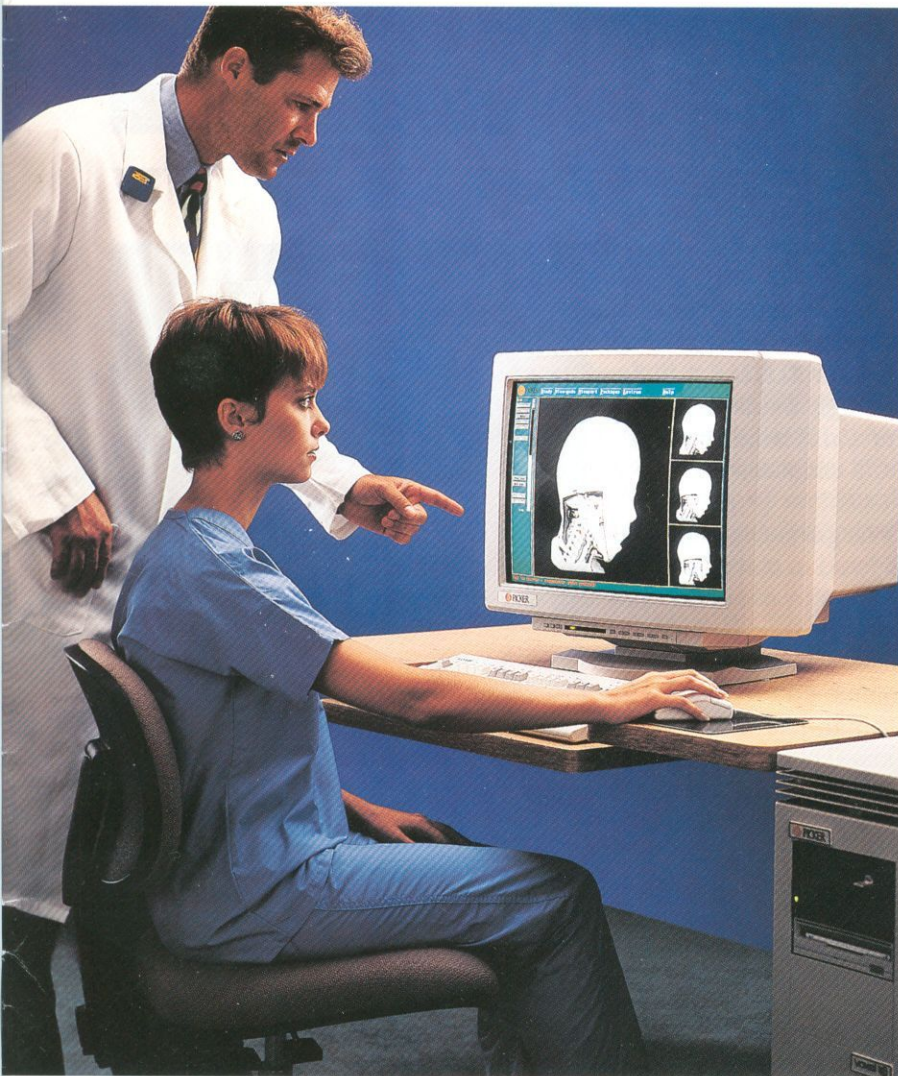




■
Critical tools necessary
for advanced or specialty
visualization.

Voxel Q

Visualization and Analysis Workstation



Description

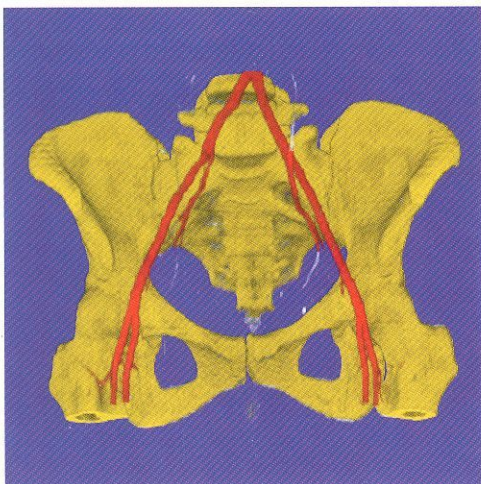
The Voxel Q™ is an advanced visualization workstation that can be used as a stand-alone system or integrated into Picker's computed tomography (CT) scanners. Voxel Q provides unsurpassed speed and ease of use for image reformatting, volume rendering and output clarity. It is the medical imag-

ing system of choice for CT and multimodality image review. Voxel Q is the only visualization system that delivers 10 million trilinear interpolations per second (TRIPS) to speed superior visualization of vascular, soft tissue and bony structures.

