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**Refractometer digital NR-101**  
**Refractometer digital NR-151**  
**Código 5901012**  
**Código 5901013**



# Digital Refractometer

# Instruction Manual

## Introduction

Thank you for purchasing this Digital Refractometer. With the user in mind, Digital Refractometers are built from modern designs and, with proper care, this instrument should provide many years of reliable performance. It's recommended this manual be read entirely before using the refractometer for the first time.

## Specifications & Features

- **Large measure range.** 
- High precision.
- Automatic Temperature Compensation ( ATC ).
- **Close ATC function.** 
- **All series of zero calibration function with distilled water. (Include NR111 45.0%-95.0%Brix)** 
- **Measure any solution's refractive index under different temperatures.** 
- Centigrade & Fahrenheit measurements
- Automatic shut off after 3 minutes
- Instantaneous reading
- Battery level display
- **Tolerance limit alarm function.** 
- Stainless steel sample plate
- Operation humidity: lower than 90%.
- Operation sea level: lower than 2000m.
- Operation temperature: 0 ( 32 °F ) - 40 ( 104 °F ).
- Storage temperature: -10 ( 14 °F ) - 50 ( 122 °F ).
- Operating time: more than 5000 times per battery.
- Power supply: 9V Alkaline Battery
- Weight: 900g
- Dimensions: 180mm×100mm×60mm

| Models                    | Type             | Range         | Resolution | Accuracy |
|---------------------------|------------------|---------------|------------|----------|
| NR111                     | BRIX             | 45.0~95.0%    | 0.1%       | ±0.1%    |
|                           | REFRACTIVE INDEX | 1.4098~1.5318 | 0.0001     | ±0.0002  |
| NR151                     | BRIX             | 0.0~95.0%     | 0.1%       | ±0.1%    |
|                           | REFRACTIVE INDEX | 1.3330~1.5318 | 0.0001     | ±0.0002  |
| NR101                     | BRIX             | 0.0~60.0%     | 0.1%       | ±0.1%    |
|                           | SALINITY         | 0.0~28.0%     | 0.1%       | ±0.1%    |
|                           | nD               | 1.3330-1.4419 | 0.0001     | ±0.0002  |
| NR USN                    | USG              | 1.000-1.090   | 0.001      | ±0.001   |
|                           | Serum Protein    | 0.0~12.0      | 0.1        | ±0.1     |
|                           | nD               | 1.3330-1.4098 | 0.0001     | ±0.0002  |
| All Models<br>Temperature |                  | 0-40℃         | 0.1℃       | ±1℃      |
|                           |                  | 32-104°F      | 0.1°F      | ±2°F     |

## Precautions

- This refractometer is an electronic instrument – it can become damaged if dropped or handled in a rough manner.
- The prism is made of optical glass and is susceptible to scratches – do not apply any rough or abrasive material and take care when cleaning the prism.
- After each use, clean the prism & prism assembly with a soft cloth or tissue soaked in water and wipe off with a dry cloth or tissue.
- Do not hold the refractometer under a stream of water from a faucet. Do not splash it with or dip it in water.
- If the surface of the prism becomes coated with an oily solution or similar, it will repel test sample and affect readings. If this occurs, the prism should be cleaned with a weakened detergent or similar solvent.
- Do not leave instrument under direct sunlight or in a vehicle on a sunny day.
- Do not use an instrument unless you have personal knowledge of calibration.

