



The Truth About Digital X-Ray Sensors

A Townie starts a thread to help inform other Townies about intraoral sensor technology

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dhanning

Member Since: 07/08/04

Post: 1 of 55

There is a lot of confusion regarding intraoral sensor technology, so I thought I would start a thread to help educate shoppers.

1. All current-generation sensors use the same general components in an assembly that is essentially a “sandwich.” The components that make up the sandwich are: a) scintillator (the best are cesium iodide)—converts the X-ray photons to light that the sensor can recognize. b) FOP, or fiber-optic plate—filters the light and directs it to the sensor. c) CMOS sensor—pixels are aligned in a grid to absorb the light according to the density of the substance that the photons are penetrating. d) Analog-to-digital convertor—converts the pixel well information to digital information that the computer translates into an X-ray. In the design of this sandwich, some manufacturers (like SuniRay2) have put the A to D converter in a separate module attached to the sensor, while others (e.g., Dexis, E2V) have put all of the components into the head of the sensor.
2. All sensors have some degree of inactive area, because the case that encloses the sensor does not allow edge-to-edge imaging. Some sensors have a little more or a little less inactive area. Having less casing means more active area, but less internal cushioning and more likelihood of a drop on a hard surface causing internal damage. This is a known trade-off in sensor manufacturing because the closer the internal sensor dimensions are to the external case dimensions, the less cushioning can be used to protect the sensor.
3. If you are getting a sensor that terminates in a USB-A connection, then you definitely want to use a 6-inch USB extension to preserve the life of the original USB connector. USB-A, which is the terminating plug on about 80 percent of today’s sensors, has a connect/disconnect life of 1,500 cycles. If you are not using an extension, you will eventually wear out the factory plug. Some manufacturers (e.g., Dexis) do not offer a repair or replacement, so you want to preserve that connection from Day One. Extensions can be purchased on Amazon for less than \$3 each. It will be the best and cheapest way to preserve the life of the sensor.
4. The most common sensor damage, when the sensor looks perfect on the outside, is compression damage to the internal components of the sensor. If you plan on taking occlusal X-rays on kids, make sure that a cotton roll or stick is placed in the molar region so the child cannot bite on the face of the sensor. The sensor face can deflect enough (with biting pressure) to compress the internal components and ruin the sensor. A drop on a hard surface can cause cracking of the FOP or delamination of the internal components. It is imperative that every staff member is aware of the fragile nature of sensors to ensure proper handling.
5. Another common failure point is where the cable meets the sensor. Proper positioning and the use of holders will greatly reduce failures from cable malfunctions. Always make sure that the cable is exiting the mouth without being bitten on. Also, avoid flexing the cable in awkward positions that put undue stress on the cable. Most sensors today have the option for cable replacement, but it is a significant cost. (Also, the sensor needs to be opened up, so there is no guarantee that the cable replacement will not cause other issues.) The best bet is to make sure that every staff member understands correct positioning.
6. In testing many different sensors with a testing phantom designed for objective comparison, I can say that when today’s sensors are properly exposed and filtered, there is not a significant diagnostic difference from one to the next.

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7. Despite there not being a significant difference in design, durability or warranty, there is a significant difference in price. The big supply house sensors (Schein/Dexis and Patterson/Schick 33) are \$10K–12K per sensor. Dental imaging technology companies (Dental TI, XDR, Video Dental, Dental Technology Consultants, Sodium Dental, Masterlink, Sota, ImageWorks and others) sell sensors that average between \$4,900 and \$5,900.
8. There are just a handful of manufacturers that make the sensors and internal components for all the sensors on the market. All sensors manufactured by E2V out of France are the exact same, the exception being the XDR sensor that has a slightly different case design. These sensors are exactly the same (BelSensor Gold, DreamSensor, Clio, QuickRay) with the only difference being the name on the case.
9. Image quality is influenced by many factors, but the three most important are: a) Correct X-ray exposure. Each head should have different settings for anterior and posterior X-rays, and small and large patients. b) Correct and consistent positioning. Maintaining consistent distance as well as a perpendicular relationship, whenever possible, between the beam and the sensor face will give the most consistent results. c) Postprocessing filters to adjust contrast/brightness and sharpness to the preferences of the end user.
10. If you have older AC X-ray heads, you probably will sacrifice a little image quality. Newer DC heads can deliver a more optimal exposure than older heads. If you are in doubt of the quality of your existing heads it is a good idea to get assurance from the vendor before making the investment in the sensors. In general, lower KV works better with digital X-ray because it returns more grayscale information.

These are some of the considerations that I recommend taking into account when “going digital.” I am sure that there will be additional insight from Townies on this topic. ■

4/16/2016

ricklin

Member Since: 08/19/04
Post: 2 of 55

David,
Well-put and 100 percent accurate.

I will add that if you like “sharp” X-rays, employ a little technology that predates most of us here ... long cone. We are all taught to use paralleling technique, à la the XCP instruments supplied with most sensors. (XCP literally stands for eXtension Cone Paralleling.)

