

# Accurate

TECHNOLOGY INC.

*Linear Digital Measuring Systems*

**ProScale®**  
LED Digital Readout



## 1/8 DIN LED Panel Mount Digital Readout

### OPERATION

*Firmware V2.0 and Higher*

---

## Warranty

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

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

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

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

### Accurate Technology, Inc.

+1 828.654.7920

800.233.0580

828.654.8824 (F)

[www.proscale.com](http://www.proscale.com)

[info@accurate-technology.com](mailto:info@accurate-technology.com)

## **SAFETY WARNING**

**Before installing this product on any machinery disconnect all power and follow the INSTALLATION manual supplied.**

---

# Table of Contents

|                  |                                    |           |
|------------------|------------------------------------|-----------|
| <b>SECTION 1</b> | <b>GENERAL INFORMATION</b>         | <b>4</b>  |
|                  | Introduction.....                  | 4         |
|                  | About This Manual .....            | 4         |
|                  | Readout Features .....             | 5         |
|                  | Readout Specifications .....       | 5         |
| <b>SECTION 2</b> | <b>SET-UP</b>                      | <b>6</b>  |
|                  | Mounting the Digital Readout ..... | 6         |
|                  | Calibration .....                  | 6         |
|                  | Maintenance.....                   | 6         |
| <b>SECTION 3</b> | <b>OPERATION</b>                   | <b>7</b>  |
|                  | Keypad Functions .....             | 7         |
|                  | ABS and INC Modes.....             | 7         |
|                  | Offset Locking .....               | 8         |
|                  | Segment Adjustment.....            | 8         |
|                  | Displayed Measurement Units .....  | 8         |
|                  | Programmable Output.....           | 8         |
|                  | Electrical Connections .....       | 9         |
|                  | RS-485 Bus Commands .....          | 9         |
|                  | RS-485 Bus Commands .....          | 10        |
|                  | System Programming .....           | 11        |
|                  | Programming Parameters.....        | 13        |
| <b>SECTION 4</b> | <b>MISCELLANEOUS</b>               | <b>15</b> |
|                  | Frequently Asked Questions.....    | 15        |
|                  | Accessories.....                   | 15        |
|                  | ProRF Encoder .....                | 15        |
|                  | ProMUX.....                        | 15        |
|                  | Analog Interface Unit .....        | 15        |

## Introduction

This LED Digital Readout is one of many Digital Readouts available for use with ProScale® Measuring Systems.

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)**. ProScale Models 150 and 250 use Capacitive Absolute measuring technology.

## About This Manual

This manual includes Operating and Programming information for:

### **1/8 DIN Red LED Panel Mount Digital Readout with Firmware version 2.000 or higher**

(Firmware version is displayed on power-up, ie **P2.000**)

**This manual **DOES NOT** include installation information for any other ProScale product.**

---

## Readout Features


- Two independent absolute measurement modes (M1 and M2) with programmable incremental mode (M3). Incremental mode can be programmed as:
  - Incremental mode disabled.
  - Incremental mode with offset adjustment.
  - Third independent absolute mode.
- Programmable offsets for both M1 and M2 absolute modes and M3 incremental mode.
- Programmable to display millimeters or decimal inches.
- Offset lockout in both incremental and absolute modes.
- Offset programming disable via system programming.
- System configuration using keyboard programming.
- Programming lockout capability using jumper selection.
- Program functions stored in non-volatile memory (EEPROM).
- RS-485 communication bus allows up to 32 individual readouts to be connected on single twisted pair cable.
- Programmable scaling factor (.001 to 9.999).
- Programmable scale direction for sign correction.
- Programmable upper and lower limits with optically isolated output.
- Multi-stage transient voltage protection.

## Readout Specifications

|                               |   |
|-------------------------------|---|
| <b>Display Range:</b>         | $\pm 999.999$ in; or $\pm 9999.99$ mm   |
| <b>Resolution:</b>            | .1mm/.01in; .01mm/.001in; .01mm/.0004in |
| <b>Repeatability:</b>         | .01mm; .001in                           |
| <b>Size:</b>                  | 1/8 DIN (4" W x 2" H x 3" D)            |
| <b>Operating Power:</b>       | 9-24VDC                                 |
| <b>Operating Temperature:</b> | 32 to 120°F, 0 to 50°C                  |
| <b>Output:</b>                | RS485                                   |

## Mounting the Digital Readout

A cutout should be made in the panel that is 45mm x 90mm (3.5 x 1.75 inches). Mounting tabs supplied with the readout will hold it in place



Cut-out opening size: 45mm x 90mm

## Calibration

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

**See Programming Parameter Pr4**

If it is desirable to change the magnitude of the measurement with respect to the amount of actual Encoder or Scale movement, a Scaling Factor may be applied to the Encoder output before it is displayed on the Readout.

