Reichert AR6 *SERIES*

Automatic Refractometer

Reichert®

REICHERT AR6 *SERIES* Refractometers

Instruction Manual

Table of Contents

Explanation of Warning Symbols

⚠ CAUTION: Risk of electric shock

▭ CAUTION: Replace with same type and rating fuse 5x20, .5A T250

⚠ CAUTION: (Refer to accompanying documents)

Please note that a refractometer is a high-precision optical instrument. It is absolutely necessary to properly maintain the refractometer to obtain the best possible accuracy. This includes thoroughly cleaning
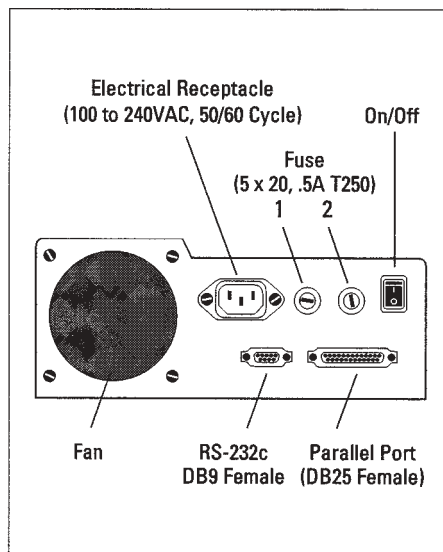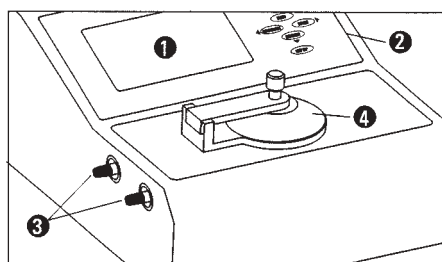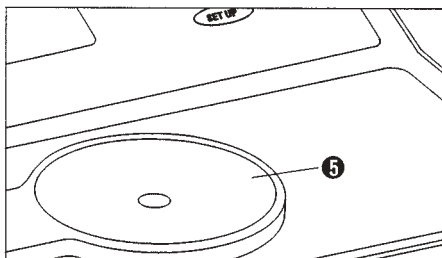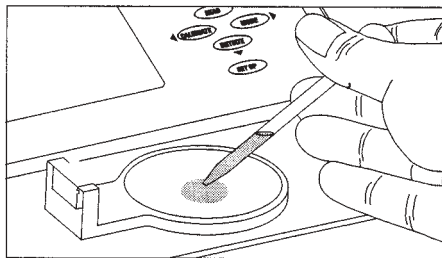

Figure 1

Figure 2

Figure 3

Figure 4

the prism and well after each sample, routinely calibrating the instrument, and replacing the lamp as necessary.

1.0 INTRODUCTION

This manual describes the proper use and operation of the REICHERT AR6 Refractometer. The REICHERT AR6 is an automatic, bench-top refractometer with digital readout It measures % solids (Brix), % solids (Brix) – temperature compensated, refractive index and refractive index –temperature compensated (Sucrose). It can be used for applications in the medical, pharmaceutical, industrial fluids, quality control, chemicals, plastics, petrochemicals and food/beverage industries.

2.0 UNPACKING

Carefully remove the REICHERT AR6 from the packing box. The following accessories have been included with the instrument

- Power cord
- Dust cover - catalog No. 1310500-43
- Instruction manual
- 13K41330 calibration oil

Do not discard the packing materials. If for any reason it becomes necessary to store or ship your REICHERT AR6 Refractometer use the packing materials for protection against damage.

3.0 SET

The REICHERT MODEL AR6 Refractometer requires no assembly. The instrument should be positioned on a bench top. Care should be taken to place the instrument in an environment with a stable temperature (i.e.: away from an air conditioner or water bath exhaust draft) and minimal vibration.

As a safety precaution the power cord has been grounded to the chassis of the instrument. Never use an adapter that may interrupt the protective grounding.

The instrument is equipped with a ventilation entrance in the base and an exhaust fan at the rear, keep these openings free of debris or obstruction.

3.1 Electrical Considerations/ Equipment Ratings

REICHERT AR6 Refractometer incorporates an auto-sensing, switching AC power supply.

IMPORTANT Before attempting to set up and operate the

CAUTION: Risk of electrical shock. Removal of the cover of the REICHERT AR6™ exposes hazardous voltages, which if contacted, could cause injury or death. Please refer servicing to a qualified service technician.

Supply Voltage Range — 100 to 240V AC, 50/60 HZ
Input power - 40W PMAX

REICHERT AR6 allow the instrument to reach a room temperature of at /east 15°C (59°F).

Attach power cord to the electric receptacle on the rear panel of the REICHERT AR6 (see Figure 1). Turn the instrument on by activating the On/Off switch located on the rear panel.

NOTE: The instrument should be allowed to warm up for 15 minutes before operating.

Range of Environmental Conditions:
- Indoor use only
- Temperatures 10°C-45°C
- Max relative humidity-80% for temperatures up to 31°C decreasing linearly to 50% (relative humidity at 40°C)
- Installation category II (overvoltage category)
- Pollution degree 2
- Altitude up to 2,000 meters

3.2 Fuses

For additional safety, all REICHERT AR6 Refracto-meters use two line fuses, both accessible from the rear panel. Replace with 0.5 amp. Time lag (T or Blue).
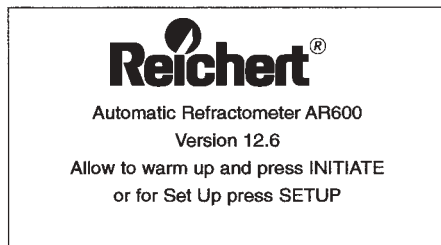
4.0 COMPONENTS

Refer to Figures 2 and 3 to locate the components described below.

