

Accurate

TECHNOLOGY INC.

Linear Digital Measuring Systems

ProPanel™



User Manual for:

ProPanel-HD & -HDE

Readout Serial # _____ Linear Multiplier _____

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SAFETY WARNING

Before using this product on or around any machinery disconnect all machinery power.

Manual # 800-1090-105 Rev B

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Introduction

ProPanel™ is a general-purpose portable measuring tool. It is ideal for making edge to edge measurements up to 100 inches (2.5m). It has been designed using high quality extruded and machined parts to provide the best accuracy and repeatability.

The measurement technology used in this model ProPanel is a ProScale® Model 580 Digital Measuring System.

ProScale digital measuring systems are affordable precision electronic devices for making linear measurements with speed and accuracy. ProScale consists of a [SCALE](#), an [ENCODER](#) (also called [READHEAD](#)) and a [DIGITAL READOUT](#) (DRO). ProPanel uses Inductive Incremental measuring technology.

ProPanel Specifications

Measuring Range:	Up to 60 Inches (1.5m), or Up to 100 Inches (2.5m)
Accuracy:	± .015in (±.4mm) uncompensated mode
Accuracy:	± .005in (±.13mm) compensated mode (HDE model)
Resolution:	.1inch .1mm .1cm or .01inch .01mm .01cm or .001inch .01mm .001cm or .0005inch .01mm .001cm or 1/16inch 1/32inch 1/64 inch
Repeatability:	.001in or .01mm or .001cm
Display Range:	± 999.999 in; ± 399 63/64 in ± 9999.99 mm; ± 999.999 cm
Operating Temp:	32 to 120°F 0 to 51°C
Temp Coefficient:	13ppm/ °F 25ppm/°C
Max. Slew Rate:	60 inches/sec. (1500mm/sec)
Power:	Two AA Alkaline Batteries
Output Format:	Mitutoyo Digimatic® SPC

ProPanel is a *one or two person* portable measuring system capable of outside or inside measurements up to 2.5m (100 inches).



Calibration

The accuracy of the ProPanel system is dependent on the manufacturing of the ProScale. There are no calibration adjustments available or necessary. The Readout has a programmable scaling factor that allows correction for slight linear inaccuracies that may be encountered.

Refer to Section 3: [LINEAR SCALING](#)

Zeroing the ProPanel is as simple as closing the two jaws and pressing the **DATUM** key. Once done, lock the display if desired. This prevents accidental re-zeroing or setting of any offsets into the Readout. For additional information, refer to Section 3: [DATUM KEY](#) and [KEY LOCK](#)

To set an arbitrary datum point, or to set in a value representing the current location of the Sliding Jaw or measuring point, use the **+**, **DATUM** and **-** keys on the keypad.

Refer to Section 3: [KEY FUNCTIONS FOR STANDARD OPERATION](#)

Outside Measuring:

Use ProPanel like a T-square. Close the jaws against the edge(s) of the article being measured, and read the result on the LCD.

Note: Whenever possible, use the full width of the jaw for measurements. This ensures the most consistent and accurate measurements.

Inside Measuring

Push the F1 key until the LCD shows a "1". This indicates the value programmed for offset addition 1 (*Programming Parameter Pr31*), will be automatically applied to any measurement.

Using the upper or lower tips of the ProPanel jaws, measure the inside dimension of interest and read the result on the LCD.

NOTE: Programming Parameter Pr30 – *Offset Addition Enable*, and Programming Parameter Pr31 – *Offset Addition 1*, have been preprogrammed for your convenience.

Programming Parameter Pr30 has been programmed to **1**

Programming Parameter Pr31 has been programmed to **24.00mm**

Maintenance

ProPanel will operate in a dry environment with non-conductive debris such as sawdust, plastic, dust, and small amounts of water splash with no adverse effects. The system should be cleaned of excess debris when necessary to prevent premature damage to the Scale or Encoder.

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

All mounting fasteners should be checked occasionally for tightness.

Occasionally check parallelism of the jaws by measuring a piece of paper between the upper tips of the jaws, then between the lower tips of the jaws. A variation of 0.05mm (0.002 inches) is within specifications.

If the jaw becomes difficult to move, and the lock/thumb screw is not tightened, verify the scale is clean. Find and remove any burrs which may have developed on the aluminum scale.

Do not use any liquid lubricants on the ProPanel.

SECTION 3

READOUT OPERATION

Fundamental Operation

All functions of the General Purpose Digital Readout are included in this section. The operations & functions that **DO NOT** apply to standard ProPanel products are shown *Grayed Out*.

KEY TIMING

The keys pictured below have multiple functions. Timing (how long a key is depressed) is important. This manual uses the term “*momentarily*” to describe a key *press and release* in less than 0.8 seconds. Whereas “*press and hold*” is used to describe a key *press and release* taking 1 second or longer.

See Table Below:



	Momentarily	Press & Hold
How long is the key pressed?	Less than .8 seconds	More than 1 second
When is key function executed?	On key release	While holding

A function is executed upon a key release for momentary key presses. A function is executed after the allotted time has elapsed for “press & hold” operations. **See Table Below:**

	Momentarily Press	Press & Hold
UNITS	Cycles measurement units: inches, fractions, mm	No effect
(in programming mode)	Increments program parameter list	Displays Pr #
Plus (+)	increments displayed value	increments faster
(in programming mode)	increments parameter value	increments faster
Datum	forces reading to programmed datum value	6 seconds: Shows battery voltage 9 seconds: Shows temperature
(in programming mode)	forces parameter to readout's default	no effect
Minus (-)	decrements displayed value	decrements faster
(in programming mode)	decrements parameter value	decrements faster

Key Functions for standard operation

ON/OFF KEY



Momentarily press

Momentarily press the **ON/OFF** key to turn the DRO off. Momentarily press it again to turn it back on. The Firmware version is displayed for two seconds after power-up.

