

ORTHOPHOS 3 / 3 Ceph / 3 DS

Service Manual

IMPORTANT:

- Please note that this document applies from serial number 8000 and for modification to ORTHOPHOS 3 DS.
- For units with serial number below 8000 please use the Service Manual, order number 18 73 467.
- In case of faults which you are unable to eliminate with the help of this manual, please contact our Customer Service.
- It is essential that you take this Service Manual with you for every visit to a customer.

Furthermore, you must always have the spare parts list and the wiring diagrams with you as well.

You can order additional copies of this Service Manual under the

- order number **58 35 744** from our department **GZP** in Bensheim.

See reverse side of manual for address.

Version 6.0

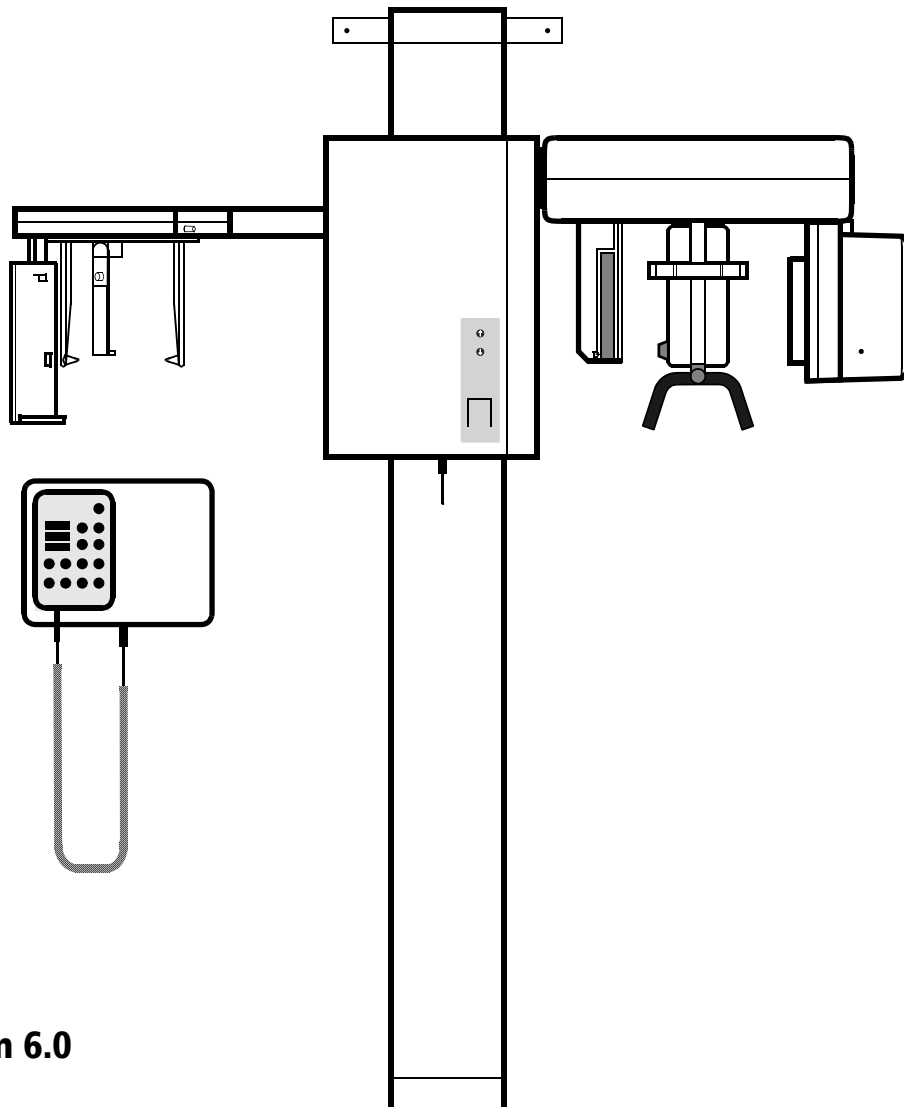
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ORTHOPHOS 3 / 3 Ceph / 3 DS

Service Manual

valid from serial no. **8000**

and for modification to **ORTHOPHOS 3 DS**



Version 6.0

The following are also required:

- **Spare parts list**

Order no. 33 33 908

- **Circuit diagrams**

ORTHOPHOS 3 / 3 Ceph / 3 DS

Order no.59 01 629

- **Tools**

- Hexagonal-head screwdrivers, angled, sizes 1, 5, 2 – 10
- Allen key, size 4, length 200 mm, for socket head screws
- Set of hexagonal wrenches, sizes 4 – 14 with 1/4" ratchet, extension and 4 socket head (Allen) inserts 3 – 6 mm
- Spirit level
- Open-end wrenches, sizes 5.5, 7, 8, 10, 13, 30, and 19, 22 for Ceph
- Torx screwdrivers, sizes 10, 20, 25
- Phillips-head screwdriver, size 1
- Insulated slot-head screwdrivers, sizes 0, 1, 2, 3, 4, 6
- Pliers for retaining ring

- **Auxiliary equipment**

- Digital multimeter, accuracy class 1
- Soldering iron for cable repairs
- Diagonal cutter
- Cable ties
- Teflon insulating tape

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1 **Important Notes**

Important Notes

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1.1 Important Notes

- The ORTHOPHOS® 3 / 3 Ceph / 3 DS
operates with the following nominal line voltages: 208V, 230-240V, 50/60 Hz.
The permissible line voltage fluctuations are 230-240V + 6%, -10%, and 208 V \pm 10%.
The internal line resistance must not exceed 0.8 Ω .
- Remote control
The unit can be equipped with a remote control inside the treatment room or outside an X-ray room.
For the tests the Multitimer can/must be removed from the remote control module and is to be connected directly to the unit (for remote control with the Multitimer without coiled cable, the coiled cable has to be connected for the tests according to the installation instructions).
Remember that the fault can then be in the deactivated cable.
- Warm-up time, self-adjustment, cool-down time, turn-off time
After power-up the unit always requires a warm-up time of one minute.
During this time, the self-adjustment routine for the mechanical elements and electronics of the unit is executed. Pressing a key during the self-adjustment causes an error indication at the Multitimer. The cool-down time between two consecutive exposures is ensured by the automatic exposure blockage determined by the pulse/pause ratio. The count down of the waiting time required is indicated on the Multitimer. The turn-off time of board XAB-OP must be at least 60s; otherwise the unit will not function correctly (no exposure readiness).
- For demonstration units set the test switch S1/S88 on board DX31 to position 2. LED V2 on board DX31 must light up.
Now, no X-ray radiation is generated.
In the interest of improved safety we recommend removing fuse F5 on board DX3.
- The overall software version of the unit is determined by the software versions of the EPROMs on board DX1 and of the Multitimer D4 as well as the version number of the memory card. Refer to the list of software versions. When switching the unit ON the versions are indicated on the Multitimer for about three seconds after the segment test.
- Interference of radio telephones with electromedical equipment
The use of mobile telephones in the area of the medical practice or clinic is prohibited in order to ensure the operational reliability and safety of electromedical equipment.
- Disposal
The X-ray tube assembly contains a tube which can implode, a small amount of beryllium, a lead lining and mineral oil.
- Error messages
Error messages are indicated on the Multitimer.
- Help messages H if radiographic readiness is not reached
Help messages are displayed on the Multitimer.



1.1 Important Notes

- If you have to remove panels from the unit.

Refer to section "Removing panels".

With the panels removed, remember that the direct incidence of sunshine or bright room light can cause unit malfunctions by activating the light barriers.

Therefore: Avoid direct sunshine and bright lighting above the unit!

Remember when reattaching the panels:

Secure sheet metal covers with screws.

IMPORTANT: For reasons of EMC it is essential to insert all screws.

Reinstall all panels.

- Measurements

Before connecting a measuring instrument, always switch the unit OFF.

Select the required current/voltage type and set the measuring range according to the expected value.

Carry out continuity tests only with the unit switched off.

If the release of several exposures with radiation is required for checking the measuring results, you must observe the specified cool-down intervals. This is ensured by the automatic exposure blockage (see Operating Instructions).

The pulse/interval ratio is 1:10, which means a 10 second pause has to follow after 1 second of radiation. This pulse/interval ratio is automatically guaranteed by the automatic exposure blockage.

However, preferable for the X-ray tube is a pulse/pause ratio of 1:20.

Adhere to the radiation protection guidelines before generating radiation.



Test runs initiated by pressing the T key on the Multitimer followed by actuation of the exposure release button are executed without radiation, i.e. the kV/mA displays remain blank. I

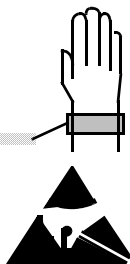
- Replacing parts

Always turn the unit OFF before replacing any parts.

When parts located close to the line transformer are to be replaced, switch off the power at the distributor box for the on-site electrical system for safety reasons.

WARNING! The discharge time for the capacitors is 4 minutes.

To protect electrostatic sensitive devices (ESD) on boards, always wear the wrist band.



The unit must be checked and newly adjusted following the replacement of the DX1 electronics, the X-ray tube assembly or a diaphragm.

The article numbers for ordering spare parts can be found in the spare parts list, order no. 33 33 908.

The figures in the spare parts list offer valuable assistance when replacing parts.

1.2 List of software versions

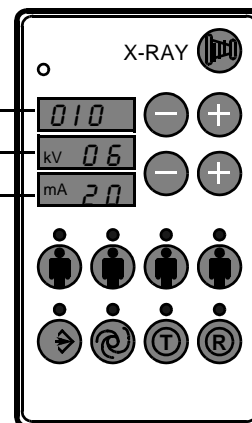
From serial no. 8000
for ORTHOPHOS 3 / 3 Ceph / 3 DS
From serial no. 6000
for systems modified to ORTHOPHOS 3 DS
IMPORTANT: No other combinations of software are allowed since these could result in undefined faults.

Multitimer

Version no. memory card

Software Multitimer D4

Software board DX1



ORTHOPHOS 3 / 3 Ceph

Unit identification 30

Overall software	DX1 J115	D4 EEPROM J4	Memory Card	Remarks
Version 7.30 04.99	020	006	010	
Version 8.30 03.01	020	006	011	kv/mA levels for Asia and USA; Anomaly level -1 for P1 and P11 for Asia
Version 9.30 05.02	021	006	011	

ORTHOPHOS 3 DS

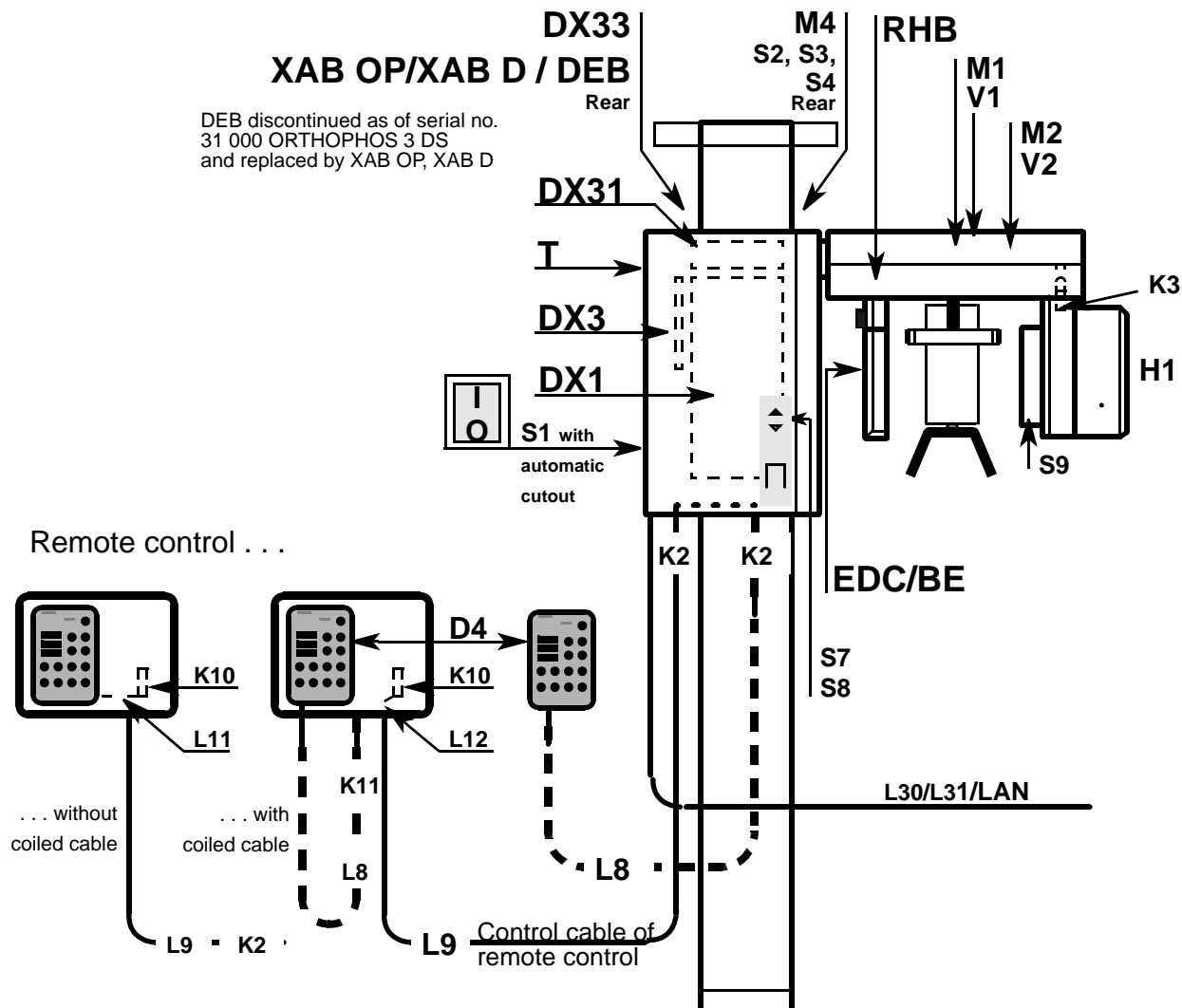
Unit identification 31

Overall software	DX1 EEPROM J115	D4 EEPROM J4	Memory Card	SIDEXIS	Service disk	Remarks
Version 01.31 04.99	020	006	010	≥ 4.2	1.12	
Version 02.31 11.00	020	006	011	≥ 4.2	1.12	XAB OP capable; conventional Ceph possible
Version 03.31 03.01	020	006	012	≥ 4.2	1.12	kv/mA levels for Asia and USA; Anomaly level -1 for P1 and P11 for Asia
Version 04.31 05.02	021	006	012	≥ 4.2	1.12	Correcting error of message E4 04, E3 48

1.3 Major Assemblies and Components

1.3 Major Assemblies and Components

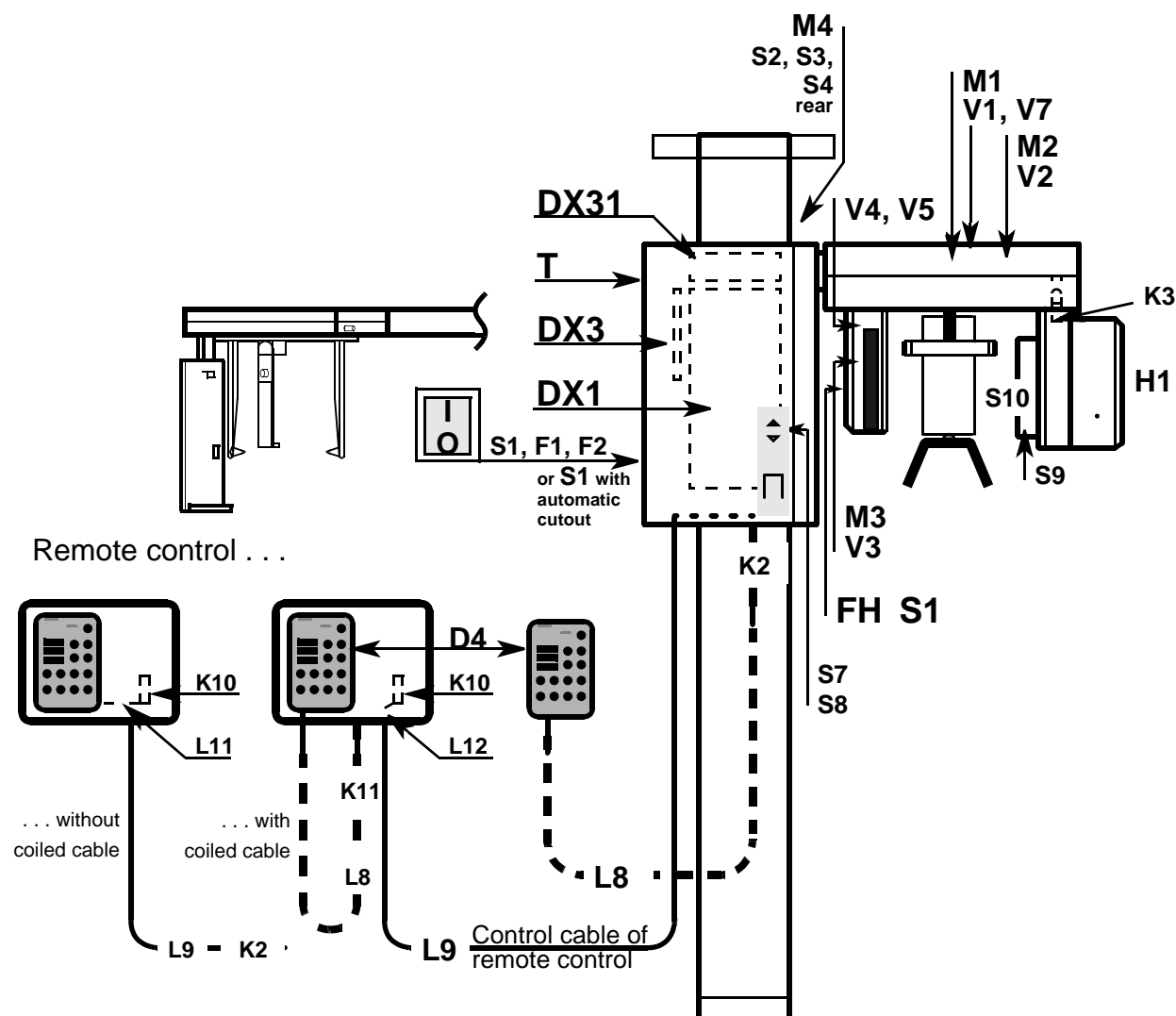
ORTHOPHOS 3 DS



BE = Image receptor
 DEB, EDC, RHB, D, DX, XAB = PC boards
 T = Transformer
 M = Memory card
 H1 = X-ray tube assembly
 M1 = Motor for rotation
 M2 = Actuator
 M4 = Motor for height adjustment
 K = Connector/terminal strips on/in the unit
 L = Leads/cables
 S = Switch

X = Connectors on boards
 V1 - V2 = Light barriers:
 V1 = Start position for rotation
 V2 = Start position for actuator M2

ORTHOPHOS 3 / 3 Ceph



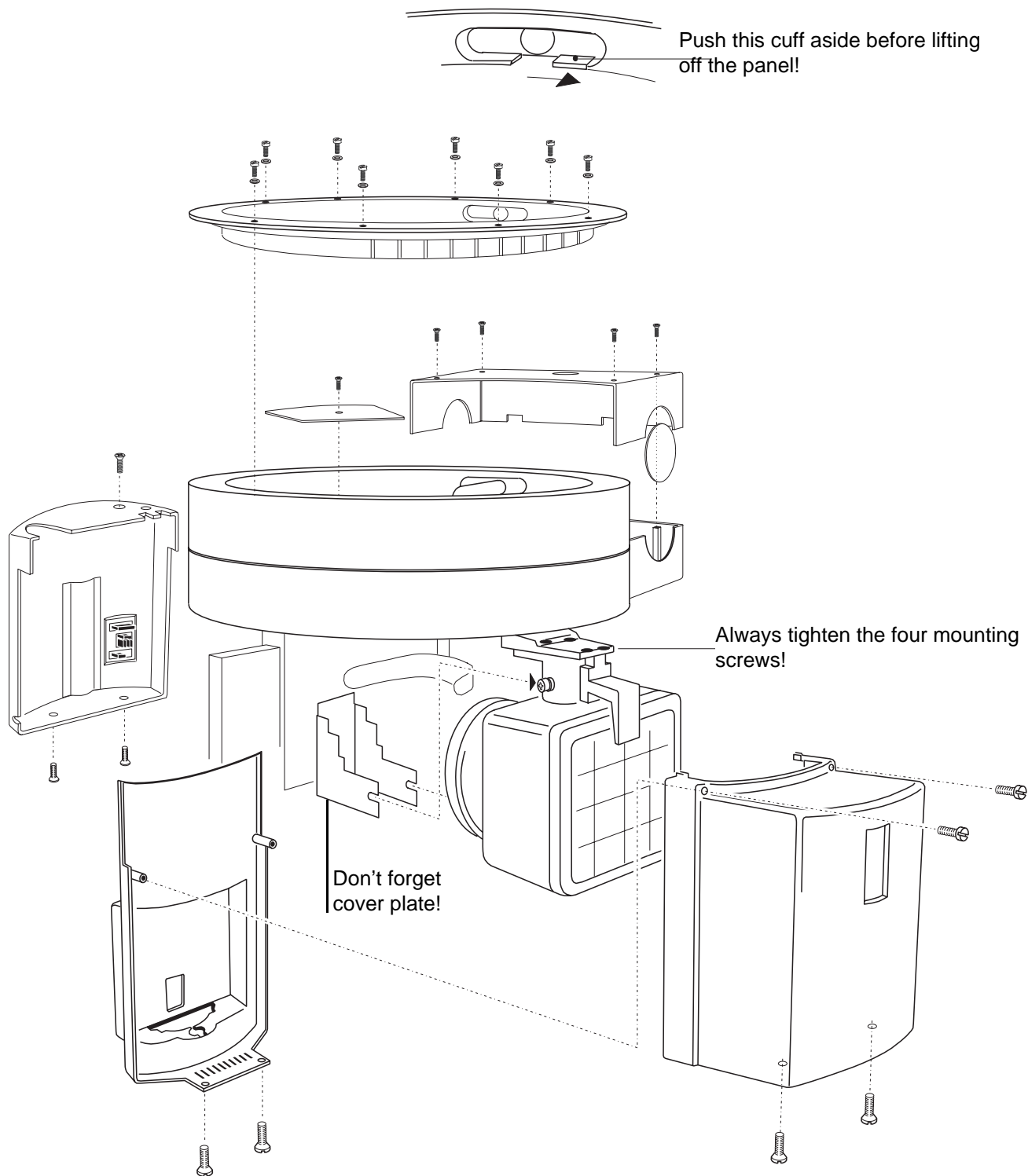
FH = Membrane keyboard
 D, DX = PC boards
 T = Transformer
 M = Memory card
 H1 = X-ray tube assembly
 F1, F2 = Main fuses
 M1 = Motor for rotation
 M2 = Actuator
 M3 = Motor for cassette movement
 M4 = Motor for height adjustment
 K = Connector/terminal strip on/in the unit
 L = Leads/cables
 S = Switch
 X = Connectors on boards

V1 - V7 = Light barriers:
 V1 = Start position for rotation
 V2 = Start position for actuator M2
 V3 = Start position for film cassette
 V4 = Exposure position cassette holder
 V5 = Cassette holder in Ceph position
 V7 = Rotation ring in Ceph position

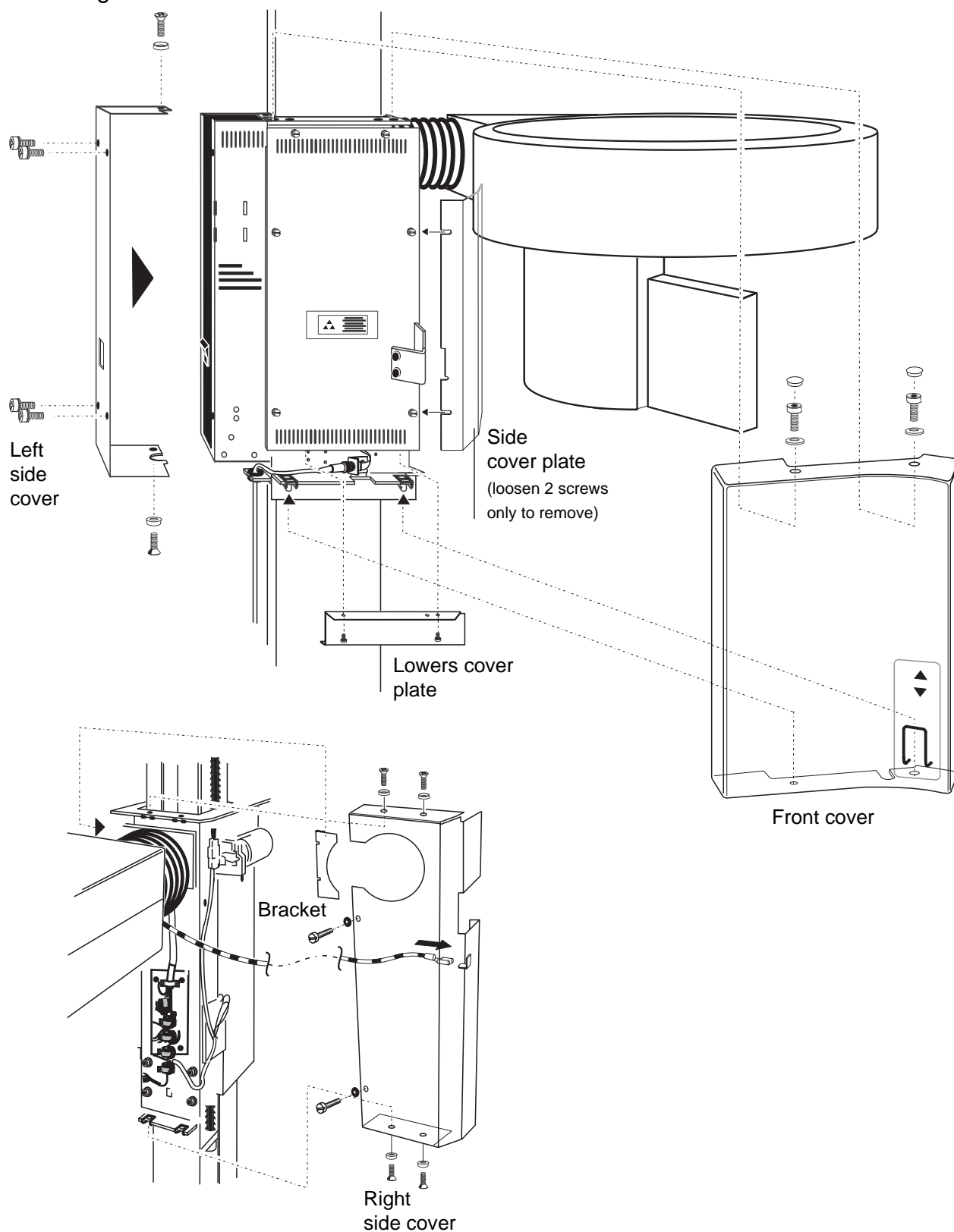
1.4 Removing Panels

1.4 Removing Panels

X-ray tube assembly, rotation ring



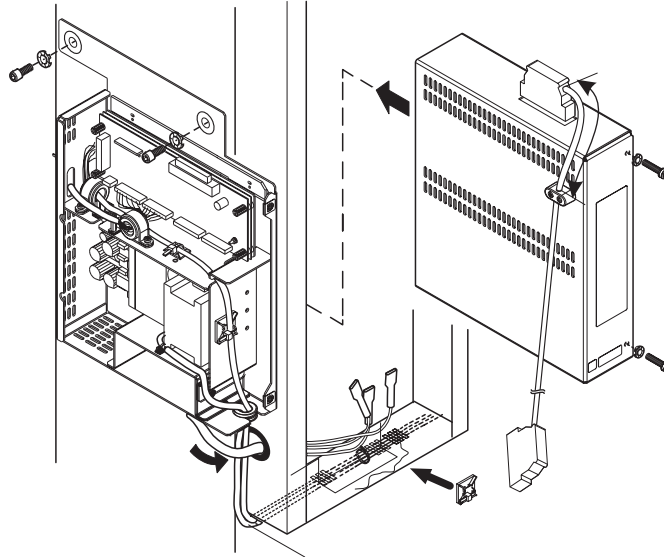
Unit carriage



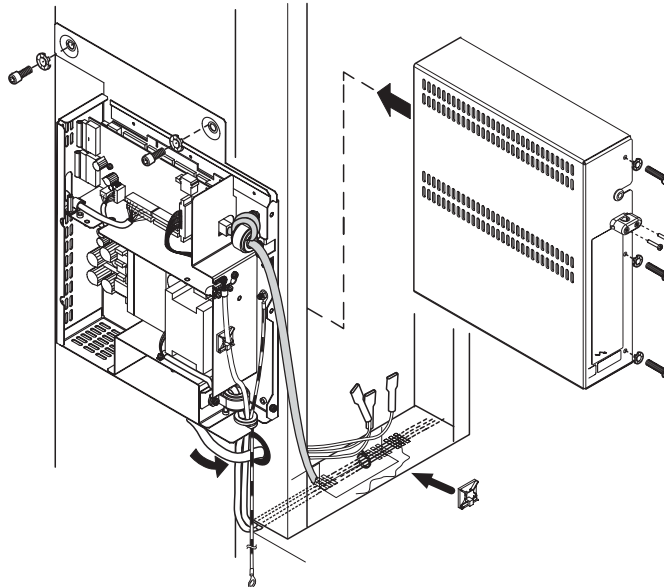
1.4 Removing Panels

Extension box ORTHOPHOS 3 DS

till Serial-No. 30 999



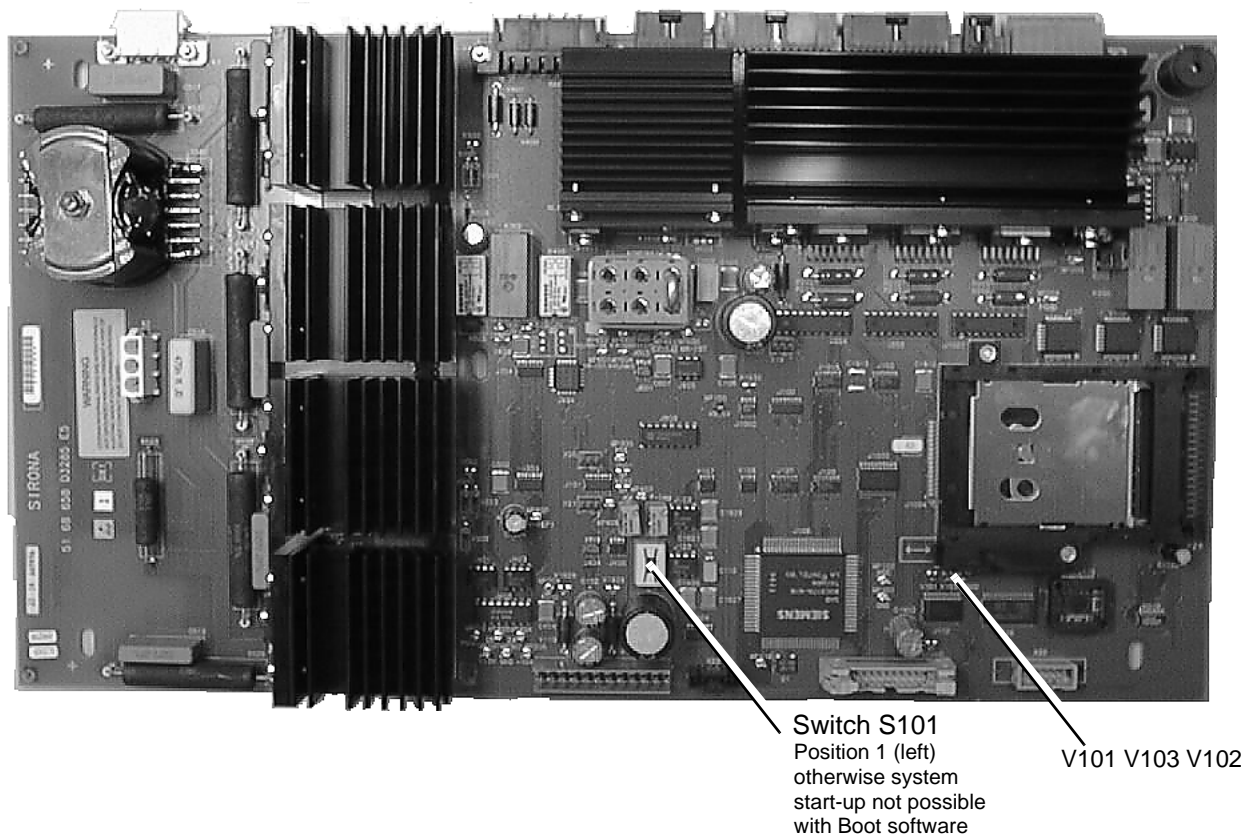
from Serial-No. 31 000



1.5 Photographs of PC Boards

DX1 board

51 68 658



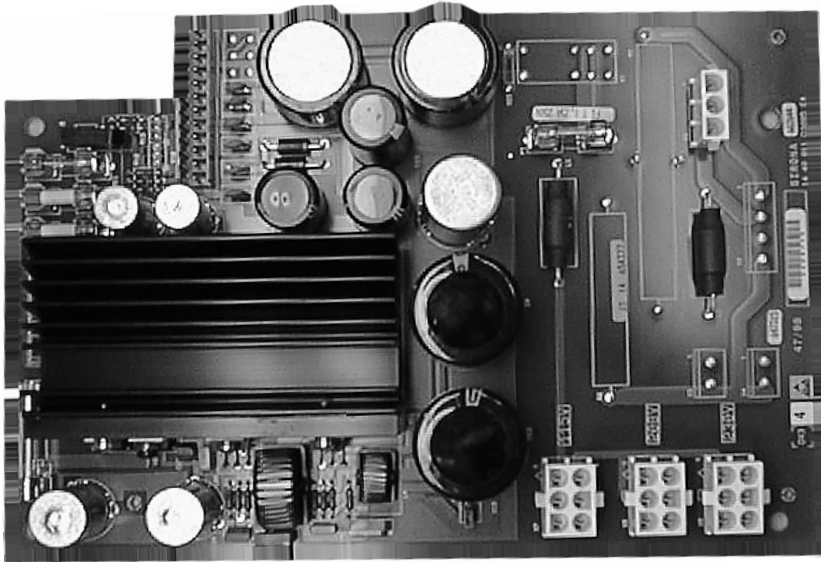
LED1 V101	LED2 V103	LED3 V102	Description	Required action
on	on	on	Controller not o.k.	Replace and adjust DX1
on	off	off	Internal XRAM not o.k.	Replace and adjust DX1
off	on	off	Internal RAM not o.k.	Replace and adjust DX1
off	off	on	Program memory for Boot software not o.k.	Replace and adjust DX1
flashing	flashing	off	Input clock of 82c54 not o.k.	Replace and adjust DX1
flashing	off	flashing	Vref2 voltage not o.k.	Replace and adjust DX1
off	off	flashing	Malfunction of Watchdog timer	Replace and adjust DX1
off	on	on	Unable to switch to memory card	Replace and adjust DX1
flashing	off	off	Program memory of memory card not o.k.	Memory card incorrect, not or only partially programmed
off	flashing	off	not assigned	
flashing	off	on	not assigned	
off	flashing	on	not assigned	
off	off	off	All tests run without errors	Everything o.k.
on	on	off	No memory card detected	Insert memory card correctly
on	off	on	Memory card not correct	Insert memory card for ORTHOPHOS

1.5 Photographs of PC Boards

DX3 and DX31 boards

DX3

14 49 011



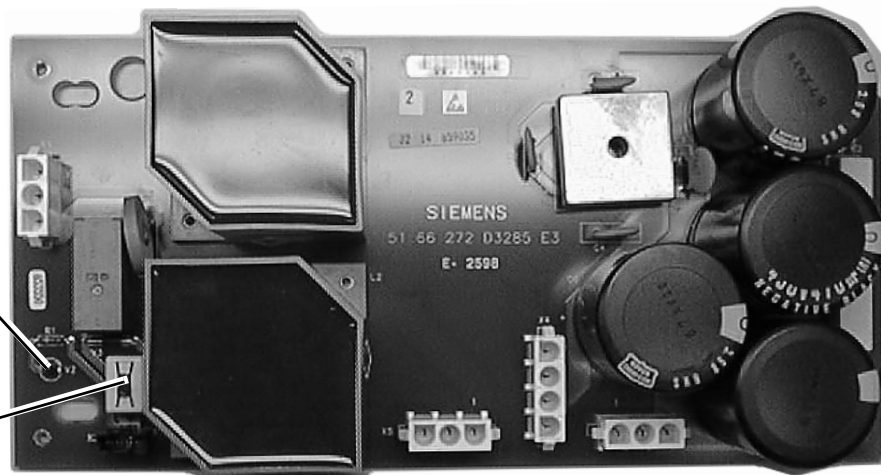
DX31

51 66 272

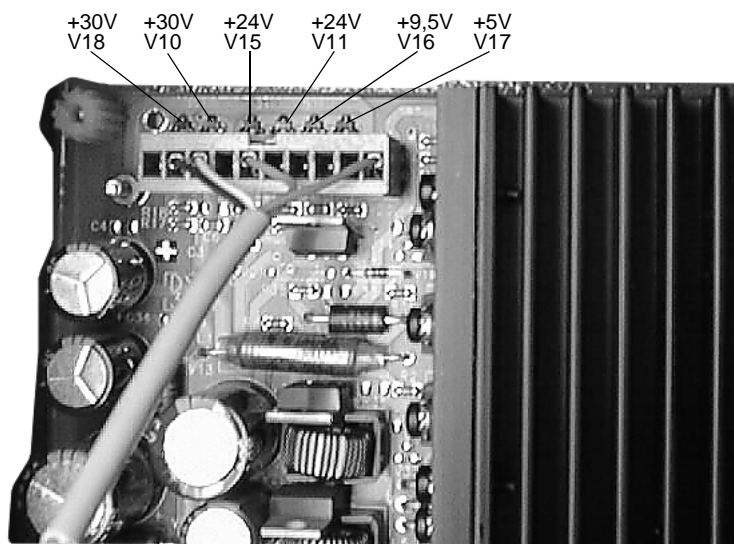
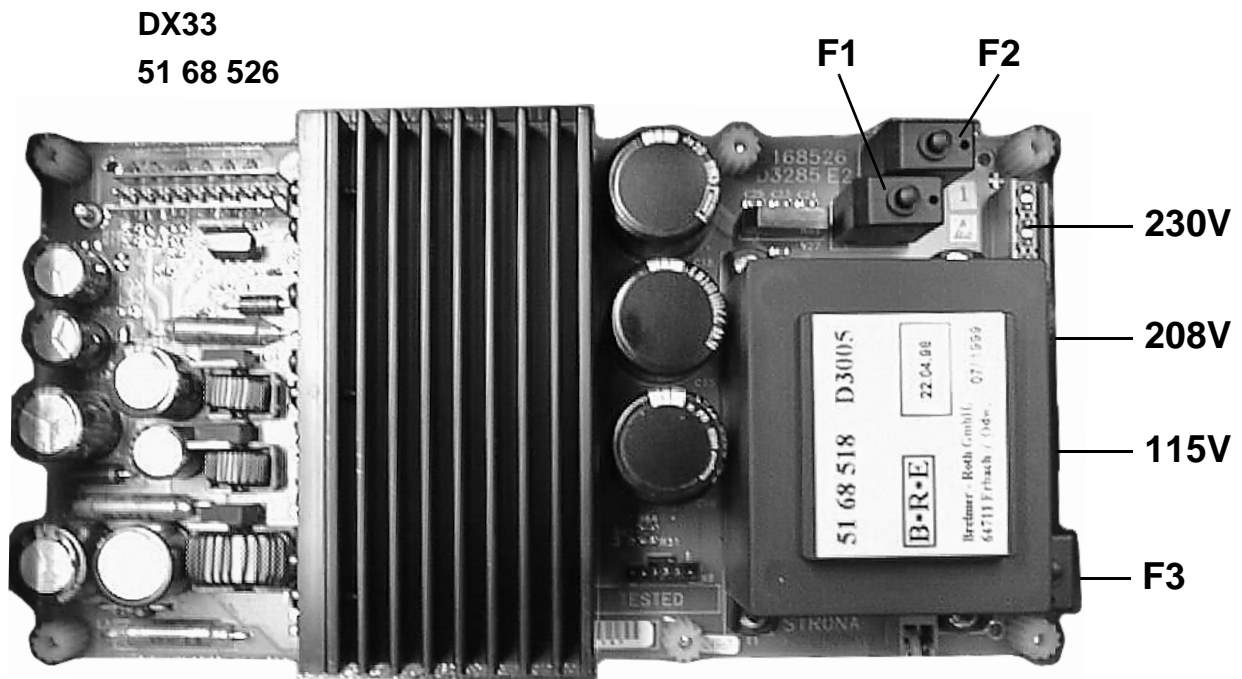
- ☐ Radiation
- ☒ S.88 Demonstration mode

V2

S.88
Position 2
Demonstration
mode



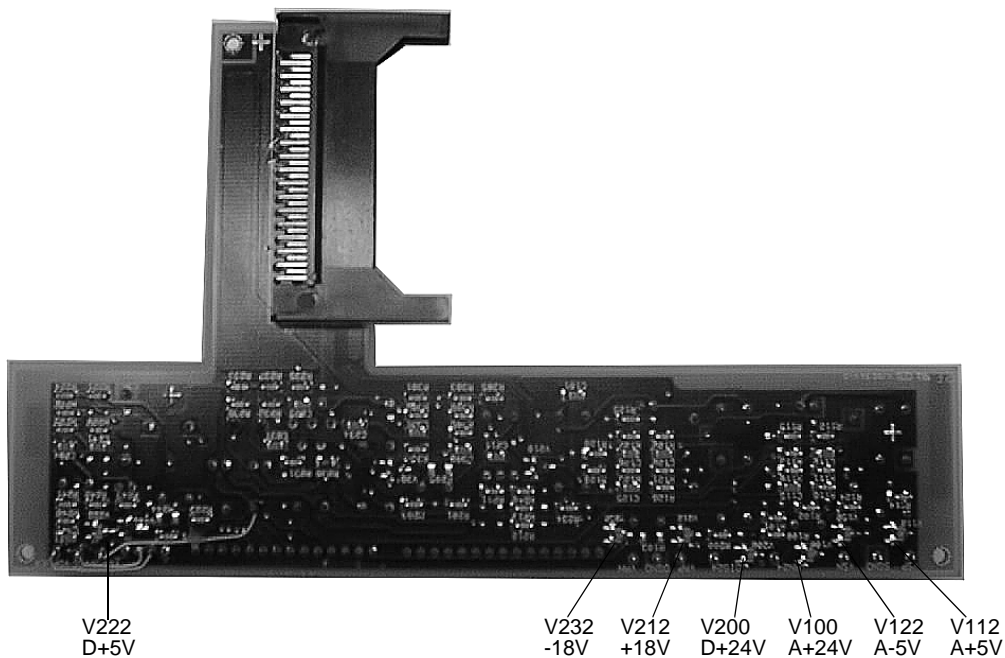
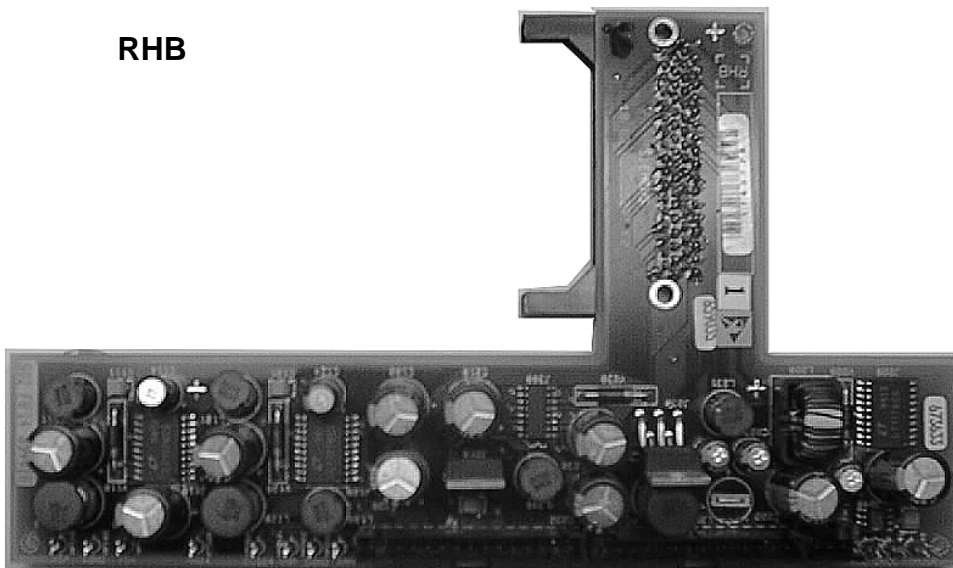
DX33 board



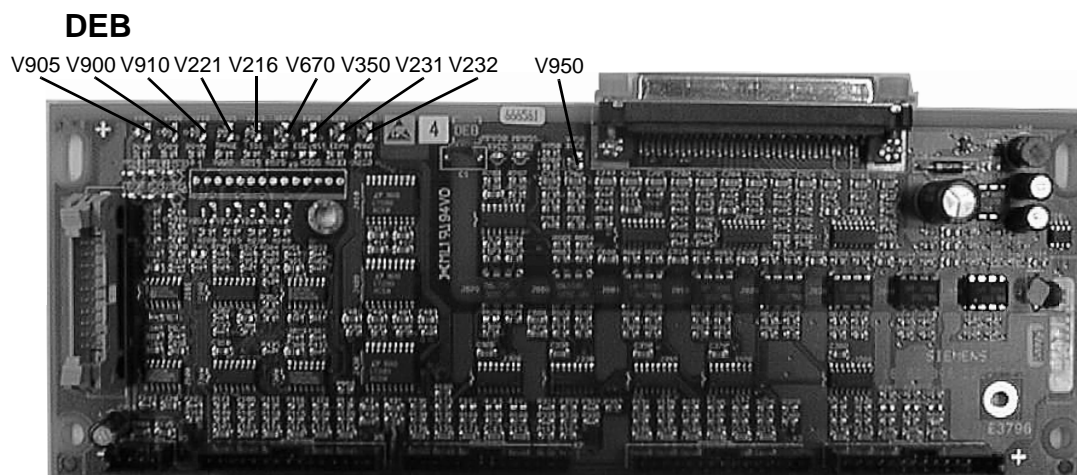
1.5 Photographs of PC Boards

RHB board

RHB



DEB board



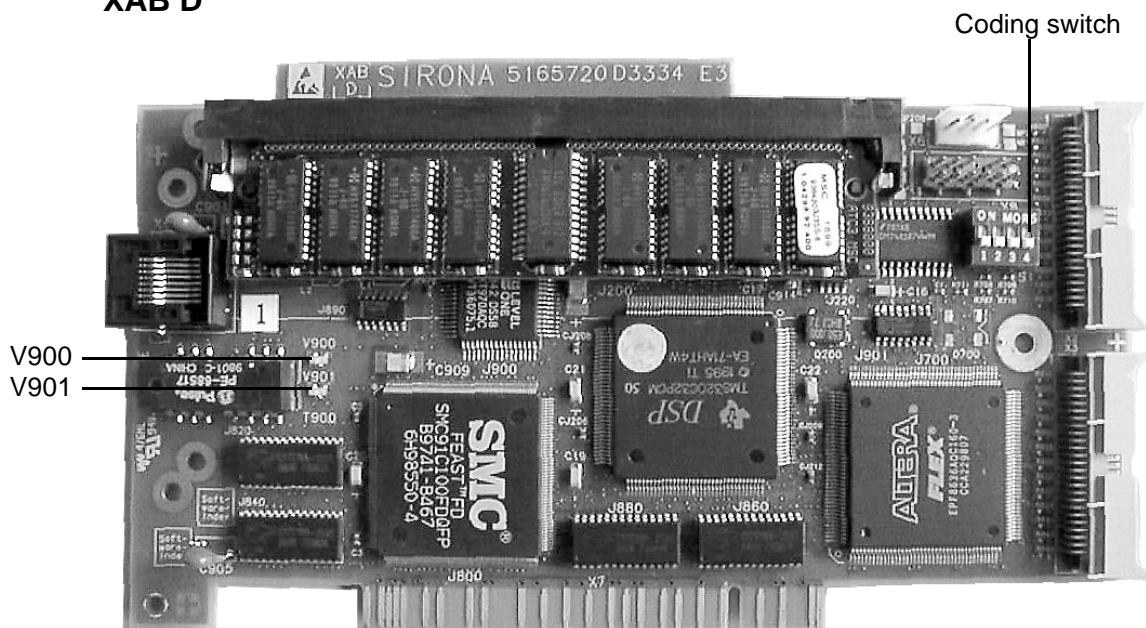
V216	LED, Out clock pulses TDI
V221	LED, radiographic mode
V231	LED, Ceph radiography mode only with ORTHOPHOS Plus DS Ceph
V232	LED, Panoramic radiography mode
V350	LED, EDC Reset (not inserted)
V670	LED, PC exposure readiness ACTIVE signal
V900	LED, digital supply voltage RHB +24V
V905	LED, analog supply voltage RHB +24V
V910	LED, supply voltage DEB +5V ORTHOPHOS
V950	LED, supply voltage DEB +5V PC

V905	V900	V910	V221	V216	V670	V350	V231	V232	V950	Status
		X						X	X	Standby Pan
		X					X		X	Standby Ceph without function
X	X	X						X	X	Panoramic radiography mode
X	X	X					X		X	Ceph radiography mode without function
X	X	X	X		X			X	X	Panoramic radiography mode Image generation test image
X	X	X	X		X		X		X	Ceph radiography mode Image generation test image without function
X	X	X	X	glows	X			X	X	Panoramic radiography mode X-ray
X	X	X	X	glows	X		X		X	Ceph radiography mode X-ray without function

1.5 Photographs of PC Boards

XAB OP and XAB D boards

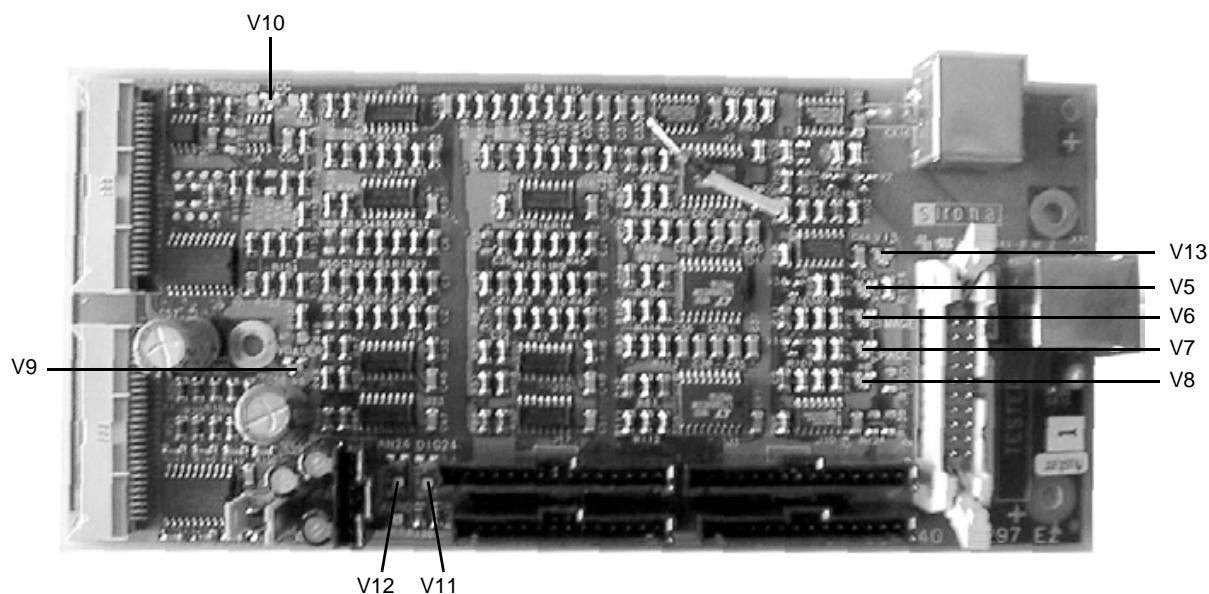
XAB D



V900 = RD Transmit, GN Receive

V901 = RD Link (address recognition), GN 100Mbps (Megabits per sec)

XAB OP



- V5 LED, TDI distance pulses
- V6 LED, IMAGE radiographic mode
- V7 LED, radiographic mode Ceph only with ORTHOPHOS Plus DS Ceph
- V8 LED, radiographic mode Pan
- V9 LED, V continuous
- V10 LED, VCC +5V
- V11 LED, Digital supply voltage +24V
- V12 LED, Analog supply voltage +24V
- V13 LED, PC exposure readiness ACTIVE signal

2 **List of Messages**

List of Messages

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2.4 List of Error Messages for SIDEXIS 2 - 9

After the cool-down interval has elapsed you want to release an exposure, but the Ready LED is flashing:




























- Press the **X-ray** key on the Multitimer.
CAUTION: Take radiation protection measures.
The **H3** or **H4** message then appears on the **kV/mA** display.
- Find in the following list the actions required to return the unit to readiness for exposure.
- Before carrying out the required action clear the help message by pressing the **R** key on the Multitimer.
























	Help message	Description	Required action
Panorama or Ceph	H3 01	Rotation unit not in the start position.	Press the Return key R .
	H3 04	Cassette holder not in Panorama position.	Swivel cassette holder to stop position. For error correction follow service routine S.16,  see page 5 - 45.
	H3 06 	Locking button on diaphragm wheel not engaged (Panorama diaphragm).	Correctly engage locking button on diaphragm wheel,  see page 3 - 15.
	H3 11	Cassette holder not in Ceph position.	Swivel cassette holder to stop position. For error correction follow service routine S.16,  see page 5 - 45.
	H3 12	Rotation unit not in start position for Cephalometry.	Press R key.
	H3 20	Radiographic data not acknowledged.	Acknowledge radiographic data with Return key R .
SIDEXIS	H4 01	Image receptor not inserted correct.	Insert image receptor up to end stop. For error correction follow service routine S.32,  see page 5 - 57.
	H4 03	SIDEXIS not ready for exposure.	Make SIDEXIS ready for exposure. See SIDEXIS Service Manual.
	H4 10	Image receptor not suitable for exposure set.	Replace the image receptor in the plug-in location according to the programmed acquisition.
	H4 20	Image could not be transferred to SIDEXIS.	Transfer exposure by SiRescue service program to the PC, see SIDEXIS User Manual. CAUTION Do not switch off the unit until the help message goes out.

The above mentioned actions will eliminate help messages caused by operating errors.

If the help message cannot be eliminated by the above actions, the fault is of another nature. Proceed with troubleshooting as described on the following pages.














2.2 List of Error Messages

	Error message	Description	Required action
Multitimer	E1 01 	A key on the Multitimer was pressed during self-adjustment or is defective.	Proceed according to section "Correcting error E1 01",  see page 3 - 19.
	E1 02  E2 03 	Signal paths to control board D1 are interrupted.	Proceed according to section "Correcting error E1 02",  see page 3 - 19.
	E1 03	Faulty communication with the unit.	Acknowledge the fault by pressing the R key on the Multitimer.
X-ray tube assembly E2 . . .	E2 01 	Appears upon pressing the exposure button. Overheated X-ray tube assembly, pulse/pause ratio not observed.	Acknowledge the fault by pressing the R key on the Multitimer. Allow the X-ray tube assembly to cool down. If the error message reoccurs, proceed according to section "Correcting error E2 01",  see page 3 - 21.
	E2 03 	See E1 02	 see page 3 - 19
	E2 04 	Zero power range has been re-initialized.	Acknowledge the fault by pressing the R key on the Multitimer. Unfortunately, the freely programmed values will be lost and must be reprogrammed. If not possible: correct the error with E2 04,  see page 3 - 23.
	E2 10	Max. radiation time of the program exceeded.	Only possible in service mode; acknowledge the fault by pressing the R key on the Multitimer. Does this error occur often? Board DX1 defective → replace and perform "Adjusting board DX1",  see page 4 - 31.
	E2 11 	kV _{max.} (tube voltage) exceeded.	Proceed according to section "Correcting error E2 11",  see page 3 - 25.
	E2 12 	mA _{max.} (tube current) exceeded.	Proceed according to section "Correcting error E2 12",  see page 3 - 27.
	E2 13 	VH _{max.} (filament voltage) exceeded.	Proceed according to section "Correcting error E2 13",  see page 3 - 29.
	E2 14 	Short-circuit of an output stage on DX1 deactivated.	Proceed according to section "Correcting error E2 14",  see page 3 - 31.
	E2 15	VH _{max.} continuously present.	Hardware error, board DX1 defective → replace and perform "Adjusting board DX1",  see page 4 - 31.
	E2 16 	kV _{actual} cable is interrupted.	Proceed according to section "Correcting error E2 16",  see page 3 - 33.
	E2 18	Non-localizable fault in obtaining the DC/AC signals.	Acknowledge the fault by pressing the R key on the Multitimer. If fault reoccurs, DX1 board is defective → replace. Perform "Adjusting board DX1",  see page 4 - 31.
	E2 20 	Occurs upon pressing the exposure button e.g. with the X-ray room door contact open - exposure release lead in the Multitimer cable is broken.	Close X-ray room door. Acknowledge the fault by pressing the R key on the Multitimer. If the fault reoccurs, proceed according to section "Correcting error E2 20",  see page 3 - 35.
	E2 35	Invalid data in the data memory.	Erase data in the EEPROM with ' Service Routine 09 '. Then press the R key. If the message reoccurs, DX1 board is defective → replace and perform "Adjusting board DX1",  see page 4 - 31.





















	Error message	Description	Required action
X-ray tube assembly E2 . . .	E2 40 	VH setpoint out of tolerance $\pm 10\%$.	Proceed according to section "Correcting error E2 40",  see page 3 - 39.
	E2 41	kV setpoint out of tolerance $\pm 5\%$.	Adjust board DX1. If not possible, DX1 board is defective → replace and adjust,  see page 4 - 31.
	E2 42	mA setpoint out of tolerance $\pm 5\%$.	Adjust board DX1. If not possible, DX1 board is defective → replace and adjust,  see page 4 - 31.
	E2 43 	VH actual value out of tolerance $\pm 10\%$.	Proceed according to section "Correcting error E2 43",  see page 3 - 41.
	E2 44 	kV actual value out of tolerance $\pm 10\%$.	Proceed according to section "Correcting error E2 44",  see page 3 - 43.
	E2 45 	mA actual value out of tolerance $\pm 10\%$.	Proceed according to section "Correcting error E2 45",  see page 3 - 45.
	E2 46	Error while increasing or decreasing the kV value.	Software error or DX1 board defective → replace and perform "Adjusting board DX1",  see page 4 - 31.
	E2 47	Incorrect setpoint value after automatic setpoint adjustment.	Adjust board DX1. If not possible, DX1 board is defective → replace and perform "Adjusting board DX1",  see page 4 - 31. EEPROM defective.
	E2 48	Faulty user offset while increasing the kV value.	Acknowledge the fault by pressing the R key. Caution: If the offset was changed by the user (possible in the range from -6 to +3) it will be reset to zero. If the fault reoccurs, the DX1 board is defective → replace and perform "Adjusting board DX1",  see page 4 - 31.
Unit E3 . . .	E3 01  E3 02 	Operating element for light barrier V3 of actuator M2 has not left/reached the tripping position.	Proceed according to section "Correcting error E3 01/02",  see page 3 - 47.
	E3 05  E3 06 	Cassette carriage has not left/reached the reference point.	Proceed according to section "Correcting error E3 05/06",  see page 3 - 49.
	E3 08	Fault in film motor counter.	Acknowledge the fault by pressing the R key. If the fault reoccurs, the DX1 board is defective → replace and perform "Adjusting board DX1",  see page 4 - 31.
	E3 12 	Key for height adjustment $\uparrow\downarrow$ was pressed during self adjustment or is defective.	Proceed according to section "Correcting error E3 12",  see page 3 - 51.
	E3 23	Return key R was pressed during the switch-on procedure or before completion of unit self-adjustment.	Acknowledge the fault by pressing the R key on the Multitimer.
	E3 24	"X-Ray Control" is indicated at switch-on.	a) If error message occurs in combination with E1 02: button was recognized on Multitimer as actuated - check buttons or replace Multitimer. b) If error message occurs alone, pull out Multitimer and switch on again. If error message occurs again: DX1 defective → replace and perform "Adjusting board DX1",  see page 4 - 31. If error message no longer occurs: replace Multitimer.

2.2 List of Error Messages – Continued

	Error message	Description	Required action
Unit E3 . . .	E3 25	Incorrect data for exposure control.	Memory card or DX1 defective → replace and perform "Adjusting board DX1",  see page 4 - 31.
	E3 26	Data in EEPROM not compatible with software version of memory card.	Check for compatibility of software versions according to the list,  see page 1 - 5. Install the correct software combination, or the memory card or DX1 is defective.
	E3 32  E3 33 	Start position for rotation was not exited/reached.	Proceed according to section "Correcting error E3 32/33",  see page 3 - 53.
	E3 35	Rotation counter not counting correctly.	Software error or DX1 board defective → replace and perform "Adjusting board DX1",  see page 4 - 31.
	E3 36 	Cassette holder was swivelled from the Pan position during the Pan exposure.	Proceed according to section "Correcting error E3 36",  see page 3 - 57.
	E3 37	Counter IC of actuators not counting correctly.	DX1 board defective → replace and perform "Adjusting board DX1",  see page 4 - 31.
	E3 39 	Light barrier for Ceph position rotation indicates invalid status.	Proceed according to section "Correcting error E3 39",  see page 3 - 61.
	E3 41	Error with counter for kV increase.	DX1 board defective → replace and perform "Adjusting board DX1",  see page 4 - 31.
	E3 42	Rotation has not reached Ceph position.	Light barriers V7/V8 maladjusted/defective.
	E3 43	Error with counter for radiation times.	DX1 board defective → replace and perform "Adjusting board DX1",  see page 4 - 31.
	E3 46 	Position of cassette holder cannot be determined.	Proceed according to section "Correcting error E3 46",  see page 3 - 63.
	E3 47*	Memory card not inserted.	Insert memory card.
	E3 48*	Inserted memory card invalid.	Replace memory card.
	E3 49	Watchdog reset performed.	Acknowledge the fault by pressing the R key. Fault occurs with voltage fluctuations; if recurs frequently: DX31 or DX1 board is defective → replace and perform "Adjusting board DX1",  see page 4 - 31.
	E3 50	This service exposure is not possible in the demonstration mode.	Deactivate demonstration mode. Turn test switch S1/S88 on DX31 to position 1. V2 on DX31 must not light up. Observe section "Demonstration mode cannot be switched ON/OFF",  see page 3 - 9.
	E3 52	Unit identification does not match the inserted memory card.	When modifying ORTHOPHOS 3 to 3 DS always perform Service-Routine S.17, when replacing DX1 only in case of deviations.  see page 5 - 49.
	E3 53	Switch S101 in right-hand position. System starts up without Boot software.	Turn switch S101 to left-hand position.
* Is not displayed on all units			

	Error message	Description	Required action
SIDEXIS	E4 01 	Exposure aborted by SIDEXIS.	Proceed according to section "Correcting error E4 01",  see page 3 - 65.
	E4 06 	Fault at one of the supply voltages.	Proceed according to section "Correcting error E4 06",  see page 3 - 69.
	E4 07	Fault in TDI pulse generation.	DX1 board defective → replace and perform "Adjusting board DX1",  see page 4 - 31.
	E4 08 	Aborted by SIDEXIS during radiation.	Proceed according to section "Correcting error E4 08",  see page 3 - 73. In service program → make SIDEXIS ready for exposure; factory service 2.
	E4 10	Communication fault with image acquisition card XOP (in PC) or XAB OP (in ORTHOPHOS).	With image acquisition card XOP: check cable L30/L31 and DEB board. With XAB OP: XAB OP does not respond or has crashed. Switch unit off and on again. Or not in correct service mode in SIDEXIS.
	E4 11 	Image receptor not ready for exposure.	Proceed according to section "Correcting error E4 11",  see page 3 - 81. Check signal path from image receptor to PC.
	E4 12	Image receptor not logged in.	Load contents of image receptor floppy.
	E4 16 	Active signal present when switching ON.	Check SIDEXIS readiness for exposure. With XOP board: Check line path from XOP board in PC to DEB/DX1 board. With XAB OP board: Check line path from DX1 board to XAB OP board. Proceed according to section "Correcting error E4 16",  see page 3 - 89.
	E4 17	Software versions of DX1 and XAB OP boards are not compatible.	Establish a valid software combination by replacing the memory card; load a new XAB-OP software version (see SIDEXIS service manual); SIXABCON description.
	E4 18	Image receptor could not be addressed prior to exposure.	Proceed according to section "Correcting error E4 11",  see page 3 - 81.
	E4 19	A software download of XAB OP is performed (no acknowledgement of error message possible).	Wait until the 4 LEDs above the patient symbols start flashing; then switch the unit off. Software download is completed.
	E4 21	The XAB OP is in the initialization phase (Boot Service) (proceed as described in SIDEXIS service manual; SIXABCON description). The XAB OP has no valid IP address.	After a valid IP address has been assigned by SIXABCON the error message can be acknowledged on the unit (R key).
	— — —	Indication at Multitimer. Communication between control board DX1 and Multitimer / board D4 is faulty.	Check V3 on Multitimer (Ready to operate). Check Multitimer cable. Check line voltage and terminal strip K1. Measure supply voltage at DX1 X1; if OK, DX1 board is defective; if not, DX3 or cable is defective.
	— — — — — —	Indication at Multitimer	At every switch-on ca. 2s, if longer: check LED V101-103. Check memory card. DX1 board is defective → replace and perform "Adjusting board DX1",  see page 4 - 31.

2.3 List of Service Routines

Service routine	Description	When required
S.01 	Radiation without rotation	All adjustments of X-ray tube assembly, e.g. acceptance testing, functional test, head adjustment, diaphragm adjustment.
S.02 	Radiation without rotation for Ceph	See S.01 .
S.03 	Adjustment of kV setpoint, mA setpoint and VH setpoint	After replacing the DX1 board, or malfunction of the X-ray tube assembly.
S.04 	Test of actual values kV, mA, VH.	After replacing DX1 or X-ray tube assembly.
S.05 	Heating adjustment	After replacing DX1 or X-ray tube assembly.
S.06 	Reading/deleting the radiation counter	After replacing the X-ray tube assembly or in warranty cases
S.07 	Deleting the error memory	After replacing the X-ray tube assembly.
S.09 	Erasing EEPROM on DX1 (deletes all data)	In case of software problems (all software adjustments are deleted and must be reprogrammed).
S.11 	Adjusting the kV increase to customer's request	Too much kV increase in the spine region.
S.13 	Hardware service	Problems with DX1 board.
S.14 	Rotation functions	Mechanical malfunctions of rotation and test of the light barriers.
S.15 	Check of actuator	Mechanical malfunctions, layer correction, light barrier adjustment.
S.16 	Check of film holder	Film holder problems.
S.17 	Unit identification	Changing the unit identification.
S.18 	Height adjustment	Checking freedom of movement.
S.25 	Adjusting the film/screen combination or the kVmA step series	Change the Program Values
S.27 	Setting country code	Change anomaly
S.32 	Image receptor test, Pan	For checking the image receptor.
S.35 	PC service	Problems with readiness for exposure.
S.37 	XAB OP service	Read out and delete IP addresses
S.88	Demonstration mode	Selected with switch S1 on DX31. Switches the unit to demonstration mode (no radiation).

The following descriptions should always be seen in relation to the ORTHOPHOS 3 DS unit.

With error message E4 01, ORTHOPHOS 3 DS is generally functional and the SIDEXIS messages must be observed. With other error messages on ORTHOPHOS 3 DS, the SIDEXIS messages indicate secondary faults.

OP : ORTHOPHOS 3 DS

XOP : Image acquisition card for Panorama radiography

EDC : Image receptor electronics on ORTHOPHOS 3 DS

Error message up to SIDEXIS 5.2x	Error message from SIDEXIS 5.3	Description	Required action
Multitimer Break 1	Multitimer Break 0xA001	Interruption caused by releasing the X-ray button on the Multitimer during radiation.	
Multitimer Break 2	Multitimer Break 0xA002	Interruption caused by releasing the X-ray button on the Multitimer between two partial exposures.	
OP Break 1	OP Break 0xB001	Interruption by OP.	Check error message on Multitimer.
OP Break 2	OP Break 0xB002	Interruption by OP.	Check error message on Multitimer.
EDC Break XXX	EDC Break 0xCxxx	Voltage problem/failure at image receptor, see Appendix A.	The displayed number XXX is an indication of several error numbers, see Appendix A.
XOP Break 1/2/3 **	XAB OP Break 0xD001/002/003 **	Timeout on the XOP/XAB, no defined functional call from OP within a preset time. (only for ORTHOPHOS Plus DS Ceph)	Check for mechanical obstruction of the OP movement. Check the software version of OP and SIDEXIS for compatibility.
XOP Break 10 **	XAB OP Break 0xD010 **	Incorrect communication between XOP/XAB and image receptor.	Remove the image receptor from its holder and reinsert it firmly. Check signal path with XOP: XOP – cable connection – OP – image receptor. Check signal path with XAB: XAB – image receptor. Check the voltages at the image receptor.
XOP Break 30	XAB OP Break 0xD030	OP pulses are more than intended for the exposure.	Check the software versions of OP and SIDEXIS for compatibility. Check whether OP is "hung up".
XOP Break 40	XAB OP Break 0xD040	Image acquisition card holds insufficient storage space for the intended exposure.	Check the software versions of OP and SIDEXIS for compatibility. Check the memory configuration of XOP/XAB.
XOP Break 50 **	XAB OP Break 0xD050 **	Image acquisition card receives no image information.	Remove EDC from its holder and reinsert it firmly. Check the signal path: Check signal path with XOP: XOP – cable connection – OP – image receptor. Check signal path with XAB: XAB – image receptor. Check the voltages at the image receptor.
XOP Break 60/70	XAB OP Break 0xD060/070	ORTHOPHOS emits incorrect exposure ID.	Check the software versions of OP and SIDEXIS for compatibility. Check the error message displayed by the OP. (data or address bus error?)

** see Correcting error of message E4 08 and E4 01.

2.4 EDC Break Annex A

The error message indicates a combination of several fault causes:
e.g. display on SIDEXIS 3 1 C

HEX	3				C			
Valence	8 2 ³	4 2 ²	2 2 ¹	1 2 ⁰	8 2 ³	4 2 ²	2 2 ¹	1 2 ⁰
Bit	7	6	5	4	3	2	1	0
Error			EDC RESET	EDC VSP	EDC VSN	EDC VDD	EDC VAN	EDC VAP
	0	0	1	1	1	1	0	0

These voltages are not present

Bit = 0 Ok, fault has not occurred

Bit = 1 Error, fault has occurred, signal is missing

Bit number	Error	LED RHB		Meaning
0	EDC VAP ERROR	V212	0x01	Voltage VAP +18 V not present/too low
1	EDC VAN ERROR	V232	0x02	Voltage VAN – 18 V not present/too low
2	EDC VDD ERROR	-----	0x04	Voltage VDD not present/too low
3	EDC VSN ERROR	V122	0x08	Voltage VSN – 5 V not present/too low
4	EDC VSP ERROR	V112	0x10	Voltage VSP +5 V not present/too low
5	EDC RESET ERROR	V222	0x20	Voltage VCC +5 V not present/too low or digital section is in reset state
6			0x40	Internal message
7			0x80	Internal message

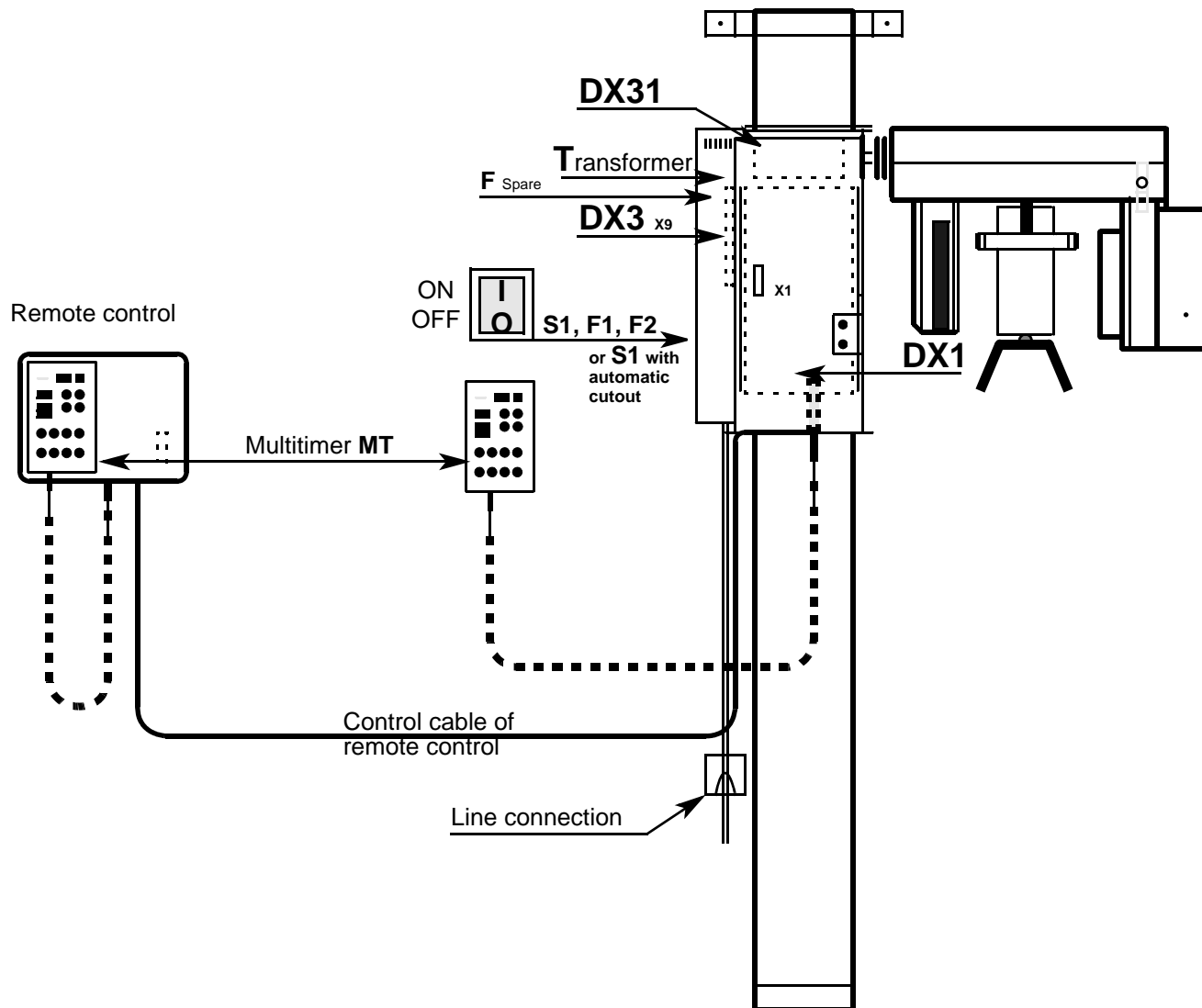
3 Troubleshooting

Troubleshooting

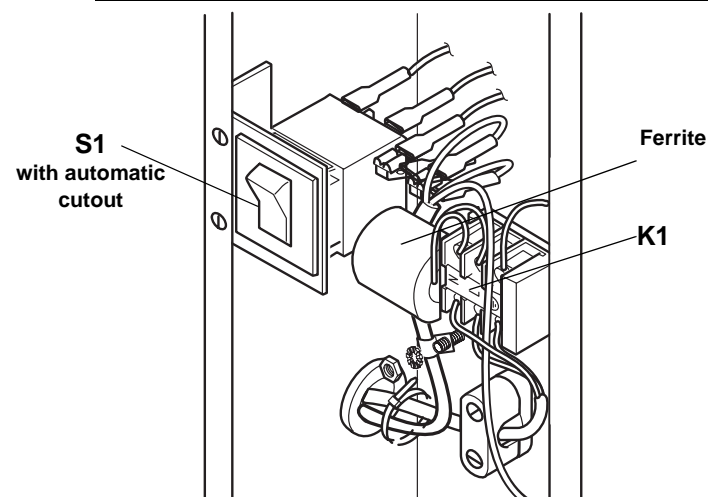
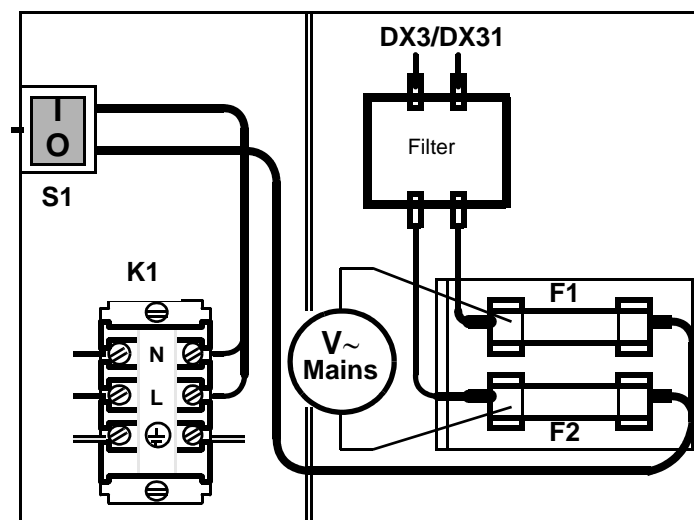
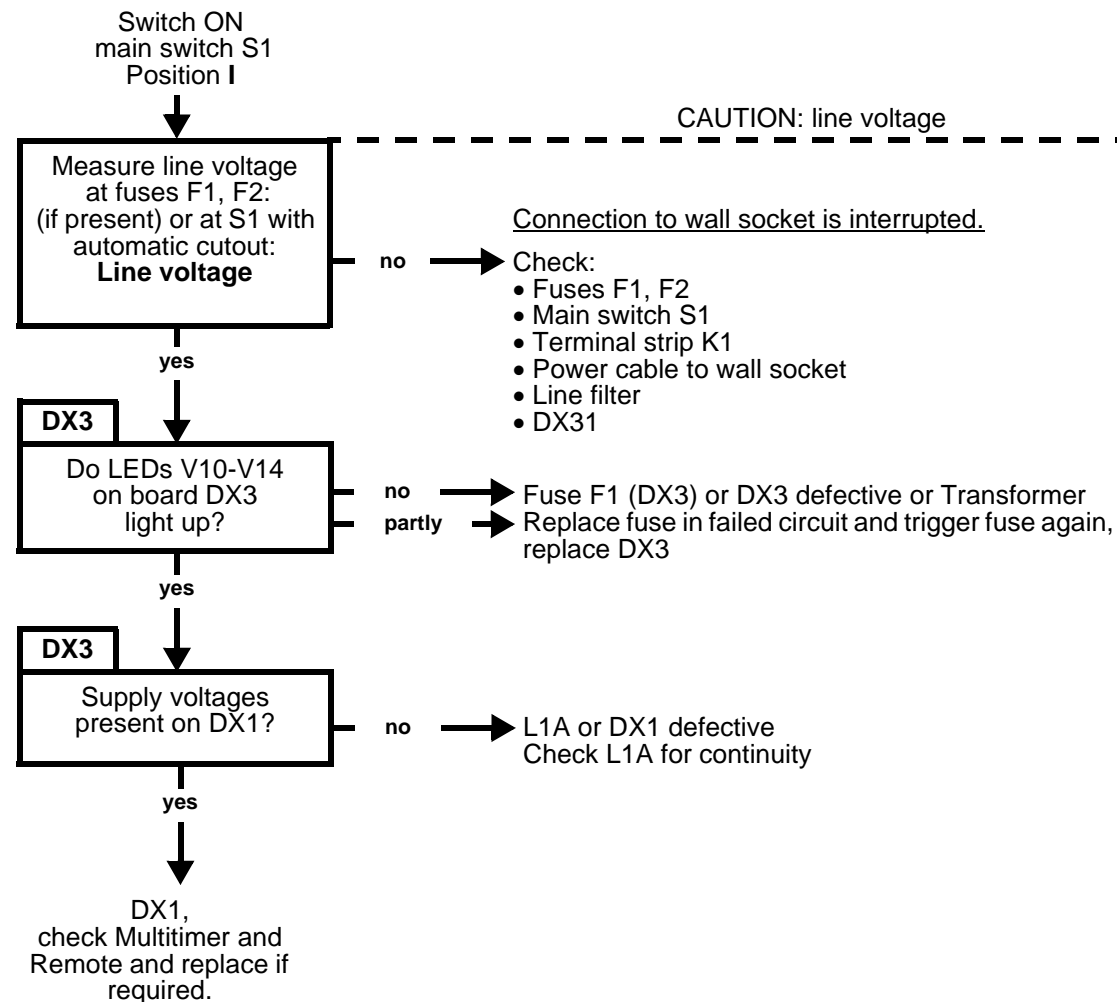
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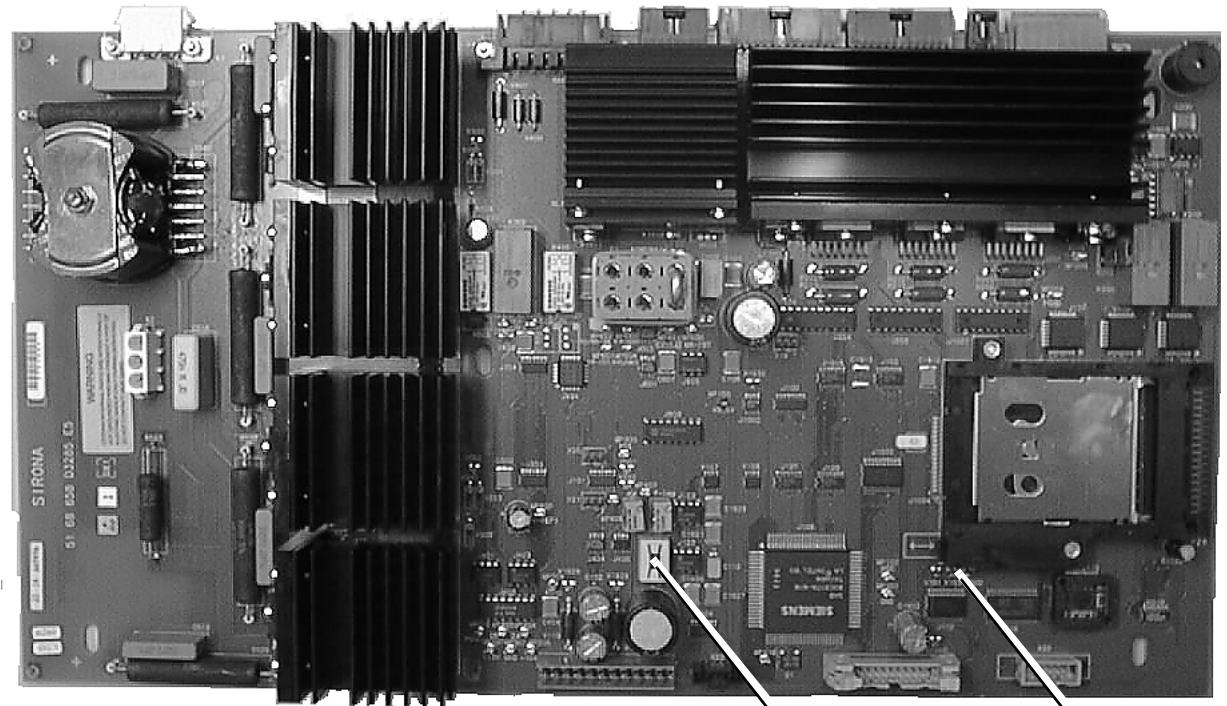


- Is the line voltage present at the wall socket?
- Are the line fuses F1 and F2 (if available) in order? If not: always replace both fuses.
- Is the voltage supply o.k., but the Multitimer stays dark nevertheless? See fault localization next page.



3.1 Unit cannot be switched on, nothing displayed on the Multitimer

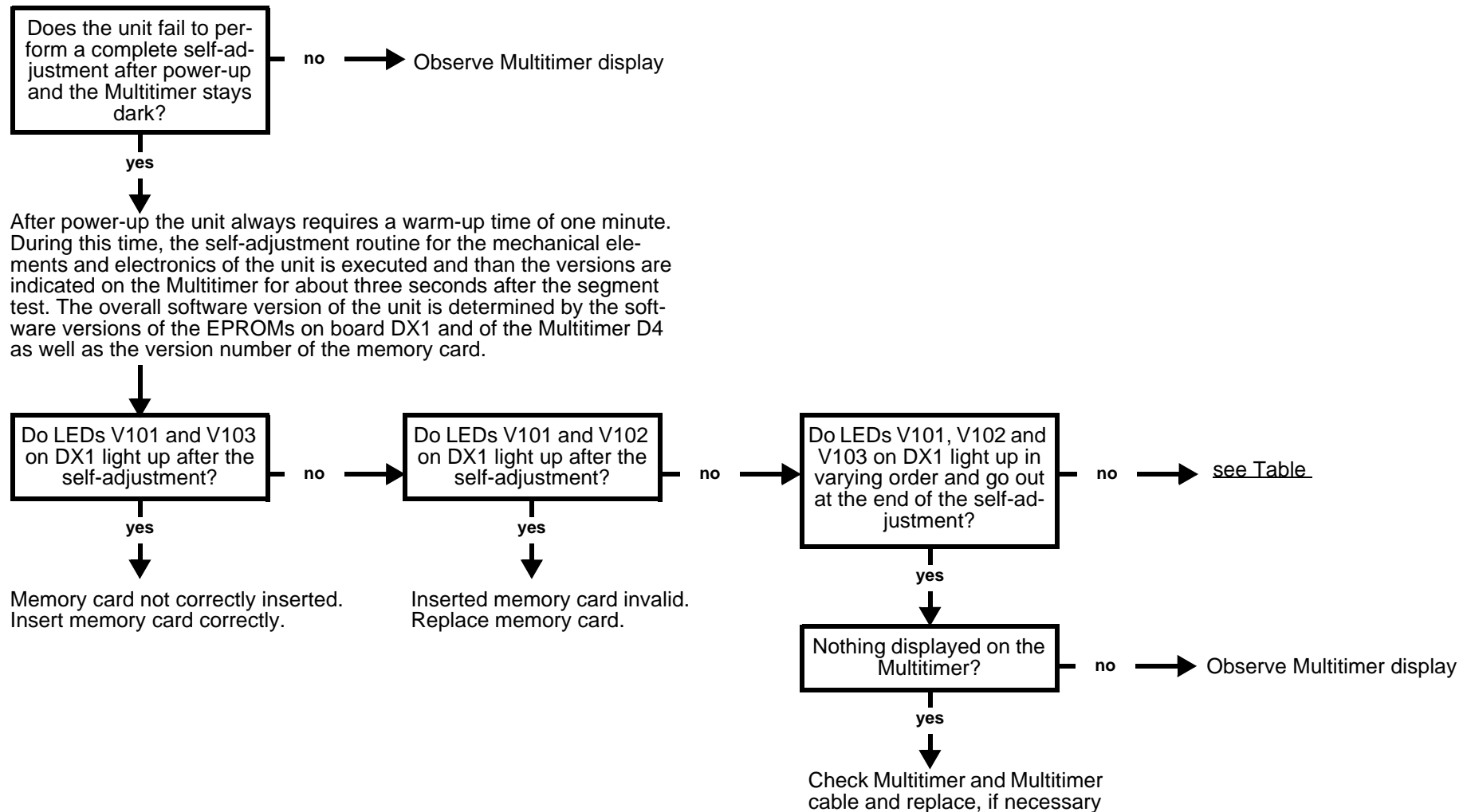
DX1



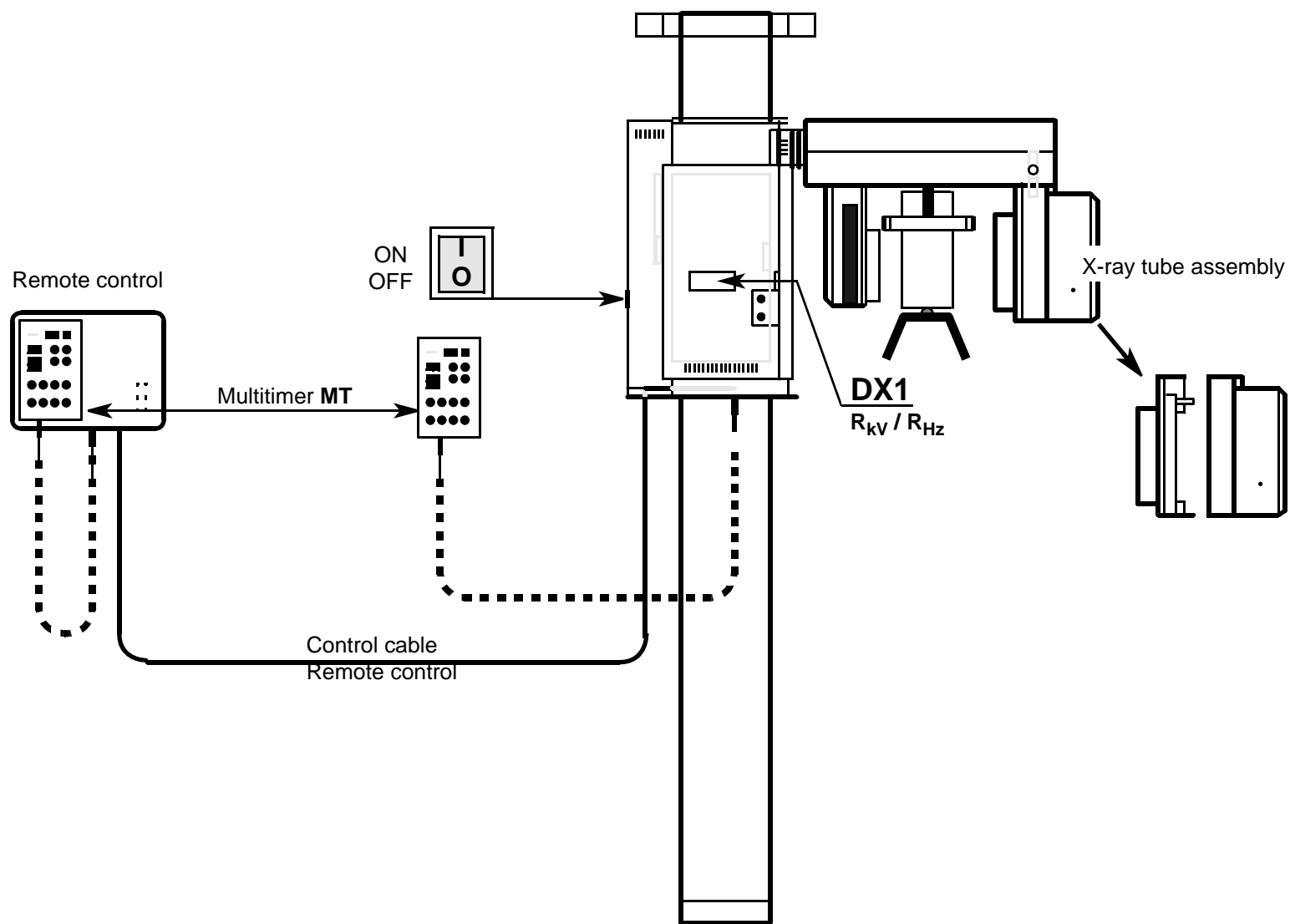
Switch S101
Position 1 (left)
otherwise system
start-up not possible
with Boot software

V101 V103 V102

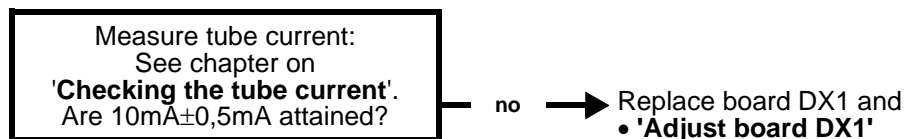
LED1 V101	LED2 V103	LED3 V102	Description	Required action
on	on	on	Controller not o.k.	Replace and adjust DX1
on	off	off	Internal XRAM not o.k.	Replace and adjust DX1
off	on	off	Internal RAM not o.k.	Replace and adjust DX1
off	off	on	Program memory for Boot software not o.k.	Replace and adjust DX1
flashing	flashing	off	Input clock of 82c54 not o.k.	Replace and adjust DX1
flashing	off	flashing	Vref2 voltage not o.k.	Replace and adjust DX1
off	off	flashing	Malfunction of Watchdog timer	Replace and adjust DX1
off	on	on	Unable to switch to memory card	Replace and adjust DX1
flashing	off	off	Program memory of memory card not o.k.	Memory card incorrect, not or only partially programmed
off	flashing	off	not assigned	
flashing	off	on	not assigned	
off	flashing	on	not assigned	
off	off	off	All tests run without errors	Everything o.k.
on	on	off	No memory card detected	Insert memory card correctly
on	off	on	Memory card not correct	Insert memory card for ORTHOPHOS



3.1 Unit cannot be switched on, nothing displayed on the Multitimer



- The processing equipment is in working order.
- The X-ray radiation indicator lights up and the acoustic signal is emitted when the release button is pressed.
- The X-ray beam is correctly adjusted. See chapter entitled 'Checking and adjusting the X-ray beam for panoramic exposures'.
- The mA meter must be in working order, i.e. it must have been checked on a functioning ORTHOPHOS 3.



yes

Check kV value with MINI X kV meter:

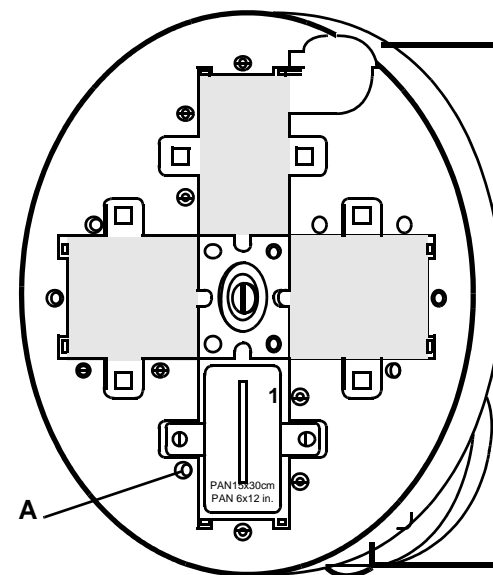
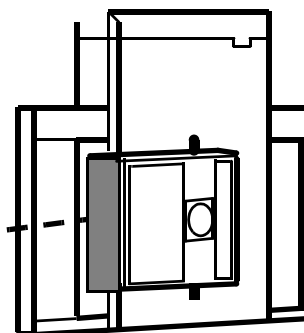
- Fasten kV meter to secondary diaphragm:
Sensor area in beam path (slot).
- Rotate empty window of diaphragm wheel in front of beam path.
(Remove locking screw A for this purpose. Not available on ORTHOPHOS 3C).
- Select Service routine S.02 was described in the chapter 'Selecting the Service routine'.
- Set the radiation time to **2 seconds** and the power to **70kV** on the multimeter.
- Release **RADIATION** and read off the kV value on the kV meter.

No display on the kV meter.
Is the sensor area properly
(fully) illuminated?

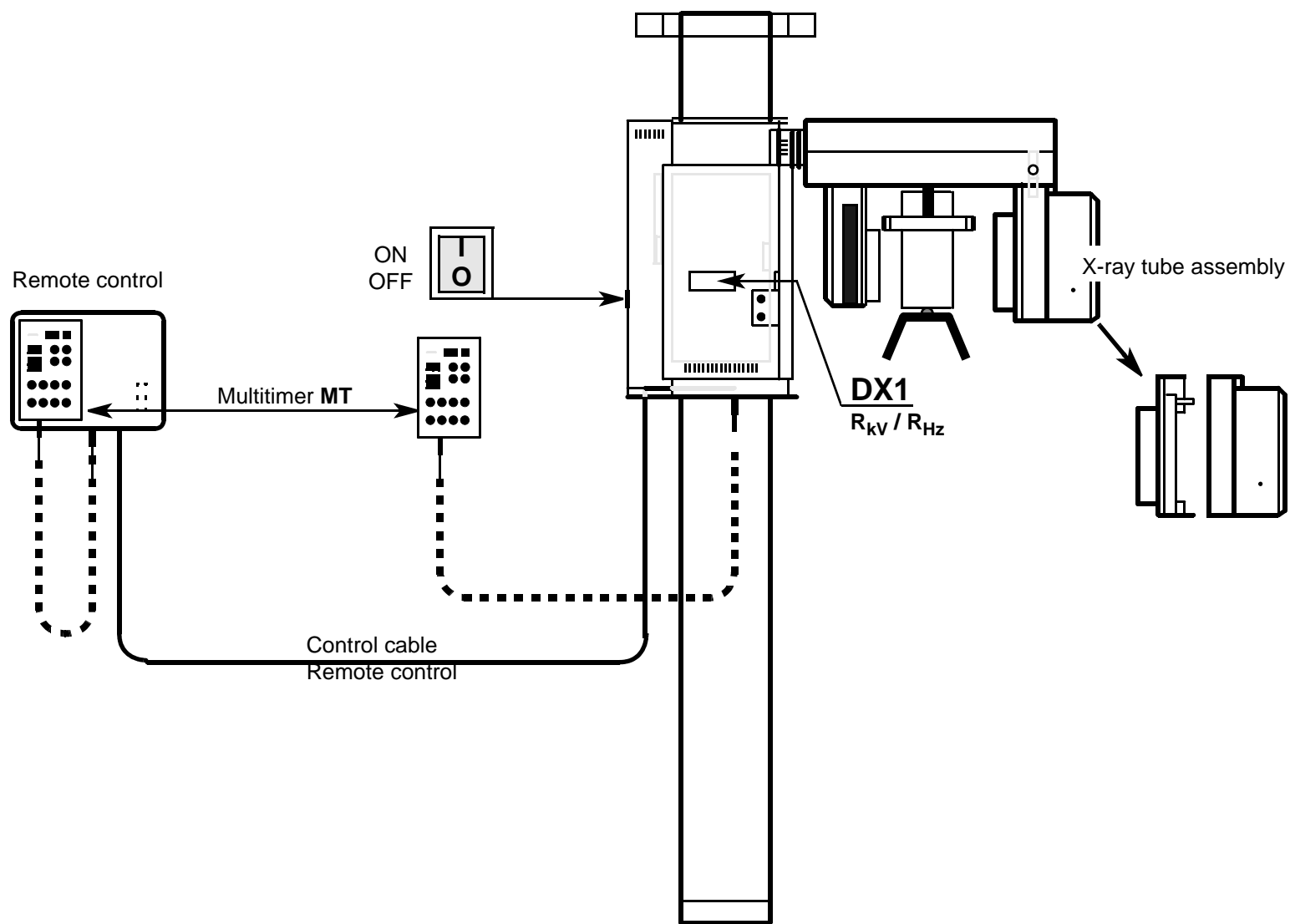
no

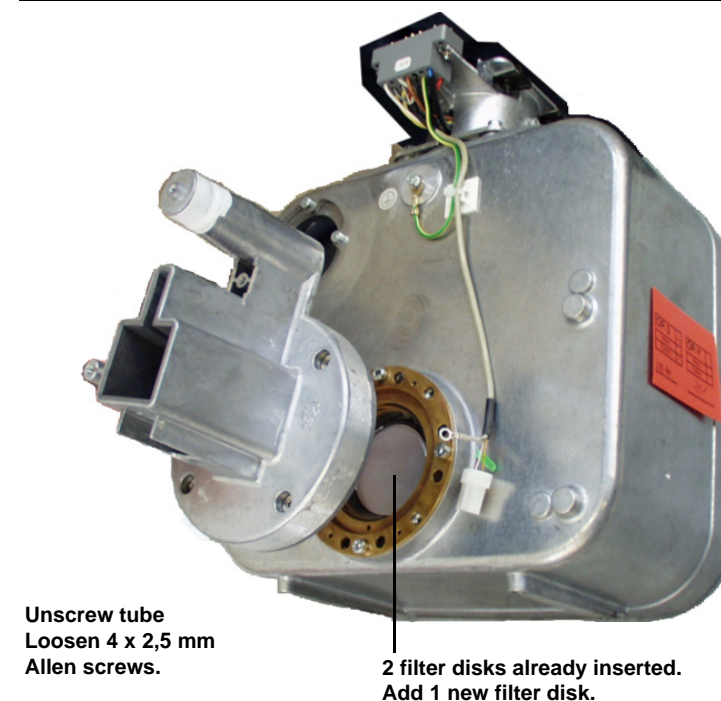
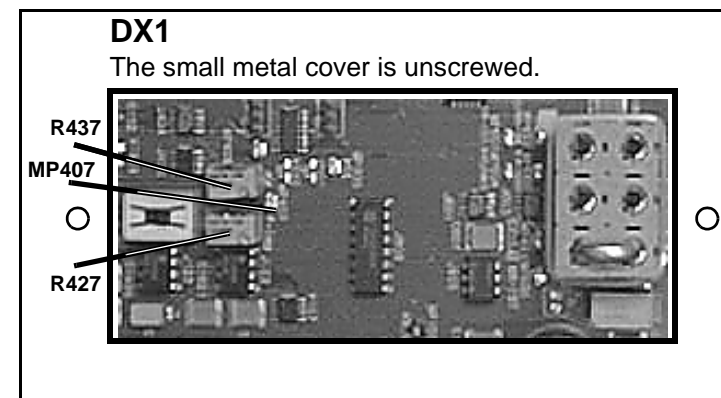
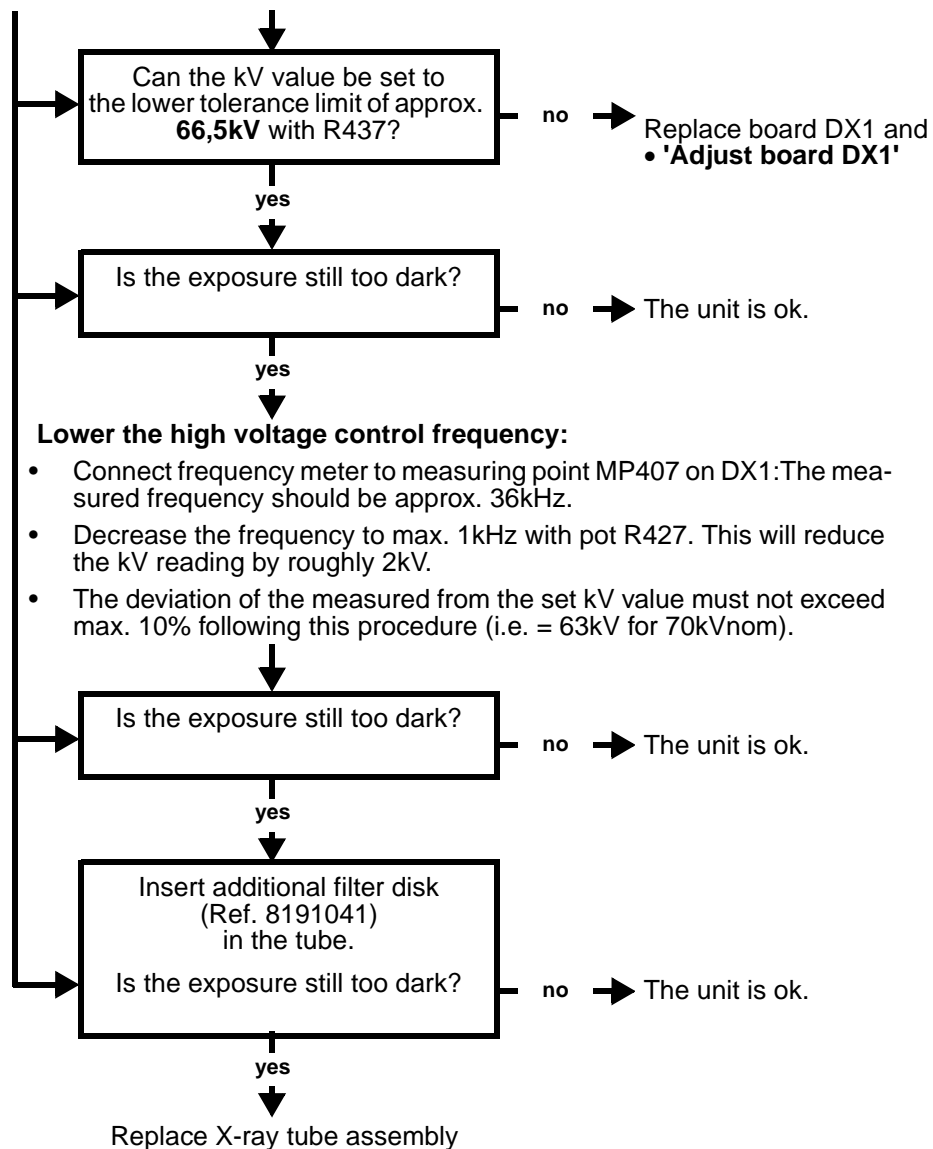
Correct position of kV meter.
Check exposure.

yes

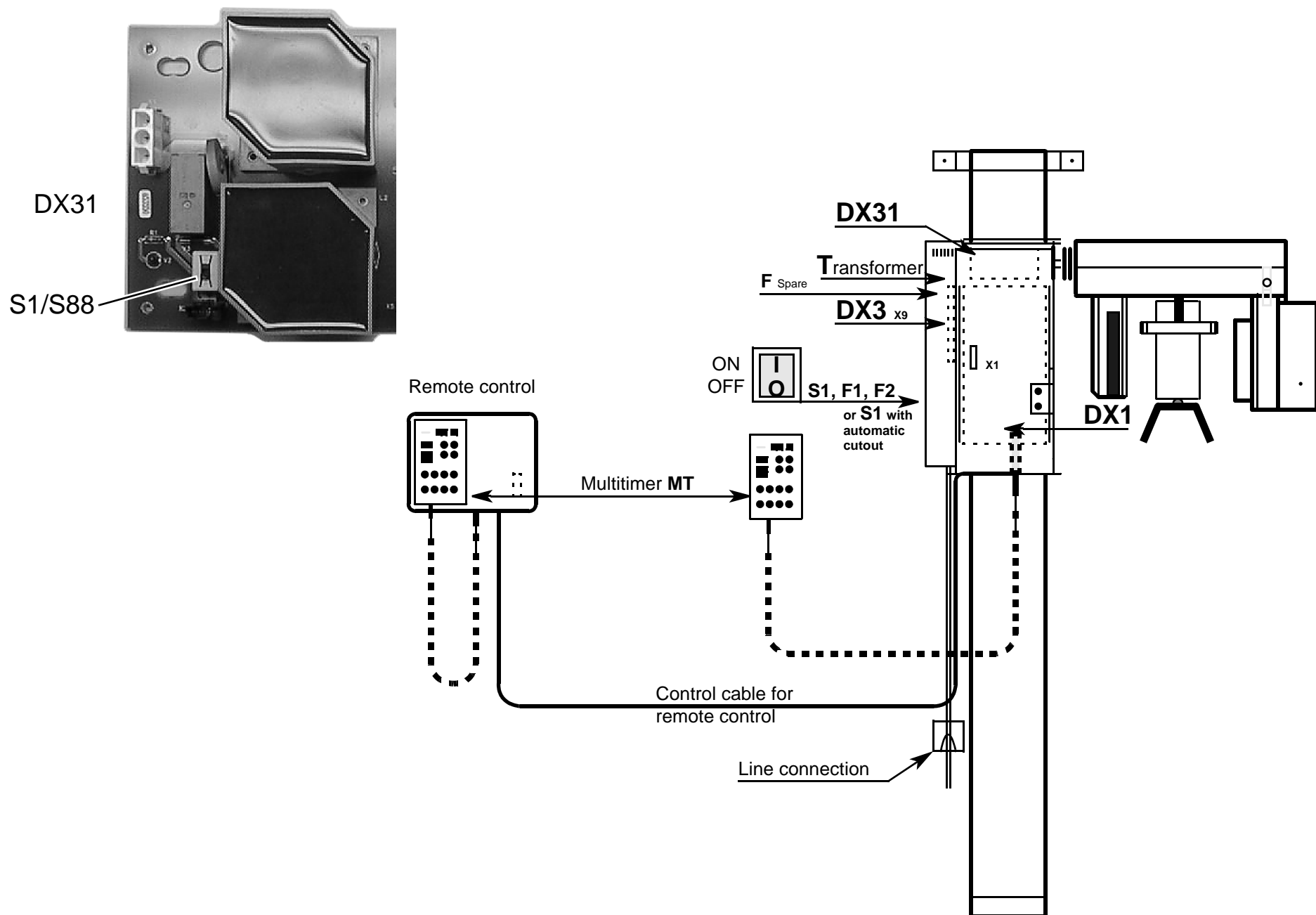


3.1 A Exposure too dark





3.1 A Exposure too dark

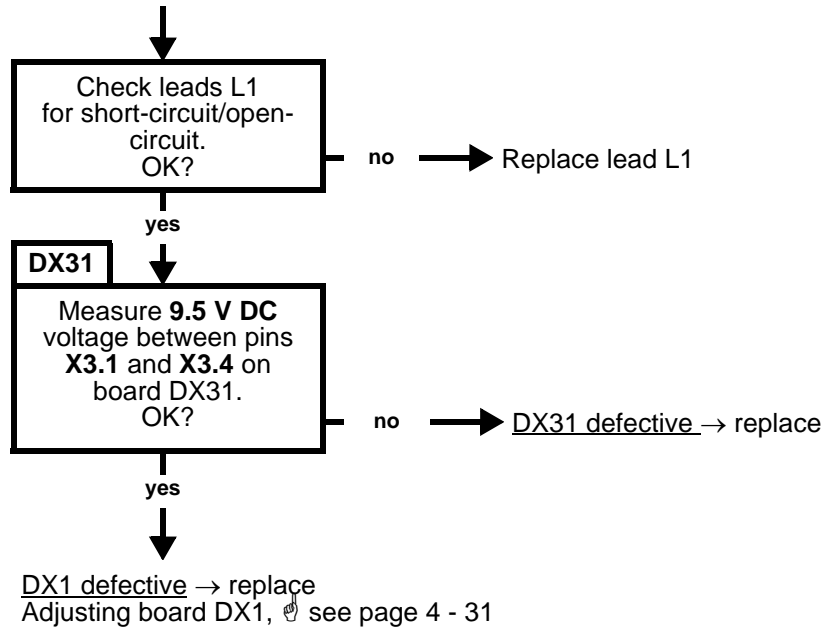


CAUTION: Always switch the unit OFF before connecting a measuring instrument or replacing any components!

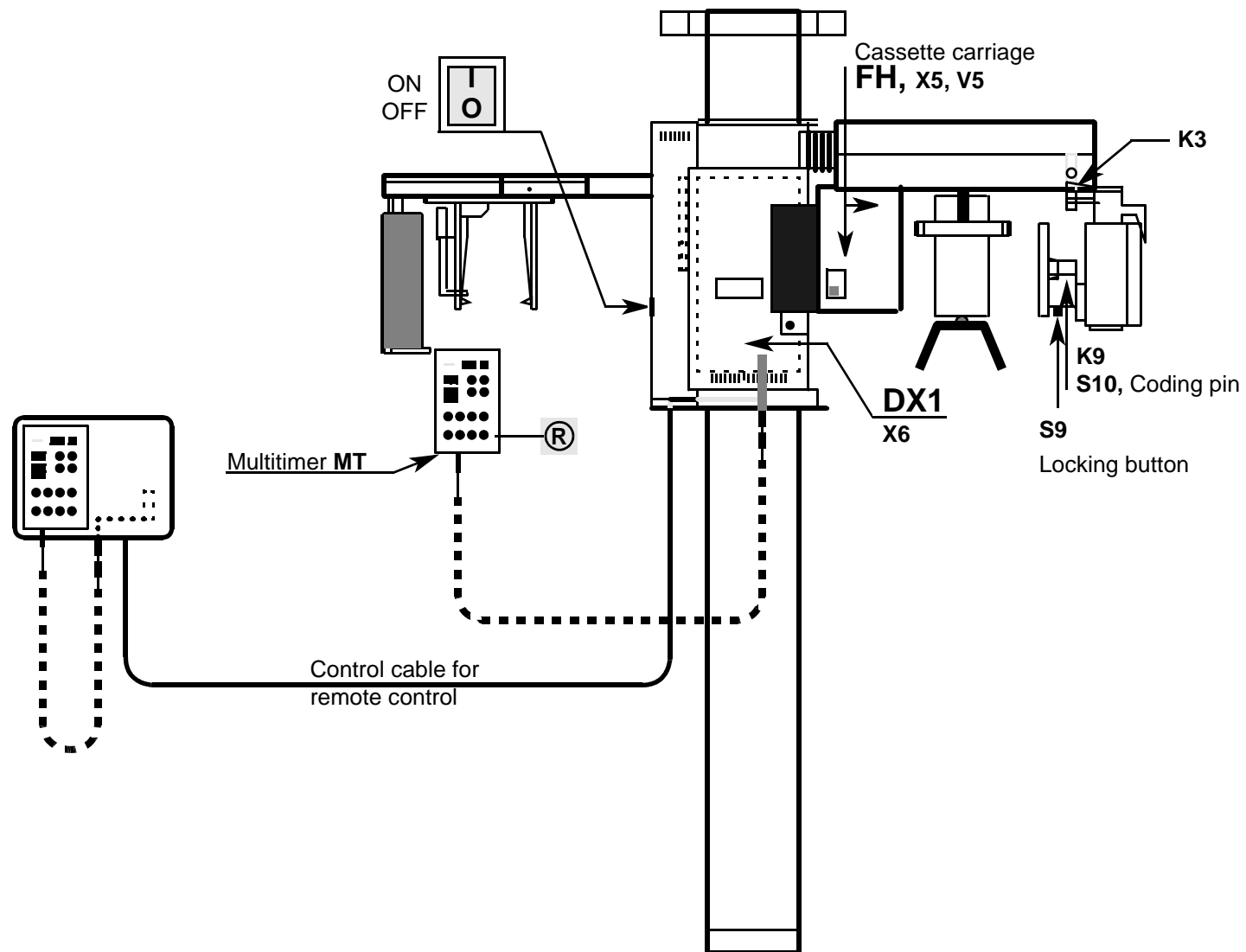
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- Check the position of the sliding switch S1 on board DX31.
After turning the unit on and completion of the self-adjustment process, S.88 must be visible on the program display for about 4 sec with the switch on the Multitimer in position 2. The same applies when switching over from position 1 to position 2.

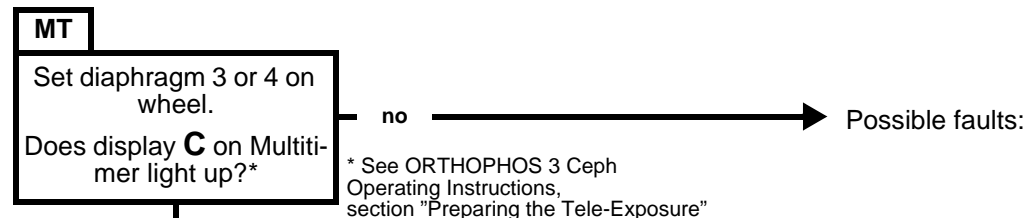
Demonstration mode
cannot be turned
ON/OFF.



3.2 Demonstration mode cannot be turned ON/OFF



- Check for operating errors according to ORTHOPHOS 3 Ceph Operating Instructions, section "Preparing the Teleradiography Exposure".
- Are the illuminated H3 help messages of no help !?



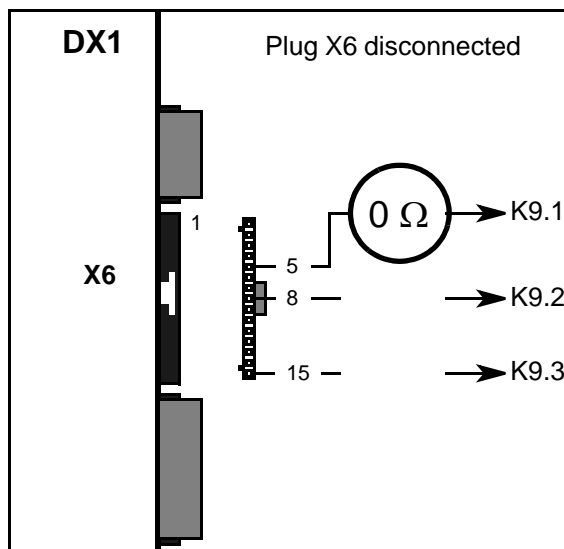
yes

Panorama cassette holder is swivelled out up to stop.

