Orthopantomograph® OP100 & OP100 D
Orthoceph® OC100 & OC100 D

Service Program Manual

INSTRUMENTARIUM

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1 Introduction

1.1 General

Instrumentarium Dental Orthopantomograph® OP100 is a panoramic x-ray equipment for producing images of dentition, TM-joints and skull with the possibility of linear tomography programs for producing longitudinal and cross-sectional tomograms of the dentition. This software can be used with any OP100 or OC100 model including OP100 CR, OP100 OT and all digital models. In this manual name OP100 is used as general name for all models unless stated otherwise.

The software is divided into two parts. User programs (Pr) are accessible by the user and they have features for configuring their unit for daily use and for changing technique factors to optimize image quality. Maintenance & Service programs (Sr) are for technical people during installation and service. Please refer to User Program chapter in OP100 User Manual for **Pr** program details.

Letters **Pr** or **Sr** in the kV display indicate that the unit is in the user or service programming mode. Numbers in the mA display indicate the actual numeric code for each program. Letters in the exposure time display indicate the mnemonic explanation for each program, to remind the user of the actual numeric program code meaning.

After you have set OP100 to the service programming mode, different service programs can be selected by pressing up and down buttons, until the desired service program code appears on the display. The display indicates the service program in the following form:

Display	Value(s)	Description
kV	Sr	The unit is in the service programming mode, and the serviceman is able to use the service programs to test the unit.
mA	70 - 92	Indicates the actual numeric code for respective service program. View the functions with up and down buttons and select with OK button.

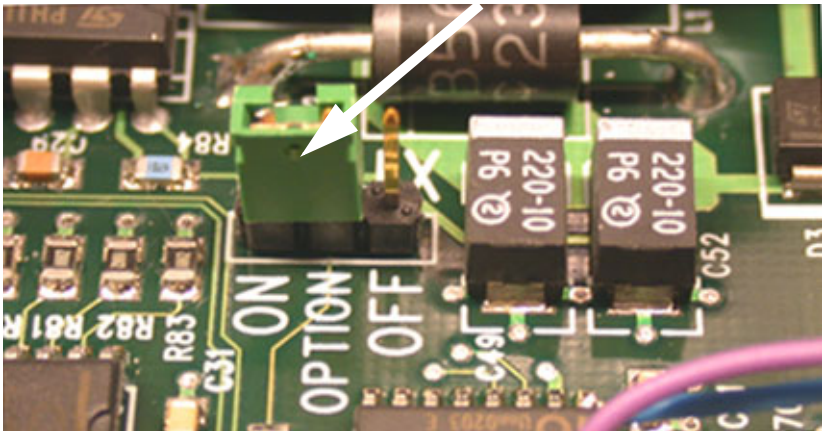
Display	Value(s)	Description
s	Log, PAy, LCA, IOC, PUP, Prh, thA, SUP, CrL, LAL, CAL, COP, PIn, Che	Indicates the alphanumeric short form for the explanation of the service program, to remind the serviceman what the numeric program code means.

The displayed service program can be activated by pressing OK button. After activating the service program the test starts. In programs which require movements and / or exposure, the test starts when pressing the exposure button.

After completing the test a tone indicates that the unit passed the test, or respective failure code **FAIL** indicates that the test has failed. Repeat the service program or select another Sr program.

1.2 EXHIBITION MODE

OP100 does not emit x-rays, when the OP100 has been set for an exhibition mode. The exhibition mode is selected, when CPU option jumper X 11 is set to **ON**.



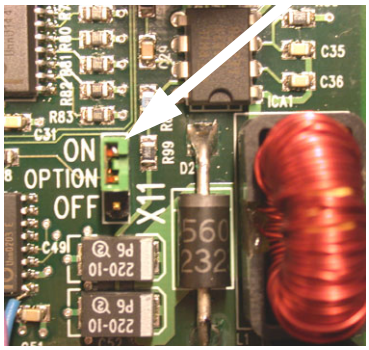


Fig 1.1. Jumber X 11 is set to ON.

1.3 SR: TEST PROGRAMS

SERVICE PROGRAM TESTS REFERENCE TABLE	
Sr 70 Log	ERROR LOG PROGRAM Scroll the failure code counters.
Sr 71 PAy	SET TRIAL PERIOD LIMIT OP100 can be programmed to enable a number (10-2000) of test exposures before OP100 shuts off.

SERVICE PROGRAM TESTS REFERENCE TABLE	
Sr 72 LCA	LATERAL CASSETTE ADJUSTMENT (Film units only) In Program 6 center Lateral TMJ-image areas can be adjusted to be symmetrical by this program, instead of adjusting microswitches. Adjustment - 0.25 - (+ 1.00) cm, in steps of 0.1 mm.
Sr 74 IOC	INPUT / OUTPUT Operation of CPU input and output signals is monitored and displayed with control panel's LED's.
Sr 76 PUP	WARMING UP SEQUENCE Tube warming up procedure.
Sr 77 Prh	PREHEAT ADJUSTMENT Automatic preheat adjustment.
Sr 79 SUP	LINE VOLTAGE DISPLAY Displays the line voltage continuously.
Sr 80 CrL	INDIVIDUAL MOTOR MOVEMENT TESTS CA, ro and LI with film units CE, ro and LI with digital units
Sr 81 bPL	Not used
Sr 87 LAL	Not used
Sr 88 CAL	CEPH SECONDARY COLLIMATOR ALIGNMENT INFORMATION Monitoring secondary collimator position.
Sr 89 COP	COUNTRY OPTIONS Remote exposure only, Disable Ceph Collimator, Disable AEC, Free kV-mA values, Select ceph mA, Ortho Zone, Ortho TMJ and Ortho Trans
Sr 90 PIn	PANORAMA INSTALLATION PROGRAM Exposure without movements and AEC frequency test.
Sr 91 CIn	CEPH INSTALLATION PROGRAM For digital units only. Cephalostat alignments.
Sr 92 ChE	INSTALLATION ENABLE/DISABLE CHECKING SETTINGS

1.4 How to use SR features

1 Switch the OP100 power off. Turn the unit back on while pressing the service programming button. Do not release the button before you see lights flashing in the control panel. Wait for a moment. Software version is displayed during the memory check. Check that all leds are lit. **OP SEr** is displayed in the control panel.

