

Product Data

No. MPDCT0246EAJ

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# Aquilion

### APPLICATION

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The Aquilion™ 64-slice system is a multislice Helical CT system that supports whole-body scanning. The system basic generates a minimum of 128 slices per second using the Selectable Slice-thickness Multi-row 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

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- **The impact of faster scanning**

Extending the scanning range allows a larger region to be scanned in a shorter time, making 64-detector systems particularly well suited to cardiovascular and trauma applications.

Cardiac examinations benefit from the improved temporal resolution and can accommodate a wider range of patients, including patients with severe shortness of breath or marked variation in heart rate.

- **Enhancing voxel resolution**

Aquilion systems, with their unique Quantum detectors, have been able to acquire true isotropic voxels since their introduction into the marketplace in 1999.

Aquilion can acquire a volume of  $64 \times 0.5$ -mm slices every rotation, with an effective voxel resolution of 0.35 mm to visualize fine details of small, complex anatomy such as the coronary arteries. Aquilion delivers extended coverage with no sacrifice in image detail.

- **Increasing accuracy over larger volumes**

As larger volumes are scanned in a single pass, X-ray beam angles change dramatically. To ensure image accuracy throughout the entire volume, reconstruction algorithms must be adapted to accommodate the wider beam angle. Aquilion utilizes Toshiba's patented advanced cone-beam algorithm TCOT, which has been modified to accommodate 64-slice image acquisition.

- **Speeding data flow**

Acquiring 64 slices of high-resolution, isotropic voxels generates huge data sets. Fast, accurate transfer of information from the detector to the data processing system is essential, and since the gantry is rotating rapidly, data should be transmitted without physical contact. Aquilion employs an innovative approach by using a high-speed coupling system for data transmission, ensuring the data integrity required for accurate image processing.



- **Improvements in volume data workflow**

Routine studies acquired with 0.5-mm isotropic voxels can generate thousands of axial images per exam. Aquilion makes the move to volume imaging by generating volume data sets that are not restricted to the axial plane. On-the-fly MPR viewing and image generation is performed at incredible speed and with unsurpassed ease of use. Intelligent zoom and mouse scroll capabilities ensure effortless navigation through volume data, providing the most accurate diagnosis possible in the shortest amount of time.

Automated exam protocols allow facilities to create custom-tailored automated scan plans, including MPR generation, and multiple distribution pathways for the entire study.

Rapid image reconstruction is ensured by a powerful, high-performance computer system with true parallel processing that performs simultaneous scanning with real-time image display and image reconstruction.

- **Improving dose efficiency**

Multidetector CT has dramatically improved the ability of clinicians to accurately diagnose disease at an early stage. With the corresponding increase in the number of CT scans, minimizing the dose in every examination becomes an even greater concern. The design choices made in Aquilion maximize dose efficiency, with tubes that reduce off-focal X-rays and detectors that provide excellent image quality at a lower dose. To further enhance patient safety, Aquilion incorporates several additional features such as Shaped filters, Quantum denoising software, <sup>SURE</sup>Exposure™3D, and Boost3D™ to ensure dose-effective imaging.

- **Tilt Helical scanning**

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

- **SUREFluoro™ (option)**

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

## COMPOSITION

### *Aquilion* < 64-slice system >

#### Standard composition (Model: TSX-101A/H)

- 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 (CETF005C)
- Quantitative bone mineral study system (CBM-14A)\*
- Display system for dental application (CDP-07A)\*
- FlyThrough software (CFT-03A)\*
- SUREFluoro (TSXF-003F)
- LCD monitor for SUREFluoro (15-inch type) (CMM-003E)
- 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)
- ECG-gated reconstruction system (CHEG-004B)
- Fast image reconstruction system (CCFR-007A)
- Fast scan kit (CGS-33B)
- Fast scan kit (CGS-41A)
- Cardiac function analysis software (CSCF-002A)
- Injector synchronization system (CKIS-004A)
- Orbital synchronized scan system (CKOS-001A)
- SUREPlaque™ (CSPV-001A)
- Vessel view (CVV-001A)\*
- Pediatric scanning system (CHKS-002A)
- Magneto-optical disk unit (CMO-12A)
- X-ray high voltage generator with X-ray power up kit (CXGS-012A)
- X-RAY Hardware Modulation kit (CXM-016A)

\* Not available in the USA.

