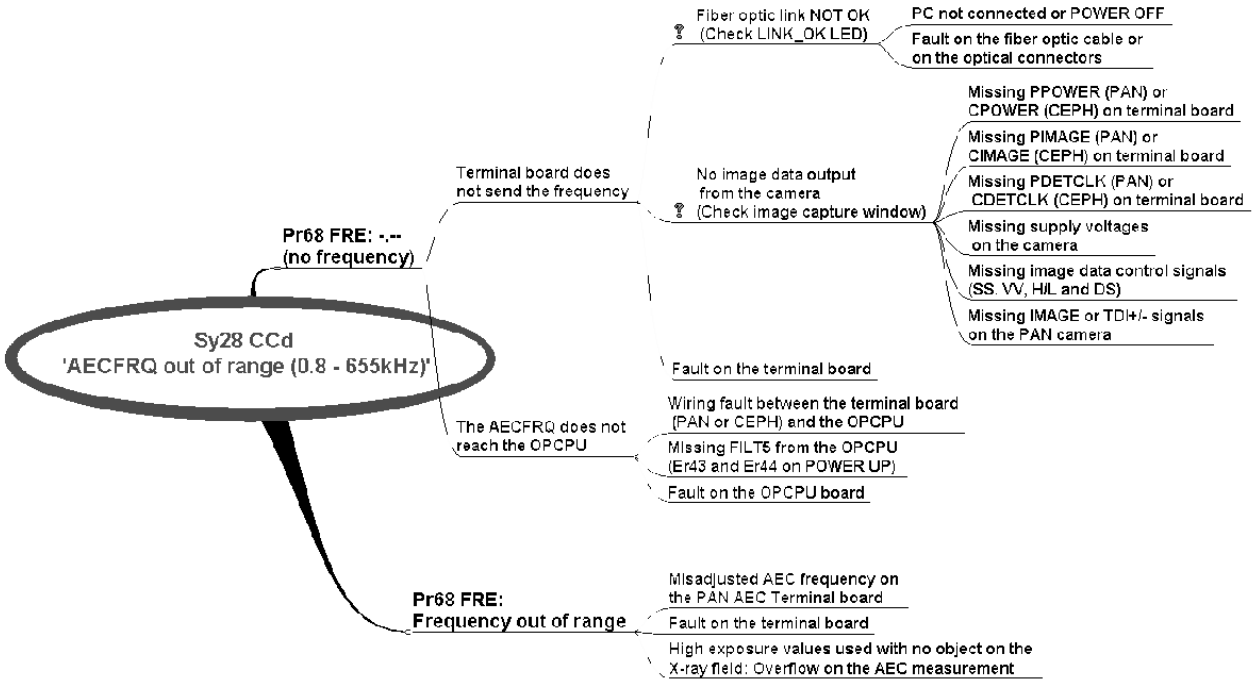
Orthopantomograph® OP200 & OP200 D
Orthoceph® OC200 & OC200 D
Troubleshooting Manual



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1 General trouble shooting

Trouble shooting guides listed in this manual are for solving imaging problems. In case there is no solution found, contact the technical customer service of the manufacturer.

Parts are identified in the wiring diagram with letter(s) followed by number eg. cable or capacitor (C), coil/inductor (L), fuse (F), lamp (LA), motor (M), switch (S), coiled cable (SC), and connector (X).

1.1 OP200 Does not operate at all

Possible causes:	Check that:
No power or OP200 is not receiving power.	Site's circuit breakers are ok
	Mains cables are connected inside the OP200 and the unit is properly connected to the mains voltage.
	Mains fuses are ok and have the correct rating.
Power switch turned off.	The power on/off switch is at **I** position. Green indicator under the carriage should be lit.
Wrong mains voltage setting.	OP200 mains voltage setting on the Power Supply Board matches the power line.
Problem with secondary voltages.	Fuses of secondary voltages are ok and that individual circuit boards are receiving the power (green LED's).
Emergency stop switch is pressed.	Make sure the problem, why the switch was pressed, is solved before releasing the switch and turning the unit on.

1.2 No exposure, no error message, but movements ok

Possible causes:	Check
Remote exposure button does not operate.	Signal EXPSW switch and its wiring. Use Sr 74 IOC.

Possible causes:	Check
Panel exposure button does not operate.	Signal PNLEXPSW switch and its wiring. Use Sr 74 IOC.
Unit is used in Test mode.	The exposure mode selection in the control panel. Select **A** or **M** instead.
Installation.	The I/O board jumper X11. Set X11 jumper to OFF or turn S2 to OFF. Exhibition mode is set when exposure lights are on but no buzzer is heard during the exposure.
Problem with Core Module signal PREHREL. Sometimes this error does not generate an error message.	The generator and exposure signals. Replace boards if needed.
Problem with Inverter Board signals KVREF or KVFB. Sometimes this error does not generate an error message.	KVREF signal line broken or KVFB D10 shorted. Replace Inverter Board.

1.3 Exposure ok, but no movements

Possible causes:	Remedy:
Unit is in the user programming mode.	Exit from the user programming mode to the normal operating mode by pressing and holding OK button for three seconds.
Unit is in the service programming mode.	Exit from the service programming mode to the normal operating mode by pressing and holding OK button for three seconds.
Film unit is in cephalostat mode.	Tests. Normal operation.

1.4 OP200 Malfunctions, but no error message

Possible causes:	Remedy:
Problem with Core Module memory contents.	Set Pr 53 nor to **on**. If this does not help, replace the Core Module.

1.5 Positioning lights do not operate

Possible causes:	Remedy:
Collimator in CEPH or QA position. No lights	Select the PAN collimator.
Collimator in TOMO position. Only TOMO laser lights operate.	
Problem with lights and their wiring.	Check the 12 VAC power line wiring, Interface Board and X19 signals.
Problem with pos.panel connectors or lights key(s).	Check the panel keys and wiring. Check both side panels. In CEPH mode check the collimator position - if CEPH - make sure that ear holders are in lateral position.

NOTE! *See patient positioning instructions in OP200 User Manual.*

1.6 Cephalostat programs cannot be selected

Possible causes:	Remedy:
Collimator in wrong position.	Check the position.
Cephalostat slot is not detected.	Check the jumper position on I/O board. **Note!** If ceph side selection jumper is not installed, the collimator apertures in Sr 82 COL service program are not able to be determined (film unit).
Cephalostat collimator is not ready.	Check collimator position.

1.7 DAP reading in Control panel is incorrect

Possible causes:	Remedy:
Either radiation rate constant is not set or collimator aperture settings undefined.	Check collimator aperture settings and radiation rate constant in Sr 82 COL and Sr 78 THA service programs.

1.8 Ceph lateral program can’t be selected

Possible causes:	Remedy:
Core Module doesn’t sense LAT/PA switch changes.	Check Ceph LAT-switch function. Check Ceph main cable in Digital unit.
Overexposed image at the end of CEPH LAT program.	Check that Ceph LAT-switch senses LAT position - if not - there isn’t soft-tissue compensation in Ceph LAT image.
	Check that nasion potentiometer frequency (caecfrq) is detected by Core Module

1.9 Automatic collimator not detected (digital unit)

Check detected collimator type by entering service program "Sr 82 COL". If automatic collimator is detected, text "Auto" along with collimator position information is displayed. Otherwise, if manual collimator is detected, text "Std" is displayed.

Possible causes:	Remedy:
Cable or connector fault.	Check that pins 5 and 10 are shorted on connector X114 on C76 (autocollimator cable).
Embedded SW version too old.	Check that the unit SW revision is R2.5 or newer. Update if necessary.

1.10 Problem with film image quality

Possible causes:	Remedy:
Problem with patient positioning	See OP200 User Manuals for details.
Technique factors not correct or not optimal for film-screen combination.	Check that image density is ok for AEC and manual modes.
	Check that constant contrast value (GCO) is set optimum for film-screen used. Lower value increases contrast.
	Check the AEC offset for each program and density settings.
	Check that the preprogrammed exposure values match to the needs and preferences of the customer.
	Check that a newly taken Quality Assurance film compares to the customer's QA reference film.
Problem with beam alignment	Verify that OP200 panoramic beam alignment is ok.
	Verify that OC200 cephalometric beam alignment is ok.

Possible causes:	Remedy:
Problem with cephalostat	Check that OC200 cephalostat head assembly is locked.
	Verify that OC200 ear holder adjustment is ok.
Soft tissue not clear in ceph image	Check that the nasion support value mathces with the soft tissue filter value.
Dark room	Check that dark room is light tight.
	Check that proper safelight (red color) and bulb max. 15W are used.
	Check that the green lights of OP200 are not fogging the film being loaded, if OP200 and film processor are in the same room.
X-ray film	Verify that film is processed immediately after exposure.
	Check that films are stored in a cool dry dark place in vertical position. Opened film packages are light tight. Film lot is not expired. Older lot should be used first.
Film processor	Check that processing chemicals strength and temperature are ok.
	Check that processor chemicals are changed frequently.
	Check that processor operation lights are not fogging the film.
	Check that processor is maintained according to the manufacturer's recommendation.

Possible causes:	Remedy:
Film Cassettes	Check that cassettes are light tight and do not have dents.
	Verify that intensifying screens are clean and without scratches.
	Check that cassette has been mounted with flat side towards the x-ray tube.
	Check that panoramic cassette lid does not have lead sheet inside it.
	Verify that intensifying screens and film used match to each other. Please consult the dealer for details.

1.11 Problems with digital image quality

High quality images with sharp contrast and good detail present optimum diagnostic information. Images with less quality are usually the result of one or more common problems, which are described here.

Possible causes:	Remedy:
Sharp image layer is not correct	See OP200 / OC200 User Manuals for patient positioning details
Overexposed image at the end of CEPH LAT program	Check that Ceph LAT-switch senses LAT position - if not - there isn't soft-tissue compensation in Ceph LAT image.

1.11.1 Image is grainy or noisy

Possible causes:	Remedy:
Not enough dose to achieve diagnostic image i.e. x-ray beam not correctly positioned compared to the camera	Verify that OP200 panoramic beam alignment is ok. Verify that OC200 cephalometric beam alignment is ok. Check AEC frequency value.

Possible causes:	Remedy:
Too low exposure values	Increasing PCo / gCo and density settings decreases image noise. Check the AEC offset and density settings. Check that the preprogrammed exposure values match to the needs and preferences of the customer. Check AEC frequency value.
Broken main cable, Inverter Board or Filament Control Board	Check that darkness of the columns in a newly taken Quality Assurance reference image increases stepwise

1.11.2 Image is striped

Possible causes:	Remedy:
Too high exposure values	Check that your exposure settings are reasonable - overexposure makes image striped in the areas where is little media on the beam.
	Decreasing PCo / gCo and density settings decreases the amount of stripes in image.
	Check the AEC offset and density settings.
	Check that the preprogrammed exposure values match to the needs and preferences of the customer.

1.11.3 Image is too dark / light

Possible causes:	Remedy:
Monitor settings are wrong	See monitor and Cliniview user manual for preferred settings Verify that you are using min. 24-bit colour. Less colours makes gray scale changes quantized. For detailed decription see Windows and / or graphics board installation manuals.
Cliniview settings are wrong	See Cliniview user manual for preferred and optimized settings

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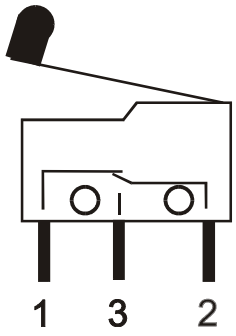
2 Electric trouble shooting

The OP200 has many safety functions and features assuring the safe operation of the equipment. In the event of certain user failures or system malfunction the unit does not produce x-rays and a failure code is displayed on the control panel.

2.1 Microswitches and position indicators



There are 15 to 18 microswitches and opto sensors in OP200 models to detect the position of the various movements of the equipment. All switches are wired to the I/O Board, and the microprocessor reads the status of the switches every 20 ms. The name of the switch is the same as the name of the signal to the microprocessor. Open switch is 5 V, and closed switch is 0 V signal level in I/O Board. Their operation can be checked by using Service Program Sr 74 IOC.

2.2 General, failure messages

In case of malfunction, the unit displays a failure message. Various letters and numbers are displayed in the technique factors display positions next to kV, mA and s. Failure code classification is displayed next to kV. A special failure code number is displayed next to mA with alphanumeric information in the s-display.

kV display

Letters in the kV-display indicate the nature of the failure, whether it is caused by user (eg. wrong collimator selected), environment (eg. low line voltage) or protection in the unit (eg. tubehead too hot), or whether there is a serious defect in the unit, which disables the complete operation (eg. program memory error):

Ch	Check. A failure caused by the user.
Sy	Safety. Temporary malfunction or protection in the unit, caused by the unit or environment. Operation is prohibited or terminated to protect the operator, patient and the unit itself. (Eg. the temperature in the tube head assembly is too high due to intensive use). After the corrective action or the wait time, the unit can be used.
Er	Error. There is a serious defect in the unit, and the operation is therefore prohibited to protect the operator, patient and the unit itself. (Eg. Failure in the Core Module).