Help message **H3 11** lights up after pressing release button.

Light barrier V5 defective, replace.

V5: plug X5 on board FH in cassette carriage.



1) The diaphragm coding pin on the rear side of the wheel does not actuate microswitch **S10** correctly:
Check coding pin and microswitch.

If both are OK, check microswitch lead from plug **K9** via **K3** to plug **X6** on board **DX1** for continuity.

K9.1 (white) → **K3.9** (green/white) → **X6.5** (green/white)

K9.2 (red) → **K3.10** (gray/white) → **X6.8** (gray/white)

If the lead is OK:

Replace board **DX1** and perform • 'Adjusting PC Board **DX1**'.

2) The stop button does not actuate microswitch **S9** correctly.
Check stop mechanism and microswitch.

If both are OK, check microswitch lead from plug **K9** via **K3** to plug **X6** on board **DX1** for continuity.

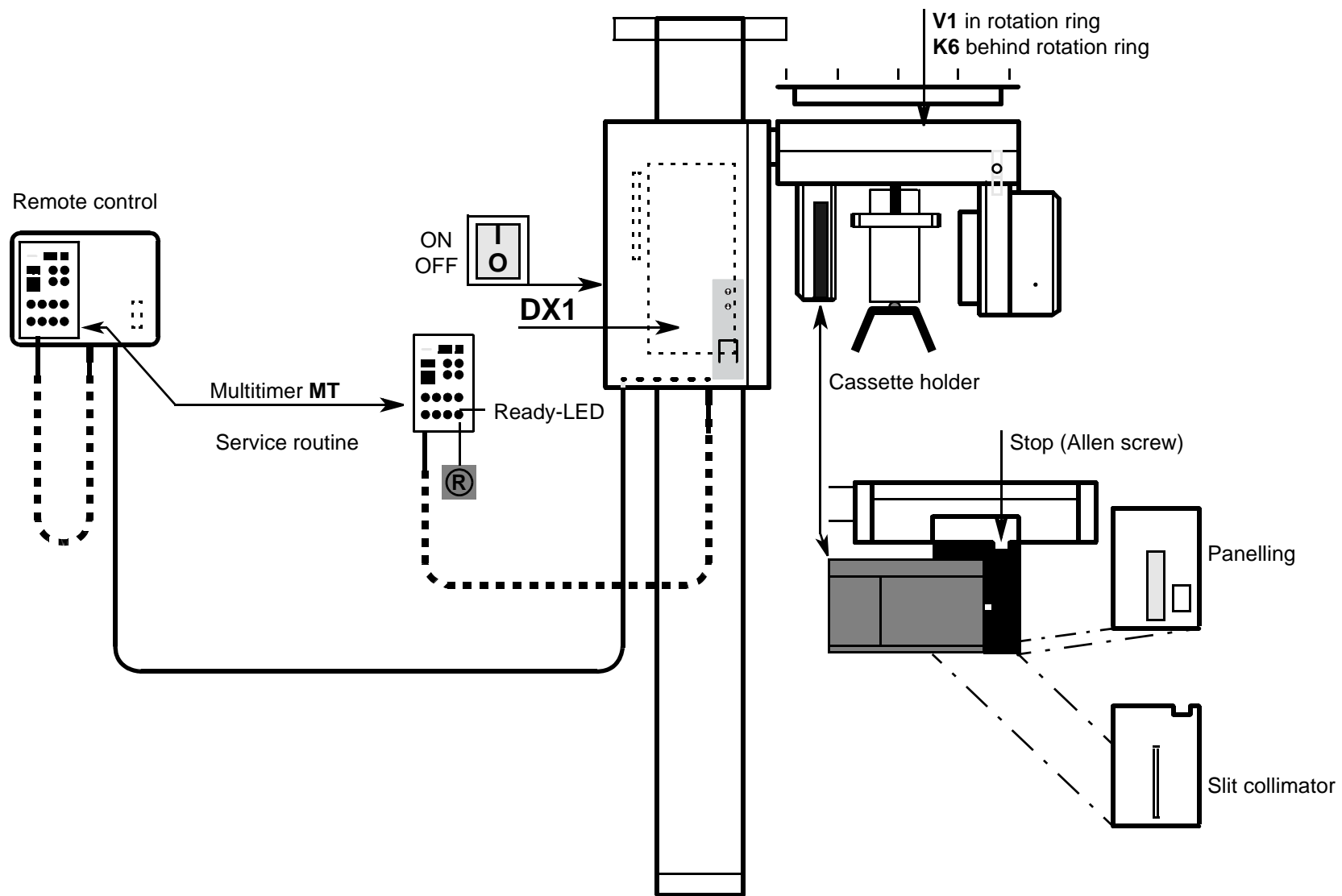
K9.1 (white) → **K3.9** (green/white) → **X6.5** (green/white)

K9.3 (yellow) → **K3.3** (gray/blue) → **X6.15** (gray/blue)

If the lead is OK:

Replace board **DX1** and perform • 'Adjusting PC Board **DX1**'.

3.3 The Teleradiography exposure is not released



Elimination of fault: Help message H3 04. The cassette holder is not in Panorama position.

- **Swivel the cassette holder for Panorama radiography in up to the stop!**
The Ready LED above the Return key R on the Multitimer continues flashing..

Eliminate the fault with Service Routine S.16, test step 03
See section "**Service Routine S.16**" see page 5 - 45

In test step 03 LED V12 above the patient symbol key on the Multitimer must be lit up.

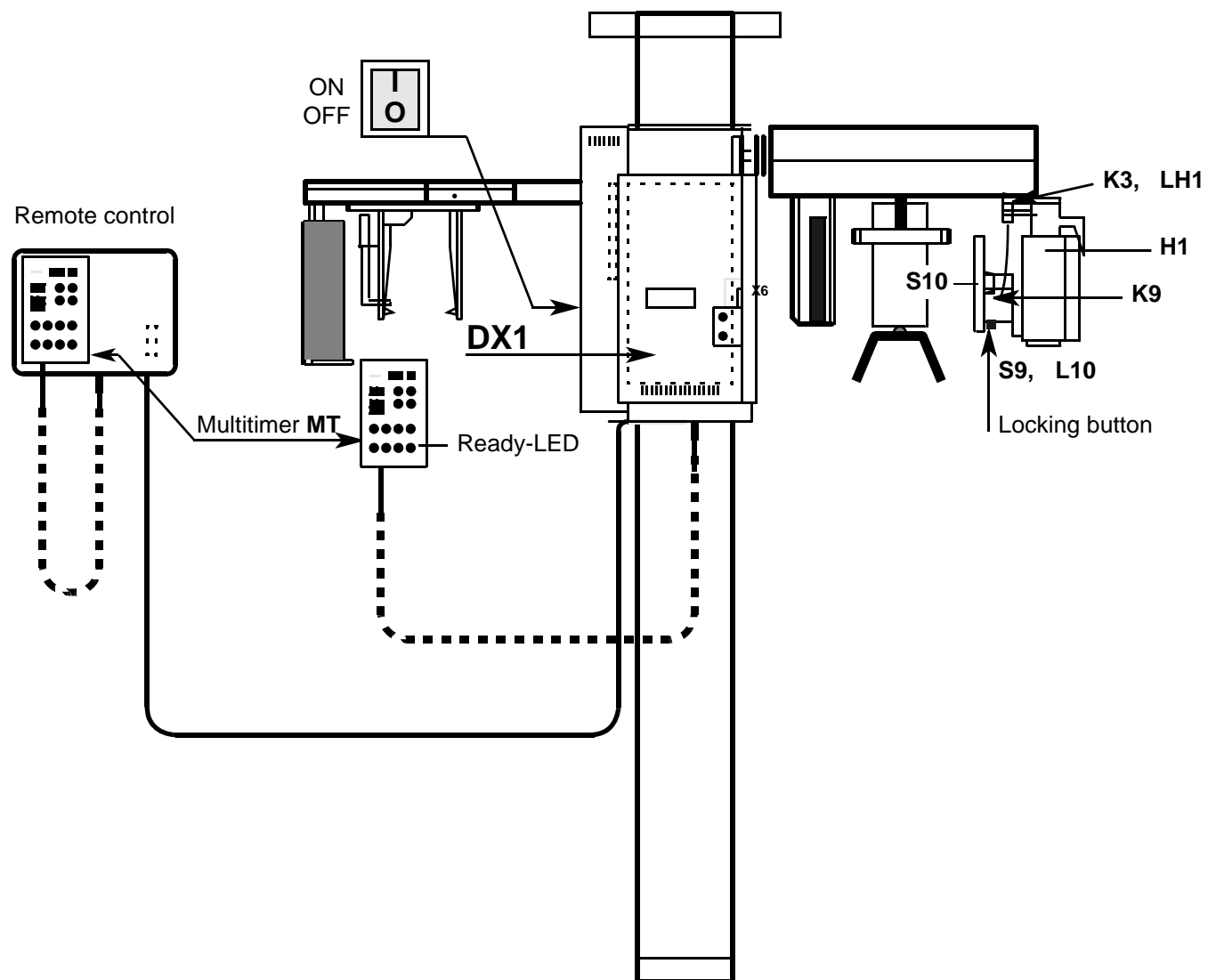
If this LED is not lit up:

Possible faults

1. The stop (hexagonal socket screw) for the cassette holder is shifted (unscrew covering and then slit collimator).
Move to correct position.
2. Light barrier V4 defective or disturbance in lead.
Test / replace / repair.

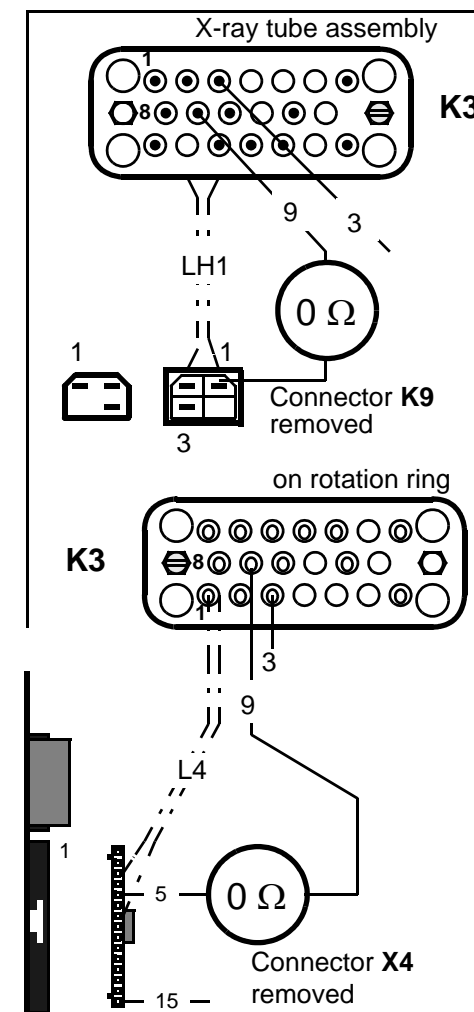
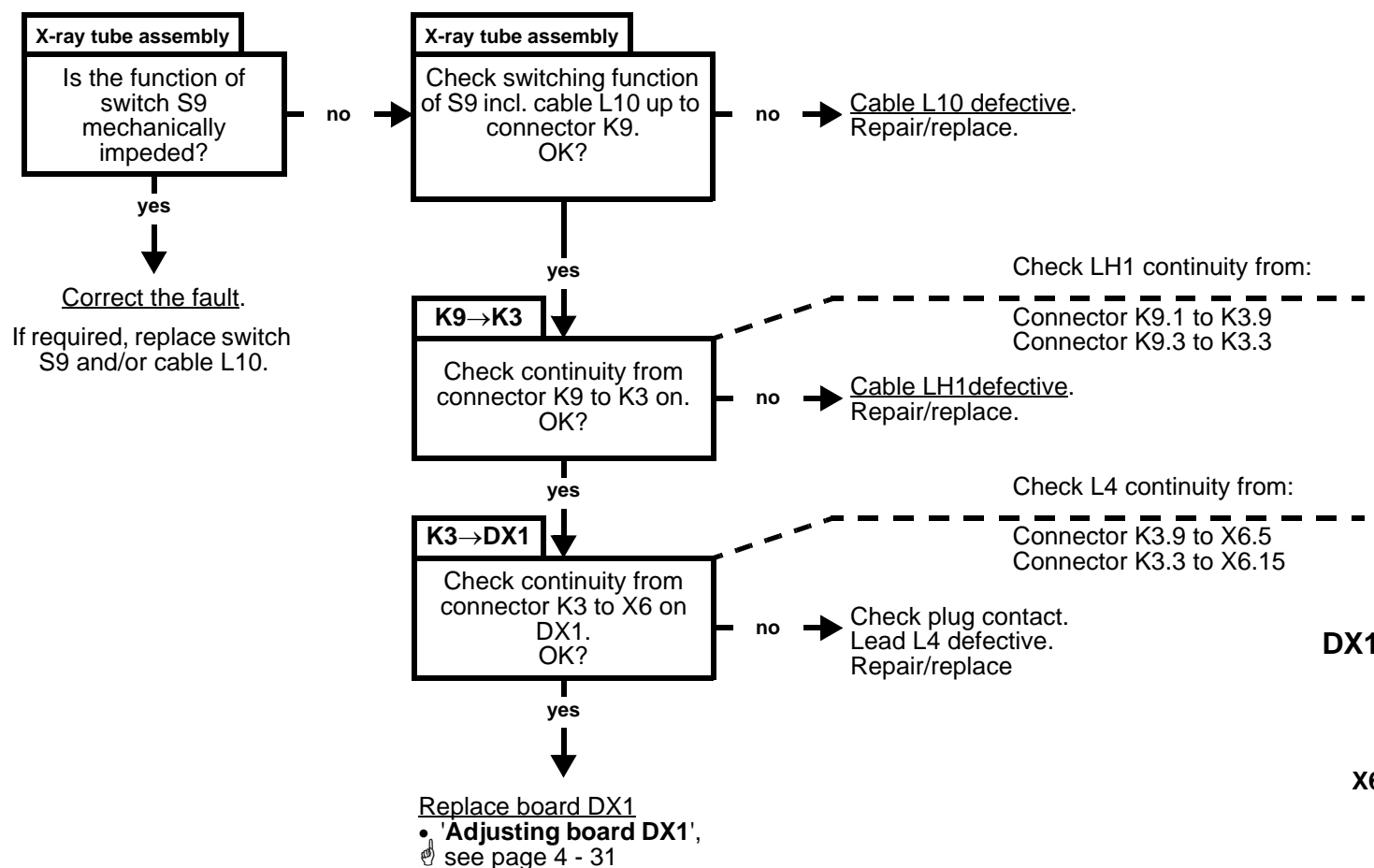


LED V12

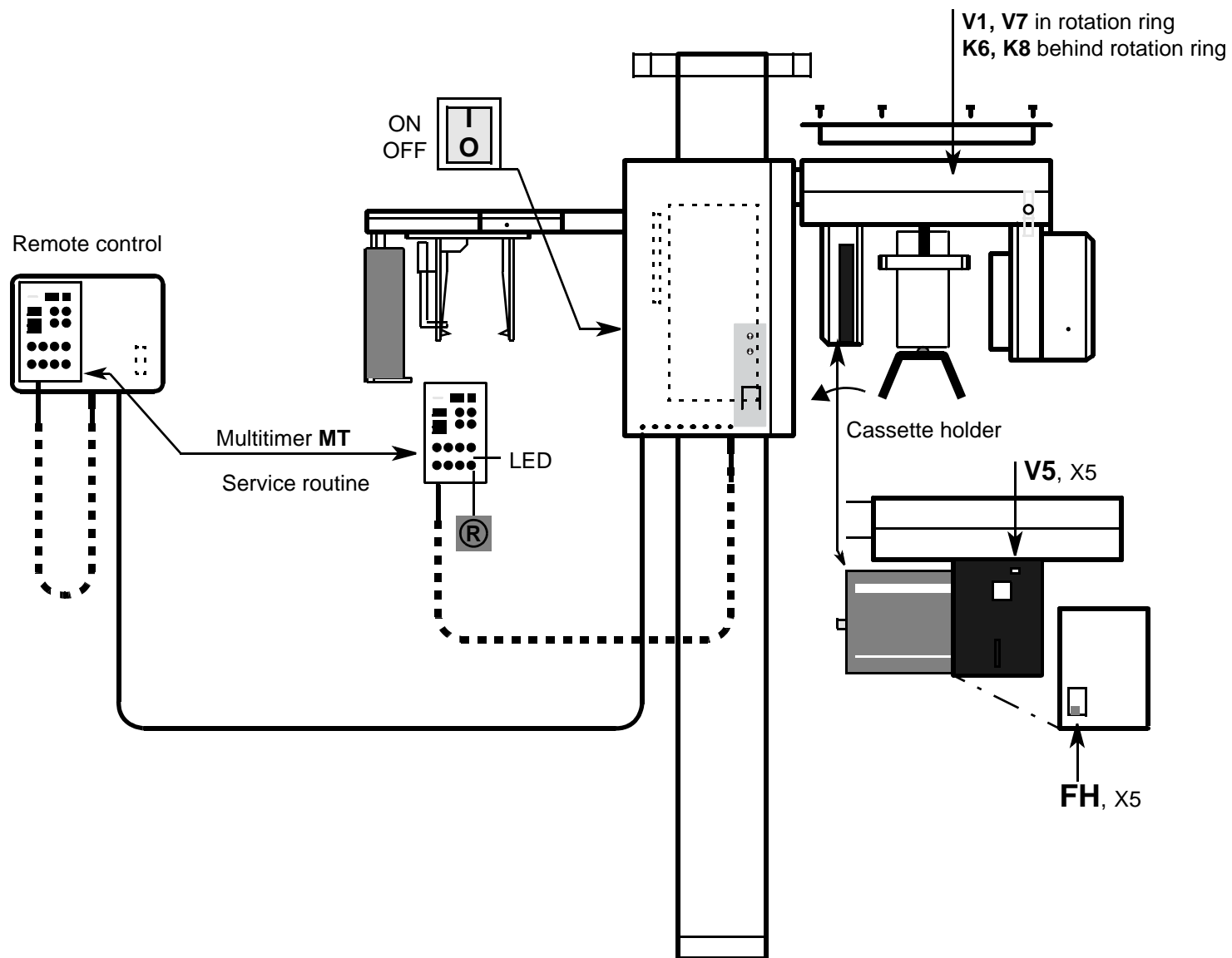


Correcting error of help message H3 06. The locking button on the diaphragm wheel is not engaged.

- Is connector K9 correctly inserted at the X-ray tube assembly?
- Has the locking button correctly engaged on the diaphragm wheel? (if present, otherwise a n L 10K short-circuit jumper is present)
Set Panorama diaphragm, screw down tightly to ORTHOPHOS 3 DS.
The Ready LED above the R key on the Multitimer is flashing.



3.5 Correcting errors of help messages H3 06.



Elimination of fault: Help message H3 11

- Swivel the cassette holder out to Ceph position up to the stop.
The Ready LED above the Return key R on the Multitimer continues flashing.

Eliminate the fault with Service Routine S.16, test step 03

See section "**Service Routine S.16**"

In test step 03 LED V11 above the patient symbol key on the Multitimer must be lit up.

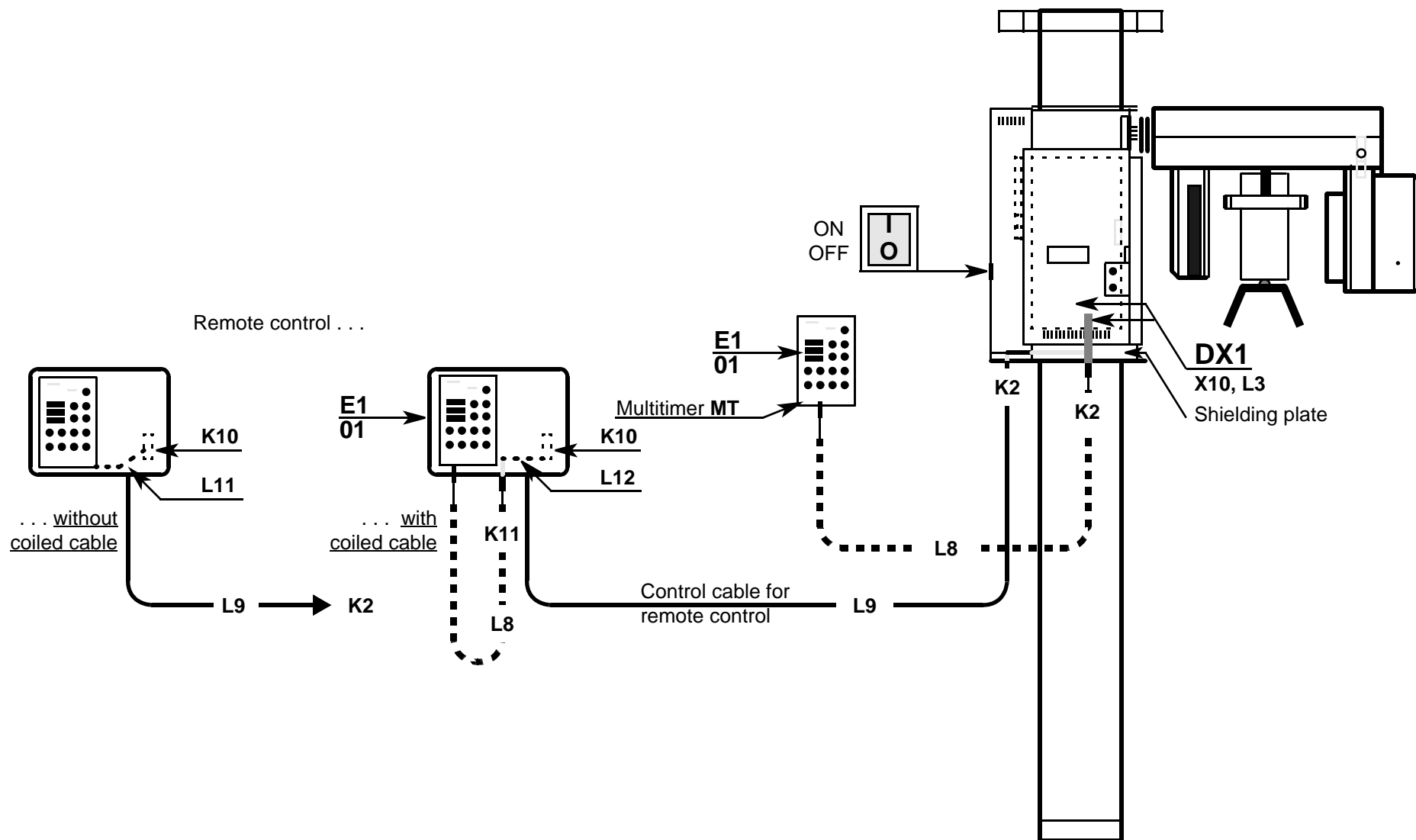
If this LED is not lit up:

Possible faults

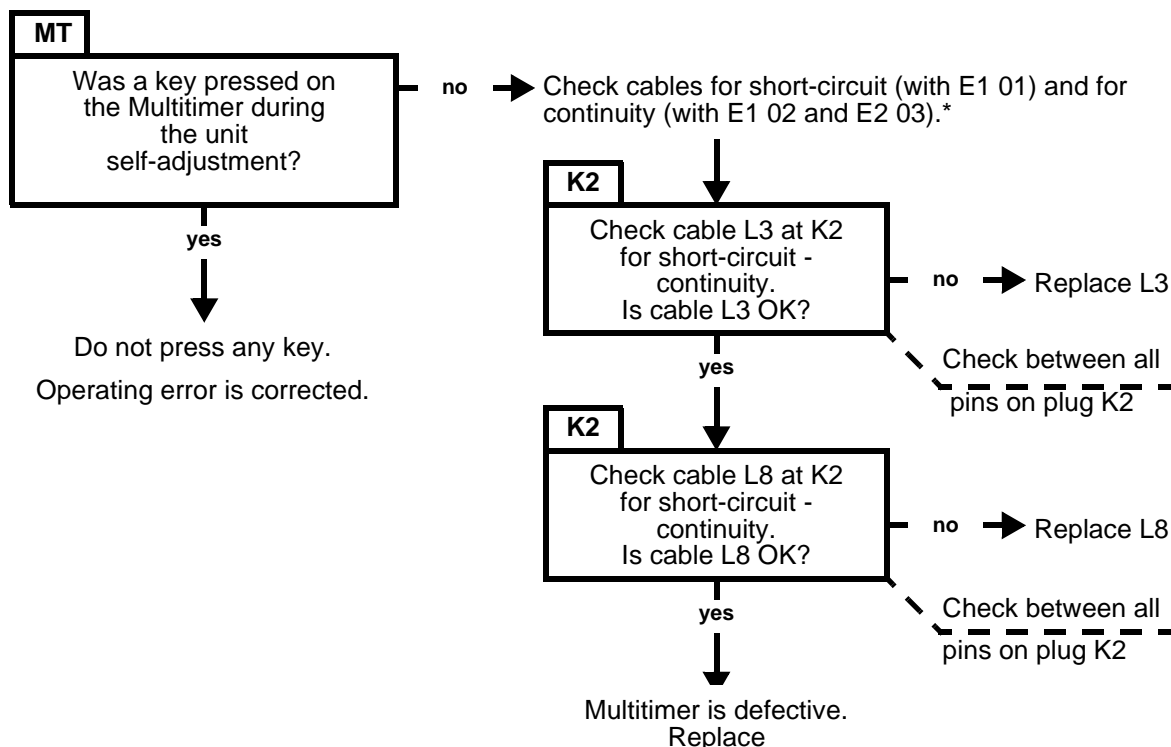
1. Light barrier V5 is not interrupted with the cassette holder swivelled out.
Check and correct switching tab and mechanism.
2. Light barrier V5 (X5 on FH) defective, or disturbance in lead.
Test / repair / replace
3. Fault on board DX1.
Replace board DX1 and perform • '**Adjusting PC board DX1**'.



LED V11

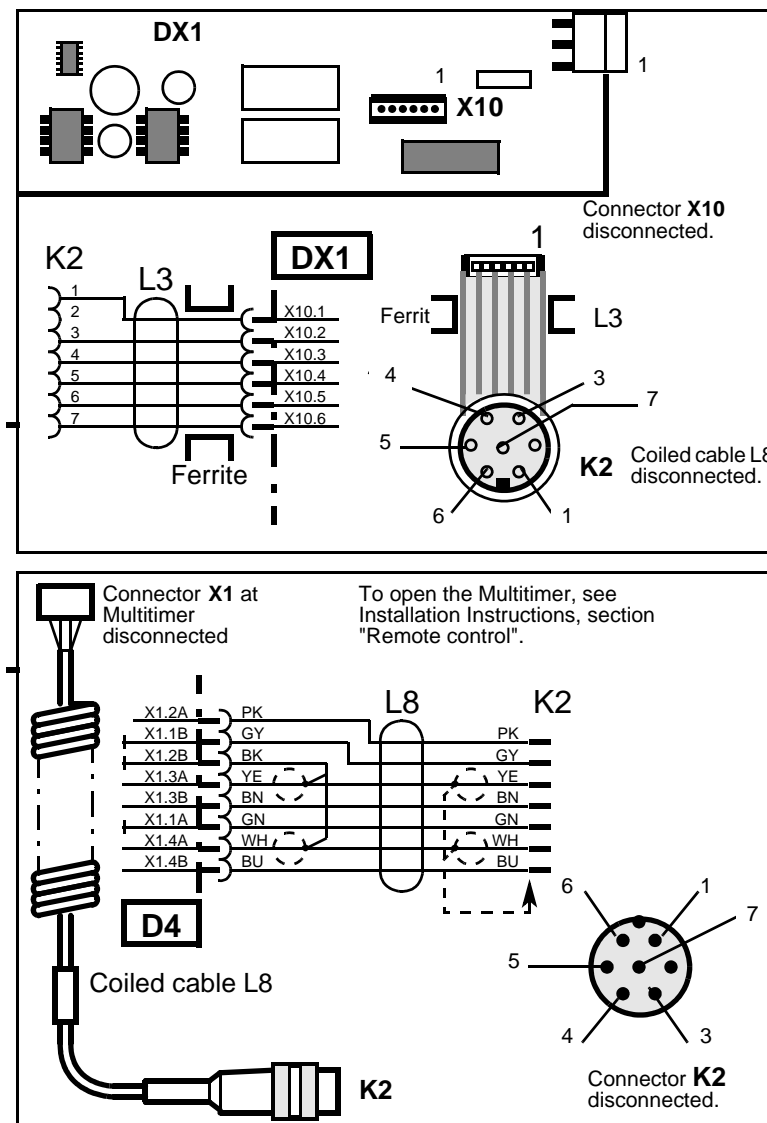


- After power ON, the unit performs a self-adjustment routine.
No key must be pressed on the Multitimer during the self-adjustment!

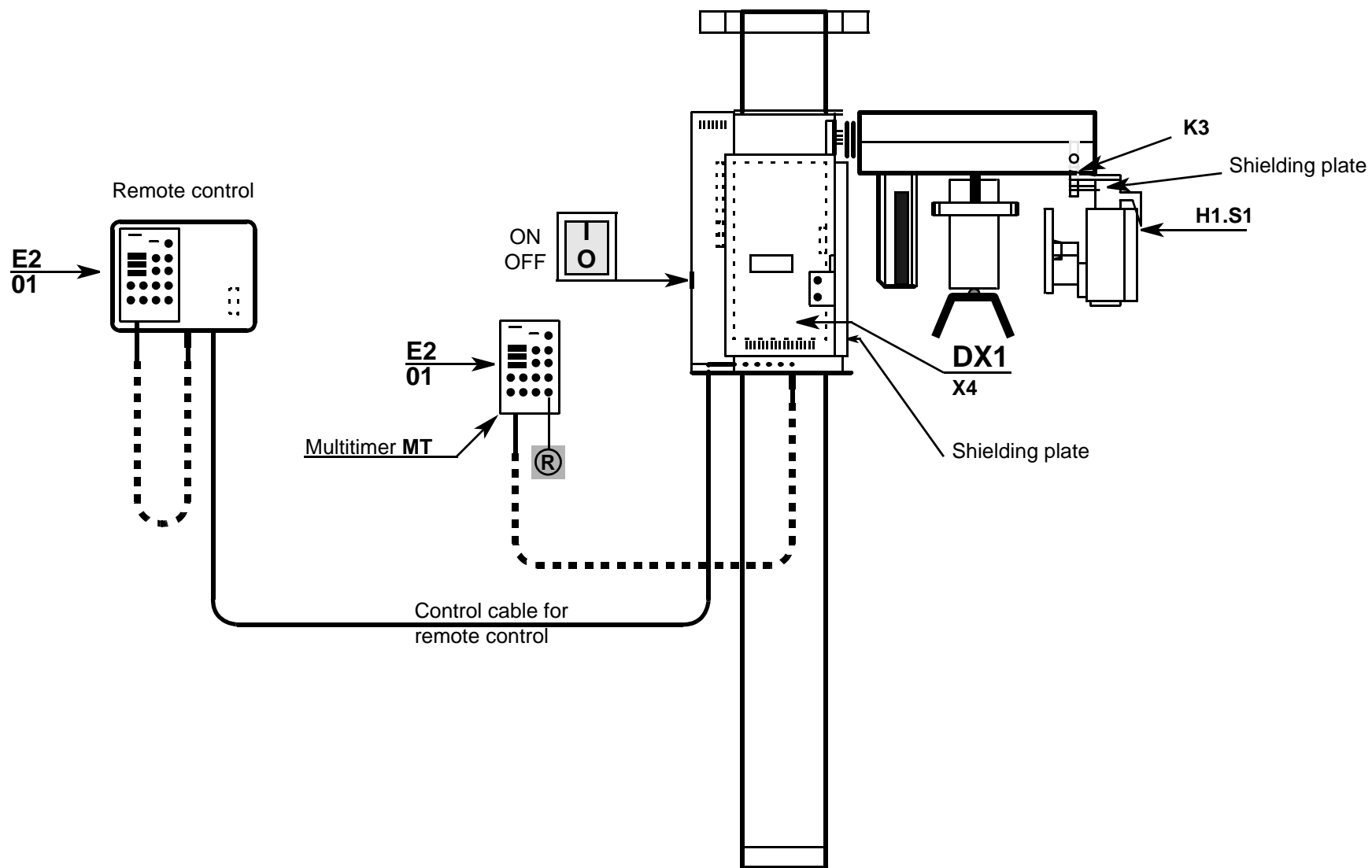


* If a remote control is provided:
Connect the Multitimer to the unit (connector K2 below the shielding plate).
If the error no longer occurs, check the cable L9 for short-circuit. With remote control without coiled cable, also check cable L11.

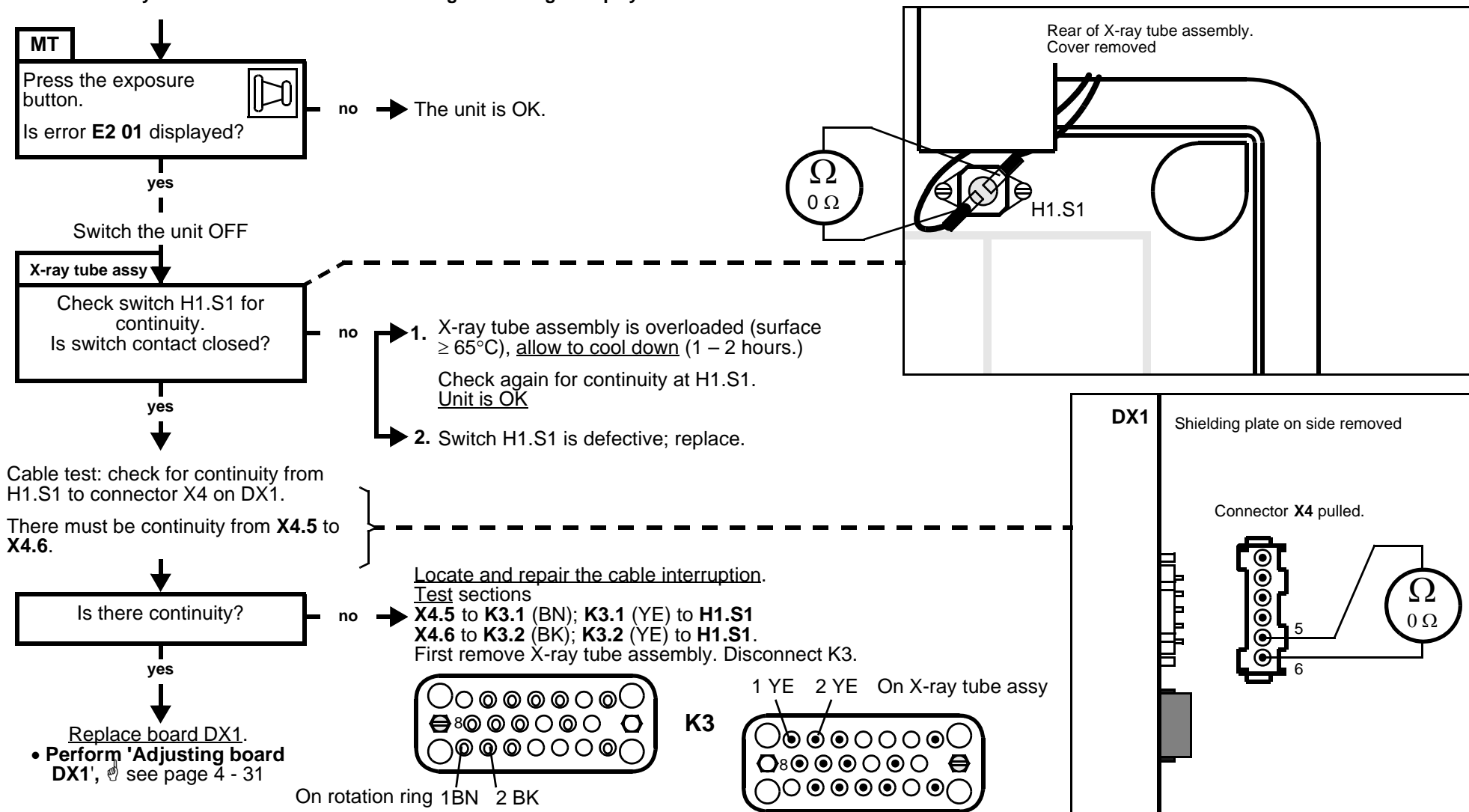
If the error persists:
Replace board DX1
• Perform 'Adjusting board DX1', see page 4 - 31



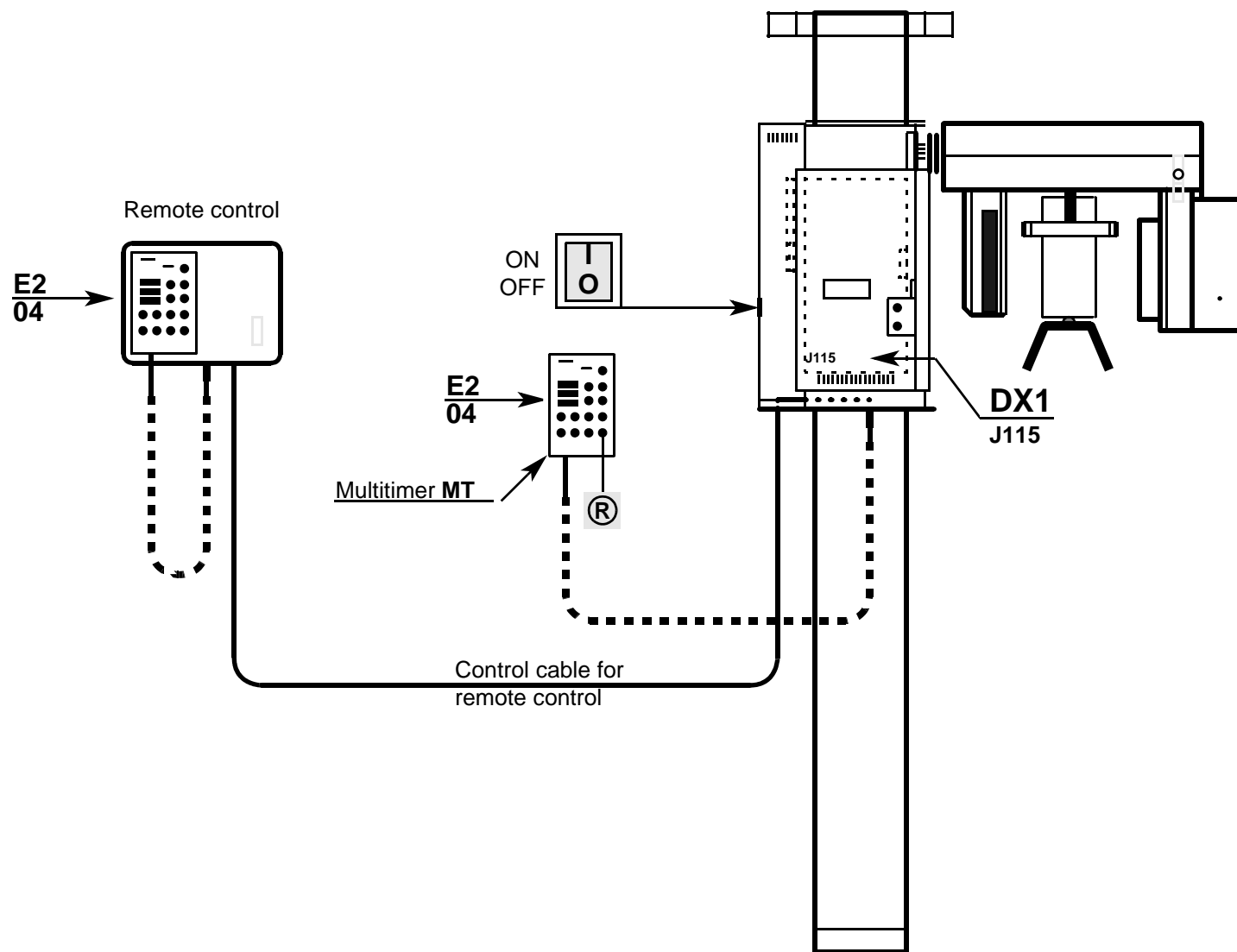
3.7 Correcting error of messages E1 01, E1 02, E2 03: Signal paths to control board DX1 are interrupted.



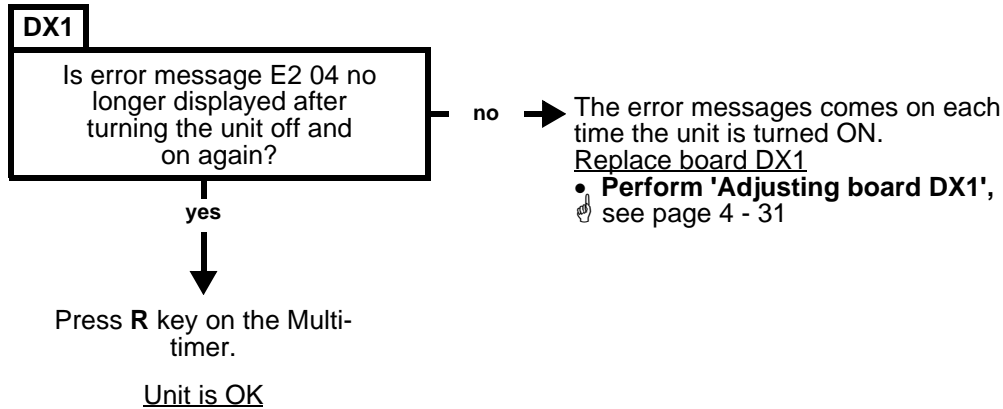
- Thermo switch H1.S1 has responded. Wait for it to close again (contact open, check connector K3). Press the R key on the Multitimer. The error message is no longer displayed.



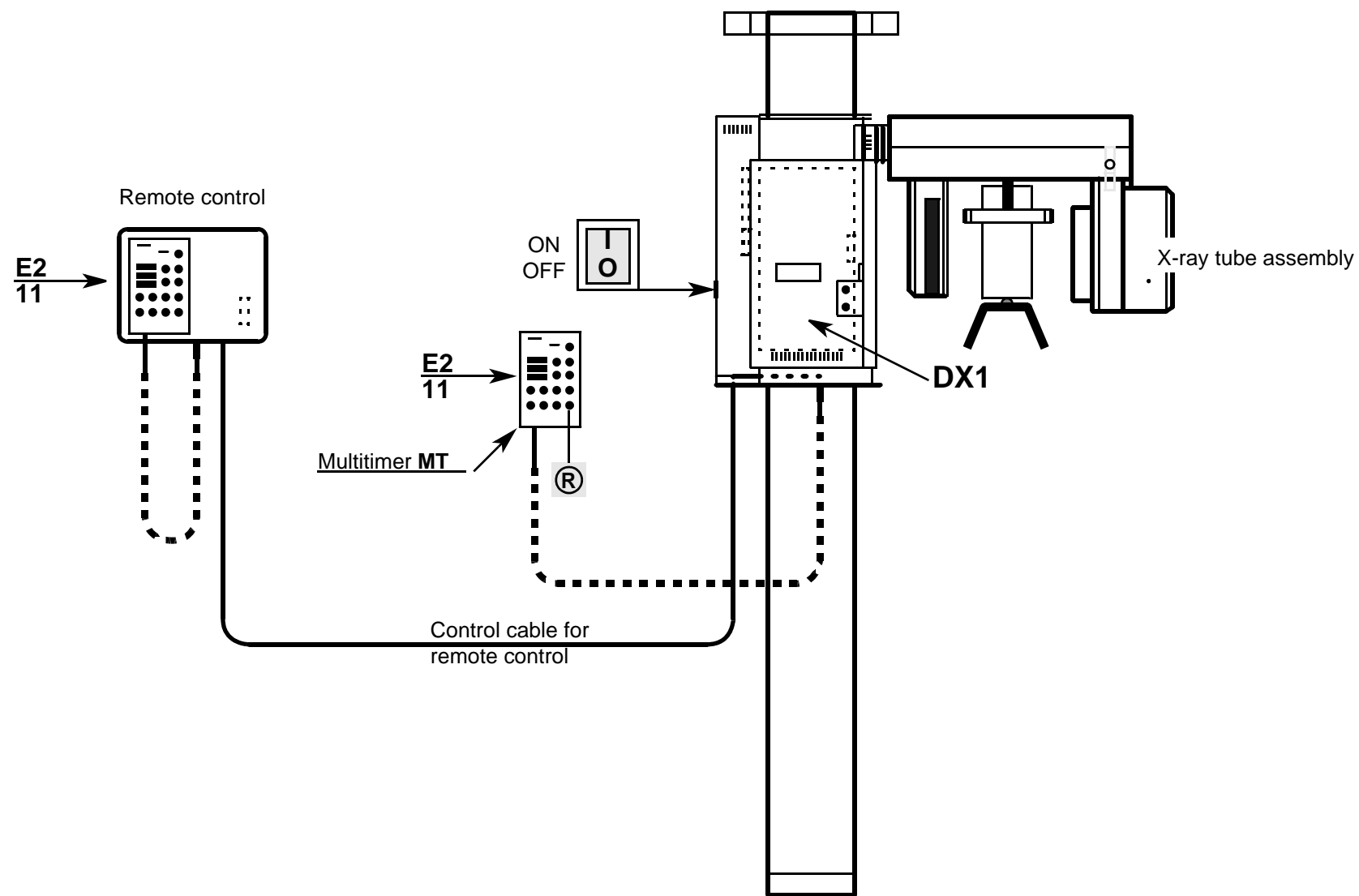
3.8 Correcting error of message E2 01: X-ray tube assembly overheated.



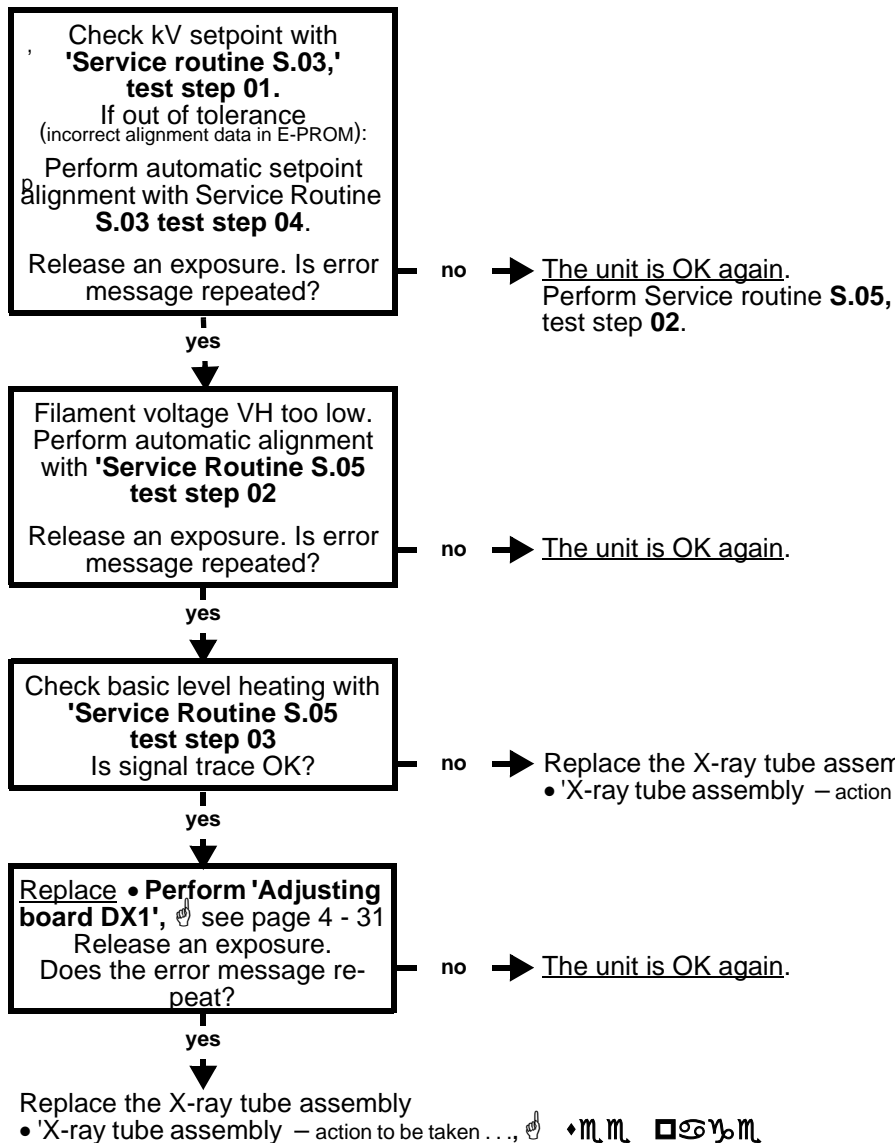
- Zero power range of EEPROM J115 is invalid or destroyed.

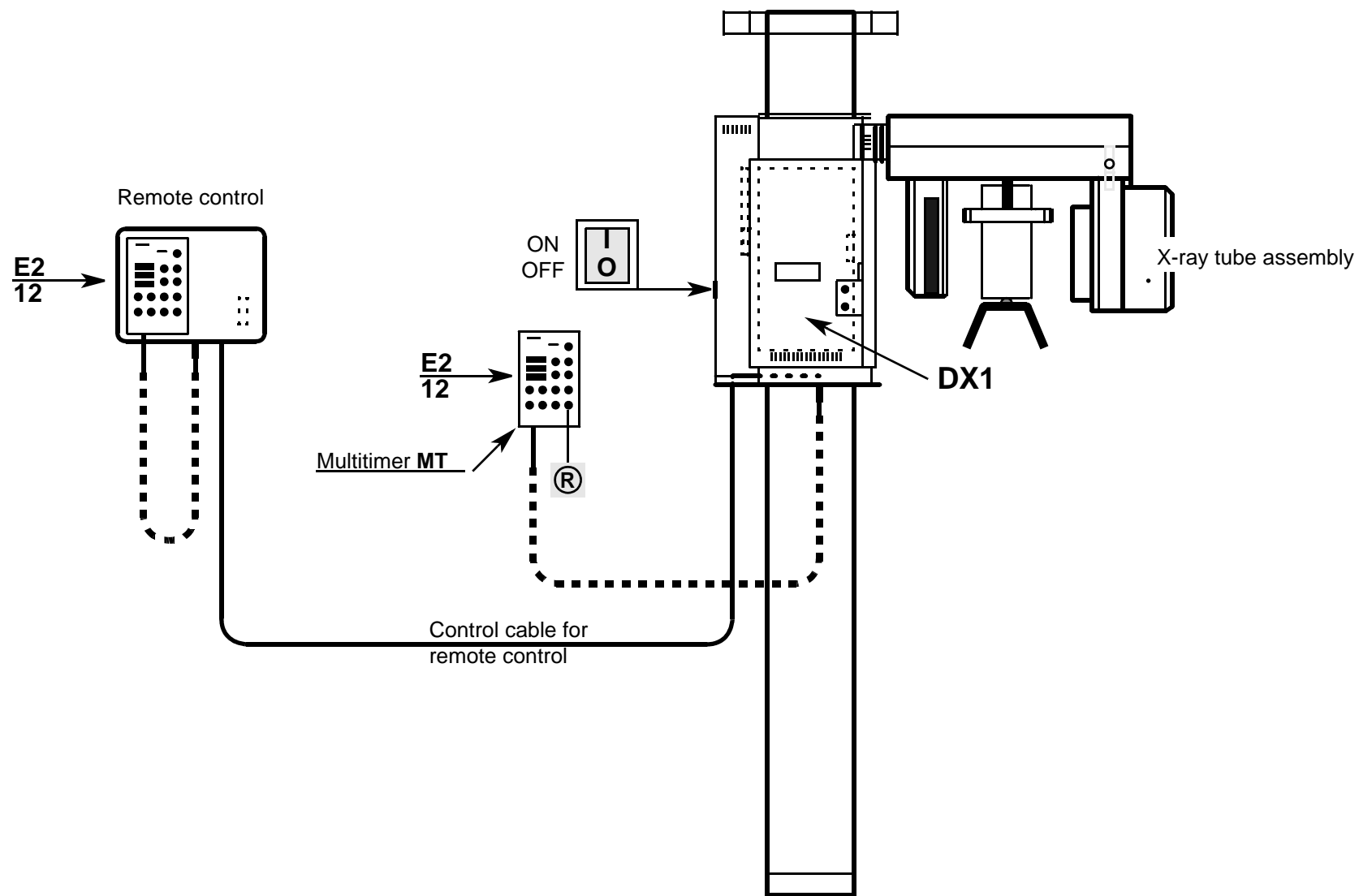


3.9 Correcting error of message E2 04: Zero power range has been re-initialized.



- KV_{max} has been exceeded.
Select highest kV value.



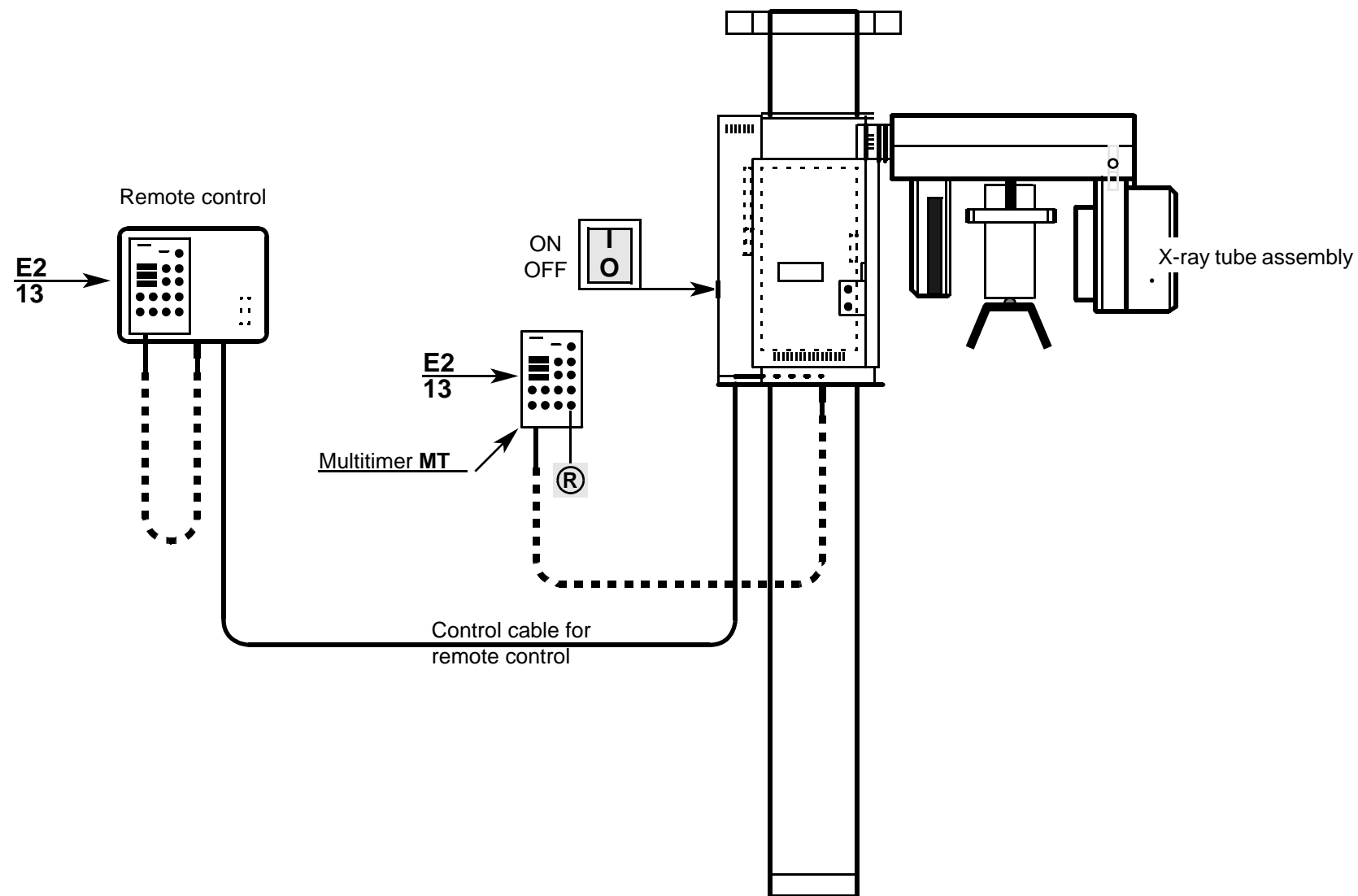


-
- ```

graph LR
 subgraph "1. Error indication immediately after start of radiation."
 direction TB
 E1[Error indication immediately after start of radiation.] --> B1[VH setpoint too high.
'Check with Service routine S.03, test step 03
Perform Service routine S.03, test step 04.
Perform Service routine S.05.2.]
 end
 subgraph "2. Error indication during radiation."
 direction TB
 E2[Error indication during radiation.] --> D2[Do test steps execute?]
 end
 B1 --> D2
 D2 -- yes --> UOK[Unit is OK.]
 D2 -- S.03 failed --> A1[Replace board DX1.
• 'Adjusting board DX1', see page 4 - 31]
 D2 -- S.05 failed --> A2[Replace X-ray tube assembly.
• 'X-ray tube assembly - action to be taken ...', see page 4 - 31]

```
- 1. Error indication immediately after start of radiation.**
- MT / DX1**
- VH setpoint too high.
- 'Check with Service routine **S.03**, test step **03**
- Perform Service routine **S.03**, test step **04**.
- Perform Service routine **S.05.2**.
- MT**
- Do test steps execute?
- S.03 failed → Replace board DX1.  
• 'Adjusting board DX1', see page 4 - 31
- S.05 failed → Replace X-ray tube assembly.  
• 'X-ray tube assembly - action to be taken ...', see page 4 - 31
- yes → Unit is OK.
- 2. Error indication during radiation.**
- MT**

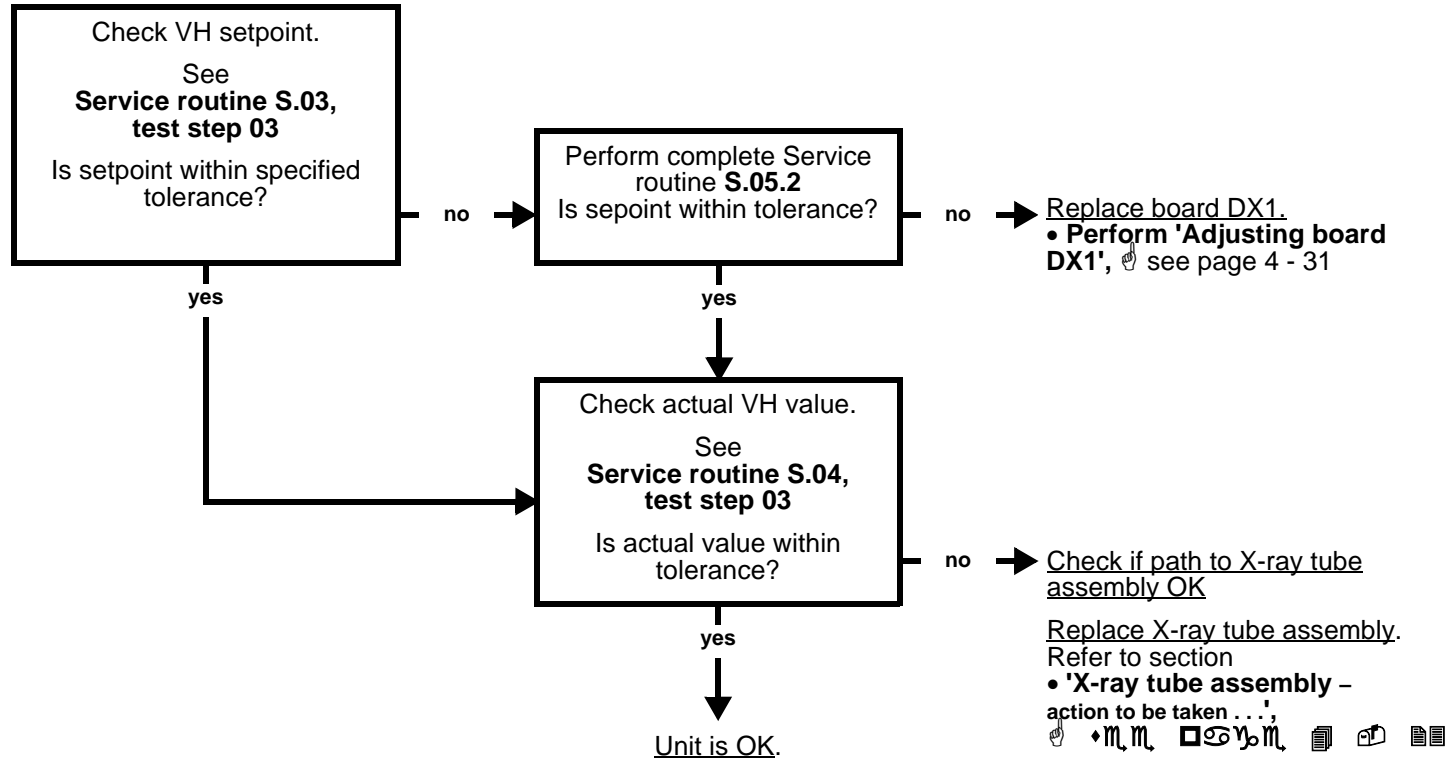
3 - 27



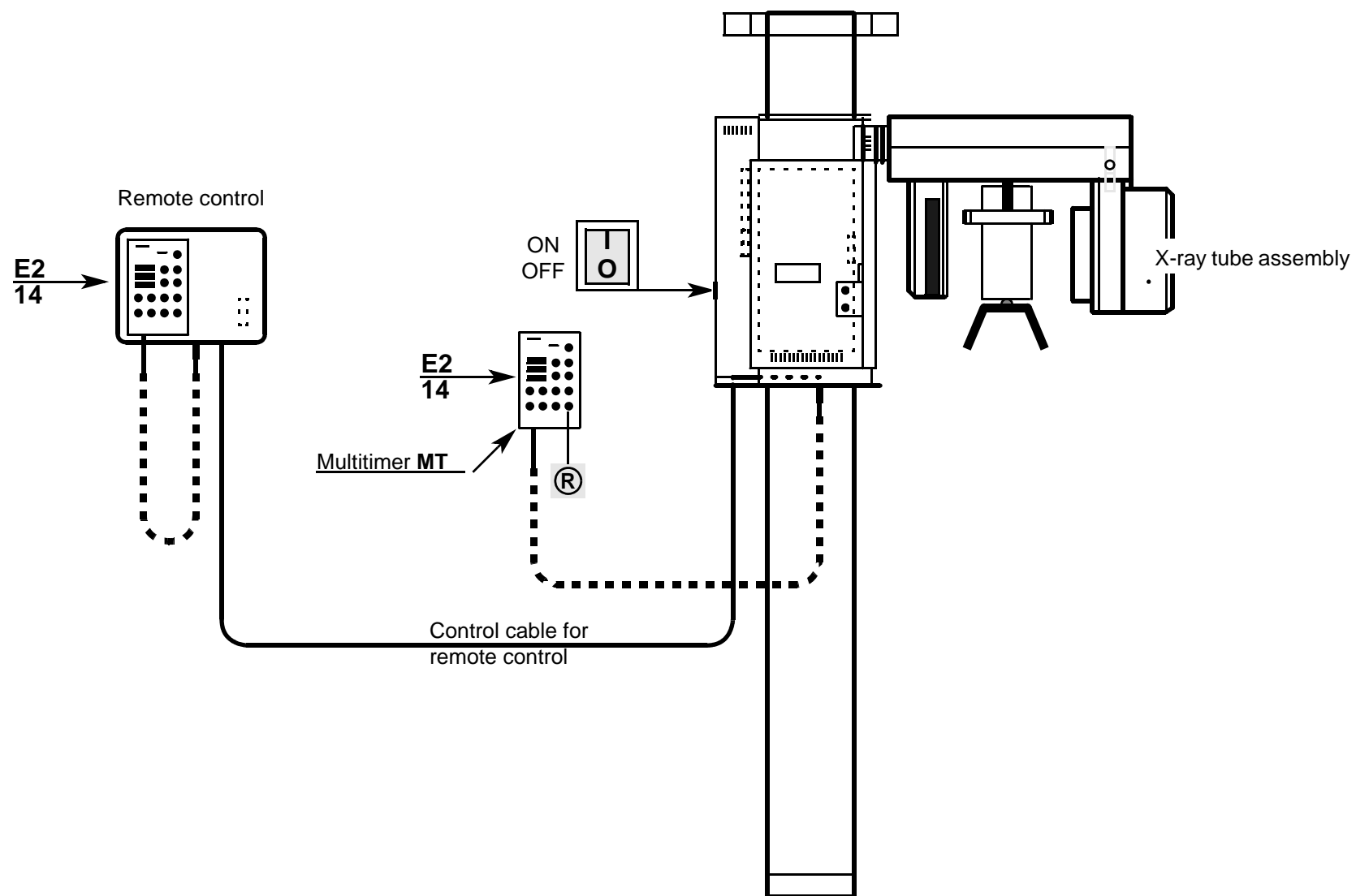
**CAUTION: Always switch the unit OFF before connecting a measuring instrument or replacing any components!**

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- Maximum filament voltage  $VH_{max}$  has been exceeded.
- Check if path from X4 on board DX1 to K3 and on to X-ray tube assembly OK.



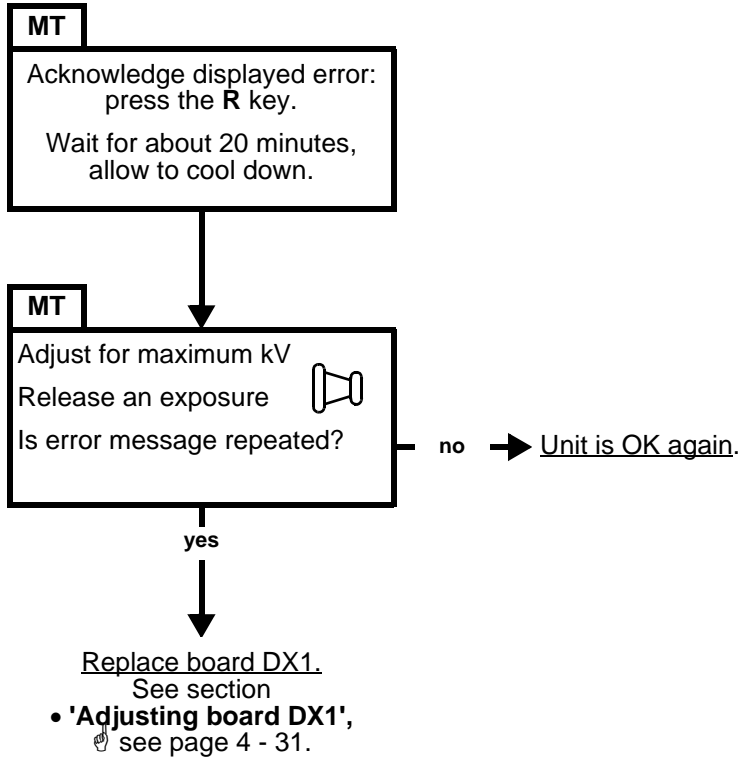
### 3.12 Correcting error of message E2 13: Filament voltage too high.



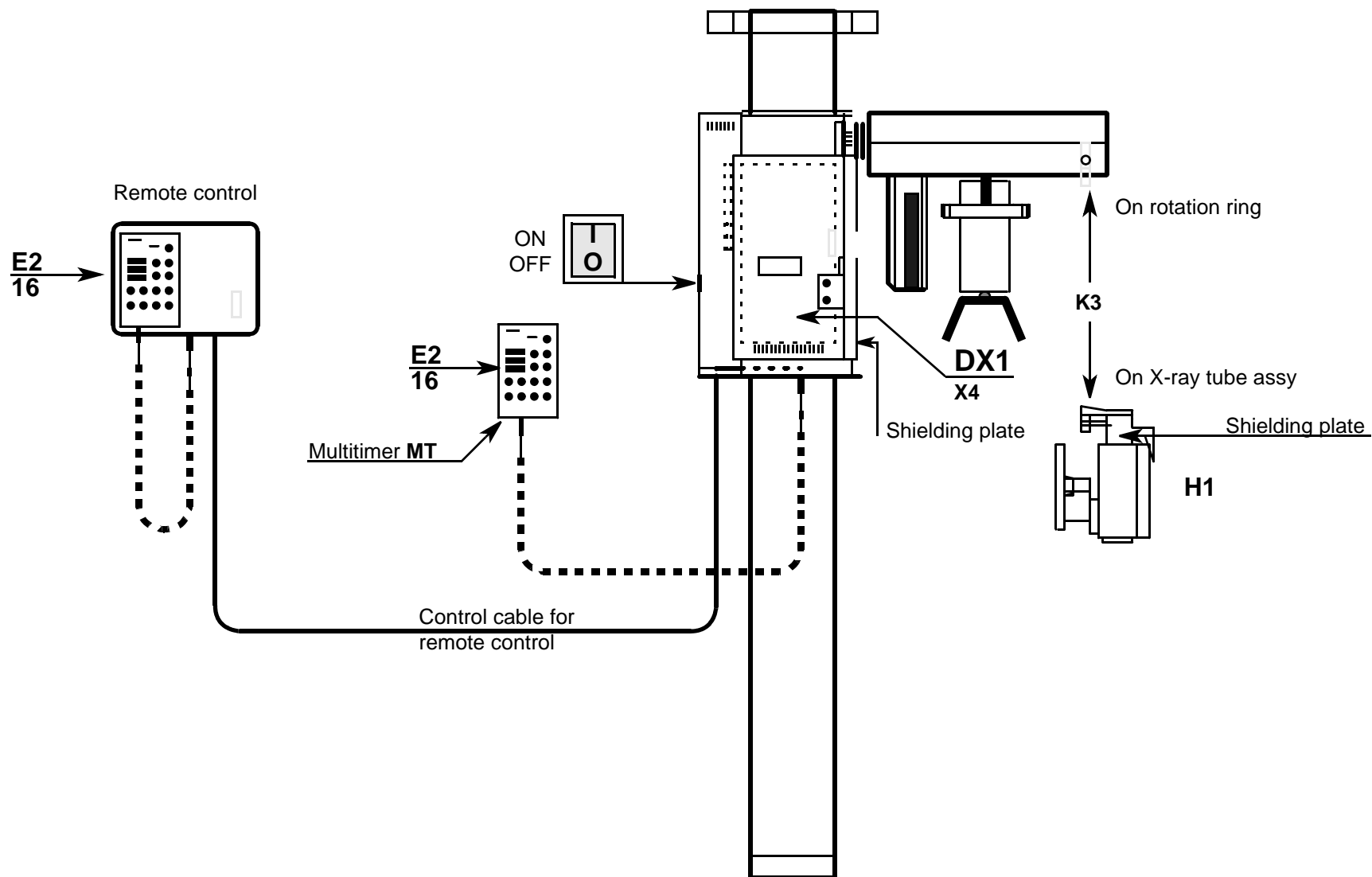
**CAUTION: Always switch the unit OFF before connecting a measuring instrument or replacing any components!**

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D 3285.077.02.06.02 07.2004

- Bridge short-circuit / transistors overheated.



### 3.13 Correcting error of message E2 14: Short-circuit in bridge.



- Is connector K3 correctly inserted at the X-ray tube assembly?
- Locate and repair the cable interruption.



Check continuity of sections

from DX1 X4.1 (RD) to K3.14 on rotation ring,  
from K3.14 (WH) to H1.R on X-ray tube assy.  
For this purpose remove the X-ray tube assy.

yes



Is there continuity?

no

Repair or replace defective cable

yes



First replace X-ray tube assembly.

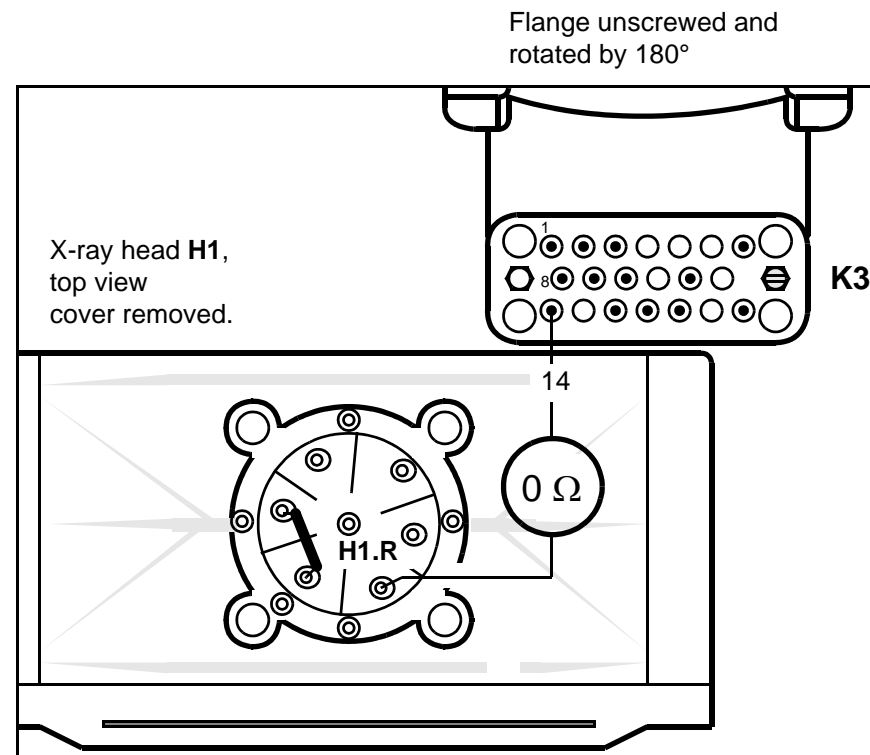
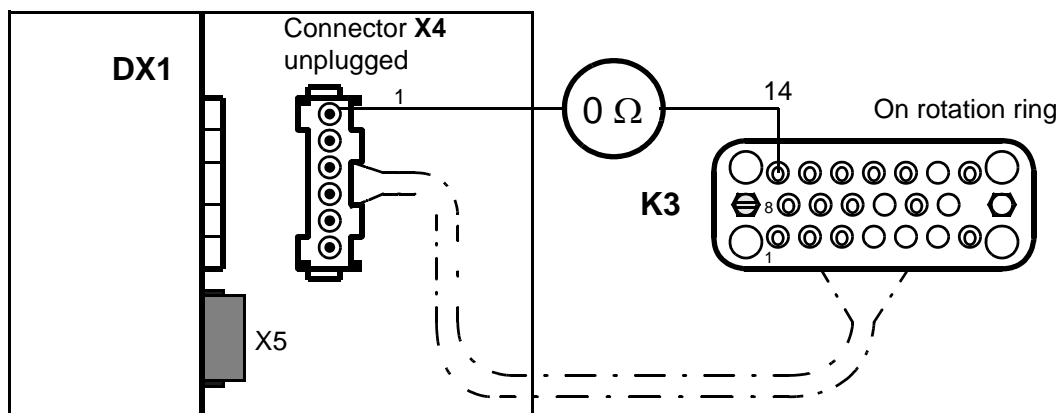
Observe section

- X-ray tube assembly – action to be taken ...,

Second replace board DX1.

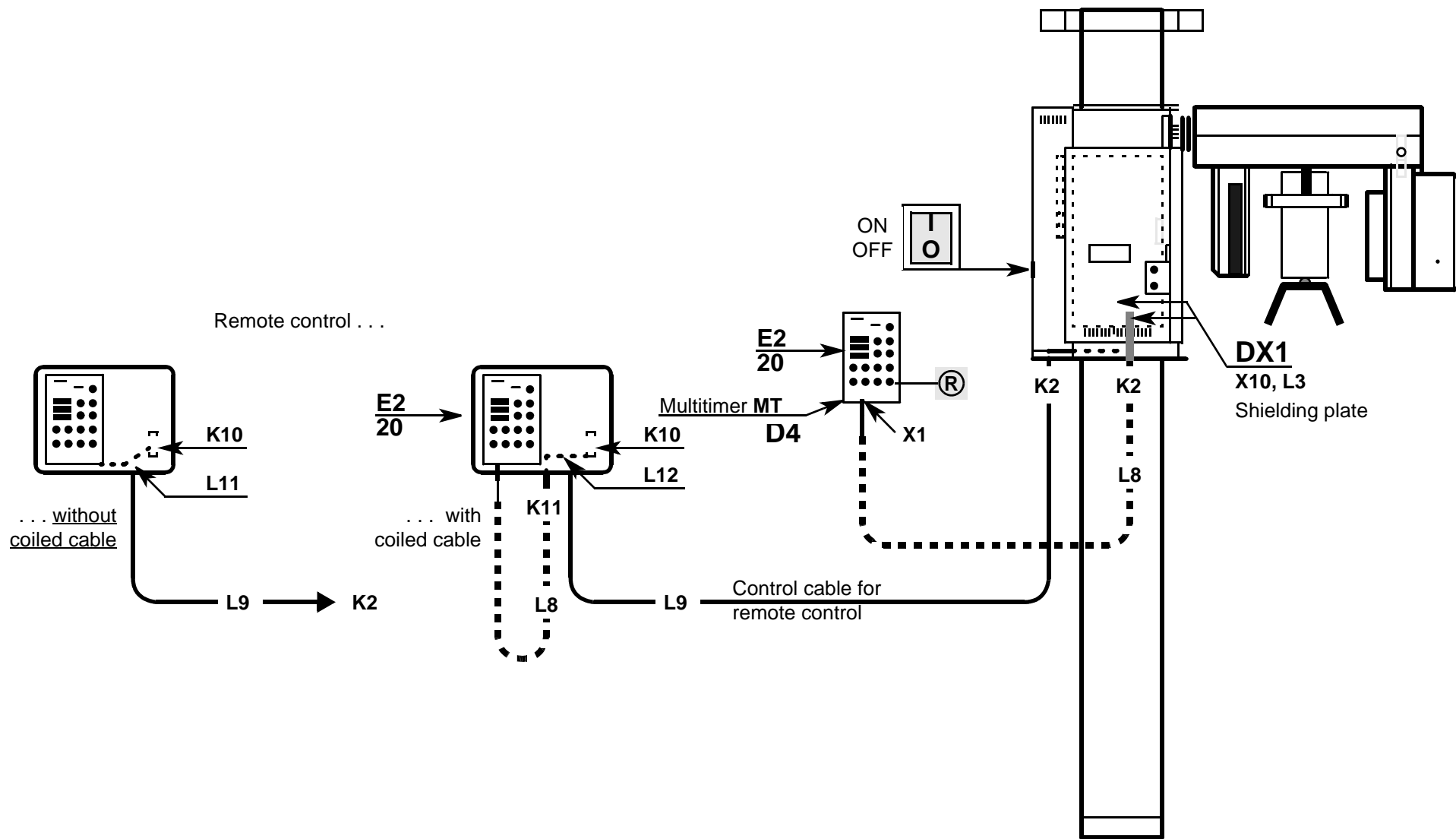
- Perform 'Adjusting board DX1', see page 4 - 31

Replace ring lead last.



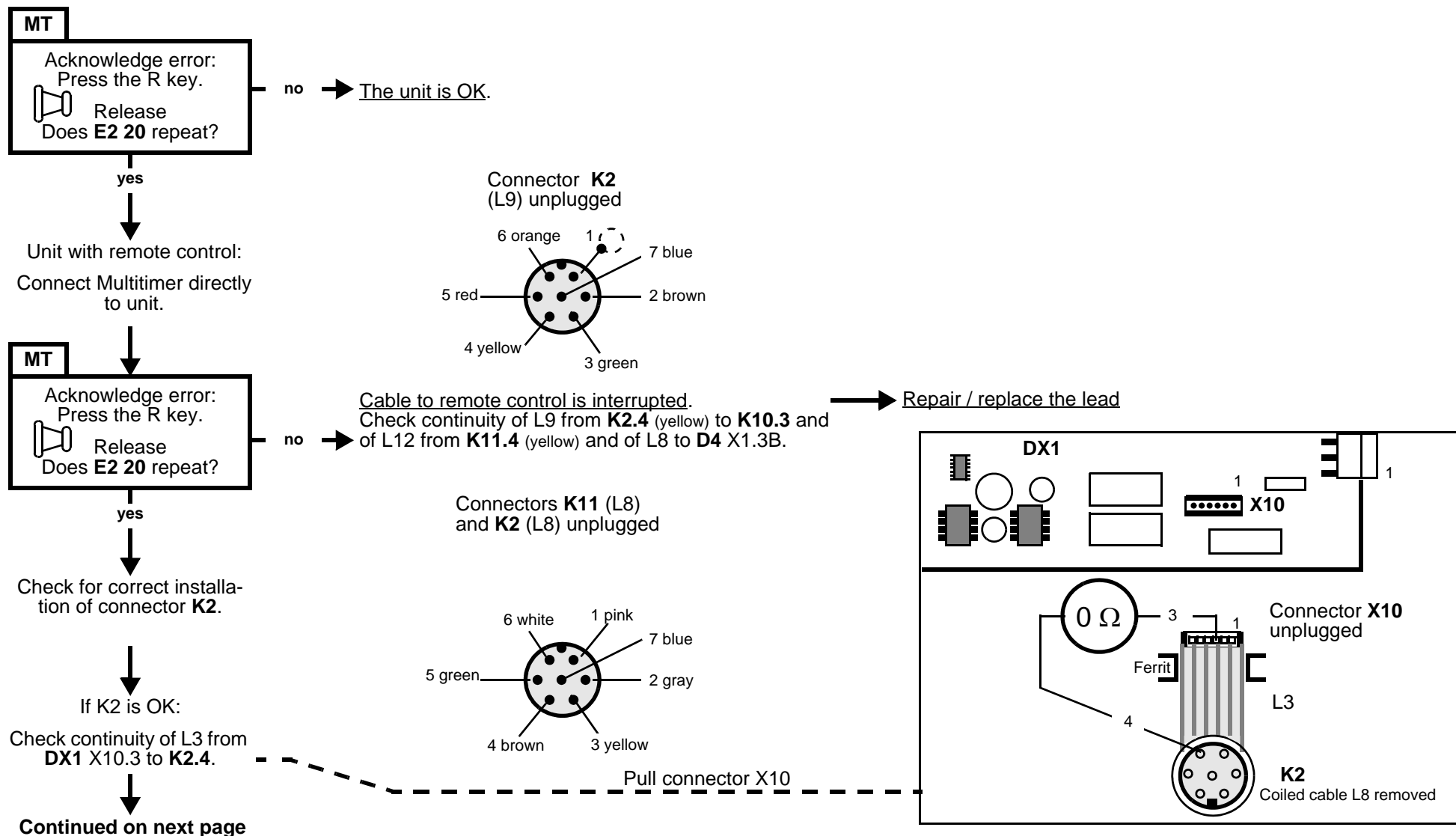
Don't forget the shielding plates during reassembly

### 3.14 Correcting error of message E2 16: kV<sub>ACTUAL</sub> – Cable is interrupted.

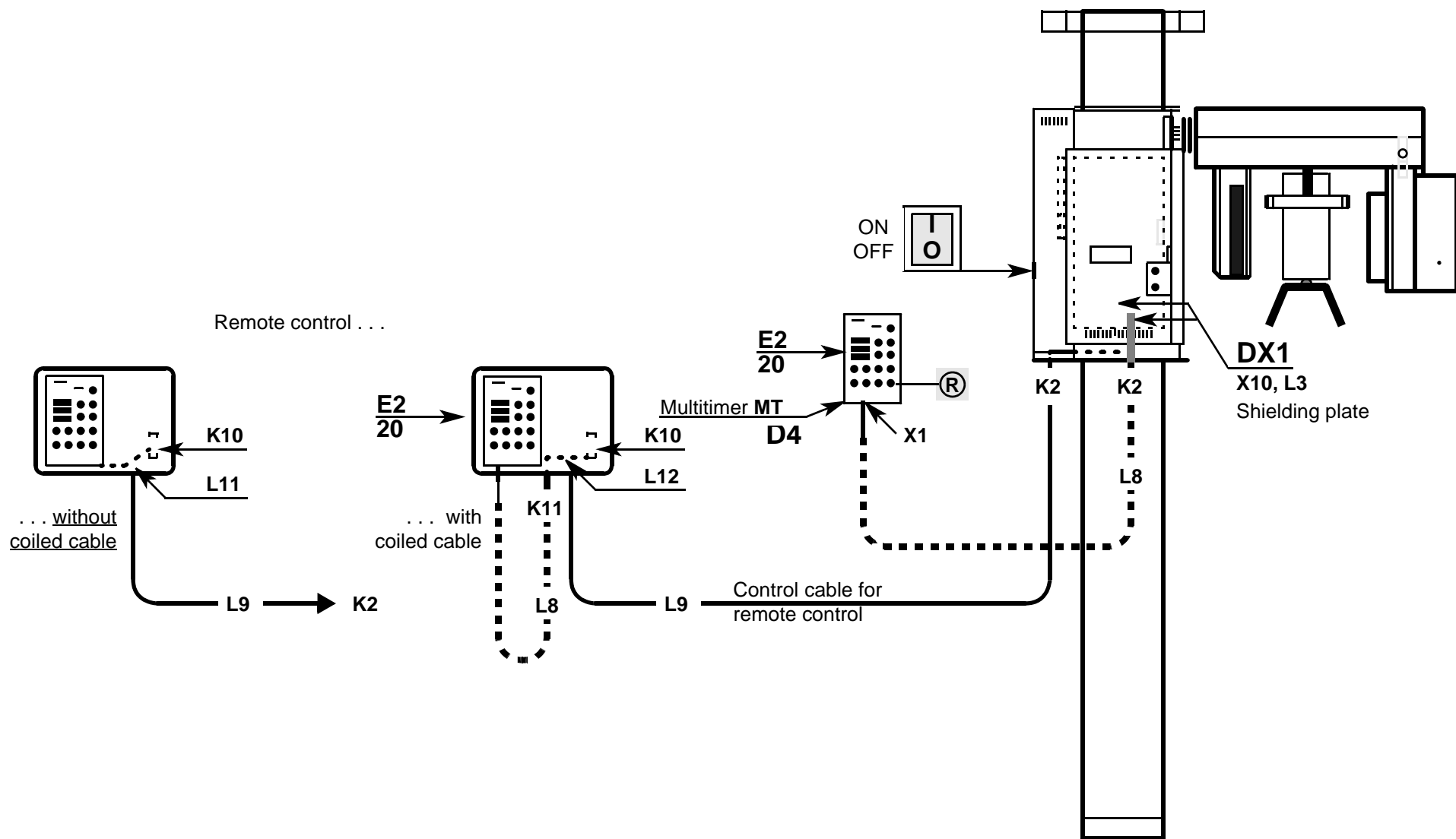




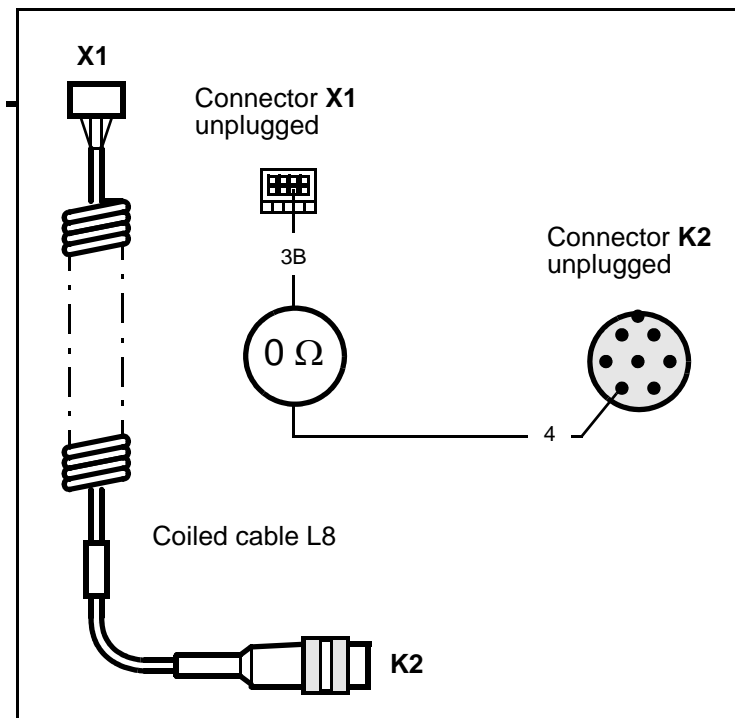
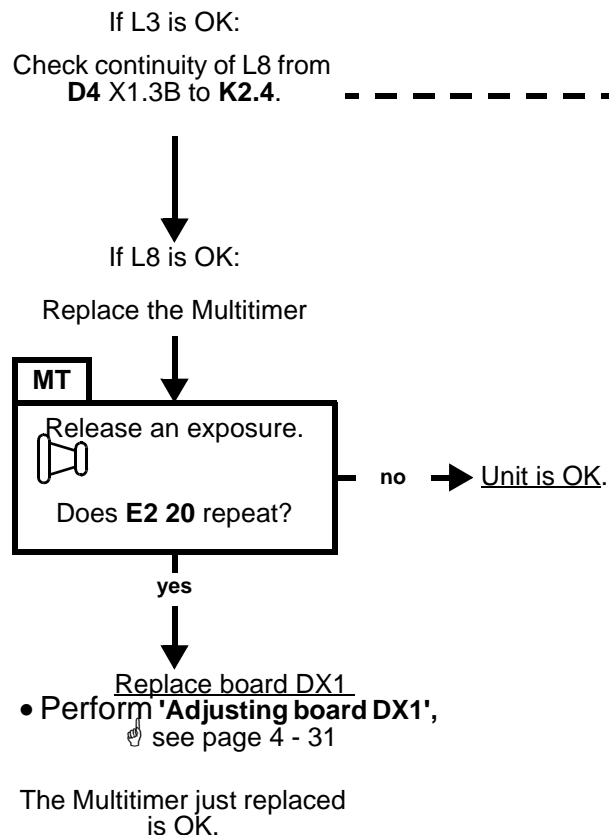
- X-ray room with door contact: Close the door and check proper function of door contact!



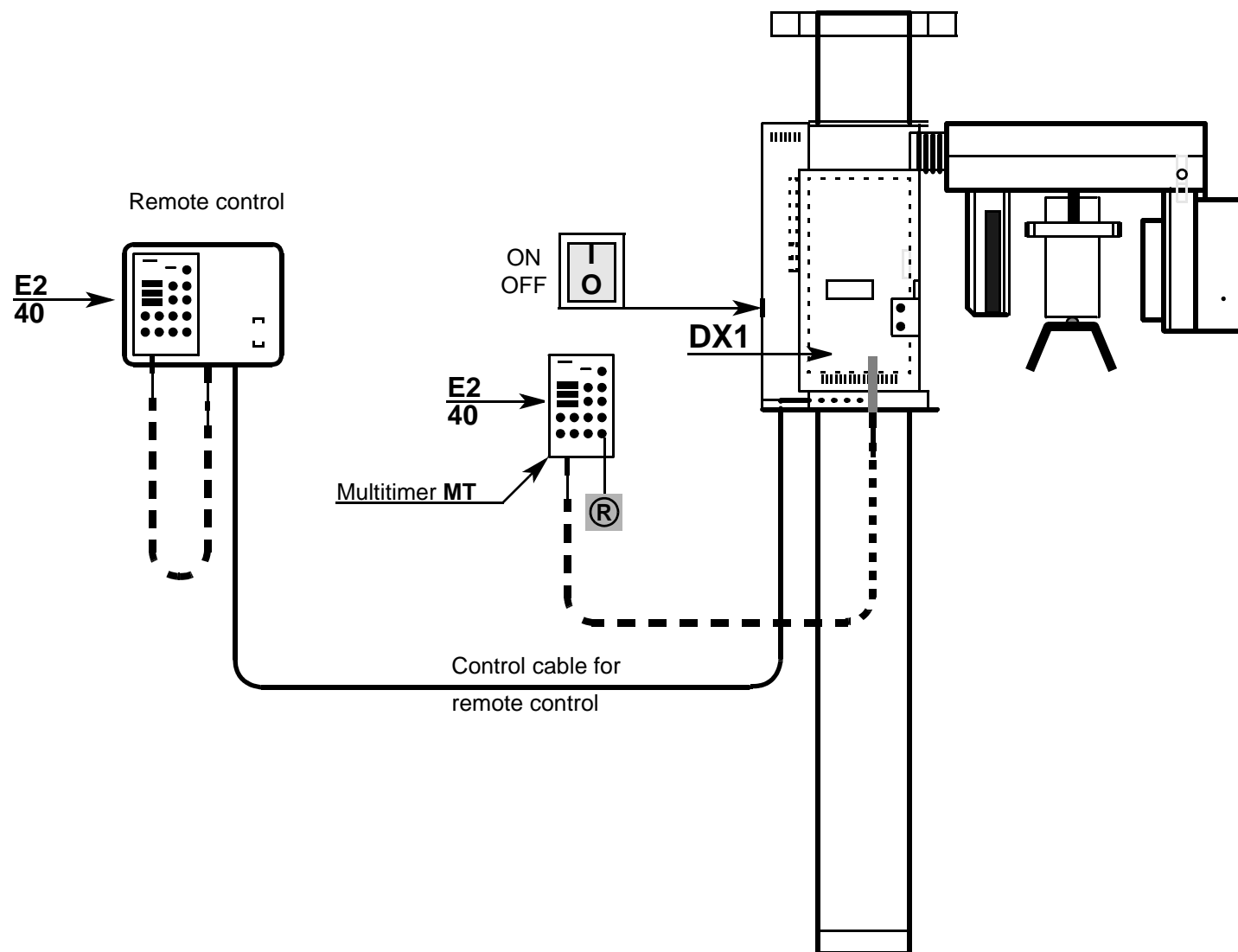
### 3.15 Correcting error of message E2 20: Interrupted exposure lead in Multitimer cable.

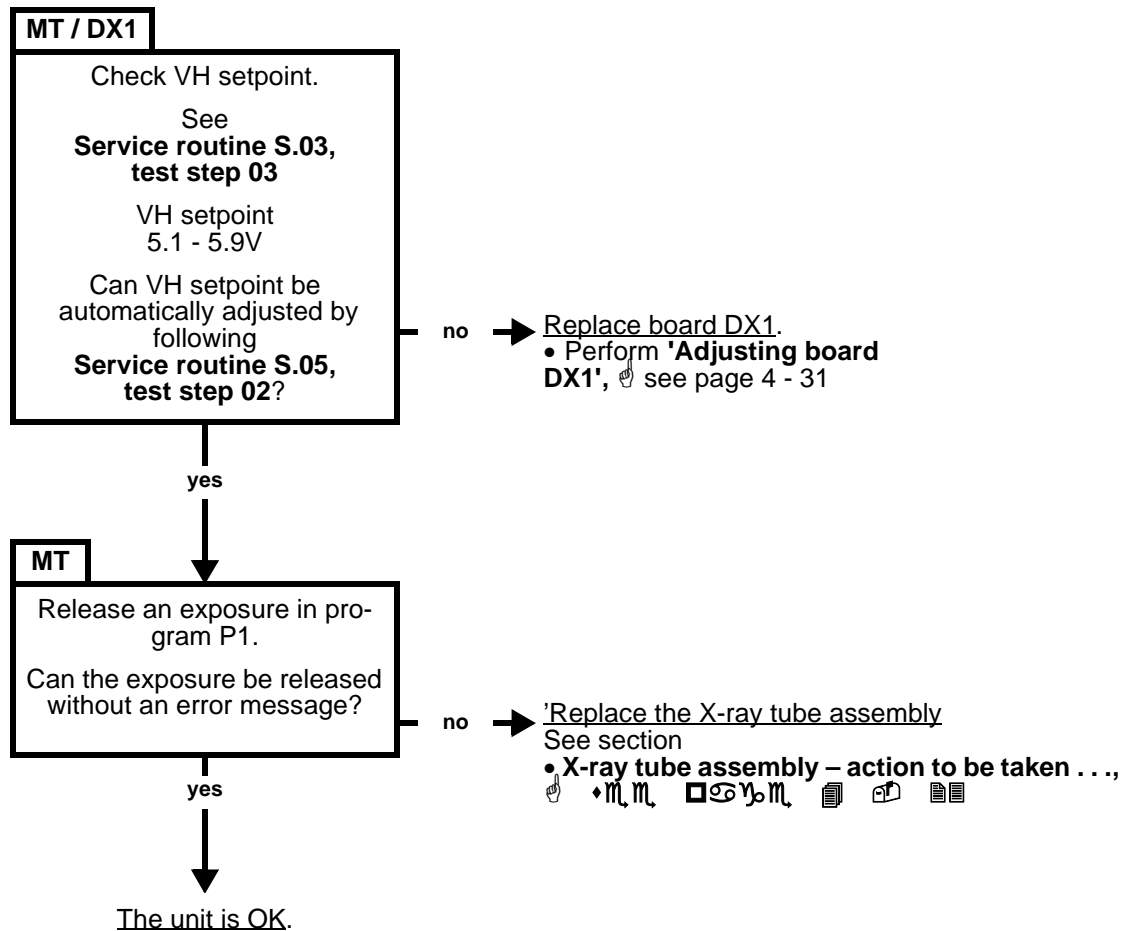


continued

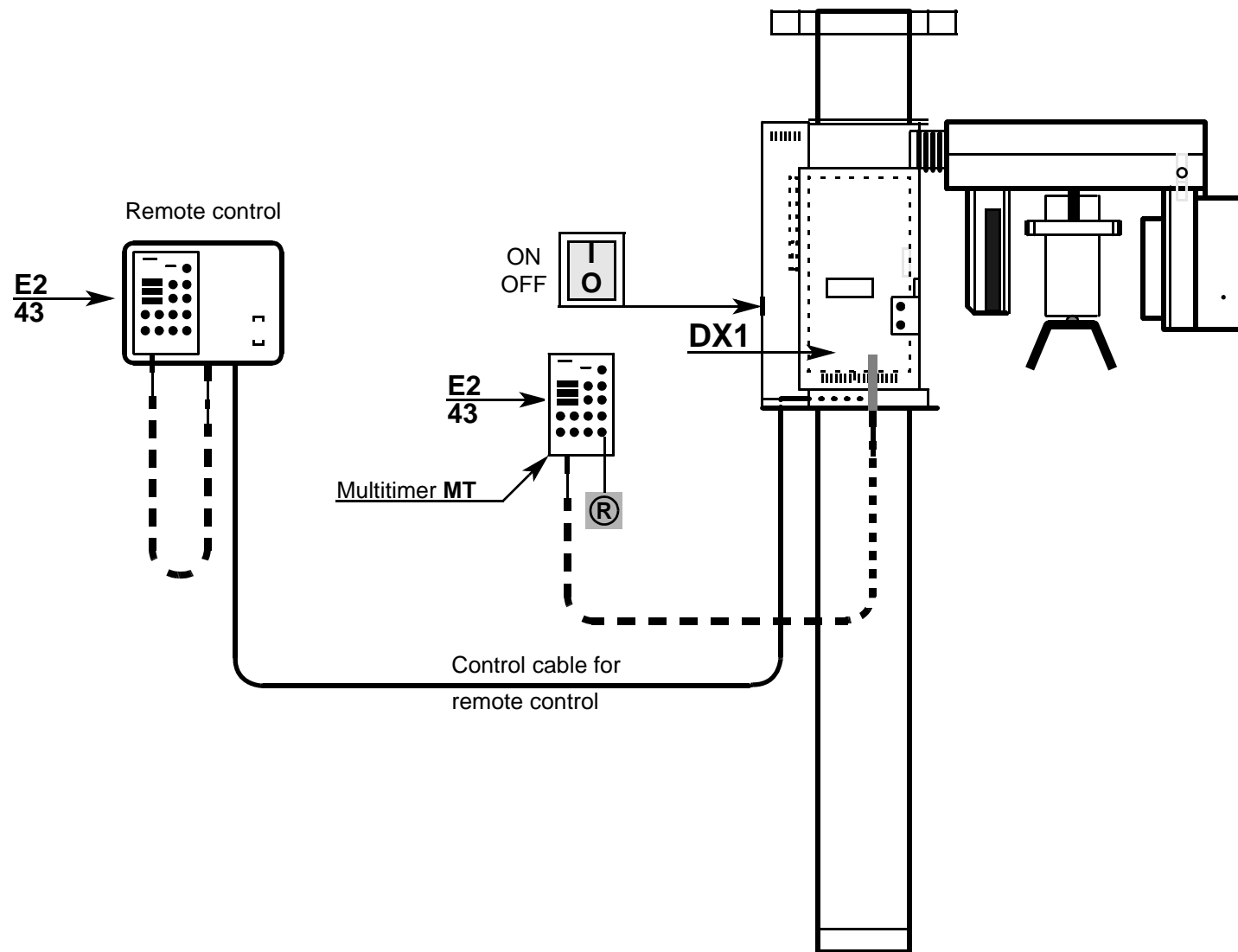


### 3.15 Correcting error of message E2 20: Exposure lead in Multitimer cable interrupted.

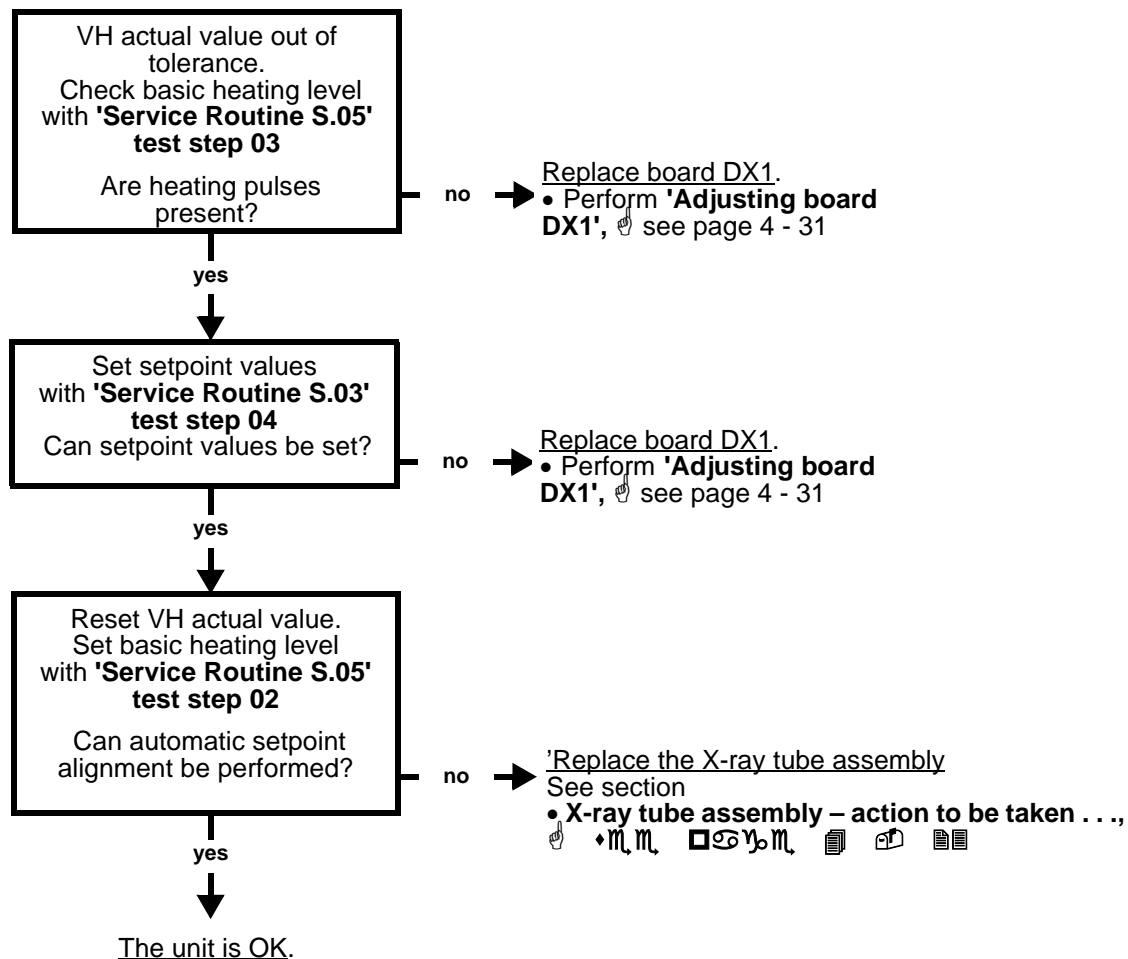




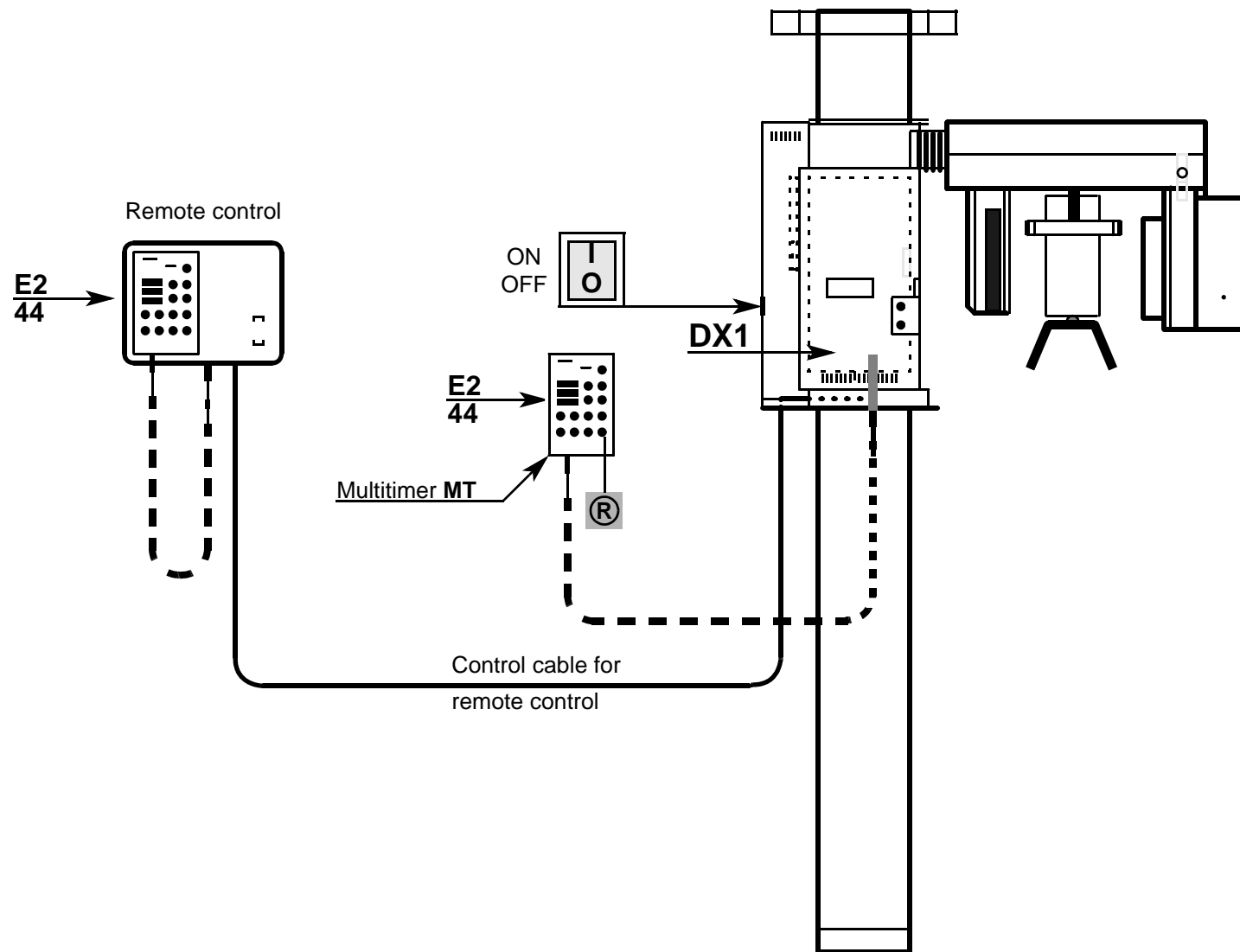
### 3.16 Correcting error of message E2 40: VH setpoint out of tolerance.



- Fuse on DX3 OK.? Plug connections from L4 OK? LEDs on DX3 lit up?

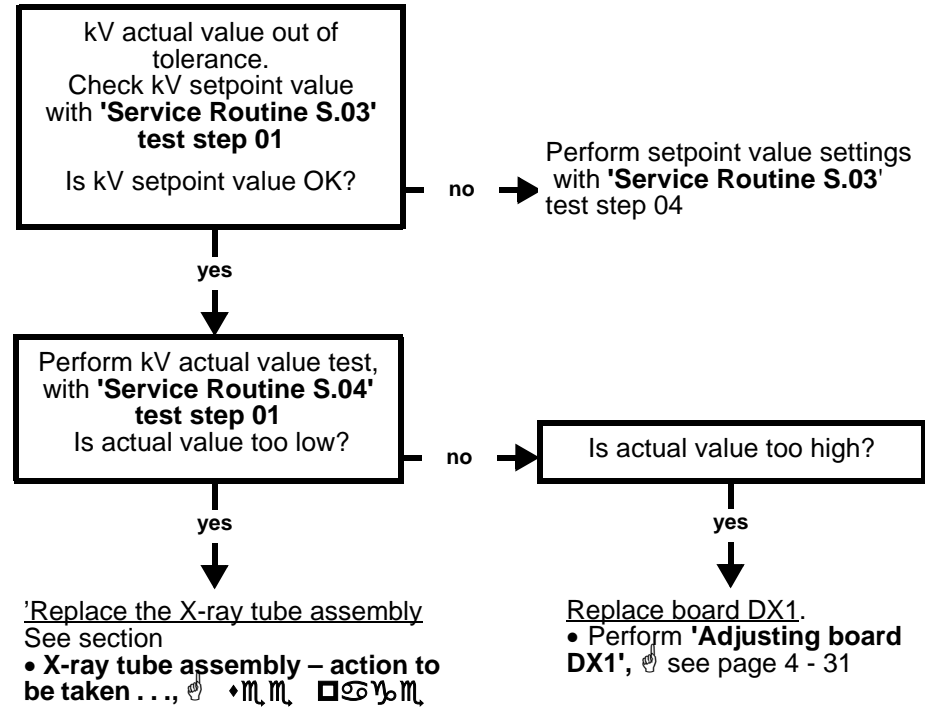


### 3.17 Correcting error of message E2 43: VH setpoint out of tolerance.

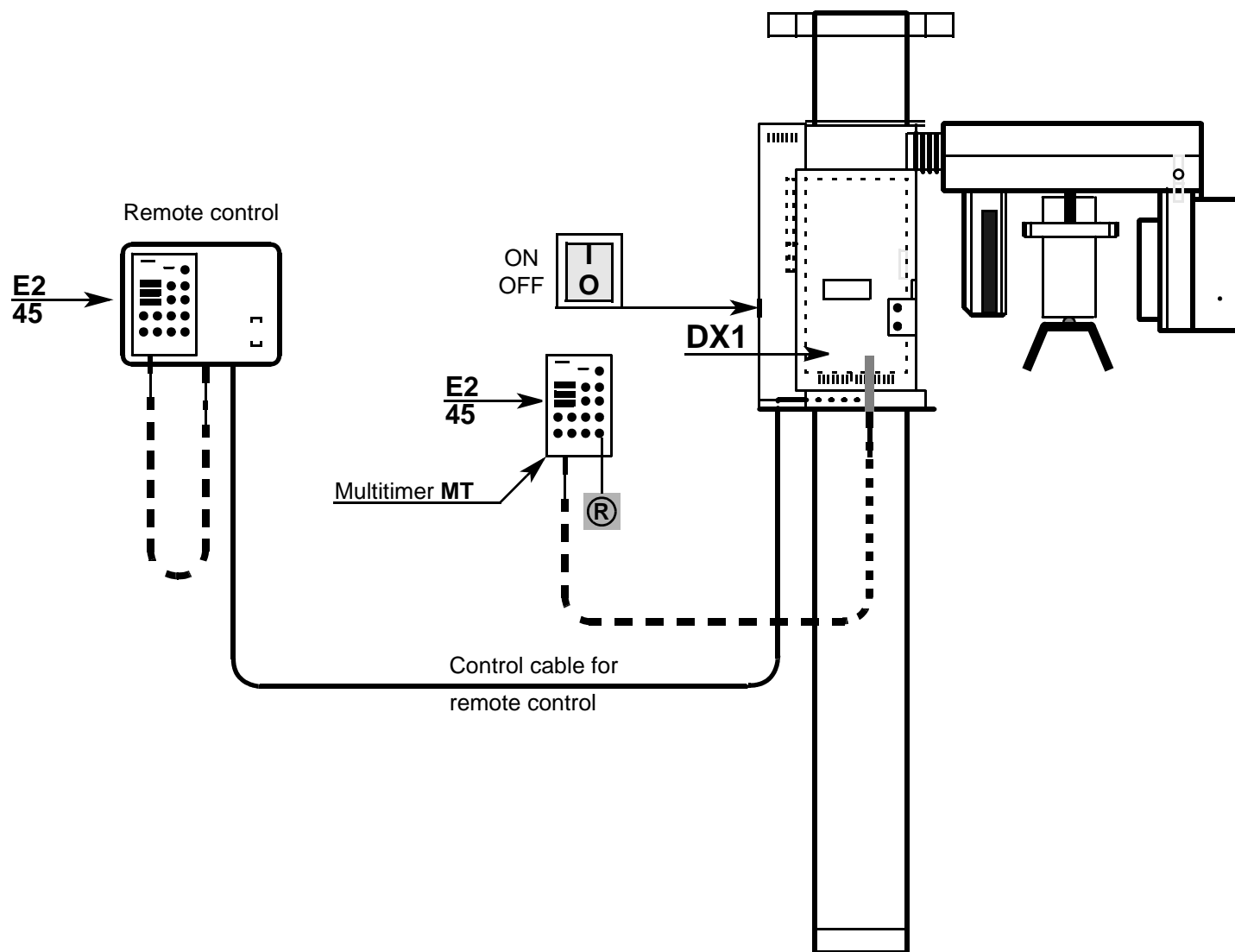


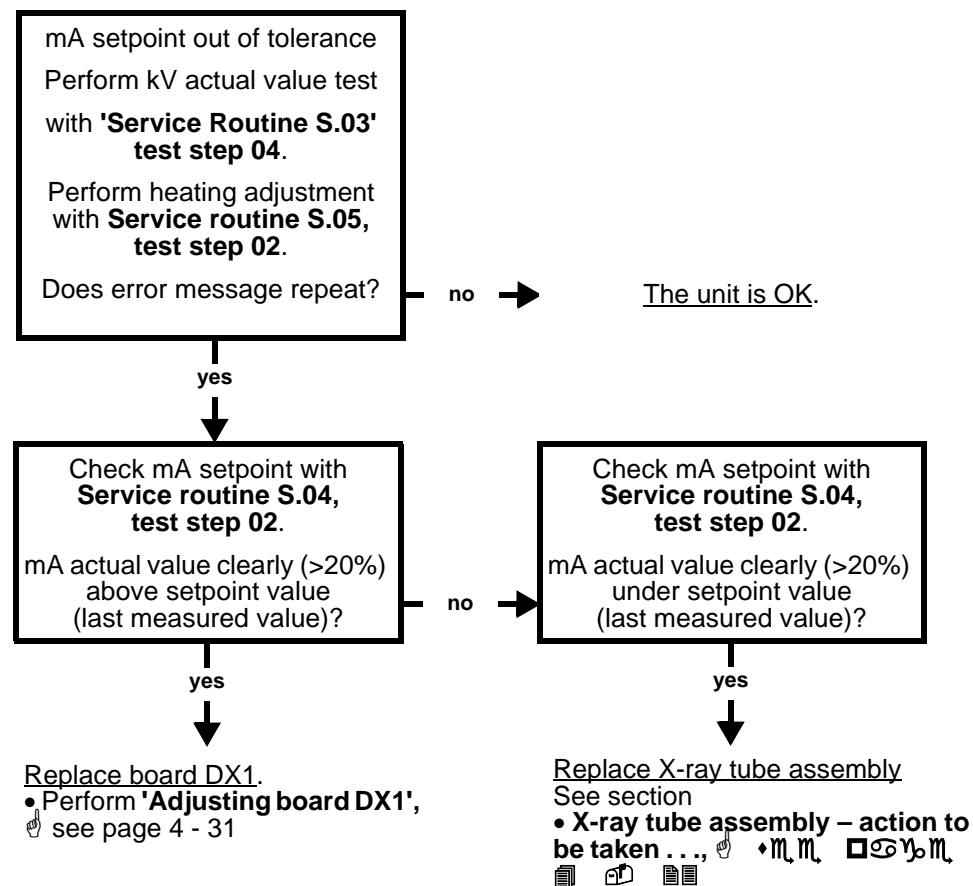


- Plug connections from L4 OK?

