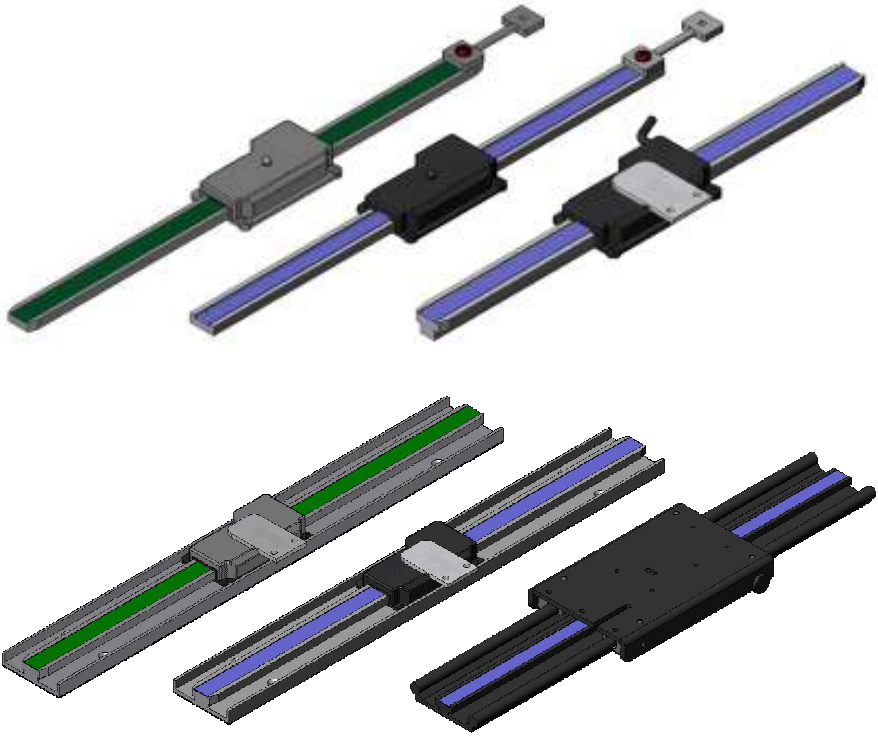
Accurate
TECHNOLOGY INC.
Linear Digital Measuring Systems

ProScale®



Models 150, 250, 180, 280, 380 & 580

INSTALLATION

WARRANTY

Accurate Technology, Inc. warrants the ProScale Models 150, 180, 250, 280, 380 and 580 against defective parts and workmanship for 1 year commencing from the date of original purchase. Upon notification of a defect, Accurate Technology, Inc., shall have the option to repair or replace any defective part. Such services shall be the customer's sole and exclusive remedy. Expenses incidental to repair, maintenance, or replacement under warranty, including those for labor and material, shall be borne by Accurate Technology, Inc. (Including freight or transportation charges during the first 30 days).

Except as expressly provided in this warranty, Accurate Technology, Inc. does not make any warranties with respect to the product, either expressed or implied, including implied warranties of merchantability or fitness for a particular purpose, except as expressly provided in this agreement.

Accurate Technology, Inc. shall not be liable for any special, incidental, or consequential damages or for loss, damage or expense directly or indirectly arising from the customer's use of or inability to use the equipment either separately or in combination with other equipment, or for personal injury or loss or destruction of other property, or from any other cause.

To request repair work, (either warranty qualified parts or not) contact Accurate Technology, Inc. directly by phone, fax, or e-mail. A Returned Merchandise Authorization (RMA) number is required before returning a product for repair.

Accurate Technology, Inc.

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www.proscale.com **info@accurate-technology.com**

SAFETY WARNING

Before installing ProScale on any machinery: Turn off machine and disconnect power.