1. Instrument Display - The instrument display is positioned on the top panel of the REICHERT AR6. It digitally displays measurement values, error messages and operator instructions.
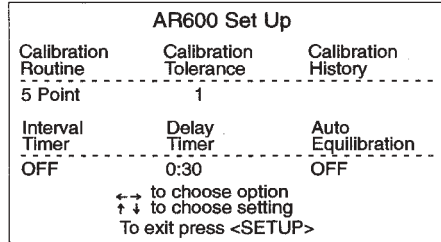
2. Controls - The controls positioned to the right of the instrument display are used to operate the REICHERT AR6. All five controls are soft-touch, membrane keys. They are labeled: INITIATE; MODE; CALIBRATE; READ and SETUP. These controls will be used to take measurements of test samples. The READ, MODE, INITIATE and CALIBRATE keys can also serve a dual function. In the SET UP screen (see section 5.0 OPERAT-ING INSTRUCTIONS) these keys are used to move a cursor. The direction of move-ment is indicated by the arrow near the key.

3. Water Bath Attachment Ports - Two inlet/outlet ports located on the left side of the REICHERT AR6 permit attachment of an optional water bath.
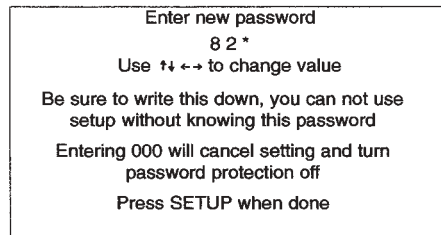
4. Sample Well Cover- The circular, hinged sample well cover is located in the middle of the refractometer's horizontal top panel. It is important that the sample well cover be closed when a measurement is being taken to eliminate or minimize stray light and evaporation effects. Keeping the cover closed when the instrument is not in use will prevent damage and contamination to the sample well and the prism surface.
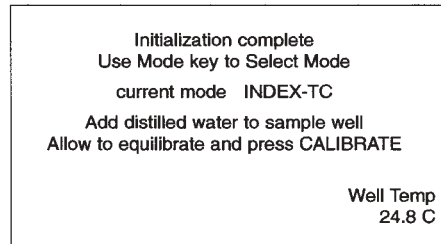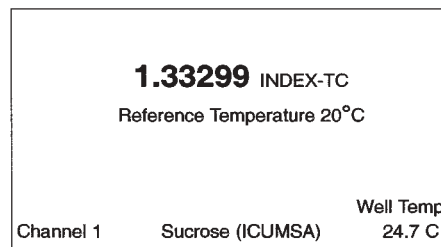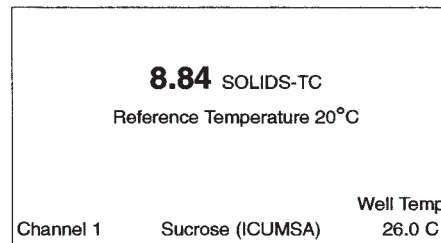

Reichert ®

Automatic Refractometer AR600
Version 12.6
Allow to warm up and press INITIATE
or for Set Up press SETUP

Screen 1

AR600 Set Up

Calibration Routine	Calibration Tolerance	Calibration History
5 Point	1	
Interval Timer	Delay Timer	Auto Equilibration
OFF	0:30	OFF

↔ to choose option
↑ ↓ to choose setting
To exit press <SETUP>

Screen 2

Enter new password
8 2 *
Use ↑↓ ↔ to change value

Be sure to write this down, you can not use setup without knowing this password

Entering 000 will cancel setting and turn password protection off

Press SETUP when done

Screen 3

Initialization complete
Use Mode key to Select Mode

current mode   INDEX-TC

Add distilled water to sample well
Allow to equilibrate and press CALIBRATE

Well Temp
24.8 C

Screen 4

1.33299 INDEX-TC

Reference Temperature 20°C

Well Temp
Channel 1   Sucrose (ICUMSA)   24.7 C

Screen 5

8.84 SOLIDS-TC

Reference Temperature 20°C

Well Temp
Channel 1   Sucrose (ICUMSA)   26.0 C

Screen 6

AR600 Set Up

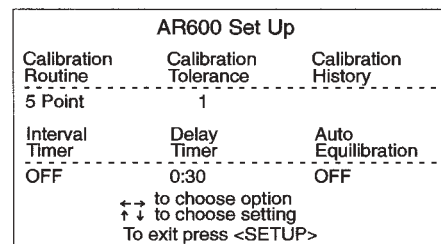| Calibration Routine	Calibration Tolerance	Calibration History
5 Point	1	
Interval Timer	Delay Timer	Auto Equilibration
OFF	0:30	OFF

↔ to choose option
↑ ↓ to choose setting
To exit press <SETUP>

Screen 7

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5. Sample Well - The sample well is made of stainless steel. In the center of the sample well is a sapphire prism surface upon which samples are placed for measurement. It is important that the sample covers the prism surface for an accurate reading.

Control Keys/Functions

1. INITIATE Key - Press this key to initiate the REICHERT AR6 prior to calibrating with water. Remember that the instrument should have reached room temperature before it is initiated.

2. SETUP Key - Press this key to access the Set Up screen for options (Screen 2).

3. MODE Key
- Refractive index (nD)
- Temperature compensated nD as sucrose (Brix) in Channel 1
- % Solids as sucrose (Brix)-Channel 1
- Temperature compensated % Solids as sucrose (Brix) in Channel 1

4. READ Key - Press to obtain readings of a sample.

5. CALIBRATE Key- Press to calibrate the REICHERT AR6.

5.0 OPERATING INSTRUCTIONS

1. Start Up
Plug in the instrument. Make sure the sample well is clean and dry and the cover is in the down position. Turn the instrument "on". The switch is located on the rear panel (see Fig. 1).

