



User's Manual for:
ProScale Model 150 & 250 Systems
& All ProScale Products using the

General Purpose LCD Digital Display

Warranty

Accurate Technology, Inc., warrants the Model 150 and Model 250 ProScale against defective parts and workmanship for 3 years 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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SAFETY WARNING

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

SAFETY WARNING

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Introduction

ProScale™ digital measuring systems are affordable precision electronic devices for making linear measurements with speed and accuracy. ProScale consists of a scale, a readhead (or encoder) and a digital display. It uses capacitive encoder technology, the same technology used in digital calipers.

Because ProScale is a solid-state electronic device there's very little to wear out. The readhead 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, 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 display, it eliminates the guesswork involved in reading and interpreting tape measures, scales & pointer, or shaft encoders. It is compatible for retrofitting, or as original equipment, on most machinery or for any general purpose measurement application where data is collected (SPC, RS232, RS485) and/or digital accuracy and repeatability is desired.

What This Manual Includes

This manual includes information for:

- **ProScale Model 150 and Model 250 measurement systems with General Purpose LCD Digital Displays.**
- **General Purpose LCD Digital Display operation instructions for other ProScale products (covered in separate manuals).**
- **General Purpose LCD Digital Displays with Firmware V2.0 and higher.**

The General Purpose LCD Digital Display comes in the following configurations:

Surface Mount



Basic Programming
2AA Batteries

OLD P/N 701-1600-120
NEW P/N 700-1600-220



Fully Programmable
2AA Batteries
SPC output

P/N 701-1600-100
P/N 700-1600-200



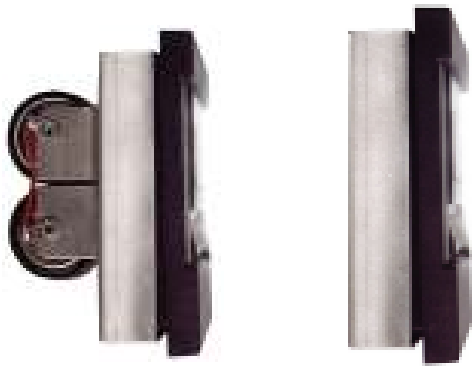
Fully Programmable
24VDC
Limit Signal Output
LCD Backlighting
P/N 701-1605-100
P/N 700-1600-205

¼ DIN Panel Mount



Fully Programmable
2D Batteries
SPC output

OLD P/N 701-1570-100
NEW P/N 700-1600-400



Fully Programmable
24VDC
Limit/Monitor Signal Output
LCD Backlighting
P/N 701-1560-100
P/N 700-1600-300



The above displays are direct replacements for the following Digital Displays:

General Purpose	701-1600-001	Panel Mount, Battery	701-1570-001
General Purpose Basic	701-1600-020	Panel Mount, 24VDC	701-1560-001
Standard	701-1505-00x	Panel Mount, Battery	701-1525-00x
Basic	701-1500-00x	Panel Mount, 24VDC	701-1550-00x
SPC	701-1115-00x		
Programmable	701-1115-00x		
Incremental	701-2000-002		
Incremental	701-1495-00x		

ProScale Terminology

All ProScale systems consist of a **SCALE**, a **READHEAD**, and a **DIGITAL DISPLAY**.

The **SCALE** consists of a series of conductive patterns bonded to an aluminum extrusion.

The **READHEAD**, or encoder, contains a computer chip which transmits and receives signals to and from the scale using capacitive coupling. The received signal is used by the readhead to calculate its position to within 10 microns (10 μ m / .0004in). This position data is then sent to the digital **DISPLAY**, where it can be displayed in millimeters, centimeters, inches, or fractions and sent to an external data acquisition device.

Each **SCALE** and **READHEAD** uses either *Incremental* or *Absolute* encoder technology. Absolute, (often referred to as *ABS*) systems use a more 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. The type of system you have (absolute or incremental) may be determined by the pictures and descriptions on the following pages of this manual, by reviewing our web site, by the label on the packaging, or by contacting your supplier.

Model 150	<i>Absolute Technology Measuring System Usually measures 250mm (10") or 450mm (18")</i>
Model 250	<i>Absolute Technology Measuring System Standard Sizes from 1.2m (4') to 6m (20')</i>



Absolute (ABS) Style Pattern

Model 100	Incremental Technology Measuring System (Discontinued 1999) <i>Usually measures 250mm (10") or 450mm (18")</i>
Model 200	Incremental Technology Measuring System (Discontinued 1999) <i>Standard Sizes from 1.2m (4') to 6m (20')</i>
Select ProScale Products ie. ProPanel, ProStop, ProKits etc.	



Incremental Style Pattern

Scales

Absolute

An (ABS) Absolute measuring technology 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 430mm (16.932 in.). The segment must then repeat.



Consider the illustration above 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 readhead 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 readhead 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 display and is transparent to the operator.

What does all this mean? If the readhead 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 (readhead unplugged from Digital Display or batteries removed from Digital Display) *and* the readhead 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 display off does NOT constitute removing power. A small amount of power is still supplied to the readhead; only the LCD is turned off.)

General purpose digital displays 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 Section 4 for additional information on *Segment Offset Adjustment*.

All Absolute (ABS) scales have a “zigzag” pattern on a green laminate. Take care to not damage the green coating. There should also be a pattern “SPLICE” approximately every 430mm (17in.). **To shorten (ABS) scales. Call Accurate Technology for assistance,** or visit: <http://www.proscale.com/other/absscalecut.htm>



Absolute (ABS) Style Pattern

Incremental

Simply stated, an Incremental system measures the distance it has traveled relative to a starting point. Incremental style scales have a repeating “bar” pattern on a green laminate. There should be a “SPLICE” approximately every 570mm (22in.). Incremental scales may be shortened if needed.

Incremental Style Pattern

Scales used on Absolute and Incremental systems should never be mixed.

Avoid drilling through the green portion of any scale. Any portion of the green that is drilled will not operate.

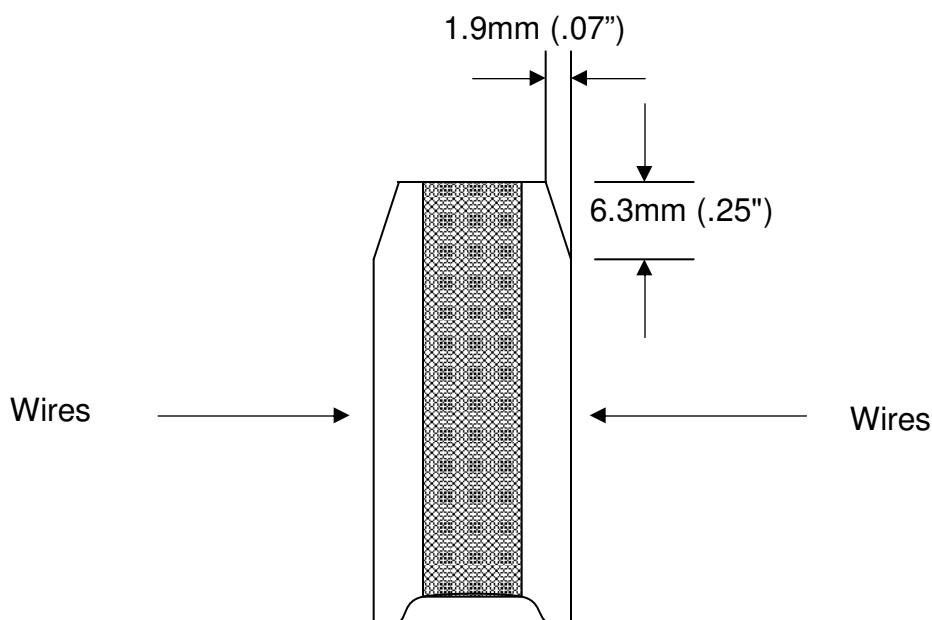
Shortening Scales

<http://www.proscale.com/support/faq.htm>

To shorten incremental scales follow these steps:

The scale has stainless-steel wires pressed into the side that could be damaged if not cut properly.

1. Clamp the wires so they do not pull away from the extrusion.
2. Using a hacksaw, cut through the aluminum extrusion.
3. Use a file or sanding tool to chamfer the cut end to the specifications shown in the illustration.
4. Remove all burrs.
5. Test the shortened scale by sliding a readhead on. There should not be any binding.



Readheads

Absolute

Absolute (*ABS*) style readheads have “**BLACK END OF SCALE**” labels on the cover, and the wire exits from the *corner* of the housing. Care must be taken not to damage the brass “fingers” inside the readhead housing. *ABS* style readheads, used in all Model 150 and Model 250 systems, must only be used on *ABS* scales and with a particular orientation. Each readhead has an arrow on the label pointing in the direction of the “**BLACK END OF SCALE**”.



Each *ABS* style scale will have one end painted black. This relationship is very important, since the readhead will work, but produce erratic results if installed backwards. To insure proper operation, be sure the arrow on the readhead is pointing toward the **BLACK** end of the scale. The standard *ABS* readhead has 3m (10 ft.) of cable. For special cable lengths, contact Accurate Technology, Inc.



Standard ABS Readhead is supplied with a 3m (10ft) cable
*OLD Part # 701-1510-001, **NEW Part # 701-1500-120***

Incremental

Incremental style readheads do *not* have labels on the cover, and the wire exits from the *center* of the housing. Care must be taken not to damage the brass “fingers” inside the readhead housing. Incremental readheads work on incremental scales **ONLY**. Orientation of incremental readheads on the scale is not important. Incremental readheads are still used on some current Accurate Technology products such as: ProStop, ProKit, Measuring Kits, ProCaliper, and ProPanel.



Standard Incremental Readhead is supplied with a 300mm (12in) cable
*Old Part # 701-1002-002, **NEW Part # 701-1500-N12***

Avoid making extension cables. If a different cable length is required, contact Accurate Technology, Inc.

Readheads used on Absolute and Incremental systems should never be mixed.

