horizontal DIAGNOST H

9848 500 17701
9848 500 17801
9848 500 17901
9848 500 18001
9848 500 18101
9848 500 18201

Vertically adjustable bucky table with floating tabletop

PMG: Systems Hamburg
Author: H. Schulz
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Manual Order No. 4512 129 30174
SUBSYSTEM 9870 404 60022 (c/94.0)
horizontal DIAGNOST H

SERVICE MANUAL - SUBSYSTEM

horizontal DIAGNOST H

Type No: 9848 500 17701
Type No: 9848 500 17801
Type No: 9848 500 17901
Type No: 9848 500 18001
Type No: 9848 500 18101
Type No: 9848 500 18201

Author: H. Schulz

In case there are any questions concerning this manual, please send this LOPAD via fax to 49/(0)40/5078 2481

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SUBSYSTEM 9870 404 60022 (c/94.0)
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TECHNICAL DATA, PLANNING TEXT

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1. Introduction

Bucky table, vertically adjustable by motor power, with floating tabletop for bucky technique and conventional techniques as practiced on ceiling cranes and floor/ceiling-mounted tubestands.

The principle of the system is the stationary central beam for bucky radiography (longitudinal center block).

This ensures easy handling and simple operation in which all centering procedures are effected with the aid of the floating tabletop. When at rest the tabletop is locked electromagnetically.

For further details refer to 2. Technical data.

On the version with tomo extension the central beam is centered via the coupling bar.

1.1. General

The equipment is intended for combination with ceiling cranes CS61, 62, 64 with floor-mounted tubestand TS 20 and with the extension kit for tomography.

1.2. Versions

| Horizontal DIAGNOST (H) without sensing (with getalit tabletop) | 9848 500 17701 |
| Horizontal DIAGNOST (H) with sensing (with getalit tabletop) | 9848 500 17801 |
| Horizontal DIAGNOST (H) with automatic cassette loader (with getalit tabletop) | 9848 500 18101 |
| Horizontal DIAGNOST (H) without sensing (with CRP tabletop) | 9848 500 17901 |
| Horizontal DIAGNOST (H) with sensing (with CRP tabletop) | 9848 500 18001 |
| Horizontal DIAGNOST (H) with automatic cassette loader (with CRP tabletop) | 9848 500 18201 |

1.3. Items supplied

The horizontal DIAGNOST H basic unit is delivered in 2 packing units.

1.4. Weights (shipment)

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<th>Packing unit, contents</th>
<th>Weight about (kg)</th>
<th>Dimensions (cm)</th>
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<td></td>
<td>net</td>
<td>gross</td>
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<td>85</td>
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2. Technical data

2.1. Mechanical data

Tabletop

Dimensions:

Table edge section:

Tabletop movements:

Height of table adjustable:

Vertical movement motorized:

Tabletop/film distance:

Brakes of table:

Forces of movement:

Brake forces:

Loads:

Floor:

Operation with TOMO:

Position of center of gravity:

Load by patient:

Operation:

Length: 2400 mm  (permeable min. dimension: 2370 mm)
Width: 690 mm     (permeable min. dimension: 520 mm)

Aluminium section

Lengthwise: ± 600 mm
Crosswise:  ± 120 mm

900 mm max., 570 mm min.

330 mm

66.7 mm

electromagnetic central brake for lengthwise and crosswise movement.

max. 20 N at max. load of 85 kg

min. 150 N for lengthwise and crosswise movements.

about 220 kg (on about 0.4 m²) load of basic unit when ready for operation (without patient). This load is subdivided into unequal parts which vary according to the position of the tabletop and are transmitted to the floor via the 8 fixing points of the base.

additional statical floor load about 40 kg, caused by tomo column.

see AZ–2.1/2.2.

max. 135 kg permissible at the protruding end of the tabletop when moved out as far as possible.

Four–part pedal–operated switching unit.
The outer two pedals control central operation of the brakes combined with switch–on of the field illuminator.
The inner two pedals control the following movements:
on the right: upward movement and
on the left: downward movement, only in centered position of the bucky carriage.

Simultaneous actuation of the two inner pedals given preference to downward movement.
The movement of the table height stops automatically on preferred table height.
2.2. Electrical data

Supply voltage: 230 V~, 5 A, 50/60 Hz
Low-tension unit: built into the baseframe of the table by the factory
Mode of connection: Top decade connectors
Extension facilities considered: space for diaphragm control unit, diaphragm adapter, tomography control unit, SID and layer-height meter

3. Compatibility

The buxy table has been prepared for combination with:
- Anti-scatter grid for 100 cm SID
- Anti-scatter grid for 110 cm SID
- AMPLIMAT measuring chamber
- Tomography unit LT (for combination with TS 20)
- Adaptation tomography unit LT to HDH (for combination with TS 20)
- Tomo LT for HDH (for combination with CS6)
- Coordinate display
- Control desk for horizontal DIAGNOST H
- Adaptation for positive beam limitation
- Tabletop getaalt
- Tabletop CRP
Scope of delivery

<table>
<thead>
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<th>Designation of items</th>
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<td><strong>Pos.</strong></td>
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<td><strong>3</strong></td>
<td>Base of unit and set of cover panels</td>
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<tr>
<td><strong>4</strong></td>
<td>Set of foundation parts</td>
</tr>
<tr>
<td><strong>5</strong></td>
<td>SUBSYSTEM manual and installation instructions</td>
</tr>
<tr>
<td><strong>6</strong></td>
<td>Accessories for cables (only for versions with sensing)</td>
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</table>
weight of unit incl. standard patient (135kg) : 354kg

Load at bearing surfaces (see AZ - 3.1)

headend side : 2022N & 206kg (CG1)
footend side : 1451N & 148kg (CG2)
total : 3473N & 354kg (CG)

centre of gravity CG at tabletop in centre position
weight of unit incl. standard patient (135kg) : 394kg

Load at bearing surfaces (see AZ - 3.1)
- headend side : 2022N Ø 206kg (CG1)
- footend side : 1451N Ø 148kg (CG2)
- rear side : 302N Ø 40kg (CG3)
- total : 3865N Ø 394kg (CG)

centre of gravity CG at tabletop in centre position
* MIN. WALL CLEARANCE IN CONJUNCTION WITH TSI0

**LAYOUT PLAN**

- **LONGITUDINAL AXIS**
- **TRANSVERSE AXIS**
- **M10 (4x)**
- **M10 (8x)**
- **CABLE INLET**
- **ONLY WITH TOMO**

Dimensions:
- MIN. 2300
- MIN. 3000
- 185, 356, 712, 185
Set of floor fixing material for HDH
### Installation:

#### Customer:

<table>
<thead>
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<th>Explanation</th>
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<tr>
<td>4522 101 72741</td>
<td>universal modular wall junction box</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4512 152 31702</td>
<td>1 mounting rail assembly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4512 152 31721</td>
<td>prot. cover for mounting rail assembly</td>
<td>set of 10 pieces each</td>
<td></td>
</tr>
<tr>
<td>4512 126 25243</td>
<td>set of screw–plug elements</td>
<td></td>
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</tr>
<tr>
<td>4512 125 71581</td>
<td>connection block</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4512 152 55244</td>
<td>protective conductor busbar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4512 152 31461</td>
<td>foundation frame</td>
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<td></td>
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<tr>
<td>0712 164 01002</td>
<td>cable M</td>
<td></td>
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<tr>
<td>0712 163 03001</td>
<td>cable N</td>
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<td></td>
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<tr>
<td>0712 163 00001</td>
<td>cable Q</td>
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</tr>
<tr>
<td>0712 164 10003</td>
<td>cable R</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0722 207 04022</td>
<td>cable MM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4522 100 85001</td>
<td>cable MP</td>
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<td></td>
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<tr>
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<td>cable MT incl. earth wire (SL)</td>
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<td>cable MT incl. earth wire (SL)</td>
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<td>cable MU</td>
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<td>0722 276 05003</td>
<td>cable dx</td>
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<tr>
<td>0722 215 01017</td>
<td>cable dy</td>
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<td></td>
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<tr>
<td>0722 215 19005</td>
<td>cable dz</td>
<td></td>
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<td>0722 186 00095</td>
<td>cable (earth wire) SL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4512 152 31241</td>
<td>cable (earth wire) SL</td>
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<td>0722 186 00503</td>
<td>cable (earth wire) SL</td>
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<td>cable (earth wire) SI</td>
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<td>8 mm measuring chamber cable</td>
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<td>8 mm measuring chamber cable</td>
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<td>8 mm measuring chamber cable</td>
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<td>8 mm measuring chamber cable</td>
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<td>X5 5070/24</td>
<td>8 mm measuring chamber cable</td>
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<td>X5 5070/28</td>
<td>8 mm measuring chamber cable</td>
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<tr>
<td>0722 299 01018</td>
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1. **Introduction**

The bucky table can be mounted only after the pre-installation work according to Planning Reference Book - XRD Hamburg has been completed.

2. **Tools**

- Set of standard tools,
- Universal-type measuring instrument,
- Precision-type spirit level 4512 152 53201 (0.3 mm/m accuracy).

3. **Installation material**

Decade cables supplied.

4. **Installing the basic unit**

If the unit is intended to be set up on 2 floor plates remove the nuts and washers from the 6 safety bolts which may have been shortened and introduce the bolts into the holes drilled.

- Place the unit upon the floor plates and align it. Fit washers and nuts onto the threaded ends of the bolts and tighten the nuts.

The torque is correct if the cone-shaped washer of the bolt is pressed flat by the M10 hexagon nut being tightened.

When fixing the unit on vertically adjustable supports or a foundation frame proceed as would be logical.

**Caution!**

The clamps at the lifting spindles have been adjusted at the factory. Do not change the adjustment of the clamps. If the clamps are wrongly adjusted the lifting motor may be subject to overload.
5. Installing the Amplimat measuring chamber

5.1. Bucky module for manual operation

The measuring chamber amplifier should be positioned on the right. Unscrew the cover panel (2 screws M3).

- Plug the Amplimat cable and screw the plug on.
- Install the measuring chamber, secure the cable by a clamp.
- Install plug VA1 and, if required, VA3 (for sensing).
- Mount the cover panel.
- Install the anti-scatter grid in the frame found in the unit.
- Mount the front covering of the bucky frame (3 countersunk screws M3).
- Insert the plastic covering.
- Fit the rear covering with 3 countersunk screws M3.
- Screw on the rear and front coverings.
- Screw on 2 lateral cover strips.

5.2. Automatic cassette loader (ACL)

- Remove the cover of the ACL (16 screws).
- Remove the cover of CPU board/drive mechanism.
- Remove the screw connecting the drive to the grid.
- Remove the grid carriage.
- Introduce the Amplimat cable and screw the connector on.
- Install the measuring chamber and screw it on with the 4 clamping screws.
- Route the Amplimat cable through the holes punched out in the ACL and fix the cable with tie-wraps.
- Re-attach grid carriage and all covers.
- Fix the label to the top of the ACL cover. This label indicates the position of the measuring fields.
6. Electrical connection

- Equip the external cables with top decade plugs.
- Introduce the top decade plugs according to connection diagrams AZ–6.1 to AZ–6.6 and Z–21 to Z–26.
- Establish protective–earth conductor connections.
- Bring 230 V to mains filter SZF.
7. Operation with sensing

Insert multi-leaf diaphragm control unit LB, 9804 602 8..01, into the installation frame and screw it on.

For operation with BWS format sensing an LD adapter 9804 183 50102 is additionally required.

- In this case first screw units LB and LD together and then insert them into the installation frame.

Install SID unit and height-of-layer measuring unit 9804 183 80002 in base SU.

Run the cables in parallel to those of the end–position switches.

Place the plug in SZ X18.

Establish electrical connection of units LD and LB according to drawings AZ–6.2 to 6.6.

With BWS with sensing only:

Connect plug points 05 and 06 of SZ101 X4.

8. Operation with tomo

Continue with section B of SUBSYSTEM manual.

Tomoigraphy unit LT.
9. Insert the tabletop

- Remove one limit stop from the front end of the tabletop.
- Slide the tabletop onto the transverse carriage (2 persons).
  
  **Caution!**
  **Avoid damaging the brakes!**
- Re-install the limit stop.

9.1. Insert the tabletop when the space is restricted

If the tabletop cannot be introduced from the side, proceed as follows on both sides of the transverse carriage:

- Unscrew the coverings (1)
  (4 sockethead cap screws from below and 1 spacing sleeve on the right side).
- Loosen coverings (2) and keep them suspended on the cable.
- Remove cable clamps and earth connections from the brakes and remove the brakes (3).
- Turn out the screws and remove the stops (4).

- Pull the transverse carriage out in forward direction.
- Attach one limit stop (accessories) to the rail of the tabletop.
- Slide the tabletop cautiously onto the transverse carriage.
- Install the second limit stop.
- Re-install the transverse carriage with the tabletop on the basic unit.
- Re-install the stops, brakes and covers.
- Press the sealing plugs into the rails of the tabletop.
9.2 Adjust the bearings for the lateral guide of the tabletop

To be adjusted only in case of lateral play of the tabletop or if it jams.

- Remove the stops of the tabletop and move the tabletop towards the foot end till the head-end ball bearings (1) are just disengaged.

Caution!
Do not move beyond pin (2)! This pin is intended to support the tabletop.

- Slightly loosen the sockethead cap screws on the bearing axles.
- Then adjust the eccentric axles with a screwdriver as follows:
  - With one bearing each at the head and foot-end sides adjust the distance between brake strip and brake magnet to 0.3 mm.
  - With the other two bearings reduce lateral play of the tabletop guide. The tabletop must move over its whole range of travel without jamming.

Screw the sockethead cap screws on again.

Note
If the adjusting range of the bearings is insufficient change the number of washers underneath the brake magnet as required:

- Loosen the screw fixing the brake magnet. While doing so, keep the opposite sockethead cap screw in the magnet in position with a screwdriver.
- Add or remove the required number of washers.
- Provide fixing screw and sockethead cap screw with a coat of locking liquid.
- Do not tighten the magnet entirely with the fixing screw. The axial play between brake magnet and fixing angle should continue to be 0.05 – 0.1 mm.
- Lock the fixing screw with the sockethead cap screw.
9.3. Adjust the 4 bearings supporting the tabletop

- Slightly loosen the sockethead cap screws on the bearing axles which are accessible from above.
- Use a 10 mm open-end spanner to turn the eccentric axles of the bearings such that the tabletop can be moved over the whole range with as little play as possible and at the same time without jamming. A punch mark on the axle indicates the maximum position of the eccentric.
- Re-tighten the sockethead cap screws.