SAFETY WARNING

Table of Contents

SECTION 1 GENERAL INFORMATION

Introduction

ProScale digital measuring systems are affordable precision electronic devices for making linear measurements with speed and accuracy. ProScale consists of a **SCALE**, an **ENCODER** (also called READHEAD), and a **DIGITAL READOUT**, or DRO. ProScale 150 and 250 use Capacitive Absolute technology, while the Model 180, 280, 380 and 580 use Inductive Incremental technology.

Because ProScale is a solid-state electronic device there's very little to wear out. The Encoder and Scale are designed to withstand shop dirt, dust, and other airborne contaminants, and the controls are sealed with a protective cover. With normal care, ProScale will last for years.

ProScale is ideal for most measuring requirements up to 6m (20ft) where high accuracy, less than 10 µm, (approximately .0005") is not needed, but affordable repeatability (better than a tape measure), or accuracy to 50 µm (.002") is desired. Because ProScale shows the exact measurement on its Digital Readout, it eliminates the guesswork involved in reading and interpreting tape measures, scales & pointer, or shaft encoders. It is compatible for any general purpose measurement application where data is collected (SPC, RS232, RS485 or wirelessly), and/or digital accuracy and repeatability is desired. It is also suitable for retrofitting, or as original equipment on most types of machinery.

About This Manual

- **This manual includes theory and INSTALLATION information for ProScale Models 150, 180, 250, 280, 380 and 580 only.**

- **This manual DOES NOT include OPERATION information for any Digital Readout. Operating and programming information can be found in the Digital Readout OPERATION manual.**

Product Specifications

Measuring Range: *

Model 150/180*	2 Standard Sizes: 0-10 inches (250mm) and 0-18 inches (450mm)
Model 250/280*	6 Standard Sizes: 0 - 24, 60, 96, 120, 180, 240 inches (0 - 600, 1500, 2400, 3000, 4500, 6000mm)
Model 380*	4 Standard Sizes: 0 - 24, 60, 96, 120 inches (0 to 600, 1500, 2400, 3000 mm)
Model 580**	4 Standard Sizes: 0 – 48, 96, 144, 192 inches (0 to 1200, 2400, 3600, 4800 mm)

Accuracy:

Model 150/180	± .003 inches (0.07mm)
Model 250/280/380	± .002 inches / foot Maximum error $\leq$ ± .008in (.20mm)
Model 580	± .003 inches / foot Maximum error $\leq$ ± .010in (.25mm)

Resolution:	See Digital Readout Operation Manual
Repeatability:	See Digital Readout Operation Manual
Operating Temp:	0 to 50°C; 32 to 120°F
Temp Coefficient:	25ppm/℃; 13ppm/ °F

Slew Rate:

Model 150/250:	15 inches/second (380mm/sec)
Model 180/280/380:	60 inches/second (1500mm/sec)
Model 580:	50 inches/second (1500mm/sec)

Output Format:	See Digital Readout Operation Manual
Encoder:	Six-conductor cable terminated by RJ12 connector is standard. Cable lengths available up 20 feet.
Dimensions:	Available at www.proscale.com

All ProScale products are MADE IN USA

* MEASUREMENT range is approximately 4 inches (100mm) *shorter* than the PHYSICAL length of the aluminum scale extrusion.
* *MEASUREMENT range is approximately 8 inches (200mm) *shorter* than the PHYSICAL length of the aluminum scale extrusion.

About ProScale

All ProScale systems consist of a **SCALE** (or track), an **ENCODER**, (or readhead) and a **DIGITAL READOUT** (DRO).

The **SCALE** consists of a series of conductive patterns bonded to an aluminum extrusion. The Model 150/180 Scale is .765 inches (19mm) wide and comes in standard lengths up to 18 inches (450mm) long. The Model 250/280 Scale is 2.02 inches (51mm) wide and comes in standard lengths up to 240 inches (6000mm). The Model 380 Scale is .765 inches (19mm) wide and comes in standard lengths up to 120 inches (3000mm) long. The Model 580 Scale is 3.00 inches (75mm) wide and comes in standard lengths up to 192 inches (4800mm) long.