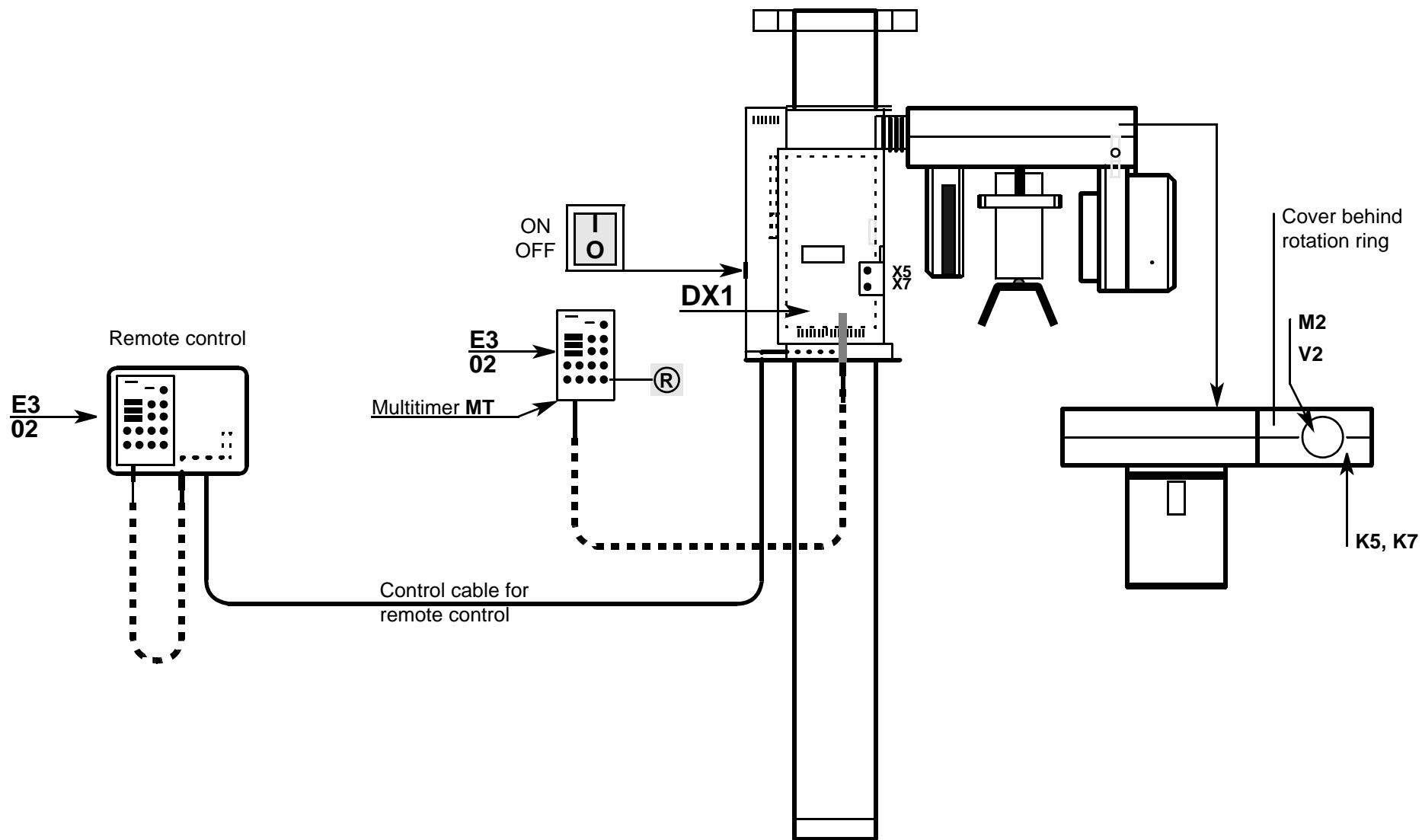


### 3.18 Correcting error of message E2 44: kV setpoint out of tolerance.

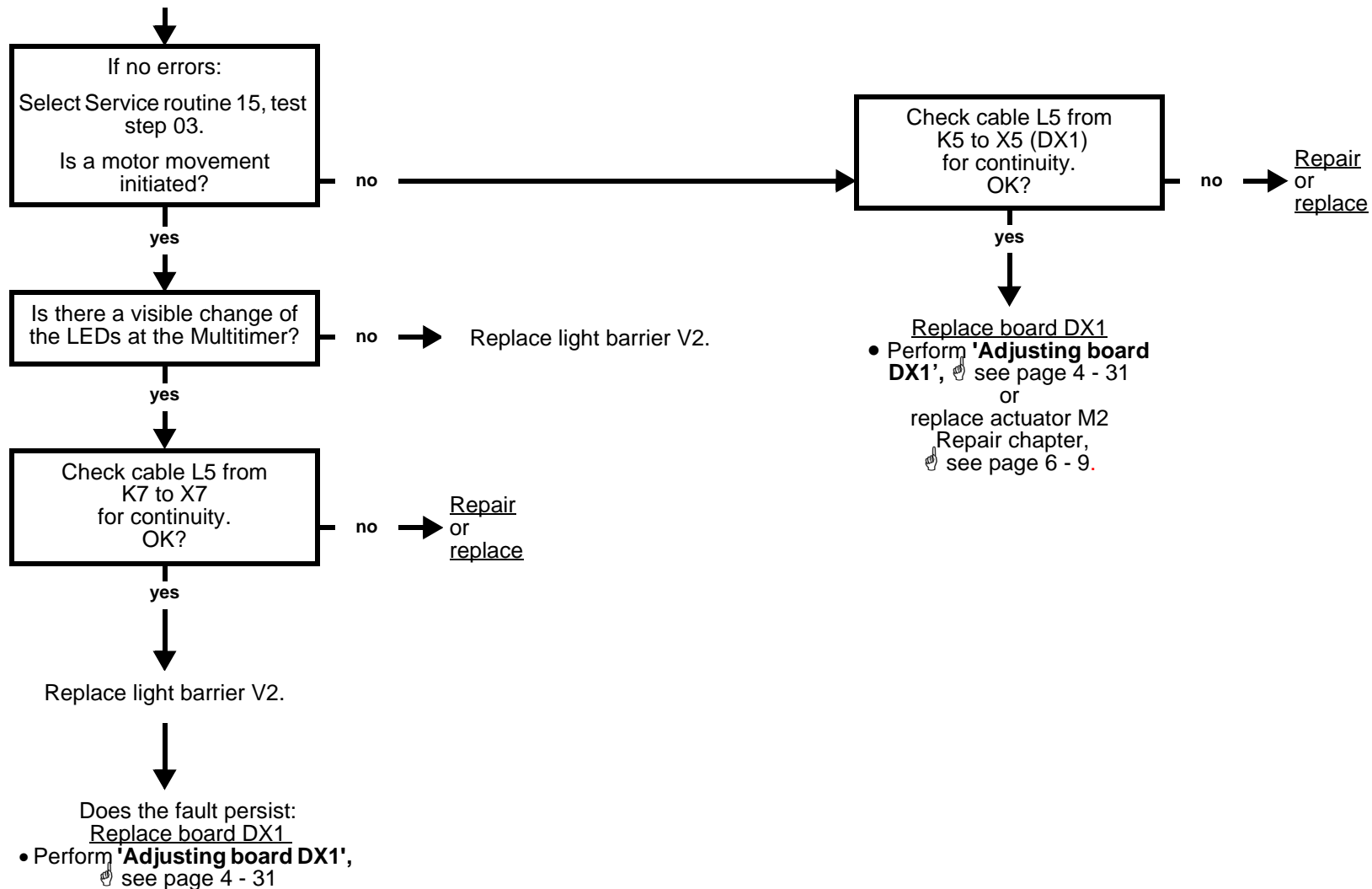




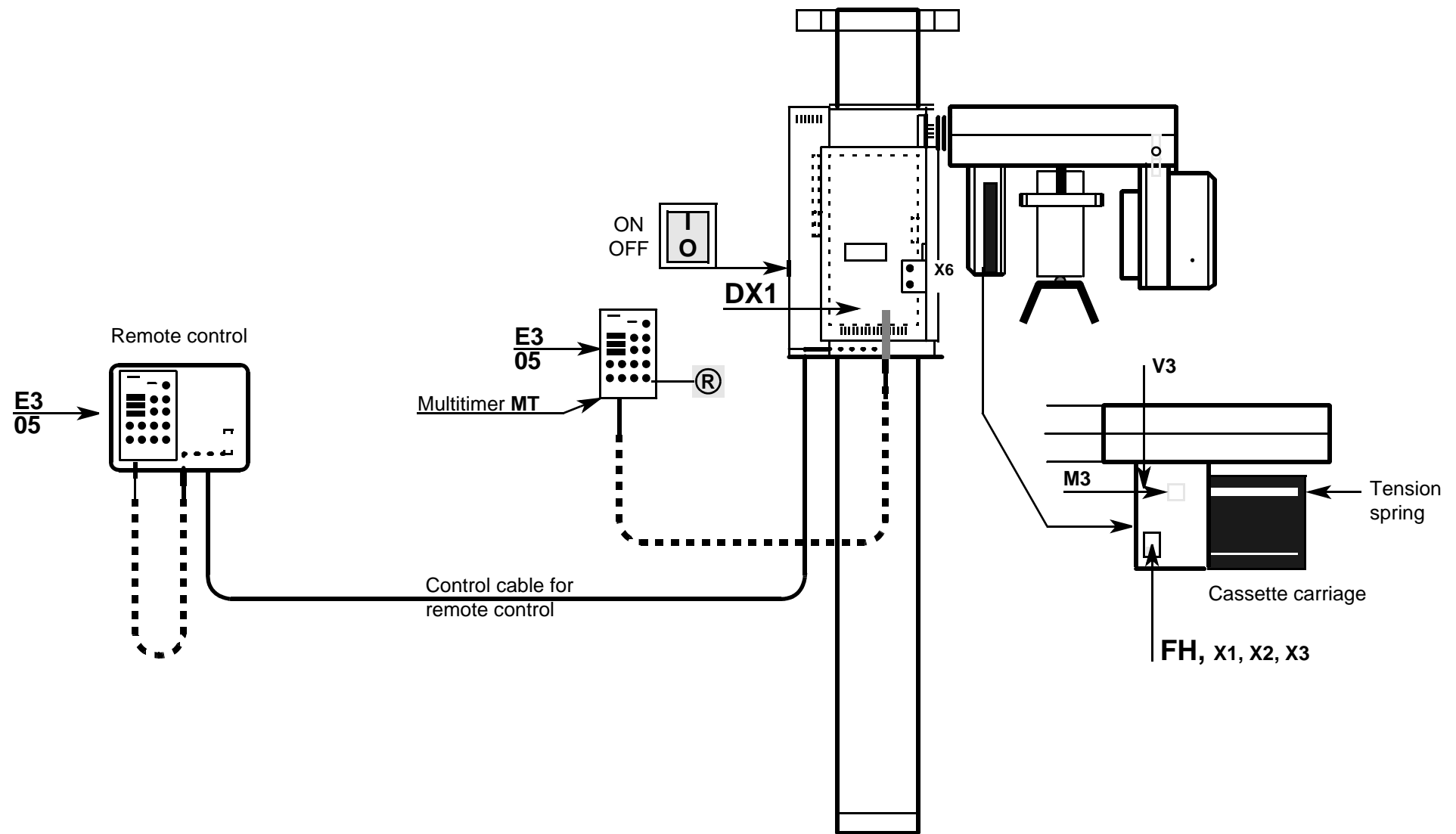
### 3.19 Correcting error of message E2 45: mA setpoint out of tolerance.



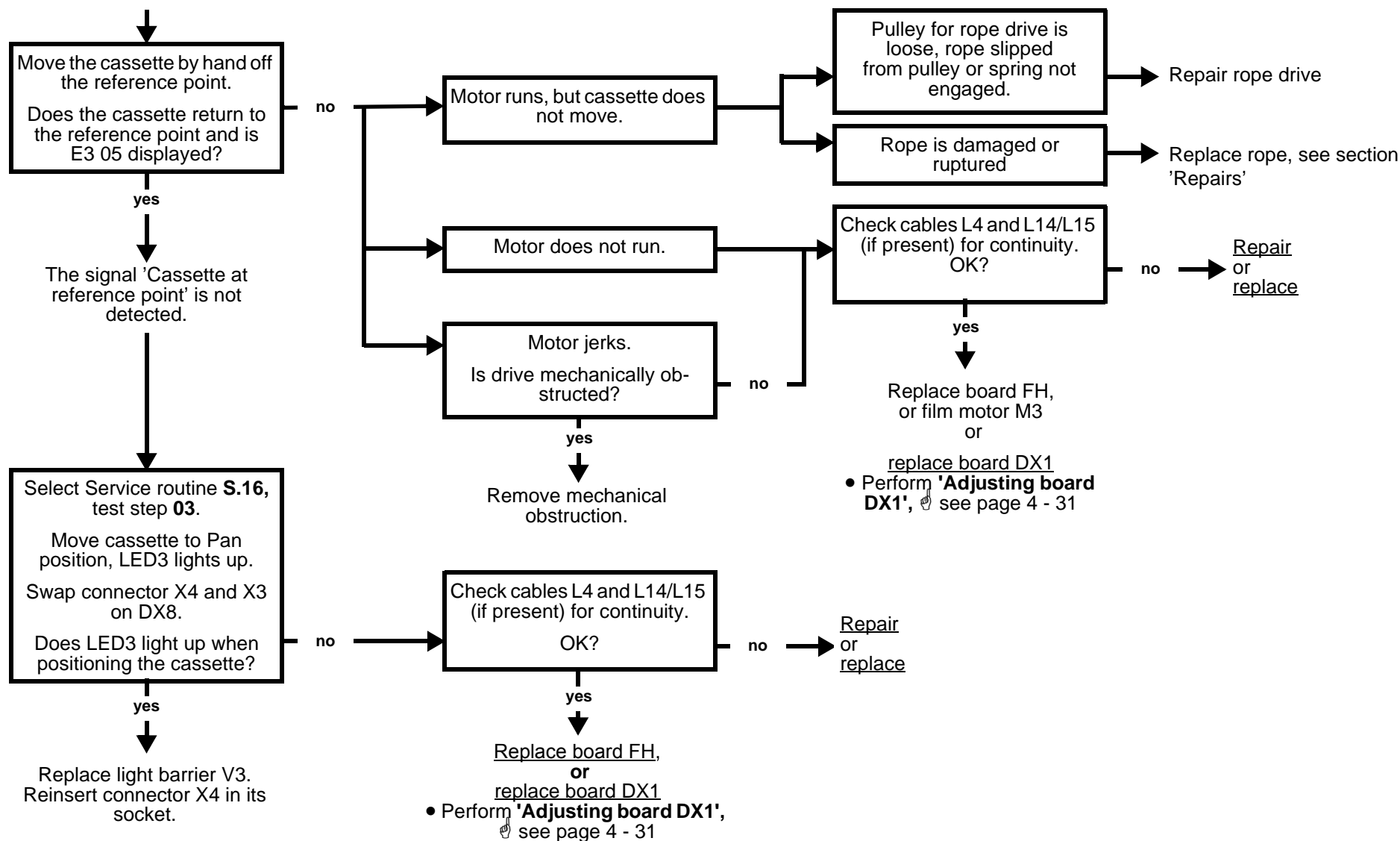
- Is seating of plug connectors K5 (M2) and K7 (V2) and of plugs X5 and X7 on board DX1 OK?
- Are supply voltages present on DX1? → LEDs V10-14 on DX3 must light up!



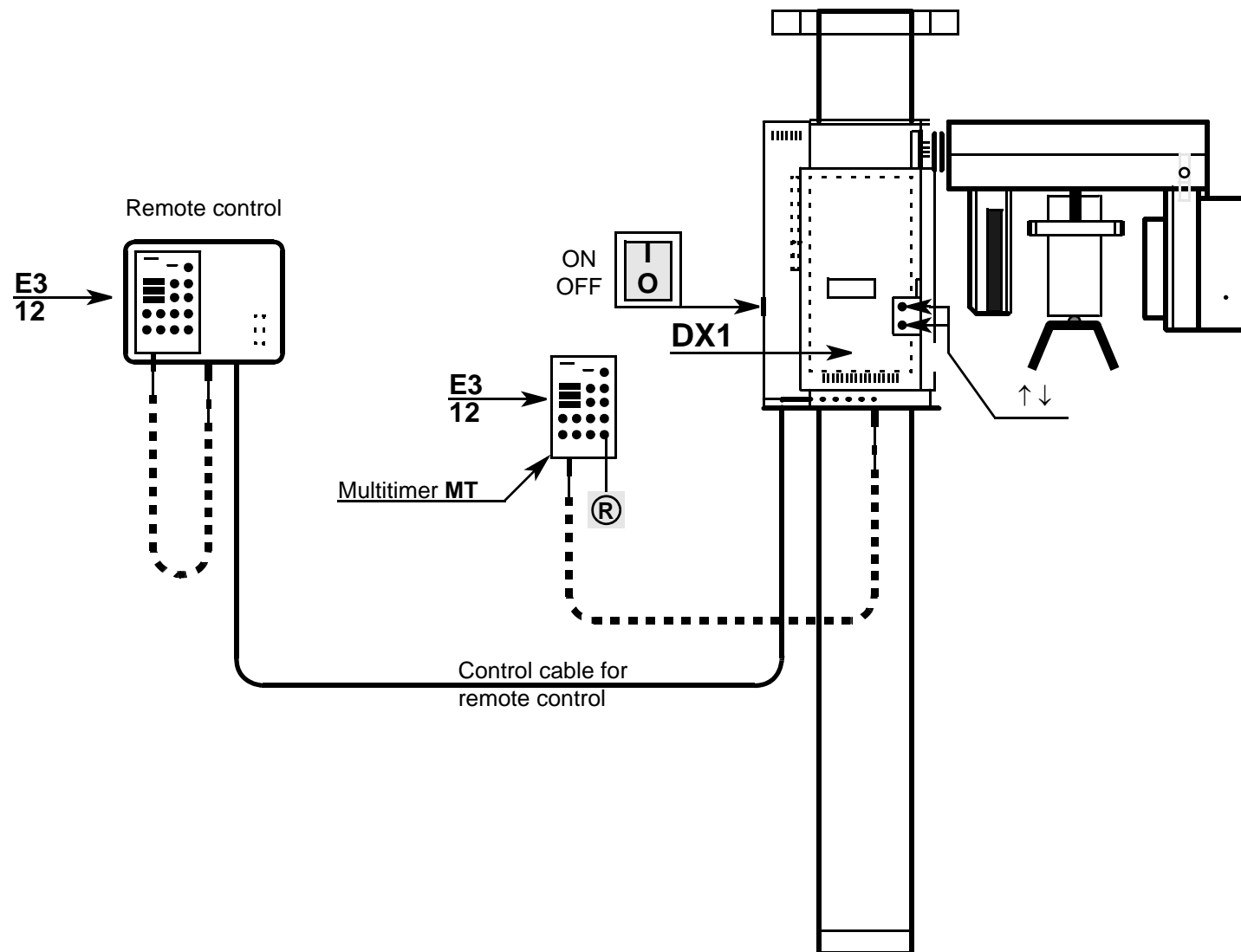
### 3.20 Correcting error of messages E3 01, E3 02: Actuator M2 has not left/reached the tripping position.



- Cassette holder must be set for Pan mode, service routine must not be selected, no help message or error message must be displayed.

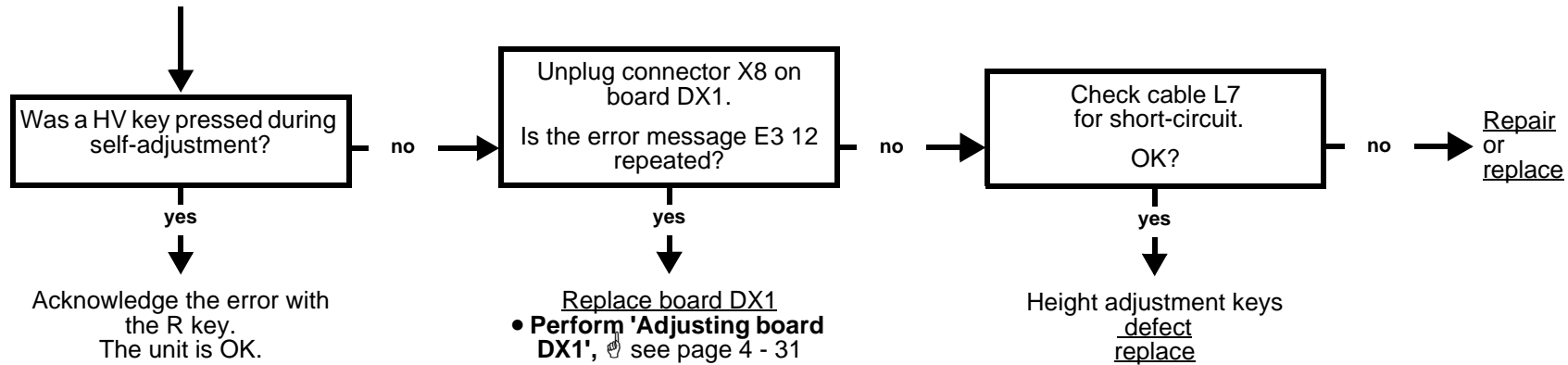


### 3.21 Correcting error of messages E3 05, E3 06: Cassette carriage has not left/reached the reference point.

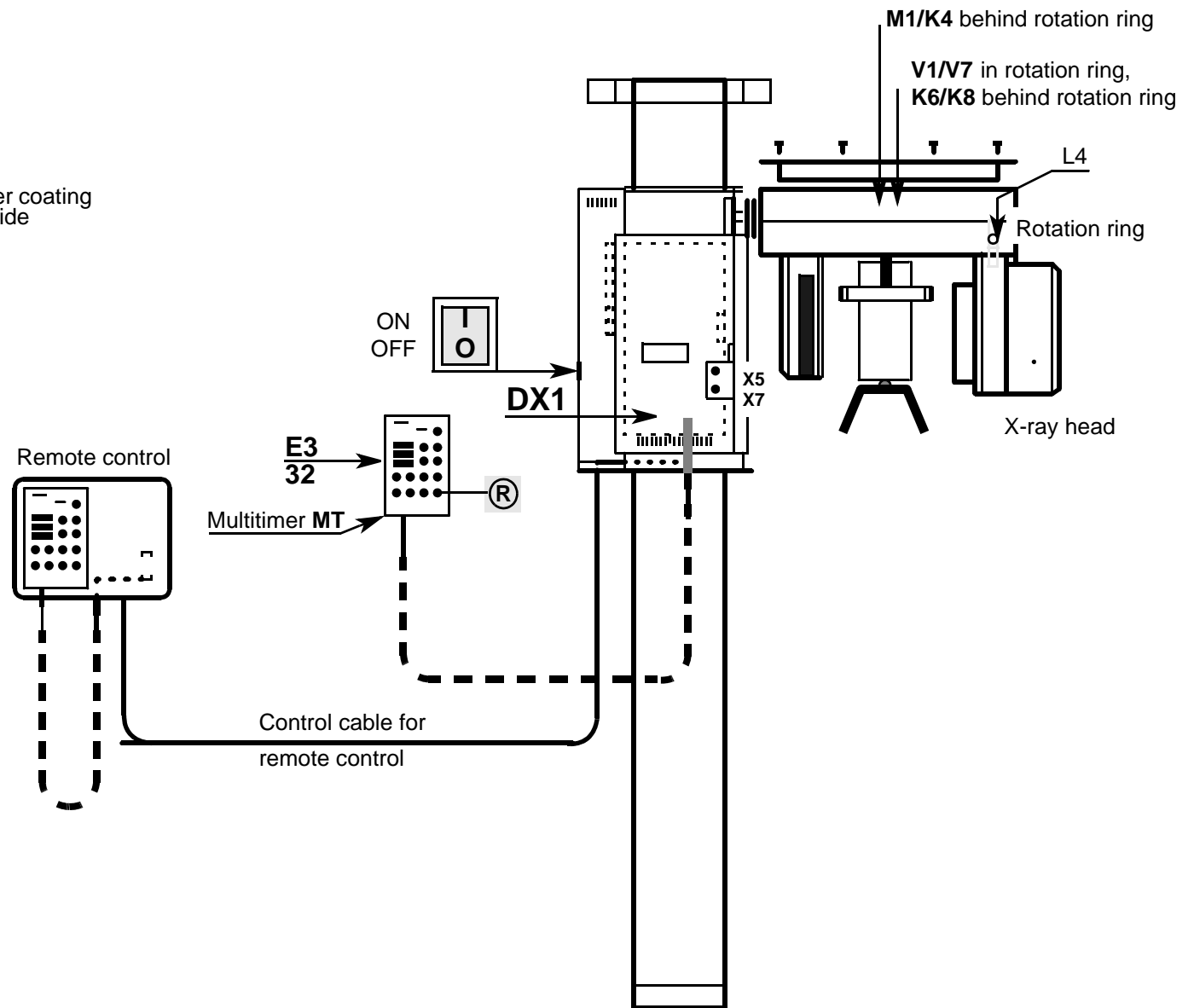
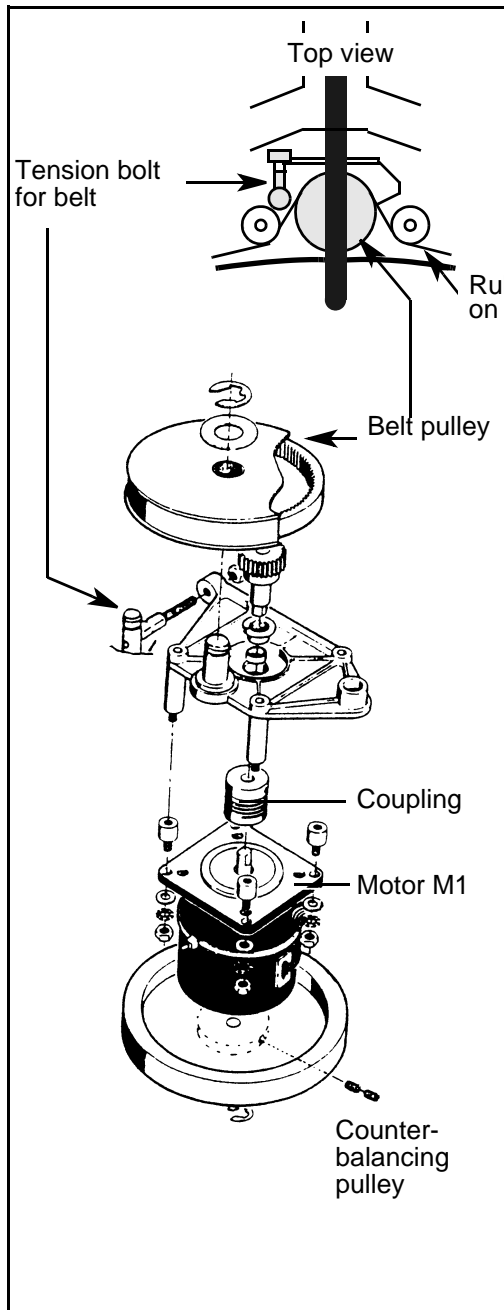




- Height adjustment keys must not be pressed during self-adjustment of the unit!



### 3.22 Correcting error of message E3 12: Key for height adjustment pressed during unit self-adjustment.



- Check rotation ring for possible mechanical faults: move the X-ray tube assy by hand over the entire rotation range. X-ray tube assy must move smoothly without grinding noise
- Possible faults: weight compensation disk on motor M1, rooting of cable L4 in rotation ring, cable ties, covers.
- Possible electrical faults: connectors X5 and X7 on DX1 must be properly inserted
- Do supply voltages reach DX1? → LEDs V10-14 on DX3 must light up!

Move the X-ray tube assembly by hand to its end position.  
Press the R key on the Multitimer.

Drive motor jerks, error message E3 33 appears after about 16 sec.

Drive motor does not run, E3 33 appears after about 16 sec.

Move the X-ray tube assembly by hand to its start position. Unplug K6. Press the T key on the Multitimer. Motor M1 runs and error message E3 32 appears?

yes  
Light barrier V1 defective. Replace.

Are contacts K4 and X5.1 - 4 OK?

no → Repair contact problem

yes

Check cable L5 for continuity. OK?

no → Repair or replace

yes

Check the winding resistors with a multimeter. Is resistance  $5 \Omega \pm 15 \%$ ?

no → Motor M1 defective. Replace, see page 6 - 5

yes

Check connection between winding and motor housing with continuity tester. Does connection exist?

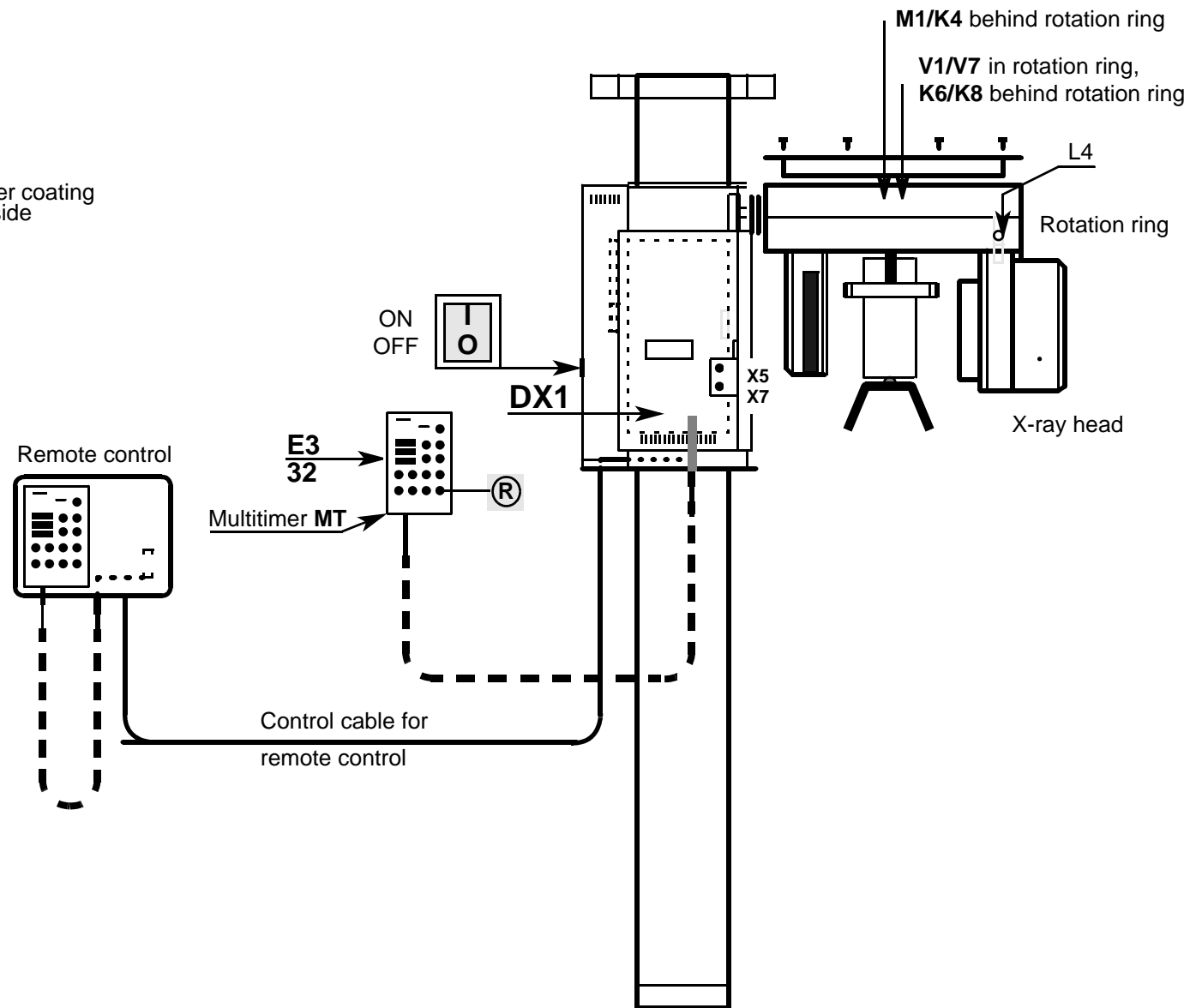
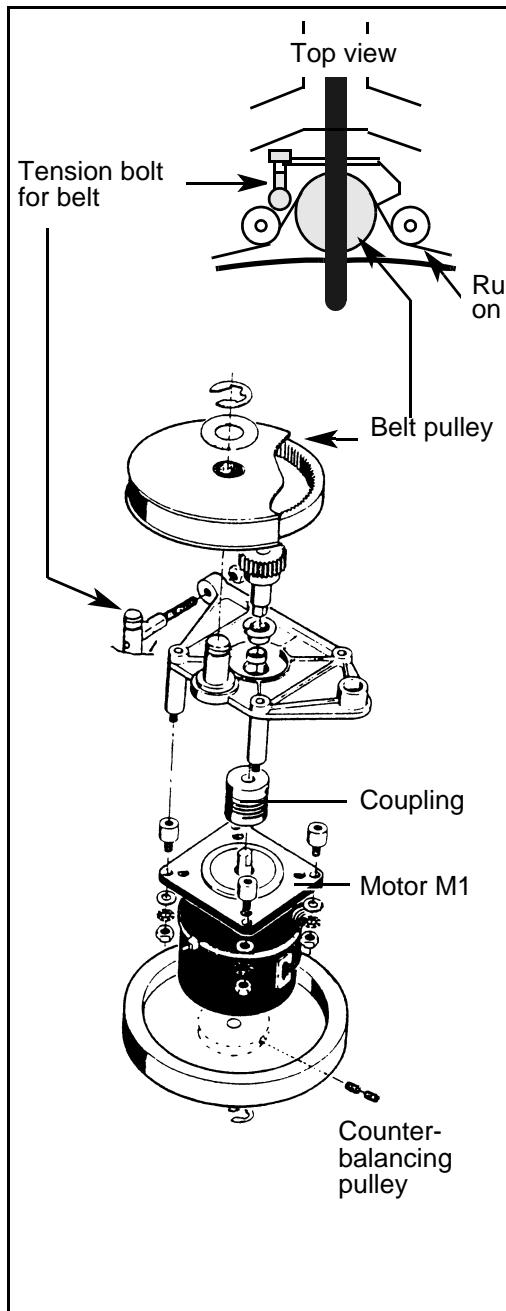
no → Replace board DX1  
• Perform 'Adjusting board DX1', see page 4 - 31

yes

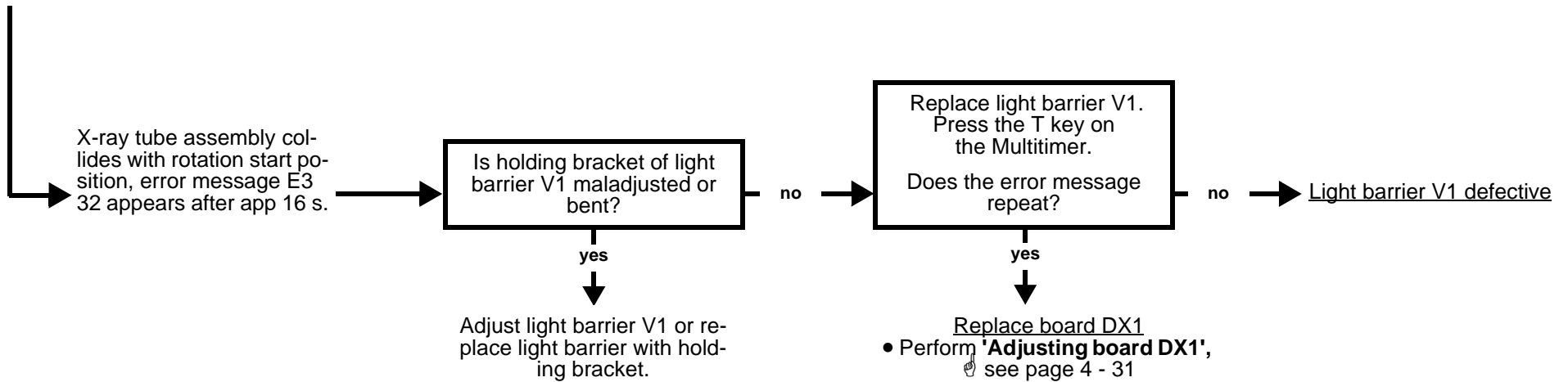
Motor M1 defective. Replace, see page 6 - 5

Continued on next page

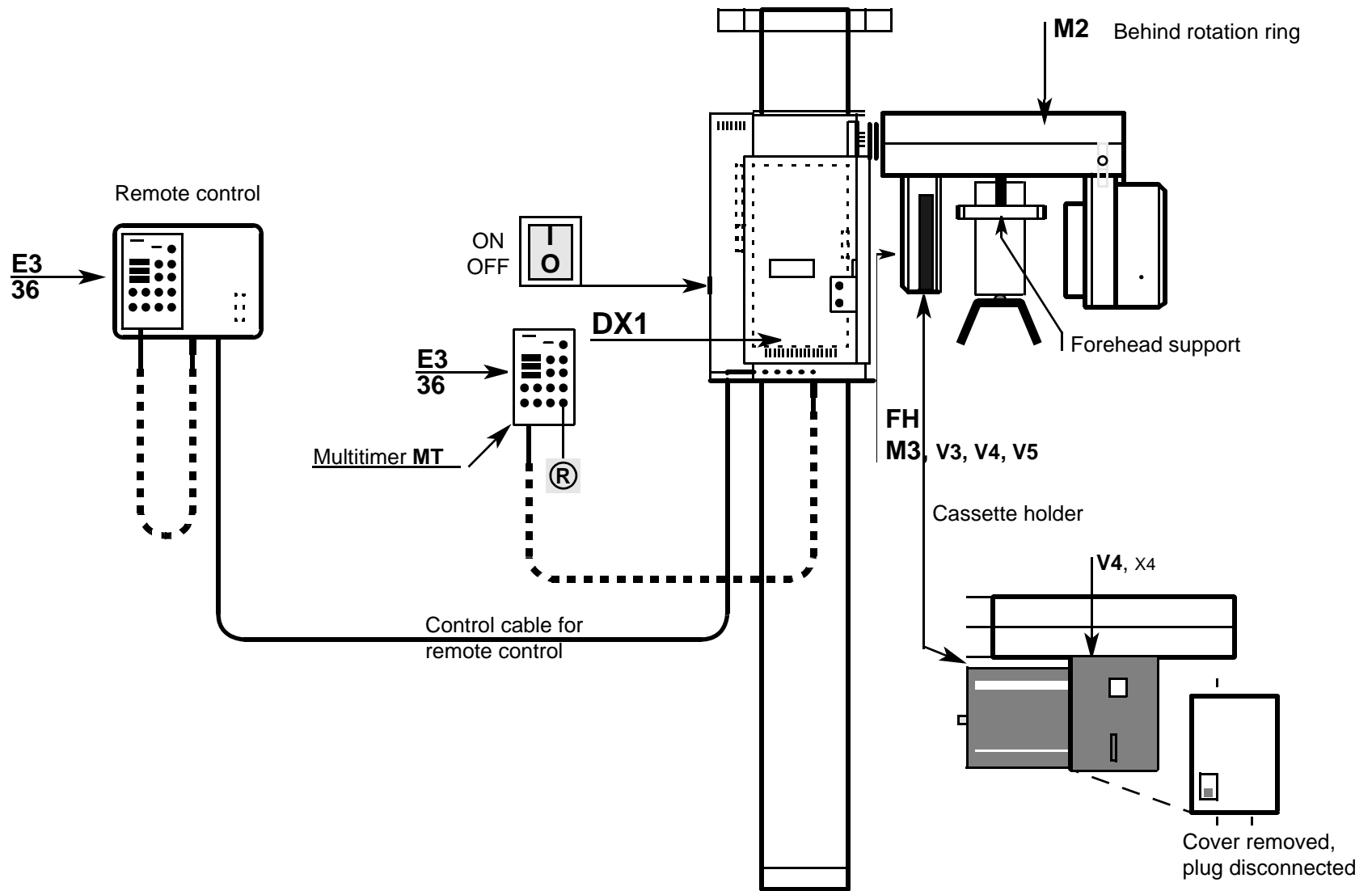
### 3.23 Correcting error of messages E3 32, E3 33: Start position for rotation was not exited/reached.



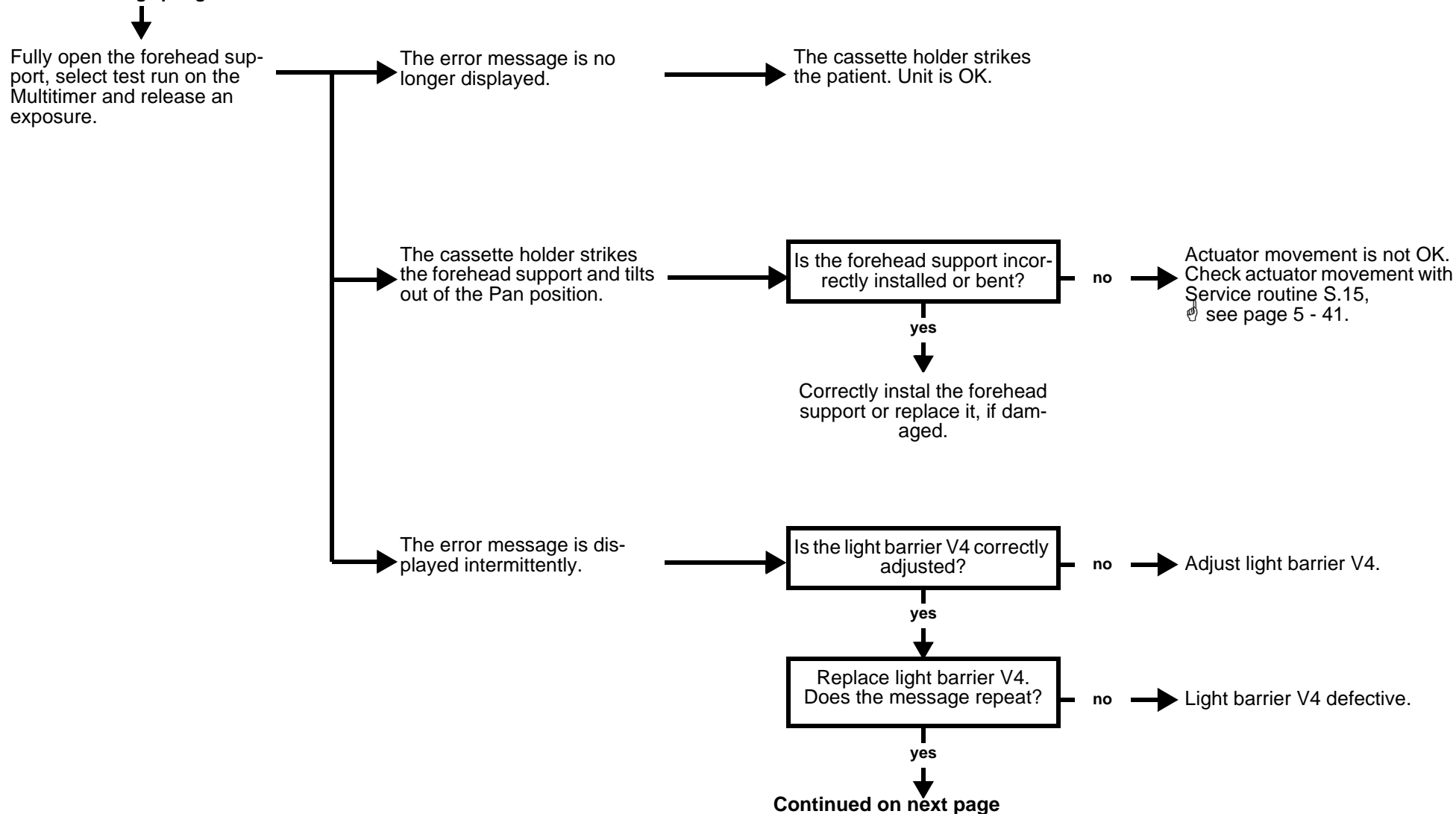
continued



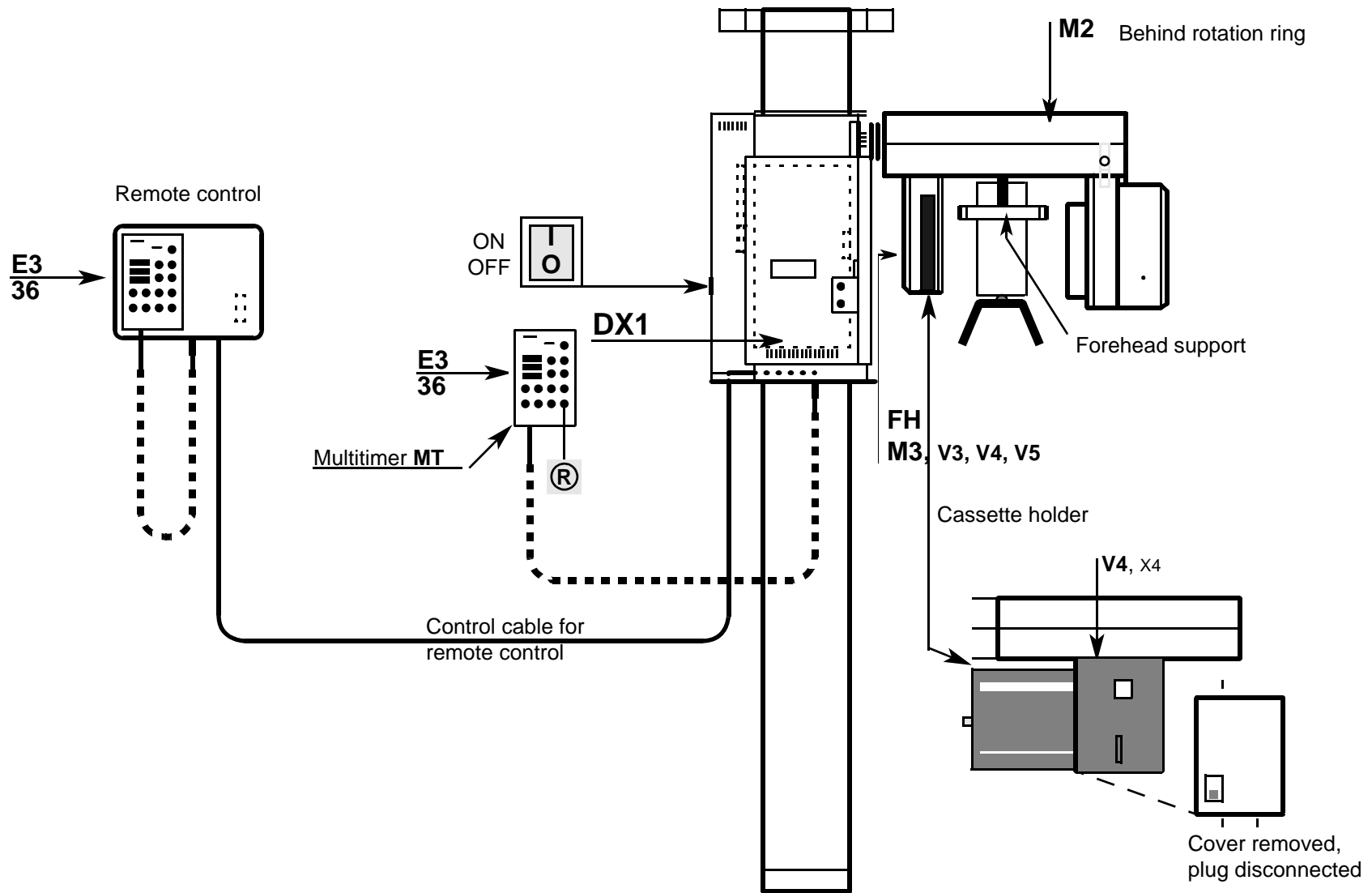
### 3.23 Correcting error of messages E3 32, E3 33: Start position for rotation was not exited/reached.



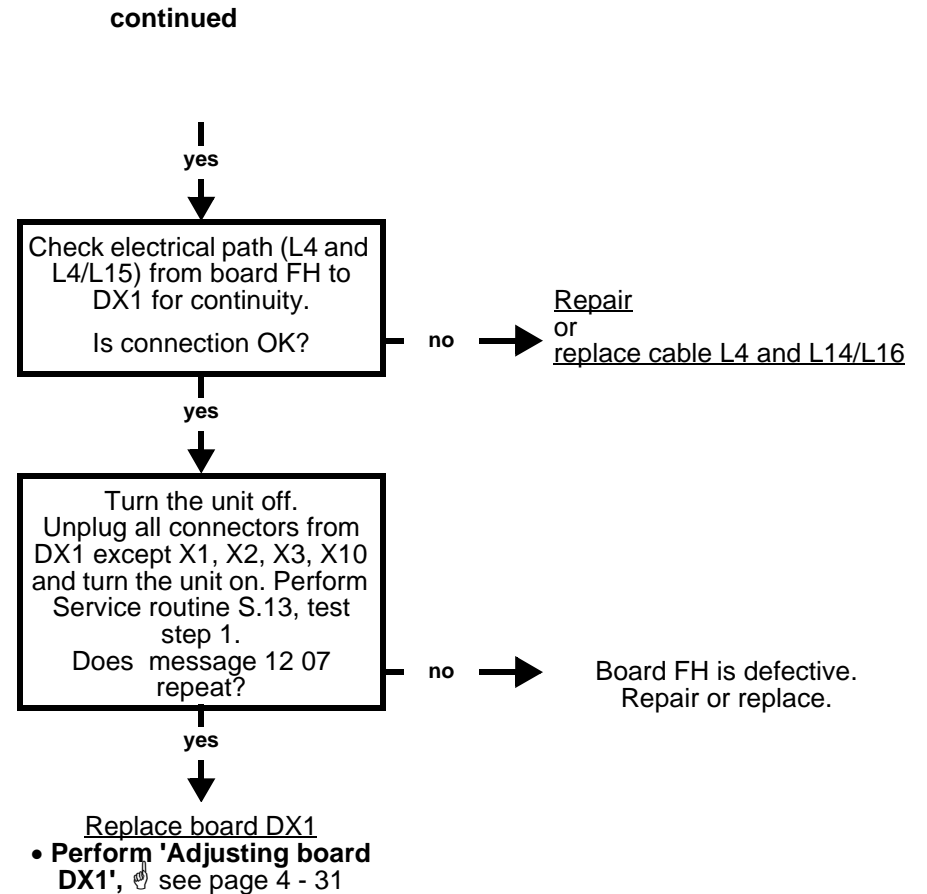
- Body parts or clothing, bandages and the like must not interfere with unit functions.  
Start test run with the T key. During the movement the cassette holder must not come into contact with the patient.  
Does retaining spring still have sufficient mechanical tension?



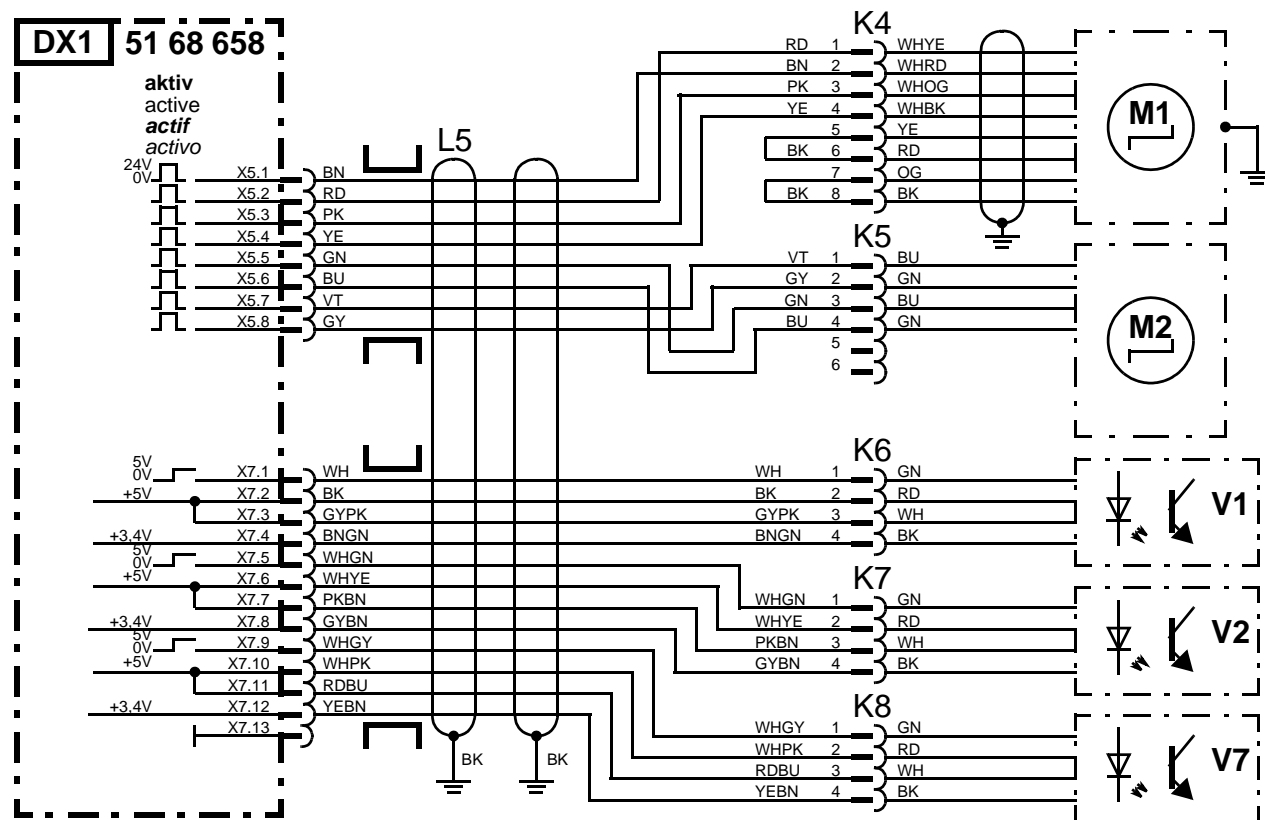
### 3.24 Correcting error of message E3 36: Cassette holder was swivelled from the Pan position during Pan exposure.



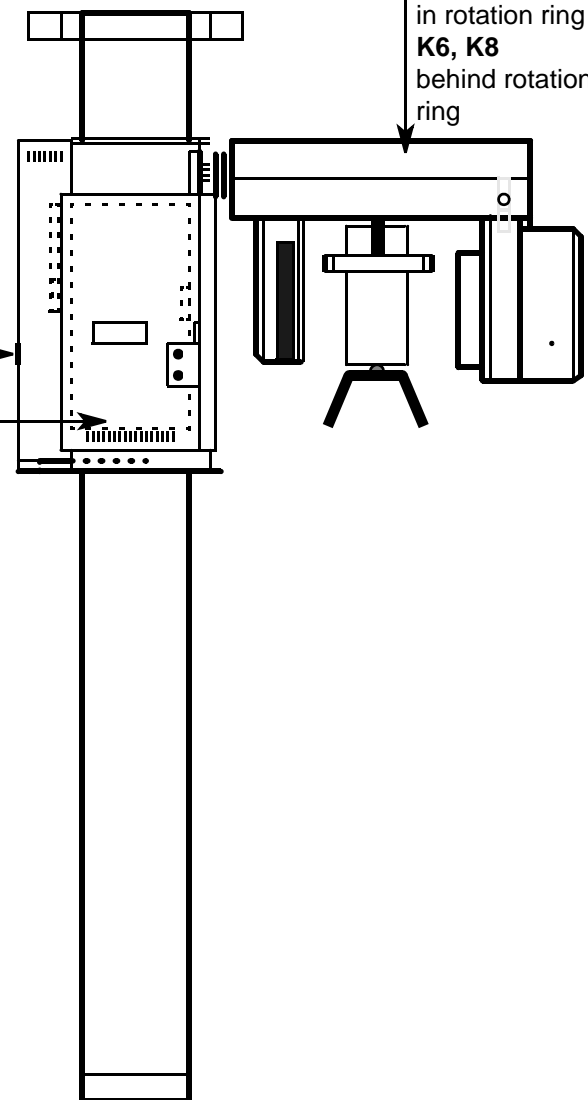




### 3.24 Correcting error of message E3 36: Cassette holder was swivelled from the Pan position during Pan exposure.



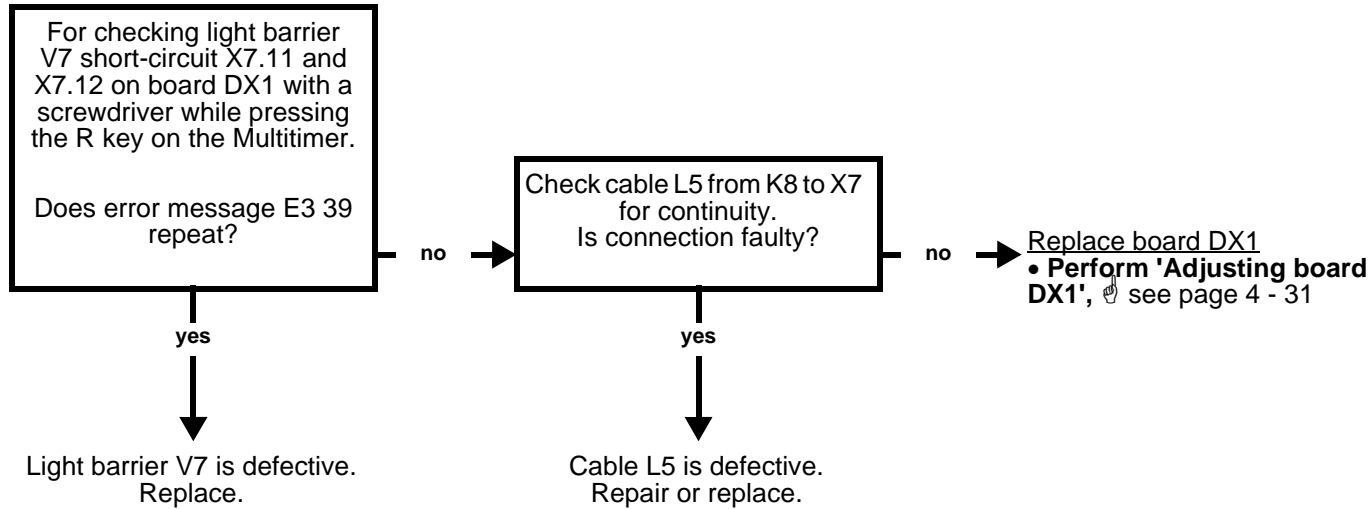
DX1



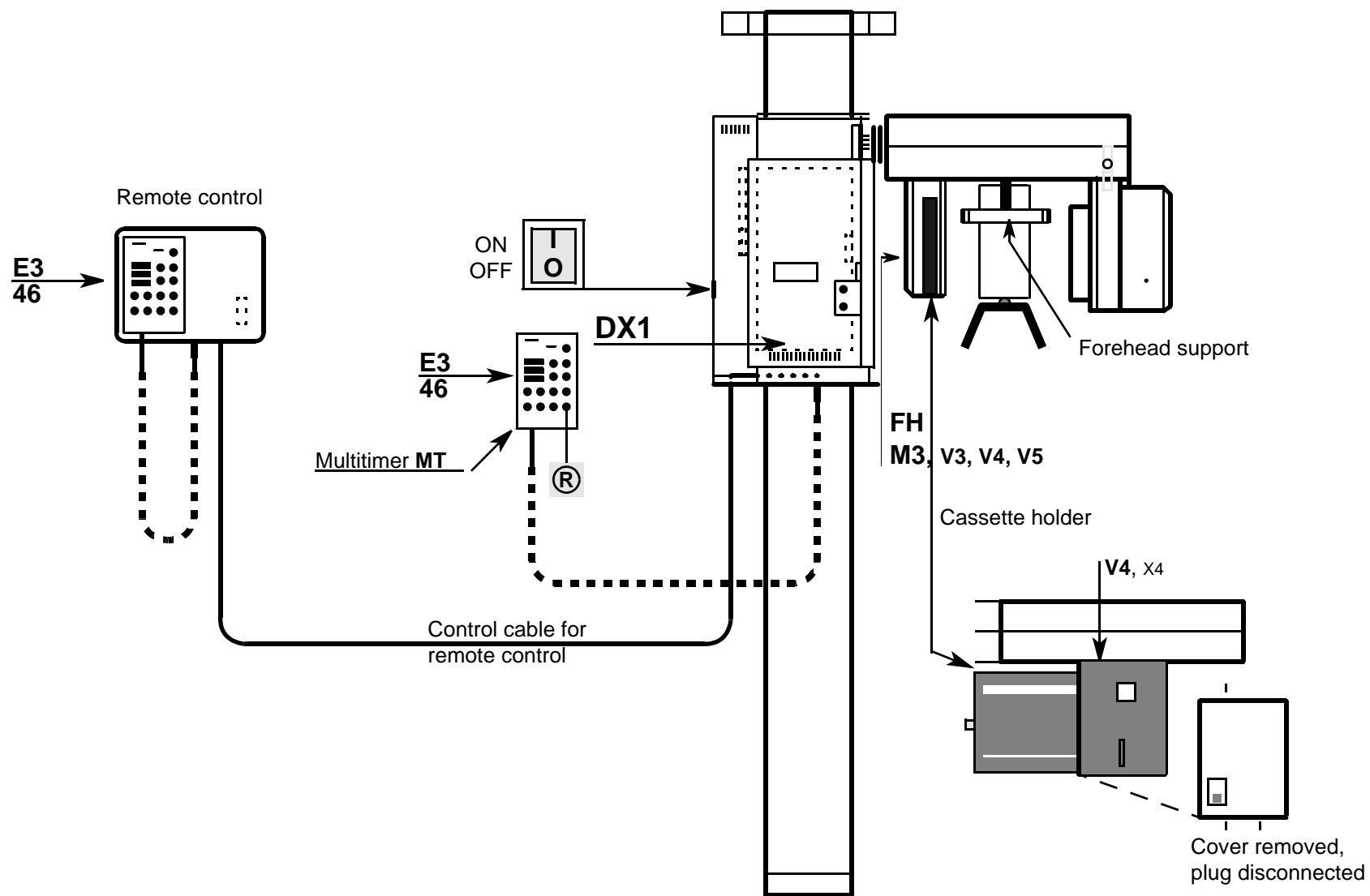
**CAUTION: Always switch the unit OFF before connecting a measuring instrument or replacing any components!**

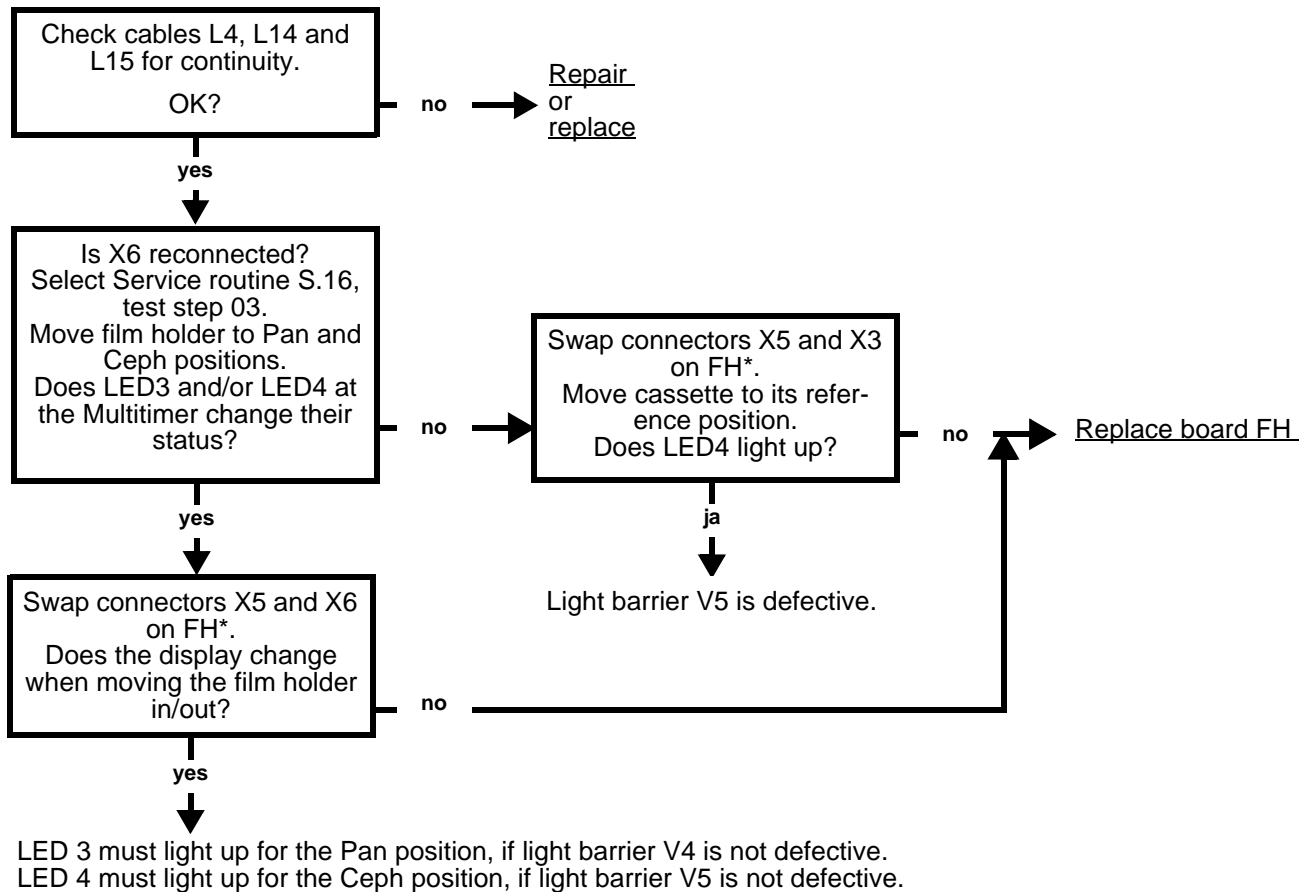
58 35 744 D 3285  
D 3285.077.02.06.02 07.2004

- Is seating of plugs K6, K and K8 and X7 on board DX1 OKi?  
Check V1, Function test with Service Routine S.14.



### 3.25 Correcting error of message E3 39 / E3 42: Light barrier for Ceph position rotation indicates invalid status

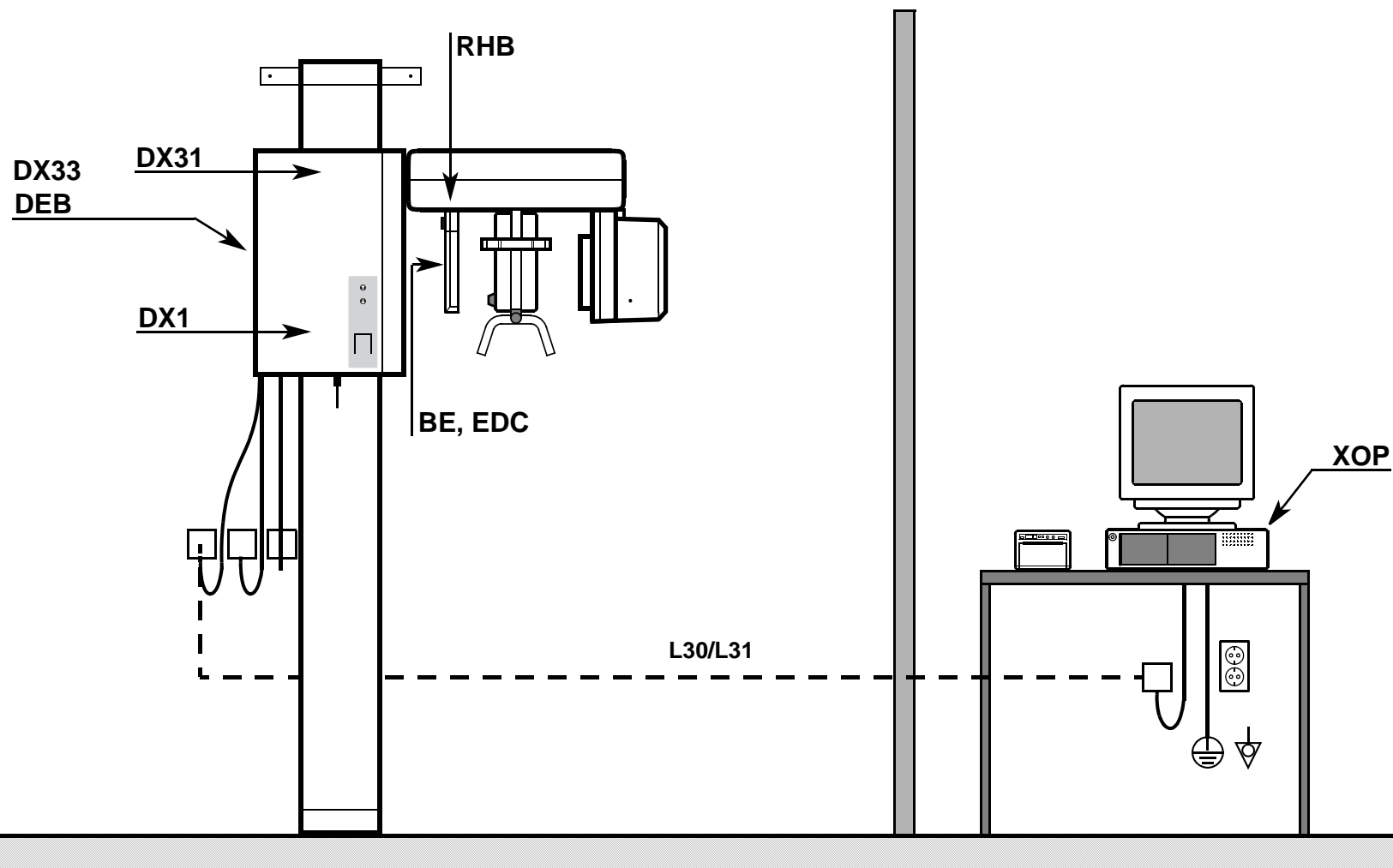


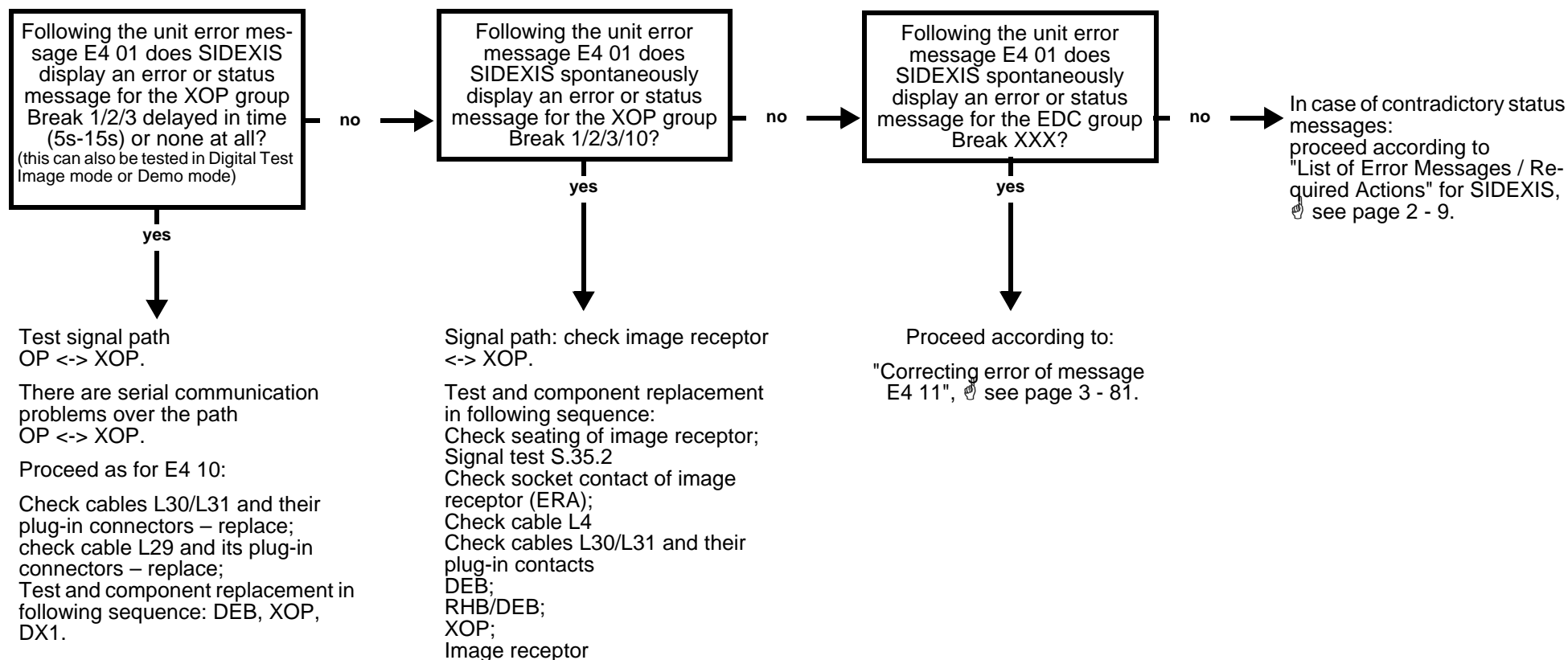


\* After the test put the connector back to its proper position.

### 3.26 Correcting error of message E3 46: Position of cassette holder cannot be determined.

up to serial no. 30 999 ORTHOPHOS 3 DS





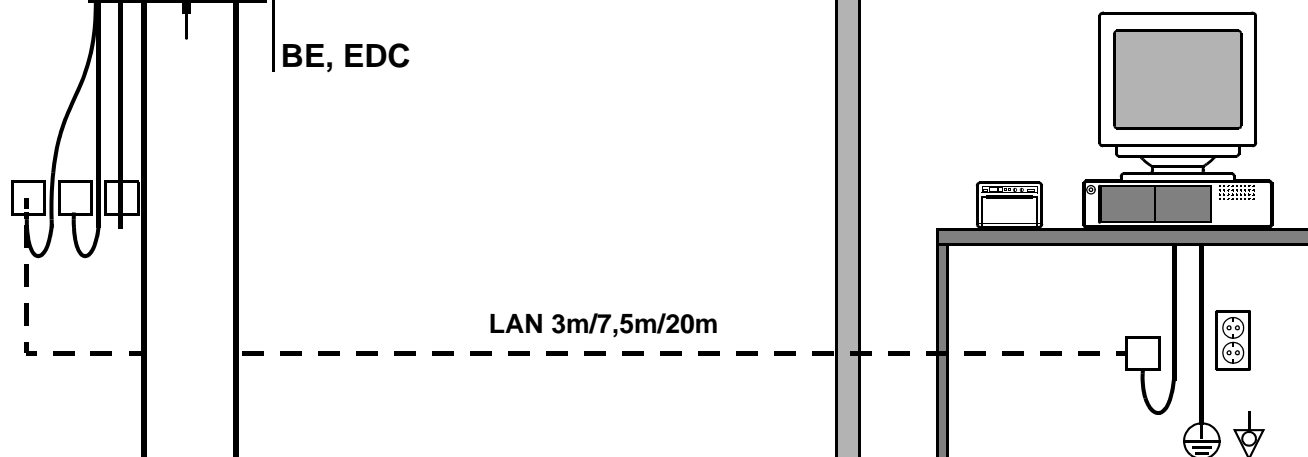
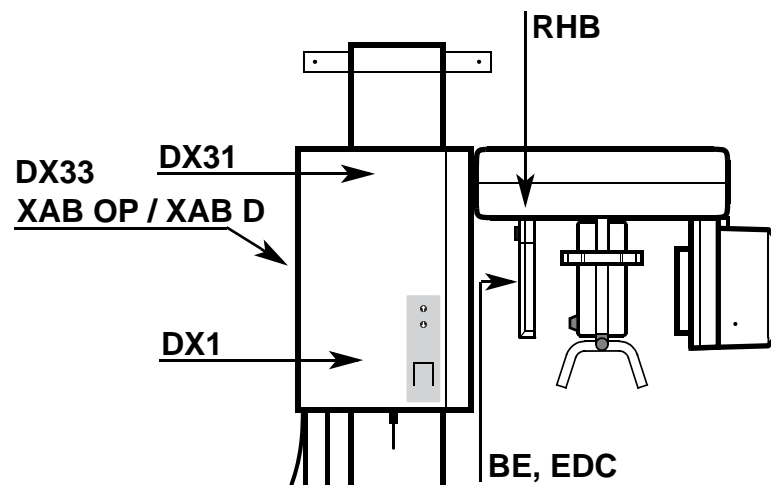
**NOTE**

SIDEXIS error message: Displayed in error box, require acknowledging.  
Occur if no image data present.  
(XOP Break, EDC Break etc.)

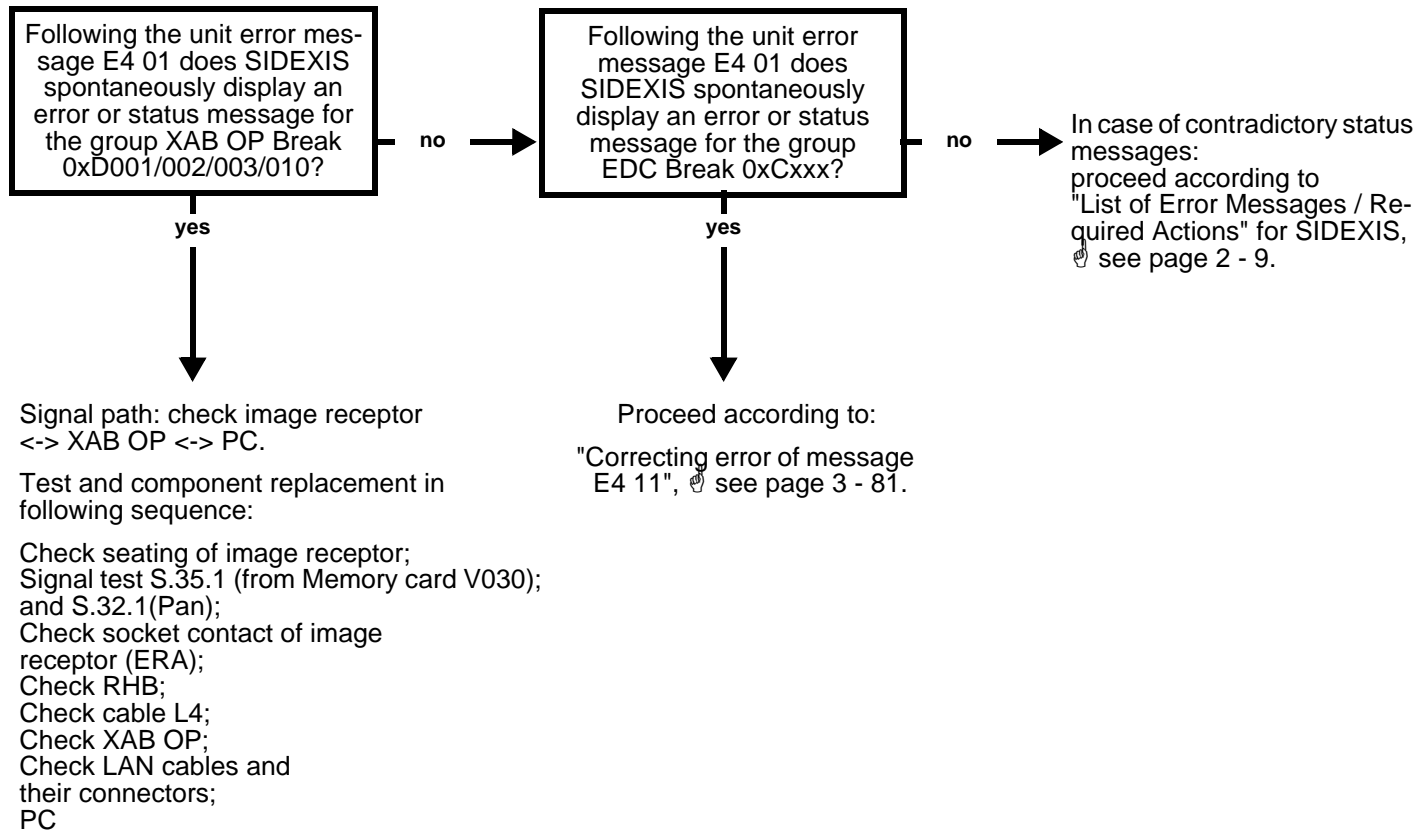
SIDEXIS status messages: Displayed for limited time in exposure readiness dialog box  
(XOP Break, EDC Break etc.)  
when image data are present.

### 3.27 Correcting error of message E4 01: Exposure aborted by SIDEXIS (with XOP).

from serial no. 31 000 ORTHOPHOS 3 DS







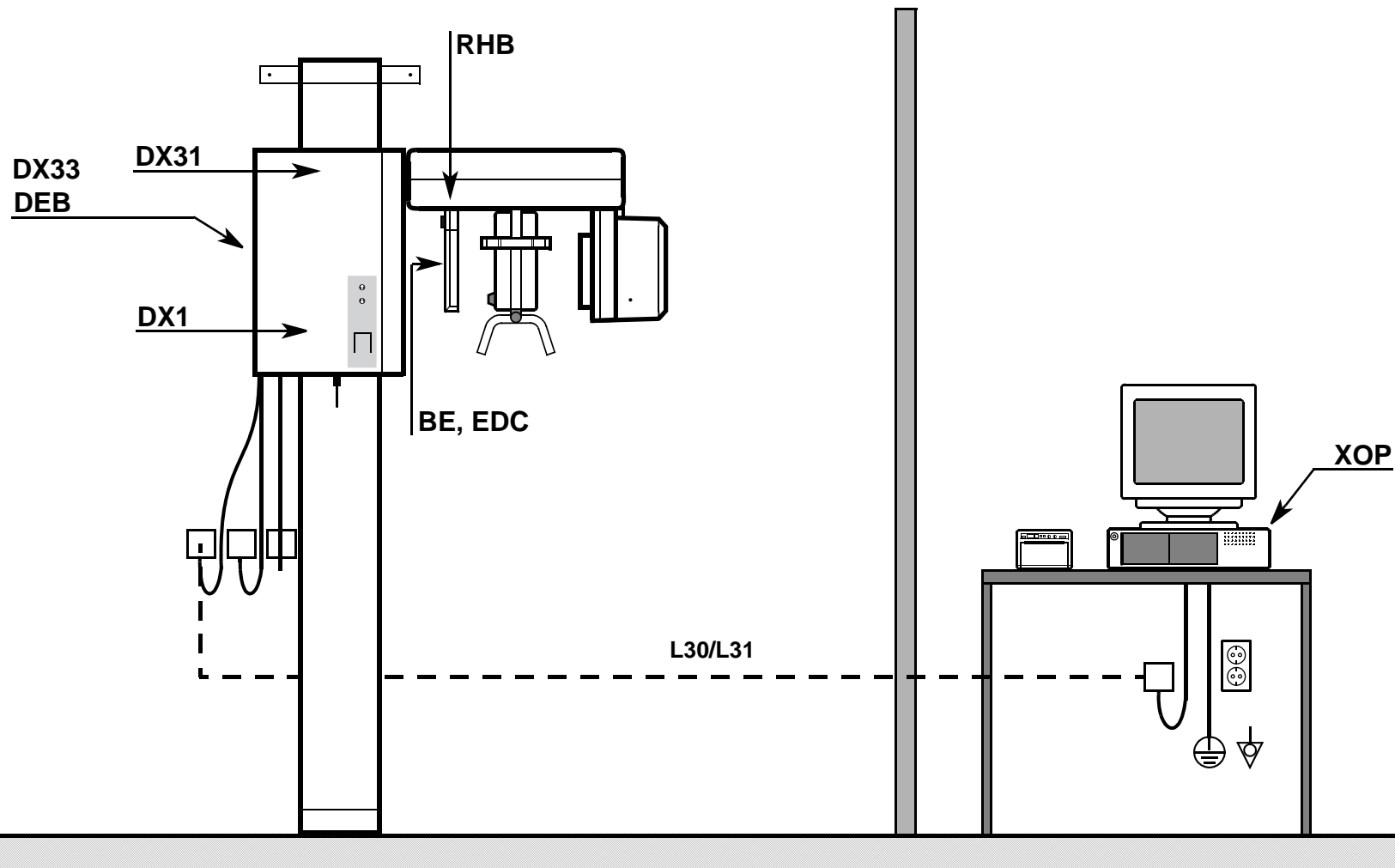
**NOTE**

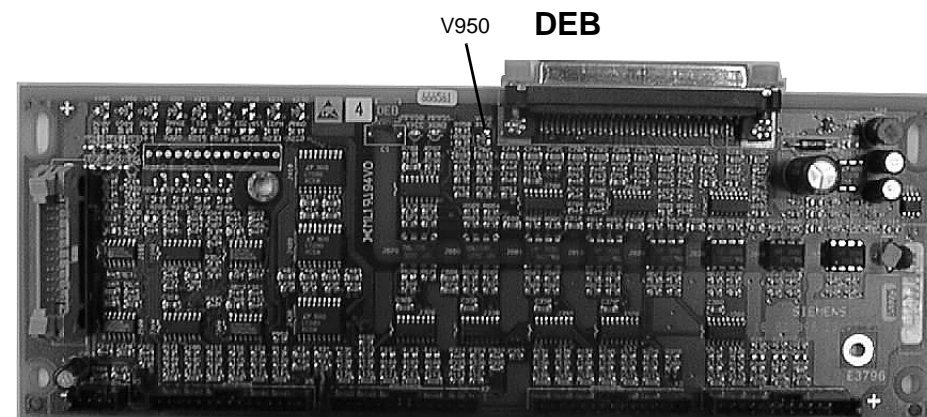
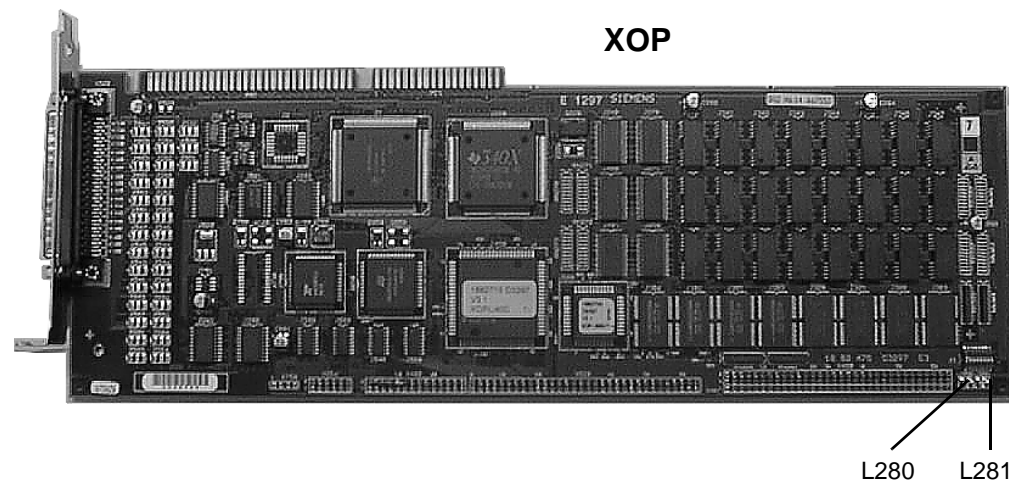
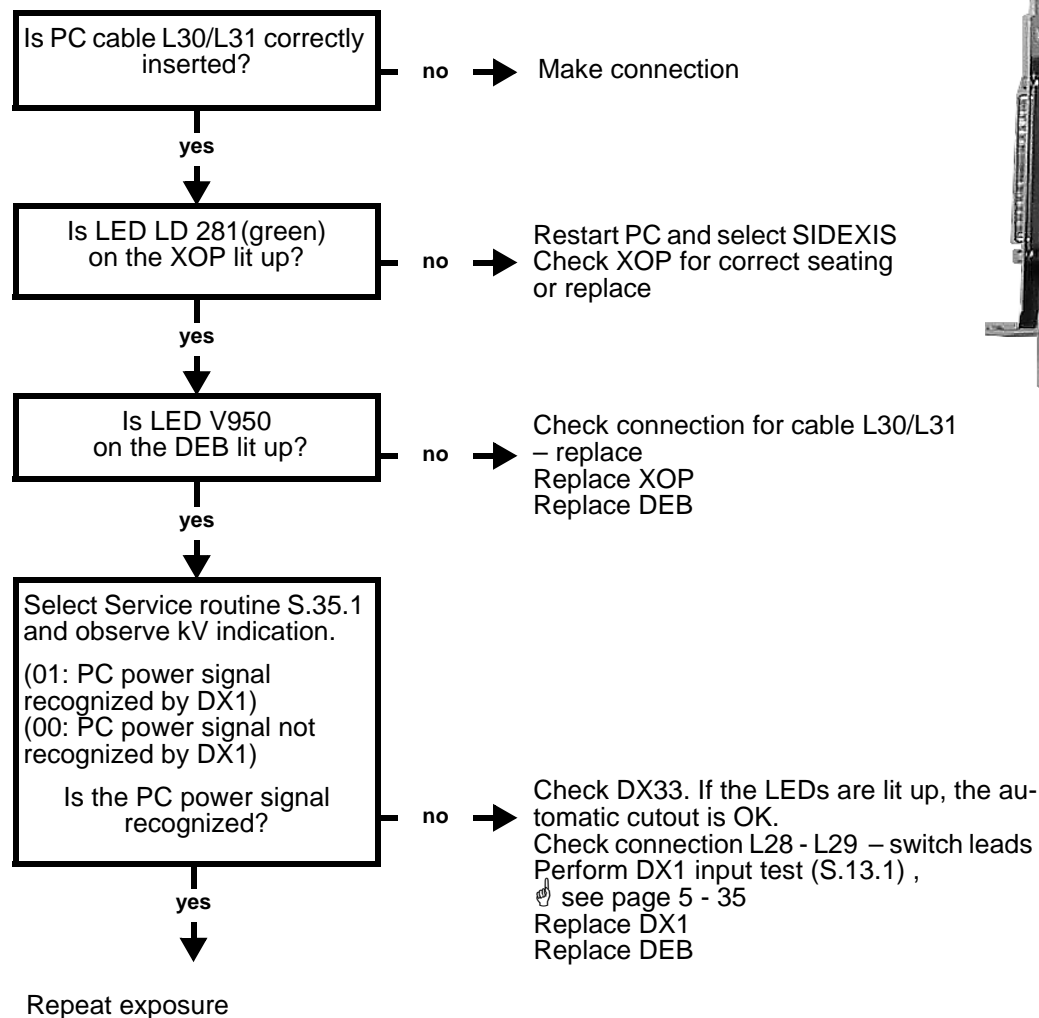
SIDEXIS error message: Displayed in error box, require acknowledging.  
Occur if no image data present.  
(XAB OP Break, EDC Break etc.)

SIDEXIS status messages: Displayed for limited time in exposure readiness dialog box  
(XAB OP Break, EDC Break etc.)  
when image data are present.

### 3.28 Correcting error of message E4 01: Exposure aborted by SIDEXIS (with XAB)

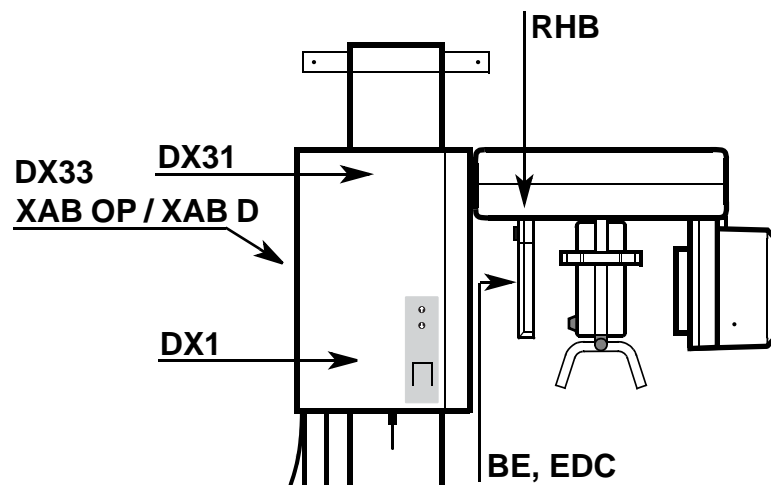
up to serial no. 30 999 ORTHOPHOS 3 DS



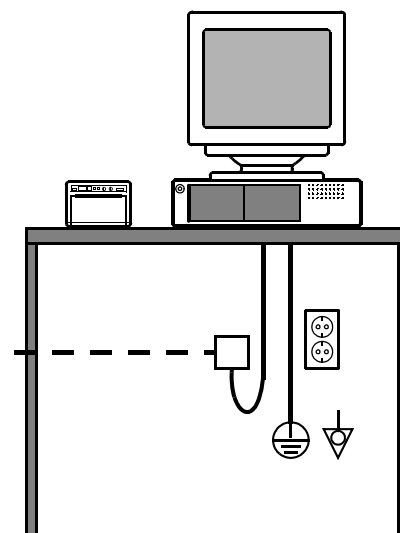


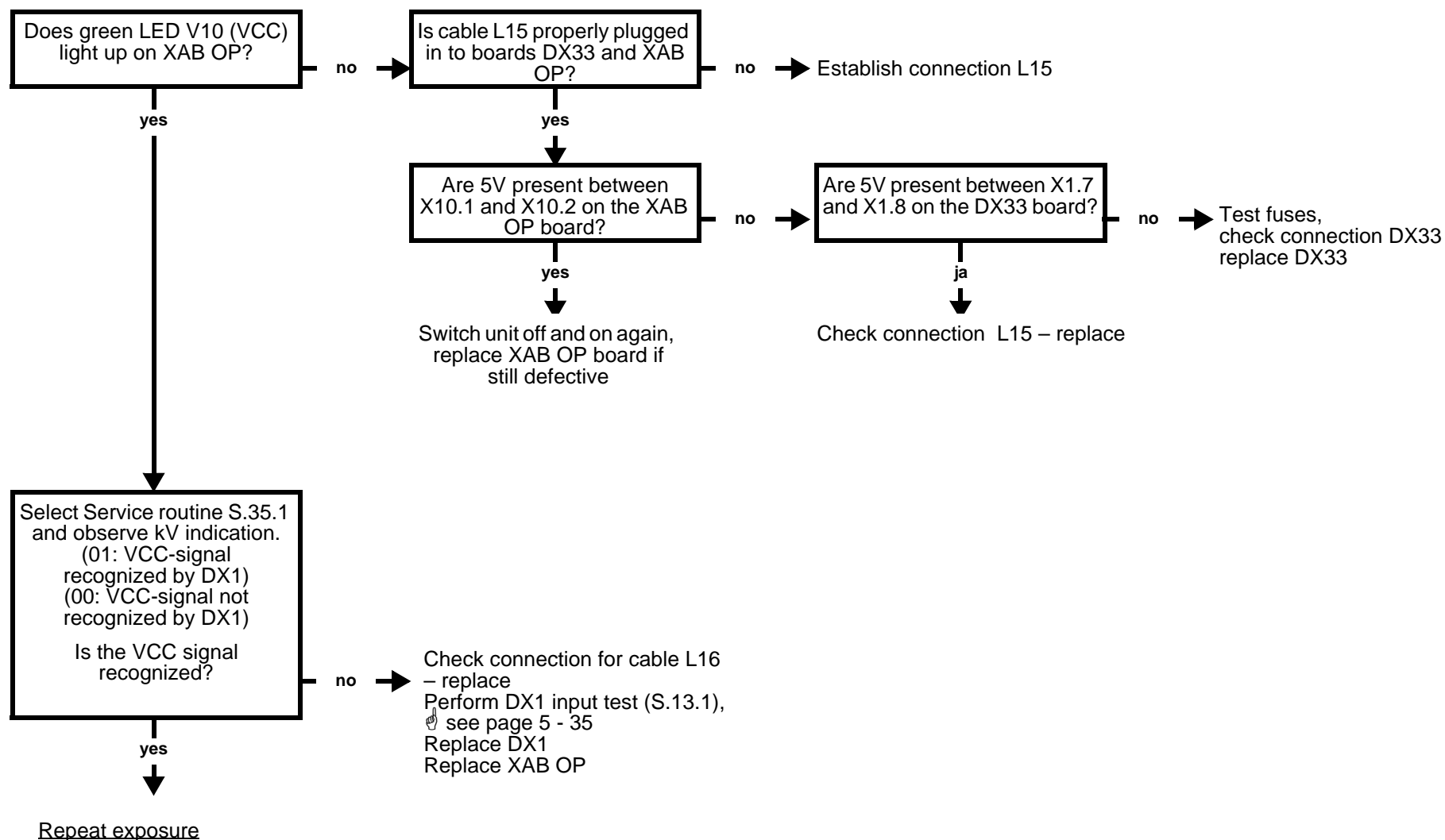
### 3.29 Correcting error of message E4 06: Fault at one of the supply voltages (with XOP).

from serial no. 31 000 ORTHOPHOS 3 DS



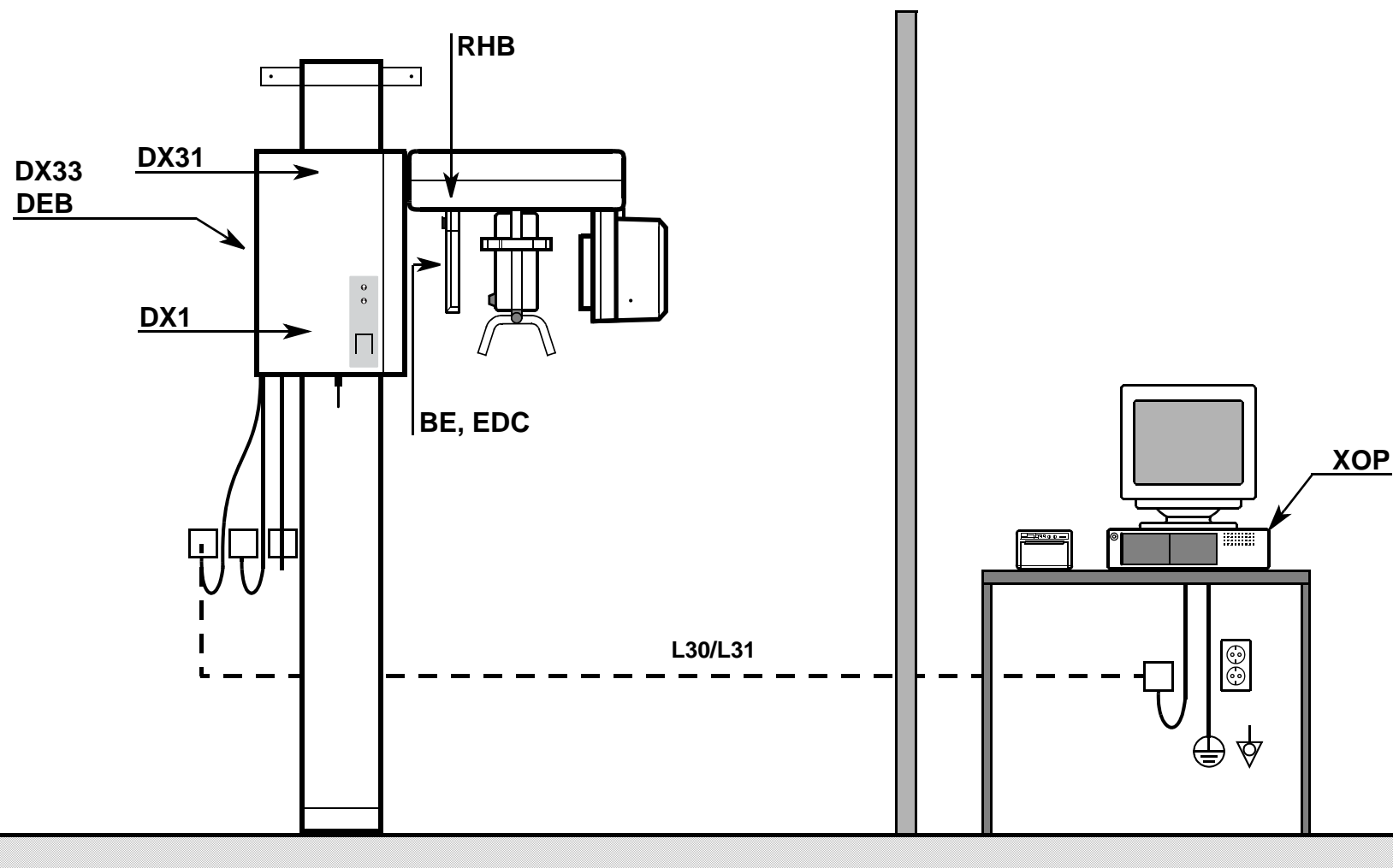
LAN 3m/7,5m/20m



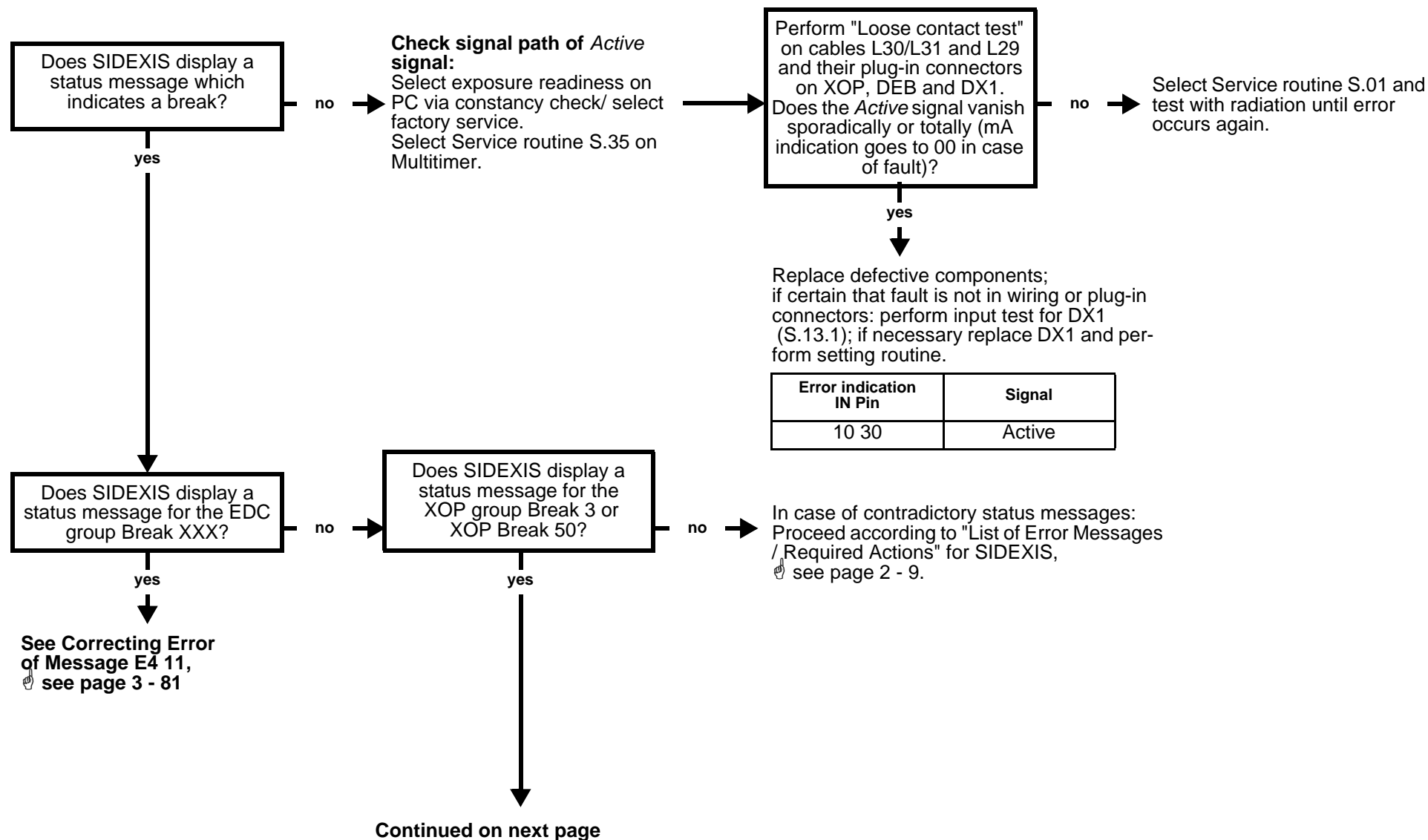


### 3.30 Correcting error of message E4 06: Fault at one of the supply voltages (with XAB)

up to serial no. 30 999 ORTHOPHOS 3 DS

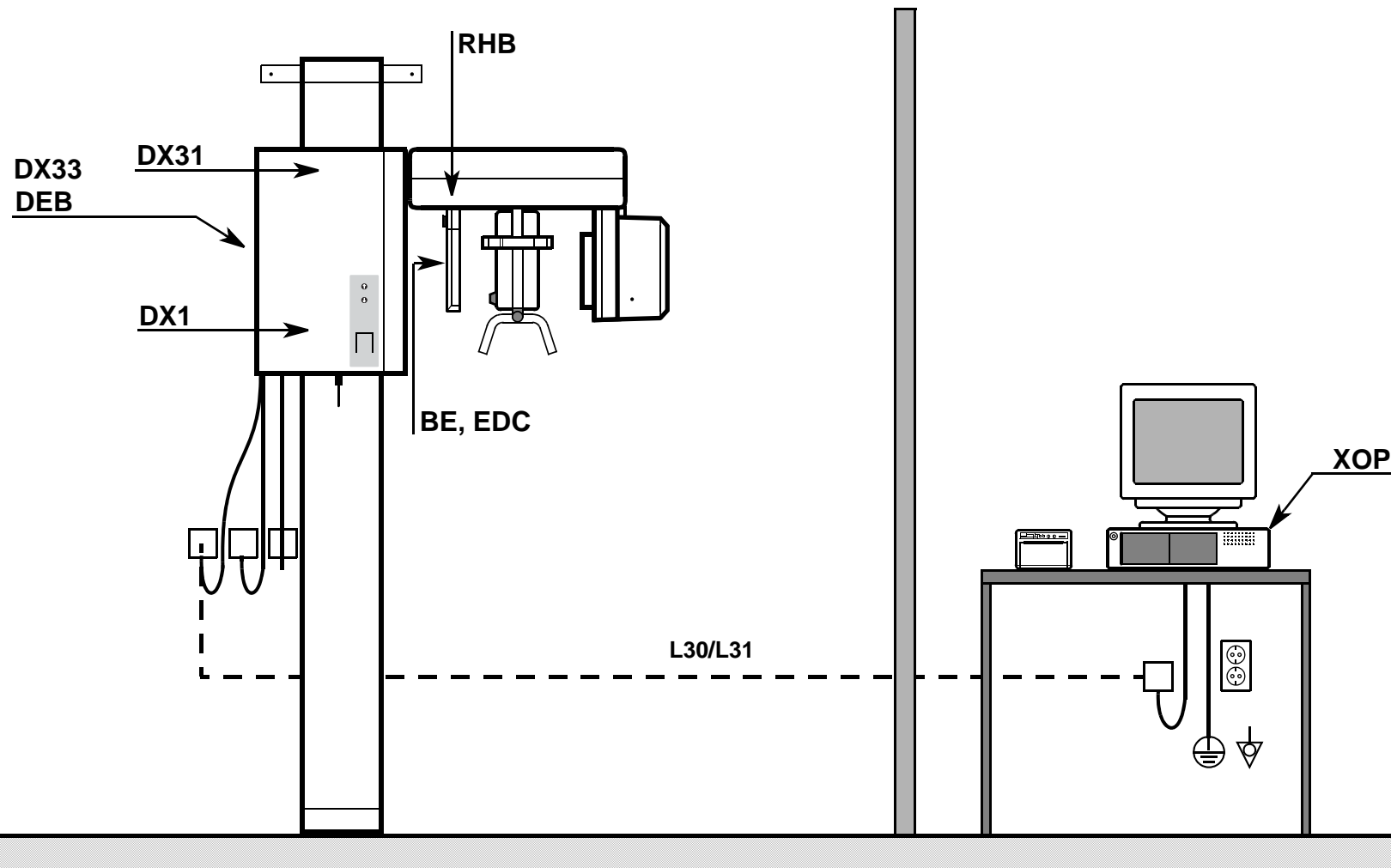


for normal operation only



### 3.31 Correcting error of message E4 08: Aborted by SIDEXIS during radiation (with XOP)

up to serial no. 30 999 ORTHOPHOS 3 DS





continued



Select Service routine S.32.2  
and perform.  
Switch on image receptor and TDI  
with X-Ray button.  
Observe LEDs on DEB:



Is correct position selected?  
(V232 lit up)

Is image receptor  
switched to  
Image mode?  
(V221 lit up)

Are TDI signals output?  
(V216 glows with half  
brightness)

Perform  
"Loose connection test"  
on L29 and its plug-in  
connectors on DX1  
and DEB.