If the instrument does not power up, check for loose or blown fuses. Fuses are located on the rear panel. The REICHERT AR6 will prompt you through preliminary initialization and calibration steps. Additionally, a Set Up screen is available to access and change operating parameters.

2. Set Up
When the instrument is first turned on the Reichert Logo and Model number will appear (Screen 1). Also shown is the software version (e.g.: 12.6). This screen instructs the user to "Allow to Warm Up and Press Initiate". Under normal circumstances with the instrument at room temperature a 15 minute warm up is sufficient before pressing the "Initiate" button. Pressing "Initiate" continues the instrument operation sequence. Pressing the "SETUP" button accesses the Set Up screen. Once the instrument's parameters are set correctly the Set Up screen can be bypassed. This screen can also be bypassed if you choose to use the default parameters.

Press "SETUP" to access the Set Up screen (Screen 2).

4

This is the AR6 Set Up screen. Use the right/left arrow keys to select the set up parameter you wish to change. Use the up/down arrows to make the changes. The following is a brief description of the parameters and available options:

Baud Rate
Default 19,200 bps
Sets the baud rate of the RS232C serial port. Options are 1200, 2400, 4800, 9600 and 19200 bps.

Calibrate Routine
Default Setting: 1 point
Selects 1 point 2, 3, 4 or 5 point calibration. The default calibration is a 1 point water, or low refractive index standard calibration. Up to 5 points may be selected. Contact Reichert for additional certified calibration liquids.

Temp Disp
Default Setting: ON
ON - Instrument screen continually shows actual prism temperature. OFF - Temperature is not displayed continually, but shown only when READ or CALIBRATE is pressed.

Channel
Default Setting: Channel 1 (Sucrose)
Options 1-15. Channel 1 is the default "Brix" or International Commission for Uniform Methods of Sugar Analysis sucrose scale. Channels 2-15 are user programmable channels. For directions and an explanation of the necessity of custom channel generation, please request the Technical Bulletin: "Custom Channel Generation for the Automatic Refractometer Line". Be sure to notify the representative that your instrument utilizes software version 12.6.

In Channel 1 the refractive index reading is converted to % Solids as sucrose (Brix) when readings are taken in the % Solids or % Solids - TC (temperature compensated to 20°C) modes. In the refractive index – TC Mode the reading is temperature compensated to a 20°C reading based on the temperature coefficient of sucrose.
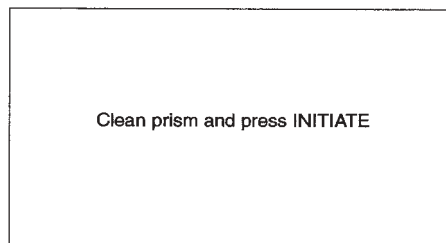
Scans
Default Setting: 128
Sets the number of times the linear array is scanned to take a reading. Options are 8, 16, 32, 64, 128, 256. This number represents the number of times the refractometer actually analyzes the sample every time a "read" is performed. The higher the number of scans, the more precise the result will be. A higher number of scans will require longer to accomplish. Typically 256 scans will take approximately 14 seconds, whereas 8 scans will take 4 seconds. Any time the number of scans is changed, the instrument must be re-initiated and re-calibrated.
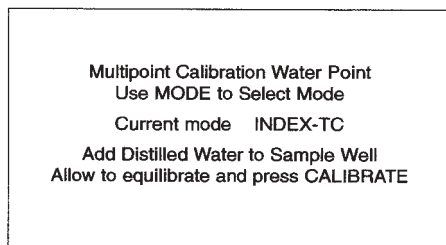
Delay Timer
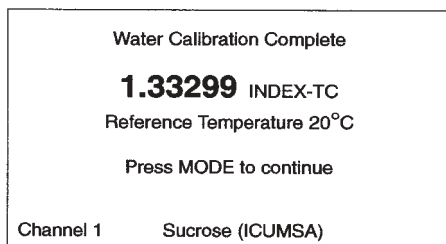*Default Setting: 0 seconds*
Sets a delay timer from the time the "READ" or "CALIBRATE" buttons are pushed until the actual reading is taken. This parameter can be set from 15 seconds to 4 minutes in 15 second intervals. A countdown timer is displayed on screen after pushing the
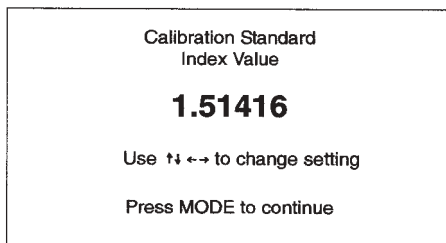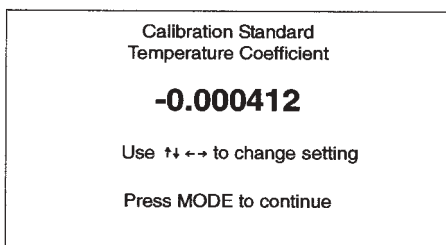

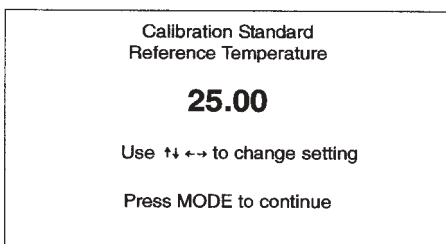Clean prism and press INITIATE

Screen 8

Multipoint Calibration Water Point
Use MODE to Select Mode
Current mode   INDEX-TC

