

		<b>SCHNELL SPEED</b>		<b>INFO - RD</b>	
<b>SIEMENS</b>	Siremobil 3 / 4		R37-022.072.01.01.02		
Datum / Date	Instructions for trouble shooting in the power section and in the filament circuit		Ersetzt / Replace		
04.89			R37-022.076.17.02.05		
				RD - Speed - Info - Nr	
				36/89	

### Trouble shooting instruction

These instructions are intended as a guide in trouble shooting in the event of sporadic and repeated faults in the power section M2 or in the case of PC board D41a / D41b and D42 failures.

The indicated sequence should be observed in performing the instructions and attention should be paid to the pertinent technical informations or summary informations available.

### Products concerned

Siremobil 3K / 3N / 3H  
Siremobil 4K / 4N / 4H

### Documents and devices required

Wiring diagram G5203  
Adjustment instructions R37-022.072 or R37-023.071  
All relevant technical informations or RD summary informations, respectively  
Internal line resistance meter  
Storage oscillograph  
Digital voltmeter DC/AC rms / Multizet P  
2 5.6-Ohm load resistors 100W, see Item 8.2  
1 twist drill, 1 mm

Unterlage wird mikroverfilmt  
This Info will be microfilmed

X

Ja/Yes

Nein/No

**SIEMENS Aktiengesellschaft** Bereich Medizinische Technik Erlangen

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# Material required

We recommend the following spare parts as basic equipment:

1 Circuit board D26	Part No. 80 71 243 or 83 51 116 or 85 70 087
1 Circuit board D28	Part No. 80 71 102 or 83 51 132 or 88 30 523
2 Circuit boards D41	Part No. 85 70 061
1 Circuit board D42	Part No. 74 81 079
1 Circuit board D12	Part No. 74 81 252
1 Circuit board D14	Part No. 74 81 278
1 Circuit board D15	Part No. 74 81 336 or 17 44 697
Transistors BUX98A	Part No. 31 49 465 or
Transistors BUS98A	Part No. 31 49 465
Transistors ESM3004	Part No. 31 66 311
Protective diodes ESM112	Part No. 77 55 556
Relays Hr 2 - Hr 4	Part No. 31 48 384
Relay board Hr 1	Part No. 74 81 211
Connectors/6 pcs per unit	Part No. 70 37 641
Possibly Sirephos	Part No. 54 97 797 or 57 22 517

## Execution

Survey of the trouble shooting procedure

1. Remarks on the error indications
  - 1.1 Error message is signalled at the control panel
    - from wiring index M onward  
green lamp goes out immediately after switching on the unit, or
    - up to wiring index L  
yellow lamp flashes immediately at the end of the turn-on blocking time after switching on the unit
    - defect in chopper amplifier D42
    - from wiring index M onward  
green lamp goes out after initial radiation release or
    - up to wiring index L  
yellow lamp flashes after initial radiation release
    - defect in monitoring, final stages D41 a/b or in the SIREPHOS.

### 1.2 Error messages in the unit

From the basis of the error messages signalled on circuit boards D14 and D28, it can be decided as to whether an error is present in the power section or in the filament circuit.

- Error in the power section  
LED D28.v9 and LED D14.v11 light up
- Error in the filament circuit  
LED D14.v11 lights up

In the case of errors occurring sporadically or for a short time, heating can be reactivated by pressing D14.s2 - error reset - .

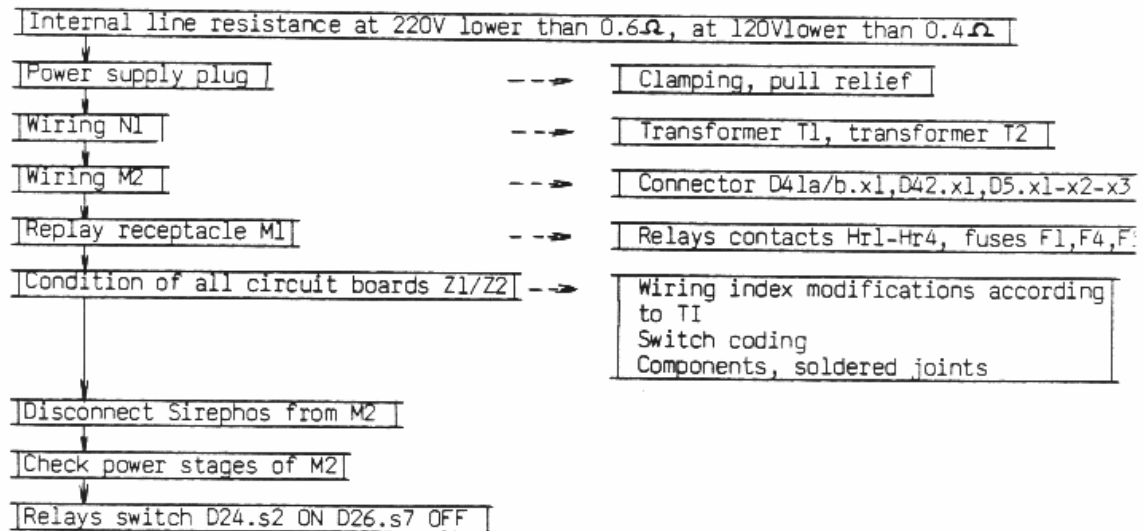
- 1.3 In the case of any errors occurring in the filament circuit, Item 6. "Filament circuit" should be preferred.

