CMT – A Medical Imaging Leader

CMT Medical Technologies is a market leader providing high-resolution digital X-ray imaging solutions for General Radiography, R&F rooms and Angiography special procedures suites. Having been at the forefront of medical imaging innovation for 25 years, CMT’s technology is today proven in more than 4,500 clinical installations worldwide.

CMT’s workforce includes scientists, software engineers and technicians with extensive experience in medical imaging and digital image processing. The ability of CMT to produce unsurpassed clinical images is the result of corporate initiative and rigorous discipline combined with a customer-centric focus and total commitment to quality.

The name CMT has become synonymous with technological innovation in the medical imaging field, providing original solutions to OEM partners, hospitals and imaging centers. The Company’s imaging solutions, backed by world class service and support, enable radiology departments to keep pace with today’s high-productivity demands.
The **SmartSPOT PrimaX RF** is a high-resolution digital imaging system designed for use with interventional and remote R/F tables from any vendor. The system’s high-resolution 1,024 x 1,024 pixel digital camera and optics can be interfaced to an image intensifier from any leading manufacturer. Likewise, the SmartSPOT PrimaX RF can be connected to virtually any generator and to any DICOM 3.0 compliant HIS/RIS and PACS system.

Specifically designed to process fluoroscopy and radiography images, the SmartSPOT PrimaX RF eliminates the need for cassette filming and 105mm spot cameras. The system’s unique combination of state of the art data acquisition and image processing technologies ensures consistently high image quality and reduced doses for patient and operator.

The SmartSPOT PrimaX RF combines a powerful PCI-based Windows XP workstation, with advanced object-oriented software and connectivity. The system’s mouse-driven Windows-based user interface makes it easy and fast to learn and use. Powerful image manipulation capabilities, such as zooming, panning, scrolling, windowing and multi-formatting, enable efficient and convenient review and pre-print preparation of large image sets.

In addition to its basic features and functions, the SmartSPOT PrimaX RF’s modular design allows for easy addition of future advanced image processing applications. Full implementation of the DICOM 3.0 communication protocol allows connectivity to any DICOM 3.0-compliant server.

**True Simultaneity**

The SmartSPOT PrimaX RF’s robust combination of software and hardware provides considerable flexibility and timesavings. A single system can be shared simultaneously by two users, with one in-room and the other handling image review, post-processing or documentation at the console. Reviewing, post-processing and filming can be carried out in parallel with patient examinations, thus increasing clinical efficiency.
KEY FEATURES
- Pentium PCI-based workstation
- Windows XP operating system
- Easy-to-use, intuitive Graphic User Interface (GUI)
- Advanced CCD-based camera, 1,024 x 1,024 pixel resolution
- 12-bit digitization depth
- Data digitization at camera’s end for improved signal to noise ratio
- Computerized camera iris control
- Comprehensive fluoroscopy acquisition package
- Fluoroscopy loop acquisition
- Simultaneous acquisition, processing, filming and archiving
- Automatic windowing, storage and imaging
- Real-time disk
- Anatomically programmed protocols
- User-selectable gamma corrections
- Integrated wide range of image review and processing capabilities
- Off-line image subtraction
- DICOM 3.0 Network Connectivity, including Store, Print, Worklist Management, Modality Performed Procedure Step (MPPS) and Storage Commitment
- Compliant with the IHE’s Scheduled Workflow (SWF) profile

COMPONENTS
High-resolution Camera
- Camera head with CCD chip
- Camera control unit
- Mechanical interface to Image Intensifier (I.I.)
- Lens with computer-controlled iris
- Iris interface to host computer

System Computer
- PCI-based workstation with Pentium processor
- Windows XP operating system
- Keyboard & mouse
- Acquisition and camera control board
- Easy-to-use, mouse-driven, intuitive Graphic User Interface (GUI)
- 512MB RAM main memory
- 80GB (or more) disk storage (35,000+ images)
- High-resolution video display controller for workstation monitor
- Interface board to camera
- CMT’s proprietary processing and display boards
- High-resolution video display controller for in-room monitor
- Color workstation monitor
- B/W in-room monitor
- Laser-imager interface (DICOM 3.0 protocol)

In-room Rack
- Isolation transformer
- Camera power supply
- PC and monitors power supply
- X-ray generator mode/I.I. size
- X-ray generator and diagnostic table interface

User Keypad
Enables in-room activation of commonly used operations, such as:
- Registered patient selection
- Close examination
- Image review
- Automatic cine display mode
- Image gray level reversal
- Negative/positive
- Zoom
- Mask
- Single/Sequence
- Test Shot/Next Phase
- Save LIH
- Subtract
**TECHNICAL SPECIFICATIONS**

