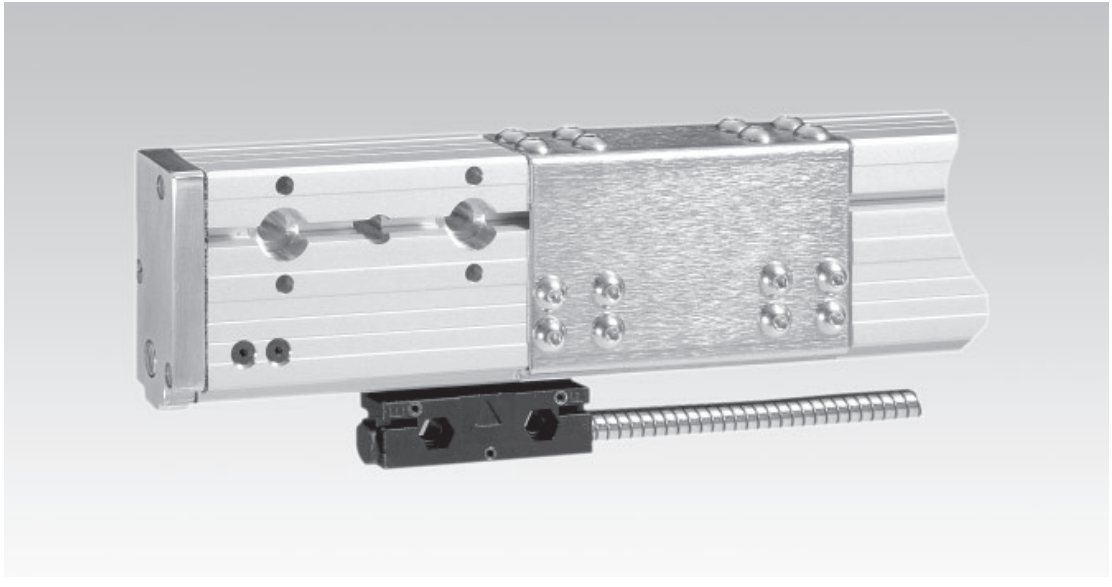
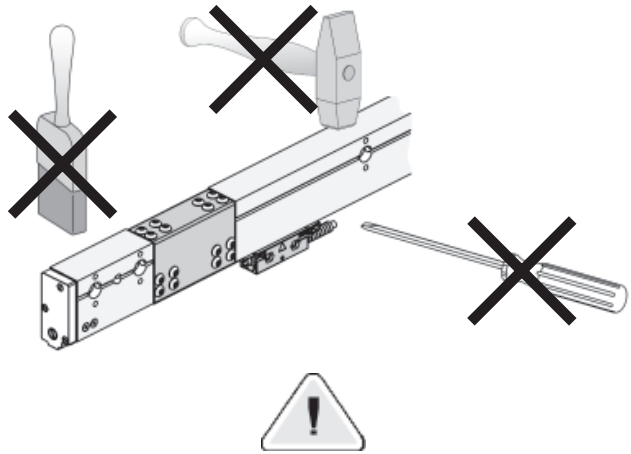
ENC 250™ SINGLE SECTION

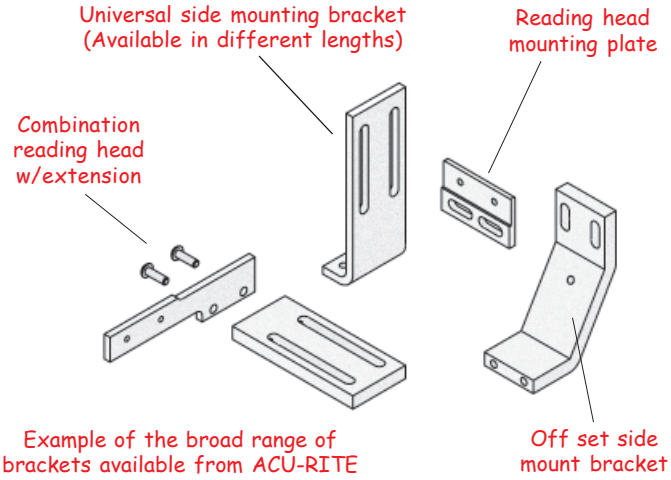


REFERENCE MANUAL

ACU-RITE®



Brackets ...



The ENC 250 linear encoder provides the accuracy and reliability of an ACU-RITE measuring system with digital output. Features and options include:

- Resolution of 5µm.
- Accuracy grade of +/-15µm/M.
- 2 ft. armor cable and extension cables up to a maximum of 75 ft for a VRO; 35 ft for a DRO.
- Mounting hardware
- Brackets and accessories

Contact your Authorized ACU-RITE Distributor for a complete list of other products and accessories.

For future ordering information or warranty service, record the linear encoder catalog number located on the scale assembly tag, and the serial number from the reading head tag.