### 2. Comments on procedure and measures in trouble shooting

- As experience has shown, many hidden and sporadic causes of error were already ascertained by visual check.
- Before starting work, measure the internal line resistance of the socket outlets on which the SIREMOBIL is operated, i.e. also at the socket where the unit is repaired.

### 3. Checks and measures required before starting the unit on the power supply

#### Survey



...

3.1 Successively perform the following checks and measures without mains connection:

- Power supply plug, check that clamping of the connection wires and pull relief of the power cable are o.k. The wire terminations must not be tinned and the protective ground wire connection wire should be longer than neutral conductor and phase.
- Wiring N1, check fasten plugs at terminal strip N1 as well as the feed wires of transformers T1 and T2 for firm seat in the terminal strips.
- Wiring M2, check all screwed connections of power section M2 for proper fastening, any possible damage and contact.

Check the plugs of circuit boards D41a.x1, D41b.x1, D42.x1 and D5.x1-x2-x3 for good contact making.

For this purpose, it would be best to check each single plug contact for good mechanical clamping, using the shaft of an 1 mm drill. Immediately replace any defective plugs. In this regard, a technical information R37-022.076.31.01.05 is available.

- Relay receptacle M1, open and check relays Hr 1 - Hr 4 for mechanical function and contact making. Immediately replace any defective relays. Reassemble relay receptacle M1 and check soldered connections of the M1 connecting wires. Check or replace mains fuses F1 and F5 (20A) as well as fuse F4 (2.5A slow-blow) for low-current switch-on.
- Check the condition of all circuit boards in frames Z1 and Z2 for dry joints, loose components, and the wiring index as well as modifications according to technical informations and position of the coding switches.

**Note:** Discharge bank of capacities C1 - C5 in M2 !

- Disconnect Sirephos connections from power section M2 - resistors r4 and r5.
- Check power stages D41 a/b and D42 of power section M2 for any possible short circuit of power transistors and protective diodes. Immediately replace defective circuit boards or transistors and protective diodes.
- Coding switches of circuit boards D24.s2 to ON - U no-load, heating off, D26.s7 OFF - radiation off, Hr 4 drops out.

#### 4. Checks and measures after turning on the unit

##### Survey

[Turn on unit]  
[Operating voltages] --- [Z1, D1, D3 indicated values, constancy]  
[Timing of operating voltages + 5V and + 15V]  
[Chopper amplifier]  
[Final stages] --- [Activation]  
[Chopper amplifier, final stages] --- [Function without phantom]  
[Monitoring] --- [Check, function]  
[Chopper amplifier, final stages] --- [Function with phantom]  
[Filament circuit] --- [Check in the case of error]  
[Power section M2] --- [Start-up, checking with Sirephos]  
[Sirephos, start-up] --- [Setting the tube currents]  
[Check of connection]

##### 4.1 Perform the following checks and measures on the unit

Connect unit with power supply and turn on.

- Operating voltages. Check LED displays for operating voltages in wrap frame Z1 on circuit boards D1 and D3.

Measure all operating voltages; in doing so, also pay attention to voltage stability.

If necessary, test circuit boards D1, D2, D3 and D5 by knocking.

Attention. When measuring the operating voltages -6V and +9V at power sections D41 a/b and D42 or directly on circuit board D5, take care to ensure that these voltages have been raised to the 280 V DC of the bank of capacitors M2.C1 - C5.

