ProScale™

SAFETY WARNING

To avoid injury: Before installing ProScale on a machine, turn off the machine and disconnect it from its power source.

Warranty

Accurate Technology, Inc., warrants this product against defective parts and workmanship for two years, commencing from the date of original purchase. Upon notification of a defect, Accurate Technology, Inc., shall have the option to repair or replace any defective part. Such services shall be the customer's sole and exclusive remedy. Expenses incidental to repair, maintenance, or replacement under warranty, including those for labor and material, shall be borne by Accurate Technology, Inc. Freight or transportation charges to Accurate Technology, Inc., shall be paid by the customer.

Except as expressly provided in this warranty, Accurate Technology, Inc., does not make any warranties in 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.

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SECTION 1

General Information

Introduction

ProScale™ is a high-precision electronic device for making linear measurements with speed and accuracy. Consisting of a scale mechanism and a display unit, ProScale can easily be mounted on shop equipment such as vertical-panel saws, planers, tenoners, and sanders. ProScale can also be mounted on CNC (computer numerically controlled) machines to automate high-precision measurements.

ProScale is compatible with most machines that are used to dimension wood, metal, plastic or composite materials. For example, you can measure lengths and widths for a vertical-panel saw, set cutting depth for a router, or set the position of a traverse rod on a tenoner. Besides measuring linear distances, ProScale is ideal for setting the positions of fences, stops, and cutters.

Because ProScale reveals the exact measurement on its display, it eliminates the guesswork involved in reading and interpreting manual scales. It also speeds up measurements. As a result, machine-setup time can be reduced considerably, maximizing throughput on a machine.

You can change ProScale's measurement mode at the touch of a button. If you are accustomed to measuring in inches, you can set ProScale to measure in sixteenths, thirty-seconds, sixty-fourths, or even in hundredths of an inch. If you work with metric measurements, press a button to measure in millimeters. In any mode, ProScale is designed to provide and maintain extreme accuracy.

ProScale is extremely rugged and durable. Because ProScale is a solid-state electronic device, it contains very few moving parts, meaning there's very little to wear out; the read head and scale are designed to withstand shop dirt, dust, and other airborne contaminants; and the controls are sealed with a protective cover for long life. With normal care, your ProScale should last for years.

Specifications

Electrical

Accuracy

Model 100-10:	± .002"
Model 100-18:	± .003"
Model 200's:	± .002" per foot to ± .008" maximum for 4 to 18 feet

Measuring Range

Model 100-10:	0" to 10" (0mm to 250mm)
Model 100-18:	0" to 18" (0mm to 457mm)
Model 200-4:	0" to 52" (0m to 1.2m)
Model 200-8:	0" to 96" (0m to 2.4m)
Model 200-10:	0" to 116" (0m to 2.9m)
Model 200-12:	0" to 144" (0m to 3.6m)
Model 200-15:	0" to 180" (0m to 4.5m)
Model 200-18:	0" to 212" (0m to 5.3m)

Repeatability:	to .001" or 0.01mm
Zero Set:	Number can be set from 0 to ± 99" or 0 to ± 2500mm
Display Range:	0 to ± 394.000" or 0 to ± 9999.00mm
Battery:	Two type AA alkaline
Battery Life:	One year with normal use (when turned off at night)

Environmental

Operating Temperature:	32 to 120°F

Physical

Interface:	ProScale's electrical interface allows the scale to be connected to a computer or controller. For interface information, refer to the electrical diagrams at the end of the manual.
Cable:	Six-conductor, terminated by RJ12 modular connector. To increase cable length, contact Accurate Technology, Inc. for parts, or purchase cable, connectors and crimping tool at Radio Shack® or equivalent retail stores. Be sure to match the color coding of the cable being modified.
Dimensions:	See Appendix A for detailed dimensional drawings.

SECTION 2

Installation

SAFETY WARNING

To avoid injury: Before installing ProScale on a machine, turn off the machine and disconnect it from its power source.

Introduction

ProScale is easy to install. By following the basics of good installation in this section, you are assured of reliable, error-free operation without any need for adjustments or modifications.

Because ProScale is installed on many types and brands of equipment, all installations are a little different. Therefore, it's the responsibility of the installer to choose bolts, screws, or other mounting hardware that guarantees proper installation, and to install ProScale for optimum operation.

> *Note:* If you ordered a kit that contains instructions for installing ProScale on a specific product, follow those instructions rather than the instructions here.

Mounting the Model 100-10" and Model 100-18"

1. Determine appropriate mounting locations. Place the read head in a location that will allow the scale to be inserted in the read head and attached via the flex link to the moving part of the target machine. Place the display housing in a location where the display will be easy to read. The locations you choose should also safeguard the cable from damage. See Figure 2-1.

<table>
<tr><td>

CAUTION

For best rejection of electrical interference, be sure that the scale is electrically in-sulated from the target machine at all times.
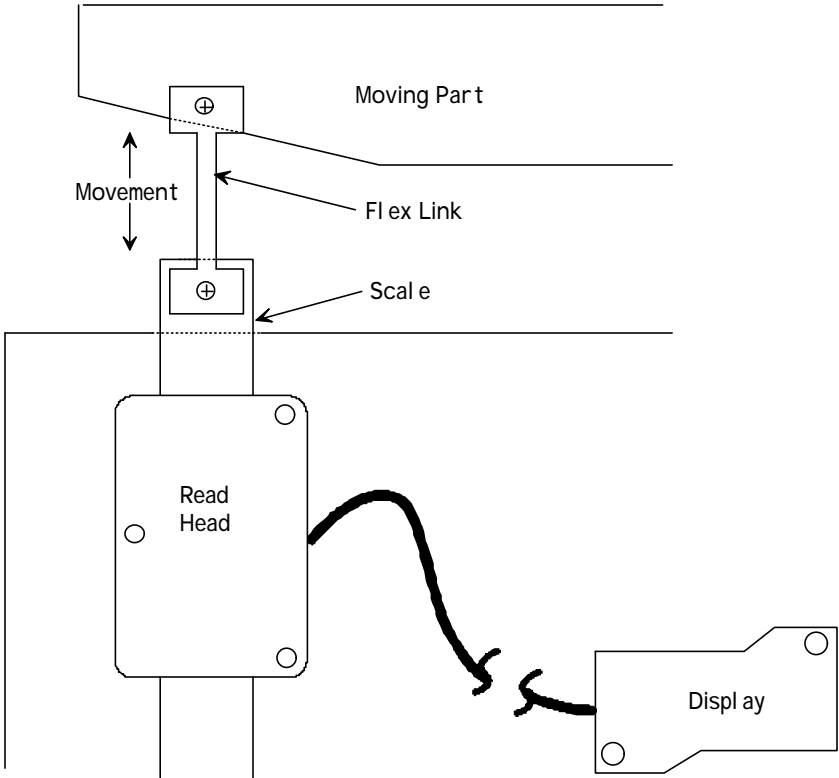
</td></tr>
</table>