UNITS KEY



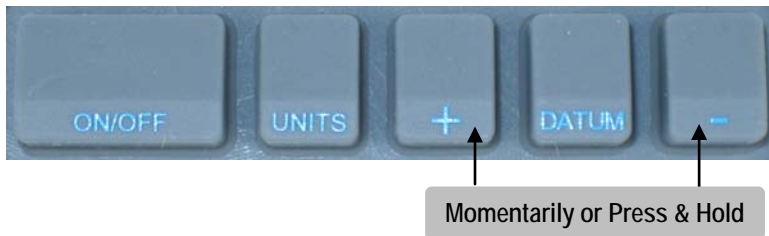
Momentarily press

Momentarily depressing the **UNITS** key will cycle the units that are displayed. With each key press, the DRO will cycle through decimal inches, fractions (16ths, 32nds, 64ths) and metric. To limit the units modes that are displayed see *Programming Parameter (Pr11)*.

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

When the measurement is greater than 99 63/64 inches, a **+100** and/or **+200** will illuminate in the upper right portion of the display to indicate this amount must be added to the displayed reading. ie: If the measurement is 154 5/8 inches, 54 5/8 and **+100** will be illuminated on the display.

PLUS (+) & MINUS (-) KEYS



Momentarily depressing the **+** or **-** key increments or decrements the current displayed value by one unit of measurement.

Pressing and holding the **+** or **-** key will cause the displayed value to change continuously. Continue pressing the key to cause the amount of change to speed up. This allows for quick adjustments over a large range of values. These keys may be locked out to prevent accidental offset changes.

See LOCK FUNCTION and Programming Parameter (Pr3).

DATUM KEY



The **DATUM** key is used to change the currently displayed value. Momentarily pressing the **DATUM** key forces the display to a user programmed value. This can be zero or any other displayable value.

See Programming Parameter (Pr1).

The **DATUM** key can be locked out to prevent accidental entries.

See LOCK FUNCTION and Programming Parameter (Pr3).

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 the format "xx.x F" or "xx.x C" where xx.x is the temperature and the units are in degrees Fahrenheit or degrees Celsius based on the current units setting (Inch or Metric). The temperature readout will continue to be displayed until the datum key is released. Temperature is sampled on startup and every 10 minutes thereafter.

Basic Functions

KEY LOCK

The Digital Readout provides a function that can be used to “lock-out” the position offset adjustment keys (+, **DATUM**, and -) to prevent accidental changes of the current displayed value. To activate the Lock function, press and hold the **ON/OFF** key and then momentarily press the **UNITS** key. The word **LOCK** will be displayed in the upper left corner of the LCD. When the **LOCK** symbol is displayed, the +, **DATUM** and - keys become inactive.

To de-activate the Lock function, press and hold the **ON/OFF** key and then momentarily press the **UNITS** key.

The Lock function can also be enabled through programming, allowing a more permanent Lock function. *See Programming Parameter (Pr3)*



DISPLAY RESOLUTION

Four display resolutions are available:

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

To change the display resolution *See Programming Parameter (Pr4)*

Inch Resolution	Maximum Value (Inches)
4 decimal places	99.9999
3 decimal places	999.999
2 decimal places	9999.99
Millimeter Resolution	Maximum Value (mm)
2 decimal places	9999.99
1 decimal place	99999.9

DISPLAYED MEASUREMENT UNITS

The measurement units displayed on the Readout when the **UNITS** key is depressed is user configurable. The table below provides a matrix for selecting which units will be displayed.

See Programming Parameter (Pr11).

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

AUTO ON/OFF

In order to prolong battery life, the Digital Readout has a built-in timer that will turn off the LCD after a period of no encoder movement or key activity. This function does NOT turn off power to the encoder; the system will not lose its position. Auto shutoff is programmable from 0 (always on), to 240 minutes. Press the **ON/OFF** key or move the scale to wake up the DRO. Any key press or encoder motion while the DRO is not in sleep mode will restart the auto shutoff timer.

The default time period before the LCD turns off is 15 minutes. This time period may be changed, or completely disabled through programming.

*See **Programming Parameter (Pr12)**.*

LINEAR SCALING

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

This function has a range of: 0.00001 to 9.99999 allowing the actual measured value to be multiplied or divided in very small or very large increments.

*See **Programming Parameter (Pr13)**.*

UPPER/LOWER LIMITS

The Digital Readout can display either **LL** for Lower Limit or **UL** for Upper Limit if a pre-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 current position 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)**.*

In addition, the programmable output can be configured to activate when either the Upper or Lower limit is exceeded.

*See **PROGRAMMABLE OUTPUT OPERATION**.*

Advanced Functions

The following additional functions & operations are available on standard ProPanel products.

See *PROGRAMMING PARAMETER (Pr23)*.



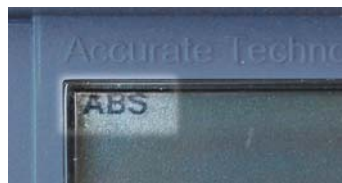
ABSOLUTE VS INCREMENTAL MEASUREMENTS.

The Digital Readout 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 an “absolute” zero point on the Digital Readout referenced from a fixed or known position. The INC measurement setting is designed to take relative or “incremental” distance measurements from one arbitrary point to another. The settings operate independently allowing separate position offsets to be programmed for ABS and INC. The Absolute position of the measuring system is not lost when using the Incremental (INC) settings, and will be recalled and displayed when the Readout is returned to Absolute (ABS) mode.

