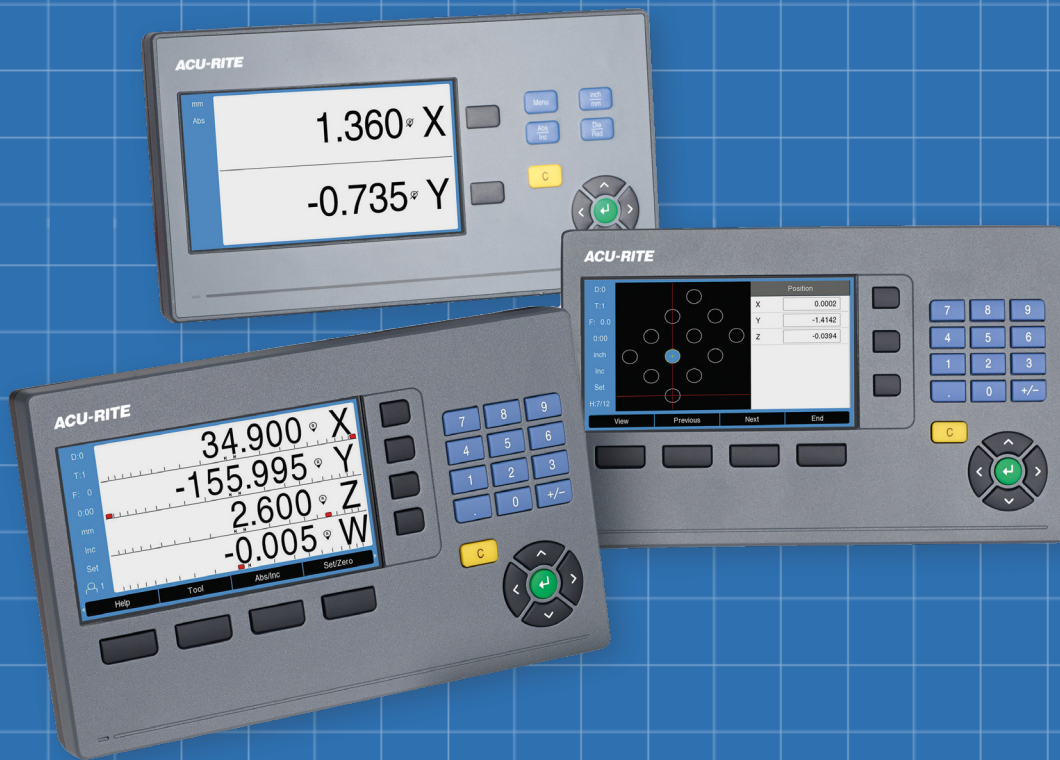


# How to Retrofit and Upgrade Legacy Machines



**ACU-RITE®**

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# Introduction

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The pressure to cost effectively get the most out of existing capital equipment is constantly increasing. Multi-axis machinery, extreme connectivity and a growing just-in-time mentality are among the larger forces at play, but large-scale investment isn't always an option or the most efficient choice.

A much cheaper, less disruptive option does exist. Some light modernization—the combination of a digital readout (DRO) and linear encoder—can bring a stagnant machine back to life, making it a profit center again. Adding a DRO and a linear encoder also eliminates paper-and-pencil calculations for offsets or other dimensions that may not appear on drawings and reduces the fatigue that comes with counting hand wheel turns and straining to read verniers.

What's more, as an older generation—along with all the know-how—continues to retire in bigger numbers, we all know how challenging it can be to attract young workers, even when careers are often very lucrative. Engaging, modern looking and empowering controls can play an important role in both hiring and streamlining workforce development. Younger workers are used to working with technology and have a desire to use it at work.

Machines that can most benefit from a DRO retrofit:

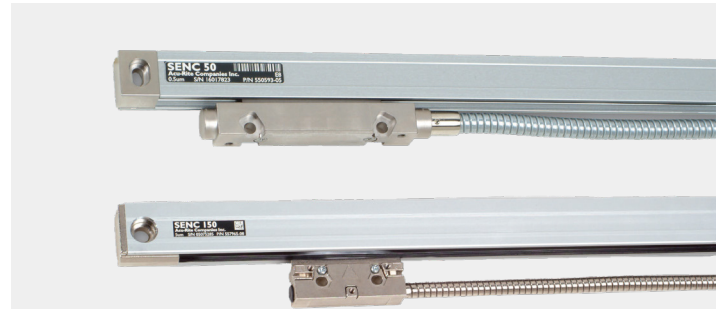
- Horizontal and vertical lathes
- Vertical boring mills and universal horizontal/vertical mills
- Surface grinders
- Optical comparators
- EDM machines

# Making installation safe and easy

Mounting the readout itself is relatively simple, and should always be packaged with instructions. That said, there are a few basic safety considerations, especially when dealing with the electronic connections.