Product Data

Description

continued



Picker's advanced visualization tools are utilized independently on the Voxel Q workstation or integrated into the CT system using Picker's exclusive LAPP™ architecture. Picker's Large Array Parallel Processor (LAPP) architecture has been specifically designed to optimize each process along the imaging chain. LAPP creates a cooperative environment where a series of dedicated processors and memory are optimized for full-speed acquisition and 2-D and 4-D image reformatting. For CT angiography (CTA) acquisition and visualization, the LAPP environment is considerably more efficient than Deterministic Performance Imaging (DPI) systems where each process competes for available computing resources. As the number of simultaneous tasks is increased, performance for systems with conventional "on-line CTA" can degrade sharply.

Features



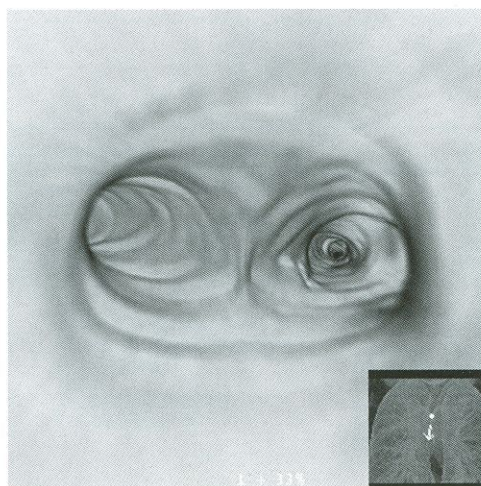
4-D Angio

4-D Angio™

4-D Angio is Picker's exclusive volume rendering technology. It provides a fast, cost-effective way to display complex CT datasets. Bony, vascular and soft tissue structures can be viewed simultaneously while maintaining the exquisite detail inherent in CT scanning. 4-D Angio provides real-time interactive control over opacity and transparency values, which permits viewing through and beyond surrounding structures such as metallic stents. This power and flexibility makes 4-D Angio the ideal method for viewing CTA and CT endoscopy (CTE) studies.

Color 4-D Angio is available with the CTA HP package. 4-D Angio images can be rendered in color for readily discerning anatomic structures. This capability allows various anatomy and/or pathology to be displayed in different colors.

Target Volume 4-D Angio is a feature available with the UltraQ™ package. It creates a high-resolution, volume-rendered image around any user-defined axis. This is a fast and accurate method for viewing CTA images when the entire dataset does not have to be viewed. Target Volume 4-D Angio renders only a selected volume of data and eliminates the need for complex segmentations.



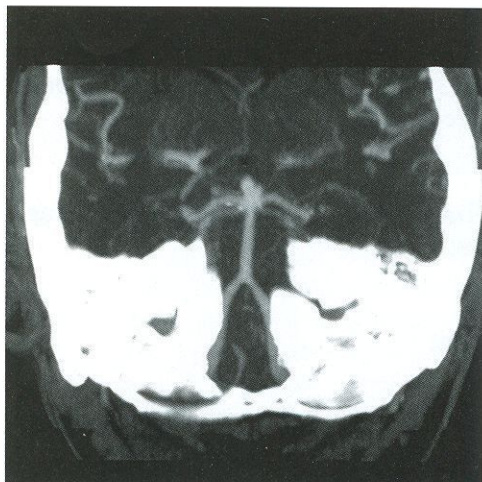
Voyager

Voyager™

Voyager is a real-time CT endoscopy tool that renders spiral CT data to provide fly-through images within and around hollow anatomic organs. Voyager utilizes 4-D Angio volume rendering to simultaneously provide endoluminal examination of organs, as well as information on extramural structures and tumor extent that is beyond the organ wall.

