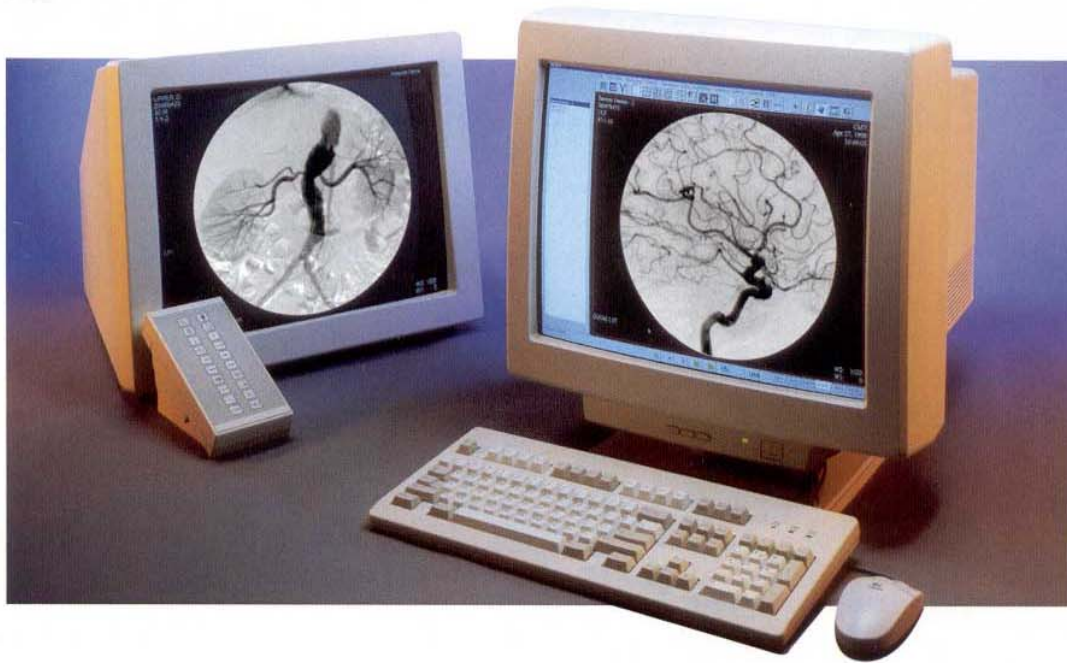


SmartSpot DSA[®]

HIGH RESOLUTION DIGITAL ANGIOGRAPHY SYSTEM



PRODUCT SPECIFICATION

CMT

APPLICATION

The SmartSPOT DSA is a high-resolution digital imaging system specifically designed to meet the requirements of special-procedures suites. By using a unique combination of state-of-the-art data acquisition and image-processing technology, the SmartSPOT DSA ensures high image quality consistently and lower doses to both the patient and the operator.

Large image sets are efficiently and conveniently reviewed and prepared for filming using the SmartSPOT DSA fast manipulation capabilities such as zooming, panning, scrolling, windowing and multiformating. Reviewing, post-processing and filming can be carried out without interfering with patient examination, thus increasing clinical efficiency.

The SmartSPOT DSA system offers an excellent, easy to use angiography acquisition and processing package. A typical study is processed in a matter of seconds using either logarithmic or linear transformations. Among the angio package main features are mask selection, landmarking, interactive mask averaging, group subtraction and automatic or manual pixel shifting.

The SmartSPOT DSA combines a powerful PCI-based workstation with Windows NT operating system using most updated object-oriented software and connectivity. The mouse-driven Windows-based user interface makes learning and using the system both fast and easy.

MAIN FEATURES

- Advanced CCD-based TV camera, 1024 x 1024 pixel resolution, 12-bit digitization depth
- Computerized TV camera iris control
- Comprehensive fluoroscopy acquisition package
- On-line Roadmapping
- Radiography acquisition rates of up to 7.5 frames per second (fps)
- Real-time DSA acquisition
- Automatic injector interface
- Support of main and reference in-room monitors
- Programmable anatomical protocols
- Simultaneous acquisition, processing, filming and archiving
- Extensive angiography package
- User-selectable gamma corrections
- Laser-imager interface
- Full compliance with DICOM 3.0 and DICOM HIS/RIS
- PCI based workstation
- Windows based mouse-driven user interface



Spot DSA

COMPONENTS

High Resolution TV Camera

- Camera head with CCD chip
- Camera Control Unit
- Mechanical mounting to I.I.
- Lens with computer-controlled iris

System Computer

- PCI-bus workstation based on the PENTIUM processor
- 128 Mbytes RAM main memory
- Windows NT operating system
- Keyboard and Mouse
- Acquisition and TV camera control board
- High-resolution video display controllers for in-room and workstation monitors
- CMT's proprietary processing and display boards
- 7.0 Gbyte image disk storage
- CD-ROM drive
- 1.44 Mbytes floppy drive

