how to choose the best digital mammo for your specific imaging needs
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FOR STARTERS
Just like all of its radiographical counterparts, mammography has gone digital. The potential for higher image quality, greater patient comfort, and increased volume have all come along with it. An additional benefit for U.S. users is the avoidance of reimbursement cuts.

What New CMS Cuts Mean for CR Image Processing

SO... Since you seem to be hitting the market for one, the following guide is designed to provide you with key information to:

- Choose the right system for you
- Have confidence in the equipment vendor it comes from
- Build a basic budget for your digital mammo project

Once you’ve covered these topics, you’ll be well on your way to the right equipment for your patients at a fair price for your facility’s budget. Click through to the next page to begin seeing for yourself.
WHICH DIGITAL MAMMO
IS RIGHT FOR ME?
There are a number of considerations to bear in mind when searching for your ideal digital mammography machine. Some of these will be budgetary, others will be relative to technical specifications, and still others will be in the realm of the ownership experience. The first type we just mentioned will have a chapter of its own later on. Right now, we’re going to talk about the last two.

Detector Size

You’ll find two sizes of digital detectors on the digital mammography market: 24cm x 30cm and 18cm x 24cm. The smaller size was released on units like the GE Senographe 2000D and DS and the Siemens Mammatom Novation. Large detectors are found on systems like Hologic’s Selenia line or GE’s later Senographe variant, the Essential.

Both sizes of detector offer excellent image quality and all the throughput and transfer perks of digital radiography in general. The real difference comes in the form of repositioning and radiation dosing.

Many women would have no change in mammogram experience or radiation dose moving from one detector size to another. But, for women with large or particularly dense breasts, a full exam on a small detector system would require repositioning, multiple compressions, and multiple X-ray exposures.

A large detector eliminates the extra time, extra discomfort, and extra radiation involved in this procedure. This also adds an additional throughput increase beyond the one a site can get from going digital to begin with.

Image Resolution

In general, digital technology represents a step forward in image quality from analog systems. Even so, there is a spectrum of image resolution levels within the digital set. One determining factor in resolution is the chemical composition of the detector. Two of the most commonly used compounds in digital mammography are cesium iodide (CsI) and amorphous selenium (α-Se). Each of these compounds is used in one of two image capture methods: indirect and direct X-ray conversion, respectively.
Indirect Conversion

Some older models, such as the GE 2000D or Fischer SenoScan use indirect flat panel detectors made with cesium iodide (CsI). In these detectors, X-rays are converted in a two-step process (Smith). X-ray energy is collected by the CsI and converted into light. The light photons are then converted to electronic signals by a photodiode array. This process is less efficient and results in some light scatter during conversion. This, in turn, can reduce resolution.

Direct Conversion

Later systems like the Hologic Selenia or Siemens Novation use direct flat panel detectors made with amorphous selenium (α-Se). In these detectors, X-rays are converted in a one-step process. The layer of α-Se in the detector absorbs the X-ray energy and converts it to an electronic signal directly (hence the name). Based on the efficiency of direct conversion and its elimination of light scatter (Hashimoto), α-Se detectors are able to offer higher image resolution. The disadvantage of direct conversion systems is their price. The novelty of the technology pushes some α-Se-based systems into a higher price bracket.

In the end, if a system is FDA-approved for use, it is capable of producing diagnostic-quality images. Digital mammography systems using indirect conversion detectors are reliable, affordable, and still used commonly. However, better image quality reduces the likelihood of repeat scans and false positives. If your budget allows for it, you may want to consider purchasing a system on the higher end of the image quality spectrum.

Tech Friendliness

As with the purchase of any kind of equipment, there will always be a certain adjustment period for the techs that will be using it. The time and money involved in training and familiarizing your staff with a new system can be reduced greatly by choosing a manufacturer, model series, or operating system they’ve used before.
Serviceability

Before selecting a system based on technical specifications, be sure to consider the availability of parts and service. It may be helpful to call service organizations in your area and find out which manufacturers’ systems they’re most familiar with. Place some calls with your usual parts vendor as well to check their stock for the system you’re considering. If you prefer to buy your service directly from the manufacturer, contact their service department to find out where the nearest engineer is located.