Features

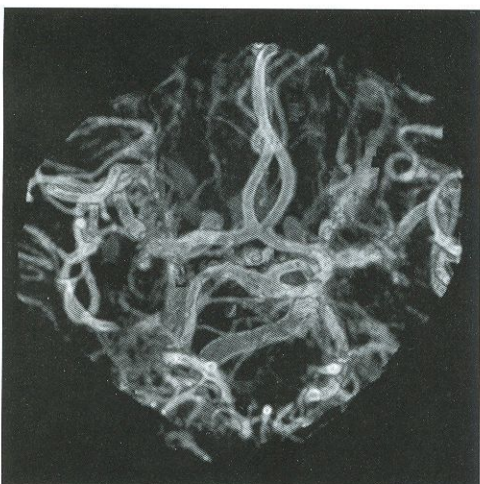
continued



TMVIP



Vessel tracking



Cerebral CTA with Skull Removal

Maximum Intensity Projection (MIP)

MIP aids in the visualization of vascular structures. It is the most commonly used method for reformatting CTA studies.

Target Volume MIP is available by adding the CTA HP package (see Computer Systems Options and Upgrades for more information) to the Voxel Q. It is a fast, high-resolution viewing mode, ideal for producing quick, accurate CTA results. Target Volume MIP renders only a selected volume of data, eliminating the need for complex segmentations.

Vessel Tracking

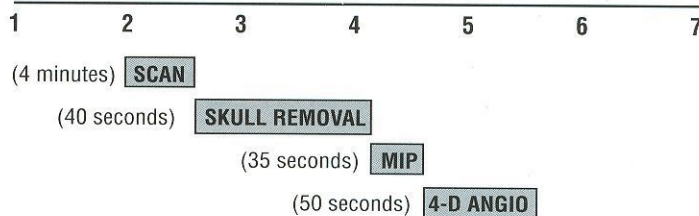
Vessel tracking is a CTA program available with the UltraQ package. It creates rapid batch sets of multiplanar reformation (MPR) images around the centerline of any vessel. The saved set of images includes rotational curved MPR images and transaxial oblique views.

The curved MPR views always visualize the entire vessel for easy localization of abnormalities. The transaxial oblique views generate images that are always perpendicular to the central axis of the vessel ensuring direct diametric measurements for accurate estimation of vessel stenosis.

Skull Removal

Skull removal is a feature available with the UltraQ package. It is a fully automated procedure which removes the bones of the skull from the dataset. The skull removal procedure is performed by the UltraSPARC™ processor in the background, allowing the user to continue visualizing other datasets. The skull removal algorithm dynamically adjusts to changing density, and it intelligently handles the complexities associated with interfaces between bones and vessels. Skull removal combined with Picker's UltraImage™ reconstruction technique provides unsurpassed soft tissue and vasculature detail.

Optimization of Cerebral CTA Process



Cerebral CTA example:

- 80 slices UltraImage spiral including acquisition and reconstruction
- Automatic skull removal
- Multiple Target Volume MIP views
- 4-D Angio volume-rendered views

RESULT: Entire cerebral CTA, acquisition to visualization in under 6 minutes

Features

continued

Multi-Image Display

The screen displayed on the Voxel Q monitor is divided into viewports which display independent or related images simultaneously. This allows from four to 48 images from CT, MR and nuclear medicine studies to be examined simultaneously on the same screen. The standard screen layout consists of one main viewport and three reference viewports.

Interactive Visualization

Voxel Q's realtime interactive visualization software provides the following features in any of the rendering modes:

- Window/level adjustment
- Volume of interest (VOI) adjustment
- Scan information display
- Movie creation and playback
- Filming/hardcopy
- Split-screen presentation
- On-line help documentation
- Zoom
- Measurement
- Screen saves
- Archive
- Disk management



Curved MPR

Cine Visualization

The cine mode allows you to rapidly move the images in the patient's z-axis direction to quickly review a large dataset of spiral images.

Volumetric Reconstruction

Volumetric rendering algorithms are used in all modes to yield superior image quality.

Multiplanar Reformatting (MPR)

The MPR mode instantly displays multiplanar reformatted images in axial, sagittal and coronal planes, as well as arbitrary oblique and curved planes.