## PERFORMANCE SPECIFICATIONS

### Scan parameters

- Scan regions: Whole body, including head
- Scan system: 360° continuous rotate/rotate
- Scan plan programming: Up to 360 different sequences can be pre-programmed.
- Scan time
  - CT scan: 0.32 s (partial), 0.5, 0.75, 1, 1.5, 2, and 3 s
- Scan cycle time (for 0.5-s scan)
  - SCAN & VIEW mode: Min. 2 s (single image display)
  - 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:  $\phi$ 180 mm (SS)  
 $\phi$ 240 mm (S)  
 $\phi$ 320 mm (M)  
 $\phi$ 400 mm (L)  
 $\phi$ 500 mm (LL)

– Scanoscopy:

Axial direction	Longitudinal direction
Up to 500 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, 6, and 8 mm  
These slice thicknesses are implemented by stacking the data acquired in one of the following acquisition modes.
- Acquisition
  - 64-row 0.5 mm  $\times$  64 rows
  - 32-row 0.5 mm  $\times$  32 rows  
1 mm  $\times$  32 rows
  - 16-row 1 mm  $\times$  16 rows  
2 mm  $\times$  16 rows
  - 4-row 0.5 mm  $\times$  4 rows  
1 mm  $\times$  4 rows  
2 mm  $\times$  4 rows  
3 mm  $\times$  4 rows  
4 mm  $\times$  4 rows  
6 mm  $\times$  4 rows  
8 mm  $\times$  4 rows
  - 1-row 1 mm  $\times$  1 row  
2 mm  $\times$  1 row  
4 mm  $\times$  1 row  
6 mm  $\times$  1 row  
8 mm  $\times$  1 row

- 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 positioning: External projector, internal projector (Both are laser projector).

### Patient couch

- Vertical movement System: Motor-driven
  - Speed of vertical movement: Max. 60 mm/s (fast mode)  
Min. 10 mm/s (slow mode)
  - Stroke: Approx. 644 mm
  - Minimum couch-top height: Approx. 300 mm
  - Maximum couch-top height: Approx. 944 mm
- Couch-top movement System: Motor-driven or manual
  - Speed of movement: 130 mm/s (fast mode)  
10 mm/s (slow mode)
  - Stroke: 2,190 mm (1,890 mm\*)
  - Scannable range: (with headrest) 1,800 mm (1,500 mm\*)
  - Step feed pitch: 0.5 to 600 mm in 0.5-mm increments
  - Reproducibility:  $\pm$ 0.25 mm  
Repeatable to within  $\pm$ 0.25 mm after 600-mm movement

\*: For the short patient couch version

- 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: Vertical movement (UP/DOWN) or AutoSet/AutoHome 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: 0.5, 0.75, 1, 1.5 s/360°
- Continuous scan time: Max. 100 s
- Scan start delay time: Min. 1 s  
Setting is possible in increments of 0.1 s.
- Image slice thickness:
  - For 64-row, 32-row, and 16-row scanning(TCOT): A maximum image slice thickness of 10 mm can be set.
  - For 4-row scanning (MUSCOT): A value of up to 5 times the scan slice thickness can be set. The maximum image slice thickness is 10 mm.
- Scan field in the longitudinal direction (including the headrest): Max. 1,750 mm/scan (Max. 1,450 mm/scan\*)
  - \*: For the short patient couch version
- Gantry tilt: Helical scan is possible in the range from 30° forward to 30° backward (only for 16-slice, 32-slice, and 64-slice acquisition).
- Couch-top speed: The couch-top speed can be specified in the range from 0.8 mm/s to 120 mm/s.
- Helical pitch (CT pitch factor display is possible):
  - For 64-row scanning (TCOT): Setting is possible in the ranges from 40 to 58 and from 71 to 96 in increments of 0.1.
  - For 32-row scanning (TCOT): Setting is possible in the ranges from 20 to 29 and from 36 to 48 in increments of 0.1.
  - 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 ranges from 2.5 to 3.5 and from 4.5 to 6.0 in increments of 0.5.
  - CT pitch factor:
    - For 64-row scanning: 0.625 to 0.906, 1.109 to 1.5
    - For 32-row scanning: 0.625 to 0.906, 1.125 to 1.5
    - For 16-row scanning: 0.625 to 1, 1.125 to 1.5
    - For 4-row scanning: 0.625 to 0.875, 1.125 to 1.5

$$\left. \begin{aligned} \text{Helical pitch} &= \text{Couch-top movement} \\ &\quad (\text{mm/rot.})/\text{nominal scanning} \\ &\quad \text{slice thickness (mm)} \\ \text{CT pitch factor} &= \text{Helical pitch}/\text{number of slices} \\ &\quad \text{scanned in a single rotation} \end{aligned} \right\}$$

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

- SURE<sup>®</sup>Exposure3D: Function for continuously varying the X-ray tube current to ensure the optimal X-ray dose during helical scanning.
- Image reconstruction time: Up to 16 images/s (0.0625 s/image)
- Real-time helical reconstruction time: 12 images/s (0.083 s/image) (1 slice, 512 × 512 matrix)
- SURE<sup>®</sup>Start<sup>™</sup>:
  - Next scan start mode
    - Auto-start mode
    - Manual start mode
  - 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 within the ROI, elapsed time
- Specification of reconstruction position: By entering the couch-top position or using the scanogram
- Reconstruction method: TCOT reconstruction (applicable to 64-row, 32-row, and 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 5 s (0.5 s, 10 rotations) in the longitudinal direction are shown for helical pitches 40 and 80.

Setting slice thickness	Helical pitch*	
	40	80
0.5 mm	200 mm	400 mm

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

**Dynamic scan**

- Scan time: 0.5, 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. 200 scans/100 s  
(0.5-s scan, 200 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 beam shape: Fan-shaped, fan angle 49.2°
- X-ray exposure: Continuous
- Rated output: Max. 60 kW
- X-ray tube voltage: 80, 100, 120, and 135 kV
- X-ray tube current: 10 mA to 500 mA (adjustable in 5-mA increments from 10 to 50 mA and in 10-mA increments for tube currents greater than 50 mA)
- X-ray tube heat capacity: 7.5 MHU
- X-ray tube cooling rate: Max. 1,386 kHU/min (16.5 kW)  
Actual 1,008 kHU/min (12.0 kW)
- Focal spot size
  - IEC 60336: 1993, nominal: 0.9 mm × 0.8 mm (small)  
1.6 mm × 1.4 mm (large)

**X-ray detection**

- Detection system: Solid-state detectors
- Main detector: 896 channels × 64 elements
- Data acquisition: 896 channels × 64 rows
- Reference detector: 1 set

- View rate: 1,800 views/s  
(0.32, 0.5-s scan)  
1,200 views/s  
(0.75, 1, 1.5, 2, 3-s scan)  
800 views/s (Scanoscopy)

**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 0.78	* to 0.98

\*: Depending on the Vari-Area or Zoom factor

  - Scanogram: Unit: mm

Scan field	S	M	L	LL
Standard	0.5	1.0	2.0	4.0
- 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 Xe-study
  - Functions for high-resolution mode for evaluation of resolution parameters
  - Functions for the auditory ossicles and the spine/with high-resolution processing
  - Functions for maintenance
- Post-scan filters
  - Standard filters: 2 types (fixed parameters)
  - User filters: 10 types (settable parameters)
  - Quantum denoising software (QDS)
- Image reconstruction time
  - CT scan: Min. 0.0625 s
  - Scanoscopy: Reconstructed and displayed simultaneously with scanning (real-time reconstruction)
- Data processor (scan console)
  - Central processing unit: 32-bit processor x 2
  - Memory size: 3 Gbytes
  - Magnetic disk unit: Raw data, 720 Gbytes  
Image data, 365 Gbytes
- Data processor (display console)
  - Central processing unit: 32-bit processor x 2
  - Memory size: 3 Gbytes

## Data storage

- Magnetic disk
  - Raw data: Max. 3,600 rotations (0.5-s Helical scan)
  - Image data: Max. 160,000
- 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)

## Image display

- Display monitor: 19-inch color LCD × 2 units  
Size of display area comparable to a 21-inch CRT monitor
- Monitor matrix: 1,280 × 1,024
- Image matrix: 1,024 × 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)
  - 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 function
  - Calibration data acquisition
  - Patient data input
  - Patient appointment function
  - Examination summary
  - eXam Plan editing
  - Modification of related information
  - Operation environment settings
  - Slice counter
- Display of exposure dose: CTDI<sub>vol</sub> (or CTDI<sub>w</sub>)/DLP/Geometric efficiency in z-direction

### 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

### Image transfer

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

### Filming

- Transfer protocol: Toshiba protocol  
DICOM print SCU
- Sheet editing function using virtual film
- T-mode: Related information items such as the patient name are displayed 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: 500 mA\*
    - Scan time: 1 s
    - Reconstruction function: FC70
    - Slice thickness: 8 mm (4 mm x 2 rows)
    - Scan field: S
  - Phantom:  $\phi$ 24 cm water
- \* Corresponds to 400 mA at a 10-mm slice thickness.
- Spatial resolution: 14.5 lp/cm at cutoff 2%  
18 lp/cm at cutoff 0% (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):  $\phi$ 0.35  $\pm$  0.05 mm
    - Standard mode (FC30):  $\phi$ 0.55  $\pm$  0.05 mm
  - Scan parameters
    - Tube voltage: 120 kV
    - Tube current: 300 mA
    - Scan time: 0.5 s
    - Slice thickness: 2 mm
    - Scan field: S
  - Phantom: Toshiba high-contrast measuring phantom (acrylic/air)
- Z-direction
  - Standard mode (FC10): 0.35  $\pm$  0.05 mm
  - Scan parameters
    - Tube voltage: 120 kV
    - Tube current: 50 mA
    - Scan time: 0.5 s
    - Slice thickness: 0.5 mm x 64
    - Helical pitch: 41
  - Phantom: Toshiba ladder phantom

- Low-contrast detectability

	2 mm at 0.3%	3 mm at 0.3%
Slice thickness	10 mm (calculated)	10 mm (calculated)
Surface dose	22.3 mGy	13.9 mGy
Phantom	$\phi$ 20 cm CATPHAN	$\phi$ 20 cm CATPHAN

- CTDI<sub>vol</sub> (Volume CTDI<sub>w</sub>, Unit: mGy/100 mAs)

- Head mode: 20.5 mGy\*
- Body mode: 9.4 mGy\*

\*: Measured on Standard Head and Body CTDI phantoms.

## SYSTEM COMPONENTS AND THEIR FUNCTIONS

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### 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 slip-ring 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. In 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.

### 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 30 cm from the floor, facilitating to transfer of the patient from a low bed or stretcher.

The construction of the couch allows the use of a mobile C-arm for combined CT-Angio examinations.

### Console

The two stand-alone consoles (one for scanning and the other for image processing) are provided with two sets of hybrid keyboards, monitors, and mice. The scanning console and the display console can be operated independently, enabling parallel processing, which significantly improves the efficiency of image processing and diagnosis.

- Functions of the console for scanning
  - Selection of scan parameters
  - Scanscope control
  - Scan control
  - Remote control of couch-top movement
  - Remote control of gantry tilt
- Functions of the console for image processing
  - Window level and window width adjustment
  - Other mouse-operated image processing functions

## OPERATING FEATURES

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### Patient handling and positioning

- The couch-top can be lowered to 300 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 Scanscope 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). Because the image is reconstructed in realtime, the scan can 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.
- 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 <sup>SURE</sup>Start function allows the operator to start helical scanning at the timing of maximum enhancement in contrast studies. <sup>SURE</sup>Start 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

- 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 real-time MPR images 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 1,085 Gbyte magnetic hard disk as standard equipment, permitting the on-line storage of approximately 160,000 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 Aquilion CT scanner.

- The system incorporates a 7.5-MHU X-ray tube with a very fast cooling rate of 1,008 kHU/min in actual use.
- High-speed scans can be performed in as little as 0.32 second per scan. Routine scans can be performed as quickly as 0.5 second per scan.
- In multislice helical scanning, scanning can be performed at 128 slices per second.
- Real-time reconstruction is possible in scanoscopy.
- CT images can be reconstructed in 0.0625 second for 0.5-second routine scans.
- The routine scan cycle time is as short as 2.0 seconds (Conventional Scan & View mode)
- Ease of operation is ensured by incorporating use of a hybrid keyboard, mouse-driven menus, and large color LCD screens.
- The couch-top can be lowered very near the floor, simplifying patient transfer.

### COMPLIANCE

Federal Food, Drug, and Cosmetic Act (FFDC ACT 510)  
Code of Federal Regulations (21 CFR) 1010/1020/1040

- |        |                            |
|--------|----------------------------|
| • 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: 1996        |
|        | IEC 60601-1-4 Amd.1: 1999  |
|        | IEC 60601-2-32: 1994       |
|        | IEC 60601-2-44: 2001       |
|        | IEC 60601-2-44 Amd.1: 2002 |

## DIMENSIONS AND MASS

Unit	Dimensions L x W x H mm (in)	Mass kg (lb)
Gantry	960 x 2,330 x 1,950 (37.8 x 91.7 x 76.8)	1,750 (3,857)
Patient couch	Long patient couch version (105.9 x 24.8 x 17.7)	480 (1,058)
	Short patient couch version (94.1 x 24.8 x 17.7)	450 (992)
Console (when a recommended dedicated desk* is used)	815 x 2,470 x 1,470 (32.1 x 97.2 x 57.9)	435** (959)
CPU cabinet	815 x 450 x 700 (32.1 x 17.7 x 27.6)	140 (309)
REC cabinet	650 x 870 x 1,470 (25.6 x 34.3 x 57.9)	260 (573)

\* Toshiba recommends a width of at least 1,600 mm.

\*\* Monitors and keyboards are included.