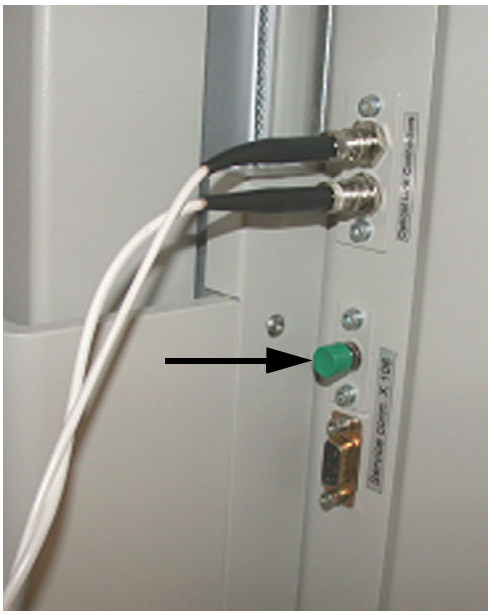


Fig 1.2. Button for the service programming mode.

2 Press OK to enter the normal operating mode.
(Hint: This is defined in the **Pr 51 PUS** option settings.)

3 Change the normal operating mode to the service programming mode by pressing and holding OK button for three seconds. Scroll thru the **Pr** (user) programs by pressing up button and the **Sr** (service) programs will be available after scrolling.

4 Use up and down buttons to view programs. Select one of the **Sr** programs by pressing OK button.

5 Make the trouble shooting, adjustments or change settings. Use left and right buttons to select option and settings. Follow the guidelines for each **Sr** program described in the next chapter.

6 Press OK to store any changes to the OP100 memory. The recently used program, eg. **Sr 76 PUP**, is displayed again.

NOTE!

If you change the parameters and forget to press OK or switch the power off too early, the storing of any changes fails. Change and store again

NOTE!

Exit the service programming mode by pressing the OK button for three seconds at the program selection level, or exit permanently by switching OP100 power off.

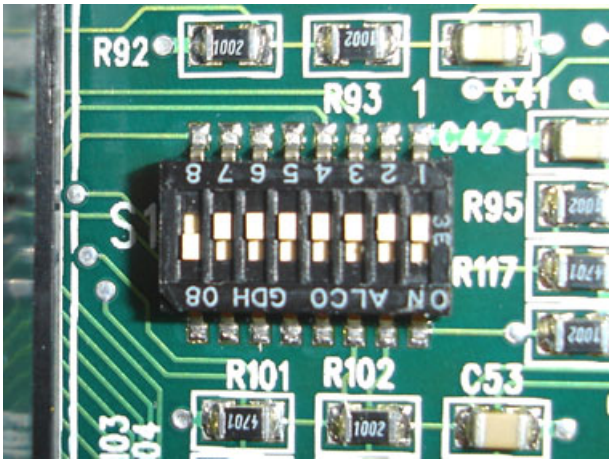


Fig 1.3. OP100 EMC ed2 film unit DIP 8-microswitch positions

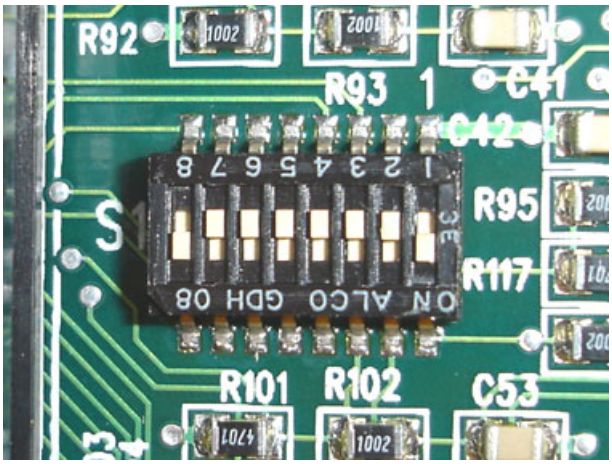


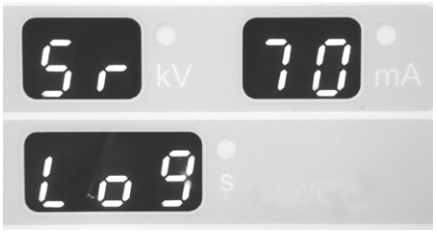
Fig 1.4. OP100 D EMC ed2 digital unit DIP 8-microswitch positions

Switch #	Feature
1	Film unit / Digital unit switch
2	Used for adapting old film unit main cable
3	Used for adapting old film unit main cable
4	Used for adapting old film unit main cable
5	Colsw't
6	Colsw't
7	Colsw't
8	caectrq

2 Service program SR features

2.1 SR 70 LOG: DISPLAY ERROR LOG

Select **Sr 70 Log**. The error log is displayed. Each logged error code is shown on the display blinking with the current error log count. The values may not be cleared.



View the CPU parameter memory (EEPROM) contents. This memory stores the failure code counters and this information can be used for obtaining OP100 D history data. Some failure counters have non-zero values at the time of installation. This is normal.

Procedure:

1 Select the program **Sr 70 Log** and press OK. View memory contents by pressing left and right buttons. KV display shows the memory location and mA/s displays show the contents, if any.