Major MPR mode capabilities include:

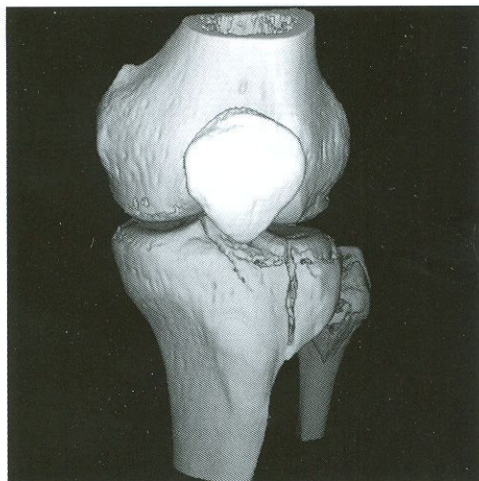
- Batch MPR package with automatic filming
- Curved MPR
- Slice plane thickness adjustment
- Oblique MPR

3-D Reconstruction (Shaded Surface Display)

This mode provides the ability to perform real-time, interactive generation and manipulation of 3-D shaded surface images.

Special 3-D capabilities include:

- Slice plane mapping
- Transparency



SSD

Features *continued*

Quantitative CTA

Quantitative CTA, available with the UltraQ package, allows the user to measure distance and angle measurements in maximum intensity projection (MIP) and Picker's exclusive 4-D Angio, as well as in 2-D, MPR and shaded surface display (SSD). This allows direct quantitative assessment of clinical pathology, such as the degree of vessel constriction and the size of atherosclerotic plaques as well as the assessment of surrounding soft tissues.

A new annotation package is included which allows text to be added to an image for highlighting areas of interest and pathology in any viewing mode.

Measurement

Advanced quantitative measurement capabilities are provided including measurements of:

- Density value (in Hounsfield units if CT) of a point or region of interest
- Distances along straight and curved lines
- Angles between lines and radius of curvature for curves
- Area, minimum and maximum voxel values, mean and standard deviation, and a density histogram for a specified region of interest
- Volume of 3-D objects

Segmentation/Disarticulation

This package provides a real-time, precise method for separating critical structures for 3-D viewing. Manual and automated tools permit the assignment of up to 15 user-selected tissue types. Voxel Q's segmentation techniques allow the selection of specific structure, tissue and organs for viewing.

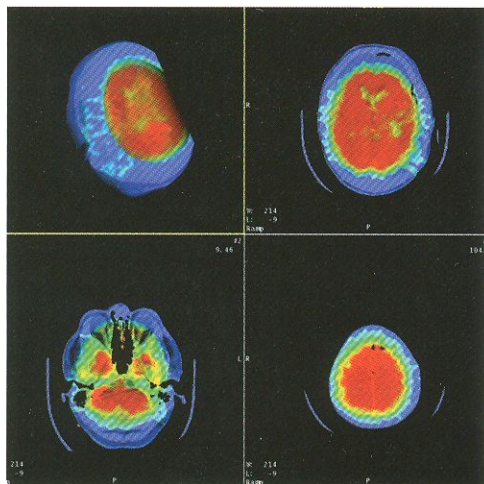
Voxel Q provides two segmentation packages, region-based and contour-based, offering a range of tools for segmentation of the anatomy. Options common to both packages include naming and assigning colors to contour lines and automatic save-to-disk.

Voxel Q's range of automated region-based techniques provide efficient segmentation of spatially-connected structures by selecting tissues according to a range of Hounsfield values. This provides the ability to plant and grow seeds within organs or bones for removal of the region or isolated display.

The contour-based package consists of a set of tools for drawing and maintaining groups of contours used in segmenting image data. Segmentation is based on user-defined contours for individual slices.

Features

continued



Fusion

Multimodality Image Fusion

Fusion is a visualization tool available for analyzing any combination of DICOM-compatible images from CT, MR, single photon emission computed tomography (SPECT) or positron emission tomography (PET) studies. Datasets can be registered and interactively viewed, either in linked viewports or as fused colorwash images. Contour matching registration, color 4-D Angio volume-rendered fusion, and linked measurements are available in this package.

Within the multimodality image fusion program, two packages are available for bone removal for cerebral CTA studies: bone masking or subtraction. These packages require both precontrast and a post-contrast scans. With the multimodality image fusion software package, the two studies can be fused together to form a new, third study with the bone removed.

