TOSHIBA

Product Data
No. MPDCT0290EA

Activion 16

APPLICATION

Activion™16 is a 16-slice Helical CT system that supports whole-body scanning.

The system generates a minimum of 32 slices per 1.5 seconds using the Selectable Slice-thickness Multirow Detector (SSMD).

In addition, the high-speed rotation mechanism and the fast reconstruction unit of the system allow quick image acquisition to further improve throughput in CT examinations.

FEATURES

- **Multislice detector**

  Detection elements with high-power and uniform output characteristics enable a minimum slice thickness of 0.5 mm, and accurate isotropic data can be acquired.

  The adoption of the SSMD method means that high-speed as well as high-resolution scanning are supported.

  The minimum slice thickness is reduced to 0.5 mm, making it possible to select the desired slice image for scanning from among 0.5 mm, 1 mm, 2 mm, 3 mm, 4 mm, and 5 mm, depending on purpose.

- **High-speed scan**

  Data for 16 slices can be acquired simultaneously in each scan. For example, scanning of the lung fields over a range of 30 cm at a slice thickness of 1 mm can be completed in 10 seconds or less.

  Since the acquisition is completed in a short period of time, this obviously alleviates the burden on the patient, but also improves throughput by eliminating the need to wait for the X-ray tube to cool down.

- **High-quality images**

  It is now possible to use thin-slice helical scanning for routine examinations. Based on high-resolution voxel data, smooth and finely-detailed 3D and MPR images can be obtained with the same size in the X, Y, and Z directions (isotropic). In CT cerebral angiography, for example, scanning over a range of 40 mm at a slice thickness of 0.5 mm can be completed in 4 seconds and image processing (such as 3D, MPR, or tomographic image processing) can be performed for a single volume acquisition dataset through simple operations.

  In addition, by stacking the data acquired using thin slices, images with reduced partial volume effects can be obtained.

- **Outstanding operability**

  Operability is improved as described below.
  - In 3D image processing or time-consuming image processing such as for regions in which calcified areas are superimposed on contrast medium, bone elimination can be performed easily while observing reference images.
  - Most 3D images can be generated using the optimal conditions by simply selecting an appropriate preset icon.

- **Selectable image slice thickness**

  It is possible to acquire the data for routine examination, detailed examination and to generate 3D images in a single scan.

  For example, by performing a helical scan with a 0.5-mm slice thickness, it is possible to generate images at various slice thicknesses from the same data, such as 10-mm slice images for routine examinations, 5-mm slice images for detailed examinations, and 0.5-mm slice images for generating 3D images. It is also possible to set the image slice thickness with multiple ranges.

  For example, by performing a helical scan of the head with a 0.5-mm slice thickness, it is possible to generate images with optimal slice thickness for each region in a single reconstruction, such as 5.0-mm slice images for the cranial base as well as 10-mm slice images for the cerebral parenchyma.

- **Exposure reduction**

  This system incorporates the quantum denoising software (QDS) as a standard function, which is effective for reducing patient exposure.

  The QDS is an adaptive filter that can recognize reconstructed objects. It can perform sharp filter processing for regions where the degree of change is high, such as tissue borders; and smooth processing for regions where the degree of change is low (close to uniform). This makes it possible to further improve the quality of images acquired using normal dosages, and improves the quality of images acquired with small dosages to an image quality level obtained with normal dosages. As a result, it is possible to reduce the exposure dose for the patient, since the scanning can be performed using the optimal dose for the expected image quality.

Activion

• ^{SURE}**Fluoro™ (option)**

Conventional CT fluoroscopy shows only a single slice, but ^{SURE}Fluoro (Multislice CT fluoroscopy) permits realtime image reconstruction to display 3 images obtained by combining data from the SSMD. ^{SURE}Fluoro significantly improves operability in biopsy and interventional procedures.

• **Tilt Helical scanning**

Helical scanning with gantry tilt, from 30° forward to 30° backward, is available because the system employs the TCOT reconstruction technique.

COMPOSITION

Standard composition (Model: TSX-031A)
• Gantry 1
• Patient couch..1
• Console ....1 set
• Accessories
  – Inter-unit cables
  – Manuals
  – Set of phantoms
  – Acquisition support
  – Footswitch for the patient couch

  Note: The console desk is not included in the standard configuration.

Optional items
• Cerebral blood-flow analysis system
  (CBP-study) (CSCP-002A)
• System transformer (CETF-004B)
• Display system for dental application (CDP-07A)*
• FlyThrough software (CFT-03A)*
• Vessel view (CVV-001A)
• ^{SURE}Fluoro (TSXF-003E)
• LCD monitor for ^{SURE}Fluoro (15-inch type) (CMM-003E)
• Magneto-optical disk drive unit (CMO-12A)
• DICOM storage SCP (COT-30D)
• DICOM MWM (COT-32D)
• DICOM MPPS (COT-33D)
• DICOM Q/R SCP (COT-34D)
• DICOM Q/R SCU (COT-35D)
• DICOM storage commitment SCU (COT-41D)
• DICOM PGP profile (COT-44A)
• DICOM fast transfer system (COT-45A)
• Color printer interface (CCP-03A)
• ECG-gated scan system (CHEG-004C)
• Injector synchronization system (CKIS-004A)
• Orbital synchronized scan system (CKOS-001A)*
• Pediatric scanning system (CHKS-002A)

  * Not available in the U.S.A.

PERFORMANCE SPECIFICATIONS

Scan parameters
• Scan regions: Whole body, including head
• Scan system: 360° continuous rotate/rotate
• Scan plan
  programming: More than 360 different sequences can be pre-programmed.
• Scan time
  – CT scan: 0.48 s (Partial), 0.75, 1, 1.5, 2, and 3 s
• Scan cycle time (for 0.75-s scan)
  – SCAN & SCAN mode: Min. 1.5 s (rapid sequence scanning, couch-top movement 10 mm)

  Note: The scan cycle time refers to the time between the start of one scan and the next.
  SCAN & VIEW mode permits immediate viewing of images after acquisition of each individual slice.

