



REFRACTIX™
DIGITAL REFRACTOMETER
INSTRUCTIONS FOR USE

Scan for additional information and languages:



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Warnings and Cautions

AMETEK Reichert® is not responsible for the safety and reliability of this device when assembly, disassembly, repair, or modification is made by unauthorized dealers or persons, or if device is not used in accordance with its Instructions for Use.

WARNING: An instruction that draws attention to risk of injury or death.

WARNING: Do not repair or service this device without authorization from the manufacturer. Any repair or service to this device must be performed by experienced personnel or dealers who are trained by Reichert or serious injury to the operator may occur.

WARNING: This device should be used in strict accordance with the instructions outlined in this Instructions for Use guide. The safety of the operator and the performance of the device cannot be guaranteed if used in a manner not specified by Reichert.

WARNING: Modifications to this device are not allowed. Any modification to this device must be authorized by Reichert or serious injury to the operator may occur.

WARNING: Do not expose the battery to temperatures below -20°C (-4°F) or above 60°C (140°F) or disassemble the batteries. Damage to this device and/or serious personal injury may result.

WARNING: Rechargeable battery is not user serviceable.

WARNING: The use of accessories or cables other than those specified, with the exception of those sold by the manufacturer as replacement parts for internal components, may result in increased emissions or decreased immunity of the equipment or system.

WARNING: Use of this equipment adjacent to or stacked with other equipment should be avoided because it could result in improper operation. If such use is necessary, this equipment and the other equipment should be observed to verify that they are operating normally.

WARNING: Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of Refractix, including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result.

WARNING: Discard all cotton swabs, wipes, and gauze as required by local & federal regulations.

CAUTION: An instruction that draws attention to the risk of damage to the product.

CAUTION: Do not bump, jar, or drop the device because damage to the electronics may occur. If the device is dropped, carefully inspect the device for damage.

CAUTION: Use of ammonia-based cleaners on the liquid crystal display (LCD) may cause damage to the display. See maintenance section for detailed cleaning instruction.

CAUTION: Do not attempt to sterilize the device or damage to the electronics may occur.

CAUTION: Do not use solvents on any part of this device as damage to the device may occur. See maintenance section for detailed cleaning instructions.

CAUTION: Do not autoclave or disinfect using high temperatures exceeding the recommended temperatures indicated in the specifications section of this manual or damage to the device may occur.

CAUTION: Do not attempt to modify the device or damage to the device may occur.

CAUTION: Do not immerse the device in water.

CAUTION: Electrical Equipment needs special precautions regarding EMC and needs to be installed and put into service according to the EMC information provided in this guide. Portable and Mobile RF communications equipment can affect Electrical Equipment.

CAUTION: Electromagnetic interference from other devices may affect this device. If interference is present, turn off other electronic devices, or remove them from the immediate area while operating this device.

CAUTION: Portable and mobile RF communications equipment can affect Electrical Equipment.

CAUTION: This device is not to be used near high frequency emitting surgical equipment.

CAUTION: Failure to perform quality control verification of this device as recommended may result in unreliable measurements, even if the device is not malfunctioning or damaged.

CAUTION: Perform water zero procedure if the device is dropped.

Symbol Information

The following symbols appear on the device:



Caution



Catalog Number



Serial Number



Date of Manufacture



Manufacturer



Consult Instructions for Use



Fragile Contents in Shipping Container—Handle with Care



Do Not Get Shipping Container Wet



This Side Up



Refer to Instructions for Use



Ingress Protection Rating



Authorization to mark by QPS Evaluation Services, Inc. for electrical safety



Direct current



Class II equipment

Introduction

Congratulations on your purchase of the Reichert® Refractix™ Digital Refractometer. Refractix is designed for Research, Production, and Quality Control personnel and is suitable for use in many industries, including Food and Beverage, Automotive, Veterinary, Pharmaceutical, Industrial, Chemical and Petrochemical.

This Instructions for Use (IFU) is designed as a training and reference manual for operation, maintenance, and troubleshooting. We recommend that you read it carefully prior to use and follow the instructions in the guide to ensure optimum performance of your new device. If used properly, Refractix will provide you with fast, accurate, and reliable measurements.

Please retain this IFU for future reference. The current version of this IFU can be downloaded from the Reichert website. For questions related to Refractix, contact your local authorized Reichert distributor or contact Reichert Technical Support directly at:

Phone: +1 716-686-4500

Toll Free (US Only): 1-888-849-8955

Fax: +1 716-686-4555

Email: reichert.information@ametek.com

Care and Handling

Please note that Refractix is an optical device. To maintain the device, clean the Sample Measurement Surface and the Sample Well after each sample.

Always store the device with the Sample Measurement Surface and Sample Well clean and dry.

Principle of Operation

As a digital refractometer, Refractix has been designed to measure the refractive index of the sample and use that to determine the temperature compensated result in the selected scale.

Temperature Compensation (TC) corrects measurements over a range of temperatures. Samples measured over the temperature range of 10°C to 40°C (50°F to 104°F) are corrected to the reference temperature of the selected scale (typically 20°C).

Temperature Compensation is necessary because refractive index varies inversely with temperature. As the temperature of the sample increases, the refractive index will fall; as the temperature of the sample decreases, the refractive index will rise.

Introduction

Environmental Conditions

Operational Environment

- Indoor and Outdoor Use
- Operating Temperature Range: 10°C to 40°C (50°F to 104°F)
- Maximum Relative Humidity: 80% for temperatures to 31°C (88°F) decreasing linearly to 50% relative humidity at 40°C (104°F)
- Pollution Degree 2
- Altitude up to 2000m

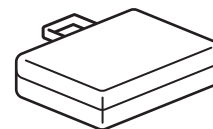
Transport and Storage Environment

- Ambient Temperature Range: -10°C to 55°C (14°F to 131°F)
- Relative Humidity Range: 10% to 95% (non-condensing)
- Atmospheric Pressure Range: 70 kPa to 106 kPa (20.7 in.Hg to 31.3 in.Hg)

Introduction

Unpacking Instructions

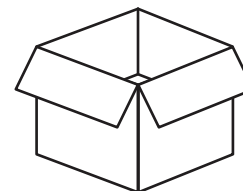
- 1 Retain original packaging to use if future transportation is required.
- 2 Remove the hard plastic clam shell storage case from the cardboard shipping container.
- 3 Remove the power supply, charger, and country-specific electrical plug adapters from the separate cardboard container.
- 4 Remove the following parts from the storage case:
 - Quick Start Guide
 - USB-C cable (when needed)
 - Refractix Digital Refractometer
- 5 Verify that all parts and accessories are included.
- 6 If anything is missing, contact Reichert at the contact information located on the last page of this Instructions for Use.