ABS

The Digital Readout automatically enters ABS (Absolute) mode when power is first applied. This is indicated by the **ABS** symbol in the upper left corner of the LCD. While in the ABS mode, all position measurements are related to the current system reference point. To enter the INC (Incremental) mode, press & hold the **ABS/INC** key for 1.2 seconds.

NOTE: To change the timing of this key to a *momentary press*, See *Programming Parameter (Pr22)*.



INC

While in the INC (Incremental mode), the **INC** symbol is shown in the upper left corner of the LCD. When the 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**) 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 Incremental starting point (plus any offset). To complete another incremental measurement from the new position, momentarily press the **ABS/INC** key. The Digital Readout will again change to 0.00 (or the previously programmed offset). To return to the ABS mode, press and hold the **ABS/INC** key for 3 seconds.

SEND

The Digital Readout has an output port that can be used to send measurement information to a compatible SPC device such as a data acquisition unit or wireless transmitter (See Section 6: *Accessories*). After connecting the SPC device to the 10 pin connector on the Digital Readout, the user may initiate the data transmission by momentarily pressing the **SEND** key. This instructs the SPC device to acquire the data from the Digital Readout. Pressing the **SEND** key will cause **Snd** to display on the LCD for 1 second to show activation of the send function (this occurs even if no SPC device is attached to the Digital Readout).

All inch modes are transmitted as decimal inches. All metric modes are transmitted as millimeters. The SPC 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 *Special Functions*). In those modes, the calculated values are transmitted.

The data format and connector style of the DRO SPC output is Mitutoyo Digimatic®. This is an industry standard that can be interfaced with most available SPC products including multiplexers & RS232 converters. If no SPC device is attached to the Digital Readout, the SEND key has no other function.

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 quickly switch from one reference point to another.

The readout built into ProPanel can support up to 4 user definable offsets that can be added to the current ABS position. **PROGRAMMING PARAMETER PR30** enables or disables this function. For example: If **PR30 = 2**, only offset 1 and 2 are available for use. **PARAMETERS PR31** through **PR 34** are the individual offset adders respectively.

When enabled, the operator scrolls through the active offsets by pressing the **F1** key. The numbers **1**, **2**, **3**, **4** will be displayed on the LCD with each press of **F1**. When no numbers are displayed, no offset addition is active. When the number **1** is displayed, Offset Addition Preset 1 (**PR31**) has been applied to the measurement and the result is now displayed on the LCD.

When the number **2** is displayed, Offset Addition Preset 2 (**PR32**) has been applied to the measurement and the result is now displayed on the LCD. When the number **3** is displayed, Offset Addition Preset 3 (**PR33**) has been applied to the measurement and the result is now displayed on the LCD. When the number **4** is displayed, Offset Addition Preset 4 (**PR34**) has been applied to the measurement and the result is now displayed on the LCD.

PROGRAMMABLE OUTPUT OPERATION

The multi-purpose connector on the General Purpose Readout provides a power input connection and, a keyboard input or solid-state output (.1A / 30 VDC) connection. The input and output functions are mutually exclusive and cannot be used at the same time.

The output signal can be configured to activate on the following conditions:

- Special Function 1: Monitor drift condition
- Special Function 2: Go/NoGo function
- Upper/Lower LIMIT error

The LCD will flash when any of the conditions above are encountered, but the output signal only changes state once and then toggles back when an intolerance condition is restored. The output can be configured for normally open (N/O, not conducting to ground) or normally closed (N/C, conducting to ground), see **PROGRAMMABLE OUTPUT POLARITY**.

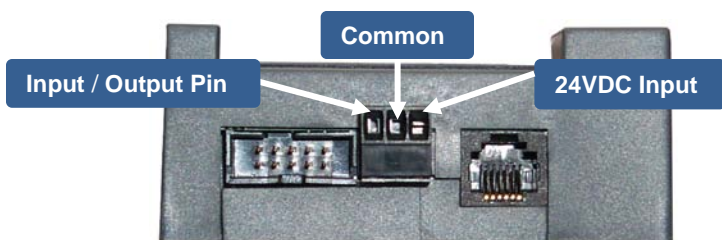
See **PROGRAMMING PARAMETER (Pr38) & Circuit Board Jumper JP5**

Caution: The output remains active during Programming. If parameters relating to the output are changed during Programming the output signal could become active! 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.

PROGRAMMABLE OUTPUT POLARITY

The polarity of the programmable output signal when not activated is user defined. The output is a transistor that conducts to Negative. The factory default is *normally open* (NO).

See **PROGRAMMING PARAMETER (Pr37)**.

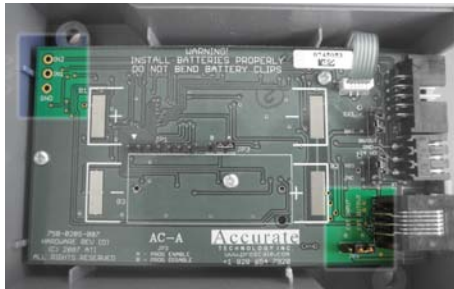


EXTERNAL KEYPAD INPUT

The multi-purpose connector on the General Purpose (GP) DRO can be configured as an input providing the ability to simulate any front panel key press with an external switch. There are three solder pads on the DRO circuit boards, labeled IN1, IN2 and GND (see below) that are used for key inputs. Any of the DRO's front panel keys may be mapped to respond to an external input. See Programming Parameters Pr35 & Pr36 along with the associated Key Function Mapping Table. 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 momentary and "press and hold" functionality.

jumper jp5 on the DRO circuit board is set to allow the input/output terminal on the GP 24 VDC power connector to be reconfigured as a direct connection to IN1. (This allows for easy external interfacing without modifying the DRO enclosure or soldering on the circuit board). Pr35 maps a key to IN1. Pr36 maps a key to IN2.