• Scan field
  – CT scan: φ180 mm (SS)
  φ240 mm (S)
  φ320 mm (M)
  φ390 mm (L)
  φ500 mm (LL)

  – Scanoscopy:

Axial direction	Longitudinal direction
Up to 390 mm	Adjustable from 200 mm to 1,750 mm (1,450 mm*)

  *: For the short patient couch version

  Note: The actual range that can be viewed is less than the couch-top movement range in scanoscopy.

• Slice thickness: 0.5, 1, 2, 3, 4, and 5 mm
  These slice thicknesses are implemented by stacking the data acquired in one of the following acquisition modes.
• Acquisition
  – 16-row   0.5 mm × 16 rows
                1 mm × 16 rows

  – 4-row   0.5 mm × 4 rows
                1 mm × 4 rows
                2 mm × 4 rows
                3 mm × 4 rows
                4 mm × 4 rows
                5 mm × 4 rows
• Gantry tilt angle: From forward 30° to backward 30° (in 0.5° increments)
  Remote control from the console is possible.

• Tube position for
  scanoscopy: 0°, 90°, 180°, and 270°
  Any arbitrary angle can be specified (in 5° increments).
• Gantry aperture: 720 mm in diameter

Patient couch

- Vertical movement

  System: Hydraulically driven

  – Speed of vertical

  movement: Up: 16 to 24 mm/s (50 Hz)

  19 to 28 mm/s (60 Hz)

  Down: 20 to 30 mm/s

  – Stroke: Approx. 588 mm

  – Minimum couch-top

  height: Approx. 310 mm

  – Maximum couch-top

  height: Approx. 944 mm

- Couch-top movement

  System: Motor-driven or manual

  – Speed of movement: 130 mm/s (fast)

  10 mm/s (slow)

  – Stroke: 2,190 mm (for the long patient couch version)

  1,890 mm (for the short patient couch version)

  – Scannable range: 1,800 mm (for the long patient

  (with headrest) couch version)

  1,500 mm (for the short patient couch version)

  – Step feed pitch: 0.5 to 600 mm in 0.5-mm increments

  – Reproducibility: ±0.25 mm

  Repeatable to within ±0.25 mm after 600-mm movement

- Couch-top width: 470 mm

- Remote control from the console is possible.

  Note: This function allows the user to check the image on the console and adjust to the couch-top without leaving the console. Adjustment is possible in 10-mm increments at the console.

- Load limit

  – Max. allowable load: 205 kg (450 lb)

- Footswitch: Auto set/Auto home function can be selected.

Voice-recorded instruction and scan system (VoiceLink)

Voice instructions to the patient can be recorded electronically by the operator and automatically played back during scan sequences as part of the eXam Plan.

- Number of messages: Max. 32 messages

- Number of seconds: Max. 128 s for a total of 32 messages

- Recording time: Max. 30 s per message

- Delay time setting: The delay time between the end of the message and the start of scanning can be set up to 10 s in increments of 1 s.

Helical scan

- X-ray tube rotation

  speed: 0.75, 1, 1.5 s/360°

- Continuous scan time: Max. 100 s

- Scan start time delay: Min. 1 s

  Setting is possible in increments of 0.1 s.

- Image slice thickness:

  – For 16-row scanning

  (TCOT): The maximum image slice thickness is 10 mm.

  – For 4-row scanning

  (MUSCOT): The maximum image slice thickness is 10 mm.

- Scan field in the longi-

  tudinal direction: Max. 1,750 mm/scan (for the long patient couch version)

  Max. 1,450 mm/scan (for the short patient couch version)

  Up to 10 scan plans are programmable in one eXam Plan. (Multiple and/or Multi-directional Helical)

- Gantry tilt: Helical scan is possible in the range from 30° forward to 30° backward (only for 16-slice acquisition).

- Couch-top speed: The couch-top speed can be specified in the range from 0.8 mm/s to 96 mm/s.

- Helical pitch:

  For 16-row scanning

  (TCOT): Setting is possible in the ranges from 10 to 16 and from 18 to 24 in increments of 0.1.

  For 4-row scanning

  (MUSCOT): Setting is possible in the range from 2.5 to 3.5 and from 4.5 to 6.0 in increments of 0.5.

$$\text{Helical pitch} = \text{Couch-top movement (mm/rot.)/nominal scanning slice thickness (mm)}$$

$$\text{CT pitch factor} = \text{Helical pitch/number of slices scanned in a single rotation}$$

Note: The CT pitch factor is defined by IEC 60601-2-44 Amd.1: 2002

- ^{SURE}Exposure^{TM} Function for continuously varying the X-ray tube current to ensure the optimal X-ray dose during helical scanning.

- Image reconstruction

  time: Up to 10 images/s (0.1 s/image)

- Real-time helical

  reconstruction time: 12 images/s (0.083 s/image) (1 slice, 512 × 512 matrix)

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- SUREStart™:
  - Continuous scan time: Max. 100 s
  - Region of interest
    (ROI): Max. 3 ROIs
  - CT number
    measurement interval: 0.083 s (12 measurements/s)
  - Scan start delay time: Min. 3 s
  - Display function: Mean CT number and elapsed time
- Specification of
  reconstruction position: By entering the couch-top position or using the scanogram
- Reconstruction method: TCOT reconstruction (applicable to 16-row acquisition data)
  MUSCOT reconstruction (applicable to 4-row acquisition data)
- Reconstruction mode: Full image
  Half image
  Detail image
- The relationships between the slice thickness and the imaging area scanned in 7.5 s (0.75 s, 10 rotations) in the longitudinal direction are shown for helical pitches 10 and 20.

Setting slice thickness	Helical pitch*	
	10	20
0.5 mm	50 mm	100 mm
1 mm	100 mm	200 mm

*: The couch-top traveling distance per rotation is shown relative to the slice thickness.

Dynamic scan
- Scan time: 0.75, 1, 1.5 s/360°
- Programmable time: Max. 1 hour
  This refers to the maximum time within which a series of scans is performed following a predetermined eXam Plan.
- Number of
  programmable scans: Max. 10
  Max. time of one continuous scan is 100 s.
- Scan plan
  - Scan interval: Min. interval is 1 s
    Setting is possible in increments of 0.1 s in a scan interval of more than 1 s.

  Note: When a scanning mode with patient couch movement is used, the minimum scan interval is limited by the time required for movement.