WARNING! *If the unit is further used,* **FAIL** *failure may cause malfunction.*

mA display

The mA-display shows the actual numeric failure code. Each failure code has a unique number, to differ one malfunction from another:

kV	**Ch**	**Sy**	**Er**
mA	1 to 19	20 to 39	40 to 50

s display

The exposure time display indicates the alphanumeric short form explanation of the malfunction. This reminds the user or the serviceman of what the actual numeric failure code means, or sometimes numeric information of the malfunction, eg. PC for personal computer and COL for collimator.

kV	Time display
Ch-failure	PC, PAC, CEC, COL, POS, rEL, PSE, rEo, EAr, PAR, LbL, bPL, StP, HSP or numbers
Sy-failure	HHo, ArC, Inu, FIL, AEC, EEP, Por, CCD, PoL, PoH, PoU, nSY, COL or numbers
Er-failure	CPU, FIL, InP

Failure code resetting

Ch failure codes can be reset by correcting the reason for the failure code (eg. changing collimator position).

Ch and **Sy** failures can be reset by pushing any key in the control panel (up-down-right-left-OK) or in the patient positioning panel.

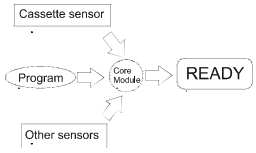
Er failures can not be reset. Switch the unit off and on, to test whether the failure was only temporary.

2.3 Film unit failure messages

2.3.1 Ch 1 CAS

Problem:	**“ Ch 1 CAS “** error message is displayed.
Why?	Cassette not ready for the exposure in QA and panoramic programs.
How is it detected?	At the beginning of the exposure the state of the PANCASSW signal is read. The indicator for panoramic film cassette, optical sensor (D1), is located inside the cassette holder, behind the cassette carriage. When the cassette is inserted the actuator on the cassette carriage moves the cam away from the optical fork, thus activating the PANCASSW signal. Error occurs when the exposure, other than cephalometric, is initiated and 1) the signal is not active or 2) the signal has not been inactive since the previous exposure. The exposure is prevented. To ensure maximal image quality the panoramic cassette can not be placed in it’s holder while aqcuiring cephalostatic image and vice versa.

Possible causes:	**Check or test:**	**Parts related:**
Panoramic or tomographic cassette not properly installed or not in place.	Remove the cassette and reinsert unexposed one. - Error should clear.	Cassette
Panoramic or tomographic cassette not replaced since the previous exposure.	- If not check the microswitch operation.	
Trying to aqcuire ceph image while pan cassette installed.	Remove pan cassette.	

Possible causes:	Check or test:	Parts related:
Signal PANCASSW passive in the Core Module.  	Check the microswitch operation & adjustment: Press the cassette against the cassette tunnel. - If the error message clears then problem with the cassette sensor alignment, adjust the microswitch or opto coupler. - If the error stays then check the wiring.	Cassette sensor assembly
	Check the wiring: - Check the connectors and wires for open or broken wire. Use the wiring diagram. - Check the wiring order on microswitch or optocoupler	Microswitch S23 or optocoupler, SC4 or C19, C18 in CR units, X114, C13, X6
	Test the wiring : - Use Sr 74 IOC. Press cassette sensor to check that the signal status changes. When signal is active (opto sensor D1 free or microswitch S23 closed), cassette is in the cassette holder. Signal is indicated by In 0 LED8, lit LED indicates the presence of the cassette. If the signal does not change then use wiring diagram and DVM (digital voltmeter) to find the problem.	

2.3.2 Ch 2 CAS (film unit)

Problem:	" **Ch 2 CAS "** error message is displayed.
Why?	Cephalostat cassette not ready with the program P11 and P12.
How is it detected?	In OC200 models there is an indicator for the cephalometric film cassette. This microswitch (S 34) is located inside the cassette holder. At the beginning of the exposure the state of the CEPHCASSW signal is read. Error occurs when the cephalometric exposure is initiated and 1) the signal is not active or 2) the signal has not been inactive since the previous exposure. The exposure is prevented. Error occur also if cephalometric cassette is installed and panoramic image acquicition started.

Possible causes:	**Check or test:**	**Parts related:**
Cephalostat cassette not properly installed or not in place.	Remove the cassette. Reinsert it. - Error should clear. - If not check the microswitch operation.	Ceph cassette

Possible causes:	Check or test:	Parts related:
Cephalostat cassette not replaced since the previous exposure.	Remove cassette and replace with unexposed one. Check the microswitch operation & adjustment: Press the cassette against the cassette sensor. - If the error message clears then problem is with the cassette sensor alignment. Adjust the microswitch. - If the error stays then check the wiring or adjust the switch.	Cassette sensor
Ceph cassette installed while PAN exposure	Remove ceph cassette	Ceph cassette

Possible causes:	Check or test:	Parts related:
Signal CEPHCASSW passive in the Core Module.	Check the wiring: - Check the connectors and wires for open or broken wire. Use wiring diagram. - Check the wiring order on microswitch.	Microswitch S34, CC4, X130, CC2, X110 or X121, C13, X8, Core Module
	Test the wiring : - Use Sr 74 IOC. Press the cassette sensor to check if the signal status changes. - If the signal does not change, then use wiring diagram and DVM to find the problem. - When switch is closed, cassette is in the cassette holder. Note that the switch is connected normally closed, i.e. the switch is closed when the actuator is released. Signal is indicated by In4 LED5, lit LED indicates the presence of the cassette.	

2.3.3 Ch 3 COL (film unit)

Problem:	**“ Ch 3 COL “** error message is displayed.
Why?	Wrong collimator selected.
How is it detected ?	Error is generated when the panoramic (P1 - P5), or special (P6 -P10) exposure is initiated while the panoramic collimator is not in the panoramic position. Error is also generated when the tomographic (P13 - P14) exposure is initiated while the collimator is not in TOMO position. Signals COL1SW to COL3SW are monitored in the Core Module.

Possible causes:	**Check or test:**	**Parts related:**
Collimator not in PAN position when panoramic (Program 1 to 5), TMJ or sinus (Program 6 to 10) selected.	Move the collimator to correct position until it “clicks”. - Error should clear. - If not check the microswitch operation.	Collimator.
Collimator not in TOMO position when Program 13 or 14 selected.		

Possible causes:	Check or test:	Parts related:
Signal COL1SW passive and/or COL2SW active in the Core Module.	Test the microswitch operation: Move the collimator. - If the error stays then check the wiring and microswitch alignment. - Remove THA cover. Visually check that the switches trigger according to the code bar and that switch levers move freely.	Collimator.
	Check the wiring: - Check the connectors and wires for open or broken wire. Use wiring diagram. - Check the wiring order on microswitch. - If error happens at OT upgrade, check the collimator code disk, there are two different models, OC200 and TOMO. Refer to the Table on next page.	S31, S32, S33, CC1, X113, C13, X8, Core Module, collimator code disk
	Test the wiring : Use Sr 74 IOC and move the collimator to check that the signal status changes. Follow the Table below. - If the signals do not change or are not correct then use wiring diagram and/or DVM to find the problem.	

Valid OC200 & OC200 OT collimator switch combinations (closed switch is active = +5V). There are two different code bars, one for OC collimators and the other for Ortho Trans collimators:

S 31 COL1SW	S 32 COL2SW	S 33 COL3SW	COLLIMATOR POSITION	
closed	closed	open	Quality Assurance collimator	
closed	open	open	Panoramic collimator	
closed *open	closed *closed	closed *open	Cephalostat collimator: 24 x 30 cm AV or 10 x 12 in AV or 10 x 8 in AH	TOMO collimator: * TOMO
open	closed	closed	18 x 24 cm or 8 x 10 in AV	18 x 24 cm AV or 24 x 30 cm AV or 8 x 10 in AV or 10 x12 in AV or 10 x 8 in AH
open	open	closed	18 x 24 cm SV or 8 x 10 in SV	18 x 24 cm SV or 8 x 10 in SV
open	open	open	No valid collimator	

2.3.4 Ch 4 COL

Problem:	**“ Ch 4 COL “** error message is displayed.
Why?	Wrong collimator selected for ceph exposure.
How is it detected?	Error is generated when the cephalometric exposure is initiated while the collimator is not in one of the cephalostat positions. Signals COL1SW to COL3SW are monitored in the Core Module.

Possible causes:	**Check or test:**	**Parts related:**
Collimator not in cephalostat position when program P11 or P12 selected from the control panel.	Move the collimator to correct position until it “clicks”. - Error should clear. - If not check the microswitch operation.	Collimator.

Possible causes:	Check or test:	Parts related:
Signal COL1SW active and/or COL2SW passive in the Core Module.	Test the microswitch operation: move the collimator. - If the error stays check the wiring and microswitch alignment. - Remove THA cover. Visually check that the switches trigger according to the code bar and that switch levers move freely.	Collimator.
	Check the wiring: - Check the connectors and wires for open or broken wire. - Check the wiring order on microswitch. - If error happens at OT upgrade, check the type of the collimator code disk: there are two different models.	S31, S32, S33, CC1, X113, C13, X8, Core Module, collimator code bar
	Test wiring : - Use Sr 74 IOC. Move the collimator to check that the signal status changes. If the signal does not change, then use wiring diagram and/or DVM to find the problem.	

2.3.5 Sy 25 AEC

Problem:	**"Sy 25 AEC"** error message is displayed.
Why?	AEC base frequency incorrect.
How is it detected?	Occurs in the AEC mode if the AEC base frequency (AECFRQ during stand by) is below 5 kHz. Exposure sequence is interrupted. **NOTE!** *The unit can be used in Manual exposure mode.*

Possible cause	Check or test	Parts related
+25V or -25V operating voltages not ok	Green LED's on AEC board and Filament board. Check the power lines	AEC board, X39, Filament board, X35, C13, X27, Power Supply board
Wrong AEC base frequency.	Check base frequency with "Sr 90 INS" option "FRE" or "Sr 78 FrE". Adjust to 5kHz.	AEC board
AEC base frequency drifts. Problem with AEC board.	Check with Sr 90 INS	AEC board
Open connector	Check the wiring. In CR models check the 15V regulator.	
Broken Core Module: signal FILT15. Optocoupler.	Check the signal and its wiring.	AEC board, X116, C13, X6, Core Module

2.3.6 Sy 28 PoC

Problem:	**“ Sy 28 PoC “** error message is displayed.
Why?	Position error: cassette movement failed during operation.
How is it detected?	This error is generated during the cassette movement if the Core Module does not receive the CASLIMSW or CASMIDSW signal within a predefined time. Core Module assumes that the cassette is not moving and interrupts all movements and exposure.

Possible causes:	Check or test:	Parts related:
Microswitches. Cassette moves, but S 24 & S 25 (or D2 & D3) CASLIMSW, CASMIDSW may not operate properly.	Use Sr 74 IOC. Test the signals, move the cassette tunnel by hand. Adjust the switches if needed.	Microswitches or optocouplers, X114, SC4 or C18, C19 in CR models, C13, X6, Core Module
Control or power. Cassette stepping motor or motor driving circuitry in Interface board may not operate properly.	Check the motor control signals. All red LED’s should be lit when motor moving.	Core Module, PAL, X 5, Interface board, X 16, X17, C13, X112, M4 & Gear assembly
	Check the power, LED’s from the Interface & Power Supply boards. Check the wiring.	X17, Interface board, Power Supply board & fuses, C13, X114, X115, M4
Mechanical. Too little friction between the drive wheel and friction surface	Clean the friction surface with alcohol.	
Problem with motor or gear assembly	Replace the motor and gear assembly.	M4 & gear assembly
Control. TIMER ICD 27 (8254) in Core Module may not operate	Replace the Core Module.	Core Module

Possible causes:	Check or test:	Parts related:
Problem with wiring	Check the wiring.	

2.3.6.1 Cassette movement, principle

Movement is generated by using a stepping motor, a gear assembly and a drive wheel, which is forced against a friction surface of the cassette holder. There are two position indicators for cassette carriage movement. These optical sensors (or microswitches in older models) are located inside the cassette holder, behind the cassette carriage.

CASLIMSW one sensor (D 2 or microswitch S 24) to indicate either end of the cassette movement.

CASMIDSW the sensor (D 3 or microswitch S 25) to indicate mid position of the cassette movement, also indicating left and right segments of the movement.