At -D26.s7 ON - circuit boards D41 a/b and D5 carry 280V DC against system earth.

#### 4.2 Timing of operating voltages +5V and +15V

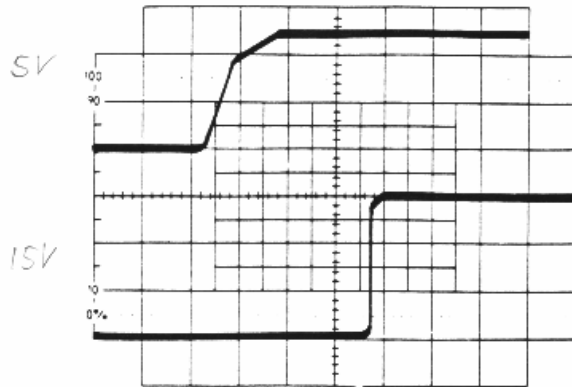


Fig. 1

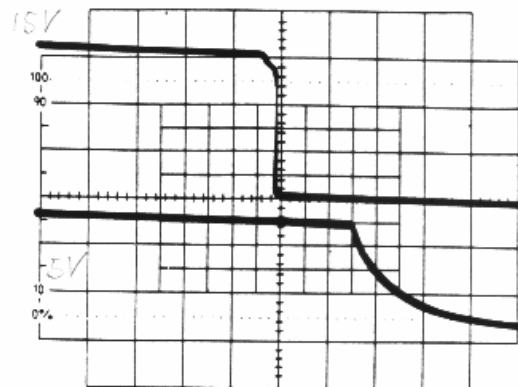


Fig. 2

When turning on the unit, the +5V must have a lead of approx. 10 ms as compared to the +15V and when turning off the unit, a lack of 100 ms approx.

If this is not ensured, the final power stages D41 a/b and D42 may have been destroyed by unintentional drive pulses resulting from this condition.

For measurement, insert circuit board D27 into the extension.

##### a) Turn-on phase

Oscilloscope storage mode  
Channel 1 on D27.z2 (+5V) 2V/div  
Channel 2 on D27.b20 (+15V) 5V/div  
Trigger channel 1 positive time 5 ms/div  
Turn on unit

As in Fig. 1, the voltage of +5V must build up approx. 10 ms earlier than the +15V voltage.

##### b) Cut-off phase

Oscilloscope storage mode  
Channel 1 on D27.b20 (+15V) 5V/div  
Channel 2 on D27.z2 (+5V) 2V/div  
Trigger channel 1 negative time, 50 ms/div  
Turn off unit

As shown in Fig. 2, the operating voltage of +5V must build up approx. 80 to 100 ms later than the +15V voltage.

- Possible errors

a) Turn-on phase

- Relay Hr 1 (M1) defective, does not switch properly - replace, if necessary
- Check activation for Hr 1 (M1), switching time 470 ms, circuit board D1.  
Fit D1 to extension.  
Oscillograph:  
Channel 1 on X2b10  
OV on X1b2  
Trigger int. negative time base 1 sec.
- If a D100 circuit board is provided, check diode V2; this is already implemented as a serial feature since August 1968. Relay Hr 5 sticking; replace if necessary.
- Short circuit between the connections of switching contacts Hr 5. 7 and 8 for the -15V, or Hr 5. 12 and 14 for the +15V.
- External short circuit or load for the
- Function of relay Hr 1 on circuit board is disturbed.

b) Off-phase

- Switching power pack D3, +5V does not hold voltage long enough, charging or electrolytic filter capacitors are deaf.
- External short circuit or load for the
- Function of relay Hr 1 on circuit board is disturbed.

**Note:** In the case of units without ESB, pay attention to the wiring index of monitoring board D1 and of voltage control circuit board D2. In this case, a summary information RD 53/88 is available; unintentional activation of parts D41 a/b and D42.