	Catalog No.	Serial No.
Axis:	_____	_____

Tape tension value: _____

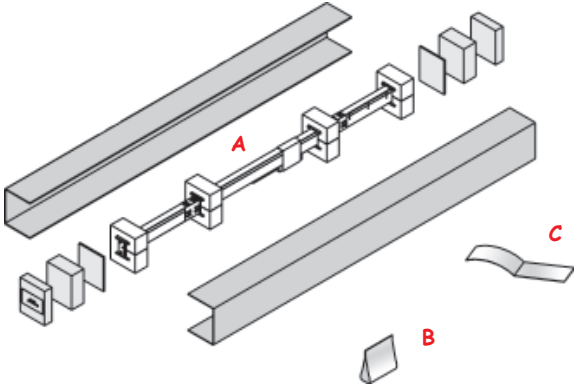
Date of purchase: _____

Distributor: _____

Address: _____

Telephone: _____

Contents ...

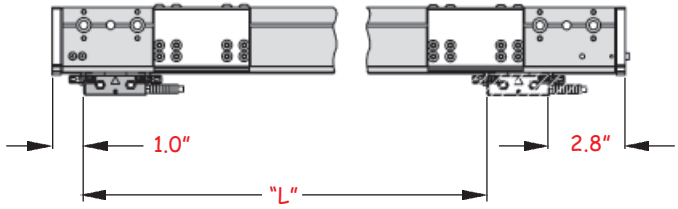


A) ENC 250 Linear Encoder
B) Encoder mounting hardware
C) Reference Manual

Please follow these preparation guide lines.

- Understand your mounting requirements.
- Mount with lip seals down and away from the work area.
- Brackets should be kept as short as possible and rigid.
- Surfaces must be in good condition, clean, and free of dirt. Remove paint from machined mounting surfaces.
- ⚠ **Alignment brackets must only be removed as instructed.**

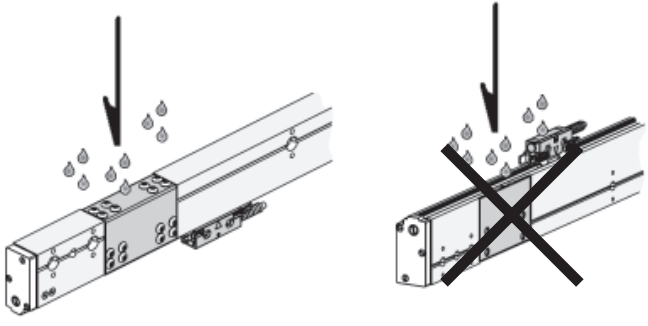
Measuring length ...



"L" = Meauring length + 2.0" nominal over travel
Travel is limited by stops at each end of scale

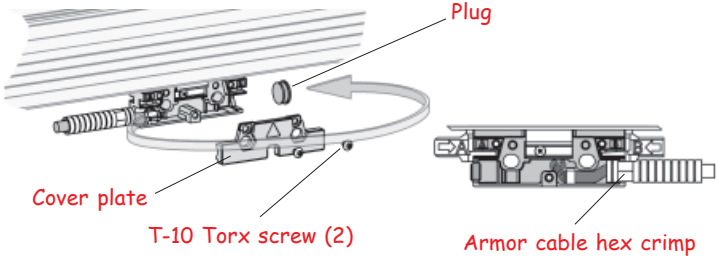
- Machine travel can not exceed the encoder measuring length.
- Either limit machine travel or obtain correct length scale.

Coolant spray ...



- Encoder lip seals to face away from coolant spray.

Changing cable exit direction ...

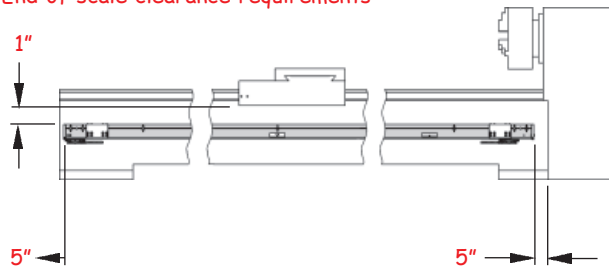


- Determine the cable exit direction before installing the encoder.
- To change the cable exit direction; remove the cover plate and rotate the cable 180°.

Use this information to plan your Linear Encoder installation.

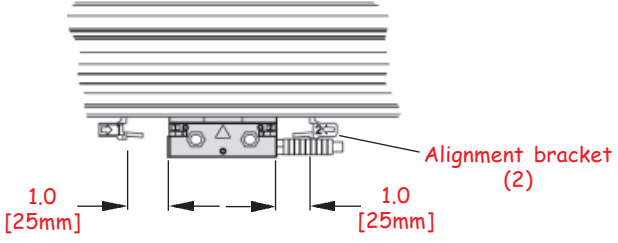
- Mount the linear encoders close to machine guide ways to ensure system accuracy.
- Space between reading head casting and mounting bracket or surface must not exceed .188".

End of scale clearance requirements

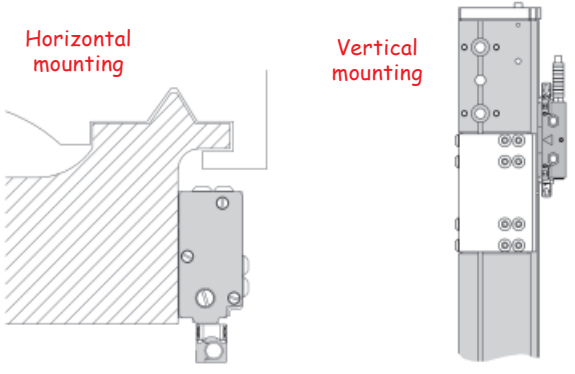


- 1" of clearance is required above the scale case top surface for access to the expansion cover fasteners.
- A minimum clearance of 5" is required at each end of the scale case.