Add Distilled Water to Sample Well
Allow to equilibrate and press CALIBRATE

Screen 9

Water Calibration Complete

1.33299 INDEX-TC

Reference Temperature 20°C

Press MODE to continue

Channel 1   Sucrose (ICUMSA)

Screen 10

Calibration Standard
Index Value

1.51416

Use ↑↓ ←→ to change setting

Press MODE to continue

Screen 11

Calibration Standard
Temperature Coefficient

-0.000412

Use ↑↓ ←→ to change setting

Press MODE to continue

Screen 12

Calibration Standard
Reference Temperature

25.00

Use ↑↓ ←→ to change setting

Press MODE to continue

Screen 13

Add calibration standard
to sample well

Allow to equilibrate

Press CALIBRATE
or MODE to go back
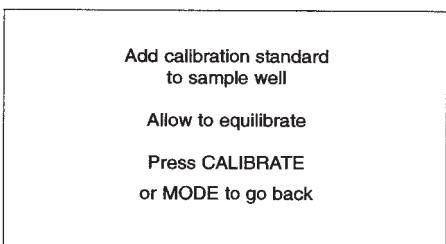
Screen 14

READ or CALIBRATE buttons when this option is used.

Interval Timer
Default Setting: Off
This option allows the instrument to take readings at definable intervals. The interval is set in HH:MM:SS format Once activated and defined, the instrument will continually take readings until a lock-out error occurs such as a lack of sample, or until SETUP is pressed and the option is disabled. The interval timer will begin its countdown to the next reading once the current reading is finished and the result is displayed. This feature is mutually exclusive of the Delay Timer and Auto Equilibration feature.

Auto Equilibration
Default Setting: Off
Auto equilibration is a feature which will automatically detect when the sample and prism have reached a thermal equilibrium state. Thermal equilibrium is essential for accurate measurement of refractive index (and thus % solids). This feature may be set from 1 to 10. This translates into stability of temperature in 0.01 degree increments. A higher number represents a looser tolerance, a lower number represents a tighter tolerance. When this feature is activated and a "READ" is initiated, the instrument will begin monitoring the temperature. A graph will be displayed of the dynamic well temperature. Once the temperature stabilizes, the instrument will automatically take the reading.

Sample Indexing
Default Setting: Off
Sample readings can be easily labeled and numbered. To activate, select the "on" setting and press "set up". A display will feature a section to enter the desired label (alphabetic, numeric, and/or symbols), a section to define reading increments, and an instruction section. Once the labelling scheme is set, follow the instructions to see a preview of the first ten readings. In this screen you will be offered options to see the next 10 labels, re-define the labeling, or exit and begin readings.

Calibration Tolerance
Default Setting: 1
The most common cause of calibration difficulties is the condition of the prism. A refractometer is a high-precision optical instrument Thoroughly clean the prism with soap and water or alcohol, followed by a rinse with distilled water. Wipe dry with a soft tissue or cloth. If you are still having difficulty, increase the value of the calibration tolerance. This will "loosen up" the instrument's tolerance for the calibration standard. It is important to verify that the values of the calibration standards are equivalent to those programmed into the instrument Be aware that every solution has a unique refractive index and

temperature coefficient at a specific reference temperature. Also, note that increasing the magnitude of the calibration tolerance can decrease the accuracy of the instrument This option should be the last choice for calibration difficulty. The calibration tolerance can be set from 1 (representing the most stringent standards, the factory standards used for calibrating with distilled, deionized water and NIST certified calibration solutions) to 50 (the loosest standard).

Invert Display
Default Setting: Off
The display screen may be displayed in either a dark background with light lettering or a light background with dark lettering. Instrument performance is not affected by this feature.

Language
Default Setting: English
Screens can be displayed in English, Spanish, French, or German. Note that the custom channel names and unit definitions will appear as entered in the custom channel program.

Time and Date
The Reichert AR6 can track the clock time in either standard 12 hour am/pm time or military time. The AR6 is Year 2000 complient. The date may be set in Month/Day/Year format

Display Time
Default Setting: Off
Activating this function will display the exact time each reading is taken. This time will remain until another reading is taken.

Restore Defaults
Default Setting: Off
This allows the user to restore all settings to the factory defaults when SETUP is pressed again. This does not erase custom channels or calibration history.
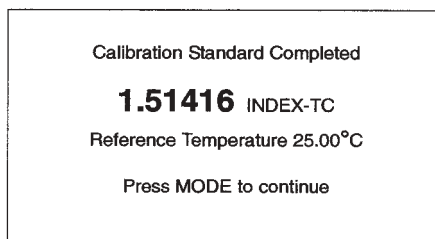
Calibration History
Default Setting: Off
Switching this setting to "on" will display the previous 512 calibrations. Some parameters extend beyond the right hand portion of the display. To see these, simply press the MODE button until the parameter desired is visible. The calibration history may be downloaded to a computer through the serial port by use of a standard communications program and entering the command "calhis".
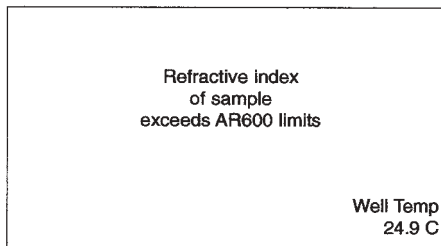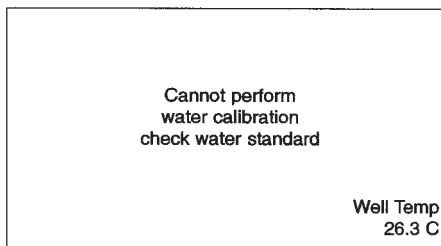
Precision
Default Setting: On
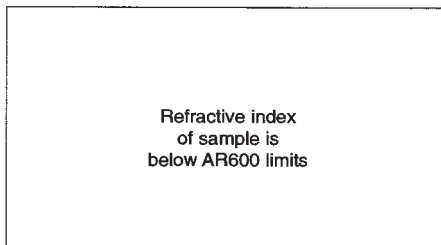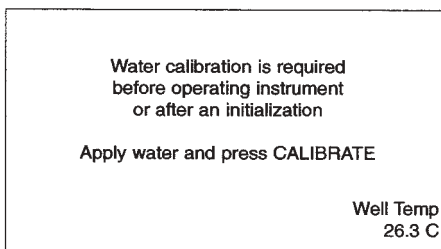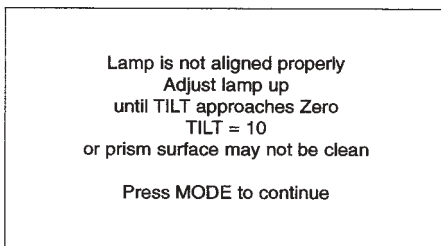ON - Instrument reads refractive index to the 5th decimal place (0.00001) and % Solids to the 2nd decimal place

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```
Calibration Standard Completed
        1.51416  INDEX-TC
 Reference Temperature 25.00°C

     Press MODE to continue
```
Screen 15

```
        Refractive index
          of sample
       exceeds AR600 limits



                         Well Temp
                           24.9 C
```
Screen 16

```
        Cannot perform
       water calibration
      check water standard


                         Well Temp
                           26.3 C
```
Screen 17

```
        Refractive index
         of sample is
       below AR600 limits
```
Screen 18

```
 Water calibration is required
  before operating instrument
     or after an initialization

 Apply water and press CALIBRATE

                         Well Temp
                           26.3 C
```
Screen 19

```
   Lamp is not aligned properly
        Adjust lamp up
    until TILT approaches Zero
           TILT = 10
  or prism surface may not be clean

     Press MODE to continue
```
Screen 20

```
         Replace lamp

   consult instruction manual
```
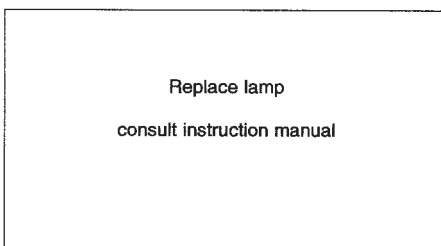*Screen 21*

(0.01). OFF - Instrument reads refractive index to the 4th decimal (0.0001) and % Solids to the 1st decimal (0.1) place.

Password
Default Setting: Off
Password protection can be used to secure options once they are set Turning password ON and pressing SETUP displays the "Enter New Password" screen (see Screen 3). Use the arrow keys to enter a 3 digit numerical password. Entering 000 cancels the setting and turns the password protection off. Press SETUP to exit the "Enter New Password" screen. A second screen confirming your choice of password will appear. Press SETUP to cancel or READ to accept the new password. Once a password is entered the instrument will prompt the user for the password each time the Set Up screen is accessed.

Sound
Default Setting: Off
ON - Chime sounds when key is pressed or a reading or calibration is displayed. OFF - Sound is turned off.

Once all operational parameters have been set using the Set Up screen press SETUP to return to the start screen (Screen 1).

3. Calibration and Sample Reading

NOTE: These instructions assume the sample well is clean and dry prior to starting. The sample well should also be completely cleaned between samples. Clean with distilled water, soapy water, methanol or isopropyl alcohol. Dry with a soft cloth.

These instructions assume the one point calibration (default) was chosen in set up.
See "Multipoint Calibration" for instructions for the multipoint calibration.

From the start screen press INITIATE. The instrument screen will blank and the words "Initiating Please Wait" will appear. During the initiating sequence the lamp brightness is set to an optimum level. When the instrument has finished initiating the "Initialization Complete" screen (screen 4) will appear.

Follow the on screen instructions to add distilled water to the sample well, allow the temperature to equilibrate and press CALIBRATE.

The instrument will display a refractive index reading between 1.33400 (prism temperature of 10°C) and 1.33059 (prism temperature of 40°C). A typical reading would be 1.33299 at a reference temperature of 20°C (see screen 5). Press the SETUP key to exit this screen. At this time the MODE key can be used to display the reading in any of the 4 instrument modes:

Index The non-temperature compensated refractive index reading.

Index-TC: The temperature compensated refractive index reading. For distilled water this value should be 1.33299 ±0.00002.

% Solids: The non-temperature compensated
% Solids scale (% Sucrose or Brix).

% Solids-TC: The temperature compensated
% Solids scale. This reading should be 0.0 (t.02) for distilled water.

Select the mode in which you want to read samples. The AR6 is now ready to read samples.

Clean the prism surface and sample well with distilled water, diluted soapy water or alcohol before applying a sample. Wipe clean with a soft cloth, rinse with distilled water and wipe dry between samples.

CAUTION: The prism surface and sample well must be thoroughly cleaned after each sample is removed. Any residue can affect the accuracy of the readings. Avoid using scented tissue, tissue with lotion, cotton or any other material which may leave a residue on the prism surface when cleaning it.

Place the sample on the prism using a pipette or applicator. Make sure the entire prism surface is covered. Close the cover, allow the sample to come to temperature equilibrium and press READ. The AR6 will display the reading in the chosen mode (see Screen 6).
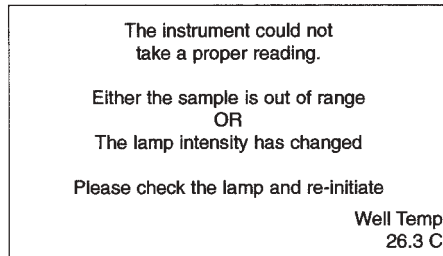
Temperature Effects on Measurements

Measurements taken using refractometry are very sensitive to subtle changes in temperature. Take this into consideration when using the AR6 refractometer. Samples with a significantly different temperature from the prism will take a longer time to equilibrate.

NOTE. If a water bath circulator is attached to the AR6 there may be a difference between the temperatures displayed on the refractometer and that measured in the circulator due to heat loss through the tubing and heat gain from the instrument The temperature indicated on the AR6 should be used if temperature corrections are required.

4. Multipoint Calibration

The AR6 may be calibrated with up to 4 standards plus water. If necessary, the water point may be changed to a low refractive index standard. Once changed, the low refractive index standard will become the default value for the first point of all calibrations. In routine use, a single point (water) or a 2 point calibration (water and a refractive index standard at the high end of the scale) will provide the required

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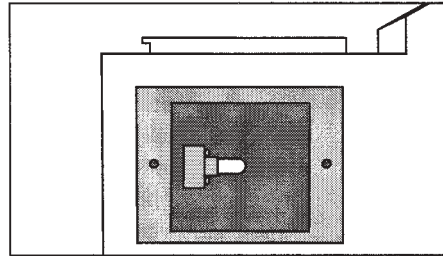The instrument could not
