

MICRO-LINE™

For Turning Applications

REFERENCE MANUAL



ACU-RITE®

*Readout Systems
Precision Glass Scales*

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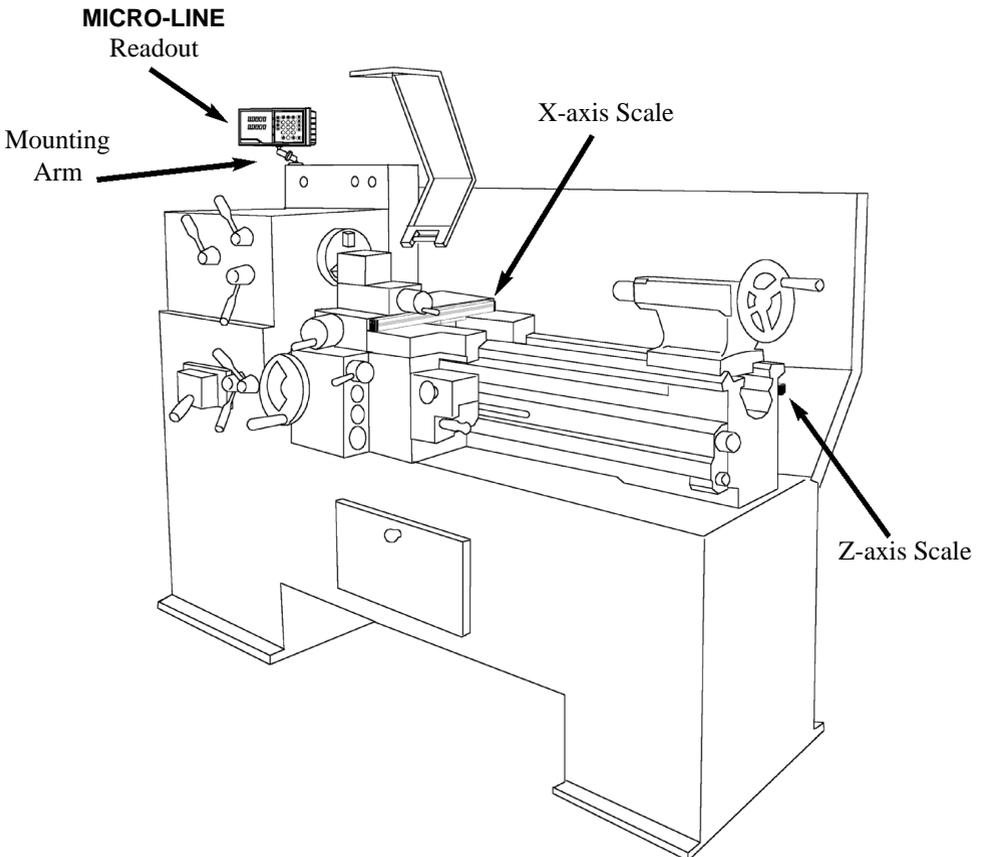
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Overview

This manual will guide you through the installation, setup, and operation of the **MICRO-LINE** system. Use it to get your system up and running “out of the box” and as a quick reference guide for your day-to-day operations.

We recommend installing the scales first, according to the instructions included with your system. After the scales are in place, install the readout and then finish setting up the system.

Here’s how a typical machine will look after the installation is complete:



INSTALLATION

Preparation

Packing List

Before you begin the installation procedure, check that you have received all of the components for your system:

- Readout & installation instructions
- Mounting arm
- **MICRO-LINE** scales
 - Cable mounting hardware
 - Scale mounting hardware
- Warranty card

If a component is missing, contact your **MICRO-LINE** distributor for replacement parts.

Warranty Records

For future ordering information or warranty service, please record all readout and scale information on the warranty card included with your **MICRO-LINE** system. The scale catalog number and serial number are located on the scale assembly tag.

Copy the information here for your own records and then mail the warranty card as soon as possible.

Distributor:	_____	
Address:	_____	
Telephone:	_____	
	Catalog No.	Serial No.
Readout	_____	_____
Axis #1	_____	_____
Axis #2:	_____	_____
Axis #3:	_____	_____
Date of Purchase:	_____	

Installing the Scales

Install the linear encoders according to installation instructions found within your Micro-Line system manual. These general installation instructions are found on page 33. Read these instructions completely even though bracket kit instructions supersede them.

Installing the Readout

Follow the readout installation instructions that are included with your mounting arm bracket kit. The electrical specifications for the readout are listed on pg. 27.

After the installation is complete, proceed to “Power Up.”

INSTALLATION

Power Up

Press the switch on the back of the readout to power up the system. A series of tests will check that the display, keypad, and memory are all working properly.

If a problem is detected, an error code will appear on the screen. (Error messages and solutions are listed on pgs. 25 - 26.) It is important to note that the **E1 message** will appear every time you power up your system and does not indicate a problem. It merely indicates that the system had lost power. To acknowledge the message, press the **CLEAR** key and proceed to the DRO mode.

Note: If the E1 message appears at any other time during normal operation, refer to pg. 25 for possible problems and solutions.

Display Saver

When the system is not used for more than 90 minutes, a decimal point will “scroll” across the X-axis display, indicating that the display saver has been activated. The display saver, like a screen saver on a computer monitor, will help prolong the life of your readout.

If the display saver has been activated, press any key on the readout or move any axis to return to the normal DRO view.

Parameter Setup

There are 3 to 4 parameters that you can define on your system:

- Display resolution (diS)
- Linear error compensation (LEC)
- Scale count directions (Ct dir)
- Input 3 ON/OFF for international units

Establish each setting the first time you power up the system. You can change the parameters later by returning to Setup and then using the **ENTER** key to scroll to the appropriate category.

Anytime you change the linear error compensation, or count direction for an axis, the absolute and incremental displays for that axis will be reset to 0. If you change these settings, you'll need to reestablish the datum point.

For international units using 5 μ m (0.0002") scales with reference marks, you will need to recall Datum. See page 32.

When in the SetUp mode, use the **CLEAR** key when you want to back-space, restore the previous value or access the previous parameter.

SETUP

Display Resolution

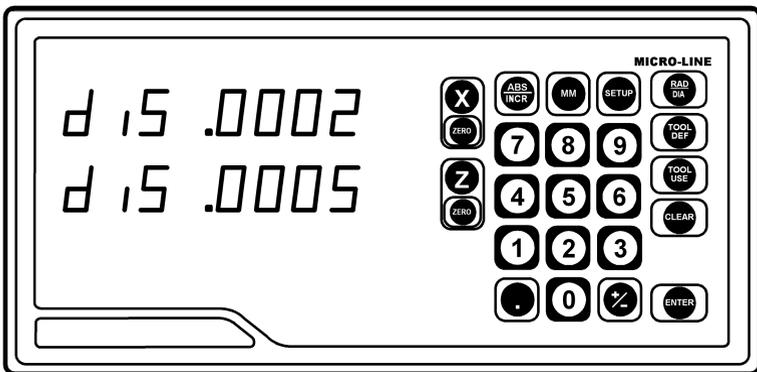
The display resolution determines how detailed each scale's position will be displayed on the readout. Use the setting that best suits each job.

To change the display resolution:

- Press the **SETUP** key. (“diS” will show on the display.)
- Press the **X** or **Z** key for the display you want to change.

