

Product Data

No. MPDCT0237EAB

# Asteion

## Super 4 Edition

### APPLICATION

The Asteion is a multislice Helical CT scanner that supports whole-body scanning.

The system generates 5.3 slices per second using a Selectable Slice-thickness Multi-row Detector (SSMD). Since it can also perform high speed reconstruction at a maximum 4 images per second, every examination can be processed at ultra-high speed. In combination with the Continuous Imaging technology, it is possible to quickly perform more accurate scanning and examinations.

### FEATURES

- **High-speed scanning**

Four slices can be acquired simultaneously in a single rotation. In the case of a run-off study from the shoulder to the pelvis of an adult patient, 720 mm can be scanned within 16.5 s with 5-mm data acquisition.

- **Long scanning range**

The long scanning range of 1,800 mm and the high scanning speed together facilitate whole-body trauma examinations without repositioning of the patient.

- **Guided mode**

When this function is selected, the operating procedures are displayed on the monitor screen of the scan console. Examinations can be performed by following the on-screen step-by-step instructions. This enables inexperienced technologists to handle emergency cases.

- **Excellent image quality**

The system achieves a low-contrast detectability of 2 mm at 0.3% and a high-contrast resolution of 0.35 mm in the x, y, and z directions.

Routine multislice helical CT examinations can be performed using slices as thin as 0.5 mm, enabling high-precision 3D and MPR images to be generated from the fine isotropic voxel data.

- **Exposure dose reduction**

The detector system has an excellent S/N ratio, which permits examinations with a reduced exposure dose. In helical scanning, the Real-EC function, which makes the amount of noise uniform for each slice, can be selected in an eXam Plan, making the minimization of unnecessary patient exposure easy.

- **Tilt helical scanning**

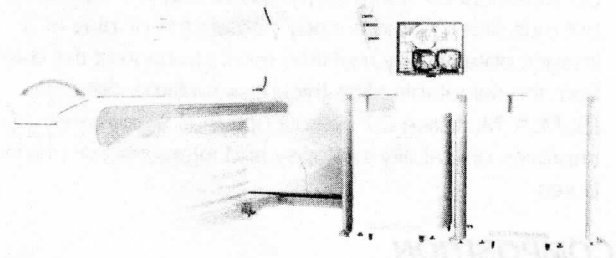
TCOT cone-beam reconstruction, which uses the Feldkamp method to precisely compensate for the angulation of the beam, enables helical scanning with the gantry tilted in the range from 30° forward to 30° backward. Angled helical acquisition is useful for many applications, including obtaining the correct scan plan for routine brain scans. This ability makes it easy to avoid X-ray exposure to the patient's orbit.

- **High patient throughput**

The high cooling rate of the 4-MHU tube, which reduces the cooling time required between scans; the high scanning speed, which reduces the exposure time; and the high reconstruction speed, which reduces the patient scan cycle time, all increase the patient throughput significantly.

The multi-tasking capabilities of the system enable patient registration and protocol setting with reconstruction in the background and thus increase flexibility. In addition, the system's ability to generate images of various slice thicknesses from a single data set permits acquisition for routine examinations, biopsy procedures, and 3D image generation to be performed in a single scan.

For example, it is possible to reconstruct 5-mm images for routine examinations, 1-mm images for detailed examinations, and 0.5-mm slice images for 3D image generation from a single data set acquired by helical scanning with 0.5-mm slices.



**Improvements in image analysis functions**

During the use of multislice systems, there may be situations where a large number of images must be generated for detailed examinations. To provide support in such situations, this system includes a function for automatically generating multiplanar reconstruction (MPR) images after completion of scanning by presetting the MPR generation conditions in the eXam Plan. A high-speed image feeding function and an auto-filming function that permits the window level to be adjusted are also provided. These functions are useful for image analysis.

**Multislice CT fluoroscopy (option)**

Conventional CT fluoroscopy shows only a single slice, but multislice CT fluoroscopy permits the display of 3 images obtained by real-time reconstruction of the data from the selectable slice-thickness multirow detector (SSMD). Multislice CT fluoroscopy thus significantly improves operability in biopsy and interventional procedures.

**COMPOSITION**

**Asteion < 4-slice system >**

**Standard composition (Model: TSX-021B/4)**

- 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 (CETF004B)
- Quantitative bone mineral study system (CBM-14A)\*
- Display system for dental application (CDP-07A)\*
- FlyThrough software (CFT-03A)\*
- Multislice CT fluoroscopy (TSXF-003E)
- LCD monitor for CT fluoroscopy (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 media (CRDM-001A)
- Color printer interface (CCP-03A)
- Pediatric scanning system (CHKS-002A)
- ECG-gated scanning system (CHEG-004D)
- Raw data storage capacity expansion kit (EISC-007A)
- Image data storage capacity expansion kit (EISC-008A)
- Raw data storage software (CRRS-001B)

\* Not available in the U.S.A.