In-room Rack

- Isolation transformer
- TV camera power supply
- PC and monitors power supply
- X-ray generator mode/I.I. size status
- X-ray generator and diagnostic table interface



User Keypad

20-keys physician remote keypad including:

- Registered patient selection
- Single / Sequence acquisition selection
- Test shot / Sequence next phase
- Save LIH image
- Image review
- Automatic cine display mode
- Image gray level reversal
- Zoom
- Mask selection
- Subtract
- Roadmapping (subtracted & live)
- Save / Select reference image

TECHNICAL SPECIFICATIONS |

TV Camera

- Sensor: CCD frame transfer
- Resolution 1,024 x 1,024, progressive and interlace
- Dynamic range: 1,000:1
- Spatial resolution: better than 750 TVL
- Digitization depth: 12-bit
- Antiblooming: greater than x100
- Frame rates: up to 30 fps in progressive mode
up to 60 fps in interlace mode
- Sampling rate: 40 MHz
- Lens with computer-controlled iris
- Automatic Gain Control (AGC)

Display Monitors

- Workstation: 17-inch color 1,600 x 1,200 pixels
- In-room: 20-inch monochrome 1,280 x 1,024 pixels

Control Circuitry

- Generator interface
- Fluoro LIH signal
- Acquisition mode/I.I. size status
- TV camera interface including horizontal & vertical scan control
- Injection start signal
- II expose signal
- VCR output

IMAGING SPECIFICATIONS |

Acquisition Modes & Speeds

- Continuous fluoroscopy (normal & subtracted)
30 fps at 1,024 x 1,024
- Digital Radiography (DR), Digital Angiography (DA),
Digital Subtraction Angiography (DSA)
up to 7.5 fps at 1,024 x 1,024

Real-time (30 fps) Processing Capabilities

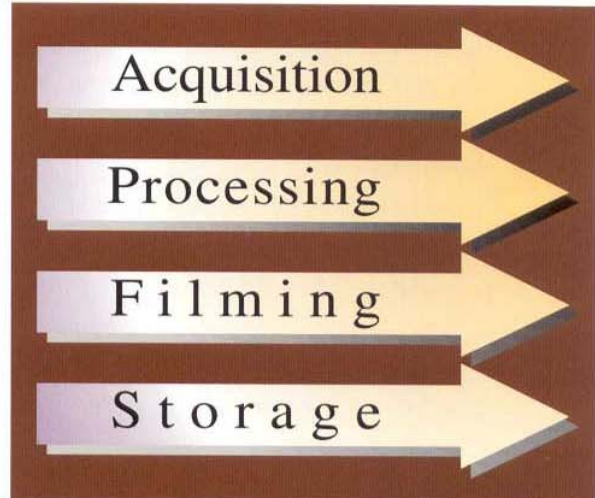
- Histogram with computer-selectable ROI
- Circle blanking (adjustable size and position)
- Fluoro PCI interface
- Recursive averaging and motion detection
- Frame integration
- Subtraction (full & partial mask)
- Windowing including reverse black & white
- Real-time edge enhancement

Data Acquisition

- Patient data entry including urgent patient registration
- Fluoro acquisition: disk store rate of up to 10 fps
- DR, DA, DSA: single pulse or sequence (programmable) modes
 - Number of phases (up to 8)
 - Pulse rate (up to 7.5 fps)
 - Duration of each phase
 - Injection phase
 - Subtraction phase
- Left/right markers
Enable labeling of acquired images
- Automatic disk storage
- Automatic cine-loop upon completion of sequence

PROCESSING

- *Window / level*
Continuously variable window limits of the displayed image. Six preset windows may 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 vertical image reversal is available as well.
- *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 Region Of Interest.
- *Alpha numeric text annotation*
User-selectable text can be superimposed anywhere in the image. Text may be moved and edited within the image.
- *Graphic aids*
Included are arrows, lines and ROIs. Line length is also available.
- *General image filtration (up to 7 x 7 kernel)*
72 preset edge filters (I.I. size dependent) are available.
- *Cine loops with variable refresh rates*
- *Electronic shutters*
Data outside the image's active area is blackened, thus increasing image conspicuity. Determination of the active area is performed either automatically or under user's control.
- *Gamma corrections*
Different gamma corrections curves (user-selectable) for the in-room monitors, workstation monitor and laser imager.