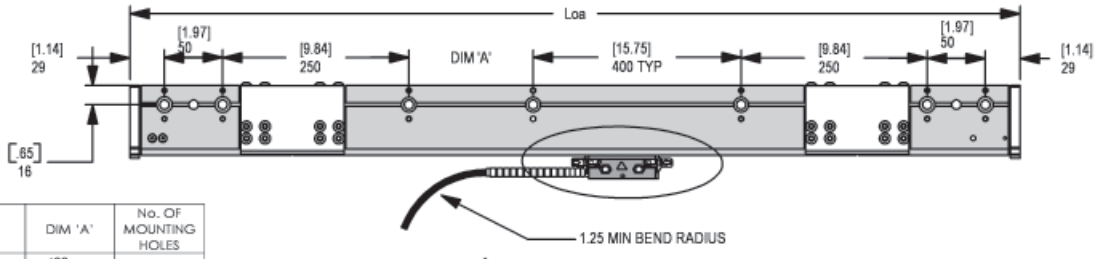
Alignment bracket removal clearance



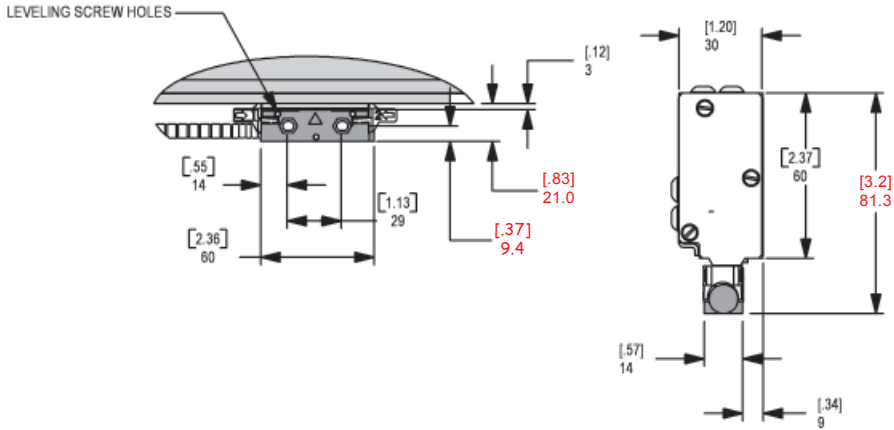
- Allow clearance for alignment bracket removal.
- ⚠ **Alignment brackets must not be removed until instructed.**



- Mount encoder in a horizontal or vertical position as shown.
- **Do not mount flat or inverted.**



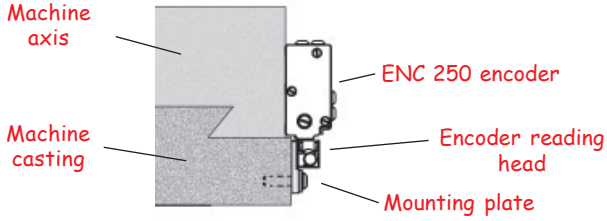
PART NUMBER	MEASURING LENGTH	OVERALL LENGTH LOA	DIM 'A'	No. OF MOUNTING HOLES
385352-50127	3240mm 127"	3458mm 136.14"	400mm 15.748"	12
385352-50135	3440mm 135"	3658mm 144.02"	200mm 7.874"	13
385352-50143	3640mm 143"	3858mm 151.89"	400mm 15.748"	13
385352-50151	3840mm 151"	4058mm 159.76"	200mm 7.874"	14
385352-50159	4040mm 159"	4258mm 167.64"	400mm 15.748"	14
385352-50167	4240mm 167"	4458mm 175.51"	200mm 7.874"	15
385352-50174	4440mm 174"	4658mm 183.39"	400mm 15.748"	15
385352-50183	4640mm 183"	4858mm 191.26"	200mm 7.874"	16
385352-50190	4840mm 190"	5058mm 199.13"	400mm 15.748"	16
385352-50198	5040mm 198"	5258mm 207.01"	200mm 7.874"	17
385352-50206	5240mm 206"	5458mm 214.88"	400mm 15.748"	17
385352-50214	5440mm 214"	5658mm 222.76"	200mm 7.874"	18
385352-50222	5640mm 222"	5858mm 230.63"	400mm 15.748"	18
385352-50230	5840mm 230"	6058mm 238.5"	200mm 7.874"	19
385352-50237	6040mm 237"	6258mm 246.38"	400mm 15.748"	19



A variety of mounting conditons can be accommodated.