10. Finishing Work

- Re-attach all coverings and check all unit functions.

11. List of assemblies

SA Brakes of tabletop (crosswise)
SC Footswitch unit
SD Brakes of tabletop (lengthwise)
SR Switch grid center
SY Central earthing point
SZ NA unit and coding field
SZF Mains filter
ST Base of unit, left
SU Base of unit, right
VA Bucky equipment
UK Control unit tomo
UL Pivot tower
UM Control box
LB Automatic diaphragm control unit
LD Diaphragm adapter.
## SETTING-TO-WORK

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DRAWINGS

Adjusting the format reference value voltage (example for SPFRHO/VE) .......... CZ–1
Adjusting the format reference value voltage (4 x blank forms) .................. CZ–1.1
1. Set the unit to the present mains voltage

1.1. Unit SZ
Connect the voltmeter to SZ–T1, points 2 and 4.

- Switch the generator on.
Setpoint of mains voltage: 220 V ± 5%.
- With overvoltage: change point 4 to 5.
- With undervoltage: change point 4 to 3.

2. Check the brakes
- Operate the left and the right foot pedal. The brakes for longitudinal and transverse movement of the tabletop are released.

The light display of the collimator lights up.

3. Check the limits of the table’s range of travel
- Move the table fully up:
The height of the table must be 900 ± 2 mm.
  Adjustable at the limit for the table height in base SU.
- For HDH with sensing:
  Measure the resistance value of FFD potentiometer SU R1 at terminals 2 and 3.
  Setpoint: 500 Ω ± 10%.
- For HDH with TOMO:
  Measure the resistance value of layer–height potentiometer SU R2 at terminals 1 and 2.
  Setpoint: 200 ohms ± 10%.
- Move the table fully down. The height of the table from floor to upper surface of tabletop must be 575 ± 5 mm.
  Adjustable at the limit for the table height in base SU.

The resistance value of the FFD potentiometer must be ≤ 4.55 kΩ.
The resistance value of the layer–height potentiometer must rise.
3.1. Set switches SU S5/S6

Move the horizontal DIAGNOST H upwards to the desired table height (about 75 cm).
- Set switch SU S5 such that it just responds.
- Move the horizontal DIAGNOST H downwards to the desired table height (about 75 cm).
- Set switch SU S6 such that it just responds.

4. Center the CS ceiling crane

4.1. Carry out adjustment and test work on the ceiling crane

Described in manual:
SUBSYSTEM CS6. Ceiling cranes, section B.

4.2. Central beam

- Carry out the centering with centering tube 4522 980 31521.
- Align flange (1) with the 3 screws such that 2 concentric rings are produced.
- Make test exposures with the centering cassette.
4.3. Centering X-ray/light
- Mount the collimator.
- Make an exposure and check whether X-ray and light coincide.
  If necessary, carry out an alignment according to the collimator manual.

4.4. Telescopic tube system perpendicular
- Fasten a perpendicular at the telescopic tube.
- Move the CS ceiling crane in vertical direction. Maximum permissible deviation: 1 mm/m.
- In case the deviation is larger align the ceiling rails again (see CS manual, section A, 4.).

4.5. Tube housing assembly right-angled with respect to the longitudinal axis
- Switch on the field illuminator.
- Set up two measuring surfaces.
- Drop two plumb bobs from the ceiling rail.
- Swing the tube housing assembly and mark the image of the crosswires on the measuring surfaces.
  Dimensions A and A' must be equal. Permissible deviation: 1.5 mm.
- Set by loosening the grub screws and turning the tube housing assembly support.

4.6. Beam axis perpendicular
- Switch on the field illuminator of the collimator.
- Move the tube housing assembly 1 m in vertical direction.
- Measure the migration of the crosswires. Maximum permissible deviation: 2 mm/m.
4.6.1. Centering in Y-direction

Turn the tube housing assembly in its clamp.

4.6.2. Centering in X-direction

There is a hole on the underside of the guide tube of the tube housing assembly (see arrow).

- Swing the tube housing assembly three times through 90° and one after the other 3 screws will become accessible through the hole in the underside of the guide tube.
- Loosen these screws and set the tube housing assembly in X-direction.
- Re-tighten the three screws and repeat the centering.

4.7. Align the bucky wallstand

Align the bucky wallstand to the middle of the axis of the table. Use a plumb bob dropped from the ceiling as a reference point.

Make the check with the field illuminator.
- Swing the tube housing assembly towards the BWS.
- Switch the field illuminator on.
- Move the tube housing assembly by 1 m in longitudinal direction.
- The migration of the crosswires with respect to the vertical line on the bucky wallstand must not exceed 1.5 mm.
- Align the BWS at right angles with respect to the beam axis.
- Check with a mirror test.
5. Align FFD and format sensing

5.1. Alignment without LD adapter  (for alignment with LD adapter refer to para. 5.2.)

5.1.1. Jumper setting

<table>
<thead>
<tr>
<th>DESIGNATION</th>
<th>JUMPER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SZ101 W1</td>
<td>from X46 to X47</td>
<td>no tomo</td>
</tr>
<tr>
<td>PCB LB1</td>
<td>W1 1 to 2</td>
<td>limit cassette size</td>
</tr>
<tr>
<td></td>
<td>W2 1 to 2</td>
<td>auto reset ON</td>
</tr>
<tr>
<td>PCB LB2</td>
<td>S1–1 closed</td>
<td>iris</td>
</tr>
<tr>
<td></td>
<td>S1–2 open</td>
<td>variable formats</td>
</tr>
<tr>
<td></td>
<td>S1–3 open</td>
<td>variable formats</td>
</tr>
<tr>
<td></td>
<td>S1–4 open</td>
<td>variable formats</td>
</tr>
<tr>
<td>PCB LB3</td>
<td>W1 lower position</td>
<td>DIRV. (internal reference)</td>
</tr>
<tr>
<td>PCB LB6</td>
<td>W1 fit</td>
<td>closing relay contact</td>
</tr>
<tr>
<td></td>
<td>W2 remove</td>
<td>closing relay contact</td>
</tr>
<tr>
<td></td>
<td>W3 fit</td>
<td>opening relay contact</td>
</tr>
<tr>
<td></td>
<td>W4 remove</td>
<td>opening relay contact</td>
</tr>
<tr>
<td></td>
<td>W5 remove</td>
<td>no internal SELAUT</td>
</tr>
<tr>
<td>PCB LB8</td>
<td>S1–1 closed</td>
<td>no VSID2</td>
</tr>
</tbody>
</table>

5.1.2. FFD potentiometer in the ceiling crane

Test points: LB X17:2 and X18:3 (U V)

- Turn the generator ON and select the TABLE BUCKY auxiliary.
- Move the crane away from the table and bring the crane to the lowest vertical position towards the floor.
- Set the vertical FFD potentiometer (UAG R1 on the CS6., UZ R1 in the TS 20) for a meter reading of 500 mV ± 10 mV.
5.1.3. FFD potentiometer in HDH (without LD adapter)

Test points: LB X17:03 and X18:3 (0 V)
Move the HDH into its upper position.
- Turn potentiometer SU R1 in the HDH for a reading of 1 V ± 10 mV.

5.1.4. FFD alignment ceiling crane (without LD adapter)

Test points: LB8 X1:R and X1:1 (0 V)
Set the maximum FFD.
Set 0 V with potentiometer LB8 R1.
Connect the measuring instrument to LB8 X1:S.
Set 1 V with potentiometer LB8 R4.
Connect the measuring instrument to LB8 X1:L.
Turn potentiometer LB8 R1 such that 20 cm vertical movement of the FFD changes the voltage by 1 V.
Move the ceiling crane until the display reads 5 V.