- Scan start delay time: Min. 0.5 s
  Setting is possible in increments of 0.1 s.
- Scan rate: Max. 133 scans/100 s
  (0.75-s scan, 133 rotations)

- Image reconstruction
  - Number of images: Max. 4 images/scan
  - Image interval: Reconstruction is possible in increments of 0.1 s.
- Reconstruction time: Min. 0.5 s
- Real-time reconstruction
  time: 12 images/s (0.083 s/image)
  (1 slice, 512 × 512 matrix)

X-ray generation
- X-ray exposure: Continuous
- X-ray tube voltage: 80, 100, 120, and 135 kV
- X-ray tube current: 10 mA to 300 mA (260 mA for 135 kV) (in increments of 10 mA)
- X-ray tube heat capacity: 4.0 MHU
- X-ray tube cooling rate: Max. 864 kHU/min
- Focal spot size
  - IEC 60336: 1993
    nominal : 0.9 mm × 0.7 mm (small)
    1.4 mm × 1.4 mm (large)

X-ray detection
- Detection system: Solid-state detectors
- Main detector: 800 channels × 28 elements
- Data acquisition: 800 channels × 16 rows
- Reference detector: 1 set
- View rate: Max. 1,200 views/s

Data processing
- Reconstruction matrix: 512 × 512
- Picture element (pixel) size
  - CT image: Unit: mm

Scan field	SS	S	M	L	LL
Pixel size	* to 0.35	* to 0.47	* to 0.63	* to 0.76	* to 0.98

*: Depending on the Vari-Area or Zoom factor

  - Scanogram: Unit: mm

Enlargement ratio (area)		Standard
Pixel size	LL	4.00
	L	2.00
	M	1.0
	S	0.50

- Reconstruction filter functions
  - Functions for the abdomen with BHC
  - Functions for the abdomen without BHC
  - Functions for the brain with BHC
  - Functions for the brain without BHC
  - Functions for the inner ear and bone
  - Functions for the lung
  - Functions for high-resolution mode
  - Functions for super-resolution mode for the inner ear, bone, and lung
  - Functions for maintenance

- Image reconstruction time
  - CT scan: Min. 0.17 s
  - Scanoscopy: Reconstructed and displayed simultaneously with scanning (real-time reconstruction)
- Data processing unit
  - Central processing unit: 32-bit processor x 2
  - Memory size: 3 Gbytes
  - Magnetic disk unit: Raw data, 144 Gbytes
    Image data, 73 Gbytes

Data storage
- Magnetic disk
  - Raw data: Max. 3,600 rotations (0.75-s helical scan)
  - Image data: Max. 100,000 (per each console)
- CD-R/DVD drive
  - CD-R
    - Storage capacity: 650 Mbytes (formatted)
    - Media: CD-R disk (in accordance with Orange Book part II)
    - Data format: DICOM format (in conformance with DICOM standards PS3.10)
    - Image data: Max. 1,000 images (assuming that images [512 Kbytes/image] are recorded on a disk at one time)
  - DVD
    - Storage capacity: 9.4 Gbytes (double-sided)
    - Media: DVD-RAM
    - Image data: Max. 16,000 images (for a double-sided disk, DICOM format)
    - Raw data: Max. 120 rotations (for a single-sided disk, 0.75-s scan)

Image display
- Display monitor: 19-inch color LCD
  Size of display area comparable to a 21-inch CRT monitor
- Monitor matrix: $1,280 \times 1,024$
- Image matrix: $1,024 \times 1,024$ (max.)
- CT number
  - Display range: From -1,536 to +8,191

  Note: The CT number measurement range is from -32,768 to +32,767.

- Window width/level: Continuously variable (adjustable at variable speed)
- Preset window: Three types of window settings can be preset for each image.
- Window types: Linear, non-linear (6 user-programmable), and double windows
- Image retrieval
  - Method: On-screen menus and keyboard
  - Mode: Image, series, and patient

- Autoview function: Software control, function key
- Multi-frame display: Reduction/cut-off display, ROI processing
- Inset scanogram display
- Selective related information display
- Cine display
  - Image display speed: Variable
- Scanogram/CT image switching: Show scano line, zoom, hide scano line
- Slice-feed playback (CineView): High-speed image feeding using the mouse or keyboard

Image processing
- Scanogram processing
  - Slice position display (display of planned slice, preset slice, and last scanned slice)
  - Anatomical scale (display of position, relative to selected zero position)
  - Slice position setting
  - Enlargement (4× for L or LL size)
- CT image processing
  - ROI setting and processing
    - ROI shape: Point, rectangular, polygonal, elliptical, irregular
    - ROI processing: Mean value, standard deviation, area, number of pixels, maximum value, minimum value
    - ROI display: Ten ROIs can be displayed on an image.
    - ROI control: Size, position, rotation
  - Measurement of distance and angle between two points
  - Profile (oblique profile also available)
  - Histogram
  - CT number display
  - Mark display (grid display, scale display)
  - Volume calculation
  - Enlargement, reduction, panning
  - Addition/subtraction between images
  - Band display (non-linear windowing)
  - Comment and arrow insertion
  - Top/bottom, right/left, black/white reversal of image
  - Image filtering
  - Image rotation (arbitrary rotation)
  - Screen save
  - High-speed axial interpolation
  - MultiView (Auto MPR)
  - Quantum denoising software (QDS)
  - Boost3D™
  - Z-sharpening
- Raw data processing
  - Zooming reconstruction
  - Stack reconstruction
  - Protect/Unprotect
  - Half-view reconstruction of helical scan raw data
  - Play/Reverse reconstruction (Helical & Dynamic scan)
  - Priority reassignment in reconstruction queue

• System management
  – Warm-up
  – Calibration data acquisition
  – Picture retouching
  – Operating environment setting function
  – Examination record
• Display of exposure
  dose: $CTDI_{vol}$ (or $CTDI_w$) /DLP/
                                 Geometric eff.

3D color image processing

High-quality 3D images can be obtained rapidly by easy operation.

