

# Accurate

TECHNOLOGY INC.

*Linear Digital Measuring Systems*

## ProScale®

### LCD Readouts



**Basic, 950 Series, General Purpose,  
General Purpose E & In-Panel  
LCD Readouts**

With Firmware Version 3.1 and higher

**OPERATION**

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READOUT SERIAL # \_\_\_\_\_

**THE FOLLOWING PROGRAMMING PARAMETERS HAVE BEEN  
PRE-CONFIGURED AT THE FACTORY FOR THIS READOUT:**

PARAMETER 2 (Reading Direction) \_\_\_\_\_

PARAMETER 13 (Linear Multiplier) \_\_\_\_\_

PARAMETER 14 (ProScale Compatibility) \_\_\_\_\_

***SAFETY WARNING***

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

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## WARRANTY

Accurate Technology, Inc. warrants the ProScale Systems 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.

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# SECTION 1

# GENERAL INFORMATION

## Introduction

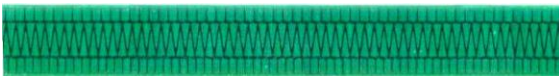
This manual includes installation and Operation for ProScale LCD [Digital Readouts](#) with operating firmware (F/W) of 3.100 or higher. These readouts may be included as part of a ProScale measuring system or other product such as [ProTable](#) or [ProPanel](#).

This manual DOES NOT include installation for other Readouts, or ProScale systems. Please refer to the appropriate [Installation manual](#) for your system.

A typical ProScale measuring system consists of three major parts:

- **SCALE** – an aluminum extrusion to which a printed circuit board with a unique pattern is bonded.
- **ENCODER** – a readhead or sensor that traverses the SCALE to determine a position or distance from some arbitrary point of origin.
- **DIGITAL READOUT** – or DRO, is the component that displays the measurement or position information sent by the ENCODER.

The Readouts covered in this Manual are compatible with these SCALES:



ProScale Models [150](#), [250](#) & [950](#) series systems, (and products based on these systems), incorporate [Absolute](#) measuring technology and may include any of several Digital Readouts including some not covered in this manual.



ProScale Models [180](#), [280](#), [380](#) & [580](#) systems, (and products based on these systems), incorporate Inductive Series I technology and may include any of several Digital Readouts including some not covered in this manual.



ProScale Models [190](#), [290](#), [390](#) & [590](#) systems, (and products based on these systems), incorporate [Inductive Series II](#) technology and may include any of several Digital Readouts including some not covered in this manual.

**If your Scale looks like this (Model 100, 200):**



**These Readouts are NOT COMPATIBLE!**

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## About This Manual

This manual includes Operating and Programming information for the LCD Readouts shown below with firmware version 3.100 to 3.999. (The Firmware version is displayed on power-up, i.e. P3.100)



### [BASIC LCD Readout](#)

Part Number 700-1600-230



### [950 Series Readout](#)

Part Number 700-1600-M50



### [General Purpose \(GP\) LCD Readout](#)

Part Number 700-1600-235



### [General Purpose \(E\) Readout](#)

Part Number 700-1600-236\*



### [In-Panel \(1/4 DIN\) LCD Readout](#)

Part Number 700-1600-435

\* Includes Temperature & Non-Linear Compensation functions.  
Supplied with [ProKit 580/590](#), [ProPanel-HD](#) and [ProTable](#) Systems.



## Readout Specifications

**Display Range:**  $\pm 999.999$  in or  $\pm 9999.99$  mm or  
 $\pm 999.999$  cm or  $\pm 399$  63/64 in

**Resolution:** .1in .1mm .1cm 1/16 or  
.01in .01mm .01cm 1/32 or  
.001in .01mm .001cm 1/64 or  
.0005in .01mm .001cm

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

### Operating Power:

950 Series, Basic: 1 CR123\* 3V Lithium Battery  
GP, In-Panel: 1 CR123\* 3V Lithium Battery or 12-24VDC

**Operating Temperature:** 32 to 120°F, 0 to 50°C

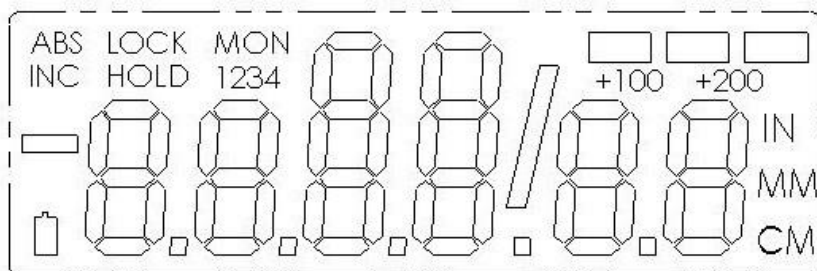
### Input:

950 Series: 10 pin ProScale ABS or Inductive Encoder  
All Others: 6 pin ProScale ABS or Inductive Encoder

### Output:

950 Series: [Digimatic® SPC](#)  
GP & In-Panel: [Digimatic® SPC](#)  
[Solid-state output \(0.1A / 30 VDC\)](#)  
Basic: None

## LCD Segments



The above figure illustrates all the segments on the Readout LCD.

\* or equivalent such as: 123, CR-123A

## LCD Readout Feature Matrix

The table below is a comparison of features among all Readouts from Accurate Technology. Readouts and their features that are **Grayed Out** are available and supported in other manuals. For more information see [Readouts](#) .

	<a href="#">Basic</a>	<a href="#">GP</a>	<a href="#">950</a>	<a href="#">Compact</a>	<a href="#">LCD</a>	<a href="#">LED</a>	<a href="#">Dual</a>	<a href="#">VDRO</a>
Surface Mounting	•	•	•	•				
In-Panel Mounting				•	•	•	•	
Software								•
Battery Operation	•	•	•	•	•			
12-24VDC Operation		•			•	•	•	
Programmable Datum	•	•	•	•	•			•
Selectable Resolution	•	•	•	•	•	•	•	•
Selectable Units	•	•	•	•	•	•	•	•
Fractions	•	•	•	•	•		•	
Auto on/off	•	•	•	•	•			
Offset Addition		•	•					
Upper/Lower Limit		•	•		•		•	
Go/NoGo		•	•		•			
Monitor Position		•	•		•		•	
Drift Alert		•	•				•	
Linear Scaling	•	•	•	•	•	•	•	•
Non-Linear Compensation*		•	•					
Temperature Compensation*		•	•					
Sum/Difference							•	
Statistics		•	•					
Backlight							•	
Relay output						•	•	
Program & Key Lock		•	•	•	•	•	•	
ProRF Wireless SPC		•	•				•	•
Output Signal(s)	None	<a href="#">SPC**</a>	<a href="#">SPC</a>	None	<a href="#">SPC</a>	<a href="#">RS485</a>	<a href="#">RS232</a>	<a href="#">.csv</a> SPC
<p>* Available ONLY with Part #'s 700-1600-236 and 700-1600-M50, with firmware versions ending in "C".</p> <p>** SPC output format is <a href="#">Digimatic™</a></p>								

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## LCD Readout Replacement Chart

<b>Readout Type</b>	<b>Old Part Number</b>	<b>Replacement</b>
General Purpose	700-1600-235G	700-1600-235
General Purpose	700-1600-225	700-1600-235
General Purpose	700-1600-200	700-1600-235
General Purpose	700-1600-001	700-1600-235
General Purpose	700-1600-220	700-1600-230
Basic	701-1495-001	700-1600-230
Standard	701-1500-00x	700-1600-235
SPC	701-1505-00x	700-1600-235
Programmable	701-1115-00x	700-1600-235
Panel Mount, Battery	700-1600-435G	700-1600-435
Panel Mount, Battery	700-1600-450	700-1600-435
Panel Mount, Battery	700-1600-405	700-1600-435
Panel Mount, 24VDC	700-1600-305	700-1600-435
Panel Mount, Battery	700-1600-400	700-1600-435
Panel Mount, Battery	701-1570-001	700-1600-435
Panel Mount, 24VDC	701-1560-001	700-1600-435
Panel Mount, Battery	701-1525-00x	700-1600-435
Panel Mount, 24VDC	701-1550-00x	700-1600-435
Mitutoyo 950 Series	950-005	700-1600-M50
<a href="#">Model 100/200</a> (Obsolete)	All	None

( 'x' denotes any number from 1-4.)

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## SECTION 2

### Mounting the Readout

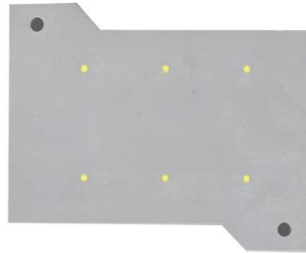
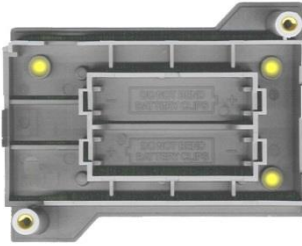
## INSTALLATION

Basic , 950, General Purpose



These Surface Mount Readouts may be mounted:

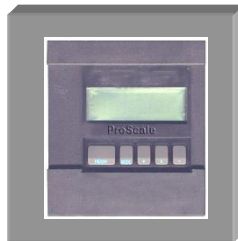
- Using Velcro or Double sided tape applied to the back side
- Drilling out the 3 holes (see below) from the inside of the case
- Using any of the six holes on the back of the case (M2 or 4-40 screws)



### ¼ DIN In-Panel

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 Readout are designed to "sandwich" panel thicknesses between 3mm (0.125") and 20mm (0.750").



