

INTRODUCTION

The MISCO Palm Abbe refractometers are advanced fourth-generation handheld digital refractometers that put laboratory precision in the palm of your hand. They are designed for the rapid and accurate determination of fluid concentrations. These instruments will automatically compensate for temperature with computer precision, and when used and cared for properly, will provide years of trouble-free service. This manual will help you maximize the usefulness of your instrument and MUST be read completely before use. If you have any questions, please call:

MISCO technical support at 440-349-1500.

The PA201 is equipped to take readings on the Brix scale and utilizes sucrose as the temperature compensation basis.

The PA202 is equipped to take readings on the Brix and Refractive Index (nD) scales. Both scales use sucrose as the temperature compensation basis. The PA202x may have up to two custom scales and may have special temperature compensation.

The PA203 may have from one to five different scales, each scale having an individual unit of measure and temperature compensation basis.

To the extent that your particular instrument is equipped with scales other than those described above, the scale specifications will be documented on a specifications card accompanying the instrument.

WARNING

THE SAFETY INSTRUCTIONS AND WARNINGS PRESENTED BELOW AND ELSEWHERE IN THIS MANUAL ARE MINIMUM REQUIREMENTS FOR THE SAFE AND RELIABLE OPERATION OF THIS EQUIPMENT. THESE PRECAUTIONS MUST BE OBSERVED DURING ALL PHASES OF USE OF THIS EQUIPMENT. FAILURE TO COMPLY WITH THESE PRECAUTIONS OR WITH SPECIFIC WARNINGS GIVEN ELSEWHERE IN THIS MANUAL COULD RESULT IN DEATH OR SERIOUS INJURY.

READ THIS MANUAL BEFORE USING THIS EQUIPMENT. You must read and follow this Manual before operating this equipment. If you have any questions, contact MISCO technical support before use.

KEEP MANUAL AVAILABLE. Keep this Manual available for reference in a safe and accessible location.

FLUIDS TESTED MAY BE HAZARDOUS OR TOXIC. You must read and follow all safety instructions and handling procedures in the Material Safety Data Sheet (MSDS) and/or Safety Data Sheet (SDS) for each fluid you choose to test. Pay careful attention to the information concerning Hazards, and to the instructions and warnings for Handling and Storage, and Exposure Controls/Personal Protection. If testing bodily fluids, take precautions to prevent exposure. In all cases, properly discard any residual sample after testing.

Calibration - Zero Set

The Palm Abbe Refractometer MUST be Zero Set before initial use and periodically thereafter. It is recommended that a Zero Set be performed at least once a day as well as prior to performing tests requiring the highest precision, or when moving between environments with extreme changes in ambient temperature.

A clean container of water is all that is needed to automatically zero the instrument. Although tap water may be used, distilled or deionized water is recommended. The water temperature for zero setting should ideally be between 10°C to 30°C (50° to 86°F). It is important to independently verify that you are indeed calibrating the instrument with water and not just a clear liquid which you think is water. Never use an instrument unless you have personal knowledge of its calibration.



1. Inspect the measuring surface to make sure it is clean and dry. Place a few drops of distilled water on measuring surface.



2. Close the sample cover and allow some time for the temperature to equalize. The sample cover MUST be closed to calibrate or take readings.



3. Press and release <GO> to turn the instrument on.



4. Press and release <MENU> until the display reads:

SET ZERO?
(GO) TO SET



5. Press and release <GO> to automatically zero the instrument. Remember to clean and dry the measuring surface after calibration.

If the calibration was successful, the instrument will display "READY", otherwise there will be an error message displayed.



Palm Abbe® Digital Refractometer

Instruction Manual PA201, PA202, & PA203



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Made in USA
Rev. 150201

Calibration - Span Set

The Span Point represents a calibration point toward the upper end of the Palm Abbe instrument. Although it is important to Zero Set the instrument daily, you may at some time want to set the span adjustment as well. The span should be set if you notice a general degradation of the instrument's accuracy and precision and/or on a periodic basis determined by your particular history with the instrument.

Factors affecting your decision to set the span adjustment include how often the instrument is used, how roughly it is handled, how often it is exposed to large temperature changes, and the level of precision you require for your measurements.

To set the span, begin with a Zero-Set, then follow the procedures for zero setting on the opposite page but go to the SET SPAN 2 / (GO) TO SET menu and substitute the calibration fluid for water in the procedure. The calibration fluid temperature for span setting must be between 15 to 25°C (59 to 77°F). If the span set is successful, the instrument will read "Ready", otherwise an error will be displayed. Follow up with a Zero-Set.



It is recommended that you use only a NIST traceable calibration fluid specific to the Palm Abbe. This fluid is available from MISCO by calling 440-349-1500 or is available for purchase online from the MISCO website, at www.misco.com (p/n CALFLU202-3).
Call MISCO for NIST Traceable Certified Calibration 440.349.1500

Menu Options

Various options are accessible through the <MENU> button. With the instrument "ON", press and release <MENU> to step through the options.

SCALE #1
(GO) TO SET

This option sets the default unit of measure, or scale, to replace the words "SCALE #1" on the display. Some instruments are programmed with more than one scale. Pressing <MENU> will step through all available scales. Press <GO> to set a scale as the default.