• 3D surface rendering
  – Clipping, texture or non-texture
• 3D volume rendering
  – Maximum intensity projection (Max-IP)
  – Minimum intensity projection (Min-IP)
  – X-ray volume rendering
  – Intensity volume rendering
  – Shaded volume rendering (an arbitrary opacity curve can be set)
• Display/processing function
  Zooming, panning, measurement (distance, angle), annotation, cutting, drilling
• Cine display
• MPR
  3 orthogonal planes/oblique image
  Curved MPR
• Easy accurate bone elimination function
• High resolution mode

Image transfer/conversion

• 1000BASE-T, 100BASE-TX, 10BASE-T
• Toshiba protocol
• DICOM storage SCU
• TIFF conversion

Filming

• Ethernet: Toshiba protocol
                                DICOM PRINT SCU
• Sheet editing function using virtual film
• T-mode: Related information items such
                                as the patient name are dis-
                                played in the footer area using a
                                larger font.

  Note: To use T-mode, the laser imager must support
        2048 pixels x 2404 pixels for a 1 x 1 frame.

• Auto filming in eXam Plans

IMAGE QUALITY

• Noise
  – Standard deviation: Less than 0.5%
  – Scan parameters
    · Tube voltage: 120 kV
    · Tube current: 260 mA
    · Scan time: 1.5 s
    · Reconstruction
      function: FC70
    · Slice thickness: 10 mm
    · Scan field: S
  – Phantom: φ24 cm water
• Spatial resolution: 14.5 lp/cm at MTF 2%
                                 18 lp/cm at cutoff
                                 (reference)
                                 8.0 lp/cm at MTF 50%
                                 (MTF calculation value)
  – Scan parameters
    · Tube voltage: 120 kV
    · Tube current: 200 mA
    · Scan time: 1 s
    · Slice thickness: 2 mm
    · Scan field: S
    · Reconstruction
      function: FC90
  – Phantom: IRIS QA phantom
• High contrast resolution
  X-Y plane
  – High-resolution
    mode (FC90):   0.35 ± 0.05 mm
  – Standard mode
    (FC30):   0.55 ± 0.05 mm
  – Scan parameters
    · Tube voltage: 120 kV
    · Tube current: 200 mA
    · Scan time: 0.75 s
    · Slice thickness: 2 mm
    · Scan field: S
  – Phantom: Toshiba standard

SYSTEM COMPONENTS AND THEIR FUNCTIONS

Gantry

The scanner is composed of the gantry and the patient couch. The scanner uses a fan-shaped continuous X-ray beam to scan the region to be examined. Transmitted X-rays are detected and converted into electrical signals by the SSMD.

The gantry includes the main body and its support mechanism. The X-ray tube and the SSMD are mounted facing each other on either side of the gantry aperture, and the X-ray tube and detectors rotate continuously around the aperture of the gantry. A slipring is employed to transmit power between the gantry and the rotating X-ray high-voltage generator assembly.

The gantry can be tilted forward and backward in order to perform tilt scanning. Three-dimensional alignment lights are provided for setting slice positions. Gantry and patient couch operating controls are provided on both sides of the front of the gantry housing. The patient guide display indicates the scan status to the operator and the patient. The X-ray high-voltage generator is built into the gantry, and the system employs a high-frequency inverter for generating and stabilizing the high voltage supplied to the X-ray tube. The generator includes electronic circuits for controlling the speed of the rotating anode in the X-ray tube. Use of a high-frequency inverter system results in high power output combined with excellent stability. In addition, the system is compact and light weight.

X-ray generator

This unit supplies stable high voltage to the X-ray tube unit. The high-frequency inverter method is employed, resulting in a light and compact design. This unit is incorporated in the gantry.

- Max. power: 42 kW

X-ray tube

This is a large-capacity, high-cooling-rate X-ray tube that is able to withstand continuous operation as in helical scanning.

- Heat capacity: 4 MHU
- Cooling rate: Max. 864 kHU/min

Patient couch

The patient couch is positioned in front of the gantry and supports the patient. The entire unit moves vertically and the top moves longitudinally. In an emergency, the couch-top can be pulled out manually with very little effort. The couch-top can also be lowered to a minimum height of approx. 310 mm from the floor, facilitating transfer of the patient from a low bed or stretcher.

Activion

Console

The console is provided with a hybrid keyboard, a monitor, and a mouse.
• Functions for scanning
  – Selection of scan parameters
  – Scanoscope control
  – Scan control
  – Remote control of couch-top movement
  – Remote control of gantry tilt
• Functions for image processing
  – Window level and window width adjustment
  – Other mouse-operated image processing functions

OPERATING FEATURES

Patient handling and positioning
• The couch-top can be lowered to approx. 310 mm (at the center of the couch top) from the floor, making it easier to transfer the patient to and from a bed or stretcher.
• Alignment lights are provided in the gantry aperture for fast and accurate patient positioning.
• High-precision couch-top positioning is possible from the integrated console or by manual operation from the control panel and clear digital readouts are provided on the gantry.
• The couch-top can be pulled out manually in an emergency.

Scanning
• Toshiba's scanoscope function provides a projection image of the patient for high-precision advance planning of the slice positions.
• The longitudinal length of the scanning field for the scanogram can be adjusted up to 1,750 mm (1,450 mm for the short patient couch version). Real-time helical permits the scan to be aborted at any time. This minimizes the patient exposure dose.
• The auto index function allows automatic incremental couch-top movement based on the slice positions determined through the scanogram.
• The eXam Plan function allows simple selection of pre-programmed scanning parameters for routine examinations, maximizing patient throughput.
• Protocol comments can be saved in each eXamPlan provideng interactive onscreen instructions for all studies reducing the need to refer to a separate protocol book.
• The Vari-area function allows the user to pre-select a region of interest for zooming using raw data, permitting immediate post-scan analysis. Zooming using raw data yields higher resolution than enlarging an image that has already been reconstructed.
• Dynamic and rapid sequence scan modes are provided.
• Multislice helical scan acquires raw data by rotating the X-ray tube continuously while moving the patient continuously through the scanner. The volume data acquired can be used to reconstruct slices at any desired axial positions. This scan mode is best used for rapid patient scanning during a single breath-hold and for high-definition three-dimensional and MPR imaging.

