

Fully automatic root canal length measuring device



Operation Instructions



<For Safe Operation>

A WARNING

- Do not use this unit in conjunction with an electric scalpel or on patients who have a pacemaker.
- The interconnection or attachment of any devices to the Root ZX which have not been
 The interconnection of attachment use by United States Food and Drug Administration The interconnection or attacting the by United States Food and Drug Administration (FDA) approved or authorized for patient use by United States Food and Drug Administration (FDA) approved or authorized for patients ZX to function improperly or imprecisely and may regulations may cause the Root ZX to function improperly or imprecisely and may regulations may cause the hoor and may compromise patient safety. J. Morita will not be responsible for any injuries caused by the use compromise patient safety. In the use of such devices shall void the use of such devices shall void the warranty on the Root ZX.

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Autoclave Notice



Wash all instruments thoroughly before autoclaving; malfunctions and discoloration can result if all chemicals and foreign debris are not completely removed.

- * It is highly recommended that instruments be autoclaved in a sterilization pouch or similar device.
- * Resin (plastic) instruments are especially subject to discoloration and shape discortions by chemicals and oils and should always be autoclaved separately from instruments see the are used with chemical solutions, oils etc.
- ※ Autoclave and drying temperatures must not exceed 135°C.

Thank you for purchasing the Root ZX, a fully automatic root canal length measuring device. For optimum performance and safety, read this manual thoroughly before using the unit. Keep this manual in a readily accessible place for quick and easy reference.

THIS MANUAL CONTAINS ESSENTIAL SAFETY INFORMATION.

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1. Features

- The Root ZX requires no adjustments or calibrations and can be used whether the canal is dry or filled with strong electrolytes such as blood, hypochlorite, saline etc. The thickness of the file has almost no effect on the measurement.
- Since the position of the file tip and the meter reading are directly related, root canal enlargement can easily be performed while continuously monitoring the length of the canal electrically.
- The meter is an easy-to-read liquid crystal display.
- The position of the file tip is easily determined by the changes in the monitor's audible signals.
- The unit is powered by commonly available "AA" batteries. (Manganese batteries can also be used.) Low power consumption enhances long battery life.
- The file holder and contrary electrode may be autoclaved.

2. Parts Identification



Accessories

Probe (1)	File Holders (3)	Contrary Electrodes (5)
Carline - amonth	(gray)	
Earphone (1)	Batteries (5)	
	("AA")	

3. Specifications

Name	Root ZX
Model	RCM-1
Rating	D.C. 7.5 V (five 1.5 volt "AA" alkali batteries)
Power consumption	0.3 W (maximum)
Measurement Voltage	A.C. 80 mV (maximum)
Measurement Amperes	10 μ A (maximum)
Displays and Indicators	Reflection, Color Liquid Crystal Display Piezoelectric Beeper
Outer dimensions	W96 × D80 × H105 mm
Weight	Approx. 550 g

4. Maintenance

Main Unit : Use a soft cloth with a little neutral detergent to wipe off the display and outside of the enclosure. Rinse the soap off with a damp cloth moistened with water.

[CAUTION]

Do not use surface disinfectants like Gluteraldhyde, Ethanol, or similar chemicals. These chemicals will any leave a residue on the surface distribution of the surface di leave a residue on the main enclosure and cause discoloration and corrosion. If you accidentally spill any of these chemicals on the Root ZX wipe them off immediately with a damp cloth.

Keep the metal end of the file holder free of debris and chemicals.

5. Disinfection & Sterilization

Wipe the probe with a cloth soaked in alcohol.

★ The file holder and contrary electrode may be autoclaved. (Do not autoclave any other parts.)

6. Cautionary Remarks

• Do not use this unit in conjunction with an electric scalpel or on patients who have a pacemaker.

Remove the back cover to install the 5 Batteries. For easy installation, put the negative (Θ) end of the battery in first. Do not reverse the positions of the negative (Θ) and positive (\oplus) ends of the battery.

- ★ Replace the batteries when the bar graph of batteries power indicator gets down to the last two lines. Accurate readings cannot be obtained with batteries which are low on power.
- ★ Never use a mixture of alkali and manganese batteries or of old and new batteries.