**PERFORMANCE SPECIFICATIONS**

**User support**

- Guided mode: The scan operating procedures are displayed on the monitor of the scan console.

**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 (360°)
  - SCAN & SCAN mode: Min. 1.8 s (rapid sequence, couch-top movement 10 mm)

Note: The scan cycle time refers to the time between one scan initiation and the next.

- Scan field
  - CT scan:
    - φ180 mm (SS)
    - φ240 mm (S)
    - φ320 mm (M)
    - φ390 mm (L)
    - φ480 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.

- Slice thickness: 0.5, 1, 2, 3, 4, 5, 8, and 10 mm  
These slice thickness are implemented by stacking the data acquired in one of the following acquisition modes.
- Acquisition:
  - 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°
- 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. 540 mm

- Minimum couch-top height: Approx. 310 mm
  - Maximum couch-top height: Approx. 850 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 couch version)  
(with headrest) 1,500 mm (for the short patient couch version)
    - 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
  - 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: Either the vertical movement or 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
- 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.

- Scan field in the longitudinal 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 0.83 mm/s to 53.3 mm/s.
- Helical pitch: (MUSCOT): Setting is possible in the range from 2.5 to 8.0 in increments of 0.5, excluding 4.0. (Pitch factor: 0.625 to 2.0)

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

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

Note: The CT pitch factor is defined by IEC60601-2-44 AMD.1 (2002).

- Real-EC: Function for continuously varying the X-ray tube current to ensure the optimal X-ray dose during helical scanning.
- Image reconstruction time: Up to 4 images/s
- Real-time Helical reconstruction time: 12 images/s (0.083 s/image)
- SureStart:
  - Continuous scan time: Max. 100 s
  - Region of interest (ROI): Max. 3 ROIs
  - CT number measurement interval: 0.125 s (8 measurements/s)
  - Scan start delay time: Min. 3 s
  - Display function: Mean CT number, elapsed time
- Specification of reconstruction position: Can be set with a minimum of 0.1-mm increments.
- Image slice thickness: Can be set to a value of up to 5 times that of the scan slice thickness. However, the maximum image slice thickness is 10 mm. (MUSCOT reconstruction)
- Reconstruction method:
  - MUSCOT Reconstruction (MULTISlice COne-beam Technology)
  - TCOT reconstruction (True COne-beam Technology)

- 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 3.0, 4.5, and 6.0.

| Image slice thickness | Setting slice thickness | Helical pitch (Note) |          |          |
|-----------------------|-------------------------|----------------------|----------|----------|
|                       |                         | 3.0                  | 4.5      | 6.0      |
| 0.5 mm                | 0.5 mm                  | 15.0 mm              | 22.5 mm  | 30.0 mm  |
| 1 mm                  | 1 mm                    | 30.0 mm              | 45.0 mm  | 60.0 mm  |
| 2 mm                  | 2 mm                    | 60.0 mm              | 90.0 mm  | 120.0 mm |
| 5 mm                  | 5 mm                    | 150.0 mm             | 225.0 mm | 300.0 mm |

Note: The couch-top traveling distance per rotation is shown in proportion 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 are performed following a pre-determined eXam Plan.
- Number of programmable scans: Max. 10  
Maximum time of one continuous scan is 100 s.
- Scan plan
  - Scan interval: Min. interval: 1 s (if an interval is set).  
(Note that "None" (no interval) can be selected.)  
Setting is possible in increments of 0.1 s in a scan interval more than 1 s.

Note: When a scanning mode with patient couch movement is used, the minimum scan interval is increased 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 0.1s.
- Reconstruction time: Min. 0.5 s
- Real-time reconstruction time: 12 images/s (0.083 s/image)

### X-ray generation

- X-ray exposure: Continuous
- X-ray tube voltage: 80, 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: 788 channels × 22 elements
- Data acquisition: 788 channels × 4 rows
- Reference detector: 1 set
- View rate: Max. 1,200 views/s

### Data processing

- Reconstruction matrix: 512 × 512 pixels
- Picture element (pixel) size

|            |      |      |      |      | Unit: mm |
|------------|------|------|------|------|----------|
| Scan field | SS   | S    | M    | L    | LL       |
| Pixel size | *to  | *to  | *to  | *to  | *to      |
|            | 0.35 | 0.47 | 0.63 | 0.76 | 0.94     |

|                   |          |      |      | Unit: mm |
|-------------------|----------|------|------|----------|
| Enlargement ratio | Standard | 2×   | 4×   |          |
| Pixel size        | 1.00 (L) | 0.71 | 0.50 |          |
| (area)            | 0.50 (S) | –    | –    |          |

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

- 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 test mode
  - Functions for auditory ossicles and the spine/with high-resolution processing
  - Functions for maintenance
- Image reconstruction time
  - Image reconstruction time: Up to 4 images/s
  - Scanoscopy: Real-time
  - Real-time reconstruction: 12 images/s (1 slice)  
24 images/s (3 slices)

Note: Real-time reconstruction of 3 slices is only for CT fluoroscopy (option). For helical scan, dynamic scan, and SureStart, real-time reconstruction is for 1 slice.