SET ZERO?
(GO) TO SET

The Zero Set option will zero or calibrate the instrument to water. See "Calibration - Zero Set."

SET SPAN?
(GO) TO SET

The Span Set option will calibrate the upper range of the instrument to a special calibration solution. See "Calibration - Span Set."

LCD-LIGHT?
(GO) YES

This option allows you to turn the LCD display backlight on or off. The options are "Yes" and "NO."

LANGUAGE?
(GO) TO SET

This option allows you to set the display to a particular language: English, Spanish, German, French, or Russian. Just follow the prompts to your language of choice and press <GO> to set.

Specifications

	PA201	PA202	PA203
Unit of Measure:	Brix	Brix Refractive Index (nD)	Up to 5 Different Scales Equivalent To
Range:	0.0 to 56.0	0.0 to 85.0 Brix 1.3330 to 1.5040 nD	1.3330 to 1.5040 nD Equivalent To
Resolution:	0.1 Brix	0.1 Brix 0.0001 nD	0.0001 nD Equivalent To
Precision:	+/- 0.1 Brix	+/- 0.1 Brix +/- 0.0001 nD	+/- 0.0001 nD Equivalent To
Well Material:	Stainless Steel		
Prism Material:	Sapphire		
Range:	0 to 50° C (32 to 122° F) Typical		
Basis:	Sucrose	Varies	Varies
Min. Sample Volume:	0.3 ml		
Measuring Time:	< 5 Seconds		
Power Supply:	2 X AAA Batteries		
Battery Life:	~3,500+ Readings		
Dimensions:	145 x 75 x 37 mm (5.7 x 2.95 x 1.46 in.)		
Net Weight:	250 grams (8.8 Oz.)		
Languages	5 Languages - English, French, Spanish, German, & Russian		
Display:	2 Lines x 12 Characters		
Color:	Blue	Blue	Black



Protected by US Patent D510880S

Taking Readings

Follow the steps below to accurately measure a fluid sample:



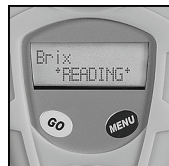
1. A single press and release of <GO> will turn the instrument on. If your instrument has more than one scale, you can press <MENU> to select a different scale.



2. Inspect the measuring surface to make sure it is clean and dry. Place a few drops of the sample to be tested on the measuring surface.



3. Close the sample cover and allow some time for the temperature to equalize. A good rule of thumb is to wait at least 30 seconds for every 20°F (10°C) difference in temperature between the fluid and the instrument. You will have to allow more time for fluids above 50 °C and for thick viscous fluids.



4. Press <GO> to automatically trigger a reading. The display will indicate the default scale name on the first line of the display and *READING* on the second line.



5. The reading will take approximately five seconds and the result will be displayed on the screen.



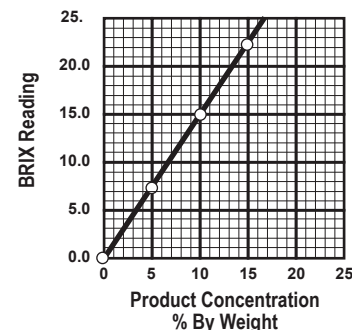
6. Press and release <GO> to take a second reading. Remember to clean and dry the measuring surface when finished.

TIP:
Holding <GO>
for 5 Seconds
Will Turn
Instrument Off.

Charting Solution Concentrations

If you are measuring sucrose solutions, you may read percent sucrose directly on the Brix scale; otherwise, the readings must be converted into solution concentrations to be useful to the user. The Brix scale originated in the food industry and is primarily a unit of measure corresponding to the percent of sugar in a sugar and water solution. The actual Brix value represents the number of grams of cane sugar in a 100 gram cane sugar solution (percent sugar wt./wt.). This direct reading relationship holds true ONLY for sucrose solutions.

Refractive index units (nD) represent a physical property of a substance but are not particularly helpful without a table to reference them.



Water = 0 Brix
5% = 7.5 Brix
10% = 15 Brix
15% = 22.5 Brix

To make both Brix and refractive index units more meaningful, they must somehow be correlated to the concentration of the solution you are testing. This is accomplished by creating a chart of solution concentrations relative to the scale. A separate chart must be made for each type of solution being tested. Occasionally, the manufacturer of the solution will provide a reference chart relating the solution's concentration to Brix or refractive index. If such a chart is not available, it is quite easy to construct one following the instructions below:

Step 1

- Mix (preferably by weight) a number of known solutions which bracket the actual concentration to be used. For example, if a 10% solution is most often used, carefully mix 5%, 10%, and 15% solutions.

Step 2

- Zero set the instrument.
- Take a Brix reading for each prepared sample with the Palm Abbe and the sample at or near room temperature (20°C / 68°F).
- Record the results and plot them on graph paper. Remember to add a point at 0.0 Brix for water.

Step 3

- Draw a straight line between the plotted points along a path that best represents the center of the data. Do not be concerned if some of the points fall slightly off the line. The concentration for future measurements of the same fluid can be determined by matching the Brix value against the corresponding concentration on your graph. A separate graph must be constructed for each type of fluid used.