For 10µm scales, the display resolution will toggle between 0.01 mm (0.0005”) and 0.02 mm (0.001”). For 5µm scales, it will toggle between 0.005 mm (0.0002”) and 0.01 mm (0.0005”).

- After you complete setting your display resolution, press **ENTER** to continue with setup or press **ENTER** then **SETUP** to return to the normal DRO display.



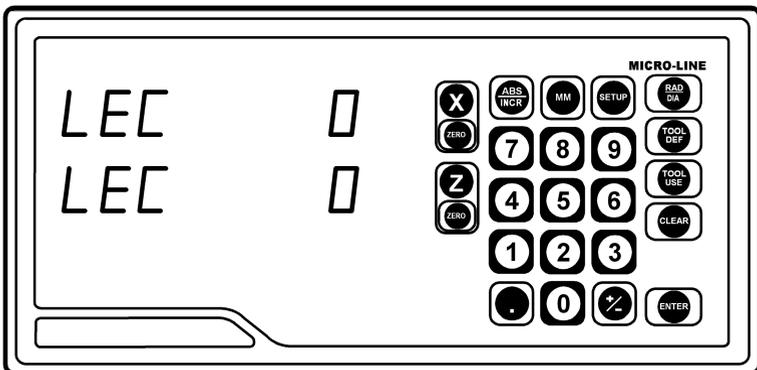
Linear Error Compensation

With **MICRO-LINE**, you can compensate for machine tool wear. If you know the linear error compensation (LEC) value in parts-per-million (PPM), you can enter it directly.

If you don't know the LEC, use the formula on the next page to determine the value for each axis.

To change the linear error compensation:

- Move to the “Linear Error Compensation” display in the Setup mode. (Press **SETUP** and then the **ENTER** key until “LEC” appears).
- Press the **X** or **Z** key for the axis you want to change. **MICRO-LINE** will display the current LEC value for that axis.
- Using the keypad, enter the linear error compensation factor (in PPM), followed by the \pm key for negative values. The number must be within -9999 and 9999 (use whole numbers). The formula for calculating the value is on the next page.
- After you complete setting your LEC, press **ENTER** to continue with setup or press **ENTER** then **SETUP** to return to the normal DRO display.



SETUP

How to Determine the Linear Error Compensation

Follow this procedure for each axis:

- In the DRO mode.
- Place a standard of known length on the machine. Make sure it's parallel with the axis being measured.
- Put the readout in the absolute display mode (**ABS/INCR** key).
- Using an indicator, locate one end of the standard.
- Press the **ZERO** key twice for the axis you are measuring. "0" should appear on the display.
- Move the indicator along the axis until it reaches the opposite end of the standard.
- Write down the length that is shown on the readout display for that axis.
- Use the formula below to calculate the LEC for the axis you just measured. Enter the result in the LEC parameter (previous page).

Note: If the measured length is greater than the standard length the LEC value will be negative.

Formula

S = Standard length
M = Measured length

$$\text{LEC} = \left(\frac{S - M}{M} \right) \times 1,000,000$$

Example

If the length of the standard you used is 10" and the measured length is 9.995", then the LEC for that axis is 500 parts-per-million (PPM).

$$\text{LEC} = \left(\frac{10 - 9.995}{9.995} \right) \times 1,000,000$$

$$\text{LEC} = 500 \text{ PPM}$$

(rounded to the nearest whole number)

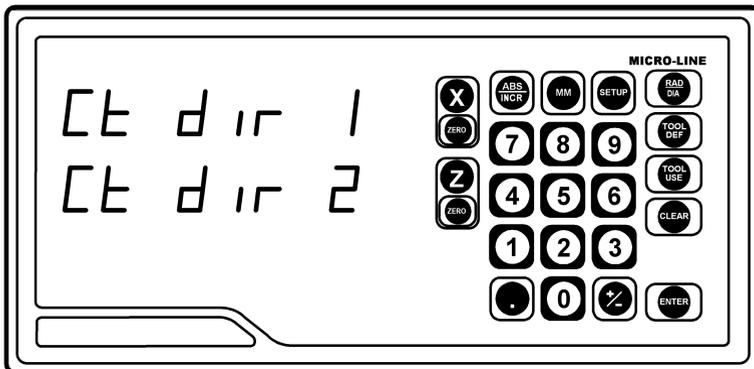
Count Direction

Use the count direction setting to define the positive counting direction for each scale. The direction will be displayed as a “1” or a “2” (the numbers are not assigned to a particular direction). You only need to change the count direction if the scale is counting in the negative direction during a positive move, or vice versa.

Refer to Conventions (pg. 31) for more guidelines.

To change the count direction:

- Move to the “Count Direction” display in the Setup mode. (Press **SETUP** and then the **ENTER** key until “Ct dir” appears).
- Press the appropriate axis key (**X** or **Z**) to change the count direction.
- After you complete setting your count direction, press **ENTER** to continue with setup or press **ENTER** then **SETUP** to return to the normal DRO display.



SETUP

International Units Only

Input 3 ON/OFF

This parameter allows you to activate the third input. When this input is enabled, Inputs 2 and 3 will be coupled on the Z-axis (both scales will count on the Z-axis).

When Input 3 is enabled, additional parameters will need to be setup. Refer to the procedures on pages 7-9 for setting up the Linear Error Compensation and Count Direction Setup functions.

Testing the Scales

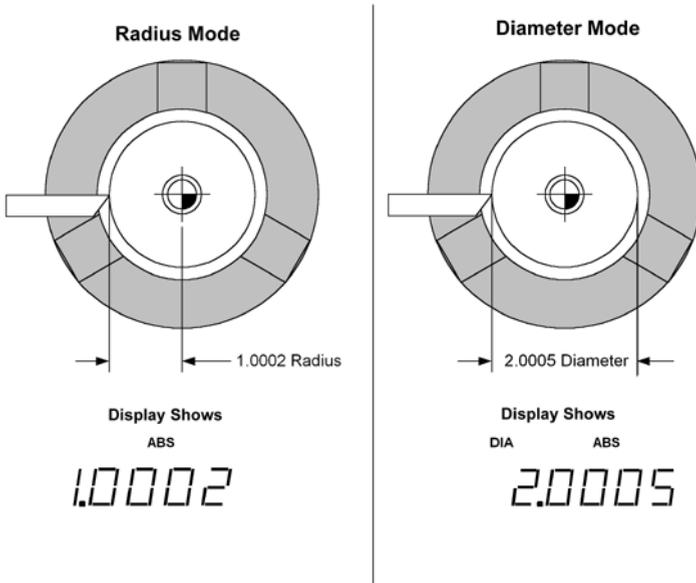
Follow these steps to confirm that your scales have been installed properly. This test will confirm the scale's electrical operation, and will also check the installation integrity.

- Locate a magnetic base on the machine and set the dial indicator on the scale's reading head casting. Zero the readout and the indicator.
- Move the axis through the full travel and return the dial to "0." The readout should also read 0 (± 0.0005 " for 10 μ m scales; ± 0.0002 " for 5 μ m scales). If it doesn't, then the scale cable may be loose, or the scale, mounting bracket, or reading head may need to be tightened or realigned.
- Repeat these steps for each scale.

Radius and Diameter

Pressing the **RAD/DIA** key lets you view the X-axis dimension either as a radius or as a diameter.

Display resolution is affected by the **RAD/DIA** key.