Dental Planning

Dental planning provides specialized processing of CT datasets for preoperative diagnosis and evaluation of the mandible and maxilla. It is used for surgical planning and evaluation in dental implant procedures.

epi-View™

epi-View is a surgical reference tool that provides presurgical guidance for the physician. epi-View employs an autostereoscopic vision which uses Picker's 4-D Angio volume rendering, thus producing a striking 3-D perspective.

epi-Client™

epi-Client is a personal computer networked to the Voxel Q, providing the ability to customize films with text, reports and institutional logos, as well as transferring movie loops and Voyager CT endoscopy studies to VHS tapes. These video recordings can incorporate voice-overs for dictation of a radiologist's report.

Fast CTA

Fast CTA is available with the CTA HP package to the Voxel Q. The CTA HP package improves 4-D Angio, MIP and DRR renderings by a factor of four. The DT4 board, included with the CTA HP package, is responsible for taking the interpolated voxel from the object memory and applying the given post-processing step to the voxel.

A special CTA menu-grouping presents all visualization tools required to analyze a CTA dataset. While inside this menu, a single button opens the desired study and allows the user to switch between 4-D Angio, MIP and oblique viewing modes.

Connectivity

Picker has taken a leadership role in implementing connectivity standards. Picker's Q-systems support ACR/NEMA DICOM v3.0 which provides multivendor image transfer using ethernet standards. In addition, Picker's HYPERLAN II is a medical imaging data communications network that offers performance, capacity and expandability for demanding high-volume, multiple-CT departments.

ACR/NEMA DICOM V3.0

The ACR/NEMA DICOM interface is a detailed specification that describes a means of formatting and exchanging images and associated information. This standard is endorsed by the American College of Radiology (ACR) and the National Electrical Manufacturers Association (NEMA) and specifies the physical connection and a set of protocols to allow the data to be transferred reliably and efficiently.

Voxel Q DICOM v3.0 capabilities include:

- Receive
- Send
- Query/Retrieve

HYPERLAN II

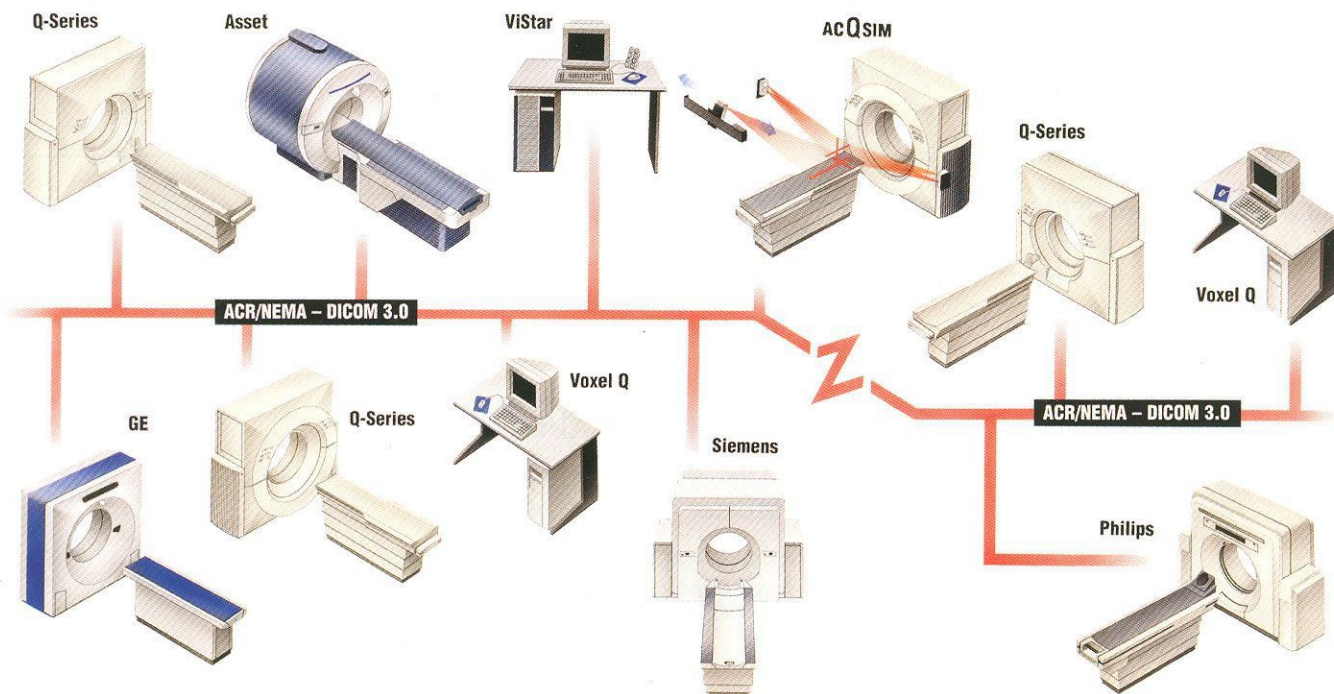
HYPERLAN II was designed for data transfer between the Voxel Q and Picker CT scanners. Using ethernet and TCP/IP protocols, HYPERLAN II runs over fiber optic and copper (coaxial and twisted pair) media.