5.1.5. FFD alignment HDH (without LD adapter)

Test points: LB8 X1:R and X1:1 (0 V)
Turn potentiometer LB8 R2 such that the voltage changes by 1 V when the table is moved by 20 cm.
Bring the HDH into its upper position.
Set an FFD of 65 cm with the ceiling crane.
- Set 3.25 V with potentiometer LB8 R4.

5.1.6. 0 V alignment LB3

Test points: LB3 X1:16 and X1:1 (0 V)
- Close the horizontal and vertical pairs of leaves.
- Set 0 V ± 20 mV with potentiometer LB3 R6.
- Connect the measuring instrument to LB3 X1:8.
- Set 0 V ± 20 mV with potentiometer LB3 R3.

<table>
<thead>
<tr>
<th>LB 1</th>
<th>LB 2</th>
<th>LB 3</th>
<th>LB 4</th>
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<td>R6</td>
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<td>R3</td>
<td>R4</td>
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<td>R4</td>
<td>R4</td>
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<td>CORR VSET:R2</td>
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<td>CORR VAC1 R1</td>
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<td>R6</td>
<td>R6</td>
<td>CORR VSET:R3</td>
<td>R5</td>
<td></td>
<td>R6</td>
</tr>
<tr>
<td></td>
<td>R3</td>
<td></td>
<td>CORR VSET:HOR 1</td>
<td>R3</td>
<td></td>
<td>CORR VAC1 IR1</td>
</tr>
<tr>
<td>SID &gt; 205</td>
<td>CORR VSET:R2</td>
<td>SID &gt; 205</td>
<td>CORR VSET:HOR 2</td>
<td>R5</td>
<td></td>
<td>R5</td>
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<tr>
<td>SID &lt; 85</td>
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<td>R6</td>
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<td></td>
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<td>R6</td>
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</tbody>
</table>

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5.1.7. Set the sensing potentiometer in the HDH bucky assembly (without LD adapter; manual bucky only, not with ACL!) 

**Note**  
*Vertical is always head to foot, horizontal is always transverse or crosstable.*

- Turn the generator ON and select the TABLE BUCKY auxiliary.
- Connect a DVM to decade pin LB X16 pin 5 (+) and pin 3 (−).
- Remove the bucky tray from the table bucky.

**Note**  
*In order for the tray to be removed, the safety latch has to be retracted. This latch is located on the right side underneath the tray.*

- Remove the cover located at the back of the tray.
- Place a cassette 35.6 cm × 35.6 cm into the table bucky tray.

**Note**  
*When inserting a cassette in the bucky tray, position the cassette so the arrow on the cassette lines up with the indent of the cassette holder in the tray.*

- Loosen the two set screws on VBR1 and rotate the potentiometer to obtain 7.9 V on the DVM.  
(CW increases the voltage, CCW decreases the voltage).

**Note**  
*Be careful not to short out the terminals on the potentiometer to the set screws!*

- Move the + lead of the DVM to LB X16 pin 6.
  - Loosen the two set screws on VB R2 and rotate the potentiometer to obtain 7.9 V on the DVM.  
(CW increases the voltage, CCW decreases the voltage).
  - Tighten the set screws on both format potentiometers of the bucky tray.
  - Re-install the cover onto the rear of the bucky tray and insert the tray into the table.
  - Verify the cassette is still centered in the bucky tray.

Continue with para. 5.4. "Alignment of collimator"
### 5.2. Alignment FFD and format sensing with LD adapter

#### 5.2.1. Jumper setting

<table>
<thead>
<tr>
<th>DESIGNATION</th>
<th>JUMPER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>SZ101 W1</td>
<td>from X46 to X47</td>
<td>no tomo</td>
</tr>
<tr>
<td>PCB LB1</td>
<td>W1 1 to 2</td>
<td>limit cassette size</td>
</tr>
<tr>
<td></td>
<td>W2 1 to 2</td>
<td>auto reset ON</td>
</tr>
<tr>
<td>PCB LB2</td>
<td>S1–1 closed</td>
<td>Iris</td>
</tr>
<tr>
<td></td>
<td>S1–2 open</td>
<td>variable formats</td>
</tr>
<tr>
<td></td>
<td>S1–3 open</td>
<td>variable formats</td>
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<tr>
<td></td>
<td>S1–4 open</td>
<td>variable formats</td>
</tr>
<tr>
<td>PCB LB3</td>
<td>W1 upper position</td>
<td>DIRV. EXT</td>
</tr>
<tr>
<td>PCB LB6</td>
<td>W1 fit</td>
<td>closing relay contact</td>
</tr>
<tr>
<td></td>
<td>W2 remove</td>
<td>closing relay contact</td>
</tr>
<tr>
<td></td>
<td>W3 fit</td>
<td>opening relay contact</td>
</tr>
<tr>
<td></td>
<td>W4 remove</td>
<td>opening relay contact</td>
</tr>
<tr>
<td></td>
<td>W5 remove</td>
<td>no internal SELAUT</td>
</tr>
<tr>
<td>PCB LB8</td>
<td>S1–1 closed</td>
<td>no VSID2</td>
</tr>
<tr>
<td>PCB LD110</td>
<td>W1 2 to 3</td>
<td>no IL present</td>
</tr>
<tr>
<td></td>
<td>W2 2 to 3</td>
<td>no BT S4</td>
</tr>
</tbody>
</table>

#### 5.2.2. Set the sensing potentiometer in the HDH
(with LD adapter; manual bucky only, not with ACL)

**Note:**
- **vertical** is always head to foot, **horizontal** is always transverse or crosstable.
- Turn the generator ON and select the TABLE BUCKY auxiliary.
- Connect a DVM to decade pin LD X6 pin 5 (+) and pin 3 (–).
- Remove the bucky tray from the table bucky.
Note
In order for the tray to be removed, the safety latch has to be retracted. This latch is located on the right side underneath the tray.
- Remove the cover located at the back of the tray.
- Place a cassette 35.6 cm × 35.6 cm into the table bucky tray.

Note
When inserting a cassette in the bucky tray, position the cassette so the arrow on the cassette lines up with the indent of the cassette holder in the tray.
- Loosen the two set screws on VB R1 and rotate the potentiometer to obtain 7.9 V on the DVM.
  (CW increases the voltage, CCW decreases the voltage).

Note
Be careful not to short out the terminals on the potentiometer to the set screws!
- Move the + lead of the DVM to LD X6 pin 6.
- Loosen the two set screws on VB R2 and rotate the potentiometer to obtain 7.9 V on the DVM.
  (CW increases the voltage, CCW decreases the voltage).
- Tighten the set screws on both format potentiometers of the bucky tray.
- Re-install the cover onto the rear of the bucky tray and insert the tray into the table.
- Verify the cassette is still centered in the bucky tray.

5.2.2.1. Horizontal format value HDH
Test points: LD106X21 (+) and X1:302 (0 V)
- Select auxiliary unit bucky.
- Insert a cassette 35 × 35 cm.
- Set the maximum voltage with potentiometer LD106 R2 and enter the voltage value in diagram CZ-1.1 located at the end of this chapter for 356 mm.
- Insert a cassette 13 cm (horizontally) x 18 cm (vertically).
- Enter the voltage value measured for 130 mm in the diagram.
- Interconnect the voltage values and extend the line till it meets the 10 V line (line A on CZ-1).
- Then connect the intersection point of the straight line and the 10 V line with zero (line B on CZ-1).
Determine the voltage value for format 13 cm which can be read on the new straight line and set the voltage with potentiometer LD106 R1.