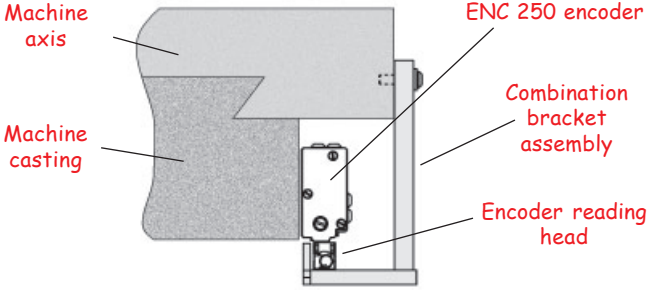
- The machine configuration determimes the brackets required to install the encoder.
- Two typical mounting conditions are shown; reading head mounting plate, and a three piece combination assembly for mounting the reading head to the machine.
- The 8-32 SHCS for mounting the reading head is a standard low head style fastener, supplied with the mounting hardware.
- The shipping bolts (M5 hex head) must be removed from the expansion covers prior to beginning the installation.
- Tool requirements are listed on page 18.

Reading head mounting plate ...



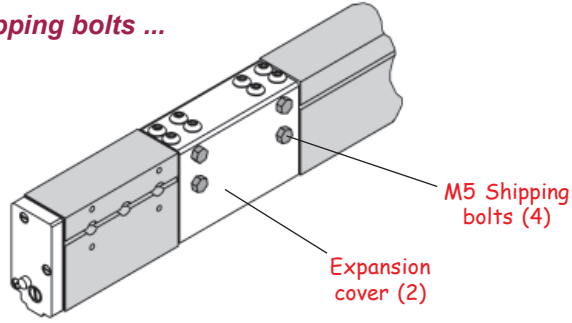
- The mounting plate typically applies to surfaces that are flush, or slightly offset.

Three piece combination bracket ...



- This combination typically applies to a lathe where the cross feed over hangs the bed mounting surface.
- A wide range of combination lengths are available.

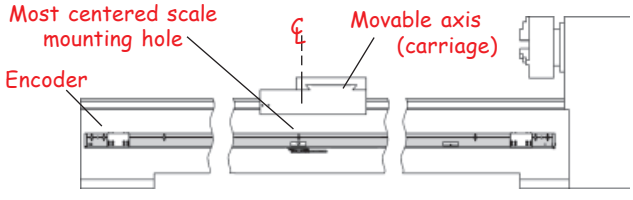
Shipping bolts ...



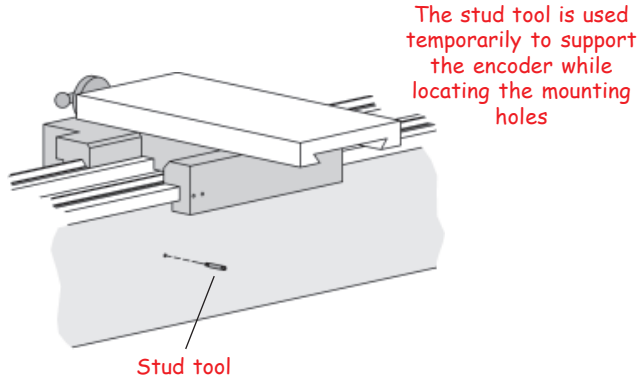
- Remove the M5 shipping bolts prior to encoder installation.

These steps apply to all mounting conditions. Although this may not pictorially represent your application, your installation procedure should follow these steps.

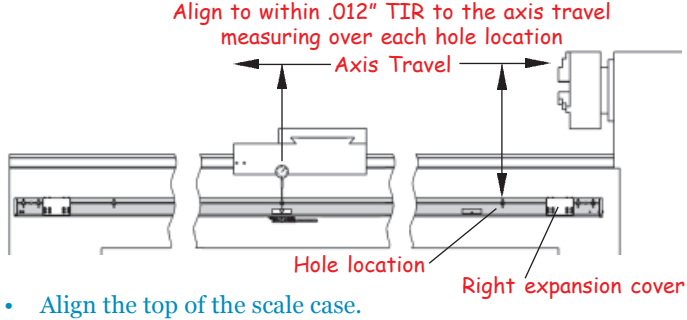
- Adjust drill depths and fastener lengths as required.
- When instructed on page 10, adjust the leveling set screws as follows:
  1. Insert, but do not tighten the 8-32 reading head screws.
  2. Use a .001-.003" shim between the leveling set screws and mounting surface.
  3. Adjust each set screw until a slight drag is felt on the shim.
  4. Evenly tighten the 8-32 reading head mounting screws.
- Contact your Authorized ACU-RITE Distributor should you require additional assistance.



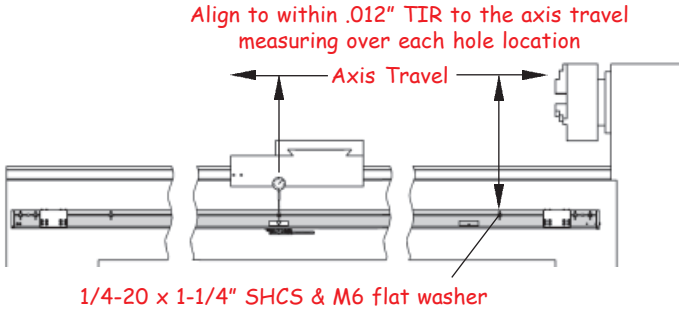
- Move the machine axis to its center of travel.
- Hold the encoder to the intented mounting location, and position for the required clearances. Allow minimal distance required for the reading head brackets.
- Mark the "most centered" scale mounting hole location to the machine with a center punch.
- Remove encoder, drill / tap location for a 1/4-20 x 1/2" deep.