Remote Preview

A Voxel Q connected to a HYPERLAN II network allows clinicians to view images within seconds of acquisition. Using Voxel Q's remote preview capability, images from spiral or axial CT scanning can be displayed within three seconds of their availability at the CT console. It saves time and improves efficiency in trauma CT image review. Remote preview also provides optimum throughput when advanced visualization is required.

Network Filming

Voxel Q remote filming is a unique feature of Picker's CT scanners. Remote filming allows images to be pushed over the HYPERLAN II network to any laser camera digitally connected to a CT scanner.



Standard Features and Options

Features	Voxel Q I	Voxel Q II	Voxel Q III	Voxel Q IV UltraSPARC
Visualization Station CPU	SPARC	SPARC	SPARC	UltraSPARC
Disk Drive	2 GB	6 GB	6 GB	11 GB
8mm Tape Drive	✓	✓	✓	✓
RAM Memory	64 MB	128 MB	128 MB	128 MB
Remote Digital Filming Module	✓	✓	✓	✓
Applications Training	✓	✓	✓	✓
Service Applications Modem	✓	✓	✓	✓
CT/MR Angiography Package (MIP)	✓	✓	✓	✓
4-D Angio	▲	✓	✓	✓
CTA HP package (4-D Voxel Accelerator)	N/A	▲	✓	✓
DICOM	✓	✓	✓	✓
Color Printer and Interface	▲	▲	▲	▲
Dental Software	▲	▲	▲	▲
Multimodality Image Fusion	▲	▲	▲	▲
9-Track	▲	▲	▲	▲
Voyager Software	N/A	▲ <small>(with CTA HP package)</small>	▲	▲
ACQSIM		▲	▲	▲
epi-Client	▲	▲	▲	▲
epi-View	▲	▲	▲	▲

LEGEND:

✓ Included feature ▲ Optional feature

Base System Components

Voxel Q CPU

Technology Platform

- Sun SPARC™ host

Operating System

- Sun OS (Unix)

Data Exchange

- Ethernet (TCP/IP); AUI connector

CPU Memory

- 16 MBytes

Service and Applications Modem

- For remote diagnostics and software upgrades
- Internal Hayes compatible - 33,600 baud

Base System Components

continued

Voxel Image Processor

Performance

- Custom bit-slice, parallel-pipeline architecture
- Picker's exclusive volume rendering accelerator
- 1,000 MIPS equivalent performing for rendering
- 10 million trilinear interpolations per second (TRIPS)

Data Storage Devices

- Expandable 2.0 GByte disk

Note: Can add additional 2.0 GByte disk, 6.0 GByte disk or 9.0 GByte disk depending on Voxel Q configuration

- 8mm tape drive system
- Cartridge output capacity up to 2.5 GBytes
- Software to read Picker Q-series scanner 8mm archive tapes

Dataset Memory

- 64 MBytes standard (upgrade to 128 MBytes)
- High-speed, eight-way interleaved object memory

Voxel Q Operator Console

Keyboard

- Full alphanumeric keyboard
- Template overlay
- 12 function keys
- Six hot keys including automated study archive, deletion, screen layout changes, disk space display and magnetic tape reading
- Mouse and mouse pad

20" Color Display Monitor

- Full-color 24-bit RGB image display plus 16-bit overlay
- 1408 x 1024 pixels displayed
- Up to 48 user-selectable independent or related viewports
- 60 Hz, non-interlaced refresh