Moving Part

Movement

Flex Link

Scale

Read Head

Display

Figure 2-1. A Typical Installation

2. Mount the read head by using three screws or bolts to fasten it to the target machine. Notice that the base of the mounting holes extends slightly below the rest of the base of the read head. This feature enables you to make a secure installation on an uneven surface. If the surface is excessively uneven, you may need to use washers or spacers to ensure a good mount.

    Note: Be sure to note the orientation of the read head. See Figure 2-2. When the side with two screw holes is on the right, moving the scale up produces positive readings and moving the scale down produces negative readings.
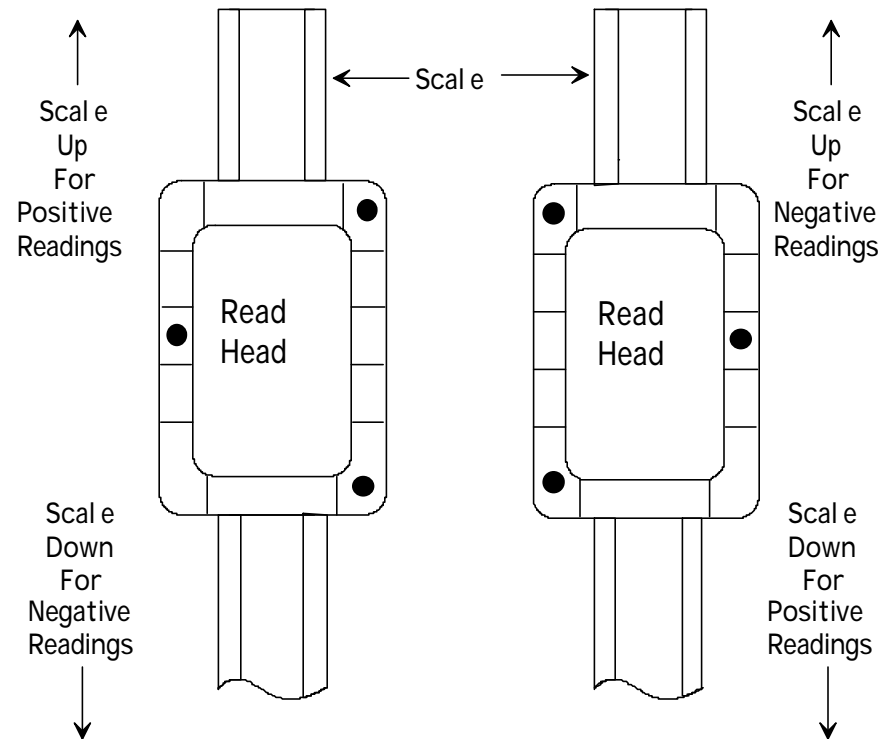
Figure 2-2. Proper Orientation of the Read Head

3. Check that the scale axis is precisely aligned with the direction of motion of the moving part. The flex link will compensate for only a small amount of misalignment.

<div style="border: 2px solid black; padding: 10px;">

CAUTION

Notice that both ends of the scale are chamfered. If your application requires a scale of a different length, you can cut the scale; however, be sure to chamfer the new end of the scale as described in "Shortening the Scale" on page 11.

</div>

4. Mount the flex link to the scale and to the moving part of the target machine. Be sure both connections are secure; otherwise, inaccurate scale readings can occur.

5. Remove the two screws on the front of the display housing and set them aside. Pull the cover from the base.

6. Looking at the inside of the base, notice that the four mounting holes near the corners have been drilled, but not completely through. See Figure 2-3. Using an awl or similar tool, punch out only the holes you need. This feature ensures that your unit will remain sealed from contaminants if you decide to mount it with fewer than four fasteners.

7. Mount the base securely.

8. Reattach the cover to the base.

Partially Drilled
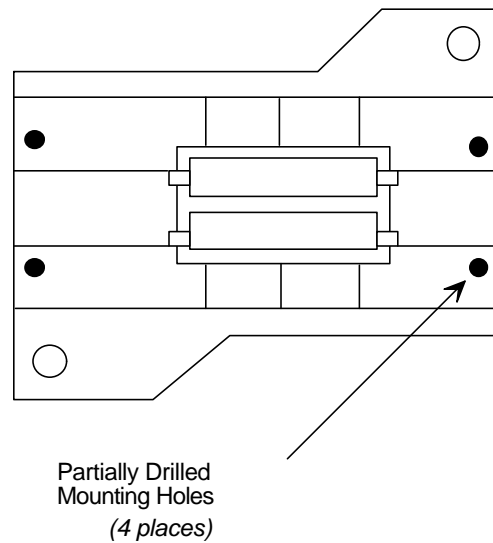Mounting Holes
(4 places)

Figure 2-3. View of the Display Base

9. Place the cable in a secure position. If necessary, fasten it with a tie wire or other fastening device. Never leave the cable where it could be damaged.