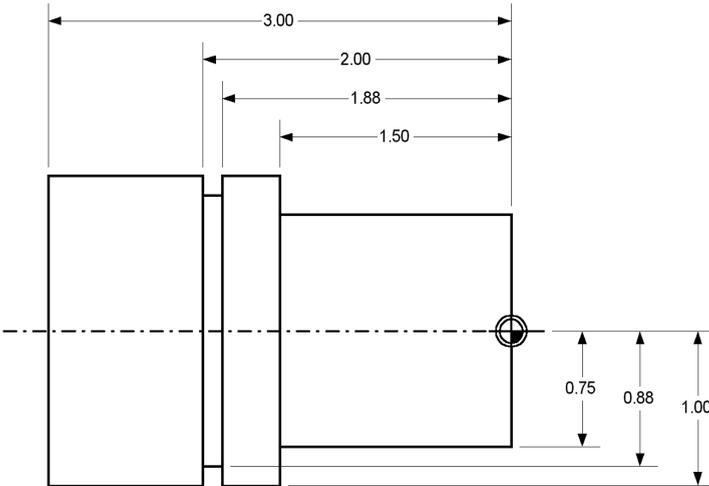
Setting the Datum (Absolute Zero)

MICRO-LINE allows you to measure both absolute and incremental dimensions. A dimension measured from the point you define as the datum is an absolute dimension. A dimension measured from any other point on your print is an incremental dimension.

Datum, also known as absolute zero or workpiece zero, is the reference point from which **MICRO-LINE** will base all of your part's coordinates. When the readout is in the ABS mode, it is actually measuring the distance from the datum to the machine axis' current position.

You will need to establish a datum for every job. Your datum may already be identified on your print; if it isn't, then establish a datum that allows you to measure most of your part's dimensions directly, with the least number of calculations.

All of the dimensions in the drawing below are based from the datum.



OPERATION

If you're using 5 μ m (0.0002") scales (international units only), **MICRO-LINE** can recall your last datum position each time you power up the system (refer to pg. 32 for the proper procedure).

To set the datum at the tool's current position:

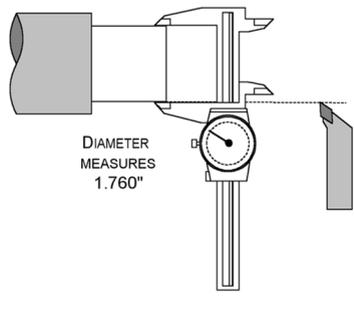
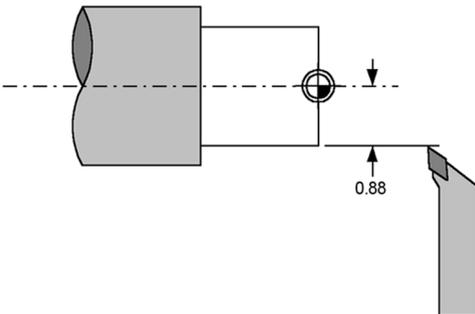
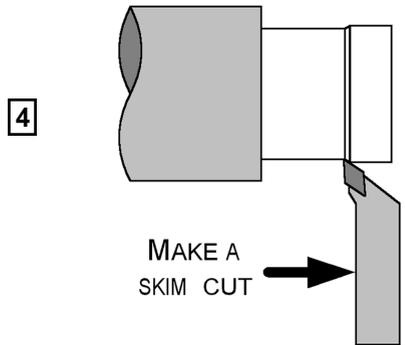
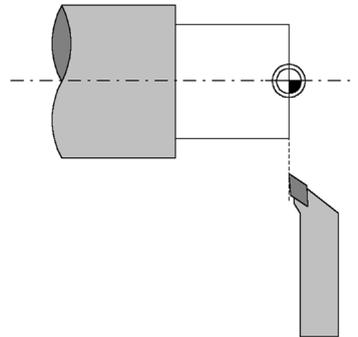
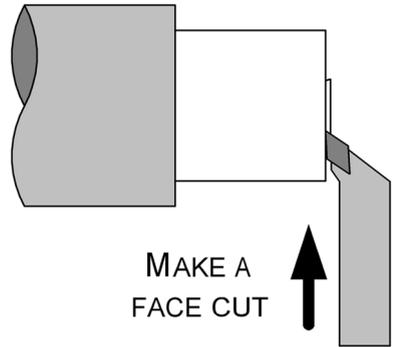
- Position the workpiece in the chuck. Move the tool until it is positioned at the location where you would like to establish the datum.
- Using the **ABS/INCR** key, select the absolute (ABS) mode.
- Press the X-axis **ZERO** key twice to establish the current X-axis position as the datum. Repeat for the Z-axis.

To set the datum using an offset:

- Using the **ABS/INCR** key, select the absolute (ABS) mode. Also check that the proper measurement (inch or mm) is selected.
- Using **RAD/DIA** key, select the Radius mode.
- Move the tool to a known point, i.e. the outside diameter of the workpiece or the face of the workpiece.
- Press the **ZERO** key once for the axis (X or Z) for which you're entering a dimension.
- Using the keypad, enter the distance from your tool's current location to the point you want to establish as the datum. Include a decimal point (.) and minus (-) sign when necessary.
- Press the **ZERO** key for the other axis, or press **ENTER** to return to the DRO display.

Example: Setting Up Your Job

1. Place your workpiece into the chuck.
2. Make a face cut and clear the workpiece by backing the tool off in the X-axis only. Do not move the Z-axis. (Fig. 2)
3. Zero the Z-axis by pressing the Z-zero key twice. (Fig. 3)
4. Make a skim cut on the diameter of the workpiece and clear the workpiece by backing the tool away in the Z-axis. Do not move the X-axis. (Fig. 4)
5. Measure the diameter of the workpiece. (Fig. 5)
6. Press the X-axis zero key once, then using the keypad, press the **RAD/DIA** key to select diameter and enter the diameter of the workpiece, then press **ENTER**. (Fig. 6)



6

5

Incremental Dimensions

As we described earlier, incremental dimensions are measured from the current tool position. If your tool is currently at 2” and you want to move an additional 3.125”, you would select the incremental mode, zero out the axis, and move the axis until the display reads 3.125.

An example of how to measure using incremental dimensions is shown on page 17.

To use an incremental dimension:

- Move the machine axis to the point from where you want to measure an incremental distance.
- Use the **ABS/INCR** key to select the incremental (INCR) mode on the readout. Also check that the proper measurement (inch or mm) is selected.
- Press the **ZERO** key below the axis(es) from which you’re measuring.
- Move the machine axis. **MICRO-LINE** will display the machine axis’ position in relation to the incremental “0” point(s) for the axis(es) you chose.

After you’ve reached the position you want and have machined the part, you can “zero” each axis again and then measure from that location to the next point on your workpiece or press **ABS/INCR** to return to the absolute mode.