**See Programming Parameter Pr7**

## Maintenance

ProScale is designed to operate in a dry environment with non-conductive debris such as plastic or sawdust. The system should be cleaned of excess debris when necessary. Do not use any liquid lubricants on the scale assembly, as this may impede the encoders ability to operate properly and will attract other contaminants to the scale.

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.

## Keypad Functions

**MODE** – Activates the following functions depending on operating state:

- Selects absolute M1 or M2 modes or incremental M3 mode of operation during normal use.
- Press and hold for offset lock.
- Advances to next programming option while in programming mode.
- Acts as a “SHIFT” key to execute special operations:
  - Mode and **0** = Programming Mode entry and exit.
  - Mode and **+** = Add segment in multi-segment mode.
  - Mode and **-** = Subtract segment in multi-segment mode.

### **+** (PLUS)

- Adds to position offset value in normal use.
- Increments value of programming option while in program mode.

### **0** (ZERO)

- Sets current displayed position to zero in either ABS or INC modes if offset programming is NOT locked.
- Set Programming Parameter value to factory default when in Programming mode.

### **-** (MINUS)

- Subtracts from position-offset value in normal use.
- Decrements value of programming option while in program mode.

## ABS and INC Modes

The independent absolute measurement modes M1 and M2 are used to display a position from a fixed reference point on a machine or coordinate system. The **PLUS**, **ZERO** and **MINUS** keys can be used to apply a position offset while the offset LOCK feature is not enabled.

The INC coordinate system can be operated in one of two modes:

- Automatic offset adjustment
- Third coordinate system similar to ABS M1 and M2

In automatic offset adjustment, an offset is programmed using the Plus, Zero and Minus keys (assuming LOCK is not enabled). Each single depression of the **MODE** key causes the programmed offset to be re-displayed as the current position on the scale. Pressing the **MODE** key twice within 2 seconds will return the display back to the ABS M1 mode of operation.

---

When programmed as a third independent absolute coordinate system, the incremental mode M3 operates exactly like ABS M1 and M2 modes. This can be useful in applications where independent coordinate systems are needed.

## Offset Locking

The ABS or INC offsets can be locked or unlocked independently of each other by depressing and holding the **MODE** key. After approximately 2 seconds, the associated coordinate system LED will flash if the offset is unlocked or glow steady if the offset is locked. If offset change has been disabled in the programming mode (**Pr2**), both of the ABS modes and INC mode will always be in the locked state. Pressing the **MODE** key will have no effect.

## Segment Adjustment

If multi-segment mode has been enabled (ProScale products with measuring ranges longer than 17 inches), pressing and holding the **MODE** key along with either the **PLUS** or **MINUS** key will adjust the segment offset by +/- one segment length for each key depression. This feature is disabled if LOCK mode is on.

## Displayed Measurement Units

This function is selected via programming option **Pr0** and can be set to millimeters or decimal inches. See the **System Programming** section for additional details.

## Programmable Output

The ProScale LED readout provides an optically isolated low current output that will be activated whenever the value of absolute coordinate system M1 exceeds the user defined limits. An independent upper and lower limit exists for this functionality and can be accessed via the programming mode. This output is limited to 10 mA at 24 VDC or 25 mA at 12 VDC.