NOTE: All Scales for 150/180/250/280/380 are approximately 4 inches (100mm) longer in physical length than their specified measuring ranges. Scales for Model 580 are 8 inches (200mm) longer than their measuring ranges.

The **ENCODER** contains a computer chip which transmits and receives signals to and from the **SCALE** using capacitive or inductive coupling. The received signal is used by the encoder to calculate its position to within 10 microns (10µm or .0004in). This position data is then sent to the **DIGITAL READOUT** where it can be displayed in millimeters, centimeters, inches, or fractions. The measurement can then be sent to an external data acquisition device via a wired or wireless transmission product.

Multiple **ENCODERS** (connected to individual **DIGITAL READOUTS** or data acquisition units) may be used on the same **SCALE** simultaneously.

Scales

Model 150 & 250 Scales

ProScale models 150 and 250 are Capacitive Absolute (often referred to as *ABS*) systems and use a robust and sophisticated method to measure position, resulting in a high immunity to electrical interference, and one that does not forget its position when power is removed.
All Absolute *(ABS)* Scales have a “zigzag” pattern on a green laminate. There may be a “SPLICE or JOINT” approximately every 430mm (17in).

An *ABS* system measures its actual position by reading a pattern which is unique at any given location over a segment length. The maximum length of

a ProScale absolute segment is 430.08mm (16.933 in). The segment must then repeat. Consider the illustration on the previous page to represent a ProScale approximately 50 inches long. There are three absolute segments joined together. Within each segment the system is absolute. However, crossing over a segment joint now presents the Encoder with information identical to what it read in the previous segment. At this point the system must be able to recognize that it has crossed a joint and therefore must add or subtract the value of 1 segment (430mm). In fact, each time the Encoder passes over a joint it must keep track of how many segments it has passed, and in which direction. This action is accomplished by the Digital Readout and is transparent to the operator.

What does all this mean? If the Encoder remains on the same absolute segment, it can have power removed, its position changed and power restored without loss of position information. However, if power is removed (Encoder unplugged from Digital Readout or batteries removed from Digital Readout) *and* the Encoder passes over a segment joint, the *transition* will not be recognized. When power is restored the system knows its absolute position on the new segment, but does not know how many segments it has passed, or in which direction. (Simply turning the Digital Readout off does **not** constitute removing power. A small amount of power is still supplied to the Encoder; only the LCD is turned off.)
Digital Readouts provide the operator with a method to adjust the segment offset so the system displays the correct reading at all times without loss of accuracy.
See Digital Readout OPERATION manual for additional information on *Segment Offset Adjustment*.
To shorten ProScale Model 150/250 Scales see:
http://www.proscale.com/other/absscalecut.htm

Model 180, 280, 380, 580 Scales
These ProScale systems use Inductive Incremental technology. Incremental Scales have a repeating “bar” pattern on a colored laminate.

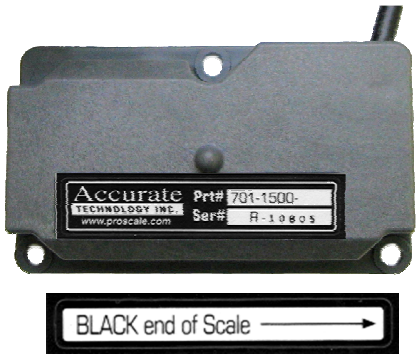
These systems measure position by reading a pattern and determining how far the encoder has traveled. Removing power from these systems will necessitate re-calibration. This could be as easy as depressing a key on the front panel of the DRO if the system was set-up when it was first installed. However, when compared to the model 150 and 250, these systems have a

faster slew rate, so they are better suited for a faster moving environment where a “repeatable” reference can be established (the reference does not have to be a zero point).
To shorten these scales simply cut to the desired length.

