

PHILIPS



Philips Mx8000 IDT 16 CT Scanner

Philips Medical systems Mx8000 IDT 16 delivers 16 simultaneous slices at sub-millimeter collimator, high resolution and isotropic imaging. New large area detectors allow more volume/unit of time in the “Z” direction making what was once time consuming will now become a fast and simple advanced clinical application. At the heart of the IDT system is the patented Tach™ Technology. This computer chip transfers data from the detector array converting the detector signal to a digital data stream eliminating noise, decreasing dose and improving image quality. The intuitive automated features of the Mx8000 IDT 16 enable clinicians to practice real-time radiology, make advanced applications routine, and optimize clinical and business results.

The Brilliance Workspace User Interface™ environment has been added to the Mx8000 IDT scanner console. The Workspace user environment is a breakthrough in addressing the primary challenge facing multislice CT users today – how to manage the large datasets generated by volumetric acquisitions, while speeding the “time diagnosis”. The Workstation is a Philips-exclusive concept designed and developed in the close collaboration with customers. It incorporates new concepts in clinical workflow support and ease-of use. Workspace is the CT user environment developed specifically for multislice CT and as such provides you with a host of clinical advantages.

- Solves the multislice data explosion by providing tools of effectively manage large datasets
- Guided Flow™ productivity qualities help you work easier and faster through extremely intelligent design
- Content-sensitive menus helps keep things organized; show you where you’ve been and where you’re going
- Hints identify the next logical action; most-used functions are always visible and shown most prominently
- Common design with other Philips systems means less training time

Based on Philips Vequion family of medical IT products and solutions the Workspace is designed as a scalable platform for growth and future applications.

Another key attribute of the Mx8000 IDT 16 is the COBRATM technology, a Cone Beam Reconstruction Algorithm that will avoid and/or correct for artifact present in reconstruction by reducing pixel to noise ratio resulting in superior image quality.

Mx8000 IDT 16 provides dose control methodologies like DoseRight ACS (Automatic Current Selection) and DoseRight DOM (dynamic dose modulation).

Mx8000 IDT 16 components include: Gantry, patient table, power distribution cabinet, cooling/heat exchanger, and the Mx8000 IDT 16 operating, viewing and processing console.

System Highlights:

- Asymmetrix™-Philips Medical System's Patented variable wide area detector providing optimal dose efficiency with 24mm total coverage
- Excelsior 800 Mbt/second Ultrahigh speed multislice data acquisition system
- 16 slice acquisition mode – 16 x 0.75mm, 16 x 1.5mm, 8 x 3mm scanning
- 0.5 second scan time for 360° degree scan
- Up to 6 images/second reconstruction time, 512 x 512 image
- On-board 60kW, high frequency, high-voltage generator
- 6.5 MHU high power x-ray tube
- Dynamic Focus System (DFS) doubles data density providing up to 24 IP/cm ultra-high Spatial resolution, in axial and spiral scanning
- DoseRight ACS (Automatic Current Selection) and DoseRight DOM (dynamic dose modulation)
- Gantry and table controls located on both sides of the gantry and on the operators console
- Large 50 cm field-of-view inside a wide, flared 70 cm aperture
- Multiple-Slice, volumetric spiral scan: up to 97.5s continuous, multiple, bi-directional acquisition
- UltraImage™
- Bolus Pro Ultra, Spiral Auto Start, Evolving Image, Ultra High resolution matrices
- Patient couch with 1570mm scannable range
- Real-time image processing: Zoom & Pan, cine, Multiformat and Image Graphics
- 80cm spiral coverage in one 13 sec. breath-hold with 1.5mm slice thickness
- Windows XP Dell Precision host computer
DICOM 3.0 complaint image format, archive and networking

Image Quality Performance

High contrast spatial resolution (measure on bar phantom with clinical protocols)

Ultra-high mode: 24.0 Lp/cm @ cut-off

High mode: 16.0 Lp/cm @ cut-off

Standard mode: 12.0 Lp/cm @ cut-off

Noise:

0.27% as measured on the Philips Medical System's system phantoms (21.6 cm water equivalent)

Low contrast resolution:

4.0 mm @ .3% as measured on the 20 cm CATPHAN Phantom

Absorption range:

-1024 to +3072 Hounsfield units

Gantry & Patient Table Scanning System

Multiple-beam continuous rotate/rotate with optimized geometry for low dose imaging

Philips patented Asymmetrix™ detectors: High efficacy two-dimensional solid state detector

Array consisting of 16,128 elements arranged in 24 distinct arcs. Software control of element

Clustering and data routing maximizes efficiency and performance.