Storage Case



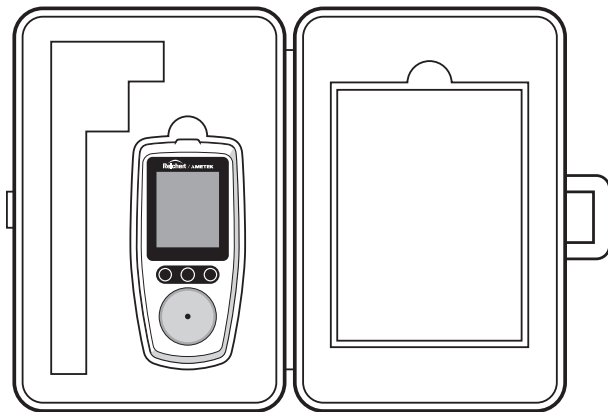
Universal Charging Plug and
International Adapters



Outer Shipping Box

Introduction

In the Case



Storage Case



Quick Start Guide



Warranty Card



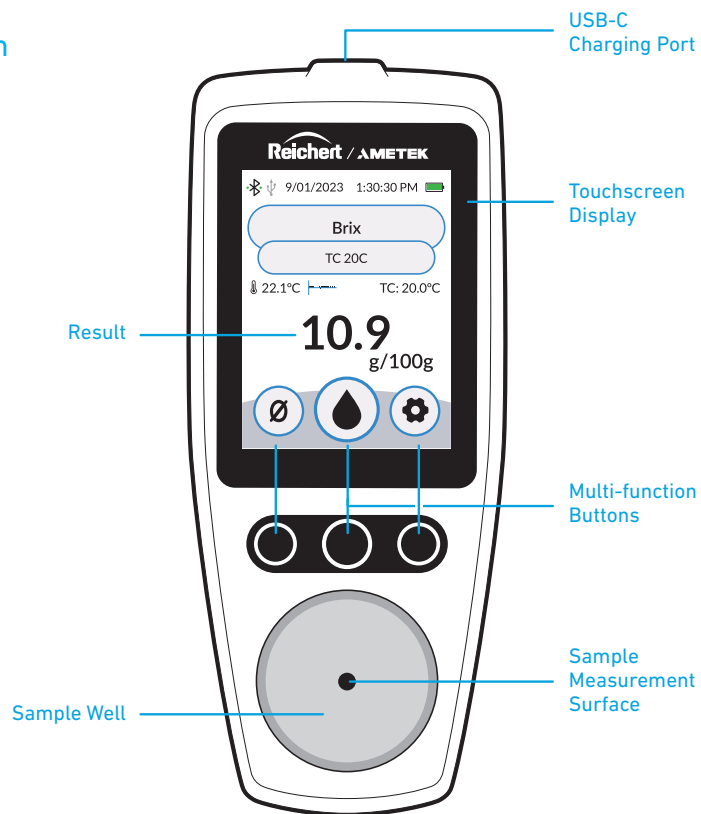
Instructions for Use



USB-C
Charging Cable

Introduction

Refractix Identification



Instructions for Use

Set up

- 1 Place the Refractix on a clean, solid surface in an environment where the temperature is stable.
- 2 Attach the appropriate country-specific plug adapter to the AC adapter. Insert one end of the USB-C Charging Cable into the AC Adapter and the other end into the back of the Refractix.
- 3 Plug the AC Adapter into an AC wall outlet. Allow time for the battery to charge.

- 4 Allow the device time to reach room temperature. This may take up to 30 minutes depending on the temperature difference between room ambient temperature and device temperature.

CAUTION: Keep the device away from heat or air conditioning vents, which can cause drafts and affect the temperature stability.

Multi-function Buttons

Refractix can be operated using either the touchscreen or the three physical buttons below the display. Each physical button performs the same action as the touchscreen button directly above it.

Power On/Off

To power on, press any button.

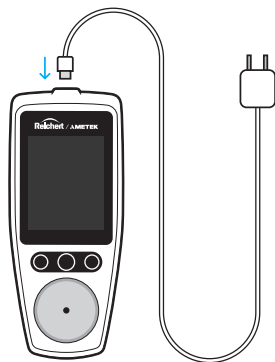
To power off, press and hold the center button for three seconds. After five minutes of inactivity (or one hour when powered by USB), the device will automatically power off.



Instructions for Use

Charging

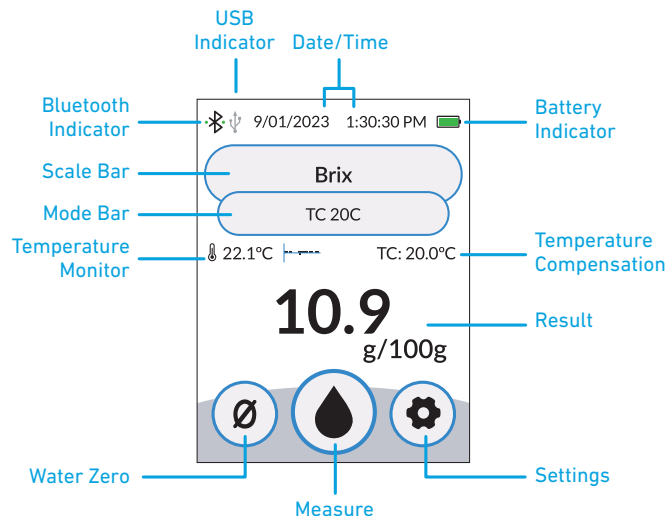
Plug a powered USB-C Charging cable into the USB-C Charging Port on the back of Refractix to charge the device. A charging notification will appear, displaying the current battery charge.