- Data processor (scan console)
  - Central processing unit: 32-bit microprocessor × 2
  - Memory size: 3 Gbytes
  - Magnetic disk unit: Raw data, 36 Gbytes  
Image data, 18 Gbytes

## Data storage

- Magnetic disk
  - Raw data: 4,000 rotations or more  
(for 0.75-s scan)
  - Image data: 16,000 images or more
- Magneto-optical disk
  - Total storage capacity: 4,800 MB  
(8 × density, double-sided)  
2,600 Mbytes  
(quadruple-density, double-sided)  
650-Mbyte single-density MODs are also supported.  
(X-series images can also be read.)
  - Image data: Maximum 16,000 images  
(for an 8 × density double-sided disk; the exact number varies depending on the compression ratio)
  - Raw data: Maximum 600 rotations  
(corresponds to 2,400 slices for 0.75-s scanning)  
(for an 8 × density double-sided disk; the exact number varies depending on the compression ratio)

## Image display

- Display monitor: 18-inch color LCD  
Size of display area comparable to that of 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 and non-linear (3 types, including double windows)
  - User-programable non-linear (6 types)

- Image retrieval
  - Method: On-screen menus and keyboard
  - Mode: Image, series, and patient
- Autoview function: Software control, function key control
- Multi-frame display: Reduction/cut-off display, ROI processing
- Inset scanogram display
- Selective related information display
- Cine display
  - Image display speed: Variable

## Image processing

- Scanogram processing
  - Slice position display (display of planned slice, preset slice, and last scanned slice)
  - Anatomical scale (display of relative position, taking any point selected as standard as 0)
  - Slice position setting
  - Enlargement (2×, 4× for L 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
    - ROI display: 3 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 (arbitrary size)
  - Addition/subtraction between images
  - Band display (non-linear windowing)
  - Comment and arrow insertion
  - Top/bottom, right/left, black/white reversal of image
  - Image filtering
  - Screen save
  - High-speed axial interpolation
  - MultiView (Auto MPR)
  - Quantum denoising filter
- Raw data processing
  - Multi-zooming (processing of raw data for 4 ROIs and multiple images)
  - Stack reconstruction
  - Protect/Unprotect
  - Play/Reverse reconstruction
  - Reconstruction queue priority change

- System management
  - Warm-up
  - Calibration data acquisition
  - Scanogram/CT image switching
  - eXam Plan editing
  - Examination record
- Display of exposure dose:
 

|   |
|---|
| CTDI <sub>ref</sub> (or CTDI <sub>vol</sub> ) /DLP/ |
| Geometric eff.                                      |

### 3D color image processing

High quality 3D images can be obtained very quickly with 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
- Segmentation
 

Partial extraction can be performed
- MPR
 

3 orthogonal planes/oblique image  
Curved MPR

### Image transfer

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

### Filming

- Ethernet:
 

|                  |
|------------------|
| Toshiba protocol |
| DICOM PRINT      |
- 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: | 0.5% or less |
|---------------------|--------------|

|                            |              |
|----------------------------|--------------|
| 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:
 

|                                 |
|---------------------------------|
| 8.0 lp/cm at MTF 50%            |
| 14.5 lp/cm at MTF 2%            |
| 18 lp/cm at cut off (reference) |

|                            |               |
|----------------------------|---------------|
| 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:                   | 16 cm Catphan |
- High-contrast resolution
 

X-Y plane

|                              |                 |
|------------------------------|-----------------|
| High-resolution mode (FC90): | φ0.35 ± 0.05 mm |
| Standard mode (FC30):        | φ0.55 ± 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 (30 mm: zooming used)                                     |
| Phantom:           | Toshiba high-contrast measuring phantom (acrylic/air ratio) |

Z-direction

|                       |                |
|-----------------------|----------------|
| Standard mode (FC10): | 0.35 ± 0.05 mm |
|-----------------------|----------------|

|                    |                        |
|--------------------|------------------------|
| Scan parameters    |                        |
| · Tube voltage:    | 120 kV                 |
| · Tube current:    | 50 mA                  |
| · Scan time:       | 0.75 s                 |
| · Slice thickness: | 0.5 mm × 4             |
| · Helical pitch:   | 2.5                    |
| Phantom:           | Toshiba ladder phantom |