- Do not engage or disengage any connecting elements while the unit is under power.
- DROs contain electrostatic sensitive components that can be destroyed by electrostatic discharge (ESD). It is essential to observe the safety precautions for handling ESD-sensitive components.
- Never touch connector pins without ensuring proper grounding.
- Wear a grounded ESD wristband when handling product connections.
- Only assign pins or wires that are used. Incorrect assignment can cause malfunctions or damage to the system.

Mounting the encoder brings us to a trickier part of the whole installation process. Nearly every machine has different bolt hole patterns, coolant drains, travels, the list goes on and on.

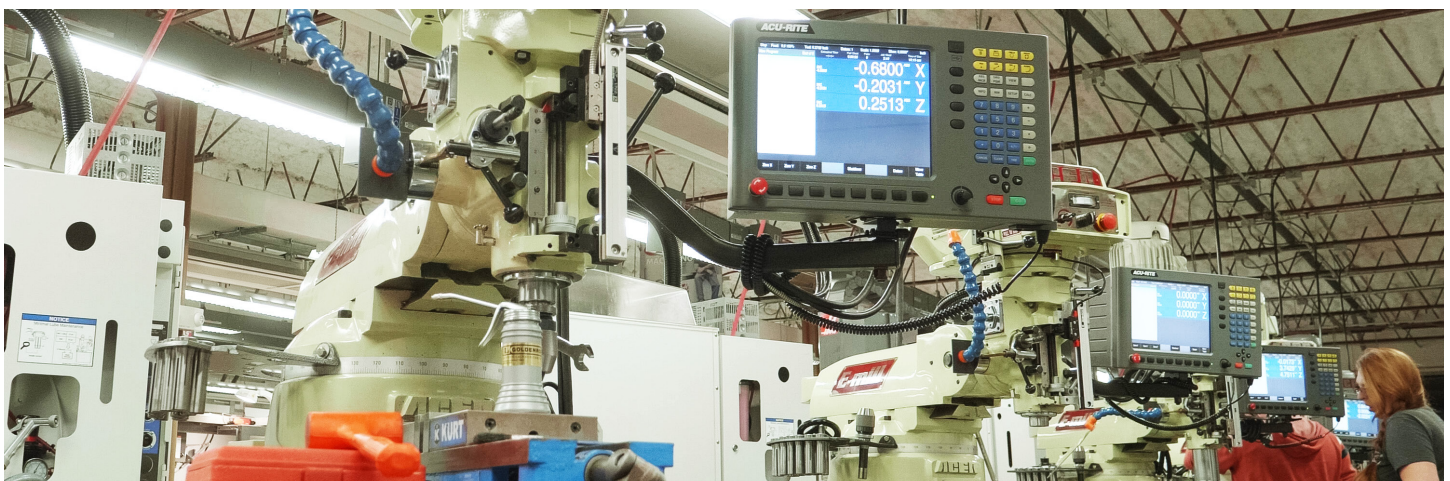


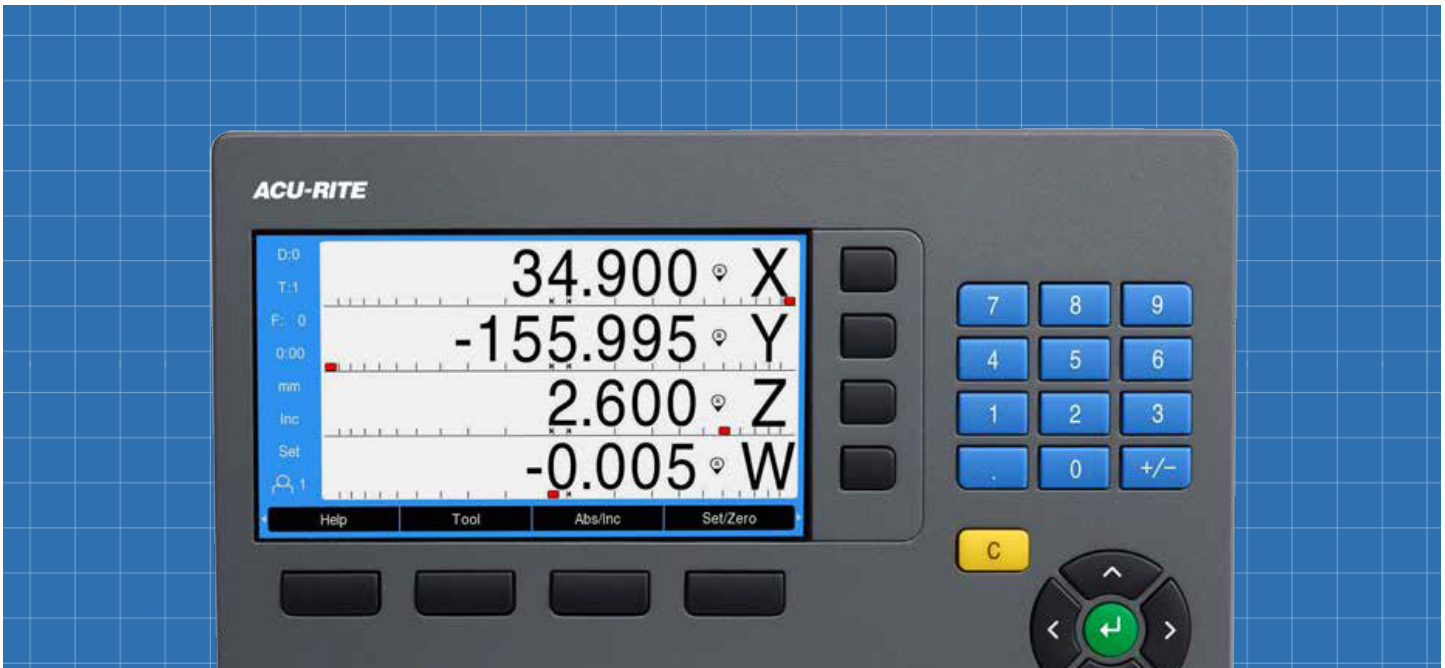
## Types of linear encoders

Absolute encoders have scales or wheels with more nuanced markings or variations for the scanning mechanism to read. Absolute encoders do not require a main reference point. In other words, immediately upon powering on a machine, specific positioning is acquired and recognized by the control. With absolute encoders, there is no need to zero out a spindle head or worktable before beginning work.

Incremental encoders function in the same fundamental way as absolute encoders, but instead of unique markings that can communicate an exact positioning, more uniform gratings communicate a relative position.

Reference marks throughout the pattern establish absolute position. As a result, machine elements that use this kind of encoder need to establish zero points before work can begin.





In most cases, this means the addition of a DRO with feedback will require careful measuring and the tapping or drilling of some sort of universal bracket. This can be painstaking—and again, you have different brands or types of machines, you’ll have to modify brackets for each.

The easiest way to install a DRO system on a machine is to use custom brackets. This can save upwards of an hour for each machine being upgraded or retrofitted.

At ACU-RITE, we make custom DRO and encoder bracketing kits for more than 100 different machine makes and models. This all but eliminates the need for measuring, drilling or tapping.

One of the other steps customers can have trouble with is measuring the proper travels. It sounds simple. But, if it’s done wrong, replacing a damaged scale can cost of thousands and render a machine inoperable.

Distributors often offer affordable installation services at the time of purchase, but there is the option to do it yourself. Most DRO systems will come with detailed, step-by-step instructions for installation that are manageable for a shop’s staff.

**Remember: The length of the machine table is not the same as the true travel, or the best scale.**

**Always measure from hard-stop to hard-stop, then choose the right size encoder scale.**

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**Read the instructions provided with the system completely. Doing things right early can make things easier later. Otherwise, here is some advice for making encoder installation easy.**

- Keep in mind, mounting equipment can be generic. You may need to modify them to fit your machine—face them off, square them up or even make your own.
- Don't remove equipment—reading head alignment brackets, for example—from the packaging until instructed.
- Placement, including cords, will depend on the features of the machine. Table locks, oil sources, switches or power sources can impact this.
- Clean all mounting surfaces.
- Keep the reading head centered during installation.
- Be sure the machine table is at the center of its travel before starting.
- Ensure that the correct length encoder is being used for total axis travel. The scale and reader head should have some clearance at the extreme ends of the travel to avoid collision.
- Save any alignment brackets with the encoder.
- Use shims to make sure mounting equipment is square and flat to the machine's casting.
- Use a dial indicator of some sort to make sure the scales are square to the travel of the machine. Do not use a level to square up scales, that does not account for uneven machine orientation. Distributors often offer affordable installation services at the time of purchase, but there is the option to do it yourself. Most DRO systems will come with detailed, step-by-step instructions for installation that are manageable for a shop's staff. All DROs and machines will be different, some of this advice may be more applicable to your situation than others.
- Dial in equipment up and down and side to side.
- Mark the axis so it can be re-centered easily.
- Unpack any encoder in a safe, clean and convenient location.
- Typically, you will not want to remove the reading head.
- Determine the cable exit direction before installing the encoder.
- When nearly done, move the axis through its full travel. Confirm that the assembly does not interfere with the machine movement. For example, brackets may include chip guards. Those are usually optional as they can lessen available travel distance. That said, you will want to do everything you can to avoid chips entering the housings, face the scale away from the cutting area.



# Making the case

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A rise in productivity due to increased utilization, output and accuracy are strong arguments, but justifying a DRO retrofit ultimately comes down to money in and money out. ROI is relatively easy to calculate; there are two ways DROs can help directly grow revenue are:

- Jobs that might have been vended out due to a lack of time and capability can be kept in-house.
- Jobs that were once turned down or quoted too high can be handled due to the increased productivity.

Should you decide the time is right to bring some of your machines back to life, we'd love to work with you. You can get started with our online DRO selector tool at [ACU-RITE.com/DRO](https://www.acu-rite.com/DRO). You'll narrow your search down quickly, depending on your specific application.



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