4.3 Chopper amplifier. Check activation of chopper amplifier.

Oscillograph  
Channel 1 on D27.TP3  
Time base 10  $\mu$ s/div  
Trigger internal channel 1 positive

Check oscillogram, Fig. 3  
Frequency up to wiring index L  
15.5 kHz (64  $\mu$ s)  
Frequency from wiring index M onward  
18 kHz (54  $\mu$ s)

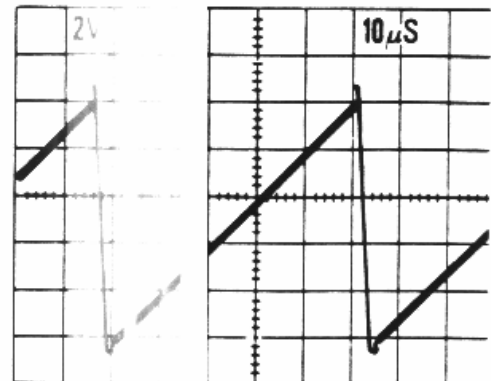


Fig. 3

#### 4.4 Final stages. Check of activation

Turn off unit, fit circuit board D28 to extension.  
Turn off monitoring of limit stages - D28.sl to ON, D26.7 ON.

##### Oscillograph

Channel 1 on D28.z22 5V/div DC  
Channel 2 on D28.z25 5V/div DC  
Time base 2m sec/div, trigger channel 1 positive  
Turn on unit, push stop button, select 40 KV fluoro by hand.  
Trigger fluoroscopy, check oscillogram according to Fig. 4 or  
Fig. 5 respectively.

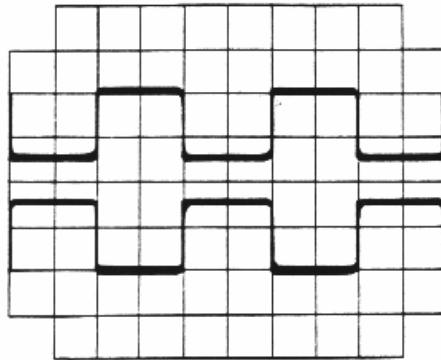


Fig. 4  
up to wiring index L

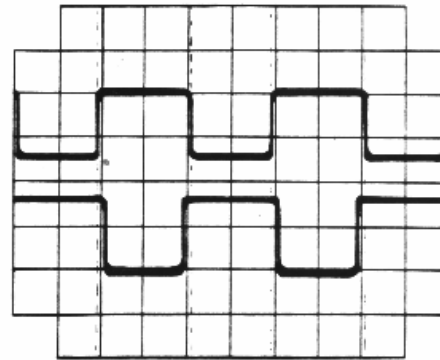


Fig. 5  
from wiring index M onward

If the monitoring responds, there is a fault in the chopper amplifier or in its activation.

Replace or repair circuit board D42. Repeat paragraph 4.4 "Final stages, check of activation".



#### 4.5 Chopper amplifier and final stages. Function test.

Turn off unit.

Note: Do not yet connect any phantom or load resistors instead of the Sirephos in this phase.

Connect monitoring of final stages - D28.sl to OFF.

Oscilloscope

Channel 1 on D26.TP.B 2V/div DC

Channel 2 on D28.TP.1 2V/div DC inverted

Time base 1 ms/div, trigger internal channel 1 positive

For calibration, connect both channels to "Ground" and place the two zero lines one upon the other.

Turn on unit.

Measure charge of bank of capacitors C1 - C5 (250 - 280V DC).

Push stop button and select 40 KV fluoro by hand.

Trigger fluoroscopy, check nominal and actual KV value according to Fig. 6.

If the monitoring does not respond, select fluoro KV by hand up to 106 KV, Fig. 7.

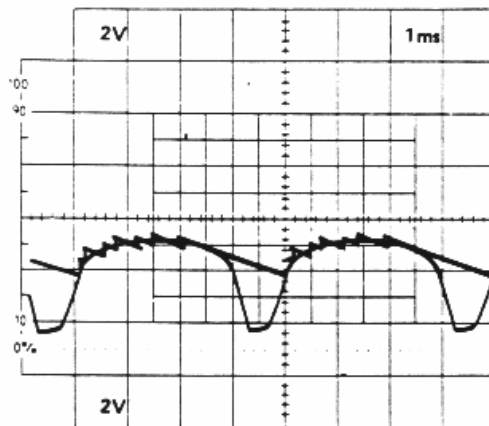


Fig. 6

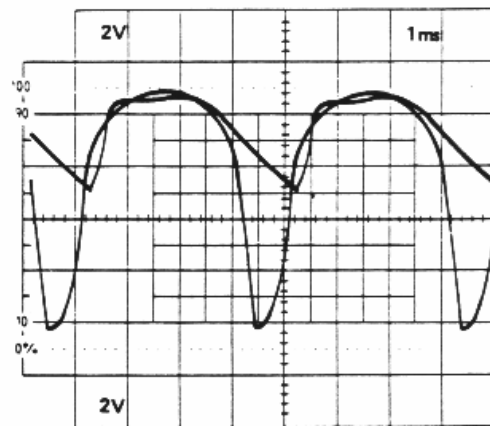


Fig. 7

**Attention:** Do not release fluoroscopy at 106 KV for a longer time than absolutely necessary since, otherwise, the load resistors M2 r4 and r5 installed in the Siremobil are heated excessively.

