Model WP9000
WeldProbe Force Gage

Sensotec, Inc.
2080 Arlingate Lane
Columbus, Ohio 43228 USA
Copyright © 1999 by Sensotec, Inc. all rights reserved
Telephone: (614)850-5000
FAX: (614)850-1111
Toll Free: 1-800-848-6564
E-mail: sales@sensotec.com
WWW: http://www.sensotec.com

Model WP9000 WeldProbe Force Gage
Sensotec Part Number: 008-0548-00
Rev. D: March, 2003

IMPORTANT! IT IS RECOMMENDED THAT YOU READ
THIS DOCUMENT THOROUGHLY BEFORE APPLYING
POWER TO THIS UNIT. THIS DOCUMENT CONTAINS
INFORMATION ON WIRING, CALIBRATION, AND USE
OF FEATURES.

Sensotec continually improves its products, and thus the
information herein is subject to change without notice.

SENSOTEC

WP 9000
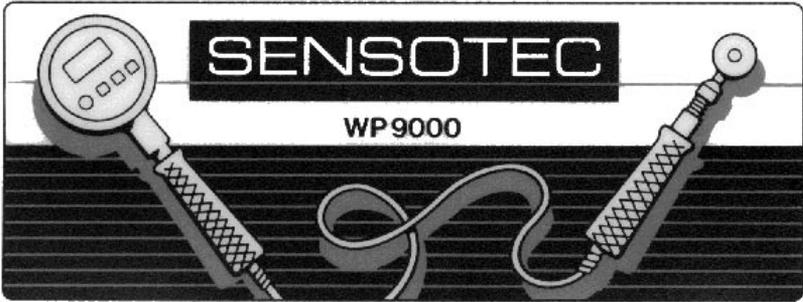
TABLE OF CONTENTS

Chapter 1
INTRODUCTION

1.1 Overview

The WeldProbe is a rugged, hand-held instrument for accurately calibrating weld electrode force on resistance welding machines. This device helps ensure compliance with ISO 9000 or QS 9000 quality requirements by taking the guesswork out of setup. Measuring accurate force levels at the electrode tips helps eliminate inaccuracies of the line-pressure readings, air cylinder friction, and mechanical wear.

The WeldProbe is designed for long life in the harsh welding environment by using Sensotec's standard fully-welded load cell construction and NEMA 4 electronics packaging. The easy-to-use design includes a simple push-button format and a large LCD display that provides both continuous and peak (maximum) force values in keypad-selectable engineering units.

High-speed digital electronics sample readings during the squeeze-weld-hold sequence and capture the peak force for display. A simple, one-button CLEAR prepares the instrument for the next reading. Two standard 9-volt alkaline batteries provide 80 hours of continuous use. Battery life is maximized with a programmable power-off feature.

1.2 Quick Operation Guide

1. Depress the [On/Off] button to power up the instrument. Wait about 5 seconds for the instrument to warm up.
2. If a non-zero value appears on the display, press and hold the [Zero] button until the display reads "-*0*-" (this takes about three seconds).
3. Insert probe, initiate welder, and take reading.
4. Press and hold the [Hi/Lo] button until the display reads "*HI*" to read the maximum (or peak) force value.
5. Press [Clear] to clear the maximum value in preparation for the next reading.
6. As shipped from the factory, the instrument will automatically shut itself off if no buttons have been pressed in four minutes.

Note: The WP9000 is a force calibration device designed to measure the force between electrodes on resistance welders. It can withstand passing current through the force transducer.

It is recommended for the saftey of the operator and the WP9000 to disable current before operation. Many repeated current firings may damage the weld force indicator.

1.3 Instrument Layout

1.3.1   LCD Display
The 4½-digit liquid crystal display (LCD) readout displays the load applied to the instrument, interacts with the user when the instrument is being set up or calibrated, and indicates if there is a problem with the instrument.

When a WP9000 instrument is turned on, it illuminates all LCD segments. Then, the engineering units the gauge will be using appears on the display. Most WP9000 instruments are calibrated in pounds ("*LBS*") and the instrument has conversion factors for many standard engineering units built in. However, if the instrument displays *SPCL* (special) it has been specially calibrated to another engineering unit at the factory. In that case, the serial number tag on the top of the instrument will indicate the engineering units being used and the capability to select other engineering units should not be used.

After the display of the engineering units, the force applied to the load cell is shown on the display. If the load applied to the load cell is above the instrument's ability to measure, the display will indicate this overrange condition by showing a "*1*" on the far left hand side of the display. The display will read "*-1*" if the instrument is underranged.