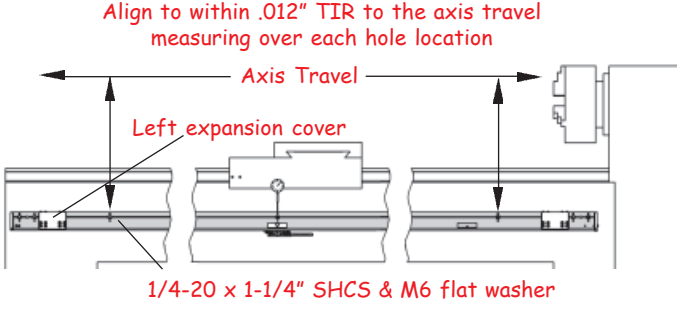
- Attach the 1/4-20 installation stud tool.
- Slide the scale case onto the stud at the same hole location.



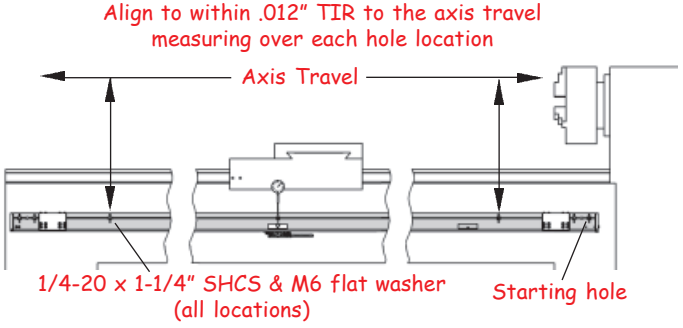
- Align the top of the scale case.
- Transfer punch the furthest right mounting hole location before the expansion cover.
- Allow the scale to swing down, drill / tap location for a 1/4-20 x 1/2" deep.



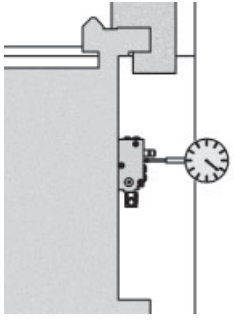
- Attach and align the top of the scale case. Secure the fastener.



- Align the furthest left mounting hole before the expansion cover with the furthest right attached hole.
- Transfer punch the left hole location.
- Drill / tap location for a 1/4-20 x 1/2" deep.
- Attach the left end, and align the top of the scale case. Secure the fastener.



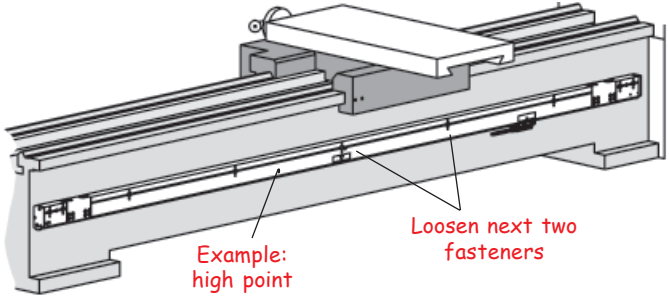
- Starting at the right end, align the top of the scale case, and transfer punch each remaining hole location.
- **Remove scale**, drill / tap locations for a 1/4-20 x 1/2" deep.
- Attach the scale case, align to within .012" TIR, & secure all fasteners. **Note:** Replace stud with fastener.



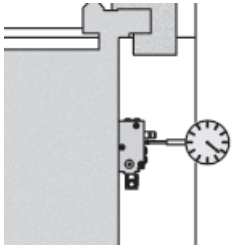
Run an indicator along the front face to locate the high point.

Mark the location, and set the indicator to 0.000"

- Align the front face of the scale case to within .012" TIR of the axis travel following the next steps.



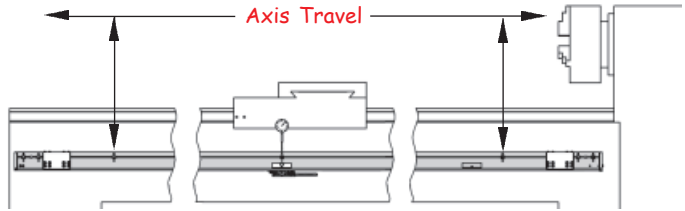
- Loosen the next two fasteners to the right of the high point.
- Move indicator to the first hole location, insert two M3 x 25mm SHSS (leveling set screws).
- Use the leveling screws to align the face to within .012" to the high point along the axis travel and secure the fastener.



Run indicator along the front face to align scale case to within .012" to the axis travel

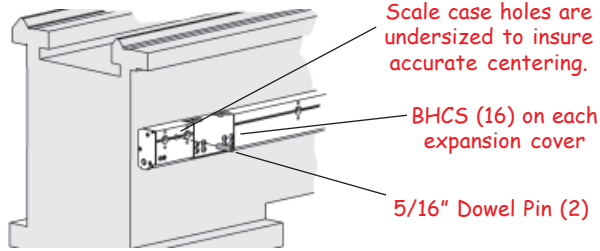
- Move indicator to the next hole location, and loosen the next fastener to the right of that fastener. Align this location.
- Repeat the previous steps to align the face at each fastener.
- Return to the high point, and use the same procedure working to the left end.