Are all signals stable?

no



**Check signal path DX1 <-> DEB**  
according to situation replace defective  
component: wiring, DEB, DX1.

yes

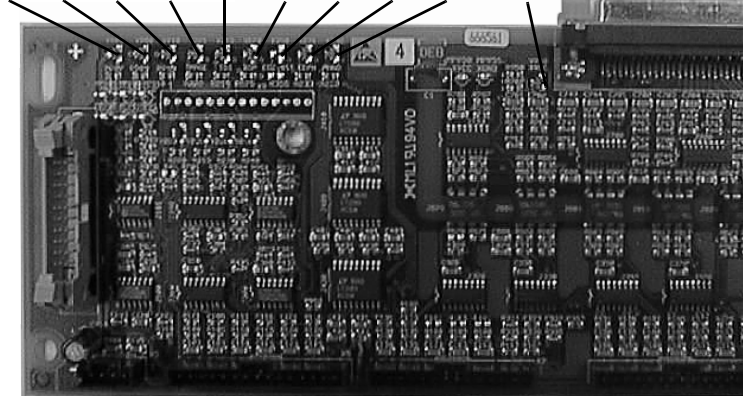


**Signal path: check image receptor <-> DEB <-> XOP**  
Test und component replacement in following sequence:

Check seating of image receptor;  
Signal test S.35.2  
Check socket contact of image receptor (ERA);  
Check cable L4  
Check cables L30/L31 and their plug-in connectors;  
DEB;  
RHB/DEB;  
XOP;  
Image receptor

**DEB**

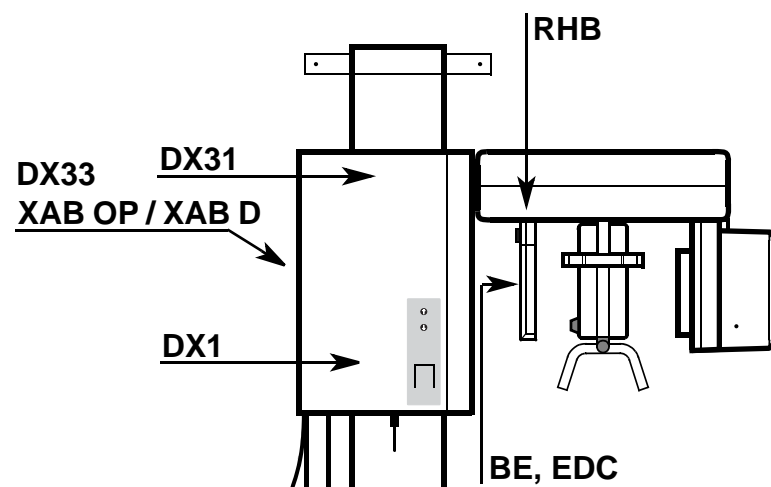
V905 V900 V910 V221 V216 V670 V350 V231 V232 V950



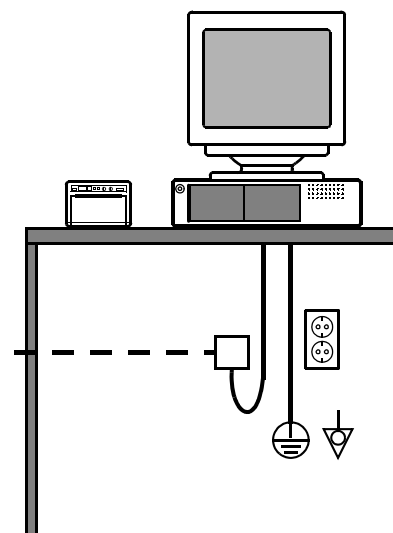
**To simplify recognition of LEDs unscrew extension box  
and attach to side.**

### 3.31 Correcting error of message E4 08: Aborted by SIDEXIS during radiation (with XOP)

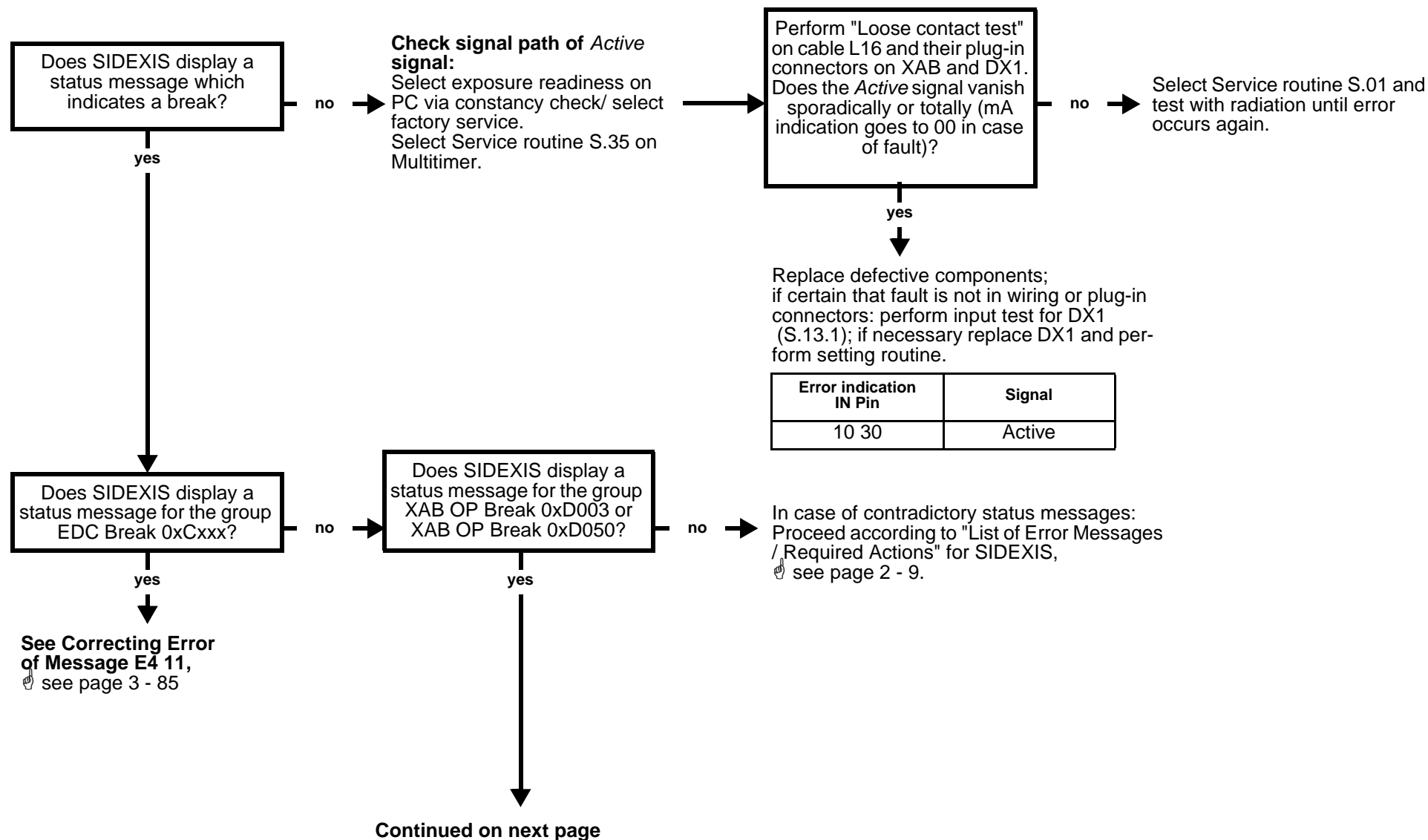
from serial no. 31 000 ORTHOPHOS 3 DS



LAN 3m/7,5m/20m

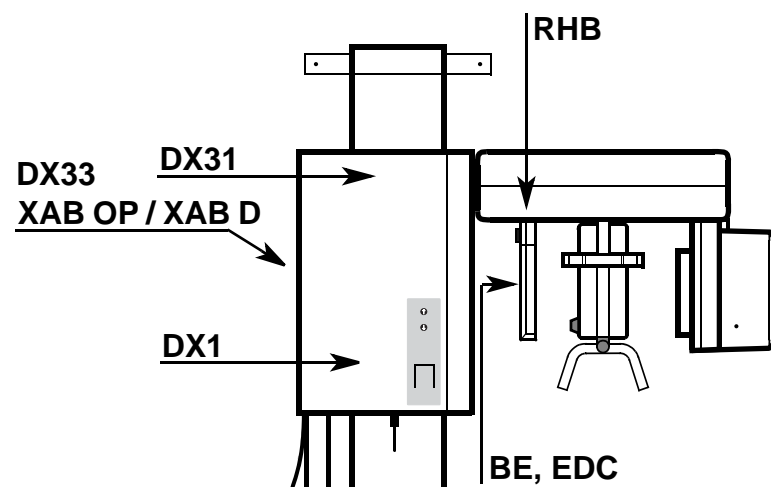


for normal operation only

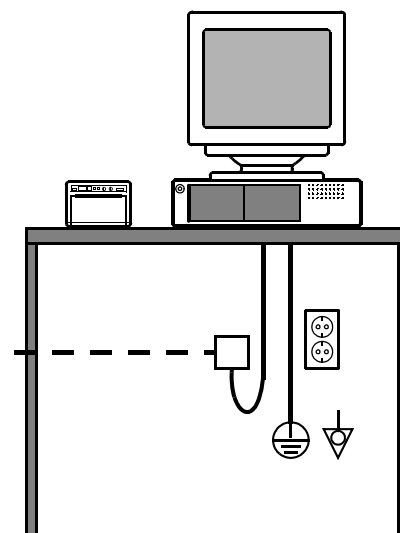


### 3.32 Correcting error of message E4 08: Aborted by SIDEXIS during radiation (with XAB)

from serial no. 31 000 ORTHOPHOS 3 DS



LAN 3m/7,5m/20m



↓  
Select Service routine S.32.2 and perform.  
Switch on image receptor and TDI with X-Ray button.  
Observe LEDs on XAB OP:

↓  
Is correct position selected?  
(V8 lights up for Pan)  
Is image receptor switched to Image mode?  
(V6 lit up)  
Are TDI signals output?  
(V5 glows with half brightness)  
Perform "Loose connection test" on L16 and its plug-in connectors on DX1 and XAB OP.  
Are all signals stable?

no →

**Check signal path DX1 <-> XAB OP**  
according to situation replace defective component: wiring, XAB OP, DX1.

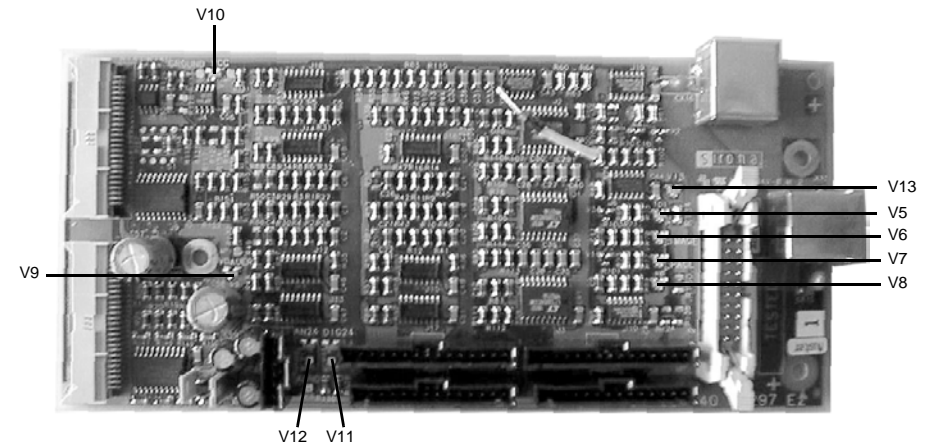
yes ↓

**Signal path: check image receptor <-> XAB OP**

Test und component replacement in following sequence:

Check seating of image receptor;  
Signal test S.35.2;  
Check socket contact of image receptor (ERA);  
Check RHB  
Check cable L4;  
Check XAB OP;  
Check LAN cables and their connectors;  
PC

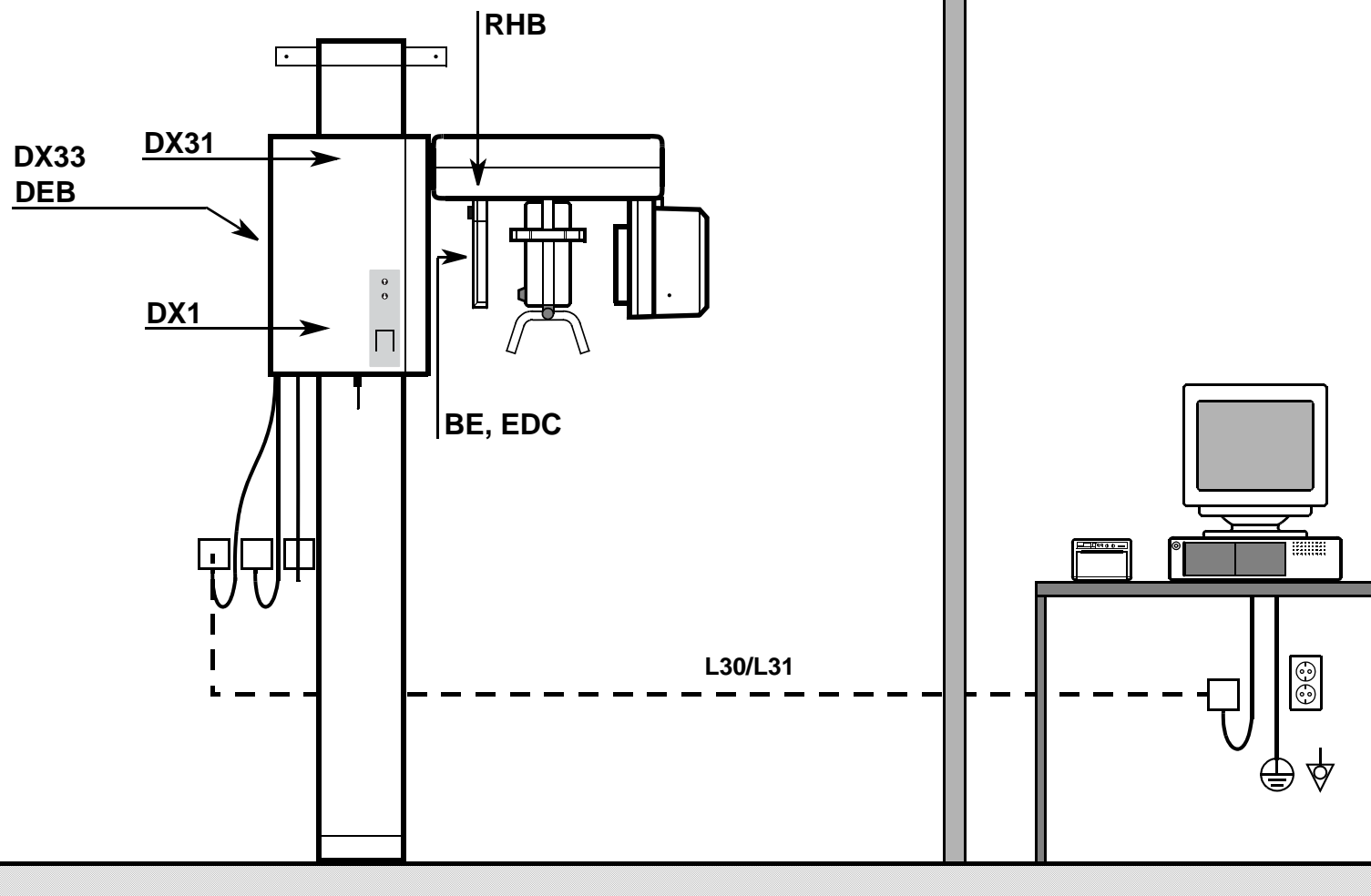
**XAB OP**



**To simplify recognition of LEDs unscrew extension box and attach to side.**

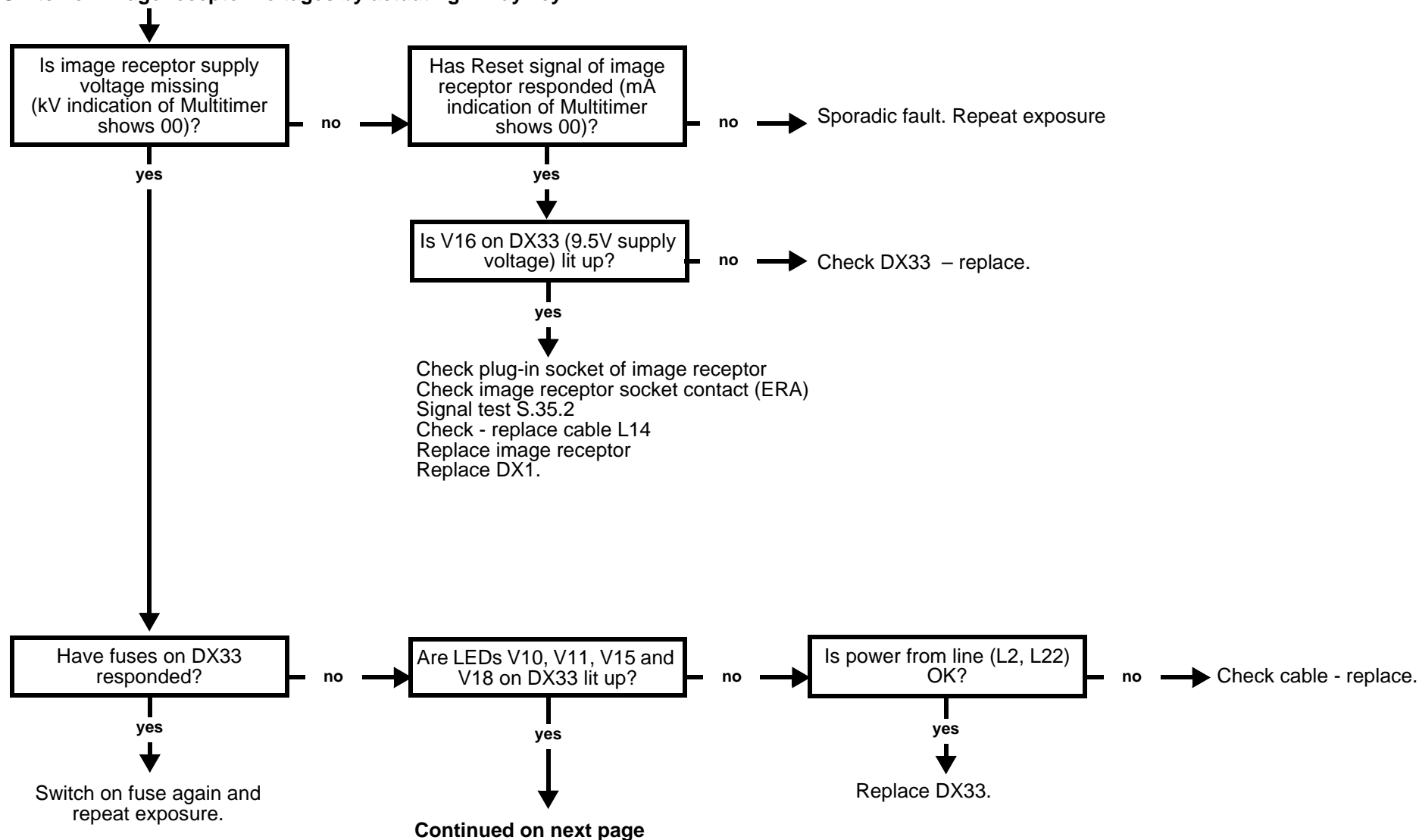
### 3.32 Correcting error of message E4 08: Aborted by SIDEXIS during radiation (with XAB)

up to serial no. 30 999 ORTHOPHOS 3 DS



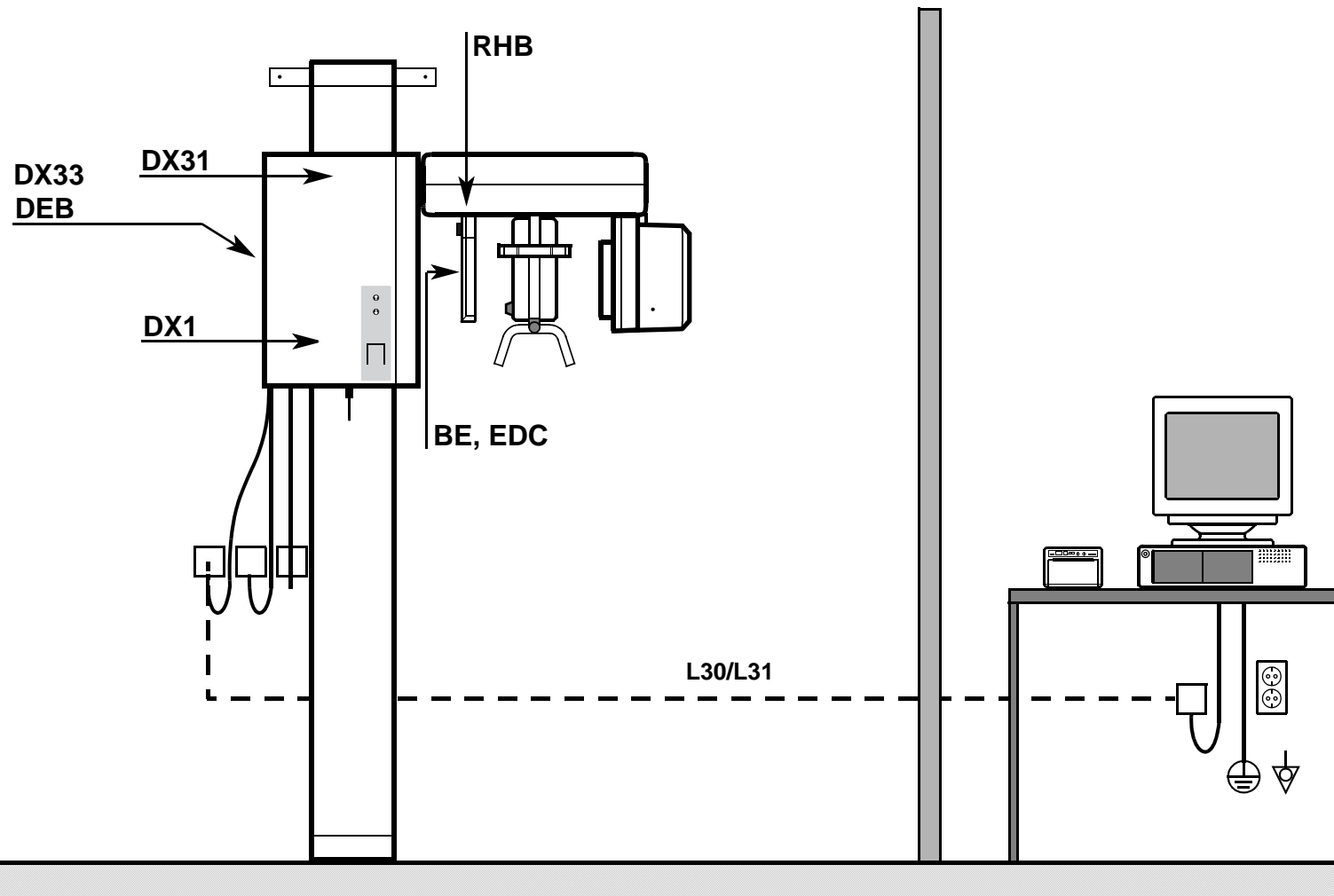
Service-Routine S.32.1 durchführen.

Switch on image receptor voltages by actuating X-Ray key.

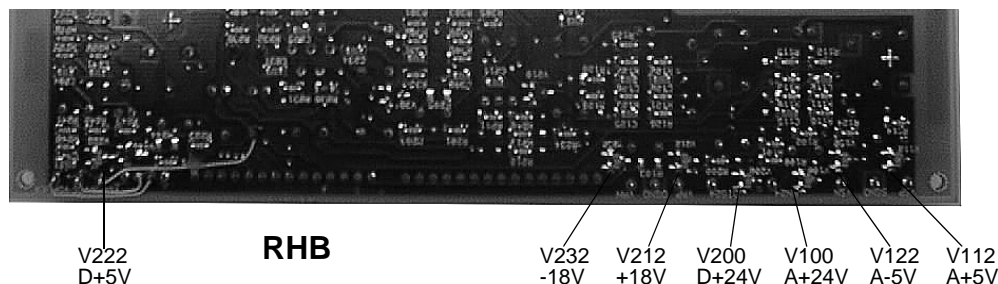
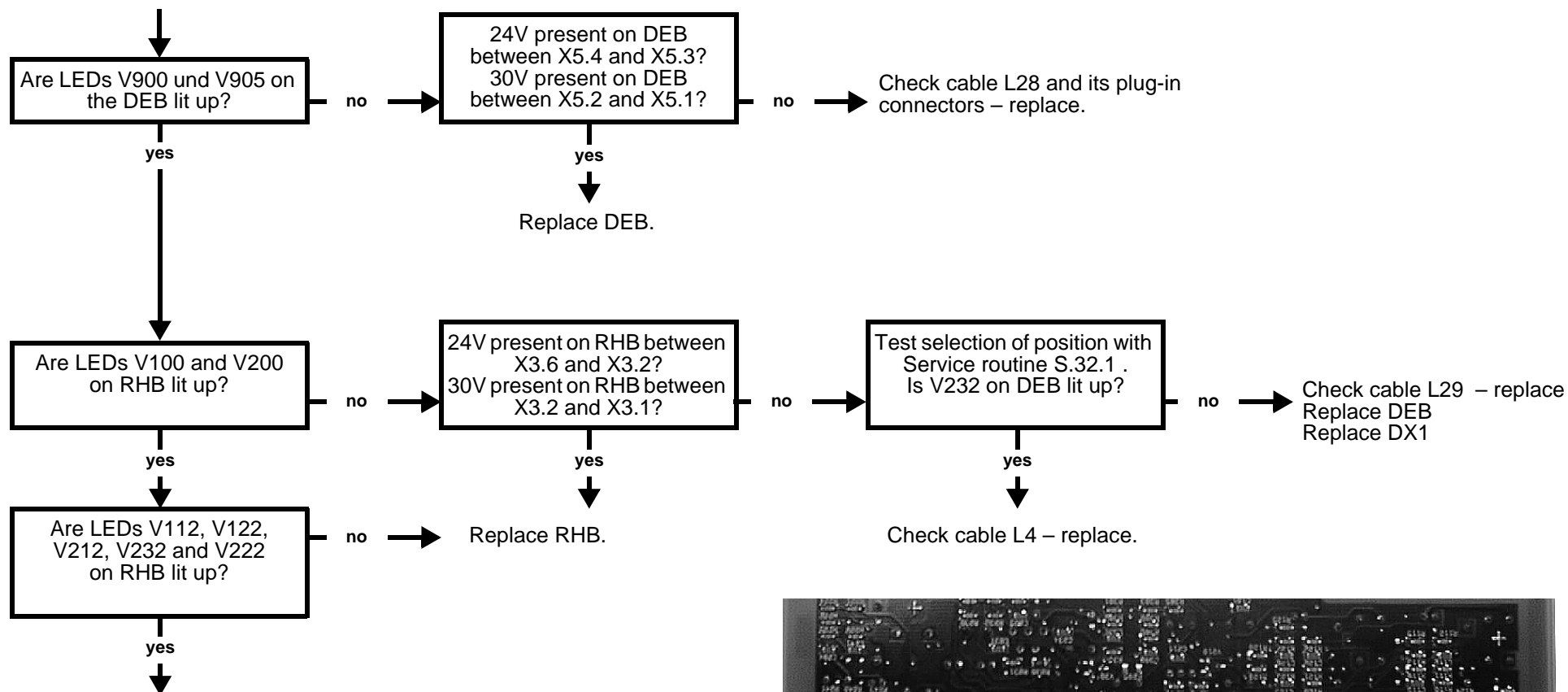


### 3.33 Correcting error of message E4 11: Image receptor not ready for exposure (with XOP).

up to serial no. 30 999 ORTHOPHOS 3 DS







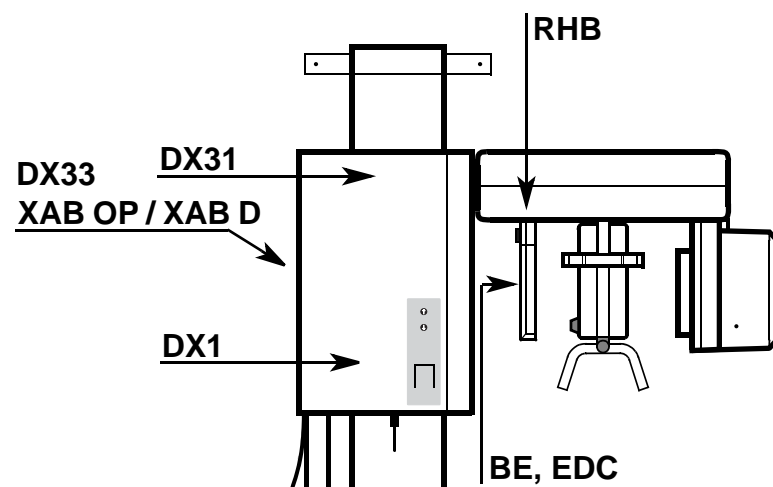
**Check signal path for voltage status signal**

Tests and component replacement in following sequence:

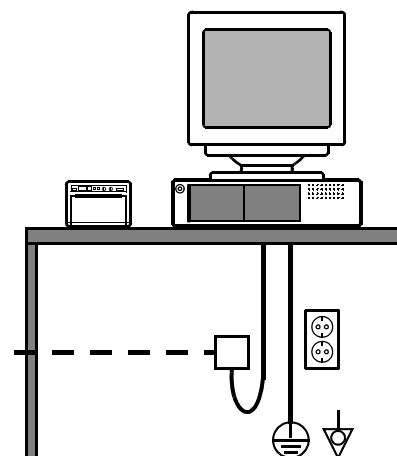
Check seating of image receptor;  
Signal test S.35.2  
Check socket contact of image receptor (ERA);  
Check cable L29;  
Check cables L30/L31 and their plug-in connectors;  
DEB;  
RHB;  
Input test DX1 with S.13.1;  
Image receptor

|                                    |               |
|------------------------------------|---------------|
| <b>Error indication<br/>IN Pin</b> | <b>Signal</b> |
| 10 30                              | Active        |

from serial no. 31 000 ORTHOPHOS 3 DS

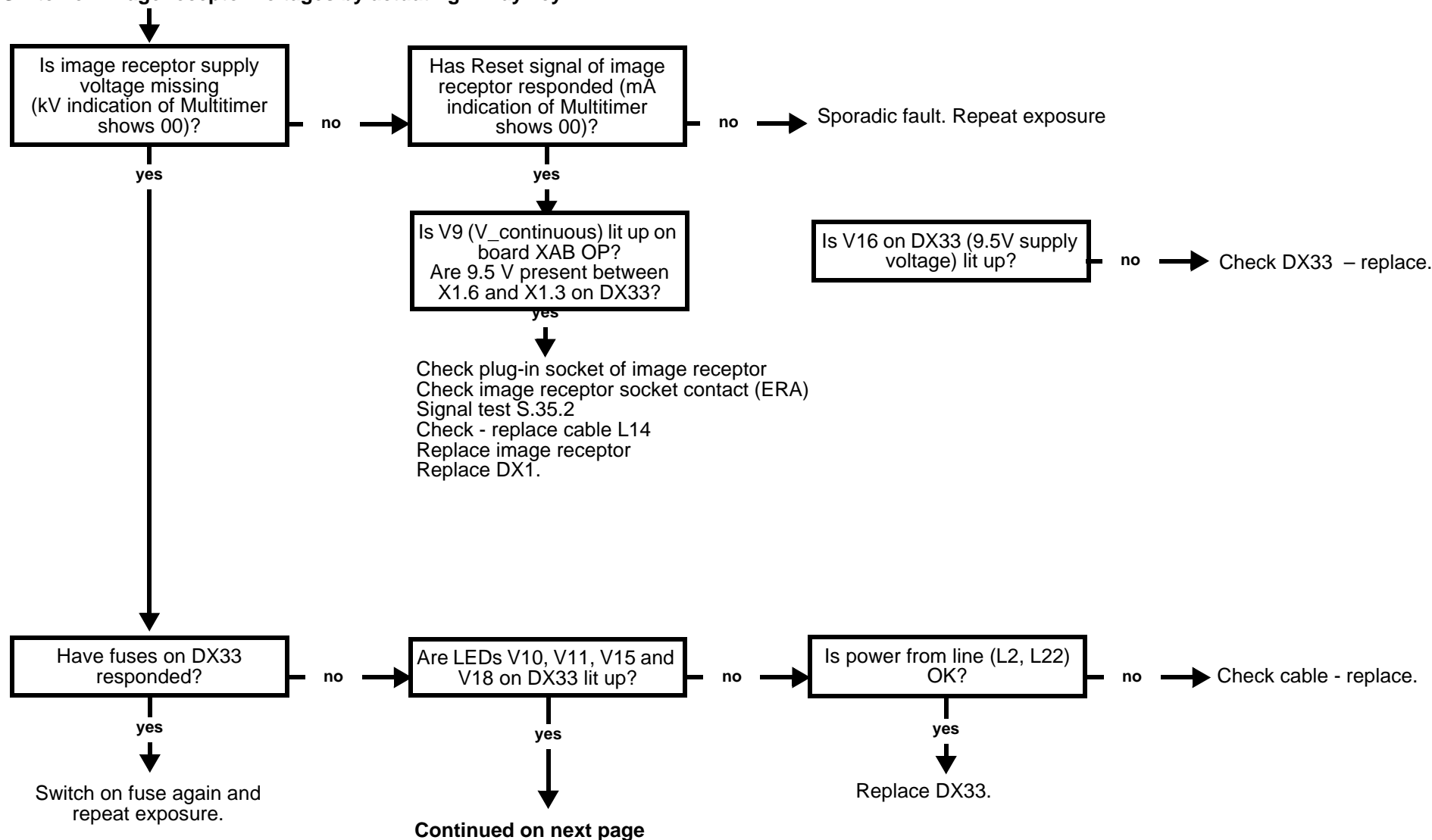


LAN 3m/7,5m/20m



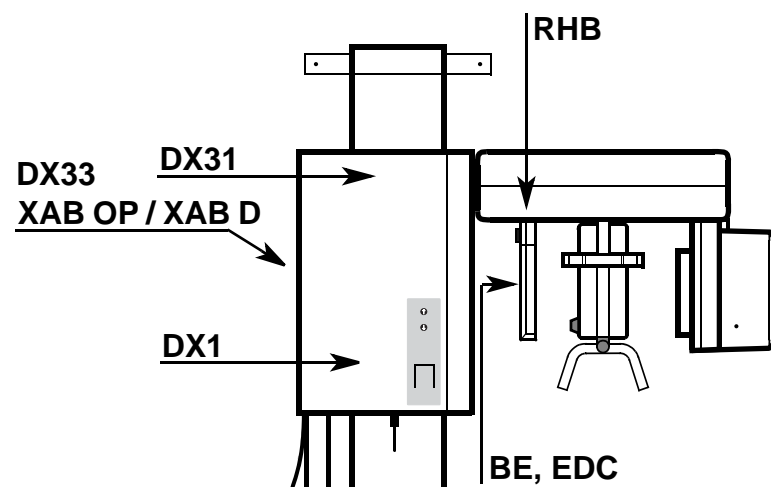
Service-Routine S.32.1 durchführen.

Switch on image receptor voltages by actuating X-Ray key.

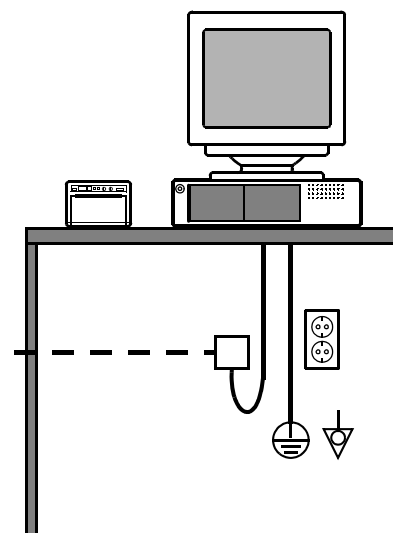


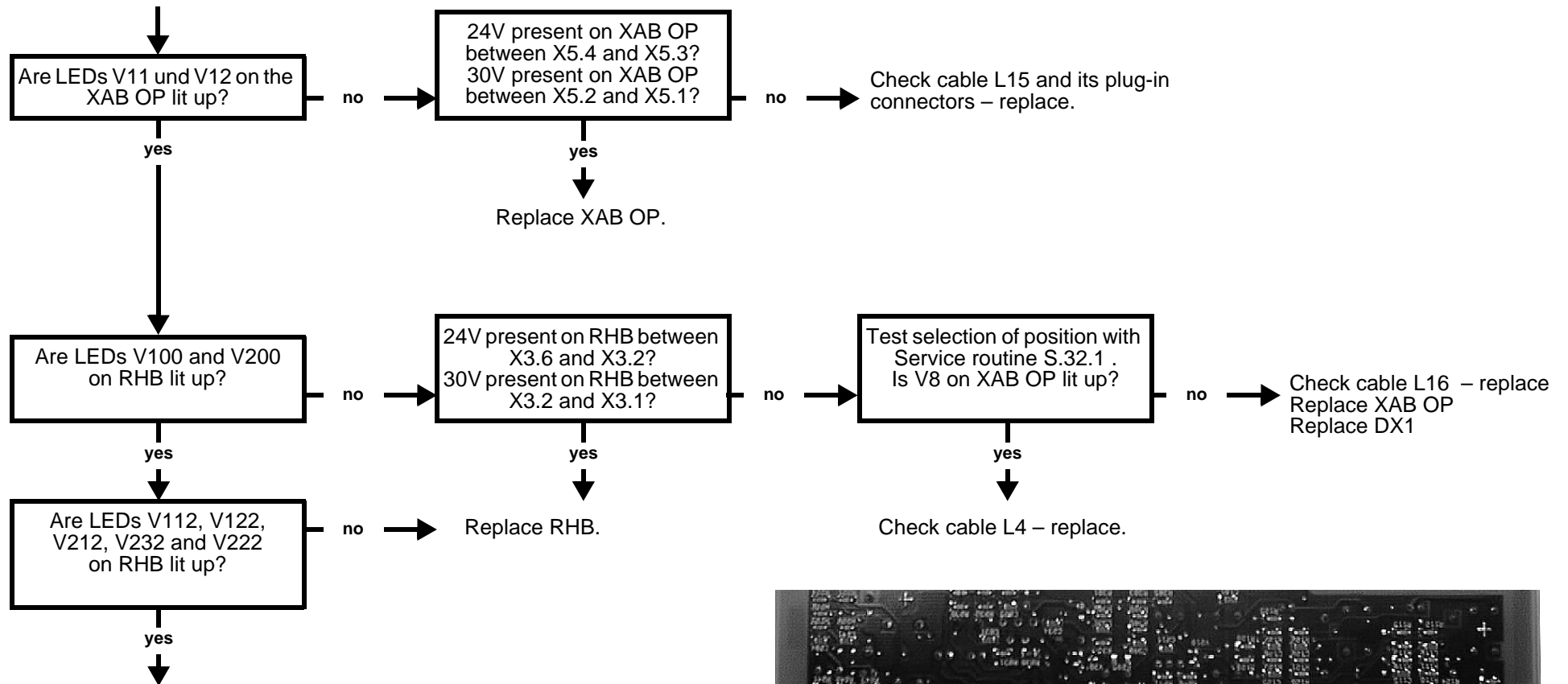
### 3.34 Correcting error for message E4 11: Image receptor not ready for exposure (with XAB)

from serial no. 31 000 ORTHOPHOS 3 DS



LAN 3m/7,5m/20m

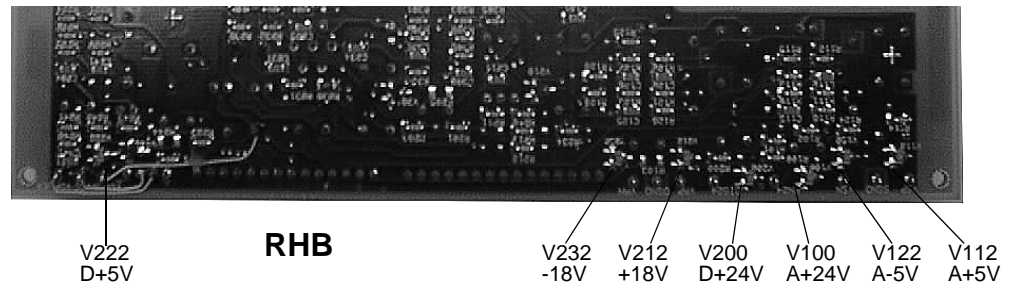




#### Check signal path for voltage status signal

Tests and component replacement in following sequence:

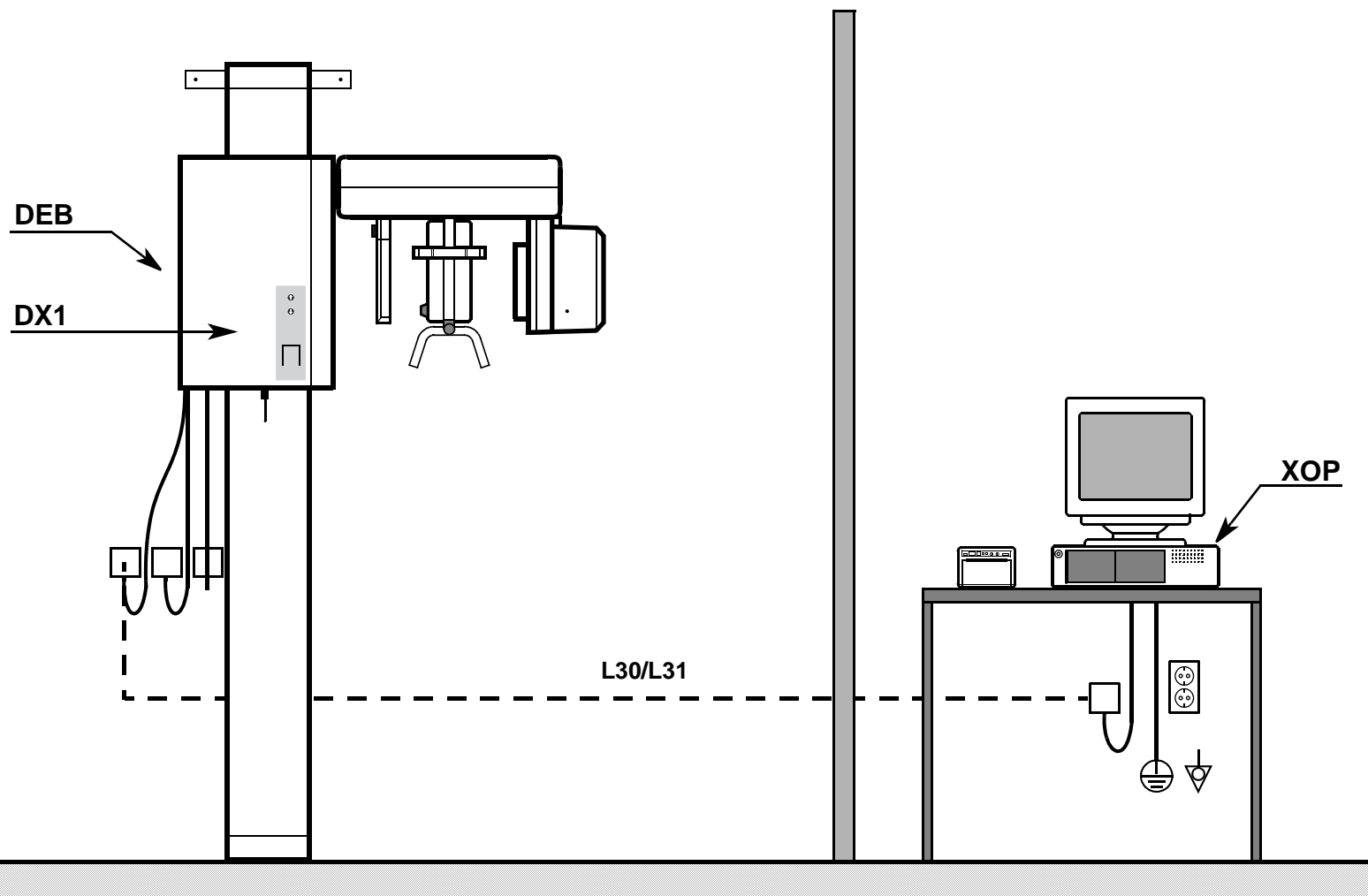
Check seating of image receptor;  
Signal test S.35.2  
Check socket contact of image receptor (ERA);  
Check cable L29;  
XAB OP;  
RHB;  
Input test DX1 with S.13.1;  
Image receptor

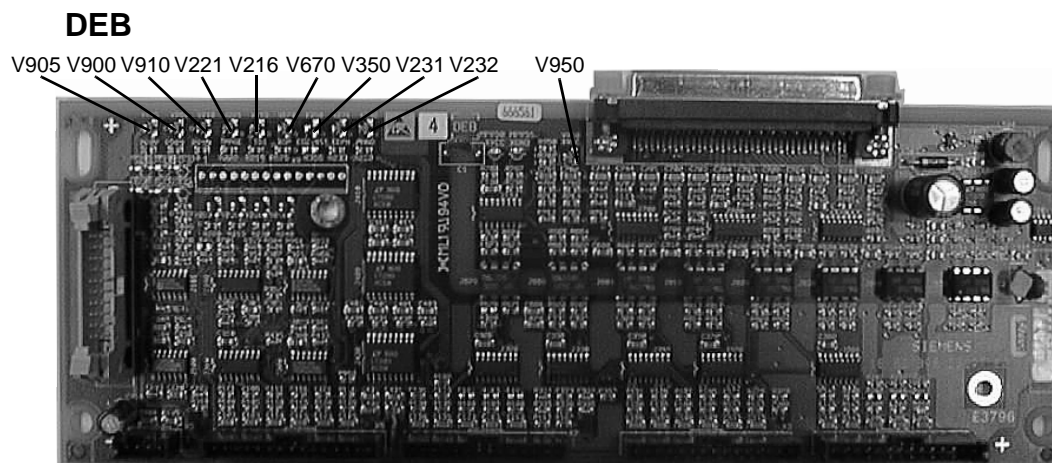
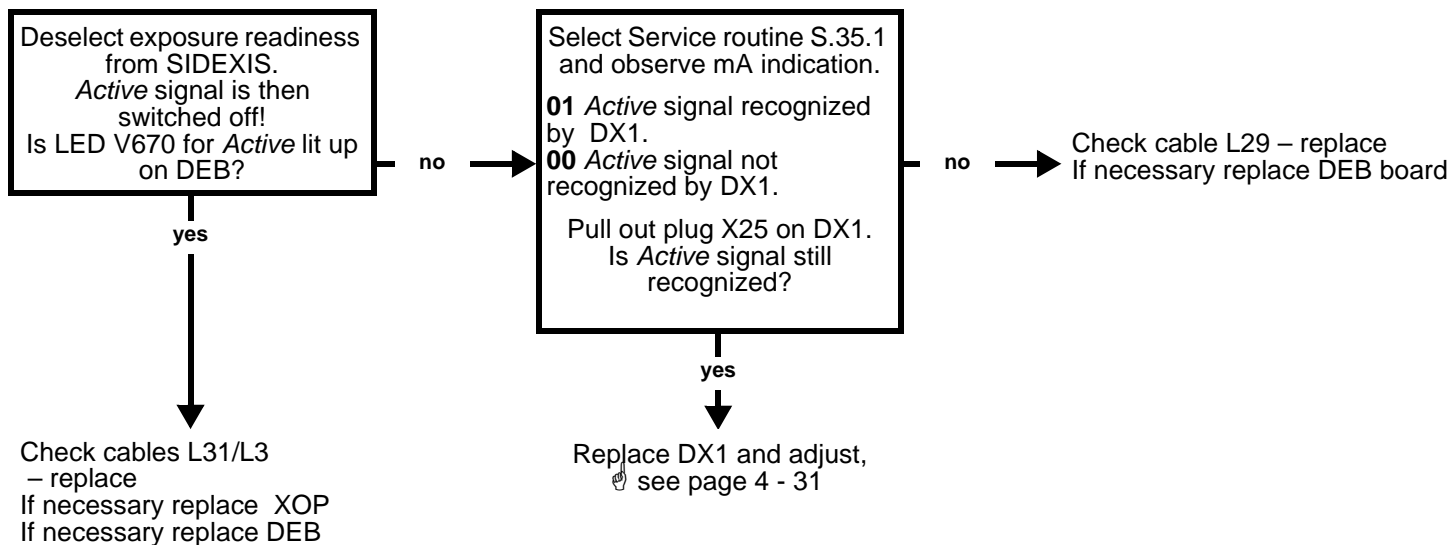


| Error indication<br>IN Pin | Signal |
|----------------------------|--------|
| 10 30                      | Active |

### 3.34 Correcting error of message E4 11: Image receptor not ready for exposure (with XAB)

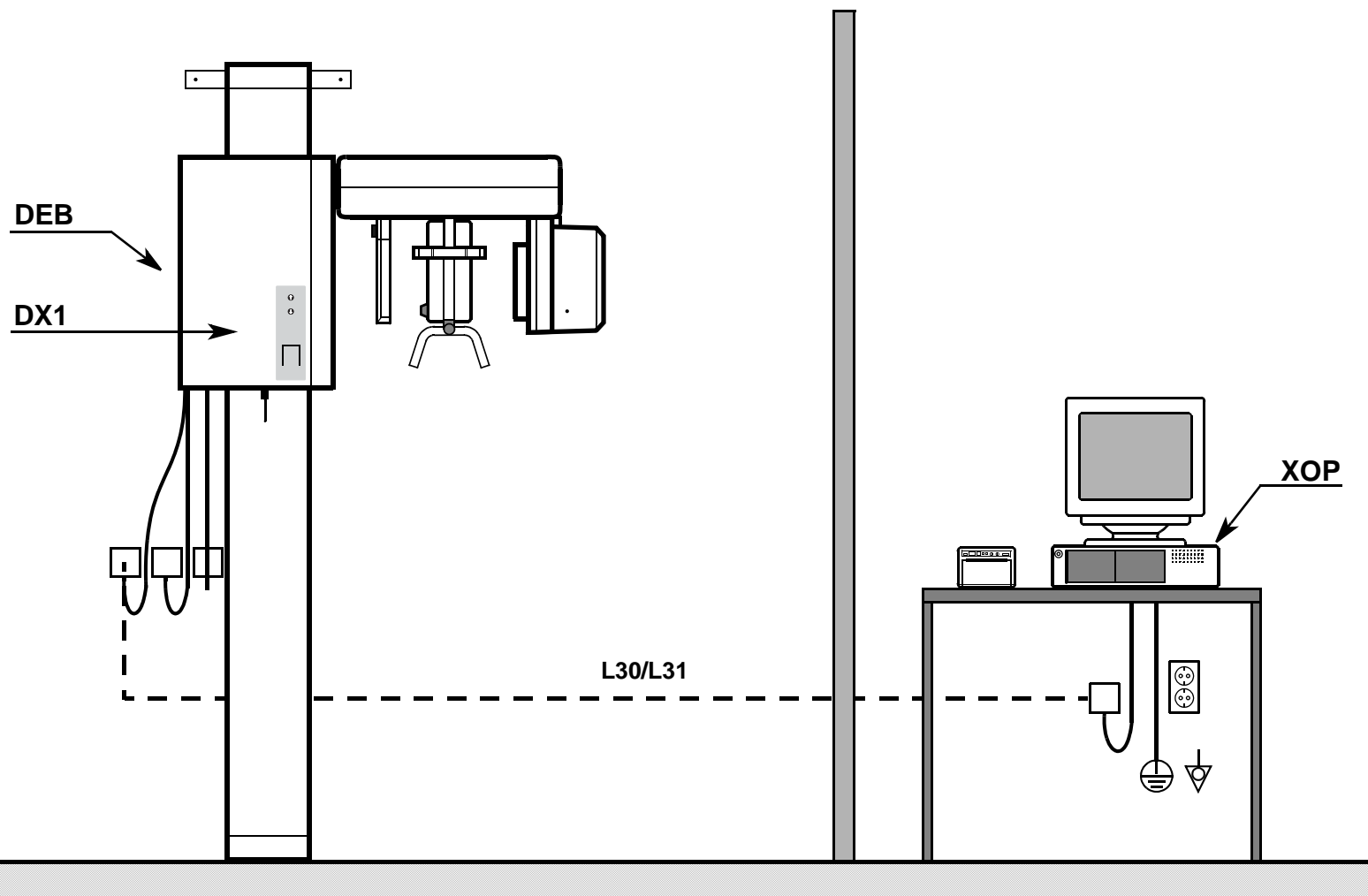
up to serial no. 30 999 ORTHOPHOS 3 DS



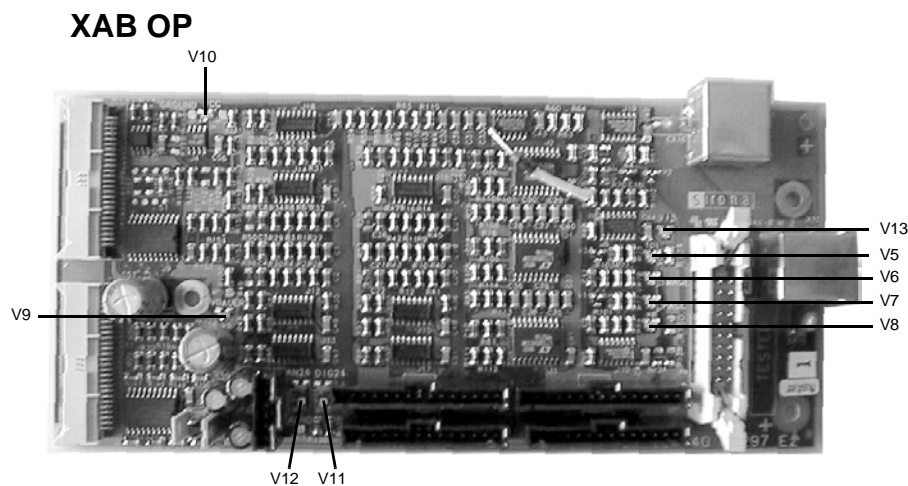
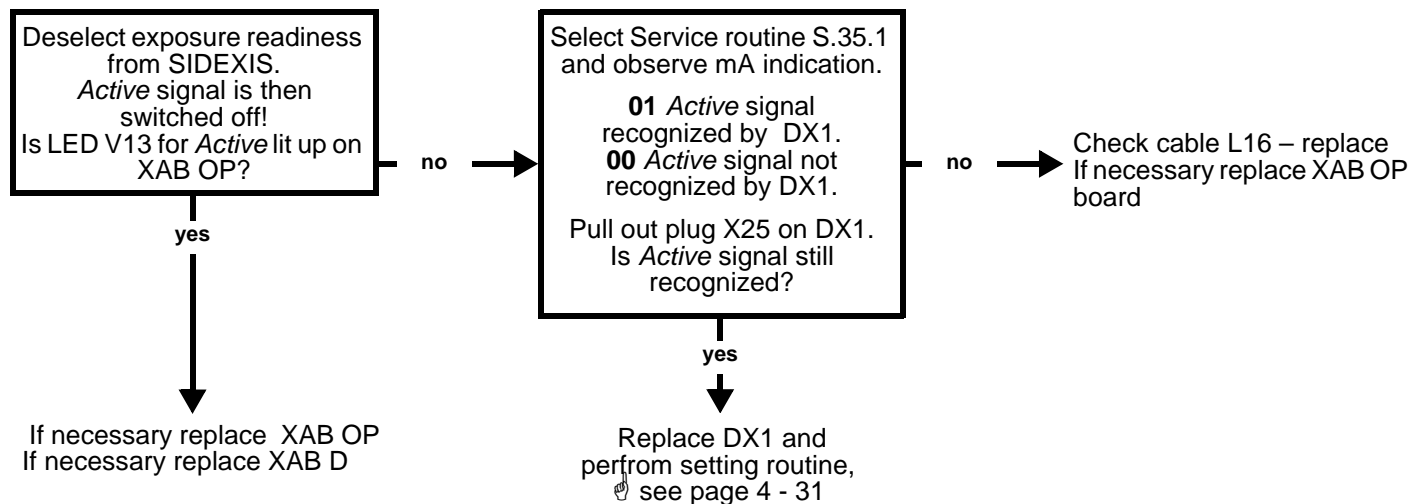


### 3.35 Correcting error of message E4 16: Active signal present when switching ON (with XOP).

from serial no. 31 000 ORTHOPHOS 3 DS







### 3.36 Correcting error of message E4 16: Active signal present when switching ON (with XAB)



## **4 Checks and Adjustments**

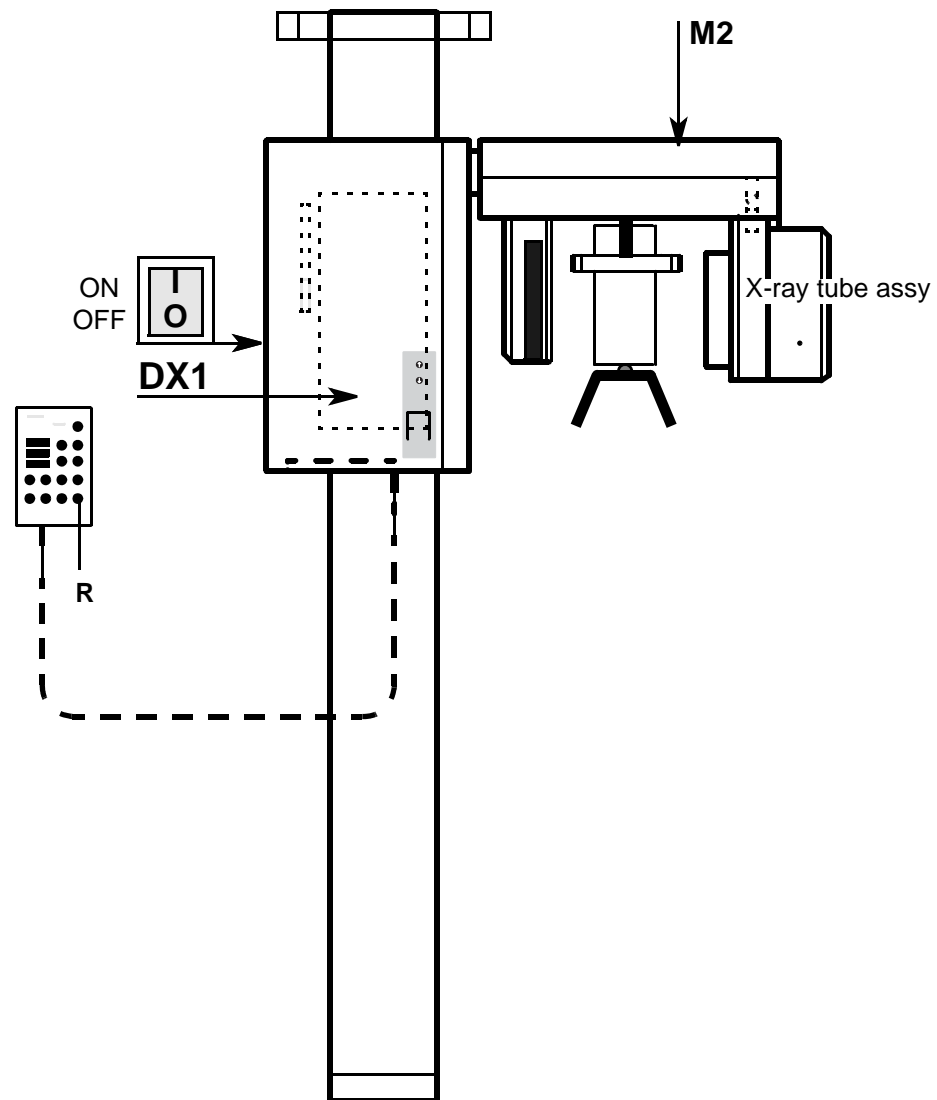
---

## Checks and Adjustments

### Contents

|      |                                                                         |        |
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| 4.3  | Checking and adjusting the X-ray beam for Cephalometry .....            | 4 - 17 |
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| 4.11 | Checking and adjusting the light localizers .....                       | 4 - 33 |





- Check once more whether the following points were observed when taking the phantom radiograph:
  - Needle phantom fully inserted.
  - Temple support fully closed.
  - Diaphragm wheel set to Panorama diaphragm 10 or 1.
  - Program P1 and lowest kV/mA preselected on Multitimer.
  - ORTHOPHOS 3 DS: SIDEXIS exposure readiness set for quality test exposure.
  - ORTHOPHOS 3: cassette inserted.

Readjustment of the actuators is required if the specified pin distances on the phantom radiograph are not within the specified tolerance (see figure on next page).

### 1. Basic settings of actuators M2:

Unscrew the cover from the carriage. Switch the unit on.  
The X-ray tube assembly is in the symmetry position.

### 2. Check the basic setting of the bite block

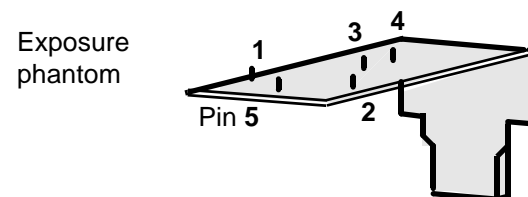
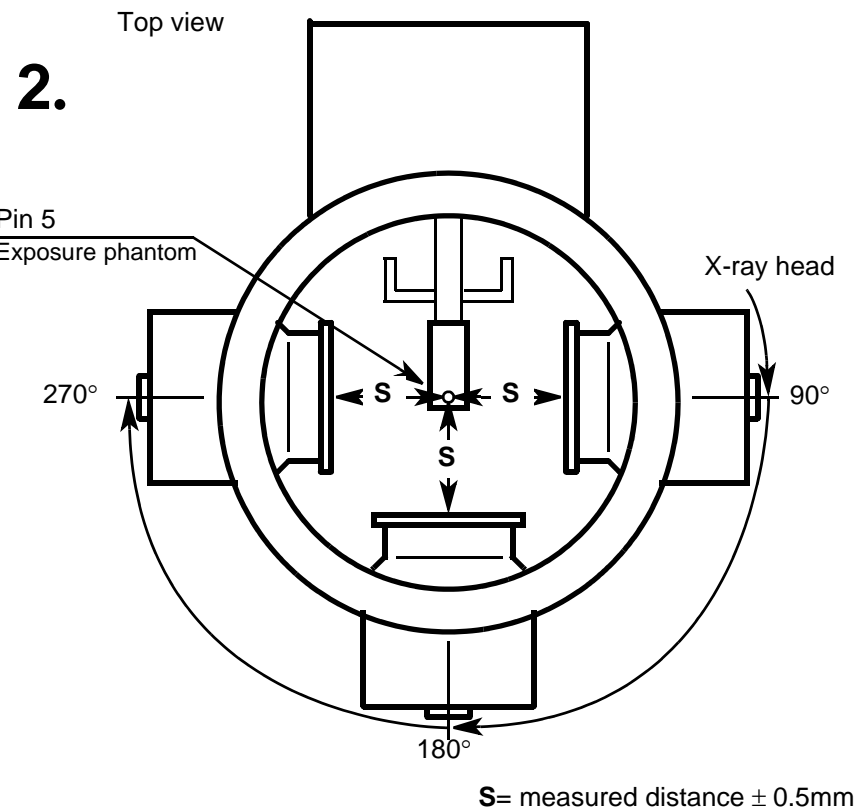
Move the X-ray tube assembly by hand to the 90° position and measure the symmetry distance  $S$  between the primary diaphragm and pin 5 (see Figure on the right).  
Set the X-ray tube assembly manually to the 180° and 270° positions and measure the symmetry distance  $S$ .

- All three symmetry distances  $S$  must be the same.  
Maximum permissible asymmetry:  $\pm 0.5 \text{ mm}$ .

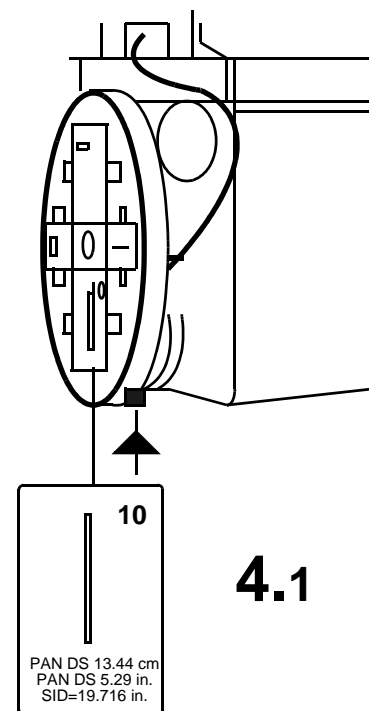
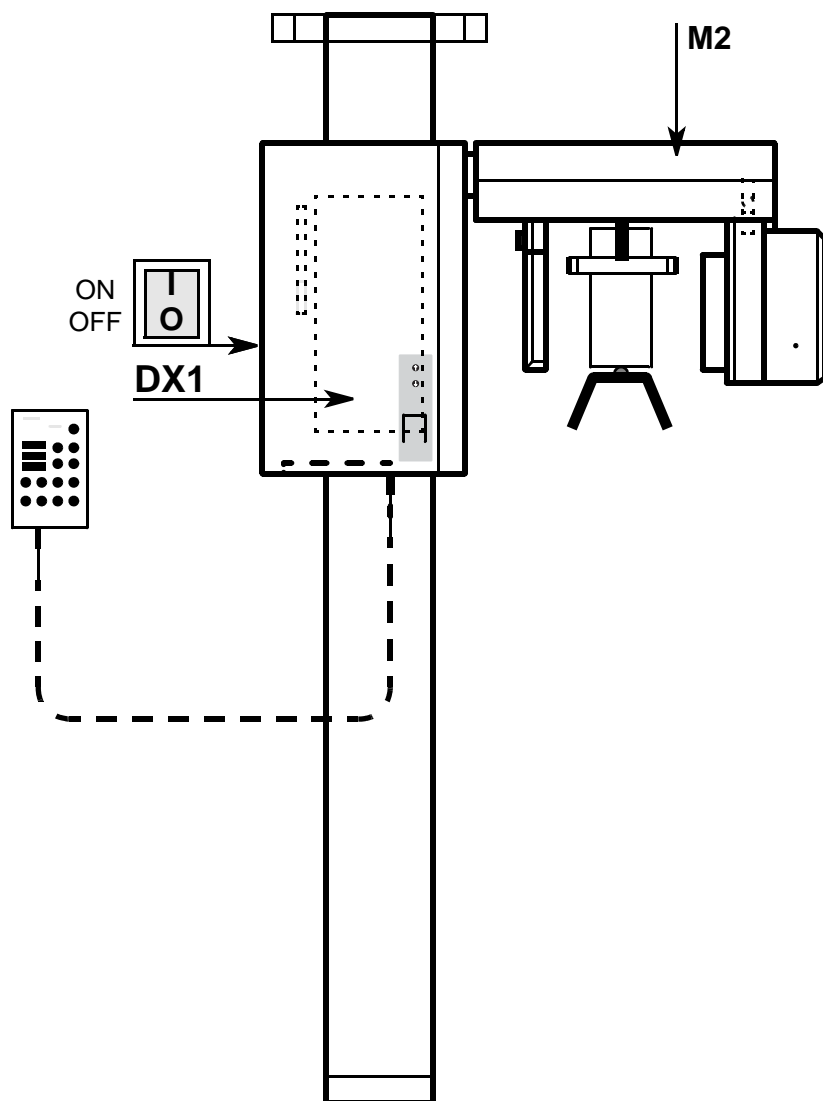
### 3. Position of the X-ray beam

After performing the basic setting, you must check the position of the X-ray beam.  
Proceed according to section  
'Checking and adjusting the X-ray beam for Panorama exposure', see page 4 - 13.

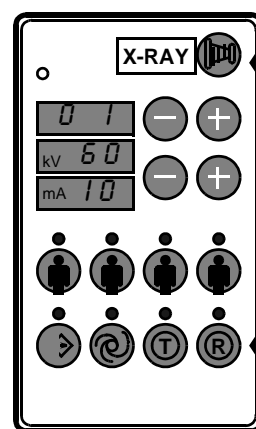
**Continued on next page**



## 4. ORTHOPHOS 3 DS



4.1



4.4



4.3

### ORTHOPHOS 3 DS Menu in SIDEXIS

Services →  
 Constancy check →  
 X-ray operators →  
 Icons XC XP →  
 Service exposure →  
 Quality test exposure (4)



Continued

#### 4. ORTHOPHOS 3 DS (digital)

4.1 **Phantom radiograph:** (X-ray beam must be adjusted)

4.2 Press Return key R. The X-ray tube assembly travels to the start position.

4.3 In the **Services** menu click on **Constancy check**

Select **X-ray operators**, click icons **XC XP**

Select **Service exposure**

Activate **Quality test exposure (4)**.

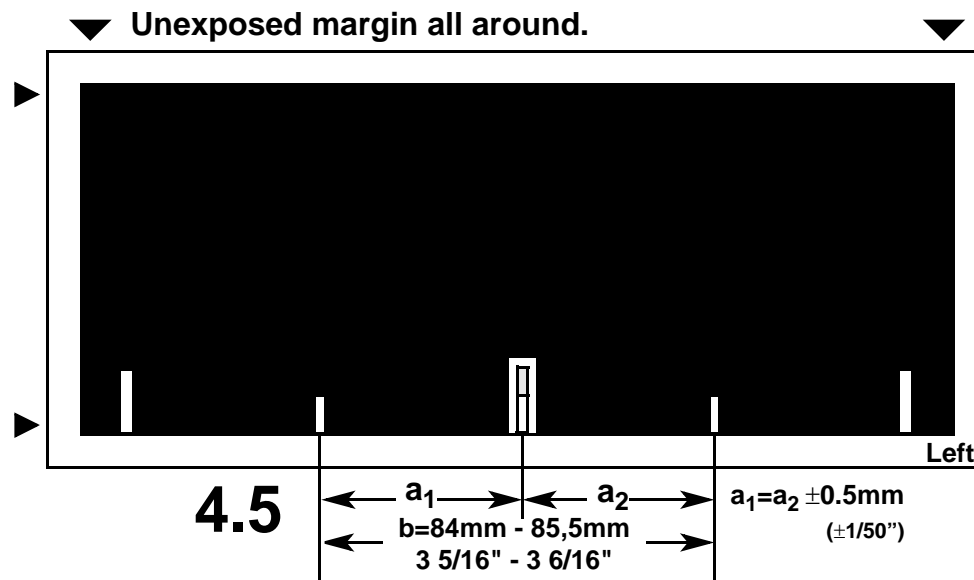
#### 4.4 CAUTION: RADIATION!

Release and exposure for one complete revolution of the rotating part.

#### 4.5 Evaluate the image on the screen.

Measure the line spacing with **Length measurement** in the **Analysis** menu.

Use the mouse cursor to determine the start point for length measurement and drag the cursor to the end point with the left mouse button pressed.



#### 5. ORTHOPHOS 3 (conventional film)

##### 5.1 Prepare the phantom radiograph

- Set the diaphragm wheel to diaphragm 1. With adhesive tape attach a 0.4 mm thick lead strip to the slot mark (contrast enhancement).  
NOTE: Use the 0.1 mm thick lead screen from an intraoral film and fold it twice in the longitudinal direction.
- Insert the phantom supplied to its end position.
- Place a non-exposed film in the cassette.
- Load the cassette in the cassette holder (see Operating Instructions).
- Swivel the cassette holder into position.
- Turn the unit on. Wait for the unit to execute the self-adjustment.

##### 5.2 Exposure "through the center"

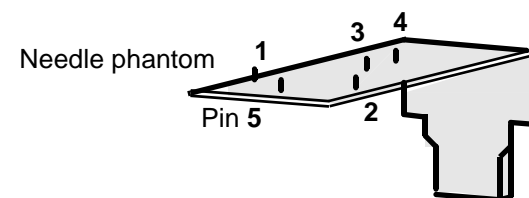
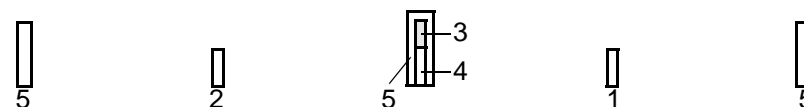
Move the X-ray tube assembly by hand to the **180°** position.

Select **Service routine S.02, test step 01** on the Multitimer  
(see section '**Service routine S.02**').

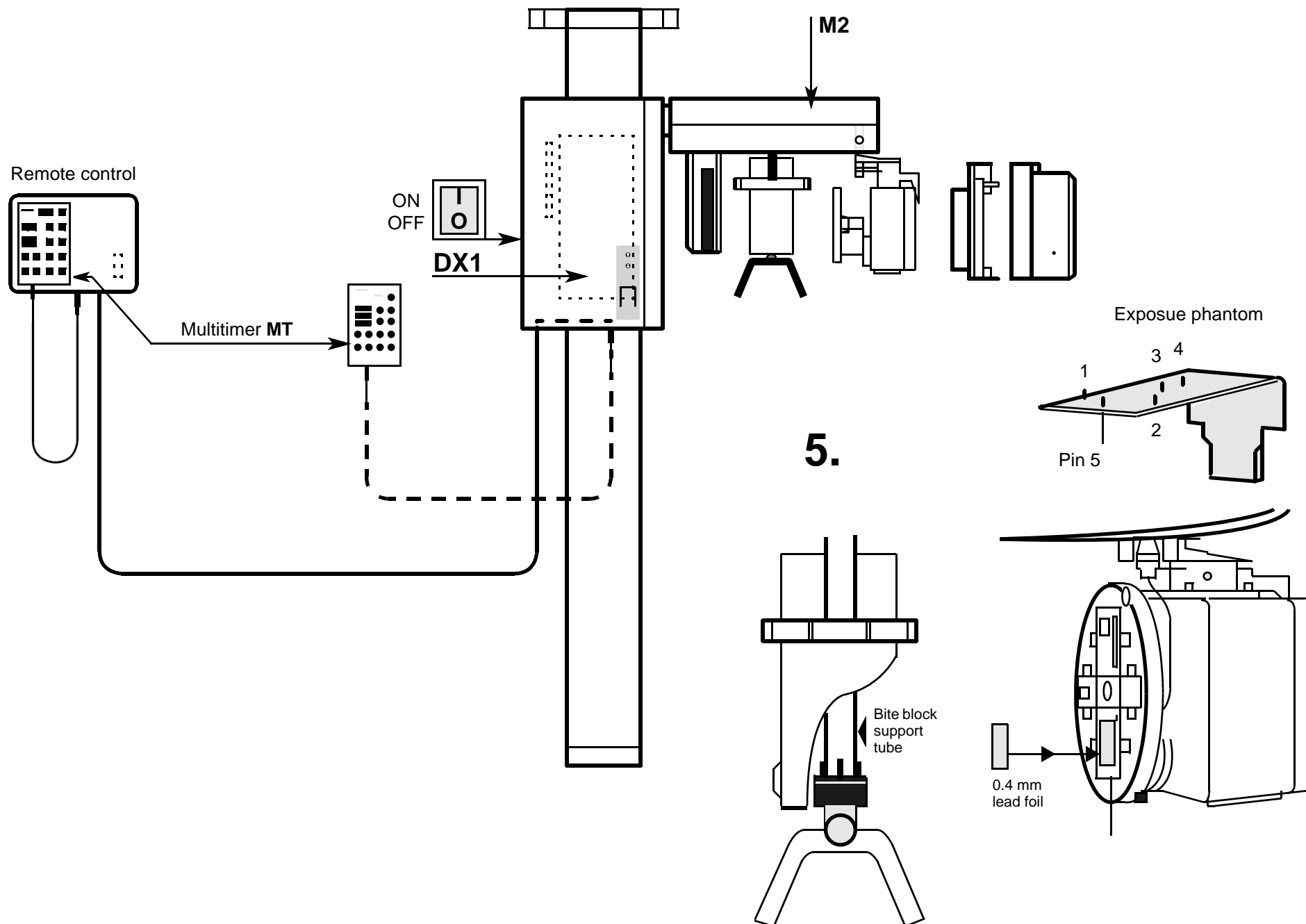
At the Multitimer select 0.50 sec exposure time with the upper - + keys  
select 60kV/10mA with the lower - + keys

Release an exposure. **CAUTION: RADIATION!**

Continued on next page



#### 4.1 Phantom radiograph - Adjusting actuator M2



**Continued**

**5.3 Panorama radiograph**

- Remove the lead strip from diaphragm 1.
- Press the Return key **R** on the cassette holder.
- The X-ray tube assembly travels to the start position.
- Deselect kV increase. (Press Memory key, LED above Memory key flashes. Press Program Display + key. O 1 appears in display.)
- Select program P1 and the lowest kV setting.
- Release an exposure for one complete rotation.

**CAUTION: RADIATION!**

**5.4 Develop and evaluate the film.**

Watch for the unexposed margin.

Pin 5 must appear within the exposed strip.

**5.5 Otherwise, adjust the cassette holder K as follows:**

- Unscrew the cover.
- Attach two line markings.
- Loosen the nut and the three screws.
- Shift the cassette holder to the required position.
- Note: 1 mm deviation on the film requires 1 mm shift of cassette holder K.
- Pin appears too far left on the film: Move K to the right → .
- Pin appears too far right on the film: Move K to the left ← .

**Recheck:** Repeat the phantom radiograph as described above.

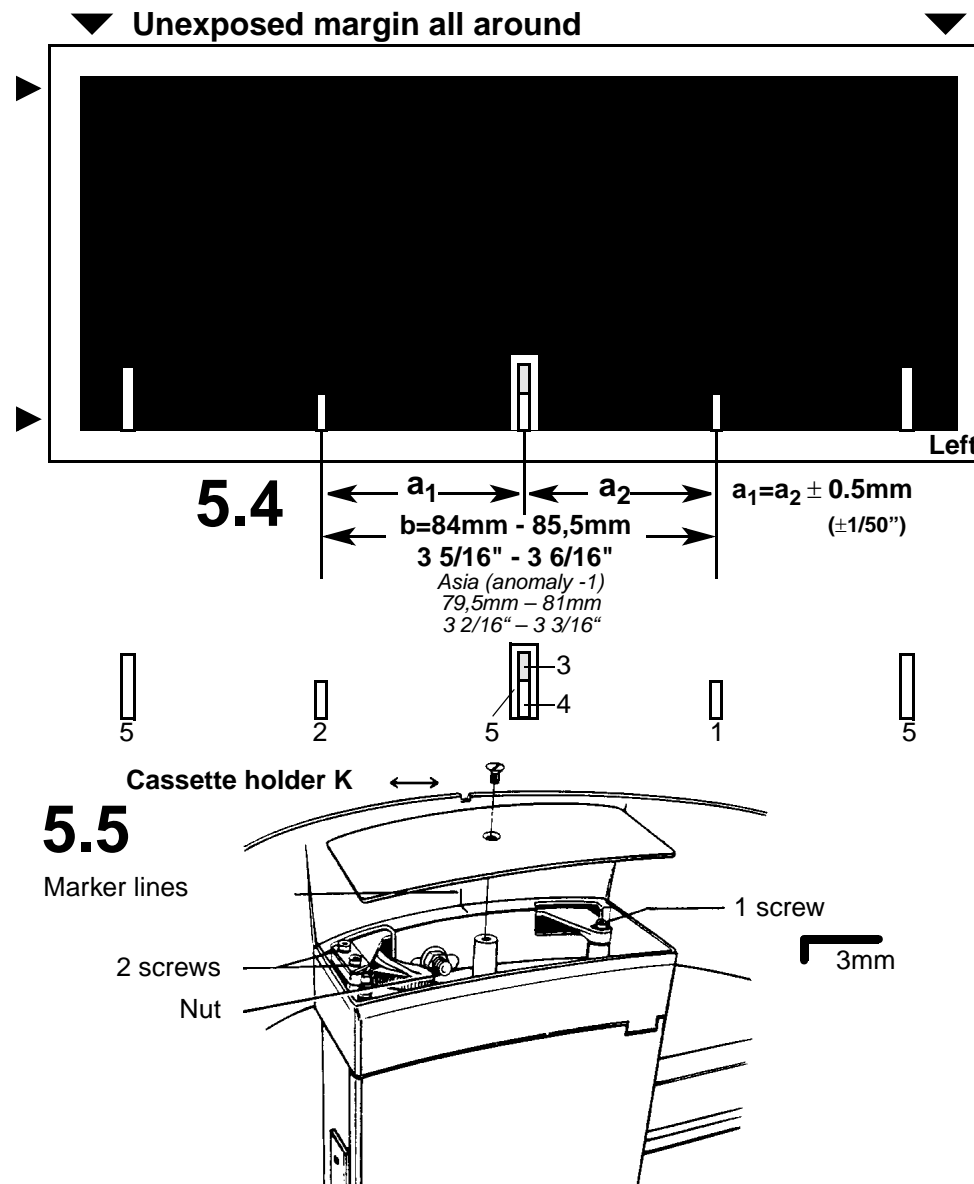
Pin 5 must appear within the exposed strip.

Panorama radiograph

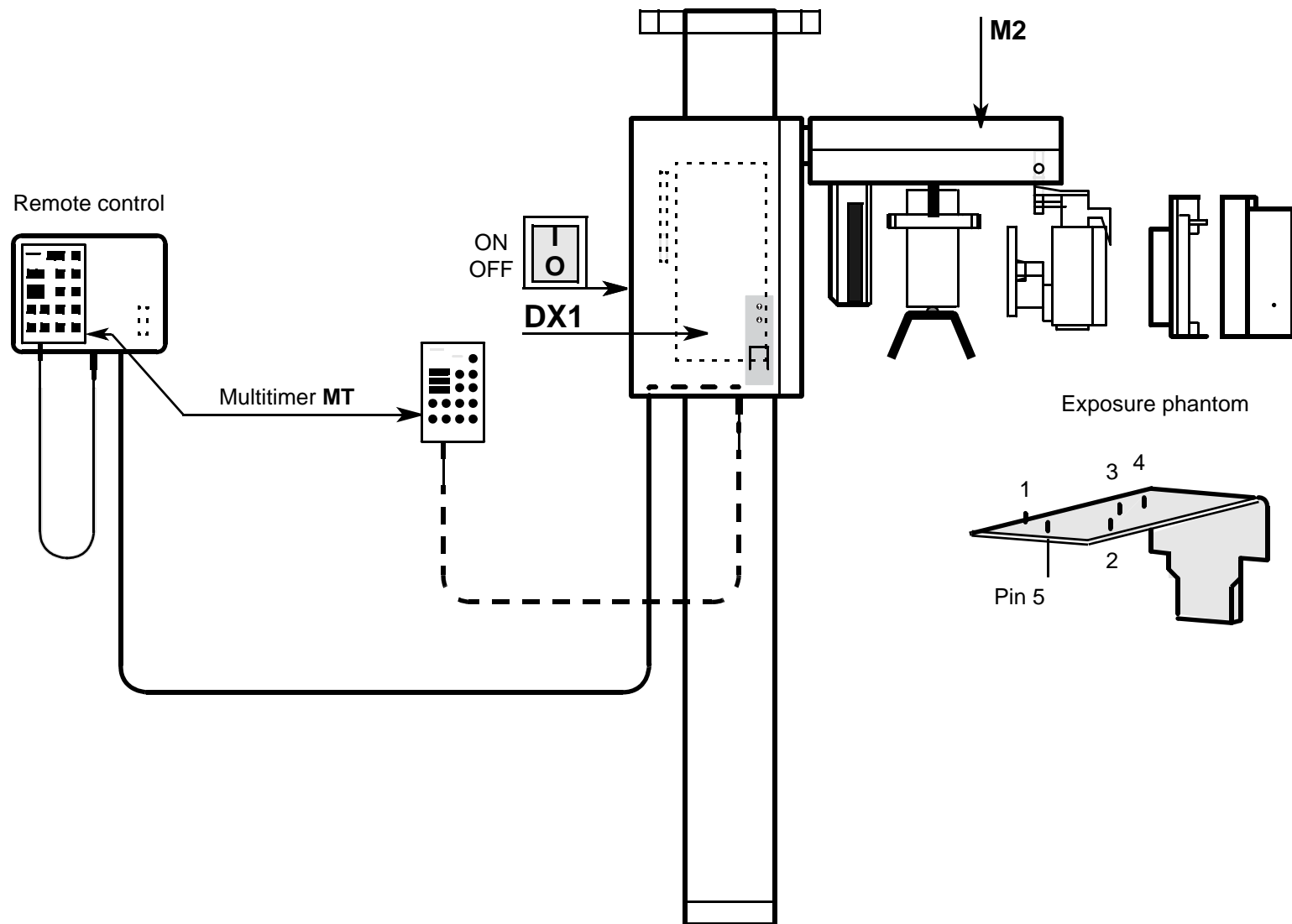
Evaluate the unexposed margin around the edge.

Line distances **b** and **a<sub>1</sub> / a<sub>2</sub>** must be within the specified tolerance.

**Continued on next page**



**4.1 Phantom radiograph - Adjusting actuator M2**



Continued

## 6. ORTHOPHOS 3 DS and ORTHOPHOS 3

### 6.1 Correction by fine adjustment of actuator M2

**Rule for spacings  $a_1$  and  $a_2$  :**

1mm difference between  $a_1$  and  $a_2$  on the film corresponds to 0.3mm maladjustment of actuators (~ 1/4 wrench turn).

If  $a_1 < a_2$  : shorter pin 4 is imaged to right of pin 3 (Figure).

Hold sleeve **B** with wrench and loosen counternut **A**.

Turn sleeve **B** in clockwise direction and fix with counternut **A**.

If  $a_1 > a_2$  : shorter pin 4 is imaged to left of pin 3.

Hold sleeve **B** with wrench and loosen counternut **A**.

Turn sleeve **B** in counterclockwise direction and fix with counternut **A**.

**Rule for spacing b:**

1mm change in spacing on the image/film corresponds to 0.5mm compensation angle.

2mm change in spacing on the image/film correspond to 1mm compensation angle.

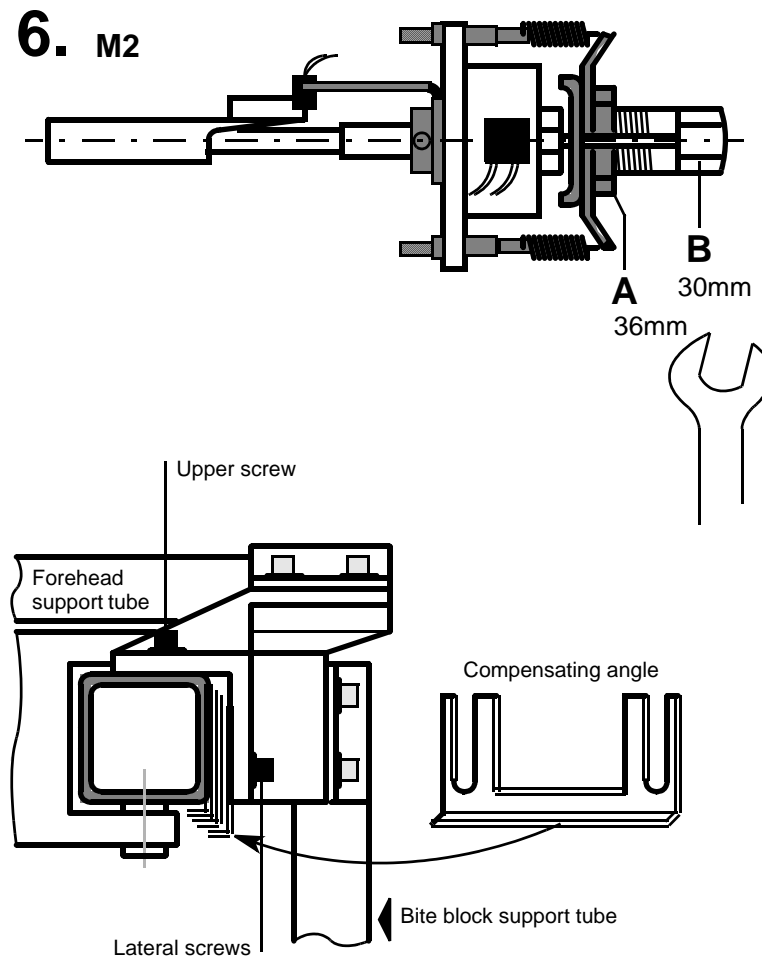
Order nos. 33 10 609 compensation angle 0.5mm, 33 10 344 compensation angle 1mm.

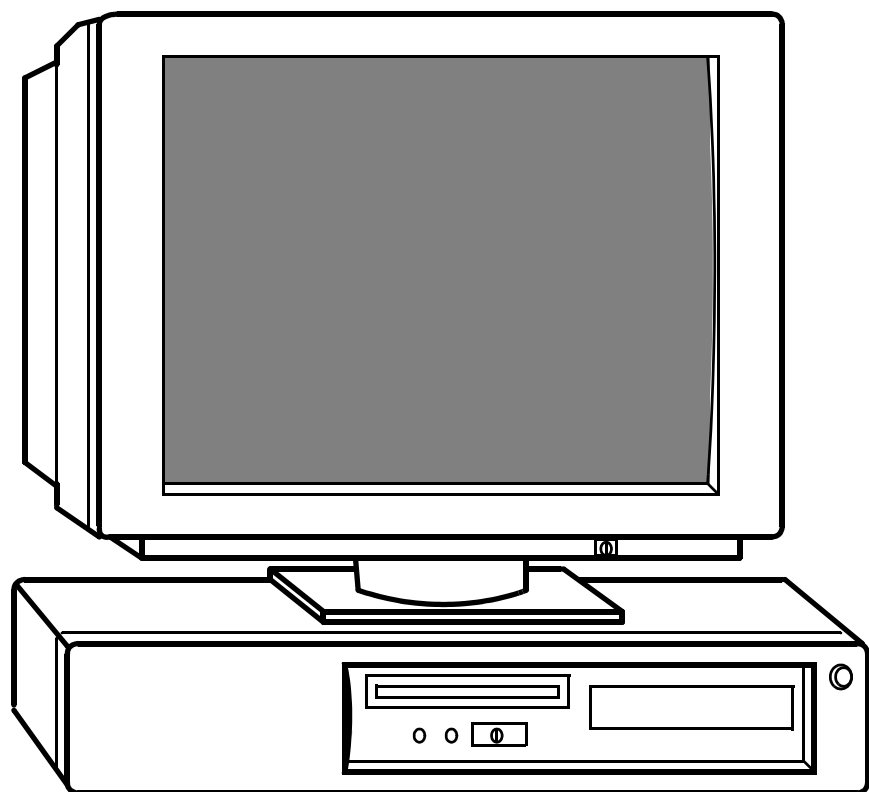
Maximum exceeded: add angle

Minimum not reached: remove angle

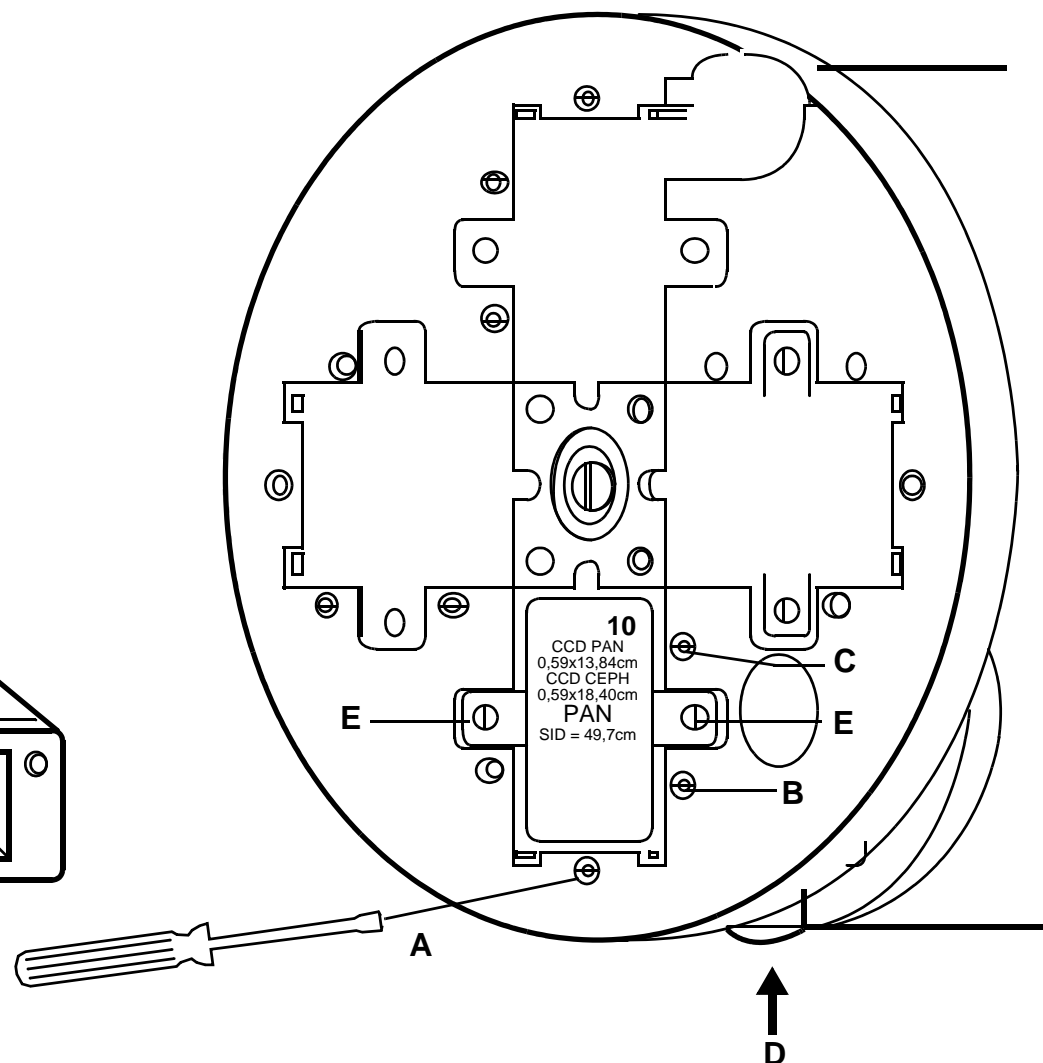
NOTE: First tighten the lateral screws and then the upper screws.

Check: Repeat a Panorama exposure (with new film).





1.



### Bei ORTHOPHOS 3 DS

- Adjust primary diaphragms 10 on the diaphragm wheel.
- Press locking button **D** to adjust the diaphragm wheel.  
Radiation is generated only if button **D** is correctly engaged.

#### 1. Establish exposure readiness:

in the **Service** menu click on **Constancy check**  
Select **X-ray operators**, click icons **XC XP**  
**Service password** (see SIDEXIS Service Manual)  
Select **Service exposure**  
Activate **Diaphragm adjustment (3)**.

#### 2. Generate RADIATION.

The beam must appear (horizontally and vertically) in the center of the diaphragm display on the screen).

NOTE: If the beam is not visible on the screen:

Set exposure readiness, darken the room, set radiation time = 4.0 sec,  
90kV/12mA, release **RADIATION**, observe the position of the beam on the fluorescent screen  
and make a coarse adjustment.

#### X "High-Low" beam correction

Loosen two screws **E** by one turn each.  
Make the beam correction with the screw (eccentrics).  
Retighten screws **E**.

#### Y "Vertical" beam correction and

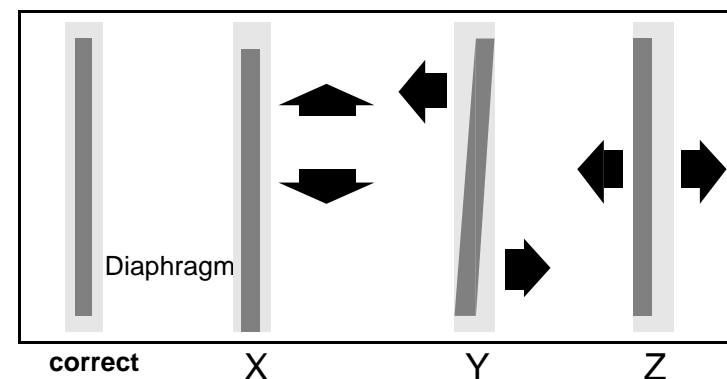
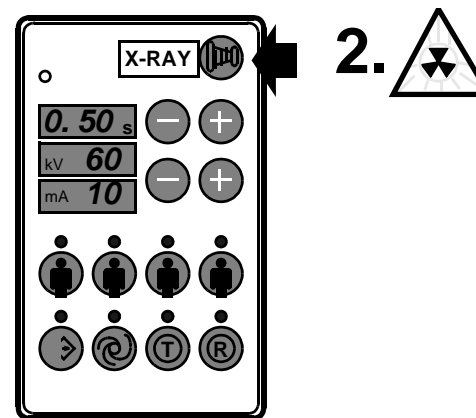
#### Z 'Right-left' beam correction

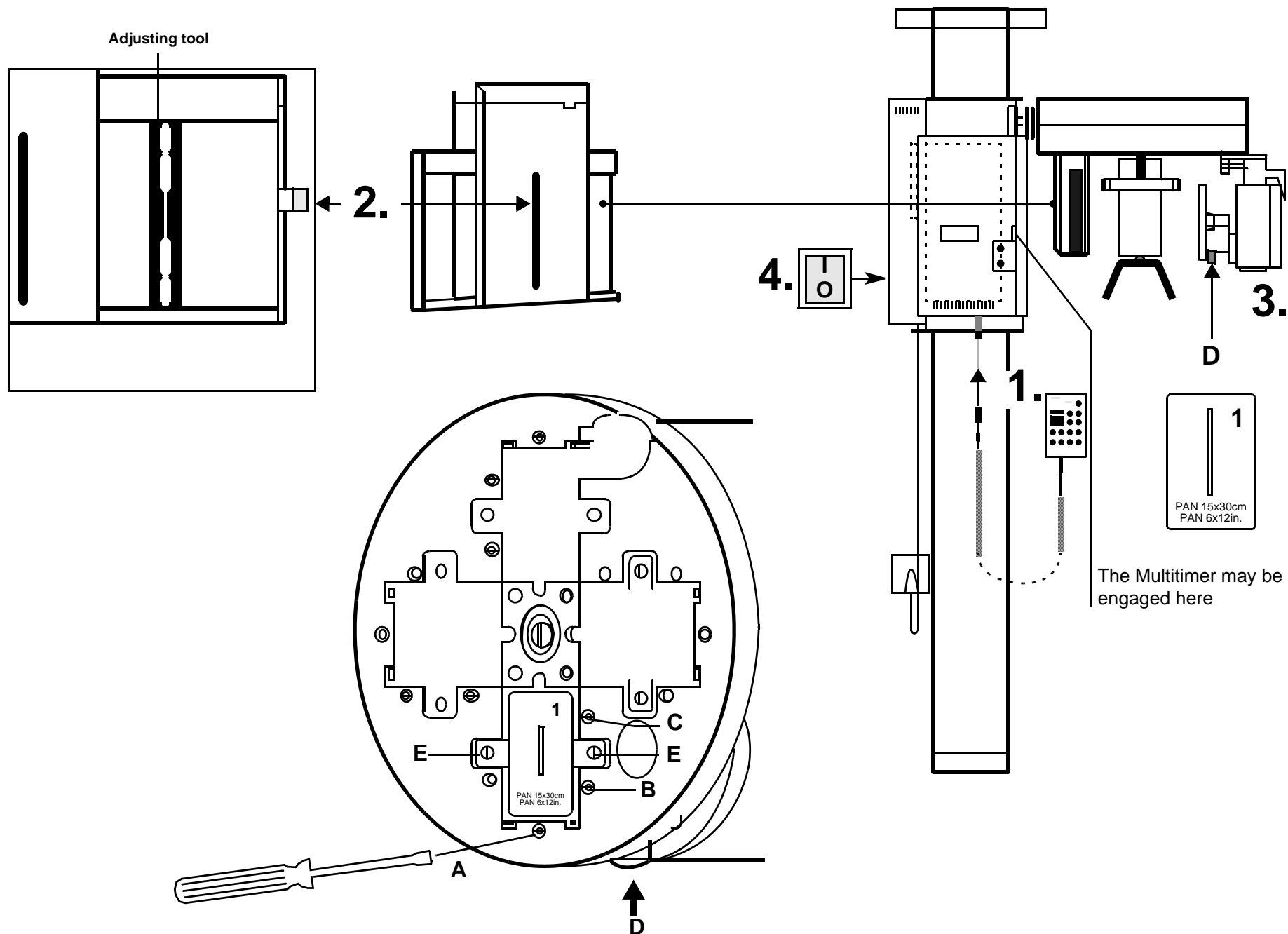
Loosen two screws **E** by one turn each.  
Make the beam correction with the screw (eccentrics).  
Retighten screws **E**.

Final check of the beam position is done in section **Phantom radiograph**,  see page 4 - 5.

- Close diaphragm displays  
( [Strg]+[F4] ).

Continued on next page







### Bei ORTHOPHOS 3

1. Insert the **adjusting tool** vertically into the cassette carriage and slide it behind the secondary diaphragm.  
Actuate main switch **S1** on the rear panel of the carriage.  
Several radiographic parameters light up on the Multitimer (see Operating Instructions).  
Darken the room.
- Set primary diaphragm 1 on diaphragm wheel (on Pan unit fixed setting, adjustable only on ORTHOPHOS 3 Ceph).
- Press locking button **D** to adjust the diaphragm wheel.  
Radiation will be generated only if button **D** is correctly engaged. When adjusting the primary diaphragm, position the beam to the indicated marks.
- Select Service routine S.01.
2. **Generate RADIATION.**  
**Release radiation only for the time necessary to recognize the beam position.**


#### X "High-Low" beam correction

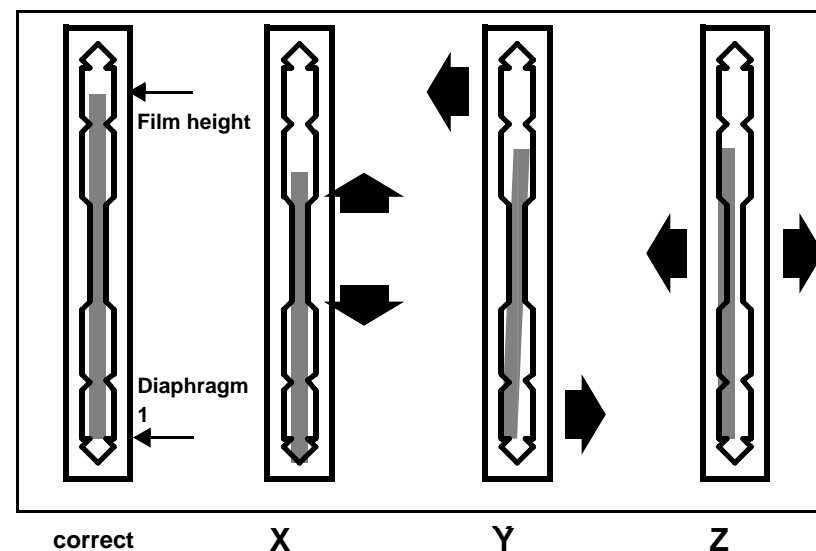
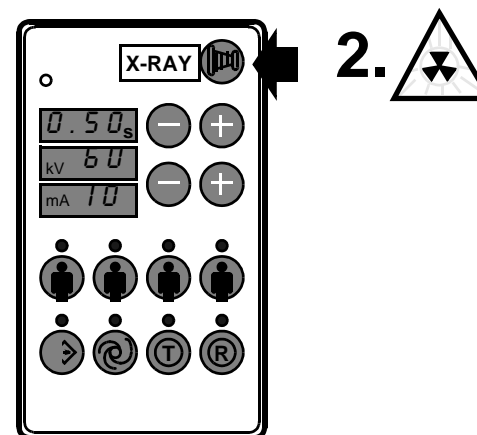
Loosen two screws **E** by one turn each.  
Make the beam correction with screw A (eccentric).  
Retighten screw **E**.

#### Y "Vertical" beam correction and

#### Z "Right-Left" beam correction

Loosen two screws **E** one turn each.  
Make the beam correction with screws B and C (eccentrics).  
Retighten screws **E**.

- Final check of the beam position is done in section **Phantom radiograph**,  see page 4 - 5.



## 4.2 Checking and adjusting the X-ray beam for Panorama radiography

2.1

2.2

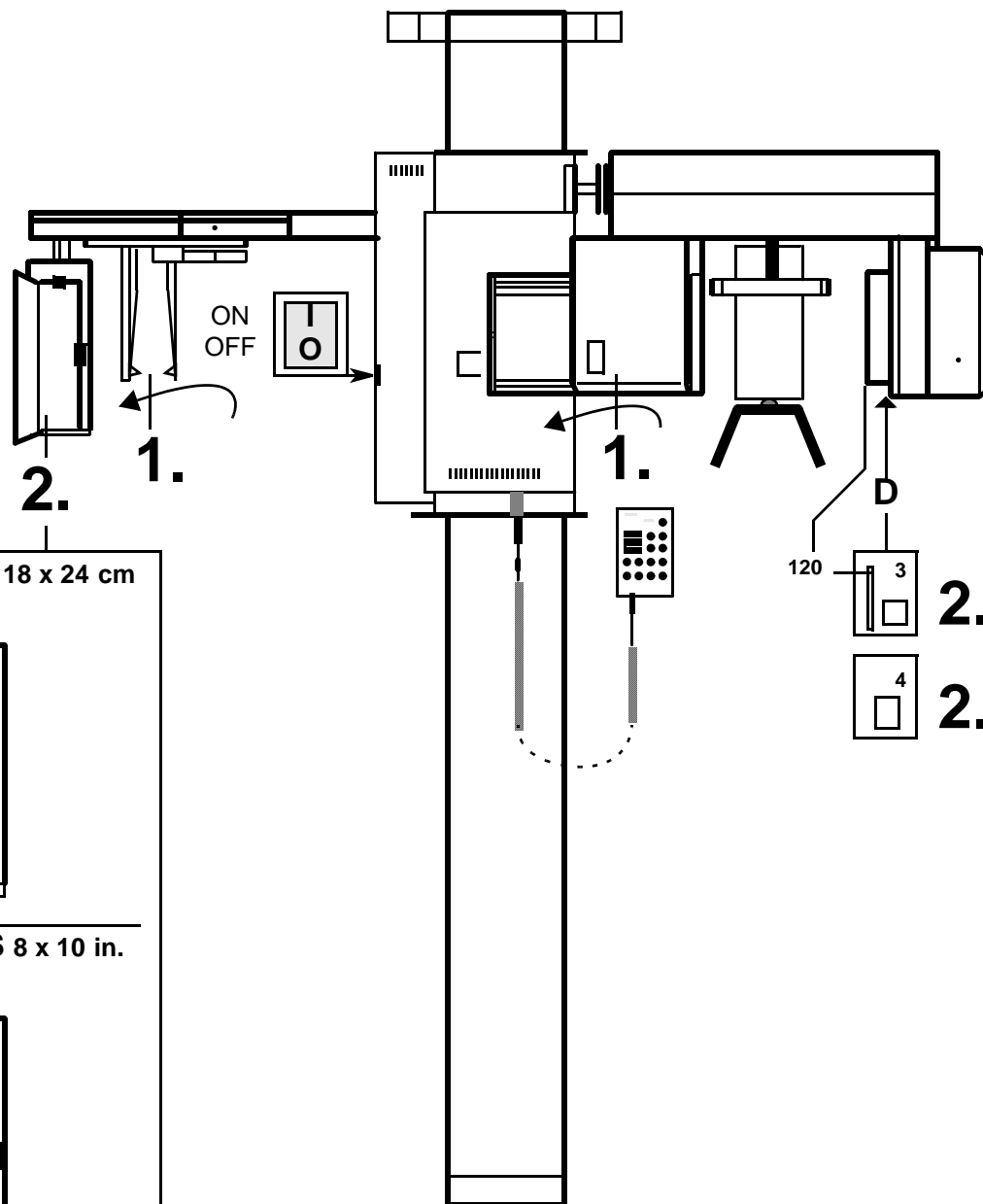
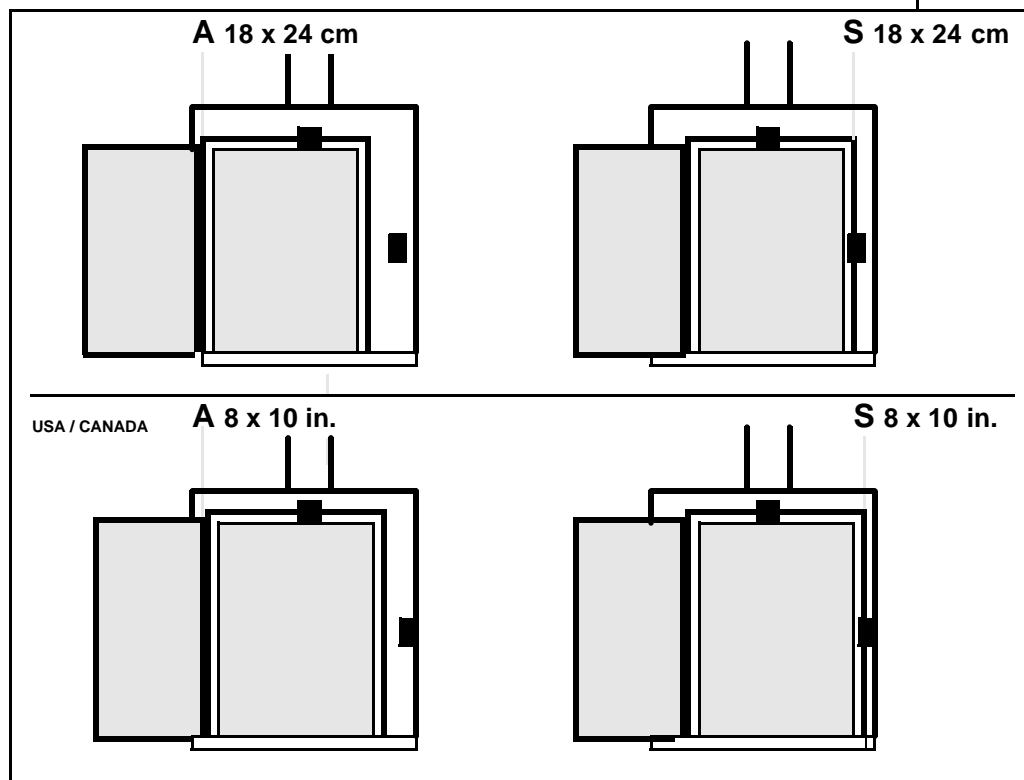
2.

1.

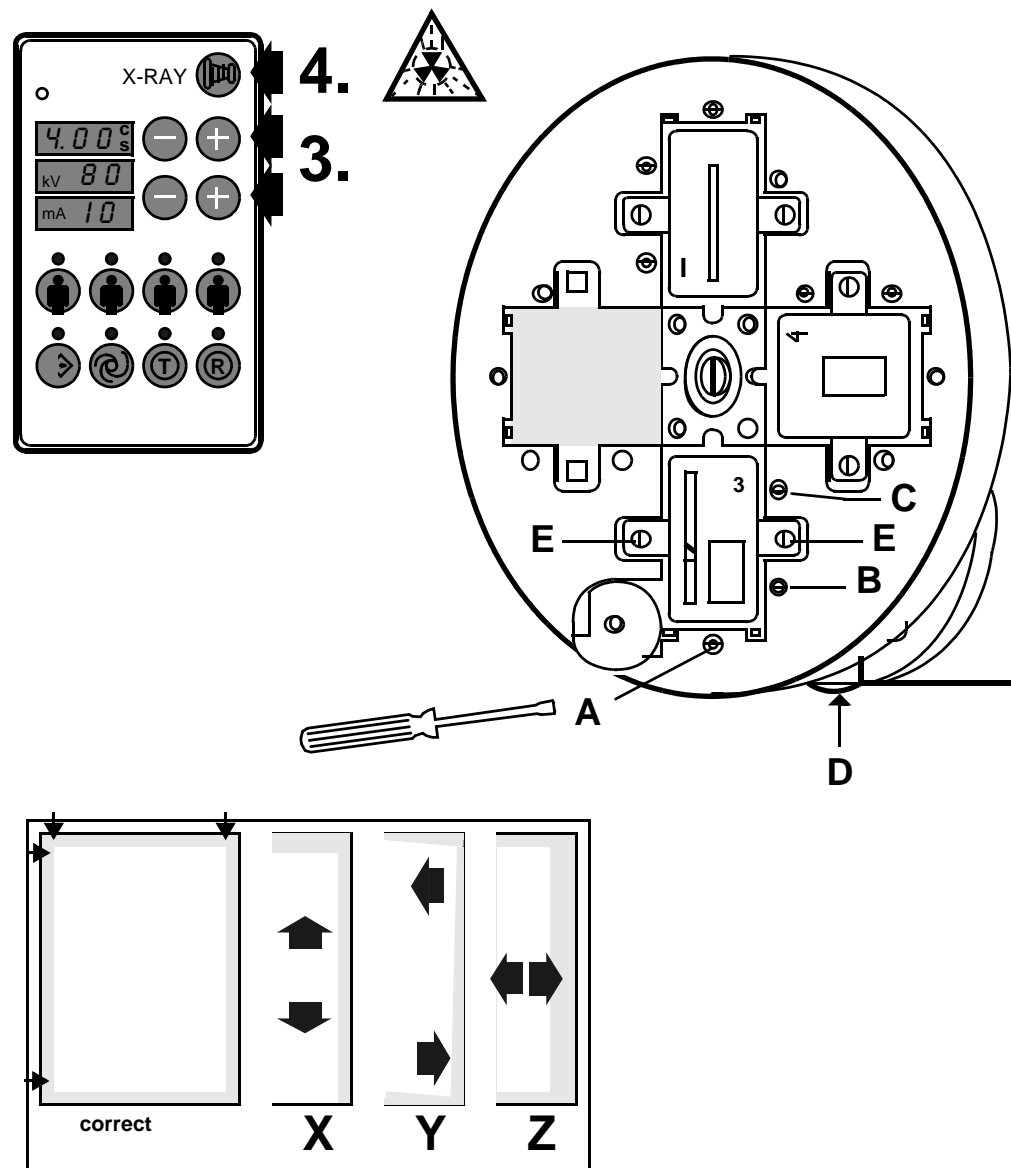
1.

2.1

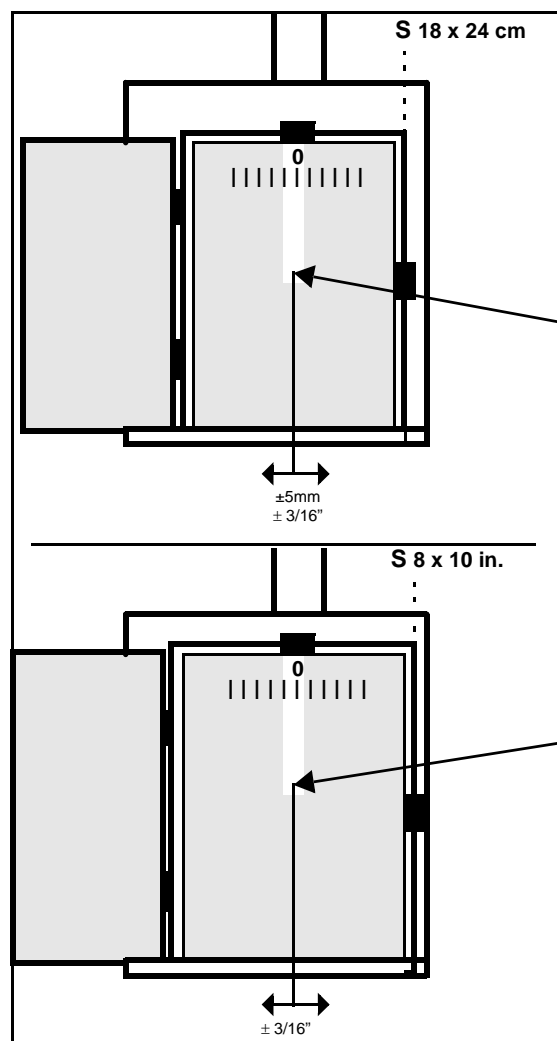
2.2



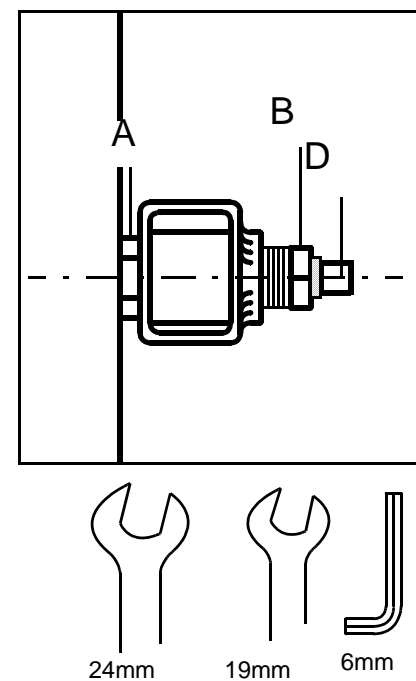
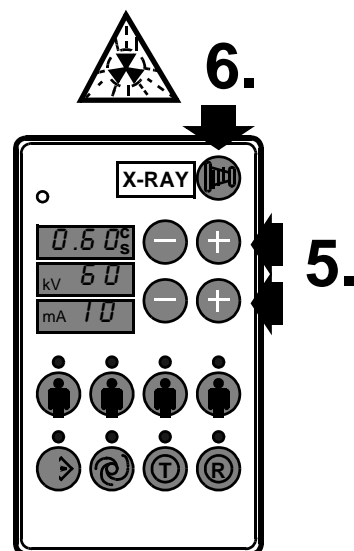
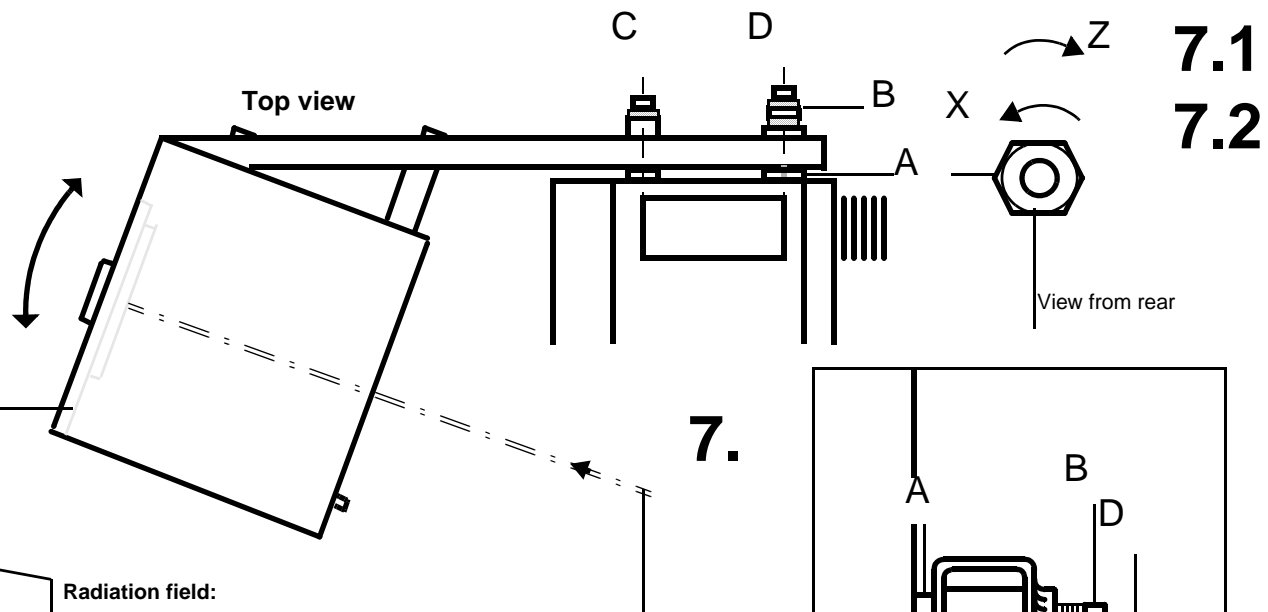
1. Open ear olives and swivel nose support up.  
Move the ear olive holder and cassette holder out of the X-ray beam path.  
Switch unit ON. Wait for self-adjustment of the unit..
  2. **Two checks / adjustments must be made:**
    - 2.1 **Check A (Asymmetrical)**  
Set diaphragm 3 on wheel (press button **D** and turn wheel).  
Set soft-tissue filter in position **120**.  
Insert opened cassette vertically and make contact to the lefthand stop.
    - 2.2 **Check S (Symmetrical)**  
Set diaphragm 4 on wheel.  
Insert opened cassette vertically up to the right-hand stop.
  3. **Set maximum kV/mA step and radiation time.**
  4. **Activate X-RADIATION.**  
Activate X-radiation only for as long as you need to recognize the X-radiation position!  
The luminescent screen must be surrounded on all sides by an even, unexposed margin.
- X "High-Low" beam correction:**  
Loosen two screws **E**. Make the beam correction with screw **A** (eccentric).  
retighten screws **E**.
- Y "Vertical" beam correction:**  
Loosen two screws **E**. Make the beam correction with screws **B** and **C** (eccentrics).  
Retighten screws **E**.
- Z "Right-Left" beam correction:**  
Loosen two screws **E**. Make the beam correction with screws **B** and **C** (eccentrics).  
Retighten screws **E**.
- NOTE**  
If the beam correction with the diaphragm adjusting screws is not sufficient, the U section of the cassette holder can be slackened and readjusted.