> **CAUTION**
>
> Do not route the cable close to control wires or motor feed lines. If this is unavoidable, order shielded cable from Accurate Technology, Inc.

Mounting the Model 200's

The Model 200's are designed so that the scale can be mounted solidly on a machine or machine table and the read head can be attached to a moving part

such as a fence or stop. A guide clip connects the read head to the moving part so that the two move together. Figure 2-4 shows a typical installation.
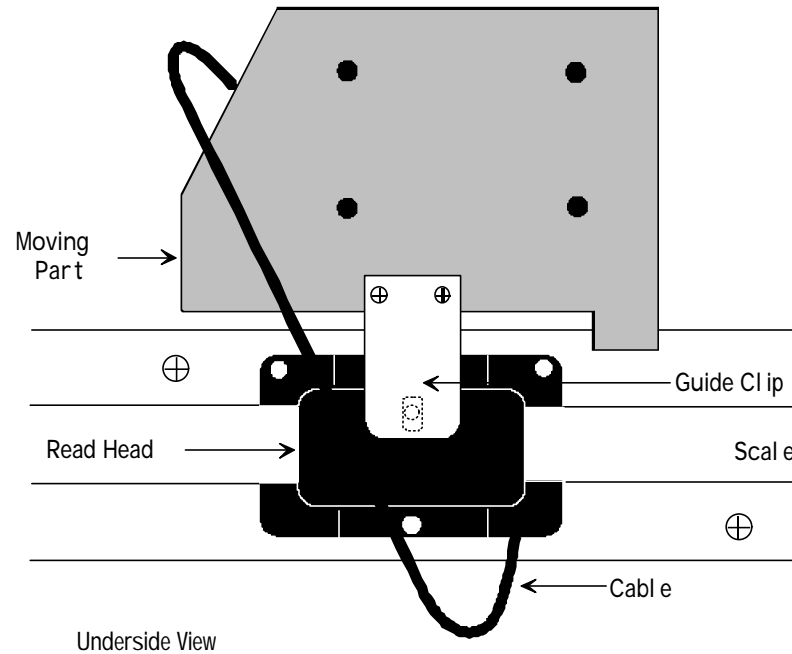

Figure 2-4. Typical Installation of the Model 200-4

The guide clip serves two purposes: 1) it provides an accurate method of transferring the movement of the moving part to the read head, and 2) it secures the moving part to the read head while providing a flexible means of separating the two units. Notice that the guide clip contains a slot and that the read head contains a spherical post; these parts must be connected when you operate the scale.

Referring to Figure 2-5, note these two installation requirements: 1) for accurate measurements, the guide clip should be mounted perpendicular to the direction of travel of the read head; 2) over its full range of travel, the guide clip should exert some pressure on the read head so that the two move as a single unit.
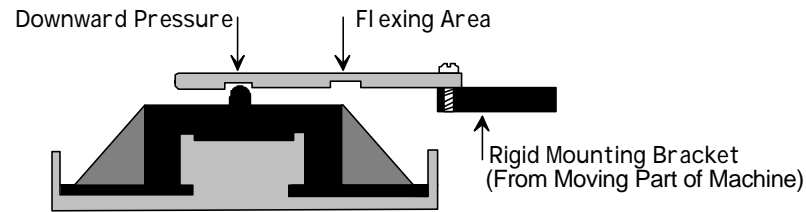
Figure 2-5. Proper Installation of the Guide Clip

Note: Mounting ProScale without using the guide clip voids ProScale's two-year warranty.

The scale is countersunk for easy installation with #6 screws. If possible, mount the scale so that the read head faces down. Doing so will minimize interference by dust or other contaminants.

Because ProScale Model 200's can be mounted on a variety of machines, you should adapt the following installation instructions to your particular application.

1. Determine appropriate mounting locations. The location of the scale should ensure proper mounting and movement of the read head and guide clip, as discussed above. Locate the display housing where it will be easy to read. The locations you choose should also safeguard the cable from damage.

    Note: Notice that both ends of the scale are chamfered. If your application requires a scale of a different length, you can cut the scale; however, be sure to chamfer the new end of the scale as described in "Shortening the Scale" on page 11.

2. Mount the scale, using the #6 self-tapping, flathead screws provided, or appropriate sheet metal or wood screws. Be sure the screw heads do not protrude above the surface of the extrusion. If they do, they will interfere with the read head.

CAUTION

If you use any other method of mounting
the scale, observe these two precautions:
1) Do not drill through the green portion of
the scale at any point over which the read
head will travel. 2) Do not mount the scale
so that mounting hardware interferes with
the movement of the read head.

---

3. Remove the two screws on the front of the display housing and set
   them aside. Pull the housing from the base.

4. Looking at the inside of the base, notice that the four mounting holes
   near the corners have been drilled, but not completely through. See
   Figure 2-3. Using an awl or similar tool, punch out only the holes you
   need. This feature ensures that your unit will remain sealed from
   contaminants if you decide to mount it with fewer than four fasteners.

5. Mount the base securely.

6. Reattach the cover to the base.

7. Using the guidelines in the beginning of this section, select a
   mounting location for the guide clip. Use a marker or center punch to
   mark locations for screw holes, and drill the holes. Mount the guide
   clip to the moving part on the target machine.

8. Refer to Figure 2-2 to determine which orientation to use when
   installing the read head for your application. Then slide the read head
   onto the scale. Continue sliding the read head until it meets and
   engages with the guide clip. Check that the guide clip exerts sufficient
   pressure on the read head, as described at the beginning of this
   section.

---

9. Place the cable in a secure position. If necessary, fasten it with a tie wire or other fastening device. Never leave the cable where it could be damaged.

    Note: If your application requires over 10' of cable, you may need to use shielded cable. Contact ATI for more information.

Shortening the Scale

If you need to shorten the scale for your application, be sure to observe these precautions. The scale is embedded with stainless-steel wires that could be damaged if you are not careful.