Insert a cassette 35 × 35 cm.
Set the voltage to +7.12 V with potentiometer LD106 R2.

5.2.2.2. Vertical format value HDH

Test points: LD106:X22 and X1:B02 (0 V)
- Select auxiliary unit bucky.
- Insert a cassette 35 × 35 cm.
- Set the maximum voltage with potentiometer LD106 R4 and enter the voltage value in diagram CZ-1.1 (located at the end of this chapter) for 356 mm.
- Insert a cassette 13 cm (vertically) × 18 cm (horizontally).
- Enter the voltage measured for 130 mm in the diagram.
- Interconnect the voltage values and extend the line till it meets the 10 V line.
- Then connect the intersection point of the straight line and the 10 V line with zero.

Determine the voltage value for format 13 cm which can be read on the new straight line and set the voltage with potentiometer LD106 R3.

Insert a cassette 35 × 35 cm.
Set the voltage to +7.12 V with potentiometer LD106 R4.

5.2.3. Set the sensing potentiometer in the BWS (manual bucky only, not with ACL!)

- Turn the generator ON and select the BWS auxiliary.
- Connect the DVM to decade pin LD X7 pin 5 (+) and pin 3 (−).
- Remove the bucky tray from the BWS.

Note
In order for the tray to be removed, the safety latch has to be retracted. This latch is located on the right side underneath the tray.
- Remove the cover located at the back of the tray.
- Place a cassette 35.6 cm × 35.6 cm into the BWS bucky tray.
Note
When inserting a cassette in the bucky tray, position the cassette so the arrow on the cassette lines up with the indent of the cassette holder in the tray.

- Loosen the two set screws on VB R1 and rotate the potentiometer to obtain 7.9 V on the DVM.
  (CW increases the voltage, CCW decreases the voltage).

Note
Be careful not to short out the terminals on the potentiometer to the set screws!

- Move the + lead of the DVM to LD X7 pin 6.

- Loosen the two set screws on VB R2 and rotate the potentiometer to obtain 7.9 V on the DVM.
  (CW increases the voltage, CCW decreases the voltage).

- Tighten the set screws on both format potentiometers of the bucky tray.

- Re-install the cover onto the rear of the bucky tray and insert the tray into the BWS.

- Verify the cassette is still centered in the bucky tray.

5.2.3.1. Horizontal format value BWS

Test points: LD106:X21 and X1:D02 (0 V)

- Select auxiliary unit BWS.

- Insert a cassette 35 × 35 cm.

- Set the maximum voltage with potentiometer LD106 R6 and enter the voltage value in diagram CZ-1.1 for 356 mm.

- Insert a cassette 13 cm (horizontally) × 18 cm (vertically) into the BWS bucky tray.

- Enter the voltage measured for 130 mm in the diagram.

- Interconnect the voltage values and extend the line till it meets the 10 V line.

- Then connect the intersection point of the straight line and the 10 V line with zero.

- Determine the voltage value for format 13 cm which can be read on the new straight line and set the voltage with potentiometer LD105 R5.

- Insert a cassette 35 × 35 cm.

- Set the voltage to +7.12 V with potentiometer LD106 R6.
5.2.3.2. Vertical format value BWS

Test points: LD106:X22 and X1:802 (0 V).
Select auxiliary unit BWS.
Insert a cassette 35 × 35 cm.
- Set the maximum voltage with potentiometer LD106 R8 and enter the voltage value in diagram CZ-1.1 for 366 mm.
- Insert a cassette 13 cm (vertically) × 18 cm (horizontally).
- Enter the voltage measured for 130 mm in the diagram.
Interconnect the voltage values and extend the line till it meets the 10 V line.
Then connect the intersection point of the straight line and the 10 V line with zero.
Determine the voltage value for format 130 mm which can be read on the new straight line and set the voltage with potentiometer LD106 R7.
- Insert a cassette 35 × 35 cm.
- Set the voltage to +7.12 V with potentiometer LD106 R8.

5.2.4. Vertical FFD adjustment
Turn the generator ON and select TABLE BUCKY auxiliary.
Move the crane away from the table and bring the crane to the lowest vertical position towards the floor.
Connect a DVM to decade LD X3 pin 2 (+) and pin 3 (-) and set the vertical FFD potentiometer UAG R1 on the crane for a meter reading of 500 mV ± 10 mV.
- Connect the DVM to decade LD X2 pin 4 (+) and pin 5 (−).
- Move the HDH tabletop to the upper position and turn potentiometer SU R1 in the HDH for a reading of 1.0 V ± 10 mV.
- Turn R2 on LD102 fully counter clockwise.
- Turn R1 on LD102 fully clockwise and set R3 to the mid position.
- Connect the DVM to test point LD102:X21 (+) and X1:B02 (−).
- Place a cassette into the bucky tray and position the crane over the cassette.

1. Using the tape measure in the crane handle assembly, adjust the height of the crane so that the FFD = 70 cm.

2. Measure the voltage on the DVM and record as V1.

3. Adjust the distance of the crane so the FFD = 90 cm.

4. Measure the voltage on the DVM and record as V2.

\[ V1 = \underline{\text{---------}} \ V. \]

\[ V2 = \underline{\text{---------}} \ V. \]
6. Subtract V1 from V2. The resultant voltage should equal 1 V ± 10 mV. If the voltage is out of tolerance, proceed as follows: (keep the FFD at 90 cm)
   - Divide V2 by the difference between V1 and V2 (V2/(V2 – V1) = V3.
   - Adjust R3 on LD102 so that the meter displays voltage V3. (FFD at 90 cm).
   - Repeat steps 1. through 5.

6. Keep the DVM connected to test point X21 on LD102 and move the FFD of the ceiling crane until the meter displays 4 V.

Move the HDH tabletop into the upper position and note the voltage displayed on the meter.

8. Adjust R2 on LD102 to increase this voltage by 500 mV.

9. Measure the voltage on the DVM and record as V1. \( V1 = \) ___________ V.

10. Lower the FFD of the table by 20 cm.

11. Measure the voltage on the DVM and record as V2. \( V2 = \) ___________ V.

12. Subtract V1 from V2. The resultant voltage should equal 1.0 V ± 10 mV. If the voltage is out of tolerance, proceed as follows:
   - Divide V2 by the difference between V1 and V2 (V2/(V2 – V1) = V3.
   - Adjust R2 on LD102 so that the meter displays voltage V3.
   - Adjust the height of the ceiling crane or table to obtain an FFD of 65 cm.
   - Adjust R1 on LD102 until the meter reads 3.25 V (± 10 mV).
   - Adjust the height of the ceiling crane or table to obtain an FFD of 100 cm and verify the voltage = 5 V (± 10 mV).
   - If the voltage is out of tolerance, repeat steps 6. through 12.

Disconnect the DVM.
5.3. BWS FFD adjustment

- Turn the generator ON and select the WALL BUCKY auxiliary.
- Place a cassette in the BWS bucky tray and position the crane in front of the cassette.
- Using the tape measure in the crane handle assembly, adjust the horizontal distance of the crane so that the FFD (film focus distance) = 65 cm.