Cassette carriage position is indicated as follows. Note that S24 is connected as normally closed, microswitch opens when the actuator is pressed. Optical sensor is considered closed when the optical path from transmitter to receiver is free, i.e. the signal is active. Closed microswitch or active signal lights the LED in Sr 74 IOC:

D 2 / S 24 CASLIMSW In0 LED7	**D 3 / S 25 CASMIDSW** In0 LED6	CARRIAGEPOSITION (viewed from tubehead towards cassette)
closed	open	left limit (end)
open	open	left half
open	closed	right half
closed	closed	right limit (end)

2.3.7 Sy 30 PoH

Problem:	**“ Sy 30 PoH “** error message is displayed.
Why?	Position error: cassette holder vertical movement failed during operation
How is it detected?	This error is generated if the Core Module does not receive the RACKLIMSW or RACKMIDSW within a predefined time. Core Module assumes that the cassette holder is not moving vertically and interrupts all movements and possible exposure sequence.

Possible causes:	**Check or test:**	**Parts related:**
Microswitches. S 21 or S 22 may not operate properly or they hit the mechanical limit before switching. Signals RACKLIMSW and RACKMIDSW	Use Sr 74 IOC. Test the signals, lift and lower the rack. Adjust when needed.	S 21, S22, SC4 or C18, C19 in CR models, X114, C13, X6 Core Module
Control & power. Rack motor or rack motor drive in Interface Board may not operate. Problem with relay.	Check the control from Core Module to Interface board. Check the motor control red LED’s: all should lit when unit is rotating. Check X16and X17 connections.	Core Module, X 5, Interface board, X 16 , C13, X114, SC4or C18, M 5
No motor power.	Check F2 on Power Supply board. Check LED’s on Interface board.	Power Supply board, X26, C5, X15

Possible causes:	Check or test:	Parts related:
Problem with gear assembly. Holder slides slightly down after the motor stopped.	Adjust the motor & gear assembly tension with the screw on top of the assembly or Replace Interface board with Interface board OT and change the PAL version. New board type has stand-by current to hold the motor.	Gear assembly.
Cassette holder stuck, does not move up nor down. Gear assembly in gridlock.	Release the grid lock: remove X21 on Interface board, press cass up or down key. If this does not help, remove the cassette holder and disassemble the motor assembly.	
Problem with wiring. Cables inside the cassette holder may inhibit the vertical movement	If equipped, check that the coiled cable moves freely.	SC4

2.3.7.1 Rack movement, principle

Movement is generated by using a DC motor, gear assembly and cogged belts. There are two position indicators for the vertical movement of the cassette holder. These microswitches are located on the cassette holder support frame and are accessible from inside the rotating unit.

RACKLIMSW one microswitch (S 22) to indicate either end of the cassette holder vertical movement.

RACKMIDSW one microswitch (S 21) to indicate mid position of the cassette holder vertical movement, also indicating upper and lower segments together with RACKLIMSW-signal.

Cassette holder position is indicated to Core Module as follows (note that S 21 and S 22 are connected as normally closed):

S 22 RACKLIMSW In0 LED2	S 21 RACKMIDSW In0 LED3	HOLDER POSITION
closed	closed	up
open	closed	upper half
open	open	lower half
closed	open	down

2.4 Digital unit failure messages

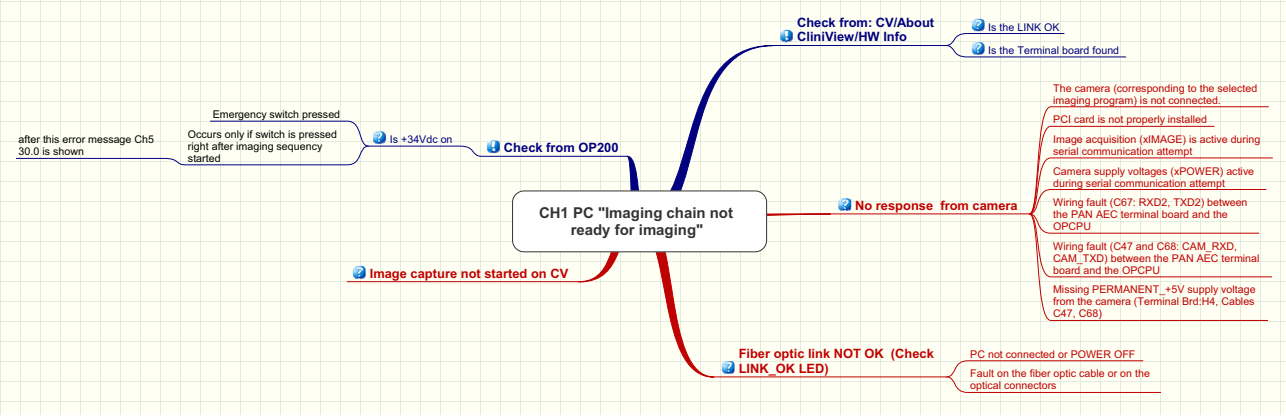
2.4.1 Ch 1 PC

Problem:	**“ Ch 1 PC “** error message is displayed.
Why?	Detector not found.
How is it detected?	Error is generated when user has pressed OP200 D or OC200 D exposure button and Core Module doesn’t receive PC ready message

Possible causes:	Check or test:	Parts related:
1. No respond from camera because:		
a) The camera (corresponding to the selected imaging program) is not connected.	Check that the CCD-detector is connected to the PAN or CEPH head according to the imaging program selected from the OP200 D / OC200 D control panel.	Camera / Detector, OP200 D / OC200 D, control panel
b) PCI Board is not properly installed	Make sure that PCI Board is installed on PC and the driver has recocnized PCI Board. Also check that LINK_OK LED H1 is **ON** on the board.	PC, PCI Board driver, PCI Board
c) Wiring fault (C67: RXD2, TXD2) between the PAN AEC Terminal Board and the Core Module.	Check the wiring and PAN AEC Terminal. If Core Module is receiving “PC Ready” message LED H4 on the Core Module is blinking after “Start OPD/OCD image...” -button is pressed in Cliniview.	PAN AEC Terminal Board, Core Module
d) Missing PERMANENT_+5V supply voltage from the camera (Terminal Board:H4, Cables C47, C68)	Check that LED H4 on the PAN AEC Terminal is ON. LED tells you if Terminal senses camera connection or in case of fixed PAN head the jumper J1 is installed.	PAN AEC Terminal Board, PAN Connector Board, Camera Connector Board
2. Image capture not started on CV	Check that you have initialized imaging sequence by pressing “Start OPD/OCD image capturing session” -button	Cliniview

Possible causes:	Check or test:	Parts related:
3. Fiber optic link NOT OK	Check that LINK_OK LED H1 on PCI Board is ON	PCI Board
a) PC not connected or POWER OFF	Check that PC is ON and Cliniview has been started after powering OP200 D / OC200 D. Note: If OP200 is switched OFF while Cliniview is ON you must either restart Cliniview or press “Start OPD/ OCD image...” -button	PC, OP200 D/ OC200 D, Cliniview
b) Fault on the fiber optic cable or on the optical connectors	Check LINK_OK LED H1 on PCI Board - it should be ON after Cliniview has been started. If LINK_OK LED is NOT ON make link test procedure.	OP200 D / OC200 D, PC
4. Gain file problem		
a) Gainfile is not found	Check that your camera’s gainfile is saved under your Instrumentarium Imaging\Cliniview\Dicc\Ortho\Gainfiles\ folder. From Cliniview’s Help - systeminfo/Device verify that Cliniview has recognized the needed gainfile in panoramic or cephalometric imaging.	PC, installation media, gain file media
b) Gainfile does not correspond to the camera	Check that Gainfile number matches to camera / detector number	PC, installation media, gain file media
5. Is +34Vdc on?		

Possible causes:	Check or test:	Parts related:
	Check if emergency switch is pressed. Error occurs only if switch is pressed right after imaging sequency is started. After this error message Ch5 30.0 is shown.	



2.4.1.1 Fiber test

Terminal Board fiber test

1. Fiber test jumper=ON
2. Connect TXD-RDX test cable
3. LINK_OK led (H4) blinks

PCI-Board fiber test

1. connect TXD_RXD test cable
2. Check Help/About/HWINFO/OP200

204-DICC_ERROR_NO_TERMINAL-error shoul result.

2.4.2 Ch 2 PAc (digital unit)

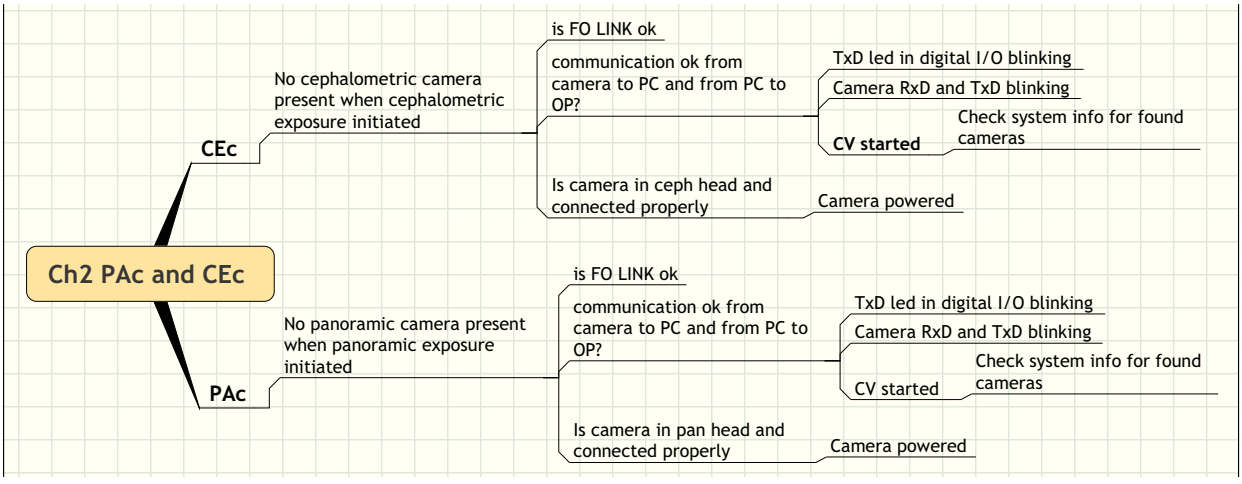
Problem:	" **Ch 2 PAc "** error message is displayed.
Why?	Sensor(s) ready in the system doesn't match to the active program selection.
How is it detected?	Before each each exposure SW check based on the "CASxxxx" message send by PC to OP what cameras are present in the system.

Possible causes:	**Check or test:**	**Parts related:**
Panoramic camera isn't in the panoramic head or installed poorly.	Check that fiber optic link is OK Check communication from camera to PC and from PC to OP. Check that ■ TxD led in digital I/O blinking ■ Camera RxD and TxD blinking ■ CV started and from system info inform for found cameras Check Camera status led that the camera is powered. (see status led information from Electrical operation and wiring manual).	Ceph cassette

2.4.3 Ch 2 CEc (digital unit)

Problem:	" **Ch 2 CEc "** error message is displayed.
Why?	Sensor(s) ready in the system doesn't match to the active program selection.
How is it detected?	Before each each exposure SW check based on the "CASxxxx" message send by PC to OP what cameras are present in the system.

Possible causes:	Check or test:	Parts related:
Too high exposure values or not enough time between exposures.	Check that fiber optic link is OK Check communication from camera to PC and from PC to OP. Check that ■ TxD led in digital I/O blinking ■ Camera RxD and TxD blinking ■ CV started and from system info inform for found cameras Check Camera status led that the camera is powered. (see status led information from Electrical operation and wiring manual).	Ceph cassette
J4 installed	Check J4 in PAN AEC terminal	



2.4.4 Ch 3 COL (digi)

Problem:	**“ Ch 3 COL “** error message is displayed.
Why?	Wrong collimator selected.
How is it detected?	Error is generated when selected program from the control panel doesn’t match to the collimator position.

Possible causes:	Check or test:	Parts related:
Collimator not in PAN position when panoramic (Program 1 to 5 or Program 9 to 10) selected.	Move the collimator to correct position until it “clicks”. - Error should clear. - If not check the microswitch operation.	Collimator and wiring

Possible causes:	Check or test:	Parts related:
Collimator signals are passive in the Core Module.	Test the microswitch operation: Move the collimator. - If the error stays then check the wiring and microswitch alignment. - Remove THA cover. Visually check that the switches trigger according to the code bar and that switch levers move freely.	Collimator.
	Check the wiring: - Check the connectors and wires for open or broken wire. Use wiring diagram. - Check the wiring order on microswitch.	S31, S32, S33, C62, X113, C67, X6, Core Module
	Test the wiring: Use Sr 74 IOC and move the collimator to check that the signal status changes. Follow the Table below. - If the signals do not change or are not correct then use wiring diagram and/or DVM to find the problem.	