**Camera**
- Sensor: CCD frame transfer
- Resolution: 1,024 x 1,024, progressive and interlaced
- Dynamic range: 1,000:1
- Spatial resolution: better than 750 TVL
- Digitization depth: 12-bit
- Images from the camera are transferred to the computer system in digital format
- Anti-blooming: greater than x100
- Frame rates: up to 30 fps in progressive mode up to 60 fps in interlace mode
- Sampling rate: 40 MHz
- Lens equipped with computer-controlled iris
- Automatic gain control (AGC)

**Display**
- Workstation: Color 1,600 x 1,200 pixel resolution
- In-room: B/W, 1,280 x 1,024 pixel resolution

**Control Circuitry**
- Generator interface
- Camera synchronization
- Iris and gain control
- In-room remote control
- Fluoro LIH signal
- Acquisition mode/I.I. size status
- Camera interface including horizontal and vertical scan control
- VCR output

**IMAGING SPECIFICATIONS**

**Acquisition Modes and Speeds**
- Continuous fluoroscopy 30 fps at 1,024 x 1,024
- Digital Radiography (photospot), single shot or sequence acquisition
- DSA (optional Angio Package required)

**Real-time (30 fps) Processing Capabilities**
- Histogram with computer-selectable ROI
- Circle blanking (adjustable size and position)
- Fluoro-PCI interface
- Recursive averaging and motion detection at 8 bits
- Frame Integration
- Last Image Hold
- Windowing, including reverse black and white

**Data Acquisition**
- Patient data entry, including urgent patient registration
- Fluoro acquisition: disk store rate of up to 7.5 fps
- Fluoroscopy noise reduction
- Anatomic programmable protocols, with single-click selection of image enhancement and display parameters
- Single-shot acquisition
- Programmable sequence acquisition:
  - Number of phases (up to 8)
  - Pulse rate (up to 7.5 fps)
- Acquisition rate and duration of each phase
- Left/right markers for labeling of acquired images
- Real-time disk
- Automatic disk storage
- Automatic cine-loop upon completion of sequence

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![Image](image.png)

**Images from the camera are transferred to the computer system in digital format.**
**PROCESSING**

- **Patient review**
  User-selectable studies/series can be transferred to the Viewer application for review & processing.

- **Window/level**
  Continuously variable width/center (brightness/contrast) of the displayed image; 6 preset windows can be programmed by the operator.

- **Window polarity inversion**
  Positive/negative polarity, user-selectable.

- **Image rotation**
  Enables rotation of the image by 90°, 180° and 270°; horizontal and/or vertical reverse also available.

- **Electronic zoom with pan & scroll capabilities**
  Fixed zoom values of 1.2, 1.5, 2, 3 and 4; interactive, continuously variable zoom, with magnification factor of up to x4.

- **Magnifying glass**
  Zoom of x2 in a user-selectable ROI (Region of Interest).

- **Text**
  User-selectable text can be superimposed anywhere in the image; text can be deleted or moved within the image.

- **Graphic aids**
  Includes lines, cursors, arrows and ROIs.

- **General image filtration (up to 7 x 7 kernel)**
  Nine preset filters (L.I. size dependent).

- **Cine display**
  Consecutive and cyclic display of images at a user controllable rate.

- **Export images**
  Selected images can be stored on floppy disk in a standard BMP format.

- **Cine loops with variable refresh rates**

- **Shutters**
  Data outside the image’s active area is blackened, thus increasing image conspicuity; automatic or user-controlled determination of the active area.

- **Gamma correction**
  Different user-selectable gamma correction curves for the in-room monitor, workstation monitor and laser imager.

- **Multi-format display**
  Formats of 2, 4, 6, 9, 12 and 20 images within a single frame.

- **Image editing**
  Copy, Duplicate, Cut, Paste, Swap & Delete operations; removal of all post-processing operations also possible.

- **Automatic background filming**
  Images are transferred to the printer in the background, enabling further acquisition & processing in parallel.