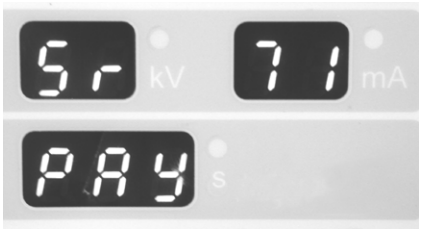
2 Press OK to exit the program. **Sr 70 Log** is displayed again. Select another program or exit the service programming mode.

kV-display Ch / Sy / Er	mA-display error number	Second / dose - display	
		Error name AND counter value	Typical value at the time of installation
Ch	05	ooo / “value“	< 10
Sy	13	LbL / “value“	< 10
Sy	21	HHo / “value“	< 10
Sy	22	Arc / “value“	< 10
Sy	23	InV / “value“	< 10
Sy	24	FIL / “value“	< 10
Sy	25	AEC / “value“	< 10
Sy	27	Por / “value“	< 10
Sy	28	PoC / “value“	< 10
Sy	29	PoL / “value“	< 10
Sy	30	PoH / “value“	< 10
Sy	31	PoU / “value“	< 10

kV-display Ch / Sy / Er	mA-display error number	Second / dose - display	
		Error name AND counter value	Typical value at the time of installation
Sy	1	nSY (not used)	
Sy	30	Poc / “value”	
Sy	32	PoA / “value“	< 10
Sy	28	CCd / “value“	< 10
Er	40	CPU / “value“	< 10
Er	43	LIN / “value“	< 10
Er	44	FIL / “value“	< 10
Er	45	InP / “value“	< 10

2.2 SR 71 PAY: SET LEASE PERIOD

OP100 can be programmed to enable a selected number of exposures, after which the exposure is prohibited and the control panel immediately displays a message **Er 46 PAy**. This feature can be used for equipment leasing and customer trial purposes.



Select **Sr 71 PAy** and adjust the lease count. The number is editable in the range 0...2000 with the special value **OFF**, when this feature is disabled. Having the number 0 selected will activate **Er 46 PAy** and prevent exposures. Other numbers will adjust the stored exposure counter into a number above the total exposure count.

In normal operation the user can test, if the test limit has been set, by pressing OK button: first the cumulative exposure counter value and then the number of free exposures are displayed with all indicators lit momentarily.

Procedure:

1 Select program **Sr 71 Pay**. The time display in the control panel shows **OFF** or a number from **1** to **2000**.

2 If the feature was disabled, **OFF** is displayed. Use left and right buttons to enable this feature and change the number of free exposures. Numbers can be changed faster by holding down right button.

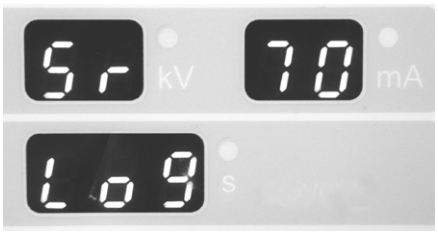
3 Select **OFF**, if you want to disable this feature.

4 Press OK to store these changes into OP100 memory, **Sr 71 PAY** will be displayed again. Select another program or exit the service programming mode.

2.3 SR 72 LCA: LATERAL TMJ IMAGE AREA ADJUSTMENT

(for film units only)

This program may be needed when cassette movement microswitches are adjusted or replaced and when the CPU board or its EEPROM is replaced. In cassette holders with optical sensors no adjustment is usually necessary.

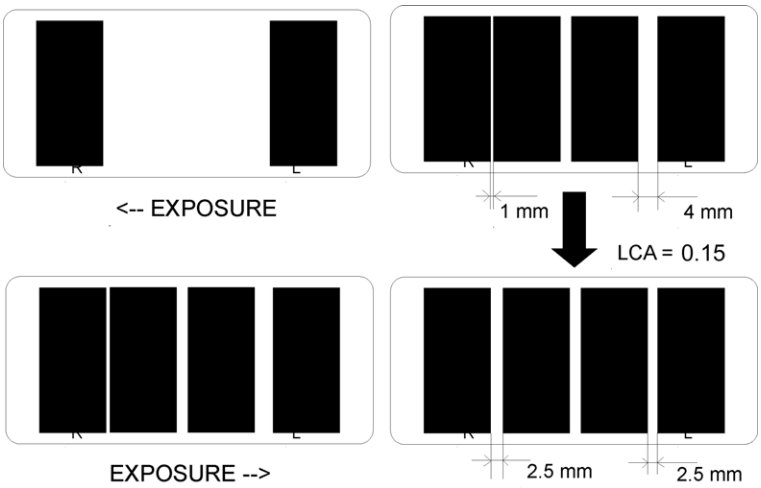


With imaging program P7 (TMJ Lateral view jaw closed and open) first two jaws are exposed and shown on the film edges, then the second exposure is started on the return movement and images are shown in the middle. The center pair image area can be adjusted to be symmetric in respect to the other image pair by using this program, instead of adjusting microswitches. The adjustment is -10...+2.5 mm, in steps of 0.1 mm (-1.00...+0.25 cm in the display).

Procedure:

1 Use customers latest TMJ Lateral view jaw closed and open x-ray film, or take one:

2 Select imaging Program P7, lowest technique factors and take the exposure. Process the film.



3 Check the film for center image pair symmetry. Calculate the amount (-0.25...+1.00 cm) of correction needed.

4 Select program **Sr 72 LCA** to enter the service programming mode. Control panel shows a number from **-0.25** to **1.00**. The number

indicates the adjustment of the positioning of the second image pair areas (center) compared to the first image pair areas (on each side).

5 Use left and right buttons in order to shift the middle image pair in steps of 0.5 mm to the left or right, respectively when the film has a side marking " **L** " on the right.

6 Press OK to store these changes into OP100 memory. OP100 will display **Sr 72 LCA** again. Select another program or exit the service programming mode.

7 Exit the service programming mode by switching the OP100 power off. Turn OP100 on again. Select imaging program 7 and lowest technique factors. Take the exposure. Process the film. Check the film for symmetry. If the result was not satisfactory, return to **Sr 72 LCA** program and repeat steps 1 to 6.