Align to within .012" TIR to the axis travel measuring over each hole location



- Recheck the scale case top alignment, by starting at the center hole location, and adjust as necessary.

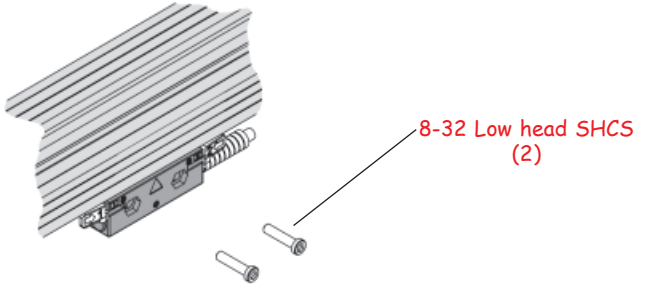
Dowel pin anchoring ...



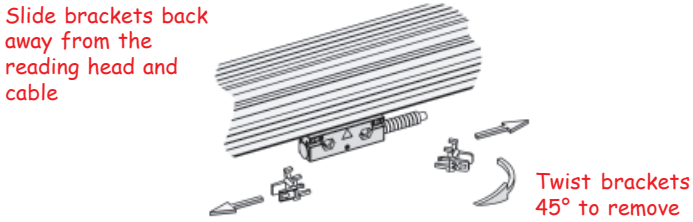
- Drill a .302" diameter hole through the dowel pin hole locations at each end of the scale case.
- Use a .312 reamer to provide a press fit.
- Insert the dowel pins at each end, with the threaded holes facing outward.
- Loosen the BHCS (16) on each expansion cover, approximately 1/8 turn each.

Universal brackets are available from ACU-RITE for mounting the reading head. ENC 150 & ENC 250 encoders use most of the same reading head brackets.

Custom designed brackets by the installer should be solid, rigidly assembled components, attached to the machine with 1/4-20 fasteners minimum.

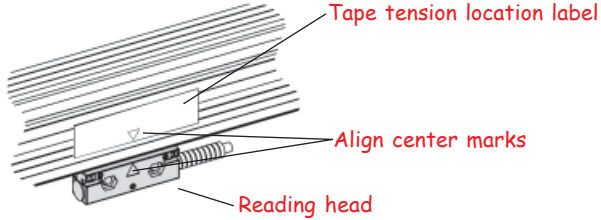


- Return the machine axis to its center of travel.
- Align the center marks on the reading head and scale case by sliding the reading head and brackets along the case.
- Locate and attach the reading head brackets to the machine.
- Align the bracket mounting holes with the reading head holes, and secure brackets in place.
  Insert the 8-32 SHCS, BUT DO NOT TIGHTEN.

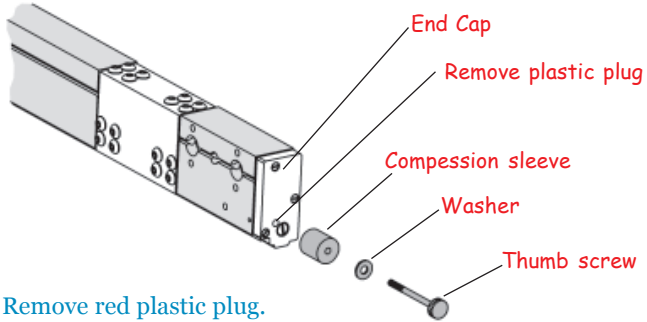


- Follow the procedure on page 7 to attach the reading head to the bracket.
- Use allen wrench from set screw adjustment to slide alignment brackets away from the reading head.
- Remove alignment brackets and save with this manual.
- Move the axis through its full travel. Confirm that the assembly does not interfere with the machine movement.

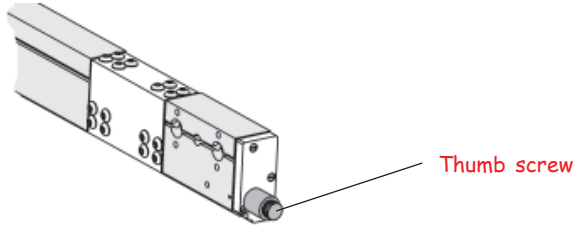
Tape Tensioning ...



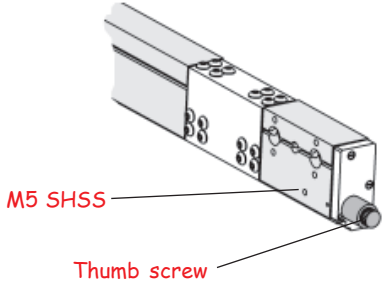
- Move the reading head to the tape tensioning position.
- Temporarily attach the reading head cable to the readout.
- Follow the readout manual's instructions for set up, and set the encoder and display resolution to .005mm. Set the readout in metric mode.



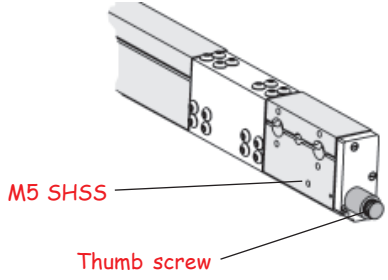
- Remove red plastic plug.
- Insert the thumb screw through the washer, compression sleeve, and into the end cap hole.
- Thread the screw into the holder inside the end cap, but do not tighten.