There are high-quality systems available from a number of companies, but readily available parts and trained service engineers can go a long way in setting one apart from the others.

Looking for Mammography Parts?

Upgradeability

If you are looking for a lower-cost 2D digital mammography option, but are interested in being able to upgrade your unit in the field with 3D tomo features down the road, consider the following: GE Essentials can be purchased on the secondary market and are upgradable (by GE) for around $100,000 - $125,000. Hologic Selenias, on the other hand, are not upgradeable. You would need to find a Hologic Dimension 2D upgradeable unit to be able to obtain a field upgrade to 3D tomo. If this option sounds appealing, be aware these systems are in short supply.

Browse All Mammography Systems for Sale
HOW CAN I BE SURE I’M GETTING A GOOD SYSTEM?
As we said in our C-Arm Buyer’s Guide, “The basic principle of vendor homework can be summed up in five words: Don’t be afraid to ask!” This idea holds true for digital mammography machines - especially if you are considering refurbished mammography. A vendor who has their refurbishment program in order should be able to tell you everything you want to know about the process they use.

Ask for a List of Refurbishment Steps

If you are working with an ISO certified vendor, this will be a document that they have on hand. Below is a list of Block Imaging’s mammography machine refurbishment procedures. Quality refurbishment programs will have a similar checklist as well:

- **Decontaminate: remove biohazards**
  Block Imaging performs internal and external cleaning plus dust removal and fully decontaminates the system.

- **Stage Mammo: set up the unit for functional testing, examine and identify components needing repair or replacement**
  This involves an initial evaluation report including mechanical performance, tube performance, and QA phantom test scans for image quality.

- **Cosmetic Reconditioning: restore original body**
  Covers are prepped for painting and dents and scratches are filled and sanded. The system is completely repainted and damaged decals, keypad overlays, and logos are replaced.

- **Component Replacement: repair or replace damaged components**
  Any components that fail functional testing are removed and repaired or replaced.

- **Calibration: ensure mammo is performing at or above OEM quality standards**
  Technical calibration is completed per OEM-specified procedures.

See a Video Example of a Refurbished Mammo System
Ask About Support

Make sure your vendor has the infrastructure to support you after your system installs. If you were to experience failure of a major system component, would your vendor have a replacement in stock? Would they be able to write the check that would get you up and running again? Could they source the part you need on short notice? Even on the used market replacement prices can be steep. Used digital detectors fall in the $25,000 to $70,000 price range. Depending on the age of your system, X-ray tubes can cost $6,000 - $20,000. These are big figures that a “mom-and-pop” organization might have difficulty swinging on short notice.

Ask for Documentation

Before your newly-refurbished system leaves your vendor’s refurbishment facility, ask them for some documentation of the work that was done. Photos, videos, QC test images; anything that helps demonstrate the system working properly and looking great prior to crating or loading.

When Your Digital Mammo Arrives

We encourage you to be onsite when your system is delivered. The number of packing precautions used often varies based on whether or not a system is purchased within the home country of the refurbisher or if it is purchased internationally.

In either case, it is recommended with most mammos that the gantry be rotated upside-down and locked in position. It is also recommended that the detector be removed carefully and packaged for protection against physical damage and drastic temperature changes. They are very sensitive and should not experience rapid temperature fluctuation. The example below shows Block Imaging’s detector crating method and temperature-controlling phase change material.

See Our Steps for Secure Detector Delivery
For domestic buyers, the unpacking process will not involve as many layers. Most domestically sold systems will be stretch-wrapped, blanket-wrapped, and strapped securely inside an air-ride vanline trailer. The three steps listed below for international buyers should still be followed as if the machine had just come out of a crate.

For international buyers, looking at the condition of the crates and any of the devices the shipping industry has designed to indicate mishandling will let you know in advance if there is cause for alarm on the transportation end of things. If there is damage to a crate or signals from an indicating device, take note of it or, better yet, a photo. These are not definitive indicators that there will be a problem, but if there is, it’s helpful to have documentation of possible contributing factors.