Digital Displays

Accurate Technology makes several different digital displays for use with ProScale products. Each display has unique features that make it suitable for different applications. The following is a listing of the displays and their descriptions:

General Purpose Surface Mount

Basic (no auxiliary keys) 2AA Bat. 701-1600-120

NEW Part # Effective April 2004: 700-1600-220

Full Fuctionality, 2AA Battery 701-1600-100

NEW Part # Effective April 2004: 700-1600-200

Full Fuctionality, 24VDC 701-1605-100

NEW Part # Effective April 2004: 700-1600-205



General Purpose 1/4 DIN Panel Mount

Full Fuctionality, 2D Battery 701-1570-100

NEW Part # Effective April 2004: 700-1600-400

Full Fuctionality, 24VDC 701-1560-500

NEW Part # Effective April 2004: 700-1600-300

Operation Instructions Included in this Manual



Other Digital Displays

1/8 DIN Panel Mount

24VDC LED, 700-1600-090
RS485 Output



1/4 DIN Panel Mount

24VDC Backlit LCD 700-1600-110
Position Control Unit



Dual Input Panel Mount

24VDC 2 line Backlit LCD 700-1600-500
2 inputs, A+B, A-B, RS232 out



Operation Covered in Separate Manual

Product Specifications

ProScale Model 150 & Model 250

Measuring Range*:

Model 150: 2 Standard Sizes:
0-250mm (10in) and 0-450mm (18in)

Model 250: 9 Standard Sizes:
0 to 300mm, 600mm, 1.3m, 2.4m, 3.0m, 3.6m, 6.0m
(0 to 12in, 24in, 52in, 96in, 120in, 144in, 240in)

Accuracy: $\pm (.025 + .064 \times L / 430)$ mm; max error ± 0.20 mm @ 1.3 to 6m
 $\pm (.001 + .0025 \times L / 17)$ in; max error $\pm .008$ in @ 4 to 20 feet
(L = length of measurement in mm or inches)

Resolution .1mm/.01cm/.01in; .01mm/.001cm/.001in; .01mm/.001cm/.0004in

Repeatability: .01mm or .001cm or .001in

Display Range: ± 9999.99 mm; ± 999.999 cm; ± 999.999 in; $\pm 399 \frac{63}{64}$ in

Operating Temp: 0 to 51°C; 32 to 120°F

Temp Coef: 25ppm/°C; 13ppm/°F

Max. Slew Rate: 400 mm/sec. (15 inches/sec.)

Available Displays: General Purpose Surface Mount LCD
(Digital Readouts) General Purpose 1/4 DIN Panel Mount LCD
1/8 DIN Panel Mount LED
1/4 DIN Panel Mount Position Control LCD
Dual Input Panel Mount LCD

Accessories: See Section 6

Output Format: Mitutoyo SPC, RS232, RS485 (Selected displays)

Readhead: 3m (10'), six-conductor cable terminated by RJ12 connector.
(Maximum cable length 6m)

Dimensions: Available at www.proscale.com.

US Patents: 4420754, 4879508, 4878013, 4959615

Warranty: Three years from date of purchase.

All ProScale products are MADE IN USA

* MEASUREMENT lengths are approximately 100mm (4in) *shorter* than PHYSICAL lengths.



ProScale Model 150-10 shown with Surface Mount General Purpose LCD Digital Display

ProScale Model 150

A General Purpose measuring system with standard measuring ranges of 250mm (10") or 450mm (18").

Model 150 systems use *ABS* style scales, *ABS* style readheads, and any of the available digital displays. Neither the scale nor readhead are compatible with any Accurate Technology incremental technology measuring systems.

ProScale Model 150 is easy to install. By following the basics of good installation, reliable, error-free operation can be expected. ProScale M150 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 installer to choose the bolts, screws, or other mounting hardware that guarantee proper installation for optimum operation.

Note: *If a custom kit was ordered which contains instructions for installing ProScale on a specific product, follow those instructions rather than the general instructions here.*

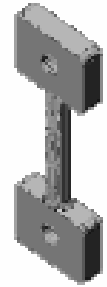
Installation

1. Note the orientation of the readhead on the scale. Be sure the arrow on the readhead points towards the “**BLACK END OF SCALE**”. This orientation is critical for proper operation of ProScale. Be sure the mounting location for the readhead and scale will allow this orientation. Take care when sliding the readhead onto the scale so the brass “fingers” inside the readhead do not get damaged. (A slight “wiggling” motion when installing the readhead on the scale will simplify the process.)
2. Determine an appropriate mounting location for the system. Most applications of the Model 150 will have the readhead held stationary while the scale is passed through the readhead. The ProScale will also operate properly if the readhead is moved along the scale (see figures on next page).

3. If the readhead is to be mounted stationary, the scale should be attached to a moving part of the measuring application or machine using the *Connector Link*.

Mount the readhead using three screws or bolts. Mount one end of the connector link to the scale using an M5 (or 10-32) screw 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/erratic readings could result. (The connector link compensates for small misalignments of the installation and acts as a *shear pin*). The connector link must be mounted in the same direction as the scale (see figure below).

Note: Failure to use the connector link could void the warranty.



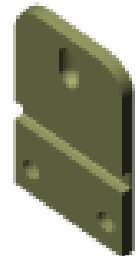
Connector Link

4. If you choose to hold the scale stationary and move the readhead to measure, you should use the *Guide Clip* to move the readhead along the scale (see figure on next page). The connector link is not necessary in this configuration.

Mount the scale using a M5 (or 10-32) screw. Be sure the scale is properly aligned as the readhead 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 readhead. The guide clip should exert some pressure over the full range of travel on the readhead so the two move as a single unit.

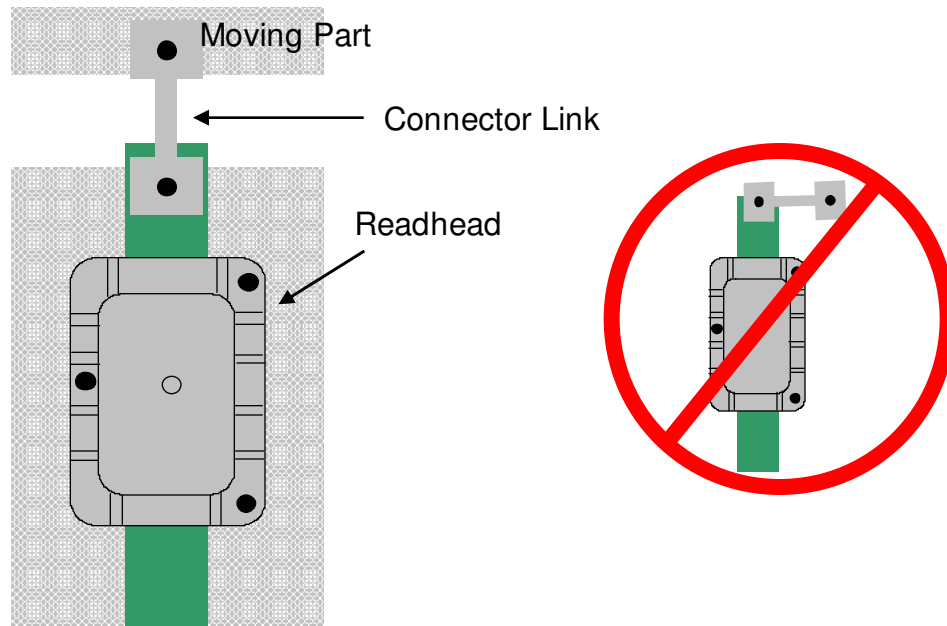
Note: Failure to use the guide clip could void the warranty.



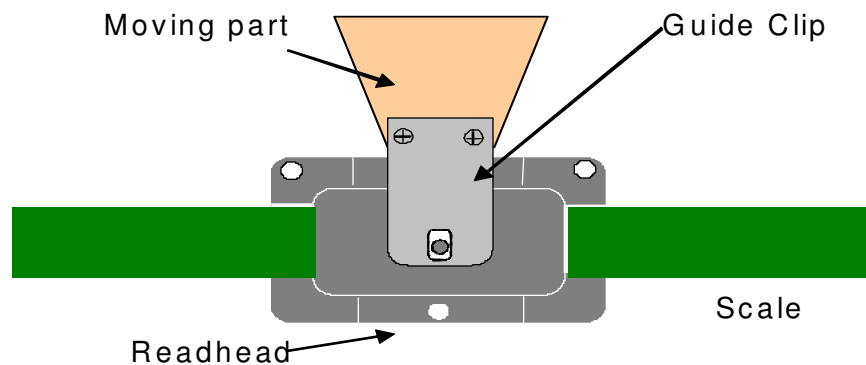
Guide Clip

5. The Digital Display may be mounted in a location which allows for easy viewing by the operator. The location of all parts should also safeguard the cable from possible damage. ProScale wiring should be kept away from electrical wiring and motors. Plug the readhead into the display. See Section 4: *Digital Display Operation*.

Typical Model 150 Installations



Readhead stationary, Scale moves



Scale stationary, Readhead moves

Calibration

Once installed, ProScale can be calibrated easily and quickly. Following is an example for calibrating ProScale on an industrial wide belt sander. Other installations follow the same general procedure.

1. Check to be sure installation of all parts is complete, all fasteners are secure, and the readhead is plugged into the digital display.
2. Set-up the machine to operate as normal. Run a part through the sander.
3. Measure the thickness of the sanded part with the most precise measuring tool available (digital calipers if possible).
4. Press the zero key on the ProScale digital display then press and hold the PLUS key to scroll until the thickness measurement is displayed (The longer the PLUS key is held down, the faster the display will scroll).
5. When the proper reading is reached, lock the display if desired. This prevents accidentally re-zeroing of the display. See Section 4: *Lock Mode*.

If the direction of movement (+ and -) on the digital display is opposite the desired direction, the display programming should be changed.

See Section 4: *Programming (Programming Parameter Pr0)*.

Maintenance

Although the ProScale will operate in a dry environment of non-conductive debris such as sawdust, the system should be cleaned of excess debris when necessary. This will prevent premature damage to the scale or readhead. Should the scale become difficult to move, check to see if debris has built up under the readhead and remove if necessary. Find and remove any burrs which may have developed on the aluminum scale. Do not use any liquid lubricants on the scale assembly, as this may impede the readhead's ability to operate properly and will attract other contaminants to the scale.