1.3.2   Low Battery Indicator
On the left side of the display, just above the minus sign, is the low battery indicator (in the shape of an arrow). When the battery voltage is less than 5 volts, the display will be blanked and the low battery indicator will illuminate to indicate that the batteries should be replaced. The low battery indicator can be seen when the instrument is turned on and all segments of the display are momentarily lighted.

When the low battery indicator is illuminated, change the batteries as soon as possible. The instrument will not function if the battery voltage falls below approximately 4 volts.

1.3.3   Decimal Point Position
The decimal point position automatically changes depending upon:
- the user selected engineering units

- the load range of the instrument

The decimal point position cannot be changed manually.

1.3.4   Incremental Display Step
The incremental display step is the value by which the last digit of the display will change. This value will be either 1, 2, or 5 display counts. It automatically changes depending upon:
- the user selected engineering units

- the load range of the instrument

The incremental display step cannot be changed manually.

1.3.5   Load Cell
The WP9000 instrument can be ordered with one of two types of load cells: those with a load sensing button, and those with a load sensing indentation. The load sensing button is useful when the WeldProbe is used with projection welders. The load sensing indentation is useful for most spot welding applications.

1.4 Maximum Safe Overload

Maximum safe overload is the force which the instrument can experience occasionally without loss of accuracy or permanent damage.

Table 1: Maximum Safe Overload

Force Range (lbs.)	Maximum Safe Overload (lbs.)
0 - 500 = 500	750
0 - 1000 = 1K	1500
0 - 2000 = 2K	3000
0 - 5000 = 5K	7500
0 - 10000 = 10K	15000

1.5 Front and Side Views
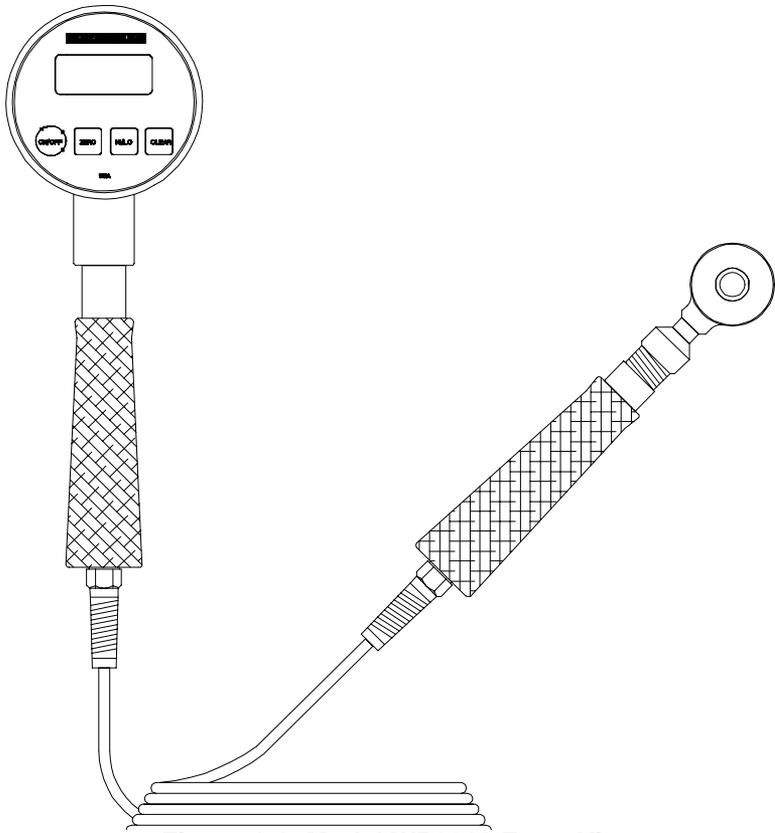
Figure 1-1: Model WP9000 Front View
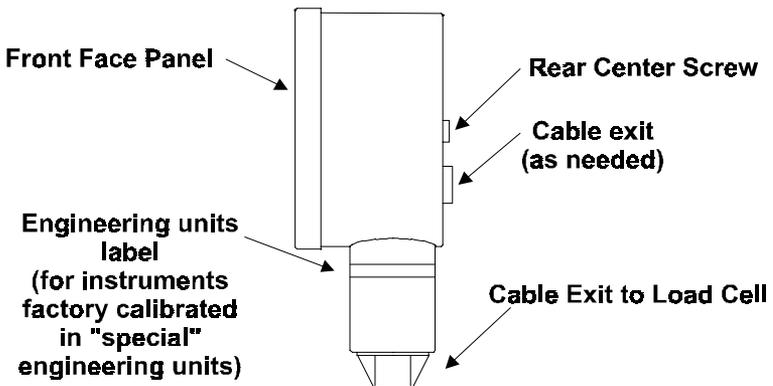
Figure 1-2: Model WP9000 Display Side View