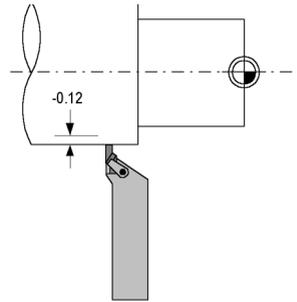
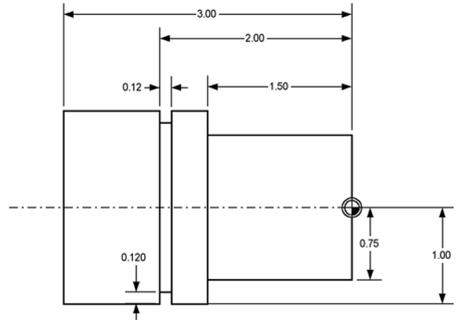
Example: Incremental Dimensions

Let's say that your print looks like this:

Using Incremental Zero

In order to cut a groove to a depth of 0.120" from the 1" radius, it is necessary to establish a zero at 1". This can be done using the incremental mode without changing the Datum. Follow these steps:

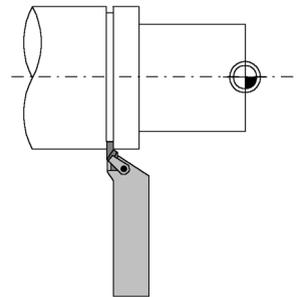
1. Move the tool until the readout display shows that the X-axis = 1.0000" and the Z-axis = 2.0000" in the absolute mode.
2. Press the **ABS/INCR** key to switch to the incremental mode.
3. Press the X-axis **ZERO** and the Z-axis **ZERO** keys.
4. Begin cutting until the X-axis reads -0.1200".



Using Incremental Presets

In addition to setting incremental zero at the current tool position, you can also preset the incremental zero from the current tool position. Enter the distance and direction you wish to move in relation to your current position. Follow these steps:

1. Move the tool until the readout display shows that the X-axis = 1.000" and the Z-axis = 2.0000" in the absolute mode.
2. Press the **ABS/INCR** to switch to the incremental mode.
3. Press the **X** key and press the following key sequence:
 - . 1 2 ENTER then press the Z-axis **ZERO** key.
4. The X-axis display will show 0.1200".
5. Begin cutting until the X-axis reads 0.0000".

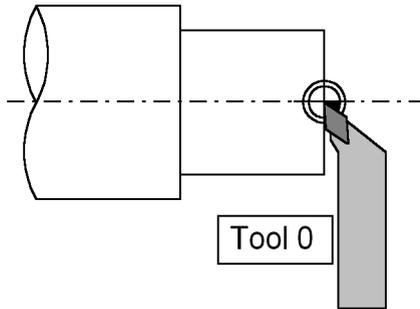


OPERATION

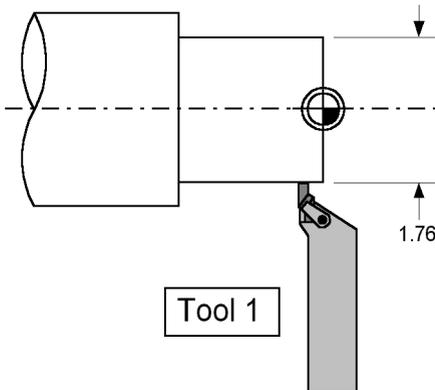
Tool Offset

The MICRO-LINE can store the dimensional offset of an additional tool. This allows you to use two tools without having to reestablish zero as you change between them. In order for this feature to work, the tools must be able to repeat their location when they are changed (Repeatable tooling). To use this feature you must first select the tool number (either 0 or 1).

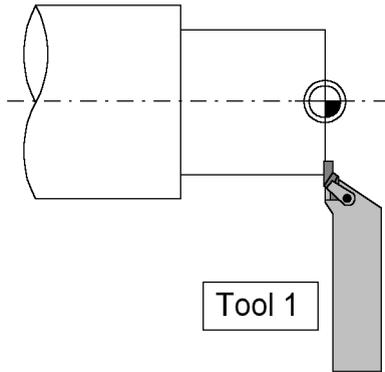
1. Place your first tool in the tool holder.
2. Press the **TOOL USE** key.
3. Press **0** to select the first tool, then press **ENTER**.
4. Set the Datum (Absolute Zero) using this tool. See page 13.



5. Change the tool to the second tool you will be using.
6. Press **TOOL USE** and enter the number **1** for the second tool.
7. Touch this tool to a diameter of known size.

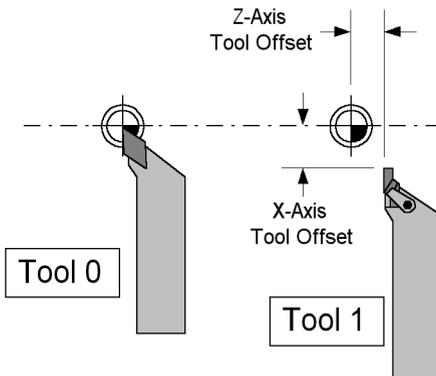


8. Press the **TOOL DEF** key and press the **X** key.
9. Press the **RAD/DIA** key to select diameter if not already selected.
10. Enter the known diameter. Press **ENTER**.



11. Move the tool so that it touches a face of known length.
12. Press the **TOOL DEF** key and press the **Z** key.
13. Enter 0 if the tool is at Datum or enter the distance the tool is from Datum by using the \pm key if the tool is in the negative direction. Press **ENTER**.

Note: Both tools are now set. To switch between them, change the tool on your lathe, then press the **TOOL USE** key, and select the appropriate tool number.



Troubleshooting Introduction

Refer to this troubleshooting guide whenever you have questions or concerns about the operation of your **MICRO-LINE** system.

This guide is arranged in three columns entitled Symptom, Probable Cause and Recommended Corrective Action. The symptoms are listed in the order of the most common, easiest to check, and least expensive to correct.

First locate the symptom that best describes the problem you're trying to solve. Then identify the probable cause that most closely matches the problem and implement the recommended corrective action.

If a problem persists or cannot be resolved using this manual, contact your **MICRO-LINE** distributor for further assistance.

TROUBLESHOOTING

Symptom	Probable Cause	Recommended Corrective Action
Dashes appear on screen <i>(cont'd)</i>	Display overflow	Move the axis toward the "0" position. As the scale counts down, the display will show the correct position.
Error message (E1) appears	Power loss occurred	This is a normal message at power up. If the message appears at any other time during operation, a problem may have occurred. Refer to pg. 25 for details.
Error messages (E2-E56) appear	Causes vary	Turn the system "off" and then "on" again, using the switch on the back of the readout. If an error (besides E1) is still detected when the system is powered up, contact your MICRO-LINE distributor for repair/replacement procedures. Refer to pgs. 25 - 26 for a list of error messages.
Keys not working properly	Invalid keypress	Turn the system "off" and then "on" again, using the switch on the back of the readout. If an error (besides E1) is detected when the system is powered up, contact your MICRO-LINE distributor for repair/replacement procedures. Refer to pg. 25-26 for a list of error messages.

Symptom	Probable Cause	Recommended Corrective Action
Scale won't count	Loose cable	Check that the scale cable is securely connected to the readout.
	Wrong input	Check that the scale cable is connected to the correct input on the back of the readout.
	Scale not installed properly	Check the scale and reading head for proper installation (refer to scale installation instructions).
	The scale's reading head is not working properly	Unplug the scale from the readout and plug it into an input for another axis. If the scale still does not count, the reading head may need to be replaced. If the scale counts on the other axis then the display may need to be replaced. See LED Failure.
Scale counts, but not correctly	Wrong count direction	Change the count direction (pg. 9).
	Scale not installed properly	Check the scale and reading head for proper installation (refer to scale installation instructions). Clean the scale, if necessary.

