

3. Inspection Procedures (1/9)

Inspection Item	Inspection Details	Measurement Method and Inspection Method	Inspection Timing		Replace	Safety	Remarks
			1	2			
1. Checking installation environment							
(1) X-ray exposure indicator	Check that the exposure indicator is properly lit.	Visually check for abnormalities.	*	*		@	If defective, report to the facility manager.
(2) Temperature and humidity	Measure the temperature and humidity. (For the permitted ranges, refer to the specifications for the instrument.)	Temperature/humidity meter	*	*			If defective, report to the facility manager.
(3) Power supply voltage	Measure the supply voltage for each instrument (100 V single-phase).	Digital multimeter	*	*			
(4) Grounding	Check the grounding.	Check for changes at the facility. Visually check for looseness or corrosion of the earth cable.	*	*			
2. Checking instrument conditions							
(1) External appearance	Check that there is no significant contamination or damage on each unit.	Visually check for abnormalities.	*	*			
(2) Nameplates	Check that no nameplate is lost, contaminated, or damaged.		*	*			
(3) Instrument cleaning	Clean all units with a cleaner.		*	*			
(4) Cable connections	Check the connection of the cable terminals and connectors on each unit.		*	*			
(5) Cable conditions	Check the cables between the units for rubbing, twisting, and pulling.		*	*			
(6) Instrument fixing	Check the instrument mounting on the floor. Ensure all nuts and bolts are tight.		*	*			
(7) Environment around the instrument	Check that there are no obstacles around the instrument.		*	*			
3. X-ray tube unit							
(1) X-ray tube unit condition and installation	Check the appearance and installation of the X-ray tube housing.	Aurally check for abnormalities.	*	*			
(2) Noise from anode rotation	Check for noises caused by anode rotation.		*	*			
(3) Heat exchanger	Check the appearance of the heat exchanger and hoses, and check for abnormal noises.		*	*			

Inspection Procedures (2/9)

Inspection Item	Inspection Details	Measurement Method and Inspection Method	Inspection Timing		Replace	Safety	Remarks
			1	2			
4. X-ray controller							
(1) Fluoroscopy operation	Check that operation is normal.		*	*			
(2) Starter operation	Check that operation is normal.	Operation check for abnormalities.	*	*			
(3) General radiography operation	Check that operation is normal.		*	*			
(4) Fluoroscopy tube voltage precision and reproducibility	Measure the tube voltage.	Measure with an oscilloscope. (See section 3.2.1.)		*			
(5) Fluoroscopy tube current precision and reproducibility	Measure the tube current.	Measure with an oscilloscope. (See section 3.2.2.)		*			
(6) Radiography tube voltage precision and reproducibility	Measure the tube voltage.	Measure with an oscilloscope. (See section 3.3.1.)		*			
(7) Radiography tube current precision and reproducibility	Measure the tube current.	Measure with an oscilloscope. (See section 3.3.2.)		*			
(8) Radiography time precision and reproducibility	Measure the radiography time.	Measure with an oscilloscope. (See section 3.3.3.)		*			
(9) Radiography tube current-time product precision and reproducibility	Measure the radiography tube current time product.	Measure with an oscilloscope. (See section 3.3.4.)		*			
(10) High-voltage cable and bushing	Remove the bushings. Check for discharge marks and damage to the packing. Wipe off old grease. Replace or re-grease the packing.	Visually check for abnormalities.		*	O		
(11) Insulating oil	Check the degree of deterioration.			*			
(12) Max. fluoroscopy dose	Measure the maximum skin dose during fluoroscopy to ensure it does not exceed 50 mGy/mm (5.75 R/min).	Measure with a dosimeter. (See section 3.5.)	*	*		@	
(13) Automatic control	(1) Fluoroscopy IBS balance conditions	Refer to the Image Quality Adjustment Manual and 3.8		*			
	(2) Memory Shot radiography conditions	Procedures for Creating Image Quality Inspection Data.		*			
	(3) Phototimer radiography conditions			*			
5. FPD-related parts							
(1) FPD	(1) Uneven brightness, scratches, dirty spots	Visually check for abnormalities.	*	*			
	(2) Check the missing pixels and size of pixel clusters.	Check for increased missing pixels at the PCU.	*	*			
	(3) Check the FPD temperature.	Check the FPD temperature at the PCU.	*	*			