In the case of fault - monitoring responds - turn off the unit. Turn off final stage monitoring. D28.s1 to ON.

Oscillograph:

Channel 1 on M2.r4 20V/div DC

Channel 2 on M2.r5 20V/div DC

OV on frame of Z2

Time base 2 ms, trigger channel 1 internal positive

Turn on unit, push stop button, select 40 KV fluoro, release radiation.

Check oscillogram Fig. 8. In the case of different amplitudes or faults, of the half-waves shown, replace or repair the corresponding final stage.

Channel 1 - circuit board D41b

Channel 2 - circuit board D41a

Both oscillograms must be identical, however, drifted by 4 ms.

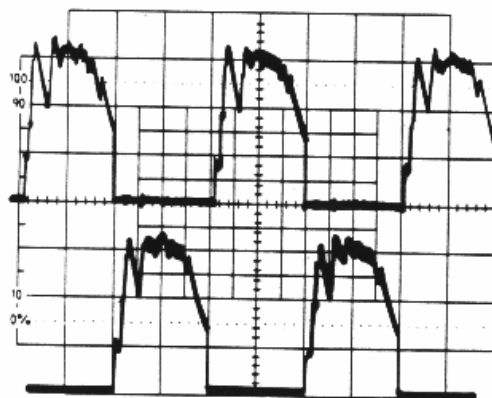


Fig. 8.

5.6 Monitoring, check, function test

Oscilloscope:

Channel 1 on D28.b26 2V/div DC

Channel 2 on D28.b28 2V/div DC

Time base 2 ms/div, trigger internal channel 1 positive

Push stop button, select 40 KV fluoro, release radiation.

Check oscillogram according to Fig. 9. The amplitudes of the two answer-back pulses must be identical, the pulse width should be 4 ms.

- Pulse pile-up as described in paragraph 4.4 "Final stage, check of activation" (see Fig. 5).

In the event of fault - answer-back pulses are not identical - trouble shooting on control circuit boards of final stages D41 a/b or on board D28. For circuit board D28, an RD summary information 51/88 "Response of monitoring without any reason" is available.

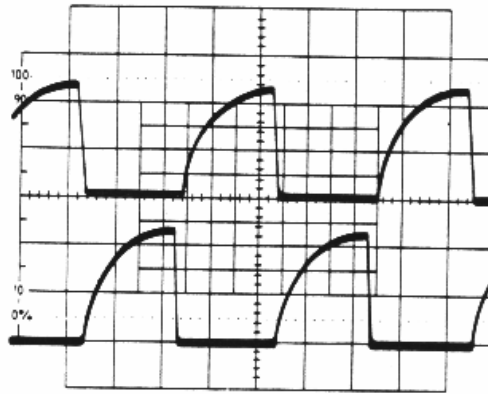


Fig. 9

- Checking the function

Connect final stage and chopper monitoring, set D28.s1 to OFF, D28.s2, s3 to ON.

Remove jumper D28.b26 from the extension board. Push the stop button, select 40 KV fluoro, release radiation. The monitoring must respond - relay Hr 4 drops out.

Turn off the unit.

Reinsert jumper D28.b26, remove jumper D28.b28.

Turn on the unit, push the stop button, select 40 KV fluoro, release radiation.

The monitoring must respond - relay Hr 4 drops out.

Turn off the unit.

Reinsert jumper D28.b28, remove jumper D28.b12

Turn on the unit, push the stop button, select 40 KV fluoro, release radiation.

The monitoring must respond - relay Hr 4 drops out.

Turn off the unit, reinsert jumper D28.b12.

5.7 Chopper amplifier and final stages, function test with phantom

Discharge bank of capacitors C1 - C5 in M2.

Connect load resistors ( $2 \times 5.6 \Omega$ ) instead of the Sirephos as shown in Fig. 10.

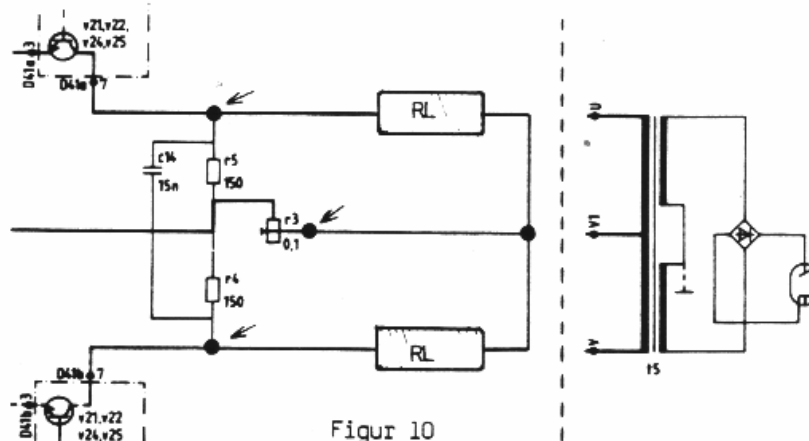
Oscillograph

Channel 1 on D26.TP.B 2V/div DC

Channel 2 on D28.TP.1 2V/div DC inverted

Time base 1 ms/div, trigger channel 1 positive

For calibration, connect both channels to "Ground" and place the two zero lines one upon the other.



Figur 10

**Attention:** Release radiation only as long as necessary since, otherwise, the load resistors are overheated.

Turn on the unit.

Push the stop button, select 40 KV fluoro, release radiation.

Select KV by hand up to 106 KV.

During this process, the monitoring must not respond.

Compare oscillogram with Fig. 11.

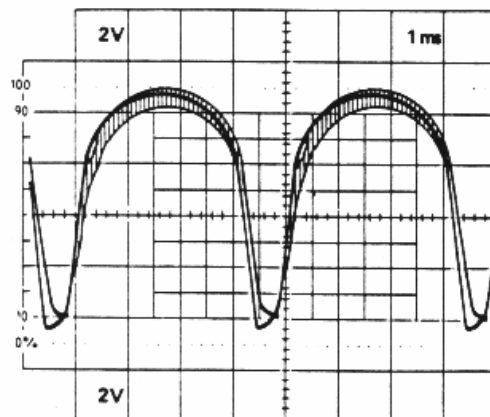


Fig. 11.

In the case of proper function or correct setting of power control D28, a perfect actual KV value curve must be obtained. Turn off the unit.  
Reinsert D28, remove load resistors.

6. Filament circuit, check without Sirephos - sirephos possibly defective

6.1 Measures to eliminate filament circuit faults

- Monitoring responds, D14.v11 lights up.

Check:

D24.s2 to OFF

Fit circuit board D12 to extension.

Remove jumpers D12.b10, D12.b14 and D12.b18.

Clamp ammeter AC rms (20 mA - 500 mA) over opened jumper D12.b18.

Connect 220V 60W incandescent lamp instead of the Sirephos between D12.b20 and D12.b10 for small-focus fluoroscopy or D12.b20 and D12.b14 for large-focus direct radiography (check changeover of focus).

Move D14.s1 into position 2.

Turn on the unit, push stop button, select 40 KV fluoro, release radiation. After approx. 10 sec, the measured current must be stable and must be adjustable with D14.r50.

Check "Filament current basic setting" (220 mA, AC, circuit boards D12 and D14) according to adjustment instructions.

Subsequently, set 2V DC with D14.r50 at test point D14.MP.G. D14.s1 in position 1.

- If no fault has occurred during this check, the Sirephos is defective and must be replaced.

Note: After replacement of the Sirephos, repeat "Filament current basic setting" as described under paragraph 6.1.

Turn off the unit, reinsert circuit board D12.  
Discharge bank of capacitors C1 - C5 in M2.

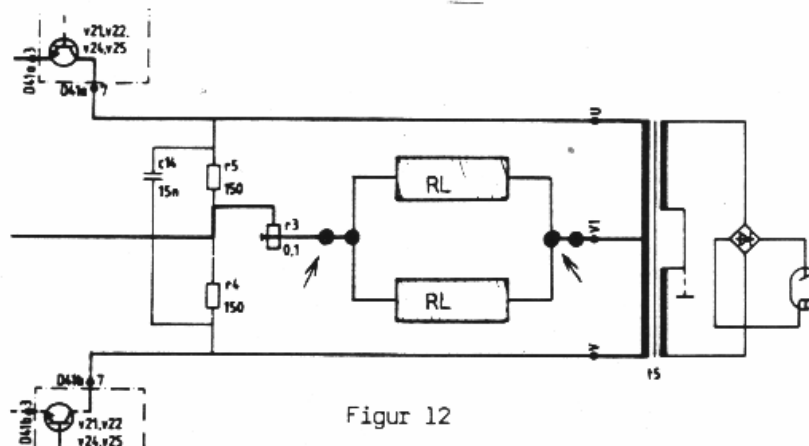
7. Start-up of power section M2 with Sirephos

Attention! From this chapter onward, observe the radiation protection!