## SITING REQUIREMENTS

### Power requirements

- Phase: Three-phase
- Voltage: 200 V\*
- Frequency: 50 Hz or 60 Hz  $\pm 0.5$  Hz
- Line capacity: 100 kVA
- Voltage fluctuation due to load variation: Less than 5%
- Power voltage fluctuation: Less than 10%\*\*

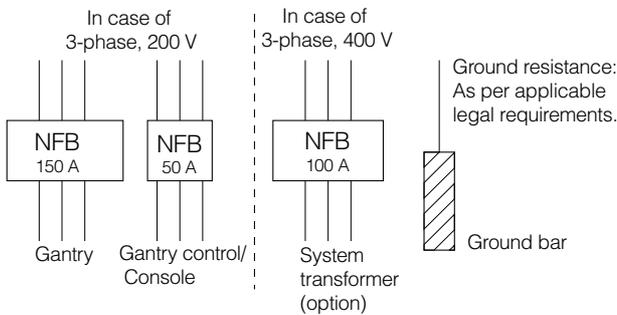
\* Please consult Toshiba in the case of other voltages or excessive power fluctuation.

\*\* 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.

### Power distribution board



## Ambient conditions

	Temperature	Humidity	Heat generation
Scan room			
Gantry	20°C to 26°C Tolerance: $\pm 2^\circ\text{C}$	40% to 80% No condensation	Approx. 14,400 kJ/h (*1) 36,000 kJ/h (*2)
Patient couch	20°C to 26°C Tolerance: $\pm 2^\circ\text{C}$	40% to 80% No condensation	Approx. 1,080 kJ/h (*1) 1,800 kJ/h (*3)
Operator's room			
Console	16°C to 28°C	40% to 80% No condensation	Approx. 21,600 kJ/h

\*1: When scanning is not performed.

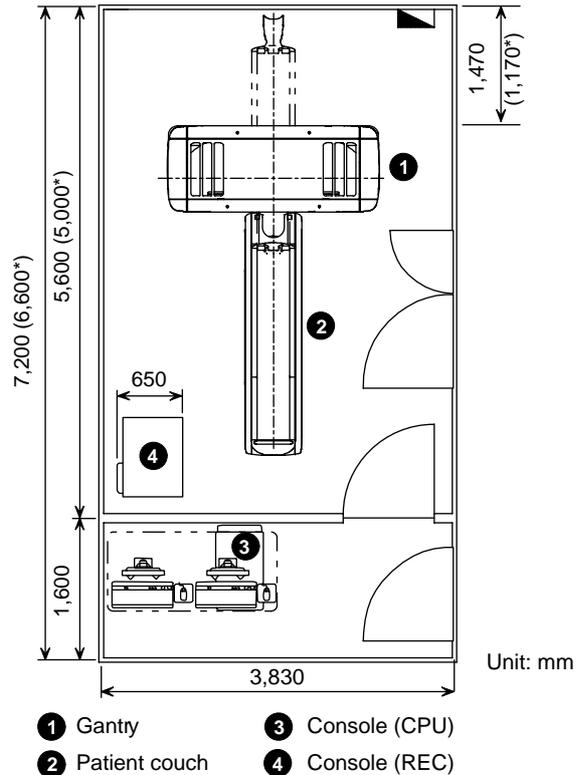
\*2: When scanning is performed continuously at maximum rated output (system with MegaCool™ tube).

\*3: When scanning is performed continuously at the maximum rated output of the system.

## Minimum area for installation

- For the long patient couch version: 27 m<sup>2</sup>
- For the short patient couch version: 25 m<sup>2</sup>

## Room layout example



## Installation requirements

### Scan room

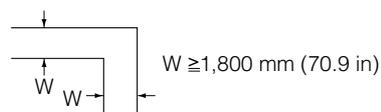
- Before installing the gantry, check the maximum permissible floor load.
- The scanner emits radiation. X-ray shielding must be provided around the scan room and the entrance in accordance with all local requirements and regulations.
- The ceiling should be at least 2,500 mm high to permit the use of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