• Real-time helical reconstruction mode makes it possible to observe the images being scanned in real time at a maximum at 12 frames per second. This mode shows any shift in the slice position in real time and helps the operator to check the scan field on the image, the contrast study timing, the presence of patient body motion, etc. The patient can therefore be released immediately after scanning.
• The SUREStart function allows the operator to start helical scanning at the timing of maximum enhancement in contrast studies. SUREStart monitors the scan from the start of a contrast study at a certain slice position while measuring the changes in CT number on the image being displayed in real time. When the contrast reaches the predefined threshold, helical scan automatically starts. This technique ensures optimal contrast enhancement, independent of individual differences in blood flow speed, and at the same time minimizes the dose of contrast medium.

Data processing
• Rapid reconstruction increases the reconstruction speed to 0.5 second in 0.75-second scans. (Scan & View mode)
• A variety of reconstruction algorithms are available and can be selected according to the anatomical region to be examined and the clinical objective of the study. These include algorithms for the abdomen, head, bone, lung, small structures, soft tissues, etc.

Image display and processing
• Reconstructed images are automatically displayed according to the window settings preset in the eXam Plan.
• The window save function allows the user to store an image with window settings different from the ones set in the eXam Plan.
• Filter parameters can be customized through simple on-screen menu selections. These parameters include the number of filtering passes, matrix size, and filter coefficients.
• Images can be rotated and reversed either right/left, top/bottom, or black/white.
• The Multi-frame feature allows up to 16 images to be retrieved and displayed simultaneously on the screen.
• The three-dimensional image display function allows color three-dimensional and MPR images in real-time to be generated from the volumetric scan data acquired by helical scanning. This results in higher definition and image quality than images reconstructed from conventional single-slice scanning. This is because helical scanning provides superior data continuity along the patient axis compared with conventional scanning.

Image storage and archiving
- The system is provided with a 217 Gbyte magnetic hard disk as standard equipment, permitting the on-line storage of approximately 100,000 images and 3,600 rotations of raw data.
- A 9.4 Gbyte DVD-RAM disk drive is provided as standard equipment. The image storage capacity of the DVD-RAM disk is approximately 16,000 images per disk.

Image filming
- Filming of images can be performed manually or automatically from the console.
- Automatic filming sends an entire study to the laser camera. Filming is performed in background mode so that other scanner and image processing functions can be performed without interruption or delay.
- When T-mode is used, related information items displayed together with an image (surrounding the image, in a small font) are displayed in the footer area using a larger font, permitting not only easier reading but also simpler film management.

  Note: To use T-mode, the laser imager must support 2048 pixels x 2404 pixels for a 1 x 1 frame.

Patient throughput
Patient throughput and cost effectiveness were major objectives in the design and production of the system.
- The system incorporates a 4.0-MHU X-ray tube with a very fast cooling rate of 864 kHU/min in actual use.
- High-speed scans can be performed in as little as 0.75 second per scan.
- Real-time reconstruction is possible in scanoscopy.
- CT images can be reconstructed in 0.5 second for 0.75-second routine scans.
- Ease of operation is ensured by incorporating a hybrid keyboard, mouse-driven menus, and a large color LCD screen.
- The couch-top can be lowered very near the floor, simplifying patient transfer.

COMPLIANCE

Council Directive 93/42/EEC
Concerning Medical Devices (Medical Device Directive)

- IEC:

  IEC 60601-1: 1988
  IEC 60601-1 Amd.1: 1991
  IEC 60601-1 Amd.2: 1995
  IEC 60601-1-1: 2000
  IEC 60601-1-2: 2001
  IEC 60601-1-3: 1994
  IEC 60601-1-4 Ed.1.1: 2000
  IEC 60601-2-28: 1993
  IEC 60601-2-32: 1994
  IEC 60601-2-44: Ed.2.1: 2002

DIMENSIONS AND MASS

Unit		Dimensions L × W × H mm (in)	Mass kg (lb)
Gantry		900 × 2,070 × 1,910 (35.4 × 81.5 × 75.2)	1,280 (2,822)
Patient couch	Long patient couch version	2,690 × 630 × 450 (105.9 × 24.8 × 17.7)	450 (992)
	Short patient couch version	2,390 × 630 × 450 (94.1 × 24.8 × 17.7)	420 (926)
CPU cabinet 1		815 × 450 × 700 (32.1 × 17.7 × 27.6)	100 (220)
CPU cabinet 2		815 × 450 × 700 (32.1 × 17.7 × 27.6)	85 (187)

SITING REQUIREMENTS

Power requirements
- Phase: Three-phase
- Voltage: 200 V*
- Frequency: 50 Hz or 60 Hz ±0.5 Hz
- Line capacity: 75 kVA
- Voltage fluctuation
  due to load variation: Less than 5%
- Power voltage
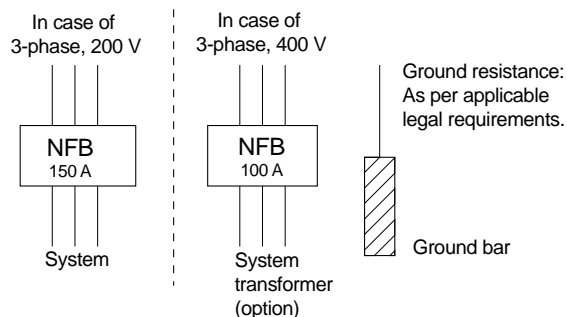 fluctuation: Less than 10%**

* Please consult Toshiba in the case of other voltages or excessive power fluctuation.

** Represents the total voltage fluctuation due to load and power variation.

Grounding
Grounding must be provided in accordance with local regulations for medically used electrical equipment.

![Activion]

Power distribution board

In case of 3-phase, 200 V

NFB 150 A

System

In case of 3-phase, 400 V

NFB 100 A

System transformer (option)

Ground resistance: As per applicable legal requirements.

Ground bar

Ambient conditions

	Temperature	Humidity	Heat generation
Scan room			
Gantry	20°C to 26°C Tolerance: ±2°C	40% to 80% No condensation	Approx. 9.720 kJ/h (*1) 32,070 kJ/h (*2)
Patient couch	20°C to 26°C Tolerance: ±2°C	40% to 80% No condensation	Approx. 1,080 kJ/h (*1) 1,800 kJ/h (*2)
Operator's room			
Console	16°C to 28°C	40% to 80% No condensation	Approx. 9,720 kJ/h

*1: When scanning is not performed.