- Low contrast detectability:

|                            | 2 mm<br>at 0.3%  | 4 mm<br>at 0.3 % |
|----------------------------|------------------|------------------|
| – Scan parameters          |                  |                  |
| · Tube voltage:            | 120 kV           | 120 kV           |
| · Tube current:            | 250 mA           | 200 mA           |
| · Scan time:               | 1 s              | 0.75 s           |
| · Reconstruction function: | FC41             | FC41             |
| · Slice thickness:         | 10 mm            | 10 mm            |
| · Scan field:              | S                | S                |
| · Surface dose:            | 31.1 mGy         | 18.9 mGy         |
| – Phantom:                 | 20 cm<br>Catphan | 20 cm<br>Catphan |

- CTDIvol (Volume CTDIw, Unit: mGy/100 mAs)

|                    |          |
|--------------------|----------|
| – Head mode        | 21.9 mGy |
| – Body mode        | 10.7 mGy |
| – Scan parameters  |          |
| · Tube voltage:    | 120 kV   |
| · Tube current:    | 100 mA   |
| · Scan time:       | 1 s      |
| · Slice thickness: | 5mm x 4  |

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 310 mm (at the center of the couch top) from the floor, facilitating transfer of the patient from a low bed or stretcher. The footswitches provided on both sides of the patient couch can be used to control couch vertical movement without using hands.

Console

The console is provided with a hybrid keyboard, monitor, and mouse.

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

Magneto-optical disk unit

The magneto-optical disk unit permits repeated recording and retrieval of data, like a floppy disk drive. It is a compact, externally mounted, large-capacity digital storage device that can be used to store a large amount of data. Automatic image archiving to the magneto-optical disk unit can be set in eXam Plans.

## OPERATING FEATURES

### Patient handling and positioning

- The couch-top can be lowered to 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 in increments of 0.5 mm is possible from the integrated console or by manual operation from the control panel and clear digital read-outs are provided on the gantry.
- The couch-top can be pulled out manually in an emergency.

### Scanning

- When Guided mode is selected, the operating procedures are displayed on the monitor screen of the scan console. Examinations can be performed by following the instructions.
- 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). Because the image is reconstructed in real time, 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.
- 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.
- The Real-EC function, which can be set in an eXam Plan, automatically adjusts the optimal tube current for every region, thus minimizing patient exposure.

- 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

- 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 54 Gbyte magnetic hard disk as standard equipment, permitting the on-line storage of approximately 16,000 images and 4,000 rotations of raw data.
- A 4.8 Gbyte magneto-optical disk is provided as standard equipment. The image storage capacity of the magneto-optical 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 Asteion CT scanner.

- The system incorporates a 4-MHU X-ray tube with a fast cooling rate of 864 kHU/min in actual use.
- High-speed scans can be performed in as little as 0.48 second per scan. Routine scans can be performed as quickly as 0.75 second per scan.
- In multislice helical scanning, scanning can be performed at a maximum 12 slices per second.
- Real-time reconstruction is possible in scanoscopy.
- CT images can be reconstructed in 0.25 second for 0.75-second routine scans.
- 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 by using the foot switch, simplifying patient transfer.

COMPLIANCE

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

- IEC: IEC 60601-2-44 (2001)  
IEC 60601-2-44 Amd.1 (2002)  
  
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)

DIMENSIONS AND MASS

| Unit          | Dimensions L x W x H<br>mm (in)             | Mass<br>kg (lb)  |
|---------------|---|------------------|
| Gantry        | 890 x 1,970 x 1,760<br>(35.0 x 77.6 x 69.3) | 1,300<br>(2,866) |
| Patient couch | Long patient couch version                  | 450<br>(992)     |
|               | Short patient couch version                 | 420<br>(926)     |
|               |   |                  |
| Console       |   |                  |
| CPU cabinet   | 820 x 450 x 700<br>(32.3 x 17.7 x 27.6)     | 120<br>(265)     |
| REC cabinet   | 820 x 450 x 700<br>(32.3 x 17.7 x 27.6)     | 140<br>(309)     |

SITING REQUIREMENTS

Power requirements

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

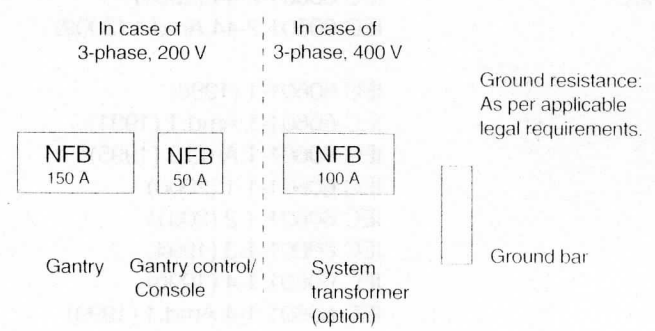
\* Please consult Toshiba in the case of other voltages or excessive power fluctuation.