In simplest terms, a long cone allows us to work with an X-ray beam that is traveling in a straight line, with minimal divergence. A long cone accomplishes this by blocking out the part of the X-ray beam that is diverging, or spreading out, by using the central portion of the beam.

For those who believe a longer exposure time equals increased patient dose, please refer to your textbooks. The combination of superior collimation and the increased distance from the X-ray tube delivers more dose reduction vs. the increase in exposure time.

X-ray imaging is a chain, and is only as strong as its weakest link. Sensors do not change the “rules” of intraoral imaging. They reduce exposure time, and they eliminate chemical processing. All the other “rules” still apply. ■

4/16/2016

Donatello

Member Since: 04/01/09
Post: 3 of 55

Just talked with some friends about their dissatisfaction with image quality using Dexis versus what they are seeing with Schick. I am also a Dexis user and have been increasingly dissatisfied with image quality, though I use a Nomad and assumed it to be the cause. From this, can I assume that it is our technique, and not Dexis, that is producing the poorer-quality images? ■

4/16/2016

dhanning

Member Since: 07/08/04
Post: 4 of 55

More likely exposure level than technique. Sensors are “dumb” because they cannot adjust for different levels of exposure automatically; they simply absorb the energy that they receive.

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Underexposed = grainy and lack of detail, while overexposed = burn out. The Nomad is 2.3mA while most wall units are 7mA. This means that you should expect a timer level that is about three times higher on a Nomad than a wall unit. This is because mA is directly related to the exposure time or pulse. Try shooting the same shot on a staff member or yourself and keep the position but increase the time in 20 percent increments. I think that you will find that you are currently shooting at too low of levels. ■

4/16/2016

njdent

Member Since: 04/16/05
Post: 11 of 55

Do you advocate placing the 6-inch USB cable on the sensor's USB plug? Or on the computer side? I have laptops that we move around, and had a port go bad because of plugging and unplugging, and flexing of the cable moving the port. In this case, should I get two 6-inch cables, one for each side? ■

5/7/2016

skr RDH

Member Since: 07/21/07
Post: 31 of 55

I also don't get why folks advise sharing sensors between operatories, unless the office is not very busy. Having more sensors means you have plenty of backup if one goes down. We have four ops and four sensors. One in each hygiene, which never get unplugged, a Size 2 in resto ops shared, and a Size 1 shared in all four.

We save a ton of time (= money) because of:

- Never having to walk all over town to pull and dig through a paper chart for X-rays.
- No processing. What does an FMS take 10 minutes' labor just for processing, when the staffer could be billing another \$30 for scaling, polishing, or discussing the restorative treatment with the patient, etc.
- No sorts, no labeling, no mounting and no duplication. Money in the bank there, too.
- Doc can see the images instantly back in her office a moment after it is taken—especially for endo, but also for hygiene recalls, so she ties up less of the hygiene time waiting while doc examines the X-rays in the op.
- Arguably easier to find lesions: Blow them up, sharpen them and adjust contrast, plus you can have multiple clinicians interpreting them at once in different places.
- Get an emergency call after hours; the doc logs in and can read the chart and see the X-rays from home or wherever. Saves a trip in once in a while.
- Doc wants a couple more PA at end of a hygiene check, although time is running tight. This makes it possible to get the PAs faster and patient to comply with booking their appointment (and getting insurance predetermined) on the spot, instead of booking them to come back next week for the PAs.
- Biggest one of all is probably patient education and compliance: You show them the lesions on their X-ray blown up to 10 inches across, and they are just more likely to book treatment. I doubt we'd ever show a patient a film the size of a postage stamp.

I'd say being all-digital saves an hour of time per staffer any given day. Mostly made up by getting more work out of them doing more important things than handwriting and shuffling paper and processing X-rays. ■

5/10/2016

Randy Smith

Member Since: 09/24/04
Post: 33 of 55

Great point! Think about it—if your practice has only one sensor, you are out of business if that fails. Even with more than one, if constantly sharing, you are increasing wear and tear on the sensor and cable, and if you're constantly moving from one part of the office to another, there is a greater risk of dropping or other damage to a sensor. If you have an op with little use, then maybe don't have a separate sensor for that, but each hygiene op should have its own sensor. ■

5/10/2016

I always quote two sensors, sometimes more. It's false economy to try to get by with one. ■

5/10/2016

ricklin

Member Since: 08/19/04
Post: 34 of 55

Why? I've never had more than one and the number of times I need to wait for it is pretty much never. Occasionally I am seeing an emergency patient and I need to wait 3½ minutes for my hygienist to finish taking BWX. No biggie. ■

5/10/2016

RubinsteinDDS

Member Since: 08/15/07
Post: 35 of 55

Mitch, film comes in five sizes. One size does not fit all. Sounds like you are still using film, too. Most offices that "go digital" don't have film or a means to process it. The issue is not so much the film, it's how quickly the processing chemicals go bad. For those who still process film too, one sensor can do the job. ■

5/10/2016

ricklin

Member Since: 08/19/04
Post: 36 of 55

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