Encoders

Model 150 & 250 Encoders

Model 150 & 250 Encoders have gray housings and **“BLACK END OF SCALE”** labels on the housing cover. Each Model 150 or 250 Scale will have one end painted black. This relationship is very important since the Encoder may work but produce erratic results if installed backwards. To insure proper operation, be sure the arrow on the Encoder is pointing toward the **BLACK** end of the Scale.
Standard Model 150 & 250 Encoders are supplied with a 10 foot (3m) cable. Custom length cables are available up to 20 feet (6m).



Model 180, 280, 380, and 580 Encoders

Model 180, 280, 380, and 580 Encoders have black housings. The Encoder orientation on the scale can be reversed. The reading direction can also be reversed through programming in the digital readout.
All Model 180, 280 & 380 encoders are supplied with a 10 foot (3m) cable. Custom length cables are available up to 20 feet (6m). Model 580 encoders are supplied with 3 inch (75mm) cables.

NOTE:
ENCODERS and SCALES of different technologies are not interchangeable.

Digital Readouts

ProScale measuring Systems can operate with any of several different Digital Readouts. Refer to the OPERATION manual that accompanied your DIGITAL READOUT for information about programming, installation and operation of the Digital Readout.
Below are brief descriptions of the Digital Readouts available for your ProScale System.
For the latest information about available Digital Readouts for ProScale Measuring Systems please visit:
http://www.proscale.com/Digital Readouts/Digital Readouts.htm

Surface Mount General Purpose LCD
Power: 2AA batteries or 12-24VDC
Output: SPC output, Configurable upper/lower limits

Surface Mount BASIC LCD
Power: 2AA batteries
Output: None

Panel Mount LCD
(Panel Mount is for a “built-in” appearance of the digital measuring system.)
Power: 1 Lithium battery or 12-24VDC

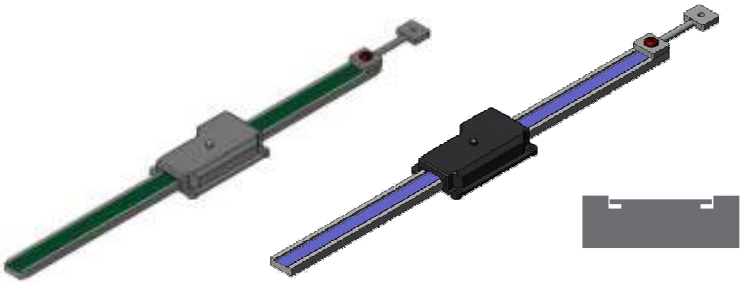
Compact Surface Mount LCD
Economical DRO
Power: 1 Lithium battery

The following Digital Readouts are available with ProScale Model 150 & 250 systems only:

Panel Mount LED
1/8 DIN Panel Mount Red LED w/RS485 output
Power: 12-24VDC

Panel Mount, Dual Input with Backlit LCD
Inputs for two encoders. Can calculate Sum, difference and Arc tangent; RS232 and (2) SPC outputs
Power: 12-24VDC

SECTION 2 INSTALLATION



Model 150 & 180 scale End View

Model 150 & 180

Scale & Encoder Installation

ProScale Models 150 & 180 are easy to install. By following the basics of good installation, reliable, error-free operation can be expected. ProScale Models 150 & 180 can be used in many different measurement applications, and with numerous types and brands of equipment. Therefore all installations will be a little different and it is the responsibility of the user to choose the bolts, screws, or other mounting hardware that guarantee proper installation for optimum operation in their application.

1. For Model 150, note the orientation of the Encoder on the Scale. Be sure the arrow on the Encoder points towards the **"BLACK END OF SCALE"**. This orientation is critical for proper operation. Be sure the mounting location for the Encoder and Scale will allow this orientation.

2. Determine an appropriate mounting location. Most applications of the Model 150/180 will have the Encoder held stationary while the Scale is passed through it. The ProScale will also operate properly if the Encoder is moved along the Scale (see figures on next pages).