*2: When scanning is performed continuously at the maximum rated output of the system.

Minimum area for installation

• For the long patient couch version: 22 m^2
• For the short patient couch version: 21 m^2

Room layout example

1,494 (1,194*)

7,130 (6,530*)

5,530 (4,930*)

1,600

3,072

Unit: mm

❶ Gantry   ❸ Console
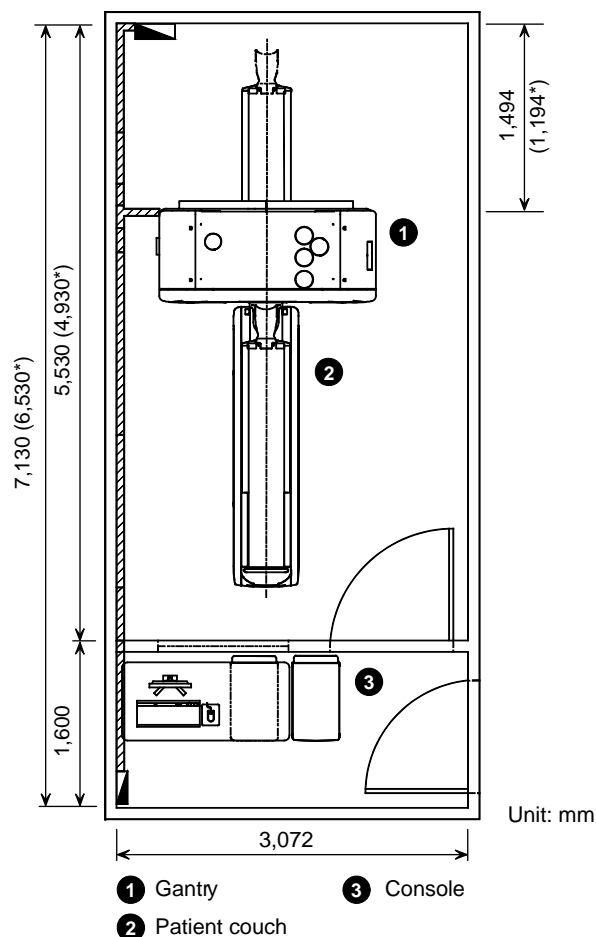
❷ Patient couch

*: For the short patient couch version
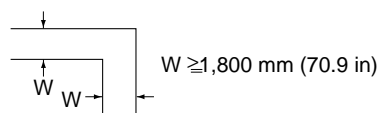
Installation requirements

Scan room
• Before installing the gantry, check the maximum permissible floor load.
• The scanner emits radiation. X-ray shielding must be provided around the scan room and the entrance in accordance with all local requirements and regulations.
• The ceiling should be at least 2,500 mm high to permit the use of a contrast medium injector.
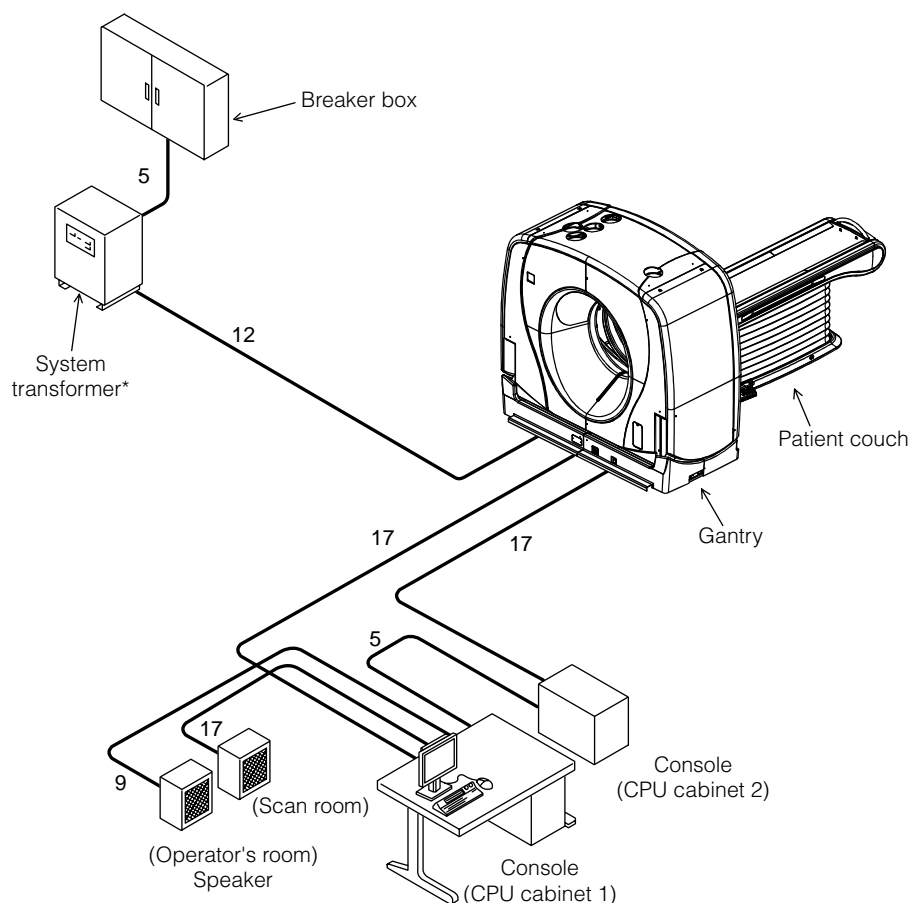• Wiring pits and ducts are required for routing cables that connect the various units.

Operator's room
• An observation window is required for monitoring the scan room. X-ray shielding of the window glass must be provided in accordance with all local requirements and regulations, and the bottom of the window frame should be 90 cm from the floor.
• Wiring pits and ducts are required for routing cables that connect the various units.
• The operator's room should have entrances for access to the corridor and the scan room.