2.4 SR 74 IOC: CPU INPUT OUTPUT CHECK

This program is used for checking the state of the CPU inputs and outputs - without opening all the covers of OP100 main assemblies. It is useful for trouble shooting CPU input signal problems, eg. the various microswitches, user buttons and opto couplers.

Select **Sr 74 IOC** from the control panel. Use left and right buttons to switch between the different displayed fields. There are multiple fields (around 24) which display different "shell variables". The values of the input / output variables is displayed with the LEDs on the control panel and the current field with a number and either **H** (high byte) or **L** (low byte) along the number.

The program shows whether the signal from some particular switch reaches the CPU or not. The output signals are somewhat arbitrary, but the information may be useful in some situations.

1 Select **Sr 74 IOC** and press OK.

2 Use left and right buttons to select different tests (**0L** - **0H** - **1L** - **1H** - **2L** - **2H** - **3L** - **3H** - **4L** - **4H** - **5L** - **5H** - **6L** - **6H**).

3 Some of the program selection LED's on the control panel are lit showing the state of the signal port; LED 1 (standard panoramic program) being bit 0 of the port and LED 2 (child panoramic) being bit 1 etc.

4 Use the tables of the input and output signals with the corresponding I/O port and bit. Use CPU Board schematics to follow signals and refer also to other volumes of the *Service Manual* for various microswitch states.

NOTE!

The control panel display will be updated with a delay. This should be understood when interpreting movements and other output signals. Stop the movement by pressing any button to see the correct output status.

5 After testing return to the program viewing level. Press OK button again. **Sr 74 IOC** is displayed again. Select another program or exit the service programming mode.

Sr 74 IOC, Input test 0L Cassette and Linear Movements		
Signal name	Description (Status, when LED on)	LED
PROJLIT	Projector lights	1
OUT1	not connected	
OUT2	not connected	
OUT3	not connected	
PILLED	Pillar layer adjustment LED	6
CENLED	Center layer adjustment LED	7
PATLED	Patient layer adjustment LED	8
OUT4	not connected	

Sr 74 IOC, Input test 0H Laser & DC motors		
Signal name	Description (Status, when LED on)	LED
OUT5	not connected	
LASLIT	patient positioning lasers	
XDIR		
XENA		
ZDIR	up/down movement direction	
ZENA	up/down enable	
RACKDIR	cassette rack direction	
RACKENA	cassette rack enable	
ZUP	upwards	7
ZDOWN	downwards	6, 7

Sr 74 IOC, Input test 0H Laser & DC motors		
RACKUP	Cassette rack up (film unit) 	8, 9
RACKDOWN	Cassette rack down (film unit) 	9

Sr 74 IOC, Input test 1L Stepper motors		
Signal name	Description (Status, when LED on)	LED
CASDIR	Cassette movement director	
CASENA	Cassette enable	
ROTDIR	Rotation direction	
ROTENA	Rotation enable	
CEPHDIR	Ceph scanning direction	
CEPHENA	Ceph scanning enabling	
LINDIR	Linear movement direction	
LINENA	Linear movement enable	

Sr 74 IOC, Input test 1H CCD power & image		
Signal name	Description (Status, when LED on)	LED
PPOWER	CCD powers to panoramic head	
PIMAGE	CCD image out of the CCD (pan)	
CPOWER	CCD powers to cephalometric head	
CIMAGE	CCD image out of the CCD (Ceph)	
TPOWER	Not connected	
TIMAGE	Not connected	
CLASLIT	Ceph laser (in up/down panel)	
CPIO31	Not connected	

Sr 74 IOC, Input test 2L Exposure		
Signal name	Description (Status, when LED on)	LED
EXPSW (Ctrl panel)	Exposure button on control panel	1, 4
INSTRUSW		2
MAOK	Not connected	
Remote expsw	Remote control exposure switch	
IN3	Not connected	
MAINS	Not connected	
IN2	Not connected	

Sr 74 IOC, Input test 2H First movement switches		
Signal name	Description (Status, when LED on)	LED
TUBEFAIL		
PANCASSW	Panoramic cassette in	2
CASLIMSW	Cassette limit switch	3
CASMIDSW	Cassette middle switch	4
LINMIDSW	Linear movement middle switch	6
LINLIMSW	Linear limit switch	7
RACKMIDSW	Cassette rack middle switch	8
RACKLIMSW	Cassette rack limit switch	9

Sr 74 IOC, Input test 3L		
Signal name	Description (Status, when LED on)	LED
	Not connected	
	Not connected	
	Not connected	
	Not connected	
	Not connected	
	Not connected	
	Not connected	
	Not connected	

Sr 74 IOC, Input test 3H		
Signal name	Description (Status, when LED on)	LED
	Not connected	
	Not connected	
	Not connected	
	Not connected	
	Not connected	
	Not connected	
	Not connected	
	Not connected	

Sr 74 IOC, Input test 4L Patient positioning panel buttons		
Signal name	Description (Status, when LED on)	LED
PATPOSLEFT	Patient positioning button, left side 	2
PATPOSRIGHT	Patient positioning button, right side 	1
PILWARD	Retrusion (progenie) occlusion 	3
CENWARD	Normal occlusion 	4

Sr 74 IOC, Input test 4L Patient positioning panel buttons		
PATWARD	Protrusion (prognathie) occlusion 	6
TEMPFAIL	Tubehead too warm	
SERVICESW	Service mode switch	8
IN1	Not connected	

Sr 74 IOC, Input test 4H Collimator & patient positioning panel		
Signal name	Description (Status, when LED on)	LED
COL1SW	Panoramic collimator	1
COL2SW	Cephalo collimator	2
COL3SW	Ortho Trans collimator	2, 3
STARTPOSLEF		4, 6
STARTPOSRIG		4, 6
PROJTRIG		7
ZDOWN		8
ZUP		9