S 31 COL1SW	S 32 COL2SW	S 33 COL3SW	S QA COL2SW	COLLIMATOR POSITION
closed	open	open	closed	Quality Assurance collimator
closed	open	open	open	Panoramic collimator
open	closed	open	open	Cephalostat collimator:
open	open	open	open	Novalid collimator

2.4.5 Ch 15 bPL

Problem:	**“ Ch 15 bPL “** error message is displayed.
Why?	The VT patient positioning device does not match the selected imaging program.
How is it detected?	The positioning device is detected with the analog signals DEV and POS.

Possible causes:	**Check or test:**	**Parts related:**
Device not detected properly	Use service program Sr 81 bPL to check the signal levels of DEV and POS (refer to the service program manual for detailed information).	X91, X333, X330, X332, OSB2 Board, OBS3 board, OSB1 board
	Check that X91 is properly connected to the Digital I/O board (code 60229), especially pins 1-4.	
	Check that the connection between the positioning device and the connector in the OP200 is free from dirt (X330).	
	Check the connections between OSB2 board (code 69140), OSB3 board (code 69131) and OSB1 board (code 69129).	

2.4.6 Ch 17 HSP

Problem:	**“ Ch 17 HSP “** error message is displayed.
Why?	Head support in invalid vertical position (low).
How is it detected?	When the head support is in the lowest position, a micro switch inside the head support is shorting signal CASLIMSW to ground.

Possible cause	**Check or test**	**Parts related**
Head support position not allowed for the current imaging program / collimator setting.	Raise the head support to an allowed position.	
Micro switch stuck or broken.	Check the operation of the micro switch	Head support's micro switch
Electrical connection broken.	Check the propagation of the signal from the micro switch to the Digital I/O board. When the switch is released, signal CASLIMSW is shorted to ground. This is seen in SR 74 IOC on page 2H as LED 3 being lit.	Head support's micro switch, Cable 202087/1, Connector to main cable X55, Connector to digital I/O board X6.

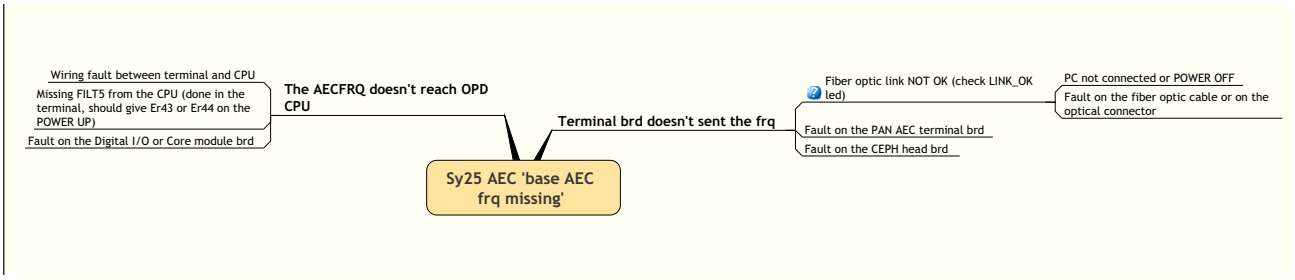
2.4.7 Sy 25 AEC (digital unit)

Problem:	**“ Sy 25 AEC “** error message is displayed.
Why?	No AEC base frq detected by embedded sw.

How is it detected?	After exposure button is pressed but before real dose dependent AEC frequency Core Module see base frq in order to detect fail in this feedback signal. If no signal activity in this line is detected this error is displayed.

Possible cause	Check or test	Parts related
Device not detected properly	Use service program Sr 81 bPL to check the signal levels of DEV and POS (refer to the service program manual for detailed information).	X91, X333, X330, X332, OSB2 Board, OBS3 board, OSB1 board
	Check that X91 is properly connected to the Digital I/O board (code 60229), especially pins 1-4.	
	Check that the connection between the positioning device and the connector in the OP200 is free from dirt (X330).	
	Check the connections between OSB2 board (code 69140), OSB3 board (code 69131) and OSB1 board (code 69129).	

Possible cause	Check or test	Parts related
Missing supply voltage from the Digital I/O brd mAfrq line, wiring fault between Digital I/O brd and PAN AEC terminal brd.	Wiring, connectors and AEC frq calibration. For detailted connector numbers see electrical operation manual and wiring diagram.	



NOTE! *Both frequency lines (paecfrq and caecfrq) drive the same digital I/O board line.*

2.4.8 Sy 28 CCd

Problem:	Sy 28 CCd error message is displayed.
Why?	Imaging chain error during exposure.
How is it detected?	This error is generated if the frequency on the AECFRQ -line is ■ out of range (0.8 - 655kHz) ■ lower during exposure than during preheat time.

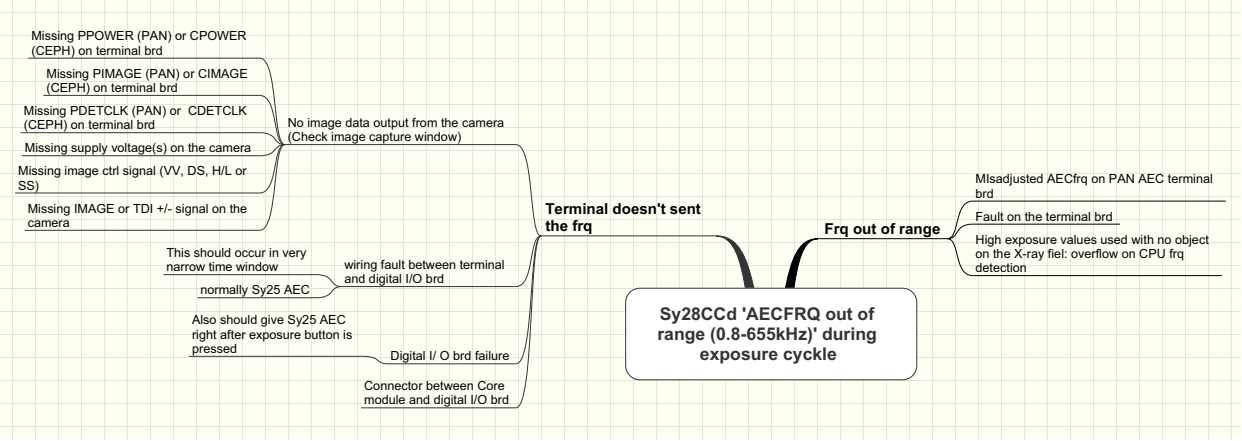
NOTE! *Sy 25 AEC is generated if signal line to Core Module is not functioning.*

Possible causes:	Check or test	Parts related
1. Terminal Board does not send the frequency:	Check with Pr68 FRE	

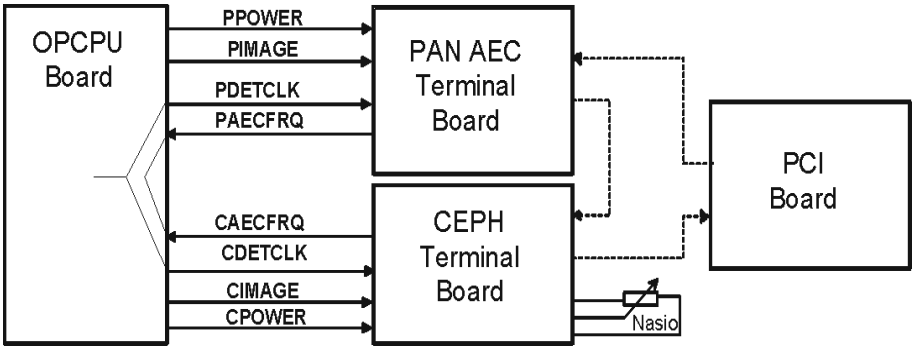
Possible causes:	Check or test	Parts related
1.1) Fiber optic link NOT OK because of:	Check LINK_OK LEDs on the Terminal Board and on the PCI Board	PAN AEC Terminal Board, CEPH Terminal Board, PCI Board.
1.1.1) PC not connected or POWER OFF	Check PC.	PC, PCI Board
1.1.2) Fault on the fiber optic cable or bad connection	Check that the fiber optic cable connectors are properly connected. Do the link test procedure to the fiber cables.	Fiber cables C41, C50 and C67.
1.2) No or interfered image data from the camera caused by:	Monitor the image capture window whether the image appears there during exposure?	
1.2.1) Missing PPOWER (PAN) or CPOWER (CEPH) on Terminal Board	Check that all the supply voltage LEDs are lit on the Camera Supply Board (PAN) or on the CEPH Head Board (CEPH) when the exposure button is pressed.	PAN AEC or CEPH Terminal Board, Camera Supply Board, CEPH Head Board, Cables C63, C67, C50, C52
1.2.2) Missing PIMAGE (PAN) or CIMAGE (CEPH) on Terminal Board	Check that the PIMAGE LED or CIMAGE LED is lit on the corresponding Terminal Board.	PAN AEC or CEPH Terminal Board, CEPH Head Board, Cables C67, C50, C52

Possible causes:	Check or test	Parts related
1.2.3) Missing PDETCLK (PAN) or CDETCLK (CEPH) on Terminal Board	Measure the frequency between the Terminal Board test points TP5 and TP6 with a multimeter: If a frequency greater than 0 is found during the exposure, the line is working.	PAN AEC or CEPH Terminal Board
1.2.4) Missing supply voltage on the camera	Check A2a. Check cables C51, C63. Check cable C47 (PAN) or C68 (CEPH). Replace Terminal Board. Replace Camera.	Cables C47, C51, C63, C68. PAN AEC or CEPH Terminal Board
1.2.5) Missing image data control signals (SS, VV, H/L and DS)	Check A2d. Replace Terminal Board. Check cable C47 (PAN) or C68 (CEPH). Replace camera.	PAN AEC or CEPH Terminal Board, Camera Supply Board, CEPH Head Board, cable C47 (PAN) or C68 (CEPH). PAN or CEPH Camera.
1.2.6) Missing IMAGE or TDI+/- signals on the PAN camera	Check A2b and A2c. Replace Terminal Board. Replace cable C47 (PAN) or C68 (CEPH). Replace camera	PAN AEC or CEPH Terminal Board, Camera Supply Board, CEPH Head Board, cable C47 (PAN) or C68 (CEPH). PAN or CEPH Camera.
1) Fault on the Terminal Board	Replace Terminal Board	PAN AEC or CEPH Terminal Board

Possible causes:	Check or test	Parts related
2.1) Wiring fault between the Terminal Board and the Core Module	Check PAECFRQ (PAN) or CAECFRQ and CEPH_AEC (CEPH) lines from the corresponding Terminal Board to the Core Module.	Cables C67, C52 and C50)
2.2) Missing FILT5 from the Core Module	Check by turning the OP power OFF and back ON whether Er43 and Er44 appear: If not, FILT5 is OK. See Er43 and 44 errors.	
2.3) Fault on the Core Module	Replace the board.	Core Module.
3) The AECFRQ frequency is out of range (0.8 - 655kHz)	Check with Sr 90 CIN that during the exposure is within the limits (0.8 - 655kHz).	
3.1)Misadjusted AEC frequency on the PAN AEC Terminal Board	Do the PAN AEC adjustment procedure (see Installation manual).	PAN AEC Terminal Board.
3.2) Fault on the Terminal Board	Check the image quality - if the image is OK (no artifacts) replace the board. Otherwise check also A2a-f.	PAN AEC or CEPH Terminal Board.
3.3) High exposure values with no object on the X-ray field	Check that you have object on the X-ray beam and / or filtration on the primary beam	Pan Sensor and PAN AEC Terminal Board.



2.4.8.1 AEC Frequency generation, block diagram



- AECFREQ: Frequency generated by the Terminal Board. Requires that
- LINK_OK is active during exposure. On panoramic imaging programs the frequency also relates to the dose measured by the Panoramic camera.
- PPOWER / CPOWER: Enables PAN / CEPH camera supply voltages
- PIMAGE / CIMAGE: PAN / CEPH image acquisition enable

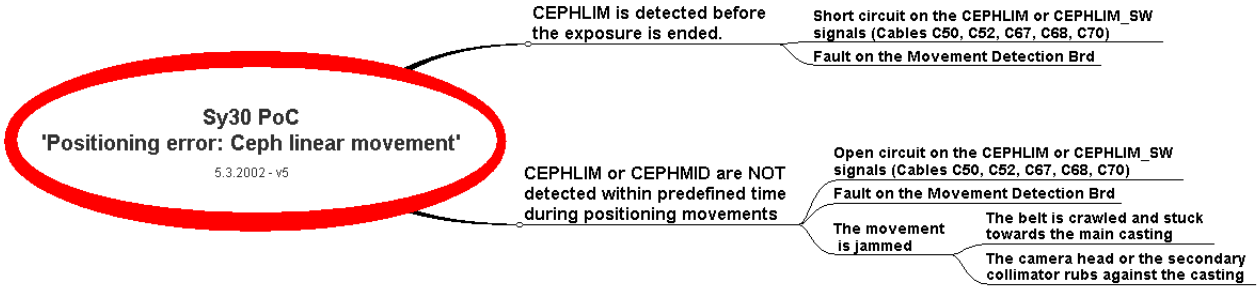
PDETCLK / CDETCLK: PAN / CEPH detector clock; “scanning speed of the cassette”.