Cable connections between units

Checks before bringing-in the unit
• Check in advance the width of the corridor, the dimensions of the entrance, and the dimensions and maximum allowable load of the stairs and elevators to ensure that it is possible to bring-in the unit safely and without difficulty.
• Minimum external dimensions of the entrance used for bringing-in the unit are as follows:
    Width:　　980 mm　　(38.6 in)
    Height:　　2,070 mm　　(81.5 in)
• The corners of corridors should be as illustrated below.
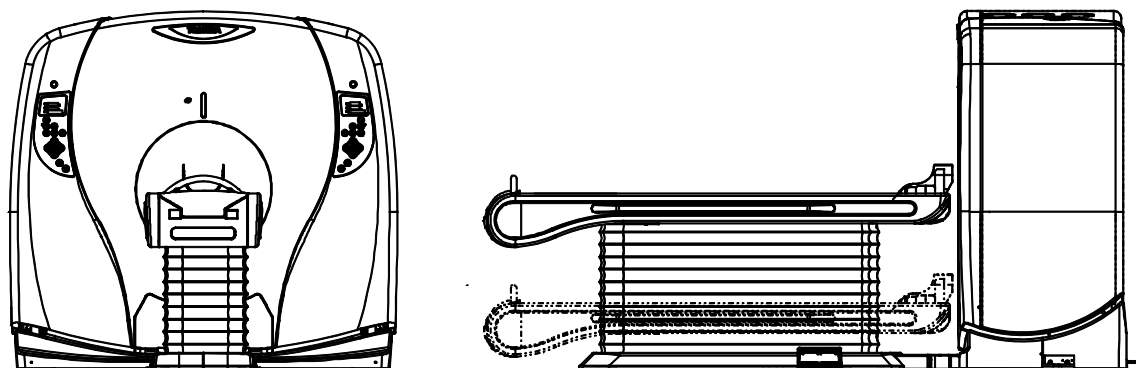• Elevator minimum load: 2,000 kg (4,400 lb)

W ≧1,800 mm (70.9 in)

*: When line voltage is 200 V ±10 V, the system transformer is not required.

Unit: m

11

Activion

Gantry and Patient Couch

OUTLINE DRAWINGS

900
(35.4)

344
(13.5)

556
(21.9)

30°   *30°*
(TILT ANGLE)

1,910
(75.2)

2,070
(81.5)
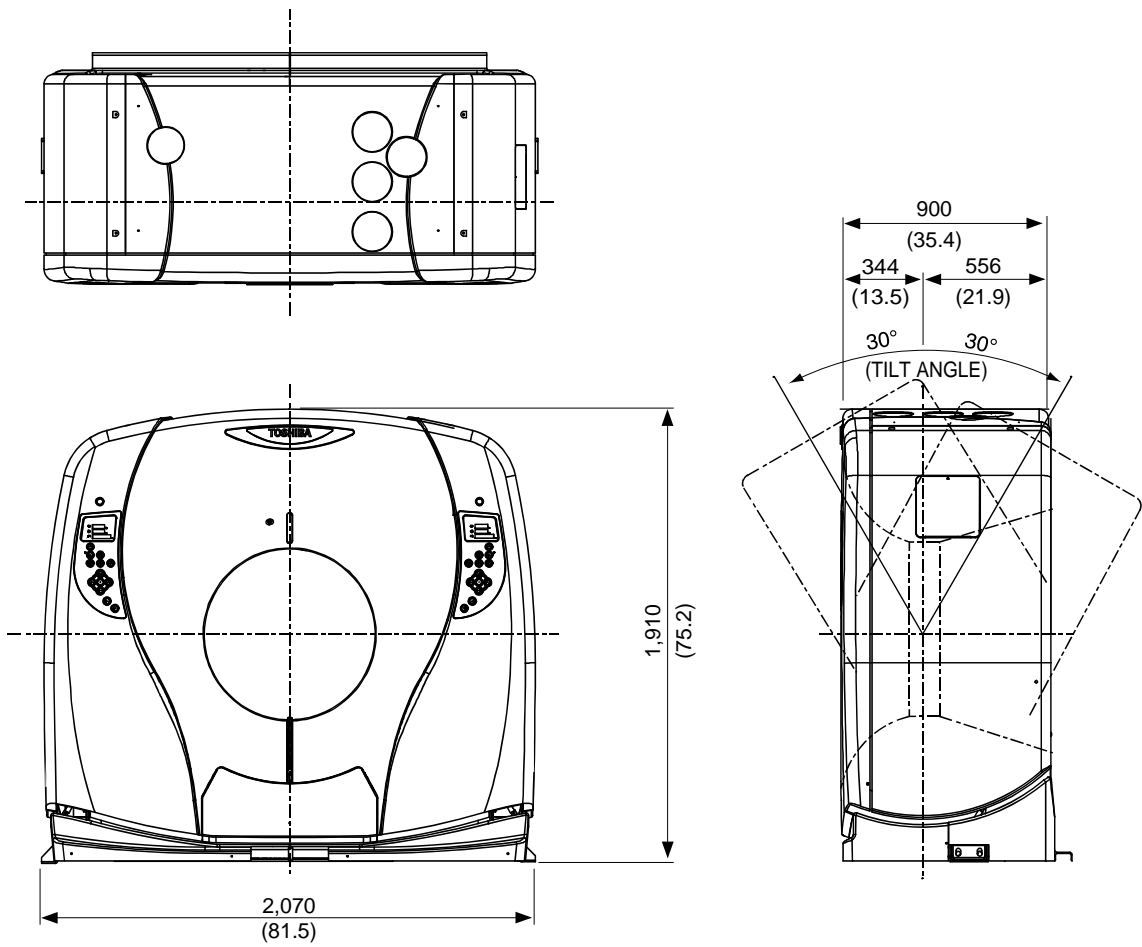
Gantry

Unit: mm (in)

OUTLINE DRAWINGS

470
(18.5)
630
(24.8)

2,190
(86.2)

2,187
(86.1)

430*
(17)

1,862
(73.3)

2,690
(105.9)

588 (23.1)

STROKE

450
(17.7)

