Accurate
TECHNOLOGY INC.
Linear Digital Measuring Systems

Operation & Maintenance Manual

ProTable™

This manual applies to all ProTables manufactured since June 2004, AND using digital display firmware version 2.xxx.

Warranty

Accurate Technology, Inc., warrants the ProTable 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 **R**eturned **M**erchandise **A**uthorization (RMA) number is required before returning a product for repair.

Accurate Technology, Inc.
+1 828.654.7920
+1-828.654.8824 (F)
www.proscale.com
email: info@accurate-technology.com

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Introduction

ProTable™ is a complete single or multi-axis, contact or non-contact, linear digital measuring system. It is ideal for a Quality Control or Quality Assurance application.

ProTable comes in two standard configurations (free-standing or bench-top) and two standard sizes (50 inches or 96 inches), but is often built to customer specifications to meet the requirements of a particular application or measuring system.

The heart of the ProTable system is an Accurate Technology ProScale™ linear measuring system. ProScale is ideal for most measuring requirements up to 20ft. where high accuracy is not needed, but affordable *repeatability*, (better than a tape measure), is desired. Because ProScale shows the exact measurement on its display, it eliminates the guesswork involved in reading and interpreting tape measures. ProScale is a solid-state electronic device so there's very little to wear out. The readhead and scale are designed to withstand shop dirt, dust, and other airborne contaminants, and the display is sealed with a protective cover. With normal care, ProTable will last for years.

All ProTable systems consist of specially manufactured SCALEs, READHEADs, and DISPLAYs. The scale is a series of conductive patterns bonded to an aluminum extrusion. The readhead, or encoder, transmits signals to the display. This position data is translated by the digital display, where it is displayed in millimeters, centimeters, or inches, and can be sent to an external data acquisition device.

ProTable is available with several options and accessories. Please refer to *Section 4: Accessories*, or visit www.proscale.com.

What This Manual Includes

This manual includes installation, operation and maintenance information for all ProTables manufactured with digital displays using firmware version 2.xxx.

Specifications

Entire System:

Measuring Range: 0 to 234 Inches

Accuracy: $\pm$ .010in Maximum error

Operating Temp: 45 to 100°F

Temp Coefficient: 13ppm / °F

System Warranty: One year from date of purchase.

Digital Display (may contain specially modified firmware):

Resolution:	Reduced Mode:	.1mm/.01cm/.01in
	Normal/Default:	.01mm/.001cm/.001in
	Increased Mode:	.01mm/.001cm/.0004in

Repeatability: 0.01mm, 0.001cm, 0.001in (depends on units displayed)

Display Range: $\pm$ 9999.99 mm, $\pm$ 999.999 cm, $\pm$ 999.999 in, $\pm$ 399 63/64 in.

Power: Two AA Alkaline Batteries (custom units may use 24VDC)

Output Format: Mitutoyo SPC

Readhead (may contain high speed components):

Max. Slew Rate: 24 inches/sec.

Scale (specially manufactured and tested)

ProTable is easy to use. By following these instructions, reliable, error-free operation can be expected, with only an occasional need for adjustments or realignment of the jaws.

Assembly:

A CD-ROM has been included with a video of the assembly process for ProTable. Please use this video along with the steps below to assemble your ProTable.

1. **Free-standing models:** Mount the legs to the bottom of the main table using the included fasteners.
2. **Free-standing models:** Attach the feet to the legs using the included fasteners. (If equipped with casters, attach them using the supplied M8 bolts and T-nuts, 2 per caster).
3. **Free-standing models:** Attach the shelf between the legs using the included fasteners.
4. The moving jaw has been adjusted at the factory prior to testing and shipping for Squareness and parallelism. If the jaw assembly arrived with any "looseness" in its movement along the linear shafts, it may require adjustment. See **Maintenance**, page 8, for details. **If any changes are made to the jaws, be sure to re-zero the system by closing the jaws together, and pressing the 0 key on the display.**
5. ProTable comes standard with a customizable digital display. Programming and operation details for the display can be found in Section 3: *Digital Display Operation*.

Operation:

If your ProTable was ordered with any accessory products, refer to the individual manuals for these products or check the included CD-ROM for information.

To measure a part:
1. Slide the moving assembly to the right until the part to be measured will fit between the jaws.
2. Place the part to be measured against the fixed jaw. If the backfence option was ordered, be sure the part is also placed against the backfence. If a V-block option was ordered, be sure the part is placed into the cradle of each V-block.
3. Slide the moving assembly up against the part to be measured. The part length is displayed.
4. Press the HOLD key to freeze the displayed reading. Press the SEND key to transmit the reading to the SPC output.