2.4.9 Sy 30 PoC

Problem:	" Sy 30 PoC " error message is displayed.
Why?	Ceph movement positioning error
How is it detected?	Appears if the CEPH linear movement (camera and secondary collimator) arrives to the end limit (CEPHLIM is activated) before the exposure is ended.

Possible causes:	Check or test:	Parts related:
Beam is not correctly aligned: The Beam Alignment Board forces the Core Module to increase the scan speed for too long period.	Check beam alignment and beam detection functionality	Beam Alignment Board Head Board Core Module Cabling
Short circuit in CEPHLIM signal (or between CEPHLIM and CEPHMID signals)	Check CEPHLIM and CEPHMID signaling from Movement Detection Board to Core Module	Movement Detection Board Ceph Straight Conn Board Ceph Terminal Board Head Board Core Module Cabling

Possible causes:	Check or test:	Parts related:
CEPHLIM or CEPHMID are NOT detected within predefined time during positioning movements	Check the CEPHLIM or CEPHLIM signals Check the Movement Detection Board Make sure that the movement isn't jammed due to 1. belt crawling 2. camera head rubbing against the casting or 3. secondary collimator rubbing against the casting 4. the nut of the camera or the secondary collimator axle is jamming	Movement Detection Board Belt Camera head Secondary collimator Inspect the drive nut tightness



Sr 74IOC in 0:	
Led 2	Led 3
LIMSW	MIDSW

2.4.10 Sy 38 COL

Problem:	"Sy 38 COL" error message is displayed.
Why?	Automatic collimator positioning error
How is it detected?	While driving the collimator motor, desired collimator position cannot be reached. Invalid adjacent collimator positions - errors in position detection or cabling. While driving the 0.8mm Cu filter solenoid, desired filter position cannot be reached.

Possible cause:	Check or test:	Parts related:
Collimator slide code strip is not properly adjusted.	Most probable cause if collimator slide wheel falls on correct slot and is lifted up from there, repeatedly, several times before error occurs. Adjust collimator code strip properly. Test collimator movements with Sr 80 co-.	Automatic collimator code strip
Collimator assembly is holding collimator slide too tight	Most probable cause if rattling noise is produced while collimator slide is moving. Bend collimator assembly top steel plate upwards to reduce pressure on moving slide. Test collimator movements with Sr 80 co-.	Automatic collimator moving slide Automatic collimator top steel plate.

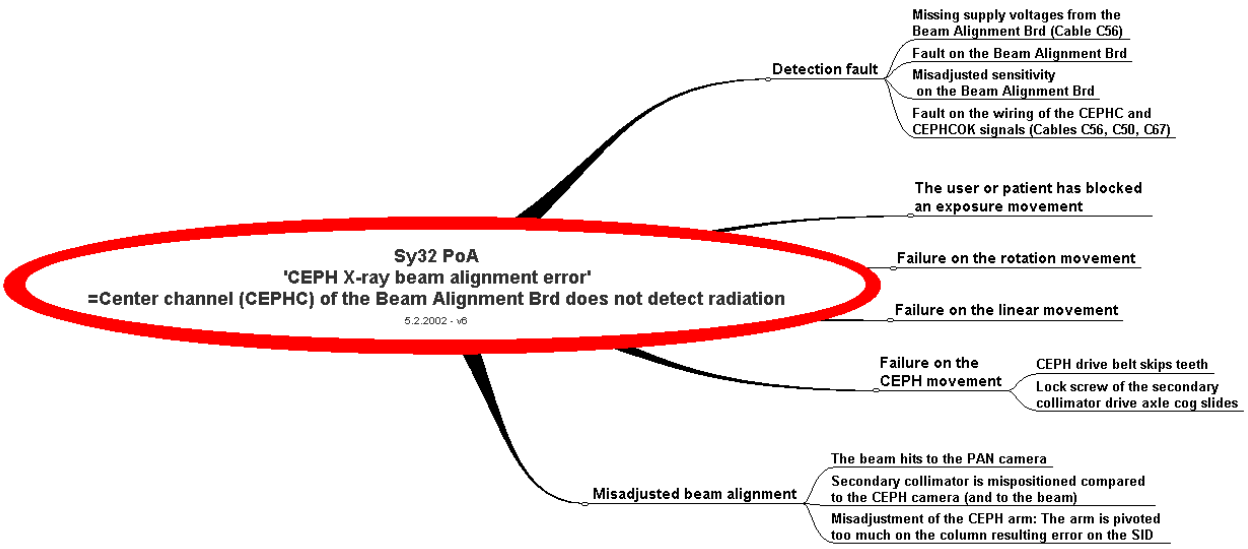
Possible cause:	Check or test:	Parts related:
Control or power. Collimator motor or motor driving circuitry in Interface board may not operate properly.	Collimator motor does not operate at all or is moving jerky. Check the motor control signals. All red LED's should be lit when motor moving.	Core Module, PAL, X5, Interface board, X16, X17, C13, C67, C76, X136, M7
	Check the power, LED's from the Interface & Power Supply boards. Check the wiring.	X17, Interface board, Power Supply board & fuses, C13, C67, X114, C76 X136, M7
Cu-filter solenoid control & power. Filter solenoid or rack motor drive in Interface Board may not operate. Problem with relay.	Check the control from Core Module to Interface board. Check X16, X17, X114 and X137 connections. Check that copper filter has not been stuck. Check that jumper X21 on interface board is installed.	Core Module, X5, Interface board, X16, X17, C67, X114, C76, Filter solenoid L13
Cu-filter solenoid microswitches . S61 or S62 may not operate properly or filter does not hit them. Signals RACKLIMSW and RACKMIDSW	Use Sr 82 COL. Ctrl panel leds 5 and 6 indicate filter on and off positions, respectively. Test the signals, move filter to both positions.	S61, S62, C76 X114, X6 Core Module
Collimator position information not sent to Digital I/O Brd correctly	Check cabling; ctrl panel LEDs 1..4 in Sr 82 COL should correspond to Collimator Board LEDs H2…H5.	Collimator cable C76 Main cable C67 Collimator Board

2.4.11 Sy 32 PoA

Problem:	" Sy 32 PoA " error message is displayed.
Why?	Beam alignment error
How is it detected?	Appears if the middle channel of the Beam Alignment Board does not detect the X-rays (CEPHC doesn't go active).

Possible cause:	Check or test:	Parts related:
Beam is not correctly aligned	Check beam position and adjust if necessary Check that the beam doesn't hit to the PAN camera Check positioning of the secondary collimator Check adjustment of the CEPH arm: The arm is pivot too much on the column resulting error on the SID	Beam Alignment Board Secondary collimator Pan camera
Beam detection fault	Check sensitivity adjustment of the Beam Alignment Board Check functionality of the Beam Alignment Board Check CEPHC and CEPHCOK (TP16) signals on Head Board Check cabling from Head to Core Module and Beam Alignment Board	Beam Alignment Board Head Board Cables

Possible cause:	Check or test:	Parts related:
Missing supply voltages from the Beam Alignment Board	Check cpower signal from Head Board (TP22) Verify that the supply voltages +5V (TP32) and -5V (TP29) are present on Beam Alignment Board (LED H4) Check cabling from Head to Core Module and Beam Alignment Board	Head Board Beam Alignment Board Cables
Failure on the linear movement	Make linear movement (Sr 80) and Core Module I/O (Sr 74 IOC) tests	Linear motor and microswitches
Failure on the rotation movement	Make rotation movement (Sr 80 ro-) and Core Module I/O (Sr 74 IOC) tests	Rotation motor and microswitches
Failure on the CEPH movement	Check that CEPH drive belt doesn't skip teeth Check that lock screw of the secondary collimator drive axle cog doesn't slide Make CEPH movement (Sr 80) and Core Module I/O (Sr 74 IOC) tests	Ceph scan motor and microswitches Secondary collimator drive axle
The user or patient has blocked an exposure movement	Check the patient positioning	



Sr 74 IOC in 4		
Led 5	Led 6	Led 7
CEPHROK	CEPHCOK	CEPHLOK

Ceph beam alignment monitors the signals coming from the Beam Alignment Board. The signal states can be verified with the control panel as follows:

1. Enter Sr 92 ChE and select **nCh** using the control panel left, right and OK buttons.
2. Exit Sr 92 ChE and select cephalometric lateral (P9) or PA (P10) projection imaging program.
3. Start exposure and monitor the beam alignment signals.

NOTE! *(CEPHLOK, CEPHCOK; CEPHROK) with the 3 center most LEDs of the AEC density scale on the control panel.*

2.5 Digital image chain trouble shooting

Before contacting the customer service gather the following information needed and send it to the customer service:

- Unit serial number
- Sensor type and serial number
- Used software (CliniView or other application)
- Software manufacturer and version
- Used PCI driver version
- Basic information about customer PC (brand, model, operating system)
- Export anonymized raw data image

To be able to locate the problem go through following checklist items.

NOTE! *See Appendix A for Optical Link Test Procedure.*

CHECKLIST

- LINK is OK – from the PCI board
  - if NOT – check that red light goes to dark fibre / grey receiver chip in the brd
  - check terminal LINK_OK leds
  - make ”linktest” to the whole imaging chain / individual brd
- Start CV, select patient – but don’t initiate exposure - yet
- Start DebugView and check communication in steady state:
  - Camera found (HWID) and corresponding gainfiles found
- enable image capturing
  - ”CASxxyy”- message is OK
  - xx defines found new cameras and yy cameras at a system overall (see also camera LEDs material)
- if selected collimator & program corresponds to the found camera -> OP goes ready
- Make exposure (with or without x-rays)
  - Program label (exp. values) appear on the image capturing screen title
  - short after this image starts to run into window
  - after x-rays stopped there should be end values in the Debugview. After this DICC set timer to 1,5s since last DMA transfer. Based on this time delay is image end interpreted.
- Exposure button should turn on the powers in the Cam Supply brd (observe also Camera Power LEDs)

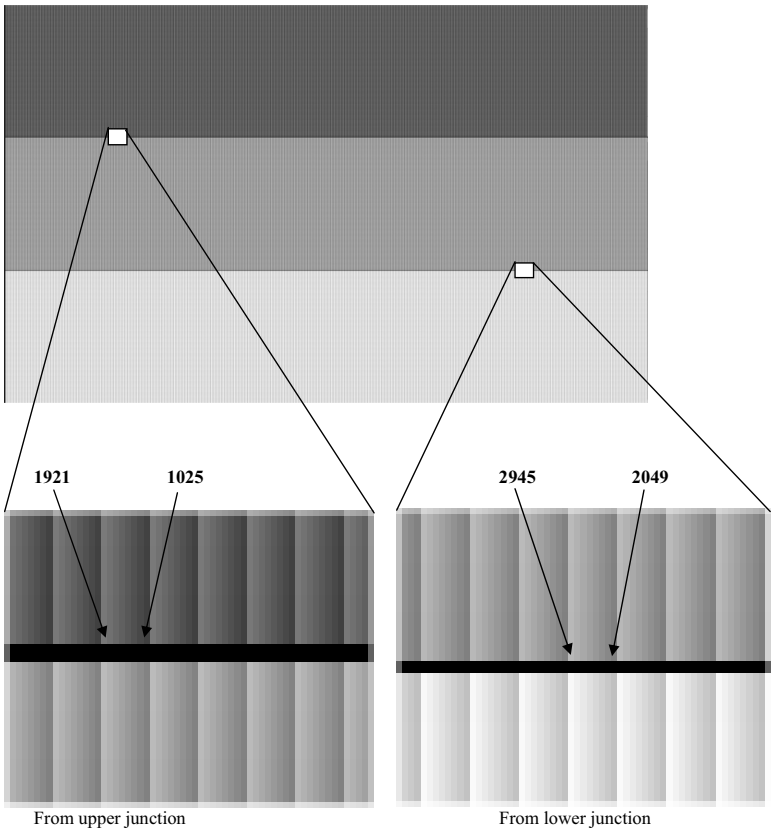
- Image LED is turned on when image layer movements start
- Test pattern values tell if all databits are there (Cam TDI (=clk) LED). See the chapter ***TEST PATTERN IMAGE PROCEDURE*** below.
- Go through all brds and leds that should be on during exposure

TEST PATTERN IMAGE PROCEDURE

1. Make sure that CV (DICC) is turned off (only one instance of DICC can be on at a same time)
2. Start DICCTEST.exe
3. Select:
   – "Test Image mode"
   – "No gain check"
4. Enable image capturing
5. Take testimage for instance following settings:
   – P1 program
   – Manual -mode (M)
   – Digital I/O OPTION switch ON (X11).
6. DICCtest: Remove Image? : Choose "NO".
7. Close DICCtest application
8. Start CliniView to be able easily measure gray scale values from the image
9. Create new test patient or open exisiting test images containing patient:
10. Import image: "CliniView/File/Import/Single Image"
11. Open image from C:\Program Files\CliniView\DICC\Simulator\DICC\Capture Temp - folder (PNG format). Choose image type "Panorama".
12. Save the image in PNG format when its opened
13. Measure gray scale values for highest and lowest values from the lower sensor border (right above black line):
    – Lightest = 2945
    – Darkest = 2049

If values differ all databits aren't present. Check camera connection and cabling from the camera to terminal.