CAUTION: DO NOT APPLY VOLTAGE TO THESE INPUTS. These inputs should only be switched to circuit negative.



SPECIAL FUNCTIONS

See *PROGRAMMING PARAMETERS (Pr24, 25, 26)*

Special Function Mode allows the DRO to perform special tasks or custom programming. These tasks interact with the **F** keys to perform functions related to a specific task or programming operation.

Note: The operations configurable via the Special Function Mode are mutually exclusive of each other. The table below provides a summary of the included standard operations and each feature is further defined below.

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

Note that when *PROGRAMMING PARAMETER Pr24* is set to 0, the **F2** to **F4** keys are disabled and have no function. (**F1**, used only for Offset Addition, is controlled by *Pr30*).

SPECIAL FUNCTION 1: MONITOR, HOLD, DELETE

PROGRAMMING PARAMETER Pr24 set to 1

Monitor Mode: F3

The Readout has the ability to monitor a measurement position to detect position drift or measurement variance. To activate the Monitor Mode, position the Encoder to the desired location and momentarily press the **F3** key. The **MON** symbol will illuminate on the LCD to indicate that the Monitor mode is active.

If the Encoder moves outside the programmed tolerance (*Pr26*) 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 mode can only be activated while in the ABS measuring mode. If the **ABS/INC** key is depressed while monitoring, or the normal operational mode is left, (programming mode, sending a data transmission), the DRO will automatically exit Monitor mode.

When the monitor mode is enabled AND the programmable output is configured for drift monitoring, the hardware output will not become active until the encoder has remained out of position for at least 2 consecutive seconds.

Hold: F4

The Digital Readout provides a feature that allows the displayed position to be “frozen” in time while the Encoder is moved from its current position. This allows measurements to be captured on the Digital Readout and held for later viewing regardless of the current Encoder position. To activate the Hold Mode, 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 frozen at this point. To release the HOLD feature, momentarily press the **F4** key again, or cycle power.

NOTES: If power is cycled when Hold Mode is active, any key (such as UNITS, DATUM, + or -) that was depressed while in Hold Mode will be executed when power is restored.

Leaving the normal measurement mode causes the DRO to automatically exit Hold mode.

Delete: F2

Momentarily pressing **F2** sends a special “*delete*” signal to the SPC data port. When a ProRF Transmitter is attached to the port, a “*delete*” message will be sent to the ProRF Receiver. This “*delete*” message removes the last measurement from the cut list when connected to a TigerStop® controller.

SPECIAL FUNCTION 2: GO/NOGO

PROGRAMMING PARAMETER Pr24 set to 2

In certain applications, it may be desirable to program upper and lower measurement tolerances to gauge 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.

The General Purpose Digital Readout can store up to 16 individual measurements indexes (*SET BY PR25*), each with its own upper and lower tolerance. Each measurement is identified with an index number from 1 to 16. A special Go/No Go Editor is used to enter the individual upper and lower tolerances for each measurement index.

To enter the Go/No Go Editor press **F3**.

This will select one of the 16 measurement indexes to be programmed. Each press of **F3** will display **Go X** where **x** is a number from 1 to 16 representing the particular index to be edited. After the last number is reached (determined by the setting of Pr25), pressing the **F3** key again will display **Go OFF** indicating that the Go/No Go function is turned off. (The **F4** key works similarly but decrements through the list).

Once a measurement index is selected (enabled), the LCD will alternate between the current Encoder position and **Go** or **no Go** depending on the current position and programmed tolerances for that index.

Next, 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 index and **U** indicates the upper tolerance is to be programmed. The LCD will then display the programmed upper limit. Use the **+** and **-** keys to set a new upper limit.

Next, program the lower tolerance by momentarily pressing **F3**.

The LCD will display **GoX L** for 1 second where **X** is the measurement index and **L** indicates the lower tolerance is to be programmed. The LCD will then display the programmed lower limit. Use the **+** and **-** keys to set a new lower limit.

To exit the Go/No Go Editor momentarily press **F3**.

NOTE: To display which measurement index is currently active (while using the editor, or during normal Go/NoGo operation) press and hold the **F4** key for 3 seconds. The LCD will display **Go X** where **X** is the measurement index currently active.

SPECIAL FUNCTION 3: ACCUMULATOR

PROGRAMMING PARAMETER Pr24 set to 3

The Measurement Accumulator Special Function allows multiple measurements to be made and a summation of the measurements displayed on the Digital Readout.

To begin accumulation measurements do the following:

1. Press the **F4** key to view any previous accumulator total 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 units mode (**UNITS** key) and the Special Functions Option, *PR 25*.
 - a. If *PR 25* is set to 0, and the Digital Readout is in one of the inch modes, (decimal or fractions), the accumulated total is displayed in Decimal Inches.
 - b. If *PR 25* is set to 0, and the Digital Readout is in metric mode, (mm or cm), the accumulated total is displayed in mm.
 - c. If *PR 25* is set any non-zero value, and the Digital Readout is in one of the inch modes, (decimal or fractions), the accumulated total is displayed as feet and inches. (fff ii) where f=feet and i = inches
 - d. If *PR 25* is set any non-zero value, and the Digital 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. Start accumulating measurements. To add a measurement to the accumulator, make a measurement and then press the **F3** key. The LCD momentarily displays **Add** to indicate that the measurement has been added to the accumulated total. Additional measurements can then be taken and added to the total using the same procedure.