Connector Link

3. If the Encoder is to be mounted stationary, the Scale should be attached to a moving part of the measuring application or machine using the Connector Link. Attach the Encoder using three screws or bolts. Attach one end of the connector link to the Scale using the screw (included) and the other end to the moving part.

Check that the Scale is properly aligned with the direction of motion of the moving part. Be sure both connections are secure or inaccurate readings could result. (The connector link compensates for small misalignments of the installation and acts as a *shear pin.)*

4. If your application is better suited to having the Scale being held stationary and the Encoder moving, you should use the Guide Clip to move the Encoder along the Scale (see figure on next page). The connector link is not necessary in this configuration. Mount the Scale using the included screws. Be sure the Scale is properly aligned as the Encoder is moved (the Guide Clip will compensate for slight misalignment in one direction only). Adjust Scale alignment if necessary. For accurate measurements, the guide clip must be mounted perpendicular to the direction of travel of the Encoder. The guide clip should exert some pressure on the encoder over the full range of travel of the Encoder so the two move as a single unit.

Guide Clip

5. Plug the Encoder into the Digital Readout.

Refer to the OPERATION manual that accompanied your Digital Readout for information about set-up, installation and operation of the Digital Readout.

Part dimensions may be viewed and downloaded at:

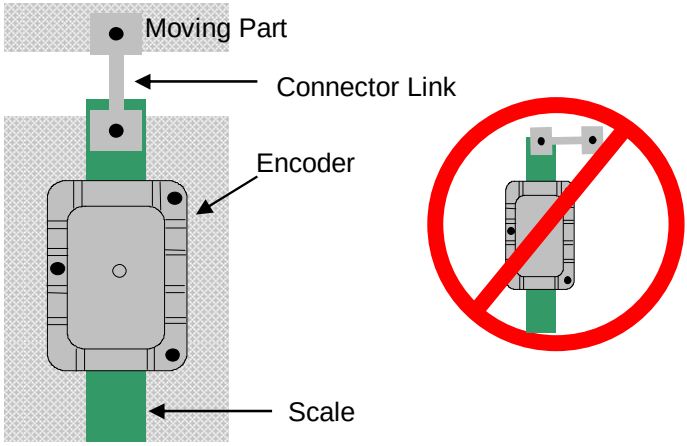
Model 150:
http://www.proscale.com/downloads/PDF_Files/Model_150_2D.pdf

Model 180:
http://www.proscale.com/downloads/PDF_Files/Model_180_2D.pdf

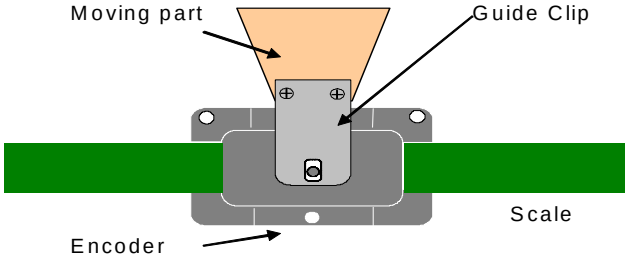
Note: If any other mounting method is used, observe the following:

- *Do not drill through the colored portion of the Scale at any point over which the Encoder will travel.*
- *Do not mount the Scale so the mounting hardware interferes with the movement of the Encoder.*