1.6 Dimensions
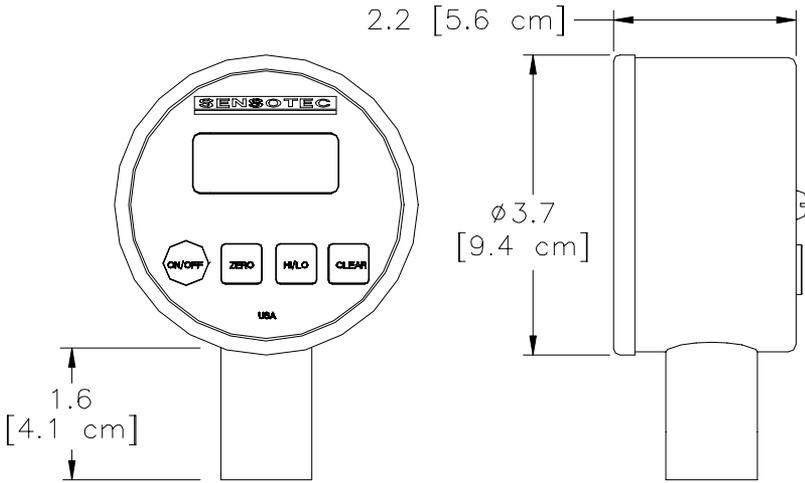
Figure 1-3: Model WP9000 Display Dimensions
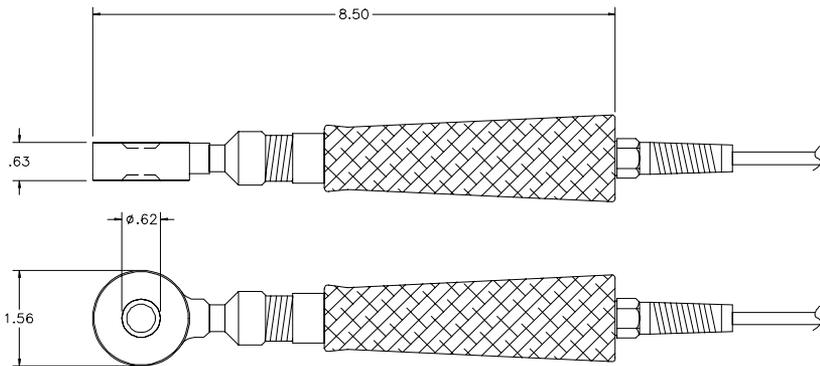
*Figure 1-4: Model WP9000 Load Cell Dimensions (2000 lbs.
Range with Sensing Indentation)*

1.7 Specifications

Sensotec continually improves its products, and thus these specifications are subject to change without notice.

Display Diameter:	3.7 inches
Accuracy:	0.5%
Operating Temperature:	30 to 180 ºF
Force Ranges 0 to:	1000, 2000, 5000, 10000 lbs.
Overload Capability:	150% of full-scale range
Calibration Engineering Units:	lbs
Built-in Engineering Unit Conversion:	lbs, Kg, kN, N, g (field selectable)
Sampling Rate:	19.2kHz internal; 24Hz display update
Power Requirements:	two 9 Volt alkaline batteries provide approximately 80 hrs continous life
Load Cell Material:	BeCu
Housing Material:	Stainless steel
High and Low Capture:	Standard, same update rate as display
Zero and Span Adjustment:	Standard
Front Panel Membrane	Tactile feedback, raised buttons
Calibration Data:	Stored on non-volatile memory chip
Package:	All-welded load cell; NEMA 4 rated display unit
Weld Current:	Survives accidental current discharge

Chapter 2
OPERATION

2.1 Battery Replacement

Two nine-volt alkaline batteries (NEDA 1604) are recommended for use in the Model WP9000. This is a common type of battery which is available at many stores. With two alkaline batteries, a Model WP9000 instrument will operate continuously on for approximately 80 hours. Carbon-zinc batteries (sometimes labeled as "general purpose" or "heavy duty") should not be used. Please note that the temperature specifications of the batteries you purchase may not be the same as those of the Model WP9000.

If two batteries are not available, the instrument will operate with only one alkaline battery installed in either clip. However, this will reduce the continuous operation time to approximately 40 hours.

The use of two lithium batteries will allow your Model WP9000 instrument to operate continuously for over 160 hours.