Communication

When connected to a PC via USB or Bluetooth, Refractix can transmit real-time measurements and export its Measurement Log to the RefractixSync PC application. To connect via USB, plug a USB-C cable into the USB-C Charging Port on the back of Refractix and connect the other end of the USB cable to a PC. To connect via Bluetooth, see the Bluetooth Setup section.

Main Screen



Cleaning and Maintenance

WARNING: Failure to clean Sample Measurement Surface and Sample Well completely as described may result in unreliable measurements or error messages. See error message table.

Following each test, Refractix must be thoroughly cleaned and dried as described below.

- 1 Use a clean, dry, residue-free wipe to remove sample from the Sample Measurement Surface and Sample Well. A cotton swab, alcohol wipe, or delicate task wipe can also be used.
- 2 Rinse the Sample Measurement Surface and Sample Well with distilled water, deionized water, or 70% IPA (Isopropyl alcohol).
- 3 Dry the Sample Measurement Surface and Sample Well with a clean, residue-free wipe.
- 4 Check surfaces to be sure that no residual haze is present. If residue is present, re-clean surfaces.

CAUTION: Never immerse device in water.

The silicone protective case can be removed for cleaning. The device housing and display can be cleaned as well.

The following cleaning agents are compatible with Refractix and the silicone protective case:

- Soap and water
- 70% IPA (Isopropyl alcohol)
- Methanol
- 7.5% hydrogen peroxide solution
- 5,000 PPM sodium hypochlorite solution (Clorox, CA)
- Sani-Cloth® Prime Germicidal Wipes (Didecyl Dimethyl Ammonium Chloride, isopropyl alcohol, and ethyl alcohol)
- CaviCide®



Water Zero

The Water Zero procedure should be performed daily. It is recommended to also perform a Water Zero if the device is dropped, after any repair, or when a questionable measurement has occurred.

CAUTION: Failure to perform a Water Zero of this device as recommended may result in unreliable measurements, even if the device is not malfunctioning or damaged.

To access the Water Zero function, press the Water Zero button on the Main Screen.

- 1 Ensure the Sample Well is visually clean, dry, and has no residue. Refer to the Cleaning and Maintenance section if cleaning is needed.
- 2 Dispense distilled or deionized water onto the Sample Measurement Surface. Ensure the entire Sample Measurement Surface is covered and that no air bubbles are present.
- 3 Press the Measure button.
- 4 Wait for the Water Zero process to complete.



If the Temperature Unstable icon is displayed, the device is waiting for the temperature to stabilize before automatically continuing the Water Zero process.

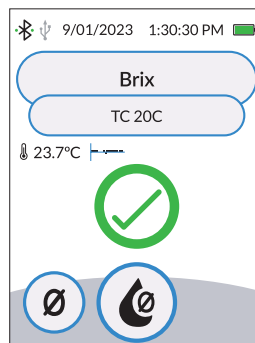


If a green checkmark is displayed, the Water Zero was successful and the device is ready to be used to measure samples.

If an error is displayed, see the Troubleshooting section. Clean the device as directed in the Cleaning and Maintenance section and repeat the Water Zero procedure.

If the Water Zero procedure continues to give an error even after a thorough cleaning, remove the device from service and contact Reichert.

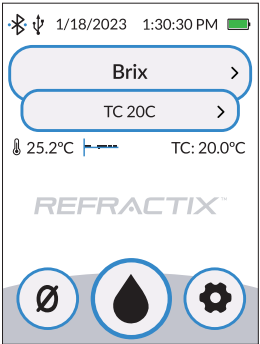
Press the X button to return to the main screen.



Scales

The currently selected scale is shown in the Scale Bar on the main screen. To change the selected scale, press the Scale Bar.

Some scales offer multiple modes (e.g., Brix: TC 20C and TC 25C). If the currently selected scale has modes, the selected Mode will be displayed in the Mode Bar (beneath the Scale Bar). Press the Mode Bar to change the selected Mode.



Below the title bar is the list of scales. Navigate to the desired scale using the arrow buttons or swipe and tap on the touchscreen to select the desired scale. A > icon at the right side of a Scale Menu item indicates that this scale has multiple modes. Selecting a scale with modes will switch to a menu displaying the available modes.

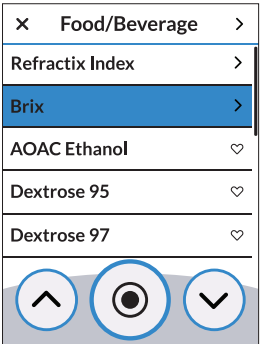
Scale Group

Scales are organized into Scale Groups (see Tables: Scale Groups). From the Scale Group menu, tap to select the desired Scale Group and return to the Scale Menu.



Scale Menu

The Scale Menu displays a list of all available scales in the current Scale Group. The title bar at the top shows the currently selected Scale Group (with a > at the right side indicating that this selection will lead to a new menu). Press this title bar to open the Scale Group menu.



Scales

Favorites

Pressing the Heart icon at the right side of any selectable scale or mode will mark that selection as a Favorite. The scale or mode will be moved to the top of its menu page and will be added to the Favorites scale group.

Selecting the Favorites scale group will display a menu of all scales/modes that have been marked as Favorites. Note: The Favorites scale group will only be available if scales have previously been marked as Favorites.

Custom Products

Selecting the Custom Products scale group will display a menu of Custom Products that have been uploaded to the device from the RefractixSync PC application.

Custom Products provide a simple way to customize Refractix scales to meet the individual needs of any user. Custom Products can use any existing scale and can be named to represent exactly what is being measured. Custom Products can also provide quick and easy Quality Control monitoring by assigning upper and lower limits. Results will be color-coded to indicate whether a measurement falls within the desired range.

See the RefractixSync IFU for details on creating and uploading Custom Products.