After the system is uncrated, the following should be done:

- Each component inspected visually for obvious damage
- Contents of each crate/box inventoried (tip: use your sales agreement as a checklist)
- Vendor contacted immediately to report damaged or missing items

Ultimately, the measure of a successful refurbishment is machine performance. Make sure to be in close communication with your installers to report problems along the way, not at the end of the install when you’re almost ready to begin scanning.

The installing engineer will run the system through full calibrations and QC checks. Once they have verified the system is operating at OEM specifications, they’ll complete an FDA form 2579 for a new installation. Your engineer should also walk your site’s technicians through the system. They will generally then request that the system be signed for on some variety of installation completion form. This will serve as the final handoff of the equipment, so be sure everything is satisfactory.

FDA 2579 Form: What Is It And Where Do I Get One?
How much is this going to cost me?
This question is pretty much always at the forefront of the leg work on any purchase, and rightfully so. Acquiring a digital mammography machine is a big investment and knowing how to build your budget is a huge asset.

The next topic we'll tackle is how much you can expect to pay on average for a digital mammography machine. We'll use several of the most popular models as reference points and let you know what ranges they fall in. But hold on! There's much more going on here than just buying a machine, plugging it in, and jumping into a full patient schedule. On top of system pricing, we'll also lay out some ballpark figures to help you budget for the refurbishment, accessories, planning, and maintenance that make up the rest of the project.

### System Pricing

#### How Much Is This Going to Cost Me?

<table>
<thead>
<tr>
<th>Digital Mammography Comparison</th>
<th>MAMMO PRICE RANGES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GE Senographe 2000D</strong></td>
<td>$50,000 - $60,000</td>
</tr>
<tr>
<td><strong>GE Senographe DS</strong></td>
<td>$55,000 - $65,000</td>
</tr>
<tr>
<td><strong>GE Essential</strong></td>
<td>$95,000 - $115,000</td>
</tr>
<tr>
<td><strong>Hologic Selenia Series</strong></td>
<td>$80,000 - $100,000</td>
</tr>
</tbody>
</table>

For a complete listing of Block's available systems and services please visit www.blockimaging.com
**Computer-Aided Detection**

Computer-aided detection (CAD) involves the use of software and computers to bring suspicious areas on a mammogram to the radiologist’s attention. The image is displayed on a monitor after the radiologist has done the initial review of the mammogram with “suspicious” areas highlighted for further study.

On average, a CAD unit on the secondary market costs between $15,000 and $20,000, depending on the manufacturer, model, and age of the system.

[Discover New Developments in CAD Mammography](#)

**RWS**

Radiologist workstations (RWS) are DICOM-enabled computer terminals that allow radiologists to review mammography system images remotely. These are generally intended to increase facility throughput by increasing image accessibility for radiologists.

Like CAD units, the price range on RWS consoles also varies based on manufacturer, model, and system age. Currently, an RWS on the secondary market is available for anywhere between $15,000 and $25,000.

**Additional Paddles**

The paddle set that will come with your mammo will vary by manufacturer, model, and detector size. Depending on the studies you intend to perform, you may want to add to that set. Using the paddle that best matches the size of the patient’s breast and the needs of the procedure will reduce scanning time, patient discomfort, and the likelihood a scan will need to be repeated. Below is a list of common mammography paddles. These average anywhere from $700 to $2,000 each on the secondary market.

- 18 x 24 compression
- 24 x 30 compression
- Square spot
- Round spot
- Axillary
- Needle localization
- Biopsy
- Implant
Standard Accessories

Accessories include things like lead aprons, radiation goggles, and leaded gloves and are a must for anyone who will be operating your mammography machine. Your cost will vary depending on the number of operators you have and whether or not any of them are the same relative size and could potentially share some of the gear.

- Aprons average $120 - $200 each.
- A variety of goggles and glasses are available beginning around $55 per pair with some types costing as much as $250 per pair.
- A variety of gloves are also available beginning in the $130 per pair range and topping out around $250 per pair.

Applications Training

Applications training, or apps training as it is commonly shortened to, is a comprehensive program that walks mammo techs through all aspects of a system, from basics like turning the unit on and off to quality assurance tests and patient positioning for all study types.