Testpattern example image from ceph sensor (panoramic image has only two lower sections):



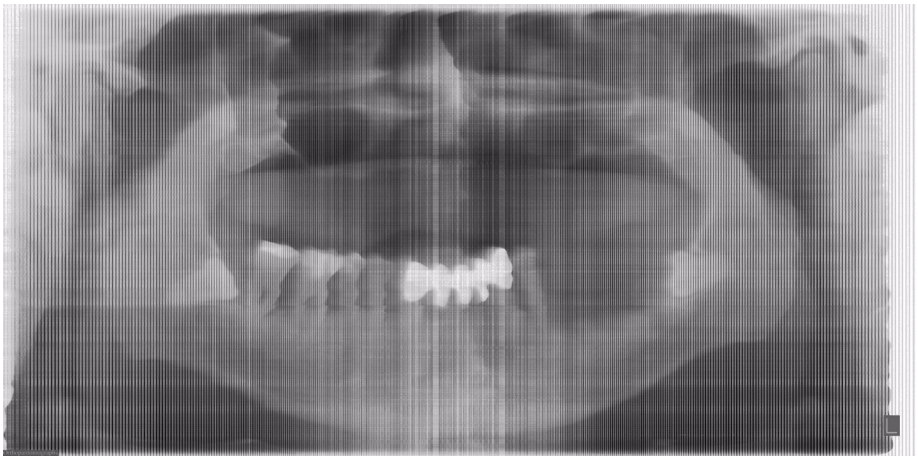
NOTE! *All signalling can be enabled (except X-rays) in exhibition mode (option switch). Test mode from ctrl panel only makes movement, but it does not for instance power the camera.*

2.6 Digital image faults

2.6.1 Detector fail

Problem:	Picture has vertical stripes
Why:	Possible camera HW problem
How is it detected:	Look at reference fig

Possible causes:	Check or test:	Parts related:
Camera have broken components	N/A	Camera/detector



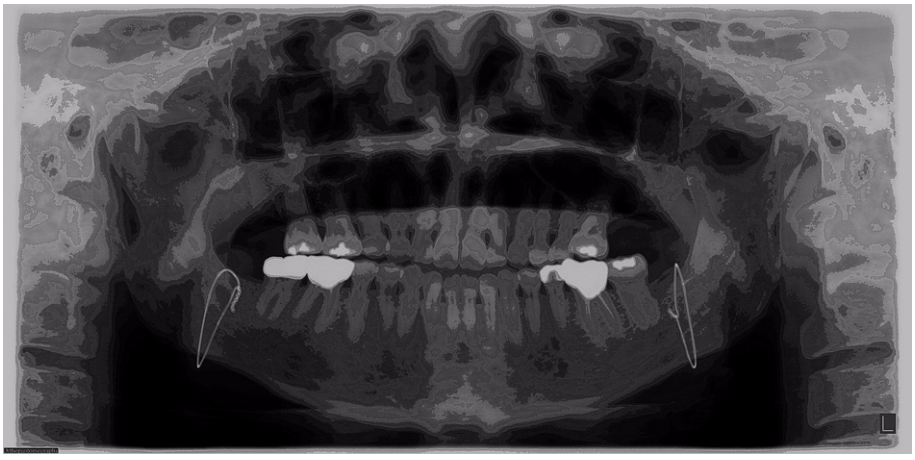
Problem:	Camera has area with meaningless data
Why:	Detector is broken
How is it detected:	Look at reference fig

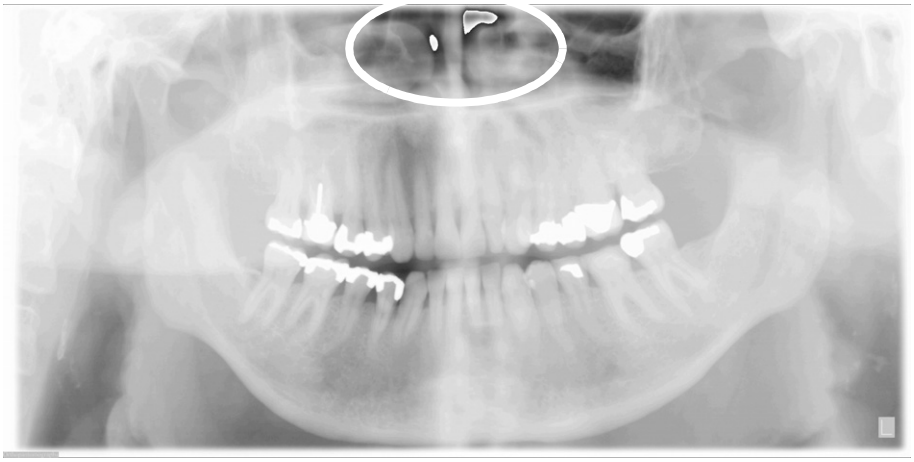
Possible causes:	Check or test:	Parts related:
Camera has dropped	Look at dropping sensor color	Camera/detector

2.6.2 Data bits missing

Problem:	Data bits missing
Why:	Bad connection between detector and terminal
How is it detected:	Picture has no dynamic

Possible causes:	Check or test:	Parts related:
Detector, Cables, Connectors, Terminal	Check following: 1. Connectors between camera and terminal 2. cables between camera and terminal 3. terminal 4. Detector	Camera/detector, Cables/connectors between detector and terminal, Terminal





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Approved: Äärynen Teemu 2008-06-04 17:35
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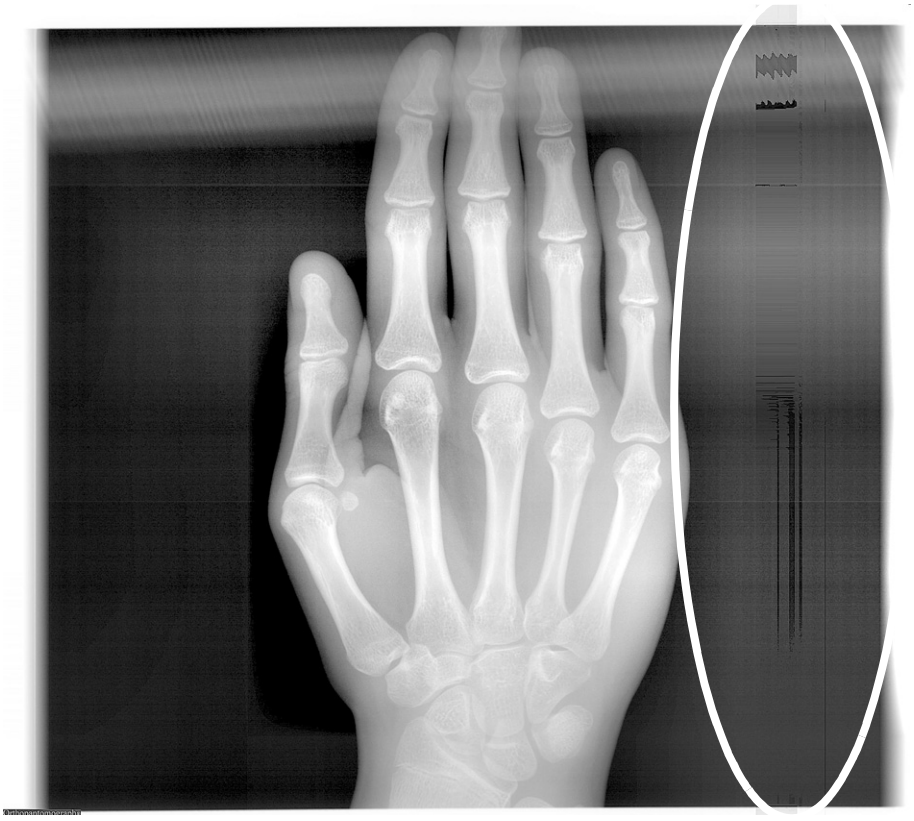
Problem:	Cephaloscan cable failure
Why:	Cephaloscan cable is broken
How is it detected:	There is area in picture with no dynamics

Possible causes:	**Check or test:**	**Parts related:**
Cephaloscan cable	Change Cephaloscan cable	Cephaloscan cable

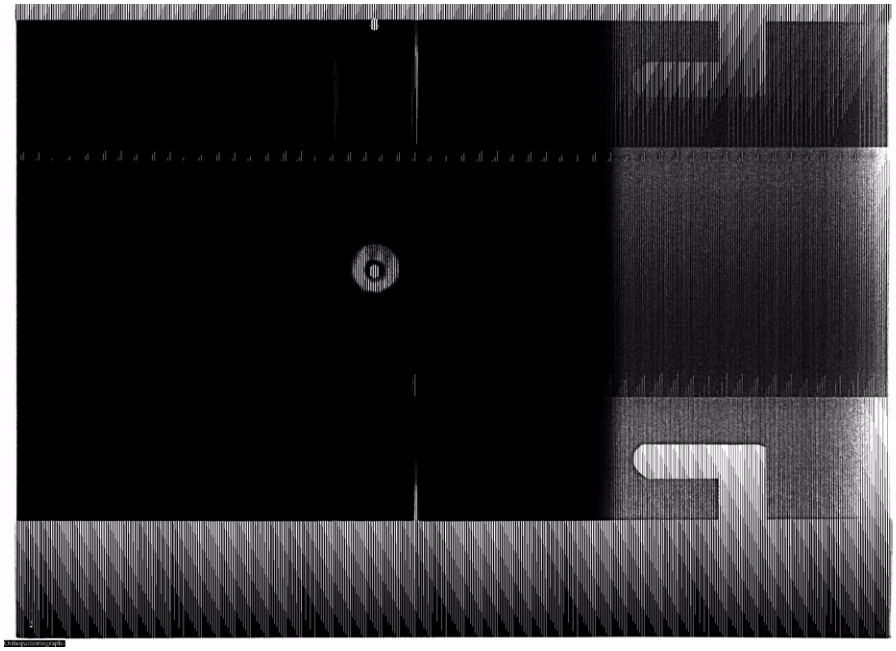


Reviewed: Rintamäki Markus 2008-05-26 15:43
Approved: Äärynen Teemu 2008-06-04 17:35
D500211, 3

2.6.3 PC

Problem:	Old driver / DICC with dual core processor
Why:	
How is it detected:	Lines in pictures are shifted

Possible causes:	Check or test:	Parts related:
PC upgraded without new driver/ DICC	Check that latest DICC and PCI driver is used	PC

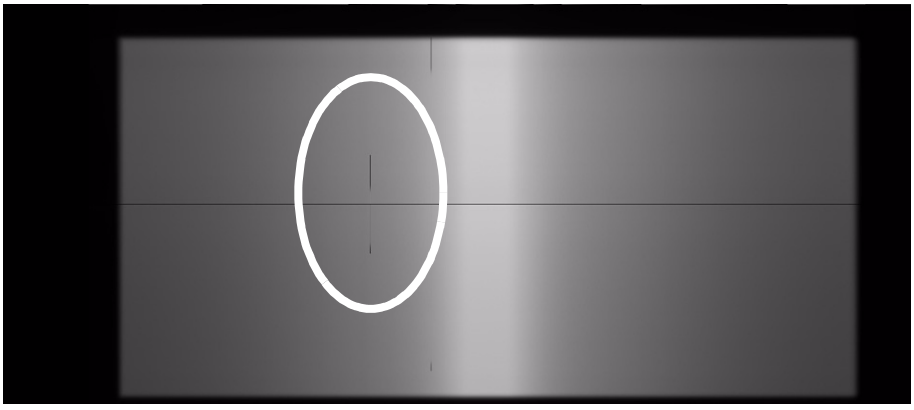


Reviewed: Rintamäki Markus 2008-05-26 15:43
Approved: Äärynen Teemu 2008-06-04 17:35
D500211, 3

Problem:	There is not enough resources in PC
Why:	Ongoing unnecessary process and programs
How is it detected:	Random needles in picture

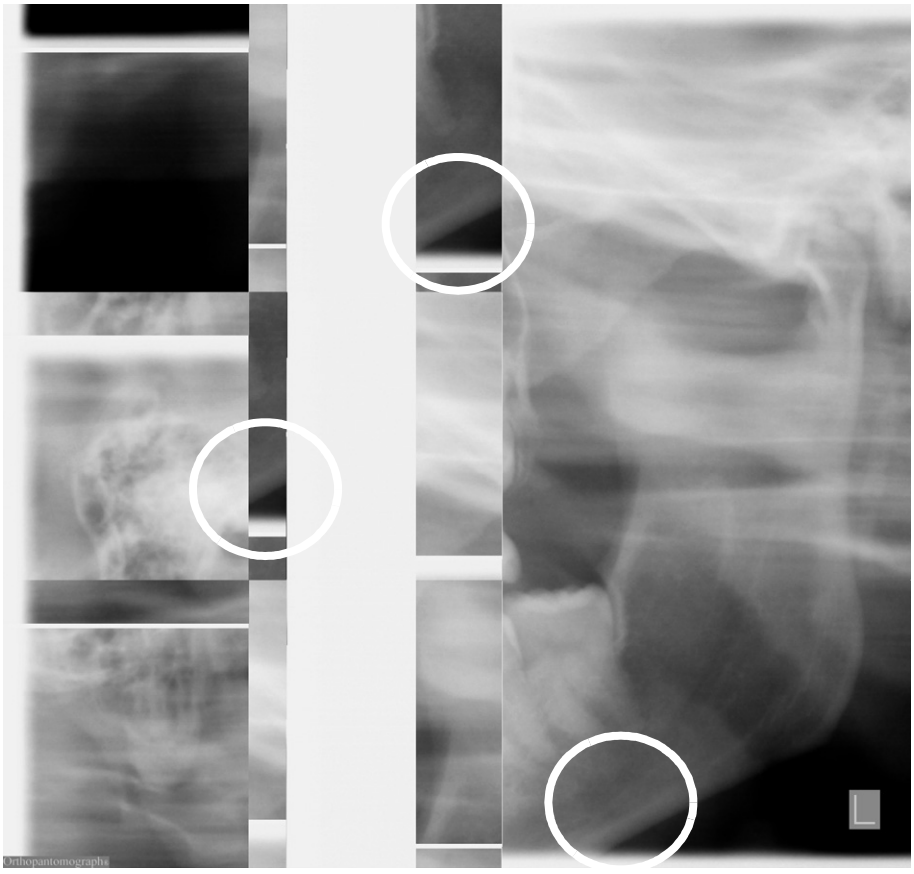
Possible causes:	Check or test:	Parts related:
	Check that there is not used unnecessary process and programs	

Fig 2.1. Problem areas in pictures.



Problem:	There is not enough resources in PC
Why:	Ongoing unnecessary process and programs
How is it detected:	Jig-saw pictures/copied parts in pictures

Possible causes:	**Check or test:**	**Parts related:**
	Check that there is not used unnecessary process and programs	
	Check that latest DICC and PCI driver is used	

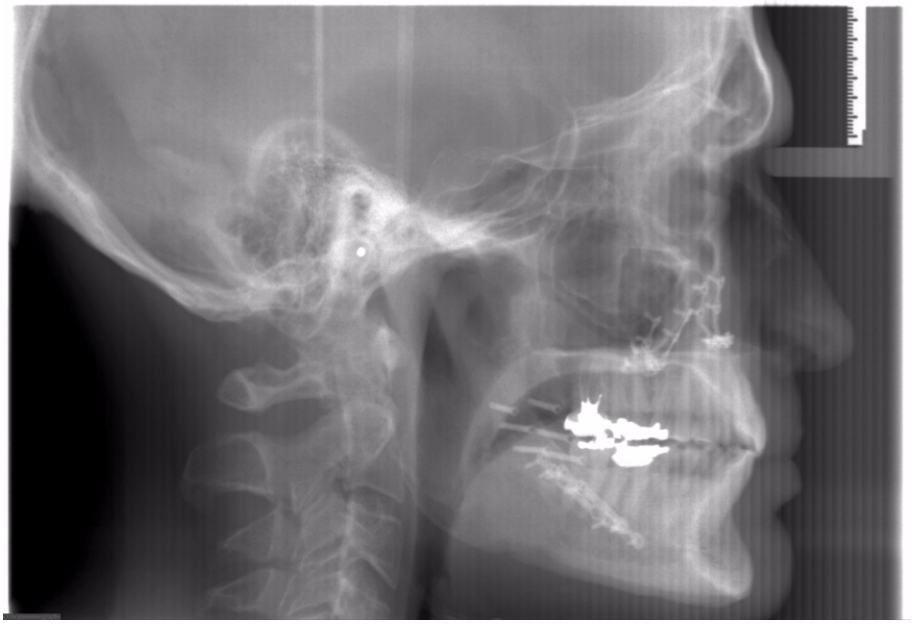


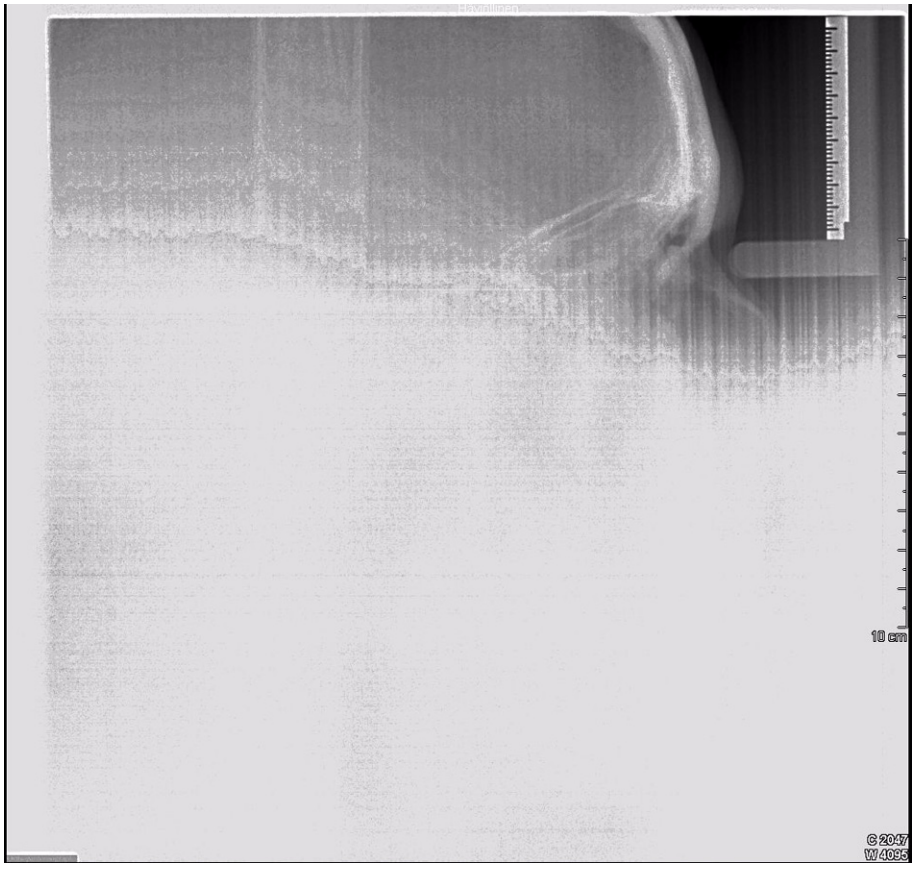
Reviewed: Rintamäki Markus 2008-05-26 15:43
Approved: Äärynen Teemu 2008-06-04 17:35
D500211, 3

2.6.4 Poor beam alignment

Problem:	Poor beam alignment
Why:	
How is it detected:	

Possible causes:	Check or test:	Parts related:
Beam is not correctly aligned	Check beam position and adjust if necessary. Check that the beam doesn't hit to the PAN camera. Check positioning of the secondary collimator. Check adjustment of the CEPH arm: The arm is pivot too much on the column resulting error on the SID	Beam Alignment Board Secondary collimator Pan camera
Beam alignment board adjustments	Check beam alignment board sensors sensitivity and adjustment	Beam alignment board





Reviewed: Rintamäki Markus 2008-05-26 15:43
Approved: Äärynen Teemu 2008-06-04 17:35
D500211, 3

2.7 Common errors

2.7.1 Ch 5 ***

Problem:	**“ Ch 5 *** “** error message is displayed, where ***” are numbers.
Why?	Line voltage is out of limits.
How is it detected?	Line voltage is derived by using the voltage to frequency (V/F) converter in the Filament control board for measuring the +25V supply. Error is generated, if the line voltage is 1) out of limits (110V: 80 - 135, 230V: 180-270) and 2) the exposure is attempted or 3) voltage goes out of limits during the exposure. When occurred, Core Module Sr 70 Iog counter #16 is incremented for history data.

Possible cause:	**Remedy:**
Line voltage out of limits.	Wait. Problem is usually occasional. Try again. If the error occured during the exposure, process the film - it may be diagnostical. If the error repeats, check the line voltage. Use Sr 79 SUP or DVM.
Mains voltage selection “230V”at Power Supply board with 110V line voltage.	Power off. Select correct line voltage setting and mains fuses: - 110 VAC: S1-S4 turned **left** - 230 VAC: S1-S4 turned **right**

2.7.2 Ch 6 POS

Problem:	**“ Ch 6 POS “** error message is displayed.
Why?	System not in Start position or unit has lost the linear movement reference.

How is it detected?	PAN: When the panoramic mode has been selected the collimator has to be in PAN position. If these conditions are not true, the error is generated and the exposure is prevented.
	CEPH: When exposure is activated the linear movement has to be at the reference position (= S17), where LINLIMSW and LINMIDSW are active and the cassette holder has to be lifted to the upper half of the movement, where RACKMIDSW is active. If these conditions are not true, the error is generated and the exposure is prevented. **NOTE!** *If cassette holder vertical movement limit, Pr 56 HLI is selected "on" and the cassette holder is driven down below the midpoint by this feature, the unit enters a special state where the error code is not generated although RACKMIDSW is inactive. If any of the cassette holder movement buttons is pressed, this special state is cleared.*
	TOMO & TMJ: Linear movement is out of bounds or the system has lost the linear position data. When the exposure is activated the system 1) has to have knowledge of position of the linear movement, and 2) this position has to be inside the bounds specified for the chosen imaging program (mode). Reference point is LIMMIDSW. When the user changes the linear movement position during the patient positioning the system continuously updates the linear movement position data. Problem arises when first the linear movement has been driven by the system on another imaging mode and then the mode is changed - the system does not know the current position. Error is generated and the exposure is prevented.
	QA: When the exposure is activated the cassette has to be at the left end looked from the tube head, CASLIMSW is active and CASMIDSW is passive. Rotation has to be in right 45° - left 45° sector (ROT1SW, ROT2SW, ROT3SW active). If these conditions are not true, the error is generated and exposure is prevented.

Possible causes:	Check or test:	Parts related:
PAN: Collimator in QA position while PAN exposure initiated.	Clear the error message. Select “PAN” collimator. Error should clear.	Collimator.
CEPH: Tube head not aligned for ceph exposure.	Press “OK” key to clear the error message. Press movement key to align the tube head.	
TMJ & TOMO: Unit has lost its linear movement reference or Imaging mode has been changed after positioning the patient.	Clear the error message. Select correct imaging program. Press movement key to reset positioning. Position the patient.	
QA: Movement key not pressed prior to the QA procedure.	Press “OK” to clear the message. READY is not lit. Press movement key . READY is lit.	
Movement key function defective.	Press the movement key. If the rotating unit does not move, check the key signal from the panel to the Core Module. Use Sr 74 IOC.	Positioning panels, X48, C10, X7, Core Module
Possible problem with movements.	Test the movements. Use Sr 80 ro-, Sr 80 Li-, Sr 80 CA-programs.	Motors, mechanical friction

2.7.3 Ch 7 ***

Problem:	**“ Ch 7 *** “** error message is displayed. “*******” is a number indicating elapsed exposure time.
Why?	Exposure button prematurely released.
How is it detected?	EXPSW or PNLEXPSW has changed logical state during the exposure cycle. Exposure is terminated and a message displayed.