take a proper reading.

Either the sample is out of range
OR
The lamp intensity has changed

Please check the lamp and re-initiate

Well Temp
26.3 C

Screen 22

Figure 5

---

accuracy. A refractive index standard oil (part #13K41330, nD = 1.51416 25°C, temperature coefficient = -0.000412) is included with the instrument. The 3, 4, and 5 point calibrations allow the user to precisely calibrate the instrument to standards near the refractive index range where measurements are being made. To obtain certified standards, contact Reichert Microsystems Inc.

Press the SETUP key (screen 7). Use the right arrow to position the cursor at the calibrate routine position. Use the up arrow to change the calibrate routine to 2, 3, 4 or 5 point. You may also want to set the timer for 15 or 30 seconds to ensure your calibration standards reach thermal equilibrium with the prism. Press SETUP again. Screen 8 will appear.

Clean the prism and press INITIATE. When the initialization is complete the water point screen (9) will appear. At this point, you can choose between doing a % solids or an index calibration (pressing MODE will toggle this). Place your distilled water sample on the prism, allow it to reach thermal equilibrium (unless you set the timer) and press CALIBRATE. If you are using a low refractive index standard for this point, press SETUP and follow the on-screen instructions to enter the refractive index, temperature coefficient, and reference temperature of your standard. The AR6 will take readings until it achieves three consecutive identical readings, or fails to do so in ten tries. A failure will prompt you to clean the prism, re-initialize the unit, and then reapply the sample (the same holds true for all calibration points). A successful calibration will bring up screen 10. At this time, pressing MODE will bring up screen 11.

This unit has the capability to calibrate with 1, 2, 3, 4 or 5 points. Naturally, the more points you use, the more accurate your readings will be. The calibration standards are NOT mutually exclusive; in other words, the points used in a 3 point calibration will all be contained in a 5 point calibration. The following chart should clarify this:

	Water	Std #1	Std #2	Std #3	Std #4
1-Pt Cal	○	●	●	●	●
2-Pt Cal	○	●	●	●	○
3-Pt Cal	○	○	●	●	○
4-Pt Cal	○	○	○	●	○
5-Pt Cal	○	○	○	○	○

○ USED   ● NOT USED

Use the up & down arrow keys to adjust the index (or % Solids) of your calibration standard. Holding the key down will cause the numbers to change faster. When it is correct, press MODE and do the same for the temperature coefficient and then the datum temperature of the standard (screens 12 and 13). You can continue to press MODE to return to index adjustment, etc. When you have the numbers correct, apply the sample, allow to

7

equilibrate, and press CALIBRATE (screen 14). A successful calibration will bring up screen 15. Repeat the procedure for the rest of your calibration standards.

NOTE: *The calibration standards must be sequential.*
In other words, the index of water is <std #1 <std #2 <std #3 <std #4. The AR6 will not sort the standards if you scramble their order, and the accuracy of your readings will diminish.

5.1 Preparing the Prism Surface for Samples

Because a refractometer is an optical instrument, it is critical to thoroughly clean the sample measurement area. Any residue could result in erroneous readings or error messages.
Clean the prism surface and sample well with diluted soapy water or alcohol followed by a distilled water rinse before applying a sample. Wipe clean with a soft cloth.

### 5.2 Applying the Sample, Taking Readings, and Shadowline Display

Place the sample on the prism surface using a pipet or applicator. Make sure the entire prism surface is covered (Figure 4). Optimum readings are obtained if enough sample is placed in the well to cover a millimeter or two of the walls of the sample well.

Close the cover and press the READ key. The REICHERT AR6 will display the reading in the selected mode.

If you change modes before taking a new reading, the instrument will use data from the current reading to produce a new display in the newly selected mode.

For example, if you want a reading in n_D, followed by % Solids using one measurement of the sample, operate the REICHERT AR6 in the n_D mode. Then press the MODE key until % Solids or % Solids-TC registers on the display. A % Solids reading will automatically be displayed. If the READ key is pressed, the AR6 will take an entirely new measurement.
In addition, the instrument now has the ability to graphically display the shadowline via the Linear Scanned Array output. This allows the user to "see what the refractometer sees". This feature may be operated after any reading by pressing the "CALIBRATE" and "MODE" keys simultaneously. The refractometer will then generate and display a graph of the Linear Scanned Array Output.

CCN: 1150   X: 972   Y:24831
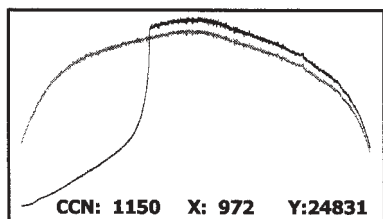
See example below.

Two lines will appear. The rainbow shaped line is the Reference Scan. The line which begins near the bottom of the screen and moves upward to intersect the Reference Scan is the Sample Reference Scan. Also shown will be the "CCN". This is the Crossing Cell Number which is the exact cell on the array which the edge of the shadowline falls on. At this point, a box will be displayed. This box may be repositioned anywhere on the screen. Pressing "SET UP" will zoom in on this boxed area. Pressing "SET UP" again will return to the full graph view. The X and Y values are also displayed. These are simply the location of the box on the screen. The line for the reference scan may be toggled on and off by pressing "READ" and "INITIATE" simultaneously in the full graph display. To exit the shadowline display, press "CALI-BRATE" and "MODE" simultaneously.