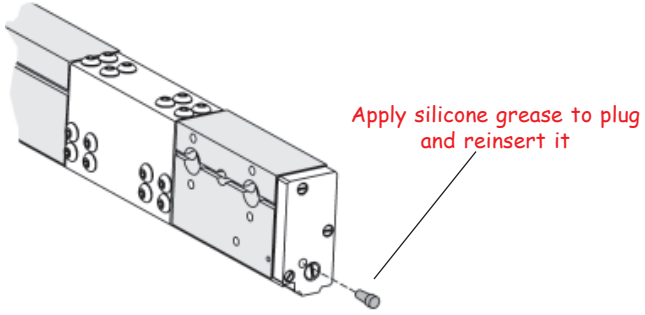
- Tighten the screw until the readout display reads approximately .05mm.
- Back off the screw until the display stops changing.
- Reset readout to zero and repeat the procedure two more times. This relaxes the tape before setting the tension.



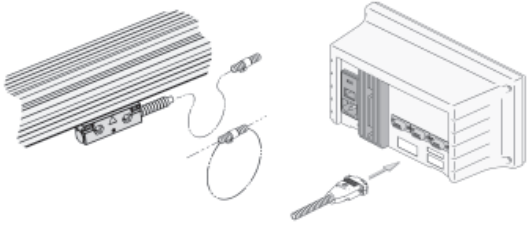
- Completely loosen the M5 SHSS, but do not remove.
- Position the readout so that it can be seen while adusting the thumb screw head.
- Insure that the readout is in metric mode.



- Refer to the tensioning value listed on the label on the case.
- Slowly tighten the screw until the display reaches the tensioning value.
- Fully tighten the M5 SHSS (30-lb-in [3.4N m]) .



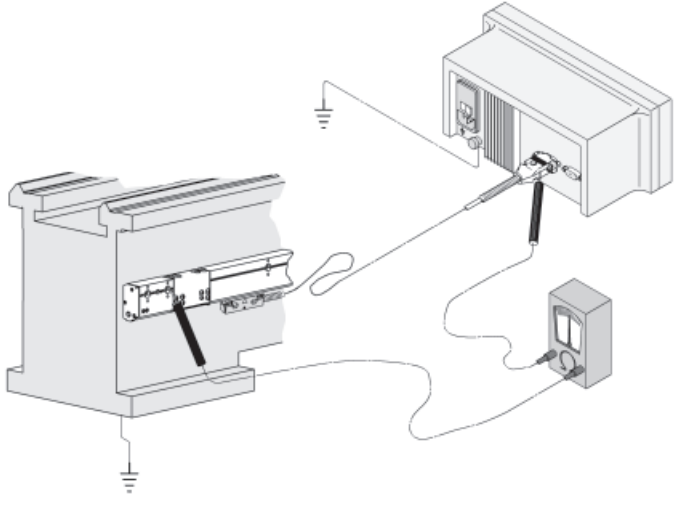
- Remove the thumb screw, sleeve, and washer.
- Apply silicone grease to the plug and reinstall it.



- With the readout properly mounted, route the cable with sufficient slack loops for machine movement to the readout.
- Secure cables by fastening with clips or ties.
- Attach the encoder connectors to the readout.

Electrical shielding ...

- Connect a ground wire from the terminal on the back of the readout to the machine or earth ground.
- Attach a ground wire from the machine to a solid earth ground.
- With the encoder attached to the cable connected to the readout, check shielding by measuring resistance between connector housing and scale unit.
  Desired value: 1 ohm max.



If you experience difficulties with your installation, do the following to determine the problem.

Checking the Readout

Difficulties on more than one axis are usually associated with the readout. Follow these steps to determine if your difficulties are associated with the readout:

- Ensure that the linear encoder connectors are correctly seated.
- Swap linear encoder cables at the readout to see if the problem is still shown in the same display.
- If the problem remains in the same display, the readout may be in error. To determine if that is the problem, repeat above steps with both encoders, but with only one encoder connected at a time. This should allow you to determine if the problem is with the readout or the encoder.
- If the problem follows the connection change, the linear encoder may be in error.

If the Readout is at fault, refer to "**What to do**" to arrange for the parts necessary to repair your system. If a linear encoder appears to be at fault, proceed with "**Checking the Linear Encoders**".

Checking the Linear Encoders

Problems on a single axis are usually associated with the linear encoder or its installation. Difficulties can be caused by improper installation, loose or misaligned bracketry, or a damaged or inoperable encoder.

Follow these steps to determine the cause of your system difficulties:

- Confirm that your bracketry and installation does not interfere with other machine structures through the entire length of the linear encoder travel.
- Check for loose fasteners. If you find loose fasteners, first confirm that the linear encoder is installed to the tolerances specified and then retighten the fasteners as required.
- Confirm that the linear encoder is installed to the specified alignment tolerances. If the installation does not meet the tolerances, reinstall the encoder according to the "**Installation Procedure**".
- Do not attempt to repair the reading head or scale assembly. The ENC 250 is field serviceable by assembly replacement only. Attempts to repair the encoder can permanently damage it and void the warranty.