TIP:
Holding the
<MENU> Button
for 5 Seconds
Will Display
Serial Number.

Auto Temp. Compensation

Refractive index is very temperature dependent. It is well known that substantially all materials expand when heated (become less dense) and contract when cooled (become more dense). The speed of light in a liquid increases as temperature increases, and the refractive index, therefore, decreases. Although this thermal effect is small for solids, the change is substantial for liquids. Automatic-temperature-compensation ensures that concentration readings of aqueous (water-based) solutions will be accurate with respect to the sample's temperature.

Unless otherwise noted, the Palm Abbe refractometer is temperature compensated for aqueous (water-based) sucrose solutions. The temperature coefficient of most aqueous solutions is generally close to that of sucrose; however, the temperature coefficient of oils, hydrocarbons, and other non-aqueous solutions is generally larger. Non-aqueous samples should be read at an ambient temperature as close to 20°C (68°F) as possible for the best precision. Certain Palm Abbe scales are programmed with temperature compensation specific to an individual unit of measure. This will be noted on the specification card accompanying the instrument.

Actually, the temperature of the sample has little bearing on the accuracy of the reading. The sample volume is relatively small compared to the thermal mass of the refractometer so, in most cases, the sample almost immediately assumes the temperature of the instrument. For the most accurate possible results, the instrument, the ambient temperature, and the fluid should be in equilibrium within the instrument's temperature range.

Troubleshooting

The most common source of error is trying to take readings with the cover open. If this is not the case, and you suspect the instrument is malfunctioning or giving an erroneous reading, try zero setting it and take a reading of water to check the zero set. If the instrument readings are still suspicious, replace the battery and repeat the above procedure.

If the instrument "locks up" and will not read or shut off, clear the instrument by removing the batteries. If unit fails to display "MISCO / PALM ABBE II" when starting, check battery insertion and polarity. If the unit still will not start, check battery charge and/or replace batteries. If batteries are good and instrument still will not start, call MISCO Technical Support at (440)349-1500.

Error Codes:

NO SAMPLE
DETECTED

Sample was not detected on prism.

CLOSE COVER
PRESS (GO)

Cover must be closed before taking reading.

OUT OF RANGE
TEMP +

Temperature out of range too high (+) or low (-).

SAMPLE OUT
OF RANGE +

Concentration out of range too high (+) or low (-).

WARNING!
LOW BATTERY

Time to change the batteries.

Care & Maintenance

Keep Measuring Surface Clean! It is extremely important to thoroughly clean the measuring surface after each use with a wet, soft, clean cloth or paper towel. This will prevent cross contamination between samples and provide accurate subsequent readings. Keep the measuring surface clean and free of residue at all times. The instrument body may be cleaned with a soft, clean cloth or paper towel, dampened with a mild liquid dish soap and water. The use of solvents or petroleum-based cleaners is not recommended.

Important Precautions!

- DO NOT SUBMERGE INSTRUMENT IN LIQUIDS.
- DO NOT hold instrument under running water.
- DO NOT leave instrument in direct sunlight or in a vehicle on a sunny day.
- DO NOT subject instrument to temperatures above 50°C (122°F) or less than -10°C (14°F).
- DO NOT attempt to repair, modify, or disassemble any portion of the instrument.
- DO NOT let liquid fall from instrument onto clothing or other surfaces after taking readings.
- DO NOT drop or subject instrument to strong shocks or vibration.
- DO NOT use a metal device to transfer samples to the measuring surface.
- DO NOT use an instrument unless you have personal knowledge of its calibration.
- DO NOT attempt to recharge the batteries that came with the instrument.
- DO NOT press the buttons with anything other than a finger.

When storing the instrument for long periods of time, it is advisable to remove the batteries. Use only AAA batteries. Pay close attention to battery polarity when inserting batteries. Reversing the polarity can cause instrument damage.

Call MISCO for
NIST Traceable
Certified Calibration
440.349.1500

Special Care of Rubber Armor Jacket

If your Palm Abbe is equipped with the optional Rubber Armor Jacket, you must take special care to ensure that any excess sample fluid does not leak down and become trapped between the jacket and instrument body. If this happens, pull the instrument from the Rubber Armor and wipe off the fluid before storing. This precaution is especially significant if the Palm Abbe is stored in the rugged waterproof storage case, since subsequent draining fluid will remain trapped in the case. This is even more important if you are testing hazardous or corrosive fluids that could damage the Palm Abbe or leak onto people or other equipment over time.

Warranty & Service

The warranty for your MISCO Product is included with the original product packaging. You must register your product warranty, within ten days of purchase, by mail or online at www.misco.com/warranty. Additional copies of the warranty and terms of sale are available from this web page as well.

To obtain service for your MISCO product, you must download an RMA form from www.misco.com/rma and then return the product (shipping prepaid), together with the RMA form, to:

MISCO
6275 Cochran Road, Solon, Ohio 44139 (USA)
Attention: Service Department

TIP:
Be Sure to
Complete RMA
Form Before
Sending Units
Back for Repair.

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