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

# Battery Operation

When the Readout battery needs to be replaced, the battery icon will appear in the lower left corner of the LCD. Press and hold the **DATUM** key for 6 seconds to display the Battery Voltage.



When battery voltage drops below 2.6v, the Readout will turn itself off until the battery is replaced.

Basic , 950, General Purpose,



Remove the screws in the upper right and lower left corners. Pull the cover off. Remove the old battery(ies). Install a new CR123 or equivalent battery noting the proper orientation. Replace the cover and screws.



## In-Panel Readout

Remove the screws holding the back cover in place. Pull the cover off. Remove the old battery. Reinstall a new CR123 or equivalent battery noting the proper orientation. Replace the cover and screws.



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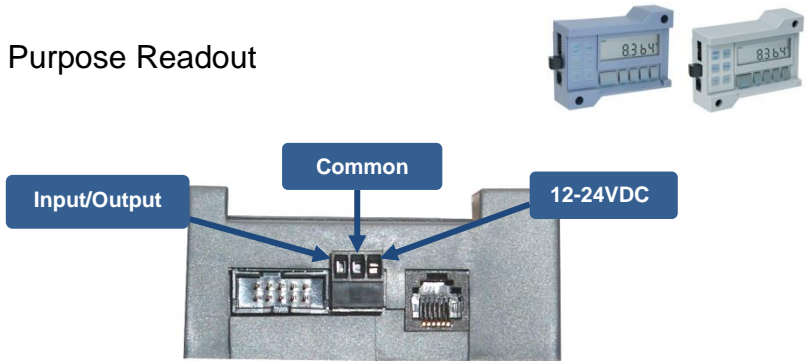
## 12-24VDC Operation

The General Purpose and the In-Panel Readouts will operate on 12-24VDC. The General Purpose Readout uses a multi-purpose plug-in connector for power as well as [input and output signals](#).

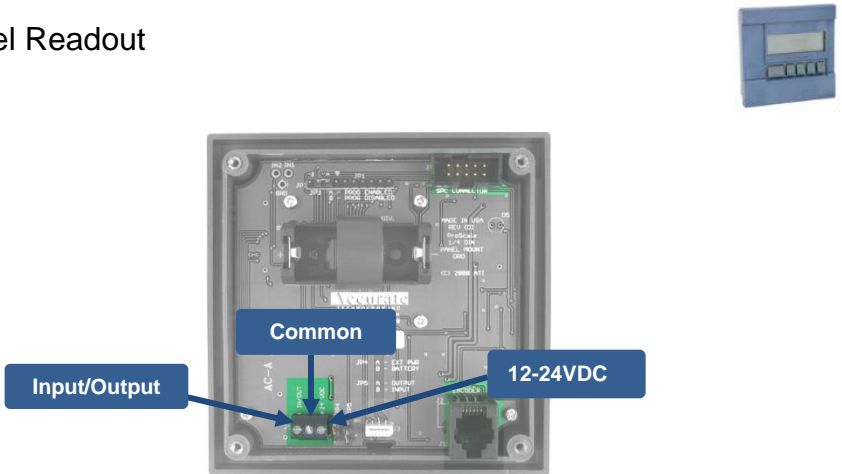
The In-Panel Readout uses screw terminals for these connections.

Also, [See Section 3: Circuit Board Jumpers](#)

### General Purpose Readout



### In-Panel Readout



When powering Readouts with 12-24VDC, the Scale and the Readout common must be connected to each other, or connected to each other via a common point. A proper connection will eliminate ground loops that may cause unstable readings on the Readout.

**NOTES: When using Model 150, 250 or 950 operated on 12-24VDC, use only Scales, & Encoders with part #'s end in 'G'.**  
**12-24VDC Readouts are designed to run on DC VOLTAGE ONLY.**

**Initial Set-up**

In most instances it will be desirable to set some initial parameters such as a reference point, measurement units and resolution for your measuring application.

**Measurement Units**

The measurement units that are displayed (inch, mm, cm) are selected with the [UNITS](#) Key.

**Current Position**

The ProScale Readout allows the current position to be easily configured, using the +, - and (optionally) [DATUM](#) Key.

**Reference Point**

The ProScale Readout allows a reference point (zero or other value) to be easily recalled using the DATUM Key. The value of this reference point is programmed in Programming Parameter [Pr1](#).

**Reading Direction**

The direction of the reading as the measurement system is moved is programmed using Programming Parameter [Pr2](#).

**Resolution**

The resolution of the displayed units is programmed using Programming Parameter [Pr4](#).

Additional [Initial Set-up](#) items MAY include:

[Auto On/Off](#)

[Key Lock](#)

[Scaling](#)

## Readout Key Timing

Several keys on the Readouts have multiple functions.

How long a key is pressed is important since the function executed when a key is pushed is dependent on how long it is pressed.

This manual uses the term “*Momentarily*” to describe a key press of less than .8 seconds, and “*Press and Hold*” to describe a key press of longer than 1 second.

	<i>Momentarily Press</i>	<i>Press &amp; Hold</i>
<b>How long a key is pressed?</b>	Less than .8 seconds	More than 1 second
<b>When is the key function executed?</b>	On key release	While holding

For *Momentary* key press operations, the Function is executed when the key is released.

For *Press & Hold* operations, the Function is executed after the key has been pressed and held for the prescribed amount of time.

See the chart below for a summary of the functions performed by the keys below:



For a video demonstration of KEY TIMING click [HERE](#).

	<i>Momentarily Press</i>	<i>Press &amp; Hold</i>
<b>On/Off Key</b>	Turns Readout power On or Off	No effect
<b>Units Key</b>	Cycles through measurement units: inches, fractions, mm	No effect
<b>Plus (+) Key</b>	Increments displayed value	Increments faster
<b>Datum Key</b>	Forces displayed reading to programmed Datum value	After 6 seconds displays battery voltage After 9 seconds displays Temperature
<b>Minus (-) Key</b>	Decrements displayed value	Decrements faster



## Readout Key Functions



### On/Off Key



Momentarily Press

*Momentarily* press the **ON/OFF** key to turn the Readout on or off.  
(The Readout Firmware (F/W) version displays for two seconds at power-on.)

### Units Key



Momentarily Press

*Momentarily* press the **UNITS** key to cycle through decimal inches, fractions (16ths, 32nds and 64ths) and metric (millimeters or centimeters) measuring modes. To configure the measurement modes that are displayed when pressing the **UNITS** key use [Programming Parameter \(Pr11\)](#).

When the Readout is in 1/16 or 1/32 inch fraction mode, a series of "bars" may appear in the upper right corner of the LCD. Each bar represents 1/64th of an inch. (i.e. when in 1/16 fraction mode and three bars appear, the measurement displayed is rounded *down* to the closest 1/16 inch, plus each illuminated bar represents an additional 1/64 of an inch, for an actual fractional measurement of 7/64ths of an inch.) For better resolution, switch to 1/32 or 1/64 mode. Or better yet, to decimal Inches.

In Fractions mode, when the measurement is greater than 99 63/64 inches, +100 and/or +200 will illuminate in the upper right portion of the LCD to indicate this amount must be added to the displayed reading. (i.e.: If the measurement is 154 5/8 inches, 54 5/8 and +100 will appear on the LCD, If the measurement is -307 23/64 inches, - 7 23/64, +100 and +200 will appear on the LCD.

---

## Plus (+) & Minus (-) Keys



Momentarily Press or Press & Hold

*Momentarily* pressing the + or - key will increment or decrement the current displayed value by one unit of measurement. (in, mm, cm or 1/64)

*Press & Hold* the + or - key to continue to increment or decrement the displayed value. The longer the key is pressed, the faster the changes occur.

The + & - keys may be locked out to prevent accidental entries by using [key lock](#) and/or [Programming Parameter \(Pr3\)](#).

## Datum Key



Momentarily Press or Press & Hold

*Momentarily* pressing the DATUM key forces the Readout to a user programmed value. This can be zero or any other displayable value.

Set the DATUM key programmed value with [Parameter \(Pr1\)](#).

*Press and Hold* the DATUM key for 6 seconds to display the battery voltage.

*Press and Hold* the DATUM key for 9 seconds to display the temperature. The temperature is displayed in "F" or "C" based on the current units setting (Inch or Metric).

The DATUM key may be locked out to prevent accidental entries by using [key lock](#) and/or [Programming Parameter \(Pr3\)](#).

---

# Fundamental Readout Functions



## Auto On/Off Timer

To prolong battery life, the Readout has a built-in function that turns off the Readout after a period of no movement or key activity. The Auto On/Off function is programmable from 0 (always on), to 240 (minutes) before entering sleep mode.

Press the **ON/OFF** key or move the measurement system to wake up the Readout. Any key press or system motion while the Readout is awake restarts the Auto On/Off timer. Use [Programming Parameter \(Pr12\)](#) to set this interval.

## Reading Direction

If the direction of readings, (increasing vs. decreasing) is opposite the desired direction, use [Programming Parameter \(Pr2\)](#) to reverse the Reading Direction.

## Resolution

The Readouts have four selectable display resolutions.