What to do

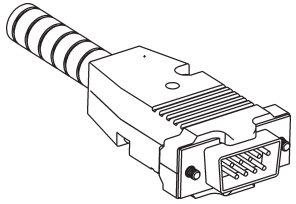
If an ACU-RITE linear encoder or readout is found to be at fault, please contact your Authorized ACU-RITE Distributor for instructions prior to removing the encoders or readout.

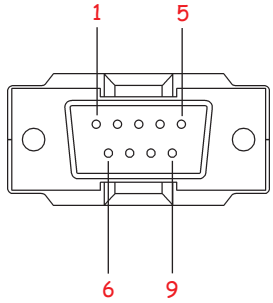
Mechanical Specifications	Digital
Resolution	5 µm (0.0002 in.)
Grating Pitch	100 µm (0.00393 in.)
Scale Medium	Reflective Metal Tape
Accuracy	±15 µm/M (0.00018in/ft.)
Maximum Slew Speed	1 M/sec. (40 in/sec.)
Force to Move Reading Head	±3.3 Newtons (0.75 lbs.)
Operating Environment Temperature / Relative Humidity	0° to 40°C (32° to 104°F) 20% to 95% (Non-condensing)
Storage Environment Temperature / Relative Humidity	-40° to 60°C (-40° to 140°F) 20% to 95% (Non-condensing)
Weight with Cable	1 kg + 3.2 kg/M (2.2 lbs. +0.18 lbs/in.)
Connecting Cable Armored	Length = .61M (2 ft.) Connector: DE-9P
Maximum Cable Length	22.9 M (75 ft.) VRO / 10.7 M (35 ft.) DRO
Measuring Length	3240 mm (127 in.) — 6040 mm (237 in.)
Reference Pulse Intervals	100 mm (3.937 in.) Distance encrypted

Output Signals and Pin-Outs

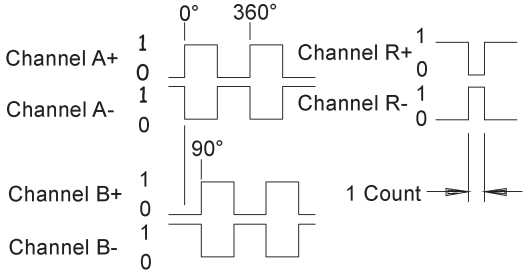
Digital Differential

Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
N/C	Green	Yellow	Blue	Red	White	Brown	Pink	Gray
N/C	Channel A+	Channel A-	Channel B+	Channel B-	Ground	Vcc, + 5.1 ± 0.1 VDC @ 140mA max.	Channel R+	Channel R-





Electrical Specifications

Parameter	Digital
Output Signals	I_{OH}- (High level output current) = 20mA V_{OH}- (High level output voltage) >2.5Vdc  I_{OL}- (Low level output current) = -20mA V_{OL}- (Low level output voltage) < 0.5Vdc
Incremental signals Signal levels	Square-wave voltage signals. Channels A and B, in 90° quadrature relationship TTL-level
Reference Mark signals Signal level	Square-wave pulse TTL-level
Power Supply	5.1 ± 0.1 VDC @ 140 mA max.

3 Year Warranty ...

ACU-RITE readouts and precision scales are warranted to the end user against defects in material and workmanship, and against any damage that occurs to the product within three (3) years from the original purchase date. ACU-RITE will, at its discretion and expense, repair or replace the returned item or any of the item's component(s) as long as ACU-RITE receives notice of the defect or damage within the three (3) year warranty period.

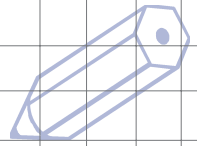
The foregoing warranty obligations are in lieu of all expressed and/or implied warranties of fitness or merchantability or otherwise, and state ACU-RITE's entire liability and the end user's exclusive remedy, under any circumstances, for any claim of damage.

In no event shall ACU-RITE be liable for incidental or consequential damages nor shall ACU-RITE's liablility for claims or damage arising out of or connected with this warranty or the manufacture, sale, delivery, or use of the products with which this warranty is concerned exceed the purchase price of said products.

You will need the following tools to complete the installation:

- 0.001" Dial Indicator with Magnetic Base
- English Hex Wrench Set
- Metric Hex Wrench Set
- Dial Calipers
- Feeler Gage
- Hand Drill
- Hand Tap
- Taps(English): 1/4-20 UNC & #8-32 UNC
- Taps(Metric): M6, M4
- Drills(English): #7 (.201"), #29 (.136"), N (.302")
- Drills(Metric): 5mm, 3.3mm, 7.7mm
- Reamer(English): .312"
- Reamer(Metric): 8mm
- Transfer Punch Set
- Hammer
- Center Punch
- Phillips Screw Driver
- Flat-tip Screw Driver

* NOTE: Both English and metric mounting hardware have been supplied. The mounting instructions reference only to the English components, but the metric components can be substituted if desired. Therefore, not all of these tools are required for all installations.



ACU-RITE IS AN
ISO 9001
CERTIFIED
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CE

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One Precision Way • Jamestown, NY 14701

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