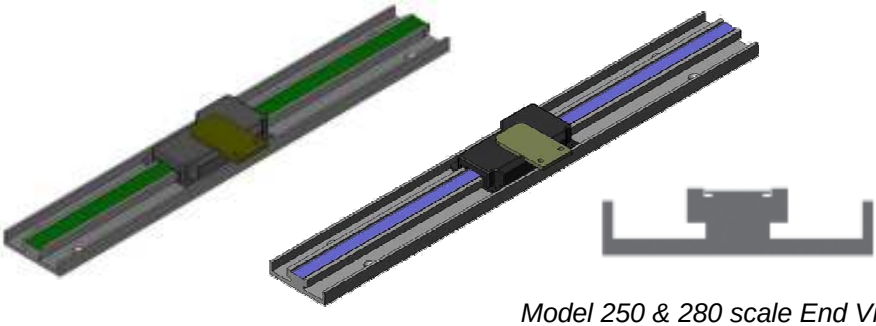
Typical Model 150/180 Installations



Encoder stationary, Scale moves



Scale stationary, Encoder moves



Model 250 & 280 scale End View

Model 250 & 280

Scale & Encoder Installation

ProScale Model 250/280 are easy to install. By following the basics of good installation, reliable, error-free operation is assured. ProScale Model 250/280 can be used in many different measurement applications, and with numerous types and brands of equipment. Therefore all installations will be a little different and it is the responsibility of the user to choose the bolts, screws, or other mounting hardware that guarantee proper installation for optimum operation.

1. For Model 250 note the orientation of the Encoder on the Scale. Be sure the arrow on the Encoder points towards the **"BLACK END OF SCALE"**. This orientation is critical for proper operation. Be sure the mounting location for the Encoder and Scale will allow this orientation.

2. Determine an appropriate mounting location for the Scale. Typical Model 250/280 applications usually have the Scale held stationary while the Encoder is moved along the Scale.

3. When installing the Model 250 & 280, you should use the Guide Clip to move the Encoder along the Scale (see figures on next page). Mount the Scale using the included screws. Be sure the screw heads do not protrude above the surface of the extrusion. Check that the Scale is properly aligned as the Encoder is moved over its length (the Guide Clip will compensate for slight misalignment in one direction). Adjust Scale alignment if necessary. For accurate measurements, the guide clip must be mounted perpendicular to the direction of travel of the Encoder. The guide clip should exert some pressure over the full range of travel of the Encoder so the two move as a single unit. *Failure to use the guide clip could void the warranty.*

Guide Clip

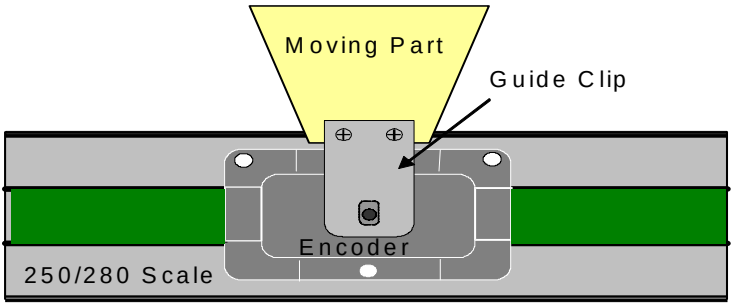
4. Plug the Encoder into the Digital Readout.

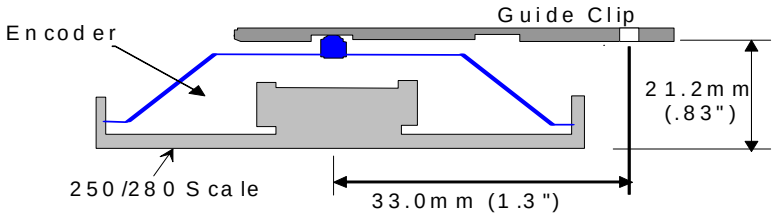
Refer to the OPERATION manual that accompanied your Digital Readout for information about set-up, installation and operation of the Digital Readout.

Note: If any other mounting method is used, observe the following:

- *Do not drill through the colored portion of the Scale at any point over which the Encoder will travel.*
- *Do not mount the Scale so the mounting hardware interferes with the movement of the Encoder.*