### 4.3 Checking and adjusting the X-ray beam for Cephalometry



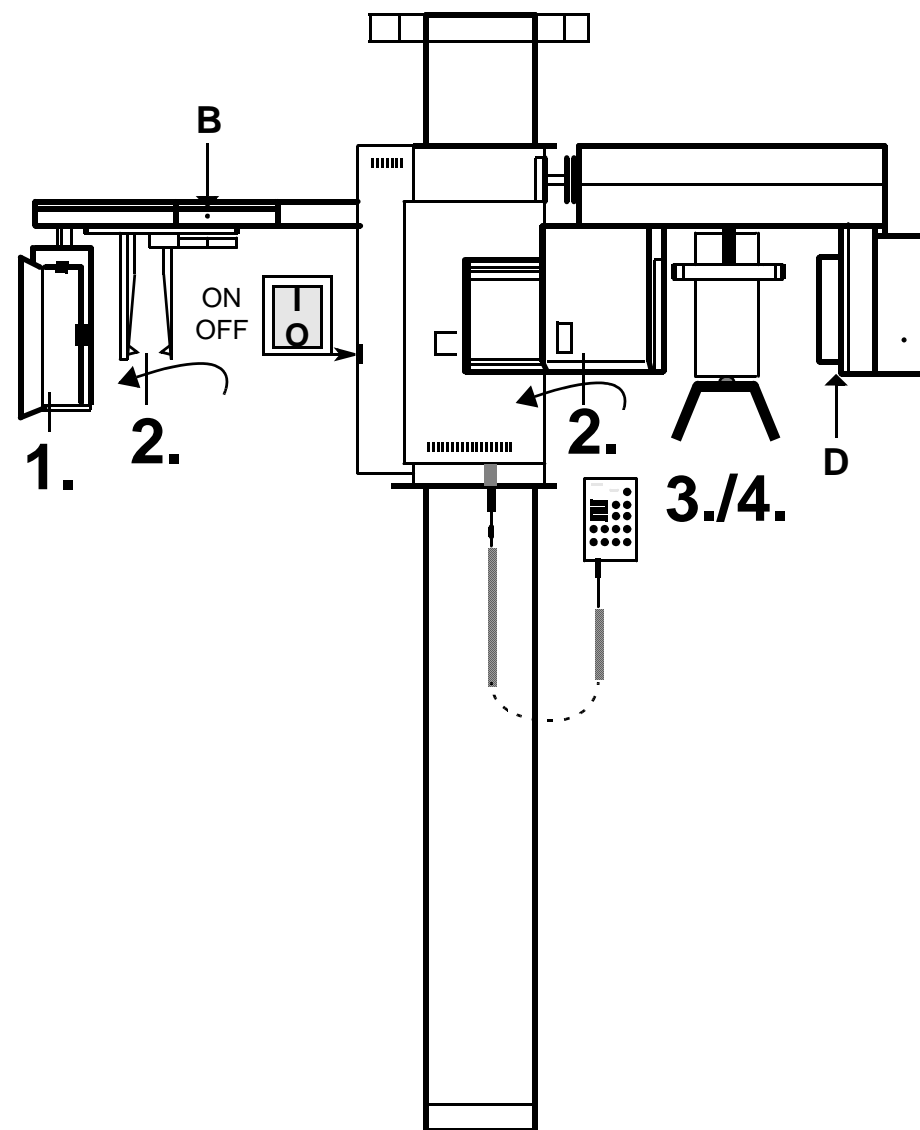
Radiation field:  
permissible deviation from centre 5 mm, 3/16"



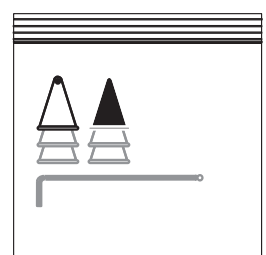
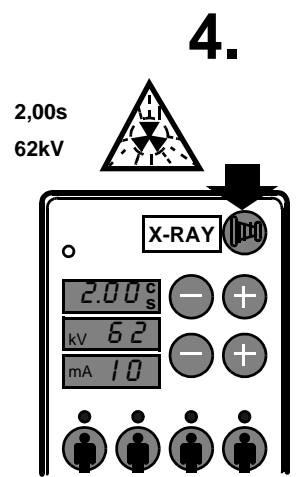
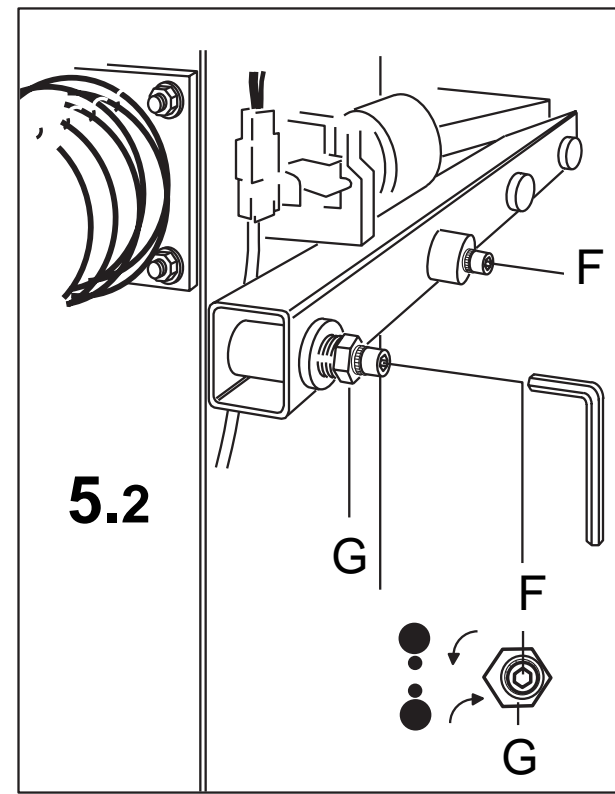
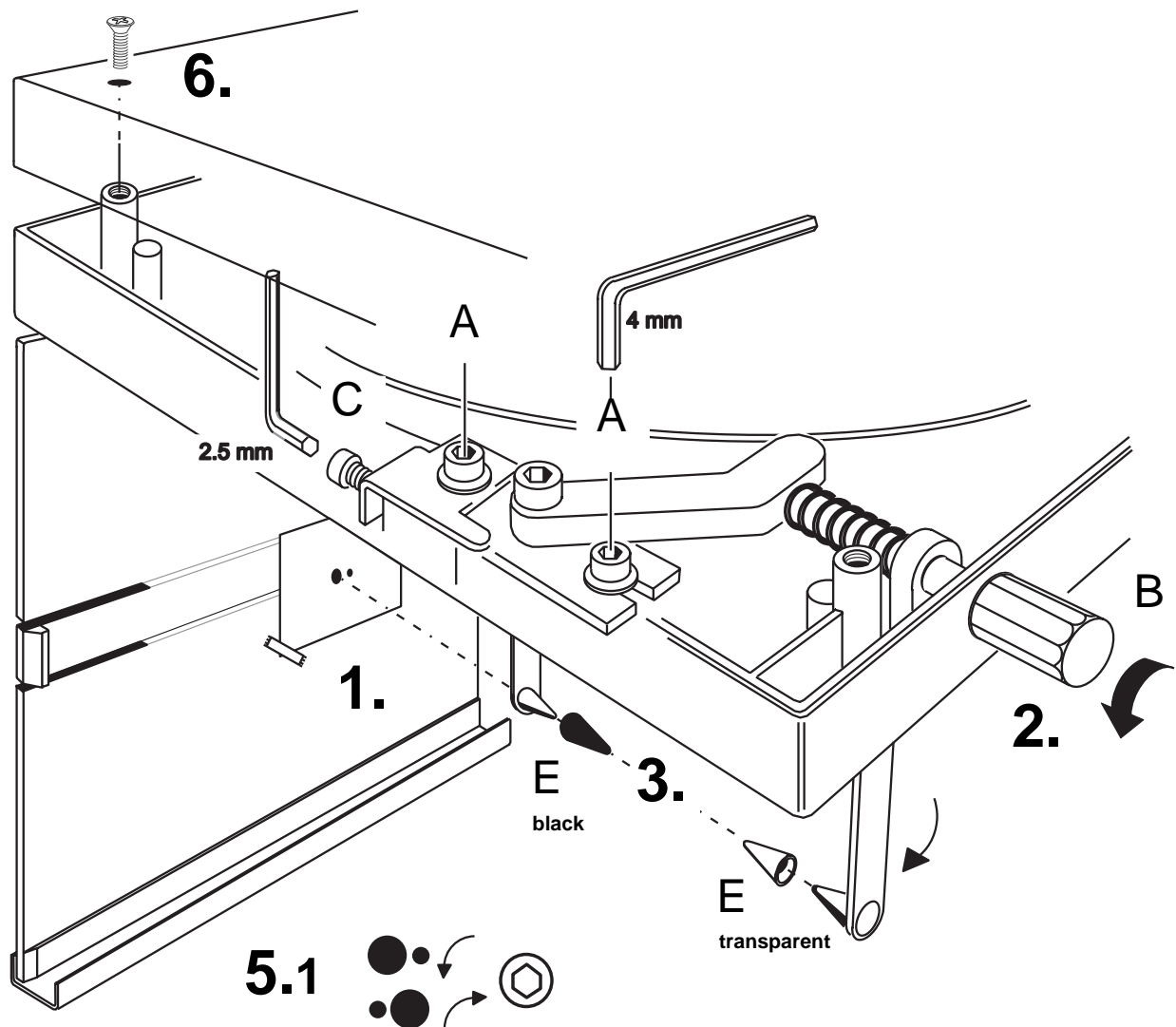
1. Open the film cassette. Place the adjustment screen supplied into the cassette and secure it with adhesive tape. Engage the lateral cassette holder at mark **S 18x24**. Insert the opened cassette all the way to the stop.
2. Swing the nose support out of the beam. Turn the ear olive holder (threaded button **B**) out of the beam direction. Swing the cassette holder for Panorama radiography out of the beam.
3. Select Service program **S.02**, test step 2.
4. Press the Return key **R**. The X-ray tube assembly travels to the position for Cephalometry. Select primary diaphragm **1** at the diaphragm wheel.
5. Select **80kV** on the Multitimer.
6. Darken the room.  
**ATTENTION! RADIATION.**  
Release radiation only as long as necessary to recognize the beam position. The radiation field must be **centered** to the **0 mark** on the adjustment screen.
7. **If the radiation field is offset:**  
Loosen screws **C** and **D** and make the correction with threaded socket **A**.  
**IMPORTANT: When adjusting the threaded socket A, hold eccentric screw B and do not change its setting.**
  - 7.1 **Radiation field is offset to the left:**  
Rotate threaded socket **A** in **z** direction.
  - 7.2 **Radiation field is offset to the right:**  
Rotate threaded socket **A** in **x** direction.

NOTE: One turn of the threaded socket **A** corresponds to a shift of the radiation field in the cassette plane by approximately 15 mm.

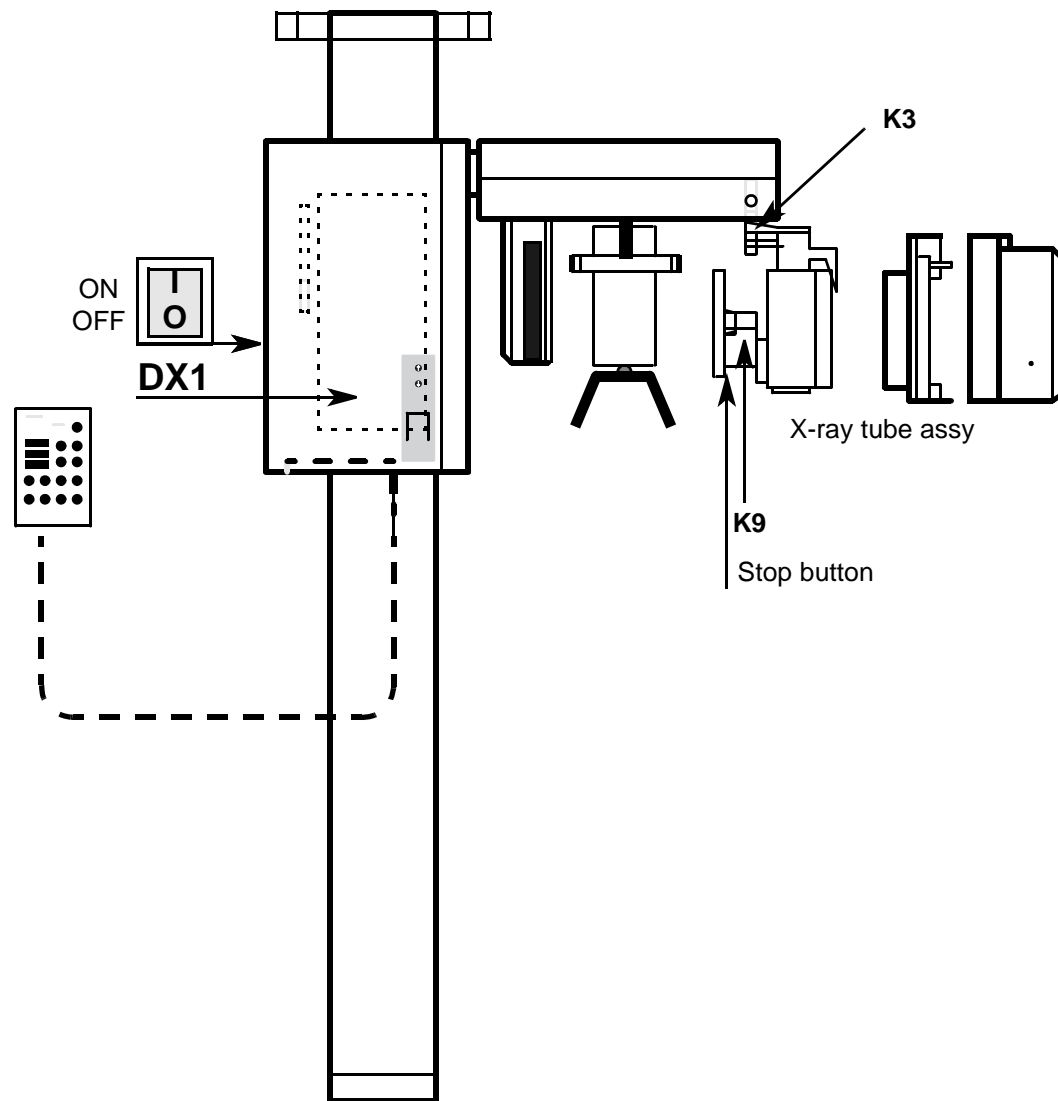
  - Retighten screws **C** and **D**.
  - Repeat the radiation/correction process until the radiation field is centered to the **0** mark.
  - Remove the adjustment screen from the cassette.



## 4.4 Checking the symmetry on the Cephalometer



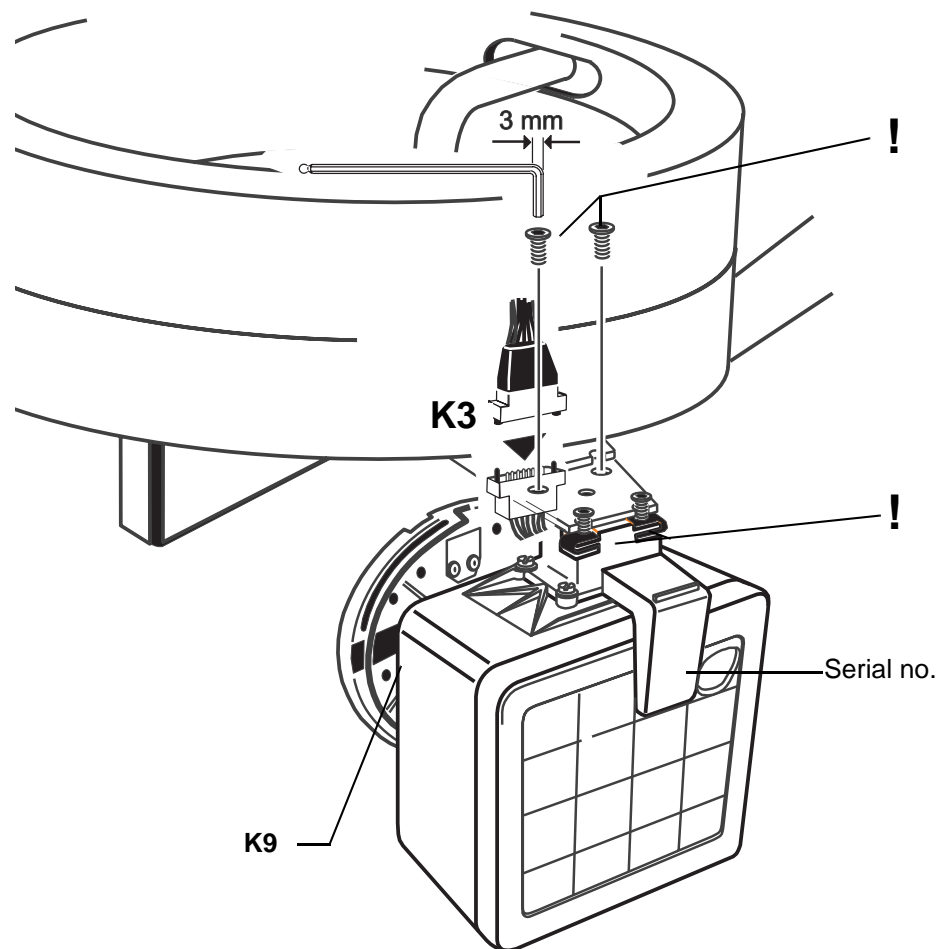
- Metal balls in the adjustment caps are displayed as dots on the screen.  
**The two dots must exactly coincide.**
- 1. Pull out the cassette holder all the way and attach an intraoral film with adhesive tape.
- 2. Loosen knob **B** (rotate ccw) and swivel the ear olives into the beam path.
- 3. Pull the ear olive holder apart and fit the adjusting caps over the ear olives.
- 4. Prepare the unit for Cephalometry (see Operating Instructions).  
Select 2.00 sec and  $\geq 62$  kV at the Multitimer.  
Release **RADIATION**. Develop and evaluate the film.
- 5. **If the two dots do not exactly coincide, adjust as follows:**  
Unscrew the upper cover.
- 5.1 **HORIZONTAL**  
Loose the two screws **A**.  
Turn screw **C** (see above for direction). Retighten screws **A**.
- 5.2 **VERTICAL**  
Turn screw **F** (see above for direction).
- Repeat the exposure and check the position of the dots again.
- Remove caps **E** and keep them with the unit.
- 6. Reattach the upper cover.



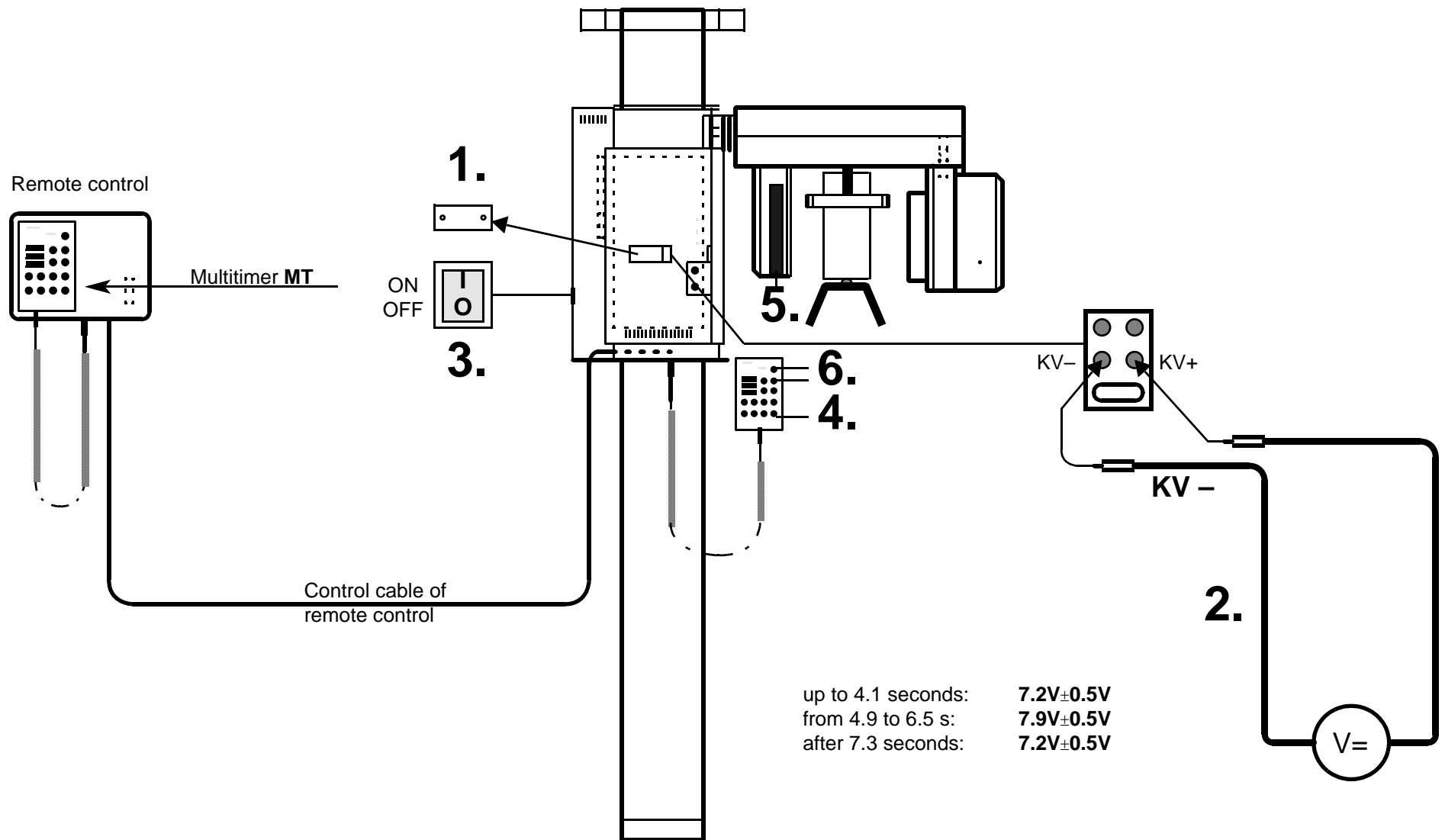


**The following steps must be taken:**

- Move unit to a convenient position for installing head. Switch unit OFF. Remove covers from X-ray head. Remove shielding plate from X-ray head. Loosen the clamp which secures the shield.
- 1. Disconnect plug connection K9 behind diaphragm wheel (only if Ceph unit present). Cut the cable ties.  
ATTENTION: Heavy weight! Unscrew the X-ray tube assembly (four screws) and disconnect K3. Attach the new X-ray tube assembly and connect K3. Tighten the four mounting screws. Plug in connector K9 and secure the cables with cable ties.
- 2. Install the diaphragm wheel (diaphragm 1 or 10 downward!) on the new X-ray tube assembly (one screw in the center, on Panorama unit one screw to secure against rotation). Ensure that the locking button (if present) functions properly!
- 3. Adjust board DX1 to the new X-ray tube assembly.  
Proceed according to section '**Adjusting board DX1**', see page 4 - 31.
- 4. ORTHOPHOS 3 DS: Readjust diaphragm 10 for Panorama radiography.  
ORTHOPHOS 3: Readjust diaphragm 1 for Panorama radiography.  
Proceed according to section '**Checking and adjusting the X-ray beam for Panorama radiography**', see page 4 - 13.
- 5. Orthophos 3 Ceph: Readjust diaphragms 3 and 4 for Cephalometry.  
Proceed according to section '**Checking and readjusting the X-ray beam for Cephalometry**', see page 4 - 17.
- The X-ray tube assembly is now matched to the other unit components.  
Enter the new serial number in the warranty passport.  
In Germany:  
Perform an Acceptance test according to the "Röntgenverordnung" (X-ray ordinance).



## 4.6 X-ray tube assembly: action to be taken during/after replacement?



- During a Panorama radiograph of the spinal column region the kV value is automatically increased by up to 12% according to the kV/mA setting.  
This kV increase can be measured as follows:
- Set user offset to 0 using Service routine S.11.

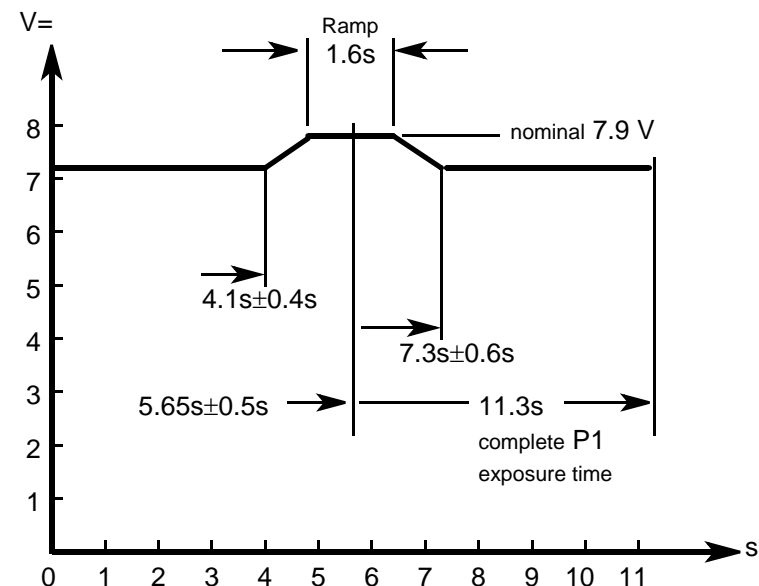
- Remove the small metal cover.
- Connect a voltmeter to **KV+** and **KV-** and select measuring range **20 V**.
- Turn the unit ON and wait for the self-adjustment to execute.
- Press the **R** key. The X-ray tube assembly travels to the start position.
- Example for an exposure: Select program **P1** and **72kV10mA** on the Multitimer. The ready LED must be off.
- ATTENTION: RADIATION!** Press the release button and wait for a complete rotation.

The following values must be reached:

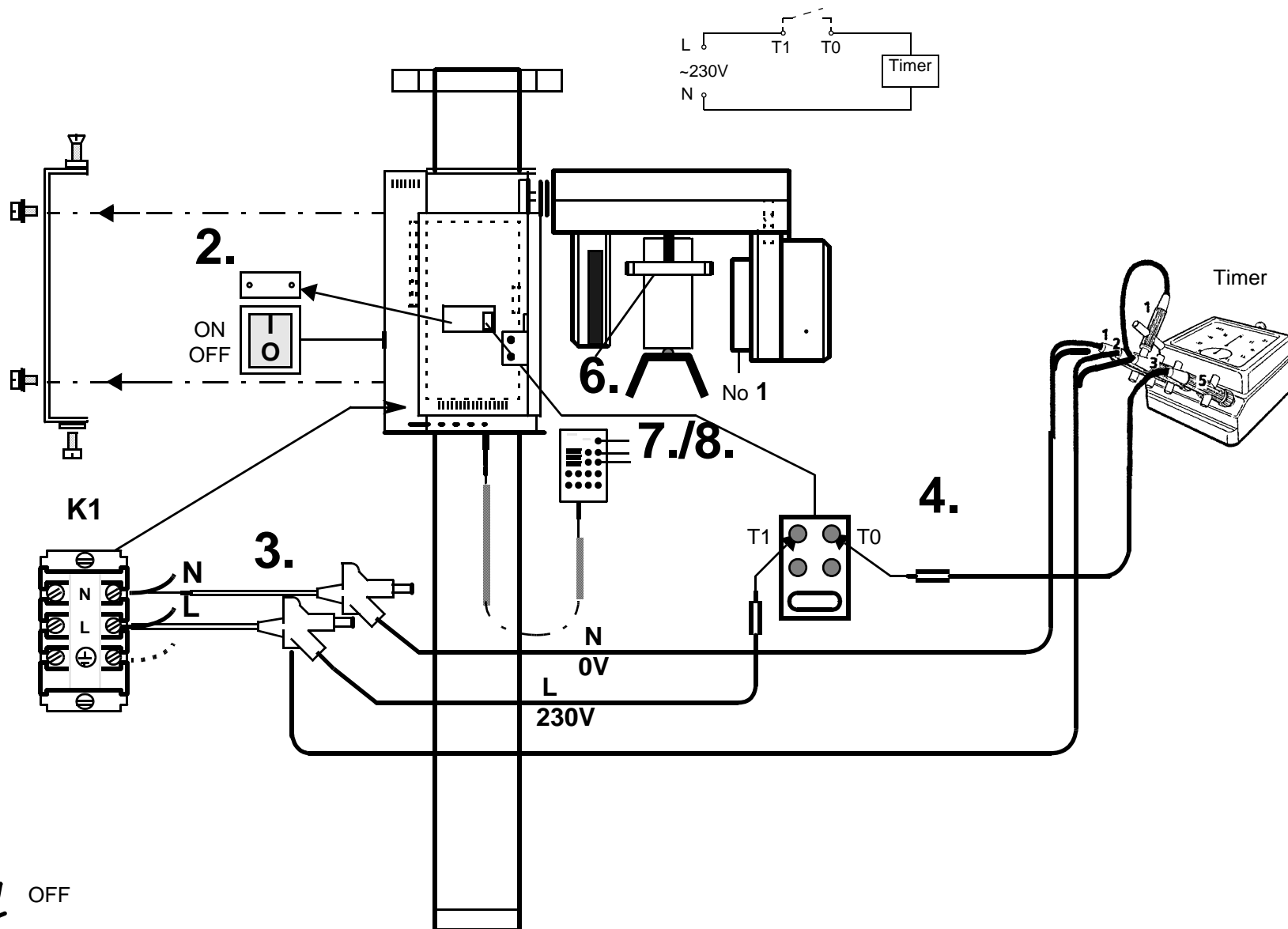
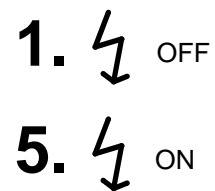
up to 4.1 seconds:  $7.2 \text{ V} \pm 0.5 \text{ V}$   
from 4.9 to 6.5 sec:  $7.9 \text{ V} \pm 0.5 \text{ V}$   
after 7.3 seconds:  $7.2 \text{ V} \pm 0.5 \text{ V}$

If the value  $7.5 \text{ V} \pm 0.5 \text{ V}$  is not reached, board DX1 is defective.


Replace board DX1 and perform "Adjusting board DX1", see page 4 - 31.




## 4.7 Radiographic density of spinal column not correct



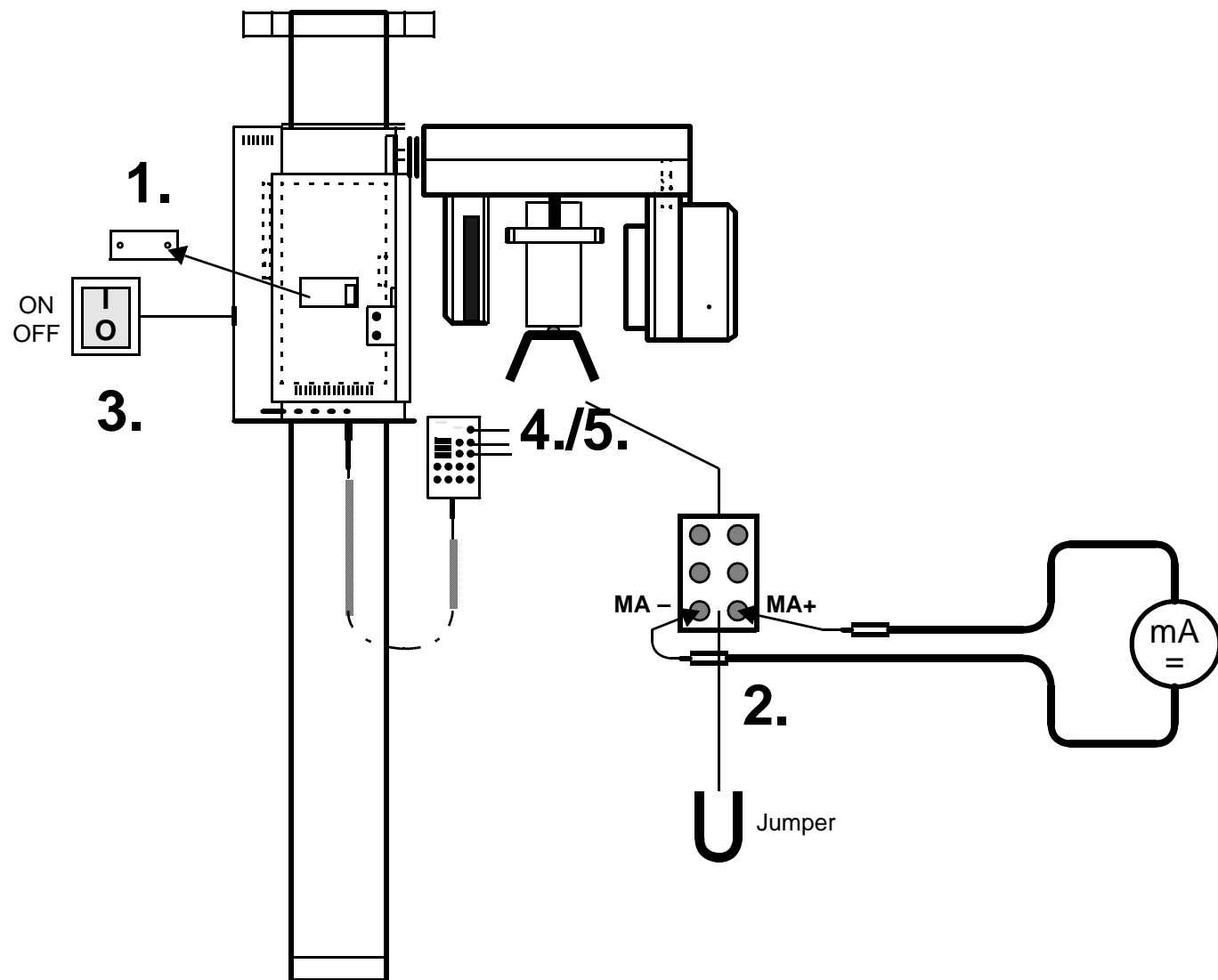
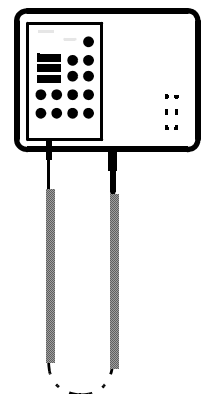
- **Panorama radiography**

1. Turn the unit OFF. Switch off the power supply line for the building.
2. Take off the side cover and the front cover.
3. Connect the timer to K1.N (0 V) and K1.L (230 V) (line voltage).
4. Connect the leads to test jacks T0 and T1.
5. Switch the power line and then the unit ON. Wait for the self-adjustment to execute.  
Move the X-ray tube assembly to the start position (by pressing the R key).  
ORTHOPHOS 3 DS: select diaphragm 10.  
ORTHOPHOS 3: select diaphragm 1.
6. Fully open the temple support!
7. Select program **P1** and **72kV10mA** on the multimeter.
8. **ATTENTION: RADIATION!** Press the release button until the X-ray display switches off automatically (complete rotation).
  - The timer must indicate an exposure time of **11.3 s ± 0.7 s**.
  - If the specified exposure time is not reached:  
Replace board DX 1 and perform '**Adjusting board DX1**',  see page 4 - 31.

- **Cephalometry**

- Leave the timer connections unchanged.
- ORTHOPHOS 3 Ceph: Set the Ceph function by selecting diaphragm 3 or 4 and select 1s radiation time.
- Select **72kV/10mA** on the Multitimer.
- **ATTENTION: RADIATION!** Press the release button until the X-ray display switches off automatically.
- The timer must indicate an exposure time of **1 s ± 0.05 s** for ORTHOPHOS 3 Ceph.
- If the specified exposure time is not reached:  
Replace board DX 1 and perform '**Adjusting board DX1**',  see page 4 - 31.

## 4.8 Checking exposure times



1. Unscrew the cover.
2. Remove the MA+/MA jumper and connect the ammeter instead. Select the 20 mA measuring range.
3. Turn the unit ON. Wait for the self-adjustment to execute.
4. Select Service routine **S.01**.

**Additionally with ORTHOPHOS 3 DS:**

Establish SIDEXIS exposure readiness by selecting **Constancy check** in the service menu

**Service exposure**

**Factory service (2)**

or set the Active signal internally with Service Routine S.35, test step 02, see page 5 - 59

**5. Measurement**

- Select the following step on the Multitimer: 72kV/10mA.

**ATTENTION: RADIATION!** Press the release button, hold it pressed and take the measurement.  
The ammeter must read **10 mA ± 0.5 mA**.

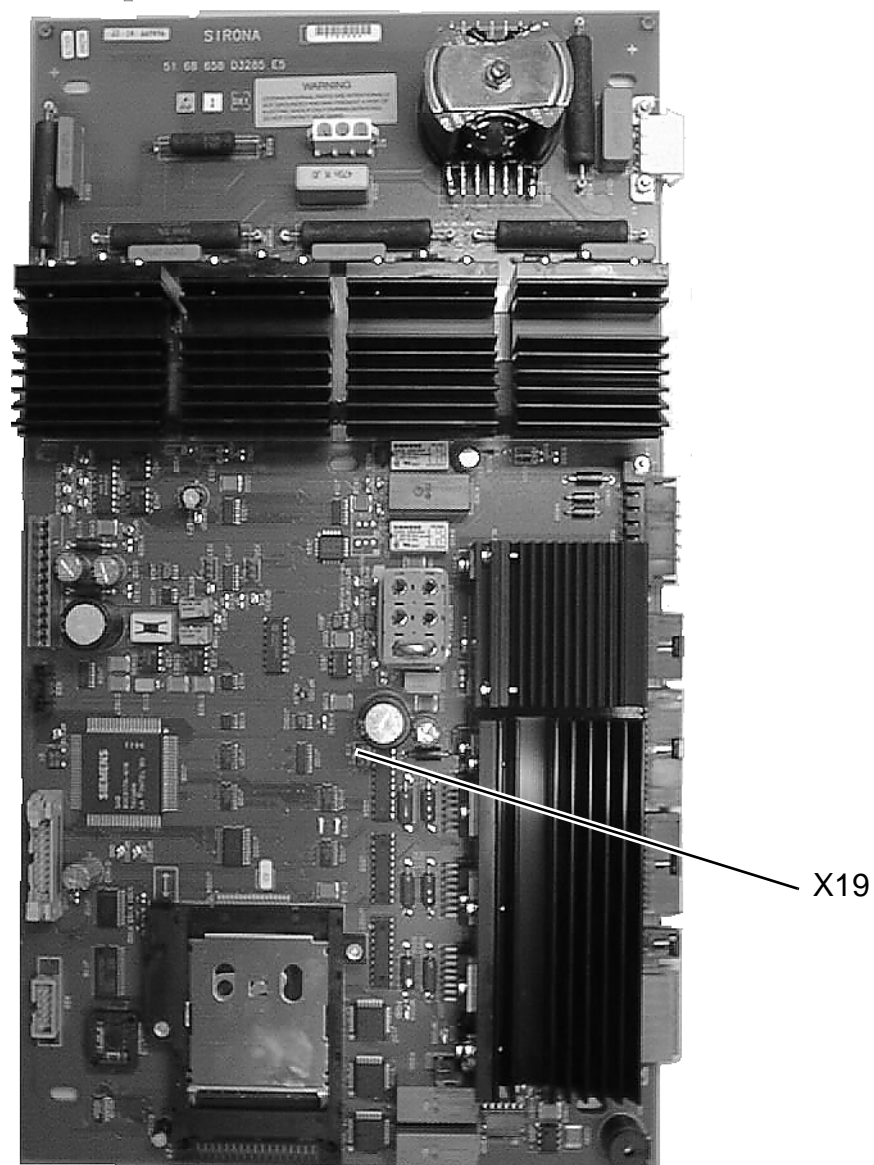
- If the measured value is OK, pull off the wires and insert the jumper again.  
Attach the covers.
- If the specified mA values are not reached, the mA setpoint must be checked:
- Select Service routine **S.03**, test step 02 or 04, and set the mA setpoint (see section "Service routines").
- Then perform Service Routine S.05, test step 02.
- If the specified values are now reached check the tube current again as described above.
- If the specified values are still not reached, adjust board DX1.  
If this is not possible, replace board DX1 and perform '**Adjusting board DX1**', see page 4 - 31.  
If the values are still not reached, replace the X-ray tube assembly.

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**4.9 Checking the tube current**

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51 68 658

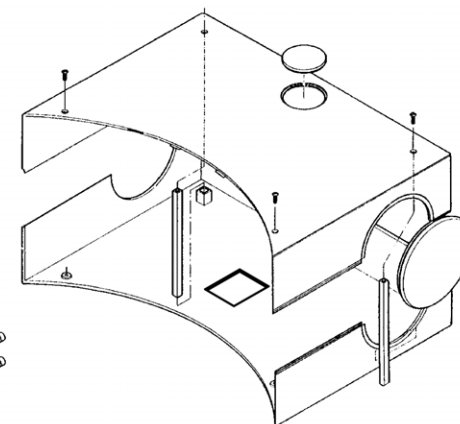
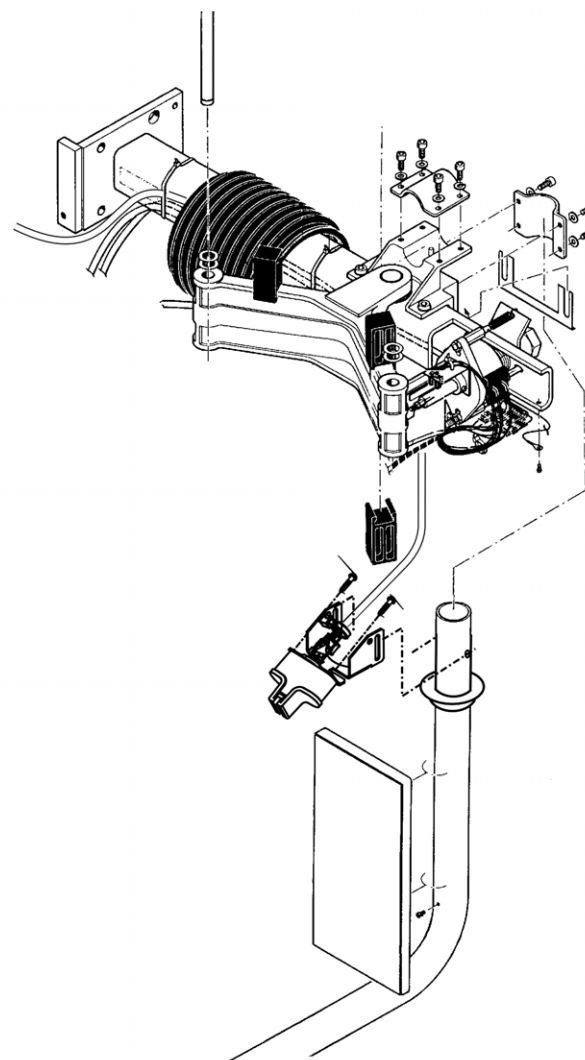
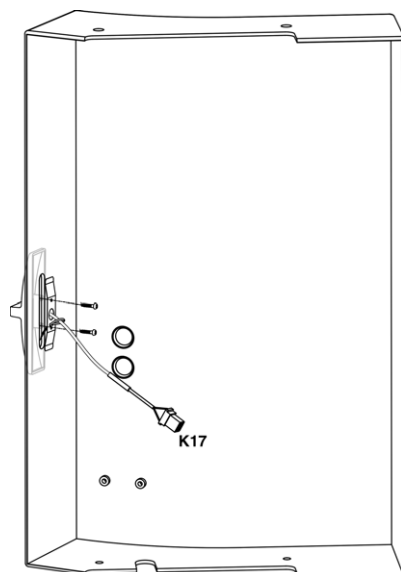
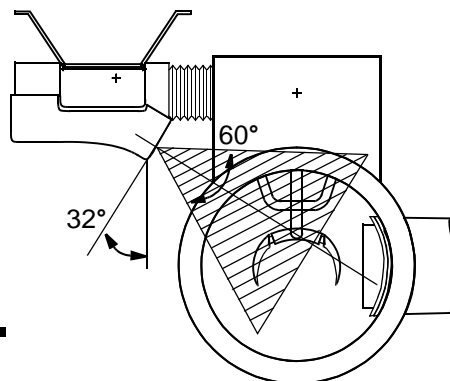




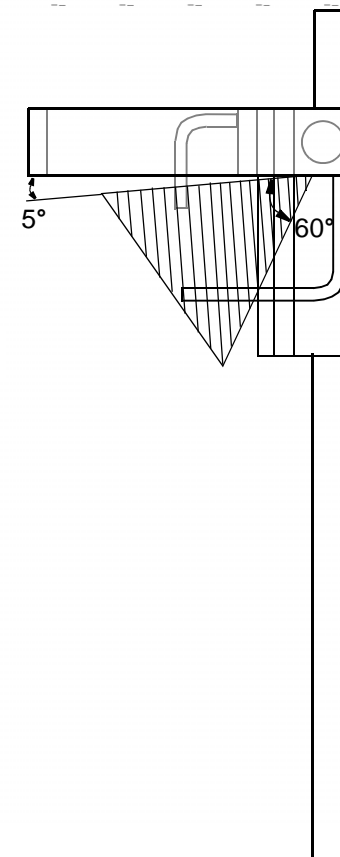
- After replacing the board plug in all connectors so that they are properly engaged.
- Plug memory card from old board DX1 onto new board.
- Check plug X19:  
On **ORTHOPHOS 3 / 3 Ceph** the **jumper** must be plugged to pins **X19.2** and **X19.3**.  
On **ORTHOPHOS 3 DS** the **jumper** must be plugged to pins **X19.1** and **X19.2**.  
(Connector X19 “configures the address line” and is important for enabling the storage of system data and settings.)
- After turning the unit ON it executes the self-adjustment. Wait until the usual displays of program/exposure time, kV and mA light up on the Multitimer.
- Perform all checks and adjustments according to section **Service routines**.
- Select Service routine **S.03**  
test step **04** (automatic system) for DX1 51 68 658.  
Adjust **setpoint values** for kV, mA and preheating.
- Select Service routine **S.05**, test step **02** (automatic system)  
Perform the **Heating adjustment**.
- Select Service routine **S.04**, test step **03**  
Check the **actual values** of kV, mA and preheating.
- Check the Unit identification with Service routine S.17.
- **Country-specific Adjustments:**
  - With Service routine S.25 Adjusting the film/screen combination or the kVmA step series.
  - With Service routine S.27 Setting country code.
- Turn the unit OFF and ON again to exit the service routines.
- Board DX1 is now correctly matched to the X-ray tube assembly.
- Reattach all shielding covers!  
Screw the small metal cover on again.

## 4.10 Adjusting board DX1

1.



2.



- The device contains a class 1 laser product.
- The light localizers are used for correct adjustment of the patient position. They must not be used for any other purposes. A distance of at least 100 mm must always be maintained between the viewer's eyes and the laser. Do not gaze into the beam.
- When the height adjustment key ↑ is pressed, the laser light localizers are always automatically switched on for 1min.
- To check the light localizers, fasten a piece of paper in the head support and mount the subnasal contact segment. The laser beam will then be displayed as a red line.
- The horizontal light beam must impinge (strike) the paper horizontally.
- The central light beam must impinge the median line of the contact segment vertically.

#### 1. Correcting the horizontal light beam.

If the light beam is not horizontal:

Check to make sure that the front cover is properly attached and the column is at a right angle to the rotary ring. If these trouble sources can be excluded, the complete laser module must be replaced. To do this, first unscrew the cover. Then unplug connector K17 and loosen the screws. Finally, fasten a new laser module with the screws.

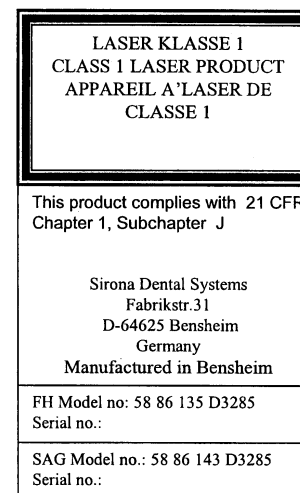
#### 2. Correcting the central light beam.

##### 2.1 If the light beam does not impinge on the median line of the contact segment:

Loosen the screw fastening the laser module to the support tube and align the light beam to the median line of the contact segment by rotating the module. Then retighten the screw.

##### 2.2 If the light beam is not vertical:

Align the light beam by turning the metal angle plate slightly.



## 4.11 Checking and adjusting the light localizers



## 5 **Service Routines**

---

## Service Routines

### Contents

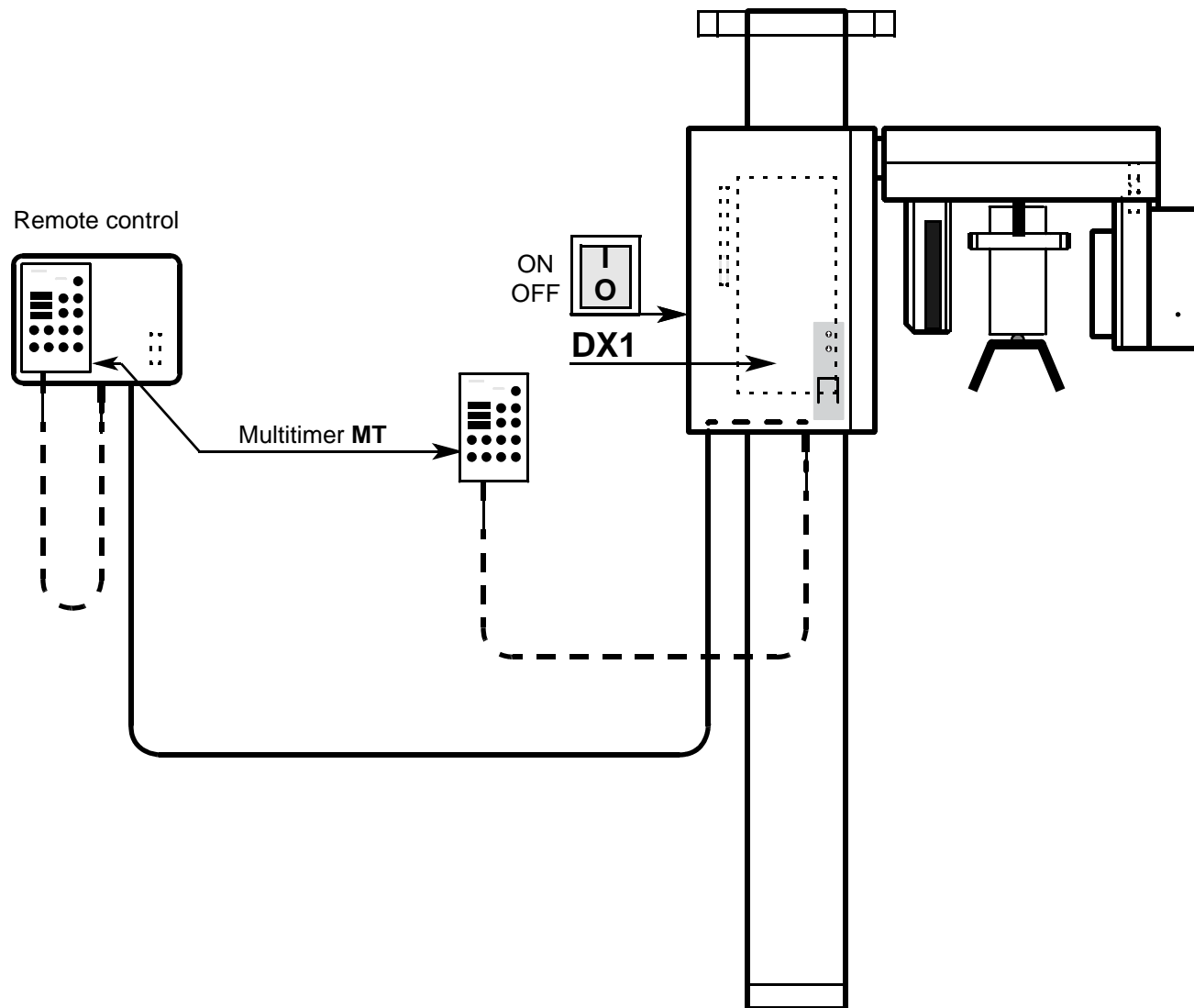
|      |                                                                                                        |        |
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- The Service routines are used to check the functionality of certain unit components and assemblies.

### Selecting a Service routine

1. Press the **Memory** key.
2. Then press the service key  for about 4 sec until the digital displays disappear.


#### Within 3 seconds:

3. Press the **Patient symbol** keys in the sequence **A – B – C** within 3 seconds.  
You have then entered the service mode.

If during the selection of the Service routine this sequence is not followed, a wrong key is pressed or the time is exceeded, the unit switches automatically back to the normal mode.


*\* A maximum of 99 error messages can be stored.*




*OE means that at this point the unit was turned OFF and ON again.*

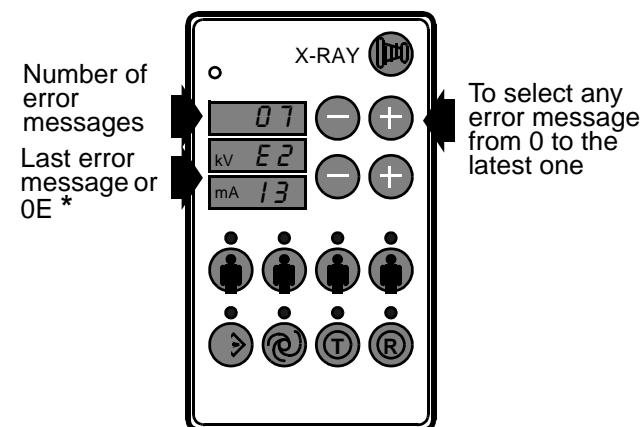
4. Press the service key .  
The digital display indicates Service routine **S.01**
5. Select the desired Service routine with the **+** or **-** keys (for example S.04).  
The selection of Service codes and test steps is described for the individual service routines on the following pages.






### Deselecting a Service routine

Switch the unit OFF and ON again.

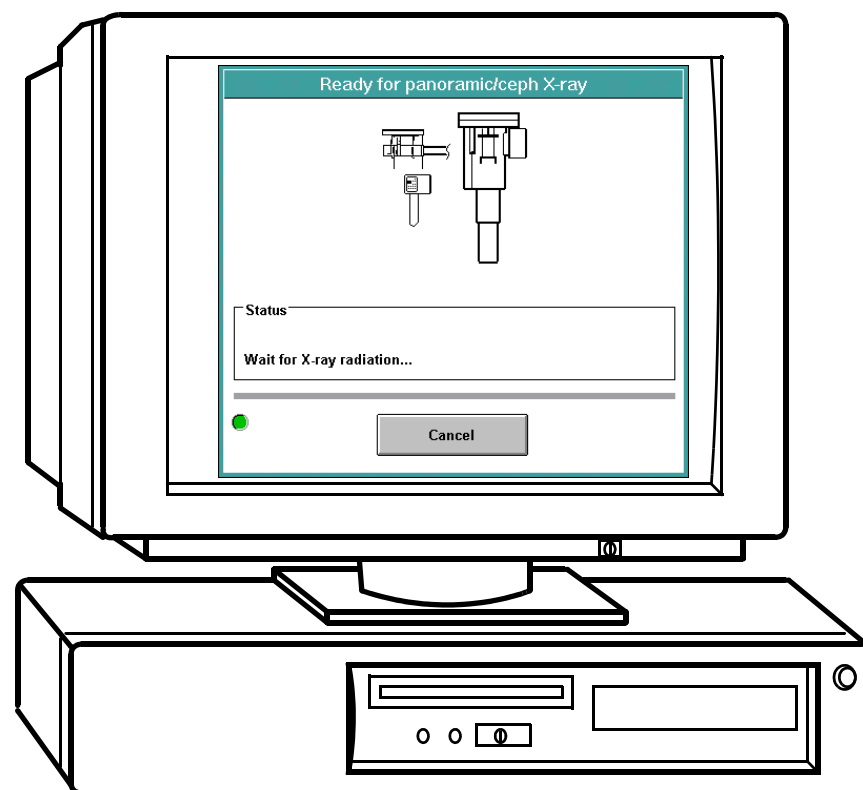
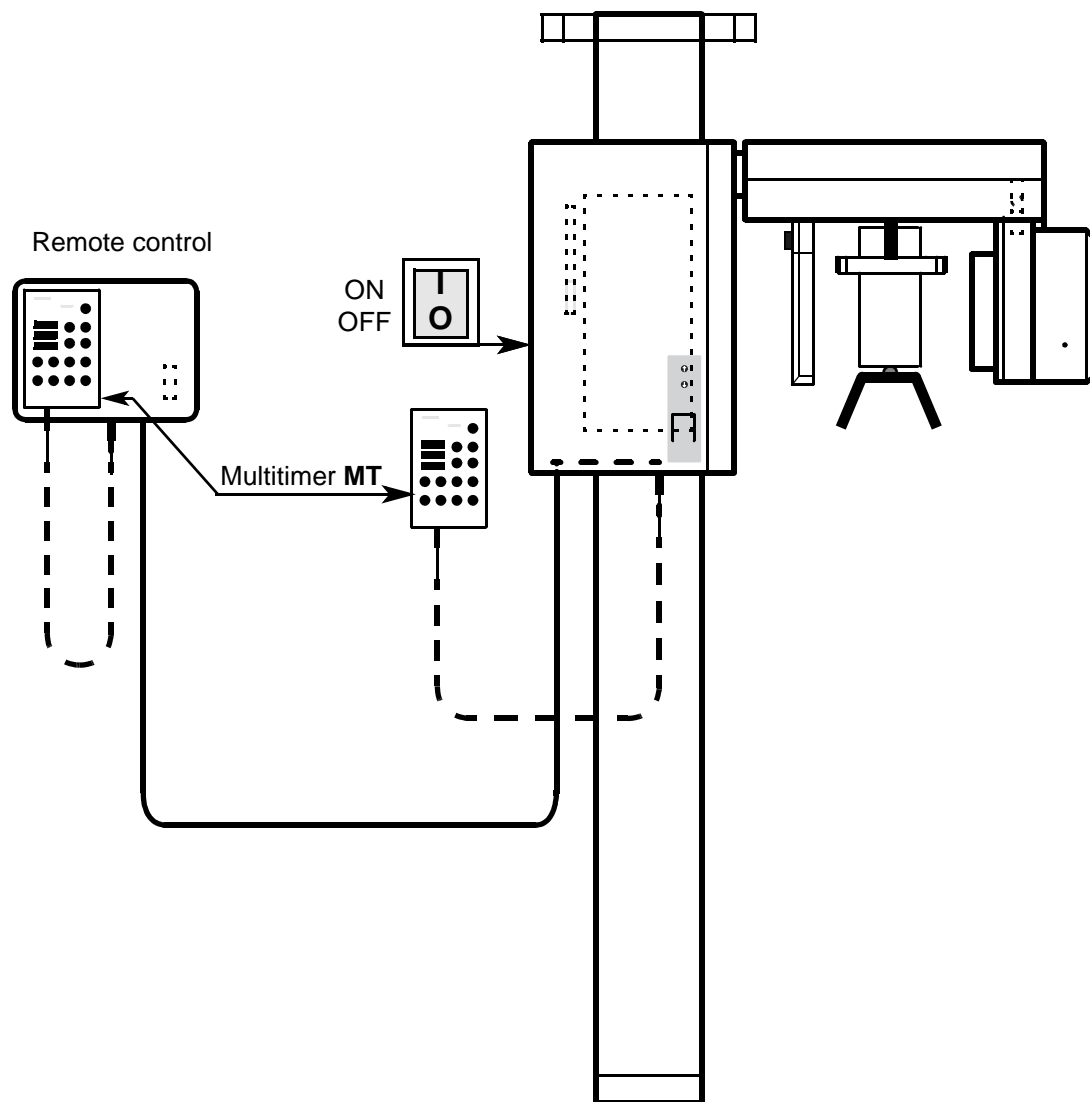
**ORTHOPHOS 3 DS:** for all service routines with radiation, set exposure readiness via **SIDEXIS**. See next page or  
set the Active signal internally with Service Routine S.35, test step 02.  
 see page 5 - 59.

1. 
2.  4s press
3. 




4.  Service key 
5.   

## 5.1 Selecting Service routines



## Additionally for ORTHOPHOS 3 DS:

**For all Service routines with radiation, set exposure readiness via SIDEXIS.**

NOTE: It is also possible with Service Routine S.35, test step 02, to set a radiation release internally  see page 5 - 59.

Switch on the PC and the monitor.

Activate the **Services** menu.

Activate the **Constancy check** menu item.

In the **X-ray apparatus** menu activate the **Select** menu window.

Activate the **XC XP** tool.

The selection dialog **Select type of check** appears:

**Service radiograph**  
**Approval test**  
**Constancy check**  
**Terminate**

If another dialog appears, select

**Terminate**

and activate **XC XP**.

In the dialog **Select type of check**

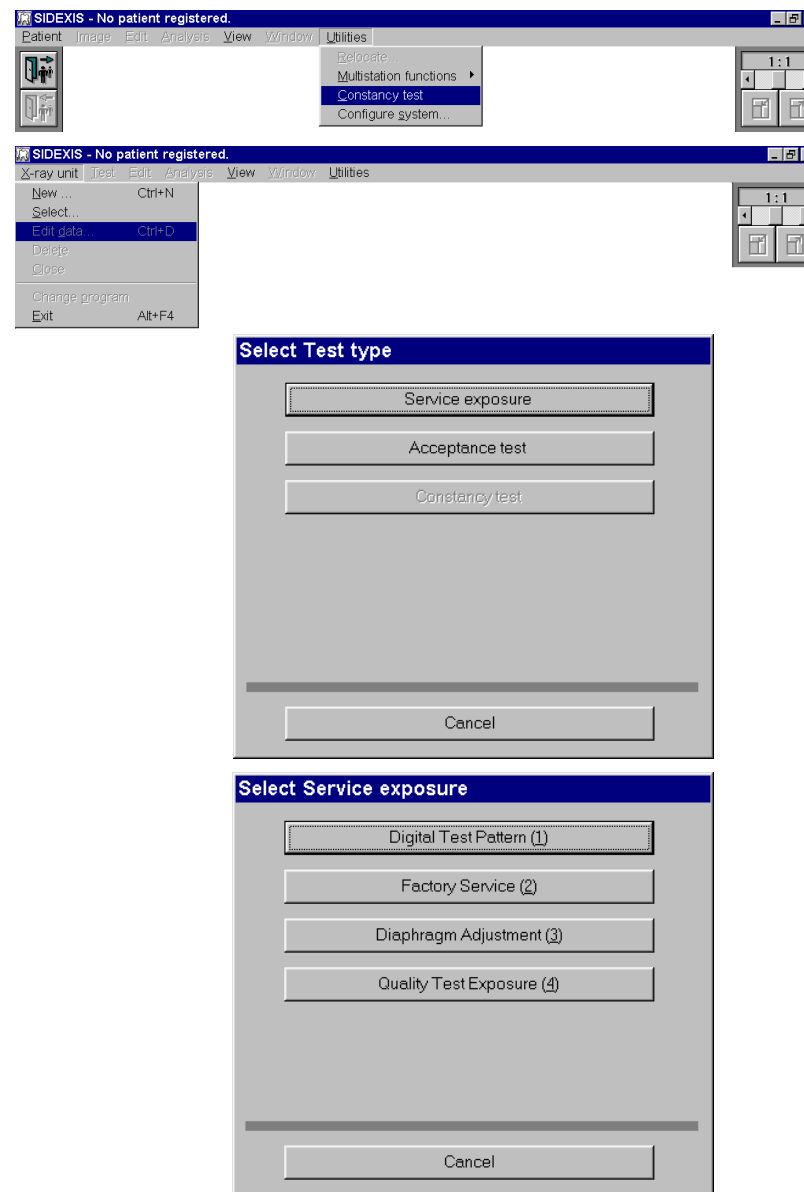
**activate Service radiograph.**

The selection dialog **Select Service exposure** appears.

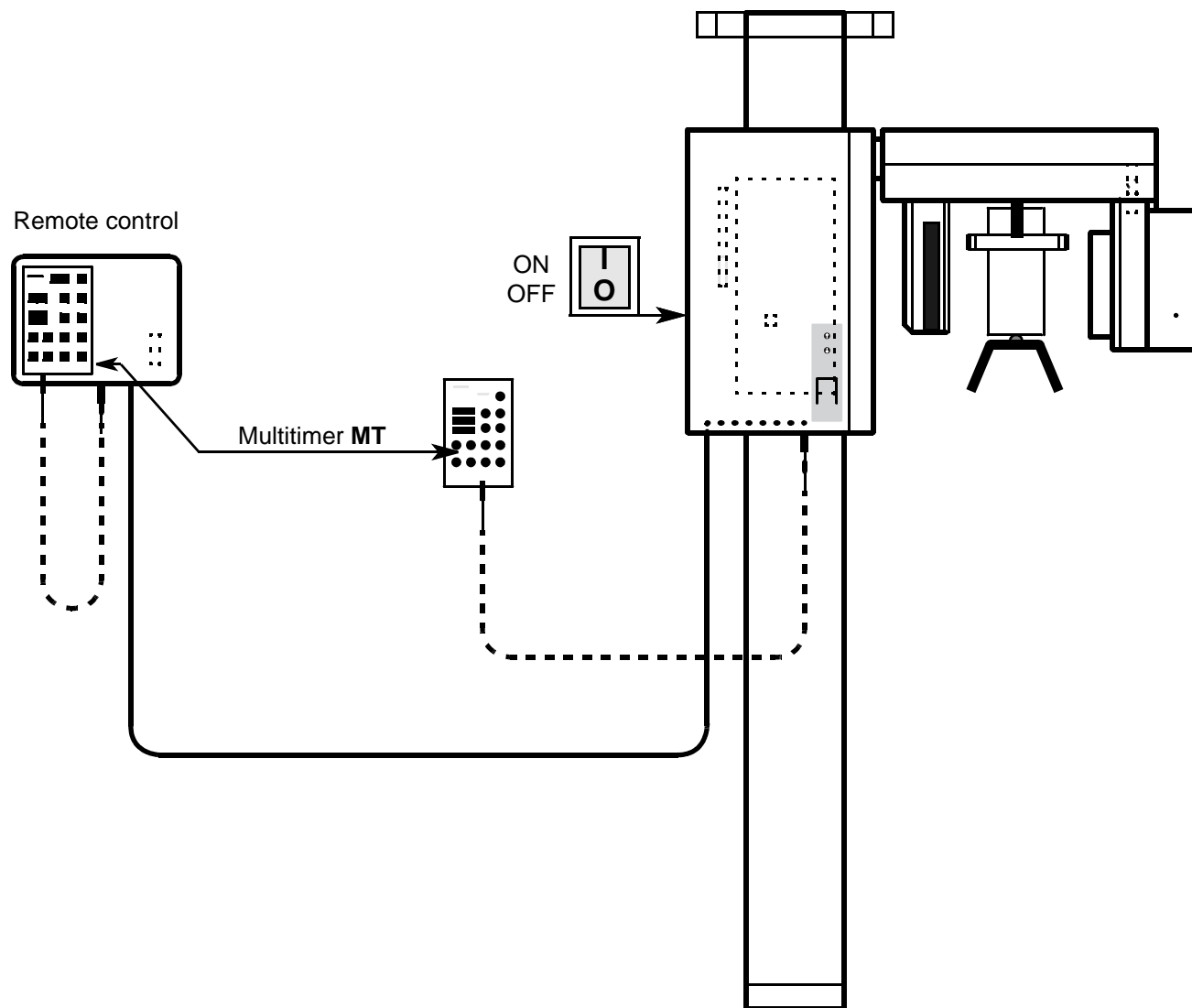
**Digital test display (1)** (checks the transmission path ORTHOPHOS - PC)  
**Factory service (2)** (sets the locking signal for service program, if not E4 08)  
**Diaphragm adjustment (3)** (diaphragm adjustment, radiation field image)  
**Quality test exposure (4)** (test exposure not stored in PDATA)  
**Terminate**

**If the service password is requested the current system date (the first four digits) must be entered in reverse order (see SIDEXIS Service Manual).**

E.g. May 24, 1995 (24.05 1995) becomes 5042.




## 5.2 Setting exposure readiness on the PC




- **Radiation without rotation can be released with Service routine S.01.**

Additionally with ORTHOPHOS DS: set readiness for exposure as described in section '**Setting exposure readiness on the PC**'. Select **Factory service (2)** or **set the Active signal internally with Service Routine S.35, test step 02.**  
☞ see page 5 - 59.

1. Select Service routine **S.01** as described in section '**Selecting service routines**'.

2. Then briefly press the service key .  
The kV display indicates **00**.

3. Enter service code **01** with the + key.

4. Then briefly press the service key .  
The values on the kV/mA display flash. The kV values can now be altered.  
The LEDs above the patient symbol keys light up.

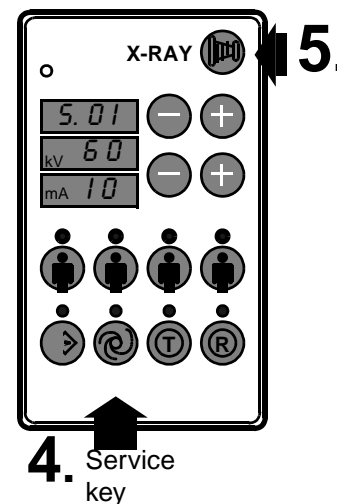
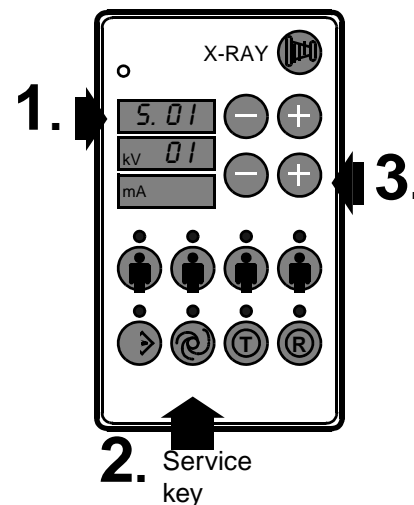
5. **RADIATION** can now be generated.  
The actual radiation time is displayed after releasing the exposure button.

NOTE: If error message **E4 08** is displayed SIDEXIS is not ready to release an exposure or an internal active signal is missing.

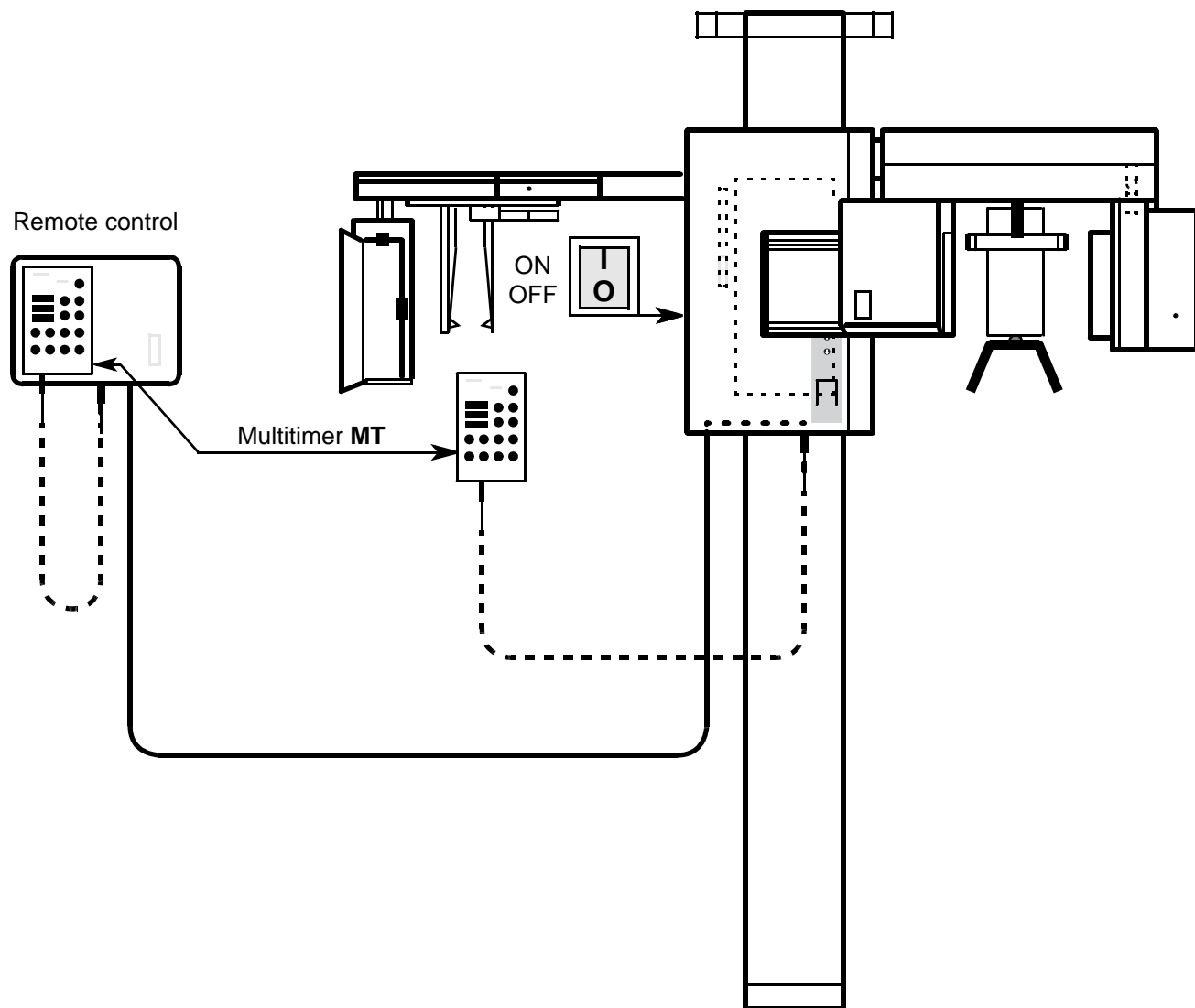
The radiation time is limited to a maximum of 14 seconds.  
The maximum radiation time of 14 seconds lights up. Press the R key.

If an exposure is released during the cool-down period, the elapsed cool-down time is displayed (automatic exposure blockage). During this time the LED above the R key flashes.

Briefly press the service key . The Service routine S.01 is terminated.







### 5.3 Service routine S.01 Radiation without rotation

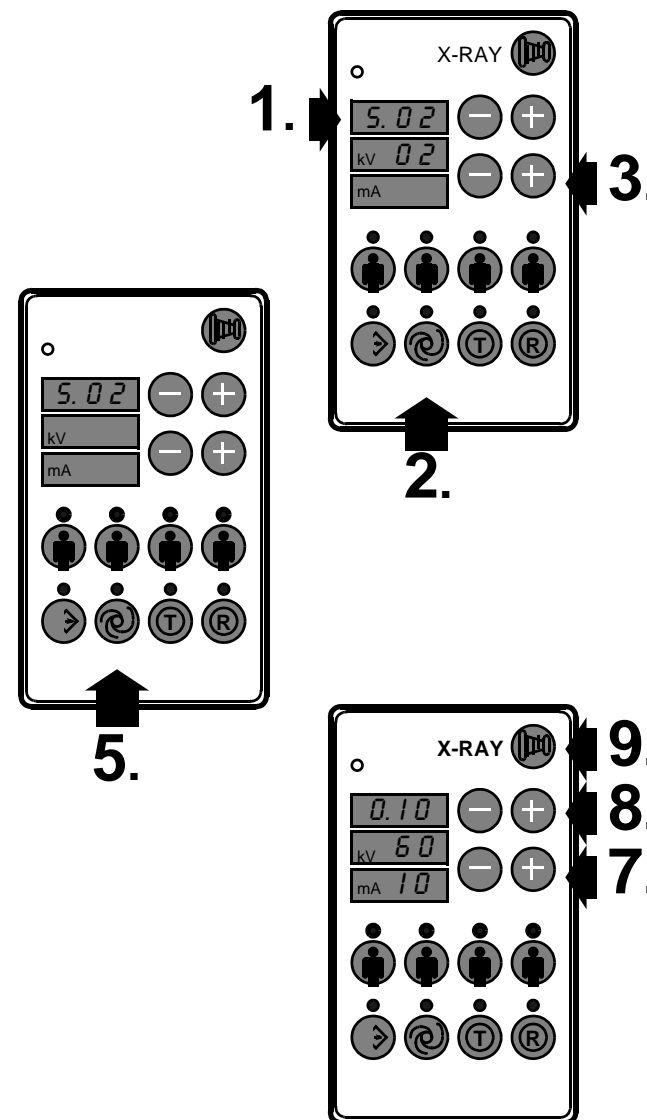




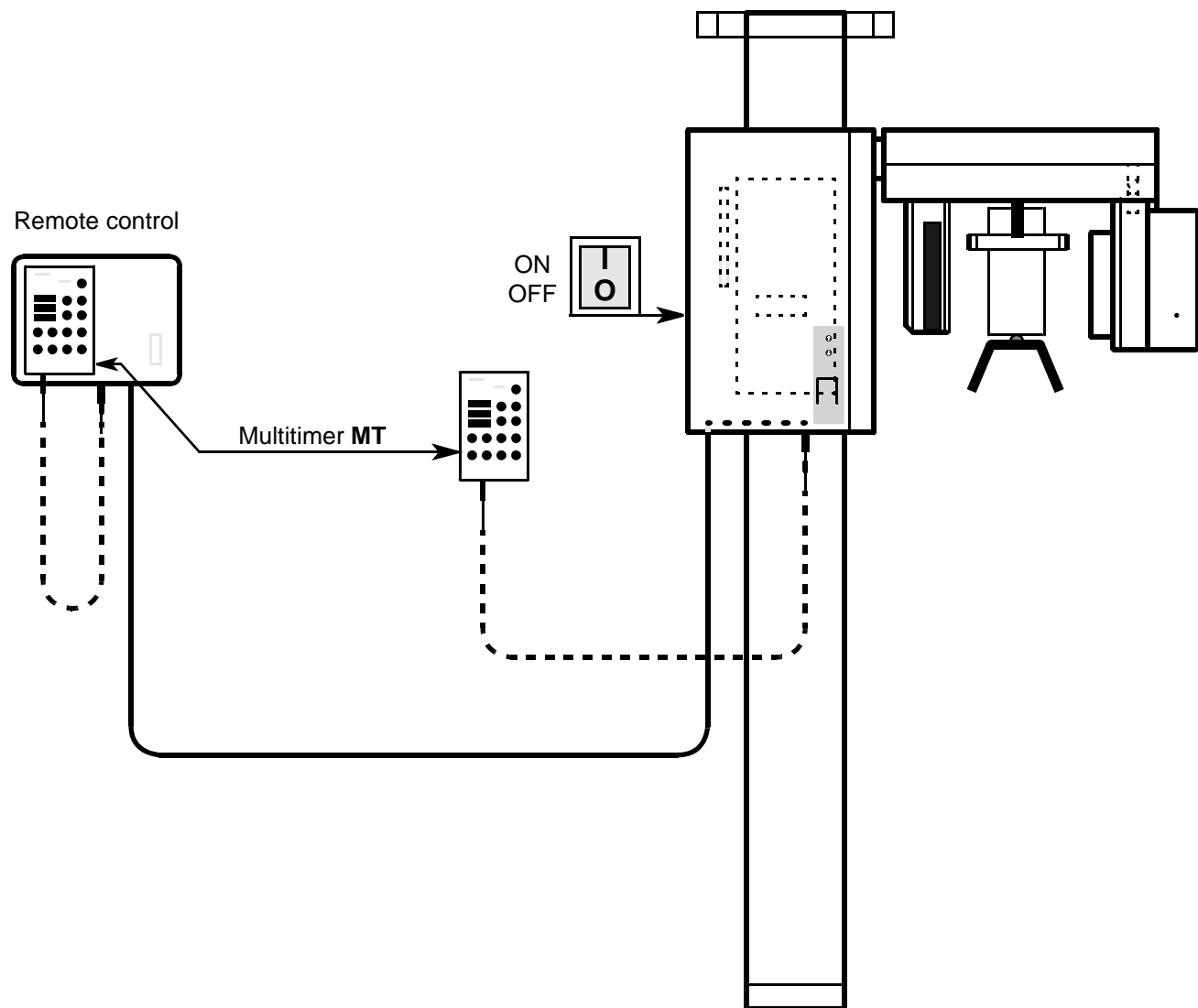
- **Radiation without rotation and with exposure times for cephalometry can be released with Service routine S.02.**

Additionally with ORTHOPHOS DS: set readiness for exposure as described in section 'Setting exposure readiness on the PC'. Select **Factory service (2)**.  
or **set the Active signal internally with Service Routine S.35, test step 02.**  
see page 5 - 59.

1. Select Service routine **S.02** as described in section "Selecting service routines".
2. Briefly press the service key .  
The kV display indicates **00**.
3. Enter service code **02** with the + key.
4. Briefly press the service key .  
Test step **01** appears on the mA display.  
ORTHOPHOS 3/3 Ceph: select Pan or Ceph diaphragm.  
NOTE:  
In **test step 01**: Radiation can be released in any position of the X-ray tube assembly.  
In **test step 02**: Radiation can be released in the Cephalometry position of the X-ray tube assembly.  
Test step 02 can be selected with the + key for kV adjustment.  
To exit a test step briefly press the service key .
5. Briefly press the service key .  
The values on the kV/mA display flash.  
The LEDs above the patient symbol keys light up.
6. Essential for test step 02: move the cassette holder to the Cephalometry position and then press the Return key R. The X-ray tube assembly then travels to the Cephalometry position.
7. Select the kV step.
8. Select the exposure time. Permissible times are 0.1 to 4.0 seconds.
9. Switch **RADIATION** on.  
The actual radiation time is indicated after releasing the exposure button.  
If an exposure is released during the cool-down period, the elapsing cool-down time is displayed (automatic exposure blockage). During this time the LED above the R key flashes.  
Acknowledge the radiation time with the R key.



## 5.4 Service routine S.02 Radiation without rotation for Ceph









- The setpoints for kV, mA and preheating VH can be checked with Service routine S.03.

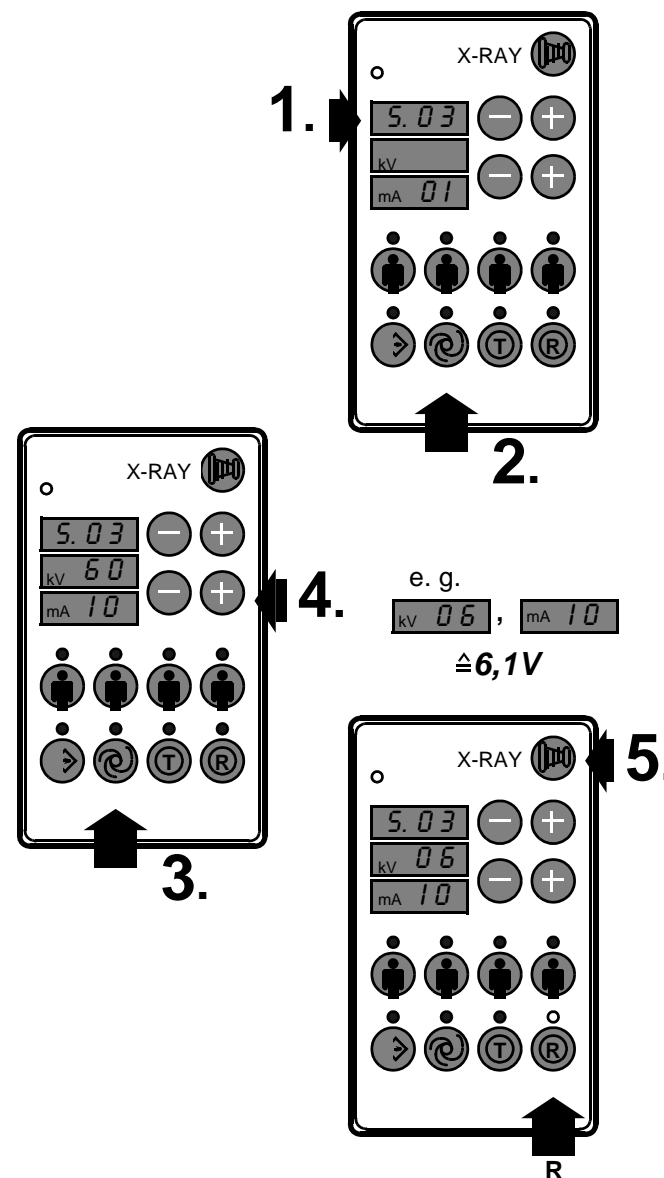
Additionally with ORTHOPHOS DS: set readiness for exposure as described in section 'Setting exposure readiness on the PC'. Select **Factory service (2)**.

or set the Active signal internally with Service Routine S.35, test step 02.

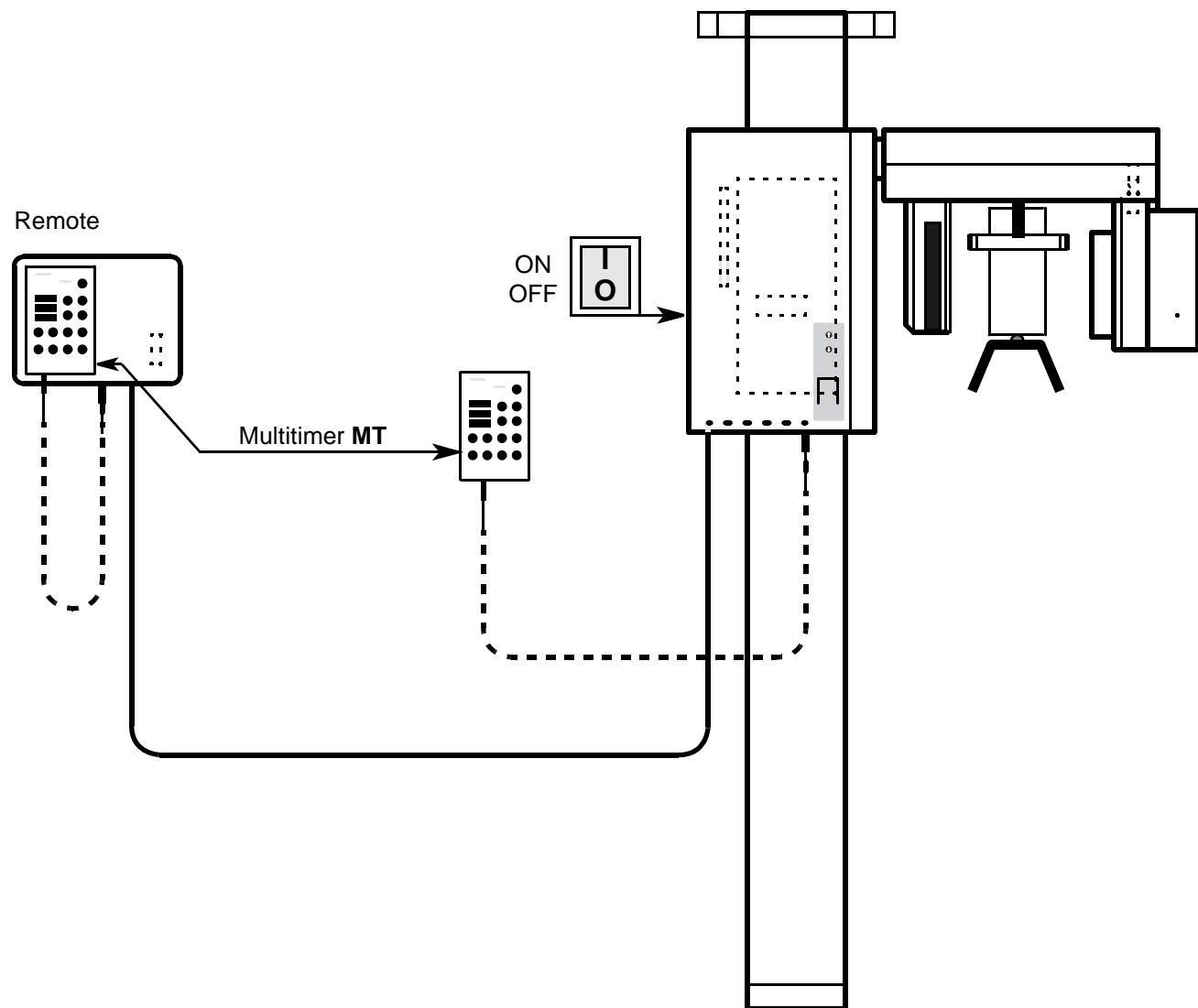
see page 5 - 59.

- Select Service routine **S.03** as described in section 'Selecting service routines'.
- Briefly press the service key . The mA display shows the step **01**.  
The kV setpoint is checked **in test step 01. kV setpoints:**  
 $6.0V \pm 0.1V \hat{=} 60kV$   
 $8.0V \pm 0.2V \hat{=} 80kV$
- Briefly press the service key . The values on the kV/mA display light up.
- Set the kV value with the + key (example in figure: 60 kV).
- Press the exposure button (hold it pressed; when releasing it the last value is displayed). The setpoint is displayed in four digits on the kV/mA display (example in figure: 06.10). The LED above the R key flashes. Press the R key; another kV value can now be tested. An audible signal may occur at the end of measurement.
- Briefly press the service key . The next test step appears.  
The mA setpoint is checked **in test step 02. mA setpoint:**  
 $5.0V \pm 0.5V \hat{=} 10mA$
- Briefly press the service key . The values on the kV/mA display light up.
- Press the exposure button (hold it pressed; when releasing it the last value is displayed). The mA setpoint is displayed in four digits on the kV/mA display.
- Briefly press the service key . The next test step appears.  
The VH setpoint is checked **in test step 03. VH setpoint::**  $05.50 \pm 0.40$  bei **60kV/10mA**.
- Briefly press the service key . The values on the kV/mA display light up. Press the exposure button (hold it pressed; when releasing it the last value is displayed). The VH setpoint is displayed in four digits on the kV/mA display.  
**VH-Sollwert: 05.10V bis 05.90V**

Continued on next page



## 5.5 Service routine S.03 Setpoints: kV, mA, preheating





### Continued

Setpoint alignment is executed automatically in test step 04.

6. Briefly press the service key . The memory LED flashes and the kV/mA display indicates FF.



### Deleting the previous offsets:

7. Press the memory key (LED stops flashing). The LED above the R key flashes.
8. Press the Return key R (LED stops flashing). The LED above the service key  lights up. The kV/mA display indicates 00.
9. Briefly press the service key .  
The display for program / radiation time shows S\_1 and 00 on the kV display.  
The program is ready for the automatic setpoint alignment. (Pressing the service key at this point causes the test step to be exited with the offsets deleted.)

### Performing the automatic setpoint alignment:

10. Press the exposure button and hold it pressed until 11 11 lights up on the kV/mA display and the LED above the memory key flashes.  
The alignment process is executed automatically.

### Storing the alignment values:

- Press the memory key (LED stops flashing). The LED above the R key flashes.
- Press the Return key R (LED stops flashing). The LED above the service key  lights up.
- Press the service key .

### Information about the displays during the automatic alignment.

Program/radiation time display: Step number of the currently active alignment parameter

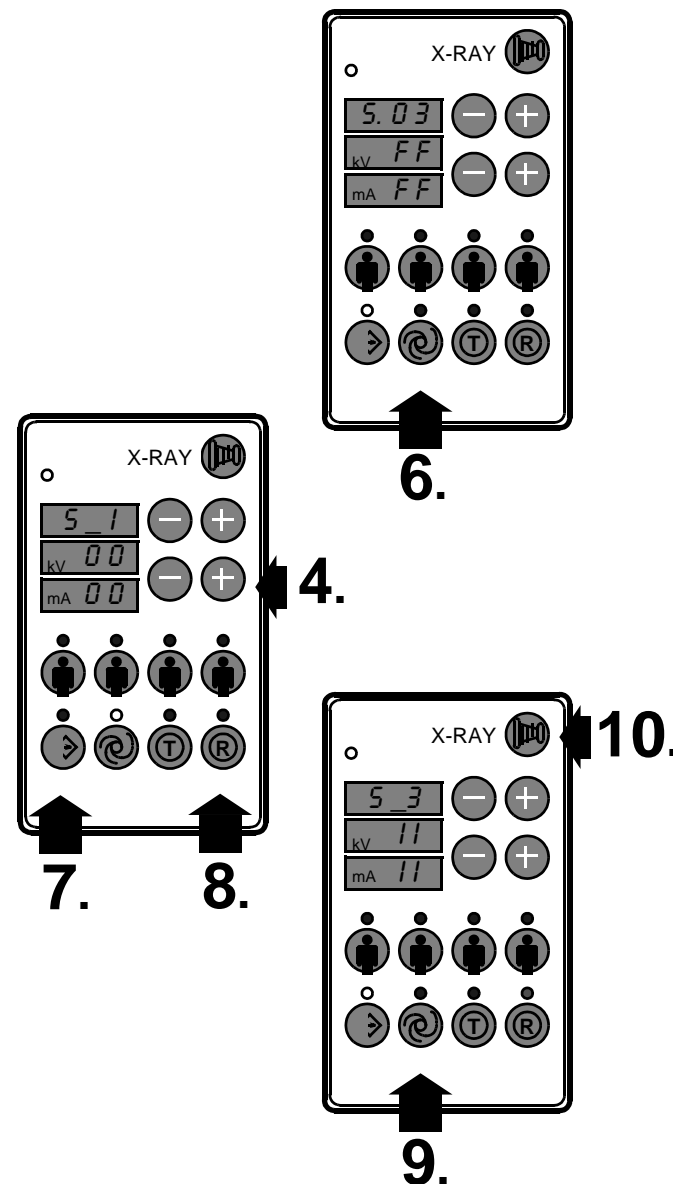
S\_1: kV alignment is active

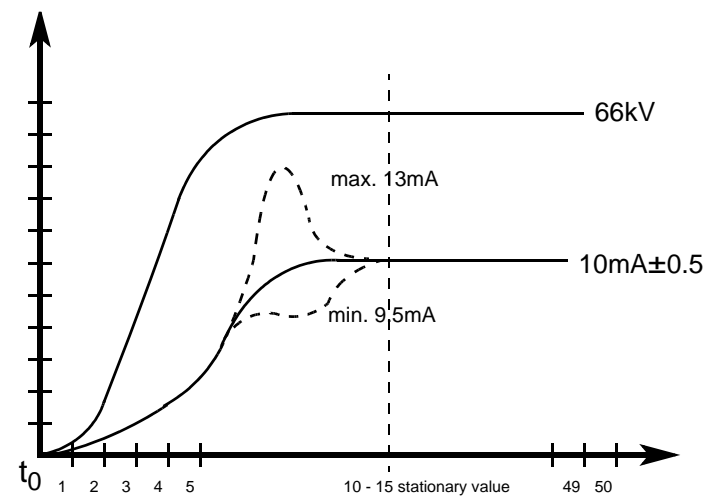
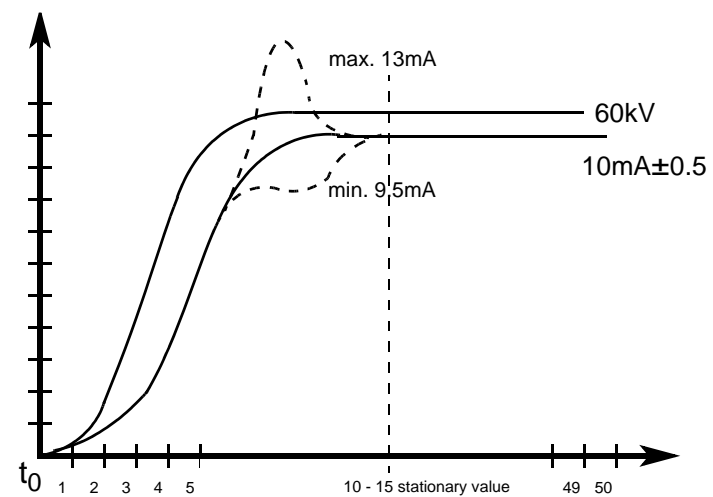
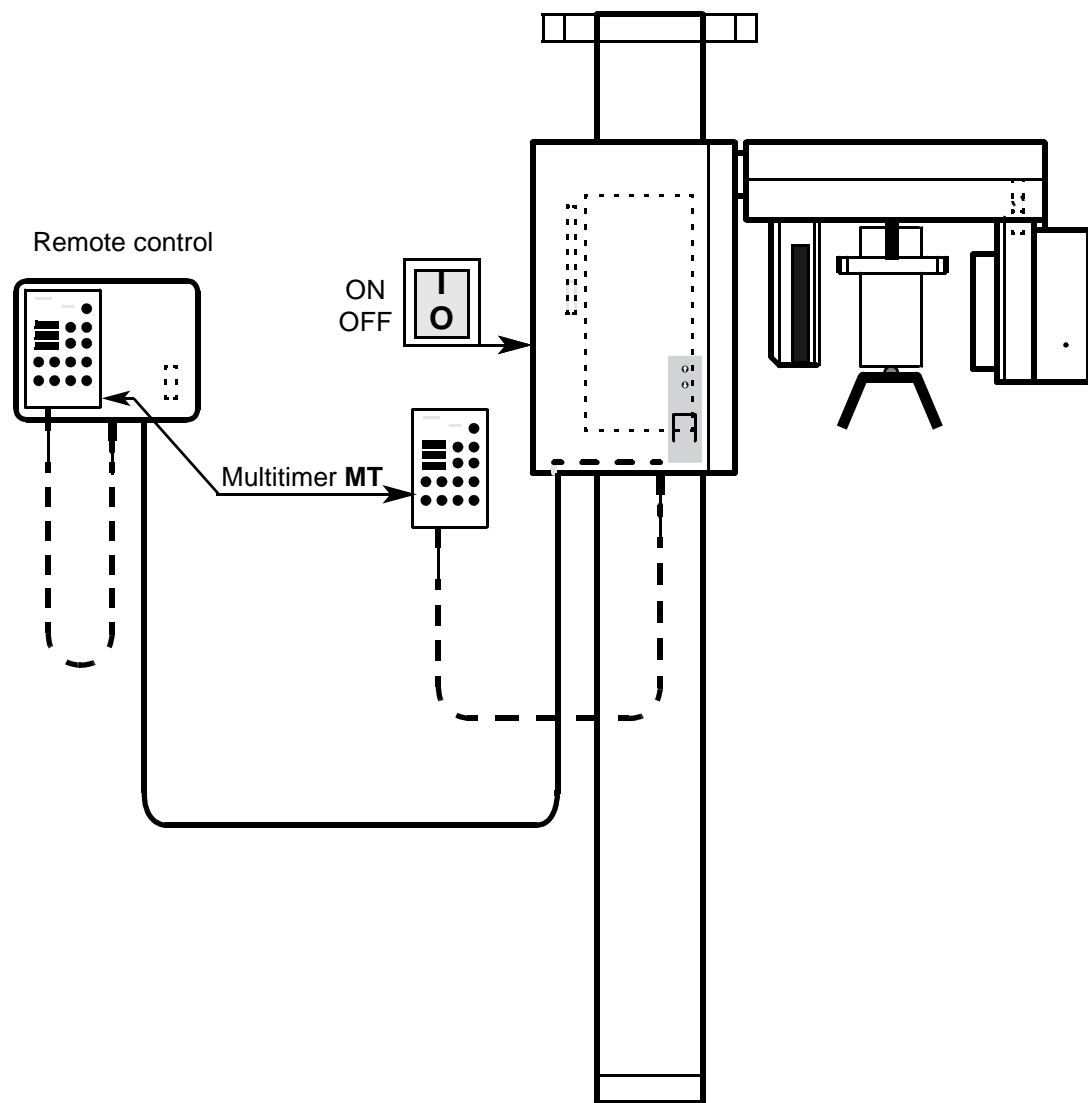
S\_2: mA alignment is active

S\_3: VH alignment is active

kV display: Consecutive number of alignment attempts within the test step number.

kV/mA display: Following the completed alignment within one test step, all kV/mA steps are selected one after the other and the error of the actual value is tested.








50 values are measured in intervals of 2 ms.  
The measured values can be plotted as points to check the transient characteristics.


- The actual values of kV, mA and preheating VH can be checked with Service routine S.04.

Additionally with ORTHOPHOS DS: set readiness for exposure as described in section 'Setting exposure readiness on the PC'. Select **Factory service (2)**.  
or set the Active signal internally with Service Routine S.35, test step 02.  
see page 5 - 59.

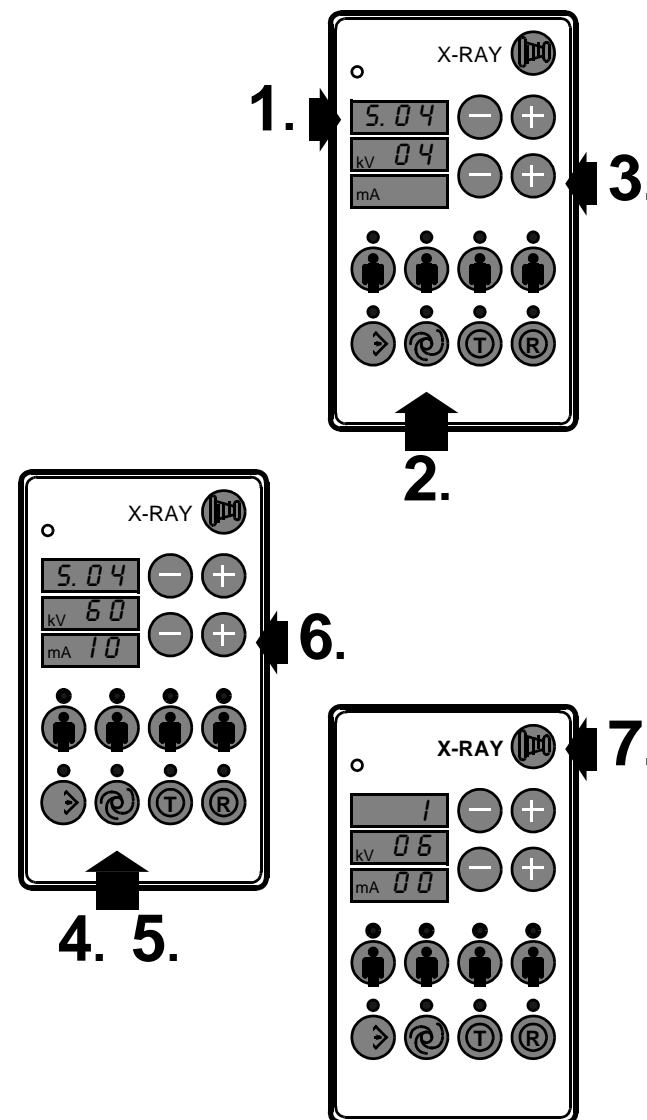
1. Select Service routine **S.04** as described in section 'Selecting service routines'.
2. Briefly press the service key . The kV display indicates 00.
3. Enter service code **04** with the + key.
4. Briefly press the service key . Test step 01 is indicated on the mA display.

The actual kV value is checked **in test step 01**. **kV actual value:** stationary kV value  $\pm 0.20$  V **06.00 V**  $\pm 0.2$  V  $\hat{=}$  **60 kV** after the tenth measured value.

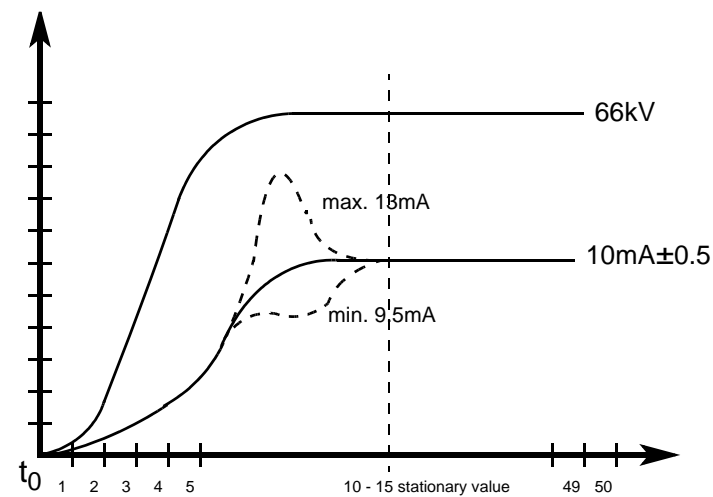
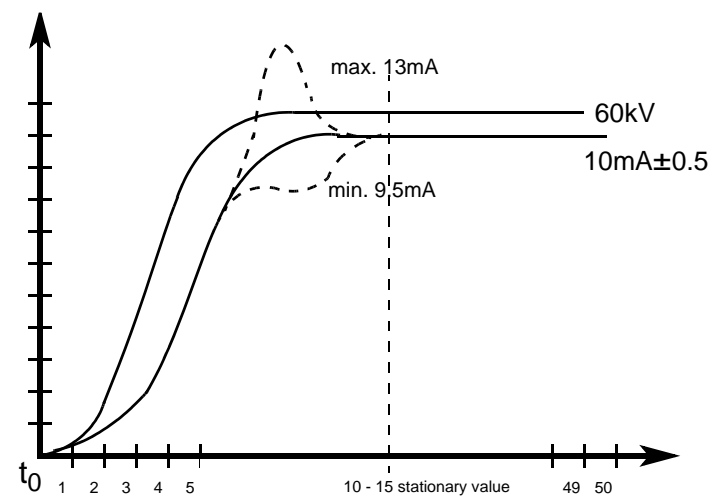
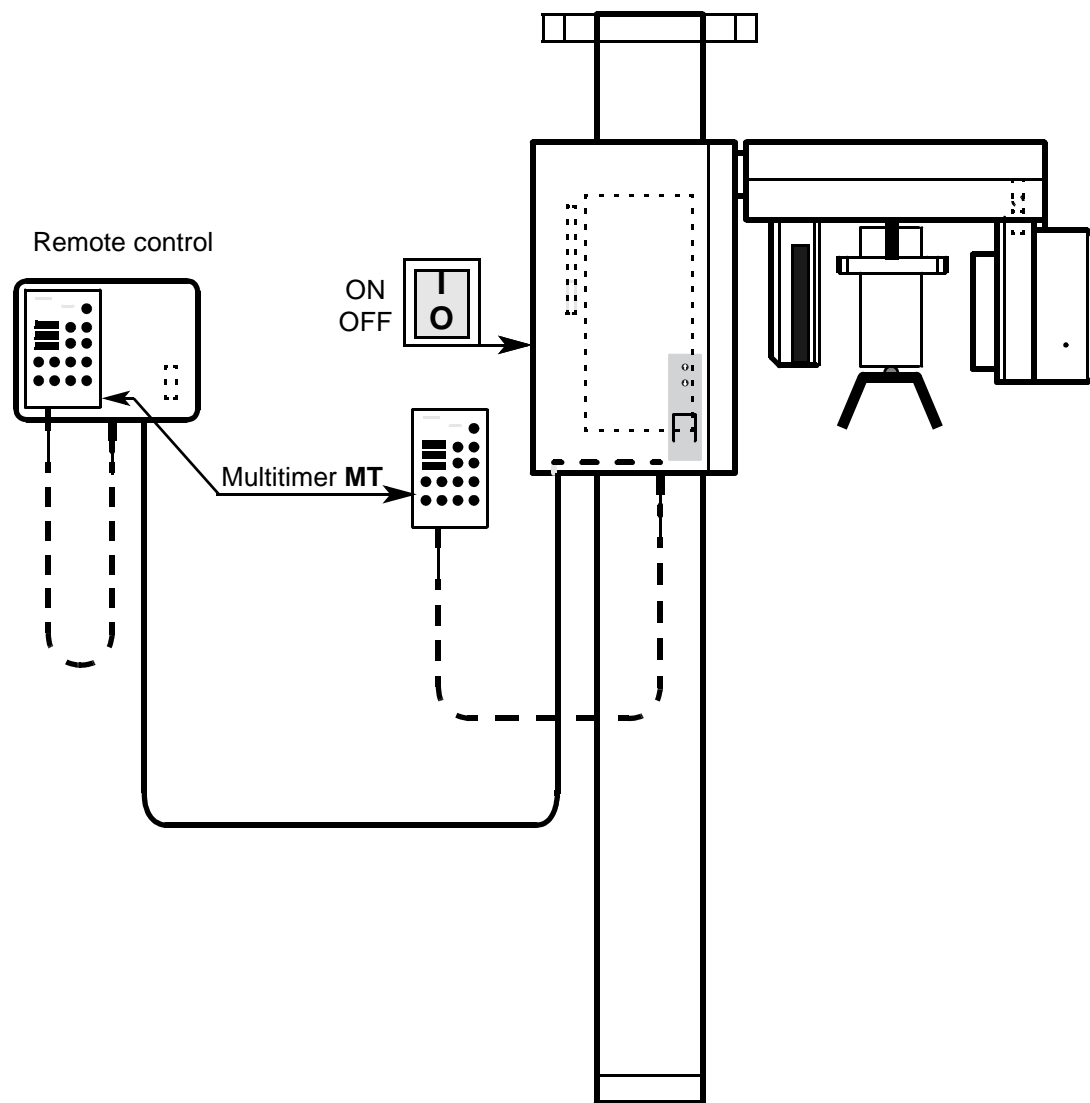
5. Briefly press the service key . The values on the kV/mA display flash. The LEDs above the patient symbol keys light up.
6. Select the kV value. Example in figure: 60kV/10mA
7. Press the exposure button and hold it pressed. **RADIATION** is generated for 0.1 second.

- The actual value is displayed in four digits on the kV/mA display:  
Example in figure **06.00 V**  $\pm 0.2$  V  $\hat{=}$  **60 kV** after the tenth measured value.  
The stationary value is:  $\pm 0.20$  V.
- A maximum of 50 measured values can be recalled with the - / + (kV) keys.  
An additional kV value can be entered for the test after pressing the R key.
- Briefly press the service key . The next test step appears.

Continued on next page



## 5.6 Service routine S.04 Actual values: kV, mA, preheating





50 values are measured in intervals of 2 ms.  
The measured values can be plotted as points to check the transient characteristics





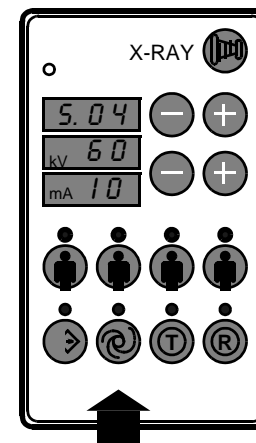
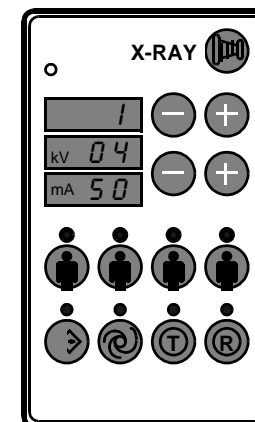
**Continued**

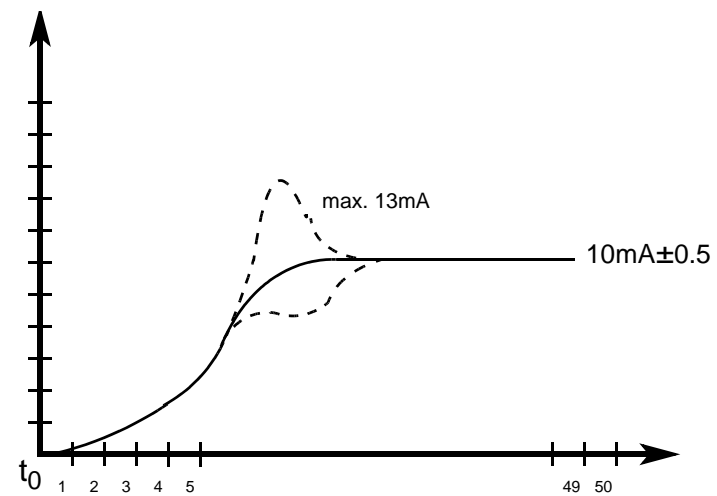
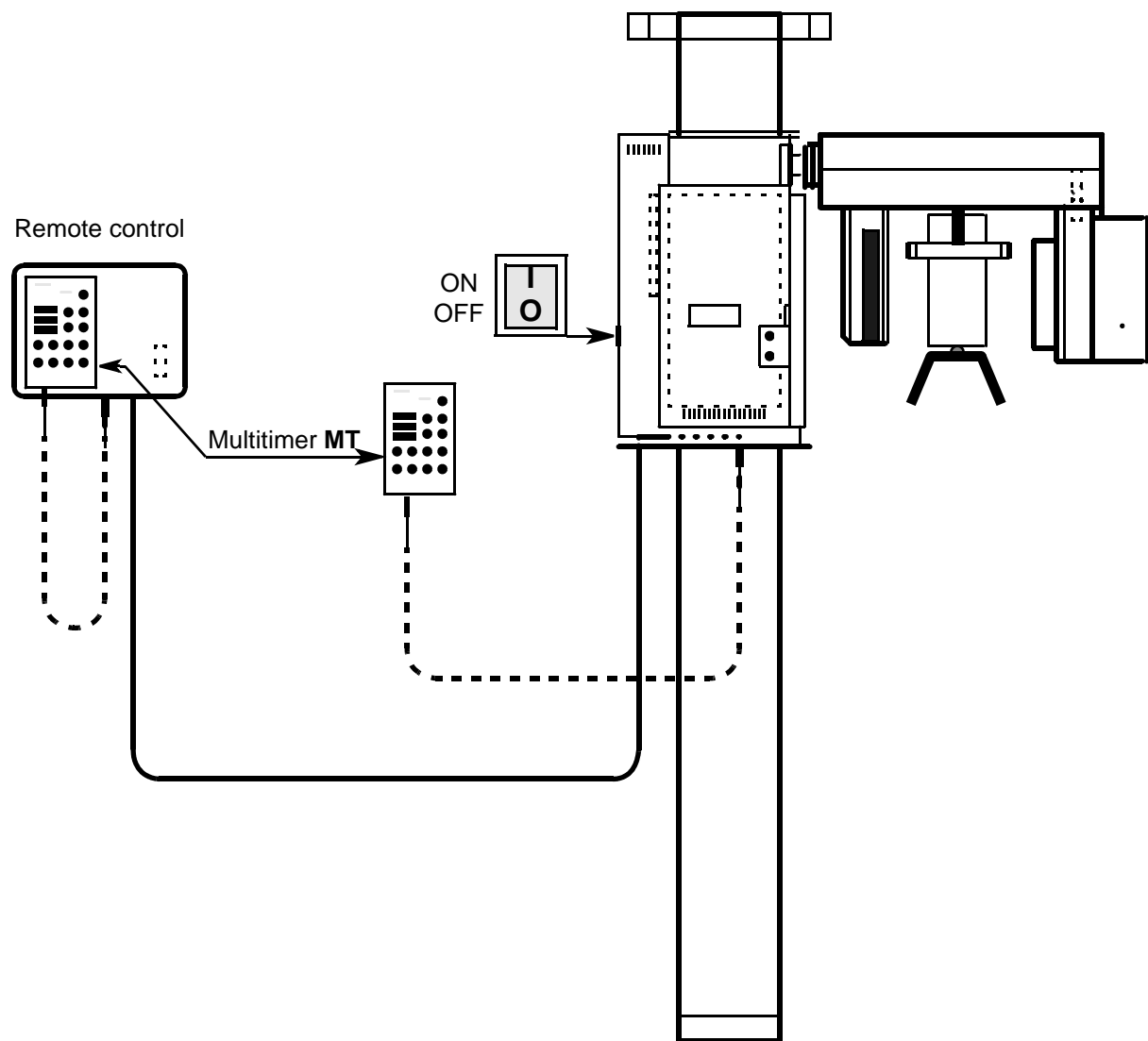
The actual mA value is checked **in test step 02**.

8. Briefly press the service key . The values on the kV/mA display flash. The LEDs above the patient symbol keys light up.
9. Select the kV value. Example in figure: 60kV/10mA
10. Press the exposure button and hold it pressed. **RADIATION** is generated for 0.1 seconds.
  - The actual value is displayed in four digits on the kV/mA display:  
After the 10th measured value: **actual mA value  $5.0 \text{ V} \pm 0.1 \text{ V} \hat{=} 10 \text{ mA} \pm 0.2 \text{ mA}$** .  
Check again with 66kV/10mA ( $5.0 \text{ V} \pm 0.1 \text{ V} \hat{=} 10 \text{ mA} \pm 0.2 \text{ mA}$ )
  - A maximum of 50 measured values can be recalled with the -/+ (kV) keys.  
An additional kV value can be entered for testing after pressing the R key.  
If you do not wish to check any more mA actual values, briefly press the service key .  
The next test step then appears.

The actual VH value is checked **in test step 03**. **VH actual value:** stationary setpoint  $\pm 0.30 \text{ V}$ .

11. Then briefly press the service key . The values on the kV/mA display flash. The LEDs above the patient symbol keys light up.
12. Select the kV value. Example in figure: 60kV/10mA
13. Press the exposure button and hold it pressed. **RADIATION** is generated for 0.1 second.
  - The actual value is displayed in four digits on the kV/mA display:  
**VH actual value: 05.20 to 05.80** (at setpoint 05.50) after the 25th measured value.
  - A maximum of 50 measuring values can be recalled with the -/+ (kV) keys.  
An additional kV value can be entered for the test after pressing the R key.  
If you do not wish to check any more VH actual values, briefly press the service key .  
Test step 01 appears again.

**9./12.****10./13.**






To exit the service routines switch the unit OFF and ON again.


58 35 744 D 3285  
D 3285.077.02.06.02 07.2004

- Service routine S.5 is needed for the heating adjustment.



Additionally with ORTHOPHOS DS: set readiness for exposure as described in section 'Setting exposure readiness on the PC'. Select **Factory service (2)**.  
or set the Active signal internally with Service Routine S.35, test step 02.  
see page 5 - 59.

1. Select Service routine **S.05** as described in section 'Selecting service routines'.
2. Then briefly press the service key . The kV display indicates **00**.
3. Enter the service code **05**. The kV display indicates **05**.
4. Briefly press the service key . Test step 01 is shown on the mA display.
5. Briefly press the service key  twice. Test step 02 is shown on the mA display.