Sr 74 IOC, Input test 5L Cephalo		
Signal name	Description (Status, when LED on)	LED
CEPHLOK/ CEPH1CAS	Ceph scanning beam on the left	
CEPHCOK	Ceph scanning beam on the center	
CEPHROK	Ceph scanning beam on the right	
CEPHLATPA		4
CEPH2CAS	Not Connected	
CEPH3CAS	Not Connected	
CEPH4CAS	Not Connected	
CEPHL	Ceph left hand side	7

Sr 74 IOC, Input test 5L Cephalo		
CEPHR	Ceph right hand side	6
CEPHDOWN	Ceph up	
CEPHUP	Ceph down	

Sr 74 IOC, Input test 5H Second movements switches		
Signal name	Description (Status, when LED on)	LED
ROT1SW	name ???	
ROT2SW	name ???	
ROT3SW	name ???	
ROT4SW	name ???	
ZMIDSW	up/down middle switch	6
ZLIMSW	up/down limit switch	7
CEPHMIDSW	Ceph scanning middle switch	8
CEPHLIMSW	Ceph scanning limit switch	9

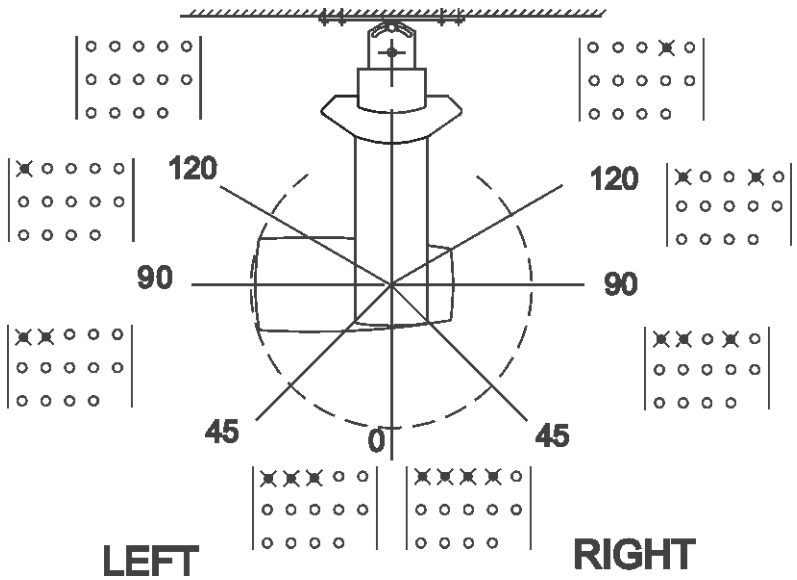


Fig 2.1. Led procedures concerning movement of the rotating unit.

Sr 74 IOC, Input test 6L First control panel buttons		
Signal name	Description (Status, when LED on)	LED
CP_BUTTON0	 OK button	1
CP_BUTTON1	 Right button	2
CP_BUTTON2	 Down button	3
CP_BUTTON3	 Left button	4
CP_BUTTON4	Not Connected	5
CP_BUTTON5	 Up button	6
CP_BUTTON6	Not Connected	
CP_BUTTON7	Not Connected	

Sr 74 IOC, Input test 6H Second control panel buttons		
Signal name	Description (Status, when LED on)	LED
CP_BUTTON8	Not applicable	
CP_BUTTON9	Not applicable	
CP_BUTTON10	Not applicable	
CP_BUTTON11	Not applicable	
CP_BUTTON12	Not applicable	
CP_BUTTON13	Not applicable	
CP_BUTTON14	Not applicable	
CP_BUTTON15	Not applicable	

2.5 SR 76 PUP: WARMING-UP PROCEDURE FOR TUBEHEAD

WARNING!

This special program generates x-rays.

Purpose of this program is to enable testing of a defective tubehead assembly, or warming up procedure of the replacement of tubehead assembly.

Procedure:

1 Select program **Sr 76 PUP**. Make the exposure. OP100 exposes with the lowest kV / mA values.

2 Repeat the exposure. No need to wait 15 seconds between the exposures as usually, but the exposures can be done sequentially. The next exposure can be taken right after the previous one. kV / mA starts rising automatically from 20 kV / 1 mA, one step after each 3.2 s exposure, until 85 kV / 13 mA is reached:

Sr 76 PUP: kV & mA Feedback Reference Voltages				
kV	mA	s	(VkVref)	(VmAref)
20	1.0	3.2	(1.00 V)	(0.24 V)
30	1.0	3.2	(1.51 V)	(0.24 V)
40	1.0	3.2	(2.00 V)	(0.24 V)
50	1.0	3.2	(2.49 V)	(0.24 V)
54	1.0	3.2	(2.71 V)	(0.24 V)
57	1.0	3.2	(2.84 V)	(0.24 V)
60	1.0	3.2	(3.00 V)	(0.24 V)
63	1.0	3.2	(3.16 V)	(0.24 V)
66	1.0	3.2	(3.31 V)	(0.24 V)
70	1.0	3.2	(3.49 V)	(0.24 V)
73	1.0	3.2	(3.67 V)	(0.24 V)
77	1.0	3.2	(3.84 V)	(0.24 V)
81	1.0	3.2	(4.06 V)	(0.24 V)

Sr 76 PUP: kV & mA Feedback Reference Voltages				
85	1.0	3.2	(4.25 V)	(0.24 V)
85	2.0	3.2	(4.25 V)	(0.49 V)
85	2.5	3.2	(4.25 V)	(0.61 V)
85	3.2	3.2	(4.25 V)	(0.76 V)
85	4.0	3.2	(4.25 V)	(0.96 V)
85	5.0	3.2	(4.25 V)	(1.22 V)
85	6.3	3.2	(4.25 V)	(1.53 V)
85	8.0	3.2	(4.25 V)	(1.92 V)
85	10.0	3.2	(4.25 V)	(2.43 V)
85	13.0	3.2	(4.25 V)	(3.06 V)

3 Complete one exposure by each technique factors listed above. In case of arcing and / or breakdown, start this test from the beginning (by pressing OK button twice).