Typical Model 250/280 Installation

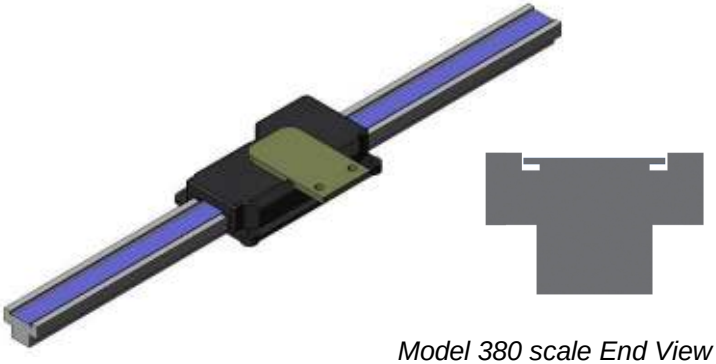




Guide Clip Pressure/Spacing (End View)

Part dimensions may be viewed and downloaded at:

Model 250:
http://www.proscale.com/downloads/PDF_Files/Model_250_2D.pdf
http://www.proscale.com/downloads/PDF_Files/M250Scaleholespacing.pdf
Model 280:
http://www.proscale.com/downloads/PDF_Files/Model_280_2D.pdf



Model 380 scale End View

Model 380

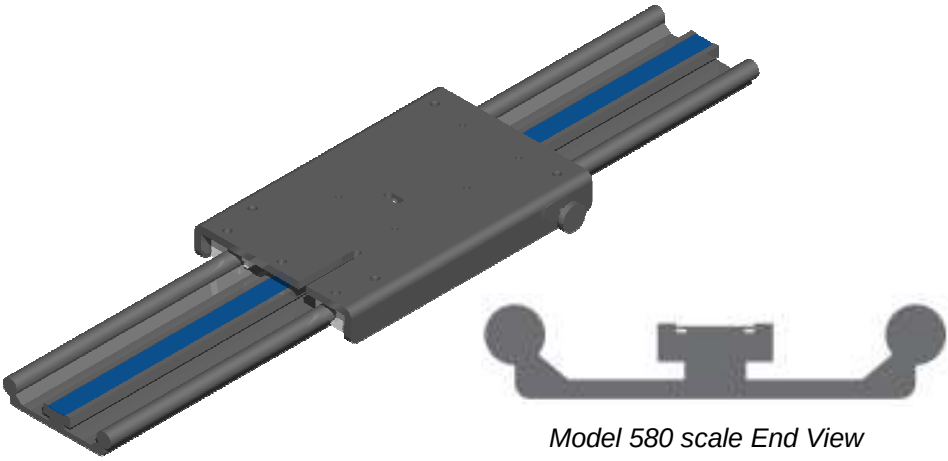
Scale & Encoder Installation

The ProScale Model 380 scale is a hybrid version of the Model 180 and 280 scales. It is often used by OEMs as an integral part of a machine. It can be installed in an "*encoder stationary, scale moving*" configuration or a "*scale stationary, encoder moving*" configuration. In either case, (particularly if the scale is to be moved through the Encoder), care must be taken to provide good alignment of the Encoder and Scale during motion.

See page 13 for "*encoder stationary, scale moving"* illustration and page 15 for "*scale stationary, encoder moving"* illustration.

Part dimensions may be viewed and downloaded at:

http://www.proscale.com/downloads/PDF_Files/Model_380_2D.pdf



Model 580 scale End View

Model 580

Scale Installation

ProScale Model 580 is easy to install. By following the basics of good installation, reliable, error-free operation is assured. ProScale Model 580 can be used in many different measurement applications, and with numerous types and brands of equipment. Therefore all installations will be a little different and it is the responsibility of the user to choose the bolts, screws, or other mounting hardware that guarantee proper installation for optimum operation.

NOTE: Do not remove the moving carriage from the scale when installing.

1. Determine an appropriate mounting location for the Scale. Remember that the moving carriage is wider than the scale. If the Model 580 system will be used as part of a measuring table, allow space for a fixed jaw to be installed on one end. Also, the scale should be recessed into a 4.5 x 0.75 inch (115 x 20mm) channel in the table's surface. Mounting the scale this way will extend the life of the Model 580 considerably.

2. The scale can be attached by drilling and countersinking holes for flathead type screws, or by using double sided foam core tape. If using flathead screws, the recommended size is #8 screws (or M4 if metric).

3. If a moving jaw will be attached to the carriage plate, the jaw should be machined with M5 clearance holes 1.50 inches on center, and 0.25 inches from the edge of the plate. Jaws heavier than 40 pounds are not

recommend, as they will reduce the life of the bearings. Also, jaws wider than 6 inches are not recommended unless the parts to be measured span the entire width of the jaw. (Measurements taken at the tips of larger jaws are prone to Abbé errors.)

4. The thumbscrew can be used to lock the carriage in place. This thumbscrew can be moved to any of the four bearing positions (requires moving a setscrew).
   NOTE: If the locking capability is desired when the Model 580 is installed into a recess, the channel in the tabletop will need to be made wider. Do not replace the thumbscrew with any product that will increase the pressure placed on the bearings.

5. There is a setscrew in each of the remaining bearings. These can be adjusted to increase or decrease the drag of the carriage.
   NOTE: Use caution when adjusting the setscrews. Too much pressure may cause premature wear on the bearings or inadvertently lock the carriage in place. Also, adjusting the setscrews may require re-adjusting the moving jaw (if installed) to be parallel to a fixed jaw (if used).

Refer to the OPERATION manual that accompanied your Digital Readout for information about set-up, installation and operation of the Digital Readout.

Note: If any other mounting method is used, observe the following:

- *Do not drill through the colored portion of the Scale at any point over which the Encoder will travel.*
- *Do not mount the Scale so the mounting hardware interferes with the movement of the Carriage.*

Part dimensions may be viewed and downloaded at:

http://www.proscale.com/support/specifications/model580specifications.htm

Frequently Asked Questions

Can I mount the Scale/Encoder without the connector link/guide clip?

The connector link and guide clip serve to provide an accurate method of transferring the movement of the moving part to the Encoder or Scale, while also absorbing any stresses that may occur. If they are not used, **the warranty could be voided.**

What does no Enc mean?

If the Encoder is off the Scale, or the Encoder cable is unplugged from the Digital Readout, **no Enc** will appear on the LCD. To clear:

1. Be sure the Encoder is on the Scale and properly oriented.
2. Unplug the Encoder from the Digital Readout for one second and then reconnect the Encoder.
3. Connect the Encoder to the Digital Readout.

The Digital Readout numbers appear to be random. (Model 150 & 250 only)

Be sure the Encoder is oriented correctly on the Scale. One end of the Scale is marked in black; be sure that the arrow on the Encoder is pointed in this direction.

The Digital Readout does not change, or changes very little, as the Scale or Encoder moves.

1. The Digital Readout is in the HOLD mode.
2. The Encoder is on the Scale backwards.
3. The Scaling factor is set very low.

SECTION 3 ACCESSORIES

ProRF SPC

ProRF allows linear measurement or position data to be transmitted wirelessly to a PC or other device having a USB or RS232 connection. The system uses 802.15.4 radio modules to provide reliable two way communication. The transmitter plugs into any Digital Readout with an SPC output.

ProRF Encoder

Instead of a long cable between the Encoder and the Digital Readout, a Transmitter at the Encoder sends data to a Receiver connected to the Readout at a remote location, or to a PC Receiver with RS232 or USB output.

ProMUX

ProMUX-3 is an easy to use hardware interface that provides communication from M150 & 250 readheads (or SPC equipped Digital Readouts) to a user's PC or PLC. ProMUX-3 supports three inputs, and one RS232.

Analog Interface Unit

The AIU is an interface designed to provide an analog signal output proportional to the displayed position of a ProScale measurement system.

SPC Converter

Gageway SM™ converts SPC output from many of our Digital Readouts to serial or USB data.

Thank you for choosing a ProScale Product

MADE IN USA

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This manual is available at www.proscale.com

Please register your system at:
www.proscale.com/registration.htm

Part # 800-1401-001 Rev B