To measure parts relative to a reference (standard):

1. Slide the moving assembly to the right until the reference part to be measured will fit between the jaws.
2. Place the reference part to be measured against the fixed jaw. If the backfence option was ordered, be sure the reference part is also placed against the backfence. If a V-block option was ordered, be sure the reference part is placed into the cradle of each V-block.
3. Slide the moving assembly up against the reference part.
4. The part length is displayed. Press the ABS/INC key to switch to relative measurement mode.
5. Measure a production part using the same method as in steps 1 to 3. The difference in length between the reference and the production parts is shown on the display. A negative number indicates the production part is shorter than the reference part.
6. If desired, the difference can be transmitted by pressing the SEND key.

Accuracy:

ProTable has been calibrated at the factory using NIST traceable gage bars. However, since ProTable is made from aluminum which has a temperature coefficient of 13ppm/°F, changes in temperature can cause differences in a given measurement. It is therefore recommended you use ProTable in a stable temperature environment.

ProTable is based on the ProScale measurement system, which is a passive device in terms of its accuracy. As such, except for temperature changes, it will not "lose" its original accuracy. When ProTable is calibrated at the factory, a scaling factor in the digital display is sometimes used to correct for linear errors.
DO NOT CHANGE THIS SCALING FACTOR; DOING SO MAY VOID YOUR CALIBRATION. If your display is ever replaced or reset to factory defaults, reprogram the factory scaling factor (shown on the front cover) to ensure optimal accuracy.

NOTE: When any mechanical devices are built on, or attached to, a measuring device; the accuracy of the "total system" will not be equal to the accuracy of the measurement device due to mechanical inaccuracies, and/or physical measurement errors (see Abbé Error, Pg. 9). ProTable measurement systems have been designed to minimize these mechanical measurement errors. However, changes in mechanical soundness (such as loose bearings), table deflection (due to a non-level surface, or large loads), or severe temperature changes can affect the accuracy and repeatability of the entire system. In addition, inconsistent measuring techniques (such as different operators) can contribute to measurement errors. A Gage R & R study should be considered if numerous operators will be using the ProTable.

Maintenance:

A regular schedule for cleaning and adjustment is highly recommended.

Free-Standing Units: All legs, feet, and shelf fasteners should be checked regularly for tightness. Tighten as needed.

Table surface, Jaw Faces, Scale, and Display: These components should be kept free of dust, dirt, and other residue as much as possible. These parts can be cleaned using compressed air (up to 80psi), or by wiping with a nonabrasive cleaner.

Bearing Rails: The bearing rails should be kept as clean as possible at all times, as any contaminants could cause an Abbé error. There are four pads that clean the bearing rails as the sliding assembly is moved. These pads should be saturated with a light machine oil as needed to ensure long life. Replacement pads are available from Accurate Technology (part number: 100-3308-001).

Moving Jaw/Bearing Adjustment: ProTable's moving head has roller bearings which help it to slide easily along the table. Of these bearings, the two in the front are eccentric and can be used to adjust the front-to-back parallelism of the moving jaw.
To adjust the bearings:
1. Loosen the spanner nuts using the supplied spanner wrench. This is done by turning the spanner nuts counter-clockwise **as viewed from the bottom of the ProTable.**
2. Adjust each of the eccentric bearings until they contact the linear shaft on the front side of the ProTable.
3. Close the sliding assembly until the fixed and moving jaws make contact with each other.
4. Using very small adjustments, rotate each of the eccentric bearings until the jaw faces are parallel. (The parallelism of the jaws can be checked by measuring a feeler gage at the front and rear of the jaws and comparing the readings.)
5. After the moving jaw is adjusted to parallel, lock the spanner nuts. When tightening the spanner nuts, be sure to keep the M6 hex wrench stationary. The spanner nuts should be rotated clockwise **as viewed from the bottom of the ProTable** until tight. Medium strength thread-locker may be used on the threads of the spanner nut if desired.
6. If excess adjustments are made, ProTable may need to be re-calibrated by an authorized technician.