To install the batteries:

1) Remove the center screw on the back of the instrument.

2) Remove the front face panel from the case.

3) The colored ribbon cable extending from the sensor to the electronics may be disconnected to make the battery installation more convenient.

4) Replace the batteries one at a time, making sure of the correct polarity.

5) Reconnect the sensor cable to the electronics.

Important note: The correct orientation of the sensor cable is shown on page 31. If you connect the sensor cable backwards, the instrument will not operate correctly.

6) Replace the front face panel.

7) Carefully replace the rear center screw.

Note: Calibration and setup values are stored in a nonvolatile memory, and are not lost during battery replacement.

2.2 Turning the Instrument On and Off

| ON/OFF | ZERO | HI/LO | CLEAR |

Push the [On/Off] button to turn the instrument on or off.

As the instrument turns on, every segment on the display is momentarily lighted. The high/low data values are cleared.

2.3 Zeroing the Display

| ON/OFF | ZERO | HI/LO | CLEAR |

Hold the [Zero] button until the the display shows "-0-" (about 5 seconds).

The instrument will retain this zero value even after the instrument has been turned off.

2.4 Restoring the Calibrated Zero

To restore the zero, first press and hold the [Clear] button, and while holding [Clear]...

... press the [Zero] button. Hold both buttons until the display shows "-PO-", then release.

The "calibrated zero" is the zero value of the instrument at the time it was last calibrated. Restoring the calibrated zero can be used to "undo" an inadvertent press of the [Zero] button.

2.5 Reading the High/Low Values

The high and low values are updated at the same rate as the tracking value.

Press the [Hi/Lo] button once to read the highest value since the last time the data was cleared.

The word "HI" and the corresponding value will flash inter-mittently on the display. This flashing indicates that the instrument is not displaying the "live" tracking value of the applied force. However, the instrument is still monitoring the applied force and updating the high and low values.

Press the [Hi/Lo] button a second time to read the lowest value since the last time the data was cleared.

The word "LO" and the corresponding value will flash inter-mittently on the display. This flashing indicates that the instrument is not displaying the "live" tracking value of the applied force. However, the instrument is still monitoring

the applied force and updating the high and low values.

Press the [Hi/Lo] button a third time to return to the "live" tracking mode. The display will show "---" to indicate tha the instrument has returned to the "live" tracking mode.

2.6 Clearing the High/Low Values

Press the [Clear] button to erase the high and low data values.

The high and low data values are also cleared when the instrument is turned off.

Chapter 3
FIELD SELECTABLE FEATURES

3.1 Introduction

This Chapter discusses the field selectable features available on the model WP9000 WeldProbe Force Gage. These features can be activated, deactivated and modified via the Setup Menu accessed by the front panel.

These field selectable features include:
- Enabling the automatic power off feature to conserve battery life

- Disabling the front panel buttons

- Changing the engineering units used to display the applied force.

- Adjusting the automatic power off time

- Changing the update rate

3.2 Setup Menu Operation

All of the field selectable features are accessed via the Setup Menu. This section discusses its operation.

To change a feature with the Setup Menu:

 Make sure the instrument is turned off. Then, press the [On/Off] button.

| [ON/OFF] | [ZERO] | [HI/LO] | [CLEAR] | While unit is checking the display (lighting all LCD segments simultaneously) press and hold down the [Zero] button. |

The display now reads "*L-LO*", which is the first item of the Setup Menu. Release the [Zero] button.

| [ON/OFF] | [ZERO] | [HI/LO] | [CLEAR] | Pressing and releasing the [Zero] button will scroll down through the available Setup Menu items. |

The table below provides a list of the items available in the Setup Menu and a brief description of each.

Table 2: Setup Menu Items

Display	Menu Item	Purpose
L-LO	Low Limit setpoint	N/A
L-HI	High Limit setpoint	N/A
EO	Enable Options	Enable Auto-Off feature; Disable front panel buttons
UNIT	Engineering units	Change engineering units used to display force
AOFF	Auto-off time	Change Auto-Off power down time
RATE	Update rate	Change update rate of force readings
VER	Internal software revision	Display internal software part number and revision
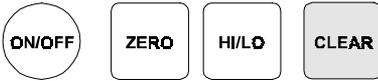
When the menu item you wish to change is displayed, press [Clear].

The display now shows the present setting of that menu item. If you only wish to examine the present setting of the menu item, you can use the [On/Off] button to turn the instrument off. Otherwise...
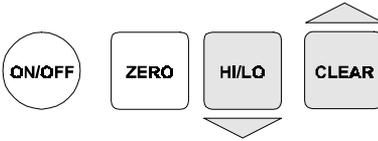
Use the [Hi/Lo] and [Clear] buttons to scroll up and down, respectively.