4 If an arc or high voltage breakdown occurs in the tubehead during exposure, this program is terminated and **FAIL** failure code will appear on the display.

5 If repetitive arcing and/or breakdowns occurred, consult Instrumentarium Imaging Technical Service.

NOTE!

It is also recommended that OP100, which has not been used for three months or more, should be warmed up with this program. Always run this program after the tubehead assembly replacement.

6 Press OK again to return to the program viewing level. **Sr 76 PUP** is displayed.

7 After the test set OP100 for normal operation mode and make a panoramic exposure (Program 1) with maximum technique factors.

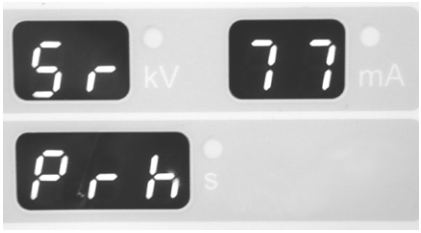
2.6 SR 77 PRH: PREHEAT AUTOMATIC ADJUSTMENT

WARNING!

This special program generates x-rays.

Select **Sr 77 Prh**. Default exposure parameters are shown with the current preheat offset parameter in the time display. The kV and mA levels cannot be edited. Press the exposure button continuously; the exposure will be made. The preheat display starts to increase and the filament feedback is monitored. If a correct level is reached the exposure stops and the final filament preheat offset reference value is left in the time display. The value can be edited with the left / right buttons; don't do it, but leave the program by pressing OK button. The value is stored into non-volatile

memory. Purpose of this program is to make the unit to adjust it's preheat level of the filament automatically.



Procedure:

1 Press the exposure button continuously. Unit makes an exposure with 85 kV.

2 Preheat level starts to rise from 0 by increasing preheat reference slowly, and the unit checks the mA level at the same time. The preheat reference data is displayed in the time display.

3 When the desired mA level is reached, program terminates the exposure. Return to program viewing level. Press OK to store the current preheat reference into the EEPROM memory.

NOTE!

The value should be between 50 and 60.

4 Press OK to return the program viewing level. **Sr 77 PRH** is displayed again. Select another program or exit the service programming mode.

2.7 SR 79 SUP: LINE VOLTAGE DISPLAY

Select **Sr 79 SUP** to check line supply voltage.

Line voltage is calculated from a measured incoming +25V supply in the Filament Control Board. Measured line voltage is shown in the time display.

Procedure:

1 Select program **Sr 79 SUP**. The display shows the approximate line voltage value:

Inaccuracy of Line Voltage Measurement	
230 VAC Line	110 VAC Line

Inaccuracy of Line Voltage Measurement	
± 5 VAC	± 3 VAC

2 Press OK to return to the program viewing level. **Sr 79 SUP** is displayed again. Select another program or exit the service programming mode.

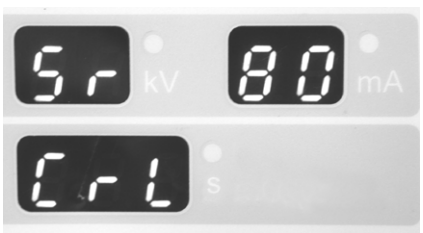
2.8 SR 80 CRL: MOTOR MOVEMENT TEST

Select **Sr 80 CrL**. The procedure allows test drives for different procedures with and without exposure. The used motor can be selected with the lowest field and is shown in the kV display as either **CA** (cassette), **ro** (rotation) or **LI** (linear) with film units. In digital models CA is replaced by **CE** (cephalostat). In the test mode the carriage is driven from the start of the current position to the end (as long as the exposure button is held down.) The final display shows the accumulated error at the end of the procedure in percent (unless too big movement error which results in failure!). The speeds and accelerations are much above the normal values and motor specific.

NOTE!

During routine service, the movement tests need to be done for each movement motor only once in each direction with speed factor 1 and number of accelerations 2. (See the following detailed instructions, steps 4 and 5!). Further testing is necessary for extensive troubleshooting only.

A	M	T
AEC mode	Manual mode	Test mode
no function	In manual mode a static exposure is active during movement test. The exposure values can be manually selected.	In the test mode the movement test is made without x-rays.



Motor movement speeds			
Motor	**Speed**	**Speed factor**	**Total speed**
CA (cassette)	50 mm/s	1	50 mm/s

Motor movement speeds			
Motor	**Speed**	**Speed factor**	**Total speed**
CE (cephalostat)	50 mm/s	1	50 mm/s
RO (rotation)	15°/s	1	15°/s
LI (linear)	15 mm/s	1	15 mm/s

Motor movement speeds			
Motor	**Speed**	**Speed factor**	**Total speed**
CA (cassette)	50 mm/s	2	100 mm/s
CE (cephalostat)	50 mm/s	2	100 mm/s
RO (rotation)	15°/s	2	30°/s
LI (linear)	15 mm/s	2	30 mm/s

The purpose of this program is to check that there is enough torque in the rotational, linear or cassette movement: the stepping motor and motor control circuit operate properly, there is enough friction and the movement does not slip nor get stuck. Tests are to be done in both directions separately.

Procedure:

1 Select program **Sr 80 CrL**. Movement test is activated by pressing and holding down the exposure button.

2 The kV display shows the type of motor movement (CA, CE, ro or LI).

3 The mA display shows the amount (1-5) of accelerations per one movement. The amount tells how many accelerating movement are done in one stroke.

4 The time display shows the velocity factor 0.1-2.5. This can be altered manually to perform the test with different speeds.

The minimum requirements for CA, CE, ro and LI movement tests:
2 accelerations and velocity factor 1.

NOTE!

The other value choices are for more precise trouble shooting investigation for the movements.

Movement is done according to settings and only to one direction at a time. At the end the displayed value in the time field should be written down. Then the value shall be confirmed by pressing OK and the test movement can be done to the other direction. The second final value should be written down also. These two values should be compared to each other and the result should either be accepted or rejected according to the limit values shown on the table below.

Motor movement test	Maximum difference of the two final values *)
CA (cassette)	1.0 mm
CE (cephalostat)	1.0 mm
ro (rotation)	2.0°
LI (linear)	1.2 mm

*) Examples of calculating the difference:
First test ends with 0.7, second test ends with 0.2.
Difference is 0.7-0.2=0.5.
If first value is 0.3 and second value is -0.3, the difference is 0.3-(-0.3)=0.6.

Acceleration

1 or 3 Time 1.25
1 or 3 Time 1.25
1 or 5 Time 1.5
1 or 3 Time 1.5

5 Display shows the actual rotation in degrees, from **0°** to **200°** and back. Note that figure **1.5** indicates that the motor is loosing pulses during acceleration that correspond to **1.5°** rotation, and **-1.5** indicates that the drive mechanics is sliding during braking sequence that correspond to **1.5°** rotation.

6 Press OK button. If test result is out of limit **FAIL** message appears to the time display accordingly after the program has been completed.

7 To test the movement back and forth keep pressing the exposure button during the first movement. Then release the button, write the number down and press OK button for confirmation. For second movement press and hold down the exposure button again.

8 To start test the movement in opposite direction, press either the patient positioning button or the start position button. The rotating unit will turn to the opposite side. Press the exposure button.

9 If the test failed and **FAIL** was displayed, check the microswitches, friction surface, drive wheel and its tension, stepping motor and its driving circuitry, cable C 13 inside the rotating unit.

10 Repeat the test when needed or return to the program viewing level by pressing OK button.

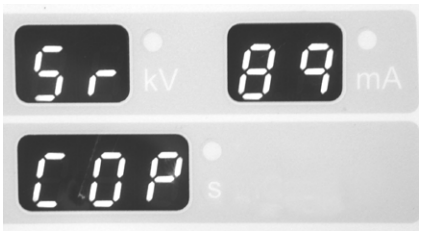
2.9 SR 88 CAL: CEPH SECONDARY COLLIMATOR ALIGNMENT INFORMATION

Select Sr 88 CAL. This procedure allows disabling the THA rotation compensation based on the x-ray beam location on the beam alignment board. Normally this option should be on to allow the unit to correct small beam alignment errors.

2.10 SR 89 COP: COUNTRY OPTIONS

Select **Sr 89 COP**. Use up and down buttons to select programmable extended options from 1 to 4 (with INSTRU rights all are available.) Visit the selection level and double check the stored value. Numeric code with alphanumeric abbreviation and stored state of appropriate selection appear on the display.

12 country option programs, which are one time settings to configure the unit for daily operation. There are four options that can be selected for Remote exposure only **1 rE**, disable first cephalostat collimator **2 C1**, no AEC for OP100 used in computerized radiography **3 nA** and free kV selection in steps of 0.1 mA **4 FE**.



Sr 89 COP: COUNTRY OPTIONS		
Program	**Option**	**Function**
1 rE	OFF	When OFF is selected the exposure is possible with both control panel and remote exposure button.
	on	When ON is selected the exposure is possible only with the remote exposure button in the AEC and Manual mode. This feature has no effect in the Test mode. In the test mode exposure is possible from both remote exposure button and control panel.
2 C1 (film units only)	OFF	When OFF is selected all collimator positions are available.
	on	ON function prevents the exposure when the collimator C1 (24 x 30 cm AV, 8 x 10 AH or special) is selected. Ready light will be off.
3 nA	OFF	When OFF is selected the normal operation with AEC is available.
	on	ON function disables AEC function. OP100 can be used without AEC Board, eg. OP100 CR models for computerized radiography with a special image plate system do not have AEC.

Sr 89 COP: COUNTRY OPTIONS		
4 FE	OFF	When OFF is selected KV and mA are selected in pairs according to Pr 52 CCO settings. This feature has no effect on the AEC mode and on preprogrammed technique factors.
	on	When ON is selected the exposure value selection is free. Selection is possible between 57 and 85 kV in steps of 1 kV in the Manual Mode. Selection of mA is from the table: 2.0 - 2.5 - 3.2 - 4.0 - 5.0 - 6.3 - 8.0 - 10 - 13 - 16. **NOTE!** Pressing the left or right button longer causes kV to change in larger steps. **NOTE!** If the kV is increased with maximum mA selection, the mA value is automatically decreased when the product of kV * mA exceeds the allowed X-ray tube rating.
5 00	OFF	Not in use
	on	Not in use
6 P6	OFF	When OFF is selected the Ortho TMJ is deactivated, but the lateral TMJ Imaging program P6 is available.
	on	ON function activates the Ortho TMJ. This program depends on INSTRU sw.
7 Or	OFF	When OFF is selected the Ortho Trans Imaging program is deactivated.
	on	ON function activates the Ortho Trans Linear Tomography Programs P13 & P14. This program depends on INSTRU sw.
8 3d	OFF	When OFF is selected the Volumetric Tomography imaging program is not activated. This program is for digital units only and depending on InstruSW.
	on	When ON is selected the optional Volumetric Tomography imaging program is activated.

Procedure:

1 Select program **Sr 89 COP** and press OK . KV and mA displays show **1** and **rE** and the time display shows **OFF** or **on**. The kV light is blinking.

2 Select one of the country option programs **1 rE**, **2 C1**, **3 nA** or **4 FE** by pressing up or down button. These four programs are all the time available. If you have the correct password, the remaining additional options comes visible: options 6 through 12.

3 Change the setting of the respective program in displays by first pressing down button. Press right button to activate this feature. **on** is displayed.