- *Multiformat display*
Formats of 2, 4, 6, 9, 12 and 20 images within a single frame.
- *Image editing*
Copy Duplicate
Cut Paste
Swap Delete
Removing of all post processing operations is also available.
- *Automatic background filming*
Images are transferred to the printer in the background, thus enabling the performance of further acquisition/processing tasks.
- *Optimized imaging parameters*
Imaging parameters are automatically set by the system according to the acquisition technique selected by the operator.

ANGIO PACKAGE

- *Real-time subtraction*
The mask image is subtracted on-line from all acquired images. Real-time subtracted images are displayed during sequence acquisition.
- *Road-mapping*
Two-phases protocol for accurate placement of catheters during fluoroscopic angiography procedures. During the first phase, a mask image is generated on-line from the fluoroscopic images using a minimum intensity projection algorithm. During phase II the mask is subtracted on-line from all incoming average images.
- *Pixel shifting*
The operator can modify the relative position between the mask and contrast images. Shifting resolutions are 1/8, 1/4, 1/2 and 1 pixel. Pixel shifting may be performed manually or automatically.
- *DSA with maximum or minimum pixel opacification*
An optimum DSA image is obtained using maximum or minimum intensity projection algorithm.
- *Group mask / Group subtraction*
Optimized mask and contrast images are obtained using averaging techniques. Images are integrated with a 16-bit accuracy.
- *Landmarking*
Mask with variable weighing factor is created and subtracted from all selected images thus enabling the display of the background anatomy.
- *Logarithmic / linear subtraction*
Post processing subtraction with linear or logarithmic transformation.
- *Real time edge enhancement*
Enables on-line filtration of incoming fluoroscopy or pulse images. Kernel size is 4 x 4 (non-symmetric coefficients) or 7 x 7 (symmetric coefficients).
- *Support of reference monitor*
Enables the display of images selected as reference.

DATA STORAGE

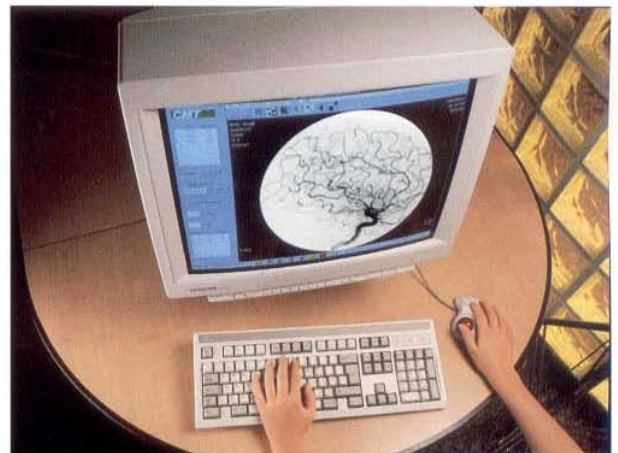
- Hard Disk: at least 3000 images 1,024 x 1,024 x 10 bit
- Local Magneto Optical Disk (MOD): 2.6 Gbyte cartridges (**optional**)

CONNECTIVITY

- Digital Laser Interface (compatible with all laser cameras using 3M-952 digital protocol)
- DICOM 3.0 network interface (**optional**)
- Support of DICOM 3.0 Compliant printers (**optional**)
- SmartSPOT View, Remote Processing and Viewing station (**optional**)

REGULATIONS COMPLIANCE

- FDA
- IEC60601-1 (1988), First Amendment (1991) and Second Amendment (1995)
- IEC60601-1-2 (1993)
- IEC60601-1-4 (1996)
- MDD (93/42/EEC)



Spot DSA

OPTIONS

DICOM interface (by Merge Technologies)

Industry standard connection to the Hospital Digital Environment. Storage and / or printing of images on external devices are supported. DICOM HIS/RIS is available as well (see CMT's conformance statement for details).

MOD (Magneto Optical Disk)

Radiographic and fluoroscopic images can be archived

Monitors

- 21-inch workstation color monitor instead of the standard 17-inch monitor.
- 20-inch monochrome monitor for in-room display of reference images.

Trackball in lieu of mouse

SmartSPOT View

Advanced processing and reviewing station. Please refer to the relative data sheet for further details.

DIMENSIONS AND WEIGHTS

	L x W x H inch (mm)	Weight (Approx.) lb (kg)
TV camera head	5.9 x 5.5 x 5.5 (150 x 140 x 140)	3.3 (1.5)
TV camera CCU	13.8 x 4.3 x 3.1 (350 x 110 x 80)	3.3 (1.5)
PC	16.9 x 7.5 x 26.6 (430 x 190 x 675)	33 (15)
Interface rack	15.7 x 21.3 x 20.5 (400 x 540 x 520)	77 (35)

INSTALLATION REQUIREMENTS

Power requirements

108-132 VAC / 10A, 198-264 VAC / 5A
Line frequency: 47 - 63Hz

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%



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