Apps training is a must for users that are new to digital mammography and it is not cheap. A day or two is recommended for the machine to have its protocols set up and for any workflow issues to be settled. Prices can vary anywhere from $1,500 - $5,000 dollars per day, not including travel expenses for the trainer. On the other hand, apps trainers are often accredited and can provide techs with the added benefit of continuing education credits for the days that they are in training.

If your techs have a high level of familiarity with systems similar to your incoming purchase, it may not be necessary to provide all of them with full apps training. Talk to your installer about providing an “in-service” or system demonstration of use in either case. This is sometimes referred to as “buttonology” or “knobology” and is essentially a basic tech tutorial.

Whether you need “buttonology” or a full three days with an apps trainer, it is imperative to communicate with your mammo tech staff and get a clear understanding of what they do and do not know.

Physicist’s Visit

This is another non-optional cost. In order for a site to comply with federal radiation regulations, a newly-installed, radiation-producing machine needs to be inspected by a certified radiation physicist. These inspectors are private contractors, so pricing for this inspection will depend entirely upon which one you choose to work with. A list of these contractors is likely to be on file and available through your state department of health.
Lead Shielding/Site Remodeling

Here’s another one that will warrant a call to your state DOH. Regulations regarding the level of lead shielding you need vary from state-to-state. You can download a list of state radiological and health department links to answer questions about your particular state.

Mammography is a modality with relatively few logistical concerns. If you’re upgrading your equipment, you probably won’t need to remodel your facility. If this will be the first mammo system you’ve installed, you should be able to create the space you need with few adjustments.

In either case, prices will vary by state requirements and by the rates of contractors in your area. The most important thing you can do to begin budgeting for this aspect of your digital mammography project is to begin the site prep conversation as early as possible with your vendor’s project management team and the installing engineer.

Ongoing Service

Even at refurbished prices, a digital mammo is a sizeable investment both monetarily and in terms of providing excellent patient care. We recommend pairing that investment with some type of warranty or service plan. Perhaps your site wants to take all the risk for parts and labor to maintain the system through your own in-house clinical engineers. It may still be worth asking about parts warranties or parts availability commitments from the refurbishment company, even for only a limited number of months.

Replacing the digital detector on a mammography system comes at a significant cost, so your facility’s appetite for risk will need to be discussed. Equipment downtime affects patient throughput, staff scheduling, and reimbursements, not to mention the anxiety level of your entire imaging department!

Example: GE Essential Detectors - Lifespan and Cost Info
The features of a digital mammography machine service contract will vary from vendor to vendor and so will pricing. Hopefully though, the homework you did on your vendor’s refurbishment program included a look into some of their service options. A year of full-coverage digital mammo service from Block Imaging averages $27,000 - $45,000. Pricing varies based on model, system and component age, and location.

For facilities with tighter budget constraints, Block Imaging offers a variety of creative service packages, whether you have an in-house biomed team or are looking for full risk management. Tube coverage, 24/7 coverage, parts AND labor, and chiller inclusions are just a few of the variables to consider as well in selecting a service agreement and provider. The chart below has more details on what features are included with each type of service plan.

Find Answers to the Most Common Questions About Mammography Service

Service Coverage Comparison

<table>
<thead>
<tr>
<th>Service Options</th>
<th>Full Service</th>
<th>Critical Component</th>
<th>Preventative Maintenance Only</th>
<th>Time &amp; Materials Only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service Window</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>24/7 coverage</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>98% uptime guarantee</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preventative maintenance</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Geography coverage</td>
<td>U.S.</td>
<td>U.S.</td>
<td>U.S.</td>
<td>U.S.</td>
</tr>
<tr>
<td>Free overnight parts shipping</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Engineer travel expenses</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineer labor expenses</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parts replacement</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option: glassware/tube coverage</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assigned service coordinator</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Tech Support</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>
NEXT STEPS
So, now you know and, as a wise (albeit animated) group of characters once said, "Knowing is half the battle". Hopefully, the second half of your digital mammo purchasing experience doesn’t feel quite like a battle, but you get the picture: We want you to know everything you can as you select your system, prepare your site, and make decisions for ongoing service support. For more information on digital mammography equipment, pricing, and service, click on the banner below to tell us about your project.

Browse All Mammography Systems for Sale

Sources:
