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Warning: This warns that it may result in serious injury of the patient or the operator if the instructions are not followed properly.

Attention: This alerts the user to the possibility of damage to the equipment, potential injury of the patient or operator, or important points concerning operation and performance.

Warning:
1. Do not use this equipment for anything other than its specified purpose.
2. Before operating this equipment, users are strongly advised to read the manual beforehand.
3. Do not use this equipment in conjunction with an electrical scalpel or on patients who have a pacemaker.
4. This unit must not be connected to or used in combination with any other apparatus or system. It must not be used as an integral component of any other apparatus or system. DiaDent Group International will not be responsible for accidents, equipment damages, bodily injuries or any other problems resulting from ignoring this warning.

Attention:
1. DiaDent will not be responsible for accidents, equipment damages, or bodily injuries resulting from repairs made by any unauthorized personnel by DiaDent Group International.
2. DiaDent will not be responsible for accidents, equipment damages, or bodily injuries resulting from any changes, modifications, or alterations to this unit.
3. DiaDent will not be responsible for accidents, equipment damages, or bodily injuries resulting from the maintenance or repairs using parts or components other than those specified by DiaDent Group International.
4. DiaDent will not be responsible for accidents, equipment damages, or bodily injuries resulting from operating the equipment in ways other than the operating procedures described in this manual or from not following the cautionary remarks and warnings in this manual.
5. DiaDent will not be responsible for accidents, equipment damages, or bodily injuries resulting from poor workplace conditions, environments, or installation conditions such as improper electrical power supply.
6. DiaDent will not be responsible for accidents, equipment damages, or bodily injuries resulting from fires, earthquakes, floods, lightening, natural disasters, or acts of God.
1. INTRODUCTION

NaviRoot is a root canal length measuring device used in dental and endodontic treatment.

2. GENERAL INFORMATION

a) Indication
NaviRoot is designed to calibrate the length of the root canal by using the fluctuations of electrical resistance value for the purpose of removing the necrotizing tissues as a result of the inflammation inside the root canal.

b) Features and Functions
NaviRoot detects the apex location in the tooth. It features a fully automatic calibrator, automatic power off function, a large LCD screen that shows and monitors your progress as the file enters the apex.
3. PRODUCT OVERVIEW

a) Main Unit

1. LCD Indicator
2. ADJ Switch
3. Down Switch(▼)
4. Up Switch(▲)
5. Set Switch
6. Main Power
7. RS232C Connector
8. Cable Connector
b) LCD Indicator

1. Buzzer: Warns with sound that file approached near Apex.
2. Battery Balance Indicator: Indicates remained Battery balance.
3. Curved Bar Scale: Indicates distance to Apex by 0.1mm from 2mm.
4. Left Bar Scale: Indicates distance to Apex by 1mm from 10mm.
5. Apex Indicator: Indicates measured canal length value as set previously.

c) Accessories

1. Cable Assembly: Cable to connect main body to file holder.
2. Lip Clip: Hook-shape terminal to connect to the lip of the patient.
3. Y-shaped Stick – long file holder: Y-shaped stick contact terminal to be used in measuring length of the teeth inside of the mouth.
4. File Holder Assembly: Component to be connected with files in the mouth of the patient by joining with probe connecting terminal.
d) Part Description:

- Main Switch: Main power switch to turn the equipment on and off.
- ADJ Switch: Mode selecting switch for the buzzer volume, battery charger, general mode, or scale position control.
- Down Switch(▼): Decrease the buzzer volume or change the scale from 2 to lower level.
- Up Switch(▲): Increase the buzzer volume or change the scale from 0 to higher level.
- Set Switch: Press to confirm mode set by ADJ switch
- Indicators: Display the setting and the calibrated length of the root canal
- Cable Assembly: Connecting terminal for calibrating the length of the root canal.
- File Holder Assembly: Intermediate connecting holder for the probe to the file
- Y-Shaped Stick – Long File Holder: Intermediate connecting holder for the probe to the file
- Lip Clip: Holder for lips
- RS232C Connector: Serial Port connector to PC

4. TECHNICAL SPECIFICATIONS

<table>
<thead>
<tr>
<th>Product Category:</th>
<th>Root Canal Locator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Name:</td>
<td>NaviRoot</td>
</tr>
<tr>
<td>Rated Current:</td>
<td>DC4.5V (DC1.5 V x 3 “AA” Alkaline batteries)</td>
</tr>
<tr>
<td>Power Consumption:</td>
<td>150 mA ±10%</td>
</tr>
<tr>
<td>Current Consumption:</td>
<td>30 mA ±5 mA</td>
</tr>
<tr>
<td>Calibrated Current:</td>
<td>4.5 μA ± 10%</td>
</tr>
<tr>
<td>Display:</td>
<td>LCD Display</td>
</tr>
<tr>
<td>Dimensions:</td>
<td>W153 x D138 x H44mm</td>
</tr>
<tr>
<td>Weight: approx.</td>
<td>Approx. 420g</td>
</tr>
<tr>
<td>Type:</td>
<td>Internal power BF</td>
</tr>
</tbody>
</table>
5. OPERATING INSTRUCTIONS

A) Preparation
1. Please make sure every switch, when pressed, performs the following functions properly.

- Main Power Switch: The Main Power Switch should turn the device on and off. The light should turn on and off with each press.