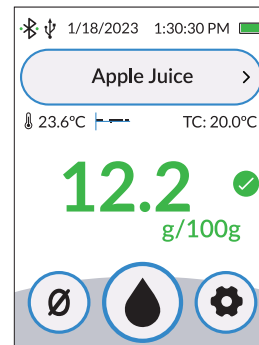


Table: Scales

Name	Units	Min	Max
Animal Serum Protein	g/100mL	0	15
AOAC Ethanol	%	0	50
Battery Electrolyte	S.G.	1	1.4631
Baumé	°Be	0	42.5
Brix: TC 20C	g/100g	0	85
Brix: TC 25C	g/100g	0	85
Dextrose 95	%	0	75
Dextrose 97	%	65	78
Diesel Exhaust Fluid	%	0	45
Ethanol	%	0	80
Ethylene Glycol: Concentration	%	0	60
Ethylene Glycol: Freezing Point	°C or °F	-55	0
Fructose: TC 20C	g/100g	0	85
Fructose: TC 25C	g/100g	0	85
Glucose: TC 20C	g/100g	0	85
Glucose: TC 25C	g/100g	0	85
Glycerine: Concentration	%	0	82
Glycerine: Freezing Point	°C or °F	-46	0
HFCS 42	%	0	75.5
HFCS 55	%	0	80
Honey	% Moisture	10	30
Invert Sugar: TC 20C	g/100g	0	85
Invert Sugar: TC 25C	g/100g	0	85
KMW (Babo)	°KMW	0	65

Name	Units	Min	Max
Methanol: <50%	%	0	50
Methanol: >50%	%	50	100
Refractive Index: Aqueous TC 20C	None	1.3300	1.5600
Refractive Index: Aqueous TC 25C	None	1.3300	1.5600
Refractive Index: Organic TC 20C	None	1.3300	1.5600
Refractive Index: Organic TC 25C	None	1.3300	1.5600
Refractive Index: No TC	None	1.3300	1.5600
Oechsle	°Oe	0	414
Phenol	%	0	100
Plato (Wort)	°P	0	88.4
Propylene Glycol: Concentration	%	0	60
Propylene Glycol: Freezing Point	°C or °F	-60	0
S.G. (Wort)	S.G.	1	1.41471
Sodium Chloride: %	%	0	25.8
Sodium Chloride: PPT	PPT	0	258
Sodium Chloride: SG	S.G.	0	1.197
TAVP 1990	TAVP	0	56.81
Urea	%	0	45
USG Canine	S.G.	1	1.06
USG Feline	S.G.	1	1.09
USG Large Animal	S.G.	1	1.06
Windshield Wash: Ethanol	%	0	80
Windshield Wash: Methanol	%	0	50

Tables: Scale Groups

Automotive
Refractive Index: No TC
Refractive Index: Aqueous TC 20C
Refractive Index: Aqueous TC 25C
Refractive Index: Organic TC 20C
Refractive Index: Organic TC 25C
Battery Electrolyte
Diesel Exhaust Fluid
Ethylene Glycol: Concentration
Ethylene Glycol: Freezing Point
Glycerine: Concentration
Glycerine: Freezing Point
Propylene Glycol: Concentration
Propylene Glycol: Freezing Point
Windshield Wash: Ethanol
Windshield Wash: Methanol

Beer/Wine/Spirits
Refractive Index: No TC
Refractive Index: Aqueous TC 20C
Refractive Index: Aqueous TC 25C
Refractive Index: Organic TC 20C
Refractive Index: Organic TC 25C
Brix: TC 20C
Brix: TC 25C
AOAC Ethanol
Baumé
KMW (Babo)
Oechsle
Plato (Wort)
S.G. (Wort)
TAPV 1990

Chemical
Refractive Index: No TC
Refractive Index: Aqueous TC 20C
Refractive Index: Aqueous TC 25C
Refractive Index: Organic TC 20C
Refractive Index: Organic TC 25C
Brix: TC 20C
Brix: TC 25C
Ethanol
Ethylene Glycol: Concentration
Ethylene Glycol: Freezing Point
Glucose: TC 20C
Glucose: TC 25C
Glycerine: Concentration
Glycerine: Freezing Point
Methanol: <50%
Methanol: >50%
Phenol
Propylene Glycol: Concentration
Propylene Glycol: Freezing Point
Sodium Chloride: %
Sodium Chloride: PPT
Sodium Chloride: SG
Urea

Food/Beverage
Refractive Index: No TC
Refractive Index: Aqueous TC 20C
Refractive Index: Aqueous TC 25C
Refractive Index: Organic TC 20C
Refractive Index: Organic TC 25C
Brix: TC 20C
Brix: TC 25C
AOAC Ethanol
Dextrose 95
Dextrose 97
Fructose: TC 20C
Fructose: TC 25C
Glucose: TC 20C
Glucose: TC 25C
HFCS 42
HFCS 55
Honey
Invert Sugar: TC 20C
Invert Sugar: TC 25C
Sodium Chloride: %
Sodium Chloride: PPT
Sodium Chloride: SG

Veterinary
Refractive Index: No TC
Refractive Index: Aqueous TC 20C
Refractive Index: Aqueous TC 25C
Refractive Index: Organic TC 20C
Refractive Index: Organic TC 25C
Animal Serum Protein
USG Canine
USG Feline
USG Large Animal

Measuring

- 1 Ensure that the Sample Measurement Surface and Sample Well are visually clean, dry, and residue-free. Refer to the Cleaning & Maintenance section below if cleaning is needed.
- 2 Dispense the sample to cover the entire Sample Measurement Surface (center black circle).
- 3 If necessary, wait for the temperature to stabilize.
- 4 Press the Measure button to perform the measurement.



Temperature Monitor

The temperature monitor displays the current temperature of the Sample Well and a graph illustrating how much the temperature is changing. If a hot or cold sample is dispensed onto the sample well, that rate-of-change will increase, and the temperature readout will turn red to alert the user that the temperature is unstable.

To ensure accurate results, it is recommended to wait until the temperature readout is black, indicating the temperature has stabilized, before taking a measurement.