If you wish to abandon the changes you made to this setting, you can use the [On/Off] button to turn the instrument off. Otherwise...

Once the setting you want is displayed, press the [Zero] button to store this setting into memory.

The next menu item will be displayed after the instrument stores the setting into memory.

3.3 Enable Options ("εo") Description

The Enable Options ("εo") menu item controls the features described in the sub-sections below.

3.3.1   Auto-off Feature
The unit will shut itself off if no buttons are pressed for the time duration specified with the Auto-off time ("$RoFF$") menu item. The unit can also be shut off with the [On/Off] button.

This feature is useful for conserving battery life. The instrument is shipped with this feature enabled.

3.3.2 Always-On Feature

The [On/Off] button is disabled and will not shut the unit off. This mode is used so that the high and low capture values, output signals, or limit alarms are not interrupted if an operator tries to shut the unit off during testing or monitoring.

3.3.3 [Zero] Button Disable Feature

This feature disables the ability to zero the display of the instrument. The ability to restore the calibrated zero is also disabled. When the [Zero] button is pressed, the display momentarily reads "-*EO*-" which indicates that the button has been disabled via the Enable Options menu item.

3.3.4 [Hi/Lo] Button Disable Feature

This feature disables the ability to read the stored high and low values on the display. The display will always read the "live" tracking value of the applied force. When the [Hi/Lo] button is pressed, the display will momentarily read "-*EO*-" which indicates that the button has been disabled via the Enable Options menu item.

3.3.5 [Clear] Button Disable Feature

This feature disables the ability to clear the high and low data values with the [Clear] button. The ability to restore the calibrated zero is also disabled. When the [Clear] button is pressed, the display momentarily reads "-*EO*-" which

indicates that the button has been disabled via the Enable Options menu item. **NOTE:** The high and low data values may also be cleared by turning the unit off and back on, unless the Always-on feature is used.

3.4 Enable Options ("*EO*") Menu Item

To activate or deactivate the features described in the previous section, the setting of the Enable Options ("*EO*") menu item must be changed. The procedure to change the setting of a menu item is described in the "Setup Menu Operation" section earlier in this Chapter.

The setting value of the Enable Options ("*EO*") menu item is obtained by adding together the values of the desired options according to the table below.

Table 3: Enable Options ("*EO*") *settings*

Feature	Disabled	Enabled
Auto-off	0	1
Always-on	0	2
[Zero] button	4	0
[Clear] button	16	0
[Hi/Lo] button	32	0

For example, to enable the Auto-off feature and disable the [Zero] button enter a setting value of "0005". As another example, to disable both the [Zero] and the [Clear] buttons enter a setting value of "0020".

If the Auto-off and Always-on features are both activated, the unit will behave as follows: The [On/Off] button can

turn the instrument on but it cannot turn the instrument off. The only way to turn the instrument off is not to press any buttons for the duration specified in the Auto-off time ("𝐴𝑂𝐹𝐹") menu item. Note that the Auto-off time ("𝐴𝑂𝐹𝐹") setting can be several hours.

3.5 Engineering Units ("𝑈𝑁𝐼𝑇") Menu Item

The Engineering Units ("𝑈𝑁𝐼𝑇") menu item determines which units-of-measure are used to display the force readings. Most WP9000 instruments are calibrated in lbs. and the instrument has conversion factors for many standard engineering units built in. The procedure to change the setting of a menu item is described in the "Setup Menu Operation" section earlier in this Chapter.

Note: If the instrument displays "𝑆𝑃𝐶𝐿" (special) when powering up, it has been specially calibrated to another engineering unit. The ability to change the engineering units is not available.

The table below gives a list of the engineering units built into the instrument.

Table 4: Engineering Units ("𝑈𝑁𝐼𝑇") Available Settings

Setting	Engineering Unit / Comment
𝐴𝐷𝐶	for factory use only
𝐿𝐵𝑆	lbs
𝑁	N
𝐾𝑁	kN
𝐺	g
𝐾𝐺	kg

3.6 Auto-off time ("*AOFF*") Menu Item

The Auto-off time ("*AOFF*") menu item is only meaningful if the Auto-off feature is enabled in the Enable Options ("*EO*") menu item. The procedure to change the setting of a menu item is described in the "Setup Menu Operation" section earlier in this Chapter.

The table below gives a list of the available settings for the Auto-off time ("*AOFF*").