1. Use a grinder (such as a Moto Tool®) to grind through the wires embedded in the sides of the scale.

2. Finish the cut by using a hacksaw to cut through the aluminum housing the scale.

3. See Figure 2-6. Use a file or grinding tool to chamfer the cut end to the specifications shown in the illustration.
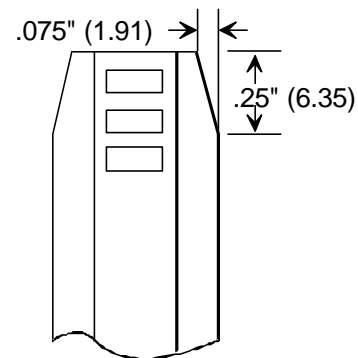
.075" (1.91)   .25" (6.35)

Figure 2-6. Proper Chamfering of Scale Ends

Changing the Batteries

To change the batteries, remove the two screws that hold the cover to the base of the display housing. Carefully pull off the cover. Remove the batteries. Reinstall new ones, noting the proper orientation shown in the battery compartment. Replace the cover and tighten the screws.

Ordering Replacement Parts

To order replacement parts, refer to Table 2-1.

Table 2-1.
Replacement Parts

Part	Part Number
Cover screws	180-1023-001
Scale mounting screws	180-1024-001
AA alkaline cell	550-1026-001
Scale with 10" range	700-3001-001
Scale with 18" range	700-3001-018
Scale with 52" range	700-3002-001
Scale with 96" range	700-3003-001
Scale with 116" range	700-3004-001
Scale with 144" range	700-3013-001
Scale with 180" range	700-3015-001
Scale with 212" range	700-3016-001
Flex link (Model 100)	100-1025-001
Guide clip (Model 200)	100-1026-001
10' extension cable	700-2000-001
Shielded cable	700-1001-001
Instruction manual	800-1000-001
Display monitor	701-2000-002
Battery clips	100-1007-001
Read head	
Model 100	701-2001-001
Model 200	701-2002-001

SECTION 3

Operation

Introduction

ProScale is both versatile and easy to operate. It offers five measurement modes, zero setting, reverse scaling, an auto-save feature, and a keyboard locking feature. Let's look at these features one by one.
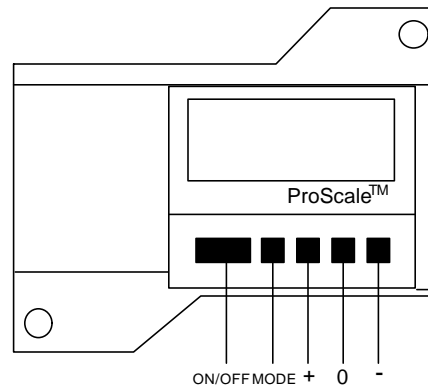

Figure 3-1. ProScale Keyboard Layout

Modes of Operation

ProScale offers five measurement modes:

16:	Measurements are displayed in sixteenths of an inch, and bars are used to indicate increments above the indicated value. Each bar represents one sixty-fourth of an inch.
32:	Measurements are displayed in thirty-seconds of an inch, and bars are used to indicate increments above the indicated value. Each bar represents one sixty-fourth of an inch.

64: Measurements are displayed in sixty-fourths of an inch.

Decimal Inch: Measurements are displayed in inches to the closest one-thousandth inch.

Millimeter: Measurements are displayed in millimeters to the closest one-hundredth millimeter.

To change modes, press the MODE button. Modes appear in the order shown above, and the current mode is saved when you turn ProScale off.

Setting the Display Options

When shipped, ProScale is set to allow the maximum number of display options at power-up. For example, users can select any of the five measurement modes shown above, and the unit is set to its normal resolution. If you prefer to limit the available options or change the resolution, you can do so by changing the positions of internal jumpers. Table 3-1 shows the options.

Table 3-1. Display Options

Jumper	Position	Function	Notes
JP1	A	Increased resolution	Display format: XX.XXXX", 99" limit XXXX.XX (mm)
JP1	B	Normal resolution	Display format: XXX.XXX", 394" limit XXXX.XX (mm)
JP2	A	All modes available	
JP2	B	Only metric mode available	
JP3	A	Normal display	
	B	Selects centimeter display	Display format: XXX.XXX cm mm indicator is blanked
JP4	A	All modes available	
JP4	B	Only mm and inch modes available	No fractions
JP5	A	Normal display	
JP5	B	Reduced resolution	Display format: XXX.XX" XXXX.X mm

To access the jumpers, remove the two screws that hold the display cover to the display base. Pull off the cover and turn it over. The jumpers are labeled as shown in Figure 3-2. To change a jumper, first note the jumper positions shown in the figure. Now lift the jumper off the posts and reposition it. Reattach the display cover.
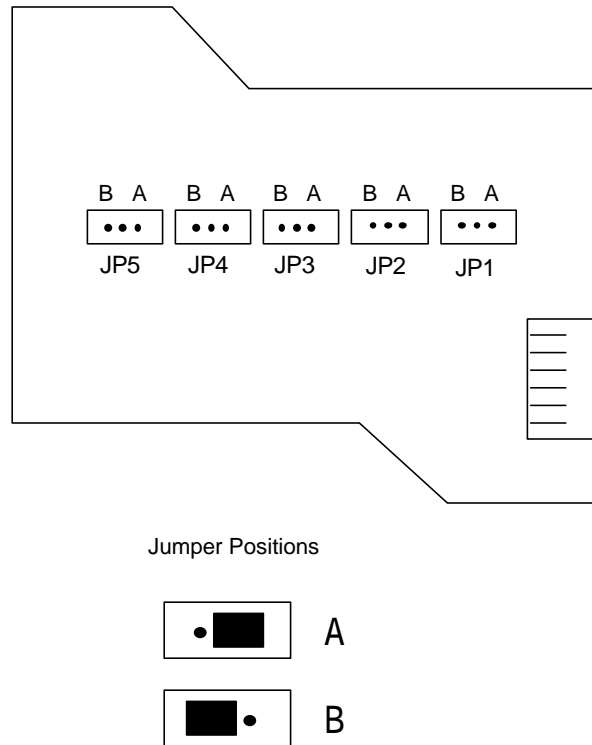

Jumper Positions

Figure 3-2. Jumper Positions for Display Options

Zero Setting

ProScale can make both absolute and relative readings. For example, if you measure the thickness of a board, you make an absolute reading. But if you want to measure how much thicker or thinner board 2 is than board 1, you make a relative reading.