4. View Accumulated Total.

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 accumulation total) to return to the measuring mode.
- c. Press **SEND** to transmit the accumulated total to the SPC port.

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

SPECIAL FUNCTION 4: STATISTICS

PROGRAMMING PARAMETER Pr24 set to 4

The Readout can perform some basic statistical analysis without the use of SPC data collection on a PC or other device. The DRO's Statistics mode can provide the following functionality:

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))

To begin the Statistics mode, complete the following:

1. Clear the statistics variables by pressing the **F4** key.
If the variables are already clear, the LCD will display **CLr**.
If there is a previous sample 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 statistics variables. The LCD will display **CLr** for 1 second and then return to normal measurement mode

2. Take a measurement sample and press the **F3** key. The LCD shows **Add** momentarily to indicate that the measurement has been accumulated. At this time the measurement is also compared to the current Min and Max values to determine if it is less than the current Minimum or greater than the current Maximum. Continue to take additional measurements and press the **F3** key after each measurement.

3. When you are ready to review the statistical data, momentarily press the **F4** key. 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 Measurement** value.

Then:

- 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 the **SEND** key to transmit the Minimum Measurement to the SPC port.

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

Then:

- 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 the **SEND** key to transmit the Maximum Measurement to the SPC port.

Press the **F4** key again and the LCD will display either **AG** or **AAG** depending on the setting of the Special Function Option parameter, **PR 25**.

If **PR 25** is set to 0, the Standard Averaging method is used and the LCD shows **AG** for 1 second followed by the **Standard Average**: (Measurement Sum ÷ Count)

If **PR 25** is NOT set to 0, the LCD shows **AAG** for 1 second followed by **Trimmed Average** ((Measurement Sum - Max - Min) ÷ (Count - 2))

- a. Press the **F3** key to clear statistics variables and return to measurement mode.
 - b. Press the **F4** key to return to measurement mode without clearing the statistics variables.
 - c. Press the **SEND** key to transmit the Average Measurement to the SPC port.
4. Press the **F3** key to clear statistics variables and return to a NEW measurement sequence.
Press the **F4** key to return to measurement mode without clearing the statistics variables and continue.

NOTES on the Statistics function:

Standard averaging will be influenced by the Min and Max 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.

Only a running summation is kept in memory, not the value of each measurement sample. 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 9.223×10^{14} mm.

Compensation Functions

NOTE: The following features are available ONLY on General Purpose Digital Readouts with firmware ending in 'C' (Part # 700-1600-236). This type of readout is supplied with ProPanel-HDE models.
(The firmware version is displayed on power-up, ie P3.000C).

TEMPERATURE COMPENSATION

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

Additionally, coefficients of expansion other than aluminum may be programmed into the DRO and the resulting measurement compensated for the different expansion rates based on a temperature sensor inside the DRO. Use this feature to maintain the highest measurement accuracy possible when using the system under wide temperature variations
See Programming Parameters (Pr41 through Pr44).

To turn on Temperature Compensation:

1. Set Pr41 to 1.
2. Next, set the compensated Low and High positions using Pr42 & Pr43. This step sets the lowest and highest ABS measurement value that will be temperature compensated. Most often this will be at 0.000 and the maximum measuring range of the system. It is possible however, if the system has been placed at a non-zero starting point that the 'lowest' reading could be a value other than 0.000.
3. If necessary, enter the expansion coefficient for the material the ProScale aluminum Scale is affixed to in Pr44.
See Pr44 for details relating to the expansion coefficient setting.

Use care if changing this setting. It will affect system accuracy!

Note: Parameters Pr41, 42 & 43 have been preset at the factory for products ordered with the "Enhanced Accuracy" option.

NON-LINEAR COMPENSATION

This function is used to enhance the basic accuracy of the ProScale system by creating a table of correction values in the DRO based on known measurement points along the length of the measurement system. The compensation table can consist of up to 126 elements. This should provide adequate compensation for any length measurement system currently manufactured by Accurate Technology.

For products purchased with the “Enhanced Accuracy” option, this feature has already been enabled and set-up at the factory and it is not necessary to repeat the initial error compensation procedure unless a measuring system component has been replaced.

Before beginning an error compensation calibration, you will need to determine how many points and the interval to calibrate. The DRO has a maximum number of 126 correction points. The smaller the compensation interval (more points) the smoother the 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.

As an example: For a measuring system 100 inches long the smallest interval that can be corrected is .8 inches, ($100 \div 126$). This also means you will need sufficient standards to create a known measurement point EVERY .8 inches. A more realistic approach would be to use an interval of two or more inches and calibrate fewer points. Keep in mind whatever interval you choose, you will need a sufficient quantity of standards to replicate every point along the measuring length.

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

The following example uses 5 inch (interval) measurement standards and a ProPanel 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, i.e. 5.00”
3. Turn the Digital Readout off. Press and hold down 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.

-
4. 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 cal . This indicates the Digital Readout is in the correction table calibration mode. This alternating display will continue throughout the calibration process.
 5. Place the moving jaw of the ProPanel against the fixed jaw. Press datum to zero the Readout.
 4. 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.
 5. Open the ProPanel and place the first measurement standard (5") against the fixed jaw. 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 standard has been digitized.
 6. Open the jaws and insert another measurement standard (5"). 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" until the maximum measuring range has been achieved.
 7. After the last standard distance 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 6, the user may wish to verify the correction point that is to be programmed next. i.e. the next Co X. This can be accomplished by momentarily pressing the F3 key. The LCD will display CP X, where X is the next correction point number that will be programmed. This feature is helpful after programming many correction points since it can be easy to loose track of the number of standards programmed.