Table 5: Auto-off time ("AOFF") Available Settings

Setting	Time
0	4 minutes
1	1 hour
2	2 hours
3	3 hours
4	4 hours
5	5 hours
6	6 hours
7	7 hours
8	8 hours

3.7 Update Rate ("*RATE*") Menu Item

The Update Rate ("*RATE*") menu item determines the number of times the force readings are updated per second. The track, high and low values are all updated at this rate. The update rate can be varied from 5 to 24 updates per second. As shipped from the factory, the update rate is set to 24 per second.

Important Note: To receive maximum accuracy in resistance welding applications, it is important to leave the update rate set at 24 per second.

3.8 Internal Software Version ("*VER*") Menu Item

The Internal Software Version ("*VER*") menu item displays the part number and version number of instrument's operating software.   The software part number and version number are of the form:

084-1087-02 1.19

Where the "084-1087-02" is the part number, and the "1.19" is the version number.

Since this string is too long to fit on the 4½ digit-display, pressing either the [Hi/Lo] or [Clear] buttons will scroll through this string 4 characters at a time.

Chapter 4
CALIBRATION

4.1 Calibration Considerations

In order to obtain optimum performance from the model WP9000 instrument when testing or re-calibrating, Sensotec recommends the following:

- Allow a 5-minute warm-up period before testing or calibration.

- The force standard you use should be at least 4 times more accurate than the specification of the WP9000 instrument.

4.2 Required Forces

In order to re-calibrate the instrument, you must have a precision force standard that can produce the zero-scale, half-scale and full-scale forces for the instrument's range. For example, if your WP9000 instrument has a range of 500 lbs, your force standard must be able to accurately produce forces of 0 lbs, 250 lbs, and 500 lbs.

If your force standard cannot produce these exact values, the instrument can be programmed in the field to expect slightly different values during the re-calibration process. For example, if your calibrated weights are equal to 0 lbs, 251 lbs and 498 lbs, you can program the instrument to expect these weights during the re-calibration process.

All WP9000 instruments are calibrated in lbs regardless of the field-selected engineering units. However, if the instrument displays the word "*SPCL*" (special) when it powers up, it has been specially calibrated to another engineering unit. In that case, the serial number tag on the top

of the instrument will indicate the engineering units that will be used for re-calibration.

To maintain NIST traceability, Sensotec can re-calibrate a WP9000 instrument for you. NIST certificates may be ordered as a separate accessory for a nominal fee.

Table 6: Required Forces (all in lbs)

Force Range	Calibration Point 0 (zero-scale force)	Calibration Point 1 (half-scale force)	Calibration Point 2 (full-scale force)
500	0	250	500
1K	0	500	1000
2K	0	1000	2000
5K	0	2500	5000
10K	0	5000	10000

4.3 Calibration Procedure

The calibration procedure consists of two parts, the first of which may not be necessary in all applications.

- First, the instrument is told exactly what zero-scale, half-scale and full-scale forces are to be applied during the calibration procedure.

- Second, the forces are applied to the instrument.

The following two sections explain this procedure.

4.3.1   Enter Forces to be Applied

The expected force values to be applied during calibration are accessed via the Factory Configuration Menu. This section discusses its operation.

To change a value with the Factory Configuration Menu:

Make certain the instrument is turned off.

Open up the instrument by removing the center screw on the back. Next, remove the front face panel. Take care not to break the wires extending from the sensor to the electronics. As indicated on Figure 4-1, move the mode jumper from the "**park**" position to the "**configure**" position.

Hold the [On/Off] button, then press the [Hi/Lo] button. The display will momentarily read "*OP-2*".

Release the [Hi/Lo] button, and the display will read "*OP*" which is the first item of the Factory Configuration Menu.

Pressing and releasing the [Zero] button will scroll down through the available Factory Configuration Menu items.

The table below provides a list of the items available in the Factory Configuration Menu and a brief description of each.

Table 7: Factory Configuration Menu Items

Display	Menu Item	Purpose
DP	Decimal Point	How many decimal points are used to edit the "*P0*", "*P1*" and "*P2*" Factory Configuration Menu items.
P0	Zero-Scale Point	The expected value in lbs of the force to be applied at zero scale.
P1	Half-Scale Point	The expected value in lbs of the force to be applied at half scale.
P2	Full-Scale Point	The expected value in lbs of the force to be applied at full scale.
INP	Input Range	For factory use only. **Do not change this setting.**

When the menu item you wish to change is displayed, press [Clear].