TROUBLESHOOTING

Symptom	Probable Cause	Recommended Corrective Action
Setup does not save values	Improper procedure	Press the ENTER key after each parameter value is entered. If you press another key instead, the new value may not be saved. Refer to pgs. 5-10 for proper procedures.
Numbers don't appear/are faded on the display	LED failure	Turn the system "off" and then "on" again, using the switch on the back of the readout. If this does not correct the problem, contact your MICRO-LINE distributor for repair/replacement procedures.

Error Messages (General)

When **MICRO-LINE** is powered up, it will run a series of tests to ensure that the software is working properly. If an error message appears, refer to the charts below for a diagnosis and solution.

E1	A power loss has occurred. This message will appear every time you power up the system and can be cleared by pressing the CLEAR key. If the E1 message appears at any time other than at power up, a power interruption has occurred and your current position may be lost. Re-establish the datum if necessary. If the problem persists, contact your distributor for repair/replacement procedures.
E2	An EEPROM memory error has occurred. Press the CLEAR key to acknowledge the error. The datum and setup information may be lost. These areas should be checked and reestablished upon power up. If the problem persists, contact your distributor for repair/replacement procedures.
E3	A ROM memory error has occurred. Press the CLEAR key to acknowledge the error. If the system does not operate properly, contact your MICRO-LINE distributor for repair/replacement procedures.
E4	A random access memory (RAM) error has occurred. Press the CLEAR key to acknowledge the error. If the system does not operate properly, contact your MICRO-LINE distributor for repair/replacement procedures.
E9	A scale miscount error (invalid waveform) has occurred. The E9 message will appear on the axis that has the error. Press CLEAR to reset the axis(es). Your current position may be lost. Re-establish the datum if necessary. If the system does not operate properly, contact your MICRO-LINE distributor for repair/replacement procedures.

TROUBLESHOOTING

Error Messages (Keypad Test)

The messages below indicate that a problem was found during the keypad test at startup. If an error message appears, turn the system off, press the appropriate key to release it back into position, and then restart the system. (Or you can press the **CLEAR** key to clear the error message.) If the key does not work during normal operation, contact your distributor for repair/replacement procedures.

E11	SETUP key	E35	5 key
E12	RAD/DIA key	E36	4 key
E15	MM key	E38	Z key
E16	ABS/INCR key	E41	3 key
E18	X key	E45	2 key
E21	9 key	E46	1 key
E22	TOOL DEF key	E48	ZERO key for the Z-axis
E25	8 key	E51	± key
E26	7 key	E54	ENTER key
E28	ZERO key for the X-axis	E55	0 key
E31	6 key	E56	Decimal point (.) key
E32	TOOL USE key		
E33	CLEAR key		

Electrical Specifications

Follow these specifications when installing your **MICRO-LINE** system.

Characteristic	Specification
Operating conditions	0° to 40°C (32° to 104°F) 25% to 85% relative humidity
Storage conditions	-40° to 60°C (-40° to 140°F) 25% to 85% relative humidity (non-condensing)
Input requirements: Voltage Frequency Current	115VAC or 230VAC, single phase 47 - 63Hz per channel 300mA @ 115V, 150mA @ 230V
Fuse	115V operation: 1/2A, 250V, 3AG, slo-blo 230V operation: 1/4A, 250V, 3AG, slo-blo
Scale input	Position signals: channels A & B TTL square wave signal in quadrature (90° nominal phase relationship) Maximum input rate: 70 kHz
Size	9.875" x 4.679" x 4.75"
Weight	4 lbs., 2 oz.
Mounting	Bottom; two 1/4"-20 threaded inserts
FCC compliance	Part 15 of FCC rules for a class A computing device
CE compliance	For Europe
ETL compliance	For United States
ETLc compliance	For Canada

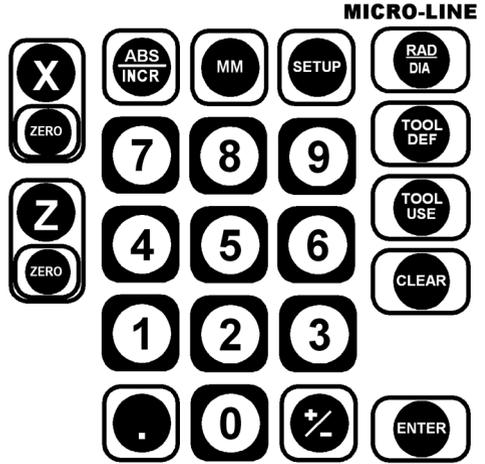
REFERENCE

Factory Default Settings

Display Resolution	High (0.0005"/0.01 mm for 10µm scale) (0.0002"/0.005 mm for 5µm scale)
Linear Error Compensation	0 parts per million
Count Direction	1
Tool Offset	Tool 1 X = 0 , Z = 0 Tool 0 X = 0 , Z = 0
Display Units	Inches
Display Mode	ABS (absolute dimensions)
Radius/Diameter	Radius

Keypad

Here's an overview of the **MICRO-LINE** keypad. Each key's function is described below.



X, Z	Correspond with the scales on the X-, and Z-axes. Used to specify a change to a particular axis.
ZERO	These keys reset the incremental or absolute display position at “0” for the corresponding axis.
ABS/INCR	Used to switch between absolute (ABS) and incremental (INCR) measurements. The active mode will be displayed at the top of the DRO display.
MM	Press this key to switch the X and Z displays between English and metric units.
SETUP	Provides access to the display resolution, linear error compensation and scale count direction.
RAD/DIA	Used to switch between radius (RAD) and diameter (DIA) dimensions. The DIA indicator will light up when diameter is displayed.

REFERENCE

TOOL DEF	Used to establish tool offset.
TOOL USE	To establish which tool offset will be used.
CLEAR	Acts as backspace key during numeric entry; otherwise, it clears or cancels the last operation.
ENTER	Completes numeric operations; selects next parameter in SETUP .
±	Changes the sign of the entered value from positive (+) to negative (-) or vice versa. Numbers are positive unless a (-) appears in front of them.
.	Decimal point can be used during numeric entry; also used to access the recall feature for international units with 5µm (0.0002") scales after power up.
0-9	Used to enter a distance.

Conventions

This section identifies the standard conventions that apply to your **MICRO-LINE** system.

DRO Mode

The **MICRO-LINE** system is considered to be in the DRO (digital read-out) mode when the X-axis and Z-axis positions are displayed.

Count Direction

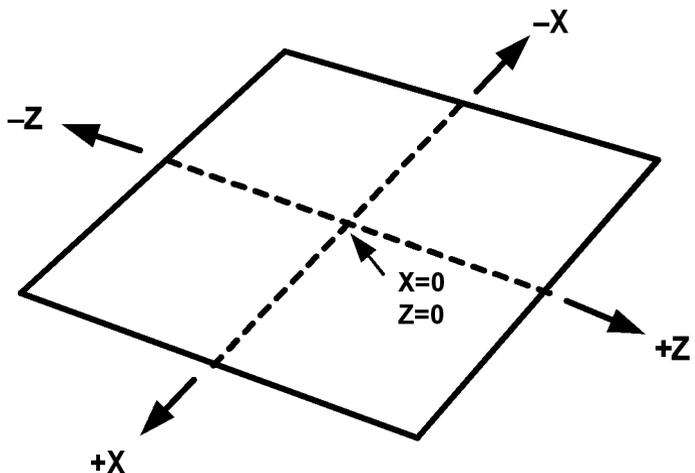
MICRO-LINE uses positive and negative numbers to display the position of the tool along each axis. The graphic below shows a typical setup for the positive and negative count directions for the X and Z-axes on a lathe. All of the examples in this manual are based upon this setup.