If an error is made during the calibration process where an incorrect table entry is recorded, the process above must be repeated starting at step 3.

OPERATING THE SYSTEM IN COMPENSATED MODE

After a successful correction table has been programmed, the DRO will operate normally and the measuring system will have a higher level of accuracy. If the encoder is positioned outside the calibrated range of operation, the LCD will display **No Co** alternately with the current position. This 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. Changing Pr39 to 1 will re-enable the previously stored compensation table.

Note: Re-setting the Digital Readout to factory settings does not erase the compensation table.

Changing the Battery

A low battery indicator will appear in the lower left corner of the LCD when the batteries require replacement.

Press and hold **DATUM** key for 6 seconds to display the Battery Voltage.

When battery voltage drops below 2.6 volts, the DRO will turn itself off until the batteries are replaced.

To replace the batteries:

Remove the screws in the upper right and lower left corners. Pull the cover off. Remove the old batteries. Reinstall 2 new AA Alkaline batteries, noting the proper orientation. Replace the cover and tighten the screws.

CAUTION: DO NOT BEND BATTERY CLIPS!
THESE CLIPS ARE DESIGNED TO BE LOOSE
WHEN THE CASE IS OPEN AND WILL
COMPRESS AND SECURE THE BATTERIES IN
PLACE WHEN THE CASE HALVES ARE
SCREWED TOGETHER.



Circuit Board Jumpers

JP1 **FACTORY USE ONLY**

JP2 **Encoder Technology Voltage** **Default is Position A**

JP3 **Programming Lock-out** **Default = Position A**

To disable front panel programming, install jumper on position B. This provides a method of configuring the Digital Readout with specific parameters, then preventing unauthorized or accidental configuration changes.

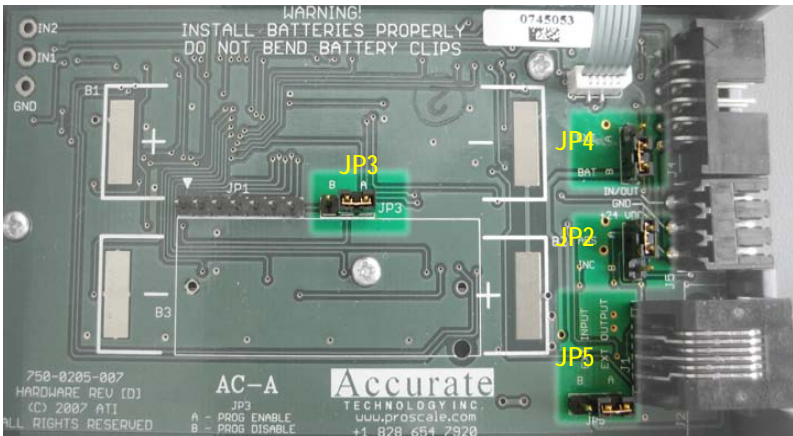
JP4 DRO Power Selection **Default = Position B**

The DRO will operate on either on internal battery power or external 24VDC. When this jumper is installed in position A, the DRO is powered by an external DC power source via the power connector. When this jumper is installed in the B position, the DRO is powered from the internal batteries.

JP5 Input/Output Selection **Default = Position A**

The DRO has a multipurpose connector used for External Power and, either an Input or Output connection. The Input & Output functions are mutually exclusive. This jumper is used to configure the connector to be used as an Input or an Output. In position A, the connector is configured for OUTPUT. In the B position, the connector is configured for INPUT and is connected directly to the IN1 solder pad on the circuit board.

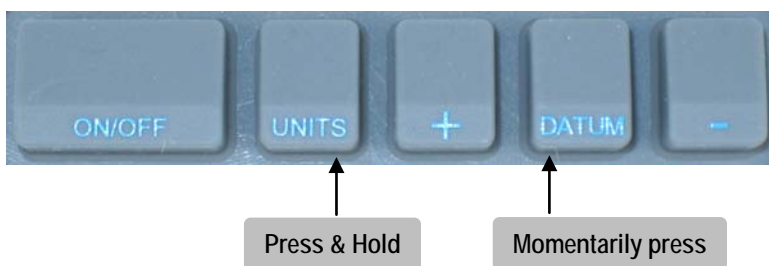
See: External keypad input & programmable output operation under advanced programming.



Several functions of the Digital Readout are user programmable. The following describes what features and functions are available and how to change the factory defaults to customize your Digital Readout.

To enter Programming Mode:

1. Press and hold the **UNITS** key then momentarily press the **DATUM** key.
2. The LCD will briefly display: **PG on** (Programming On), then **Pr 1**, (indicating Programming Parameter #1)
3. Release the **UNITS** key
4. The value stored for **Pr1** is displayed.

**Once in the Programming Mode:**

Moving up parameter list - Momentarily press the **UNITS** key to advance through the Programming Parameter list, first displaying the Programming Parameter number then the currently programmed value.

Moving down parameter list - Press and hold the **ON/OFF** key and momentarily press the **UNITS** key to move backward through the Parameter list.

Increase parameter value - Momentarily press the **PLUS (+)** key while displaying a Programming Parameter Value to increase the parameter setting.

Decrease parameter value - Momentarily press the **MINUS (-)** key while displaying a Parameter Value to decrease the parameter setting.

Reset parameter value to default setting - Momentarily press the **DATUM** key while displaying a Programming Parameter Value to reset the parameter to the factory default value.