1,038 (40.9)
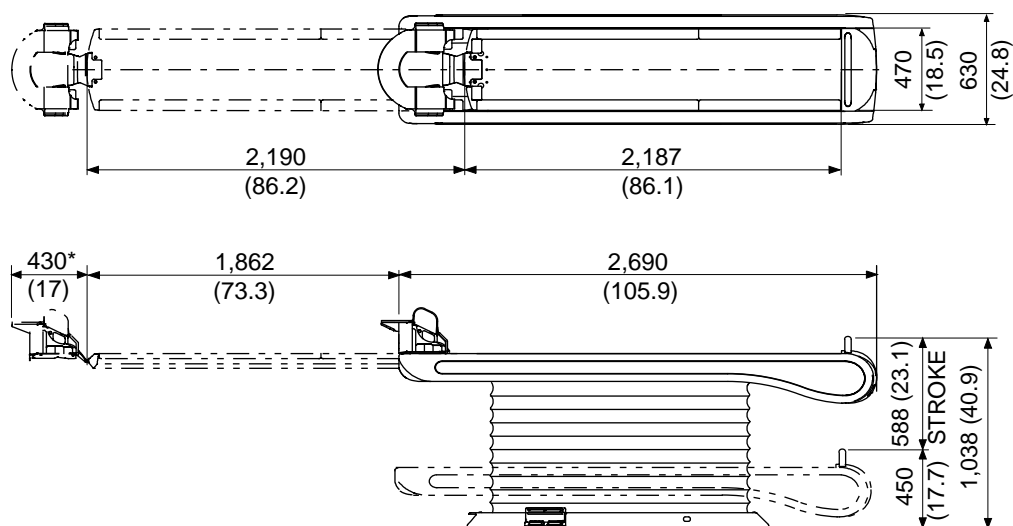
* When the arm up holder is mounted.

Patient Couch (for the long patient couch version)
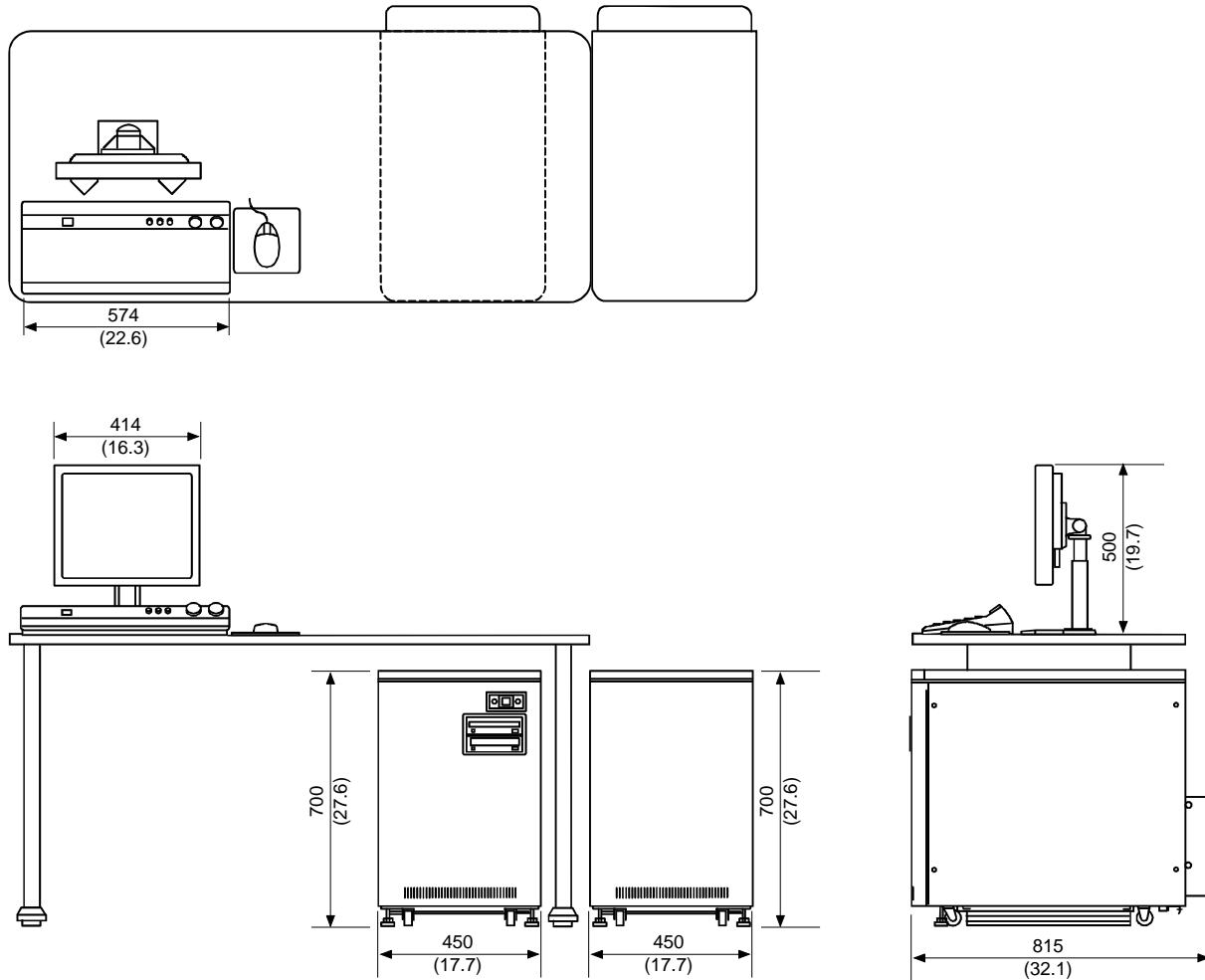
Unit: mm (in)

OUTLINE DRAWINGS

470
(18.5)
630
(24.8)

1,890
(74.4)

1,887
(74.3)

430*
(17)

1,562
(61.5)

2,390
(94.1)

588 (23.1)

STROKE
1,038 (40.9)

450
(17.7)

* When the arm up holder is mounted.

Patient Couch (for the short patient couch version)

Unit: mm (in)

15

OUTLINE DRAWINGS

574
(22.6)

414
(16.3)

500
(19.7)

700
(27.6)

700
(27.6)

450
(17.7)

450
(17.7)

815
(32.1)

Console

Note: The console desk is not included in the standard configuration.
Some of the units shown in the photograph on the front page differ from those shown in the drawings above.

Unit: mm (in)

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