X-axis:

The axis will move away from the center for a positive count direction.

Z-axis:

The axis will move away from the spindle for a positive count direction.



Recalling the Last Datum Setting For International Units

If you're using 5µm **MICRO-LINE** scales, **MICRO-LINE** can retrieve your last datum setting when you power up your system. This feature is especially useful when you have to shut down the system in the middle of a job, or if a power interruption occurs. When power is restored, **MICRO-LINE** will use Position-Trac™ technology to read the scales' reference marks and recall the datum within seconds.

The recall feature only works after you have completed the initial system setup and established a datum, so it won't be accessible the very first time you turn on the readout. After you've completed those operations, you can recall the datum for every power up thereafter.

To recall your last datum:

- Power up the system.
- Press the **CLEAR** key to clear the E1 message.
- Press the decimal point (.) on the readout's keypad. Move the tool in the *positive* count direction along the X-axis. Keep moving it until the system recalls the datum and "found" flashes on the screen. The system will automatically reset the X-axis value to reflect the distance from the tool's current position to the datum.

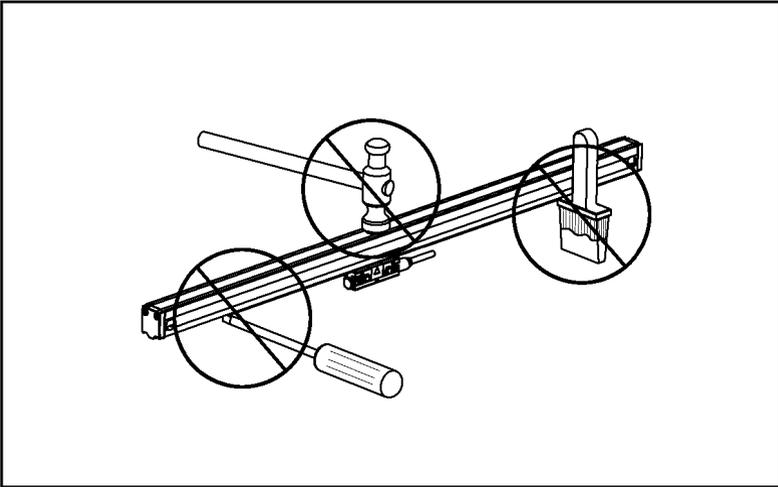
Repeat this procedure for the Z-axis, always moving the tool in the positive count direction.

After you've completed the recall procedure, you can move to the datum by positioning the tool until the display reads "0" for each axis.

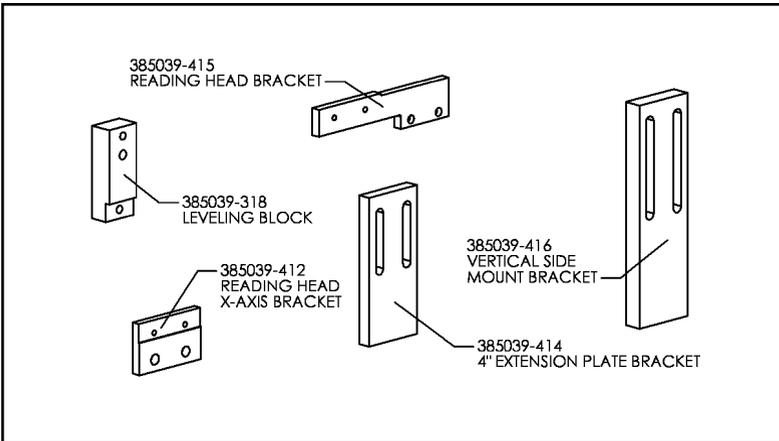
Note: If Input 3 is being used, the datum will not be correct until both the Z-axis and Input 3 scales have been recalled.

General Installation Instructions for the Scale

Please do not expose the scale to the following:



Installation Brackets



- Installation brackets and tools are available.
- Your Authorized ACU-RITE Distributor can assist you in selecting brackets and tools for your installation.

REFERENCE

Introduction

The Micro-Line precision glass scale provides the accuracy and reliability of an ACU-RITE measuring system. Features and options include:

- Digital resolutions of 5 or 10 μ m.
- Accuracy Grade of $\pm 10 \mu\text{m}/1000\text{mm}$.
- Home reference signals on international units only.
- Braided cables of 10 or 15ft. lengths.
- Two scale case forms:
 - Top mounting scale available 2 - 120" measuring length
 - End mounting scale available 2 - 22" measuring length
- Mounting Fasteners
- Installation Brackets

See Page 2 to fill out warranty record information.

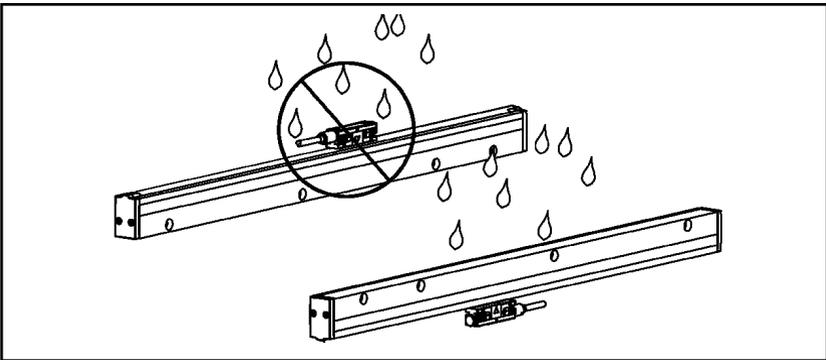
Scale mounting hardware and cable mounting hardware are provided with each Micro-Line Scale.

Mounting Preparation

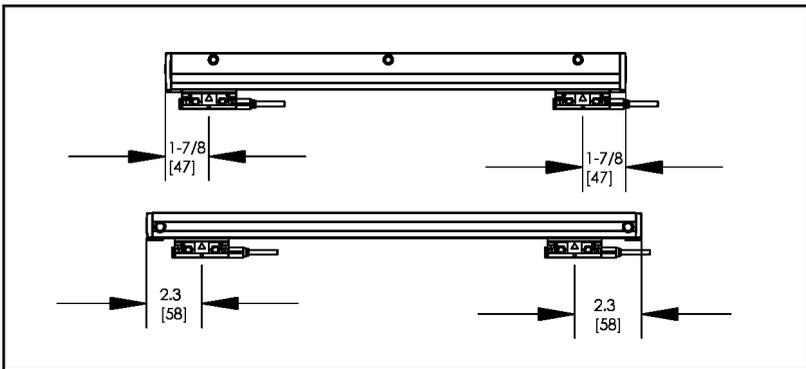
- Understand your mounting requirements.
- Mount with lip seals down and away from the work area.
- Brackets should be short and rigid.
- Surfaces must be in good condition, clean and free of dirt and paint.
- Ensure the correct length scale is being used for the total machine travel.



Do not remove alignment brackets until instructed.



Never mount with lip seals upward or toward work area.