Abbé Error

Abbé error is a condition that may not be visible to the human eye, but will affect linear measurements.
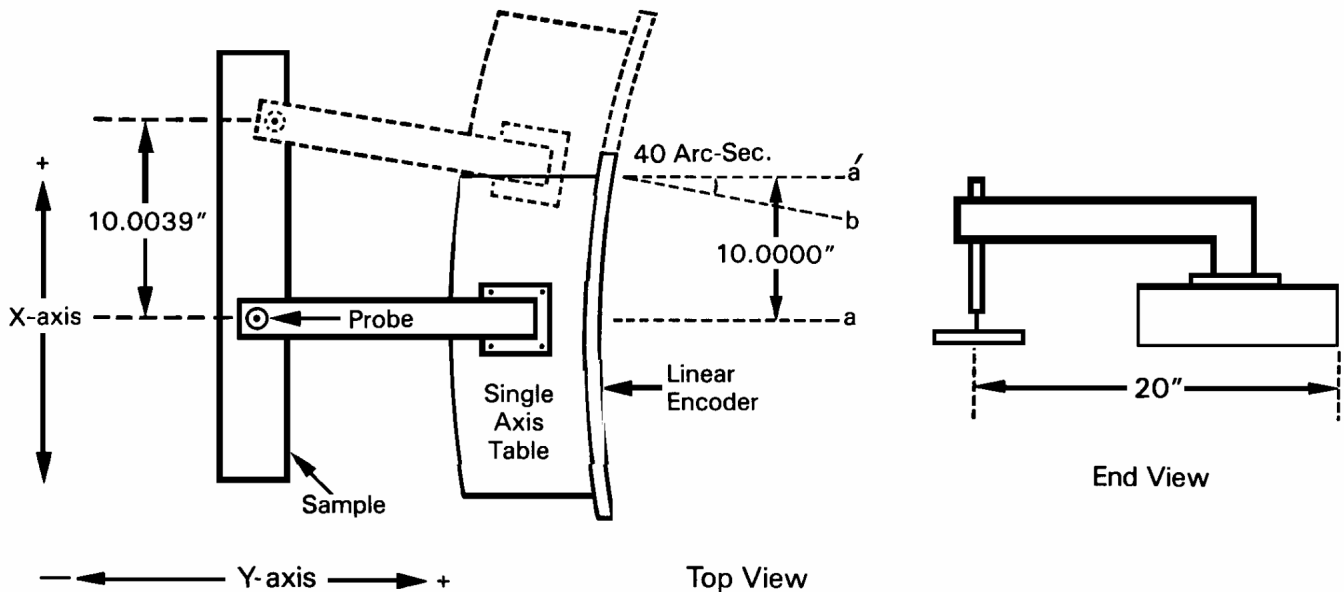
Abbe error refers to a linear error caused by the combination of an angular error and a dimensional offset between the sample and the measuring system. It is important to understand that the information the encoder is providing is only the position of the encoder on the scale. To illustrate this, see 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 problem to be solved. Angular error can best be countered through proper design.

Angular errors can also be induced as a result of improper measurement techniques. Be sure when making measurements you have placed your sample on the ProTable so it is parallel to the measuring surface and square to the jaws. Consistency will yield repeatable results.

This section covers programming and operation of the Digital Display supplied with ProTable.

About the Display

The display operates on 2AA batteries (or 24VDC on some custom models). It comes standard with an auxiliary keypad with 6 keys.

Mounting the Display

If you choose to relocate Digital Display, It can 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 can tapped for M2 or 4-40 screws.
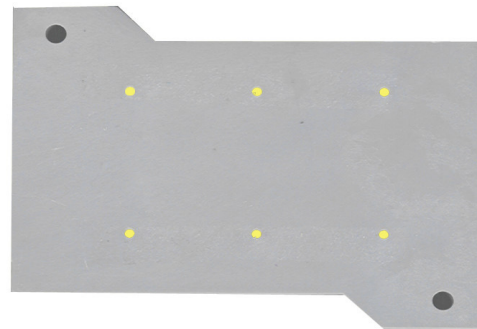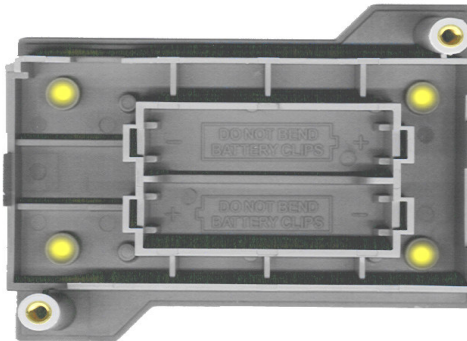
NOTE: Care must be taken when using the inside holes. If using the lower left hole as shown above, be sure to use a screw that will not rise above the extruded countersink as this may short the input connector.