Exit programming mode - Press and hold the **UNITS** key. Momentarily depress the **DATUM** key. The LCD will briefly display: **PG OFF** (Programming Off), then return to normal operation. **NOTE:** The system will automatically exit programming mode after 60 seconds of no key activity.

The Digital Readout Programming Parameters are listed below.
Values in [] are the range of values available for that Parameter.
Factory defaults values are shown in **Bold Red**.

Parameters that are CUSTOM SET for ProPanel operation are:

Parameter Pr14 has been programmed to **0**

Parameter Pr30 has been programmed to **1**

Parameter Pr31 has been programmed to **24.00mm**

Parameters that **DO NOT** apply to ProPanel systems are shown **Grayed Out**.

NOTE: Programming parameters are not sequentially numbered due to firmware differences between systems and provision for future enhancements / features.

Pr 1 – Datum Key [0 to ± 999.999in] or [0 to ±9999.99mm]

The programmed value that will be recalled whenever the Datum key is pressed during normal operation.

Default = 0.00

Pr 2 – Direction of Travel

[0 or 1]

This parameter controls the sign of travel (positive vs. negative) when the measuring system is moved.

FACTORY SET FOR PROPANEL TO 1

Pr 3 – Key Lockout

[0 or 1]

This parameter controls the operation of the +, - and **DATUM** keys. If enabled, (set to 1), these keys will not function and the **LOCK** symbol will appear on the display. This prevents accidental changes when depressing these keys during normal operation.

Default = 0

Pr 4 – Display Resolution

[1, 2 or 3]

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

A value of **1** will display x.x.

A value of **2** will display x.xx

A value of **3** will display x.xxx

A value of **4** will display x.xxxx

Default = 3

NOTES:

- Decimal inches have a maximum of 3 decimal places (4 places ± .0005).
- Millimeters have a maximum of 2 decimal places (even if the programming parameter is set to 3 or 4).
- This programming option has no effect when displaying fractions.

Pr 5 – Movement Required for DRO Auto-On [0.3 to 10mm]

This parameter sets the amount of jaw movement required to automatically wake up the digital readout when it is turned off.

Default = 0.1mm

Pr 11 – Displayed Measurement Units [0 to 6, 0]

This parameter controls the type of measuring units that will be displayed on the DRO.

The table below illustrates the possible combinations of measuring units that can be configured by changing the value of this programming parameter.

FACTORY SET FOR PROPANEL TO 2

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

Pr 12 – Auto-Off Time [0 to 240, 15]

This parameter allows changing of the amount of time before the display turns off to conserve battery power. The value of this parameter represents the number of minutes of idle operation (no movement or key presses) before the display turns off.

When Auto off is enabled, pressing the **ON/OFF** key or movement of the encoder will wake up the DRO.

A value of '0' disables the auto off feature (DRO is always ON).

Default= 15

Pr 13 – Linear Compensation [0.0001 to 99.9999, 1.0000]

This parameter sets a linear multiplier correction factor in the DRO that is applied to the actual measurement prior to any offsets and then the adjusted measurement is displayed on the LCD. This is useful, for instance, if you would like to display half, double, or any other value that can be achieved by multiplying the amount of actual movement by the value of the parameter setting.

FACTORY SET FOR THIS PROPANEL TO:

Pr 14 – ProScale Compatibility

[0 or 1]

This enables or disables compatibility with ProScale absolute systems. Set to 0 for all ProScale 150-10, 180, 280, 380 and 580 type systems. Set to 1 for ProScale Model ABS systems longer than 16 inches (Model 150-18 and all Model 250 systems).

FACTORY SET FOR PROPANEL TO 0

Pr 21 – Backlight Control

[0 to 10]

(Applies to custom built units only.)

Pr 22 – ABS/INC Key Operation

[0 or 1]

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

0 = Hold **ABS/INC** key for 1.2 seconds to enter INC mode.

1 = Momentary (less than 1 sec) press **ABS/INC** key to enter INC mode.

Default = 0 (1.2 seconds)

Pr 23 – Auxiliary Keypad Enable

[0 to 3, 3]

Enables or disables the operation of the **ABS/INC** and **SEND** keys on the auxiliary keypad. See a list of values below for key mapping.

0 = Disable Both Keys

1 = Enable **ABS/INC** Key only

2 = Enable **SEND** Key only

3 = Enable Both Keys

Default = 3 (Enable both keys)

Pr 24 – Special Functions.

[0 to 4, 0]

This is used to control special functions that utilize the **F2, F3 & F4** keys.

These functions are listed below.

Default = 0 (No Special Functions)

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

Pr 25 – Special Functions Option.

[0 to 16, 0]

The parameter may be used when a special function has been selected to customize the operation of the special function. See the Special Functions section for details on this parameter's use.

Default = 0

Pr 26 – Monitor Drift Tolerance. [.0004" to 120", **.01"**]

This parameter sets the amount of drift that must occur in monitor mode to trigger a drift condition indication.

Default = .01"

Pr 27 – Use Soft Limits. [**0** or **1**]

Enables or disables the use of soft limits. If enabled, a message on the LCD is displayed when the measuring system is operating outside the programmed (Pr 28 & Pr 29) position limits. 0 = off, 1 = on.

Default = 0 (off)

Pr 28 – Lower Soft Limit Position. **Range: Any displayable position.**

Defines the position to be used as the lower limit if the USE SOFT LIMITS parameter is enabled (Pr 27=1).

Default = 0.000

Pr 29 – Upper Soft Limit Position. **Range: Any displayable position**

Defines the position to be used as the upper limit if the USE SOFT LIMITS parameter is enabled (Pr 27=1).