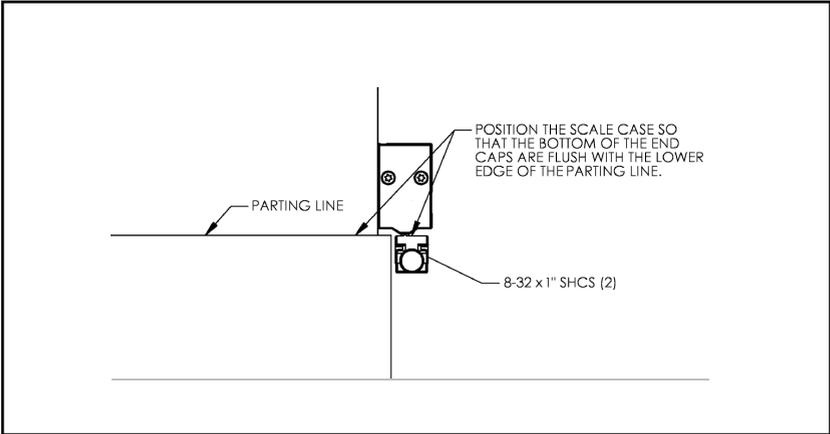


Limit equipment travel to scale measuring length or less.

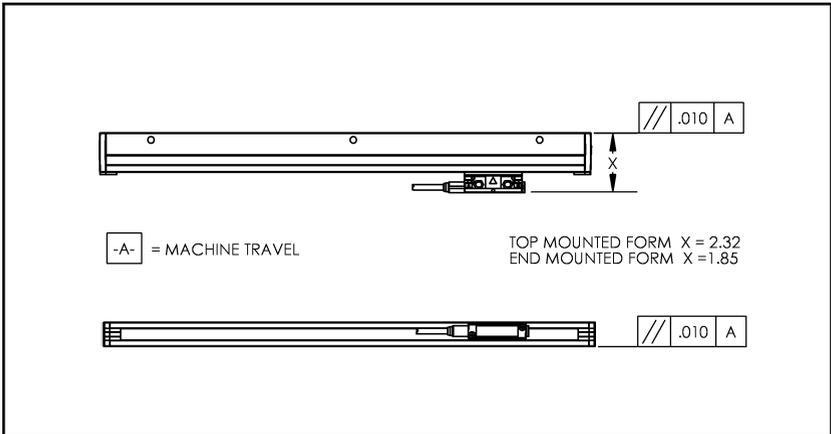
REFERENCE

Mounting Information

- Mount the scale close to machine guide ways to ensure system accuracy.
- Follow kit instructions when using an ACU-RITE bracket kit.



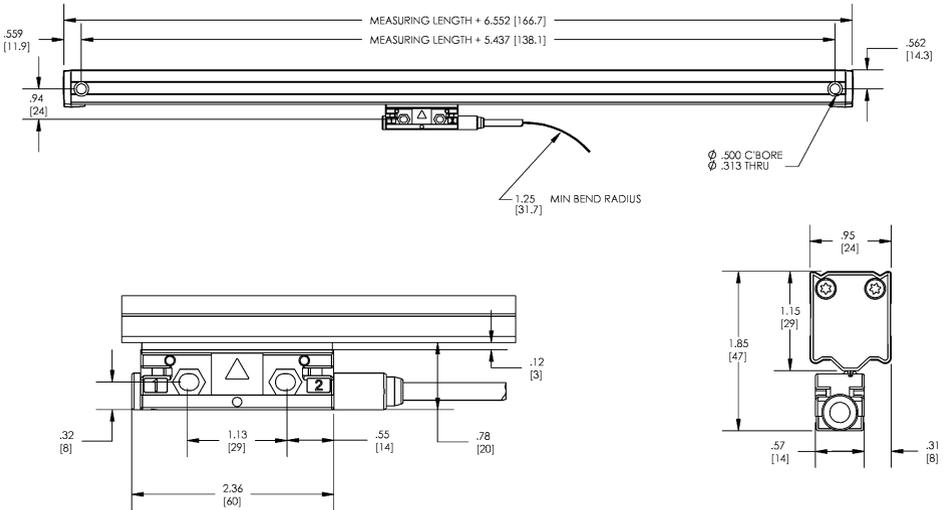
- Mounting surfaces offset greater than .18" between the reading head and mounting surface require a spacer or bracket.
- Use reading head leveling set screws to adjust for gap behind the reading head.



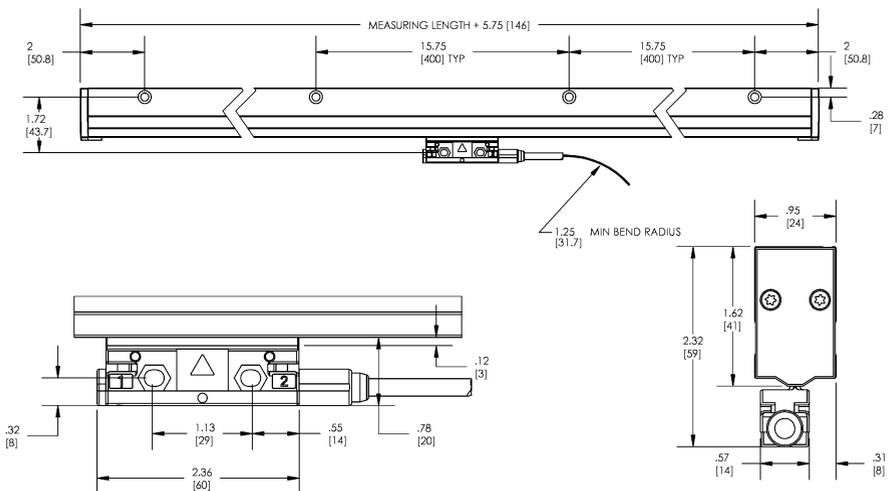
- Tolerances of .010" TIR apply to all mounting dimensions.

