

Synopsis of Electronic Apex Locators (Project 08-22) (9/09)

Successful endodontic therapy requires accurate location of the apical foramen and proper working length determination. The traditional method of apex location consists of exposing a radiograph with an endodontic file strategically placed near the apical foramen.

Electronic apex location is an alternative method of apex location. Electronic apex locators use an electrical circuit, traversing through the endodontic canal and the patient's oral tissues, to determine the location of the apical foramen. The earliest models of electronic apex locators were unreliable and caused patient discomfort. It wasn't until the late 1980s that reliable units were introduced which did not cause patient discomfort.

Today, electronic apex locators are commonly used in conjunction with radiographic apex location. Some studies have questioned the accuracy of electronic apex locators,¹ but most have shown electronic apex location to be comparable in accuracy to radiographic apex location.^{2,3} Other studies have shown electronic apex location to be more accurate.^{4,5} Comparisons of different electronic apex locators on the market have demonstrated varying degrees of accuracy.^{2,3,4}

An electronic apex location system consists of a console, a lead that attaches to a file placed into the canal, and another lead that attaches to the patient's lip. With the two leads in place, and with the file at the apex, an electrical circuit can be created, running from one lead to the file, out the apex to the periodontal ligament, through the patient's mucosa to the lip-clip, and back to the console. Since hard tooth structure is a poor electrical conductor the circuit cannot be completed until the file tip reaches the patient's electrolytic tissues at the apical foramen. When the advancing file tip finally reaches the apical foramen the electrical circuit is maximized and recognized by the system, which then notifies the provider through visual means on an LCD or LED screen, and usually with an audio signal.

The earlier single-frequency electronic apex locators were often unreliable when the canal contained fluid, since this allowed generation of a weak electrical current before the apical foramen was reached. The newest generation of apex locators uses technology that is purportedly much less affected by the presence of fluid. A simplified explanation of this technology is that it uses two frequencies and monitors the changes in both as the apex is approached, allowing calculation of the location of the apical foramen. Today's dual frequency electronic apex locators are heavily promoted as no longer being affected by the presence of tissue, blood, electrolytes, etc. Studies seem to indicate this to be true.^{6,7}

Electronic apex locators are small, light-weight, equipment items that can easily be transported from room to room. Most are battery-operated and most have an automatic shut-off function. They all have a display or screen to show the practitioner the approximate distance of the file tip from the apex and to show when the apical foramen is reached. All electronic apex locators in this synopsis have an audio signal to indicate when the foramen is reached. The current trend is to make the units small enough to be placed close to the oral cavity for easy viewing and enhanced ergonomics.

The following [synopsis](#) consists of tables of select electronic apex locators and basic product information listed alphabetically by manufacturer. This synopsis should assist the reader in comparing, contrasting, and purchasing an electronic apex locator.

[Click here](#) to view the electronic apex locators.

References

1. Hoer D, Attin T. The accuracy of electronic working length determination. *Int Endod J* 2004; 37:125–131.
2. DeMoor RJ, Hommez GM, Martens LC, De Boever JG. Accuracy of four electronic apex locators: an in vitro evaluation. *Endod Dent Traumatol* 1999;15:77–82.
3. Lucena-Martin C, Robles-Gijon V, Ferrer-Luque CM, De Mondelo JM. In vitro evaluation of the accuracy of three electronic apex locators. *J Endod* 2004;30:231–233.
4. Kaufman AY, Keila S, Yoshpe M. Accuracy of a new apex locator: an in vitro study. *Int Endod J* 2002;35:186–192.
5. Ounsi HF, Haddad G. In vitro evaluation of the reliability of the Endex electronic apex locator. *J Endod* 1998;24:120–121.
6. Kobayashi C, Suda H. New electronic canal measuring device based on the ratio method. *J Endod* 1994;20:111–114.
7. Meares W, Steiman H. The Influence of sodium hypochlorite irrigation on the accuracy of the Root ZX electronic apex locator. *J Endod* 2002;28:595–598.