Inspection Procedures (3/9)

Inspection Item	Inspection Details	Measurement Method and Inspection Method	Inspection Timing		Replace	Safety	Remarks
			1	2			
6. Digital image processing unit							
(1) Filter		Visually check for abnormalities.	*	*			
(2) Fan	Check that the fan is rotating.	Visually and aurally check for abnormalities.	*	*			
(3) Image capture operation	(1) SPOT	Visually confirm operation and check for image abnormalities.	*	*			
	(2) SER radiography (7.5 fps)		*	*			
	(3) DSA radiography *1) (7.5 fps)		*	*			
	(4) Digital multi-frame imaging (4 frames)		*	*			
	(5) Digital tomography *1) (30°, fast)		*	*			
	(6) Tomosynthesis *1) (60 kV, 1.25 mAs)		*	*			
	(7) RSM-DSA *1) (7.5 fps)		*	*			
	(8) SLOT *2)		*	*			
(4) Image reading	Shuttle operation, IVR master operation, etc.	Operation check for abnormalities.	*	*			
(5) File operations	Image display, copy, print, delete, etc.		*	*			
(6) Fluoroscopy image processing	Invert, loop, fluoroscopy recording, etc.		*	*			
(7) DVD reading and writing	Writing to DVD and reading from DVD		*	*			

*1) Option, *2) Option

Inspection Procedures (4/9)

Inspection Item	Inspection Details	Measurement Method and Inspection Method	Inspection Timing		Replace	Safety	Remarks
			1	2			
(9) Printing and density	(1) Auto print, manual print	Operation check for abnormalities.	*	*			
	(2) Check the density with a SMPTE test pattern.	Check with a densitometer.	*	*			
(10) DICOM transmission *1)	Check DICOM transmission.	Operation check for abnormalities.	*	*			
(11) DICOM MWM/MPPS information transmission *1)	Check DICOM MWM/MPPS information transmission.		*	*			
(12) Dose Display Accuracy	Check displayed dose on DAP and Calculated Dose	See 3.4 Dose Display Accuracy	*				
7. Image quality							
(1) Fluoroscopy image quality	Check overall image quality of the FPD-DR system (spatial resolution, contrast).	See 3.3 Procedures for Creating Image Quality Inspection Data, 3.3.1 Fluoroscopy Image Evaluation.		*			
(2) Radiography image quality	Check overall image quality of the FPD-DR system (spatial resolution, contrast).	See 3.3 Procedures for Creating Image Quality Inspection Data, 3.3.2 Radiography Image Evaluation.		*			
(3) Fluoroscopy S/N ratio	Vq (FPD)			*			
8. Accessories							
(1) Monitor	(1) Check brightness and contrast with an SMPTE test pattern.	Visually check the density distribution.	*	*			
	(2) Pixel losses	Visually check for abnormalities.	*	*			
(2) Intercom	Check the volume and sound quality.	Aurally check for abnormalities.	*	*			
(3) VTR *1)	Check operation and recorded images.	Operation check for abnormalities.	*	*			
(4) Monitor cart (support) *1)	Check caster operation and the cable condition.	Visually confirm operation and check for abnormalities.	*	*			
(5) Laser imager *1)	Check the printing operation. *1)	Operation check for abnormalities.	*	*			
*1) Option							

Inspection Procedures (5/9)