Zero setting on ProScale allows you to make relative readings with ease. First determine your zero point. In the case above, the zero point is the thickness of board 1. Measure board 1 with ProScale, press the zero button, remove board 1, and insert board 2. ProScale shows the difference between the two boards. A positive reading means that board 2 is thicker than board 1 by the indicated amount; a negative reading means that it is thinner.

ProScale retains its display readings even when it is turned off. Therefore, it isn't necessary to zero the display when you turn on the ProScale.

Zero setting is required when:

- The display batteries have been removed.
- You have pressed PLUS, MINUS, or ZERO either accidentally or while making relative readings.
- If you are changing the installation of equipment.
- You think that a reading may be wrong.
- The read head is unplugged from the display housing.

Reverse Scaling

If you set a zero point on ProScale, moving the scale in one direction will produce positive readings. Moving the scale past zero in the opposite direction will produce negative readings. Reverse scaling means changing the orientation of the read head so that positive readings become negative and negative readings become positive.

To reverse the readings, slide the read head off the scale and mount the read head in the opposite direction. *Note:* You must reverse the head, not the scale.

Auto Save

ProScale "remembers" all current settings, even when it is turned off. Not only does it remember the current measurement, but also the current mode. The Auto Save feature makes your job much easier. When you turn ProScale back on, you can continue where you left off. It's not necessary to zero the reading or change the mode.

Also, don't be concerned if you press a button when ProScale is turned off. Although ProScale remembers all settings, the keyboard is nonfunctional when the unit is off.

Incrementing or Decrementing the Display

Sometimes you will need to use ProScale's PLUS or MINUS button to adjust a reading. Here's one example. If ProScale is attached to a surface planer, the planer can't physically move to a 0" thickness. To get an accurate reading, set ProScale to an arbitrary thickness. Plane the board and measure the thickness with a caliper or other ProScale device. Then use the PLUS or MINUS buttons to set the value you measure into the display.

> *Note:* When you press the PLUS or MINUS button, the display scrolls slowly for a couple seconds and then fast.

Locking the Keyboard

If you want to leave ProScale on while you are away from the area, you can lock the keyboard so that the current settings can't be accidentally changed. To lock the keyboard:

1. Press and hold the ON/OFF key and quickly press the MODE key. If you don't press the MODE key soon enough, you will turn ProScale off. When the "mm" or "in" indicator flashes, the keyboard is locked.

2. Release the MODE key and then the ON/OFF key.

Use the same procedure when you want to unlock the keyboard.

Operating Procedure

Because ProScale has so many applications, it's impossible to include instructions for each in this manual. However, as the following procedure indicates, ProScale simplifies your measurements in just about any application.

Here is a basic procedure for using ProScale on a planer. For other types of equipment, vary the procedure as needed.

1. Calibrate the display as described in "Incrementing or Decrementing the Display" on page 17.

2. Press ZERO to identify the height of the machine table as zero.

3. Adjust the machine table until ProScale displays the desired thickness. Now you are ready to plane the wood.

Accounting for Kerf

When a measurement must account for kerf, ProScale makes it easy for you to make the measurement without having to perform any calculations. For example, in Figure 3-3 a panel saw has been used to true the top of a panel. If you now want to saw the panel to its finished length, follow this procedure:

Step 1. Truing Cut
1. Make the truing cut.
2. Zero ProScale.

Step 2. Accounting for Kerf
1. Move the blade down the thickness of the kerf by reading ProScale.
2. Zero ProScale.

Step 3. Cutting the Panel
1. Move the saw down until ProScale reads the desired panel length.
2. Make the cut.

For other instruments in which kerf must be considered, vary this procedure accordingly.
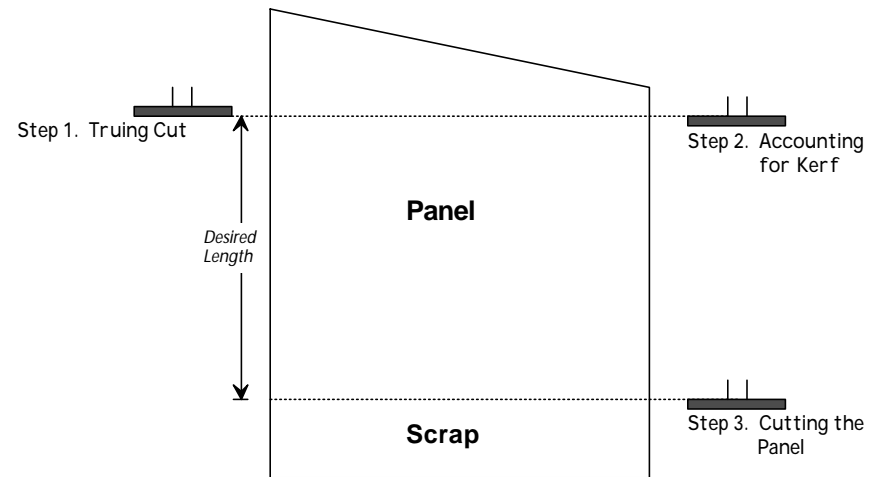
Figure 3-3. How to Account for Kerf in Your Measurement

Maintenance

To ensure the best performance from ProScale, remove dust from the unit occasionally.

> **CAUTION**
>
> If you use compressed air to clean the unit, make sure the air lines are clear of water. ProScale can be damaged if water gets inside.