The display now shows the present setting of that menu item. If you only wish to examine the present setting of the menu item, you can use the [On/Off] button to turn the instrument off. Otherwise...
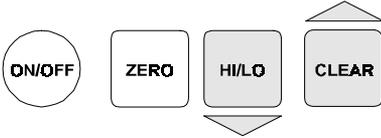
Use the [Hi/Lo] and [Clear] buttons to scroll up and down, respectively.

If you wish to abandon the changes you made to this setting, you can use the [On/Off] button to turn the instrument off. Otherwise...

Once the setting you want is displayed, press the [Zero] button to store this setting into memory.

The next menu item will be displayed after the instrument stores the setting into memory.

After you have finished using the Factory Configuration Menu, the mode jumper must be moved from its "**configure**" position to its "**park**" position as indicated in Figure 4-1. Close the unit up and replace the center screw.

4.3.2   Apply Forces

Make certain the instrument is turned off.

Open up the instrument by removing the center screw on the back. Next, remove the front face panel. Take care not to break the wires extending from the sensor to the electronics. As indicated on Figure 4-1, move the mode jumper from the "**park**" position to the "**calibration**" position.
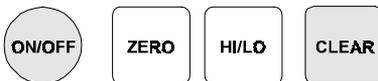
Hold the [On/Off] button, then press the [Clear] button. The display will momentarily read "*OP-1*".

The display will begin to alternately flash between the force required for calibration point #0 (for example "*0000*"

and "----"). If you wish to abandon the calibration procedure, press the [On/Off] button to turn the unit off. Otherwise...

Apply the indicated force to the instrument. Press [Clear] until "-*P*-" is displayed, indicating that the reading is being stored.

Next, the display will begin to alternately flash between the force required for calibration point #1 (for example, "*0500*") and "----".

Apply the indicated force to the instrument. Press [Clear] until "-*P*-" is displayed, indicating that the reading is being stored.

Finally, the display will begin to alternately flash between the force required for calibration point #2 (for example, "*1000*" and "----").

Apply the indicated force to the instrument. Press [Clear] until "-*P*-" is displayed, indicating that the reading is being stored.

When the last force point has been entered, the instrument will turn itself off. At this time, the mode jumper must be moved from its "**calibration**" position to its "**park**" position as indicated in Figure 4-1. Close the unit up and replace the center screw.

Check that the instrument has been calibrated properly by turning it back on and using the force standard.

4.4 Rear View of Front Face Panel

Options Circuit Board
(Arrangement varies according to model)

Proper orientation of sensor cable

or

BROWN
RED
ORANGE
YELLOW

RED
BLACK
WHITE
GREEN

Mode jumper positions

"PARK"
Jumper should be located here during normal operation.

"CALIBRATION"
Place jumper in this position to recalibrate instrument.

"CONFIGURE"
This jumper position is normally not used by the customer.

Figure 4-1: Front face panel (rear view), showing mode jumper positions and orientation of sensor cable

4.5 Calibration Error Messages

If unexpected forces are encountered during the calibration procedure, the WP9000 instrument will alert the user by flashing the word "*HELP*" and a message number on the display. This indicates that the calibration process cannot continue, and that you must turn the instrument off and re-calibrate again when the error has been corrected. A list of error message numbers and their causes is given in "TROUBLESHOOTING" on page 33.

Chapter 5
TROUBLESHOOTING

5.1 Introduction

This chapter provides information on correcting common problems that may be encountered operating and calibrating the instrument.

5.2 Help Message Codes

If the instrument detects a problem during its power-on self-test, operation, or calibration, it will alert the user by flashing the word "*HELP*" and an error message code number on the display. The instrument cannot continue operation and you must turn the instrument off and correct the error.

- "*HELP 01*": Calibration error.
  Analog to digital converter overrange.
  One of the force points is above the calibration range of the instrument. Or, the sensor cable is not connected properly.

- "*HELP 02*": Calibration error.
  Analog to digital converter underrange.
  One of the force points is below the calibration range of the instrument. Or, the sensor cable is not connected properly.

- "*HELP 04*": Calibration error.
  The applied forces at any two calibration points did not differ enough.

- "*HELP 23*": Self-test error.
  The engineering unit conversion that you selected cannot be rendered on a 4½-digit display. For example, consider the case of an instrument with a range of

2000 lbs. If you were to select grams ("G") in the Engineering Units ("$UNIT$") menu item the instrument would signal this error. This is because 2000 lbs equals 907184 grams which cannot be shown on a 4½-digit display.

- "$HELP \ 27$": Non-volatile memory write error.
  "$HELP \ 28$": Non-volatile memory read error.
  "$HELP \ 29$": Non-volatile memory verify error.
  "$HELP \ 39$": Non-volatile memory version mismatch.
  "$HELP \ 40$": Analog-to-digital converter not ready.
  Turn the instrument off and on again. If these problems persist, contact Sensotec.