Inspection Item	Inspection Details	Measurement Method and Inspection Method	Inspection Timing		Replace	Safety	Remarks
			1	2			
A Main body of R/F table	It corresponds to the item "8. RF Table unit" in the attached maintenance inspection report (SVTS-0171).						
A -1 Power Check of Control Circuit <8. RF Table unit, (1) of SVTS-0171>	Power supply voltage	Measured with a voltmeter (effective value) In the case of temporal fluctuation, the fluctuation range is also indicated.		*			For the remarks with ☆ mark listed below, related information is available on M506-E345.
A -2 Table vertical movement mechanism (Tabletop up/down movement) <8. RF Table unit, (2) of SVTS-0171>	(a) Check the tension of the roller chain.	Pull with 5 kg force, ensure deflection is 3 ~ 5 mm.	*	*	@	@	Important ☆ Inst. Manual M506-E362
	(b) Confirmation of sprockets	For scratches or abnormal shavings		*		@	
	(c) Check Chain Fitting	Confirm Clip Insertion		*		@	
	(d) Damage and lubrication of roller chains	After checking for abnormalities, grease up.	*	*		@	
	(e) Overrun Limit Sensor Operation	Check for abnormalities.		*		@	☆
	(f) Stopping position (potentiometer operation)	"	*	*			Inst. Manual M506-E362
	(g) Abnormal sound, noise, confirmation	"	*	*			
	(h) Damage and tension of belts	" Replace when worn or damaged.		*			Inst. Manual M506-E362
	(i) Wear and lubrication of rack and pinion	" After inspection, grease up.		*			☆
	(j) Abrasion and fixation of rail	"		*			☆
A -3 Tabletop transverse movement mechanism (Tabletop left/right movement) <8. RF Table unit, (3) of SVTS-0171>	(k) Abnormal sound and fixing of bearing	"		*			
	(l) Check that the pulleys and sprockets do not come off.	"		*			
	(m) Check the mounting screws of the motor, reduction gear, tension sprocket, etc.	"		*		@	
	(a) Stopping position (Limit SW operation)	Check for abnormalities.	*	*		@	☆
	(b) Damage to the front side of tabletop guard plate	"		*		@	
	(c) Damage to the rear side of tabletop guard plate	"		*		@	
	(d) Abnormal sound, noise and confirmation	"	*	*			
	(e) Wear and lubrication of gears	" After inspection, grease up.		*			☆
	(f) Wear, lubrication and fixing of the rail	"		*			☆
	(g) Abnormal sound and fixing of bearing	"		*			
	(h) Check that the gear does not come off.	"		*			

Inspection Item	Inspection Details	Measurement Method and Inspection Method	Inspection Timing		Replace	Safety	Remarks
			1	2			
A -4 Table Tilt Mechanism <8. RF Table unit, (4) of SV/TS-0171>	(i) Check the mounting screws of the motor, etc.	"		*		@	
	(a) Check the tension of the roller chain.	Pull with 10 kg force and check that the deflection is 5 mm.	*	*		@	☆ Inst. Manual M506-E362
	(b) Confirmation of sprockets	For scratches or abnormal shavings		*		@	
	(c) Check Chain Fitting	Confirm Clip Insertion.		*		@	
	(d) Damage and lubrication of roller chains	After checking for abnormalities, grease up.	*	*		@	
	(e) Overrun Limit Sensor Operation	Check for abnormalities.		*		@	
	(f) Stopping position accuracy (potentiometer operation)	"	*	*			Inst. Manual M506-E362
	(g) Abnormal sound, noise, confirmation	"	*	*			
	(h) Damage and tension of belts	" Replace when worn or damaged.		*			Inst. Manual M506-E362
	(i) Wear and lubrication of gears	" After inspection, grease up.		*			☆
	(j) Abrasion and fixation of rail	"		*			☆
	(k) Abnormal sound and fixing of bearing	"		*			
	(l) Check that the pulleys and sprockets do not come off.	"		*			
A -5 Detection assembly vertical movement mechanism (FPD carriage up/down movement) <8. RF Table unit, (5) of SV/TS-0171>	(m) Check the mounting screws of the motor, reduction gear, tension sprocket, etc.	"		*		@	
	(a) Overrun limit SW operation	Check for abnormalities.		*		@	☆
	(b) Stopping position accuracy (AC servo operation)	"	*	*			Inst. Manual M506-E362
	(c) Abnormal sound, noise, confirmation	"	*	*			
	(d) Wear and lubrication of gears	" After inspection, grease up.		*			☆
	(e) Wear, fixation and clean rails	"		*			☆
	(f) Abnormal sound and fixing of bearing	"		*			
	(g) Check the mounting screws of the motor, reduction gear, etc.	"		*		@	