NOTE: If the readhead requires a longer cable, contact Accurate Technology.

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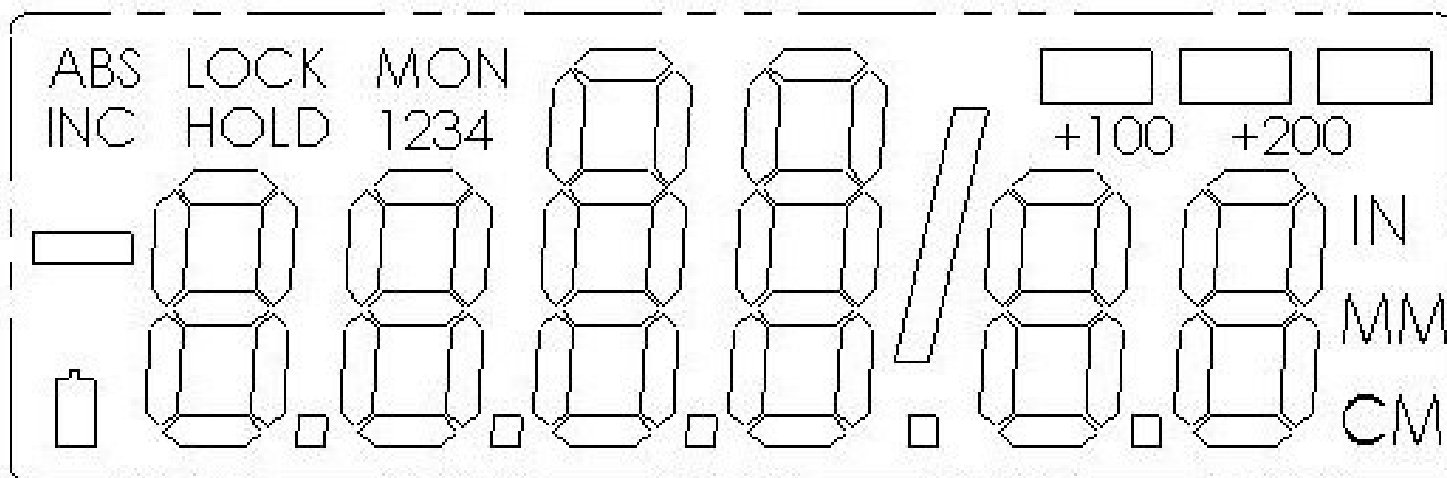
The above figure illustrates all the segments available on the Digital Display.

Display Keys

Key Press Timing

All of the keys pictured above have multiple functions. The timing, which is how long a key is pressed, and the combination of the keys that are pressed is important. This manual uses the term *"momentarily"* to describe a key press of typically less than 1 second, and *"press and hold"* is used imply a key press of longer than 1.5 seconds.

(For example: When using a Computer keyboard to type a capital letter, *"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 PRESS. This is important since some keys will execute different functions based on how long they are pressed.

These key operations, once tried, quickly become intuitive.

ON/OFF key

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 LCD will automatically turn itself off to conserve battery life. While off, if a position change is detected (greater than .05mm or .002in) or the **ON/OFF** button is pressed, the LCD will automatically turn itself on with no loss of measurement information. (This setting can be changed using Programming Parameter Pr8. The factory default setting is 15 minutes.)

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

MODE key

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) and metric.
(The available units for display can be changed using Programming Parameter Pr6.)
(The metric units –mm or cm – can be changed using Programming Parameter Pr5.)
When the display is in a decimal mode (mm, cm or in) it will automatically change the number of decimal places in order to display larger values. 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. For example: 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 63/64 inches, a +100 or +200 indicator will show in the upper right portion of the LCD to indicate this amount must be added to the displayed reading. For example: If the measurement is 154 5/8 inches: 54 5/8 and +100 will be displayed on the LCD. If the measurement is -307 23/64 inches: -7 23/64, +100, and +200 will be displayed on the LCD.
(The resolution of the display - number of decimal places - can be changed using 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. The longer the **+** or **–** keys are held down, the faster the displayed position will change. (The **+**, **0,** and **–** keys can be "locked out" using either LOCK MODE - described on the next page – or by using Programming Parameter Pr3.)

Display Functions

Lock Mode

The user can "lock-out" the position offset adjustment functions (+, -, 0 keys) to prevent accidental changes of the currently displayed position. To activate the lock mode, press and hold the ON/OFF key and then momentarily press the MODE key. The LOCK symbol will appear/disappear on the LCD display with each lock/unlock operation. When the LOCK symbol is displayed, the +, - and 0 keys will not change the displayed position. NOTE: ABS and INC measuring modes have independent lock operations.
(The display can also be programmed to be locked using Programming Parameter Pr3.)

Segment Offset Adjustment

The scales that ProTable is manufactured with contain multiple scale pattern/segments which 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 can 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. 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. To subtract one 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.
(The display can be programmed to read only one segment and ignore the "splices" between segments. See Programming Parameter Pr1 for details.)
NOTE: If your ProTable display uses a scaling factor to provide optimum accuracy (see next page), Segment Offset Adjustment should not be used.

Offset Addition

Offset addition allows the user to preset up to 3 different offset amounts that are added to the displayed reading with each press of the F1 key. This allows the user to quickly switch measurement reference points from one point to another. 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 plus the value of parameter Pr11 (Offset Addition 1). Offset 3 is the ABS position plus parameter Pr12 (Offset Addition 2). Offset 4 is the ABS position plus parameter Pr13 (Offset Addition 3). To advance from one offset to another, momentarily press the F1 key. After offset 4, the display moves back to offset 1.

Limit Mode

The digital display will show either **"LL"** for Lower Limit or **"UL"** for Upper Limit if a pre-programmed upper or lower value is reached. Upper and Lower limit values are programmed using parameters Pr16 and Pr17, but are only active if Output Signal is enable (Pr14 is set to 1). The display will toggle between the current position value and "LL" or "UL" when a lower limit or an upper limit is reached. The position value is shown for 2 seconds, then the "**LL**" or "**UL**" is shown for 2 seconds. This will continue for as long as a limit has been exceeded. **NOTE: Limit monitoring is always active, even while a display is in programming mode.**

Scaling

All ProTable 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, such as for Linear Error Compensation. 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.

(The scaling factor is programmed using Programming Parameter Pr7.)

IMPORTANT NOTE ABOUT SCALING:

This function is used to compensate for linear errors when calibrating ProTable at the factory. The scaling factor used may be different for each ProTable. The factory setting of the scaling factor has been recorded below, and on the front cover of this manual. Changing or deleting this factory setting could void your ProTable's calibration. *If your digital display is ever replaced or reset to factory defaults be sure to re-program the scaling factor to the value shown below.*

THE SCALING FACTOR FOR THIS PROTABLE IS:

Changing the Batteries

A low battery indicator will appear in the lower left corner of the LCD display when new batteries are needed. Remove the screws in the upper right and lower left corners of the display. Lift 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 WHEN THE CASES ARE SCREWED TOGETHER.

Auxiliary Keys

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 the fixed jaw. 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. the fixed jaw). To enter 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 moving jaw. This is typically a position of zero (0) but may be changed by using the + or - keys to provide an initial offset. Sliding the moving jaw in either direction will display the distance moved from the initial INC starting point (plus any initial 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 initial 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" 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 moving jaw 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 moving jaw moves outside the programmed tolerance the displayed reading will flash, indicating a drift condition. When the moving jaw 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 displayed reading will also stop flashing. (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 drift tolerance is controlled by Programming Parameter Pr18.

The display can also be programmed to automatically enter or exit the MONitor mode based on elapsed time or movement of the moving jaw. If Auto Monitor ON (Programming Parameter Pr19) is used, the Digital Display will automatically enter the monitor mode after 30 (or 60) seconds without a position change. If Auto Monitor OFF (Programming Parameter Pr20) is used, the display can automatically exit the monitor mode when the position change exceeds a programmable distance from the monitored position (Programming Parameter 21). These features allow the ProTable to be kept in monitor mode without manually pressing the monitor key.

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 LCD for 1 second to show activation of the send function (this will occur even if there is not an SPC device connected). The data format and connector style of the 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 ProTable is sent to the SPC connector in either millimeters or decimal inches, whichever is currently displayed on the LCD.

F1 / F2

The F1 key is used for the Offset Addition functions; see page 13.
The F2 key is used with the RF transmitter (if equipped).
These keys may also be 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. Each of the keys pictured have multiple functions. The timing, which is how long a key is pressed, and the combination of the keys that are pressed is important. This manual uses the term *"momentarily"* to describe a key press of typically less than 1 second, and *"press and hold"* is used imply a key press of longer than 1.5 seconds.

(For example: When using a Computer keyboard to type a capital letter, *"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 PRESS. This is important since some keys will execute different functions based on how long they are pressed. These key operations, once tried, quickly become intuitive.

To enter the programming mode, press and hold the **MODE** key, 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 Parameters.

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

Press the **+** (plus) key to increase the current parameter's setting.

Press the **-** (minus) key to decrease the current parameter's setting.

Press the **0** (zero) key to reset the current parameter to the default setting.

To exit the programming mode, press and hold the **MODE** key, 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.)

NOTE: The display will automatically exit programming mode after 60 seconds without key activity.

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. THIS ACTION COULD VOID YOUR CALIBRATION BY SETTING PR 7 TO A VALUE OTHER THAN THE ONE SET AT INITIAL CALIBRATION.

Programming Parameters are listed below. Values in [ ] show the available range of values that can be used for that parameter. Default settings are shown in **bold.**

Pr0 – Encoder Direction   [**0**,1]
> Change this value to reverse the direction of measurement readings.

Pr1 – Enable/Disable Segment Offset   [0, **1**]
> 0 = For scales shorter than 430mm; should not be used for ProTable
> 1 = For scales longer than 430mm and **ProTable**

Pr2 – High Speed Readhead   [0, **1**]
> 0 = Normal Readhead
> 1 = High Speed Readhead (for all readheads with "H" in the part number)
> This setting should be 1 for most ProTable measuring systems.

Pr3 – Enable/Disable the +, - and 0 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 display's resolution in *decimal* mode. (No changes to 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)
> When using Increased resolution, measurements over 100 inches will automatically be reduced to 3 decimal places.

Pr5 – Metric Display Units [**0**, 1]
> Controls whether a metric reading is displayed in millimeters or centimeters.
> 0 = millimeters
> 1 = centimeters

Pr6 – Disable Fractions and/or 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.

Pr7 – Scaling Factor [.0001 .. 9.9999] Default = SEE SCALING, PAGE 14
> The multiplier applied to the readhead's measurement. Scaling factors less than 1.0000 will make the displayed measurement less that the actual measurement. Scaling factors greater than 1.0000 will make the displayed measurement greater than the actual measurement. **THIS SETTING WILL BE SPECIFIC TO EACH UNIT; SEE PAGE 14 FOR THE ORIGINAL FACTORY SETTING.**

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 will "wake-up" the display and reset the timer.

Pr9 – Auxiliary Keys Enabled or Disabled　　[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 the 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 2 is selected (see Section 3 -*Offset Addition*), this value is added to the current ABS position. **Default = 1.000 inch**
Only active if Pr10 is set to 1.

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

When offset 3 is selected (see Section 3 -*Offset Addition*), this value is added to the current ABS position. **Default: 1.500 inches**
Only active if Pr10 is set to 1.

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

When offset 4 is selected (see Section 3 -*Offset Addition*), this value is added to the current ABS position. **Default: 2.000 inches**
Only active if Pr10 is set to 1.

Pr14 – Output Signal Mode　　　[**0**, 1]

Configures the hardware output signal for activation on Monitor drift conditions or Upper/Lower limit alarm conditions. (Functions on 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 = 0.000 inches**
    A*ctive only when parameter Pr14 = 1.*

Pr17 – Upper Limit [-999.999 to 999.999in] or [-9999.99 to 9999.99mm]
    Sets the upper limit alarm value. **Default = 5.000 inches**
    A*ctive only when parameter Pr14 = 1.*

Pr18 – Drift Tolerance [.01 to 9999.99mm] or [.001 to 999.999in].
    Range of motion allowed (+ or -) while in Monitor mode. **Default =. 01 inches**

Pr19 – Automatic Monitor ON Time   [**0**, 1 or 2]
    Configures display to automatically activate the Monitor mode after 30 or 60
    seconds of encoder inactivity.
    0 = feature disabled
    1 = 30 seconds
    2 = 60 seconds

Pr20 – Automatic Monitor OFF Enable[**0**, 1]
    Configures display to automatically exit the 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 = 0.500 inches**
    This parameter is relevant only when **Pr20=1**.

Pr22 – Backlight ON time   [0, **1**, 2, 3 or 4]
    The ON time of the LCD backlighting (functions on 24VDC displays only).
    0 = always off
    1 = 3 seconds; Backlighting is activated when a key is pressed.
    2 = 7 seconds; Backlighting is activated when a key is pressed.
    3 = 15 seconds; Backlighting is activated when a key is pressed.
    4 = Always on.

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

Pr24 – RF System Address   [**0**..63]

Pr25 – RF System Identification   [**0**..31]

Pr26 – Noise Rejection   [0 to 7] **Default = 2.**
   Change setting to larger number to increase the display's immunity to EMI.