6.0 DIAGNOSTICS
The following screens describe potential errors that can occur when operating the AR60O:
"High Sample" screen - The sample has a refractive index exceeding the 1.52000 operating range limit (see Screen 16).
"Low Sample" screen - The sample has a refractive index below the 1.32000 operating range limit (see Screen 18).
"Water Calibration" screen - This screen will be displayed when the READ key is pressed before a water calibration. Clean the prism, calibrate with water and reread the sample (see Screen 19).
"Lamp is not Aligned" screen - This screen may appear if a sample has been left on the prism. Thoroughly clean and dry the prism surface. If the message persists, the lamp may need re-alignment. Note the direction to move the lamp and re-center the lamp. Alignment is done with the instrument running. Use a metal screwdriver to move the lamp due to it's high temperature. Exercise care to avoid breaking the lamp. Wear eye protection in case the lamp shatters. Follow the on screen instruction to initiate and recalibrate the AR6 (see Screen 20).

"Replace Lamp" screen - The lamp is burned out Replace the lamp following instructions in section 11.0 LAMP REPLACEMENT (see screen 21).
"Could Not Take Proper Reading" screen - This screen will be displayed if the lamp intensity has changed since the initialization procedure. This can be caused by normal aging of the lamp or large line voltage fluctuations. Check to be sure the lamp is illuminated, turn the AR60O off and back on, follow the on screen instruction to initiate and calibrate instrument (see Screen 22). If the condition persists change the lamp. If it continues with a new lamp a line voltage conditioner may be required. Alternately, the AR60O

could be plugged into a separate line source, preferably a source without electrical appliances which have large current draws (e.g.: motors, compressors, heaters, etc.).

7.0 CHANNELS
Channel one (1) on the REICHERT AR6 is pre-programmed at the factory with the % Sucrose or «Brix» scale per the International Commission for Uniform Methods of Sugar Analysis (ICUMSA).

Up to 14 additional custom channels may be programmed using your own refractive index/temperature/% Solids data. Access to the channels is from the SET UP screen. Custom channels may also include definitions for units of measure such as specific gravity, % protein, g/ml, etc. The unit of measure labels are completely definable and up to 20 characters can be used. Results may be displayed in as many decimal places as desired.

To learn more about custom channel programming, request «Custom Channel Generation for the Automatic Refractometer Line» from a Reichert representative. Be sure to inform the representative that you are using software version 12.6.

8.0   AUTOMATIC TEMPERATURE COMPENSATION

Automatic Temperature Compensation corrects readings taken over a range of temperatures (e.g.: 10°C – 40°C in channel 1) to a reference temperature reading (usually 20°C). This can be used in lieu of controlling the temperature of the prism and sample with an external water bath. Temperature correction or control is necessary because refractive index varies inversely with temperature. A typical temperature coefficient for an aqueous solution is -0.00021°C. For an organic liquid it is typically -0.0004/°C.

However, it is always necessary to allow your sample temperature to equilibrate so that the AR6 can properly correct for temperature.

The automatic temperature compensation modes in channel 1 are based on the temperature coefficients (n_D 1°C) of sucrose per the ICUMSA scales. When taking readings in the D–TC (refractive index – Temperature Compensated) mode these coefficients

may not be valid depending on the solution.

9.0 WATER BATH ATTACHMENT

There may be testing applications that require that the prism assembly temperature be maintained above or below ambient temperature. Commercial water circulators with heating, cooling or combined capabilities are generally available from instrument supply dealers. Check with your Reichert customer service representative for a suggested list of suppliers.

If a water bath attachment is used, care should be taken to avoid exposing the prism assembly to thermal shock. The ambient prism temperature should be raised and lowered by gradually increasing or decreasing the temperature of the circulating water. The REICHERT AR600's automatic temperature compensation feature is designed to provide precise measurements in the 10^4-45^4C temperature range (Channel 1). Connections between the instrument and the circulator should be 1/4" (.635cm) flexible tubing. Observe the operating instructions of the water bath manufacturer.

10.0 CARE AND CLEANING

The REICHERT AR6 is a precision optical instrument designed for years of trouble-free operation. The interior components are protected from dust, spills and other damage. The stainless steel refractive prism assembly is sealed with corrosion-resistant epoxy.

The use of strong solvents such as N,N-Dimethylformamide or N,N-Nimethylacetamide, cresols, phenols and other taracids should be avoided. Tetrahydrofuran or some lacquer thinners and their components can also deteriorate the prism seal over a long period of time, or when applied at elevated temperatures.

All non-optical components can be cleaned with soap and water or methanol. Avoid using all other harsh solvents or acetone-based products when cleaning.

10.1 Care of Prism Surface

The prism surface should be cleaned immediately after use. The sample should be wiped off with a dry tissue, followed by a thorough cleaning with soap and water or methanol and then distilled water.