Inspection Procedures (7/9)

check item	inspection content	Measuring method and inspection method	Inspection Timing		Replace	Safety	Remarks
			1	2			
A -6 Support Column Assembly Vertical Movement Mechanism (POST up/down movement) <8. RF Table unit, (6) of SVTS-0171>	(a) Overrun limit SW operation	Check for abnormalities.		*		@	☆
	(b) Operation of the safety switch	"		*		@	
	(c) Stopping position accuracy (AC servo operation)	"	*	*			Inst. Manual M506-E362
	(d) Abnormal sound, noise, confirmation	"	*	*			
	(e) Wear and lubrication of gears	" After inspection, grease up.		*			☆
	(f) Wear, fixation and clean rails	"		*			☆
	(g) Abnormal sound and fixing of bearing	"		*			
	(h) Check the mounting screws of the motor and reduction gear, etc.	"		*		@	
A -7 X-ray tube rotation movement mechanism (oblique penetration) <8. RF Table unit, (7) of SVTS-0171>	(a) Stopping position accuracy (AC servo operation)	Check for abnormalities.	*	*			Inst. Manual M506-E362
	(b) Abnormal sound, noise, confirmation	"	*	*			
	(c) Damage and tension of cables	"		*			
	(d) Check the mounting screws of the motor and reduction gear, etc.	" Replace when worn or damaged.		*		@	
A -8 X-ray tube vertical movement mechanism (SID drive) <8. RF Table unit, (8) of SVTS-0171>	(a) Overrun limit SW operation	Check for abnormalities.		*		@	☆
	(b) Stopping position accuracy (potentiometer operation)	"	*	*			Inst. Manual M506-E362
	(c) Abnormal sound, noise, confirmation	"	*	*			
	(d) Damage and tension of the belt	" Replace when worn or damaged.		*			Inst. Manual M506-E362
	(e) Wear and lubrication of gears	" After inspection, grease up.		*			☆
	(f) Wear and fixation of the rails	"		*			☆
	(g) Abnormal sound and fixing of bearing	"		*			
	(h) Check that the pulleys and sprockets do not come off.	"		*			
	(i) Check the mounting screws of the motor and reduction gear, etc.	"		*		@	

Inspection Procedures (8/9)