Putty/Walnut Computer Desk

- Includes matching adjustable chair

Storage Capabilities

IMAGE STORAGE

Standard Image Disk	Voxel Q
Capacity	2.0 GByte
Storage: Uncompressed Images (256 ²)	9,360
Storage: Uncompressed Images (512 ²)	2,340
Optional Image Disk*	
Additional Capacity 2.0 GByte	4.0 GByteTotal
Total Storage: Uncompressed Images (256 ²)	23,760
Total Storage: Uncompressed Images (512 ²)	5,940
Additional Capacity 6.0 GByte	6.0 GByteTotal
Total Storage: Uncompressed Images (256 ²)	38,160
Total Storage: Uncompressed Images (512 ²)	9,540
UltraSPARC Standard Image Disk	Voxel Q
Capacity	11 GByte
Storage: Uncompressed Images (256 ²)	81,120
Storage: Uncompressed Images (512 ²)	20,280
Standard 8mm Tape	
Capacity	2.2 GByte
Storage: Uncompressed Images (512 ²)	4,000

Computer System Options and Upgrades

CTA HP Package

- Target Volume MIP
- Color 4-D Angio
- Fast CTA
- Voyager (Optional)

UltraQ Package

- Skull Removal
- Vessel Tracking
- Target Volume 4-D Angio
- Quantitative CTA
- Upgrade to 128 MBytes

Disk Upgrades

- Upgrade to additional 2.0 GByte disk
- Upgrade to additional 4.0 GByte disk
- Total of 20.0 GByte available

Interface Options

Networking

- HYPERLAN II
- Entry/MTE ethernet converter
- ACR/NEMA DICOM v3.0
- TIFF output package
- MPEG output package

Remote slave monitor option

- Full-image viewing capabilities
- 20-inch, full color, 24-bit RGB monitor
- Maximum distance from Voxel Q to control center: 50 feet (15.24m), without amplifiers

Computer System Options and Upgrades

continued

Laser camera interface option

- Major vendors supported

Color printer and interface option

- Color dye sublimation
- Near-photographic quality color hardcopy
8.5 inches x 11 inches (21.6cm x 27.9cm)
or 8.5 inches x 14 inches (21.6cm x 35.6cm)
- Continuous-tone printing with up to 256 levels of gray scale
- Up to 16.7 million colors

Optional nine-track magnetic tape system

Third-party tape reader option

* One year warranty on the Voxel Q system and associated optional hardware.

Site Requirements

General

- Dedicated/private telephone line (direct-in-dial, analog type) prior to installation
- All ethernet and/or filming cables required are run to the Voxel Q system tower enclosure at time of installation
- The coordination of fiber optic cable installation (if necessary) with Picker-recommended fiber optic contractor
- Placement of the Voxel Q inside of the range of one gauss magnetic field may affect image quality

Equipment Dimensions

Tower enclosure dimensions

Width: 13 inches (33.0cm)

Depth: 30 inches (76.2cm)

Height: 29 inches (73.7cm)

Computer desk dimension

Width: 48 inches (121.9cm)

Depth: 30 inches (76.2cm)

Height: 29 inches (73.7cm)

Total height (monitor to floor): 52 inches (132.1cm)

Weight

Workstation: 150 lbs. (67.5kg)

Computer module: 200 lbs. (90.0kg)

Electrical

- Standard 120 VAC (U.S.A., Canada and Puerto Rico or other in-coming international local power)* 15-amp dedicated circuit (standard three-prong plug) power is recommended
- 50 or 60 Hz

* Isolation transformer and cable package available for international power conversion requirements.

Site Requirements

continued

Environment

Ambient Temperature

- 50 to 80 degrees Fahrenheit (10 to 26.7 degrees Celsius)

Humidity

- 20 to 80%

Altitude

- 0 to 10,000 feet (3,048m)

Power Dissipation

The btu/hr. ratings listed below are estimations based on an average hourly duty cycle and standby modes of equipment operation:

EQUIPMENT	btu/hr	kW	hp
Host Graphic Processor	4,000	0.8	1.0
Monitor, Keyboard, Mouse	1,473	0.2	0.3
TOTAL	5,473	1.0	1.3

Note: Contact the Picker Site Planning Department for specific requirements pertaining to imaging/viewing equipment floor space and electrical, mechanical, structural and environment specifications.

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