Default = 5.000"

Pr 30 – Offset Addition Enable. [**0** to **4**, **0**]

Enables or disables offset addition function. This feature allows the user to choose from up to 4 programmed values that can be added to the current position using the **F1** key.

1 = Offset 1 enabled

2 = Offsets 1 & 2 enabled

3 = Offsets 1, 2 & 3 enabled

4 = Offsets 1, 2, 3 & 4 enabled

FACTORY SET FOR PROPANEL TO 1

Pr 31 – Offset Addition Preset 1.

Range: Any displayable position

This value is added to the current ABS position when Offset Addition is enabled (Pr 30 not set to 0) and Offset Preset 1 is selected with the F1 key. (1 segment is lit on the LCD).

FACTORY SET FOR PROPANEL TO:

Pr 32 – Offset Addition Preset 2.

Range: Any displayable position

This value is added to the current ABS position when Offset Addition is enabled (Pr 30 not set to 0) and Offset Preset 2 is selected with the F1 key. (2 segment displayed on LCD).

Default = 2" (50.8mm)

Pr 33 – Offset Addition Preset 3.

Range: Any displayable position

This value is added to the current ABS position when Offset Addition is enabled (Pr 30 not set to 0) and Offset Preset 3 is selected with the F1 key. (3 segment displayed on LCD).

Default = 3" (76.2mm)

Pr 34 – Offset Addition Preset 4.

Range: Any displayable position

This value is added to the current ABS position when Offset Addition is enabled (Pr 30 not set to 0) and Offset Preset 4 is selected with the F1 key. (4 segment displayed on LCD).

Default = 3" (76.2mm)

Pr 35 – External Keypad Input 1.

[0 to 11, 0]

Allows an external normally open switch to be connected to the DRO and emulate any key operation of the system. See: circuit board jumper jp5 also.

Default = 0 (no key map)

Pr 36 – External Keypad Input 2.

[0 to 11, 0]

Allows an external normally open switch to be connected to the DRO and emulate any key operation of the system.

Default = 0 (no key map)

Value of Pr 35 & 36	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

Pr 37 – Programmable Output Polarity.

[0 or 1]

Sets the normal state of the programmable output when **not** activated. The output is a transistor that conducts to negative.

0 = Normally open.

1 = Normally closed.

Default = 0 (NO)

Pr 38 – Programmable Output Operation.

[0, to 3, 0]

Selects the function that the programmable output activates on.

See: [CIRCUIT BOARD JUMPER JP5](#) also.

0 – No Operation.

1 = Drift Monitor

2 = Soft Limits

3 = Go/No Go

Default = 0

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

The following Programming Parameters are available only on ProPanel HDE models. (DRO has firmware ending in “C”).

Pr 39 – Non-Linear Compensation Enable. [0 or 1]

Enables or disables the Non-Linear Compensation feature of the DRO.

FACTORY SET FOR HDE MODELS TO 1

Pr 40 – Non-Linear Compensation Interval. [0.5 to 10.0,

5.0]

Sets the distance interval used while performing non-linear compensation calibration.

Default = 5” (127mm)

Pr 41 – Temperature Compensation Enable. [0 or 1]

Enables or disables the temperature compensation feature of the DRO.

FACTORY SET FOR HDE MODELS TO 1

Pr 42 – Temp. Comp. Low Position. Range: Any displayable position

This parameter indicates to the DRO the lowest (smallest) position of the encoder under normal operation based on the ABS position.

If a new datum is applied to the ABS position, this parameter must be updated for proper operation.

Default = 0.00

Pr 43 – Temp. Comp. High Position. Range: Any displayable position

This parameter indicates to the DRO the highest (largest) position of the encoder under normal operation based on the ABS position. If a new datum is applied to the ABS position, this parameter must be updated for proper operation.

FACTORY SET TO 100.000 INCHES

Pr 44 – Temperature Compensation Coefficient. [10 to 999,

222]

This parameter allows the user to modify the temperature expansion coefficient value used when temperature compensation is enabled. The value displayed is internally multiplied by 10^{-7} to yield an expansion in meters/meter $^{\circ}\text{K} \times 10^{-6}$. For example, the thermal expansion coefficient for aluminum is $22.2 \text{ m/m } ^{\circ}\text{K} \times 10^{-6}$. This would be entered into the display as 222.

Default = 222

Range: 10 to 999 will yield values: $1.0 \text{ m/m } ^{\circ}\text{K} \times 10^{-6}$ to $99.9 \text{ m/m } ^{\circ}\text{K} \times 10^{-6}$.

Note: Coefficients MUST be in m/m $^{\circ}\text{K}$, NOT in/in $^{\circ}\text{F}$.

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

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

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

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 batteries 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 batteries to clear this message.

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

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

The Digital Readout does not change, or changes very little, as the jaws are moved.

1. The Digital Readout is in the HOLD mode.
2. The Readout Scaling factor is set very low.

Data Transmission

ProPanel Digital Readouts output Mitutoyo Digimatic® SPC. This signal can be converted to RS232 using one of our data interface products, or transmitted wirelessly using one of the ProRF Wireless products.

Accessories

ProRF SPC

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



Cone set

Optional Set of two full, and one half, cones for making hole-to-hole and hole-to-edge measurements with the ProPanel



Thank you for choosing a ProScale Product,

IT WAS PROUDLY MADE IN THE USA

Accurate Technology, Inc.

270 Rutledge Rd. Unit E

Fletcher, NC 28732 USA

828-654-7920

www.proscale.com

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

P/N 800-1090-105 Rev B

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