check item	inspection content	Measuring method and inspection method	Inspection Timing		Replace	Safety	Remarks
			1	2			
A -9 Compression cone drive mechanism <8. RF Table unit, (9) of SVTS-0171>	(a) Confirmation of compression force	Confirm that compression force is less than 76.4 N. Adjust if out of range in "Calibration Menu" according to Section 2 "Maintenance" of ZS-200 Installation Manual.		*		@	☆ Inst. Manual M506-E362
	(b) Surface flaw check of the cone	Check for abnormalities.		*			
	(c) Abnormal sound check	" " Replace if damaged.		*			
	(d) Damage and tension of the chain	Adjust chain tension according to Section 2 "Maintenance" of ZS-200 Installation Manual before adjusting compression force because chain tension is much related to compression force.		*			Inst. Manual M506-E362
	(e) Wear and lubrication of the rail	" " After inspection, grease up.		*			☆
	(f) Looseness and abnormal noise of the bearing	"		*			
A -10 Shoulder rest <8. RF Table unit, (10) of SVTS-0171>	(g) Check the mounting screws for motor, reduction gear, etc.	"		*		@	
	(a) Looseness or damage of the fixing screws	Check for abnormalities.	*	*		@	
	(b) Effectiveness and damage of the spring	"		*		@	
	(a) Looseness or damage of the fixed part	Check for abnormalities.	*	*		@	
	(b) Effectiveness and damage of the spring	"		*		@	
	(c) Damage to the shoe	"		*		@	
A -11 Foot rest <8. RF Table unit, (11) of SVTS-0171>	(a) Looseness or damage of the fixing screws	Check for abnormalities. If the M3 screw at the end of the knob shaft is loose, re-apply the Loctite and re-tighten. At that time, firstly, wipe off as cleanly as possible the Loctite adhering to the present state. Remove the female screw side with a tap, and wipe off the male screw side with a cloth. Loctite (red) is recommended for new application, but red is stronger than normal Loctite (blue), and if you try to loosen it forcibly, the screw may be damaged, so be careful.		*		@	
	(b) Dirt or damage to the shoe	" " Clean up. Replace if damaged.		*			
	(c) Deformation or damage of the washer	Replace if deformed or damaged.		*			
A -12 Hand grip <8. RF Table unit, (12) of SVTS-0171>	(a) Looseness or damage of the fixing screws	Check for abnormalities. If the M3 screw at the end of the knob shaft is loose, re-apply the Loctite and re-tighten. At that time, firstly, wipe off as cleanly as possible the Loctite adhering to the present state. Remove the female screw side with a tap, and wipe off the male screw side with a cloth. Loctite (red) is recommended for new application, but red is stronger than normal Loctite (blue), and if you try to loosen it forcibly, the screw may be damaged, so be careful.		*		@	
	(b) Dirt or damage to the shoe	" " Clean up. Replace if damaged.		*			
	(c) Deformation or damage of the washer	Replace if deformed or damaged.		*			

Note: 1N = 0.101972 kgf 1 kgf = 9.80665 N 76.4 N $\approx$ 7.8 kgf

Inspection Procedures (9/9)

check item	inspection content	Measuring method and inspection method	Inspection Timing		Replace	Safety	Remarks
			1	2			
B Table control circuit, connection and fixation	It corresponds to the item "8. RF Table unit" in the attached maintenance inspection report (SVTS-0171).						
B -1 Control circuit	(a) Operation check of control relays	Check for abnormalities	*	*		@	
	(b) Operation confirmation of emergency stop	"	*	*		@	
	(c) Check the power supply voltage of the boards.	Check +5V, +15V, -15V, +24V power supply.		*			
B -2 Remote control console <8. RF Table unit, (13) of SVTS-0171>	(a) Operation confirmation of emergency stop	Check for abnormalities	*	*		@	
	(b) Operation check of the operation switch	"		*		@	
	(c) Check for abnormal display	"		*			
	(d) Connection check of the terminals and connectors	"		*			
B -3 Local control console <8. RF Table unit, (14) of SVTS-0171>	(a) Operation confirmation of emergency stop	Check for abnormalities	*	*		@	
	(b) Operation check of the operation switch	"		*		@	
	(c) Check for abnormal display	"		*			
	(d) Connection check of the terminals and connectors	"		*			
B -4 Main unit control console <8. RF Table unit, (15) of SVTS-0171>	(a) Operation confirmation of emergency stop	Check for abnormalities	*	*		@	
	(b) Operation check of the operation switch	"		*		@	
	(c) Check for abnormal display	"		*			
	(d) Connection check of the terminals and connectors	"		*			
B -5 Cable Connection	(a) Cable damage check	Check for abnormalities		*		@	
	(b) Connection check of the terminals and connectors	"		*			
	(c) Check the fixing screws.	"		*		@	
B -6 Screw, bolt, and floor fixing							
C Collimator	It corresponds to the item "8. RF Table unit, (16) " in the attached maintenance inspection report (SVTS-0171).						
C -1 Opening/closing mechanism	(a) Check for abnormal sound.	Check for abnormalities		*			
	(b) Damage and fixing of wire ropes	" After inspection, grease up		*			☆
C -2 Effective field size	Dimension check	Refer to the installation manual.		*			Inst. Manual M506-E362
C -3 Control circuit	Connection check of the terminals and connectors	Check for abnormalities		*			
C -4 Mounting	Check the fixing screws.	"		*		@	