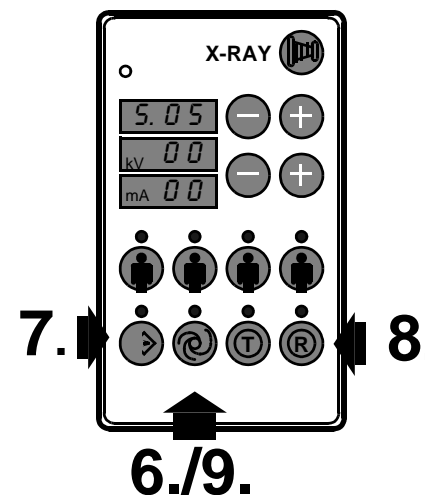
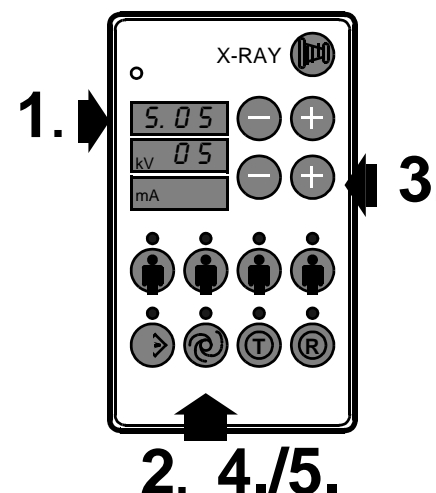
#### Test step 02

- Preheating is automatically adjusted with service routine **S.05**, test step **02**.  
Do not perform this test step before warmup.
- 6. Briefly press the service key .  
**FF FF** appears on the kV/mA display. The LED above the memory key flashes.

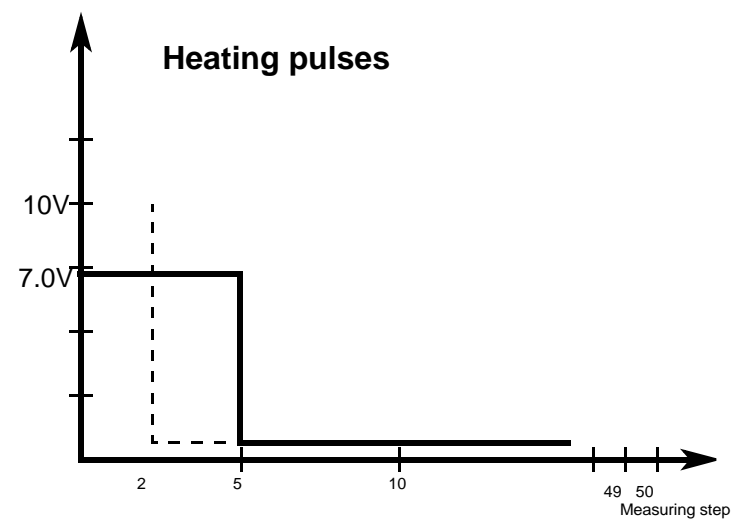
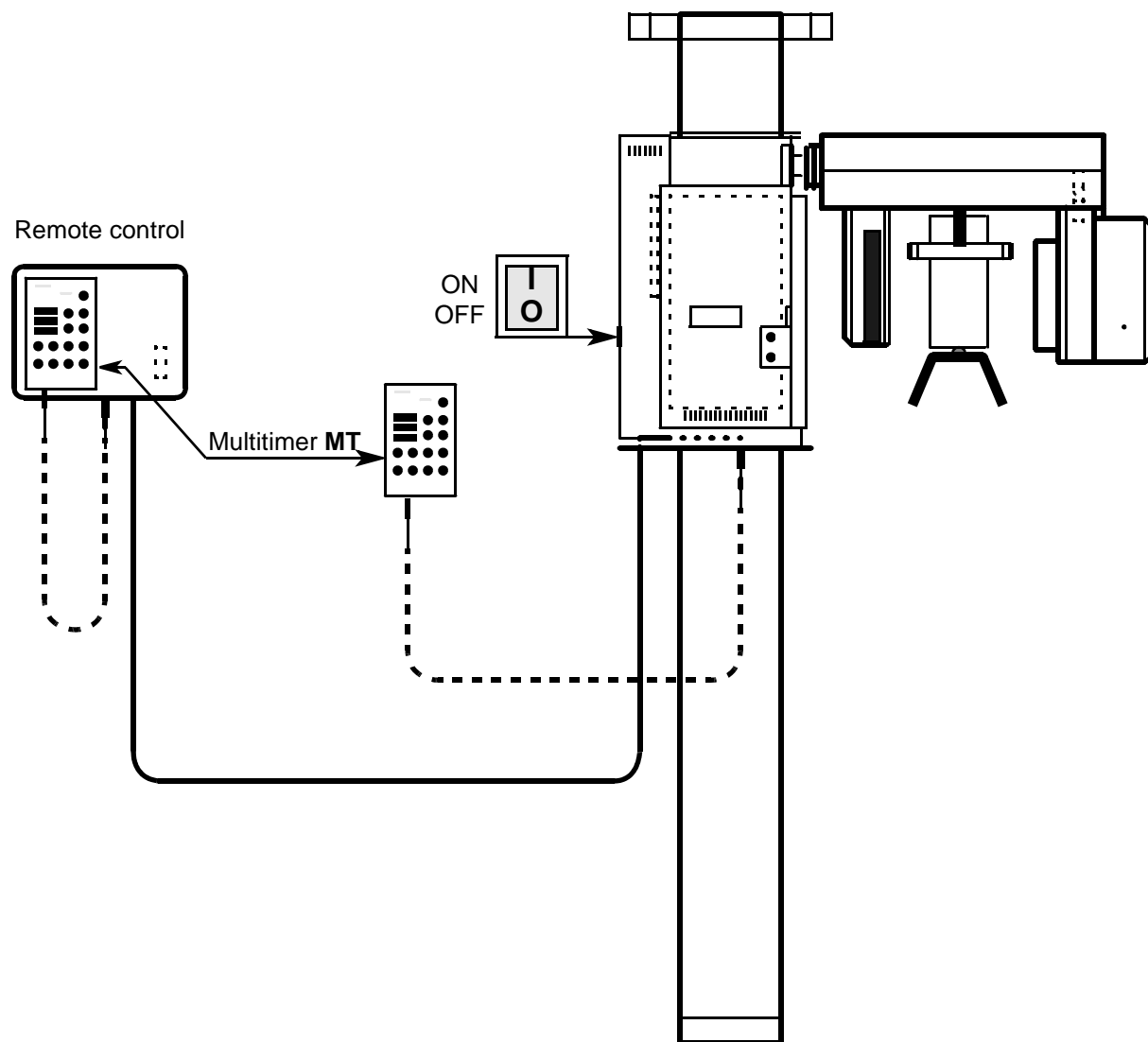
#### Deletion of previous offset:

7. Press the memory key. The LED above the R key flashes.
8. Press the Return key R. The kV/mA display indicates **00 00**.  
The LED above the service key  lights up.
9. Briefly press the service key . **60/10** flashes on the kV/mA display.  
The program is now ready for the automatic VH adjustment (pressing the service key again at this point causes the test step to be exited with the offsets deleted).

Continued on next page



## 5.7 Service routine S.05 Heating adjustment





**Continued****Performing the automatic setpoint alignment:**


10. Press the X-ray key and hold it pressed until the kV/mA display shows **0510 - 05 90**, and the LED above the memory key flashes.  
The alignment process is executed automatically.  
The following takes place during the alignment:

Starting with 1 second **RADIATION** to warm up the system there are several exposure releases with 100 msec radiation time each in order to optimize the preheating value.  
The cool-down intervals between radiation phases are indicated on the mA display, and the number of optimizing steps is indicated on the program/radiation time display.

**Storing the alignment values:**

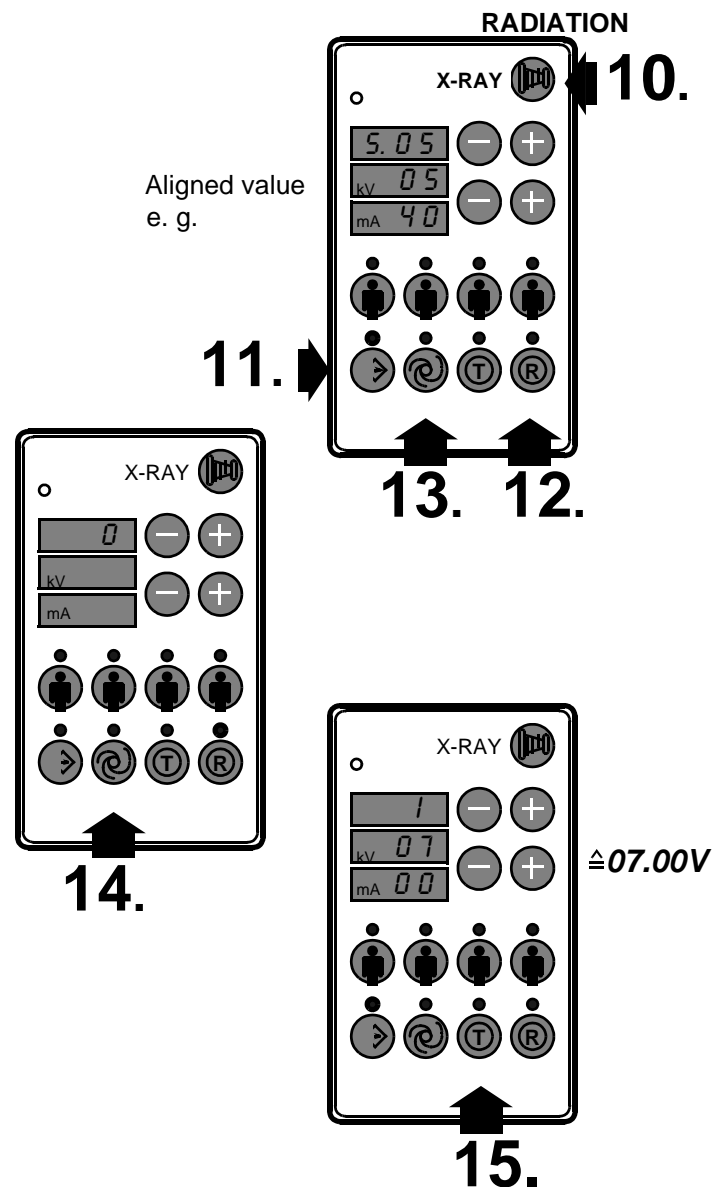
11. Press the memory key (LED stops flashing). The LED above the R key flashes.  
12. Press the Return key R (LED stops flashing). The LED above the service key  lights up.  
13. Press the service key . The preheating value is now stored.

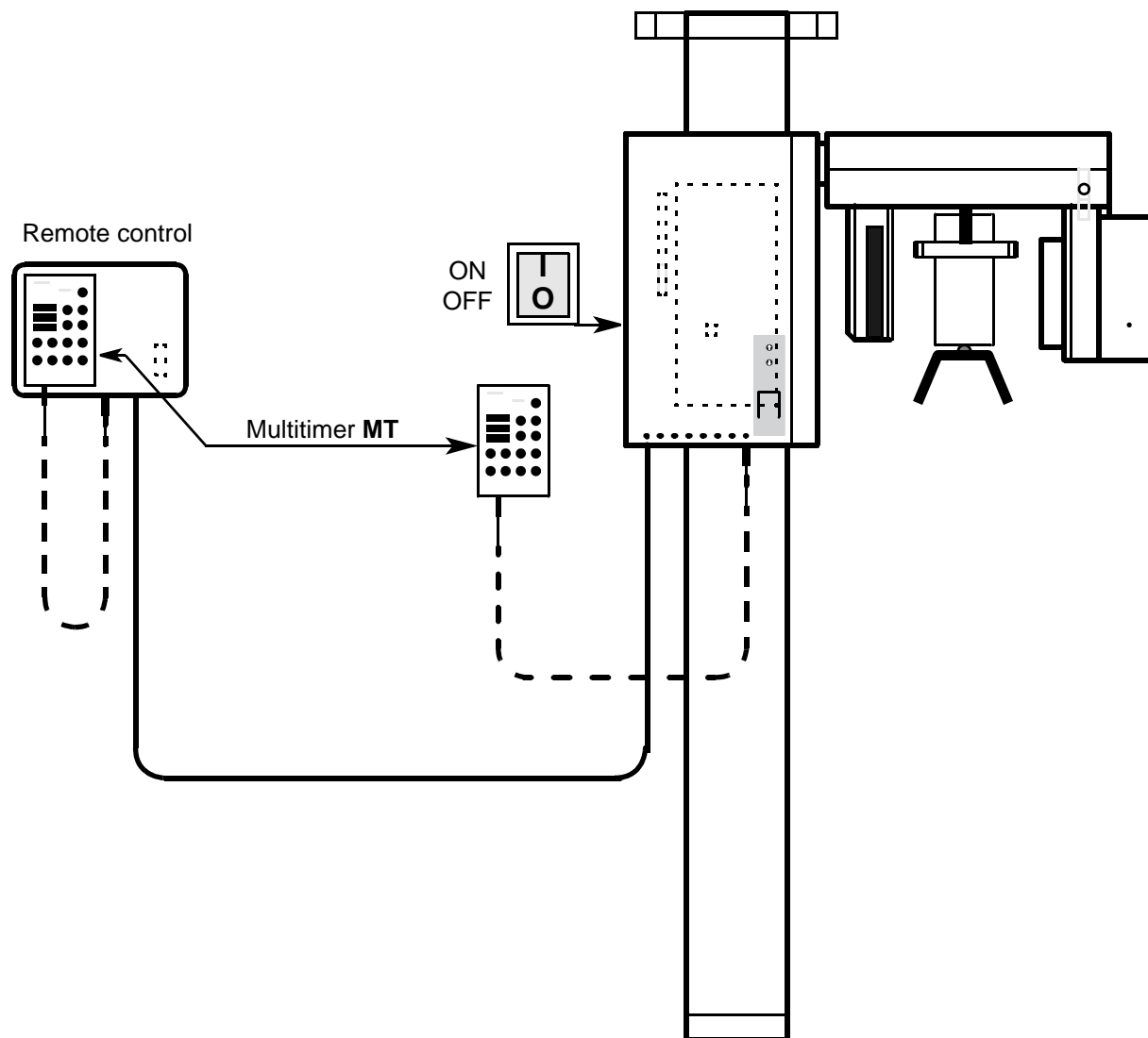
**Test step 03**

- Basic heating is checked with Service routine **S.05**, test step **03**.
14. Briefly press the service key .  
The program/radiation time display indicates **0**. The LED above the test rotation key lights up.
15. Press the test rotation key.





**After pressing the test rotation key, the following indications may appear:**

- The program/radiation time display indicates **1**, and the kV/mA display shows the voltage value. Ten voltage values can be called up with the kV/mA +/- keys (pulse sequence of basic heating). The first two measurements must be approximately **7.0V**, while the voltage must be about **0.0V** after the fifth measured value at the latest.  
If this change of signal is not clearly visible, the basic heating is faulty.
- The program/radiation time display indicates **0**, and the mA display shows **00**.  
The VH actual signal remains on low level - basic heating is faulty.
- The program/radiation time display indicates **0**, and the mA display shows **11**.  
The VH actual signal remains on high level - basic heating is faulty..





- The number of radiation releases can be determined with Service routine S.06.

1. Select Service routine **S.06** as described in section 'Selecting service routines'.
2. Briefly press the service key . The kV display indicates 00.
3. Enter the service code **06** with the + key.
4. Briefly press the service key .  
Test step 01 appears on the mA display.
5. Briefly press the service key . The memory LED flashes.  
The present count (max. 65535) is indicated on the program/kV/mA display.
6. Briefly press the service key . The next test step appears.

NOTE: Other test steps can be selected with the kV +/- keys.

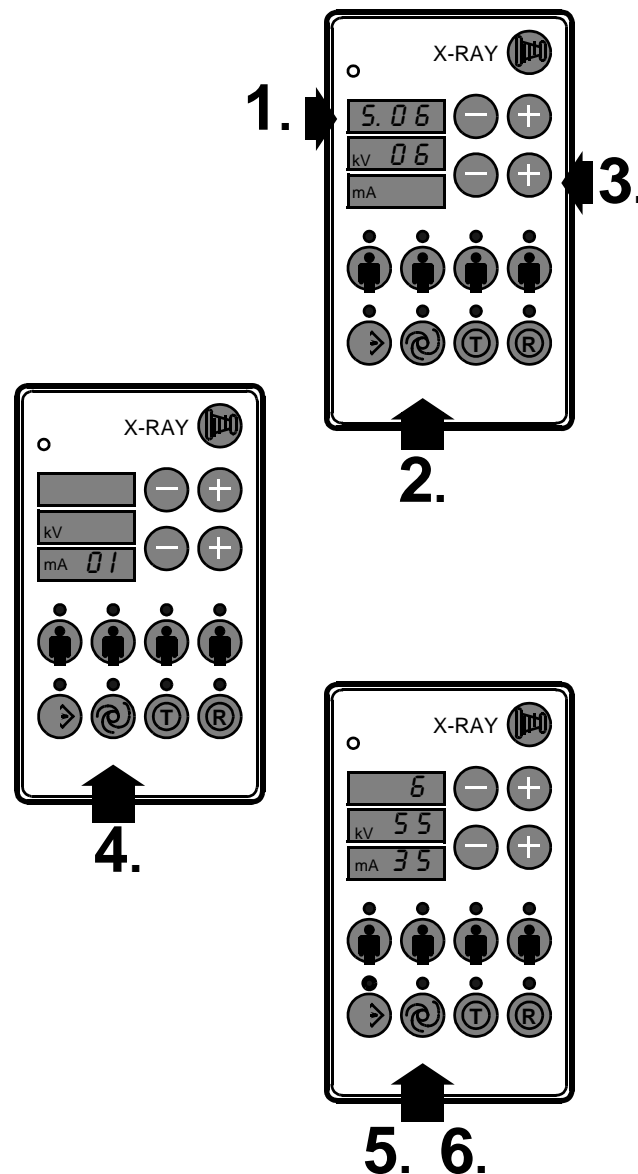
- Press the memory key to reset the counter, the R LED flashes (with memory card versions > V26). Press the Return key R. The display shows 00.

The Pan exposure counter is displayed in **test step 01**.

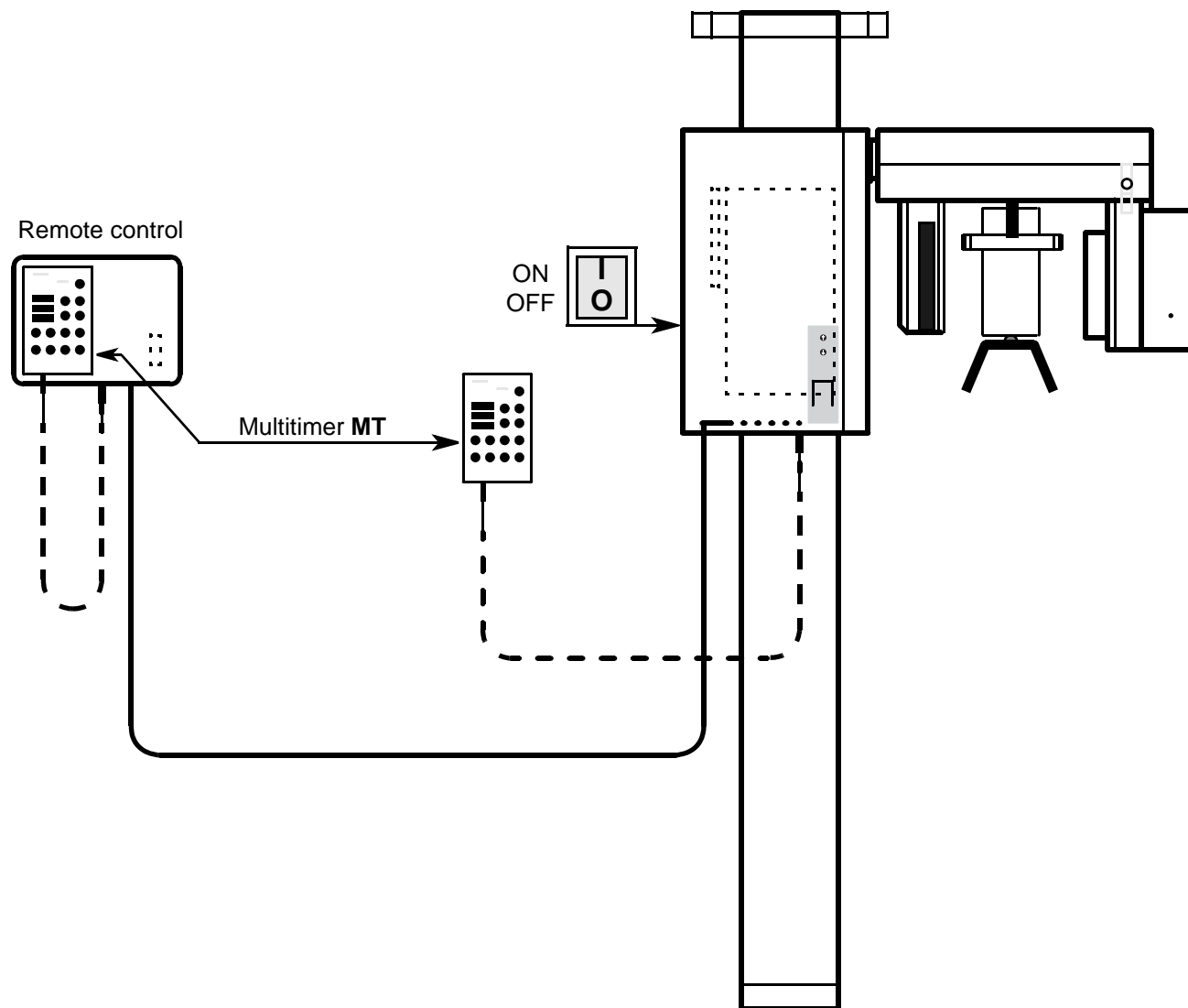
The Ceph exposure counter is displayed in **test step 02**.

The total of all radiation releases is displayed in **test step 03** (including service exposures).

The total of all rotations is displayed in **test step 04**.




## 5.8 Service routine S.06 Radiation counter (decimal display)






- The Service routine **S.07** is used to erase the contents of the EEPROM error memory on board DX1 after the X-ray tube assembly has been replaced.

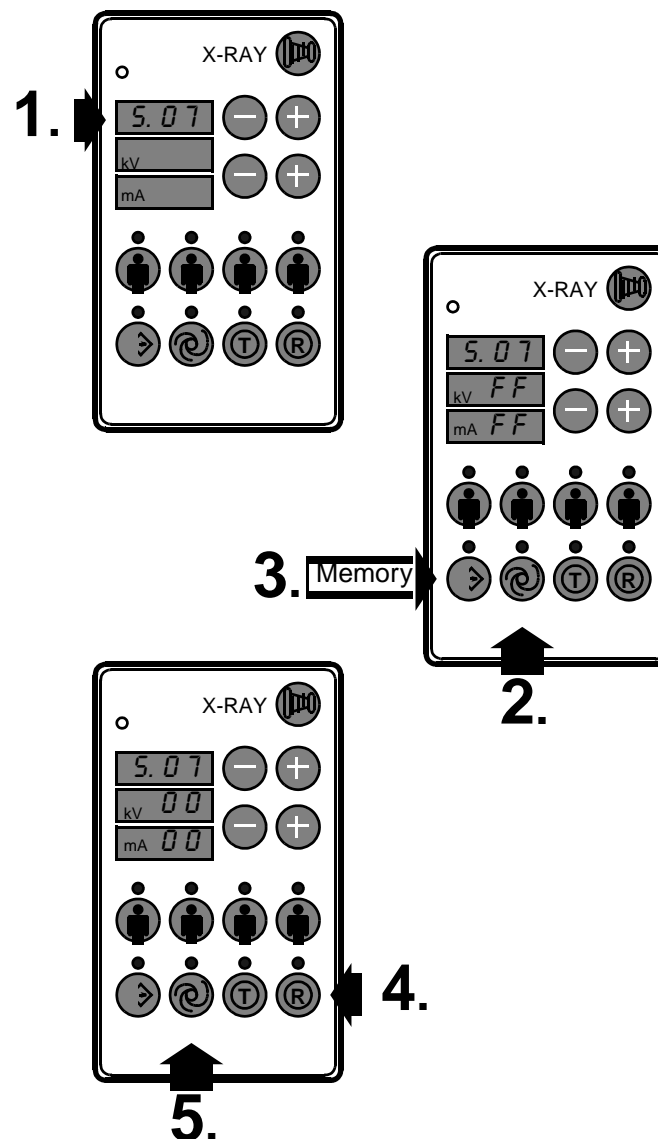
1. Select Service routine **S.07** as described in section 'Selecting service routines'.

2. Briefly press the service key .  
**FF FF** is indicated on the kV/mA display.  
The LED above the memory key flashes.

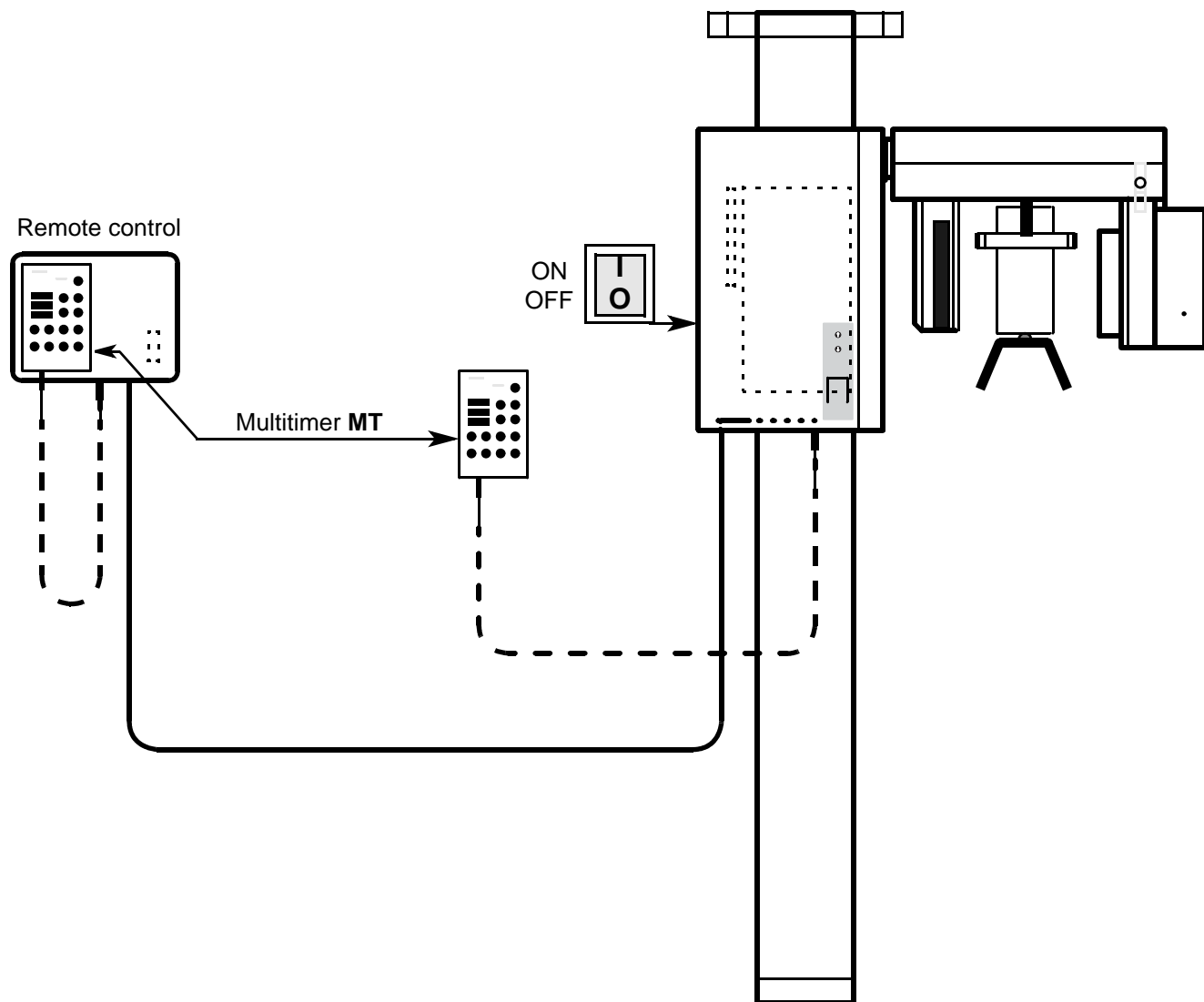
3. Press the memory key.  
The LED above the R key flashes.

4. Press the Return key R.  
With Service routine **S.07** the error memory is erased.  
The kV/mA display indicates **00 00**.  
The LED above the service key  lights up.

5. Briefly press the service key . This completes the test.






## 5.9 Service routine S.07 Erasing the error memory




To exit the service routines switch the unit OFF and ON again.

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D 3285.077.02.06.02 07.2004

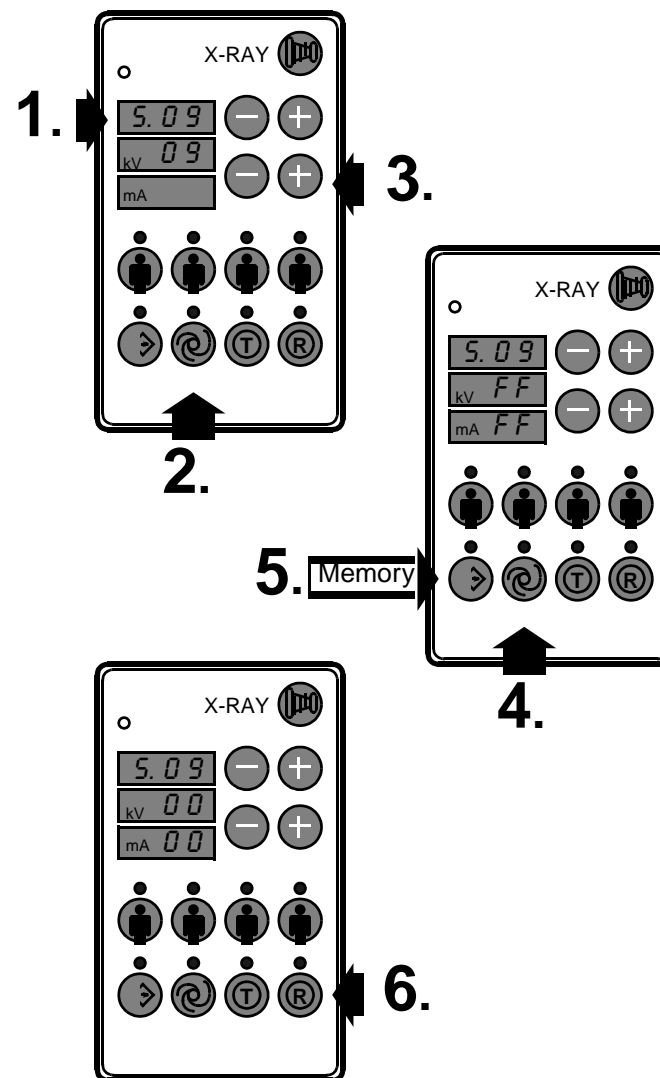
- The service routine **S.09** is used to erase all data programmed in the EEPROM on board DX1.

1. Select Service routine **S.09** as described in section 'Selecting service routines'.
2. Briefly press the service key .  
The kV display indicates **00**.
3. Enter the service code **09**.  
The kV display indicates **09**.
4. Briefly press the service key .  
**FF FF** appears on the kV/mA display.  
The LED above the memory key flashes.
5. Press the memory key.  
The LED above the key R flashes.
6. Press the Return key R.  
With Service routine **S.09** all programmed data contained in the EEPROM are erased. **00 00** is shown on the kV/mA display.  
The LED above the service key  lights up.

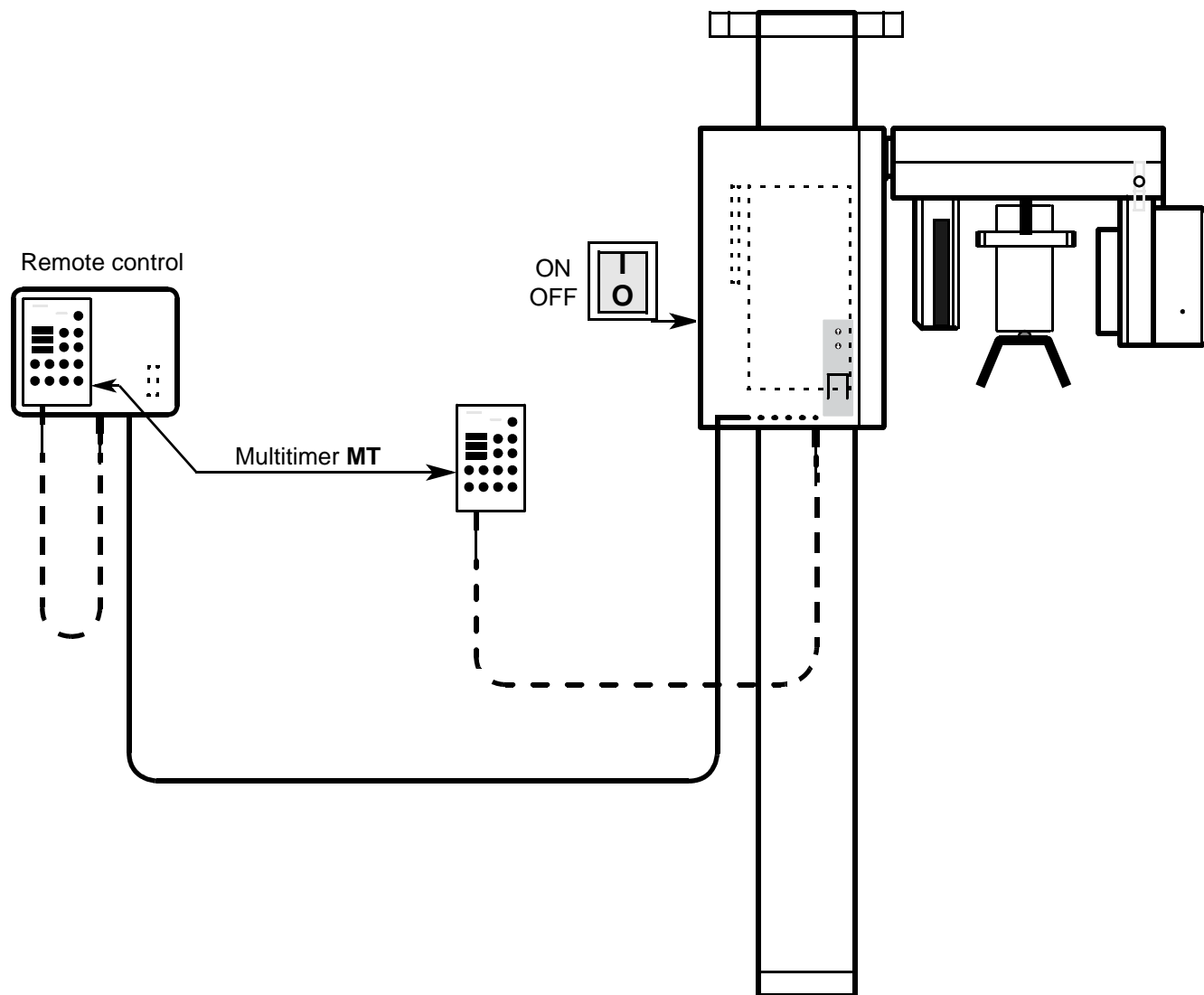
- Then briefly press the service key . This completes the test.

**NOTE:**

With Service routine **S.09** all preset values in the EEPROM will be lost →  
Readjust DX1.




## 5.10 Service routine S.09 Erasing EEPROM DX1



To exit the service routines switch the unit OFF and ON again.

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D 3285.077.02.06.02 07.2004

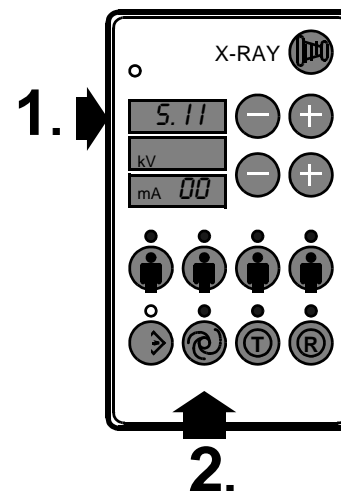
- Service routine S.11 is used to adjust the kV increase in the spinal region for Panorama radiography.

1. Select Service routine **S.11** as described in section '**Selecting service routines**'.
2. Briefly press the service key .  
The memory LED flashes.  
The preset correction value for the kV increase appears on the kV or the mA display. The factory setting is **00** on the mA display.
3. Set the kV increase correction value in percent steps within ranges of +3 % and -6 % using the kV +/- keys.  
The positive % value is shown on the kV display and  
the negative % value is shown on the mA display.


|       |     |     |     |
|-------|-----|-----|-----|
|       | +1% | +2% | +3% |
| kV 02 | 01  | 02  | 03  |
| mA    |     |     |     |

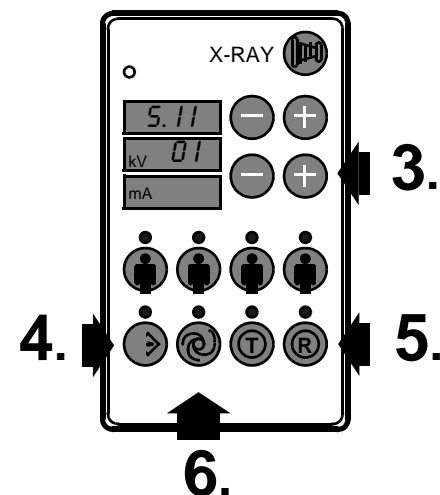
  

|       |     |     |                   |
|-------|-----|-----|-------------------|
| kV    |     |     |                   |
| mA 02 | 01  | 02  | 03                |
|       | -1% | -2% | -3% . . . . . -6% |

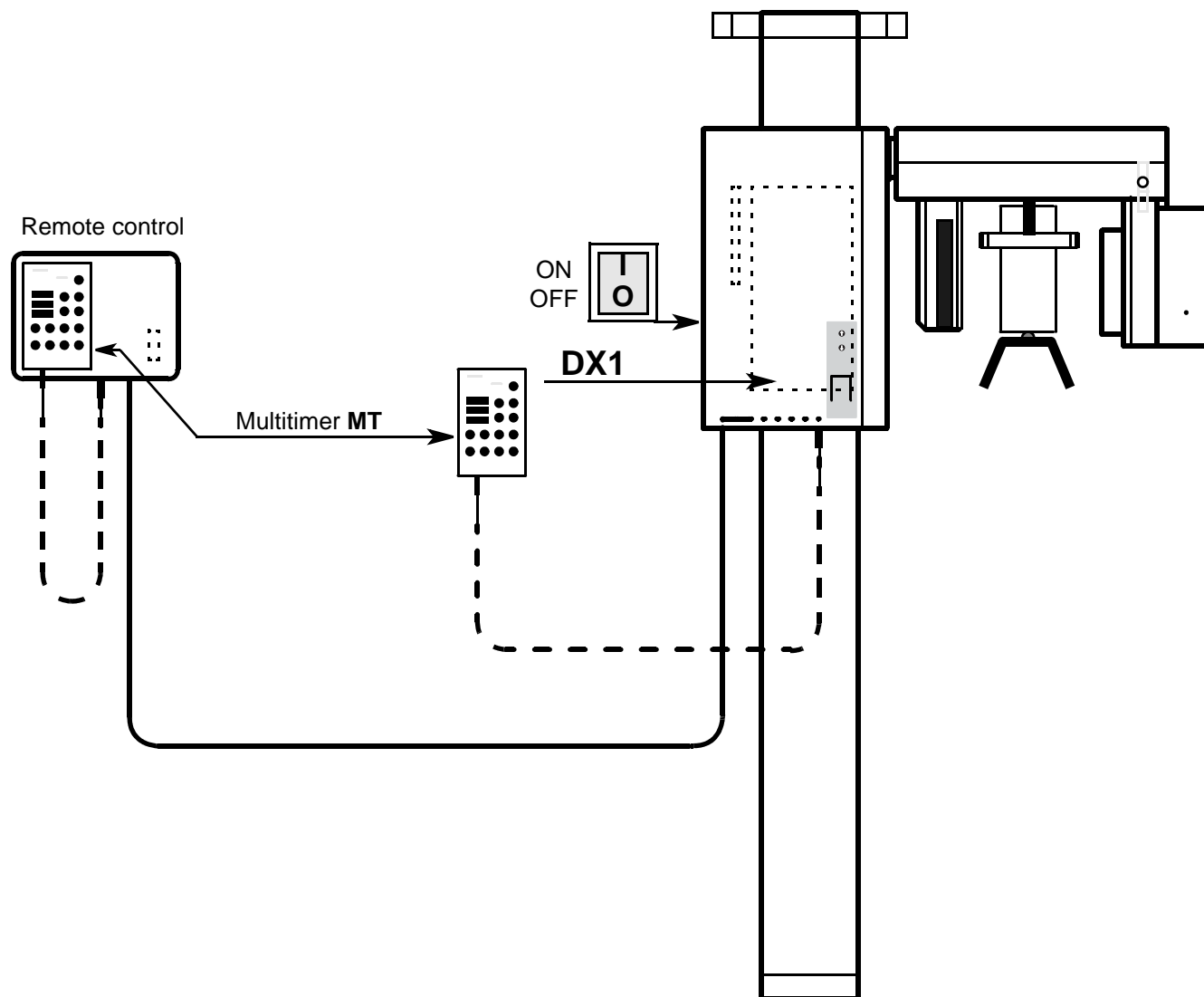



#### Programming the kV increase correction value:

4. Press the memory key (LED stops flashing).  
The LED above the R key flashes.
5. Press the Return key R (LED stops flashing).
6. Press the service key .




## 5.11 Service routine S.11 Setting the kV increase correction value for Panorama radiography



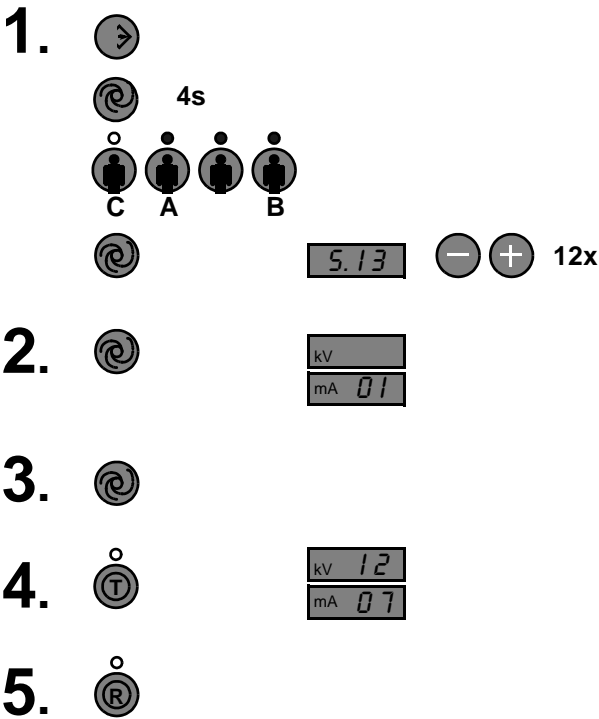
- The input signals to board DX1 can be tested with Service routine S.13.
  - Turn the unit off. **Unplug** connectors X4, X5, X7, X8, X9, X23 and X25 from board DX1 (if present). Connectors X1, X2, X3 and X10 must remain connected. Turn the unit on again. Pull out plug X6 (must be pulled out while system is running, otherwise HV installation help is released).
  - Acknowledge the error message by pressing the R key on the multimeter.
1. Select Service routine **S.13** as described in section 'Selecting service routines'.
  2. Briefly press the service key . The mA display indicates test step 01.

The input signals to board DX1 are checked **in test step 01**.

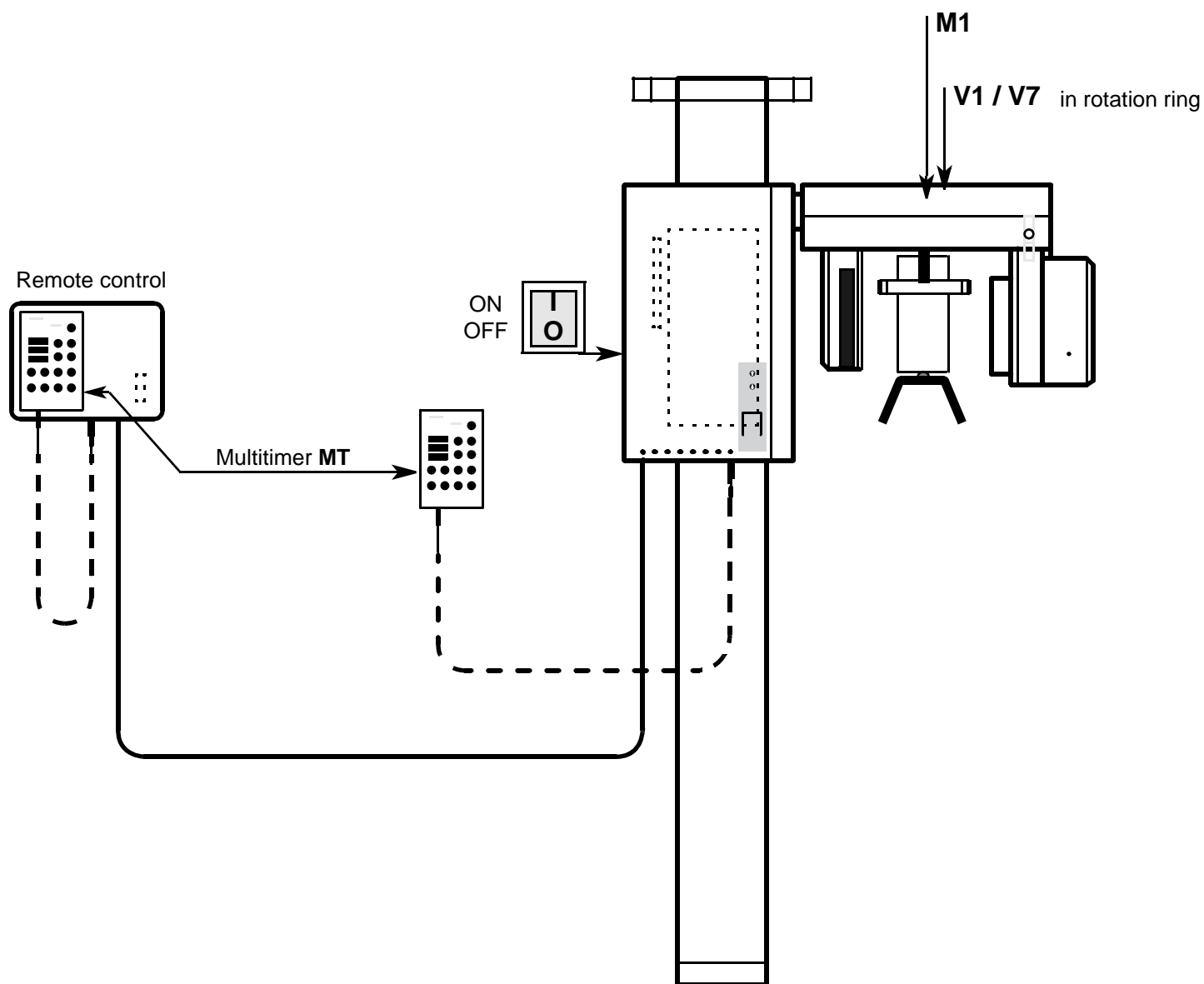
3. Briefly press the service key .  
The test LED lights up.
4. Press the test key.  
The R LED flashes.  
All inputs are tested for their status with all connectors unplugged. A faulty input status is indicated with its IN number and pin number. The errors can be subsequently recalled using the +/- keys of the kV/mA displays.  
kV display = IN number (input)  
mA display = pin number  
**If no error is detected, the kV/mA displays indicate 00.** For all error indications not contained in the table, please contact your customer service.

| Error indication<br>IN Pin | Signal                   |
|----------------------------|--------------------------|
| 10 30                      | Active                   |
| 12 06                      | Cassette reference point |
| 12 07                      | Cassette Pan position    |
| 12 08                      | Cassette Ceph position   |

5. Press the **R** key to terminate the error indication.
6. Turn the unit off and reconnect all connectors.




## 5.12 Service routine S.13 Hardware service







• **Certain rotation functions are checked with Service routine S.14.**



1. Select Service Routine **S.14** as described in section 'Selecting service routines'.
2. Briefly press the service key .  
The mA display indicates **01**.

The **rotation functions** are tested for **Panorama mode in test step 01**.

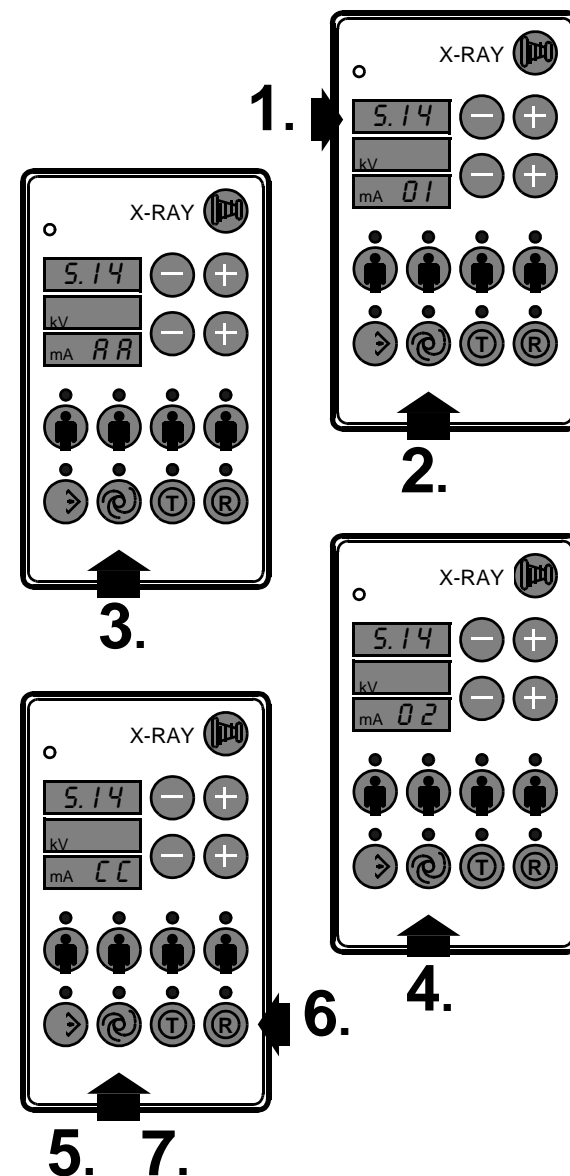
3. Briefly press the service key .  
**AA** is indicated on the mA display (with the X-ray tube assembly in the start position).
- If the X-ray tube assembly is not in the start position, the LED above the R key flashes. In this case press the Return key R. The X-ray tube assembly travels to the start position and the LED turns off. **AA** lights up on the mA display.
- If the X-ray tube assembly does not travel to the start position, error message **E3 33** is displayed after about 16 seconds. Proceed according to section 'Correction error of message E3 33',  
see page 3 - 53.

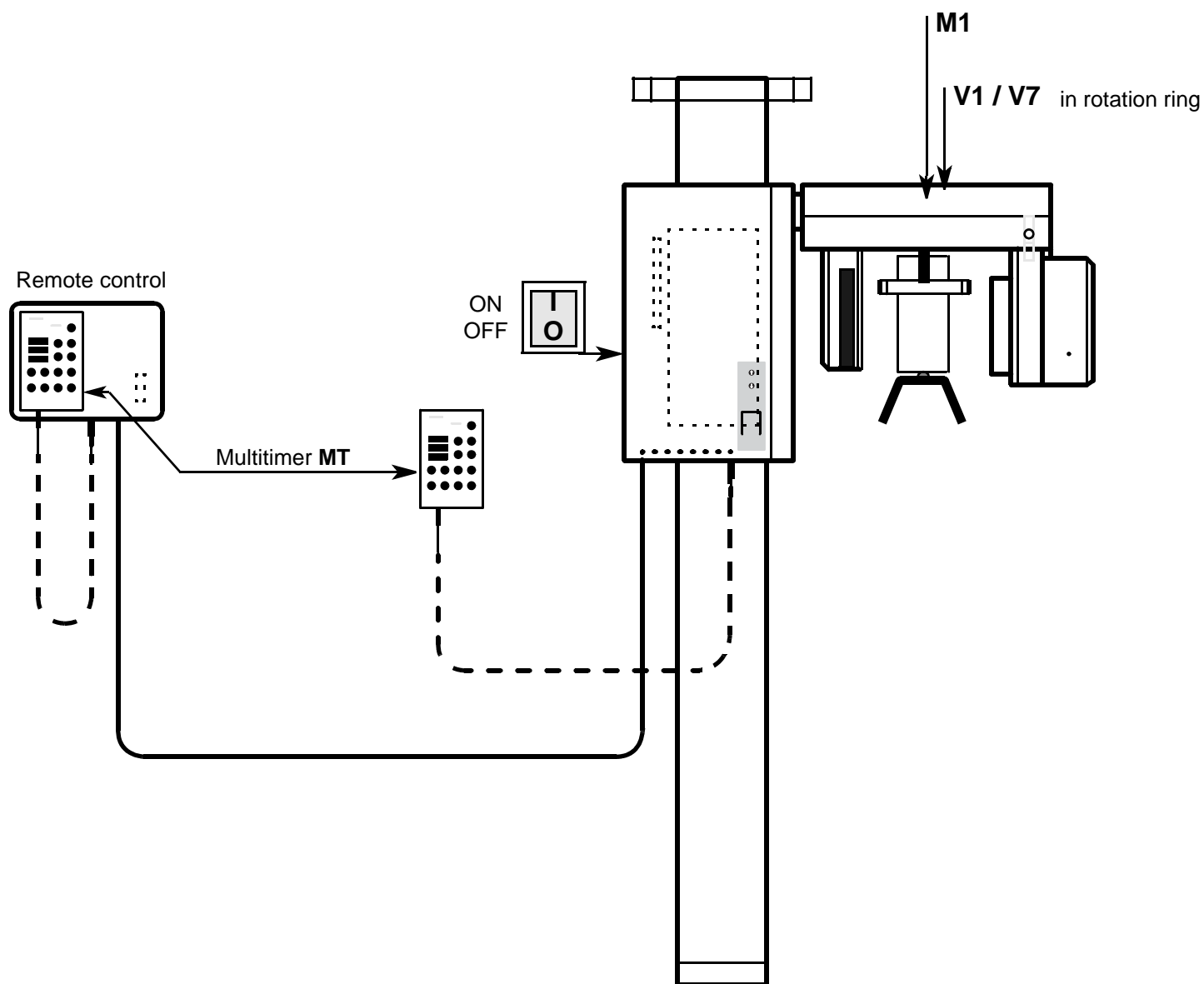
4. Briefly press the service key .  
The mA display indicates test step **02**.

The **movements for Cephalometry** are checked in **test step 02**.

5. Briefly press the service key .  
The mA display indicates **00**. The LED above the R key flashes.
6. Press the Return key R.  
The X-ray tube assembly travels to the exposure position for Cephalometry and the LED turns off.  
**CC** is indicated on the mA display  
The rotation motor M1 keeps the X-ray tube assembly in this position.  
If the X-ray tube assembly is moved out of this position, the motor switches off and the LED above the R key flashes.  
Error message **E3 42** appears if the Ceph position is not reached.
7. Briefly press the service key .  
The mA display indicates test step **03**.



Continued on next page






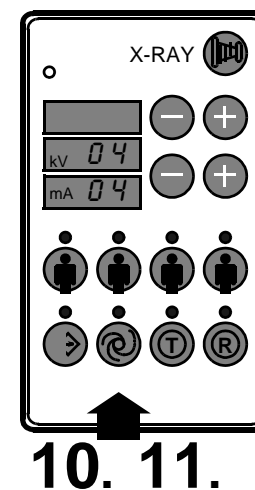
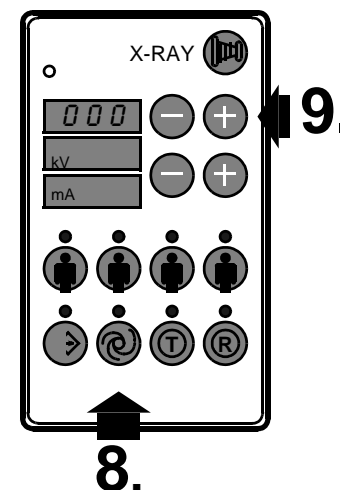
### Continued

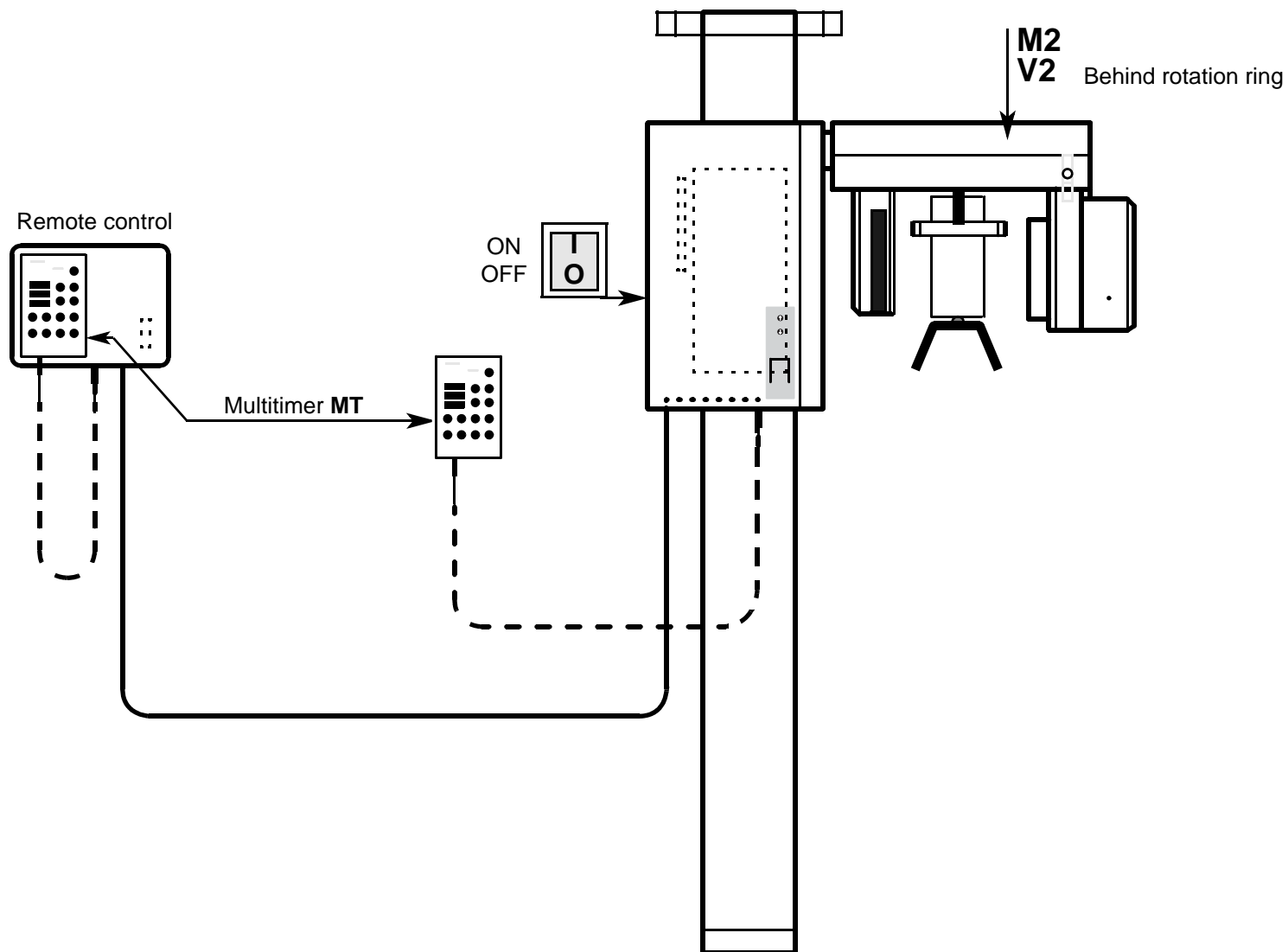
Free movement of the X-ray tube assembly / rotation ring is possible **in test step 03**.

8. Briefly press the service key 
  - If the X-ray tube assembly is not in the start position, the LED above the R key flashes. In this case press Return key R. The X-ray tube assembly now travels to the start position and the LED turns off. The LEDs above the two left-hand symbol keys must light up.
9. Start the rotation with the program + key.  
1° angular steps are possible. The steps from 0° to 225° are displayed on the program / radiation time display.  
To return press the - key.
10. Briefly press the service key   
Test step 04 appears on the mA display

The forked light barriers V1/V7 in the rotation ring are checked **in test step 04**.

11. Briefly test the service key 
  - By hand move the X-ray tube assembly to the start position for Panorama radiography (V1).
  - **The LEDs above the two left-hand patient symbol keys must light up.**
  - By hand move the X-ray tube assembly to the exposure position for Cephalometry (V7).
  - **The LEDs above the two right-hand patient symbol keys must light up.**












- The actuator M2 is checked with Service routine S.15.

1. Select Service routine S.15 as described in section 'Selecting service routines'.

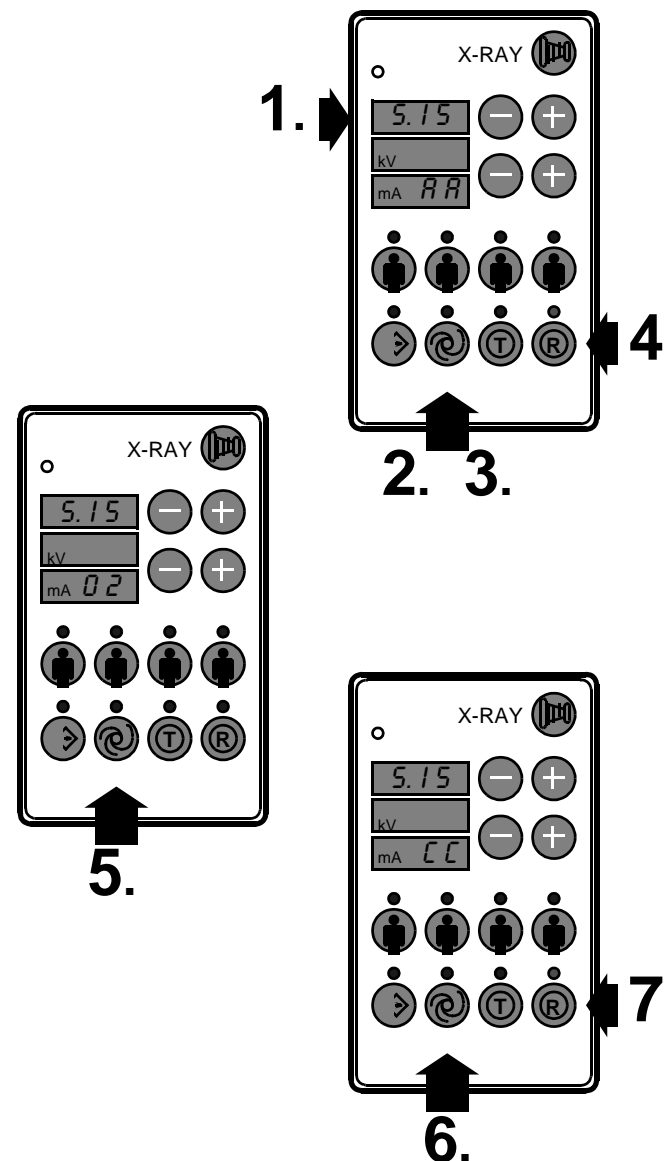
**Test step 01:** Panorama mode (no movement of the rotation ring)

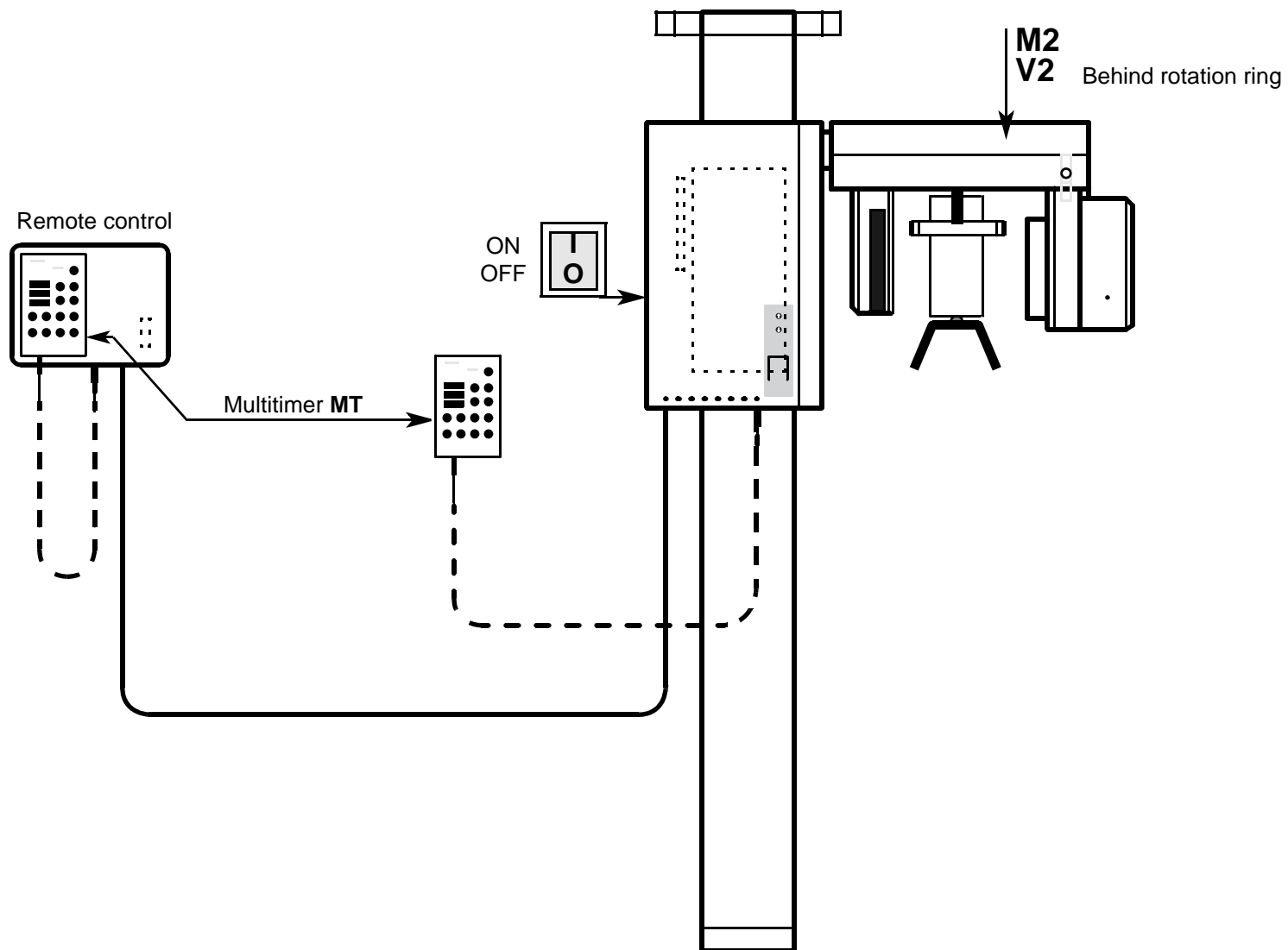
2. Briefly press the service key .  
The mA display indicates test step 01.
  3. Briefly press the service key .  
00 appears on the mA display. The LED above the R key flashes.
  4. Press the Return key R on the Multitimer.  
The actuator approach the start position (switching edge for light barrier V2 at the actuator).  
The mA display indicates AA. The LED above the service key  lights up.
- If the actuator do not travel to the start position, error message E3 02 is displayed after about 12 seconds. Proceed then according to section 'Correcting error of message E3 02',  
 see page 3 - 47.

**Test step 02:** Cephalometry mode (no movement of the rotation ring)

5. Briefly press the service key .  
The mA display indicates 02.
  6. Briefly press the service key .  
00 is indicated on the mA display. The LED above the R key flashes.
  7. Press the Return key R on the multitimer.  
The actuator approach the **cephalometry position** (switching edge for light barrier V2). The  
mA display indicates CC. The LED above the service key lights up.
- If the actuators do not approach this position, error message E3 02 is displayed after about 12 seconds.  
Proceed then according to section 'Correcting error of message E3 02',  
 see page 3 - 47.



Continued on next page

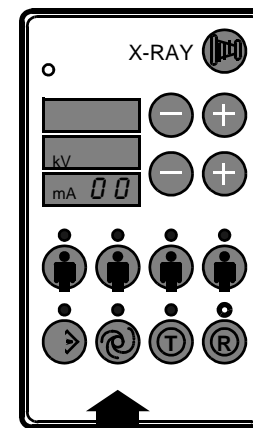




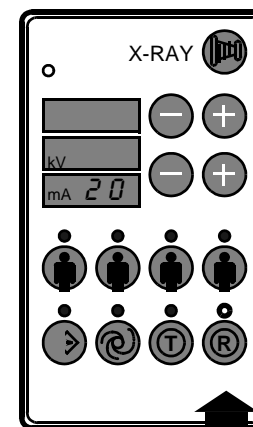
## Continued

**Test step 03:** Free movement of actuator M2 (no movement of the rotation ring)

8. Briefly press the service key .  
The mA display indicated **03**.
9. Briefly press the service key .  
**00** is indicated on the mA display, the LED above the R key flashes.
10. Press the Return key **R** on the multimeter. The actuator moves to the **trigger position**.  
(Trigger position = switching edge of light barrier V2).  
The LED turns off. The mA display indicates **20**.
11. The actuator can be adjusted to a value from 0 - 35 (1 digit = 1 mm) with the kV +/- keys.
  - From values **0** to **19** (+1) the 4 LEDs above the patient symbol keys **do not light up**.
  - From values **20** to **35** the 4 LEDs above the patient symbol keys **light up**.
  - The change "LEDs on/off" takes place at the switching edge for **light barrier V2** at the actuator.

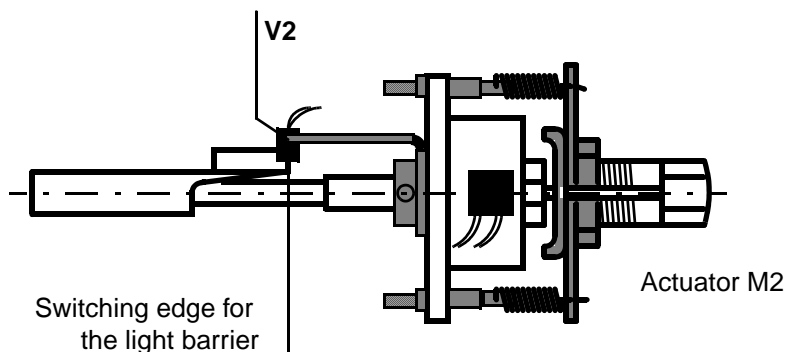


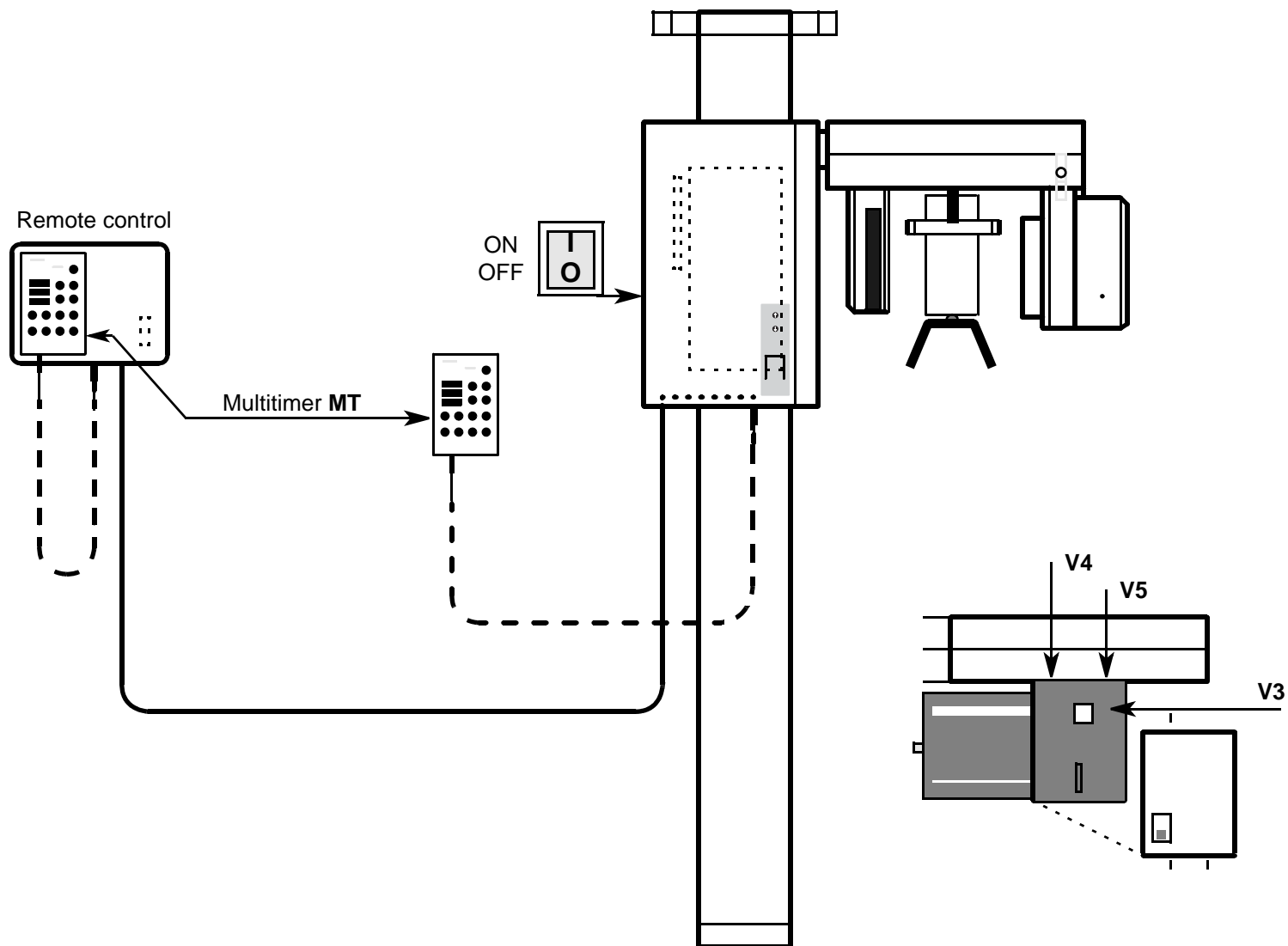
8. 9.



10.

11.









### ORTHOPHOS 3 / 3 Ceph only



- The Service routine S.16 is used for checking the film holder.

- Select Service routine S.16 as described in section 'Selecting service routines'.

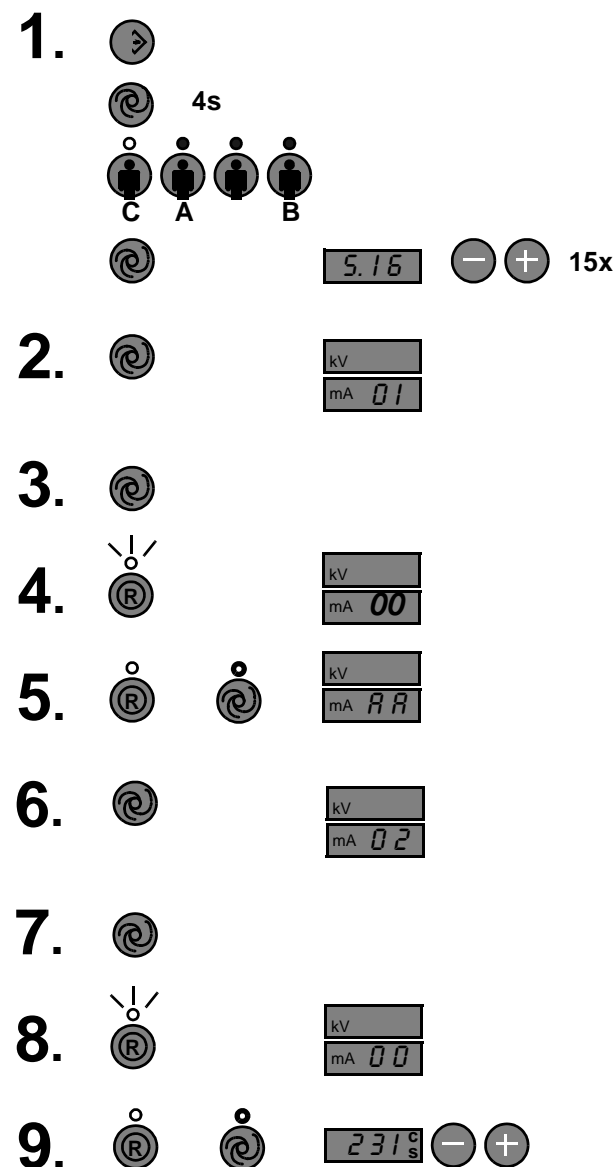
#### Test step 01: Approaching the film reference point

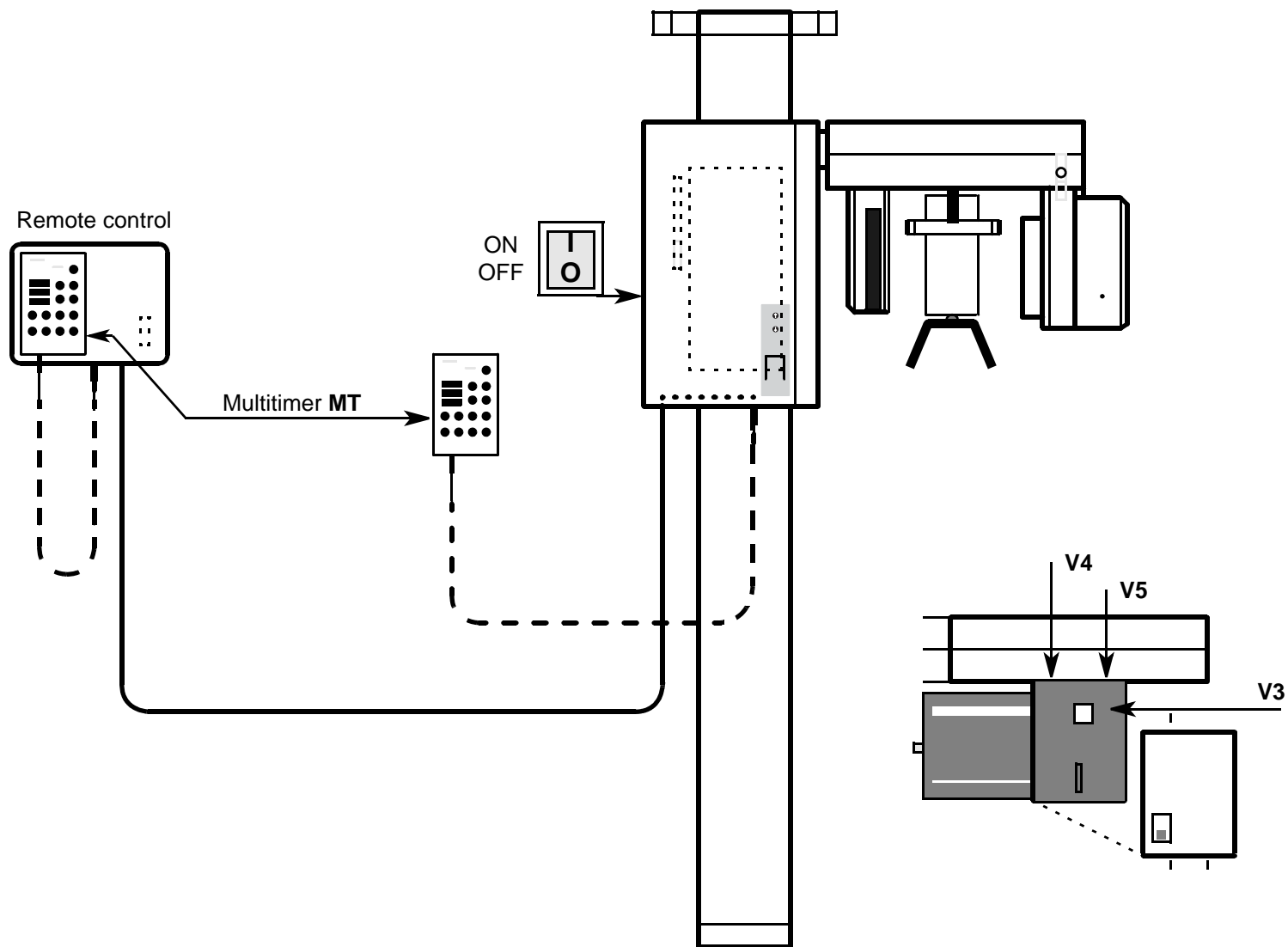
- Briefly press the service key .  
The mA display indicates test step 01.
  - Briefly press the service key .
  - Move the cassette holder to the Ceph or Panorama position.  
00 is indicated on the mA display (if film not already in reference position).  
The LED above the R key flashes.
  - Press the Return key R on the multimer.  
The film moves to the reference position.  
AA is indicated on the mA display. The LED above the service key lights up.
- If the film does not travel to the reference position within a certain time, error message E3 06 is displayed. Proceed then according to section 'Correcting error of message E3 06', see page 3 - 49.

#### Test step 02: Free movement

- Briefly press the service key .
  - Briefly press the service key .
  - Move the cassette holder to the Ceph or panorama position.  
00 is indicated on the mA display (if film not already in reference position).  
The LED above the R key flashes.
  - Press the Return key R on the multimeter.  
The film travels to the reference position. 000 is indicated on the program / radiation time display. The 4 LEDs above the patient symbol keys light up.
- The film can be moved in the range from 000 to 231 by the program / radiation time +/- keys.  
Upon leaving the reference position, the 4 LEDs above the patient symbols turn off.



Continued on next page

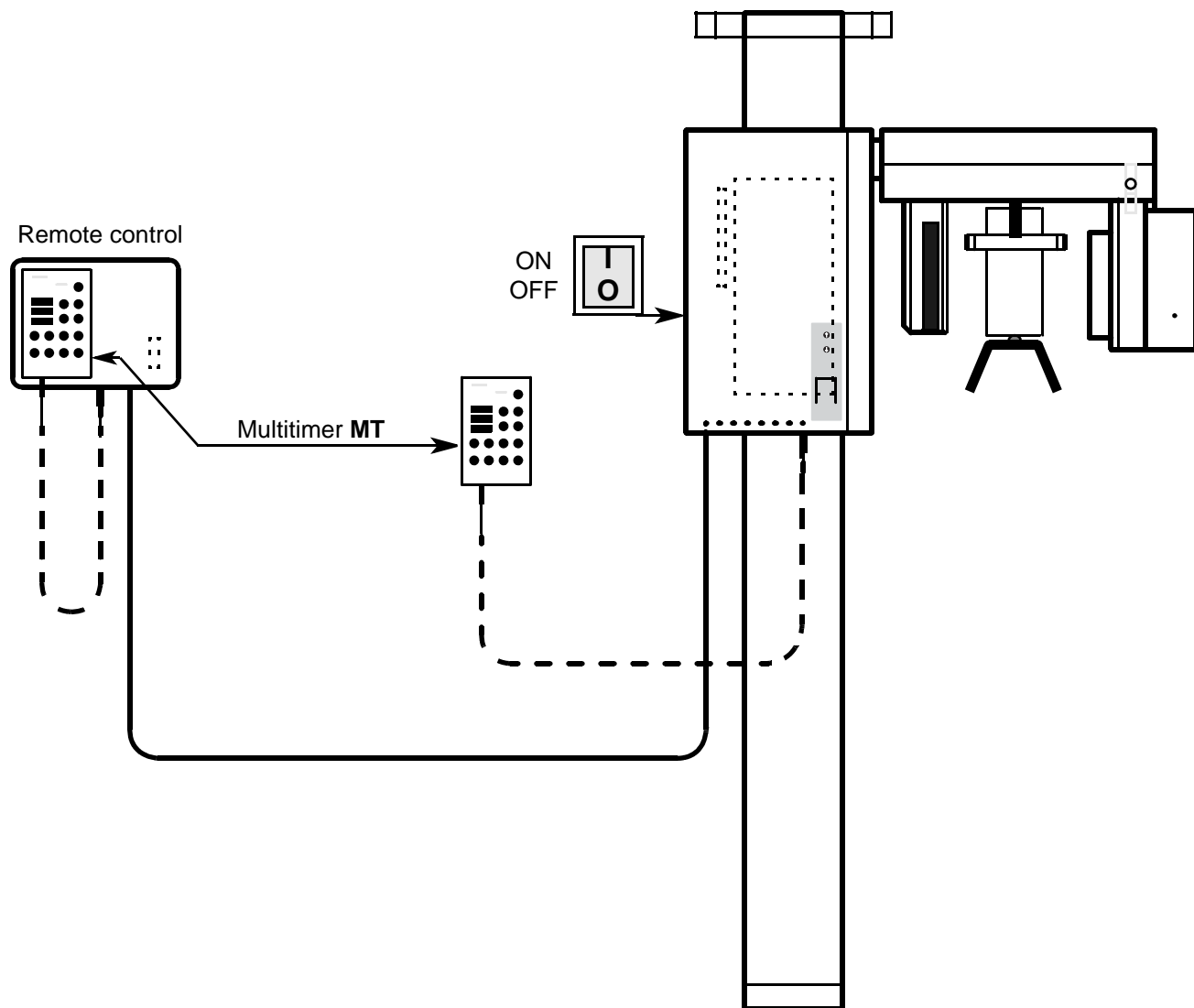






## Continued

### Test step 03: Light barrier test



10. Briefly press the service key .  
The mA display indicates test step 03.
11. Briefly press the service key .
  - The LEDs above the patient symbols show the switching state of the light barriers. All LEDs are turned off if no light barrier is activated.
  - LED 1 lights up: Light barrier V3 'reference point of film' is activated.  
The condition for the correct indication of the light barrier signal by LED 1 is:  
Light barrier V4 'Panorama position' must be activated - LED 3 lights up  
or light barrier V5 'Ceph position' must be activated - LED 4 lights up.
  - LED 3 lights up: Light barrier V4 'Panorama position' is activated.
  - LED 4 lights up: Light barrier V5 'Ceph position' is activated.



- **Service routine S.17 is required for the modification of unit versions.**

1. Select Service routine **S.17** as described in section '**Selecting service routines**'.
2. Briefly press the service key .  
The kV display indicates **00**.
3. Enter service code 17.  
The kV display indicates **17**.
4. Briefly press the service key .  
The unit identification stored in the EEPROM of the unit is indicated on the mA display.  
If the unit identification of the memory card should deviate from that on the EEPROM but is compatible with it, then the LED above the memory key flashes.

#### Taking over the unit identification:

5. Press the memory key (LED stops flashing).  
The LED above the R key flashes.
  6. Press the Return key R (LED stops flashing).  
The **new** unit identification now stored in the EEPROM is indicated on the mA display.
  7. Briefly press the service key . This exits the Service routine S.17.
- Transferring the unit identification is not possible, if:
    1. The unit identifications already match (LED above the memory key not flashing).
    2. An incompatibility of the unit identifications (see table) exists (LED above the memory key not flashing).
  - To exit Service routine S.17 briefly press the service key .

#### Unit compatibilities:















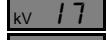





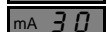






##### Group A:

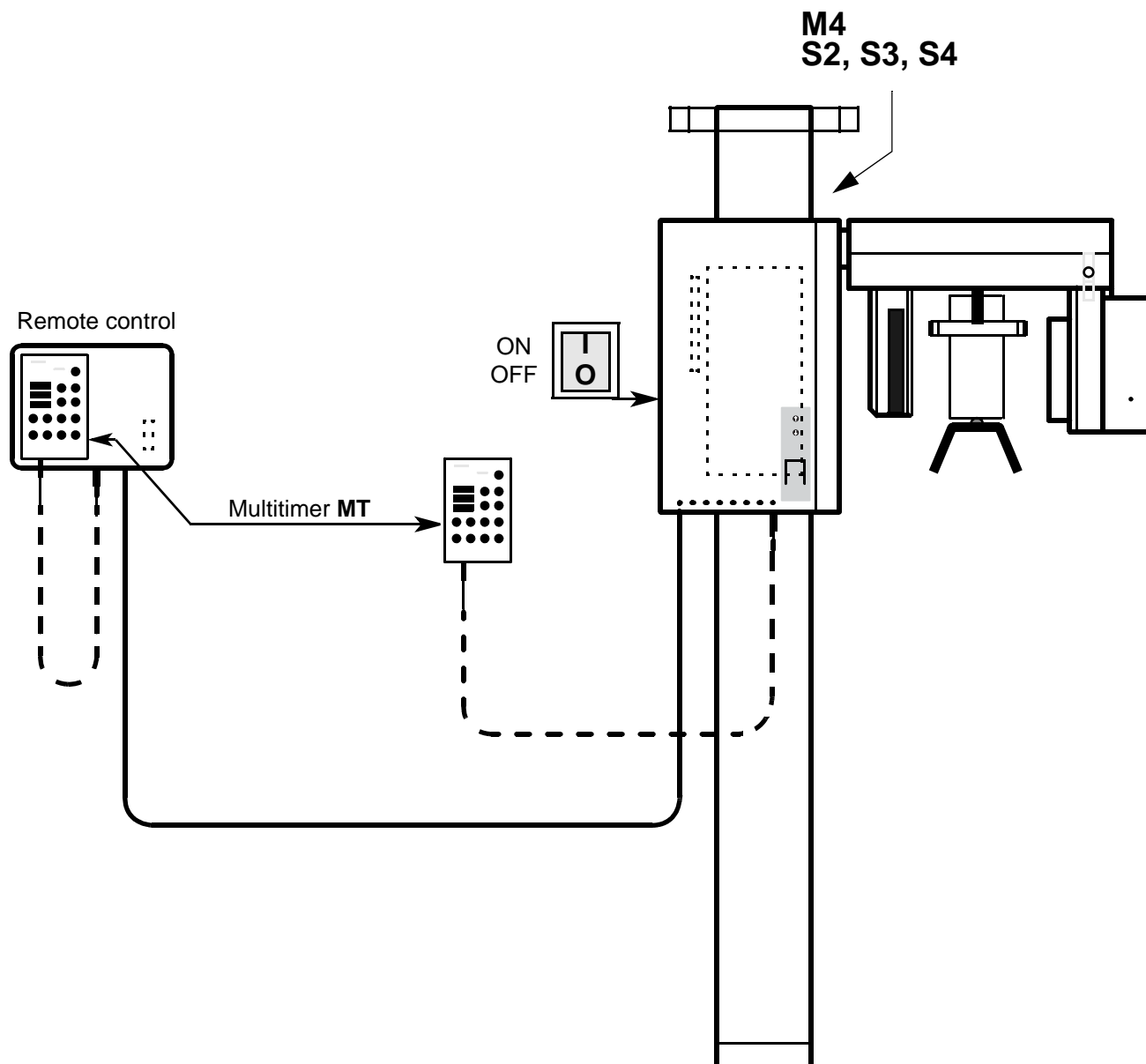
10 = ORTHOPHOS DS (Ceph)  
12 = ORTHOPHOS Plus DS TSA (Ceph)  
50 = ORTHOPHOS Plus / (CD) Filming device  
51 = ORTHOPHOS 5 / (CD) Filming device  
52 = ORTHOPHOS TS / (CD) Filming device

##### Group B:


30 = ORTHOPHOS 3 / (C) Filming device  
31 = ORTHOPHOS 3 DS

Group identifications may be reprogrammed freely within a group, but not across groups.



1.   4s  
     
    16x
2.    

3.    
   17x
4.    
 
5.  
6.  
7. 





- **Service routine S.18 is needed for checking the height adjustment.**
- Place the removed panels or substituting weights for the removed panels of approximately 6kg on the rotation ring.

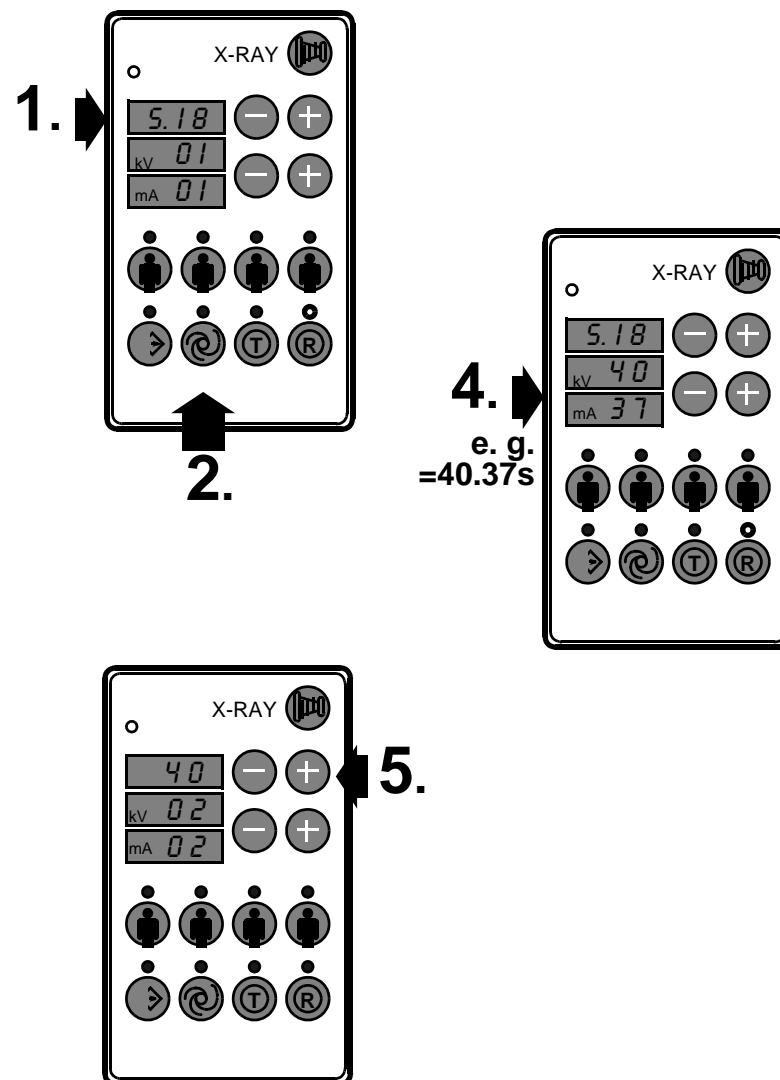
1. Select Service routine **S.18** as described in section '**Selecting service routines**'.
2. Briefly press the service key . The mA display indicates test step **01**. Select the desired test step with kV +/- keys.

**Test step 01:** Checking smoothness of movement

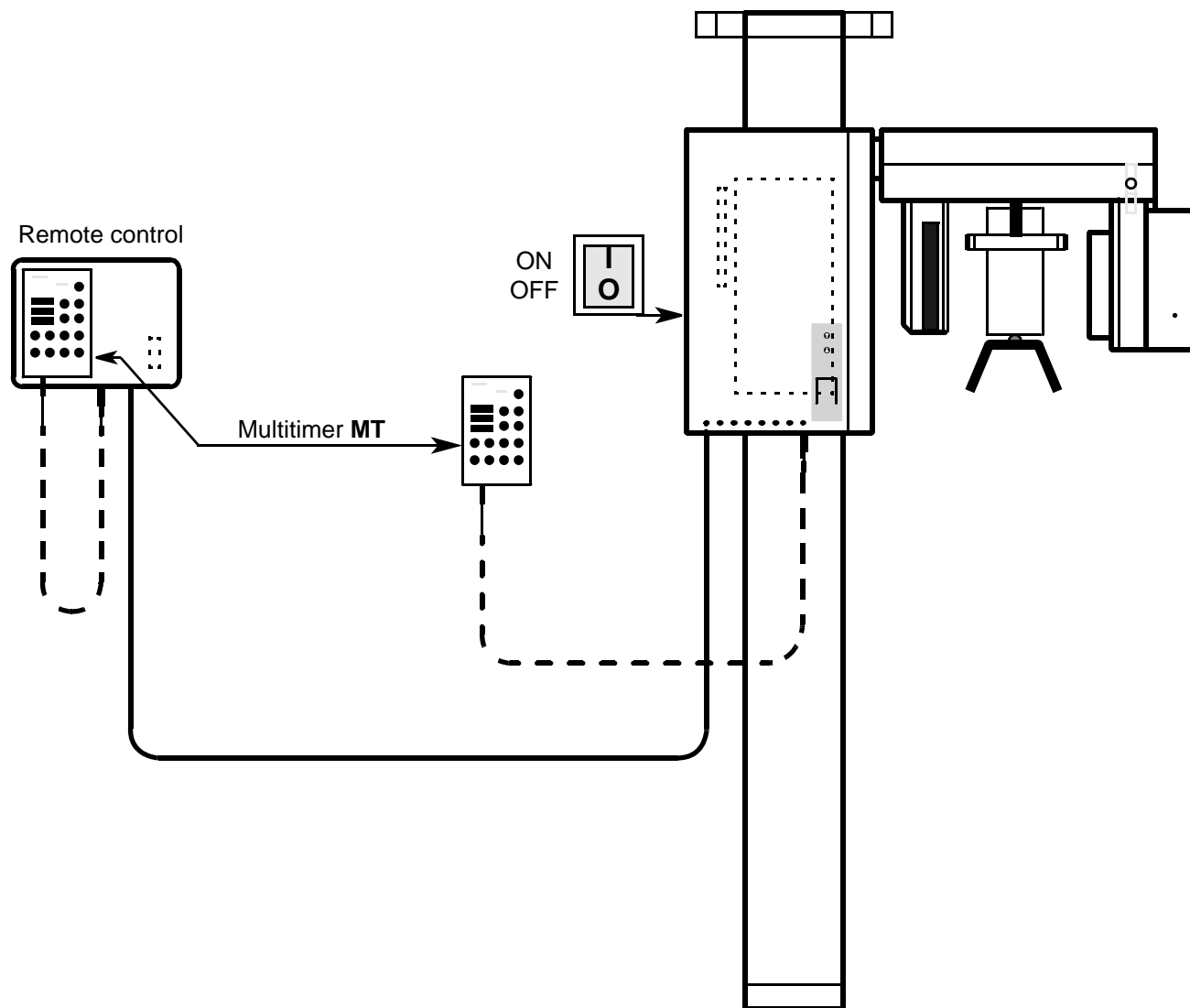
3. Briefly press the service key . The kV display indicates 00.
4. With the HV keys move over the entire travel range for the height. The travel time is indicated in seconds. Display accuracy 0.01s. A typical travel time is between 40 and 60s. Briefly press service key . The mA display indicates test step **02**.

**Test step 02:** Travel at constant speed.

- Briefly press service key . The kV display indicates test step **02**. 001 is indicated on the Program/Radiation time display of the Multimeter.
5. With the + / - keys set a PWMvalue between 1 and 400. You can expect movement beginning with a value of 30-50.
  6. Move the unit from the HV key.
  7. Briefly press service key . The mA display indicates test step **01**.



from serial no. 32 000 ORTHOPHOS 3 DS  
12 000 ORTHOPHOS 3







To exit the service routines switch the unit OFF and ON again.

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- **Service routine S.25 must be performed for adjusting and checking the film/screen combination or the kVmA step series.**

1. Select Service routine **S.25** as described in section 'Selecting service routines'.
2. Briefly press the service key . The kV display indicates **00**.
3. Enter service code 25. The kV display indicates **25**.
4. Briefly press the service key . The LED above the memory key flashes.

**For ORTHOPHOS 3/3 Ceph** from software version V08.30

Intensifying Screen Kodak Lanex Regular with film Kodak T-Mat G, Agfa Ortholux.


**For ORTHOPHOS 3 DS** from software version V03.31





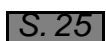



















On the mA display, the value **30** or the preprogrammed value must be indicated, if it does not appear, a kVmA step series or a film/screen combination can be adjusted with the kV/mA +/- keys

|                                            |           |                                                                                                                                                                            |                      |     |
|--------------------------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----|
| <b>world-wide</b><br>(except USA and Asia) | <b>30</b> | Step series                                                                                                                                                                | <b>60/10 - 80/10</b> | Pan |
| <b>USA</b>                                 | <b>2A</b> | You can change between the two step series by actuating one of the two smaller ( <b>60/6 - 76/10</b> ) or one of the two larger ( <b>60/10 - 80/10</b> ) patient symbols.  |                      | Pan |
| <b>Asia</b>                                | <b>1A</b> | You can change between the two step series by actuating one of the two smaller ( <b>60/10 - 80/10</b> ) or one of the two larger ( <b>60/11 - 80/11</b> ) patient symbols. |                      | Pan |

(Other characteristic values are not permissible.)

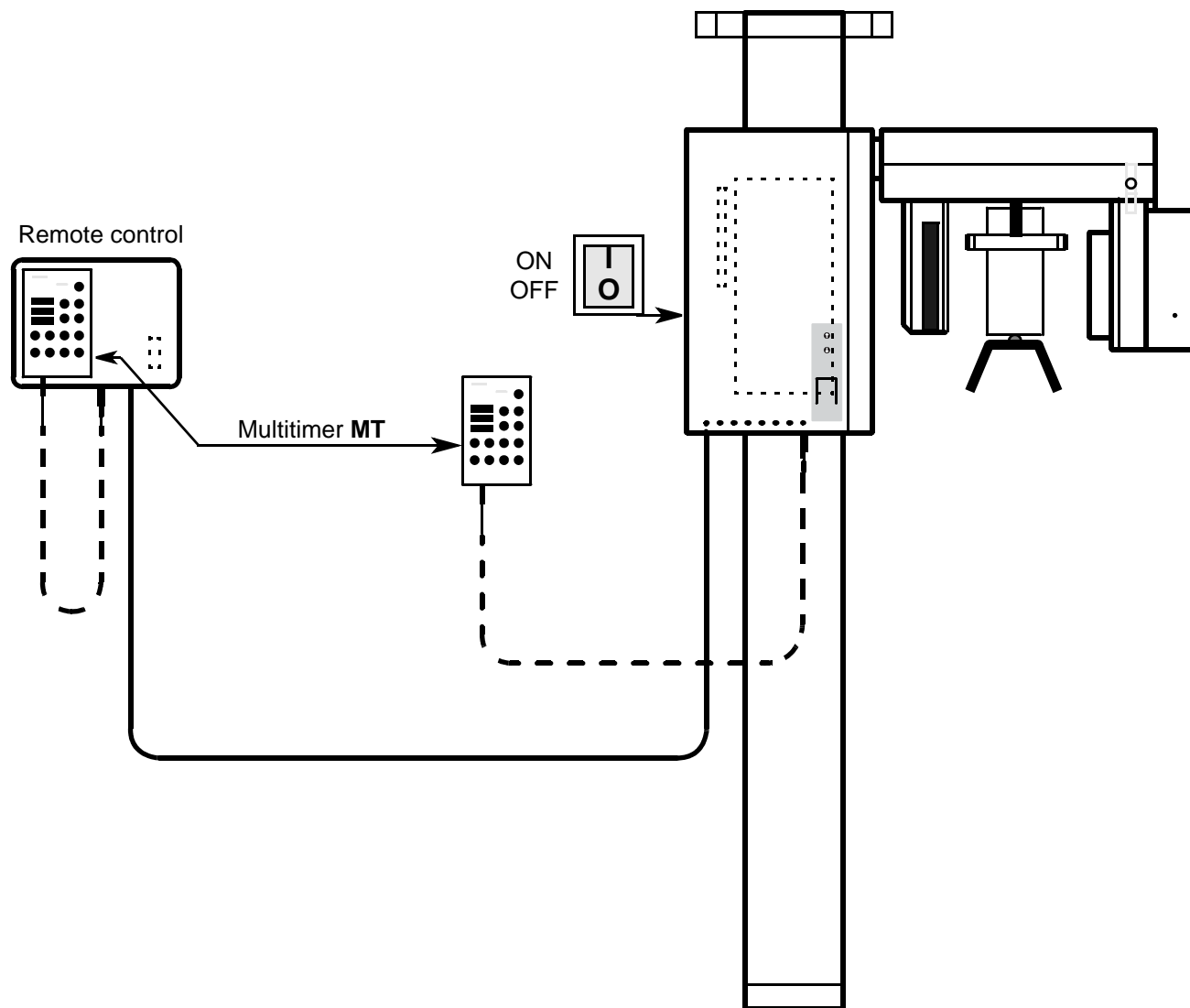
#### Programming procedure:

5. Press the memory key (LED stops flashing). The LED above the R key flashes.
6. Press the Return key R (LED stops flashing). The LED above the service key flashes.
7. Briefly press the service key . Service routine S.25 is now exited.



1.   4s      20/21x
2.   
3.      25x
4.    
5.  
6.  
7. 

## 5.18 Service routine S.25 Adjusting the film/screen combination or the kVmA step series

from serial no. 32 000 ORTHOPHOS 3 DS  
12 000 ORTHOPHOS 3




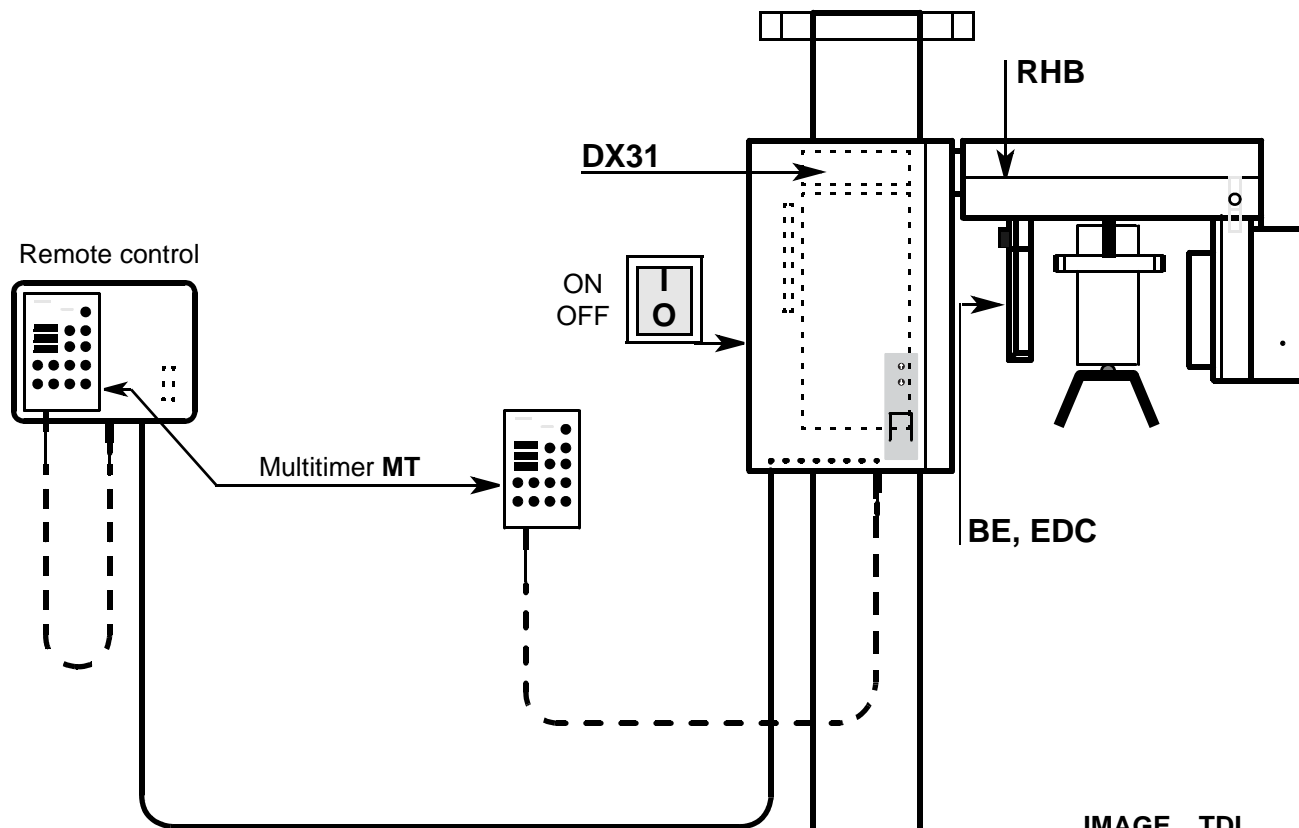
- **Perform the Service routine S.27 for setting and checking the country code.**

1. Select Service routine **S.27** as described in section '**Selecting service routines**'.
2. Briefly press the service key .  
The kV display indicates **00**.
3. Enter service code 27.  
The kV display indicates **27**.  
The mA display indicates test step **01**.
4. Briefly press the service key .  
The program/time display and kV display are switched off.  
The currently set country code is displayed on the mAs display.
5. Set the required country code with the kV/mA  $\pm$  keys.  
If the country code is changed, the memory LED starts to flash.  
The following country codes are allocated currently:

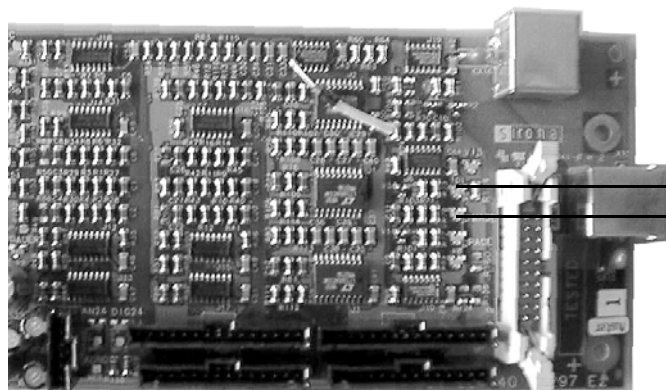
| Country code | Meaning            |
|--------------|--------------------|
| 00           | World without Asia |
| 01           | Asia               |

**Programming procedure:**

6. Press the memory key (LED stops flashing).  
The LED above the R key flashes.
7. Press the Return key R (LED stops flashing).  
The LED above the service key flashes.  
The programming process is thus concluded.
8. Briefly press the service key . Service routine S.27 is now exited.

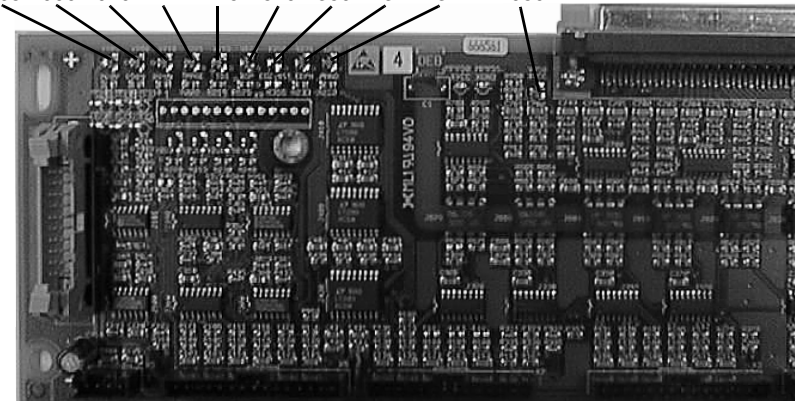


**XAB OP**




V5 TDI  
V6 IMAGE


IMAGE TDI DEB  
V905 V900 V910 V221 V216 V670 V350 V231 V232 V950



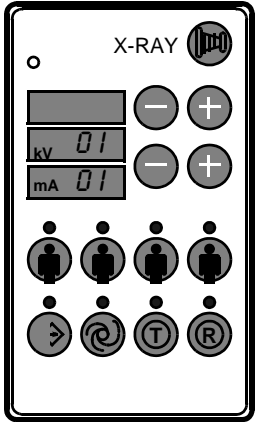
For ORTHOPHOS DS Service routine S.32,.

- **Service routine S.32 is required for checking the image receptor.**
- 1. Select Service routine **S.32** as described in section '**Selecting service routines**'.
- 2. Briefly press the service key . The mA display indicates test step **01**.  
Select the desired test step with the kV +/- keys.


**Test step 01:** Checking the voltage supply for the image receptor  
The supply voltages can be measured on board RHB.

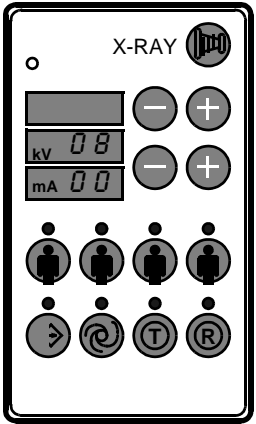
- 3. Briefly press the service key . **dd dd** is indicated on the kV/mA display.
- 4. Press the X-ray button. For 240 seconds the image receptor is ready for exposure.  
The operating time of 240 sec on the program/radiation time display counts backwards.  
The LED above the R key flashes.
- The readiness for exposure may be turned off earlier by pressing the R key.
- The cool-down interval is 1/2 the exposure time and can be retrieved by pressing the X-ray key.

| Test step 01 |    |             |
|--------------|----|-------------|
| kV display   | 00 | VCC missing |
|              | 01 | VCC OK      |
| mA display   | 00 | reset       |
|              | 01 | no reset    |




**Test step 02:** Clock pulses for image information

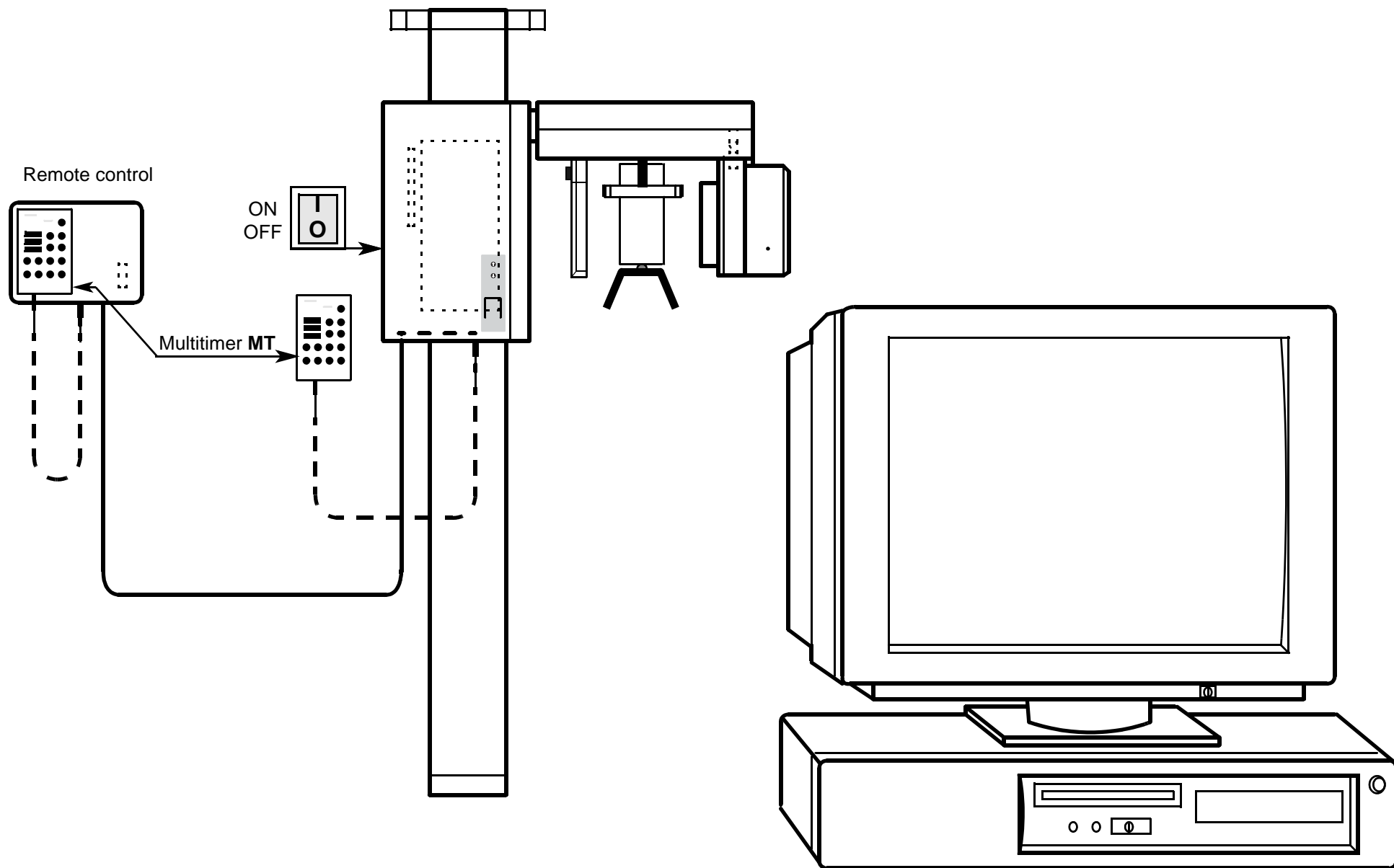
- 5. Briefly press the service key .  
The TDI pulse frequency is indicated in Hertz (0800 = 800 Hz) on the kV/mA display.
- The frequency can be adjusted in the range from 1000 Hz to 100 Hz with the kV +/- keys.
- 6. Press the X-ray button. For 240 seconds the image receptor is ready for exposure.  
The operating time of 240 sec on the program/radiation time display counts down.  
The LED above the R key flashes.
- The image receptor provides pulses for permanent image information (signals IMAGE and TDI are generated). Check the LEDs on board DEB or XAB OP.
- The readiness for exposure may be turned off earlier by pressing the R key.
- The cool-down interval is 1/2 the exposure time and can be called up by pressing the X-ray key.