Always remove the batteries when the unit is not in use for long periods or during shipping.

Use files and reamers which have plastic (resin) handles.

Always attach the file holder to an upper part of the file near the handle. The metal and plastic parts of the file holder can be damaged if they are attached to the file's cutting part or the transition from round shaft to cutting part.

Make sure the probe plug is securely plugged into its jack. A poor connection can prevent measurement.











Clip the file as shown in the right illustration.

If the file is forced into the position shown in the right illustration, it may not make a correct measurement or the holder could be damaged.

probe, file holder, or saliva ejector clip.

Always take an x-ray to check the results.

Occasionally the meter overreacts as soon as the file touches the inside of the root canal. Please see the enclosed flowchart for an explanation of possible causes of such readings and their solutions.







7. General Explanations

1) Reading the Meter

The position of the file tip is indicated by the meter in the display. The audible alarm will begin to beep slowly when the meter reaches 2.

The bar indicating the apical constriction of the root canal flashes on and off.

The meter's 0.5 reading indicates that the tip of the file is in the vicinity of the apical foramen (i.e., an average of $0.2 \sim 0.3$ mm past the entrance to the apical constriction towards the apex). At this point the picture of the root canal will start flashing and the sound of the alarm will change.

If the file reaches the major foramen (meter reading "0"), the alarm will change to a single, sustained beep and the word "APEX" will begin flashing. The small triangle located at the lower right, which also indicates "'0". will also begin flashing.

The position indicated by the 0.5 reading on the meter is the same for virtually all teeth. When the meter reaches 0.5, its sensitivity increases. The difference between meter readings 0.5 and 1.0 is approximately equivalent to $0.2 \sim 0.5$ mm.







The monitor indicates when the file has entered the apical constriction by the flashing image of the root canal and by the meter; the length of the file inside the canal can then be used as an estimate of the working length of the canal.

The position of the bar indicating the apical constriction of root canal can be moved with the screw on the bottom of the unit. However, it is recommended that this setting not be changed since when the meter reaches 0.5 mm the sensitivity of the unit is at its peak.

The factory setting for the bar is 0.5. The measurement is not changed by moving the bar.



2) Audible Alarm

The volume of the alarm may be adjusted and 3 types of alarm sounds may be selected.

- Adjust the volume of the alarm with the screw on the bottom of the unit. Turn the screw in the direction indicated by the arrow to increase the volume.
- Never turn the sound all the way off.
- Three types of alarm sounds may be selected with the switch located on the bottom of the unit. The selected sound appears in the upper, right part of the display.

	Botto	n	
•]])		/	ALARM
12	3	6	\bigcirc
		Ð	()
 Alarm Typ	e Switch		
Alarm V	olume A	djus	tment Screw

	Sound			
Switch	Display	Near Apex	In Apical Constriction	Passed Apex
	• J] 1	Slow Beeping Single Pitch	Fast Beeping	Continuous Beep
	•))) 2	Slow Beeping Two Pitches	Fast Beeping	Continuous Beep
	•)) 3	Slow Beeping Three Pitches	Fast Beeping	Continuous Beep

When the earphone is plugged into the PHONE jack, the sound of the alarm is audible only through the earphone.

Do not pull on the cord when disconnecting the earphone.



Flashes 🍃

3) Batteries

The Root ZX is powered by 5 "AA" alkali batteries and will operate continuously for approximately 100 hours. (This is the equivalent of 6 to 12 months of normal use.) Manganese batteries may also be used, but they will not last as long as alkali ones.

 \star A bar graph in the upper right hand corner of the display indicates how much power is left in the batteries. Replace all 5 batteries when there are only 2 lines left in the bar graph and an image of a battery appears in the lower left corner of the display.

8. Operation

gray) on the probe.

mouth.

1) Plug the probe into the PROBE jack on the main unit.

Do not pull on the cord when disconnecting the probe.

Probe Connector (white) Plug In Plug in



Contrary Electrode **Probe Connector** (gray)



2) Insert the file holder's plug (gray) into its connector (also

Insert the contrary electrode's plug into its connector on the probe (white) and hook the electrode in the corner of the





- 3) Press the main switch and turn the unit on. Check the display and make sure the apical constriction bar is flashing
 - ★ Attach the file holder to the file only after the main switch has been turned on. (Accurate measurement is not possible if the main switch is turned on after the file holder has been attached to a file already inserted in a tooth.)

Now insert a file into the tooth.



4) Fasten the file holder onto the metal part of the file in the tooth.



5) Insert the file (in most cases size 10) until the meter reads 0.5 mm. Then advance the file with slow clockwise turn until the word " APEX " will begin to flash.

When the apex is reached turn the file with slow counterclockwise turn until meter reads 0.5 mm again.

Since some canals have multiple constrictions it is essential that the file be taken to the apex then returned to the apical constriction to insure that the meter is registering the apical constriction. Position the rubber marker on the surface of the tooth as a reference point to determine the canal's working length.

Note: Read section on Advanced Trouble - Shooting for using advanced techniques to obtain working length.









6) Determine the canal's working length.

The working length of the canal used to calculate the length of the filling material is actually somewhat shorter; find the length of the canal up to the apical seat (i.e., the end point of the filling material) by subtracting 0.5~1.0 mm from the working length indicated by the 0.5 reading on the meter.

- ★ The above estimate of the canal length will differ somewhat depending on the individual tooth and the shape of the canal. This discrepancy must be judged by the dentist as he works on the tooth.
- 7) Press the main switch again to turn the unit off.

※ The unit will automatically turn itself off after 20 minutes if you forget to.

- 8) The Root ZX can be used for purposes other than length determination.
 - Detect file perforation.

In the case of file perforation Root ZX will sound a single sustained beep and word "APEX" will begin flashing.

• Detect post perforation.

In the case of a post perforation the file holder can be connected to a large size file and the file should make contact with the post. In the case of a perforation Root ZX will sound a single sustained beep and the word "APEX" will begin flashing.

★ Clinical judgment, including knowledge of root anatomy, is important when interpreting results for this indication.

9. Trouble



 \times If the above procedures do not solve the problem refer to Advanced Trouble - Shooting.

10. Advanced Trouble - Shooting

This section should be referred to only if all steps in the previous section have been checked.

1) The meter in the display does not move.

- The canal may be calcified.
- The canal may be obstructed by dentin shavings (meter will only react correctly when file passes through apical constriction).
- The inside of canal may be extremely dry. Moisten the canal.
- The canal is exiting the root at sharp right angle (sometimes the canal exits the root at sharp angles and the file is unable to follow the bend). In this case a reading of 1.5 to 2.5 might be seen on the display and the operator will be unable to insert the file any further in the canal. If the file is able to pass the curve Root ZX may sound a single sustained beep and the word " APEX " will begin flashing (the meter display will jump to apex). Retract the file just enough so the single sustained beep stops and the word " APEX " Stops flashing (the meter reading will jump back to 1.5 to 2.5). This is your working length.
- The apex may be surrounded by a pustule. Measurement is sometimes impossible in this case.

2) The meter overreacts as soon as the file touches the inside of the root canal.

- When the canal has an especially large foramen and is filled with an electrolytic solution, the meter often overreacts as soon as the file touches the inside of the root canal, but it will automatically return to normal as the file advances towards the apex.
- The pulp chamber should be clean and dry.
- If the meter still overreacts at the apex, dry some of the electrolytic solution and use a larger file that is closer to the size of the apex.
- measurement cannot be made if a large amount of pulp is left in the canal. Sometimes an accurate
- In cases when the tooth has large amalgam restoration or crown the meter will overreact (the meter may jump if current leaks through a metal prosthesis to the gums or periodontal tissue).
 In this case keep the chamber dry and use a plastic insulating sleeve to prevent the current from grounding out. The insulating sleeve is a plastic or polyvinyl tube which does not allow the current to leak. Slide a 5 6 mm piece onto the file and then insert the file in the canal. This will prevent the current from leaking and will stabilize the meter reading.