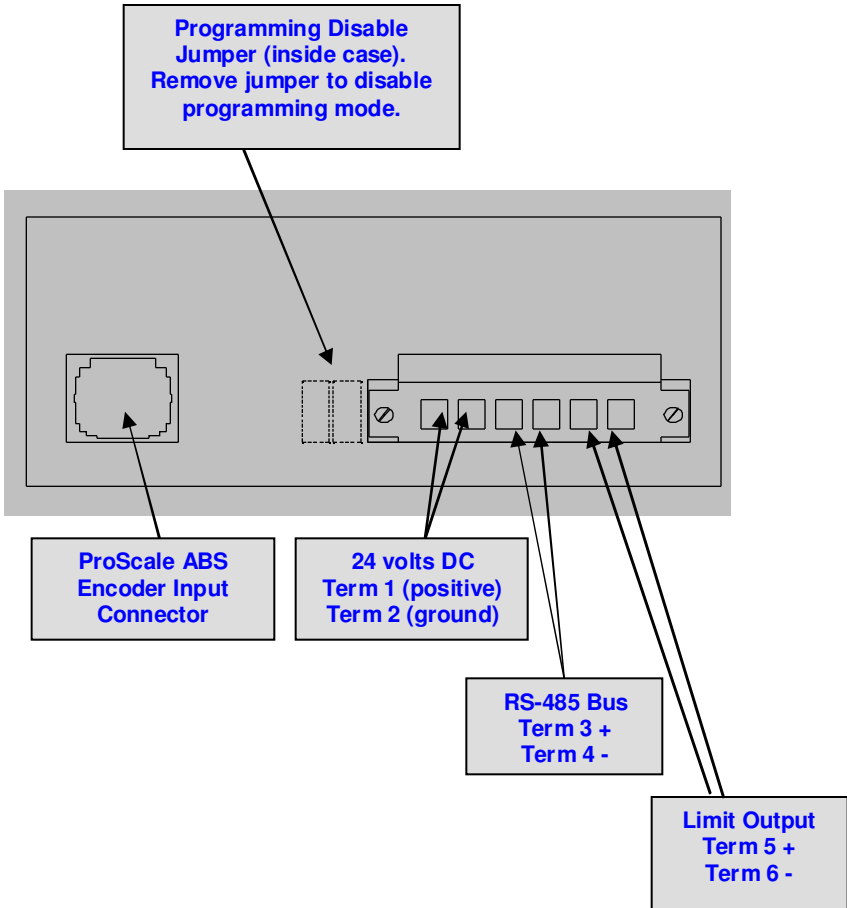
**See Programming Parameters Pr9, Pr10, Pr11, Pr14**



---

## Electrical Connections

This illustration shows all of the electrical connections to the ProScale LED readout. Power supply voltage is connected at terminals 1 (plus) and 2 (ground). RS-485 bus is connected to terminals 3 (plus) and 4 (minus). Limit output (optional) is connected to terminals 5 (positive) and 6 (negative).



---

## RS-485 Bus Commands

The ProScale LED readout can be queried for its current position and status data via the RS-485 two-wire bus. Commands are issued using ASCII data transmitted in a packet form. The position query command (from host) is shown below:

*See Programming Parameters Pr5, Pr6 and Pr12*

| <u>Byte #</u> | <u>Definition</u>                         |
|---------------|---|
| 1             | Readout Address (ASCII 1 through ASCII b) |
| 2             | Position Query Command (ASCII A)          |
| 3             | Data Bytes To Follow (ASCII 0)            |

The LED readout will respond with the following string:

| <u>Byte #</u> | <u>Definition</u>   |
|---------------|---|
| 1             | Echo of display address (ASCII 1 through ASCII b)         |
| 2             | Number of data bytes to follow (ASCII : 10 bytes)         |
| 3             | Current coordinate system (ASCII 0 = M1, 1 = M2, 2 = M3)  |
| 4             | Units mode (ASCII 0 = mm, 1 = inches, 2 = future funtion) |
| 5 – 12        | Position in ASCII data. Format = -xxx.xx or -xxx.xxx      |

The readout expects individual characters to be received no more than 100 milliseconds apart. A minimum inter-character time should be no less than 3 milliseconds. If the inter-character time exceeds 100 milliseconds, the data packet will be ignored.

The readout will begin sending the requested position data within 30 milliseconds of a valid query command.

---

## System Programming

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

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

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

Programming can be disabled by removing the PROG jumper inside the rear panel of the readout. All program parameters are maintained in non-volatile memory (EEPROM) and are preserved in the event of total power failure.

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

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

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

---

Once in programming mode, the left-most digit on the readout represents the programming parameter number (0 through 14). The number on the right represents the current value of the displayed parameter.