4 Press left button, if you don't want this feature. " **OFF** " is displayed.

5 Press OK to store any changes into OP100 memory. Control panel displays **Sr 89 COP** again.

2.11 SR 90 PIN: PANORAMA INSTALLATION PROGRAM

WARNING!

This special program generates x-rays.

Test AEC frequency or exposure without movements. (EPS) Stepping motors do not operate during the exposure cycle. This program can be used while doing electrical troubleshooting or calibration. When this program is used, the KVOK and MAOK signals are not monitored. Therefore Sy 23 Inu and Sy 24 FIL error codes are not enabled. Only Sy 22 *** error code is monitored. (In earlier unit model OP100 this feature was Sr 75 EPS).

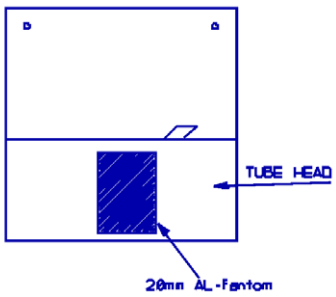
Select **Sr 90 PIn**. The panoramic installation procedure is selected.

Procedure:

1 Select **Sr 90 PIn** and press OK.

The mA and kV display show active exposure values and the time display the exposure time. These can be edited (free kV editing.) The exposure mode toggles between different functions for the exposure:

		
AEC mode	Manual mode	Test mode
Automatic mode selects the AEC calibration test; the time display shows the AEC frequency during exposure. 144 ± 3	Manual mode selects exposure w/o movements; only a static exposure is done.	For film units only, the test mode shows the AEC base frequency in the time display, but no radiation is actually done. 5,0 ± 0,3



Placement of the fantom

NOTE!

When calibrating the AEC frequency, the tube head front cover must be on and the aluminium calibration tool (code 60441) must be attached with tape right in front of the primary collimator.

2 Select the technique factors, kV, mA and exposure time. Make the exposure. Cassette is not required, as this program does not detect the cassette sensors, however the cassette needs to be in place and centered when checking the AEC frequency during exposure for film units. Read the AEC frequency from the time field, verify the beam alignment on the fluorescent tool or capture the EPS image by CliniView (digital units).

If AEC frequency is correct (144 kHz) the middle led is illuminating. If some other led is illuminating the AEC frequency must be adjusted with potentiometer.

NOTE!

This AEC frequency adjustment is for digital units only.

NOTE!

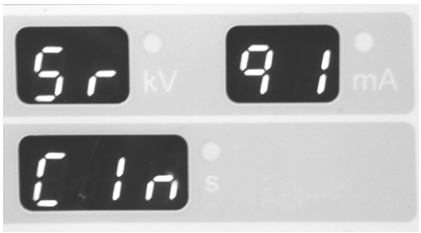
If this program is used to align cephalometric field, make sure that OC100 is positioned in User mode for cephalometric exposures (Program 11 or 12 with film /
Program 9 or 10 with digital -> ceph collimator -> movement button) before entering this program.

3 After the exposure the unit is ready for additional exposures.

4 Return to the program viewing level. Press OK again. **Sr 90 PIn** is displayed. Select another program or exit the service programming mode.

2.12 SR 91 CIN: CEPH INSTALLATION PROGRAM

For digital units only. Select **Sr 91 CIn**. The ceph installation procedure is active. Different sub-functions are available by using the different exposure modes. As exposing without movements and driving the ceph head to the alignment position. Also aiming the cephalostat beam at the ceph sensor on digital units is possible.



During exposures, the exposure values are shown in the kV/mA/s fields; the beam detector signals are shown in the density field.

		
AEC mode	Manual mode	Test mode
Do not use the (A) AEC mode. This is for future upgrades.	(M) Manual mode performs an exposure w/o movements using the selected exposure values.	(T) Test mode drives the secondary collimator and detector into the ear-holders position (alignment position). The value in time field is offset for tube head aiming at the ceph CCD detector.

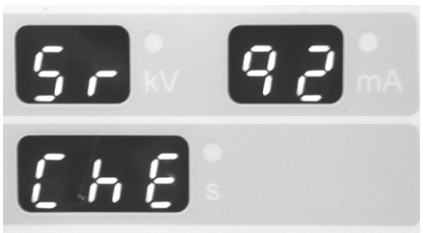
NOTE!

The following Ceph alignment for digital units only!

The test mode offset value in the time display tells in centimeters (at ceph CCD level) where the x-ray beam is aimed at the cephalostat CCD sensor. This offset value should be used to correct the beam in to the center of the ceph detector at the alignment position, instead of adjusting the code disk at the rotation disk. A negative value aims the beam more left and a positive value moves beam more to the right. After changing the offset value press the positioning button to drive secondary collimator and detector in to the new alignment position and make a test exposure again in the manual mode to see the new location of the beam. Repeat if necessary.

2.13 SR 92 CHE: INSTALLATION CHECK ENABLE / DISABLE SETTINGS

Select **Sr 92 ChE**. The left and right buttons toggle between the values **OFF**, **nCA**, **nPC**, **nCo**, **nCh**; which mean normal checks, no cassette check, no workstation link check, no collimator check; and finally none of the listed checks. Additionally, the OP100 has the settings **nrA** (no radiation) and **non** (nothing), which function similarily to the EXHSW (OPTIONSW) selection, i.e. turn the radiation (EXPENA) off. All the values are in a hierarchical order, which excludes more and more when proceeded. Return to normal operating mode and check that the checks have been overridden. Reset the system by switching the power off and on again. All checks are active again.



Value	Description
OFF	Normal check
nPC	no workstation link check (digital units)
nCO	no collimator check
nCA	no cassette check (film units)
nCh	none of the above listed checks
nrA	no radiation
non	nothing checked during exposure

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Orthoceph® OC100 & OC100 D
Service Program Manual, English

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