Fractions display mode is not affected by resolution changes.

.1in	.1mm	.1cm	or
.01in	.01mm	.01cm	or
.001in	.01mm	.001cm	or
.0005in	.01mm	.001cm	

Use [Programming Parameter \(Pr4\)](#) to set the displayed resolution.

Data displayed (and sent to the SPC output) is auto-ranging. This means the selected resolution may be temporarily overridden if the measurement or position to be displayed exceeds the maximum displayable value for the programmed resolution. The Readout will continue to automatically reduce the resolution to 1 decimal place or until an allowable resolution is achieved. The available resolutions are:

Inch Resolution	Maximum Displayed Value
4 decimal places	99.9999
3 decimal places	999.999
2 decimal places	9999.99
1 decimal place	99999.9
Millimeter Resolution	Maximum Displayed Value
2 decimal places	9999.99
1 decimal place	99999.9

---

## Measurement Units

The different measurement units displayed on the Readout are user configurable. The table below provides a matrix for selecting the measurement units that may be displayed when pressing the **UNITS** key.

Use [Programming Parameter \(Pr11\)](#) to set this value.

Programming Parameter Pr 11 Value	Measurement Units Displayed
0	All inch units, & millimeters
1	Millimeters only
2	Decimal inches & millimeters
3	Decimal inches & centimeters
4	All inch units, & centimeters
5	Centimeters only
6	Decimal inches only

## Key Lock

The Readout provides a function that can “lock-out” the position adjustment keys (+, DATUM & -) to prevent accidental changes of the displayed value.

To activate Key Lock: *Press and Hold* the **ON/OFF** key and, while pressing it, *Momentarily* depress the **UNITS** key, now release both keys. The word **LOCK** will be displayed in the upper left corner of the LCD.



When **LOCK** is displayed on the LCD, the +, **DATUM** and - keys will not function to change the readout. To de-activate the Key Lock: *Press and Hold* the **ON/OFF** key and, while pressing it, *Momentarily* depress the **UNITS** key, now release both keys. Key Lock may also be enabled through Readout Programming. This method allows a more permanent Key Lock since programming can be disabled with a hardware jumper inside the Readout. See [Programming Parameter \(Pr3\)](#) to enable this function.

## Linear Scaling

This function is useful when the actual measurement or position must be multiplied or divided before being displayed on the Readout.

This function has a range of 0.0001 to 9.9999 allowing the actual measured value to be multiplied or divided in very small or very large increments.

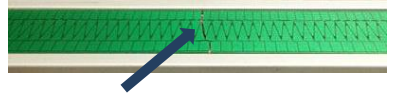
See [Programming Parameter \(Pr13\)](#) for additional information.

**Use care when enabling this function. It will force the readout to display a value different from the actual measurement or position.**

---

## Segment Offset

This function applies **ONLY** to ProScale Model 150, 250 & 950 systems and other ProScale products measuring more than 17 inches (430mm) **AND** employing Absolute measurement technology. (If the Aluminum Scale on your product looks like this it is Absolute technology.)



For measuring systems longer than 17 inches (430mm), multiple measuring panel segments are installed end-to-end on the Scale (see arrow). This provides a quasi-absolute measurement capability in which the Encoder can calculate its position on any individual segment but cannot determine which particular segment it is currently on. To solve this problem, the Readout tracks which segment the Encoder is currently on. In certain situations, the crossing from one segment to another may not be detected. This may occur if the Encoder is disconnected from the Readout and then moved along the Scale to another segment. It may also occur if the Encoder is moved too quickly between segments, (>10ips). If the segment tracking count is incorrect because of one of these situations, you can re-adjust the Readout to correct the error. This adjustment is referred to as the **SEGMENT OFFSET ADJUSTMENT**.



To add one segment to the displayed value:

*Press and Hold* the **UNITS** key and then *Momentarily* press the **+** key. The display will increase by 430.08mm (16.933 inches). To subtract one segment from the displayed value, *Press and Hold* the **UNITS** key and then *Momentarily* press the **-** key. This function is operative only when Pr14 is set to 1. See [Programming Parameter \(Pr14\)](#) for additional information.

## Upper/Lower Limits

LCD Readouts can display either **LL**, for Lower Limit, or **UL**, for Upper Limit, if a user programmed upper or lower reading is exceeded.



Upper and Lower Limits are set with [Programming Parameters Pr28 and Pr29](#) but are only active if [Pr27](#) is set to 1. The display toggles for 2 seconds between the current measurement and **LL** if the Lower Limit is exceeded, (or **UL** if the Upper Limit is exceeded). This continues as long as either limit is exceeded.

See [Programming Parameters \(Pr27, 28, 29\)](#) for additional information.

For General Purpose and In-Panel Readouts, an output signal may be configured to activate when either the Upper or Lower limit is exceeded.

[SEE PROGRAMMABLE OUTPUT OPERATION.](#)

---

## Advanced Readout Functions



These advanced functions are only available on [General Purpose](#) and [950 Series](#) Readouts with the Auxiliary keypad pictured here.



### Absolute / Incremental

The Readout has two measurement indexes. One is called ABS (absolute) and the other INC (incremental).

The ABS measurement setting is designed to allow a user to set an origin point on the Readout referenced to a fixed or known position. The INC measurement setting is designed to take relative or incremental measurements from one point to another. The settings operate independently allowing separate position offsets to be programmed for ABS and INC. The origin, or known position of the measuring system is not lost when using the INC measurement mode and is recalled and displayed when the Readout is returned to ABS mode.

NOTE: The terms "[Absolute](#)" and "[Incremental](#)" are used here to describe a measurement function or technique and should not be confused with Absolute and Incremental when used in reference to the type of [Measuring Technology](#) employed by different ProScale products.

#### Absolute (ABS)

The Readout automatically enters ABS mode when power is first applied. This is indicated by **ABS** in the upper left corner of the LCD. While in ABS mode, all position measurements are related to the current system reference point.

To enter INC (Incremental) mode:

*Press and Hold* the **ABS/INC** key for 3 seconds.

NOTE: To change the timing of this key to *Momentarily*, see [Programming Parameter \(Pr22\)](#).



#### Incremental (INC)

While in the INC mode, **INC** is shown in the upper left corner of the LCD.

When INC mode is initially entered, the displayed position will change to reflect a new reference point at the current position of the Encoder. This is typically a position of zero (**0.00**) but may be changed by using the **+** or **-** Key to enter an offset. Moving the Encoder 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 Readout will again change to zero (or the previously programmed offset). To return to the ABS mode, *Press and Hold* the **ABS/INC** key for 3 seconds.



---

## Send

The Readout has an output port that may be used to send measurement or position information to another device (i.e. a PC) via a wireless transmitter or wired data converter.



See [Section 6: Accessories](#)

After connecting a transmitter or cable to the 10 pin output connector on the Readout, the user may initiate the data transmission by momentarily pressing the **SEND** key. This will cause *Snd* to display on the Readout for 1 second to show activation of the send function (even if no device is attached to the Readout).

All inch modes are transmitted as decimal inches. All metric modes are transmitted as millimeters. The position data transmitted is typically the displayed position on the LCD, with the exception of when Special Function Mode is set to Measurement Accumulation or Statistics modes (See [Advanced Readout Functions](#)). In those modes, the displayed (or calculated) values are sent, NOT the current encoder position.

The data format and connector style of the output port is Mitutoyo [Digimatic](#). This is an industry standard that can be interfaced with most products including multiplexers & RS232 converters (See [Section 6: Accessories](#)).

**NOTE: When using a Wired Data Converter with Model 150 or 250 systems, Scales and Encoders with part numbers ending in 'G' should always be used.**

## Offset Addition

Offset addition allows values to be pre-programmed that are then added to the measurement, and the sum is displayed on the LCD. This function allows the user to switch from one reference point to another.

See [PROGRAMMING PARAMETERS \(Pr30, 31, 32, 33 & 34\)](#)

The General Purpose and 950 Series Readouts support up to 4 user definable offsets that may be added to the ABS position.

[PROGRAMMING PARAMETER Pr30](#) enables or disables this function.

[PROGRAMMING PARAMETERS Pr31, 32, 33 & 34](#) are used to configure this function.

When enabled, the user can scroll through the active offsets by pressing the **F1** key. The numbers **1**, **2**, **3** or **4** will be displayed on the upper left part of the LCD with each press of **F1**. When no numbers are displayed, no offset addition is active.



When the number **1** is displayed in the upper left corner, Offset Addition Preset # 1 ([Pr31](#)) has been applied to the measurement and the result is now displayed on the LCD.

1234

Similarly, when the number **2** is displayed in the upper left corner, Offset Addition Preset # 2 ([Pr32](#)) has applied to the measurement. When the number **3** is displayed, Offset Addition Preset 3 ([Pr33](#)) has been applied to the measurement, and when the number **4** is displayed, Offset Addition Preset 4 ([Pr34](#)) has been applied to the measurement and the result displayed.

# Advanced Programming Functions



Advanced Programming Functions allow the Readout to perform special tasks or invoke custom programming. These tasks interact with the **F** keys to perform functions related to a specific task or programming operation.

**Note:** The Advanced Functions configurable via [Pr24](#) are mutually exclusive of each other. The table below provides a summary of the functions available.

Programming Parameter Pr24 Value	Function
0	No Advanced Functions.
1	F3 = MON F4 = HOLD F2 = SPC delete
2	Go/No Go gauge operation
3	Measurement Accumulation
4	Statistics Mode

**Note:** When [PROGRAMMING PARAMETER Pr24](#) is set to **0**, the **F2**, **F3** & **F4** keys are disabled and have no function. However, the **F1** key, used only for [Offset Addition](#), is independently controlled by Pr30.

Set Programming Parameter [Pr24](#) = **1** to enable this function.

## Monitor

The Readout can monitor a position to detect drift or measurement variance. To activate the Monitor mode, position the Encoder (system) to the desired location and *Momentarily* press the **F3** key. The **MON** symbol will illuminate on the LCD to indicate Monitor mode is active.

If the Encoder moves outside the programmed tolerance the LCD reading flashes, indicating a drift condition. When the Encoder is moved back within the programmed tolerance, the displayed reading will stop flashing. To exit the monitor mode, *Momentarily* press the **F3** key. The **MON** symbol will turn off and the currently displayed position will stop flashing.

Monitor can only be activated while in the [ABS measuring mode](#). If the **ABS/INC** key is depressed, or the normal operational mode is changed (enter programming mode or sending a data transmission), the Readout will automatically exit Monitor mode.

**NOTE:** When the Monitor mode is enabled AND the [programmable output](#) is configured for drift monitoring, the output will not become active until the system has remained 'out of position' for at least 2 seconds.





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## Hold

The Readout provides a feature that allows the displayed measurement or position to be “held”. This allows information to be captured on the Readout and held for later viewing regardless of the current Encoder position.



HOLD

To activate the HOLD, *Momentarily* press the **F4** key. **HOLD** will be displayed in the upper left corner of the LCD. The currently displayed position and selected key presses will be held.

To release the HOLD feature, *Momentarily* press the **F4** key again, or cycle power.

### NOTES:

- If power is cycled when HOLD is active, any key (such as UNITS, DATUM, + or –) that is depressed while in HOLD will be executed when power is restored.
- Leaving the normal measurement mode, (i.e. enter programming mode, SEND, or using the Go/No Go editor) causes the Readout to automatically exit HOLD.

## Delete

*Momentarily* pressing **F2** sends a special “delete” signal to the output data port. When a ProRF Transmitter is attached to this port, a “delete” message will be sent to the ProRF Receiver.



This “delete” message removes the last measurement from a cut list when connected to another device such as an automated stop or cutting system.

---

## Go/NoGo



In certain applications, it may be desirable to program upper and lower measurement tolerances to measure parts. If the measurement falls within the programmed tolerance, a “Go” condition occurs. If the measurement is not within the upper or lower tolerance, a “No Go” condition occurs.

Set Programming Parameter [Pr24](#) = **2** to enable this function.  
Programming Parameter [Pr25](#) is used to configure this function.  
**F3** & **F4** are used to edit the function parameters.

### Programming the Go No/Go Function

The Readout can store up to 16 measurement points (set by [Pr25](#)), each with its own upper and lower tolerance. Each measurement index is identified with a number from 1 to 16. The Go/NoGo Editor is used to enter individual upper and lower tolerances for each measurement point as follows:

1. Press **F3** to enter the Editor. The LCD will display **Go X** where x is a number from 1 to 16 representing the measurement point to be edited. (Pressing **F3** will increment through the list of points (Pr25), while pressing **F4** will decrement through the list). When the point to be programmed is reached go to Step 2.
2. *Press and Hold* the **UNITS** key and *Momentarily* press the **F4** key. The LCD will display **GoX U** for 1 second where **X** is the measurement point and **U** indicates the *upper tolerance* is to be programmed. Use the **+** and **-** keys to set an upper limit, go to Step 3
3. *Momentarily* press **F3**. The LCD will now display **GoX L** for 1 second where **X** is the measurement index and **L** indicates the *lower tolerance* is to be programmed. Use the **+** and **-** keys to set a lower limit, go to Step 4.
4. After the last point is reached, (determined by Pr25), pressing **F3** again will display **Go OFF** indicating that the Editor is off.

### Operation of Go No/Go Function

To increment through the list of measurement points press **F3**.  
To decrement through the list of measurement points press **F4**.

To display which measurement index is currently active, press and hold **F3** or **F4** for 3 seconds. The LCD will display **Go X** where **X** is the measurement index currently active. Once a measurement point is selected, the LCD will alternate between the current position and **Go** or **no Go** depending on the current position and programmed tolerances for that measurement point.

---

## Measurement Accumulator



This Function allows multiple measurements to be made, and the sum displayed on the Readout.

**SET PROGRAMMING PARAMETER Pr24 = 3** to enable this function.

**PROGRAMMING PARAMETER Pr25** is used to configure this function.

**F3 & F4** are used to execute this function.

1. Press the **F4** key to view any previous accumulator value.  
The LCD will display **Accu** for 1 second followed by the total accumulated measurements. The display format for the accumulated total is controlled by both the currently selected measurement mode (**UNITS** key) and the Programming Parameter Pr25.
  - a. If **Pr25** is set to 0, and the Readout is in inch mode, (decimal or fractions), the accumulated total is displayed in Decimal Inches.
  - b. If **Pr25** is set to 0, and the Readout is in metric mode, (mm or cm), the accumulated total is displayed in mm.
  - c. If **Pr25** is set to any non-zero value, and the Readout is in inch modes, (decimal or fractions), the accumulated total is displayed as feet and inches. (fff ii) where f=feet and i = inches
  - d. If **Pr25** is set to any non-zero value, and the Readout is in metric mode, (mm or cm), the accumulated total is displayed as meters and millimeters. (MM mmm) where M=meters and m=millimeters.
2. Press the **F3** key to clear the accumulator.  
The LCD will display **CLr** for 1 second. The DRO will return to the normal measuring mode.
3. To add a measurement to the accumulator, make the measurement and then press the **F3** key. The LCD momentarily displays **Add** to indicate that the measurement has been added to the accumulated total. Continue to add measurements by pressing the F3 key as each measurement is made.
4. To view the accumulated total, press the **F4** key.  
The following options are now available:
  - a. Press **F3** to clear the total and return to the measuring mode.
  - b. Press **F4** (DOES NOT clear the total) to return to the measuring mode.
  - c. Press **SEND** to transmit the accumulated total to the output port.

**NOTE:** This Function maintains a running sum of the measurements taken. Individual measurements in a series cannot be edited or deleted. If an error is made and an incorrect measurement is taken, the entire summation must be cleared and repeated. No rounding of inches or millimeters occurs when configured for feet/inches or meters/millimeters.

---

## Statistics



This Function can perform some basic statistical analysis without the use of SPC data collection on a PC or other device. The Statistics Function can provide the following information:

1. Measurement Count.
2. Minimum Measurement.
3. Maximum Measurement.
4. Average Measurement in two modes:
  - a. Standard average (Measurement Sum  $\div$  Count)
  - b. Trimmed average ((Measurement Sum - Max - Min)  $\div$  (Count - 2))

Set Programming Parameter [Pr24](#) = 4 to enable this function.

**F3 & F4** are used to execute this function.

To begin the Statistics Function:

1. Clear the statistics variables by pressing the **F4** key. If the variables are already clear, the LCD will display **CLr**. If there are previous samples in memory, the LCD will display **Cn** representing the measurement count for 1 second followed by a non-zero number. Press the **F3** key to clear the memory. The LCD will display **CLr** for 1 second and then return to normal measurement mode
2. Take a measurement and press the **F3** key. The LCD displays **Add x** momentarily to indicate that the measurement has been added and how many (**x**) have been accumulated so far. Continue to take additional measurements and press the **F3** key after each measurement.
3. Review the Data:

Press the **F4** key and the LCD will display **Cn** for 1 second followed by a non-zero number. This number represents the measurement **Count**.

Press the **F4** key again and the LCD will display **Lo** for 1 second followed by the **Minimum** Measured value.

Then you may:

  - a. Press **F3** to clear statistics variables and exit.
  - b. Press **F4** to continue without clearing the variables.
  - c. Press **SEND** to transmit the Minimum Measurement to the output port.

Press the **F4** key again and the LCD will display **HI** for 1 second followed by the **Maximum** Measured value.

Then you may:

  - a. Press **F3** to clear statistics variables and exit.
  - b. Press **F4** to continue without clearing the variables.
  - c. Press **SEND** to transmit the Minimum Measurement to the output port.

---

Press the **F4** key again and the LCD will display either **AG** or **AAG** depending on the setting of the [PROGRAMMING PARAMETER PR25](#).

Then you may:

- a. Press the **F3** key to clear statistics variables and exit.
- b. Press the **F4** key to continue without clearing the statistics variables.
- c. Press **SEND** key to transmit the Average Measurement to the output port.

If **Pr25** is set to **0**, the Standard Averaging method is used and the LCD displays **AG** for 1 second followed by the Standard Average:  $(\text{Measurement Sum} \div \text{Count})$

If **Pr25** is set to any **non-zero** value, the LCD displays **AAG** for 1 second followed by Trimmed Average  $((\text{Measurement Sum} - \text{Max} - \text{Min}) \div (\text{Count} - 2))$

**Notes** on the Statistics Function:

Standard averaging will be influenced by the Minimum and Maximum measurement values. If these values vary greatly from the measurement population, the average will not reflect a “centered” representation of the measurement population.