Measuring

Results

When the measurement process is finished, the result will be shown on the display.

12.4
g/100g

Custom Products can provide useful Quality Control monitoring by assigning upper and lower limits for evaluation of measurement results. If the selected scale is a Custom Product with limits, the result will be displayed in green if it falls within the specified limits, or red if it falls outside them.

11.9 ✓
g/100g

13.5 ✗
g/100g

Settings

To access the device settings, press the Settings button on the Main Screen.

Navigating

To use the touchscreen, swipe to scroll through the menu and touch a row to select it.

To use the buttons, press the Up or Down Arrows to scroll through the menu, then press the Select button to enter or change the highlighted setting.

To exit the Settings menu, touch the (x) icon in the upper-left or select the Exit row at the end of the menu.

Scale: Opens the Scale menu. See the Selecting a Scale or Mode section.

Info: The Information screen will display device information, including the device serial number and current software versions.

Measurement Log: The Measurement Log records the last 5,000 measurements/events performed on the device. The Measurement Log can be downloaded to a PC for storage/printing.

Temperature Units: Sets the units used to display temperature values.

°C / °F

×	Settings
Scale	>
Info	>
Measurement Log	>
Temperature Units	°C
Sleep Timer	30s
^ ● v	

Settings

Sleep Timer: Sets the amount of time before the screen dims and the current measurement is removed.

30s / 60s / 90s

To wake up the screen, touch the display. After five minutes of inactivity (or one hour when powered by USB), the device will automatically power off.

Brightness: Sets the screen brightness.

High / Medium / Low

Theme: Sets the color theme.

Dark / Light

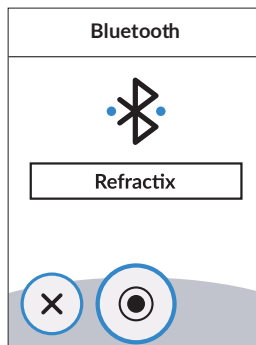
Set Date/Time: Enter the Set Date/Time screen.

To navigate through the date/time fields, either tap to select the desired field or press the Down button to select the next field. Press the (+) and (-) buttons to adjust the selected value. When "Save?" is highlighted, press the (Check) button to save the new date/time or the (X) button to cancel and exit.

Bluetooth: Enter the Bluetooth setup screen. See Bluetooth Setup section for instructions.

Exit: Select this row to exit the Settings menu.

Bluetooth Setup



Press the Select button to turn Bluetooth on or off. The large Bluetooth icon will turn yellow while turning on and then stay lit, indicating Bluetooth is turned on. Colored dots indicate that the device is connected.

When an external device is attempting to pair to the Refractix, this screen will display a Pairing Key to be entered on the external device. See the RefractixSync IFU for instructions on connecting Refractix to the PC application.

Press the X button to exit.

Troubleshooting

The table below provides a guide for troubleshooting some basic Refractix operational problems. If a problem persists after using this guide, contact the Reichert Technical Support Group. Contact information is on the last page of this manual.

SYMPTOM	PROBABLE CAUSE	CORRECTION
Device will not turn on.	Button not pressed.	Press any button.
	Depleted battery in device.	Recharge the battery.
	Mechanical or electronic damage.	Arrange for service through the Reichert Technical Service Group.
Battery will not charge.	Charger is not properly plugged in.	Plug in the Charger, ensuring both ends of the USB Charging Cord are fully inserted into both the Charging Plug and the Refractix.
	Battery is too hot or too cold (higher than 45°C (113°F) or lower than 0°C (32°F)).	Allow battery to either warm up or cool down so it is between 45°C (113°F) and 0°C (32°F) then charge the battery.
	Incorrect voltage to electrical outlet.	Check the voltage to the electrical outlet.
	Device is hotter than 45°C (113°F) or colder than 0°C (32°F).	Allow device to either warm up or cool down so it is between 0°C (32°F) and 45°C (113°F).
	Battery charge is low.	Device will need to have batteries recharged soon.
	Battery has no charge. Device will shut down.	Charge battery. If symbol reappears after charging the battery, contact the Reichert Technical Support Group.

Troubleshooting

SYMPTOM	PROBABLE CAUSE	CORRECTION
 0xXXXXXX	Internal system error.	Device will power off. Restart device. If error occurs again, contact the Reichert Technical Support Group.
	Not enough sample on Sample Measurement Surface.	Dispense sample onto the Sample Measurement Surface.
	Sample Well and/or Sample Measurement Surface is dirty.	Clean and dry the Sample Measurement Surface and Sample Well per Cleaning and Maintenance section.
	Sample Measurement Surface is scratched or stained.	Inspect the Sample Measurement Surface for scratches or stains. If scratches or stains are present, remove the device from service.
	Measurement is outside the displayable range of values.	No action. The properties of the sample are outside the range of the selected scale. Verify that the correct scale and mode are selected. Verify that the correct sample was dispensed onto the Sample Measurement Surface.
	Device requires cleaning and Water Zero.	Perform Water Zero procedure on device.
	Not enough sample on Sample Measurement Surface.	Dispense more sample onto the Sample Measurement Surface.
	Sample Well and/or Sample Measurement Surface is dirty.	Clean and dry the Sample Measurement Surface and Sample Well per Cleaning and Maintenance section.
	Sample Measurement Surface is scratched or stained.	Inspect the Sample Measurement Surface for scratches or stains. If scratches or stains are present, remove the device from service.

Troubleshooting

SYMPTOM	PROBABLE CAUSE	CORRECTION
	Temperature is changing too much.	Wait for the temperature to stabilize. The Water Zero will be performed once temperature is stable.
Inaccurate Measurements.	Device requires cleaning and Water Zero.	Perform Water Zero procedure on device. Perform Quality Control checks to verify device accuracy.
	Mechanical or electronic damage.	Arrange for service through the Reichert Technical Support Group.
	A substance other than distilled water is in the Sample Well.	Clean and dry the Sample Measurement Surface and Sample Well per Cleaning and Maintenance section. Dispense distilled water onto the Sample Measurement Surface. Re-try the Water Zero. If error occurs again, contact the Reichert Technical Support Group.
Any other error	Device requires cleaning and Water Zero.	Clean and dry the Sample Measurement Surface and Sample Well per Cleaning and Maintenance section. Dispense distilled water onto the Sample Measurement Surface. Re-try the Water Zero. If error occurs again, contact the Reichert Technical Support Group.