Pr0 0

To change the current value of the parameter, press the **PLUS** or **MINUS** key to increase or decrease the displayed value. Each parameter has a limited range that cannot be exceeded by additional key presses of the **PLUS** or **MINUS** key.

Press the **ZERO** key to revert to the factory default setting for that parameter.

To move to the next programming parameter, momentarily press the **MODE** key. Parameters are numbered 0 through 14. When the last parameter has been reached, pressing the **MODE** key again will restart the parameter list at 0.

The following pages describe each programming parameter in detail.

---

## Programming Parameters

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 **Red**.

- Pr0 – Measurement Units** [0,1]  
0 = Millimeters  
1 = Decimal Inches
- Pr1 – Factory Setting** [0,1] Set this option to “0” only  
0 = ProScale  
1 = Do Not Use
- Pr2 – Program Offset Enable** [0,1]  
Enables or Disables offset programming from the readout keypad.  
If enabled, DRO will always be in LOCK mode.  
0 = Offset Programming Disabled  
1 = Offset Programming Enabled
- Pr 3 – Multi-Segment Mode** [0,1]  
Enables multi-segment measuring mode  
0 = Multi-segment mode Disabled (Model 150-10 setting)  
1 = Multi-segment mode Enabled (Model 150-18 & all Model 250s)
- Pr4 – Encoder Direction** [0,1]  
Changes the sign operation on the readout to alter which direction measurements are increasing or decreasing.
- Pr5 – RS-485 Bus address** [0 to 32]  
This value identifies the readout when used on a multi-point bus.  
0 = Inactive
- Pr6 – RS-485 Bus baud rate** [0, 1, 2, 3]  
0 = 1200 baud  
1 = 2400 baud  
2 = 9600 baud  
3 = 19200 baud

- 
- Pr7 – Scale Factor** [0.0001 to 99.9999]  
Applies a scaling factor to the value read by the ProScale linear encoder prior to display. **Default = 1.0000**
- Pr8 – M3 Operation.** [0 or 1]  
Configures the operation of the third coordinate system (M3).  
0 = Auto offset mode  
1 = M3 mode operates similar to ABS modes M1 and M2 and can be used as a third absolute coordinate system.
- Pr9 – Programmable Lower Limit.** [ $\pm$  9999.99mm;  $\pm$  999.999in]  
References the M1 absolute coordinate system and activates the hardware output if the value of M1 decreases below this value.  
**Default = 0.000mm**
- Pr10 – Programmable Upper Limit** [ $\pm$  9999.99mm;  $\pm$  999.999in]  
References the M1 absolute coordinate system and activates the hardware output if the value of M1 increases above this value.  
**Default = 127.00mm** (5 inches)
- Pr11 – State of the Limit Output signal** [0 or 1]  
When M1 position is within the limits set in Pr9 and Pr10:  
0 = The output terminals are closed  
1 = The output terminals are open
- Pr12 – Streaming data output** [0 or 1]  
0 = a request must be issued from a host to receive position data.  
1 = position data is streamed out the bus port at the encoder sampling rate.
- Pr13 – Readout Resolution** [0, 1, or 2]  
Sets the displayed resolution.  
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
- Pr14 – Limit Output signal Enable/Disable** [0, 1]  
0 = Disabled  
1 = Enabled

### Frequently Asked Questions

#### What does “Err 2” mean?

If the Encoder is off the Scale, or the Encoder cable is unplugged from the Readout, an “Err 2” will appear on the Display. To clear error:

1. Be sure the Encoder is on the Scale and properly oriented.
2. Unplug the connector from the Readout for one second.  
Reconnect the Encoder cable to the Readout.

#### Can I mount the scale/encoder without the connector link/guide clip?

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

#### The Readout displays numbers but they seem to be random.

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

### Accessories

#### ProRF Encoder

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



#### ProMUX

ProMUX-3 is an easy to use hardware interface that provides communication from Model 150 & 250 encoders (or SPC equipped readouts) to a user's PC or PLC. ProMUX-3 supports three inputs, and one RS232 output.



#### Analog Interface Unit

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



---

**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](http://www.proscale.com)

*Please register your system at:  
[www.proscale.com/registration.htm](http://www.proscale.com/registration.htm)*

**P/N 800-1095-001, Revision M, Copyright © 2008,  
Accurate Technology, Inc. All rights reserved.**