Jumpers

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

The 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'.

Digital Display Circuit Board
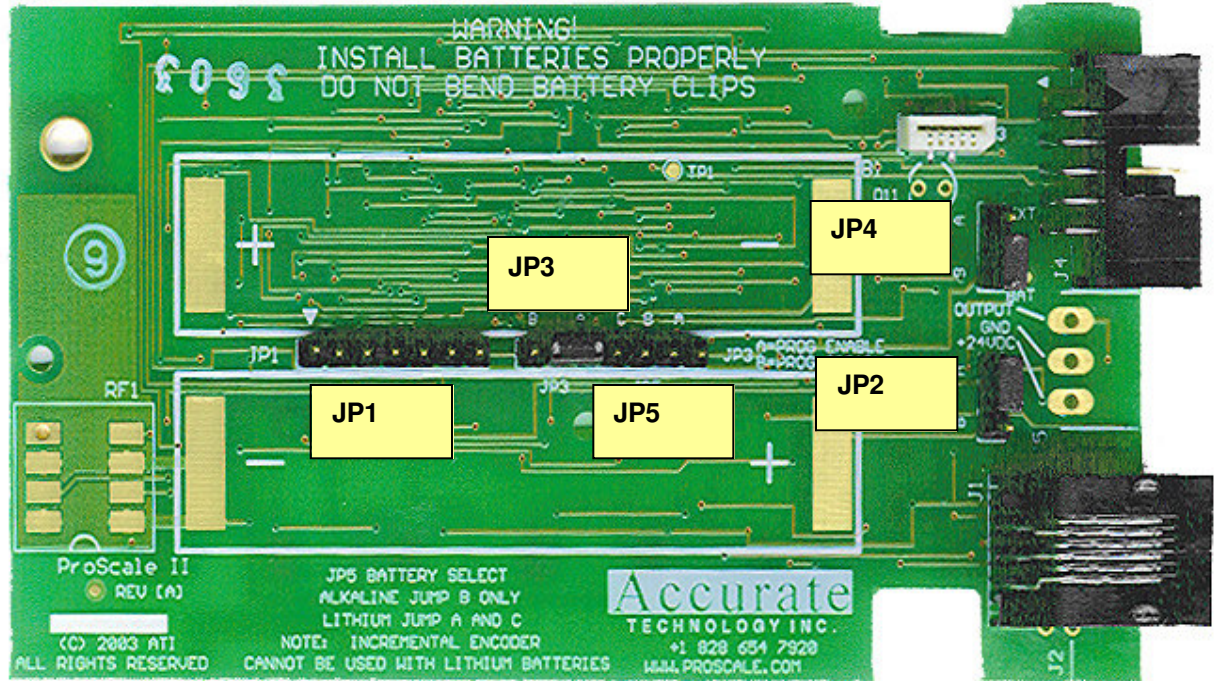
JP1, JP4, JP5   PROTABLE FACTORY USE ONLY

JP2   Encoder Selection
ProTable Digital Displays should have the shorting jumper in position **A**.
Position B is reserved for older, Incremental Style ProScale Systems

JP3   Programming Enable/Disable
Entry to the programming mode of the 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 3: *Programming*. This provides the user with a method of configuring the display with specific parameters, then preventing unauthorized configuration changes.

Key Function Summary:

ON/OFF   Momentary press: Turn LCD power on or off
ON/OFF   Press & Hold for 5 seconds: Show Battery Voltage
ON/OFF   (Press & Hold) and MODE (Momentarily):
          Normal Use: Enable/Disable LOCK mode
          In programming mode: Step back one parameter
ON/OFF   (Press & Hold) and MODE (Press & Hold) for 10 seconds: LCD Segment Test
          & reset all programming parameters to factory defaults

MODE   Momentary press:
          Normal Use: Change displayed units (fractions to decimals and back)
          In programming mode: Step forward one parameter
MODE   (Press & Hold) and '**0**' (Momentarily): Enter or Exit Programming Mode
MODE   (Press & Hold) and '**+**' (Momentarily): Add one segment value
MODE   (Press & Hold) and '**-**' (Momentarily): Subtract one segment value

+   Momentary press: Increment displayed value once
+   Press & Hold: Increment displayed value repeatedly

0   Momentary press:
          Normal Use: Zero current reading
          In programming mode: Default current parameter value

-         Momentary press: Decrement displayed value once
-         Press & Hold: Decrement displayed value repeatedly

ABS/INC   Momentary press: Change to new INC measurement mode
          Press & Hold for 3-4 seconds: Revert to ABS measurement mode.

MON   Momentary press: Enter or Exit monitor mode

HOLD   Momentary press: Enter or Exit HOLD mode

F1   Momentary press: Advances to next Offset Addition Reading

F2   Momentary press: Deletes previously sent SPC output transmission (only
          when used with ProScale RF display and receiver).

ProMUX-3™

ProMUX 3 is an easy to use hardware interface device providing communication and control of one, two, or three ProScaleABS linear encoders from a user provided PC or PLC.

The interface unit and a low voltage plug-in power supply are supplied.

The user provides the host PC or PLC and a standard DB-9 serial cable (male to female).

Uses for the ProMux 3 include axis position measurement on XY or XYZ quality control measurement tables, machinery position control (NON-CNC), tooling measurement devices and the like.

Pro-RF™

Pro-RF is a bidirectional radio frequency communication system consisting of a base module and a remote module.

The Remote module provides the data acquisition functions. It accepts 1 ProScale (or Mitutoyo) SPC signal as input and relays the information via RF link to the Base module.
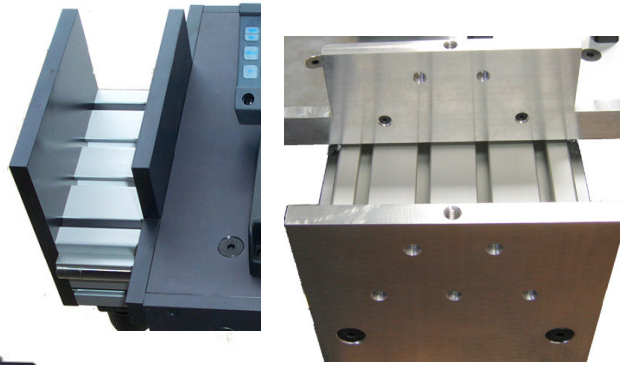
The Base module communicates to a host PC via RS-232 operating at 57,600 Baud. The system can support up to 32 remote modules, each up to 100 meters away.

ProTable Options

In addition to **ProMux-3** and **Pro-RF**, the following options are available for ProTable:

Custom Jaws
- Aluminum or Steel
- With no holes or with custom located holes
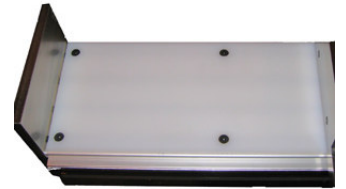- Standard or custom shapes and features
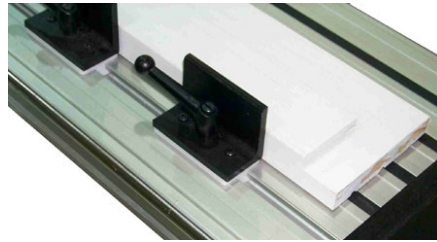
Digital Calipers
- Mitutoyo Digimatic™ 6 or 12 inch.

Wear Sheets
- Replaceable UHMW sheets for table surface protection

Fence
- Full fixed back fence
- Adjustable back fence

Data Collection and Processor
- Mitutoyo DP-1VR data logger/printer

Digital Display
- 24VDC operation with backlighting and LIMIT signal output

- **V blocks** (not shown)
- For facilitating measurement of round stock

Casters
- Heavy duty casters allow ProTable to be mobile

Canvas cover (not shown)
- Custom made cover to protect ProTable

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, a "no Enc" will appear on the display. To clear error:

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

How come the display does not change as the head is moved?

1. The display is in the HOLD mode. Press & release the Hold button.
2. The readhead is no longer engaged by the clip. Re-engage the readhead.

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. The clips are designed to expand when the two case halves are screwed together.

PRODUCT REGISTRATION

Fill out for your records and FAX to Accurate Technology at +1.828.654.8824 or Register online at:
www.proscale.com/registration.htm

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City　　　　　　　＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿

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Country　　　　　＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿

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Purchased When: ＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿＿

ProTable Serial Number:
Manufactured Date:

Thank you for choosing an Accurate Technology Product

MADE IN USA

Accurate Technology, Inc.

270 Rutledge Rd. Unit E

Fletcher, NC 28732 USA

800 233-0580 • 828-654-7920

Fax 828-654-8824

www.proscale.com

customerservice@accurate-technology.com

This manual is available at www.proscale.com

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www.proscale.com/registration.htm