Dynamic Range: 1,000,000 to 1

Data Sampling Rate: Up to 2320 views/revolution/element

Gantry Aperture: 700 mm diameter
Gantry Tilt: 30° to +30°
Scan Field of View: 50-500mm
Slice Thickness: 0.6, 0.75, 1.5, 3.0 mm and Fused combinations – sequential axial mode 0.8 – 7.5 mm Variable – spiral mode
Scan Angles: 240°, 360°, and 420°
Scan Times: 0.5, 0.75, 1, 1.5, 2 seconds for full 360° scans
(Optional 0.4 seconds for full 360° scans)
Slice Position indicator: Internal slice plane laser marker
External positioning, triple-axis laser marker
-Controls for gantry tilt, table elevation and stroke are located on both sides of the gantry and on the scan control panel. Large numerical displays for each function ensure accurate control.

Patient Table

Longitudinal motion:

- Stroke: 2000 mm in normal mode
- Scannable range: 1570 mm
- Speed: 0.5 to 100 mm/sec
- Position accuracy: ± 0.25 mm

Vertical motion:

- Range: 480 to 1000 mm above floor
- Speed 10 mm/sec or 30 mm/sec

Table accessories:

- Carbon-fiber, metal-free head holder ideal for trauma applications
- Full line of mattresses, cushions, supports and strap

Table load capacity:

- 200kg (450 lbs) with full accuracy

Table extensions:

- Aids in scanning “legs in” position.

Scanning Modes

Sequential Axial Scanning

- Multiple-slice scan with up to 16 contiguous slices acquired simultaneously with incremental table movement between scans
- Fused modes for reconstructing partial volume artefacts thick slices from thin slice acquisition

Spiral Scanning

- Multiple-slice spiral acquisition
- Multiple contiguous slices acquired simultaneously with continuous table movement during scans
- Multiple, bi-directional acquisitions
- Spiral exposure: up to 97.5 sec. of uninterrupted spiral scanning
- Spiral pitch ; 0.13 to 1.7 (users selectable)
- Spiral image reconstruction
- Modes: concurrent, Off-line, and Evolving Image
- Slice acquisition rate: Up to 38 slices per second in 0.4 seconds

Typical spiral performance examples:

Application	Collimation	Rotation (sec)	Pitch	Coverage (mm)	Scan Time(s)
Abdomen/Pelvis	16 x 1.5mm	0.5	1.3	400	7
Lungs Hi Res	16 x 0.75mm	0.75	1.3	250	12
Whole Body	8 x 3mm	0.5	1.3	1200	19
Coronary CTA	16 x 0.75mm	0.42*	0.625	120	7

Survival Scanning:

- Radiographic technique for sequence planning and automatic positioning
- Viewing angles: 0°, 90°, 180°
- Longitudinal speed: 100mm/sec
- Measurement increment: 0.3mm
- Scan Length: up to 1570mm
- Scan Width: 500mm

X-ray System

- Generator Power: 60kw
- Three selectable voltages: 90, 120, 140kVp
- Current selectable from: 30 to 500mA in 1mA increment

X-ray Tube

- Phillips Patented Dynamic Focal Spot (DFS) for high spatial resolution up to 24 Lp/cm
- Anode heat capacity: 6.5MHU (80% usable)
- Max. anode cooling rate: 730 KHU/min
- Housing cooling rate: 550 KHU/min
- Focal spot (nominal size)
- Standard: 0.8 x 1.2 mm
- Small: 0.5 x 0.7 mm
- Radiation leakage: Compliant with U.S. CDRH, Federal Radiation Performance Standards, 21 CFR, Subchapter
- Metal Casing tube insert; rotating graphite composite anode; anode heat capacity usable to 80% of nominal capacity, 5.3 million heat units effective capacity