- ADJ Switch: The selecting switch for buzzer volume, battery charger, general mode, and APEX positioning mode. Each press should make the cursor blink as it changes from APEX positioning mode, to buzzer mode, and to battery selection mode.

- Up Switch(▲): The switch to increase the buzzer volume or to change the APEX point number to a lower value. Each press increases the volume louder or the number lower.

- Down Switch(▼): The switch to decrease the buzzer volume or to change the APEX point number to a higher value. Each press decreases the volume or the number higher.

- Set Switch: This switch confirms the setting mode as per user selection.

2. Please check the main parts and accessories.
3. Please check if the LCD is displayed properly when the Main Switch is turned on.
4. The main parts should be connected to the Probe, while the opposite terminal should be connected to the File Holder Assembly (or lead tip), and the other terminal to the Lip Clip.
B) How to measure the root canal

After rubber dam is placed, follow these steps:

**Step 1:** Turn the power on after the probe is connected to the File Holder Assembly.

**Step 2:** Place the lip clip on the patient’s mouth.

**Step 3:** Connect the file to the file holder and slowly insert it into the root canal until the measurement reaches 0.5mm.

**Step 4:** Place the rubber marker to the standard position of the tooth and measure the length of the canal.

**Step 5:** Turn the power off. The power will also automatically turn off after 8 minutes of inactivity. It is important to verify the measured figure with a radiograph.

6. ADVANTAGE FEATURES

- NaviRoot can be used in both wet and dry condition.
- Compact size saves counter space.
- Battery power indicator and automatic power off function saves energy and battery life.
- Minute current ensures patient comfort.
- Exact measurement regardless of contamination level.
- Adjustment can be made for selected root canal position.
- Either alkaline or rechargeable batteries can be used.
- The measured figure on the left display shows the distance from the root canal apex. The curved shape on the center of LCD display shows the enlarged image of the area of 2mm from the access of upper root canal. It helps to confirm the minute value measured from the root canal.
7. PRECAUTIONS

1) Notes for Usage
   - Insert the file half way to the canal and then connect it to the file holder. Reading the display should be done as you slowly insert the file into the canal.
   - Inside of the root canal should not be dried before calibration. Irrigate the canal up to the proper level; however, to avoid any electric leakage, it should not be overfilled with liquid.
   - The size of the file should not be too small, but should fit in the canal snugly.
   - The measurement process should not be done only once. To prevent mistakes and errors, the procedure should be done more than twice.
   - The measuring tolerance for NaviRoot is “±0.5mm” and it is within the International Standard.

2) Storage & Maintenance
   - Use a soft cloth and slightly wet it with detergent to clean the unit if it becomes contaminated or dirty.
   - Avoid dropping the device or any activities that will send strong vibration and shocks to the unit as damages will occur.
   - Avoid contact with water.
   - Do not store the device and the instruments in a humid environment.
   - Avoid any contact with chemicals, gas, and any corrosive materials. Immediately remove any foreign material on the tips.
   - Do not expose the unit to the sun.

3) Caution after Installation
   - Make sure the surface is flat when installing the unit.
   - Dropping the device could cause damages and malfunctions.
   - Proper care should be taken.
   - Never leave the unit within the reach of children or let children play with it. Do not immerse unit in water or let water enter the unit as it will cause damages and defects.
4) Caution during Operation

- This unit must only be operated by dentists and other legally license professionals.
- Patients must be under careful observation during the treatment.
- Water, detergent, or alcohol should not remain on the surface of the unit.
- Use proper posture and observe safety precautions to avoid injuries.

5) Cleaning and Sterilization

- The lip clip has to be sterilized before the first use as it is not sterilized in the factory.
- The lip clip should be steam sterilized for at least 10 minutes after each usage at 132 degrees.
- Avoid direct sunlight, temperature and air pressure fluctuation, dust, salt, or sulfur contained air as these factors may damage the unit.

6) Safety Equipment

- During user’s measuring, if too close to apical, alarm will beep continuously to be recognized by user.
- If user approaches apical during measuring of the root canal, bar scale and numbers will indicate details to prevent from apical to be holed.
- When not used: Even if user does not turn off power, after 8 minutes ± 1 minute, power will turn off automatically.
- When examining patient, if user approaches near Apex, buzzer sound will change from short sound to long sound, and this will indicate current position is near measuring point, and Apex indicator will blinking on the Windows, repeatedly.
- During operation, to prevent the case when power voltage becomes too lowered, and cannot continue operation, if battery goes near out, indicator light will blinking repeatedly, and you can change battery and continue using.
8. ACCESSORIES & PART NUMBERS

Maintain the unit by replacing worn-out or broken cords and holders.

1) Lip Clip
2) Cable Assembly
3) File Holder Assembly
4) Y-Shaped Stick – long file holder

9. WARRANTY

We guarantee one(1) year warranty from the date of purchasing date. This warranty is valid only when the product is used properly in compliance with the instructions specified in this user guide. If a defect arises within the warranty period, we will repair the product at no charge, using new or refurbished replacement parts. Or exchange the product with a product that is new or which has been manufactured from new or serviceable used parts and is at least functionally equivalent to the original product.

This warranty does not apply: (a) to damage caused by accident, abuse, misuse, misapplication, or non-our products; (b) to damage caused by service performed by anyone other than us; (c) to a product or a part that has been modified without the written permission; (d) if any our serial number has been removed or defaced; or (e) in case of accessory items (Lip Clip, Cable Assembly, Y-shaped stick, File holder assembly)