Product	PAL (Precision Apex Locator) 	Propex 	Root ZX II 
Manufacturer	BRASSELER USA 1 Brasseler Blvd Savannah, GA 31419 (800) 841-4522 (912) 925-8525 (912) 927-8671 FAX www.brasselerusa.com	DENTSPLY Maillefer 5100 East Skelly Dr, Ste 300 Tulsa, OK 74135 (918) 878-0470 (800) 924-7393 (800) 924-7389 FAX www.maillefer.dentsply.com	J. Morita USA, Inc. 9 Mason Irvine, CA 92618 (800) 566-7482 (949) 581-9600 (949) 465-1095 FAX www.jmoritausa.com
Price Suggested Retail Government	\$970.00 \$598.00	\$899.00 \$528.53	\$999.90 \$950.00
GSA Contract	V797p-3110M	V-797P-3003M	No
Screen Type/Size	LCD/2.5" x 2"	LCD/3.2" x 2.0"	LCD/3" x 4"
Power Supply	4 AAA 1.5V batteries	Rechargeable 3.6V NiMH battery	3 alkaline AA batteries (non-rechargeable)
Automatic Shut-off after Non-use	Yes, after 10 minutes	Yes, after 5 minutes	Yes
Components Included with Unit	Probe, 3 file clips, 3 lip clips, 1 extension cord, tester, and batteries included	12- 24 hour charger, battery, 2 lip clips, 2 connection hooks, measuring cable	Probe, 3 file holders, 5 contrary electrodes (lip clips), tester, 3 AA batteries
Autoclavable Components	File clips, lip clip, extension cord	Lip clips, connection hooks	File holders, contrary electrodes
Warranty	1 year	1 year	1 year
Item Number	5012798U0	670-600	24-5336392
Additional Information	- Audible alarm	- Battery status indicator	- Replaced Root ZX
DECS Evaluation	No	No	No (evaluated predecessor, RootZX)

*The manufacturers provided the data in this table. The listing or omission of a product in the following tables does not imply endorsement, approval, or disapproval by DECS.

Synopsis of Electronic Apex Locators*

Product	TriAuto ZX	APX-21	Miltex Mark VII
			
Manufacturer	J. Morita USA, Inc. 9 Mason Irvine, CA 92618 (800) 566-7482 (949) 581-9600 (949) 465-1095 FAX www.jmoritausa.com	LGE Dental Devices 903 Willowleaf Way Rockville, MD 20854 (877) 298-5186 (240) 403-7186 www.lgedental.com	Miltex, Inc. 589 Davies Dr York, PA 17402 (800) 645-8000 (717) 840-9335 (866) 854-8400 FAX www.miltex.com
Price Suggested Retail Government	\$2,142.00 \$1,850.00	\$1,099.00 \$989.00	\$714.79 Call for government pricing
GSA Contract	No	No	No
Screen Type/Size	LED/0.5" x 2.0"	LCD/3.5" x 1.4"	LED/0.5" x 1.0"
Power Supply	DC 3.6 +/- 1V (NiCd battery pack); Charger – 120 VAC 50/60Hz	4 AA 1.5V batteries	2 lithium batteries
Automatic Shut-off after Non-use	Yes	Yes, after 20 minutes	Yes, after 90 seconds
Components Included with Unit	Handpiece, contra-head, charger, battery, probe, 3 file holders, 5 contrary electrodes, function tester	File clip probe, lip hook electrode, measuring cable, touch probe, 60 ECG electrodes	File clasp, hook, main plug, napkin clasp
Autoclavable Components	File holders, contrary electrodes, contra-head	File clip probe, lip hook electrode	File clasp, hook, main plug, napkin clasp
Warranty	1 year	2 years on unit, 6 months for accessories	2 years
Item Number	24-5316227	"APX-21"	017-23180
Additional Information	- Apex locator and battery-operated endodontic handpiece - Requires Ni-Ti files	- Unit can be ordered with lip hook electrode instead of ECG electrodes	- Can be fastened to patient napkin
DECS Evaluation	Yes	No	No