Note
If an FFD of 65 cm is not possible, use the smallest FFD. It may be necessary to rotate the X-ray tube, so that the collimator faces the cassette. To accomplish this depress the black button located on the crane handle and/or the lever on the telescopic arm and rotate the tube in the desired position.

- Connect a DVM to decade LD X3 pin 8 (+) and pin 9 (−) and set the horizontal FFD potentiometer on the crane for a reading of 900 mV ± 50 mV).
- Turn R7 on LD102 fully counter clockwise.
- Turn R8 on LD102 to the mid-range position.
- Connect a DVM to test point LD102:X21 (+) and X1:B02 (−)

<table>
<thead>
<tr>
<th>LD 102</th>
<th>LD 106</th>
<th>LD 110</th>
<th>LD 302</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
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<td>R1</td>
<td></td>
</tr>
<tr>
<td>R2</td>
<td>R2</td>
<td>R2</td>
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</tr>
<tr>
<td>R22</td>
<td>R22</td>
<td>R22</td>
<td></td>
</tr>
</tbody>
</table>

1. Adjust the distance of the crane until the FFD = 100 cm.
2. Measure the voltage on the DVM and record as V1. \( V1 = \) ______ V.
3. Adjust the distance of the crane until the FFD = 120 cm.
4. Measure the voltage on the DVM and record as V2. \( V2 = \) ______ V.
5. Subtract V1 from V2. The resultant voltage should equal 1 V ± 10 mV. If the voltage is out of tolerance, proceed as follows: (keep the FFD at 120 cm)
   - Divide V2 by the difference between V1 and V2 \( V2/(V2 - V1) = V3 \).
   - Adjust R8 on LD102 so that the meter displays voltage V3.
   - Repeat steps 1. through 5.

- Adjust the distance of the ceiling crane to obtain an FFD of 100 cm.
  - Adjust R7 on LD102 for 5 V (± 10 mV).
  - Adjust the distance of the ceiling crane to obtain an FFD of 120 cm. Verify a meter reading of 6 V (± 10 mV).
  - Disconnect the DVM.
  - Remove the cassette from the BWS bucky tray.
5.4. Alignment of collimator

5.4.1. FFD alignment on LB8

Test points: LB8 X1:S and X1:1 (0 V)

Set 0 V with potentiometer R4.
- Connect the multimeter to test point: LB8 X1:U against X1:1 and record the voltage.
- Connect the multimeter to test point: LB8 X1:L against X1:1.
- Adjust LB8 R1 for a reading of the INVERSE value of the recorded voltage from LB8 X1:U.

5.4.2. Format alignment on LB2

Insert a cassette 35 × 35 cm (14" × 14") in the bucky tray.

Turn the generator on and select bucky auxiliary.

Turn potentiometer LB2 R2, R4 and R6 fully counter clockwise.

Verify that switch LB8 S1–1 is closed.

Set an FFD of 1 m.

The scales on the collimator must read 34.5 × 34.5.

Correction with LB2 R5 (horizontal)

LB2 R3 (vertical).
5.4.3. Test exposures with radiation

- Turn the collimator through 45°.
- Set an FFD of ≤1 m.
- Insert a cassette 35 × 35 cm.
- Make one exposure each with the small and the large focus.
  Expose the film such that the film density is 0.9 – 1.2 (50 kV, 4 mAs).
  Tolerances:
  ±2 mm difference between large and small focus.

- Measure the exposed part of the film.
  Edges of the film
  Edges of the X-ray field
  Dimensions a and b must be equal.
  Tolerances: ≤2% of FFD
  Adjustable with LB2 R5 (horizontal)
  LB2 R3 (vertical).

- Make a test exposure with a cassette 13 × 18 cm.
  The same tolerances are applicable.
5.5. Manual collimator – FFD <65 cm

1. Turn the generator ON and select the TABLE BUCKY auxiliary.
2. Place a cassette into the table bucky tray and position the crane in front of the cassette.
3. Turn the manual override key switch fully counter clockwise to ensure that "Manual Override" is not activated.

Adjust the vertical distance of the crane for a FFD of 65 cm.

Adjust LB1 R4 until the "Manual mode light" just illuminates.

Increase the FFD, the "Manual mode light" should extinguish.

- Decrease the FFD until the "Manual mode light" illuminates. The FFD should equal 65 cm. If this is not correct, repeat steps 1. through 3.
- Remove the cassette from the table bucky tray.

5.6. Manual collimator – FFD >2M

1. Turn the generator ON and select the WALL BUCKY auxiliary.
2. Place a cassette into the wall bucky tray and position the crane in front of the cassette.
3. Turn the manual override key switch fully counter clockwise to ensure that "Manual Override" is not activated.

Adjust the horizontal distance of the crane for a FFD of 200 cm

2. Adjust LB1 R3 until the "Manual mode light" on the collimator just illuminates.
3. Decrease the FFD, the "Manual mode light" should extinguish.

- Increase the FFD until the "Manual mode light" illuminates. The FFD should equal 200 cm. If this is not correct, repeat steps 1. through 3.
- Remove the cassette from the wall bucky tray.
5.7. Exposure prevention – anode angle coverage 100 cm  FFD = 43 cm

- Extend LB1 and connect a DVM to X1:U (+) and X1:1 (-) on LB1.
- Turn the generator ON and select the WALL BUCKY auxiliary.
- Place a cassette into the wall bucky tray and position the crane in front of the cassette.
- Turn the manual override key switch on the collimator fully clockwise to activate the "Manual Override".
- Adjust the horizontal and vertical shutters on the collimator for 43 cm as displayed on the front panel of the collimator.

1. Adjust LB1 R1 until the voltage on the DVM reading just switches "low".
   - Move the DVM from LB1 X1:U (+) to LB1 X1:V.

2. Adjust LB1 R2 until the voltage on the DVM just switches "low".

3. Close the vertical shutters, the voltage on the DVM should go "high".
   - Open the vertical shutters until the voltage on the meter switches "low". The vertical shutter size should be 43 cm. If incorrect, set the vertical shutter size for 43 cm and repeat steps 2. through 3.
   - Move the meter from LB1 X1:V (+) to LB1 X1:U.

4. Close the horizontal shutters, the voltage on the meter should go "high".

5. Open the horizontal shutters until the voltage on the meter just switches "low". The horizontal shutter size should be 43 cm. If incorrect, set the horizontal shutter size for 43 cm and repeat steps 1., 4. through 5.
   - Verify at the generator control desk that exposures are NOT possible if either shutter is opened greater then 43 cm.
   - Remove the cassette from the wall bucky tray.
   - Turn the generator OFF, disconnect the DVM and remove LB1 from the extender card.
5.8. Collimator lamp voltage and timer adjustment

Loosen the screw holding the collimator lamp cover and remove the cover.

Caution!
Do not touch the lamp with bare hands, the oils on your skin will reduce the lamp's life span. If the lamp is inadvertently touched, clean it with alcohol applied on a clean cloth.

Connect a DVM (AC volts) across the lamp.

- Turn the generator ON.
- Depress microswitch S1, located above the lamp. The meter should read between 11.5 and 12.00 VAC if not, proceed as follows:

Measure the voltage across wires 1 and 6 on terminal block LB100 on the LB chassis (this will be the reference point to start from on the chart).

- Turn the generator OFF.
- Using the chart on the following page, program terminal block LB100 to be appropriate position.