## Automatic Temperature Compensation (ATC)

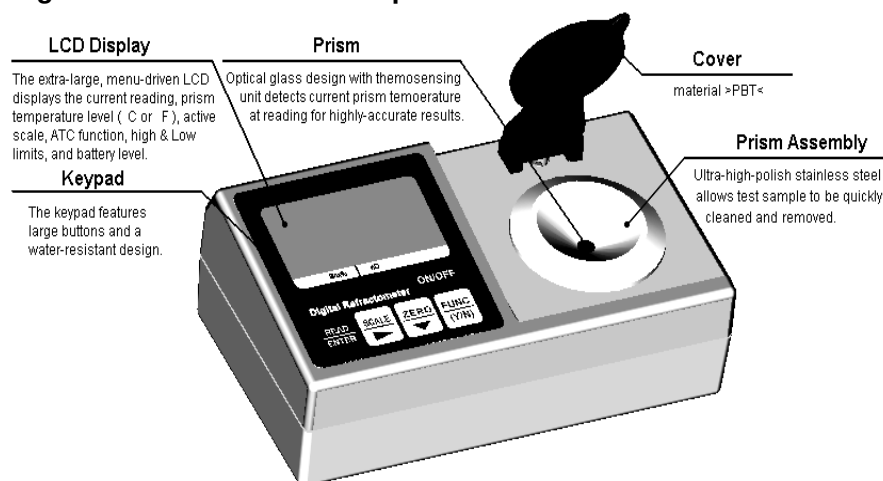
Automatic-temperature-compensation insure that concentration reading of aqueous (water-based) solution will be accurate with respect to the sample's temperature. This digital refractometer is able to automatically correct for differences in the temperature of the sample to a reference temperature, usually 20°C. It is well know 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 with temperature, and the refractive index therefore decreases. Although this thermal effect is small for solids, the change in density for liquids is substantial. For example, the reading for a sucrose solution will change by approximately 0.5 Brix for each 10°F (5°C) change in temperature. So a 10 Brix solution read at 42°C (108°F) would read 8 Brix on a non-temperature compensated instrument. Many hand-held refractometers are not temperature compensated and require the user to manually take temperature measurements and apply a correction. Other hand-held refractometers offer only rudimentary compensation in the range of 18°C (65°F) to 35°C (95°F). This digital refractometer can automatically compensate for temperature differences within the range 5°C to 40°C. For the most accurate possible readings the instrument, the ambient temperature and the fluid should be in equilibrium within this temperature range. When testing a sample with a temperature that deviates a great deal from the temperature of the instrument. It may be necessary to put the instrument and the fluid in the same environment for some time. A good rule is to wait approximately 30 minutes for each 10°F (5°C) difference in temperature in order to conduct measurement after keeping the instrument, fluid to be tested and environment in the same temperature.

## Confirmation of Package

Please confirm the following contents of the package immediately when the Unit is unpacked.

- ▶ Instruction Manual ..... 1
- ▶ bottle of distill water ..... 1
- ▶ battery ( 9 v ) ..... 1
- ▶ Leatheroid carried bag ..... 1
- ▶ burette ..... 1

## Digital Refractometer Components



## Calibration

- Calibration should be performed on a daily basis for optimum results and accuracy. For the best results, perform calibration in a controlled environment of 20 °C (68 °F) using distilled water of the same temperature. It's recommended to allow the instrument and the distilled water to reach temperature equilibrium with the controlled environment before calibration takes place.
- Apply approximately 1.0 ml (or more) of distilled water to the prism surface. Press the ZERO key for 3 seconds. When calibration is complete, "CAL" will be shown on the LCD display. To check the nD value of the zero setting for the distilled water, press the ZERO key, quickly, once. This data can be viewed at any time to show the last calibration value.
- If the distilled water used for calibration falls outside of the acceptable measurement range, the "calibration error" symbol will flash in the lower right section of the LCD. If this occurs, perform calibration again with another sample of distilled water. Repeat until successful and "CAL" is shown on the LCD display.
- When calibration is complete, gently wipe the prism using tissue paper.

## LCD Keypad Components

### Prism Temperature

The current temperature of the prism, Switchable °C/°F.

### ATC Function

The setting of the automatic temperature compensation function, Switchable ON/OFF.

### High Limit

Indicates if the user-defined high-limit setting has been exceeded or if the reading falls outside of the upper limit of the instrument.

### Low limit

Indicates if the user-defined Low-limit setting has been exceeded or if the reading falls outside of the lower limit of the instrument.

### Measurement Value

The large LCD digits display the Brix, nD, or Salinity value. The central 3 digits are used for Brix & Salinity. All 5 digits are used for Refractive Index (nD).

### Scale Indicator

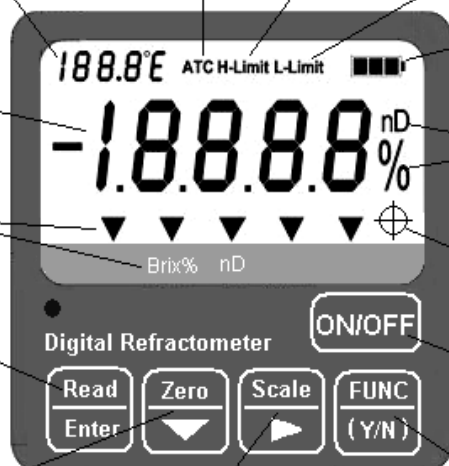
The active scale is indicated by an arrow over the printed scale on the keypad.