Table & Gantry Tilt

Controls for gantry tilt, table elevation and stroke are conveniently located on both sides of the gantry and on the scan control panel. Large numerical displays for each function ensure accurate control

Operator Console

Computing and Display System with Brilliance Workspace software

Reconstruction Computer:

- Industry-leading data processing computer based on embedded array of parallel processors, delivering more than 5 GIPS. 108GB SCSI raid system for raw data storage.

Host Computer: Windows XP Dell Precision host computer

Main Memory: 2GB RAM

Operating System: Brilliance user interface with Windows XP, mouse driven Windows-like graphic interface

Data Management and Archiving

DICOM 3.0 compliant image format. Lossless image compression/decompression algorithm is used during image storage/retrieval to/from an EOD.

Hard Disk Storage Capacity (typical number of images)

512 x 512 image matrix: 146GB HD: 257,121 (Uncompressed)

9.1GB EOD: 39,000 (compressed); 19,000 (uncompressed)

Network Requirements

Network connections should be located within 10 feet of the console. The Mx8000 IDT 16 supports 10/100mbps (10/100BaseT) network speeds. Phillips recommends 100mbps network speed. For optimal performance, network should be segmented from the rest of the hospital network. Category 5 cables are recommended for all installations. Network jacks must be 8 pin modular (RJ45). The Mx8000 IDT 16 should be connected to the network via patch cord connection to the facility infrastructure. The customer is responsible for providing physical network (wire), IP address, default router IP address, and subnet mask for each system installed.

Automatic Exposure Controls

DoseRight ACS (Automatic Current Selection)

DoseRight ACS feature optimizes the dose for each patient. Based on the planning scan, DoseRight automatically determines the patient diameter and suggests the lowest mA's settings throughout the exam to maintain constant image quality at low dose. The result is consistently high quality images tailored to individual diagnostics preferences. For smaller patients, DoseRight automatic current selection offers potential dose reduction of up to 50%.

DoseRight DOM (dynamic dose modulation)

DoseRight DOM reduces the dose up to 50 percent versus current techniques for certain exams. This technique automatically distributes or controls tube current, increasing the signal over larger areas of attenuation (shoulders, hips etc.) and decreasing signal over small areas of attenuation. This automatic signal adjustment delivers both dose and noise level reduction, without a loss of resolution or overall image quality. DoseRight DOM modulates the tube current during each rotation according to the patient body symmetry change using specially developed hardware and software algorithms.

DoseRight ACS (Automatic Current Selection) can be used independently or in addition to **DoseRight DOM** (dynamic dose modulation).

Scan Control

- Study Procedure Initiation: Intuitive registration of patient information and clinical procedure selection, using anatomic graphical display and sample images.
- Scan Protocols: A large number of pre-defined and user programmable scan protocols including multi-protocol procedures can be stored and retrieved. Scan parameters may be easily modified before the scan and during the study to meet specific clinical needs.
- Pilot Plan: Planning via interactive mouse control of multiple, independent acquisition series of any type on Surview image

- Manual Scan: Enables slice-by-slice scans under operator control with on-line or off-line reconstruction, background image archiving to local or remote storage devices, without operator intervention.
- Other features include, window control, emergency button, intercom system, enable button, pause button.

Auto Voice/Auto Recording

Includes a standard set of commands for patient communication in several languages. In addition, each operator can record a custom set of commands in his/her own voice.

Auto Filming

MasterFilm™ allows the operator to set up and store filming parameters. Pre-stored protocols can be set to include auto-filming. The Operator has options to film immediately after each image, at the end of a series, a film after the end of a study and review images prior to print. The operator can also automatically film the study at three different windows.

Data Management

Image archiving is organized according to the DICOM 3.0 hierarchical model. In a DICOM 3.0 compliant image format. Lossless image compression/decompression algorithm is used during image storage/retrieval to/from all local archives. Advanced database type sorting of patients and images enable fast and easy manipulation of files

- Directions: Images and scan raw data files, stored on image hard disk or other archiving media, can be sorted and displayed by patient name, patient number, date, type of image or any other field in the image files
- Image Storage: Storage of displayed image, or series of images, to any archive
- Image Copy: Background transfer of user-selected file groups from any storage device to any other DICOM 3.0 device (local, remote or removable)

Reconstruction and Display

RapidView Reconstruction (Scan Tools)

RapidView reconstruction is the result of years of advanced research and was designed to forever remove the bottle neck between CT scan acquisition and image visualization. RapidView provides dramatic improvements in workflow by displaying images at breakthrough rates, regardless of acquisition speed or reconstruction parameter. The RapidView system employs true cone beam reconstruction algorithms and Phillips-patented back projection hardware to provide the user with the images the desire, along with the best-in-class reconstruction speeds, without compromise in image quality.

Cone Beam Reconstruction Algorithm – COBRA (ScanTools)

Phillips' multi-patented ConeBeam Reconstruction Algorithm (COBRA) enables true three-dimensional data acquisition and reconstruction in both axial and spiral scanning. This avoids and/or corrects artifacts present in reconstruction by reducing pixel to noise ratio, resulting in superior multislice image quality.

Reconstruction Modes

Concurrent: Axial and spiral modes- image reconstruction concurrent with acquisition

Off-Line (batch): Background image reconstruction of user-defined groups of raw data files with automatic image storage.

Evolving Reconstruction (ScanTools)

Provides real-time 256 x 256 matrix image reconstruction and display in step with spiral acquisition. Images can be modified for window width and level, zoom and pan prior to reconstruction. At the end of acquisition, all images are updated with the desired viewing settings.

Add Reconstruction (ScanTools)

Enables quick and easy unplanned or modified reconstructions of part or all of the images prospectively or retrospectively planned.

Reconstruction Parameters

Any study can be set up to automatically reconstruct using various reconstruction parameters. Exams can be tailored online while planning the scan, or during off-line recon. Up to six different reconstructions, assignments are possible for each study. Image reconstruction parameters include image matrix, filters, enhancements, zoom and pan, and archive. Image Matrix: 512, 768, and 1024 matrices

UltraImage (ScanTools)

UltraImage includes proprietary pre-and post-processing hardware and software for enhanced visualization of soft tissue structures. UltraImage significantly improves image quality for the most accurate representation of even the most difficult to image anatomic areas, such as the bone-brain-air interface in neurological exams. The full clinical impact of UltraImage is best appreciated in the brain, long bones, spine, pelvis or shoulder, where subtle, soft tissue structures can be obscured by adjacent high contrast bone.

Image Processing (ScanTools)

The interactive image viewer is designed for fast, efficient and simple image review and filming purposes. Images can be handled individually or in user-selected groups.

- Image viewer window: Displays a single image or a selection of images.
- Zoom & Pan: Magnification from 0.8 to 10 times
- Scroll Bar, Leaf and Cine, Invert Image, Image Parameters Display

Image Graphics (ScanTools)

To help interpret clinical images, a variety of text and graphic aids can be individually positioned and manipulated with the mouse:

- Text annotation
- Cursors for pixel value measurements.
- Regions of Interest (ROI) – elliptical, rectangular, curved or freehand, with instantaneous calculation and display of area, average pixel value and standard deviation. Values of several ROIs may be added or subtracted
- Lines, grid and scales for distance measurements, curved and freehand lines for measuring any shape.
- Arrows for pointing to features.

- Angle measurements.
- Histogram of pixel values in a user-defined region of interest.
- Profile of the pixel values along any line.
- Grid with adjustable spacing for distance assessment.

Window Control (ScanTools)

- Eight user-defined preset windows provide fast and convenient window setting. Mouse-driven fine adjustments of the window center and width enable optimal image viewing
- Highlight Window: paints user-defined range of CT density ranges on the same image, i.e. thorax slice with lung and mediastinum windows
- Invert window: Ability to toggle between negative and positive image.

Post-Processing Analysis Tools

SlabViewer (ScanTools)

MPR-MultiPlanar Reformation (ScanTools)

Maximum or Minimum Intensity Projection (MIP) (ScanTools)

3-D SSD Reconstruction (ScanTools)

MasterCut (ScanTools)

With the MasterCut Feature, MPR (Multiplanar Reformatting) Curved cuts along vascular structures can be defined on Maximum Intensity Projection (MIP) or volume rendered images to display panoramic and cross-sectional views that accurately visualize the vasculature.

RelateSlice (ScanTools)

RelateSlice is a Phillips-exclusive tool provided in Volume Rendering, 3-d SSD, MIP and MPR, that correlates the axial image to a user-selected location on multiplanar views and renderings. RelateSlice makes it easy for a user to compare the axial image to its post-processed presentation, improving the user's productivity and diagnostic confidence.

Masterlook (ScanTools)

An automated real-time image enhanced, or smoothing, that can be defined for up to three independent density ranges, such as lung, soft tissue and bone.

3-D Small Volume Analysis (ScanTools)

3-D Small Volume Analysis permits tumor or nodule characterization with respect to growth rates within the 3-d application. This tool uses automatic segmentation for help in identifying a solitary nodule or tumor (early staging of lung cancer), and measures volumetric parameters such as nodule volume, long axis, and short axis for follow-up purposes.

Q-CTA- Quantitative CT Measurement Tool Package (ScanTools)

Q-CTA is a tool kit for quantitative measurements of anatomic structures, such as vasculature pathology from 2-D , 3-D or volume-rendered images.

CT Time Laps

Graphic display of CT pixel values vs. time is available for analysis of uptake and perfusion of contrast media with time.

Volume Rendering (ScanTools)

Phillips advanced volume rendering 3-D visualization software provides unique simultaneous visualization of vasculature, soft tissue and bone. Unlike conventional 3-D or MIP, Volume-rendering visualization offers real time interactive control over opacity and transparency values. This permits viewing through and beyond surrounding structures, such as metallic stents and arterial calcifications, and virtually eliminates the need for organ segmentation.

Environment:

Operating Temperature

Gantry Room: 15-28° C (59-82° F)

Console Room: 15-28° C (59-82° F)

Utility Room: 15-28° C (59-82° F)

Max. Temperature Gradient: 5° C/hr

Humidity: 20% - 75%, non-condensing

DICOM Modality Worklist

Package includes all hardware, software and software licenses necessary to support connection to hospital information or radiology information systems (HIS/RIS) via DICOM modality worklist.

Spiral Auto Start (SAS):

Hardware connection between contrast injector and Mx8000 IDT 16. Scan initiation is triggered from contrast injector with user selectable preset delay.

Bolus Pro Ultra:

Bolus Pro Ultra is an automated injection planning technique for Phillips Mx8000 IDT 16 CT system. It enables the user to monitor actual contrast enhancement and initiates scanning at predetermined enhancement level. There are two BolusPro Ultra modes: Manual Start, and Auto Tracker Start initiated by injector trigger. Auto Tracker Start by injector trigger feature requires the Mx8000 IDT 16 to be equipped with the Spiral Auto Start (SAS) option and a SAS compatible contrast injector. Then the time from injection start is counted down, and the scanner is automatically initiated after a preset interval. This delay helps save patient irradiation at the beginning of the injection, when the Contrast agent cannot yet be viewed.

Evolving Image:

Real-time 256 x 256 matrix image reconstruction and display in step with spiral acquisition. At the end of the acquisition, all images are updated.

Ultra High Resolution Martices (768 and 1024)

This facility enables ultra high-resolution scanning in large fields of view. This package is ideal for lung and temporal bone imaging.

Stereotaxis

Software package for CT-aided stereotactic surgery planning.