- **Subtraction with user-selectable mask**

**DICOM 3.0 CONNECTIVITY**

- **Digital Laser Interface (optional)**
- **Image Storage (optional)**
- **Modality Worklist (optional)**
- **MPPS - Modality Performed Procedure Step (optional)**
- **Storage Commitment (optional)**

DICOM Conformance Statement is available at: www.cmt-med.com

**IHE (Integrating the Healthcare Enterprise) COMPLIANCE**

Supports the following IHE profiles:

<table>
<thead>
<tr>
<th>Profile</th>
<th>Actor</th>
<th>Transactions</th>
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</thead>
<tbody>
<tr>
<td>Scheduled Workflow (SWF)</td>
<td>Acquisition Modality</td>
<td>Modality Worklist Provided, Modality Procedure Step In Progress, Modality Procedure Step Completed, Modality Images Stored, Storage Commitment</td>
</tr>
<tr>
<td>Patient Information Reconciliation (PIR)</td>
<td>Acquisition Modality</td>
<td>Modality Worklist Provided, Modality Procedure Step In Progress, Modality Procedure Step Completed</td>
</tr>
<tr>
<td>Consistent Presentation of Images (CPI)</td>
<td>Acquisition Modality</td>
<td>Modality Images Stored, Modality Presentation State Stored, Storage Commitment</td>
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<td></td>
<td></td>
<td>Print Composer</td>
</tr>
<tr>
<td>Portable Data for Imaging (PDI)</td>
<td>Portable Media Creator</td>
<td>Distribute Imaging Information on Media</td>
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DATA STORAGE
- Local archiving: at least 35,000 radiographic images of 1,024 x 1,024 resolution
- Local Digital Video Disk (DVD-RAM): 9.4GB cartridges (optional)
- Data export to CD-R media; complies with IHE Portable Data for Imaging (PDI) integration profile (optional)

REGULATORY COMPLIANCE
- FDA
- IEC601-1-4 (1996)
- MDD 93/42/EEC
- HIPAA-compliant

INSTALLATION REQUIREMENTS
Power requirements
115 VAC / 10 A or 220/230 VAC / 5 A

Temperature range
Operation: 13 - 35°C (55 - 95°F)
Storage: -40 - 60°C (-40 - 140°F)
Transport: -40 - 60°C (-40 - 140°F)

Relative humidity (non-condensing)
Operation: 20 - 80%
Storage: 5 - 95%
Transport: 5 - 95%

DIMENSIONS AND WEIGHTS

<table>
<thead>
<tr>
<th></th>
<th>L x W x H (mm)</th>
<th>Weight (Approx.) (kg)</th>
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<tbody>
<tr>
<td>Camera</td>
<td>45 x 52 x 54</td>
<td>2.2</td>
</tr>
<tr>
<td></td>
<td>(115 x 131 x 137)</td>
<td>(1)</td>
</tr>
<tr>
<td>Workstation</td>
<td>25.8 x 17.5 x 8.4</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>(655 x 445 x 213)</td>
<td>(20)</td>
</tr>
<tr>
<td>Interface Rack</td>
<td>20.5 x 21.3 x 15.8</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>(520 x 540 x 400)</td>
<td>(35)</td>
</tr>
</tbody>
</table>

OPTIONS
- DVD (Digital Video Disk)
  For local backup of fluoroscopy and radiography images.
- CD-RW
  Enables export of patient examination in IHE-compliant Portable Data for Imaging (PDI) format on CD-R media.
- Barcode Scanner
  Enables scanning of the Patient ID or Accession Number for automatic query of the examination and patient demographic details from the HIS/RIS server.
- Extended FOV
  Enables the combining of images in order to generate an image with a large Field of View.
- DICOM Print
  Enables printing of images on any DICOM 3.0 compliant network imager.
- DICOM Store
  Enables exporting images to any DICOM 3.0 compliant archiving server (PACS).
- DICOM Modality Worklist Management (MWM)
  Enables automatic retrieving of patient demographics from the HIS/RIS server.
- DICOM Modality Performed Procedure Step (MPPS)
  Enables sending of examination details & billing parameters to the radiology information system.
- DICOM Storage Commitment
  Enables receipt of a commitment from the storage server that images are safely stored and can be safely deleted from the local archive.
- Angiography Package (Acquisition & Processing)
  - Real-time subtraction
    Acquired images are subtracted on-line from the mask image and displayed during sequence acquisition. Images are kept in the disk in unsubtracted format.
  - Road mapping
    Two-phased protocol for accurate placement of catheters during fluoroscopic angiography procedures. During the first phase, a mask image is generated on-line from the fluoroscopy images using a minimum intensity projection algorithm. During phase II of the protocol, incoming averaged images are subtracted in real-time from the mask image generated in the first phase.
  - Subtraction
    Post-processing subtraction with linear or logarithmic transformation and a variable weighing factor.
  - Pixel Shifting
    The relative position between the “mask” and “contrast” images can be modified by the operator. Shifting resolutions are 1/8, 1/4, 1/2 and 1 pixel. A “home” function enables the realignment of the original images.

DSA (Digital Subtracted Acquisition)
“Optimum” images are generated using maximum (or minimum) opacification techniques.