The Digital Display should be cleaned periodically with compressed air to remove any dust on the lens and keys.

All mounting fasteners should be checked occasionally for tightness.



ProScale Model 250 shown with Panel Mount General Purpose LCD Display

ProScale Model 250

A General Purpose measuring system with nine standard measuring ranges from 0-300mm (12in.) up to 0-6m (20ft.).

Model 250 systems use *ABS* style scales, *ABS* style readheads, and any of the available digital displays. Neither the scale nor readhead are compatible with any Accurate Technology incremental technology measuring systems.

ProScale Model 250 is easy to install. By following the basics of good installation, reliable, error-free operation is assured. ProScale M250 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 installer to choose the bolts, screws, or other mounting hardware that guarantee proper installation for optimum operation.

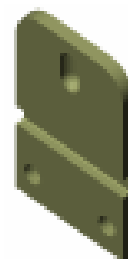
Note: If a custom kit was ordered which contains instructions for installing ProScale on a specific product, follow those instructions rather than the general instructions here.

Installation

1. Note the orientation of the readhead on the scale. Be sure the arrow on the readhead points towards the “**BLACK END OF SCALE**”. This orientation is critical for proper operation of ProScale. Be sure the mounting location for the readhead and scale will allow this orientation. Take care when sliding the readhead onto the scale so the brass “fingers” inside the readhead do not get damaged. (A slight “wiggling” motion when installing the readhead on the scale will simplify the process.)
2. Determine an appropriate mounting location for the system. Most applications of the Model 250 will have the scale held stationary while the readhead is moved along the scale. However, the ProScale will read correctly if the readhead is moved along the scale or if the scale is moved through the readhead.
3. When the scale is stationary and the readhead moves to measure, you should use the *Guide Clip* to move the readhead along the scale (see figures on next page). Mount the scale using M4 (or #8) screws. Be sure the screw heads do not protrude above the surface of the extrusion. Check that the scale is properly aligned as the readhead is moved over its length (the Guide Clip will compensate for slight misalignment). Adjust scale alignment if necessary.

For accurate measurements, the guide clip must be mounted perpendicular to the direction of travel of the readhead. The guide clip should exert some pressure over the full range of travel on the readhead so the two move as a single unit.

Note: Failure to use the guide clip could void the warranty.



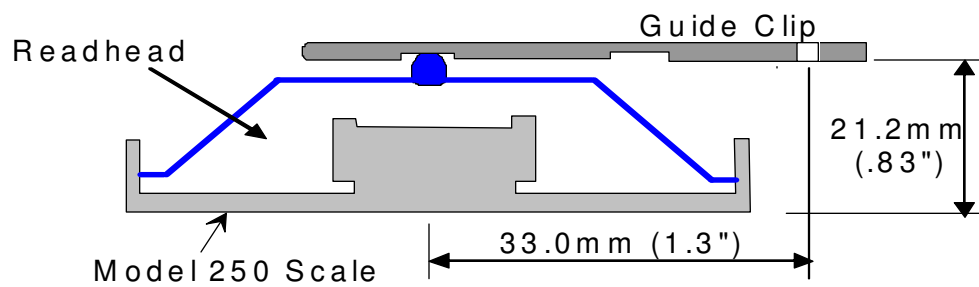
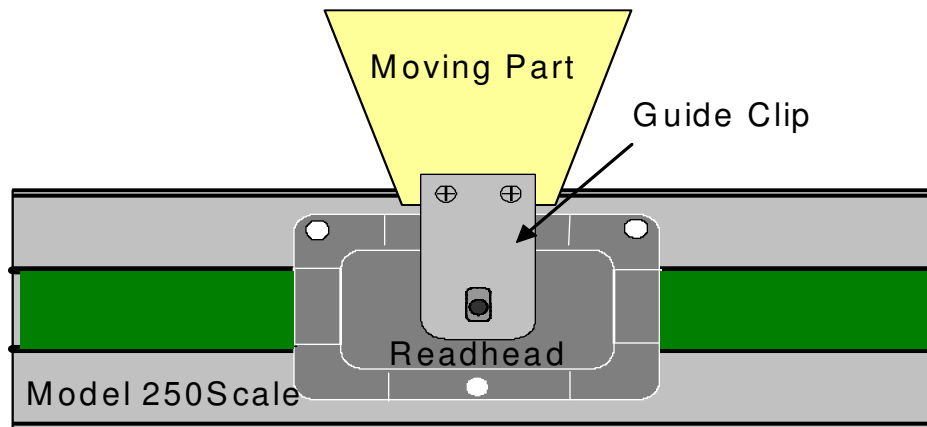
Guide Clip

4. The Digital Display may be mounted in a location which allows for easy viewing by the operator. The location of all parts should also safeguard the cable from possible damage. ProScale wiring should be kept away from electrical wiring and motors. Plug the readhead into the display. See Section 4: *Digital Display Operation*

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

- A. Do not drill through the green portion of the scale at any point over which the readhead will travel.
- B. Do not mount the scale so the mounting hardware interferes with the movement of the readhead.

Typical Model 250 Installation



Guide Clip Pressure/Spacing (End View)

Calibration

Once installed, ProScale can be calibrated easily and quickly. Following is an example for calibrating ProScale on a table saw fence. Other installations follow the same general procedure.

1. Check to be sure installation of all parts is complete, all fasteners are secure, and the readhead is plugged into the digital display.
2. Cut a part using the normal fence operation.
3. Do Not move fence until calibration is completed.
4. Measure the dimension of the part with the most precise measuring tool available (i.e. digital calipers).
5. Press the zero key on the ProScale digital display then press and hold the PLUS key to scroll until the measurement you just made is displayed. (The longer the PLUS key is held down, the faster the display will scroll).
6. When the proper reading is reached, lock the display if desired. This prevents accidentally re-zeroing of the display. See Section 4: *Lock Mode*

If the direction of movement (+ and -) on the digital display is opposite the desired direction, the display programming should be changed. See Section 4: *Programming (Programming Parameter Pr0)*.

Maintenance

Although the ProScale will operate in a dry environment of non-conductive debris such as sawdust, the system should be cleaned of excess debris when necessary. This will prevent premature damage to the scale or readhead. Should the scale become difficult to move, check to see if debris has built up under the readhead and remove if necessary. Find and remove any burrs which may have developed on the aluminum scale. Do not use any liquid lubricants on the scale assembly, as this may impede the readhead's ability to operate properly and will attract other contaminants to the scale.

The Digital Display should be cleaned periodically with compressed air to remove any dust on the lens and keys.

All mounting fasteners should be checked occasionally for tightness.

SECTION 4

DIGITAL DISPLAY OPERATION

This section covers the installation, programming and operation of the [General Purpose LCD Digital Display](#) (Firmware V2.0 and higher). This display is supplied on ProScale Model 150 and Model 250 systems (covered in this manual) as well as several other ProScale products whose operation is covered in their respective manuals but the digital display information is contained here.

If your ProScale product has a digital display other than a [General Purpose LCD Digital Display](#), please refer to the separate manual for that individual display.

[General Purpose LCD Digital Displays](#) come in several configurations. The major differences are described below:

Surface Mount Displays



Basic

2AA Batteries
SPC output

P/N 701-1600-120

NEW P/N 700-1600-220

(New Part numbers effective April 1, 2004)



Fully Programmable

2AA Batteries
SPC output

P/N 701-1600-100

P/N 700-1600-200



Fully Programmable

24VDC
Limit/Mon. Signal Output
LCD Backlighting
P/N 701-1605-100
P/N 700-1600-205

Basic Display

This display operates on 2AA batteries. It is ideal for machinery applications where more advanced programming features are not desired or required. Functions such as switching between ABSolute and INCremental readings, SENDing data, MONitoring drift, HOLDing a reading and Special Function keys are not available. This display does not have Signal output, Back-Lighting, or special function capability.

Programming Parameters Pr0 - Pr8 and Pr16 & 17 are applicable to the [BASIC](#) display.

Fully Programmable, Battery Operation

This display operates on 2AA batteries. It includes all the features of the **BASIC** display plus: It has an auxiliary keypad with 6 keys for: switching between ABSolute readings and INCremental measurements, MONitoring position drift, SENDing data out the SPC connector, HOLDing the reading, and F1 & F2 special function keys.

This display does not have Limit Alarm / Monitor **Output**, or Back-Lighting.

Programming Parameters from Pr0 to Pr23 except Pr14, 15 & 22 are applicable to this display.

Fully Programmable, 24VDC

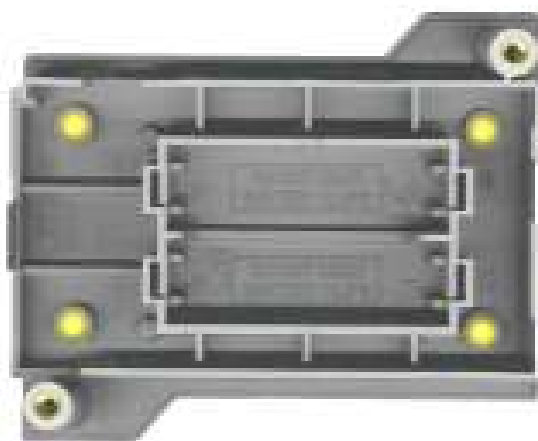
This display includes all the features of the **PROGRAMMABLE** Battery display. This display is intended to operate on 24VDC. It comes with a connector that allows easy connections for supply voltage and also serves as the output connection for the position Limit / Monitoring output signal.

Programming Parameters Pr0 to Pr23 are applicable to this display.

Mounting the Surface Mount Display

The SURFACE MOUNT General Purpose Digital Display may be mounted:

- Using Velcro or Double sided tape
- Drilling out any of the four holes from the inside of the case
- Using any of the six holes on the back of the case which may tapped for M2 or 4-40 screws.



NOTE: Care must be taken when using the inside holes. If using the lower left hole as shown above, be sure to use a screw that will not rise above the extruded countersink as this may short the input connector.

Panel Mount Displays

The General Purpose LCD Display for panel and enclosure mounting applications comes in two versions. Both are designed to fit a ¼ DIN (90mm x 90mm) (3.5in x 3.5in) panel opening. One version is battery operated (2D) and the other is designed for 24VDC operation. Both versions have full programming capability.



Fully Programmable
2D Batteries
SPC output

P/N 701-1570-100

NEW P/N 700-1600-400



Fully Programmable
24VDC
Limit/Monitor Signal Output
LCD Backlighting
P/N 701-1560-100
P/N 700-1600-300

Fully Programmable, Battery Operation

This display operates on 2D batteries. It has an auxiliary keypad with 6 keys for: switching between ABSolute readings and INCRemental measurements, MONItoring position drift, SENDIng data out the SPC connector, HOLDing the reading and suspending key press activity, and F1 & F2 special function keys.

This display does not have Limit Alarm / Monitor Output, or Back-Lighting.

Programming Parameters Pr0 through Pr23 are applicable to this display.

Fully Programmable, 24VDC

This display includes all the features of the **PROGRAMMABLE** Battery display. This display is intended to operate on 24VDC. It comes with a connector that allows easy connections for supply voltage and also serves as the output connection for the position Limit / Monitoring output signal.

Programming Parameters Pr0 through Pr23 are applicable to this display.

Mounting the Panel Mount Display

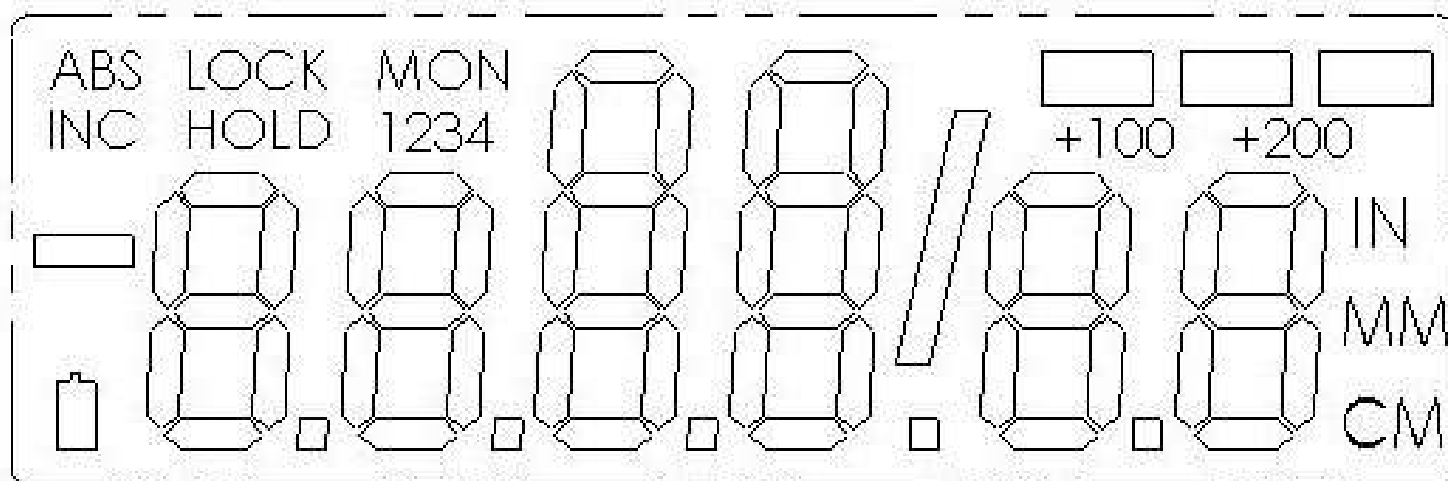
A cutout should be made in the panel at least 90mm x 90mm (3.6 x 3.6 inches), but no larger than 93mm x 93mm (3.7 x 3.7 inches)..

The cases of the digital display are designed to "sandwich" panel thicknesses between 3mm (0.125") and 20mm (0.750") between the front and rear display cover.

Note: If Panel is thinner than 3mm (0.125 in), shorter screws must be used for the display casing or damage to the front cover of the display will occur.

Display Operation

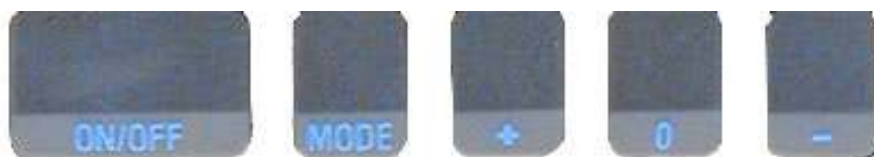
The LCD



The above figure illustrates all the segments available on the Digital Display.

CAUTION: Pressing and holding the **ON/OFF** and **MODE** key for 10 seconds while the display is turned off will perform a full segment LCD test AND re-set all programming parameters to factory defaults

Display Keys



Timing

The keys pictured above, found on all General Purpose LCD Digital Displays, have multiple functions. Timing, that is how long a key is depressed, and the combination of the keys pressed is important. This manual uses the term “*momentarily*” to describe a key press of typically less than 1 second. Whereas “*press and hold*” is used imply a key press of typically longer than 1.5 seconds. As an example; when using a PC keyboard to type a capital letter you would “*press and hold*” the SHIFT key and “*momentarily*” depress the LETTER key.

In addition the key(s) “*function*” is executed on the key RELEASE, not the key DEPRESS. This is important since some keys execute different functions based on how long they are depressed. These key operations, once tried, quickly become intuitive.

ON/OFF

Momentarily pressing the **ON/OFF** key will cause the display to turn on or off. The Firmware Version is displayed on power-up or when **ON/OFF** key is pressed. While on, if no key presses or positional changes occur within 15 minutes, the Digital Display will automatically turn itself off to conserve battery life. While off, if a position change is detected (.05mm or .002in) or the **ON/OFF** button is pressed, the display will automatically turn itself on with no loss of measurement information.

(Programming Parameter Pr8. Factory default set to 15 minutes.)

Battery voltage is displayed by pressing and holding the **ON/OFF** key for 5 seconds while display is turned on.

CAUTION: Pressing and holding the **ON/OFF and **MODE** key for 10 seconds while the display is turned off will perform a full segment LCD test AND re-set all programming parameters to factory defaults**

MODE

The digital display can show measurement information in Imperial or Metric. To change the current display mode, momentarily press the **MODE** key. With each key press the display will cycle through decimal inches, fractional inches (1/16), (1/32), (1/64) (If enabled by **Programming Parameter Pr6**) and metric (mm or cm based on setting of **Programming Parameter Pr5**).

When the display is in a decimal mode (mm, cm or in) it will auto-range to the next resolution if the value is displayable in the next range. This allows the display to be used with Mitutoyo Digimatic® products in inch mode or different resolutions other than 2 decimal places.

When the display is in 1/16 or 1/32 inch fraction mode, a series of “bars” in the upper right corner of the LCD each represent an additional 1/64th of an inch measurement. ie. When in 1/16 inch mode and three bars are showing, the measurement displayed is rounded *down* to closest 1/16 inch and each illuminated bar indicates an additional 1/64 of an inch (“heavy”) measurement. For better resolution switch to 1/32 or 1/64 fraction mode. For the best resolution switch to a decimal mode.

When the measurement is greater than $\pm 99 \frac{63}{64}$ inches, a **+100** or **+200** will show in the upper right portion of the LCD to indicate this amount must be added to the displayed reading. ie: if the measurement is $154 \frac{5}{8}$ inches, $54 \frac{5}{8}$ and **+100** will be displayed on the LCD. If the measurement is $-307 \frac{23}{64}$ inches - $7 \frac{23}{64}$, **+100** and **+200** will be displayed on the LCD.

The **Resolution** of the display can be set for *Normal*; (.01mm or .001in), *Reduced*; (.1mm or .01in) or *Increased*; (.01mm or .0005in) (**Programming Parameter Pr4.**)

+, 0, and – Keys

The **+** (plus), **0** (zero) and **–** (minus) keys are used to change the currently displayed position to a different value. The **0** key forces the unit to display 0. Momentarily depressing the **+** key increments the current position by one unit of measurement. Momentarily depressing the **–** key decrements the current position by one unit. Pressing and holding the **+** or **–** keys will cause the displayed position to change continuously. Holding down the key will cause the amount of change to speed up. This allows for quick adjustments over a range of large values. These keys can be “locked out” to prevent accidental offset or zero entries. **(See Programming Parameter Pr3)**

Digital Display Functions

Lock Mode

The user can “lock-out” the position offset adjustment functions (**+**, **–**, **0** keys) to prevent accidental changes of the current displayed position. To activate the lock mode, press and hold the **ON/OFF** key and then momentarily press the **MODE** key. The word LOCK on the LCD display will turn on or off with each lock/unlock operation. When the LOCK symbol is displayed, the **+**, **–** and **0** keys will not change the displayed position. On Displays with an auxiliary keypad: ABS and INC modes have independent lock operations. **(See Programming Parameter Pr3. Factory default is Enabled.)**

Segment Offset Adjustment

For scales that are longer than 430mm (17 inches), multiple scale pattern segments are installed end-to-end on the aluminum extrusion. This provides a quasi-absolute measurement capability in which the readhead can calculate its position on any individual scale segment but cannot determine which particular segment it is on. To solve this problem, the Digital Display tracks which scale segment the readhead is on by detecting the “splice” between one segment and adjacent segments.

In certain situations, the crossing from one segment to another may not be detected by the display. This may occur if the readhead is disconnected from the digital display and then moved along the scale to another segment. It may also occur if the readhead is moved too quickly between two segments. (Maximum slew rate is 400mm/sec, 15in/sec)

If the segment tracking count is incorrect because of one of the above situations, the user can re-adjust the display to correct the error. This adjustment is referred to as the *Segment Offset Adjustment*.

To add one segment value (430.08mm) to the displayed value, hold the **MODE** key and then momentarily press the **+** key. The displayed position will increase by 430.08mm (16.933 inches). To subtract one encoder segment from the displayed value, press and hold the **MODE** key and then momentarily press the **–** key. The displayed position will decrease by 430.08mm.

(See Programming Parameter Pr1 and *SCALES* in Section 1 of this manual for additional information. Factory Default is set to Enable this function.)

Offset Addition

Offset addition allows the user to preset up to 3 different distances that are then added to the Digital Displays position when selected. This allows the user to quickly switch measurement modes from one reference point to another such as in the case of inside and outside measurements on ProPanel or multiple stations on a vertical panel saw.

To utilize the offset addition feature, programming parameter Pr10 must be set to 1. The display will then flash one of “offset” numerals 1, 2, 3 or 4 located in the upper left corner of the LCD. Offset 1 is the ABS position with no offset addition. Offset 2 is the ABS position with parameter Pr11 (Offset Addition 1) added to it. Offsets 3 and 4 have similar functions with parameters Pr12 and Pr13 added to the ABS position respectively.

To move from “Offset” 1 to 2, momentarily press the F1 key. Each depression of the F1 key advances to the next offset. After offset 4, the display will move back to offset 1.

(See Programming Parameters 9, 10, 11, 12 and 13. Factory default is *Disabled*.)

Limit Mode

The digital display will show either “**LL**” for Low Limit or “**UL**” for Upper Limit if a pre-programmed upper or lower reading is encountered. Upper and Lower limits are set with programming parameters **Pr16** and **Pr17** but are only active if **Pr14** is set to 1. Display toggles between current position display and “LL” or “UL”. The position is shown for 2 seconds and the “LL” or “UL” is shown for 2 seconds. This continues as long as a limit has been exceeded. Limit monitoring is always active, even in programming mode.

Numerous Programming parameters, including Offset Addition and Limit mode indicate a ‘factory default set in inches’. The equivalent offset/limit value in mm or cm is applied if you switch the MODE of display to mm or cm. ie These parameter values take on the unit of measurement MODE (mm, cm or inches) active when programming is entered.

Scaling

All General Purpose Digital Displays have the ability to “scale” the actual measurement. This function is useful when the actual measurement must be multiplied or divided before being displayed. **Care should be taken when using this function since invoking it will cause the unit to display a reading different than the actual measured or traversed value.**

This function is set using **Programming Parameter Pr7. The Factory Default is set to 1.000 - No Scaling**

Changing the Batteries

A low battery indicator will appear in the lower left corner of the LCD display when new batteries are needed.

Surface Mount Displays: remove the screws in the upper right and lower left corners. Pull the cover off. Remove the old batteries. Reinstall new AA Alkaline batteries, noting the proper orientation. Replace the cover and tighten the screws.

CAUTION: DO NOT BEND BATTERY CLIPS!

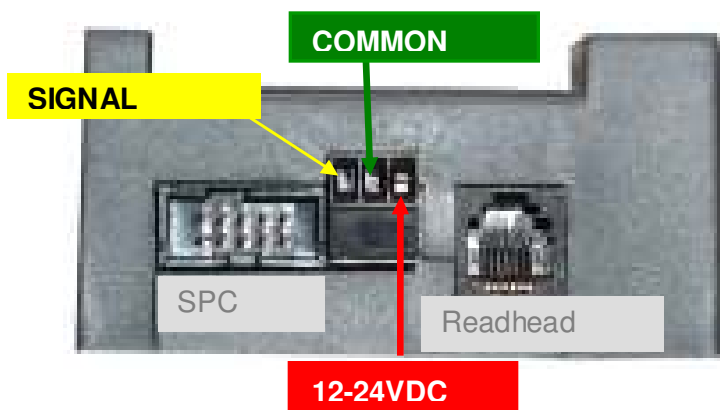
THESE CLIPS ARE DESIGNED TO BE LOOSE WHEN THE CASE IS OPEN AND WILL COMPRESS AND SECURE THE BATTERIES IN PLACE WHEN THE CASES ARE SCREWED TOGETHER.

Panel Mount Displays: Remove and replace 2D batteries noting proper orientation.

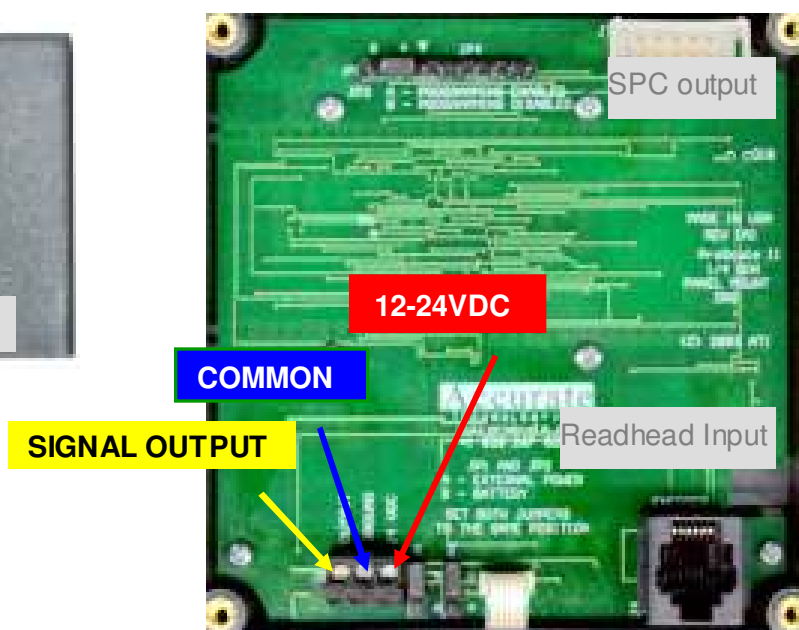
24VDC Operation

The 24VDC Digital Displays have some additional functions that are not available on battery powered displays.

**The 24VDC displays are designed to run on DC voltage ONLY.
DO NOT ATTEMPT TO OPERATE THESE DISPLAYS USING AC VOLTAGE**



Surface Mount Above,
Panel Mount Right



Limit/Monitor Signal Output

This function is available on 24VDC powered Digital Displays ONLY.

A connector provides a solid-state output (.1A / 30 VDC) that can be configured to activate on either a position drift (MONitor) condition or a measurement limit (LIMIT) error. The output can be configured for normally open (N/O, not conducting to ground) or normally closed (N/C, conducting to ground). Although the Digital Display LCD flashes when either a position drift (MONitor) condition or a measurement limit (LIMIT) error is encountered, the output signal only changes state once for out of limit condition and then toggles back when an in limit condition is restored.

For additional programming information see [Limit Mode](#) above and [MONitor Mode](#) below.

Caution: These functions are active during Display Programming. If their parameters are changed during programming the output signal could become active.

(See Programming Parameters 9, 14 and 15. Factory default is MONitor, N/O.)

Backlighting

This function is available on 24VDC powered Digital Displays ONLY.

LCD backlighting can be configured to always remain OFF, to always remain ON or to come on when any key is pressed and remain on for 3, 7 or 15 seconds.

(See Programming Parameter 22. Factory default is on for 3 seconds.)

Auxiliary Keypad



As seen on the Panel Mount Display



As seen on the Surface Mount Display

The Auxiliary Keypad is found only on Digital Displays that are Fully Programmable (See **Programming Parameter 9. Factory default is all keys enabled.**)

ABS - INC

The Digital Display has two measurement “indexes”. One is referred to as **ABS** and the other is **INC**. The **ABS** measurement setting is designed to allow the user to set a current position on the display referenced from a fixed or known position such as a saw blade, or stop. The **INC** measurement setting is designed to take relative distance measurements from one arbitrary point to another. The systems operate independently allowing separate position offsets to be programmed. The **ABS** position of the measuring system is not lost when using the **INC** settings.

ABS Mode – The ProScale automatically enters ABS mode when power is first applied. This is indicated by the ABS symbol in the upper left corner of the display. While in the ABS mode, all position measurements are related to the current system reference point (i.e. sawblade, stop, origin etc.) To enter the INC mode, momentarily press the **ABS/INC** button.

INC Mode – While in the INC mode, the INC symbol is shown in the upper left corner of the display. When the INC mode is initially entered, the displayed position will change to reflect a new reference point at the current position of the readhead. This is typically a position of zero (0) but may be changed by using the **+** or **-** keys to provide an offset. Moving the readhead in either direction will display the distance moved from the initial INC starting point (plus any offset). To complete another incremental measurement from the new position, momentarily press the **ABS/INC** key. The display will again change to 0 (or the previously programmed offset). To return to the ABS mode, press and hold the **ABS/INC** key for approximately 3-4 seconds.

HOLD

The Digital Display provides a feature that allows the displayed position to be “frozen” in time while the readhead is moved from its measuring position. This allows measurements to be captured on the display and held for later viewing regardless of the current readhead position. To activate the HOLD mode, momentarily press the **HOLD** key. The HOLD symbol will be shown in the upper left corner of the display. The currently displayed position and selected key presses will be frozen at this point. To release the HOLD feature, momentarily press the **HOLD** key again.

MONitor

The Digital Display has the ability to monitor a position to detect position drift or measurement variance. To activate the monitoring mode, position the readhead to the desired location and momentarily press the **MON** key. The MON symbol will flash on the display to indicate that the position monitor mode is active.

If the readhead moves outside the programmed tolerance the displayed reading flashes, indicating a drift condition. When the readhead is moved back within the programmed tolerance, the displayed reading will stop flashing.

To exit the monitor mode, momentarily press the **MON** key. The MON symbol will stop flashing and the currently displayed position will also stop flashing.

NOTE: Position monitor mode can only be activated while in the ABS measuring mode. If the ABS/INC key is depressed while monitoring, the position-monitoring mode is automatically exited.

The display can be programmed to automatically enter or exit the MONitor mode based on elapsed time or movement of the encoder.

If the programmable **auto monitor** is enabled (Programming parameter Pr19 set to 1), the Digital Display will automatically enter monitor mode after either 30 or 60 seconds of no encoder motion. If the programmable auto monitor is disabled, the ProScale will automatically exit monitor mode if the encoder is moved beyond a programmable distance from the monitored position. This option, in conjunction with auto monitor activation, allows the ProScale to be kept in monitor mode without manually pressing the monitor key.

(See Programming Parameters 19,20, 21. Factory default is OFF.)

SEND

The Digital Display provides an output port that can be used to send measurement information to a compatible SPC device such as a printer or data acquisition unit. After connecting the SPC device to the 10 pin connector on the display, the user may initiate the data transmission by momentarily pressing the **SEND** key. This signals the SPC device to acquire the data from the digital display.

Pressing the **SEND** key displays “**Snd**” on the display for 1 second to show activation of the send function (even if no SPC device is attached to the ProScale).

The data format and connector style of the ProScale SPC output is the same as Mitutoyo SPC. This is an industry standard that can be interfaced with most available SPC products including multiplexers, RS232 converters and PC plug-in boards. Data from the ProScale is sent to the SPC connector in either millimeters or decimal inches, whichever is currently displayed on the LCD.

If no SPC device is attached to the display, the SEND key has no other function.

See *Section 6 Accessories* for interface and data acquisition products descriptions.

F1 / F2

These keys are used for special features and/or Custom programming functions.

Programming

Several functions of the digital display are user programmable. The following instructions describe what features are available and how to change the system's factory defaults to customize the display for your application.

The keys pictured have multiple functions. Timing, which is how long a key is depressed, and the combination of the keys pressed is important. This manual uses the term "*momentarily*" to describe a key press of typically less than 1 second. Whereas "*press and hold*" is used imply a key press of typically longer than 1.5 seconds. As an example; when using a PC keyboard to type a CAPITAL letter you would "*press and hold*" the SHIFT key and "*momentarily* depress the appropriate letter key.

The "*function*" associated with the key(s) pressed is executed on the key *RELEASE*, not the key *DEPRESS*. This is important since some keys execute different functions based on how long they are depressed. These key operations, once tried, quickly become intuitive.



To enter programming mode, *press and hold* the **MODE** key and then *momentarily* press the **0** (zero) key. The **MODE** key must be held for approximately 1 second before the depression of the **0** (zero) key.

Once you are in the Programming Mode, *momentarily* pressing the **MODE** key will advance through the Programming Parameter list.

To step backwards in the Programming Parameter list *press and hold* the **ON/OFF** key and *momentarily* press the **MODE** key.

Momentarily pressing the **+** (plus) key while displaying a Programming Parameter will increase the parameter setting.

Momentarily pressing the **-** (minus) key while displaying a Programming Parameter will decrease the parameter setting.

Momentarily pressing the **0** (zero) key while displaying a Programming Parameter will revert the parameter to its factory default setting.

CAUTION: The **Limit Mode** (**See Programming Parameters 14,15 16 17**) functionality is still active even while the display is in programming mode. Changing LIMITS may result in the Limit/Monitor Signal hardware output becoming active immediately.

To exit programming mode, *press and hold* the **MODE** key and then *momentarily* press the **0** (zero) key.

NOTE: The display will automatically exit programming mode after 60 seconds of no key activity.

Programming Parameters are listed below. Values in [] are the available range of values that can be programmed for that entry. Factory defaults are shown in **bold**.

Pr0 – Encoder Direction [0,1]

Change value to reverse the direction of measurement readings.

Pr1 – Enable/Disable Segment Offset [0, 1]

0 = For ABSOLUTE scales shorter than 430mm, (16.9in). ALL Incremental scales
1 = For All ABSOLUTE scales longer than 430mm, (16.9in).

Pr2 – High Speed Readhead [0, 1]

0 = Normal Readhead

1 = High Speed Readhead

Use this setting *only* if instructed by special instructions included with High Speed Readheads. A setting of 1 will impact battery life.

Pr3 – Enable/Disable the +, - and ZERO keys [0,1]

0 = Disables operation of Zero, + and – keys (Display will be in Lock Mode).

1 = Enables operation of Zero, + and – keys.

Pr4 – Display Resolution [0, 1, or 2]

Sets the displayed resolution in *decimal* mode. (No change in fractions mode.)

0 = Reduced resolution Inch = xxx.xx MM = xx.x

1 = Normal resolution Inch = xxx.xxx MM = xx.xx

2 = Increased resolution Inch = xx.xxxx MM = xx.xx (Inch mode only)

Auto scaling will allow measurements of over 100 inches when in high resolution.

Measurements over 100 inches will automatically be reduced to 3 decimal places.

Pr5 – Metric Display Units [0, 1]

Controls whether the measured value is displayed in millimeters or centimeters when in metric mode.

0 = millimeters

1 = centimeters

Pr6 – Disable Fractions/Inches [0, 1, 2]

0 = All measurement modes (millimeters or centimeters, inches and fractions)

1 = No Fractions. Only decimal inches and metric units* will be displayed.

2 = Only Metric. No Imperial (decimal inches or fractions) will be displayed.

* Pr5 will determine if mm or cm are displayed for metric units.

Pr7 – Scaling Factor [.001 .. 99.999] **Default = 1.000** (No Scaling.)

The multiplier applied to the measurement. Scaling factors less than 1.000 will make the displayed measurement less than the actual measurement. Scaling factors greater than 1.000 will make the displayed measurement greater than the actual measurement.

Pr8 – Automatic Power Off [0 to 60] **Default = 15.**

Sets the amount of time in ‘minutes without activity’ before the display automatically turns off.

0 = Disables Auto Off.

Encoder motion or ON/OFF key “wake-ups” the display and resets the timer.

Pr9 – Auxiliary Keys Enable/Disable [0..7]

0 = ABS/INC, MON and HOLD Disabled

1 = ABS/INC Key Enabled

2 = MON Key Enabled

4 = HOLD Key Enabled

7 = All Keys Enabled

To enable keys, add up combination of key values. A value of 2 enables only the MON key. A value of 7 enables all 3 Keys.

Pr10 – Offset Addition Enable [0, 1]

0 = Offset Addition Disabled

1 = Offset Addition Enabled.

SEE ALSO Pr11, Pr12, Pr13

Pr11 – Offset Addition 1 [-999.999 to 999.999in] or [-9999.99 to 9999.99mm]

When offset 1 is selected (see section 4 -*Offset Addition*), this value is added to the current ABS position. **Default = 1.000IN**

Only active if Pr10 is set to 1. Note: Default is set in Inches

Pr12 – Offset Addition 2 [-999.999 to 999.999in] or [-9999.99 to 9999.99mm]

When offset 2 is selected (see section 4 -*Offset Addition*), this value is added to the current ABS position. **Default: 1.500IN**

Only active if Pr10 is set to 1. Note: Default is set in Inches

Pr13 – Offset Addition 3 [-999.999 to 999.999in] or [-9999.99 to 9999.99mm]

When offset 3 is selected (see section 4 -*Offset Addition*), this value is added to the current ABS position and displayed. **Default: 2.000IN**

Only active if Pr10 is set to 1. Note: Default is set in Inches

Pr14 – Output Signal Mode [0, 1]

Configures the hardware output signal for activation on MONitor drift conditions or Upper/Lower limit alarm conditions. (24VDC displays only)

0 = Monitor drift,

1 = Limit.Alarm

SEE ALSO Pr15, Pr16, Pr17

Pr15 – Output Polarity [0, 1].

Used to configure the signal output. N/O or N/C in relation to circuit ground.

0 = N/O, the output is Normally Open (not conducting to ground).

1 = N/C, the output is Normally Closed (conducting to ground).

Pr16 – Lower Limit [-999.999 to 999.999in] or [-9999.99 to 9999.99mm]

Sets the lower limit alarm value. **Default = 0.000IN.**

*Active only when parameter Pr14 = 1. **Note: Default is set in Inches***

Pr17 – Upper Limit [-999.999 to 999.999in] or [-9999.99 to 9999.99mm]

Sets the upper limit alarm value. **Default = 5.000IN.**

*Active only when parameter Pr14 = 1. **Note: Default is set in Inches***

Pr18 – Drift Tolerance [.01 to 9999.99mm] or [.001 to 999.999in].

Range of motion allowed (+ or -) while in MONitor mode. **Default =. 01IN.**

Note: Default is set in Inches

Pr19 – Automatic Monitor ON Time [0, 1 or 2]

Configures display to automatically activate MONitor mode after 30 or 60 seconds of encoder inactivity.

0 = disabled. 1 = 30 seconds. 2 = 60 seconds.

Pr20 – Automatic Monitor OFF Enable[0, 1]

Configures display to automatically exit MONitor mode after a programmed distance (**Pr21**) has been exceeded from the drift tolerance position (**Pr18**).

0 = disabled 1 = enabled.

Pr21 – Automatic Monitor OFF Distance [0.001 to 999.999in] or [0.01 to 9999.99mm].

The distance that must be exceeded from the drift tolerance position (**Pr18**) to activate auto monitor off. **Default = 0.500in**

This parameter is relevant only when **Pr20=1**. **Note: Default set in Inches**

Pr22 – Backlight ON time [0, 1, 2, 3 or 4]

The ON time of the LCD backlighting (24VDC displays only).

0 = always off. 1 = 3 seconds. 2 = 7 seconds. 3 = 15 seconds. 4 = always on.

Backlighting is activated when a key is pressed.

Pr23 – Future Enhancement DO NOT CHANGE [0,1,2] **Default =1**

Pr24 – Future Enhancement DO NOT CHANGE [0..63] **Default =0**

Pr25 – Future Enhancement DO NOT CHANGE [0..31] **Default =0**

CAUTION: Pressing and holding the ON/OFF and MODE key for 10 seconds while the display is turned off will perform a full segment LCD test AND re-set all programming parameters to factory defaults

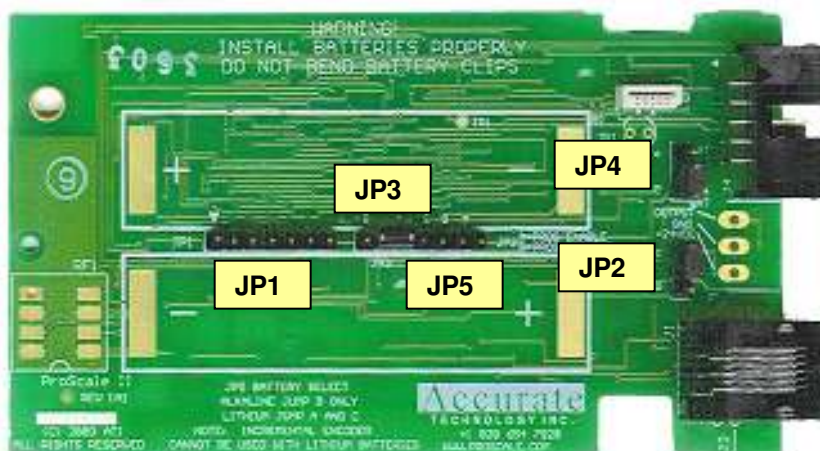
Jumpers – Surface Mount Display

Although the ProScale display uses a keyboard-programming mode to enable and configure features in the unit, several selection jumpers are located on the circuit board for additional system configuration.

User configurable jumpers consist of three pins and a 'shorting block'.

The center of these pins is 'Common'. One end pin is labeled 'A' and the other end pin is labeled 'B'.

Surface Mount Display
Circuit Board



JP1 FOR FACTORY USE ONLY

JP2 Absolute/Incremental Encoder Selection

The General Purpose Digital Display supports both Incremental and Absolute style measuring systems (See Section 1: *ProScale Terminology*). To configure the display for use with absolute (*ABS*) type encoders (default), install the shorting jumper in position A. For incremental type encoders, install the shorting jumper in position B.

(ProScale Model 150 & 250 are Absolute systems. Other Accurate Technology products such as ProCaliper, ProPanel, Measurement Kits, and ProStop are Incremental systems)

NOTE: This functionality is not related to the ABS / INC measurement modes described in Section 4: *Auxiliary Keypad*.

JP3 Programming Enable/Disable

Entry to the programming mode of the ProScale display can be enabled or disabled based on this jumper setting. To enable keyboard programming (default), install the shorting jumper in position A. **To disable keyboard programming, install the shorting jumper in position B.** When programming mode is disabled, the user cannot access the programming functions via the **Mode + 0** keys as described in the Section 4:

Programming. This provides the user with a method of configuring the display with specific parameters and prevents unauthorized configuration changes.

JP4 Display Power

This jumper configures the Digital Display to operate on either Battery or 24VDC.

This jumper will be set at the factory based on the type of display you have ordered.

JP5 FOR FACTORY USE ONLY

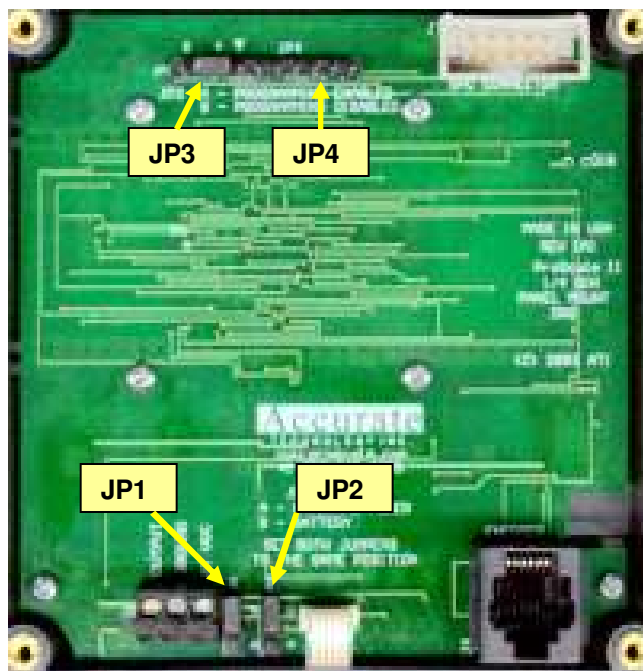
Jumpers – Panel Mount Display

Although the ProScale display uses a keyboard-programming mode to enable and configure features in the unit, several selection jumpers are located on the circuit board for additional system configuration.

User configurable jumpers consist of three pins and a 'shorting block'.

The center of these pins is 'Common'. One end pin is labeled 'A' and the other end pin is labeled 'B'.

*Panel Mount Display
Circuit Board*



JP1 & JP2 Display Power

These jumpers set the display to operate on either 2D batteries or 24VDC.

To configure the display to operate on 24VDC power JP1 **AND** JP2 should be set to position **A** THEY MUST BE SET ON THE SAME SETTING

To configure the display to operate on battery power JP1 **AND** JP2 should be set to Position **B** THEY MUST BE SET ON THE SAME SETTING

JP3 Programming Enable/Disable

Entry to the programming mode of the ProScale display can be enabled or disabled based on this jumper setting. To enable keyboard programming (default), install the shorting jumper in position A. **To disable keyboard programming, install the shorting jumper in position B.** When programming mode is disabled, the user cannot access the programming functions via the **Mode + 0** keys as described in the Section 4:

JP4 FOR FACTORY USE ONLY

Programming Summary

Programming		Factory Default	Works with Digital Display:			
Parameter	Function		Basic	2AA	2D	24VDC
Pr0	Encoder Direction	0	☐	☐	☐	☐
Pr1	Segment Offset	1 - On	☐	☐	☐	☐
Pr2	High Speed ReadHead	0 - Off	☐	☐	☐	☐
Pr3	Zero, Offset Entry	1 - Enable	☐	☐	☐	☐
Pr4	Display Resolution	1 - Normal	☐	☐	☐	☐
Pr5	mm or cm	0 - mm	☐	☐	☐	☐
Pr6	Fractions, mm, in	0 - all	☐	☐	☐	☐
Pr7	Scaling	1.000 (none)	☐	☐	☐	☐
Pr8	Auto off	15 - 15 min.	☐	☐	☐	☐
Pr9	Auxiliary Keypad	7 - all keys		☐	☐	☐
Pr10	Offset Addition	0 - disabled		☐	☐	☐
Pr11	Offset Addition 1	1.000 Inch		☐	☐	☐
Pr12	Offset Addition 2	1.500 Inch		☐	☐	☐
Pr13	Offset Addition 3	2.000 Inch		☐	☐	☐
Pr14	Output Mode	0 - drift				☐
Pr15	Output Polarity	0 - N/O				☐
Pr16	Lower Limit	0.000	☐	☐	☐	☐
Pr17	Upper Limit	5.000 Inch	☐	☐	☐	☐
Pr18	Drift Tolerance	.01 Inch		☐	☐	☐
Pr19	Auto Monitor ON	0 - disabled		☐	☐	☐
Pr20	Auto Monitor OFF	0 - disabled		☐	☐	☐
Pr21	Auto Monitor Distance	.500 Inch		☐	☐	☐
Pr22	Backlight On	1 - 3 seconds				☐
Pr23	FUTURE FEATURE	1				
Pr24	FUTURE FEATURE	0				
Pr25	FUTURE FEATURE	0				

Jumpers and Key Press Summary

Circuit Board Jumpers

<u>JUMPER</u>	<u>SURFACE MOUNT DISPLAY</u>	<u>PANEL MOUNT DISPLAY</u>
JP1	Internal Use Only	Power Selection (set same as JP2)
JP2	Absolute (ABS) or Incremental System	Power Selection (set same as JP1)
JP3	Programming Enable/Disable	Programming Enable/Disable
JP4	Display Power – Battery or 24VDC	Internal Use Only
JP5	Internal Use Only	N/A

Key Press Functions:

ON/OFF (*Press & Hold*) + **MODE** (*Momentarily*)

Enable/Disable LOCK mode ('0', '+' & '-' keys).

MODE (*Press & Hold*) + '0' (*Momentarily*)

Enter or Exit Programming Mode

While in Programming mode:

MODE (*Momentarily*)

Advances through the Programming Parameter list.

ON/OFF (*Press & Hold*) + **MODE** (*Momentarily*)

Steps backwards in Programming Parameter list

+ (*Momentarily*) while displaying a Programming Parameter

Increases the Parameter setting.

- (*Momentarily*) while displaying a Programming Parameter

Decreases the parameter setting.

0 (*Momentarily*) while displaying a Programming Parameter

Reverts the parameter to its Factory Default setting.

MODE (*Press & Hold* + '+' or '-' (*Momentarily*))

Apply Segment Offset Adjustment

ON/OFF (*Momentarily*)

Turn Display power on or off

ON/OFF (*Press & Hold*) for 5 seconds

Display Battery Voltage

ON/OFF + **MODE** (*Press & Hold Both keys*) for 10 seconds (with display power off)

LCD Segment Test & sets ALL Programming parameters to factory defaults

How long a key is depressed, and the combination of the keys pressed is important. The term (*Momentarily*) describes a key press of typically less than 1 second. Whereas (*Press & Hold*) is used imply a key press of typically longer than 1.5 seconds.

For example: When using a PC keyboard to type a CAPITAL letter you would “*press and hold*” the SHIFT key and “*momentarily*” depress the LETTER key.

In addition, a key(s) “*function*” is executed on the key RELEASE, not the key DEPRESS of that key(s). This is important since some keys execute different functions based on how long they are depressed. These key operations, once tried, quickly become intuitive.

Frequently Asked Questions

What does “no Enc” mean?

If the readhead is off the scale, or the readhead cable is unplugged from the digital display, an “no Enc” will appear on the display. To clear error:

1. Be sure the readhead is on the scale.
2. Unplug the connector from the display for one second.
3. Reconnect the readhead cable to the digital display.

The battery clips seem to be very loose. Is this normal?

Yes. DO NOT attempt to bend these clips or wedge anything between them and the case. These clips are designed to expand when the two case halves are screwed together.

Can I mount the scale/readhead 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 readhead or scale, while also absorbing any stresses that may occur. If they are not used, the warranty could be voided.

The display reads numbers but they seem to be random.

Be sure the readhead is oriented correctly on the scale. One end of the scale is black. Be sure that the arrow on the readhead is pointed in the correct direction.

The display does not change as the scale/readhead moves.

The display is in the HOLD mode. Press & release the Hold button.