7.1 Checking the possibly defective Sirephos in the HV circuit

If the Sirephos in the HV circuit is suspected of being grossly defective, the Sirephos can be connected in series with the load resistors to power section M2 for checking. If a fault is present, the final stage monitoring will respond.

Connect Sirephos to the terminals of resistors r3, r4 and r5 on M2, as shown in Fig. 12.



RL = 5.6  $\Omega$  100 W load resistor

Remove jumper D12.x1 - x2, connect measuring instrument - DC to measure the tube current. D24.s2 to ON.  
Turn on the unit.  
Push the stop button, select 40 KV fluoro by hand.  
Trigger fluoroscopy, select KV to 106 KV by hand.  
At 40 KV, the measured capacitive component should be approx. 1 mA and at 90 KV approx. 2 mA.

If the final stage monitoring responds or the capacitive component at 90 KV exceeds 3 mA, the Sirephos should be replaced.

If no fault occurs, set D24.s2 to OFF.

In the following checks, too, the monitoring must not respond.

Turn off the unit  
Fit D28 to extension.

When checking the actual KV value curve, pay attention to abnormal glitches:

Oscilloscope

Channel 1 on D26.TP.B 2V/div DC

Channel 2 on D28.MP.1 2V/div DC inverted

For calibration, connect both channels to "Ground" and place the two zero lines one upon the other.

Turn on the unit.

Push the stop button, select 40 KV fluoro, release radiation and select up to 106 KV. The tube current should not exceed the displayed value or should be adjustable to this value.

Trigger direct radiography with 90 KV, subsequently with 40 KV. Owing to the connected resistors, the actual KV value and the tube currents are below normal values.

If no fault has occurred, shut down the unit, discharge bank of capacitors C1 - C5 in M2 and remove load resistors. If a fault is present, the Sirephos must be replaced.

8. Initial start-up of Sirephos, setting the tube currents

Connect the Sirephos while paying attention to firm seat of the terminals and to the wiring.

8.1 Setting the tube currents; observe sequence

- Fluoroscopy	40 KV - 106 KV	
- ESB	106 KV - 40 KV	
- Direct radiography	90 KV - 40 KV	set

Note! For direct radiography, first of all reduce the tube current for 40 KV (60 mA) by turning the r6 on circuit board D15 by approx. 2 turns from right to left. Measure current; subsequently, readjust step by step without radiation, each time checking the setting with radiation in between.

Check actual KV value curve according to adjustment instructions and readjust, if necessary. Subsequently, check once more tube currents for fluoroscopy, ESB and direct radiography and adjust, if necessary.

When checking the actual KV value curve, pay attention to abnormal glitches:

Oscilloscope

Channel 1 on D26.TP.B 2V/div DC

Channel 2 on D28.MP.1 2V/div DC inverted

For calibration, connect both channels to "Ground" and place the two zero lines one upon the other.

Turn on the unit.

Push the stop button, select 40 KV fluoro, release radiation and select up to 106 KV. The tube current should not exceed the displayed value or should be adjustable to this value.

Trigger direct radiography with 90 KV, subsequently with 40 KV. Owing to the connected resistors, the actual KV value and the tube currents are below normal values.

If no fault has occurred, shut down the unit, discharge bank of capacitors C1 - C5 in M2 and remove load resistors. If a fault is present, the Sirephos must be replaced.

8. Initial start-up of Sirephos, setting the tube currents

Connect the Sirephos while paying attention to firm seat of the terminals and to the wiring.

8.1 Setting the tube currents; observe sequence

- Fluoroscopy	40 KV - 106 KV	
- ESB	106 KV - 40 KV	
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Note! For direct radiography, first of all reduce the tube current for 40 KV (60 mA) by turning the r6 on circuit board D15 by approx. 2 turns from right to left. Measure current; subsequently, readjust step by step without radiation, each time checking the setting with radiation in between.