Turn the generator ON and recheck the lamp voltage. If the voltage still does not fall between 11.5 and 12 V, repeat step 1.

Using a stop watch (or a watch with a second hand) measure the time that the collimator lamp stays illuminated. The allowable time is between 27 and 33 seconds.
If incorrect, proceed as follows:
- If the lamp stays too long, adjust LA1 R1 counter clockwise. (LA1 R1 is located on a small PC board inside the collimator).
- If the lamp shuts off too quickly, adjust LA1 R1 clockwise.
- Re-time the duration of the collimator lamp, adjust LA1 R1 as required until the "ON" time is 30 ± 3 seconds.
### Wiring of T1 for different lamp supply voltages

<table>
<thead>
<tr>
<th>Voltage on T1 (nominal load of 8A)</th>
<th>Wire Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>12.00</td>
<td>8</td>
</tr>
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<td>8</td>
</tr>
<tr>
<td>22.05</td>
<td>8</td>
</tr>
</tbody>
</table>

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**Diagram of T1 and LB Connections**

[Diagram showing connections of T1 and LB]
5.9. Collimator centering lamp adjustment

Turn the generator ON.

Position the crane over the tabletop and fully open the vertical and horizontal shutters.

Activate the collimator lamp and the centering light on the collimator.

Note
The centering light button is located on the left side of the angulation meter on the crane handle.

- The centering line should line up with the cross hairs in the X-ray field. If the centering light does not line up in the center of the X-ray field, adjust the centering light by moving the toothed sheet metal lever in the desired direction.

Note
The toothed sheet metal lever can be accessed by sticking a screwdriver through the centering light exit hole in the control handle.
5.10. AMPLITMAT chamber switching adjustment

- Extend PCB LB6 and connect a DVM to X1:4 (+) and X1:1 (−).
- Turn the generator ON and select the TABLE BUCKY auxiliary.
- Place a cassette in the table bucky tray and position the crane at an FFD of 100 cm over the cassette.
- Adjust the horizontal shutters for 27 cm and the vertical shutters for 23 cm, as displayed on the front panel of the collimator.

1. Adjust LB6 R17 until the voltage on the meter just switches "high".
   - Move the positive (+) meter lead from LB6 X1:4 to LB6 X1:D.
   - Adjust LB6 R23 until the voltage just switches "high".

2. Close the vertical shutters until the voltage on the DVM just switches "low".

3. Open the vertical shutters until the voltage on the meter just switches "high". The vertical shutters size should be 23 cm. If incorrect, set the vertical shutter size for 23 cm and repeat steps 2. and 3.
   - Move the positive (+) meter lead from LB6 X1:D to LB6 X1:4.

4. Close the horizontal shutters until the voltage on the DVM just switches "low".

5. Open the horizontal shutters until the voltage on the meter switches "high". The horizontal shutters size should be 27 cm. If incorrect, set the horizontal shutter size for 27 cm and repeat steps 1., 4. and 5.
   - Open the horizontal and vertical shutters to 35 cm.
   - Select and verify that all three (3) AMPLITMAT chambers on the generator can be selected.

   Note
   If only the center AMPLITMAT chamber can be selected, program jumper W12 on LB6 to the "other" position.
   - Close the horizontal and vertical shutters to 20 cm.
   - Verify that only the center AMPLITMAT chamber is selected.
   - Remove the cassette from the table bucky tray.

- Select the wall bucky auxiliary at the generator control desk, and verify that the AMPLITMAT field switching functions in the same manner as the table bucky. If not:
  - If using a SUPER CP generator, check the Bucky II programming for auxiliaries 1 and 2.
  - If using a MEDIO CP generator, check jumper wires at EZA X7 and EZA X8. Refer to the system interconnect wiring diagrams.
  - Turn the generator OFF, disconnect the meter and remove LB6 from the extender card.
5.11. Table bucky chamber orientation check

Turn the generator ON and select the following on the generator desk:
- TABLE BUCKY auxiliary.
- LEFT AMPLIMAT field.
- 60 kV.

2. Place a cassette in the table bucky and center the crane over the left AMPLIMAT field.
   Note
   The bucky grid must be "cocked" before an exposure can be made.

3. Adjust the crane to an FFD 100 cm.

4. Adjust the horizontal and vertical shutters until only the left AMPLIMAT field is in the X-ray field. Cover the right and center fields with a lead apron.

5. Verify that the filtration disk on the collimator is set to "0".
   Warning!
   Radiation will be produced when the exposure button on the desk is depressed.
   Take all necessary radiation precautions.

6. Make an exposure by depressing the exposure button on the generator desk. The exposure time should be shorter than 10 ms. If the exposure time is longer than 10 ms, the wrong AMPLIMAT field is being selected.
   Perform the followings:
   - Turn the generator OFF.
   - Disconnect the table bucky AMPLIMAT cable from the generator.
   - Switch wires A and H with each other on the AMPLIMAT cable (EZB X1002).
   - Re-connect the AMPLIMAT cable.
   - Repeat steps 1. through 6.

7. Center the crane over the right AMPLIMAT field and cover the left and center fields with a lead apron.

8. Make an exposure by depressing the exposure button on the generator control desk.
   Verify the exposure time is less than 10 ms.

9. Select the right AMPLIMAT field on the generator control desk.

10. Make an exposure by depressing the exposure button on the generator control desk.
    Verify the exposure time is less than 10 ms.

11. Remove the cassette from the table bucky.
5.12. BWS AMPLIMAT chamber orientation check

1. Turn the generator ON and select the following on the generator desk:
   - TABLE BUCKY auxiliary.
   - LEFT AMPLIMAT field.
   - 60 kV.

2. Place a cassette in the wall bucky and center the crane over the left AMPLIMAT field.

3. Adjust the crane to an FFD 180 cm.

4. Adjust the horizontal and vertical shutters until only the left AMPLIMAT field is in the X-ray field. Cover the right and center fields with a lead apron.

5. Verify that the filtration disk on the collimator is set to "O".

   Warning!
   Radiation will be produced when the exposure button on the desk is depressed.
   Take all necessary radiation precautions.

6. Make an exposure by depressing the exposure button on the generator desk.
   The exposure time should be shorter than 10 ms.
   If the exposure time is longer than 10 ms, the wrong AMPLIMAT field is being selected.
   Perform the followings:
   - Turn the generator OFF.
   - Disconnect the wall bucky AMPLIMAT cable from the generator.
   - Switch wires A and H with each other on the AMPLIMAT cable (EZB X1001).
   - Re-connect the AMPLIMAT cable.
   - Repeat steps 1. through 6.

   • Center the crane over the right AMPLIMAT field and cover the left and center fields with a lead apron.

   • Make an exposure by depressing the exposure button on the generator control desk.
     Verify the exposure time is less than 10 ms.

   • Select the right AMPLIMAT field on the generator control desk.

   • Make an exposure by depressing the exposure button on the generator control desk.
     Verify the exposure time is less than 10 ms.

   • Remove the cassette from the wall bucky.
6. Operation with tomo continue with section C of the tomo manual

Continue with section C of the "Tomography unit LT" manual.

7. Set the bucky exposure delay

For all ACL see para. "Exposure start setting" of the ACL documentation.

The exposure must be made not until 120 – 150 ms after the grid magnet has dropped out to avoid that the release of the exposure coincides with the point of reversal of the bucky grid in case of short-time exposures.