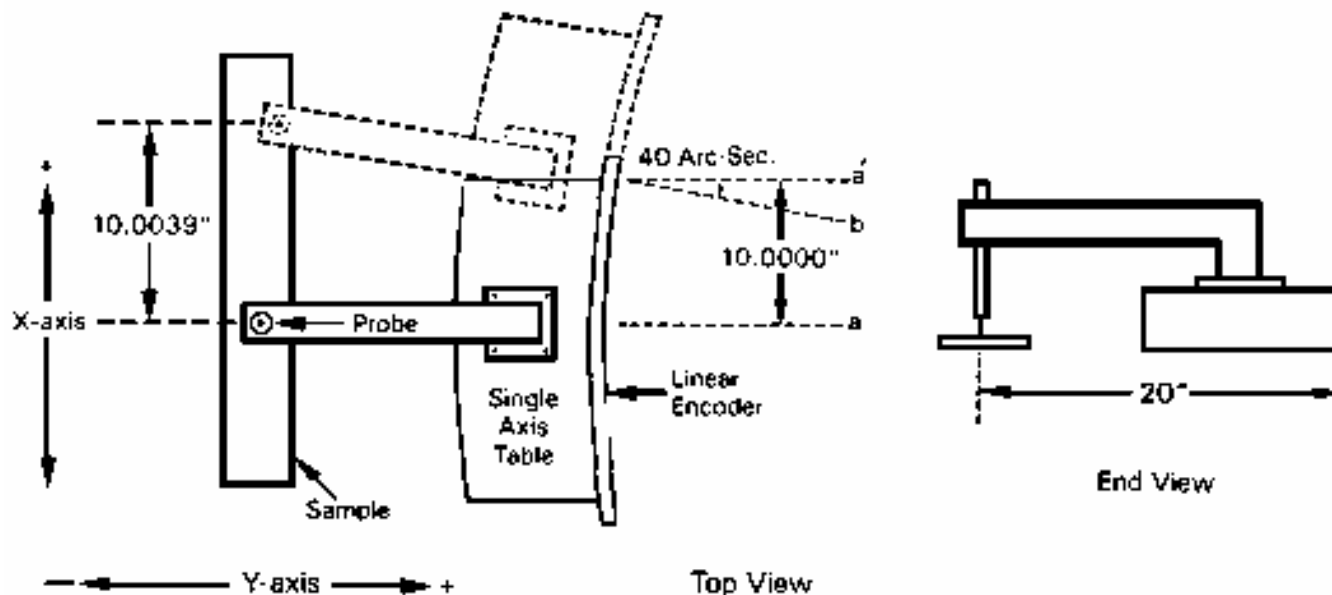
Product Communication

ProScale's electrical interface allows the readhead position to be read directly or through the digital display by a computer or other data acquisition device. Interface diagrams are available upon request.

Abbe Error

Abbe error is a condition that may not be visible to the human eye, but will affect linear measurements. Be sure to take precautions when installing ProScale in order to eliminate the possibility for Abbe error.

Abbe error refers to a linear error caused by the combination of an angular error and a



dimensional offset between the sample and the measuring system. It is important to understand that the information the encoder is providing is **only the position of the readhead on the scale**. To illustrate this, see the figure, which shows a linear measuring device. (The apparent distortion in the measuring device is intentional - for this example - to show the measuring device with a curvature in its mounting.)

Suppose the curvature in the figure is sufficient to produce an angle of 40 arc-seconds. If the measuring device moves 10 inches, the probe will be found to have moved 10.0039 inches, resulting in an error of +0.0039 inches. Abbe error could be lessened by moving the measuring system closer to the sample. This effectively solves one half of the Abbe error problem (offset) and leaves only the angular mounting problem to be solved. Angular error can best be countered through proper design and placement of the linear scale. Sources of angular error include:

1. Mounting the linear scale to an imperfectly flat surface.
2. Mounting the linear scale to an imperfectly straight surface.
3. Curvature of ways (or linear bearings) used to measure the sample.
4. Contaminants between the probe and item being measured.
5. Friction in any part(s) of the measuring device.



ProMUX-3™

ProMUX-8™

ProRF™

AIU™

The **ProMUX 3** is an easy to use hardware interface device providing communication and control of one to three ProScale ABS linear encoders from a user provided PC or PLC.

ProMUX-3: 1, 2 or 3 INPUTS; 1 RS232 OUTPUT

The **ProMux-8** multiplexer is designed for OEM and system integrators for use in acquiring setup positional information (non-CNC) on industrial production machinery.

ProMux-8 communicates with a host PC or PLC via RS-232 or RS-422 serial interface. Up to 15 multiplexers can be connected to the same RS-422 bus

The **Pro-RF™** system consists of a base module and a remote module that communicate over a **bi-directional** RF interface.

The Remote module provides the data acquisition functions.

It accepts SPC as input and relays the information via RF link to the Base module.

The Base module communicates to a host PC via RS-232 operating at 57,600 Baud.

The system can support up to 32 remote modules up to 100 meters away for the base.

The **Analog Interface Unit (AIU)** is designed to provide an analog signal output that is proportional to the current position being displayed on a ProScale linear measurement system. The interface provides a DC signal range from 0 to 5 volts or 0 to 10 volts

SECTION 7

SPARE PARTS

Description	Part Number	Description / Use
Digital Display, LCD, (Fully Programmable)	700-1600-200	ProScale M150/250, AA Batteries
Digital Display, LCD, (Fully Programmable)	700-1600-205	ProScale M150/250, 24 VDC
Digital Display, LCD, (Basic)	700-1600-220	ProScale M150/250, AA Batteries
Digital Display, LCD, 1/4 DIN Panel Mount	700-1600-300	ProScale M150/250, 24 VDC
Digital Display, LCD, 1/4 DIN Panel Mount	700-1600-400	ProScale M150/250, 2D Batteries
Readhead, ABS, 12 inch cable	701-1500-012	ProScale M150/250
Readhead, ABS, 24 inch cable	701-1500-024	ProScale M150/250
Readhead, ABS, 36 inch cable	701-1500-036	ProScale M150/250
Readhead, ABS, 72 inch cable	701-1500-072	ProScale M150/250
Readhead, ABS, 120 inch cable	701-1500-120	ProScale M150/250 (standard)
Readhead, ABS, 20 foot cable	701-1500-240	ProSet
Readhead, ABS, Coiled Cable, 80 inch	701-1500-C80	ProKits, ProScale M150 & 250
Readhead, ABS, custom cable length	701-1500-xxx	'xxx' = length in inches
Readhead, INC, 12 inch cable	701-1500-N12	ProPanel, ProStop, M.T. Kits
Readhead, INC, 24 inch cable	701-1500-N24	ProScale M200
Readhead, INC, 72 inch cable	701-1500-N72	ProScale M100
Readhead, Digi, 12 inch cable	701-1500-D12	Digi-Fence, Digi-Stop
Readhead, Digi, 36inch cable	701-1500-D36	Digi-Scale Models 10 & 20
Readhead, Digi, 72 inch cable	701-1500-D72	Digi-Scale Models 10 & 20
Scale, ABS, 10in / 250mm measuring range	700-1500-010	ProScale Model 150-10 Scale
Scale, ABS, 18in / 450mm measuring range	700-1500-018	ProScale Model 150-18 Scale
Scale, ABS, 12in / 300mm measuring range	700-2500-012	ProScale Model 250-1 Scale
Scale, ABS, 24in / 600mm measuring range	700-2500-024	ProScale Model 250-2 Scale
Scale, ABS, 52in / 1.3m measuring range	700-2500-052	ProScale Model 250-4 Scale
Scale, ABS, 96in / 2.4m measuring range	700-2500-096	ProScale Model 250-8 Scale
Scale, ABS, 120in / 2.9m measuring range	700-2500-120	ProScale Model 250-10 Scale
Scale, ABS, 144in / 3.6m measuring range	700-2500-144	ProScale Model 250-12 Scale
Scale, ABS, 240in / 6.0m measuring range	700-2500-240	ProScale Model 250-20 Scale
Scale, INC, 10in / 250mm measuring range	700-3000-010	ProScale Model 100-10
Scale, INC, 18in / 450mm measuring range	700-3000-018	ProScale Model 100-18
Scale, INC, 52in / 1.3m measuring range	700-3000-052	M200, M.T.K, ProStop, -Kit, -Panel
Scale, INC, 96in / 2.4m measuring range	700-3000-096	M200, M.T.K, ProStop, ProKit
Scale, INC, 120in / 2.9m measuring range	700-3000-120	M200, M.T.K, ProStop, ProKit
Scale, INC, 240in / 6.0m measuring range	700-3000-240	M200, M.T.K, ProStop
SPC Cable, 3m, 10 pin to 10 pin	700-1003-001	SPC out to peripheral devices
Universal Mounting Kit	902-0001-001	Installation brackets 150/250
Connector Links, Package of 5	100-1025-005	Used with Model 150 systems
Guide Clips, Package of 5	100-1026-005	Used with Model 250 systems
Fixed Price Repair (call for RMA)	Model	Description
Readheads	450-1010-001	All ProScale Systems
Digital Displays	450-1030-001	All ProScale Systems
Scales	450-1060-001	Scales up to 24 inches (600 mm)
Scales	450-1061-001	Scales up to 60 inches (1.5m)
Scales	450-1062-001	Scales up to 150 inches (3.8m)
Scales	450-1063-001	Scales up to 220 inches (5.6m)
Scales	450-1064-001	Scales up to 240 inches (6.0m)

PRODUCT REGISTRATION

Fill out for your records **and**
FAX to Accurate Technology @ +1.828.654.8824 or
Register on line at <http://www.proscale.com/registration.htm>

Name _____

E-Mail _____

Company _____

Address _____

Address _____

City _____

State/Region _____

Zip/Postal Code _____

Country _____

Purchased From: _____

Purchased When: _____

ProScale Serial Number:

Thank you for choosing a ProScale Product



MADE IN USA

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Fletcher, NC 28732 USA

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Fax 828-654-8824

www.proscale.com

customerservice@accurate-technology.com

This manual is available at www.proscale.com

*Please return your Product Registration Card
or register your system at:*

<http://www.proscale.com/registration.htm>