\*\* 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.

### Power distribution board



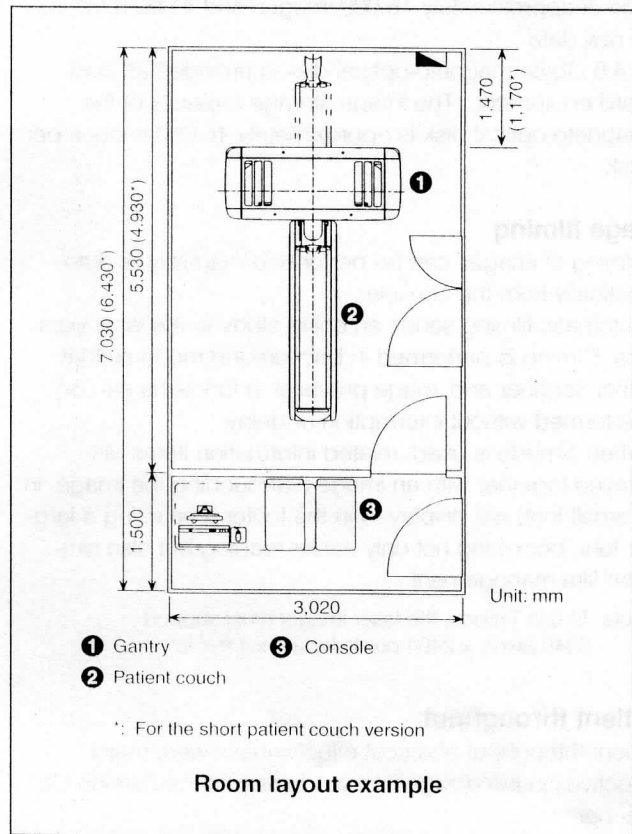
### Ambient conditions

|                 | Temperature(*1)                 | Humidity                      | Heat generation                                |
|-----------------|---------------------------------|-------------------------------|--|
| Scan room       |                                 |                               |  |
| Gantry          | 20°C to 26°C<br>Tolerance: ±2°C | 40% to 80%<br>No condensation | Approx.<br>9.720 kJ/h (*2)<br>32.070 kJ/h (*3) |
| Patient couch   | 20°C to 26°C<br>Tolerance: ±2°C | 40% to 80%<br>No condensation | Approx.<br>1.080 kJ/h (*2)<br>1.800 kJ/h (*3)  |
| Operator's room |                                 |                               |  |
| Console         | 16°C to 28°C                    | 40% to 80%<br>No condensation | Approx.<br>10.800 kJ/h (*2)                    |

- \*1: When the system is not operating: 0°C to 40°C  
 \*2: When scanning is not performed.  
 \*3: 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<sup>2</sup>
- For the short patient couch version: 20 m<sup>2</sup>



### Installation requirements

#### Scan room

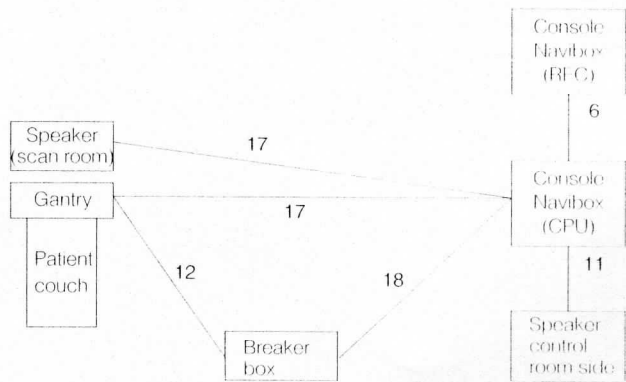
- Before installing the gantry, check the maximum permissible floor load.
- The scanner emits radiation. X-ray shielding must be provided around the scan room and the entrance in accordance with all local requirements and regulations.
- The ceiling should be at least 2,500 mm high to permit the use of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

Operator's room

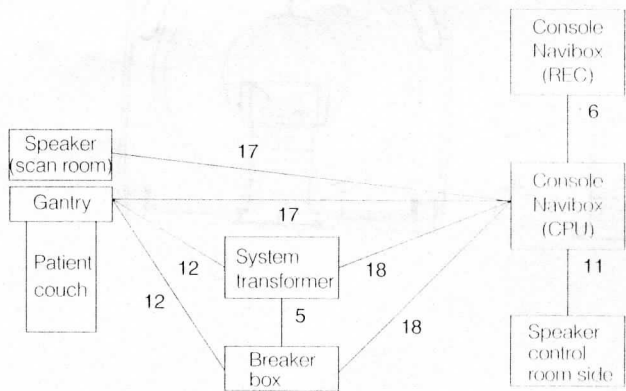
- An observation window is required for monitoring the scan room. X-ray shielding of the window glass must be provided in accordance with all local requirements and regulations, and the bottom of the window frame should be 90 cm from the floor.
- Wiring pits and ducts are required for routing cables 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

• Without system transformer



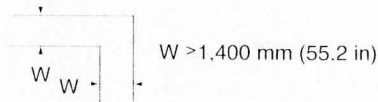
• With system transformer



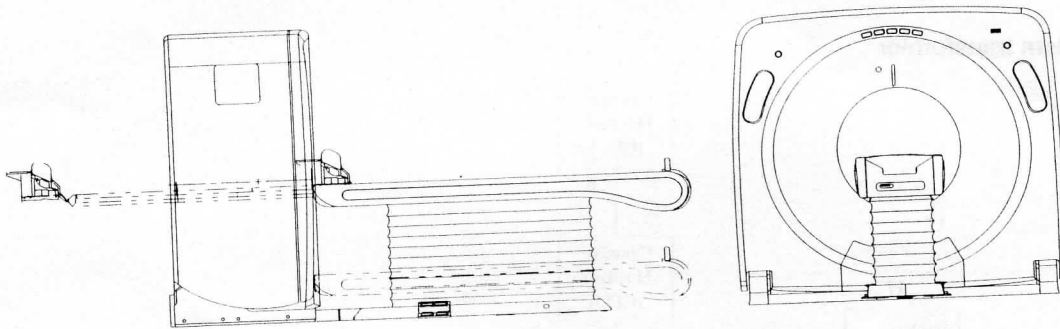
Unit: m

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: 1,860 mm (73.2 in)
- The corners of corridors should be as illustrated below.
- Elevator minimum load: 1,600 kg (3,527 lb)



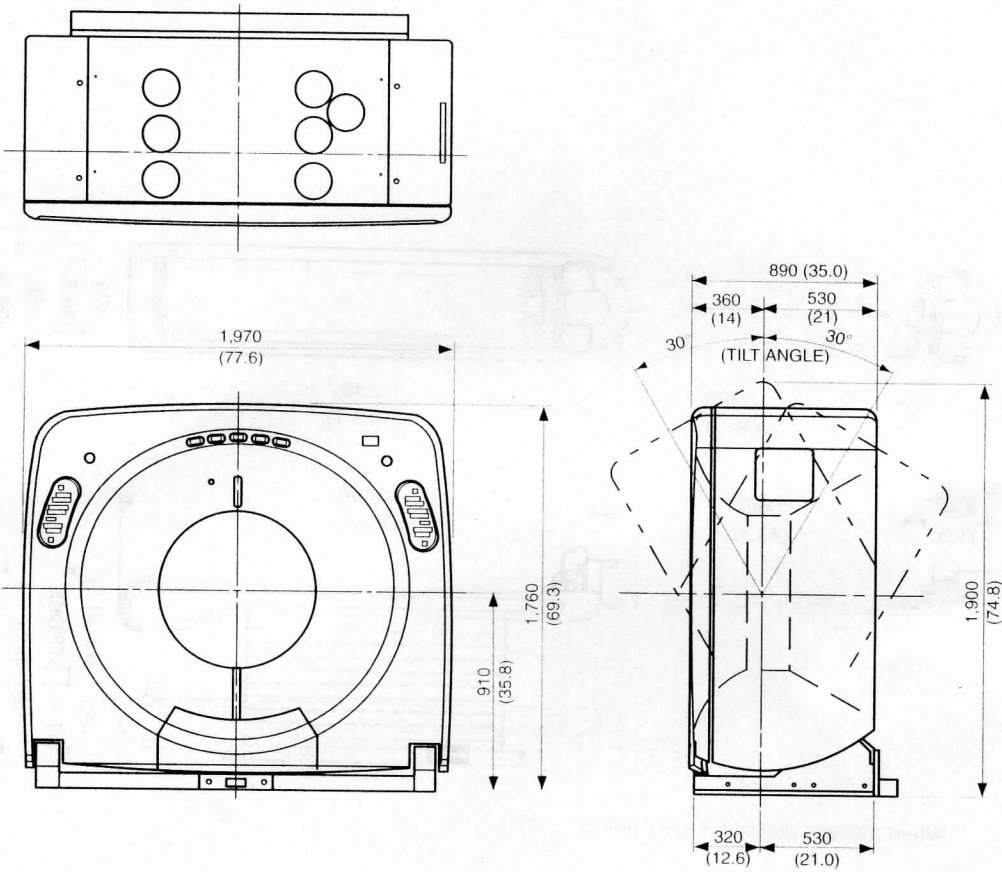
**OUTLINE DRAWINGS**



**Gantry and Patient Couch**



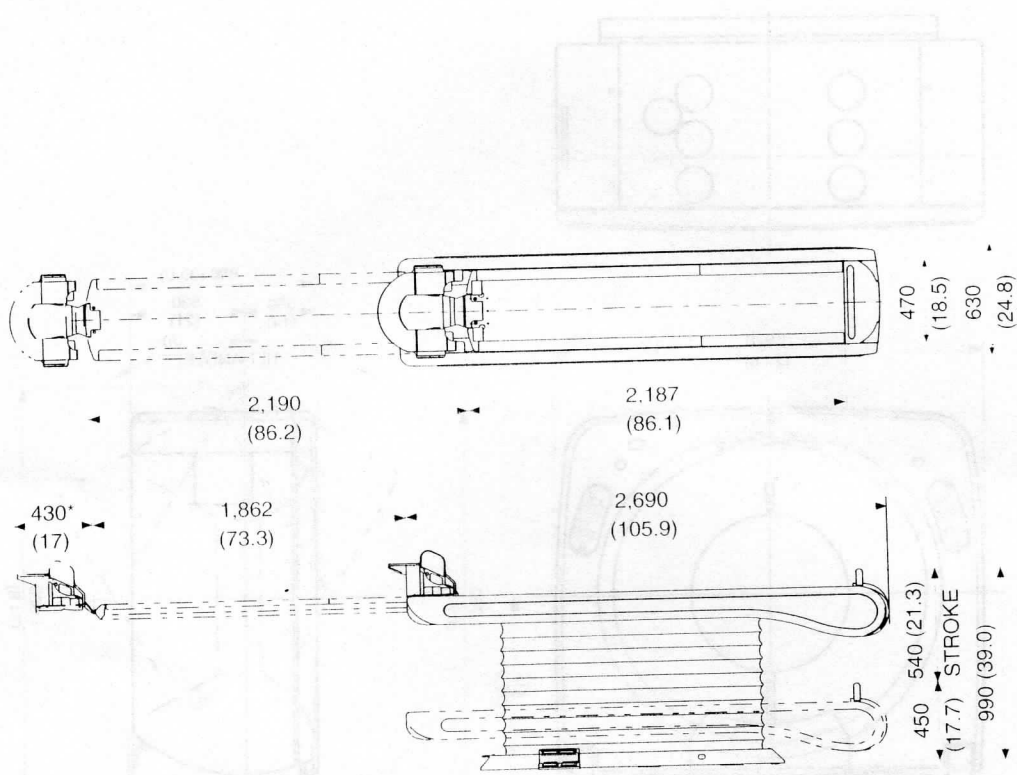
OUTLINE DRAWINGS



Gantry

Unit: mm (in)

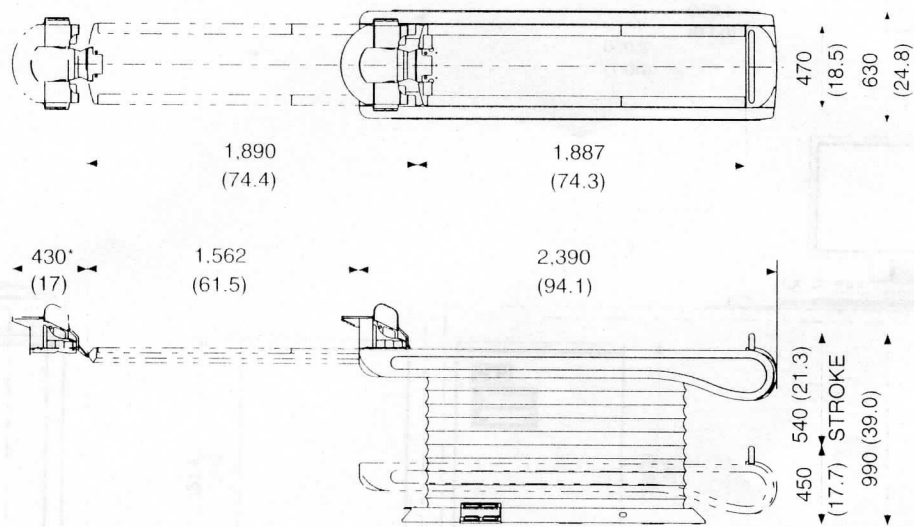
OUTLINE DRAWINGS



Patient Couch (for the long patient couch version)