Dimensions for Both Scale Types

End Mounted Scale Form

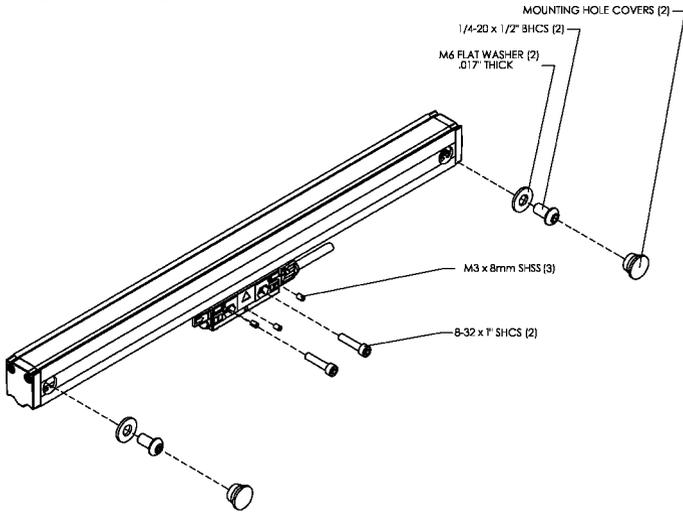


Top Mounted Scale Form

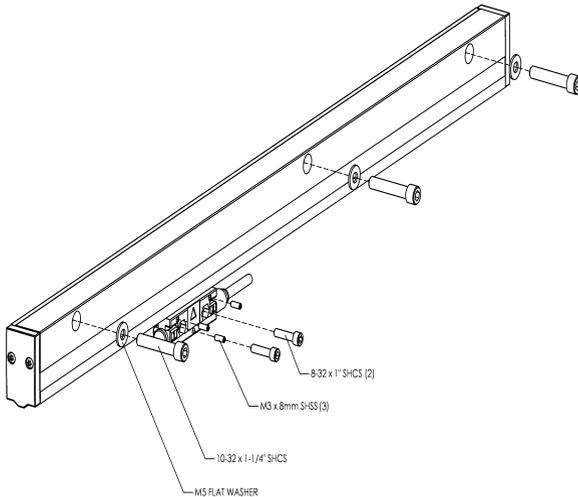


Mounting Descriptions for Both Scale Types

End Mounted Scale Form



Top Mounted Scale Form



Installation Procedure

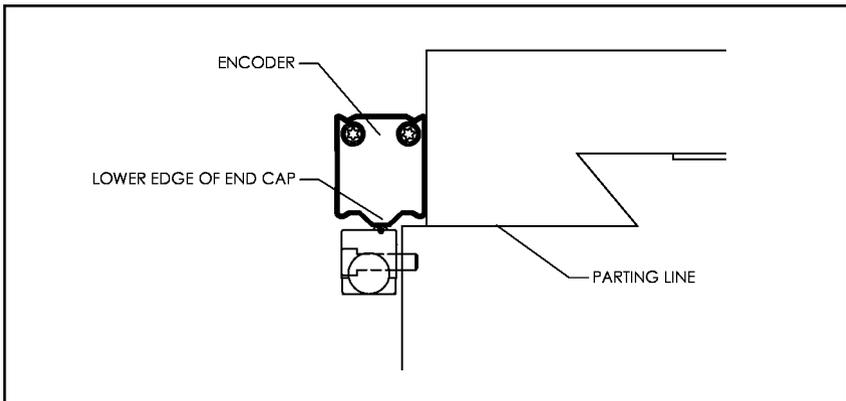
These steps apply to all mounting conditions. Although this may not pictorially represent your application, your installation procedure should follow these steps.

 **ACU-RITE bracket kit instructions supercede this section.**

- Adjust drill depths and fastener lengths as required.
- Contact your authorized ACU-RITE distributor if assistance is required.

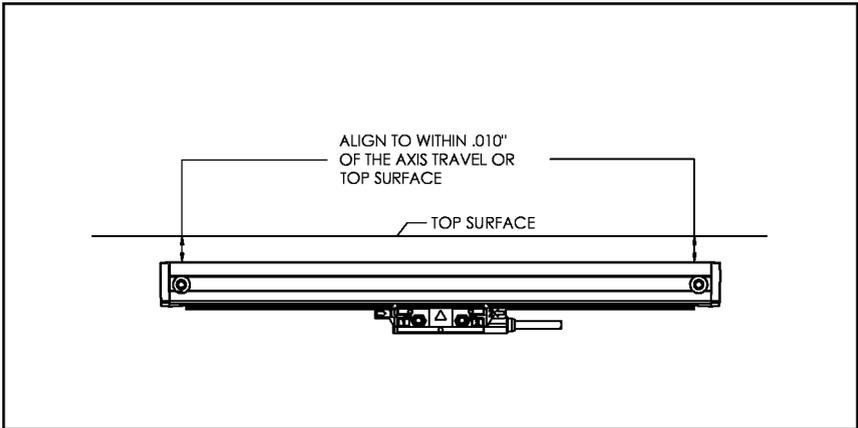
First Steps:

1. Move the machine axis to its center of travel.
2. Mark the machine axis location so that it can be recentered easily.
3. Slide the reading head with the alignment brackets attached, along the scale case to the center of the scale case.

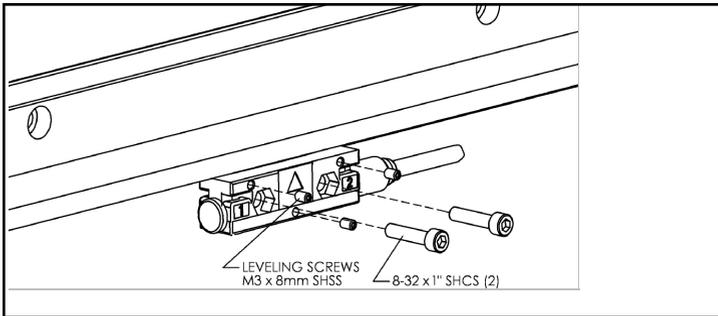


4. Locate the bottom of the end cap flush with the axis parting line.
5. Mark one end mounting hole.
6. Drill and tap the first end mounting hole. Drill and tap a 10-32 x 1/2" deep hole for a top mounting form or a 1/4-20 x 1/2" deep hole for an end mounting form. Attach the scale.

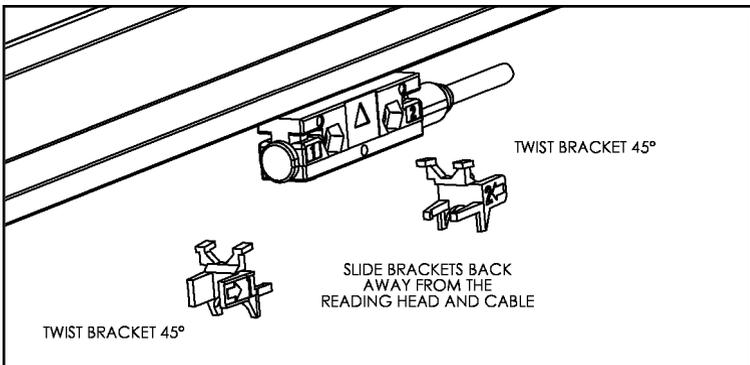
REFERENCE



7. Align to within .010" TIR to axis of travel and mark the second end mounting hole. Drill and tap.
8. Attach the scale and align to within .010" TIR to axis of travel.
9. For the top mounting, form indicate to within .010" TIR over each mounting hole and mark hole location. Drill and tap all remaining holes. Attach the scale and align to within .010" TIR to axis of travel.
10. For end mounting form, after scale is attached and aligned, insert mounting hole covers.
11. Ensure the axis is still at its center of travel and the reading head is centered on the scale. Mark the reading head mounting holes.
12. Move the axis and drill and tap for 8-32 (M4).



13. Move the axis to align reading head mounting holes.
14. A gap may exist between the reading head and its mounting surface, requiring leveling screw adjustment.
15. To adjust the leveling screws, place a .001" -.003" feeler gage (or shim) between one leveling screw and the mounting surface at a time.
16. Adjust the leveling screw until a slight drag is felt on the feeler gage. Repeat this for each leveling screw, 3 total.
17. Evenly tighten the two 8-32 SHCS to secure the reading head.



18. Use Allen wrench to slide brackets away from the reading head.
19. Remove alignment brackets and save for future use.
20. Route cable with slack loops allowing for axis motion.
21. Secure excess cable by fastening with clips and ties.
22. Move the axis through its full travel. Confirm that the assembly does not interfere with the machine movement.

Hassle-Free Warranty

ACU-RITE readouts and precision glass 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 circumstance, for any claim of damage.

In no event shall ACU-RITE be liable for incidental or consequential damages nor shall ACU-RITE's liability for any 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.

ACU-RITE IS AN
ISO 9001
CERTIFIED
MANUFACTURER



ACU-RITE®

ACU-RITE INCORPORATED

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