Due to the different exposure delay times of the different generator types the total delay time must be adjusted at the bucky tray.

Coarse adjustment with link VA1 W1, fine adjustment with potentiometer VA1 R14.

<table>
<thead>
<tr>
<th>Generator</th>
<th>Generator delay time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>ms</td>
</tr>
<tr>
<td>SM 40</td>
<td>40 – 50</td>
</tr>
<tr>
<td>SM 70</td>
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<td>SM 80</td>
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<td>MM 80/85</td>
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<td>8 – 15</td>
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<tr>
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<td>8 – 15</td>
</tr>
<tr>
<td>MEDIO 51</td>
<td>40 – 60</td>
</tr>
</tbody>
</table>

7.1. Link VA1 W1

Link removed: 120 ms delay.
Link inserted: 85 ms delay.

At a generator delay time of 1 – 40 ms:
1. Remove the link.

At a generator delay time of 40 – 60 ms:
2. Insert the link.
7.2. Fine adjustment of delay time

- Measure the delay time between $20$ and $21$ with an oscilloscope on VA1–X10 and X11.
- Set this time to 130 ms with VA1–R14. R14 is accessible through a hole in the right-hand side panel of the bucky tray.

7.3. Check the delay time by test exposures

- Attach the lead plate supplied to the grid with a piece of adhesive tape. Hole in the lead plate on the center of the grid. Its long side in parallel with the direction of the grid movement.
- Make 2 exposures on the same film.

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Exposure time</th>
<th>kV</th>
<th>mA</th>
<th>Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.5 s</td>
<td>60</td>
<td>15</td>
<td>0.6 mm</td>
</tr>
<tr>
<td>2</td>
<td>0.02 s</td>
<td>125</td>
<td>25</td>
<td>0.6 mm</td>
</tr>
</tbody>
</table>

The images of the hole on the film correspond to the delay time.
- Set dimension "A" to 8 +2 mm with potentiometer VA1–R14.
  ($\frac{1}{4}$ revolution clockwise = 1 mm displacement towards the center of the stroke).
8 Test exposures

Do not measure the image quality until having completed the adjustment of the bearings opposite the guide bearings and the supporting bearings of the overhead suspension device.

The measuring equipment required is a bar–pattern phantom.

- Switch the unit on and select tomography on the control desk.
- Switch on the field illuminator of the collimator and cover a field of about 6 × 12 cm.
- Turn the 0.1 Cu + 1 Al filter disk of the field illuminator into the beam of radiation.
- Adjust the bar–pattern phantom symmetrically in relation to the field illuminated.
- Switch on the field illuminator for the layer height and adjust it vertically until the horizontal row of holes in the middle of the bar pattern phantom coincides with the center line of the light mark.
- Insert a cassette 18 × 24 cm.
- Make an exposure with the following data:
  - linear 30°/0.8 s
  - tomography 48 kV, 50 mA, fixed current, small focus.
- Check that the processed film bears the height–of–layer mark.

8.1 Evaluation of the bar–pattern radiograph

The pattern has 16 groups of 5 parallel bars each. The distances between the bars and the thickness of the bars decrease from group to group.

While the bars and the distances between them continue to be visible for the naked eye down to the smallest group, the number of groups clearly defined on a radiograph is restricted.

From a specific group downwards the group of bars on a radiograph will merely appear as a uniform gray line. The limit between perceptibility and non–perceptibility of the bars and the distances is the criterion for the "resolution" of a bar–pattern radiograph.

Attention! Pseudo–resolution.

The term of "pseudo–resolution" is applicable if the first group of lines no longer definable (when viewed from the left to the right) is followed by other groups of lines which appear to be defined again. These groups of lines, however, are displaced in phase so that the lines turn to be intervals and the intervals turn to be lines. If this phenomenon is noticed, the criterion for the resolution is the first resolved group of lines from the left.

The individual groups of bars bear the identification figures 1.0 through 4.86, corresponding to the number of bars per millimeter. The last group of bars still resolved is the criterion for the "resolution", while the "pseudo–resolution" must not be considered.

8.2 Resolution of bucky radiographs

The value of the "resolution" of a bucky radiograph can generally be expected to be as follows:

- 3.19 periods/mm and better for focus 0.6
- 2.09 periods/mm and better for focus 1.2.
8.3. Resolution of tomograms

Evaluate the exposures released as follows:
At least one point of the vertical row of points must be sharply defined as a round dot in the unblurred central area (plane of layer) of the bar-pattern radiograph.
An obvious distortion indicates a serious defect in the coupling between tomography carriage and tube housing. In this case first check the close fit of the film in the screen carriage and, secondly, the adjustment of the bearings, particularly the guide bearings on the overhead suspension device. If after the necessary corrections the point in the plane of the layer continues to be unSharply defined, advise the Service Division Hamburg.
If the point is defined clearly and without distortion, the resolution of the unblurred plane of the layer can be determined.
The resolution values of tomograms can be expected to be the following:
- 2.32 periods/mm and better for focus 0.6
- 1.88 periods/mm and better for focus 1.2.

8.3.1. Checking the layer-height

If the light mark and the actual layer-height are on the same level, the horizontal row of holes of the bar-pattern phantom is in the center of the unblurred area of the bar-pattern radiograph.
Considering the 30° inclination of the bar-pattern phantom the actual difference in height between two holes in the vertical row is 1 mm.
A max. deviation of 3 mm is permissible.

9. Finishing work

- Mount all cover panels.
- Clean the ceiling rails.
- Attach all labels and marks.
Drawings
Schematic diagrams

Simplified diagram power supply Z1-1
Schematic diagram without Tomo Z1-1.1
Schematic diagram with CS6. and Tomo Z1-1.2
Schematic diagram HDH manual diaphragm Z1-2.1
Schematic diagram HDH automatic diaphragm Z1-2.2
Schematic diagram HDH and VD with sensing Z1-2.3
Schematic diagram HDH with ACL and sensing Z1-2.4
Schematic diagram HDH and VD with ACL and sensing Z1-2.5
Schematic diagram manual bucky without Tomo Z1-3.1
Schematic diagram manual bucky with Tomo Z1-3.2
Schematic diagram automatic cassette loader without Tomo Z1-3.3
Schematic diagram automatic cassette loader with Tomo Z1-3.4
1) When using manual collimator 9804 602 80001 separate the connector cable at SZ101 X10:06

2) SZ101W1: To be removed with automatic diaphragm

Schematic diagram
HDH manual diaphragm
Drawings

Wiring diagram
Wiring diagram SZ
Wiring diagram ACL
Plan of potentials and functions
Wiring diagram free exposure interlock HDH with VD1/VD2
Z2-1
Z2-2
Z2-3
Z2-4
Z2-5
with Tamo: 101W1: from 101X45 to 101X47
101W2: to be removed with Tamo
without Tamo: 101W1: from 101X46 to 101X47
Make the following wiring additions:

- LDX 13 – 7 to decade pin 1
- LDX 13 – 10 to decade pin 3
- decade pin 2 to SZX 11 – 8
- decade pin 3 to SZX 11 – 9

Wiring diagram

Free Exposure Interlock
HDH with VD 1 / VD 2
Printed-circuit boards

SZ 101  Power supply and coding field  Z3- 1.1
SZ 101  Power supply and coding field  Z3- 1.2
ST 101  Rectifier unit               Z3-  2
SU 100  Height stop                 Z3-  3
VA  5   LVLE power supply for automatic cassette loader Z3-  1