### Operator's room

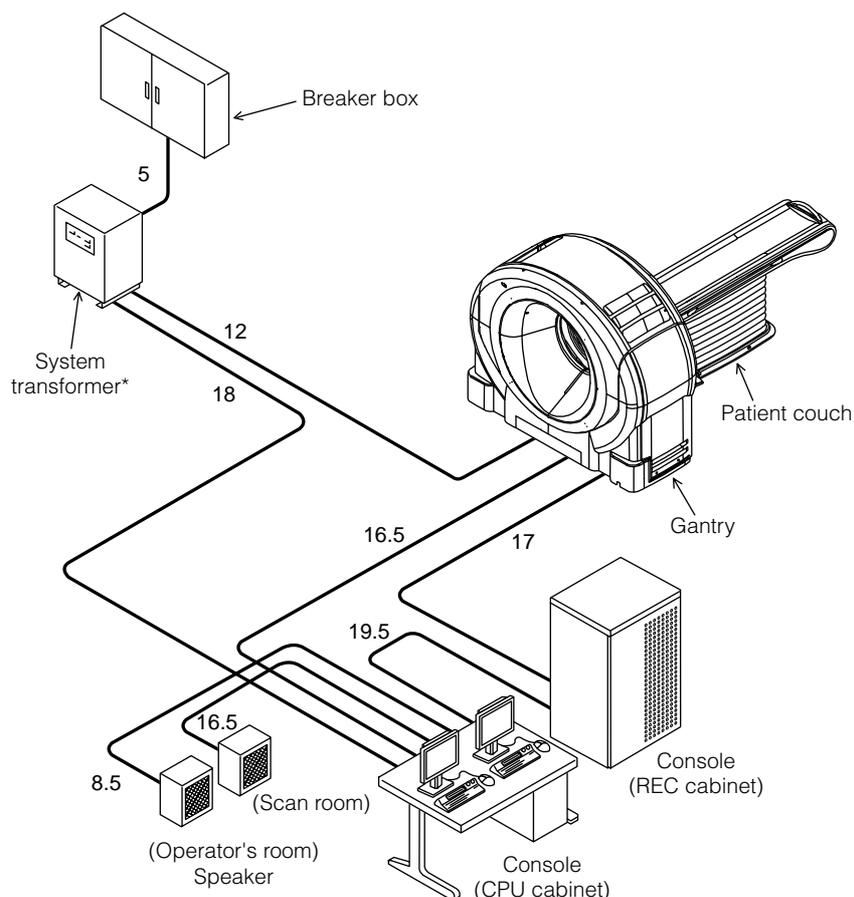
- An observation window is required for monitoring the scan room. X-ray shielding of the window glass must be provided in accordance with all local requirements and regulations, and the bottom of the window frame should be 90 cm from the floor.
- Wiring pits and ducts are required for routing cables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

### 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: 1,100 mm (43.3 in)
  - Height: 2,050 mm (80.7 in)
- The corners of corridors should be as illustrated below.
- Elevator minimum load: 2,000 kg (4,400 lb)