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Synopsis of Electronic Apex Locators*

Product	Endex	Endex Plus	Formatron D10
			
Manufacturer	Osada, Inc. 8436 West Third St, Ste 695 Los Angeles CA 90048 (800) 426-7232 (323) 651-0711 (323) 651-4691 FAX www.osadausa.com	Osada, Inc. 8436 West Third St, Ste 695 Los Angeles CA 90048 (800) 426-7232 (323) 651-0711 (323) 651-4691 FAX www.osadausa.com	Parkell, Inc. 155 Schmitt Blvd P.O. Box 376 Farmingdale, NY 11735 (800) 243-7446 (631) 249-1134 (631) 249-1242 FAX www.parkell.com
Price Suggested Retail Government	\$740.00 Govt pricing not available	\$850.00 Govt pricing not available	\$549.00 Govt pricing not available
GSA Contract	No	No	No
Screen Type/Size	Color-coded analog needle gauge/1.2" x 2.6"	Color-coded analog needle gauge/1.2" x 2.6"	LED/2.5" x 1.0"
Power Supply	Rechargeable NiCd battery block, 90 minute charger	Rechargeable NiCd battery block, 90 minute charger	9V battery
Automatic Shut-off after Non-use	No	Yes, after 5 minutes	Yes, after approx 5 minutes
Components Included with Unit	2 lip clips, rechargeable battery and charger, main probe cord, file end probe cord	2 lip clips, rechargeable battery, battery charger, main probe cord, file end probe cord, Y-stick	9V battery, wire assembly, gold-plated instrument clip, lip contact assembly, extra lip clip, calibration plug, quick-probe contact
Autoclavable Components	Lip clips, probe end cords	Lip clips, probe end cords	Lip contact assembly, lip clip, cable, and quick-probe contact
Warranty	1 year	1 year	5 years
Item Number	"Endex"	"Endex Plus"	D610
Additional Information	- Manual reset button - Free shipping/accessories for government purchasers - "Red-stripes" file insulation	- Automatic reset - Free shipping/accessories for government purchasers - "Red-stripes" file insulation	- Three month money back trial period
DECS Evaluation	No	No	No

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Synopsis of Electronic Apex Locators*

Product	Elements Apex Locator	Mini Apex Locator
		
Manufacturer	SybronEndo 1717 West Collins Ave Orange, CA 92867 (800) 346-3636 (714) 516-7979 (714) 628-8503 FAX www.sybronendo.com	SybronEndo 1717 West Collins Ave Orange, CA 92867 (800) 346-3636 (714) 516-7979 (714) 628-8503 FAX www.sybronendo.com
Price Suggested Retail Government	\$1,099.00 \$727.03	\$539.00 \$385.78
GSA Contract	V797P-3001M	V797p-300IM
Screen Type/Size	LCD/ 2" x 3"	NA
Power Supply	AC, or rechargeable NiMH battery pack	1 AA 1.5V battery
Automatic Shut-off after Non-use	Yes	Yes
Components Included with Unit	AC adapter, battery pack, patient lead cord, bifurcated probe, file clip, lip clip	Lead wire w/file clip, lead wire for lip hook, lip hook, disposable sleeves
Autoclavable Components	Probe, file clip, patient lead cord	Lead wire, file clip, lip hook
Warranty	1 year	3 years
Item Number	973-0321	973-0280
Additional Information	- Element Diagnostic Unit is also equipped with apex locator/vitality tester - Both units are available w/without satellite feature	Additional Items Available - Mini File adapter - Mini Probe - Long Probe
DECS Evaluation	No	No

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