### Read/Enter Key

Pressed to perform a reading, Functions as the ENTER key in menu mode.

### Zero/Calibration Key

Pressed to perform a zero calibration, to eliminate accidental calibrations, the key must be pressed for 3 seconds. One quick press displays the nD value of the last calibration.



### Scale Key

Toggles instrument through the Brix, Refractive Index (nD), and Salinity scales.

### Battery Level

The current power level of the installed 9V battery.

### Scale Symbols

The "°" symbol is used for Brix & Salinity Readings, The "nD" symbol is used for Refractive Index Readings.

### Calibration Error

Will Flash if the water used for calibration falls outside of the accepted range.

### ON/OFF Key

Powers the instrument on and off. Auto-off shuts down the instrument after 3 minutes of non-use.

### Function Key

Pressed to enter menu mode. Functions as the Y/N key in limit alarm condition.

## General Use

**MEASUREMENTS:** Apply approximately 1.0 ml (or more) of sample to the prism surface. Press the READ key. Within 1 second, the value is shown on the LCD display. For the best results, gently clean and wipe the prism with distilled water and tissue paper.

**PRISM TEMPERATURE DISPLAY:** The current temperature of the prism is shown in the upper left corner of the LCD display. To toggle between °C and °F, press Func. & Y/N button, until "°C" (or °F) display on the LCD, and press Zero & Setting button to transfer between °C & °F. Press Read & Enter button to confirm temperature display.

**AUTOMATIC TEMPERATURE COMPENSATION:** Press Func. & Y/N button into function option condition until "AtC. Y(or n)" appear on the LCD. Press Zero & Setting button to transfer between "Y" or "n". Press Read & Enter button to confirm your setting. If ATC is active, the ATC indicator will be shown at the top of the LCD display. It's recommended to have the ATC function active for the Brix scale. The effective temperature compensation range is 5 to 35 °C.

**ACTIVE SCALE:** The scales can be switched between Brix, Refractive Index, and Salinity by press the SCALE key until the desired scale is shown by the scale indicator at the bottom section of the LCD display.

**POWER:** The instrument is powered on and off by pressing the ON/OFF key. The battery-saving auto-off function powers the refractometer down after 3 minutes of non-use. The current power level of the installed battery is shown in the upper right corner of the LCD display. When the level drops to less than 3 bars, replace with a new 9V battery.

## Setting High & Low Limits

### Function Description:

Tolerance limit alarm means a range of alarm is set inside the unit, if the measurement results higher or lower than the range, the unit will be in alarm condition (Red alarm light flashes).

#### The lowest limit alarm setting:

- ▶ Press Func. & Y/N button into lowest limit alarm setting condition, LCD will appear "L-Limit", "L.L.Y".
- ▶ Press Read & Enter button into the lowest limit alarm value setting condition, LCD appear "L-Limit" and numbers. "L-Limit" and the digit to be revised will flash.
- ▶ Press Scale & Tab and Zero & Setting buttons to revise the alarm value.
- ▶ Press Read & Enter button to confirm your setting.

#### Close lowest limit of alarm value setting:

- ▶ Press Func. & Y/N button into close lowest limit alarm condition, "L.L.n" (only when the lowest limit alarm has existed.)
- ▶ Press Read & Enter button to confirm, then the lowest limit alarm condition is closed.

#### The highest limit alarm setting:

- ▶ Press Func. & Y/N button into highest limit alarm setting condition, LCD will appear "H-Limit", "H.L.Y".
- ▶ Press Read & Enter button into the highest limit alarm value setting condition, LCD appear "H-Limit" and numbers. "H-Limit" and the digit to be revised will flash.
- ▶ Press Scale & Tab and Zero & Setting buttons to revise the alarm value.
- ▶ Press Read & Enter button to confirm your setting.

#### Close highest limit of alarm value setting:

- ▶ Press Func. & Y/N button into close highest limit alarm condition, "H.L.n" (only when the highest limit alarm has existed.)
- ▶ Press Read & Enter button to confirm, then the highest limit alarm is off.

## ERRATIC READINGS

Many factors can affect consistent result. If readings are falling significantly above and / or below expected values, the battery may need to be replaced or calibration may be necessary. In addition, harsh exterior light may be interfering with how the prism is detecting the sample. If this is suspected, make use of the supplied prism cover by placing the cover over the prism during measurement. Also, some sample may contain suspended solids which can affect the overall repeatability of results. Filtering and thorough mixing these samples before testing typically improves repeatability.