3) The meter may give an erroneous reading for the following reasons.

- Retreatment of root canals with silver points.
- Large lateral canals present.
- Incomplete apex.

If the above procedures do not solve the problem check the device's operation by moistening your finger with water and placing the file holder and the opposing electrode about 1 cm apart on it. A consistent meter reading shows that the unit is in proper working order.

Contact your local dealer or our office listed on the back page of this manual if the above procedures do not solve the problem.

11. Replacement Parts List



No.	CODE NO.	DESCRIPTION	NOTE
1	7503660	Probe	
2	7503670	File Holders (gray) (5)	
3	7503680	Contrary Electrodes (5)	
4	7503700	Earphone	

12. Warranty

One Year Limited Warranty

- 1. The manufacturer gives a worldwide guarantee for one year beginning from the date of purchase. Within this period any defect which is due to faulty manufacture or material will be remedied by repair or replacement at the option of the manufacturer or its distributor.
- 2. Warrnaty repair and service: In the event of a claim under this guarantee, the appliance is to be sent to the service facility of the distributor with a short description of the probelm and a copy of the sales receipt from the dealer as proof of purchase and title to warranty.
- 3. In the case of damage caused by wear and tear, careless handling and repairs not carried out by an authorized sevice facility, the warranty ceases to be valid. this guarantee may not form the basis for any claims for damages, in particular not for compensation of consequential damages. The buyer assumes responsibility for damage due to dropping of the unit, improper use and utilization of the product and chemicals other than those stated in this instruction manual for cleaning.
- 4. This warranty does not include the external accessories, file electrode, batteries or tansportation costs.

13. ROOT ZX Check List

◎ Root Canal Length
• The meter's 0.5 reading is the standard for determining the length of the canal.
© Working Length
 The working length of the canal can be estimated as being 0.5~1.0 mm shorter than the canal length indicated by the meter's 0.5 reading.
 The tip of the file has actually passed slightly beyond the apical constriction when the meter reads 0.5.
These general standards differ slightly depending on each individual tooth and canal shape; the dentist should judge each case as he is working on it.
 Take an x-ray to confirm the results.
L

Unusual Results or Problems



II Meter goes off the scale right away. (Imprecise, erratic or short readings.)

Is the crown of the tooth covered with an overflow of blood or chemicals?

Erratic meter behavior may result from blood, chemical etc. overflowing the canal onto the crown or neck and making electrical contact with the gums.



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TROUBLESHOOTING WITH THE ROOT ZX APEX LOCATOR

PROBLEM	POSSIBLE CAUSES
"Instant" reading	•wet pulp chamber
	 file is touching metal crown or filling
No reading	 debris blocking apical opening
	 sudden curvature near apex
Erratic reading	 operator error; don't push and pull file, instead, rotate gently
	 abundance of pulp tissue near apex—remove more pulp tissue
	 sodium hypochlorite surface tension—replace with H₂0
	 electrical current interference; place a small amount of Glyde File Prep gel into canal prior to file insertion





SS152 12/99

ROOT ZXTM APEX LOCATOR

- 1) Turn the Root ZX Apex Locator on—then connect probes.
- 2) Place file in holder and connect lip clip to patient's lip.
- 3) Dry all moisture from pulp chamber.
- 4) Place a small amount of Glyde File Prep[™] gel into canal; this will help prevent erratic readings.
- 5) Advance file with gentle clockwise motion until audible beep is heard (at about Level 2).
- 6) Continue clockwise advancement, noting the meter's movement toward the green bar. When beeps become more rapid, the file is nearing a constriction. Continue advancing slowly until meter's tooth symbol begins flashing, signifying the file has reached a constriction.
- 7) Gently continue advancing until beeping becomes solid or continuous. The file has reached the terminus, or apex. Very delicately continue advancing until the word "APEX" appears on the meter and the red arrow to the right begins flashing. The file tip is now beyond the apex.
- 8) Carefully retract the file counterclockwise until the meter returns to the green bar area, and the tooth symbol begins flashing again. Now the file is at the apical constriction.