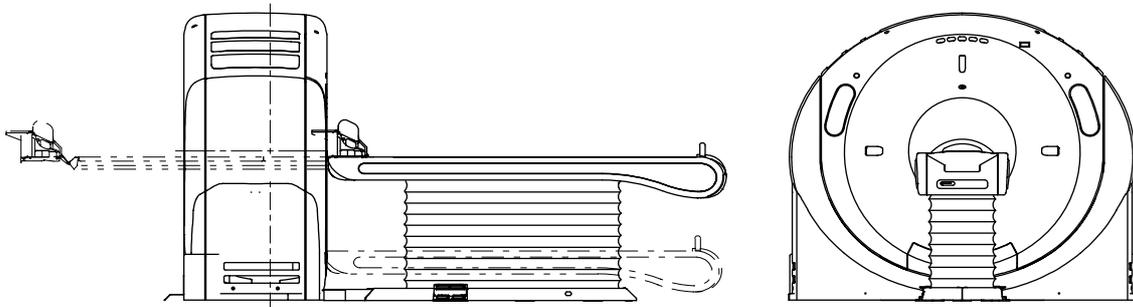
### Cable connections between units



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

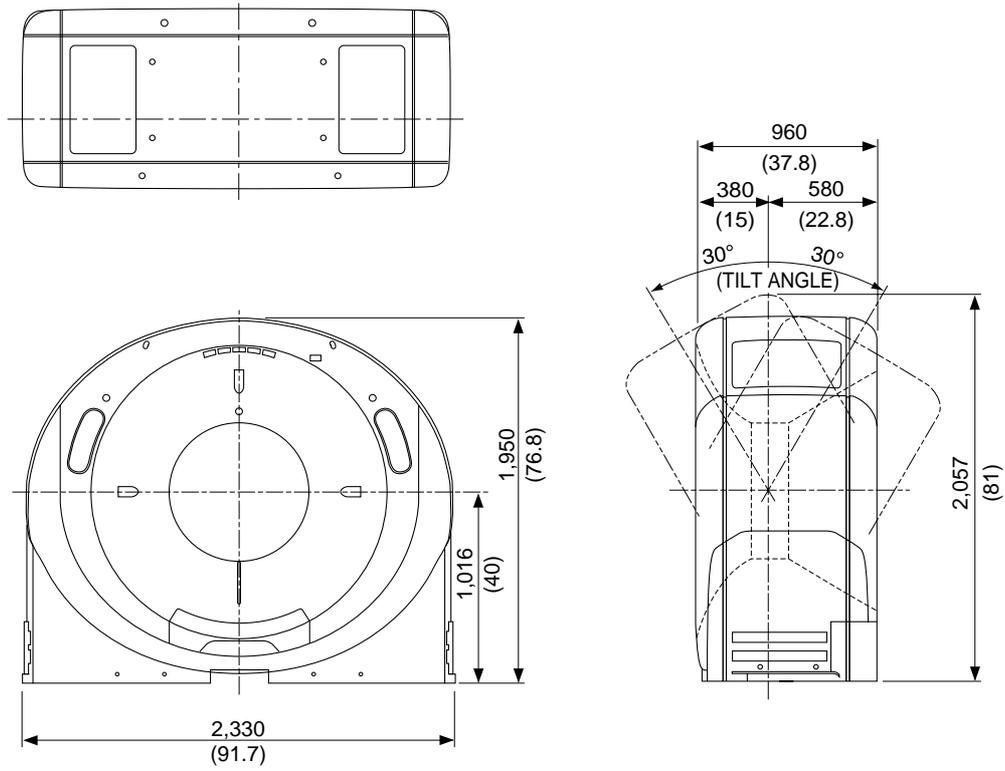
Unit: m

**OUTLINE DRAWINGS**



**Gantry and Patient Couch**

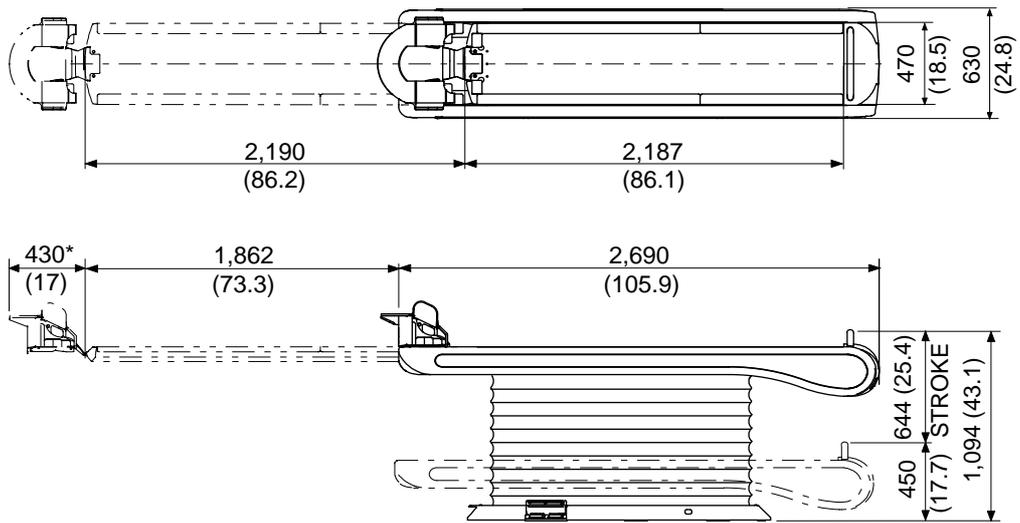
**OUTLINE DRAWINGS**



**Gantry**

Unit: mm (in)

**OUTLINE DRAWINGS**

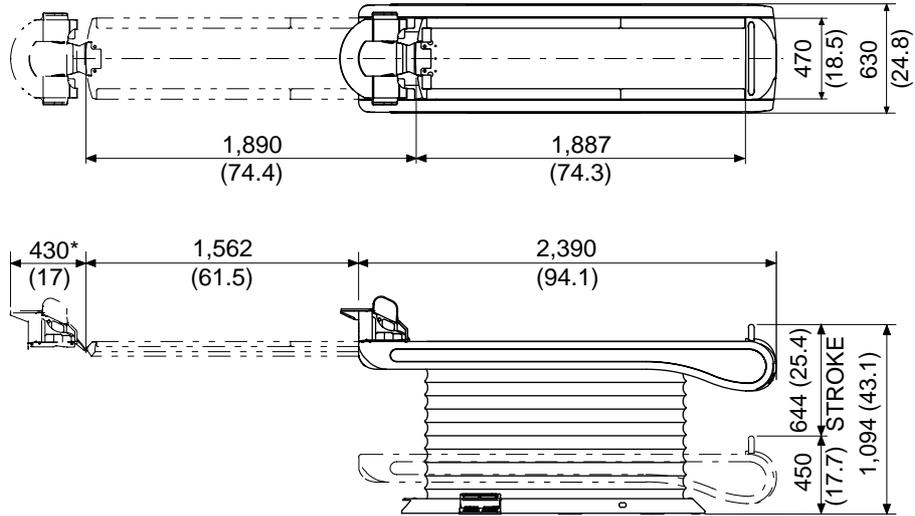


\* When the arm up holder is mounted.