5.3 Troubleshooting Hints

- Verify that the power source is operating correctly. Make sure the batteries are fresh or that the external supply is wired correctly.

- Verify that you have set the instrument to read in the desired units-of-measure.

- Verify that the sensor cable is connected correctly. The figure on page 31 shows the correct orientation of the sensor cable.

- If you have changed the display update rate from the factory default of 24 per second, it may now be set too low for your application and this may be interpreted as the peak readings being too low. Try increasing the display update rate.

- The sensor and the electronics are a matched set. Do not, under any circumstances, exchange sensor and electronics on two different instruments.

- The [Zero] button must be held down for 5 seconds before the display will be zeroed. This is in order to prevent unintentional zeroing of the display.

- As shipped from the factory, the instrument will shut itself off after four minutes unless any button is pressed. You can adjust this Auto-off feature if you wish.

- Inspect the instrument for physical damage. If the instrument is physically damaged, consult the factory for repair. Do not attempt repairs as this may void the warranty.

- When all else fails, disconnect the batteries for 5 seconds, then reinstall.

WARRANTY

Limitation of Remedy and Disclaimer of Warranty

Any of our products which, under normal operating conditions, proves defective in material in workmanship within one year from the date of shipment by Sensotec, Inc., will be repaired or replaced free of charge, provided that the buyer (1) promptly notifies Sensotec, Inc. of any such defect; (2) provides Sensotec, Inc. with satisfactory proof of the defect and that the product was properly installed, maintained, and operated within the limits of rated and normal usage; and (3) obtains from Sensotec, Inc. authorization to return the product. Any such product shall be returned with transportation charges prepaid. The replacement product will be shipped F.O.B. our plant.

The remedy set forth herein does not extend to any product or part thereof which, under normal usage, has an inherently shorter useful life than one year. The remedy set forth herein does not apply to damage or to defects in any product caused by the buyer's misuse or neglect, nor does it apply to any product which has been repaired or disassembled which, in the sole judgement of Sensotec, Inc. affects the performance of the product.

The remedy set forth herein is the buyer's exclusive remedy, and will satisfy all obligations of Sensotec, Inc. whether based on contract, negligence, or otherwise. Sensotec, Inc. is not responsible for any incidental or consequential loss or damage which might result from a failure of any Sensotec, Inc. product.

THIS EXPRESS WARRANTY IS MADE IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE.

Obtaining Service Under Warranty

Advanced authorization is required prior to the return to Sensotec, Inc. Before returning the items, either write to the Repair Department c/o Sensotec, Inc., 2080 Arlingate Lane, Columbus, Ohio 43228, or call (800) 848-6564 with: 1) a part number; 2) a serial number of the defective product; 3) a technical description* of the defect; 4) a no-charge purchase order number (so products can be returned to you correctly); and 5) ship and bill addresses. Shipment to Sensotec, Inc. shall be at Buyer's expense and repaired or replacement items will be shipped F.O.B. our plant in Columbus, Ohio. Non-verified problems or defects may be subject to an evaluation charge. Please return the original calibration data with the unit.

Obtaining Non-warranty Service

Advance authorization is required prior to the return to Sensotec, Inc. Before returning the item, either write to the Repair Department c/o Sensotec, Inc., 2080 Arlingate Lane, Columbus, Ohio 43228, or call (800) 848-6564 with: 1) a part number; 2) a serial number of the defective product; 3) a technical description* of the malfunction; 4) a purchase order number to cover Sensotec, Inc.'s repair cost; and 5) ship and bill addresses. After the product is evaluated by Sensotec, Inc., we will contact you to provide the estimated repair costs before proceeding. The minimum evaluation charge is $95. Shipment to Sensotec, Inc. shall be at Buyer's expense and repaired items will be shipped to you F.O.B., our plant in Columbus, Ohio. Please return the original calibration data with the unit.

Repair Warranty

All repairs of Sensotec, Inc. products are warranted for a period of 90 days from date of shipment. This warranty applies only to those items which were found defective and repaired. It does not apply to products in which no defect was found and returned as is or merely re-calibrated. Out of warranty products may not be capable of being returned to the exact original specifications or dimensions.

Technical description of the defect: In order to properly repair a product, it is necessary for Sensotec, Inc. to receive information specifying the reason the product is being returned. Specific test data, written observations on the failure and specific corrective action you require is needed.

SENSOTEC

(800)848-6564