**Test step 03:** Detection of plug-in slot

- 7. Briefly press the service key .  
The kV display indicates whether or not the image receptor has been detected.
- kV display:                00 means image receptor not plugged in,  
                                  01 means image receptor plugged in.

5.20 Service routine S.32 Image receptor service: Panorama



### ORTHOPHOS DS only

- Service routine S.35 is required for checking the readiness for exposure.
- Set the readiness for exposure as described in section 'Setting exposure readiness on the PC'. Select **Factory service (2)**.

1. Select Service routine **S.35** as described in section 'Selecting service routines'.

2. Briefly press the service key .  
Briefly press the service key . The kV display indicates 01.

#### Test step 01: PC Service

- The image receptor hardware Active signal is output to the kV display

|    | XOP/DEB                                                                | XAB OP                                                |
|----|------------------------------------------------------------------------|-------------------------------------------------------|
| 00 | PC voltage supply DEB_XPWR is not present.<br>LED V950 (DEB) VCC = OFF | XAB OP not in operation<br>LED V10 (XAB OP) VCC = OFF |
| 01 | PC voltage supply DEB_XPWR is present.<br>LED V950 (DEB) VCC = ON      | XAB OP in operation<br>LED V10 (XAB OP) VCC = ON      |

- The signal ACTIVE is indicated on the mA display.

00: ACTIVE is not present

01: ACTIVE is present

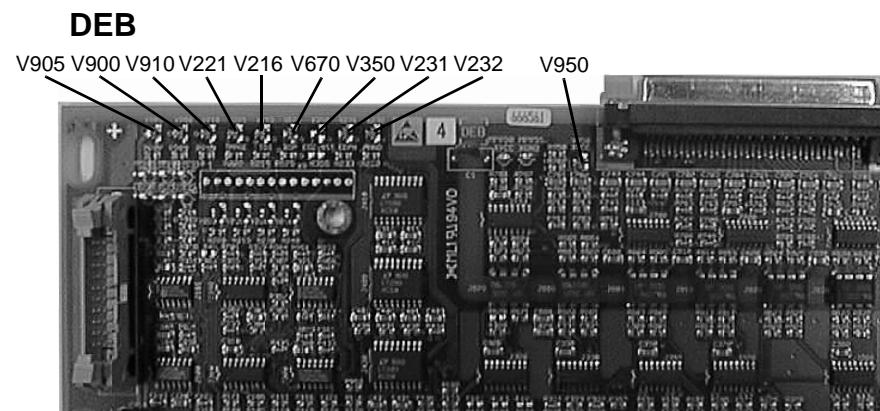
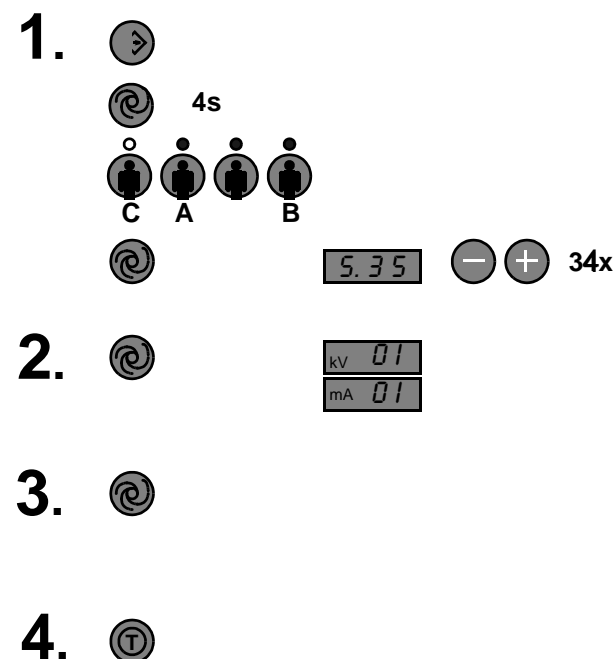
3. Briefly press the service key . Test step 02 is displayed.

#### Test step 02: Setting the Active signal

In the mA indication of the Multitimer 00 is displayed

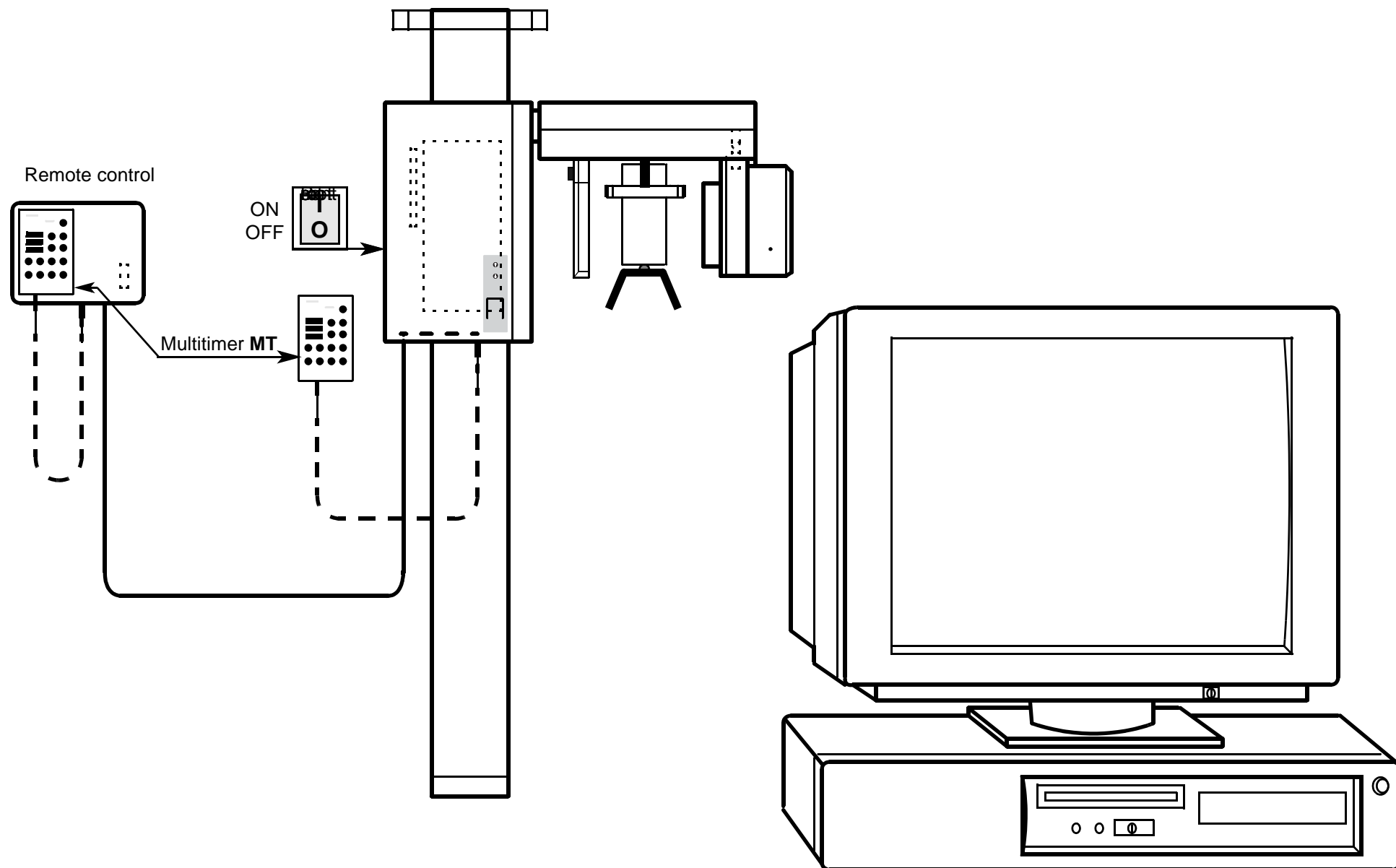
4. Actuate the test sequence button on the Multitimer to set the Active signal.  
The ma indication changes to 11.

Now Service routines S.01, S.02, S.03, S.04, S.05 can be run without first selecting "Con-  
stancy check/Factory service" on the SIDEXIS PC (use ± keys to select)  
You can also reset the active signal in the same way with this test step (switch mA indication  
back to 00 with test sequence button). However, the active signal is automatically reset when  
factory service is selected on the SIDEXIS PC or the unit is switched off.





## 5.21 Service routine S.35 PC service

from serial no. 31 000 ORTHOPHOS 3 DS






**For ORTHOPHOS 3 DS only:**

- **Service routine S.37 is required to call up and delete the IP address settings.**
1. Select service routine **S.37** as described in the chapter 'Selecting a service routine'.
  2. Press the  service key briefly.  
The kV display reads **00**.
  3. Enter service code **37** with the + key.  
The kV display then reads **37**.
  4. Press the  service key briefly.  
Test step 01 appears on the mA display.  
Select the required test step with the kV +/- keys.

**Test step 01: Address displays**

5. Press the  service key briefly.  
On the program/radiation time display the first 3-digit block of the IP address appears and the 1-LED patient symbol lights up.  
The kV display reads **01**.

The addresses can be read out as follows:

Select the address with kV +/- keys and the kV display.


01 = IP address

02 = Standard gateway

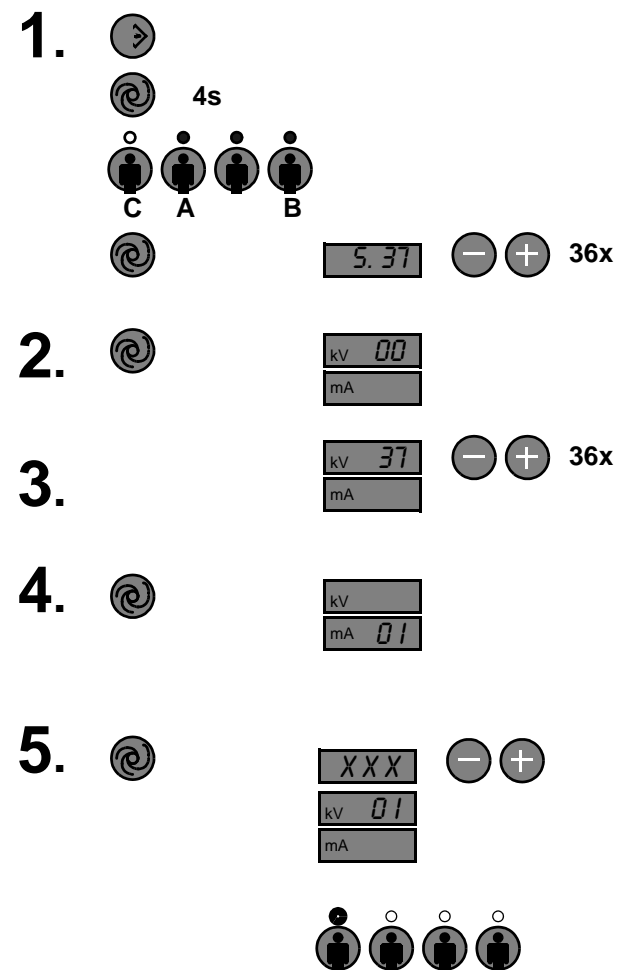
03 = Subnet mask

Use the patient symbol keys to switch to the next address block.

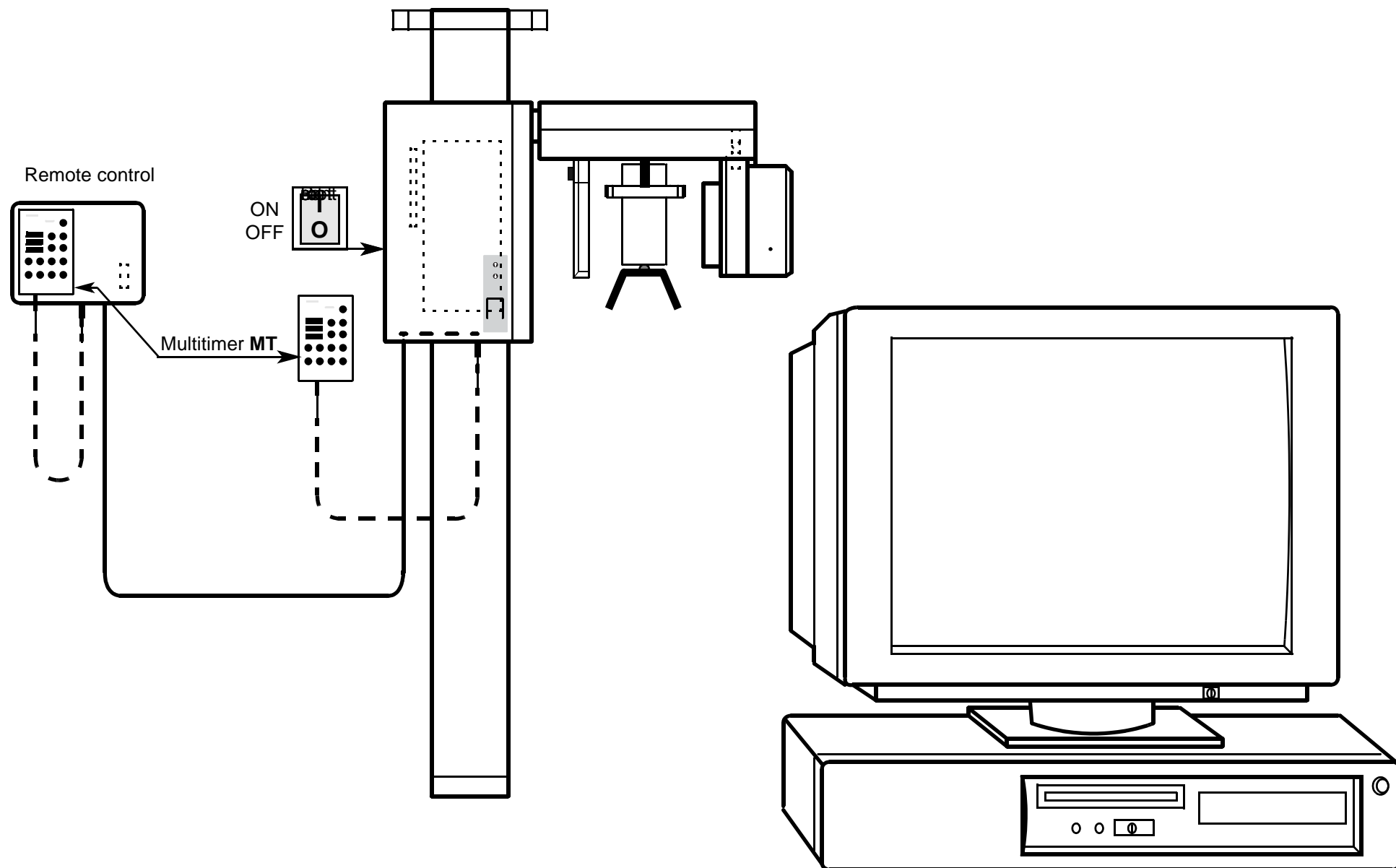
Syntax "xxx . xxx . xxx . xxx" (Led 1, Led 2, Led 3, Led 4).

**Note:** If the system concerned is an XOP system or the XAB system is not recognized, the kV/ mA display will be set to "EE/EE" after the test step is selected with the  service key.  
If no communication takes place, error message E4 10 will be displayed.




Continued on next page



from serial no. 31 000 ORTHOPHOS 3 DS



**Test step 02:** Deleting the IP addresses  
This test step is required to reset the X-ray component to the factory setting

6. Press the  service key briefly.  
The kV/mA display reads **FF FF**.  
The LED above the Memory key flashes.
  7. Press the Memory key.  
The LED above the R key flashes.
  8. Press the R return key.  
The addresses of the XAB system are deleted.  
The kV/mA display reads **00 00**.
  9. Press the  service key briefly.
  10. Switch the unit off, wait for at least 60s and then switch it back on.
- If the **"Configuration of X-ray Components"** (SIXABCON) program and the **"New Component"** field are selected on the PC, error message E4 21 (the XAB system is in "Boot Service") will appear following the self-adjustment procedure. The unit is ready to receive new addresses.
  - If the **"New Component"** dialog is **not** selected on the PC, the XAB system will automatically set its internal default addresses after 10s have elapsed at the latest, and can be detected under these addresses until the next time it is switched off.
- Note:** If the system concerned is an XOP system or the XAB system is not recognized, the kV/ mA display will be set to "EE/EE" after the test step is selected with the  service key.  
If no communication takes place, error message E4 10 will be displayed.



| Default address setting of networked Orthophos |                  |                |
|------------------------------------------------|------------------|----------------|
| 01                                             | IP address       | 192.168.15.200 |
| 02                                             | Standard gateway | 192.168.15.1   |
| 03                                             | Subnet mask      | 255.255.255.0  |



## 6 Repairs

---

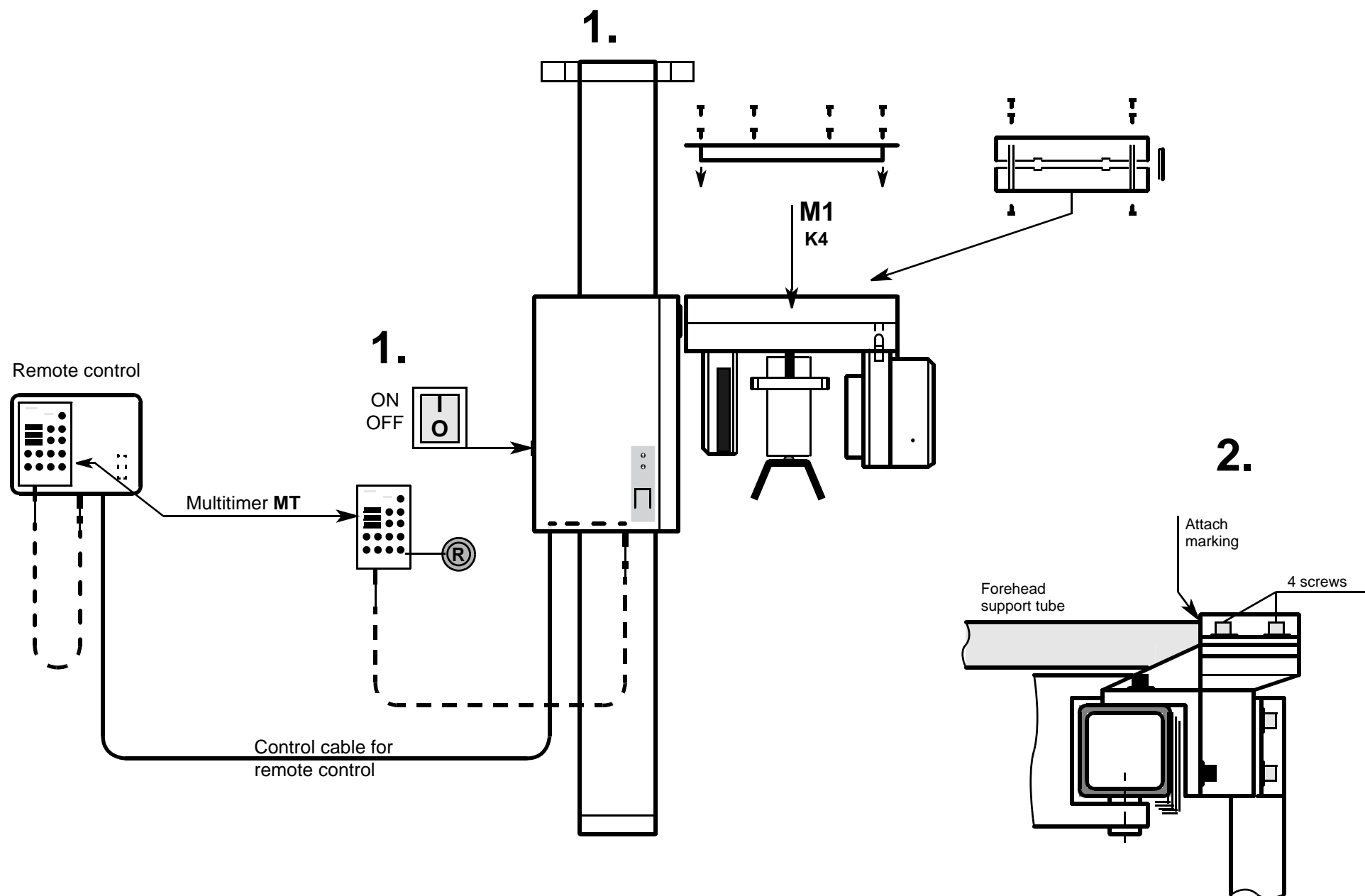
## Repairs

---

### Contents

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| 6.2 | Replacing the actuator M2 .....                                 | 6 - 9  |
| 6.3 | Replacing the spindle with motor M4 for height adjustment ..... | 6 - 11 |
| 6.4 | Replacing the cassette holder for Panorama radiography .....    | 6 - 15 |
| 6.5 | Replacing the rope and/or the cassette drive motor M3 .....     | 6 - 17 |
| 6.6 | Replacing socket contact for image receptor .....               | 6 - 21 |
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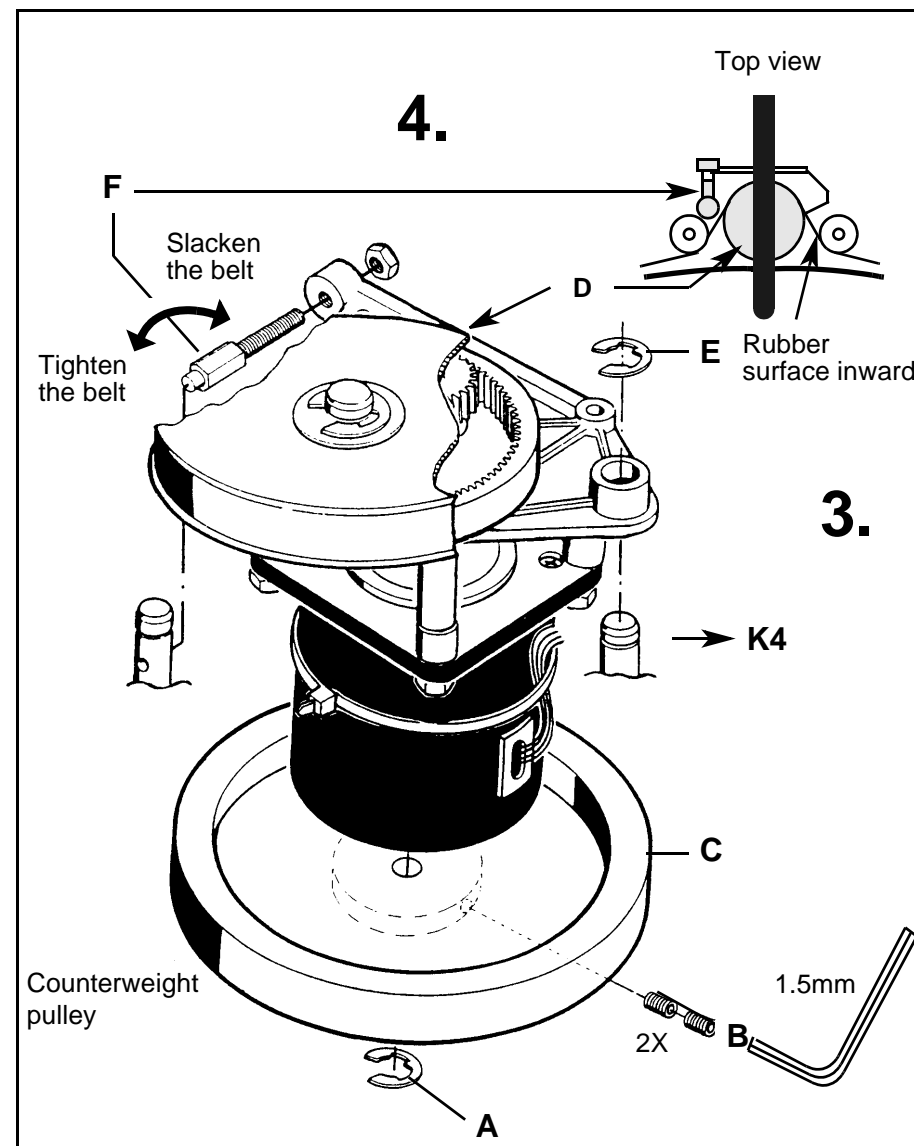


**ATTENTION: Always turn the unit OFF before connecting a measuring instrument or replacing any parts!**

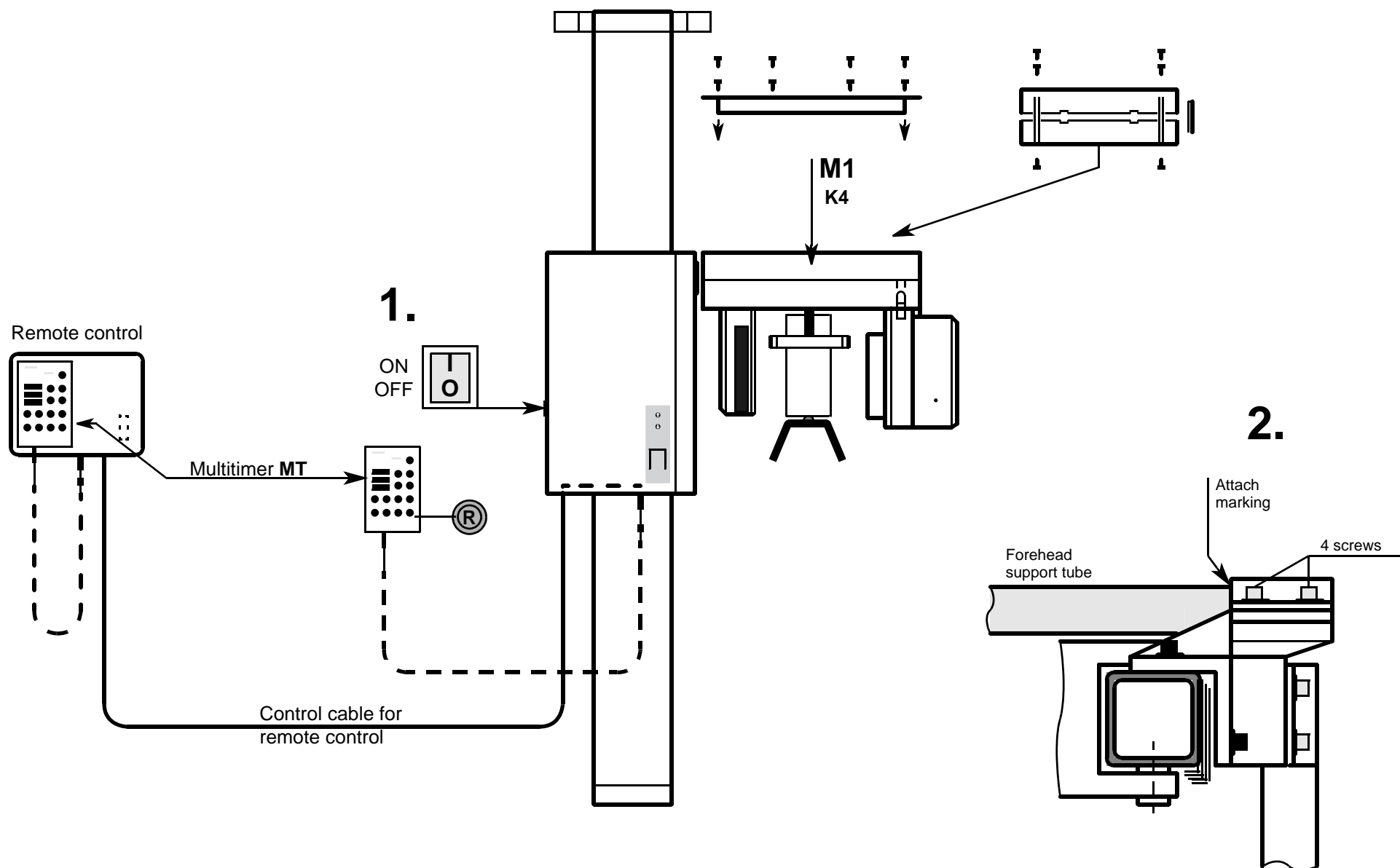
58 35 744 D 3285  
D 3285.077.02.06.02 07.2004

- Unscrew the two covers behind the rotation ring (6 screws).
  - Unscrew the rotation ring cover (8 screws).
1. Switch the unit ON. Wait for the unit self-adjusting routine to execute. Move the unit to a convenient height for working. Switch the unit OFF.
  2. Forehead support: Mark the position of the forehead support tube. Loosen the four screws and pull out the forehead support.
  3. Replace motor M1:
    - Separate plug K4.
    - Pull off safety ring **A**.
    - Unscrew threaded pin **B**.
    - Take out counterweight pulley **C** from below.
    - Turn belt tensioning bolt **F** until belt is loosened.
    - Take flat belt off pulley **D** (rubber coating inside, position adhesive position over tube unit).
    - Pull off safety ring **E**.
    - Take out complete motor M1 from above.
    - Install new motor. Feed flat belt correctly over rollers.
    - Attach counterweight pulley and secure with the two threaded pins **B**.
    - Couple plug connection K4.
  4. Adjust flat belt:
    - Switch the unit ON. Wait for the unit self-adjusting routine to execute.
    - Manually turn x-ray head to the middle rotation position.
    - Hold the X-ray head by hand and press the **R** key on the Multitimer.
    - At the same time, turn the belt tensioning bolt **F** (tighten) until the belt no longer slips.

Continued on next page




## 6.1 Replacing the rotation motor M1

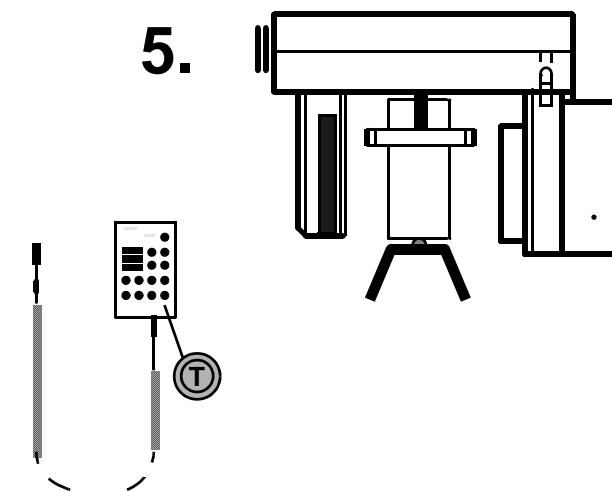
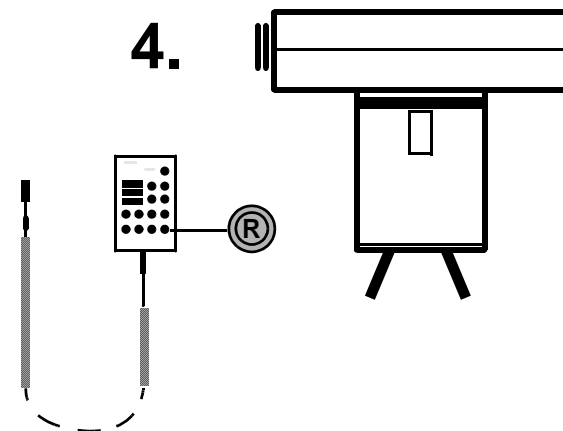


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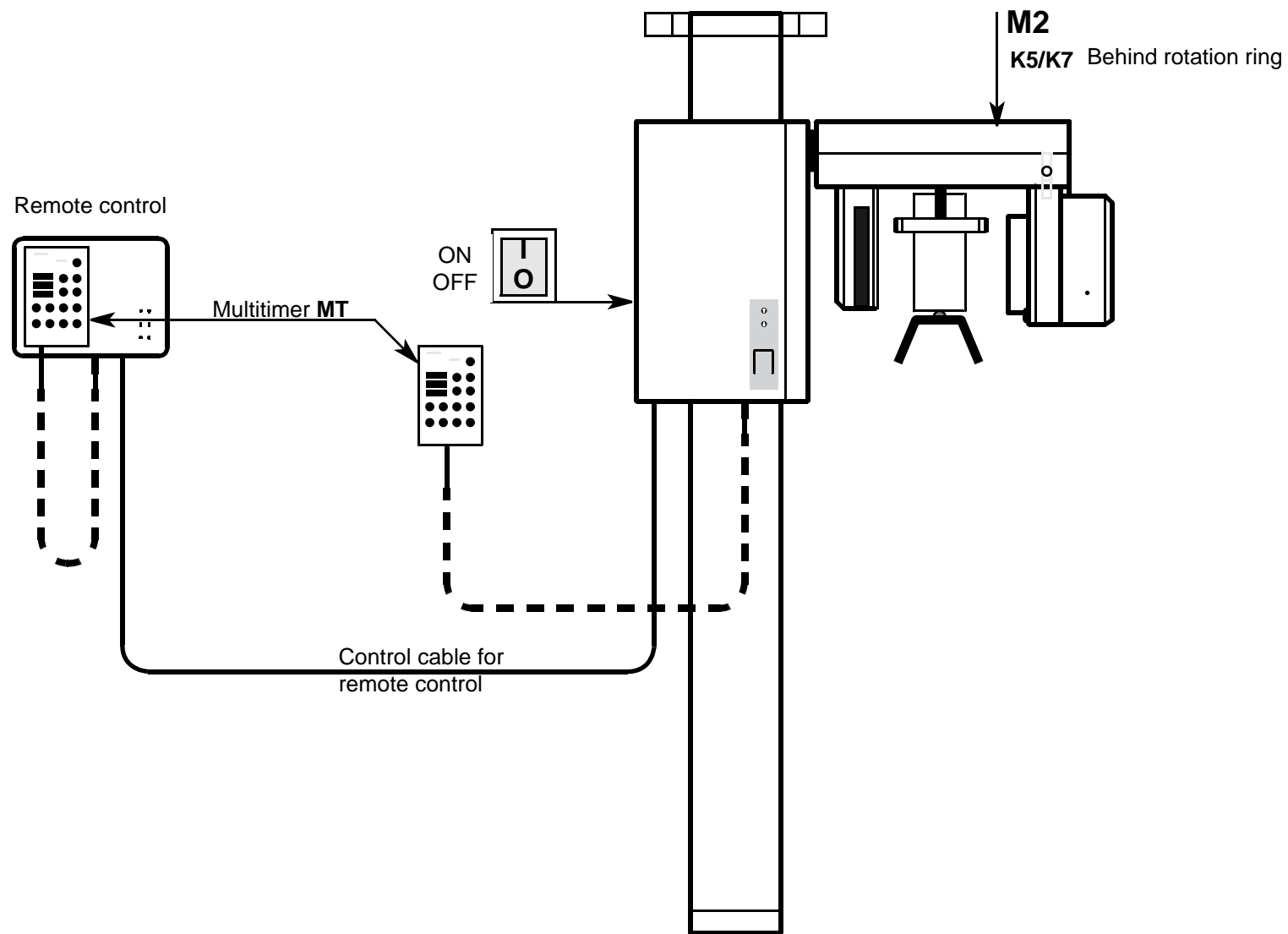
- If error code **E3 33** is displayed:
- Press the **R** key on the Multitimer.
- The error code **E3 33** display goes out.
- Press the **R** key on the Multitimer and continue the procedure for tightening the belt.

**5. Perform the rotation test:**

- Manually rotate the X-ray head to the rotation start position.
- Press the **T** key on the Multitimer.
- The test rotation must take place uniformly and smoothly.  
(perform test rotation 3 – 4 times).
- Attach the counternut to the belt tensioning bolt **F**.
- Insert the forehead support up to the marking and tighten it down.  
The forehead support tube must be vertical (use a spirit level)!
- Completely equip the unit.
- Final check:  
Take a phantom exposure. Proceed as in the section  
'Phantom Radiograph – Adjusting Actuator M2'  see page 4 - 5.



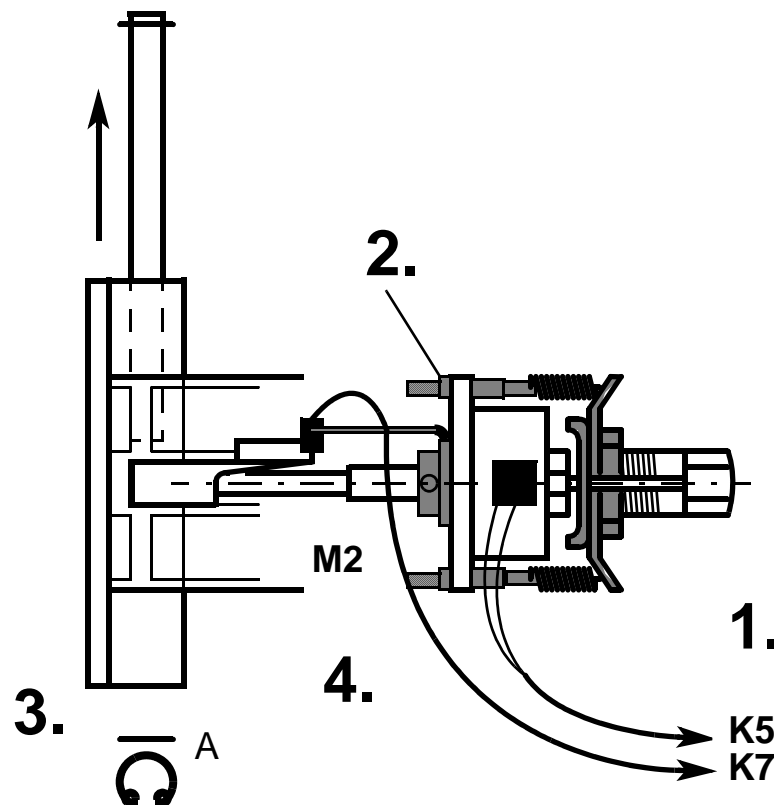
## 6.1 Replacing the rotation motor M1



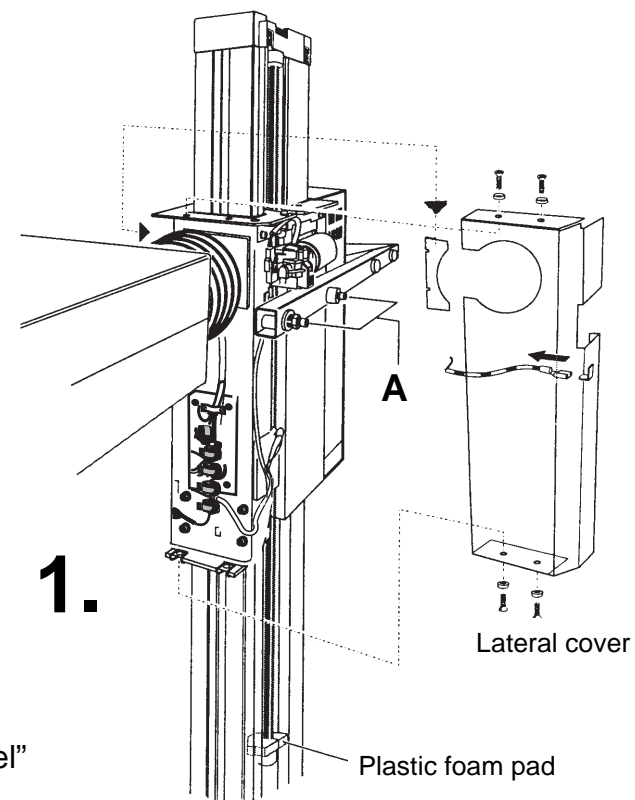
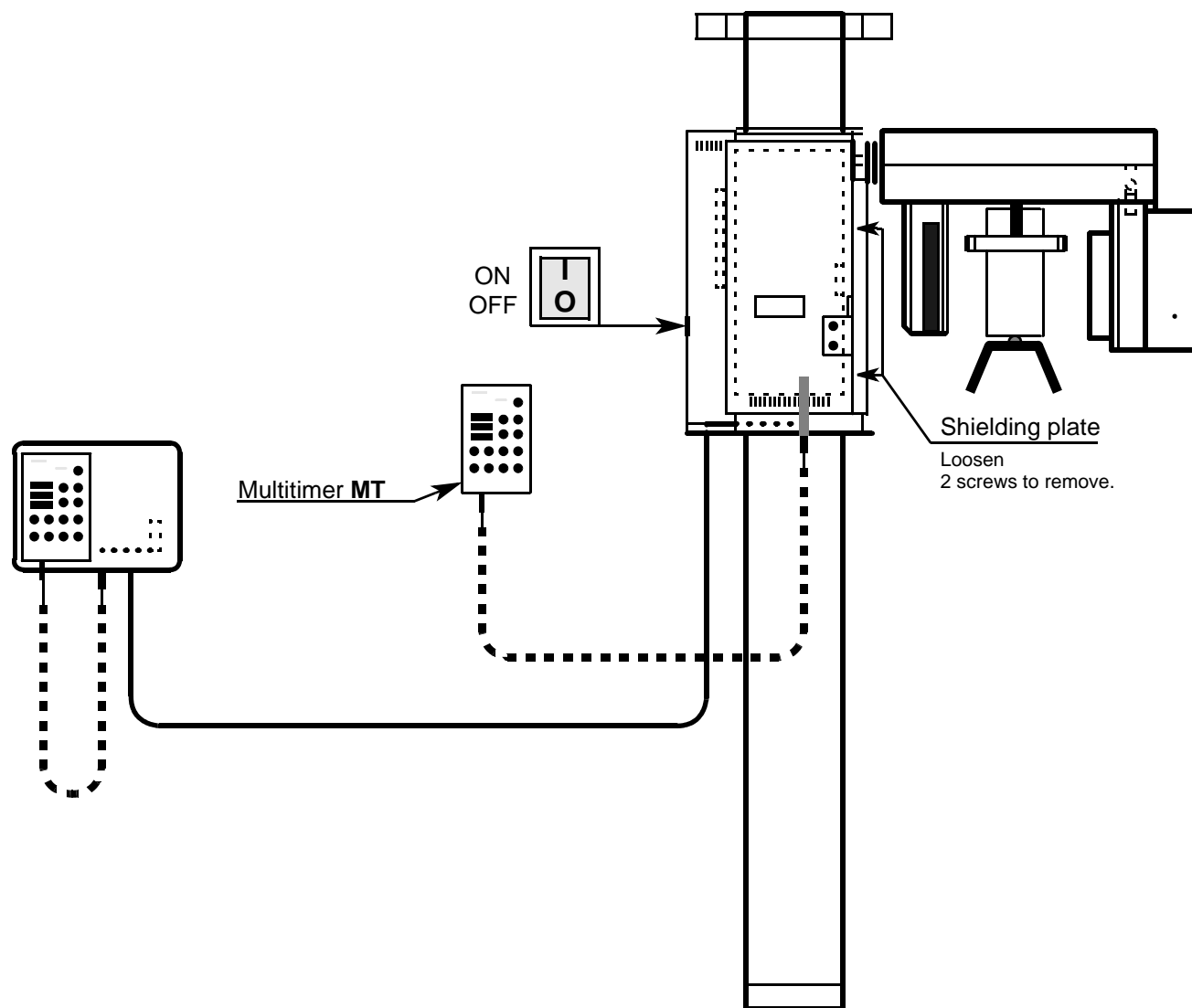
**ATTENTION: Always turn the unit OFF before connecting a measuring instrument or replacing any parts!**

58 35 744 D 3285  
D 3285.077.02.06.02 07.2004

- Switch ON the unit.  
Move the unit to a convenient position for working. Switch OFF the unit.  
After removing the covers, the following steps are required:
- 1. Loosen plug connections **K5** and **K7**.
- 2. Unscrew nuts (top and bottom) from spring tensioners.  
Push rotation ring away from motor.  
Separate spring tensioners from motor with draw springs.
- 3. Pull safety ring **A** away from axle.  
Pull axis out of support arm until you can remove actuator.
- 4. Take out actuator.
- Install new actuator.  
Attach safety ring **A** to axis.
- Adjust actuator.  
Proceed as described in the section '**Phantom Radiograph – Adjusting . . .**'.  
☞ see page 4 - 5.



## 6.2 Replacing the actuator M2



See section "Removing Panel"

- The unit remains installed at the wall.  
Switch the unit OFF.

#### 1. Preparations

- Remove the front cover and the lateral shielding plate.
- Remove the lateral cover (grounding!)
- Remove the plastic foam pad.

##### With ORTHOPHOS 3C:

Unscrew the cephalometer support arm with Cephalometer:  
Unscrew the two Allen screws **A**.  
Carefully place the support arm with Cephalometer on a soft base.

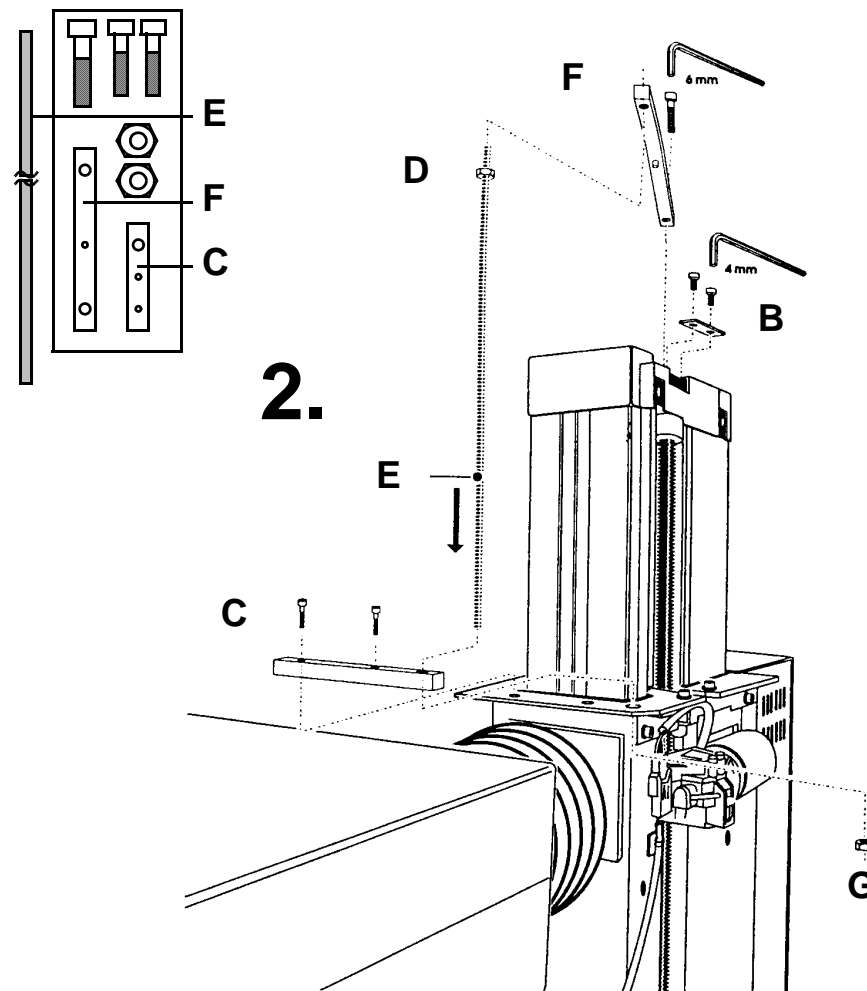
#### 2. Removing the spindle with motor.

**The tool set 33 12 068 is needed.**

- Unscrew the cover plate **B**.
- Attach the cross bar **C** to the carriage with two M5 Allen screws.
- Screw the lock nut **D** approx. 2 cm on the threaded rod **E**.
- Fit the threaded rod **E** through the holes of the cross bar **C** and the carriage.
- Using an Allen screw, fasten the cross bar **F** diagonally on the headpiece.
- Screw the threaded rod **E** into the cross bar **F** and tighten it with the lock nut **D**.
- Screw the nut **G** on the threaded rod **E** from below.
- Unscrew the set screw **H** and turn the stop socket **X** approx. 5 cm lower.
- Turn the nut **G** upwards until the threaded rod **E** projects out of the headpiece.
- Pull the pin **K** out of the spindle and remove 3 disks.
- Unplug the motor plug **K13**.
- Unscrew the 4 Allen screws **L**.
- Remove the spindle with motor.

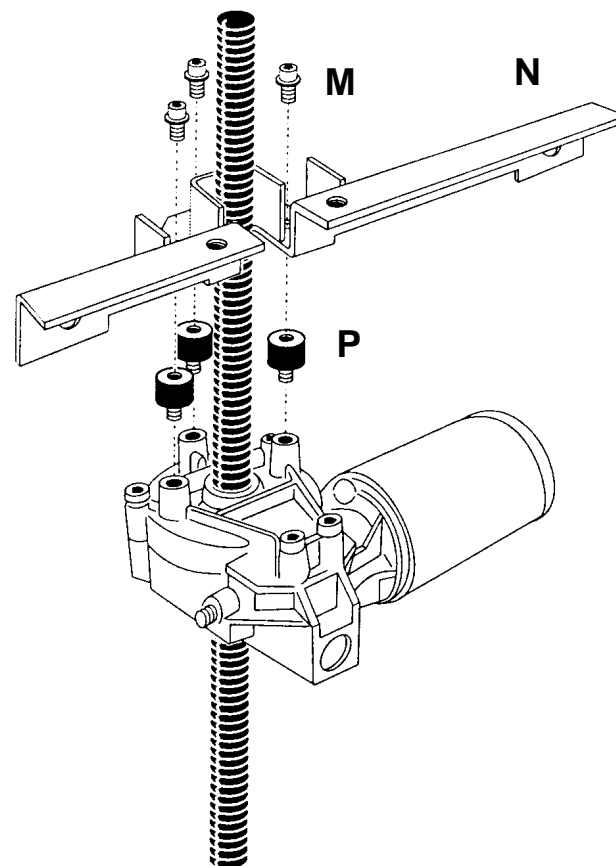
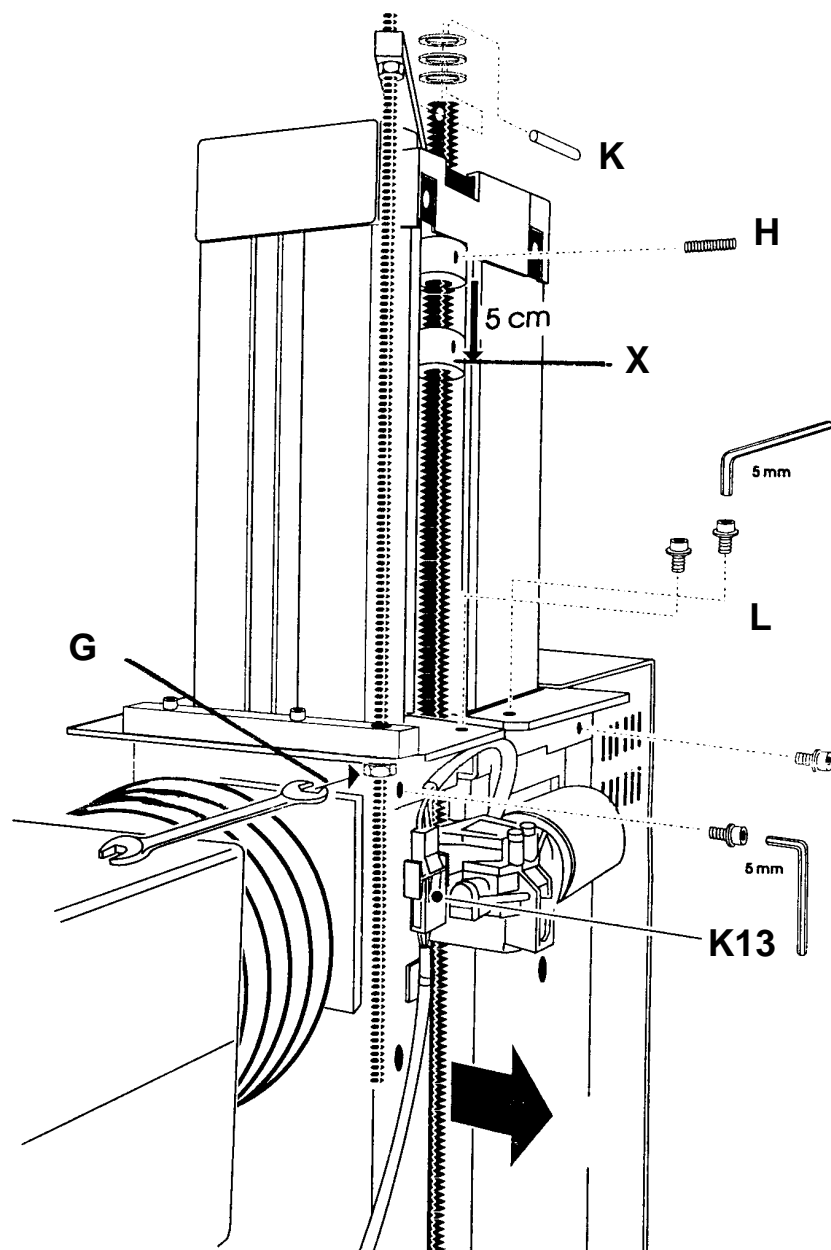
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Removal tools  
33 12 068



## 6.3 Replacing the spindle with motor M4 for height adjustment

3.





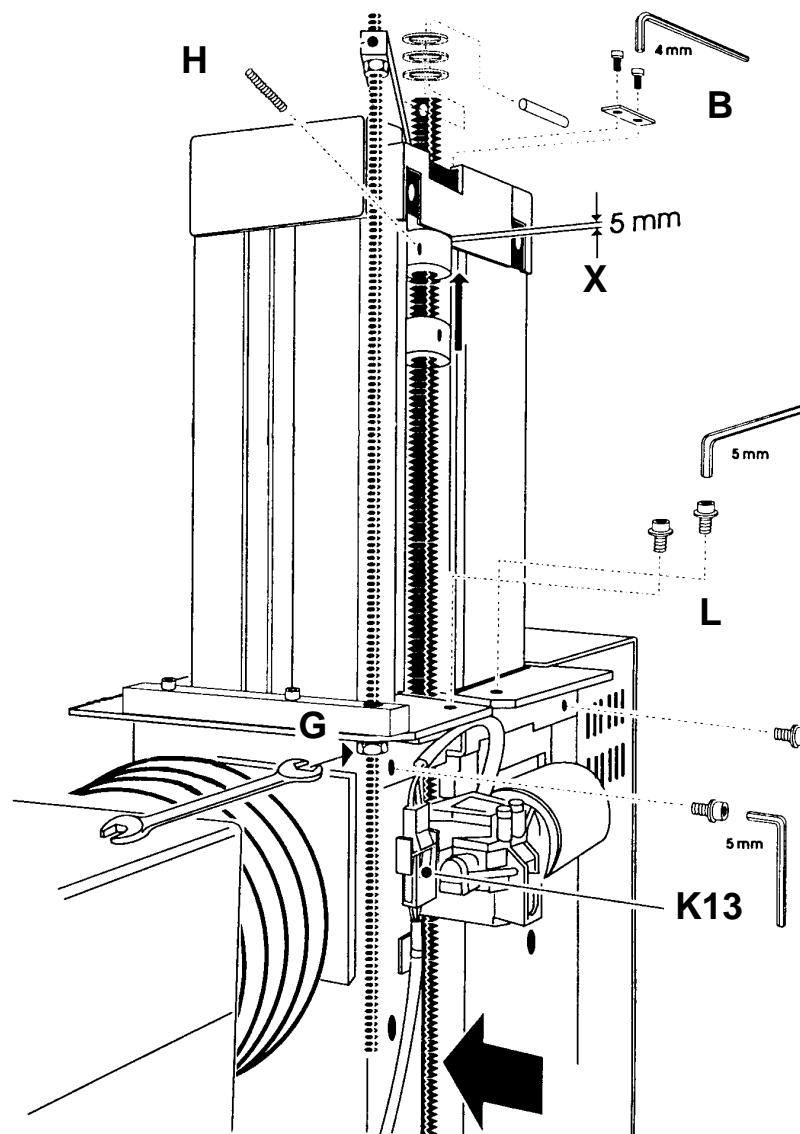
**Continued**

**3. Installing the new spindle/motor.**

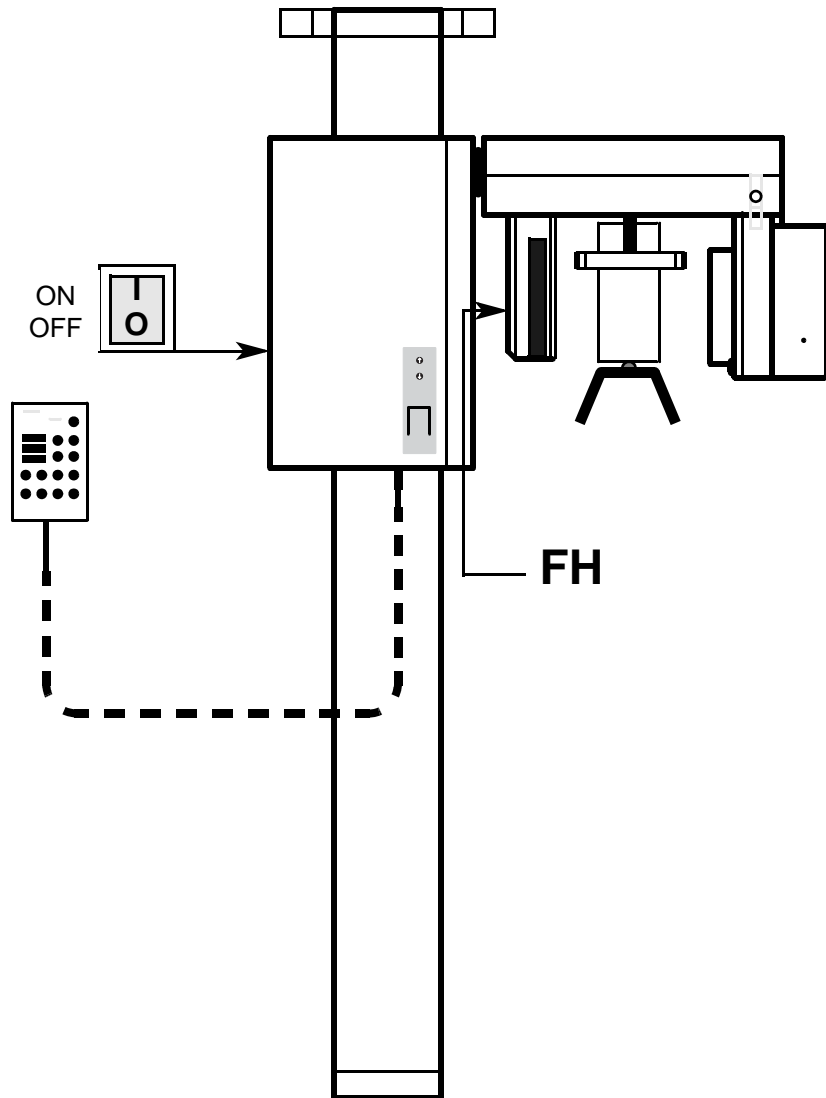
- Unscrew the 3 Allen screws **M** from the removed spindle/motor and remove the motor bracket **N**.
- Remove the 3 gimetal bearings **P**.
- Install the 3 metal bearings **P**, the motor bracket **N** and the 3 Allen screws **M** on the new spindle/motor.
- Fasten the spindle/motor in the stand and attach the motor bracket **N** to the carriage with 4 Allen screws **L**.
- Put three disks on the spindle.  
The **plastic foam pad** must be in the **center**.
- Insert the setscrew **K** into the spindle.
- Turn the nut **G** downwards and unscrew it from the threaded rod.
- Attach the cover plate **B**.
- Turn the stop socket **X** upwards.  
There must be a clearance of approx. 5 mm between the socket and the head piece.
- Lock the socket **X** with the setscrew **H**.
- Detach the removal tools.
- Fit the motor plug **K13**.

**4. Concluding work**


- Fit the plastic foam pad on the spindle.
- Install the covers.  
Don't forget to connect the ground wire!
- With ORTHOPHOS 3 Ceph: Install the Cephalometer support arm with cephalometer.  
See ORTHOPHOS 3 Ceph Mounting Instructions!
- Switch the unit ON and check function.
- With ORTHOPHOS 3 Ceph: "Verify the Symmetry on the Cephalometer".  
See ORTHOPHOS 3 Ceph Mounting Instructions!

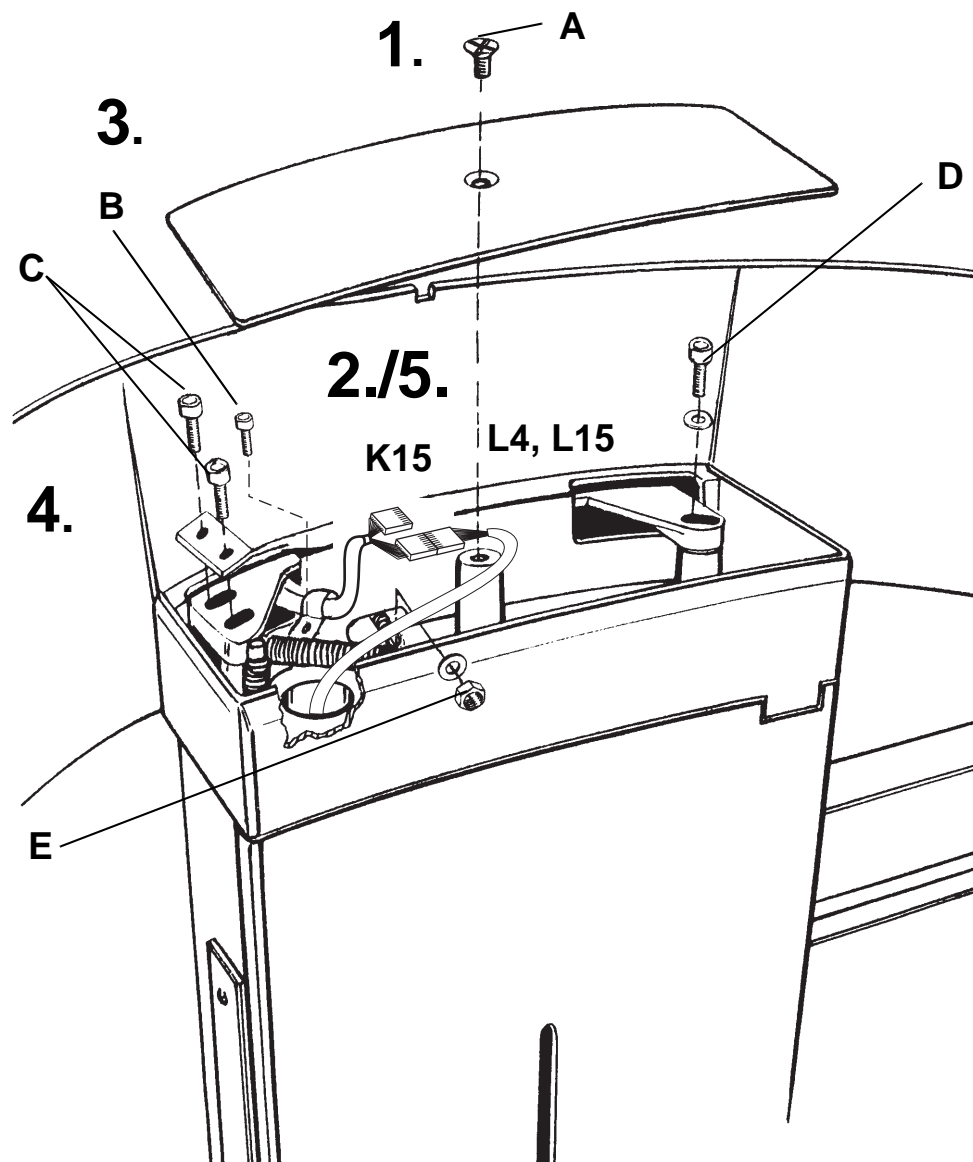


**6.3 Replacing the spindle with motor M4 for height adjustment**

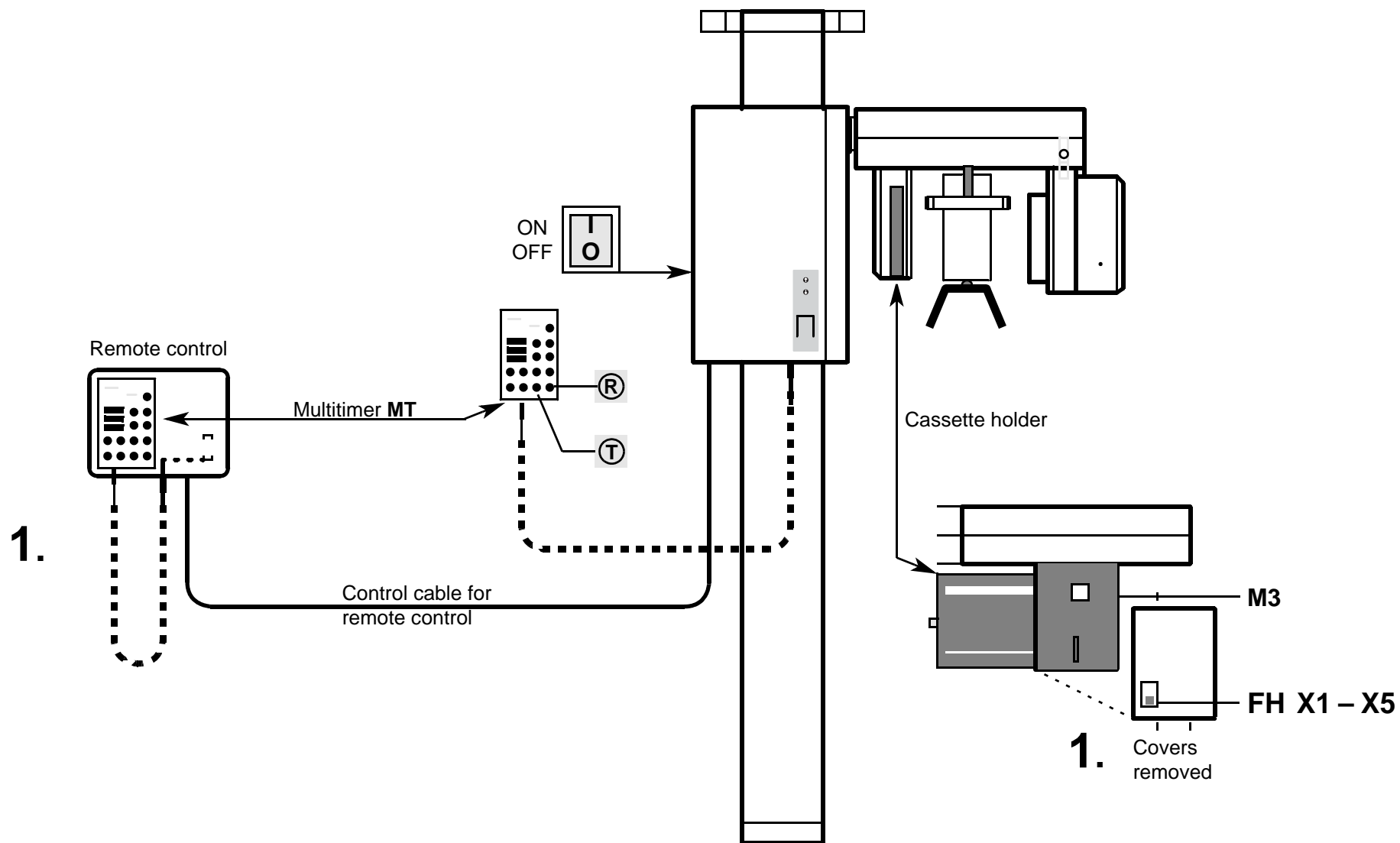


**Take anti-static measures to prevent ESD damage!**

- Turn the unit OFF.
- 1. Take out screw **A** and remove the cover.
- 2. Disconnect plug **K15** (L4 and L15).
- 3. Unscrew the cable clamp (screw **B**).
- 4. Remove screws **C**, **D** and nut **E**;  
while watching for shims and washers!  
Attention: Hold and remove the cassette holder.
- 5. Screw on the new cassette holder.  
Connect L4 and L15 (connector **K15**).  
Remount the cable clamp.  
Replace the cover and insert screw **A**.
- 6. Tighten the screw of the cover.
- Adjust the cassette holder.  
Proceed according to section '**Phantom radiograph**' from step 4,  see page 4 - 5.




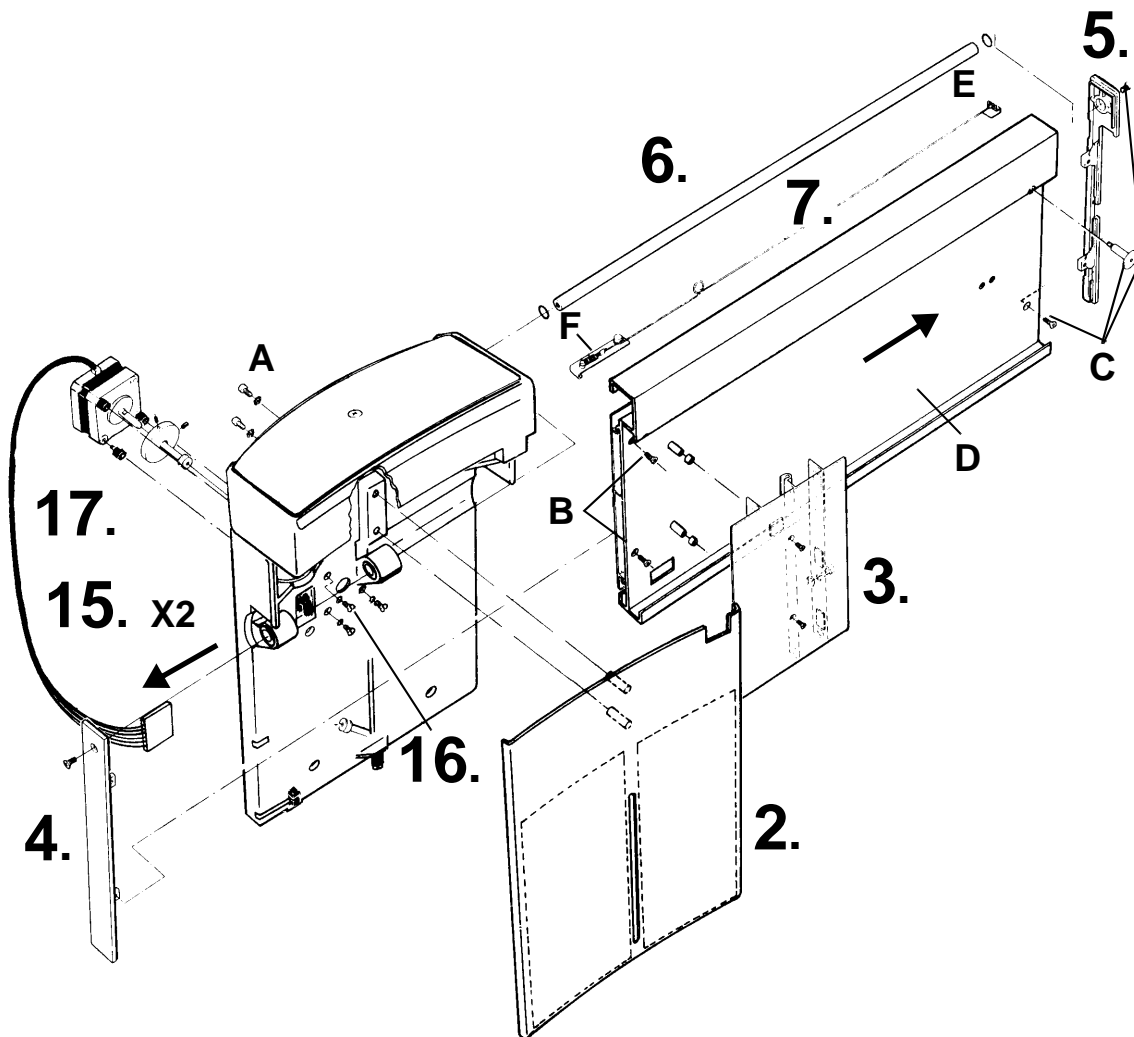
## 6.4 Replacing the cassette holder for Panorama radiography



**Take anti-static measures to prevent ESD damage!**

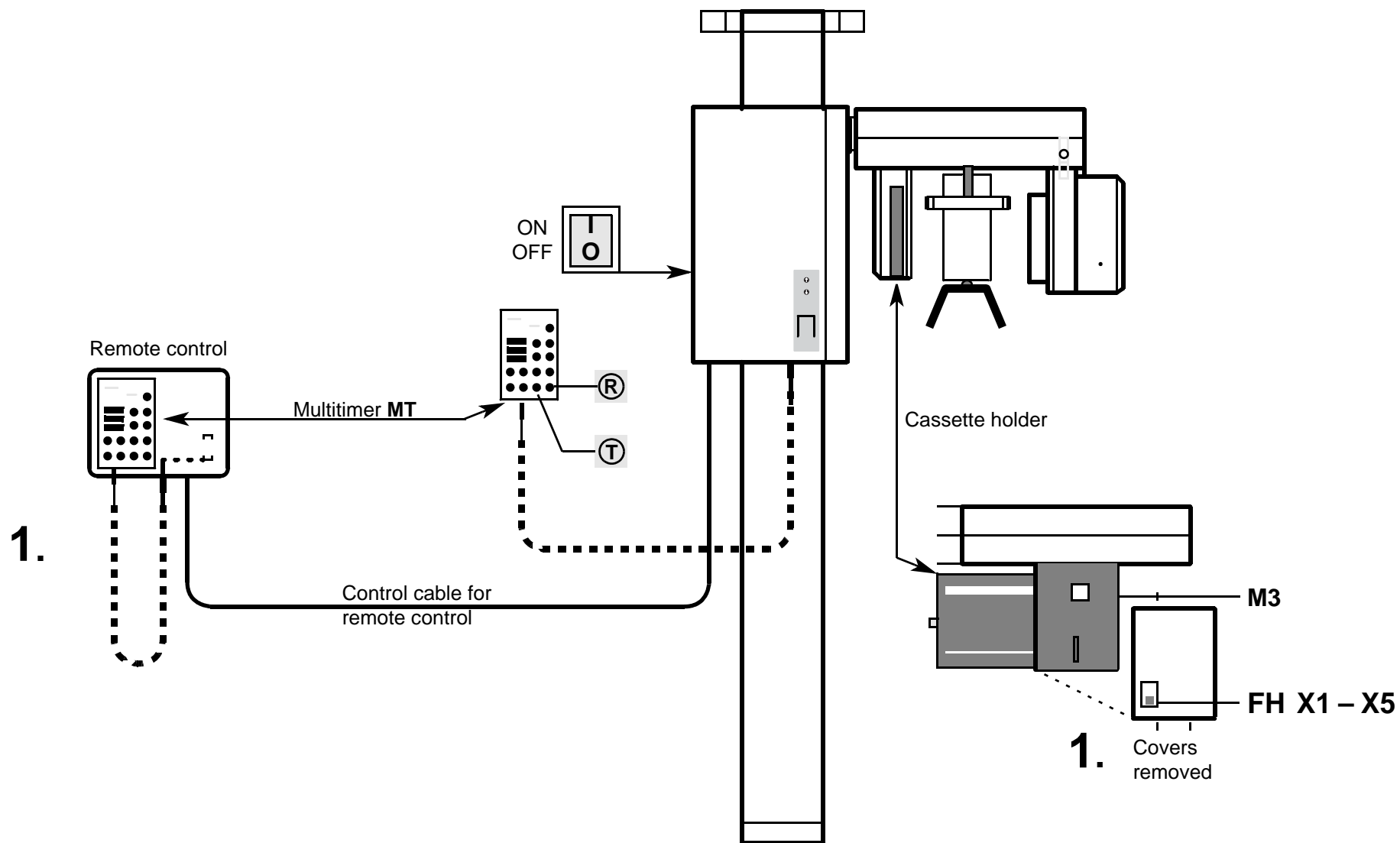
**Replacing the rope:**

- Turn the unit OFF
- 1. Remove the cover from the cassette holder.
- 2. Take out screws **A** and remove the secondary diaphragm.
- 3. Remove 2 screws and the profile metal sheet.
- 4. Remove screws **B** and the profile metal sheet.
- 5. Remove screws **C** and the profile metal sheet.
- 6. Pull out the guide shaft with the O rings.
- 7. Unhook the tension spring with holding bracket **F** and the rope with holding bracket **E**.  
Pull the profile metal sheet **D** from its guide.  
Remove the tension spring from the rope and attach it to the new rope.
- 8. Place the profile metal sheet **D** in the guide and slide it in 20 mm.
- 9. Wind the (new) rope around the guiding groove of the guide shaft and hook it to the holding brackets **E + F**. 
- 10. Pull the rope with holding bracket **E** through the profile metal sheet **D**.
- 11. Slide the profile metal sheet **D** halfway onto the guide roller.
- 12. Hook the holding bracket **E** with the rope into the profile metal sheet.
- 13. Wind the rope around the peg on holding bracket **F** and engage the tension spring.  
Hook the holding bracket **F** into the profile metal sheet.
- 14. Insert the guide shaft and place the O rings on both ends of the shaft.  
Secure both lateral profile metal sheets with screws.
- Completely assembly the cassette holder.



**Continued on next page**

## 6.5 Replacing the rope and/or the cassette drive motor M3

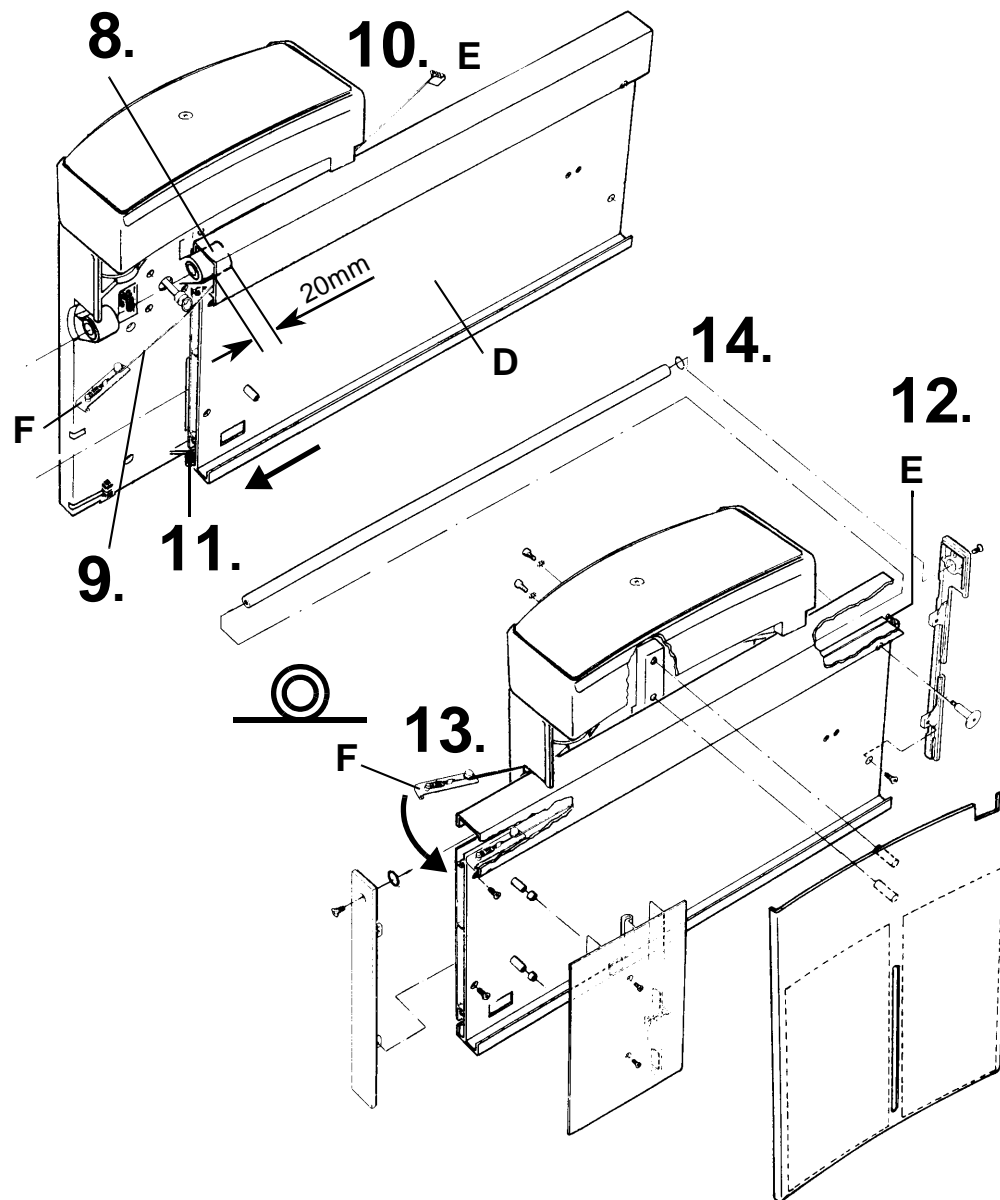


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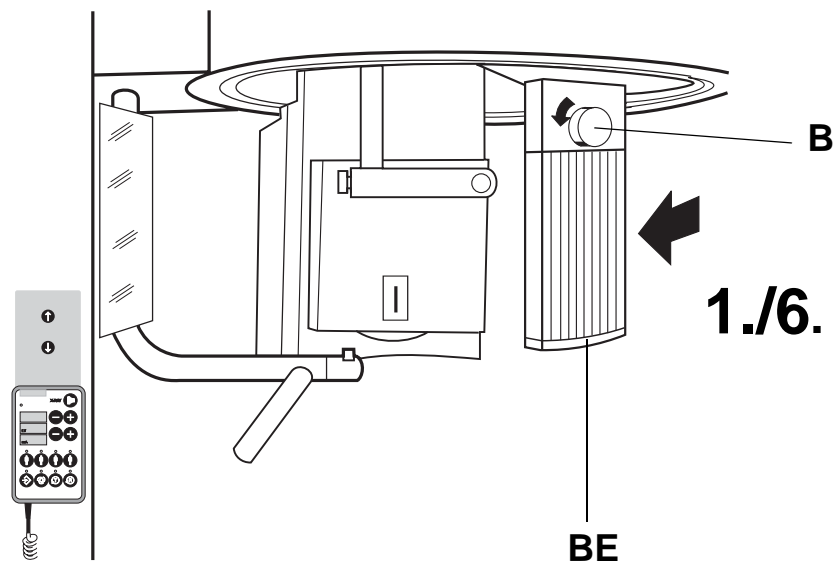
Take anti-static measures to prevent ESD damage!

**Replacing motor M3:**

- Proceed according to steps 1. – 7. above.
15. Unplug connector X12.
16. Take out the counter-sunk screw and remove the motor.
17. Take out the worm screws and pull out the drive shaft.
- Install the new motor.
  - Now proceed according to steps 8. – 14. above.

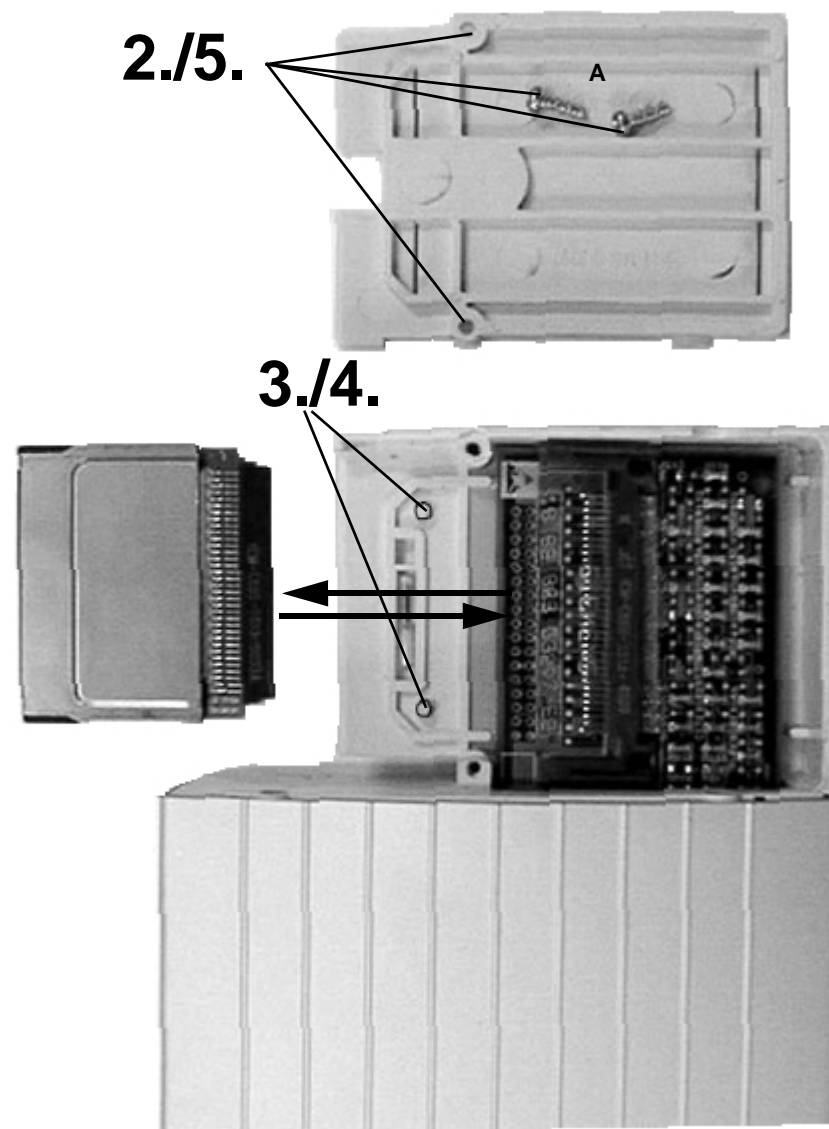


## 6.5 Replacing the rope and/or the cassette drive motor M3

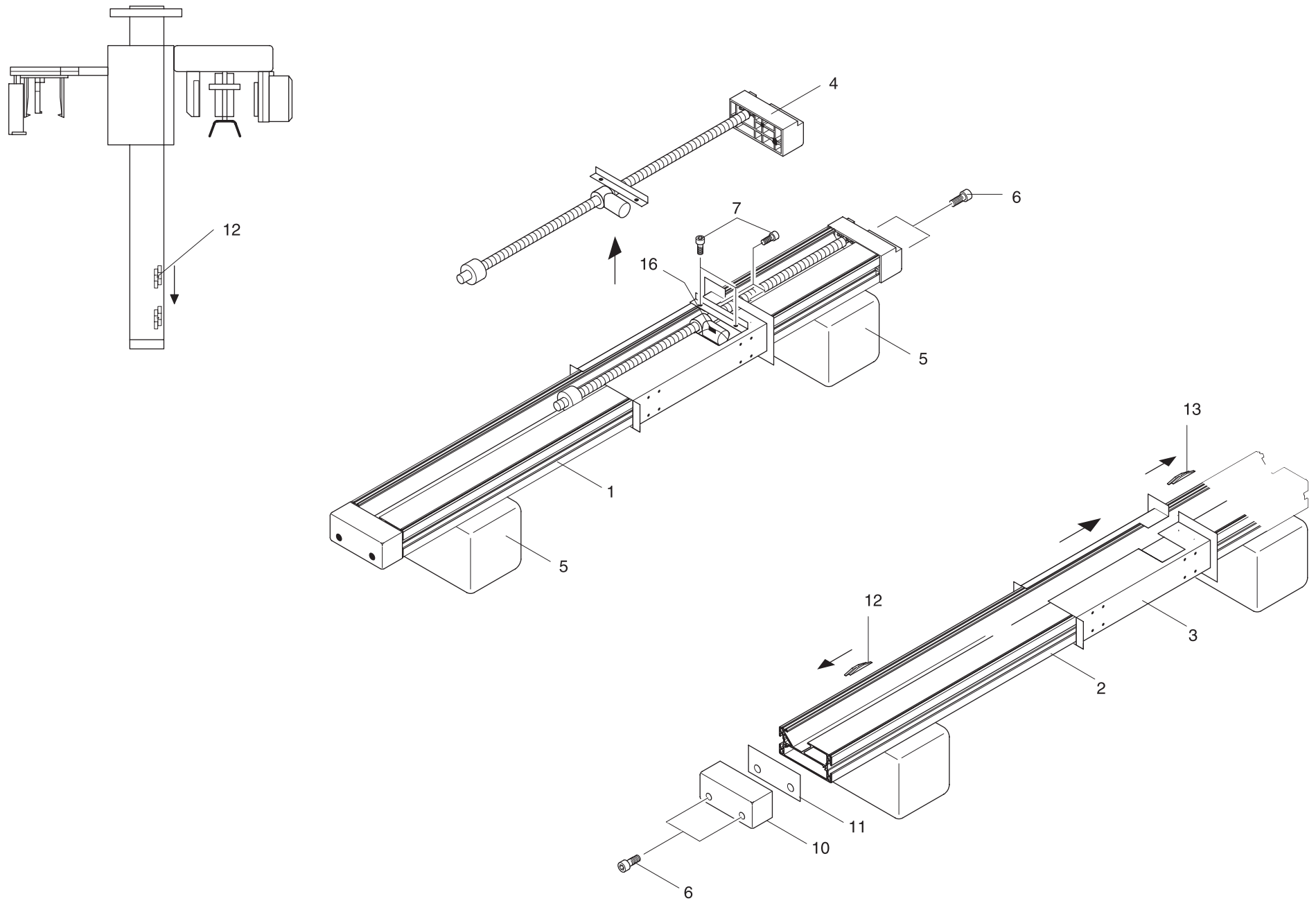




1. To remove the image receptor turn control knob **B** to the right and pull out the image receptor.
  2. Unscrew the two screws **A**. Take off the cover.
  3. Lift socket contact of image receptor slightly, since it is attached to the housing. Then pull the socket contact off.
  4. Attach the new socket contact, making sure that the plug connection is correctly attached. Press down to engage.
  5. Unscrew the cover.
  6. Push in the image receptor BE up to the endstop (turn control knob B to the left).
  7. Perform the pin position recognition with Service routine S.32.3 for Panorama radiography.
  8. Generate a digital test image.  
Press exposure button.  
A rotation without radiation is initiated.  
A dialog box appears.  
If the display  
**OK**  
appears, the data path is functioning correctly.  
Actuate the **OK** softkey.  
The test image generated is then displayed on the screen.  
If the display  
**Error**  
appears, see the instructions in the Service Manual.
- Close the test image ([Ctrl]+[F4]).



## 6.6 Replacing socket contact for image receptor

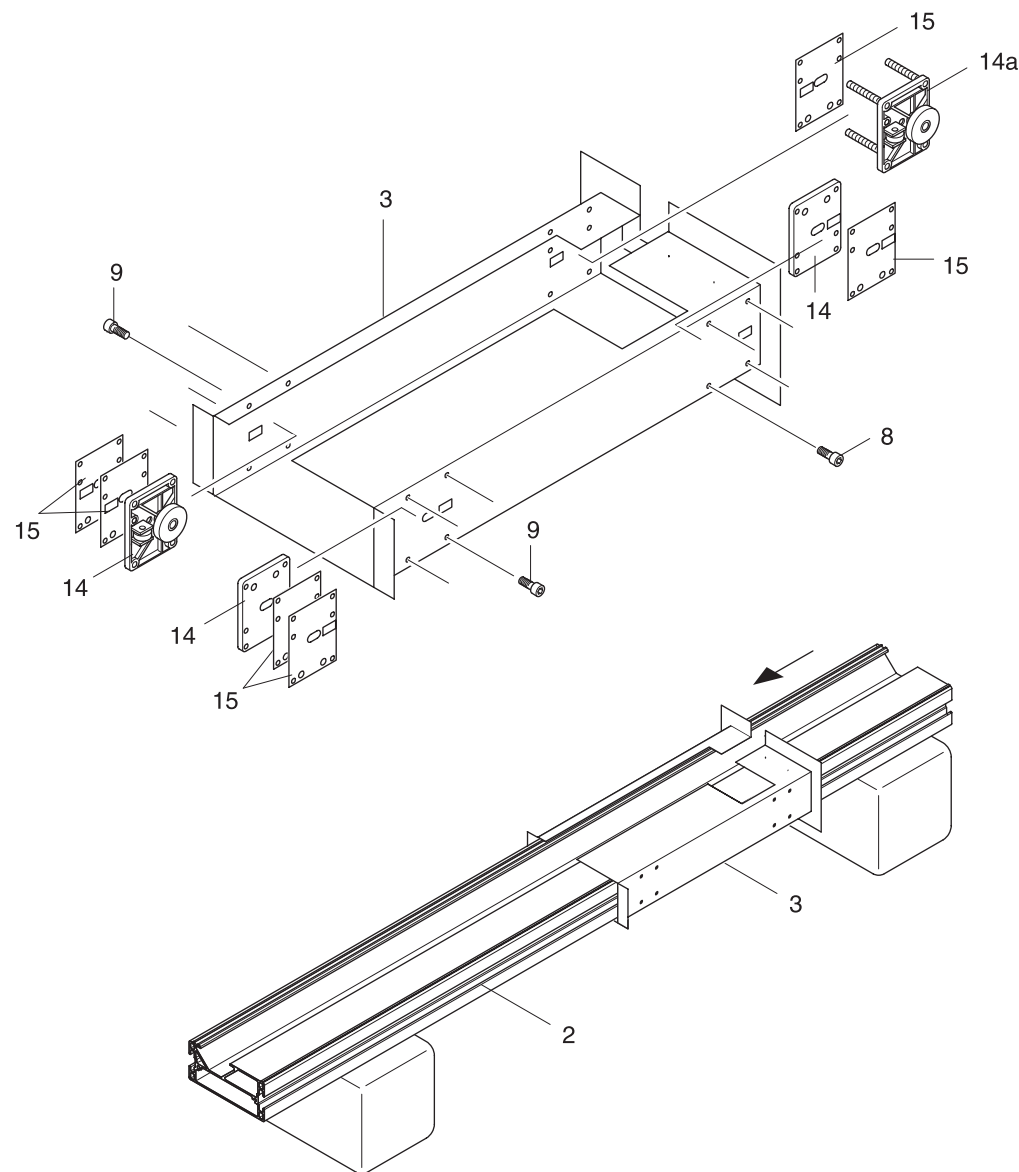


- **To install this spare part you will also need the Installation Instructions for ORTHOPHOS 3, order no. 33 34 039, or ORTHOPHOS 3 Ceph, order no. 33 34 120..**

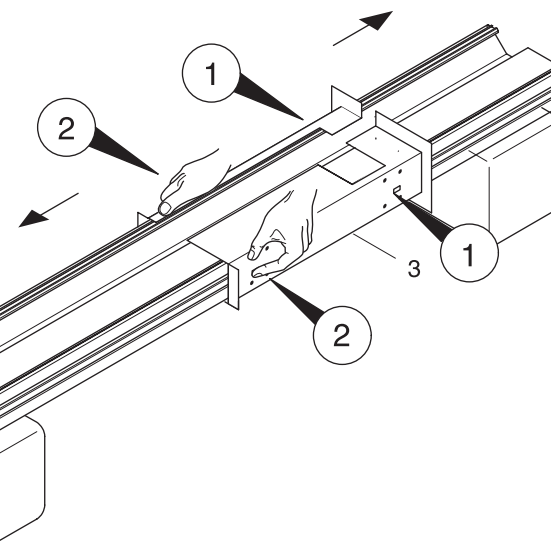
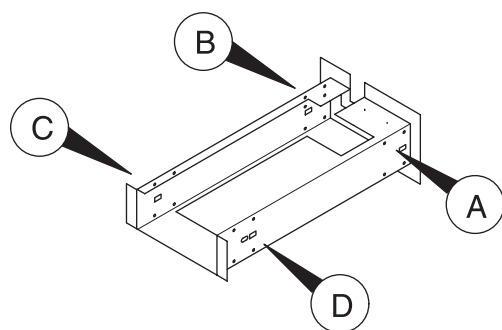
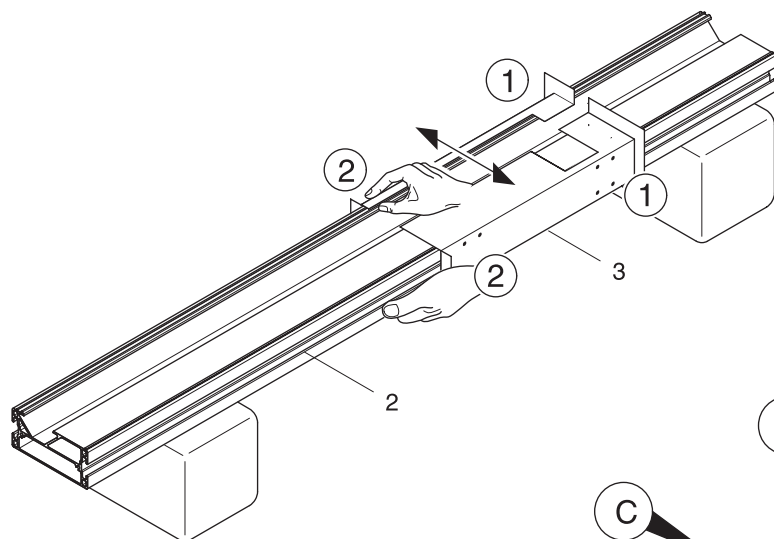
- Loosen the switch ramp (12) (setscrew) and fix it to the bottom mark.  
For the following disassembly steps please refer to the ORTHOPHOS 3 or ORTHOPHOS 3 Ceph, chapters "Making the Plug-in Connections", through to "Installing the Column" in reverse order.
  - Remove the polystyrene blocks (5) from the packaging and place them under the stand (1).
  - Loosen the screws (6 and 7).
  - Disconnect the plug(16).
  - Completely remove the drive (4).
  - Remove the screws (6) and take off the headpiece (10) and cover plate (11).
  - Loosen the switch ramps (12 and 13) (setscrews) and push them out of the column stand (2) section.
  - Roll the carriage (3) off the stand in the direction of the arrow.
  - Replace the roller support (14) of the carriage (3).
  - Insert new compensating plates (15) (8 compensating plates supplied) between the roller seat (14) and the carriage (3) as shown in the drawing and tighten them with the screws (8 and 9) (torque  $\geq 5$  NM)
- ATTENTION! Screw M6x12 (item 8) is only to be used for the roller seat with set screw (14a)!**

- Slide the carriage (3) onto the replacement stand (2) in the direction of the arrow.

Continued on next page



## 6.7 Replacing Column Stand



## Continued

### Checking for play

- While holding the column stand (2), move the carriage (3) towards test point ① and test point ② in the direction of the arrow.
- If there is any free play, install further compensating plates between the roller support and the carriage.

### Reducing the play

If an uneven number of compensating plates was required in test area ①, install an additional compensating plate at position **A**.

If an uneven number of compensating plates was required in test area ②, install an additional compensating plate at position **C**.

Number of compensating plates at position **A=B+1**

Number of compensating plates at position **C=D+1**

Once the compensating plates have been installed, check for play again.

### Checking the roller play

When moving the carriage (3) across the entire length of the stand, it must be possible to hold the rollers in areas ① and ②.

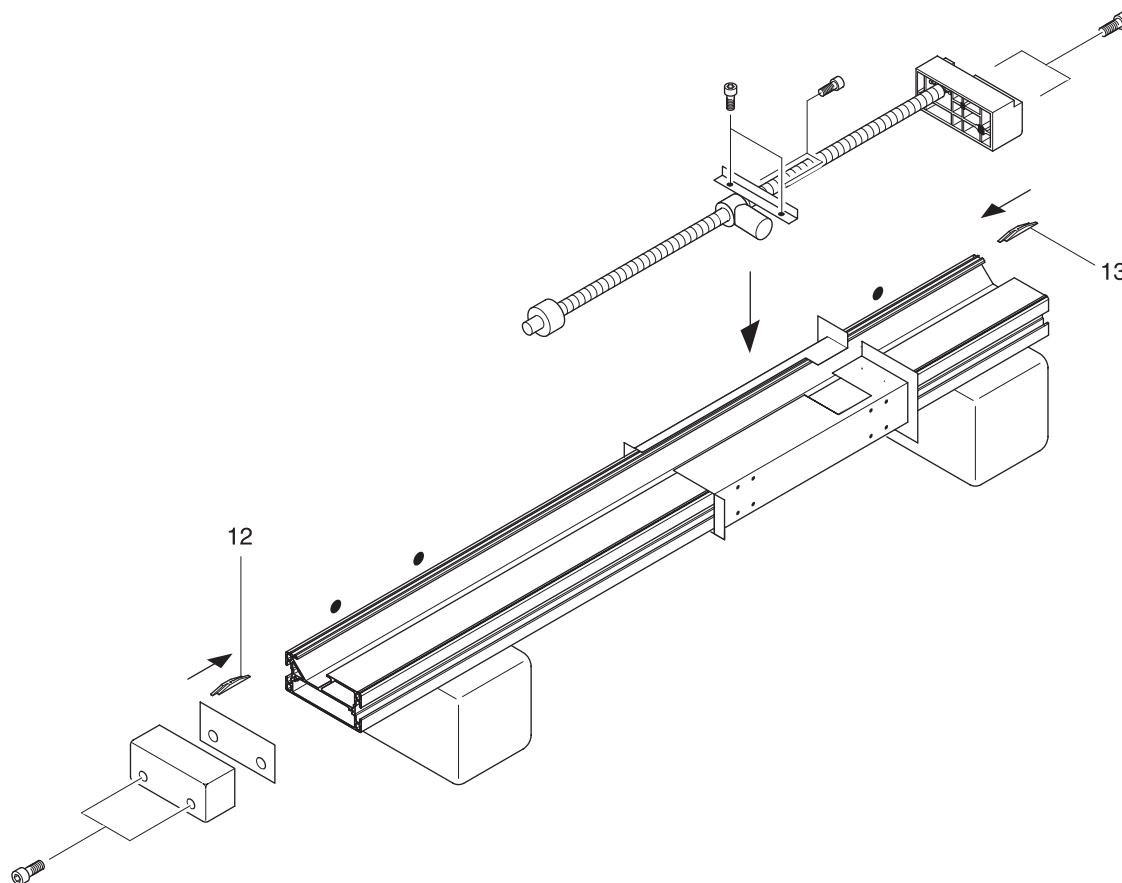
Tighten the switch ramp (12) in the corner of the first mark.

Tighten switch ramp (13) in the center of the mark.

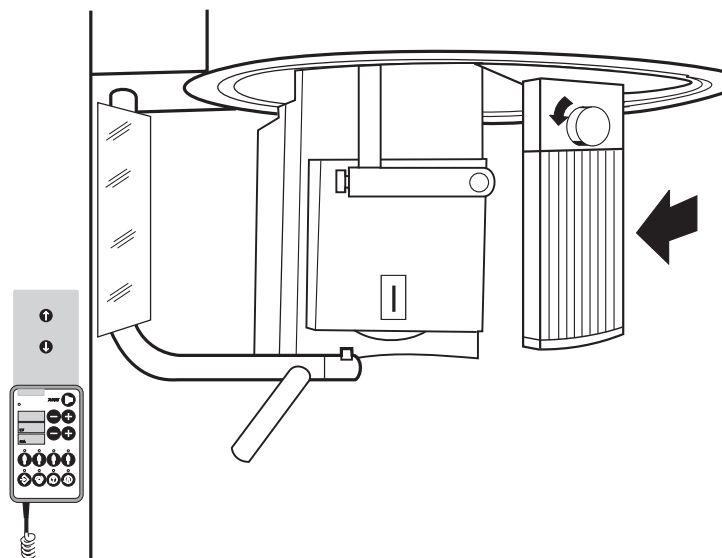
Install the drive spindle and headpiece and reconnect the plug.

Install the headpiece with the cover plate.

Complete all further steps as described in the chapters "Installing the Column" through to "Making the Plug-in Connections" in the ORTHOPHOS 3 or ORTHOPHOS 3 Ceph.



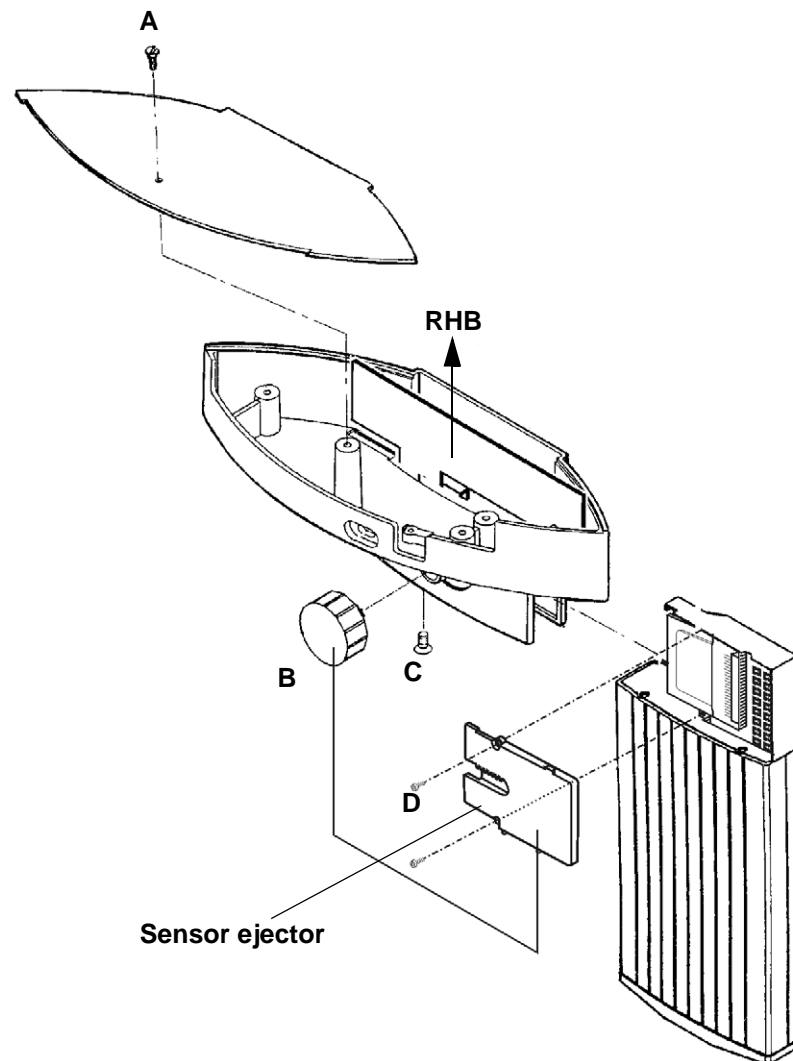
## 6.7 Replacing column stand



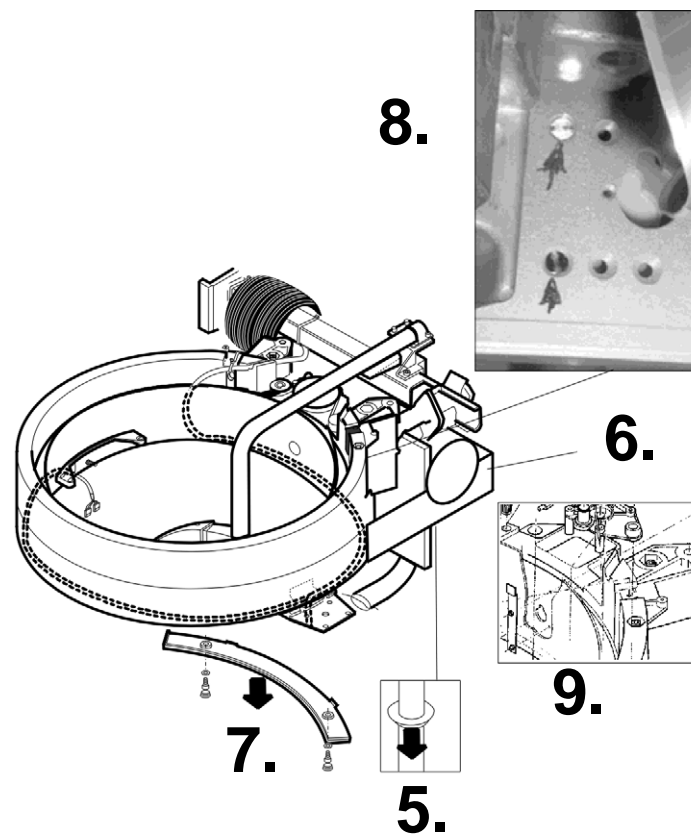
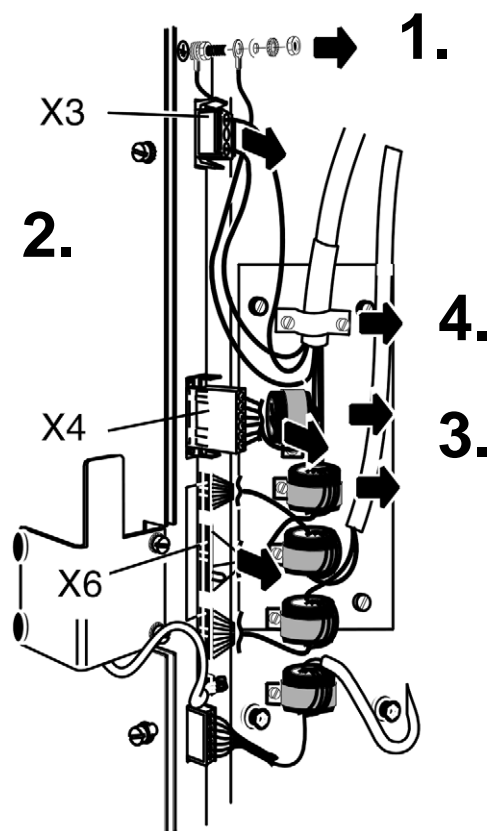
**ATTENTION: Always turn the unit OFF before connecting a measuring instrument or replacing any parts!**

58 35 744 D 3285  
D 3285.077.02.06.02 07.2004

- If the image receptor cannot be screwed in and out easily or fits into the guide too loosely, replace rotary knob or/and sensor ejector.
1. To remove the image receptor, turn rotary knob **B** clockwise and pull out the image receptor.
    - 1.1 Check the sensor ejector for any damages on the teeth; if they are damaged, replace sensor ejector.
    - 1.2 Remove two screws **D**. Replace sensor ejector.
  2. Replace rotary knob **B**
    - 2.1 Unscrew upper cover **A**.
    - 2.2 Remove lower Torx screw **C**.
    - 2.3 Lift PCB RHB slightly.
    - 2.4 Pull out rotary knob **B**.
    - 2.5 Insert new rotary knob and push down PCB RHB again.
    - 2.6 Turn in screw **C** and reattach the upper cover using the screws.