Unit: mm (in)

OUTLINE DRAWINGS

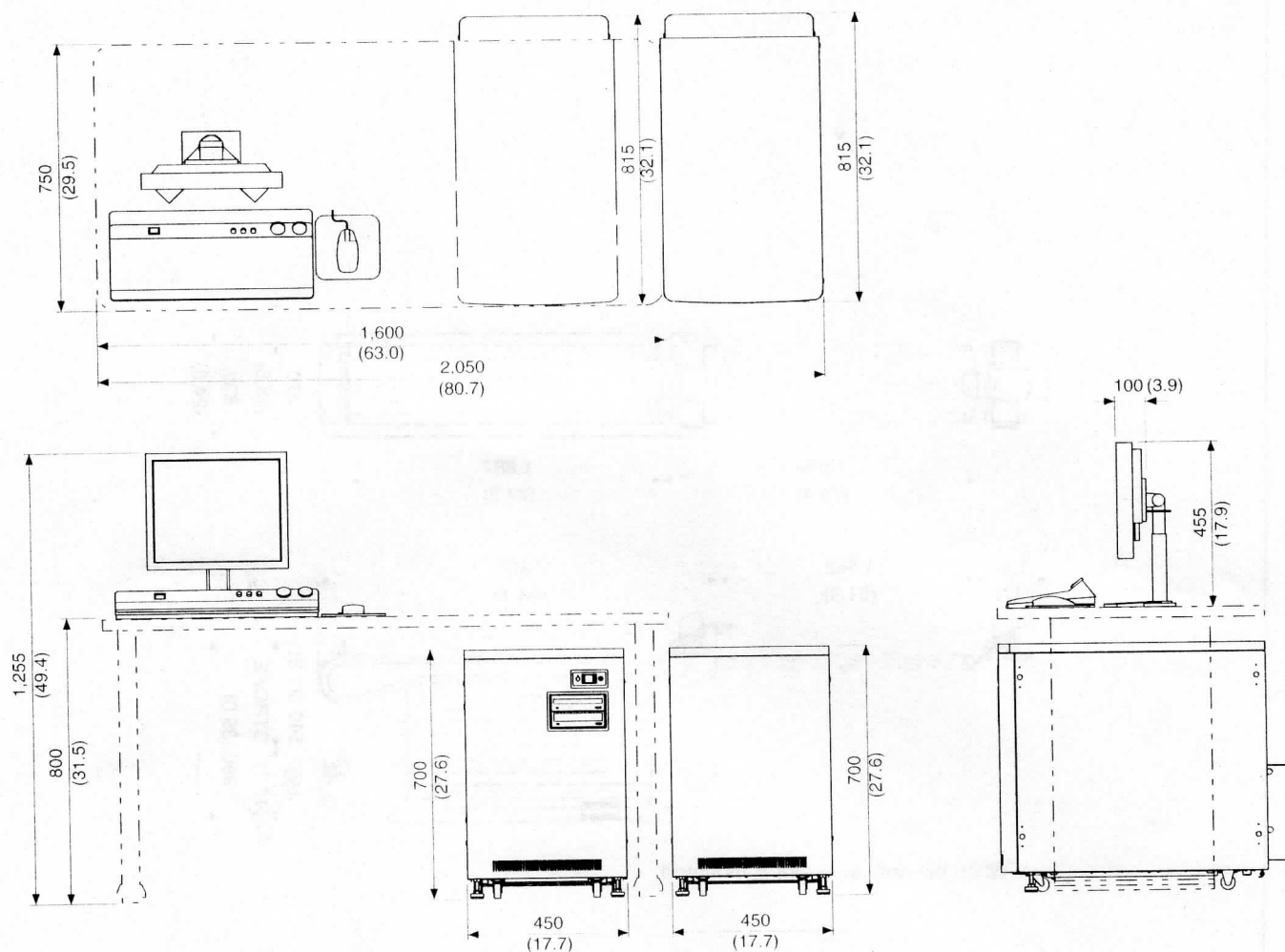


When the arm up holder is mounted.

Patient Couch (for the short patient couch version)

Unit: mm (in)

## OUTLINE DRAWINGS



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 drawing above.

Unit: mm (in)



### TOSHIBA MEDICAL SYSTEMS CORPORATION

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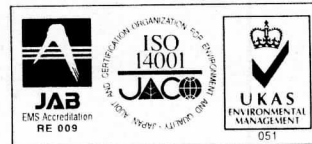
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