Specifications

Catalog Number 13910000	
Physical Dimensions	
Size	17.6 cm x 7.3 cm x 4.2 cm (7"x 2.9"x 1.7")
Weight, unpacked	249.5g (8.8 oz.)
Measurement Range	1.3300 – 1.5600 nD
Readability	0.0001 nD
Accuracy	± 0.0001 nD
Temperature Compensation (TC) Range	10°C to 40°C (50°F to 104° F)
Light Source	589 nm LED
Sample Measurement Surface and Sample Well	Sapphire Prism cemented to Stainless Steel Sample Well
Three-Button Operation	Buttons functions are displayed on the touchscreen.
Power	Rechargeable lithium-ion battery. The device is capable of more than 250 readings on a battery charge.
A/C Adaptor Input Voltage	100-240V ~ 50-60Hz 0.32-0.19A
A/C Adaptor Output	5.1V=2.4A 12.24W
Software Revision	The software revision can be found in the Info section of the Settings Menu.

Disposal

This product does not generate any environmentally hazardous residues. At the end of its product life, follow your local laws and ordinances regarding the proper disposal of this equipment.

Regulatory Compliance

Device Regulatory Classification

Insulation Protection: Internally Powered
(3.7 V rechargeable battery) / Class 2
Ingress Protection: IP65
Operation Mode: Continuous

Compliance

Refractix complies with:

USA Compliance

UL 61010-1 (Edition 3.1)
UL standard for safety Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements

CE Compliance

IEC 61010-1:2010 + A1:2016 + COR1:2019 (Edition 3)
Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements

IEC 61326-1:2020 (Edition 3)
Electrical equipment for measurement, control, and laboratory use – EMC requirements – Part 1: General requirements

CISPR 11:2015 + A1:2016 + A2:2019 / EN 55011:2016 + A1:2020
Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement

IEC/EN 61000-3-2:2018 + A1:2020
Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment $\leq 16\text{A}$ per phase)

IEC/EN 61000-3-3:2013 + A1:2017 + A2:2021
Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current $\leq 16\text{A}$ per phase and not subject to conditional connection

Radio Equipment Directive (RED) 2014/53/EU

ETSI EN 300 328:2019-07 Ed. V2.2.2
Wideband transmission systems; Data transmission equipment operating in the 2.4 GHz ISM band and using wide band modulation techniques; Harmonized Standard covering the essential requirements of article 3.2 of Directive 2014/53/EU

ETSI EN 301 489-1:2019-11 Ed. V2.2.3
Electromagnetic Compatibility (EMC) standard for radio equipment and services;
Part 1: Common technical requirements; Harmonized Standard for Electromagnetic Compatibility

ETSI EN 301 489-17:2020-09 Ed. V3.2.4
Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonized Standard for Electromagnetic Compatibility

IEC 62479:2010
Assessment of the compliance of low-power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz)

Australia Compliance

AS/NZS 4268:2017
Radio equipment and systems –
Short range devices – Limits and methods of measurement
Method of compliance per standard above

FCC Compliance

FCC 47 CFR Part 15 Subpart B – Class B Digital Device – Unintentional Radiators

ANSI C63.4:2014
American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage
Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

Regulatory Compliance

IC (INDUSTRY CANADA) Compliance

CSA C22.2 NO 61010-1 3rd Edition

Safety Requirements for Electrical Equipment for measurement, control, and laboratory use – Part 1: General Requirements

ISED ICES-001:2020 Ed. 5

ISED ICES-001, Issue 5 – Industrial, Scientific, and Medical (ISM) Equipment
RSS-102 ISSUE 5

RSS-247 EDITION 2

Compliance is suggested by ISED Canada as CAN ICES-3 (A) / NMB-3 (A)
Method of compliance per each standard above.

Japan Compliance

Low power data communications in the 2.4GHz band - Radio Equipment
Technical Regulations Conformity Certification of Specified Radio equipment
(ordinance of MPT N° 37, 1981)
Certificate No: 201-210665 / 00

FCC Bluetooth RF Transmitter Characteristics

- Contains FCC ID: WAP3072
- Contains IC: CYBLE-343072-02 (AIROC Bluetooth LE Module)
- Frequency 2402-2480 MHz, Spread Spectrum

IC Bluetooth RF Transmitter Characteristics

- License: IC: 7922A-3072
- Frequency 2402-2480 MHz, Spread Spectrum

Japan Bluetooth RF Transmitter Characteristics

- Certification No. 201-210665

FCC/IC Statements

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter, except in accordance with FCC test procedures. This transmitter is considered as mobile device.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

The minimum separation distance to human body is 40 mm. RF exposure or SAR evaluations is not required when the separation distance is 40 mm or more.

Guidance Tables

Guidance and Manufacturer's Declaration – Electromagnetic Emissions / Industrial Electromagnetic Environment

Electromagnetic Emissions

All Industrial, Scientific, and Laboratory Electrical Equipment and Electrical Systems

Refractix is intended for use in the electromagnetic environment specified below. The customer or user of Refractix should ensure that it is used in such an environment.

EMISSIONS TEST	COMPLIANCE	ELECTROMAGNETIC ENVIRONMENT - GUIDANCE -
Conducted and Radiated RF Emissions CISPR 11	Group 1	Refractix uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
Conducted and Radiated RF Emissions CISPR 11	Class B	Refractix is suitable for use in all establishments, including domestic establishments and those directly connected to the public low-voltage power supply network that supplies building for domestic power.
Harmonic Distortion IEC 61000-3-2	Class A	
Voltage Fluctuations and Flicker IEC 61000-3-3	Complies	

Guidance Tables

Guidance and Manufacturer's Declaration – Electromagnetic Immunity / Industrial Electromagnetic Environment

Electromagnetic Immunity

Industrial, Scientific, and Laboratory Electrical Equipment and Electrical Systems

Refractix is suitable for use in electromagnetic environment specified below. The customer or user of Refractix should ensure that it is used in such an environment.

IMMUNITY TEST	IEC 61326-1 TEST LEVEL	COMPLIANCE LEVEL	ELECTROMAGNETIC ENVIRONMENT - GUIDANCE
Electrostatic Discharge IEC 61000-4-2	±4kV Contact ±8kV Air	±4kV Contact ±8kV Air	Floors should be wood, concrete or ceramic tile. If floors are synthetic, the R/H should be at least 30%.
Electrical Fast Transients/ Bursts IEC 61000-4-4	±2kV Mains Power Lines ±1kV I/O Lines 100 kHz repetition frequency	±2kV Mains Power Lines ±1kV I/O Lines 100 kHz repetition frequency	Mains power quality should be that of a typical residential, commercial or hospital environment.
Surges IEC 61000-4-5	±1kV Line-to-line ±2kV Line-to-ground	±1kV Differential Mode N/A Common Mode	Mains power quality should be that of a typical residential, commercial or hospital environment.
Voltage Dips IEC 61000-4-11	0% Ut, 1.0 cycle 40% Ut, 10/12 cycles for 50 Hz and 60 Hz, respectively 70% Ut, 25/30 cycles for 50 Hz and 60 Hz, respectively Single phase: at 0°	0% Ut, 1.0 cycle 40% Ut, 10/12 cycles for 50 Hz and 60 Hz, respectively 70% Ut, 25/30 cycles for 50 Hz and 60 Hz, respectively Single phase: at 0°	Mains power quality should be that of a typical residential, commercial or hospital environment. If the user of Refractix requires continued operation during power mains interruptions, it is recommended that Refractix be powered from an uninterruptible power supply or battery.
Voltage Interruptions IEC 61000-4-11	0% Ut, 250/300 cycles for 50 and 60 Hz, respectively	0% Ut, 250/300 cycles for 50 and 60 Hz, respectively	
Power Frequency 50/60Hz Magnetic Field IEC 61000-4-8	3A/m 50/60 Hz	30A/m 50 Hz or 60 Hz	Power frequency magnetic fields should be that of a typical residential, commercial or hospital environment.

Guidance Tables

Guidance and Manufacturer's Declaration – Electromagnetic Immunity / Industrial Electromagnetic Environment

Electromagnetic Immunity

Industrial, Scientific, and Laboratory Electrical Equipment and Electrical Systems

Refractix is suitable for use in electromagnetic environment specified below. The customer or user of Refractix should ensure that it is used in such an environment.

IMMUNITY TEST	IEC 61326-1 TEST LEVEL	COMPLIANCE LEVEL	ELECTROMAGNETIC ENVIRONMENT - GUIDANCE
Conducted disturbances induced by RF fields IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	(V1) = 3 Vrms 150 kHz to 80 MHz (V2) = 6 Vrms in ISM bands between 150 kHz and 80 MHz 80% AM at 1 kHz	Portable and mobile RF communications equipment should be no closer to any part of Refractix, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended Separation Distance: $d = 3.5/V1(\sqrt{P})$ 150kHz to 80 MHz $d = (10/3)(3.5)/V2(\sqrt{P})$ 150kHz to 80 MHz in ISM bands $d = 3.5/E1(\sqrt{P})$ 80 to 800 MHz $d = 7/E1(\sqrt{P})$ 800 MHz to 6.0 GHz $d = 12/E2(\sqrt{P})$ 80 MHz to 800 MHz $d = 23/E2(\sqrt{P})$ 800 MHz to 1 GHz Where P is the max output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m). Field strengths from fixed transmitters, as determined by an electromagnetic site survey, should be less than the compliance levels in each frequency range. Interference may occur in the vicinity of equipment marked with the following symbol. 
Radiated RF Electromagnetic Fields IEC 61000-4-3	3 V/m 1.4 GHz to 6 GHz 80% AM at 1kHz	(E1) = 3 V/m 1.0 GHz to 6 GHz 80% AM at 1kHz	
	10 V/m 80 MHz to 1 GHz 80% AM at 1kHz	(E2) = 10 V/m 80 MHz to 1 GHz 80% AM at 1kHz	

Note 1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

* Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. The measured field strength in the location in which the ME Equipment or ME System should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the ME Equipment or ME System.

* Over the frequency range 150 kHz to 80 MHz, field strengths should be less than [V1] V/m.

* The ISM (industrial, scientific and medical) bands between 0.15 MHz and 80 MHz are 6,765 MHz to 6,795 MHz; 13,553 MHz to 13,567 MHz; 26,957 MHz to 27,283 MHz; and 40.66 MHz to 40.70 MHz. The amateur radio bands between 0.15 MHz and 80 MHz are 1.8 MHz to 2.0 MHz, 3.5 MHz to 4.0 MHz, 5.3 MHz to 5.4 MHz, 7 MHz to 7.3 MHz, 10.1 MHz to 10.15 MHz, 14 MHz to 14.2 MHz, 18.07 MHz to 18.17 MHz, 21.0 MHz to 21.4 MHz, 24.89 MHz to 24.99 MHz, 28.0 MHz, to 29.7 MHz and 50.0 MHz to 54.0 MHz.

Guidance Tables

Guidance and Manufacturer's Declaration – Electromagnetic Immunity / Industrial Electromagnetic Environment

Recommended Separation Distances between Portable and Mobile RF Communications Equipment for Industrial, Scientific, and Laboratory Equipment and Systems

Recommended Separation Distances between Portable and Mobile RF Communications Equipment and Refractix.

Refractix is intended for use in the electromagnetic environment in which radiated RF disturbances are controlled. The customer or user of Refractix can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF Communications Equipment and Refractix as recommended below, according to the maximum output power of the communications equipment.

Max Output Power of Transmitter (W)	Separation (m) 150 kHz to 80 MHz Outside ISM Bands $d = 1.2(\sqrt{P})$	Separation (m) 150 kHz to 80 MHz In ISM Bands $d = 1.94444(\sqrt{P})$	Separation (m) 80 to 800 MHz $d = 1.2(\sqrt{P})$	Separation (m) 800 MHz to 6 GHz $d = 2.3(\sqrt{P})$
0.01	0.1166	0.1944	0.1166	0.2333
0.1	0.3689	0.6149	0.3689	0.7378
1	1.1666	1.9444	1.1666	2.3333
10	3.6893	6.1489	3.6893	7.3786
100	11.6666	19.4444	11.6666	23.3333

For transmitters rated at a maximum output power not listed above, the recommended separation distance (d) in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

Note 1: At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

Note 3: The compliance levels in the ISM frequency bands between 150 kHz and 80 MHz and in the frequency range 80 MHz to 6.0 GHz are intended to decrease the likelihood that mobile/portable communications equipment could cause interference if it is inadvertently brought into patient areas. For this reason, an additional factor of 10/3 has been incorporated into the formula used in calculating the recommended separation distance for transmitters in these frequency ranges.

Guidance Tables

Guidance and Manufacturer's Declaration – Electromagnetic Immunity / Industrial Electromagnetic Environment

Electromagnetic Immunity

Immunity to Proximity Fields from RF Wireless Communications Equipment

Refractix is intended for use in the electromagnetic environment as specified below related to proximity fields from RF wireless communications equipment.

IMMUNITY TEST: Radiated RF IEC 61000-4-3 Table 9 IEC 60601-1-2 Test Level for IEC 61326-1							Compliance Level	Electromagnetic Environment - Guidance
Test Frequency (MHz)	Band (MHz)	Service (MHz)	Modulation	Maximum Power (W)	Distance (m)	Immunity Test Level (V/m)	Compliance Level	$d = 6/E \sqrt{P}$ where d = Minimum separation distance in meters E = Immunity test level in V/m P = Maximum power in Watts (W)
385	380-390	TETRA 400	Pulse Modulation 18 Hz	1.8	0.3	27	27 V/m	
450	430-470	GMR 460, FRS 460	FM ± 5 kHz deviation 1 kHz sine	2	0.3	28	28 V/m	
710 745 780	704-787	LTE Band 13, 17	Pulse Modulation 217 Hz	0.2	0.3	9	9 V/m	
810 870 930	800-960	GSM 800/900, TETRA 800, iDEN 820, CDMA 850, LTE Band 5	Pulse Modulation 18 Hz	2	0.3	28	28 V/m	
1720 1845 1970	1700-1990	GSM 1800; CDMA 1900; GSM 1900; DECT; LTE Band 1, 3, 4, 25; UMTS	Pulse Modulation 217 Hz	2	0.3	28	28 V/m	
2450	2400-2570	Bluetooth WLAN, 802.11 b/g/n, RFID 2450, LTE Band 7	Pulse Modulation 217 Hz	2	0.3	28	28 V/m	
5240 5500 5785	5100-5800	WLAN 802.11 a/n	Pulse Modulation 217 Hz	0.2	0.3	9	9 V/m	

Warranty

This product is warranted by Reichert, Inc. against defective material and workmanship under normal use for a period of two years from the date of invoice to the original purchaser. (An authorized dealer shall not be considered an original purchaser.) Under this warranty, Reichert's sole obligation is to repair or replace the defective part or product at Reichert's discretion.

This warranty applies to new products and does not apply to a product that has been tampered with, altered in any way, misused, damaged by accident or negligence, or which has had the serial number removed, altered or effaced. Nor shall this warranty be extended to a product installed or operated in a manner not in accordance with the applicable Reichert instruction manual, nor to a product which has been sold, serviced, installed or repaired other than by a Reichert factory, Technical Service Center, or authorized Reichert Dealer.

Lamps, bulbs, charts, cards, batteries, and other expendable items are not covered by this warranty.

All claims under this warranty must be in writing and directed to the Reichert factory, Technical Service Center, or authorized instrument dealer making the original sale and must be accompanied by a copy of the purchaser's invoice.

This warranty is in lieu of all other warranties implied or expressed. All implied warranties of merchantability or fitness for a particular use are hereby disclaimed. No representative or other person is authorized to make any other obligations for Reichert. Reichert shall not be liable for any special, incidental, or consequent damages for any negligence, breach of warranty, strict liability or any other damages resulting from or relating to design, manufacture, sale, use or handling of the product.

PATENT WARRANTY

If notified promptly in writing of any action brought against the purchaser based on a claim that the instrument infringes a U.S. Patent, Reichert will defend such action at its expense and will pay costs and damages awarded in any such action, provided that Reichert shall have sole control of the defense of any such action with information and assistance (at Reichert's expense) for such defense, and of all negotiation for the settlement and compromise thereof.

PRODUCT CHANGES

Reichert reserves the right to make changes in design or to make additions to or improvements in its products without obligation to add such to products previously manufactured.

CLAIMS FOR SHORTAGES

We use extreme care in selection, checking, rechecking and packing to eliminate the possibility of error. If any shipping errors are discovered:

1. Carefully go through the packing materials to be sure nothing was inadvertently over-looked when the unit was unpacked.
2. Call the dealer you purchased the product from and report the shortage. The materials are packed at the factory and none should be missing if the box has never been opened.
3. Claims must be filed within 30 days of purchase.

CLAIMS FOR DAMAGES IN TRANSIT

Our shipping responsibility ceases with the safe delivery in good condition to the transportation company. Claims for loss or damage in transit should be made promptly and directly to the transportation company.

If, upon delivery, the outside of the packing case shows evidence of rough handling or damage, the transportation company's agent should be requested to make a "Received in Bad Order" notation on the delivery receipt. If within 48 hours of delivery, concealed damage is noted upon unpacking the shipment and no exterior evidence of rough handling is apparent, the transportation company should be requested to make out a "Bad Order" report.

This procedure is necessary for the dealer to maintain the right of recovery from the carrier.



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