Error Codes

ProScale warns you if an error occurs by displaying "Err" plus an error number on the display. If an error occurs, refer to the table below. If the remedy shown in the table does not solve the problem, unplug the connector from the display and reinstall it. If the error message still appears, detach the display cover from the housing (see Section 2) and replace it. Be sure to zero the unit or set it to the previous reading.

Table 3-2. Error Codes

Error		Cause		Remedy
1, 2 or 3	(a)	Read head off of scale.	(a)	Be certain read head is on scale.
	(b)	Read head not connected to display.	(b)	Check connection and cable for damage, and repair. (Be sure display mounting screws are not shorting modular connector.)
	(c)	Read head is reset due to reading error (from fast movement, electrical noise, static discharge or other cause).	(c)	Remove connector from display momentarily, then replace.
	(d)	Faulty or shorted connection from read head to display.	(d)	If (c) does not correct problem, disconnect batteries in display, then reconnect and repeat.
4, 6 or 7	(a)	Attempting to display measurements over 99 inches in fractions. Can occur from combination of reading and offset.	(a)	Place read head near desired zero position, remove connector from display momentarily, then replace. Set desired offset or zero on display.
	(b)	Read head offset far from desired zero.	(b)	See (a).
5 or 8	(a)	Display monitor does not find proper digits although data stream is OK.	(a)	Check connections and cable for damage, and repair.

Communicating With Other Equipment

ProScale's electrical interface allows the read head position to be read by a computer or other instrument. Refer to the electrical diagrams in Figures 3-4 through 3-9.
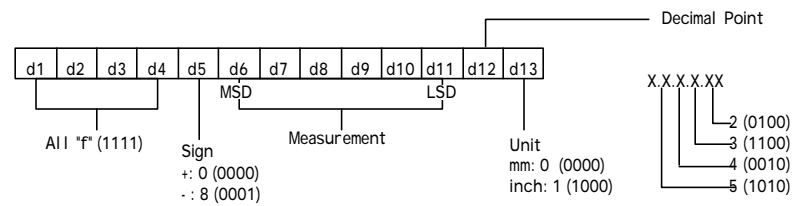
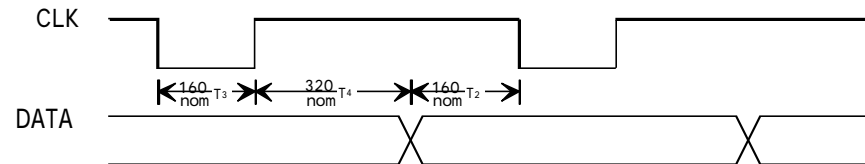## Read Head Output

Figure 3-4. Data Format
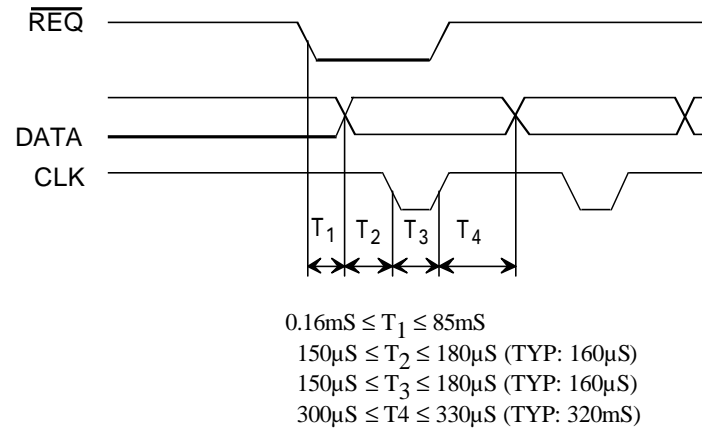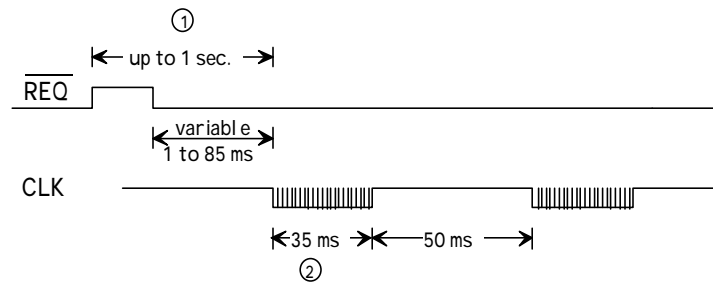

Figure 3-5. Timing of CLK and DATA

$0.16\text{mS} \leq T_1 \leq 85\text{mS}$
$150\mu\text{S} \leq T_2 \leq 180\mu\text{S} \ (\text{TYP: } 160\mu\text{S})$
$150\mu\text{S} \leq T_3 \leq 180\mu\text{S} \ (\text{TYP: } 160\mu\text{S})$
$300\mu\text{S} \leq T4 \leq 330\mu\text{S} \ (\text{TYP: } 320\text{mS})$

Figure 3-6. Timing Chart

① May be some recovery time after REQ goes high of about 1 second before clocks and data are output when REQ goes low.

② Contains 52 clock pulses for 13 4-bit words.