Check actual KV value curve according to adjustment instructions and readjust, if necessary. Subsequently, check once more tube currents for fluoroscopy, ESB and direct radiography and adjust, if necessary.



9. Checking the unit in warmed-up condition

Cover the unit with clothes to produce accumulation of heat.  
After the unit has warmed up, execute all functions.

10. Auxiliary devices

- 10.1 The required load resistors can be obtained from the factory under the Part No. 10 38 298 B0608.

We recommend to install these resistors with bolts vertically on a Pertimax support or similar material (100 x 200 mm, 10 mm thick).

Resistor dimensions:

Length:	165 mm
Diameter:	approx. 22.5 mm
Hole diameter of a ceramic element:	10 mm

- 1.2 Provide the 220V 60W bulb (household) with screw base and leads with Hirschmann terminals.

TDT 413 / Bühler

# SIEMENS

TDF - PARTICIPANTS

TDT GVL  
GVLG 1. Hr.Hetz

SIREMOBIL 3

LB 02.03 00 /87.04

Language english  
Place Erlangen  
Begin of course 22-Jun-1987 08:15  
End of course 15-Jul-1987 16:15

D

Participants	Origin
ASCHERL ERWIN	WRK AVW
ATIKOMTRIRAT PRASONG	THA
BENNEL JOHN RICHARD	GBR LON
BETTENCOURT ALBANO	POR
GULLO GIULIO	ITL PAL
HENDEL HORST HANS	WRK AVW
MCDUGALL IAN	GBR GLA
SGHABI SAYED	LIA
TAY BOON HWEE	SIN
TICOZZI STEFANO	ITL MAI
YACOBVITCH EFRAIM	ISR

Number of participants 11

FACHSCHULUNG

FACHSCHULUNG

Friday

12.6.86

Mr G. Stokes

29/3

GP/111

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All Branch Technical Supervisors  
Installation Supervisors  
J Otley Rhodes Ltd / Ulster X-Ray Ltd

Siremobil 3 - Display Prom

It has come to our notice that there has been a change of type and part number for the above prom. This new prom type carries the same data, but will only fit PCB D24 part number 84 13 031 G5255.

There have been a number of units delivered with the older type D24 part number 80 71 060 G5255 together with the new prom type which is not compatible. If you take delivery of this combination please re-order the older prom type part number 17 47 747 G5203.

Summary:

Prom 85 70 095 G5203 fits PCB D24 84 13 031 G5255

Prom 17 47 747 G5203 fits PCB D24 80 71 060 G5255

Regards

G Stokes

# ***SPEED INFO ANGIO***

**SIEMENS**



**Redesign Universal Collimator**

RA 0-000.092.03.01.02

Increased Operating Reliability

Replaces

Date

4/91

Angio-Speed-Info-No./Year

27/91

## Modification instruction

### Modification type:

A: Specified modification initiated by TDG 11 ☐

B: Mandatory with full maintenance contract ☒

re B: Modification material free of charge

yes ☐

no ☒

Tentative delivery date:

Arcing X-ray tube cause a hang up of the collimator control or also a initialize sequence.

### Products concerned:

Redesign Universal Collimator Part. Nr. 71 49 610 (UT) to Serial No. 01090

Redesign Universal Collimator Part. Nr. 71 49 602 (OT) to Serial No. 01140

### Material required:

1 pc. of metal film resistor 2,2 KOhm

2 pcs. of ceramic multilayer capacitor 100 nF

### Time required:

1 technician / 1 hour

### Work sequence:

- remove collimator covers.
- swing D 11 board out.
- solder the 100 nF capacitor on board D 11 between connector X 19 pin 25 and connector X 1 pin 3 (+5V) on the solder side.
- cut the green wire on D11 connector X 19 pin 25 and solder the 2,2 KOhm resistor between the two cut ends. (Isolate resistor with a shrink tube)
- swing D12 board (Frontpanel) out.
- solder the 100 nF capacitor on board D 12 between pin 36 and pin 40 of IC 7 on the component side.
- switch the equipment on and off several times. The collimator must show "0" on all error displays after each start up.
- install collimator covers.

Mühlhäußer / TDRA 3

SPO\_INF/MUEHLHAUESSANGIO/MODIF/IC/REDESIGN/CHP

This Info will be micorfilmed



Yes

No

**SIEMENS Aktiengesellschaft Bereich Medizinische Technik Erlangen**

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