The sapphire prism is very hard and has excellent scratch and staining resistance. Strong acids or bases, however, should not be measured with this instrument, nor used as cleaning agents.

Warm water is recommended for removing sugar residues and methanol for oil based samples, followed by a water cleaning. Use only diluted neutral detergents to clean the prism. Do not use any metal or sharp pointed objects to clean or pry loose the prism seal or residue on the sample well.

11.0 LAMP REPLACEMENT

WARNING: *Unplug the instrument power cord before attempting to replace the illuminator lamp.*

Remove the old lamp and replace it with Catalog No. 13105040. The contacts of the bulb must be cleaned with a soft emery cloth before replace-ment Be sure that no fingerprints are left on the surface of the replacement bulb

12.0 RS232C

The REICHERT AR6 refractometer includes a serial communications port accessible from the rear panel. The port has a DB 9-pin female connector. Output data is comma delimited in standard ASCII code and consists of the channel number (e.g.: CH1), the channel identifier (e.g.: Brix for channel 1), the mode (e.g.: % Solids-TC20 for a percent solids scale temperature compensated to 20 degrees centigrade), the actual reading (e.g.:10.62) and the actual measured sample temperature (e.g.: 22.6^2C). This port will support custom channel programming using standard communication Software. Do not use a "Null Modem" cable.

Communications settings are: 8 Data Bits, No Parity, 1 Stop Bit Flow Control Xon/Xoff, Baud Rate settings are described in section 5.2.

The AR6 is capable of being controlled from a computer through the serial port interface by using any standard communications program such as «Terminal» or «Hyperterminal». Reading output through the serial port may be formatted to retrieve virtually any data, in any order desired. To format the serial string output, type the letters «help sf'. Brief instructions will appear. To set the serial format, type the letters «sf' followed by the letters for the output options desired. The default setting is GFA. Numerous additional commands are available through the serial port. Ask a Reichert representative for a complete list of commands.

13.0 PRINTER OUTPUT

The REICHERT AR6 refractometer is compatible with an external printer. The parameters included in the parallel port data output string correspond to the serial port data output string. To select parameters for output, set the serial port output format as in Section 12.0. The output is available at the DB-25P type connector located on the rear panel of the REICHERT AR6 (Figure 1).

Communication is by a 7-bit, parallel bus inter-face with synchronous operation. Contact your Reichert customer service representative for more information about connecting a printer to your REICHERT AR6 refractometer.

14.0 SPECIFICATIONS

Models
AR60
AR600

Illumination
10 Watt Tungsten Halogen with 589nm bandpass filter

Display
5 1/4" X 3" (134mm x 76mm) graphical LCD

Range
Channel 1: Dissolved Solids: 0 to 90% Solids (as sucrose per ICUMSA)

Refractive Index: 1.32000 to 1.52000 nD (nD-Sodium D-Line Refractive Index)

Readability
AR60:   0.1% Solids 0.0001nD
AR600:   0.01% Solids 0.00001nD

Precision*
AR60:   ±0.1 %Solids ±0.0001nD
AR600:   ±0.01 %Solids ±0.00001nD

Refractive Index Standard Oils ±0.00002

Typical clear samples, % Solids Temperature Compensated, as sucrose ±0.02%

Temperature Compensation Range
10°—45°C per ICUMSA tables, Channel 1. User Definable, Channels 2-15

Temperature Compensation Accuracy ±0.1°C

Sample Types
Transparent, Translucent or Opaque

Dimensions
11 1/4'W x 16"L x 6 1/4"H (28.5cm x 40.6cm x 15.9cm)
Net Weight 16 lbs. (7.3kg)

Sample Temperature Control
Heat (cool) exchanger surrounding prism permits temperature control by an external water bath circulator from 10°C-60°C.

Prism Assembly
Stainless Steel, synthetic Sapphire sealed with solvent-resistant epoxy.

Data Output
25 pin parallel port 9 pin RS232C

Baud Rate
1200 to 19,200 user settable

Calibration
1 point
Water or low index standard

2-5 point
Water or low index standard and Refractive Index or Brix standard

Channels
Channel 1: ICUMSA Brix scale
Channels 2-15: User programmable

Sample Scans
8-256 user settable

Read Countdown Timer
0-4 min. adjustable in 15 second intervals

Password
3 digit user settable numeric password

* The precision and accuracy of Refractive Index measurements is dependent on operator skill, the laboratory environment, temperature control, the accuracy of calibration standards, chemical stability of the sample, viscosity of the sample and concentration of the sample. A product demonstration is suggested to validate the true precision and accuracy of these instruments in your laboratory.

15.0 ACCESSORIES

Catalog No. 13106100
Flow cell with temperature control. The flow cell allows samples to be pumped to the prism surface. Typically a peristaltic pump with a flow rate of approximately 10-15 ml./min is used. Use of the flow cell generally increases instrument precision and eliminates errors due to an unclean prism surface. Use of the flow cell also allows the user to pre-temperature equilibrate extremely hot or cold samples. Ports are provided for circulation of a controlled temperature fluid.

Catalog No. 13106200
Funnel Flow Cell with temperature control. This offers the same benefits as the flow cell, but eliminates the need for a pumping device. 13106200 includes the flow cell, funnel, funnel attachment, and tubing.

Catalog No. 13106300
Sample press with temperature control. The sample press creates an enclosed sample volume by contacting the top of sample and the prism well. It is useful for decreasing equilibration times of very viscous or hot or cold samples.

ISO-9001 Certified

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