Figure 3-7. Request Line Timing
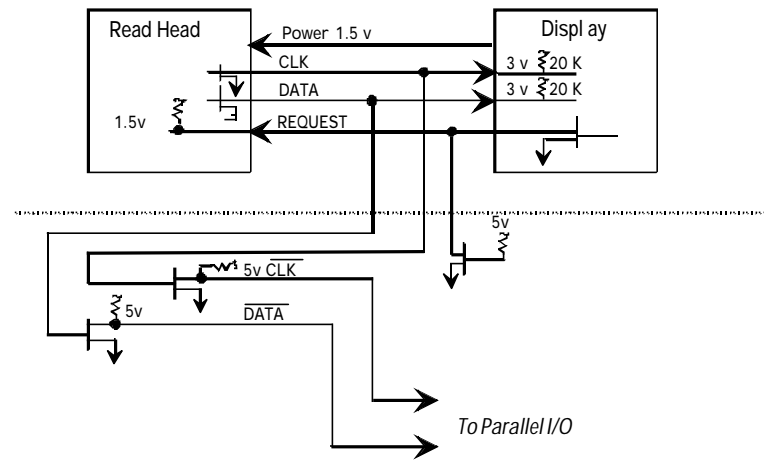
Figure 3-8. Typical computer interface. Computer must monitor CLK and DATA lines.
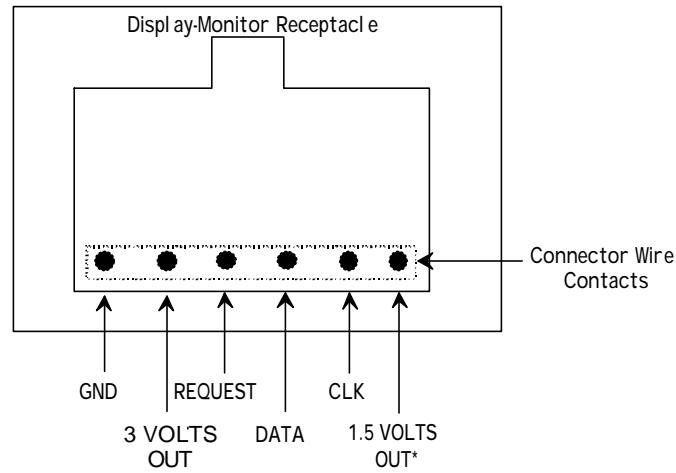
*For connection to Digimatic products,
do not use 1.5-vol t connection.

Figure 3-9. Connector Pinout Diagram

SECTION 4

Appendix A

Installation Notes

.30" (7.6)

L

.075" (1.91)

.25" (6.35)

.75" (19.05)

.25" (6.35)

Tapped for
10-32

MEASURING RANGE (MR)	L
10" (250)	14.25" (362)
18" (450)	22.25" (565)

Figure A-1. Model 100

Countersink Min.
depth of #6 screw

.357" (9.07)

2.02"
(51.3)

.142" Dia.
(3.6)

.125" (3.18)

MEASURING RANGE (MR)	L
52" (1.32)	56" (1.42)
96" (2.44)	100" (2.54)
116" (2.95)	120" (3.05)
144" (3.66)	148" (3.76)
180" (4.57)	184" (4.67)
212" (5.38)	216" (5.49)

.270 (6.86)
Min

.02" to .025"
(.50 to .64)

Enlarged
View
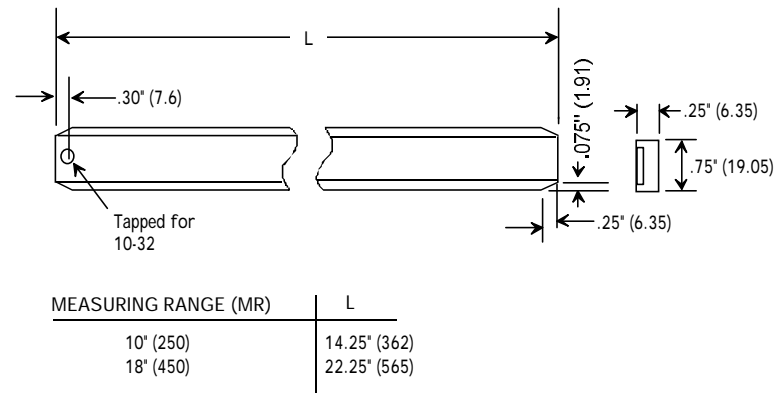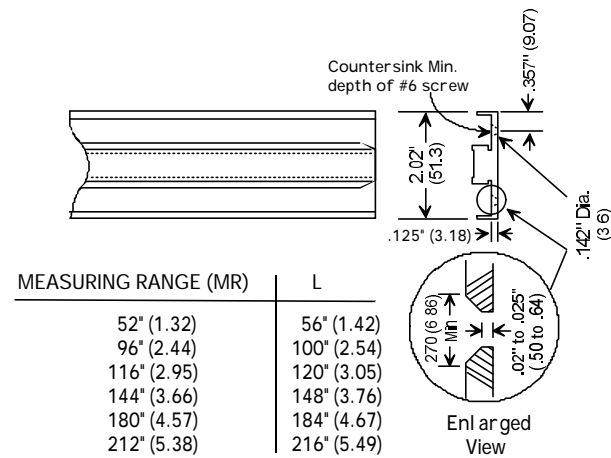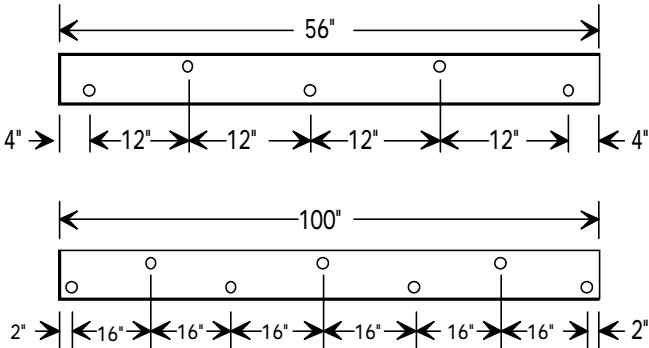
Figure A-2. Model 200