Trimmed averaging, in this implementation, subtracts the Min and Max values prior to the averaging calculation. This yields a more “centered” representation of the measurement population that will be closer to the median value of the measurement population.

Lack of memory resources limits this Function to Averaging. Only a running summation is kept in memory, not the value of each measurement sample. Because of this, we cannot calculate the statistical values of median or standard deviation. On the other hand, this implementation allows for a large number of measurement samples to be accumulated. Measurement count can be up to 65,536 samples. Measurement summation can be  $9.223 \times 10^{14}$  mm.

# Advanced Hardware Features



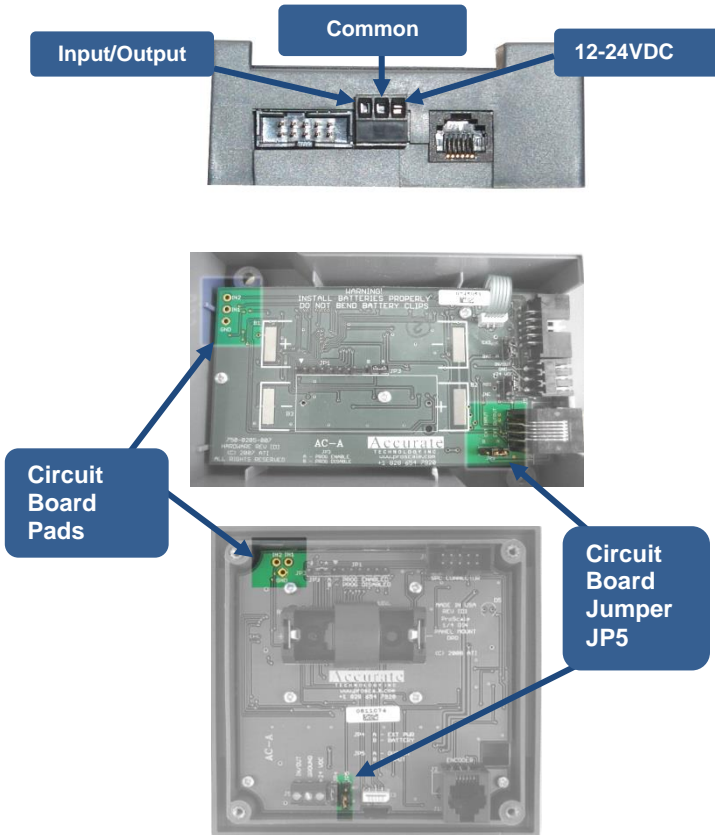
## Input/Output Connections

An external connector and internal circuit board pads on the General Purpose Readout, and the on-board connector and circuit board pads on the In-Panel Readout provide:

- External Power connection points
- A solid-state Output Signal connection (0.1A / 30 VDC).
- [Auxiliary Key Pad](#) Input connections

This Function is configured using [PROGRAMMING PARAMETER \(Pr38\)](#) & [PROGRAMMING PARAMETERS Pr35 & Pr36](#) and [CIRCUIT BOARD JUMPER JP5](#)

These INPUT and OUTPUT functions are mutually exclusive and cannot be enabled concurrently.



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## External Power

For 12-24VDC Power INPUT connections, see [12-24VDC Operation](#) earlier in this manual.

## Output Signal Configuration

Set [JP5](#) on the readout circuit board to position **A**.

Set [PROGRAMMING PARAMETER \(Pr38\)](#) for the event that will trigger the output signal.

Value of Pr 38	Function
0	No Operation
1	Drift ( <a href="#">Monitor</a> ) Operation
2	<a href="#">Limits</a>
3	<a href="#">Go/NoGo</a>

## Output Signal Polarity

The polarity of the output signal is set using [PROGRAMMING PARAMETER \(Pr37\)](#). The output is a transistor that conducts to Negative. The factory default is *normally open* (NO).

**NOTES:** The LCD will flash when any of the programmed conditions above are encountered, but the output signal only changes state once and then toggles back when an in-tolerance condition is restored.

When the Monitor mode is active AND the programmable output is enabled, the hardware output will not become active until the error condition has lasted at least 2 consecutive seconds.

**CAUTION:** The output signal remains active during Programming.

If parameters relating to the output are changed during Programming, the output signal could become active!

---

## Advanced Keypad Input

This Function allows external activation of two keys on the Advanced Key Pad.

[Pr35](#) maps a key to **IN1** (input 1) and [Pr36](#) maps a key to **IN2** (input 2).

This function is configured using [PROGRAMMING PARAMETERS Pr35 & Pr36](#) and [CIRCUIT BOARD JUMPER JP5](#)



**JUMPER JP5** on the Readout circuit board must be set to position **B** to enable external inputs.

The multi-purpose external connector on the General Purpose Readout provides a direct connection to **IN1** (only). This allows for easy external interfacing without modifying the case or soldering on the circuit board.

There are three solder pads on **both** Readout circuit boards, labeled **IN1**, **IN2** and **GND** (the In-Panel readout connections are limited to circuit board solder pads, no external connections.) Any two of the Auxiliary keys may be mapped to respond to an external input by programming Pr35 and Pr36 using the Key Function Mapping Table below.

The inputs must be from a normally open “dry” (**no voltage applied**) switch, connected between ground (**GND** or common) and **IN1** and/or **IN2**. The switch input operates exactly the same as the mapped key providing both *Momentarily* and *Press and Hold* functionality.

**CAUTION: DO NOT APPLY VOLTAGE TO THESE INPUTS.**  
**These inputs should only be switched from OPEN to GROUND.**

Value of Pr 35 & 36	Mapped to Key
1	On/Off
2	Units
3	Plus
4	Datum
5	Minus
6	ABS/INC
7	Send
8	F1
9	F2
10	F3
11	F4



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## Compensation

Temperature and Non-Linear compensation Functions are ONLY available on General Purpose (Part # 700-1600-**236**) and 950 Series Readouts with firmware ending in ‘**C**’.

The firmware version is displayed on power-up, ie **Ʋ3.000c**.



### Temperature Compensation

This Function provides automatic compensation of measurement variations caused by changes in the ambient temperature where the measurement system is used.

Additionally, coefficients of expansion other than aluminum may be programmed and the resulting measurement compensated for the different expansion rates based on a temperature sensor inside the Readout. Use this feature to maintain the highest measurement accuracy possible when using the system under wide temperature variations or when mounting the ProScale aluminum scale extrusion to steel or other surfaces having a different temperature expansion rate than aluminum.

This function is configured using [PROGRAMMING PARAMETERS \(Pr41 & Pr44\)](#)

To activate Temperature Compensation:

1. Set [Pr41](#) to 1.
2. If necessary, enter the expansion coefficient for the material that the ProScale aluminum Scale is affixed to with [Pr44](#).  
**Use care if changing this setting. It will affect system accuracy!**

**Note:** Parameters **Pr41** & **44** are preset at the factory for any products ordered with the “**Enhanced Accuracy**” option.

---

## Non-linear Compensation

The Non-Linear Compensation Function is used to enhance the basic accuracy of the ProScale system by creating a table of correction values in the Readout, based on known measurement points along the length of the measurement system. The compensation table consists of up to 126 elements or points.

This function is enabled by setting [PROGRAMMING PARAMETERS \(Pr39\) = 1](#)  
This function is configured using [PROGRAMMING PARAMETERS \(Pr40\)](#) and the **F1 & F2** Keys

[ProPanel HD-E](#) and [ProTable](#) systems purchased with the *Enhanced Accuracy* option are enabled and configured at the factory. **It is not necessary to repeat the initial error compensation procedure unless a system component has been replaced (Readout, Encoder or Scale).**

For [ProKit Model 580/590](#) users, the initial error compensation procedure **must be performed by the end user** on the 'total measuring environment' in order for this function to be meaningful.

Before beginning a Non-Linear error compensation, you will need to determine how many points and at what interval to compensate. The Readout has a maximum of 126 correction points. The smaller the compensation interval (more points) the smoother the corrected calibration curve will be. Measurement standards such as Gage Blocks in lengths from .50 inch to 10.0 inches should be used. Keep in mind however, that you will need a sufficient number and selection of standards to create the number of points you decide to correct.

Example: For a measuring system 100 inches long, the smallest interval that can be corrected is .8 inches, ( $100 \div 126$ ). This means you will need sufficient standards to create a known measurement correction point EVERY .8 inches. A more realistic approach would be to use an interval of two or more inches and calibrate fewer points.

It is IMPORTANT that the placement of the measurement standard(s) during calibration be repeatable and that it is a useable point to make measurements at during normal operation. This becomes even more critical as the surface area used for normal measurements increases beyond the size (area) at which the corrections are made.

---

The following example uses 5 inch (interval) measurement standards and an Accurate Technology ProTable as the measuring system under calibration. Other applications would use a similar procedure.

1. Set **Pr39** (Compensation Enable) to **1**.
2. Set **Pr40** (Compensation Interval) to the length of the measurement standards multiple that will be used during the calibration, in this example **5.000** inches.
3. Exit Programming Menu.
4. **Turn off the readout with the On/Off button.** Press and Hold the **DATUM** key and the **ON/OFF** key for approximately 10 seconds. After that time, the LCD will turn on and complete a segment test. You can release the **ON/OFF** and **DATUM** keys at this time.
5. After the LCD test is complete, the Readout will show the firmware version for about 1 second. This will be followed by the LCD showing the current position alternating with **ca1** . This indicates the Readout is in the correction table calibration mode. This alternating display will continue throughout the calibration process.
6. Place the measuring system moving jaw (stop) against the fixed jaw (stop). Press **DATUM** to zero the Readout.
7. Press the **F1** key. This enters the first correction point into the table. The LCD will momentarily show **Co 0** indicating that the entry was accepted.
8. Open the jaw and place the first measurement standard (5.000in.) against the back-fence. Close the moving jaw until the face of the jaw gently touches the measurement standard. Press the **F1** key. The LCD will show **Co 1** indicating the first measurement point has been digitized.
9. Open the jaws and insert another measurement standard (10.000in). Close the moving jaw until the face of the jaw gently touches the measurement standard. Press **F1**. The LCD will show **Co 2** briefly. Continue this step with additional standards placed end to end every 5.000" until the maximum measuring range has been achieved.
10. After the last correction point has been digitized, press the **F2** key. The LCD will momentarily show **CoE** indicating that the calibration process has ended.

---

During the calibration process outlined in Step 7, the user may wish to verify the correction point that is to be programmed next. This can be accomplished by *Momentarily* pressing the **F3** key. The LCD will display **CP X**, where **X** is the **next** correction point number to be programmed. This feature is helpful after programming many correction points since it can be easy to lose track of the number of standards programmed.

**NOTE:** If an error is made during the calibration process where an incorrect table entry is recorded, the entire process must be repeated.

### **Operating in Compensated mode.**

After a successful correction table has been programmed, the Readout will operate normally and the measuring system will have a higher level of accuracy.

**NOTE:** If the encoder is positioned outside the calibrated (corrected) range of operation, the LCD will display **No Co** alternately with the current position. This is normal and indicates that the system is operating outside the calibrated measuring range and has a reduced measuring accuracy.

If you choose to turn off Non-Linear Compensation (**Pr39=0**), the compensation table will be saved in memory. Thereafter, changing **Pr39** to **1** will re-enable the previously stored compensation table.

**NOTE:** [Resetting](#) the Readout to factory default settings does not erase the compensation table.

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## Circuit Board Jumpers

**JP1**                    **FACTORY USE ONLY**

**JP2**                    **FACTORY USE ONLY**

**Position A ONLY**

**JP3**                    **Programming Lock-out**

**Default = Position A**

Front panel programming of the Readout can be enabled or disabled through the use of this circuit board jumper.

Front panel Programming is enabled when the shorting jumper is installed in position **A**. To disable Front panel Programming, install jumper on position **B**. When programming is disabled, user cannot access the programming functions via the front panel as described in the [Section 4: PROGRAMMING PARAMETERS](#). This provides a method of configuring the Digital Readout with specific parameters, and preventing unauthorized or accidental changes.

**JP4**                    **Readout Power Selection**

**Default = Position B**

The General Purpose and In-Panel Readouts operate on either on internal battery power or external 12-24VDC. When this jumper is installed in the **B** position, the Readout is powered from the internal battery. When this jumper is installed in position **A**, the Readout must be powered by 12-24VDC DC.

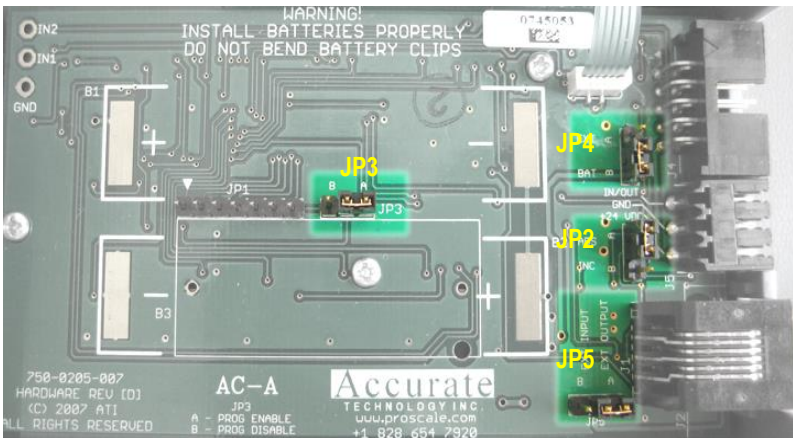
**JP5**                    **Input/Output Selection**

**Default = Position A**

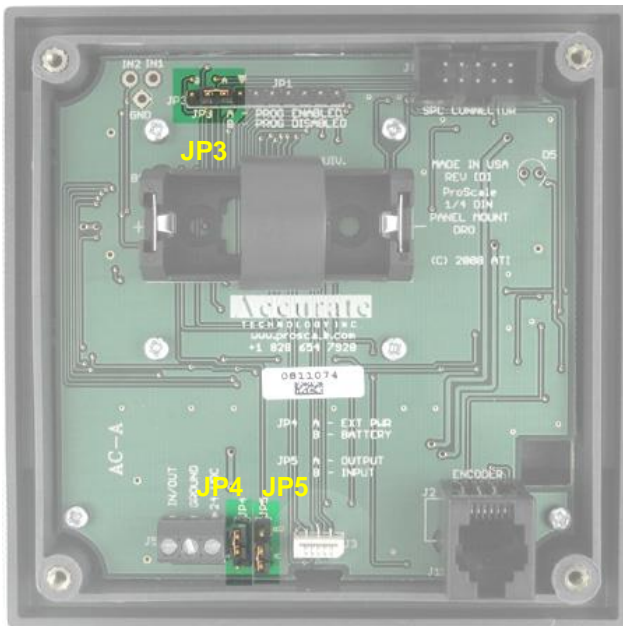
The General Purpose and the In-Panel Readouts have connections used for External Power or an Input/Output connection. This jumper is used to configure the connections as Inputs or Outputs. In position **A**, the connections are configured for OUTPUT. In the **B** position, the connections are configured as INPUTS

See: [EXTERNAL KEYPAD INPUT](#) & [PROGRAMMABLE OUTPUT](#)

## General Purpose, Basic & 950



## In-Panel



Many functions of these Digital Readouts are user programmable and may need to be configured for different applications.

## Key Timing

Several keys on the Readouts have multiple functions. The function that is executed when a key is depressed is dependent on how long the key is depressed. Therefore, how long the key is depressed is important. This manual uses the term “*Momentarily*” to describe a key depression of less than .8 seconds, and “*Press and Hold*” to describe a key depression of longer than 1 second.

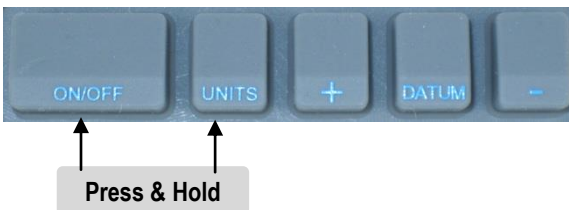
	<i>Momentarily</i>	<i>Press &amp; Hold</i>
How long a key is pressed?	Less than .8 seconds	More than 1 second
When is the key function executed?	On key release	While holding

For Momentary key operations, the Key Function is executed on release. For Press & Hold operations, the Key Function is executed after the key has been depressed for the prescribed amount of time.

## Resetting All Parameters

To reset all programming parameters to their Factory Default settings:

1. Turn the Readout power off.
2. Insure [JP3](#) is in position A
3. *Press and Hold* the **ON/OFF** and **UNITS** keys for 10 seconds.



The Readout will:

1. Perform a full segment LCD test
2. Display the current firmware version
3. **Reset all programming parameters to factory default values. (not recommended unless instructed by factory technician)**  
[See pg 2](#) of this manual for settings particular to this readout.  
[See Programming Parameter Summary](#) for a list of Factory Defaults.

## Programming Parameter Summary

The table below lists all available Readout Programming Parameters and values that will be restored when the Readout is [Reset To Factory Parameters](#).

**Refer to [Page 2](#) for any parameters that may have been pre-set at the factory for your Readout or System.**

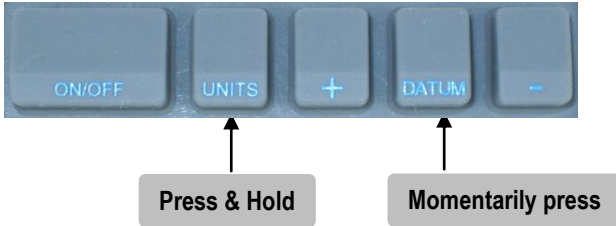
Parameter	Function	Range	Default
Pr1	DATUM	[0 to $\pm 999.999\text{in}$ ] or [0 to $\pm 9999.99\text{mm}$ ]	0
Pr2	Direction of Travel	[0 or 1]	0
Pr3	Key Lockout	[0 or 1]	0
Pr4	Readout Resolution	[1,2,3 or 4]	3
Pr5	Move to Wake Readout	[0.10 to 10mm]	0.10mm
Pr11	Readout Units	[0 to 6]	0
Pr12	Readout Auto-Off Time	[0 to 240]	15
Pr13	Linear Compensation	[0.00001 to 9.99999]	1.00000
Pr14	ProScale Compatibility	[0 or 1]	1
Pr22	ABS/INC Key Operation	[0 to 1]	0
Pr23	Auxiliary Keypad Enable	[0 to 3]	3
Pr24	Special Functions	[0 to 4]	0
Pr25	Special Function Variable	[0 to 16]	0
Pr26	Drift Monitor Tolerance	[.01 mm to 3048 mm] or [.001 in to 120 in]	.010in
Pr27	Upper/Lower Limits	[0 or 1]	0
Pr28	Lower Limit	[0 to $\pm 999.999\text{in}$ ] or [0 to $\pm 9999.99\text{mm}$ ]	0
Pr29	Upper Limit	[0 to $\pm 999.999\text{in}$ ] or [0 to $\pm 9999.99\text{mm}$ ]	5.000in
Pr30	Offset Addition	[0 to 4]	0
Pr31	Offset 1	[0 to $\pm 999.999\text{in}$ ] or [0 to $\pm 9999.99\text{mm}$ ]	.500in
Pr32	Offset 2	[0 to $\pm 999.999\text{in}$ ] or [0 to $\pm 9999.99\text{mm}$ ]	2.000in
Pr33	Offset 3	[0 to $\pm 999.999\text{in}$ ] or [0 to $\pm 9999.99\text{mm}$ ]	3.000in
Pr34	Offset 4	[0 to $\pm 999.999\text{in}$ ] or [0 to $\pm 9999.99\text{mm}$ ]	3.000in
Pr35	External Key Input 1	[0 to 11]	0
Pr36	External Key Input 2	[0 to 11]	0
Pr37	Output Polarity	[0 or 1]	0
Pr38	Output Function	[0 to 3]	0
Pr39	Non-Linear Compensation	[0 or 1]	0
Pr40	Non-Linear Interval	[0.5 to 10.0 in.]	5.000in
Pr41	Temperature Comp.	[0 or 1]	0
Pr44	Temperature Comp. Coef.	[10 to 999]	150



---

## Enter Programming Mode

*Press and Hold* the **UNITS** key while *Momentarily* pressing the **DATUM** key. The LCD will briefly display: **PG on** (Programming On). Release both keys. The LCD will then display **Pr 1**, (indicating Programming Parameter #1) for about 1 second, then display the value stored for **Pr1**.



[Video demonstration](#)

## Navigating Programming Mode:

To move up Parameter list:

*Momentarily* press the **UNITS** key to advance up through the Programming Parameter list. The Readout will display the Parameter number, then the current programmed value.



To move down Parameter list:

*Press and Hold* the **ON/OFF** key and *Momentarily* press the **UNITS** key to move backward through the Parameter list.



To Increase a Parameter value:

*Momentarily* press the **plus (+)** key while the Parameter value is displayed.



To Decrease Parameter value:

*Momentarily* press the **minus (-)** key while the Parameter value is displayed.



To Reset a Parameter value to the Factory Default setting:

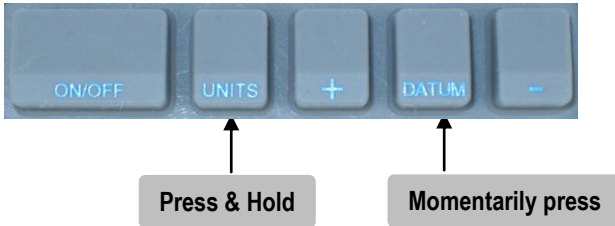
*Momentarily* press the **DATUM** key while the Parameter value is displayed.



---

## Exit Programming Mode

1. *Press and Hold* the **UNITS** key until the Readout displays **Pr x**
2. *Momentarily* press the **DATUM** key. The LCD will display **PG off**
3. Release both keys. The Readout will return to normal operation.



[Video demonstration](#)

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

---

## Programming Parameters Details

**NOTE: Programming parameters are not sequentially numbered due to firmware differences between measurement systems and the provision for future enhancements, functions and custom features.**

Programming Parameter Values in brackets [ ] represent the range of possible values available for that Parameter.

The Factory **Default Value** for each parameter is shown in **Bold Red**.

**Pr1 – Datum Key ..... [0 to ± 999.999in] or [0 to ± 9999.99mm]**

The value that will be recalled (on the display) when the **DATUM** key is pressed during normal operation. This value would normally be set to 0.00, but may be set to any value the readout is capable of displaying.

**Default Value= 0.00**

**Pr2 – Direction of Travel ..... [0 or 1]**

This parameter controls the direction (positive vs. negative) displayed on the readout when the measuring system is moved.

**Default Value = 0**

**Pr3 – Key Lockout ..... [0 or 1]**

This parameter controls the operation of the **+**, **-** and **DATUM** keys.

**Default Value = 0**

Pr 3 Setting	Key Action
0	+, - and Datum keys respond normally
1	+, - and Datum keys are locked

**Pr4 – Readout Resolution ..... [1, 2, 3 or 4]**

This parameter sets the number of places to the right of the decimal point displayed on the Readout. When the Readout is in a decimal mode (in, mm or cm), it will auto-range to the next lower resolution if the value is too large to be displayed in the current setting but is displayable in a lower resolution.

**Default Value = 3**

Pr 4 Setting	Display Resolution
1	x.X
2	x.XX
3	x.XXX
4	x.XXXX

**NOTES:**

- Decimal inches have a maximum of 3 decimal places (4 places ± .0005).
- Millimeters have a maximum of 2 decimal places
- This option has no effect when displaying fractions.

---

**Pr5 – Movement to Wake Readout ..... [0.10 to 10mm]**

This parameter sets the amount of encoder, (or system), movement required to automatically wake up the Readout when it is turned off or in sleep mode.

**Default Value = 0.10mm**

**Pr6 – Fractional Rounding ----- [0 or 1]**

This parameter is used to control rounding in Fractional display mode. When set to 0, rounding down to the least full 1/64th is used. When set to 1, rounding to the **nearest** 1/64th is used. (i.e. 1/64th + .0078" or greater rounds **UP** to next 1/64th.)

**Default Value = 0**

**Pr11 – Readout Measurement Units ..... [0 to 6]**

This parameter controls the type of measuring units the Readout displays when the **UNITS** key is pressed. The table below illustrates the possible combinations of measuring units that will be displayed by changing this parameter.

**Default Value = 0**

Pr 11 Setting	Displayable Units
0	All inch units and millimeters
1	Millimeters only
2	Decimal inches and millimeters
3	Decimal inches and centimeters
4	All inch units and centimeters
5	Centimeters only
6	Decimal inches only

**Pr12 – Readout Auto-Off Time ..... [0 to 240]**

This parameter changes the amount of time before the display turns off to conserve battery power. The value is the number of minutes of idle operation (no movement or key presses) before the display turns off. When this parameter is enabled ( $\neq 0$ ), pressing the **ON/OFF** key or movement of the encoder or system will wake up the Readout.

A value of '0' disables the Auto Off feature (the Readout is always on).

**Default Value = 15 (minutes)**

**Pr13 – Linear Compensation ..... [0.00001 to 9.99999]**

This parameter invokes a linear multiplier correction in the Readout that is applied to the actual measurement prior to any offsets. This adjusted measurement is then displayed on the Readout.

**Default Value = 1.00000**

**Pr14 – ProScale Compatibility ..... [0 or 1]**

This parameter sets the Readout to operate with the correct technology.

This parameter is preset at the factory if the Readout is purchased as part of a complete System. See also [Segment Offset](#). **Default Value = 1**

0	Model 180, 280, 380 and 580 Systems
1	Model 150, 250 and 950 Systems

**Pr21 – NOT USED**

**Pr22 – ABS/INC Key Operation ..... [0 or 1]**

This parameter controls the amount of time the **ABS/INC** key needs to be pressed to enter the **INCRe**mental measuring mode.

**Default Value = 0**

Pr 22 Setting	Key press to enter <b>INCRe</b> mental mode
0	<i>Press and Hold</i> ABS/INC key (1.2 sec)
1	<i>Momentary depress</i> ABS/INC key (< 1 sec)

**Pr23 – Auxiliary Keypad Enable ..... [0 to 3]**

The parameter controls the operation of the **ABS/INC** and **SEND** keys.

**Default Value = 3**

Pr 23 Setting	<b>ABS/INC</b> and <b>SEND</b> keys
0	Disable Both Keys
1	Enable abs/inc Key only
2	Enable send Key only
3	Enable Both Keys

**Pr24 – Special Functions ..... [0 to 4]**

This parameter controls which [Advanced Programming Function](#) is active

**Default Value = 0**

Pr24 Setting	<b>Advanced Readout Function</b>
0	None
1	F3 = MON, F4 = HOLD, F2 = Delete
2	Go/NoGo
3	Measurement Accumulation
4	Statistics

**Pr25 – Special Function Variable ..... [0 to 16]**

The parameter may be used by a special function to customize it's operation. See [Advanced Programming Function](#) for instances when this parameter is used.

**Default Value = 0**

**Pr26 – Drift Monitor Tolerance [.01 mm to 3048 mm] or [.001 in to 120 in]**

This parameter sets the amount of drift that must occur in [MONitor](#) mode to trigger a drift indication.

**Default Value = .01 in**

---

**Pr27 – Upper/Lower Limits ..... [0 or 1]**

This parameter Enables/Disables the use of the [Upper/Lower Limits](#) Function.  
(Set Pr 28 to the lower limit & Pr 29 to the upper limit).

**Default Value = 0**

Pr 27 Setting	Upper/Lower Limits Function
0	Function DISABLED
1	Function ACTIVE

**Pr28 – Lower Limit ..... [0 to ± 999.999in] or [0 to ± 9999.99mm]**

This value sets the lower limit of Upper/Lower Limits function when Pr27 = 1.

**Default Value = 0.000**

**Pr29 – Upper Limit ..... [0 to ± 999.999in] or [0 to ± 9999.99mm]**

This value sets the upper limit of Upper/Lower Limits function when Pr27 = 1.

**Default Value = 5.000 in. (127.00mm)**

**Pr30 – Offset Addition ..... [0 to 4]**

This parameter Enables/Disables the use of the [Offset Addition](#) function.

Pr31, Pr32, Pr33, and Pr34 set the value of the offsets to be added.

**Default Value = 0**

Pr30 Setting	Offsets Enabled
0	None
1	Offset 1 Enabled
2	Offsets 1 & 2 Enabled
3	Offsets 1, 2 & 3 Enabled
4	Offsets 1, 2, 3 & 4 Enabled

**Pr31 – Offset 1 ..... [0 to ± 999.999in] or [0 to ± 9999.99mm]**

This value is added to the current measurement (or position) when:

Pr 30 ≠ 0, and **1** is displayed in the upper left area of the LCD.

**Default Value = .500 in. (12.7mm)**

**Pr32 – Offset 2 ..... [0 to ± 999.999in] or [0 to ± 9999.99mm]**

This value is added to the current measurement (or position) when:

Pr 30 ≠ 0, and **2** is displayed in the upper left area of the LCD.

**Default Value = 2 in. (50.8mm)**

**Pr33 – Offset 3 ..... [0 to ± 999.999in] or [0 to ± 9999.99mm]**

This value is added to the current measurement (or position) when:

Pr 30 ≠ 0, and **3** is displayed in the upper left area of the LCD.

**Default Value = 3 in. (76.2mm)**

**Pr34 – Offset 4 ..... [0 to ± 999.999in] or [0 to ± 9999.99mm]**

This value is added to the current measurement (or position) when:

Pr 30 ≠ 0, and **4** is displayed in the upper left area of the LCD.

**Default Value = 3 in. (76.2mm)**

**Pr35 - Pr38 apply to General Purpose and In-Panel Readouts.**



**Pr35 – External Key Input 1 ..... [0 to 11]**

This parameter maps the Auxiliary Key to be [activated externally](#).

**Default Value = 0**

**Pr36 – External Key Input 2 ..... [0 to 11]**

This parameter maps the Auxiliary Key to be [activated externally](#).

**Default Value = 0**

Value of Pr 35 & 36	Key
0	None
1	On/Off
2	Units
3	Plus
4	Datum
5	Minus
6	ABS/INC
7	Send
8	F1
9	F2
10	F3
11	F4

**Pr37 – Programmable Output Polarity ..... [0 or 1]**

This sets the normal state of the [programmable output](#) when **not** activated and Circuit board jumper **JP5** is in position **A**.

**Default Value = 0**

Pr 37 Setting	Output Polarity
0	Normally Open (NO)
1	Normally Closed (NC)

**Pr38 – Programmable Output Function ..... [0 to 3]**

Selects the function that the [programmable output](#) activates on when Circuit board jumper **JP5** is in position **A**.

**Default Value = 0**

Value of Pr 38	Function
0	No Operation
1	Monitor (Drift) Operation
2	Upper/Lower Limits
3	Go/No Go

**Pr39 through Pr44 apply to General Purpose E and 950 Series Readouts (Firmware versions end in 'C')**



**Pr39 – Non-Linear Compensation** ..... [0 or 1]  
 This parameter Enables/Disables the [Non-Linear Compensation](#) function.  
**Default Value = 0**

Pr 39 Setting	Non-Linear Compensation
0	Off
1	On

**Pr40 – Non-Linear Compensation Interval** ..... [0.5 to 10.0 in.]  
 This parameter sets the distance interval used while performing non-linear compensation calibration.  
**Default Value = 5.000 in. (127mm)**

**Pr41 – Temperature Compensation** ..... [0 or 1]  
 This parameter enables (disables) the [temperature compensation](#) feature.  
**Default Value = 0**

Pr 41 Setting	Temperature Compensation
0	Off
1	On

**Pr42 & Pr43 – NO LONGER USED**

**Pr44 – Temperature Compensation Coefficient** ..... [10 to 999]  
 This parameter sets the temperature expansion coefficient used when temperature compensation Pr41 = 1.  
**Default Value = 150**

**Range:** 10 to 999 will yield values from 1.0 m/m °K x 10<sup>-6</sup> to 99.9 m/m °K x 10<sup>-6</sup>.  
**Note:** Coefficients MUST be in m/m °K.



---

**Frequently Asked Questions****What does no Enc mean?**

If the Encoder is off the Scale, or the Encoder cable is unplugged from the 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 Readout for one second and then reconnect the Encoder.
3. Connect the Encoder to the Readout.

**What does b FAIL mean?**

When the readout displays this message it means the battery voltage has dropped to a level where reliable operation is no longer possible.

[Install new battery](#) to clear this message.

**What does P FAIL mean?**

When the readout displays this message it means the battery voltage has dropped to a level where reliable programming is not possible.

[Install new battery](#) to clear this message.

**The Readout numbers appear to be random.** (Model 150, 250 & 950)

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

**The Readout does not change, or changes very little, as it moves.**

1. The Readout is in the [HOLD](#) mode.
2. The Encoder is on the Scale backwards. (Model 150, 250 & 950)
3. The [Scaling](#) factor is set very low.

**The Readout alternately shows “no Co”.**

The readout has [non-linear compensation](#) enabled and either:

1. The position of the encoder is outside the calibrated range  
*Move the encoder to a position within the calibrated range*
2. The system datum has changed.  
*Make sure the system [datum](#) is set properly.*
3. The Readout is in [INC](#) mode.  
*Return to [ABS](#) mode and check Datum.*

[Additional On-Line FAQs](#)

### [ProRF SPC](#)

ProRF allows linear measurement or position data to be transmitted wirelessly to a PC (or other device with a USB or RS232 connection.) The system uses 802.15.4 radio modules to provide reliable two way communication. The transmitter plugs into the SPC data output connector on the General Purpose and 950 Series Readouts



### [ProRF Encoder](#)

Instead of a long cable between the Encoder and the Readout, a Transmitter at the Encoder sends data to a Receiver. The receiver can be connected to a Readout at a remote location or to a PC RS232 or USB port. (Not compatible with 950 Series systems)



### [ProMUX](#)

ProMUX-3 is an easy to use hardware interface that provides communication from Model 150 & 250 Encoders (or SPC equipped readouts) to a user's PC or PLC. ProMUX-3 supports three inputs, and one RS232 output. (Not compatible with 950 Series systems.)



### [Analog Interface Unit \(AIU\)](#)

The AIU is an interface designed to provide an analog signal output proportional to the displayed position of a ProScale measurement system. It connects to the SPC data output connector on the General Purpose and 950 Series Readouts.



## SECTION 7

## OTHER PROSCALE PRODUCTS

### ProStop

**ProStop** is a complete Digital Stop and Fence System for miter saws. It includes an aluminum Fence, a Flip Stop with fine adjust, reversible 90°/45° plate and double locking mechanism. No other manual stop and fence system can match ProStop's .001 in. repeatability.



### ProPanel-HD

**ProPanel-HD** is a precision portable measuring tool built and used like a caliper to make inside, outside, diagonal, hole-edge and hole-hole dimensional measurements. This is a rugged linear measuring tool is designed to make "on the manufacturing floor" measurements.



### ProKit 590

The ProKit 590 is an ideal foundation for a "build-it-yourself" dimensional measuring system. ProKit 590 is available in measuring lengths up to 190 inches (4.8m). [SPC](#) output comes standard. Wireless data transmission is optional.



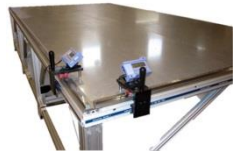
### ProTable

ProTable is a self contained, single axis measuring table/QC station. Leg sets and casters make this product easy to move around the manufacturing floor. Temperature compensation and non-linear error correction are built into the readout. Systems are available up to 24 ft. long. [SPC](#) output comes standard. [Wireless](#) data transmission is optional.



### ProTable XY

Two-axis measuring system designed for panel or sheet type products from .012 - .250 inch thick. The top is 3/8" hard anodized cast aluminum plate. Each axis is guided by a steel linear bearing. Backfences are 1/4" stainless steel. Contact pins are hardened steel. Available in the standard sizes or custom configurations. Temperature compensation and non-linear error correction built in. [SPC](#) output is standard. [Wireless](#) data transmission is optional.



### ProTable-CAB

ProTable-CAB is a two axis measuring system designed for quick and affordable length and width measurements of cabinet doors or other panel type products.

ProTable-CAB is built with low friction bearings to insure smooth operation and to minimize errors.



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**Thank you for choosing a ProScale Product,**

**IT WAS PROUDLY MADE IN THE USA**



**Accurate Technology, Inc.**

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Fletcher, NC 28732 USA

828-654-7920

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