## 6.8 Replacing rotary knob and sensor ejector





**ATTENTION: Always turn the unit OFF before connecting a measuring instrument or replacing any parts!**

58 35 744 D 3285  
D 3285.077.02.06.02 07.2004

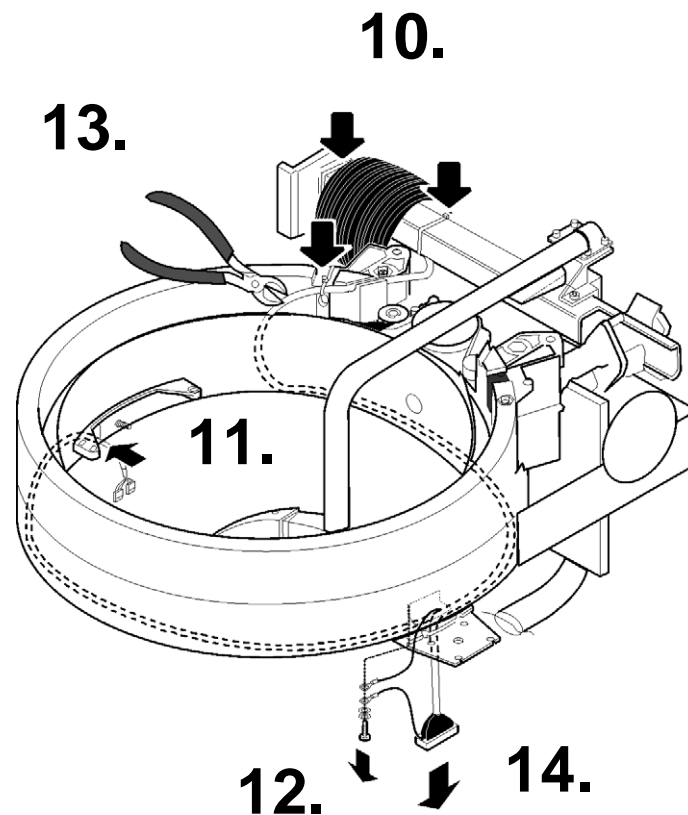
- Open the unit.
  - **Remove the old ring cable.**
  - Column side
1. Unscrew the ground cable (SW 7 mm).
  2. Pull the plug connections X3, X4 and X6 off the old ring cable on the unit side.
  3. Unscrew the 2 upper annular cores (can be reused) and pull the cables out from the cores.
  4. Unscrew the cable clamp (2 screws)
- Ring side

*Do NOT unscrew the holder A for the light barrier.*

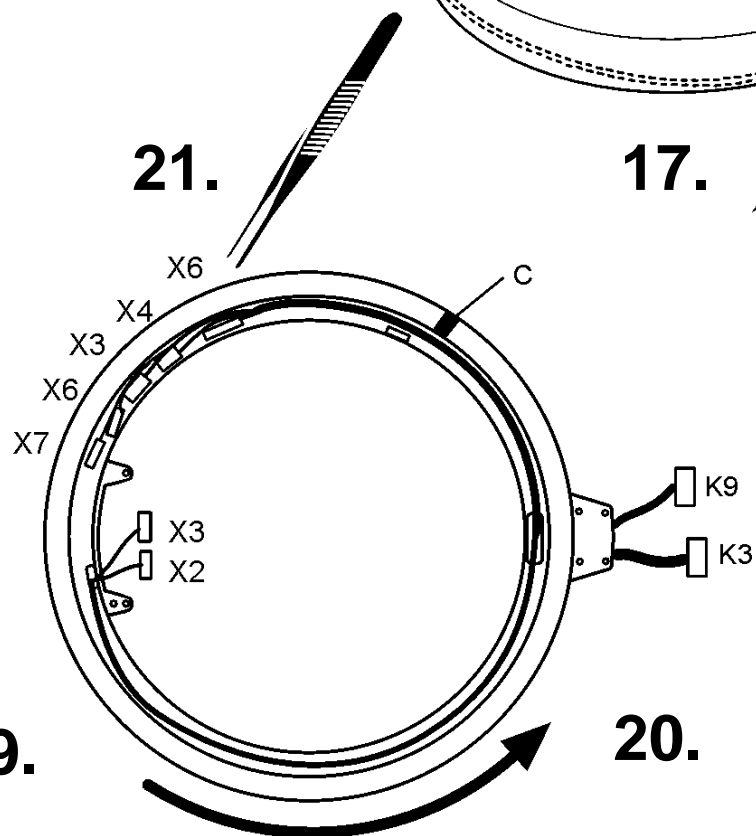
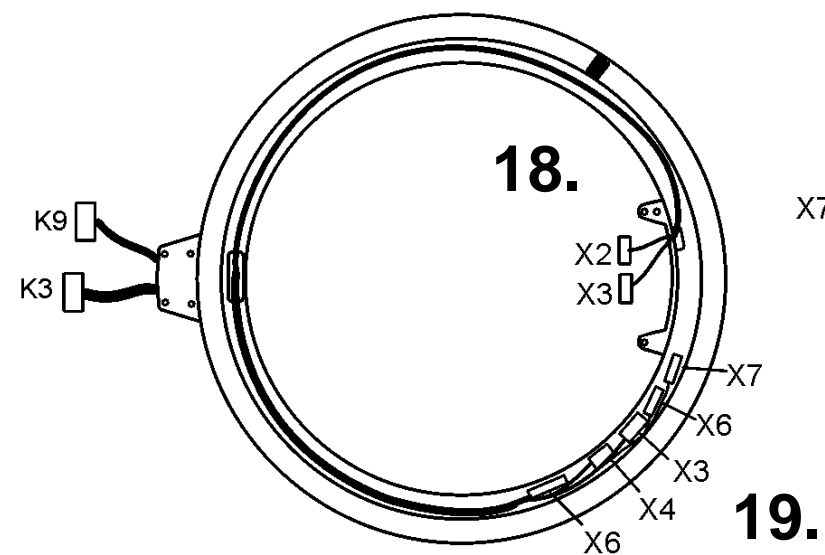
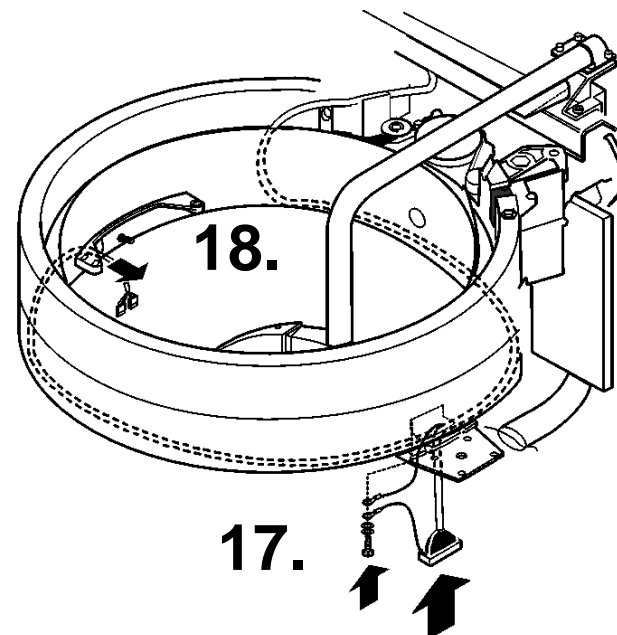
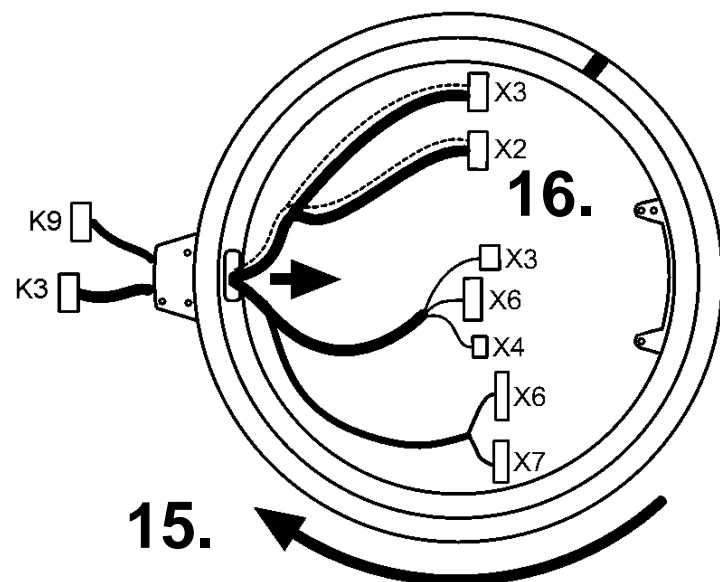
Unscrew the Ceph bracket:

5. Push the sleeve downwards.
6. Remove the lower part of the cover (2 screws).
7. Unscrew the segment **B** (2 caps, 2 screws and washers).
8. Turn the ring until the screw heads are visible. Mark the position of the screw heads.
9. Undo the 2 screws on the Ceph bracket and remove it.
10. Cut the 3 cable ties and remove them. Draw the cable through the bellows.
11. Draw the cable end coming from the film holder through the opening in the ring (X1A, X1B).
12. Pull off plug K9. Loosen the cable clamp. Unscrew the X-ray tube assembly. Unscrew the shielding eye on the connector **K3 and K9** from the ring (2 leads).
13. Cut through the ring cable L4.
14. Draw the connector **K3 and K9** and the ring cable through the opening on the X-ray tube assembly out from the ring (the ring cable is no longer required).

**Continued on next page**



## 6.9 Replacing ring cable L4



21.

17.

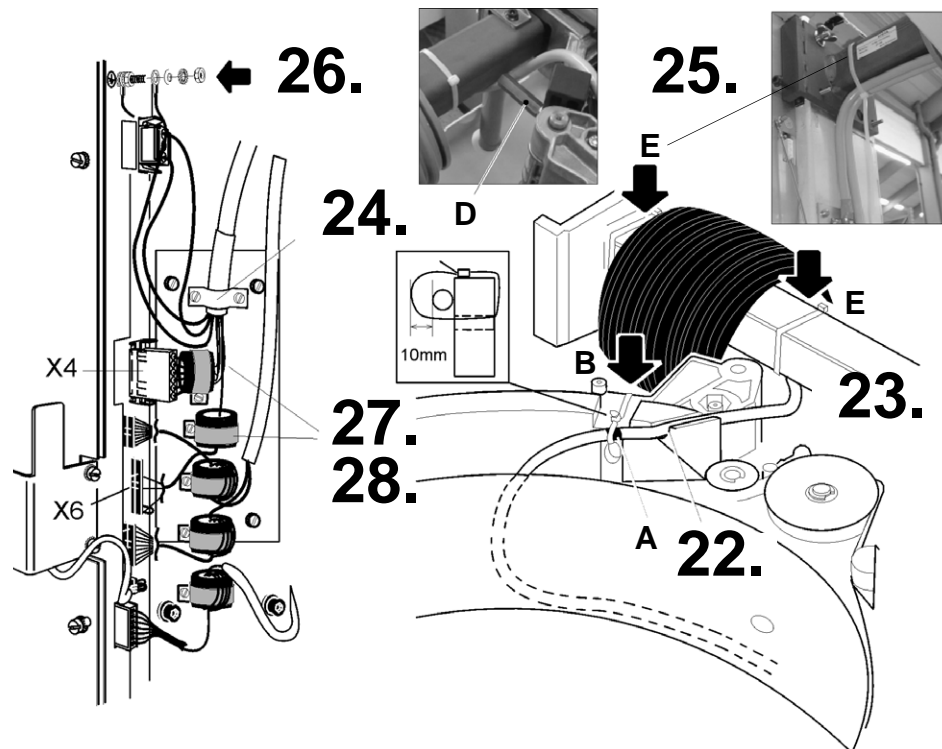
18.

19.

20.

Continued from previous page

- **Install the new ring cable**
  - Inserting the ring cable into the ring
1. Rotate the X-ray tube assembly mounting bracket into the left position.
  15. Draw the new ring cable with the plug connections on the device side through the opening on the X-ray tube assembly to the inside of the ring.  
Sequence of the plug connections: X6 (sensor plug), → X7, → X3, → X4, → X6 (diaphragm signal), → ground wire, → X2, → X3.
  - Danger of damaging the plug connections on the device side.
  - Lay the long cable end over the ring.
  16. Align the plug **K3** and **K9** for the tube assembly and screw the 2 grounding eyes (black and copper-colored) onto the ring.  
Push the plug **K3**, do not pull on the cable!
  17. Lay the shielded cable (X2, X3) in the ring and draw the plugs X2, X3 through the opening in the sensor holder, until the hexagonal sleeve projects approx. 20 mm.
  18. Insert the main strand of the ring cable into the ring as shown.
  19. Rotate the ring carefully to the right and thus guide the ring cable underneath the light barrier **C**.
  20. Using tweezers, carefully take the ring cable out of the ring behind the light barrier.
  21. Insert the unit side of the ring cable into the recess in the ring and fix it with a cable tie **B** at the mark **A**.  
The cable tie on the ring must have approx. 10 mm play.
  22. Guide the ring cable through the bellows.
  23. Fasten the ring cable with a cable clamp (2 screws).
  24. Lay the cable behind the bolt **D** and fasten it with 2 cable ties **E** to the ring carrier (green mark beneath cable tie).  
The cable must rest firmly against the ring carrier.
  25. Screw in the ground wire.
  26. Guide the cable (X4) through the ferrite core and screw it in.
  27. Draw the cable (X6) through the ferrite core and screw it in.
  - Fastening the Ceph bracket.



## 6.9 Replacing ring cable L4



## 7 **Maintenance**

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# Maintenance

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### Measurements

Always switch the unit OFF before connecting the measuring instruments.

Select the correct current/voltage type and adjust the measuring range to match the expected readings.

Perform continuity tests only on units which are switched off.

If several exposures with radiation must be taken to check a measurement, make sure that the prescribed cool-down intervals are observed.

***Observe the radiation protection guidelines before releasing the radiation.***

***When opening the unit:***

***Please observe precautionary measures when handling PCBs (ESD).***

***Make sure you touch a ground point to discharge yourself prior to touching the components.***



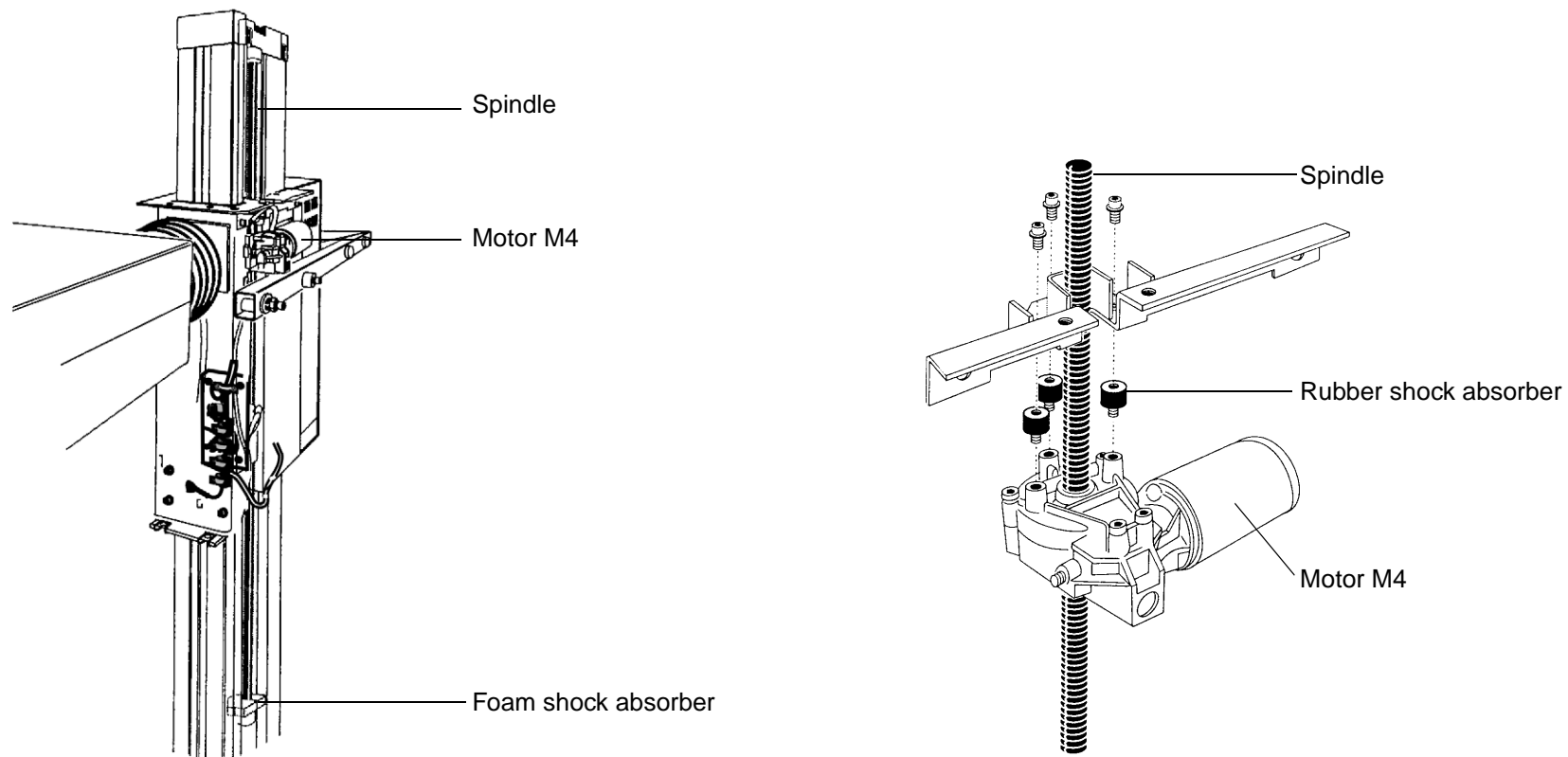


Fig.1: Spindle/Motor M4



### Check whether the height adjustment causes atypical running noises:

- Move the unit up and down through its entire adjustment range.

The following running noises may then occur:

- Repetitive, knocking noises which occur depending on the speed of adjustment.  
Motor bearing damaged.  
☞ See chapter 6.3, Replacing the spindle with motor M4 for height adjustment.
- Loud humming noise.  
Rubber shock absorber and/or foam shock absorber brittle. Replace rubber shock absorber and/or foam shock absorber.
- Heavy, hammering bearing noises in the column which influence the synchronism of the unit. Check roller treads for damages and for movability.  
☞ See chapter 6.7, Replacing Column Stand.

### Check whether the limit switch and the safety limit switch for the height adjustment is functioning reliably:

- Move the unit up and down through its entire height adjustment range:  
Limit switches "UP" and "DOWN" must respond.  
Actuate safety switch manually, motor must stop.

If limit switches or safety switch do not work, check microswitch and cable L6 and replace them if necessary.

### Check whether the acoustic signal can be heard during height adjustment:

If no acoustic signal is audible, replace and adjust PCB DX1.

☞ See chapter 4.10, Adjusting board DX1.

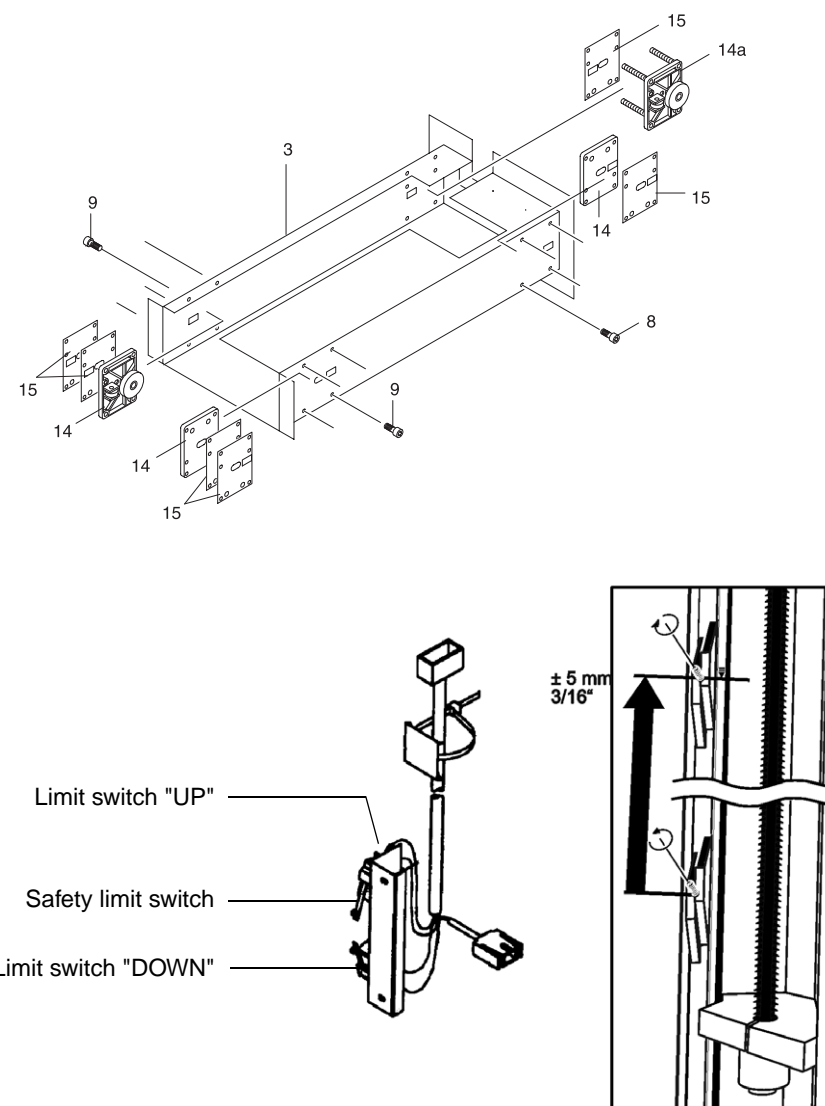


Fig.2: Rollers/Limit switch

## 7.1 Checking the height adjustment

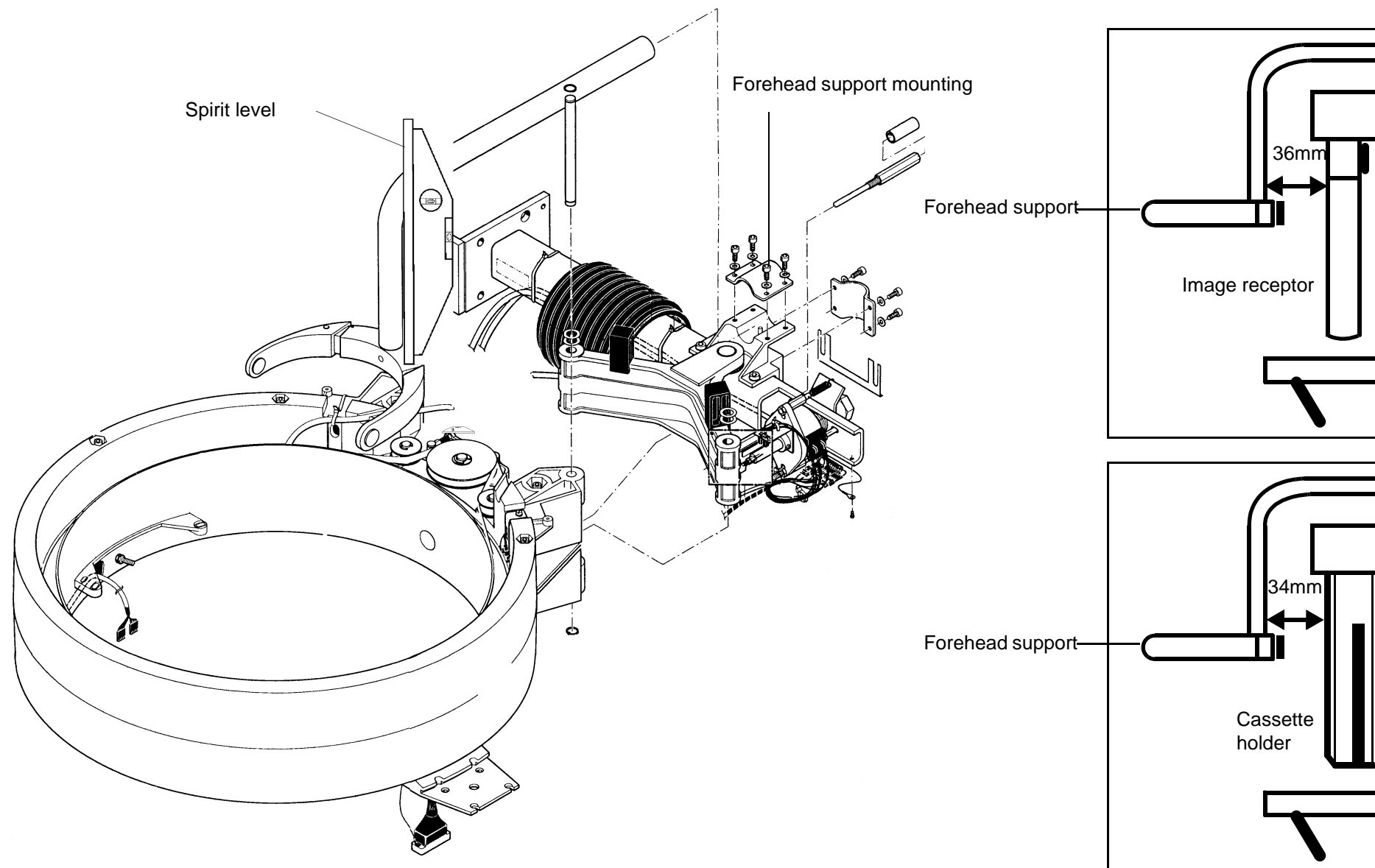


Fig.3: Forehead support

**Check the forehead support to make sure that it is mounted vertically:**

- Place a spirit level against the tube bend of the forehead support. 🖐 See Fig. 3: Forehead support
- Check for a distance of 36mm between the tube bend and the image receptor and of 34mm between the tube bend and the cassette.

If the forehead support is not mounted vertically or the distance is not correct, adjust the forehead support.

**Check whether the temple supports can be adjusted symmetrically:**

- Rotate the adjusting knob for the temple supports while observing the position of the temple support arms.

If the temple supports cannot be adjusted symmetrically, replace forehead support.

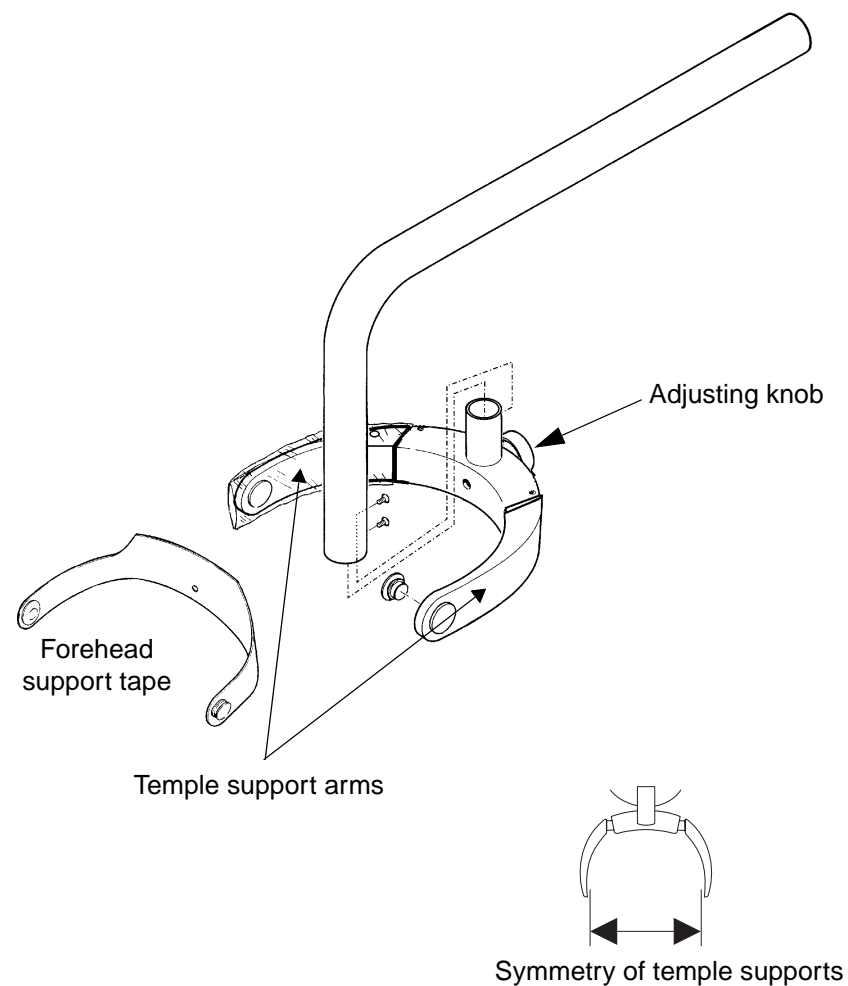


Fig.4: Adjusting the temple supports

## 7.2 Checking the forehead support

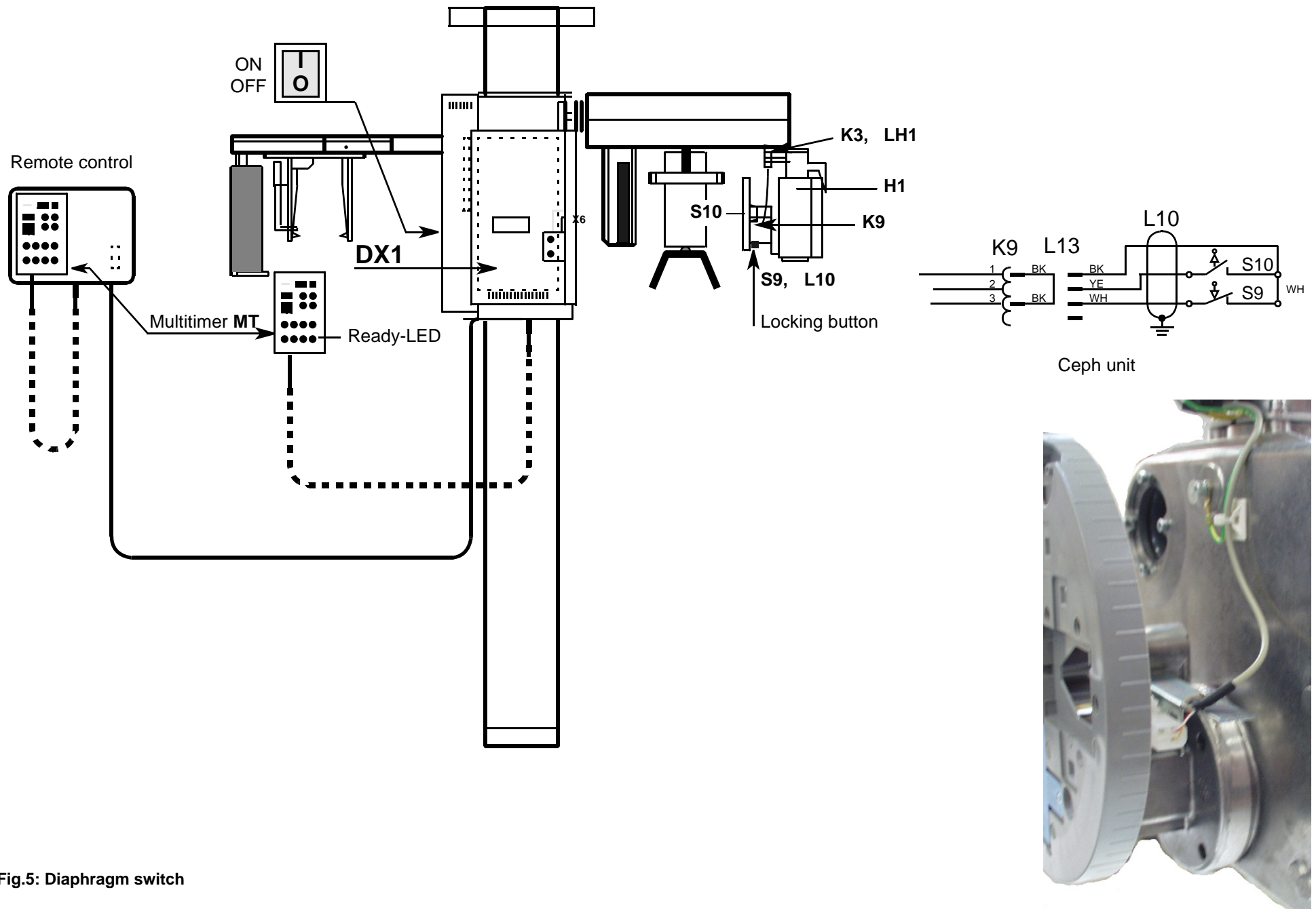


Fig.5: Diaphragm switch

### Only on units with cephalometer

#### Check the diaphragm wheel to make sure that it can be rotated and engages securely:

- Press locking button briefly and turn diaphragm wheel until it engages.

The diaphragm number appears at the top right of the diaphragm window.

☞ See Fig. 6: Diaphragm wheel.

If the diaphragm wheel cannot be turned or does not engage, check it:

☞ See chapter 3.5, Correcting errors of help messages H3 06.

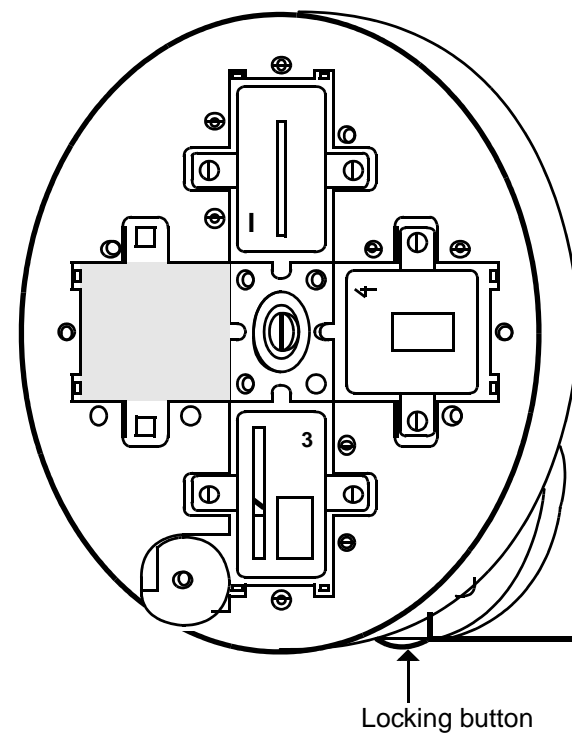


Fig.6: Diaphragm wheel

## 7.3 Checking the diaphragm wheel

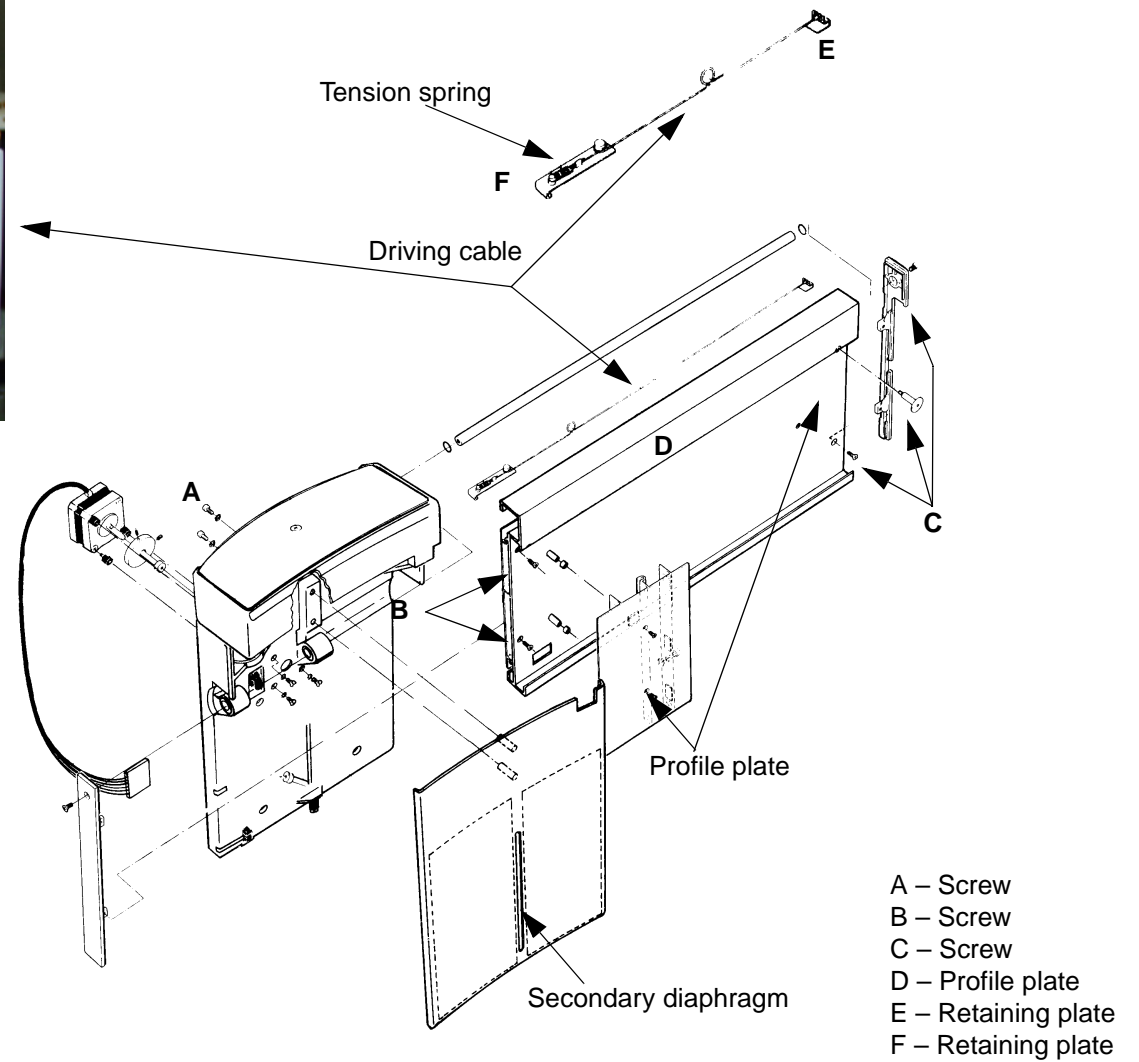
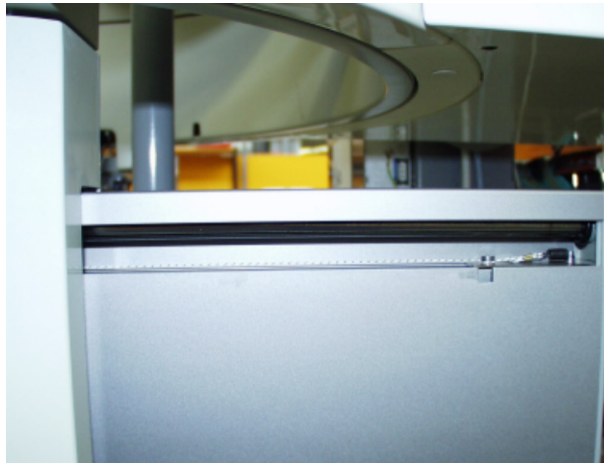


Fig.7: Position of cassette holder driving cable

### Check whether the cassette holder engages securely in both end positions:

- Swivel the cassette holder in and out.
  - ☞ See Fig. 8: Cassette holder with swiveling movement.
- Check whether the restoring spring snaps the cassette holder into the end position securely.

If the cassette holder is not locked in place, grease the travel track with “Longtime TD2” and check for mechanical wear and tear. Replace the cassette holder if necessary.

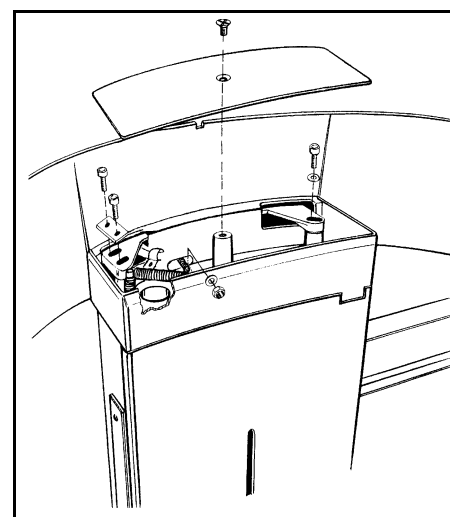
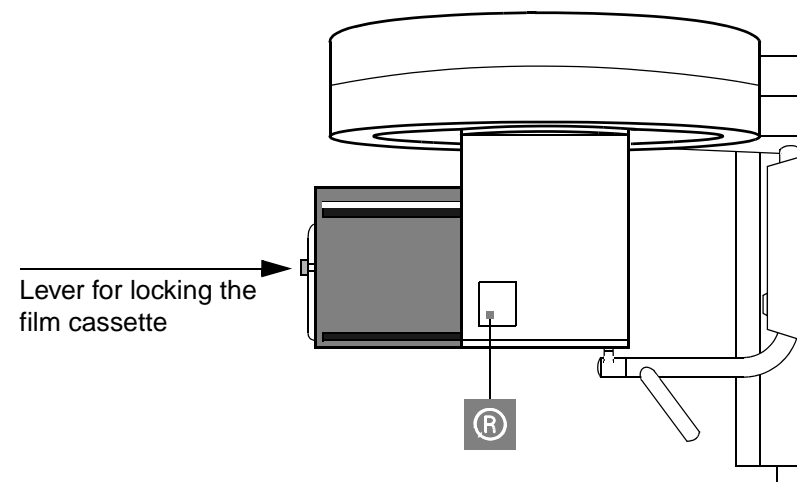
### Check the cassette holder driving cable to make sure it is not damaged:

- Perform visual check of driving cable to determine whether it is stretched, spliced or damaged.

☞ See Fig. 7: Position of cassette holder driving cable.

If the driving cable shows any signs of damage, replace it:

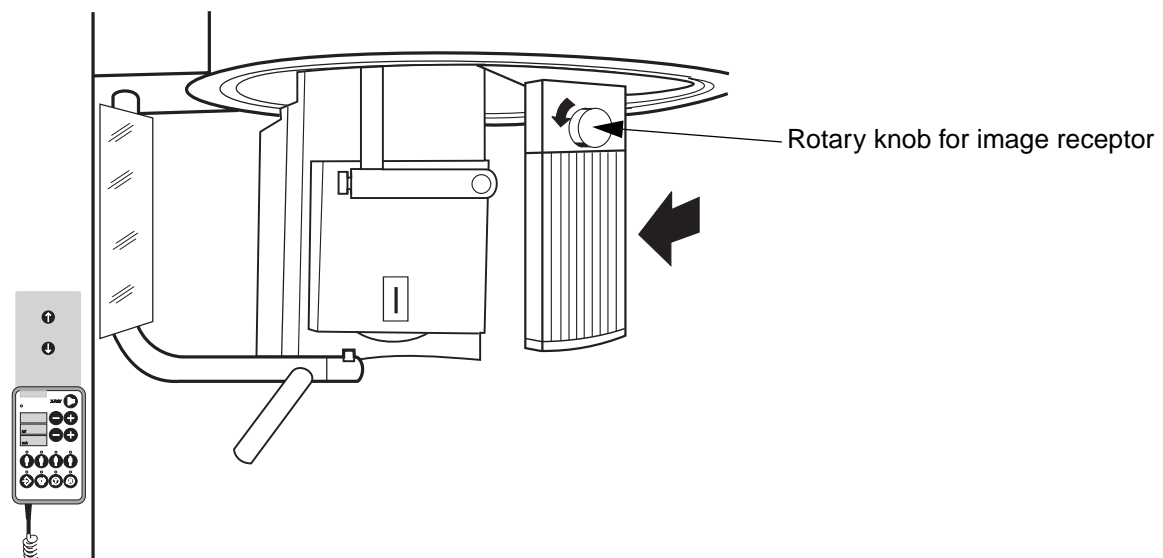
☞ See chapter 6.5, Replacing the rope and/or the cassette drive motor M3.



Swiveling movement of cassette holder

Fig.8: Cassette holder with swiveling movement

## 7.4 Checking the cassette holder



**Fig.9: Image receptor with rotary knob**



**Check whether the image receptor can be screwed in and out easily and fits in the guide snugly:**

- Screw the image receptor in and out by turning the rotary knob. Make sure that the image receptor moves easily and without jolting.

☞ See Fig. 10: Rotary knob and sensor ejector.

If the image receptor cannot be screwed in and out easily or fits into the guide too loosely, check whether the teeth on the rotary knob or the sensor ejector are broken. Replace any damaged parts:

☞ See chapter 6.8, Replacing rotary knob and sensor ejector.

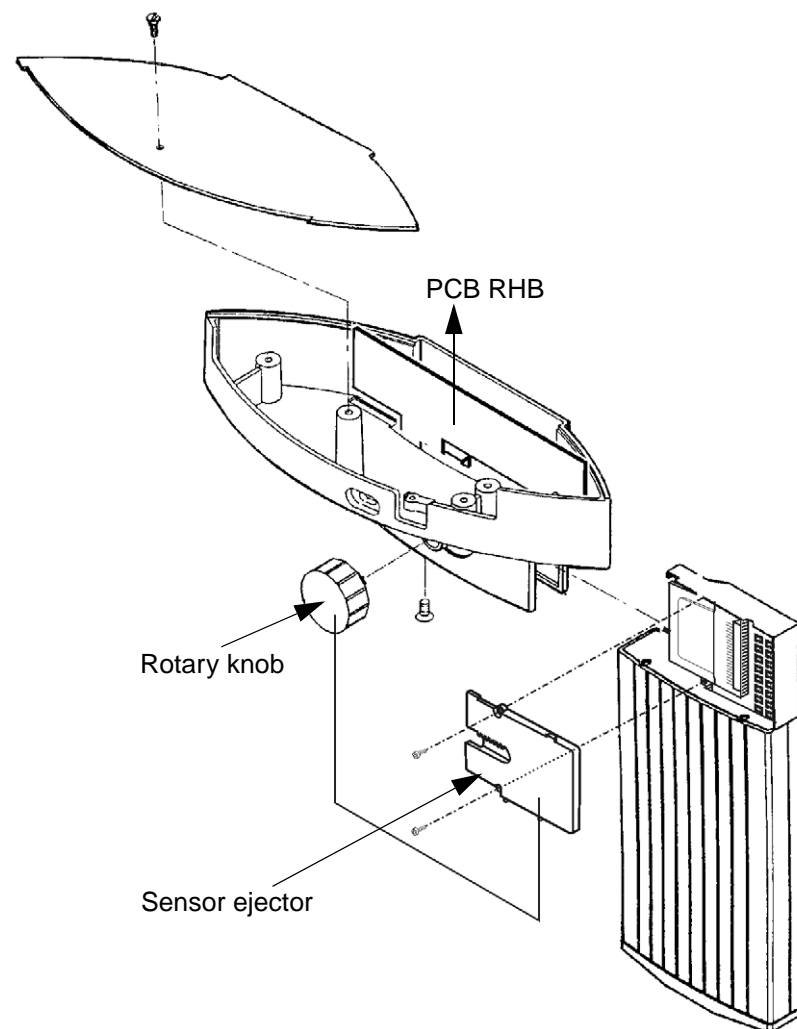
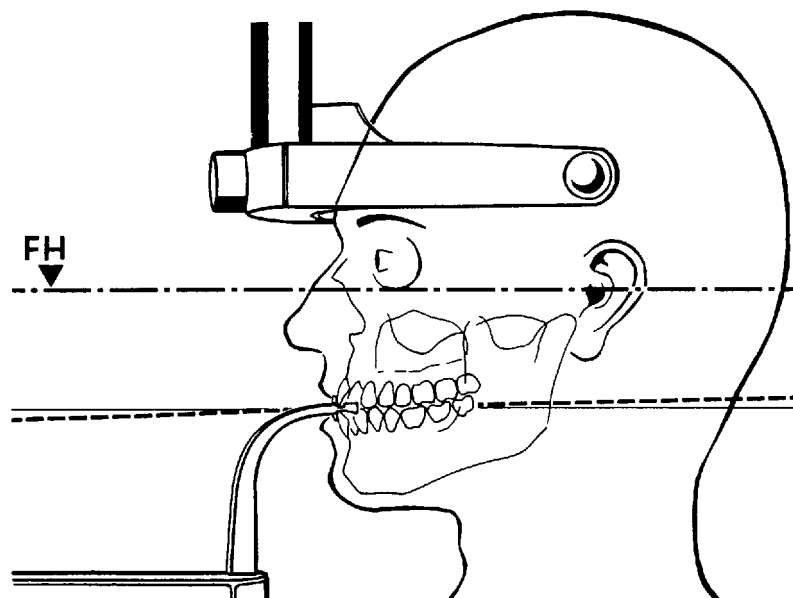


Fig.10: Rotary knob and sensor ejector

## 7.5 Checking the image receptor



FH – Frankfort horizontal plane

Fig.11: Adjusting the light localizer

**Check whether the light localizer can be adjusted:**

- Switch on light localizer and adjust its height using slider B.

If the light localizer cannot be moved freely:

- Remove rubbed-off parts
- Polish surface
- Lightly lubricate with vaseline

If the light localizer still won't move freely, replace front cover.

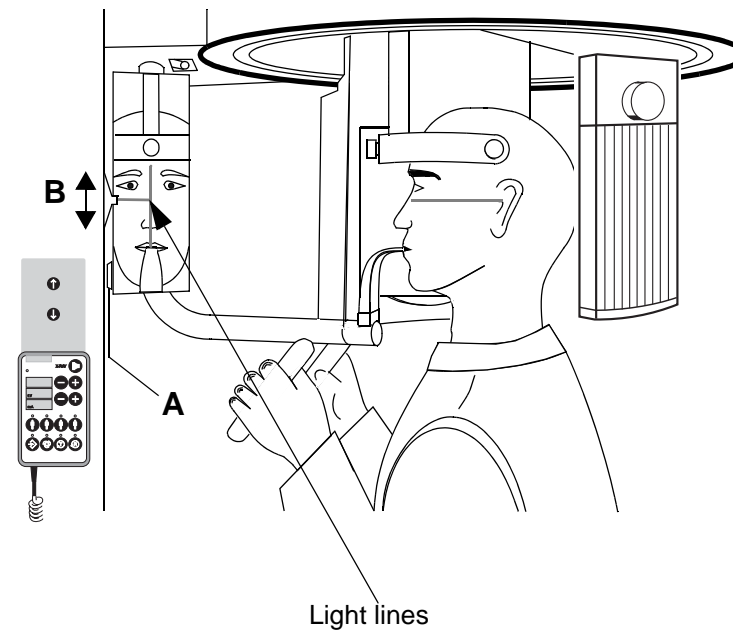


Fig.12: Light localizer with light lines

## 7.6 Checking the light localizer

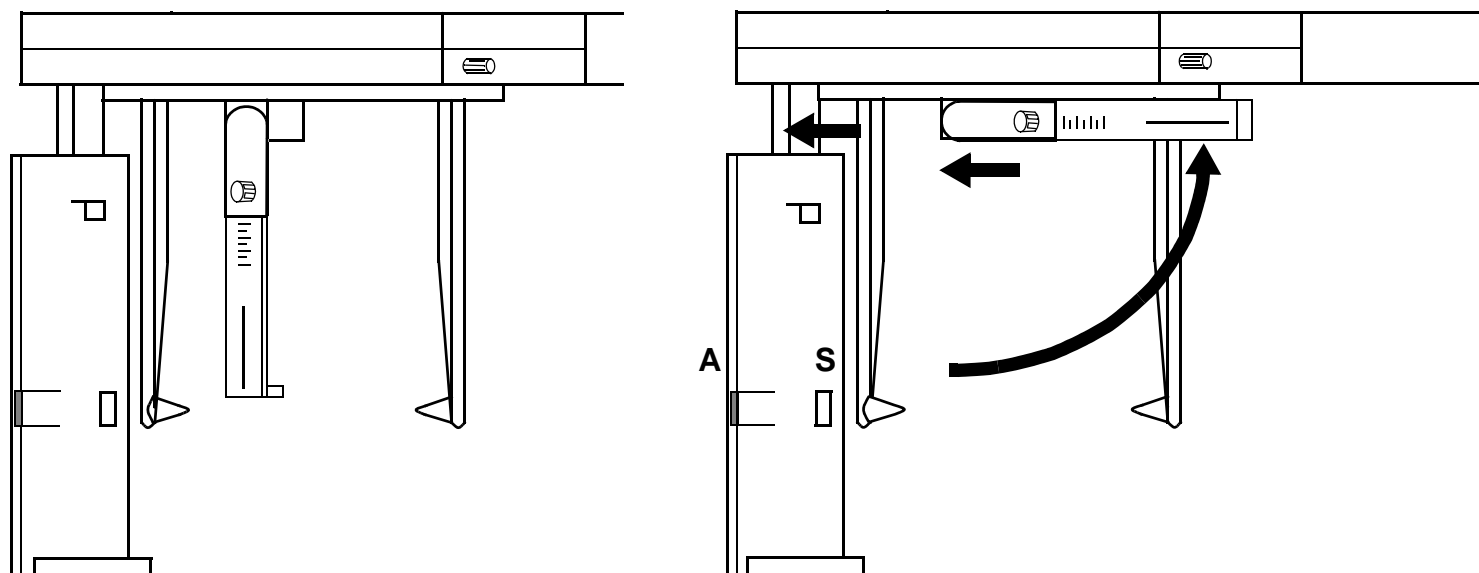


Fig.13: Cephalometer

### Check whether the head support can be swiveled:

- Loosen the locking screw. ☞ See Fig. 14: Head support can be swiveled
- Rotate the head support.

The head support must lock in place at 0°.

If the head support cannot be rotated or does not engage properly, check whether it is mechanically obstructed. Eliminate any mechanical obstacle and set the cephalometer, adjust the locking screw mechanically:

☞ See chapter 4.5, Checking and adjusting the ear olives.

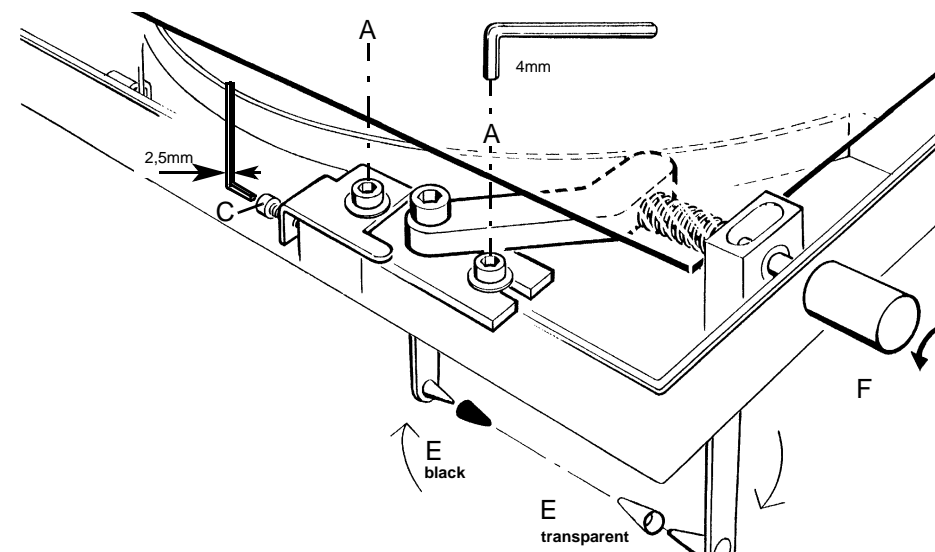


Fig.14: Head support can be swiveled

## 7.7 Checking the conventional cephalometer

▼ Unexposed surrounding border ▼

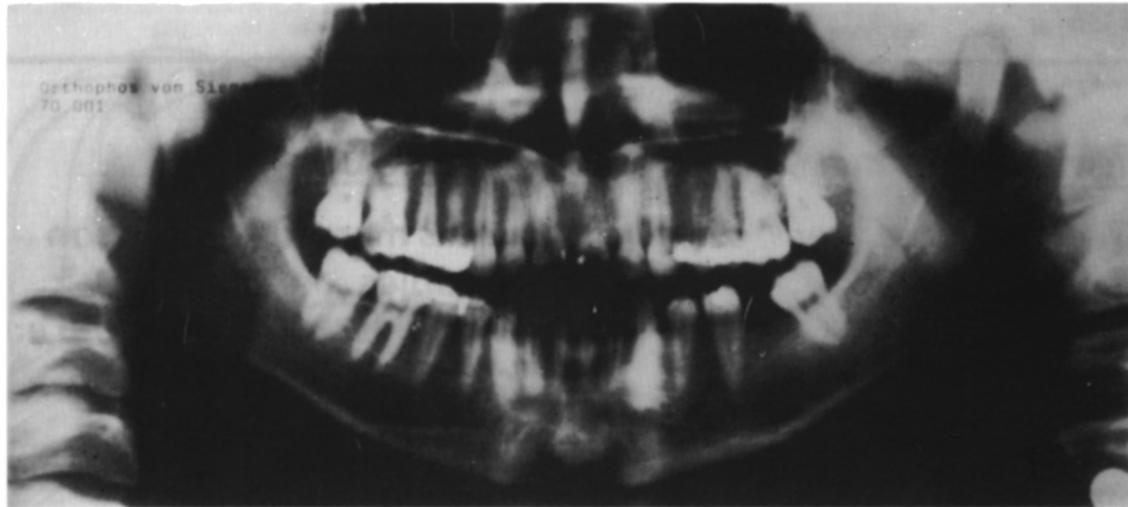


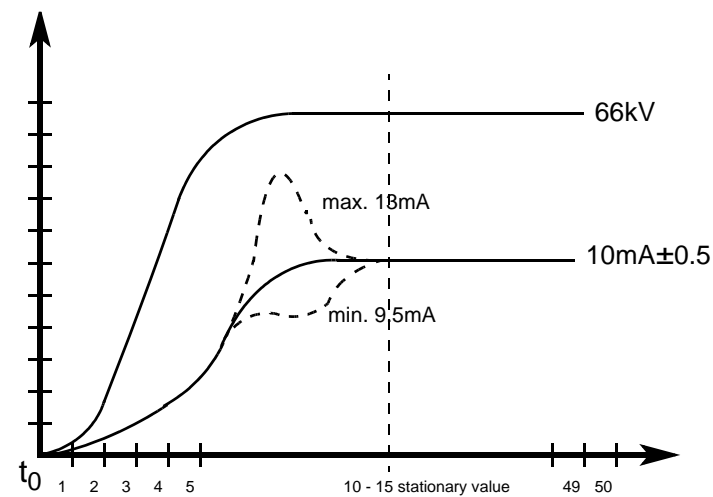
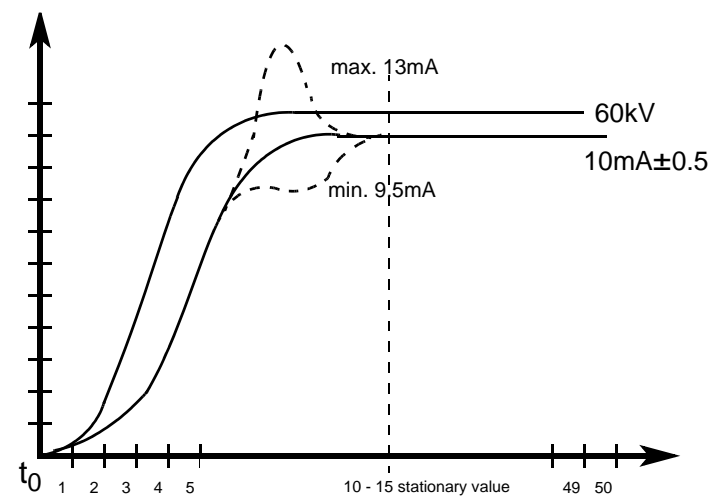
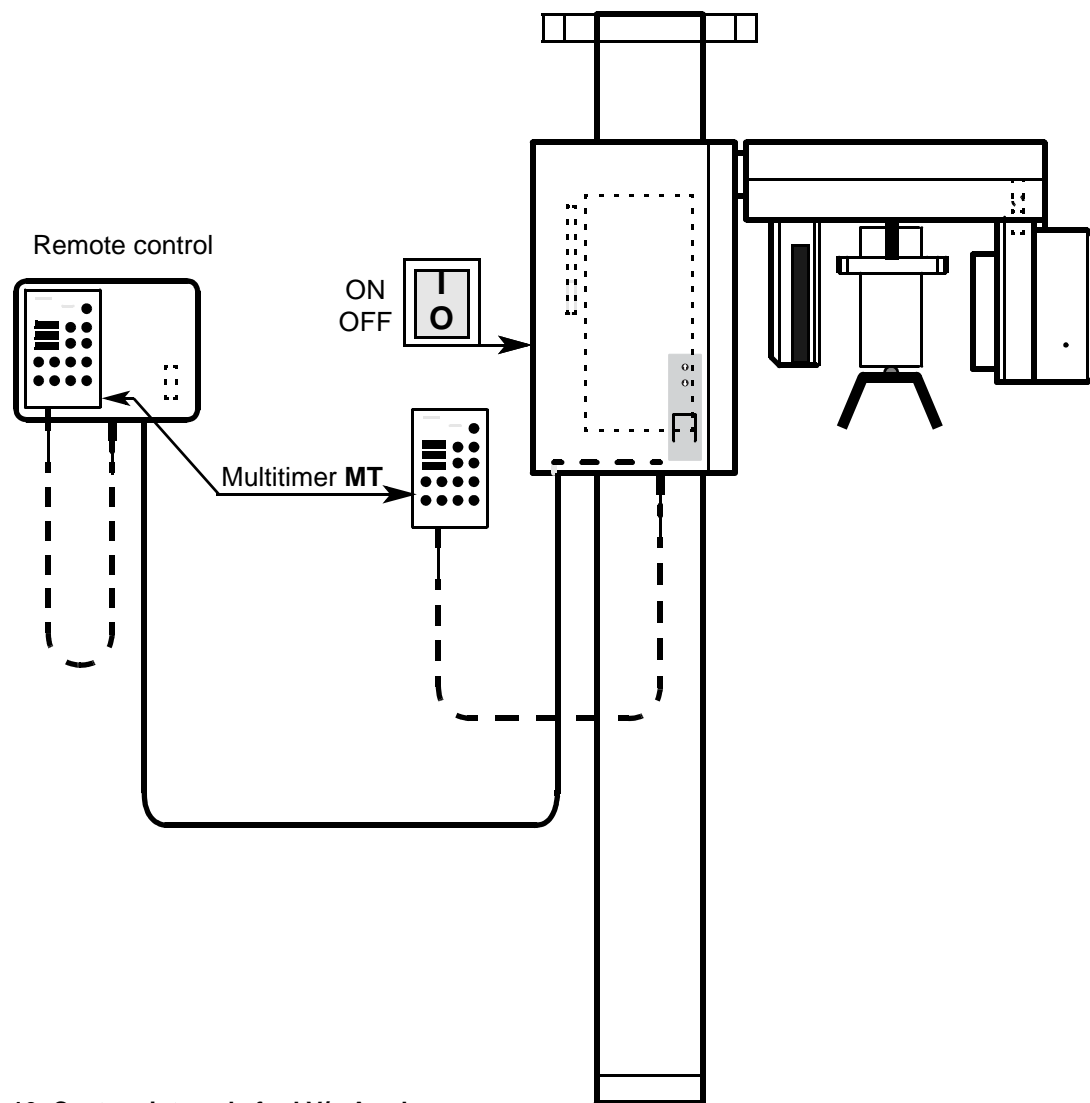
Fig.15: Checking an exposure taken by the dentist

### Check whether existing exposures taken by the dentist are OK:

- Check existing exposures taken by the dentist for unexposed surrounding borders. 🖐 See Fig. 15: Checking an exposure taken by the dentist.
- Check whether the exposures show normal definition.
- Check whether the density of the X-ray image is OK.

If the quality of the exposure is unsatisfactory in any way, compare the selected exposure settings with the ones specified in the Operating Instructions and check the diaphragm if necessary:

- 🖐 See chapter 7.10, Phantom/needle phantom exposure with ORTHOPHOS 3/3 Ceph.
- 🖐 See chapter 7.11, Phantom/needle phantom exposure with ORTHOPHOS 3 DS/3 Ceph with Upgrade Kit



50 values are measured in intervals of 2 ms.  
The measured values can be plotted as points to check the transient characteristics

Fig. 16: Capture intervals for kV/mA values

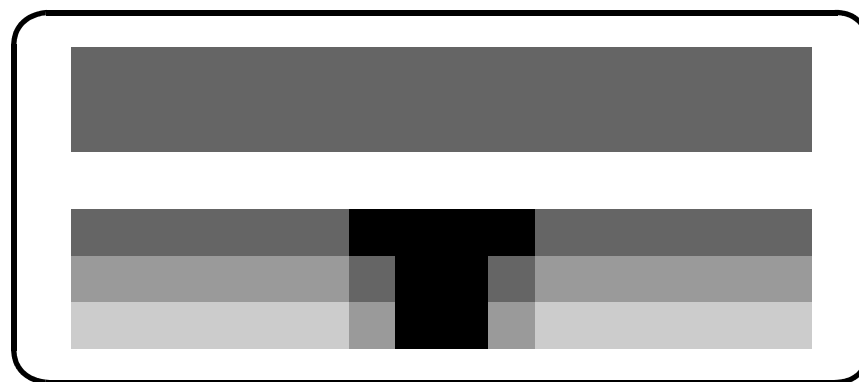


**Check whether the actual kV/mA values and the preheating are correct:**

- Select service routine S.04 and check the actual kV/mA values.

If the actual kV/mA values and/or the preheating are not within tolerance, readjust the kV/mA values and the preheating:

👉 See chapter 5.7, Service routine S.05 Heating adjustment.



**Fig.17: Needle phantom exposure and phantom exposure**

Check whether the phantom exposure is OK:

**⚠ ATTENTION**

Radiation will be released.  
Observe the radiation protection guidelines.

*Use the same type of film as is used by the operator in the practice!*

- Take a phantom exposure.

The density stripes produced on the film by the phantom must be parallel. No recognizable peaks should occur.

If the phantom exposure is not correct, check the X-ray beam adjustment:

- ☞ See chapter 4.2, Checking and adjusting the X-ray beam for Panorama radiography.

*Continued on next page*

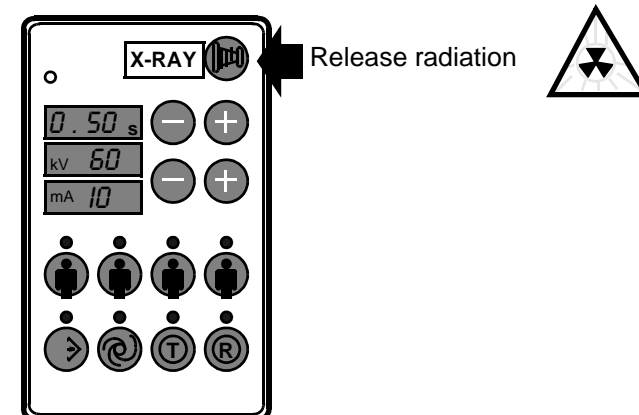
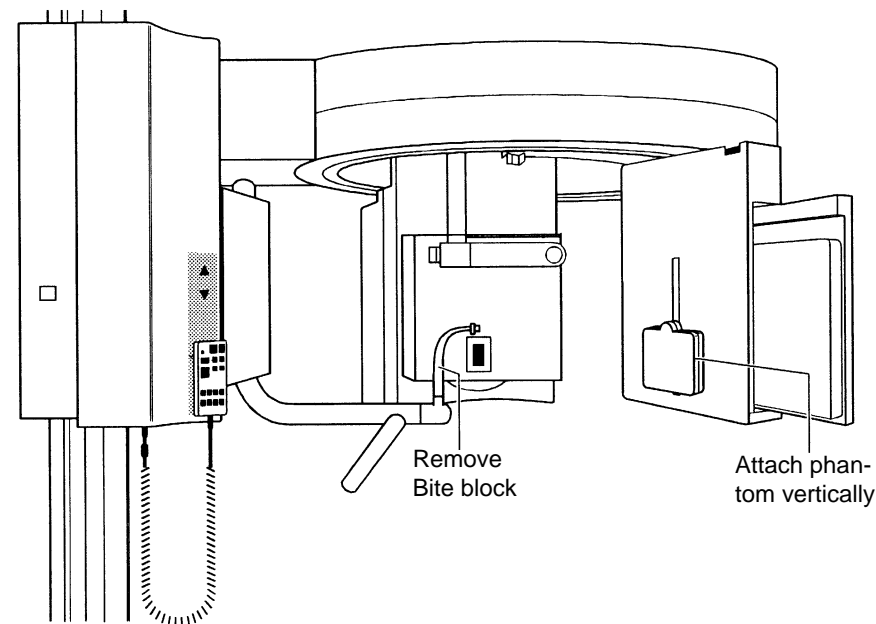


Fig.18: Phantom exposure

## 7.10 Phantom/needle phantom exposure with ORTHOPHOS 3/3 Ceph

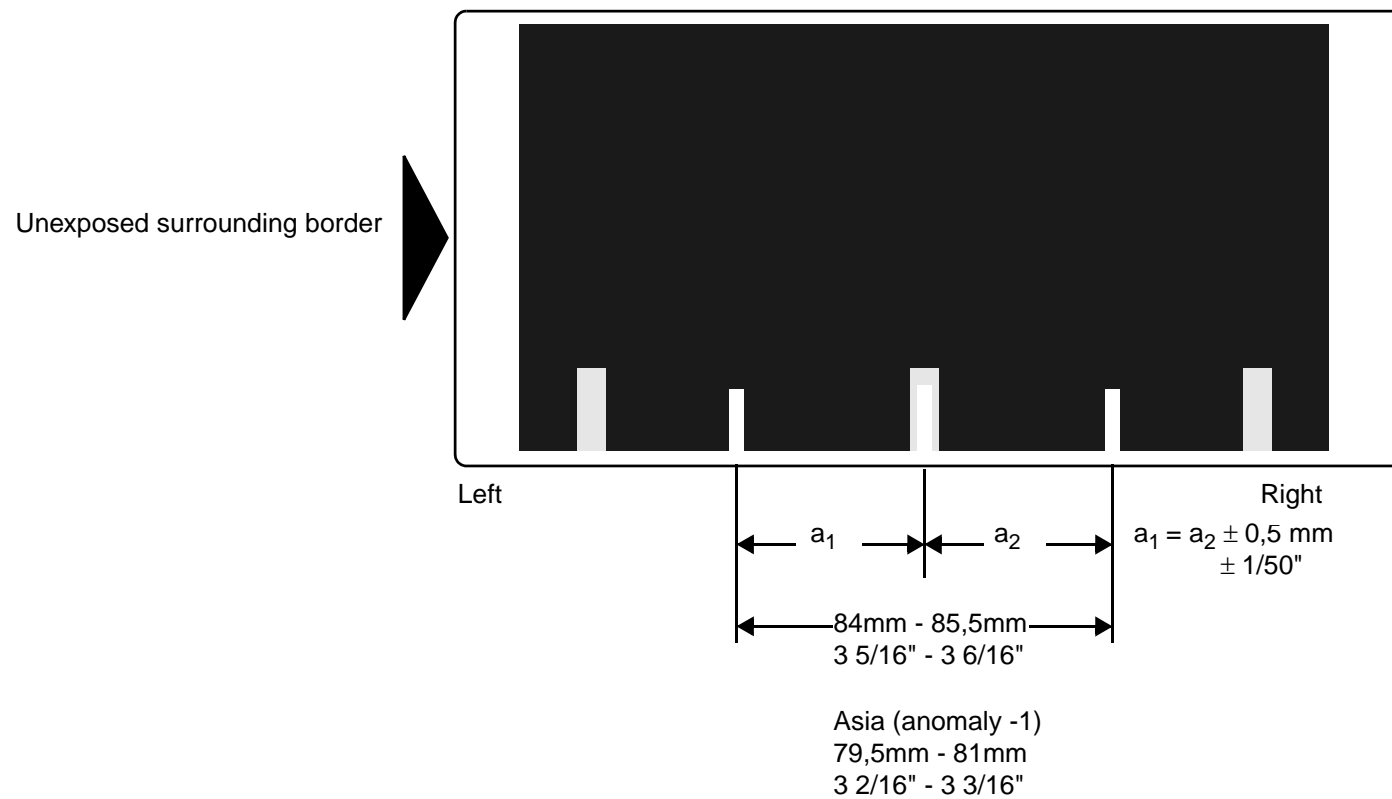


Fig.19: Needle phantom exposure

Continued from previous page

Check whether the needle phantom exposure is OK:



**ATTENTION**

Radiation will be released.  
Observe the radiation protection guidelines.

*Use the same type of film as is used by the operator in the practice!*

- Take a needle phantom exposure and compare it with the exposure made during installation.
- Measure needle distances, film length and surrounding border.

If the needle phantom exposure is not correct, adjust actuator M2:

☞ See chapter 4.1, Phantom radiograph — Adjusting actuator M2.

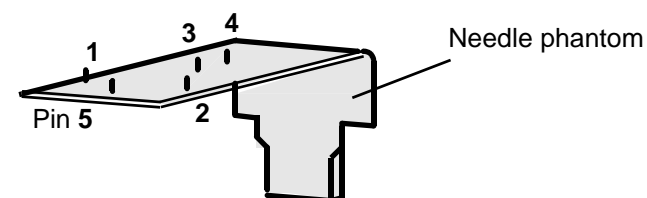


Fig.20: Needle phantom

## 7.10 Phantom/needle phantom exposure with ORTHOPHOS 3/3 Ceph

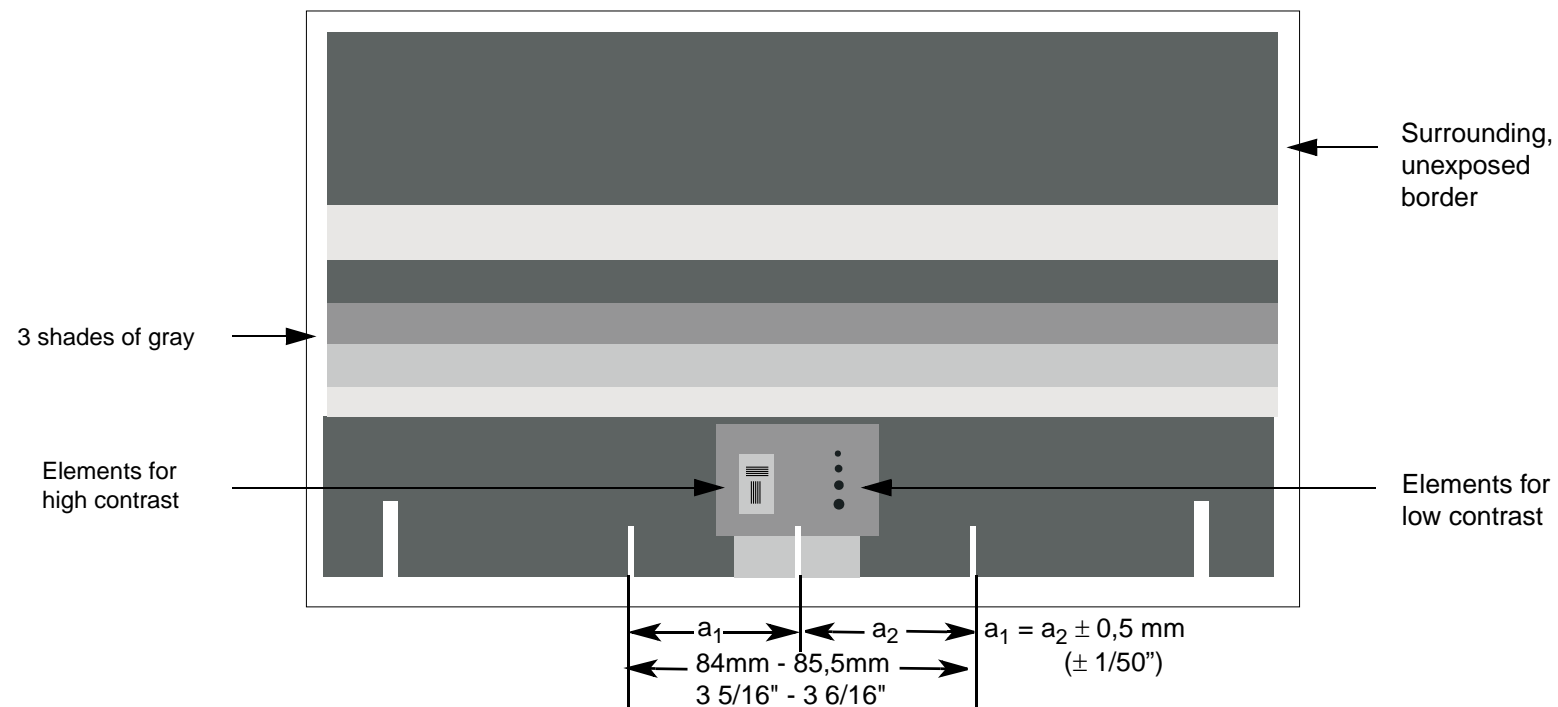


Fig.21: Needle phantom exposure, phantom exposure

## Check whether the phantom/needle phantom exposure is OK:

### **ATTENTION**

**Radiation will be released.  
Observe the radiation protection guidelines.**

- Make SIDEXIS ready for an exposure and take an exposure:
  1. Select diaphragm position 10.
  2. Remove bite block/contact segment.
  3. Insert exposure phantom into bite block holder.
  4. Insert contrast element **A** with hole into plug-in plate of exposure phantom.
  5. Mount phantom with clamp on sensor.
  6. Move unit into starting position.
  7. Release exposure.
- Compare the exposure just taken with a control exposure.

If the phantom/needle phantom exposure is not correct, adjust the X-ray beam:

- ☞ See Chapter 4.1 - Phantom radiograph — Adjusting actuator M2
- ☞ See Chapter 4.2 - Checking and adjusting the X-ray beam for Panorama radiography.

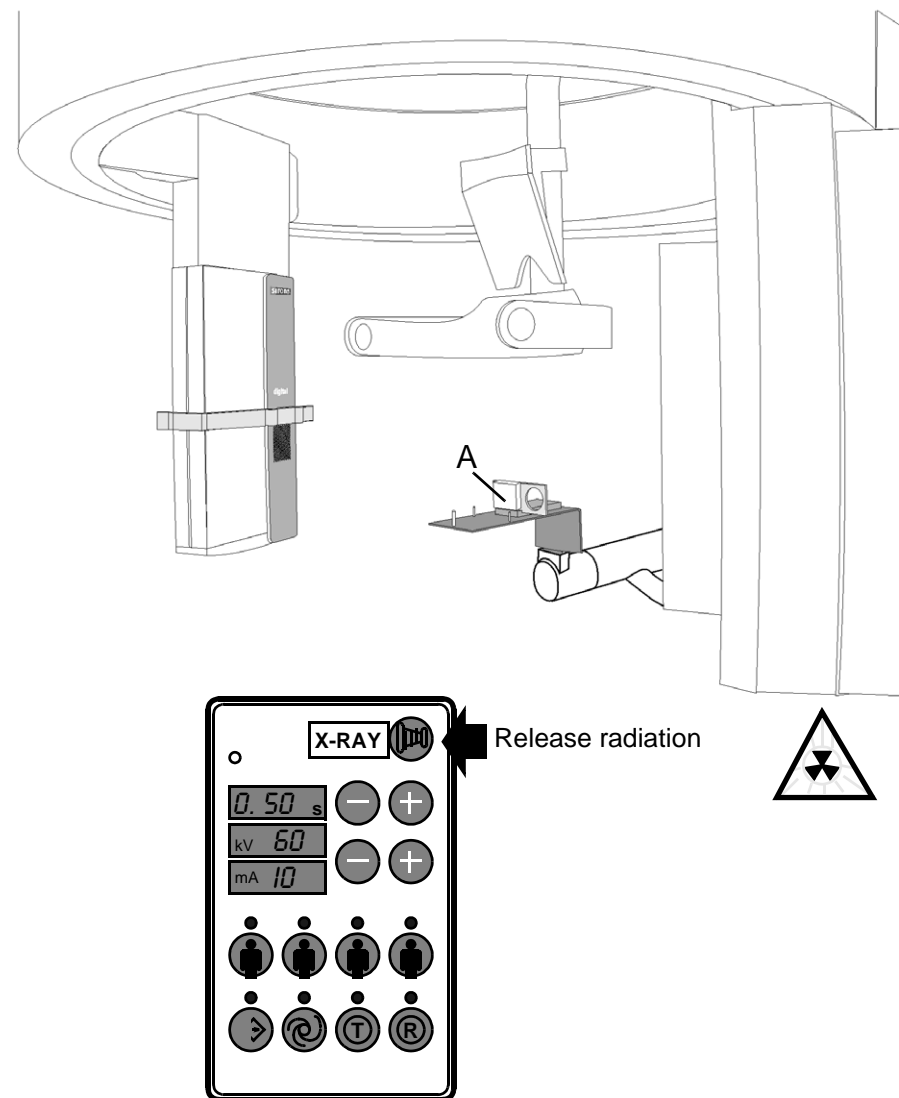


Fig.22: Phantom / needle phantom exposure

## 7.11 Phantom/needle phantom exposure with ORTHOPHOS 3 DS/3 Ceph with Upgrade Kit

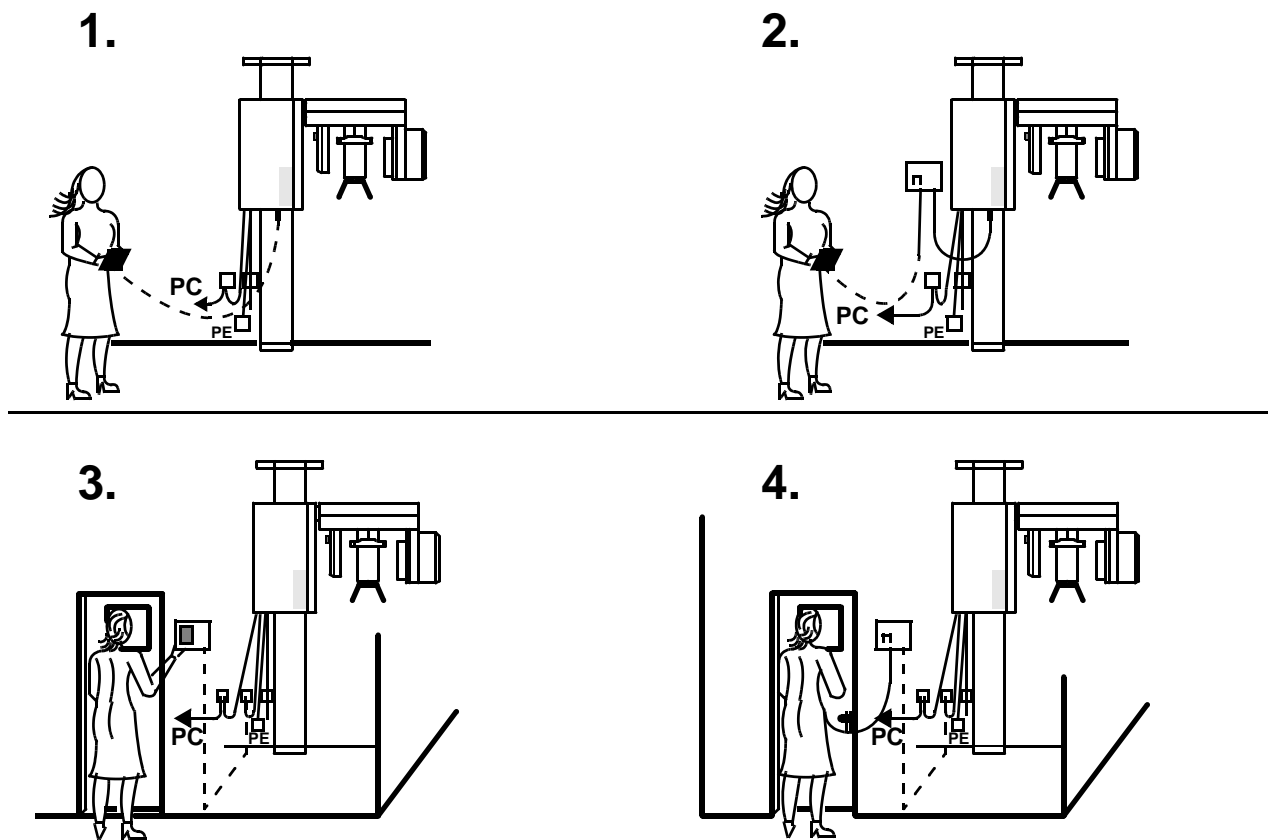


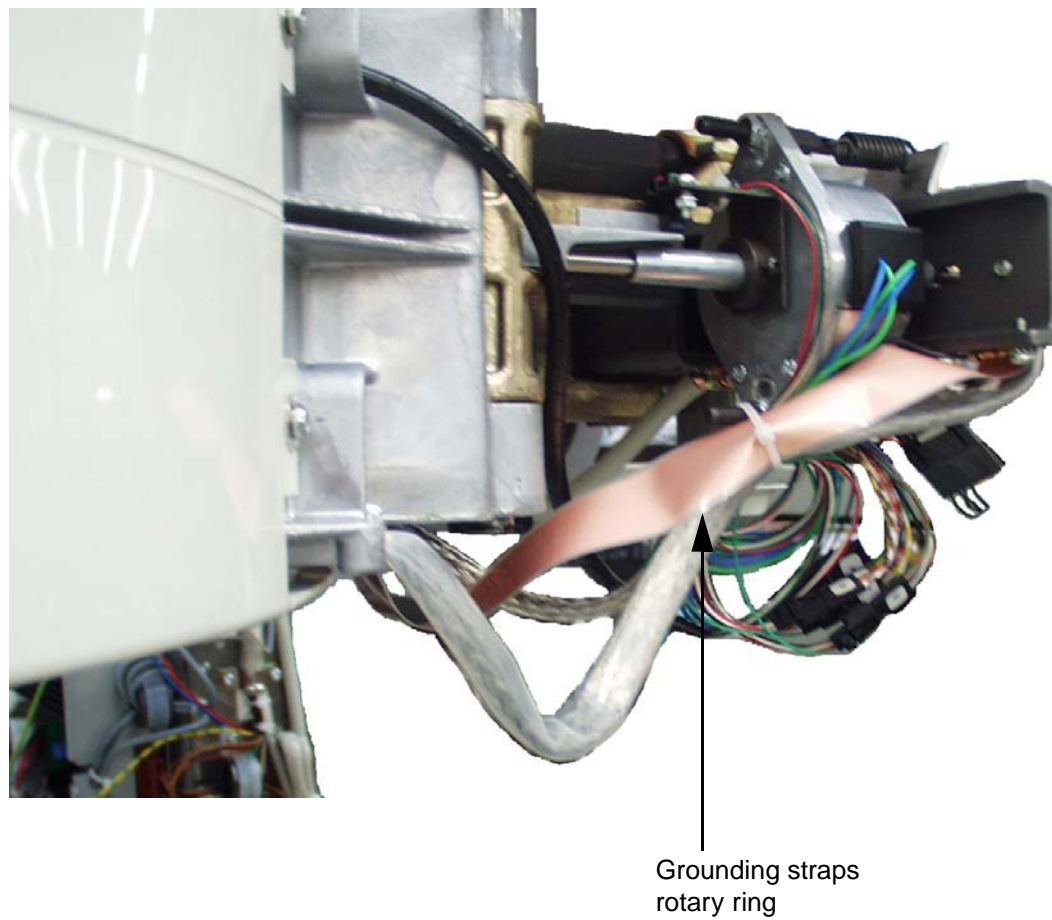
Fig.23: Possible cable routings



**Check whether the routing of the cables to the unit is OK:**

- Check power cable, protective ground wire, control cables and data transfer cables.
- Perform a visual check to make sure that the cables show no external signs of damage.

If a cable is externally damaged, replace it.



**Fig.24: Position of grounding straps**

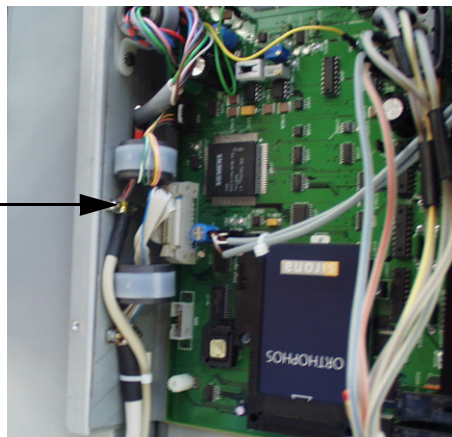
**Check whether the grounding straps have complete and firm contact at the positions marked:**

- Check the grounding straps visually and by touching them with your hands.

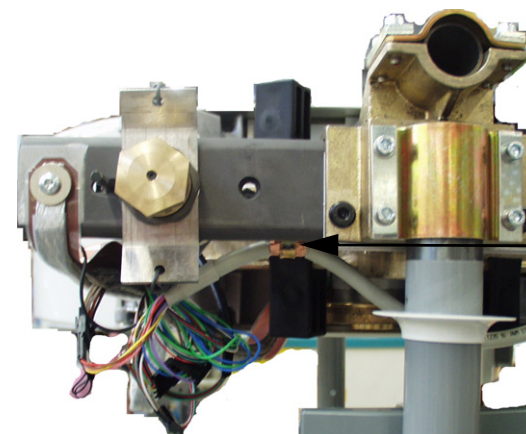
☞ See Fig. 24: Position of grounding straps.

If the grounding straps do not have complete and firm contact, fasten them properly.

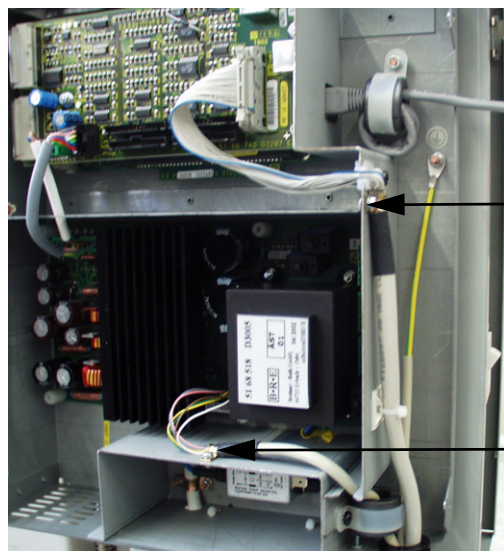
If the grounding straps are damaged, replace them.



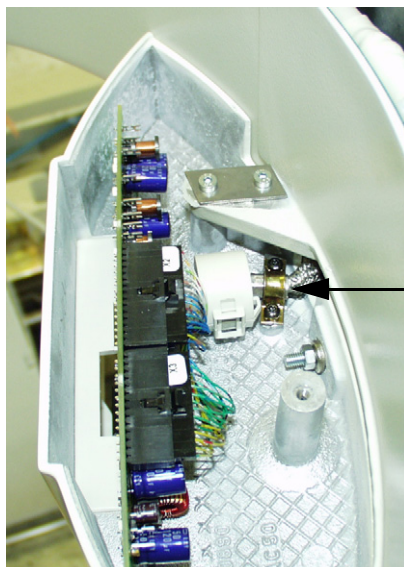
DX1



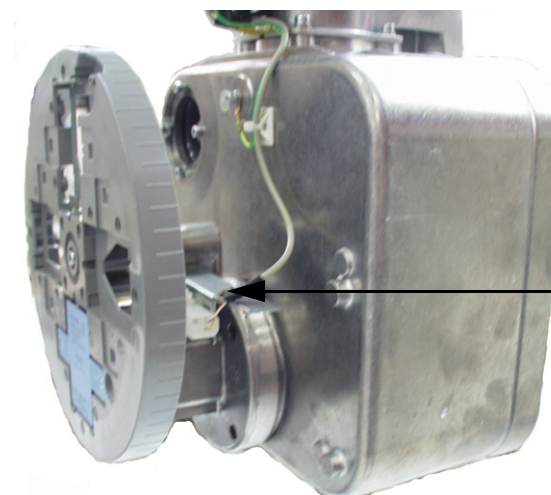
Ring cable



Extension Box



RHB-Board



X-ray tube assembly

**Fig.25: Position of shielding**

**Check whether the shielding of the cables has firm contact:**

- Check the cable shielding visually and manually at the positions marked above.

☞ See Fig. 25: Position of shielding.

If the shielding does not have firm contact with the cables, fasten the shielding properly.

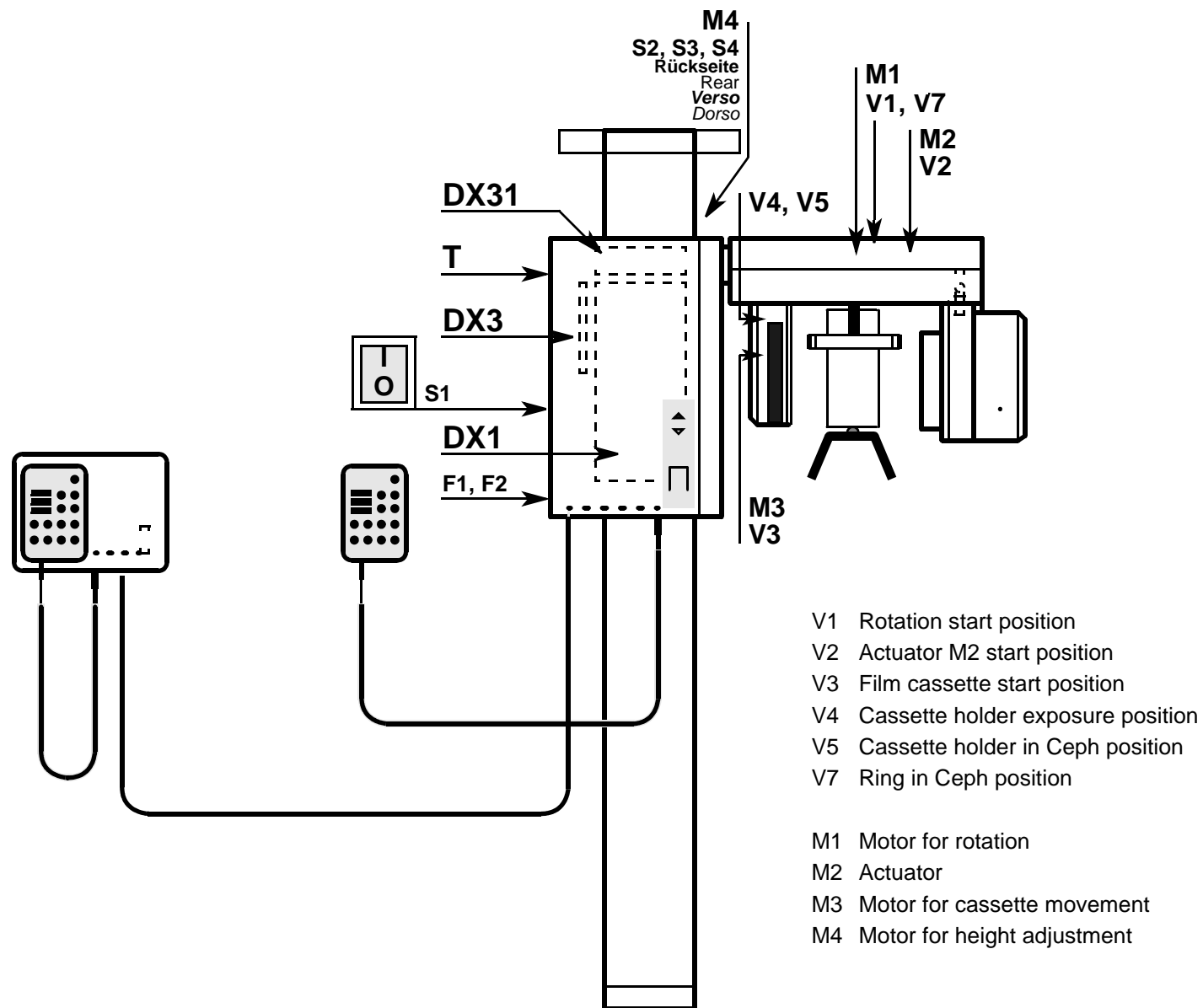


Fig.26: Position of light barriers V1 – V7

### Check whether light barrier housings V2 to V8 are free of damage and properly secured:

- Remove the ring cover.
- Perform a general check of light barriers for mechanical obstruction by pinched litz wires etc. and eliminate problem if necessary:  
 ☞ See Fig. 26: Position of light barriers V1 – V7.
- Perform a visual check of light barriers for damage or wear and tear, e.g. scuff marks or cracks.
- Check light barriers for firm fastening with your hands.

If individual light barriers are damaged, replace them.

### Check whether the ring cable shows signs of external damage or wear and tear:

- Check visually while turning the rotary ring through its entire adjustment range by hand.

If the ring cable does not properly snuggle into the shaft of the ring as a loop, replace the ring cable:

- ☞ See Fig. 27: Position of ring cable L4
- ☞ See chapter 6.9, Replacing ring cable L4.

If the insulation of the ring cable is seriously damaged, replace the ring cable:

- ☞ See chapter 6.9, Replacing ring cable L4.

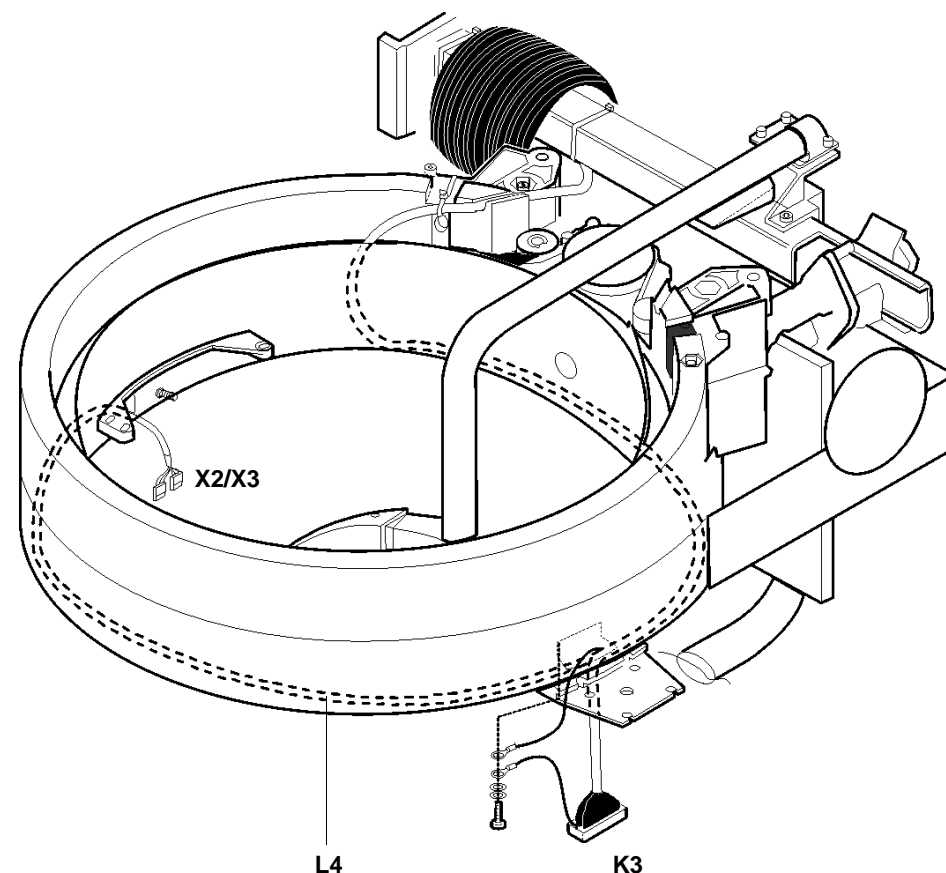
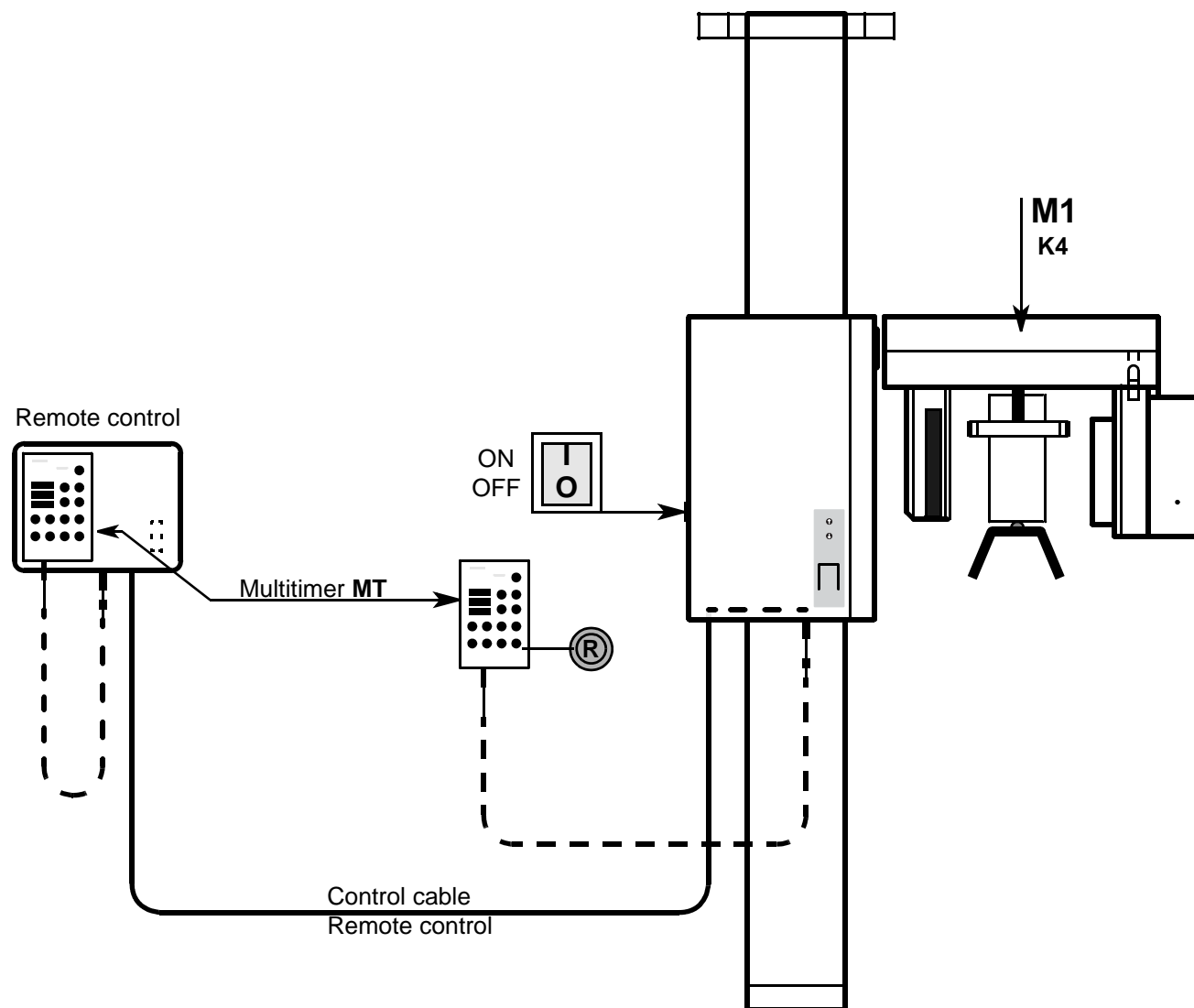


Fig.27: Position of ring cable L4

## 7.15 Checking light barrier housings V1 to V7/ring cable

**Fig.28: Rotation motor M1**



### Check whether the prestress of the flat belt on rotation motor M1 is sufficient:

- Trigger rotation while holding the X-ray tube assembly in place. The motor must jam.

If the motor does not jam and the flat belt slips, adjust the flat belt:

☞ See Chapter 6.1 - Replacing the rotation motor M1.

### Check whether the counterbalancing disk on rotation motor M1 is properly attached:

- Check with your hands.

If the counterbalancing disk is not properly attached, tighten it with the setscrews.

*First screw the counterbalancing disk tight with the first setscrew; then secure it with the second setscrew.*

☞ See Fig. 29: Tension of flat belt.

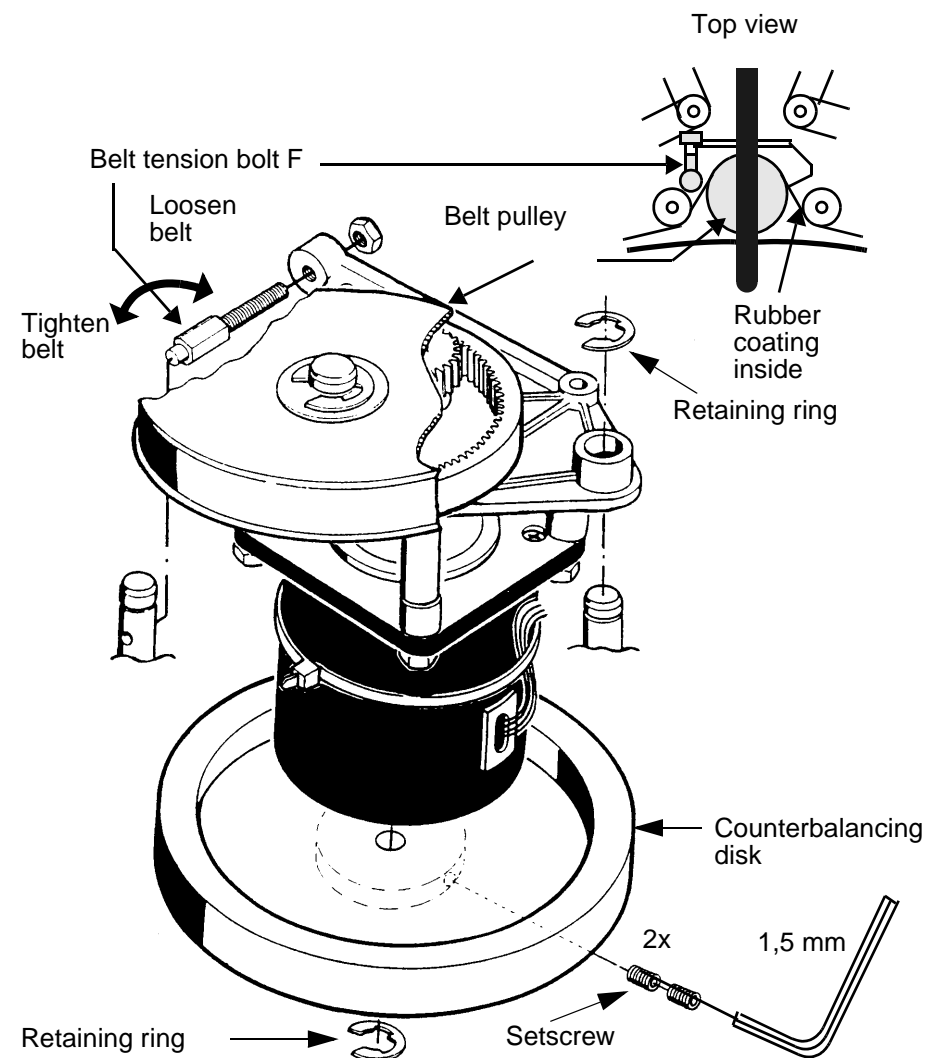


Fig.29: Tension of flat belt

## 7.16 Checking the flat belt on rotation motor M1

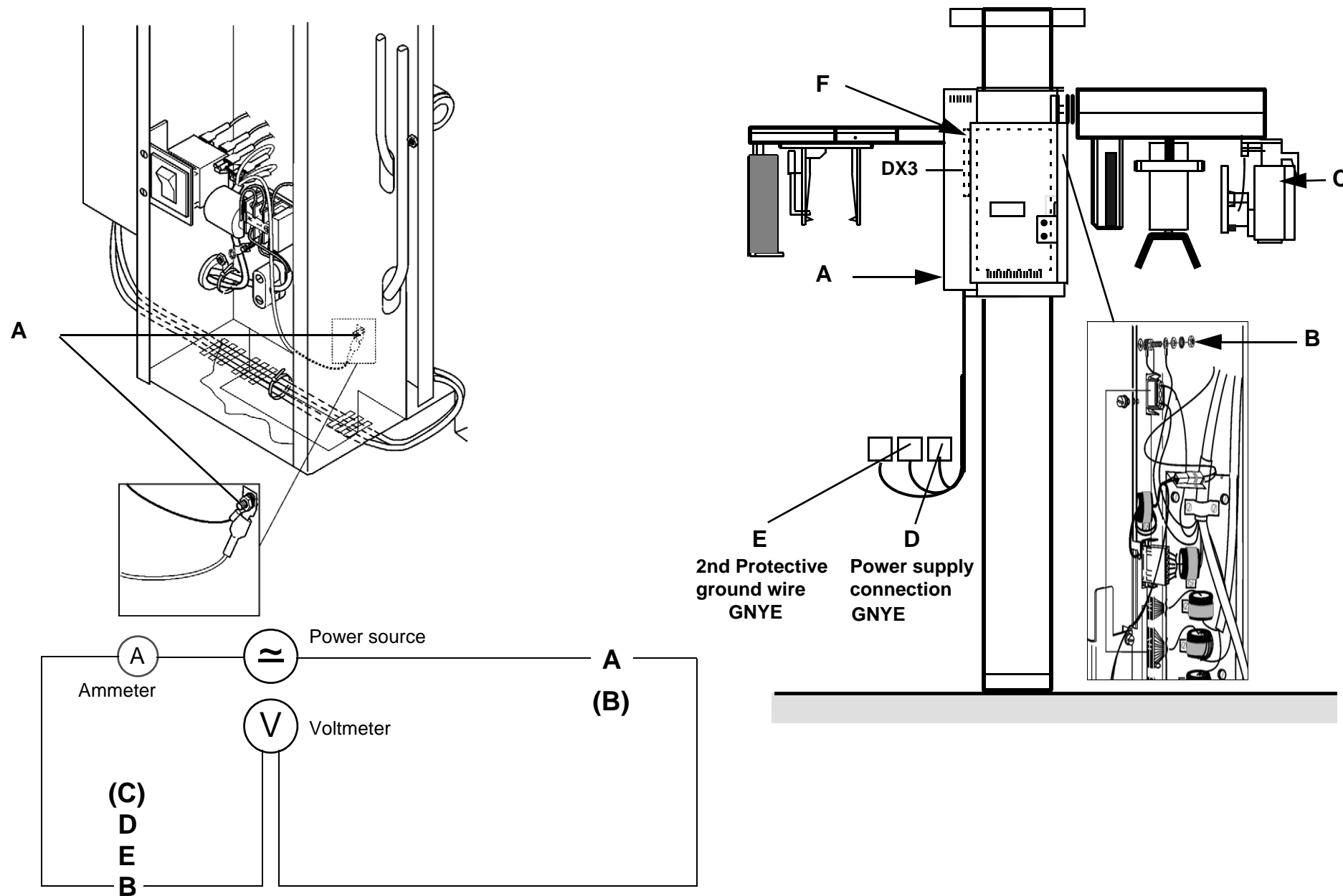


Fig.30: Measuring setup for protective ground wire test



### ATTENTION

**DANGER: Perilous shock hazard.**  
**Switch power off.**

- Switch power OFF at the main switch for the building installation.
- For pluggable units, remove the power plug from the electric outlet.
- Remove the power connection from the line terminal. Unclamp the second protective ground wire, if present.
- Remove the following cover parts:
  - Cover
  - Segment
  - Lateral cover plate
  - Front panel
  - X-ray tube assembly cover

### Check whether the protective ground wire resistance (Table 1) complies with the specifications:

A power source of at least 0.2A with a no-load voltage of 24V max. and 4V min. is required.

- Apply an electric current between the parts specified in Table 1 for at least 5s.
- Measure the voltage drop with the voltmeter and the current with the ammeter. Then calculate the resistance using the formula  $R = U / I$ .

If the resistance exceeds the value specified in Table 1:

### Check whether the protective ground wire is fastened according to specifications:

- Check whether the flat washer, toothed lock washer and cable lug are mounted on the protective ground wire in the right order and whether the nuts of the ground wire connections are tightened securely.

If the ground wire is not fastened according to specifications, fasten the ground wire properly.

| Table 1: Protective ground wire test between |   |                            |              |
|----------------------------------------------|---|----------------------------|--------------|
| A and                                        | D | GNYE wire                  | 0.1 $\Omega$ |
| A and                                        | E | 2nd protective ground wire | 0.1 $\Omega$ |
| A and                                        | B | Stud                       | 0.2 $\Omega$ |
| B and                                        | C | Tube assembly housing      | 0.2 $\Omega$ |
| F Visual check                               |   |                            |              |

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3 Ceph with Upgrade Kit**

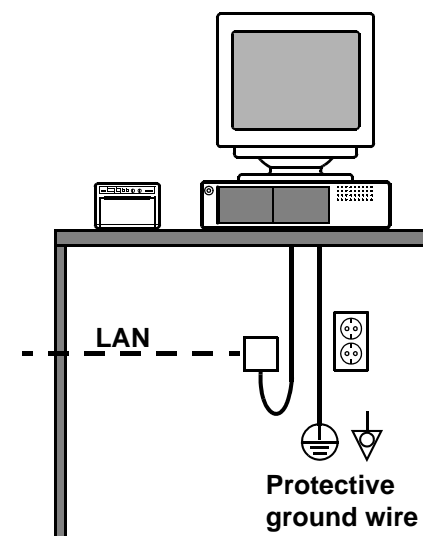
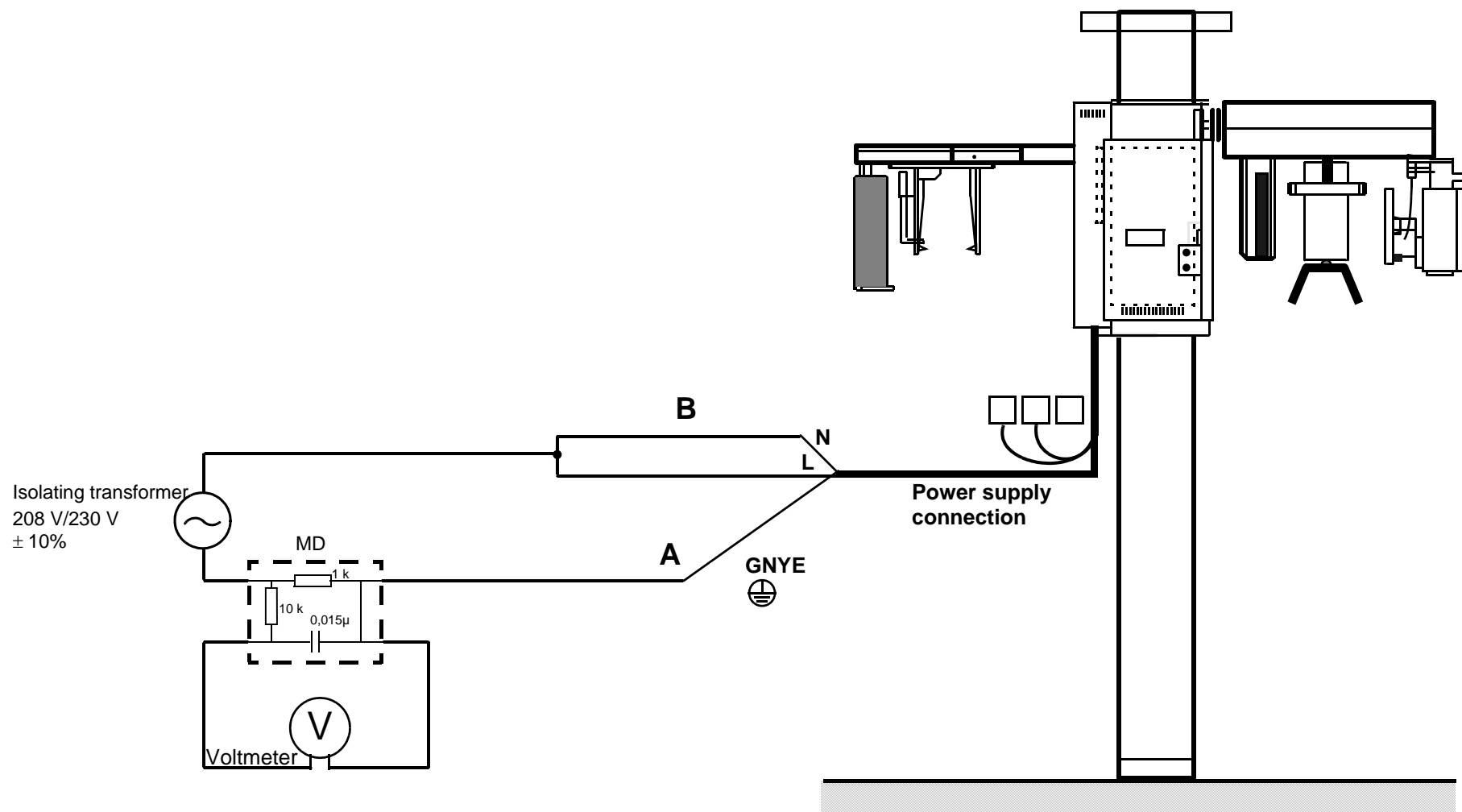


Fig.31: Protective ground wire test

Continued on next page

## 7.17 Checking the protective ground wire and the unit's leakage current



**Fig.32: Measuring setup for testing the unit's leakage current**

Continued from previous page

### Check whether the unit's leakage current complies with the specifications:

#### **ATTENTION**

**DANGER: Perilous shock hazard:**

**Do not touch the unit's housing while measuring the leakage current.**

A high resistance measuring voltage source at line frequency (isolating transformer 208 V/ 230 V  $\pm$  10%) and a measuring circuit compliant with the requirements of IEC 601 are required.

Complete test units, e.g. the "Bender tester", fulfill these requirements.

- Check whether the unit power switch is turned on.
- Connect a high resistance measuring voltage source between the short-circuited power cable or plug B and ground wire A.
- Measure voltage drop across MD.

The numerical value of the measurement corresponds to the leakage current in  $\mu$ A, see adjacent table.

The measured value must not exceed **5 mA**.

- Enter measurement results in maintenance certificate for subsequent comparison measurements.
- Describe or enter the measuring instrument or measuring setup used in the adjacent field for reasons of reproducibility.

If the leakage current is not OK, measure the input interference suppression filter and check whether the leakage current is still too high.

If the leakage current is still too high, this may be due to one of several different reasons:

- Damaged cables
- Isolation fault in the motor
- Missing isolation plates
- Shields stuck or lying on top
- Plugs improperly fastened etc.

| Measuring range |   | Leakage current |  |
|-----------------|---|-----------------|--|
| mV              | = | $\mu$ A         |  |
| V               | = | mA              |  |

Describe and enter measuring setup/measuring instrument:

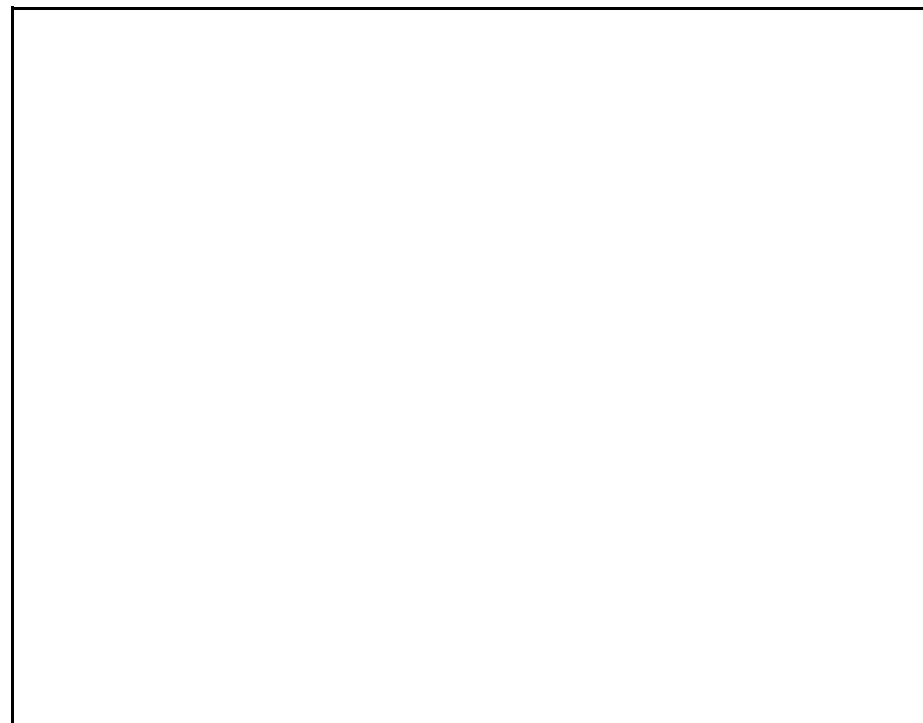


Fig.33: Comparison table: Leakage current and measuring range

## 7.17 Checking the protective ground wire and the unit's leakage current





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We reserve the right to make any alterations which may be due to technical improvements.

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