Figure A-3. Model 200 Hole Pattern
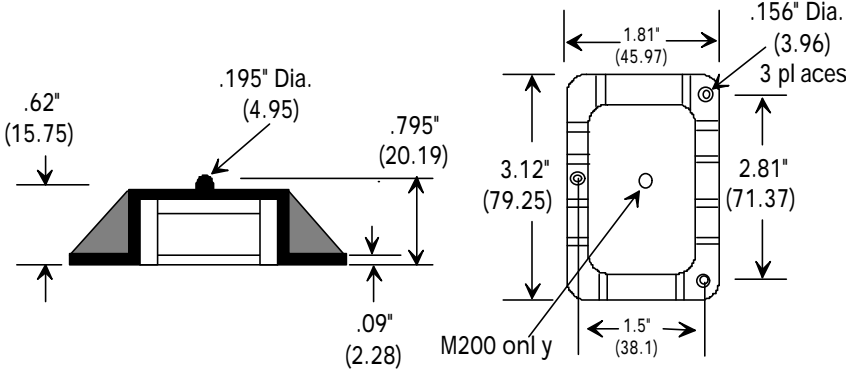
CABLE LENGTH

Model 200:   6" (152.4 mm)
Model 100:   6' (1.83 m)

Figure A-4. Model 100 and Model 200 Read Head
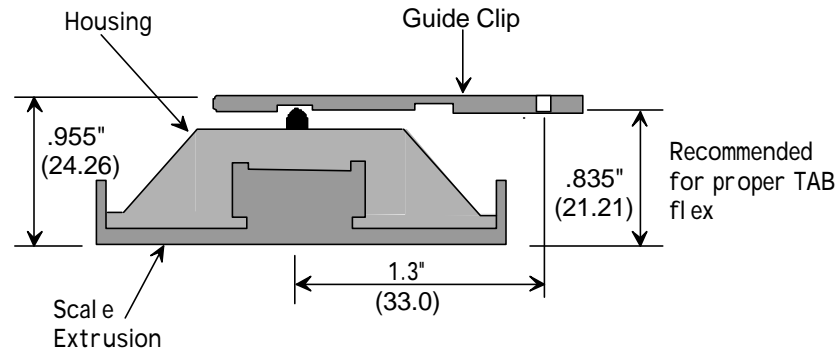
Figure A-5. Model 200 Scale and Housing
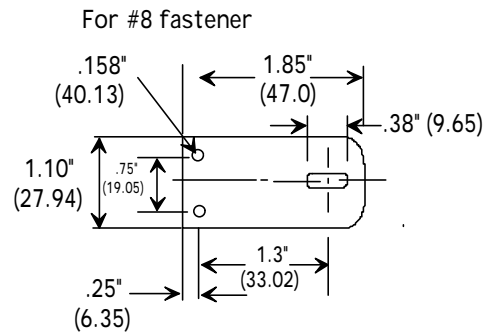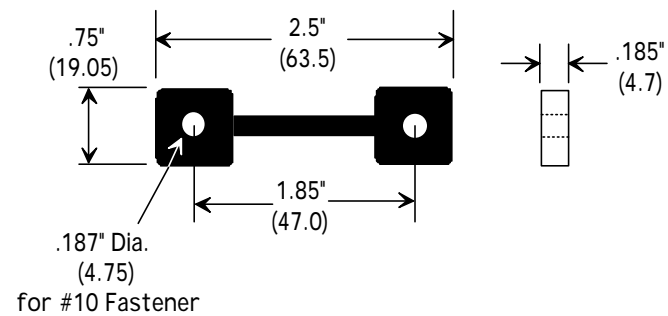

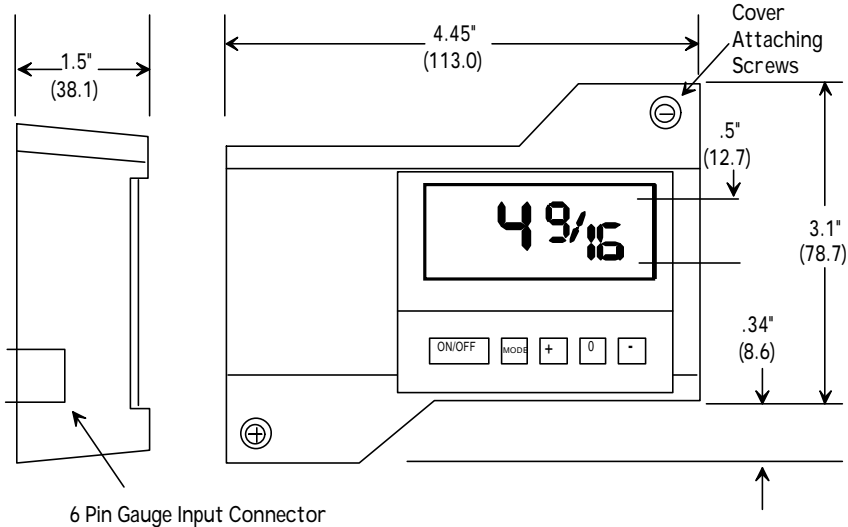Figure A-6. Model 200 Guide Clip

Figure A-7. Model 100 Flex Link
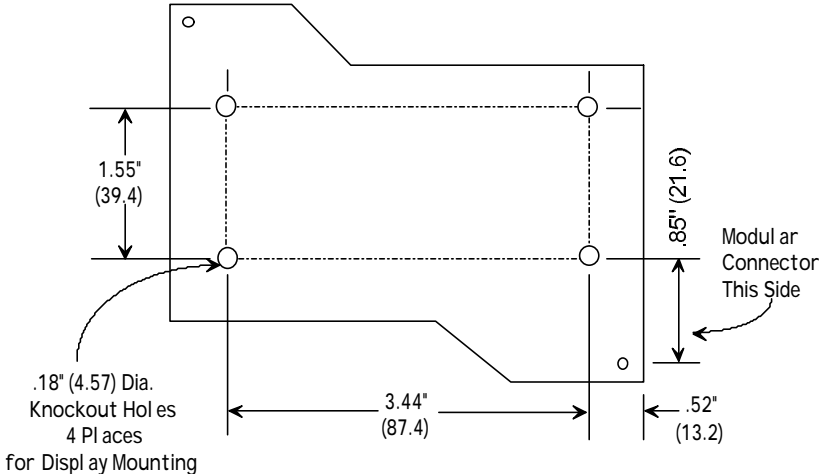
Figure A-8. Display Monitor

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