**Patient Couch (for the long patient couch version)**

Unit: mm (in)

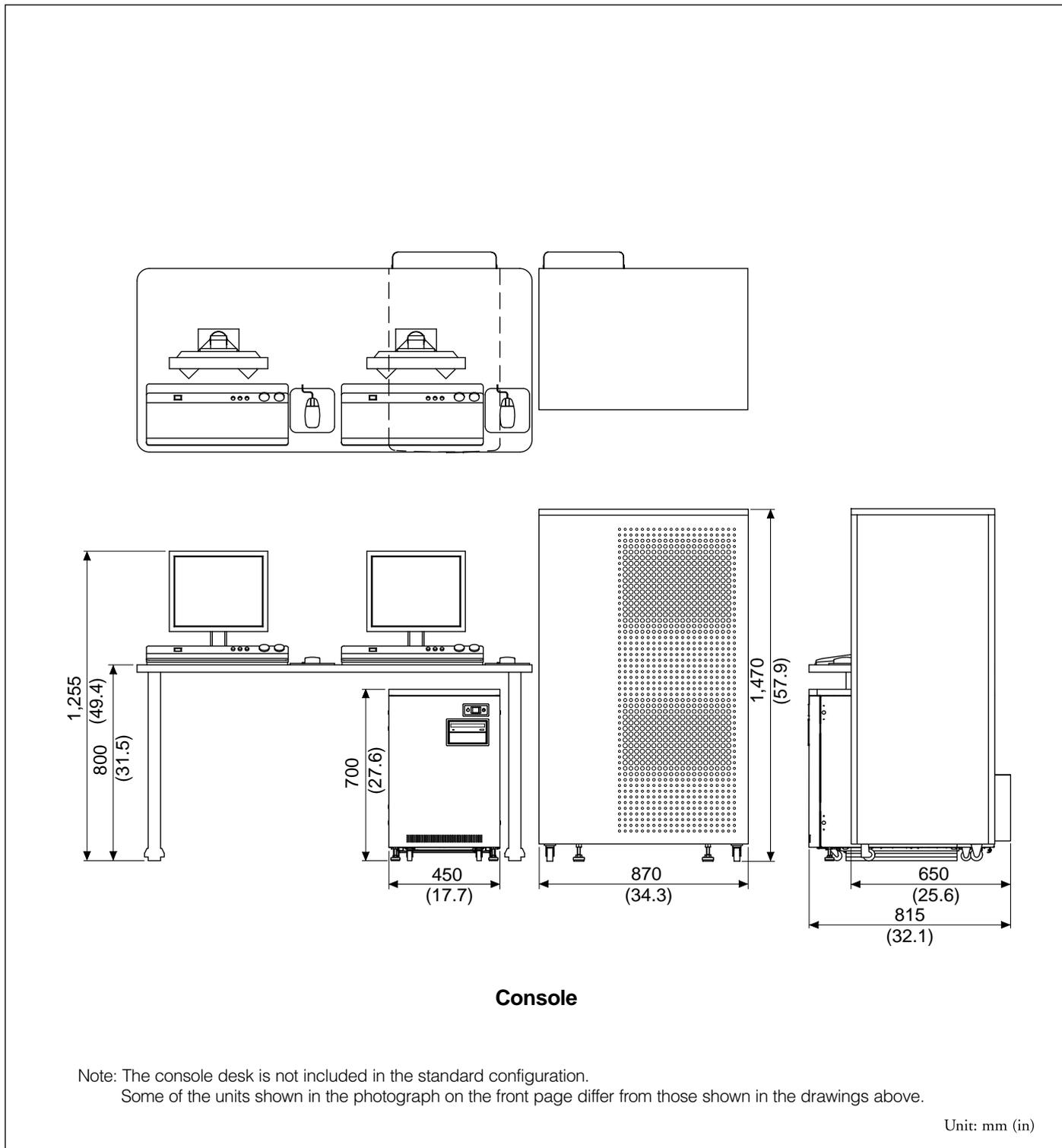
**OUTLINE DRAWINGS**



\* When the arm up holder is mounted.

**Patient Couch (for the short patient couch version)**

Unit: mm (in)

**OUTLINE DRAWINGS**

**TOSHIBA MEDICAL SYSTEMS CORPORATION**

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