Possible causes:	**Check or test:**	**Parts related:**
Operator has released the exposure button during the exposure.	If the error appeared before the exposure, try again.	
	If the error appeared during radiation, process the film, it may have enough information for diagnosis. Reposition the patient and retake with new film.	
Problem with exposure switch or switch wiring. Signal PNLEXPSW .	Make several test “ T “ exposures, use eg. program P1. Press and release repeatively, check that the unit moves accordingly.	Control panel microswitch, control panel, SC3, X105, C9, X1, Core Module
	Check the wiring from the switch to the Core Module. Problem may be intermittent indicating defective switch, wire or contact.	

Possible causes:	Check or test:	Parts related:
Problem with remote exposure switch or switch wiring. Signal EXPSW.	Make several test " T " exposures, use eg. program P1. Press and release repeatively, check that the unit moves accordingly.	Remote exposure switch, coiled cable, X103, SC2, X102, C12, X3, Core Module
	Check the wiring from the switch to the Core Module. Problem may be intermittent indicating defective switch, wire or contact.	

2.7.4 Ch 8 PSE

Problem:	**" Ch 8 PSE "** error message is displayed. Message occurs during power-up sequence and is cleared after few seconds.
Why?	Preventative service reminder after 2000 exposures.
How is it detected?	Pr 59 PSE has been set "on" or reseted "rES" 2000 exposures earlier. Software increments this counter after every exposure. **NOTE!** *This feature can be disabled when Pr 59 PSE is set to "OFF". This error code has no effect to the unit's normal operation.*

2.7.5 Ch 9 rEo

Problem:	**“ Ch 9 rEo “** error message is displayed.
Why?	Automatic or Manual mode exposure was initiated from control panel, while remote exposure only is allowed.
How is it detected?	PNLEXPSW and EXPSW signals are monitored by software. Unit has been configured with Sr 89 COP, “1 rE” ? “on” for remote exposure only mode. PNLEXPSW has changed its logical state during the exposure resulting to an error message. This error message does not come with test “T” mode.

Possibe causes:	**Check or test:**	**Parts related:**
Exposure was initiated from the control panel, while remote exposure only is allowed.	Press “OK” to clear the message. Use remote exposure.	
Broken D15 on Core Module, if the exposure was initiated from remote switch. Signal PNLEXPSW = EXPSW.	Unit configured with Sr 89 COP, 1 rE to “on”. Set Sr 89 COP, 1rE to “OFF”. Press the remote exposure switch. If the error disappered, then Core Module D15 is defective. For temporary measures leave the unit as is - it can be used from both exposure switches, or replace D15 or Core Module.	Core Module, D15

2.7.6 Ch 11 PAr

Problem:	**“ Ch 11 PAr “** error message is displayed.
Why?	Exposure parameters exceed tube capacity at a given point of time
How is it detected?	Before each each exposure SW calculate estimate of the anode heat content and based on selected exposure values SW decide whether the next exposure is possible to make without overheating anode.

Possible causes:	**Check or test:**	**Parts related:**
Too high exposure values or not enough time between exposures.	Select lower values or wait. **NOTE!** Normally user shouldn't have this error message instead Sy20 will appear.	

2.7.7 Ch 12 dCC

Problem:	**“ Ch 12 dCC “** error message is displayed.
Why?	Tube head radiation rate measurement result (dose calibration constant) is needed to enable correct dose calculation result. This constant can be set in program Sr 78 THA.
How is it detected?	During powering up SW checks if radiation rate figure is set. If not Ch12 dCC is displayed. This doesn't prevent exposure, but dose calculation result isn't shown due to this missing constant.

Possible causes:	**Check or test:**	**Parts related:**
Missing value for tube head radiation rate.	Sr 78 THA **NOTE!** Setting THA value (changing tube head) reset tube preheat constant. Adjust preheat with Sr 77 Prh program.	

2.7.8 Ch 16 StP

Problem:	**“ Ch 16 StP “** error message is displayed.
Why?	Emergency stop switch is pressed.
How is it detected?	All movement and exposure is prevented when +34 secondary DC-voltage is switched off by pressing stop switch. **NOTE!** *This can be done in either one or both heads.*

Possible causes:	**Check or test:**	**Parts related:**
Ceph emergency switch replacement. Cable is missing in PAN unit.	Switch replacement cable behind left upper side door.	
Emergency switch pressed	Check emergency switches.	

2.7.9 Sy 20 ***

Possible causes:	**Check or test:**	**Parts related:**
Emergency switch cable is not properly connected.	Check connections (cable 5143898), connectors X301A on LRD board, connectors C1 and C3 emergency switch.	cable 5143898, connectors X301A, emergency switch

Problem:	Sy 20 *** error message is displayed. *** indicating elapsing waiting time.
Why?	OP200 is not ready for the next exposure.
How is it detected?	Exposure is disabled, if the following exposure would exceed the average power ratings of the x-ray tube or stepping motors. If the exposure switch is pressed, this failure code appears on the display. Countdown of the required wait time (***) is displayed in the time display. When countdown reaches zero, the message is automatically cleared. Occurrence of this error code increments the Core Module counter number #17.

Possible cause	Remedy
OP200 is not ready for the next exposure.	Wait until the unit is ready or use lower values if possible. Elapsing waiting time (***) in seconds in s-display.

NOTE! *Manual mode might be possible to perform because AEC need more heat capacity due to unknown exposure values.*

2.7.10 Sy 21 HHo

Problem:	Sy 21 HHo error message is displayed.
Why?	Tubehead hot. Exposure is disabled as the tubehead assembly (THA) temperature has exceeded 75°C.
How is it detected?	Temperature switch in THA is open, signal TMPFAIL active. A lit LED (H12) on the Filament Control Board indicates active TMPFAIL signal. This error may occur after intensive use, especially if the ambient temperature is high. Message is automatically cleared when the THA temperature has dropped below approximately 60°C. Occurrence of this error code increments the Core Module counter number #18.

Possible cause	Check or test	Parts related
OP200 THA is not ready for the next exposure.	Wait until the unit is ready. Relatively long waiting time (typically over half an hour) is needed for the THA to cool down.	
Problem with TMPFAIL signal or temperature switch (seldom).	Check the signal wiring. Replace parts when needed.	THA, THA - X32, Inverter Board, C15, Filament Board, C67, Core Module

2.7.11 Sy 22 Arc

Problem:	Sy 22 Arc error message is displayed.
Why?	Tubehead or generator failure during the exposure cycle.
How is it detected:	TUBEFAIL signal has gone active (high voltage has dropped below reference) five times while KVOK and MAOK signals are active. Error is also generated if KVOK signal is passive while MAOK is active (this condition is ignored during the first 300ms of the exposure). Exposure cycle is terminated. Occurrence of this error code increments the Core Module counter number #19. Single occurrence of the TUBEFAIL signal causes a momentary shutdown of the generator, then the exposure continues and the Core Module counter number #27 is incremented. This can be seen on film as a narrow unexposed vertical line.

Possible cause	Check or test	Parts related:
Single THA arc.	If the problem happened with patient exposure, look at the picture on PC screen, it may be diagnostical. Verify the kV and mA values used for reference.	
	Try again. Single arcs are normal phenomena in an x-ray tube that occur every now and then. - If no error then ok. - If this error comes frequently, it indicates a worn-out x-ray tube or some other problem in the tube head assembly or related components.	

Possible cause	Check or test	Parts related:
Impurities in the THA oil. Several THA arcs.	Run the THA warming up sequence Sr 76 PUP. - If ok then problem propably occasional. - If not then tube head assembly (THA) may be defective.	
Wrong preheat calibration value	Check the value in Sr 77 Prh, it should be around 55. - If not, run Sr 77 Prh again. New value is calibrated.	
Problem with main cable C67. Error occurs and repeats usually at the same rotation place.	Make radiation tests. Use Sr 90 PIN. Make several exposures and rotate by hand: - If the error occurs at one location, check the wiring, replace C67 if needed	
Broken Power Supply Board or capacitor C1 or C2. Error repeats.	Measure rectifier bridge D4, if may be defective. Unit may tolerate low kV/ma exposure, but not high exposure values. Replace D4 or Power Supply Board.	Power Supply Board, C1, C2
Broken tubehead assembly. Error repeats.	Run Sr 76 PUP. - Check if the error comes with low or high kV - Check if the error is related to output power (=kV * mA) -Replace the THA.	THA
Problem with cabling (C4, C67, C15), signal +310VDC & 310V GND	Check the capacitor cable screws C1 & C2 and X22.	C1 & C2, X22, C4
	Main cable X23 - C67 - X30	C67
	Generator cable X37 - C15	C15
Bad mains line wire connection	Check the power plug connection. Unit may tolerate low kV/ma exposure, but not high exposure values.	Mains voltage connection

Broken Inverter Board or fuse F1.	Check the F1 fuse. Replace the Inverter Board	Inverter Board & F1

2.7.12 Sy 23 Inu

Problem:	**Sy 23 Inu error message is displayed.**
Why?	Inverter failure. Tube current and voltage are not rising during exposure.
How is it detected?	KVOK and MAOK signals are or go passive (= 0V) during exposure. This error is also generated if TUBEFAIL signal goes active five times while both KVOK and MAOK are passive. Exposure is interrupted and the Core Module counter number #20 is incremented.

Possible cause	**Check or test**	**Parts related**
No 310VDC on the Inverter Board.	310VDC is indicated by LED H4 on Power Supply Board and LED H1 on Inverter Board	Power Supply Board, Capasitor C1 & C2
Other power supply voltages missing from Inverter Board.	Check the LED's on Inverter and Power Supply Boards. Check the wiring.	Power Supply Board, X27, C67, X35, C15
Fuse F1 on Inverter Board has blown.	Fuse F1 & foils around it.	F1, Inverter Board
Open connector or broken wire. Loose capasitor wire.	Check the generator wiring.	All high voltage parts
Broken Power Supply Board	Replace the board.	Power Supply Board
Broken Inverter Board	Replace the Inverter Board (Broken Tube head assembly) Replace the THA	THA

2.7.13 Sy 24 FIL

Problem:	Sy 24 FIL error message is displayed.
Why?	Filament failure. Tube current not rising during exposure.
How is it detected?	During exposure sequence: Tube current is not rising during the exposure. KVOK signal active, but MAOK signal passive during the exposure. This condition is ignored during the first 300ms of the exposure. Exposure is interrupted and the Core Module counter number #21 is incremented. During power up sequence: Sy 24 FIL is also generated during power-up sequence if preheat-reference has not been calibrated. Normally this is caused by new Core Module. Use Sr 77 Prh to calibrate the preheat. If Sy 24 FIL occurs at powerup after calibration of the preheat value, the EEPROM may be defective.

Possible cause	Check or test	Parts related
Broken filament in the x-ray tube (broken THA)	Replace THA .	THA
Missing supply voltages on the Filament Control Board	Check the LED's & power wiring	, X35, Filament Board
Broken Filament Control Board	Replace the board.	Filament Board
Problem with signals & wiring from Filament Control Board to the THA	Check the generator wiring and boards.	Filament Board, C15, Inverter Board
Wrong preheat calibration value.	Check the value in Sr 77 Prh., it should be around 50. - If not, make the exposure. New value is calibrated.	

Possible cause	Check or test	Parts related
Problem with new Core Module.	Fill out the OP200 Configuration Form for setting data. Replace Core Module. Reprogram Pr and Sr parameters.	Core Module
New tube head changed. THA figure in Sr 78 thA program not set or changed.	Set the thA value. **NOTE!** *After setting thA value run Sr 77 prH program.*	

2.7.14 Sy 26 EEP

Problem:	" Sy 26 EEP " error message is displayed.
Why?	EEPROM memory corrupted
How is it detected?	The EEPROM memory consistency is checked by the software at startup. If an non-recoverable error is detected a Sy 26 EEP error is reported. This means that the memory contents were partly or totally reset.

Possible cause	Check or test	Parts related
Core Module	Replace Core Module. Reprogram the parameters.	Core Module

2.7.15 Sy 27 Por

Problem:	Sy 27 Por error message is displayed.
Why?	Position error: rotation movement failed.
How is it detected?	This error is generated during rotation if the Core Module does not receive the correct sequence of ROTSW1 to ROTSW4 signals within a predefined time. Core Module assumes that the rotating unit is not rotating and interrupts all movements and exposure.

Possible causes:	Check or test	Parts related
Unit rotates, but microswitches S 11 to S 14 may not operate properly. Signals ROT1SW to ROT4SW.	Use Sr 74 IOC. Test the signals, rotate by hand.	S11 - S14, C11, X9, Core Module
Problem with motor control. Rotation stepping motor or motor driving circuitry in Interface Board may not operate properly.	Check the control from Core Module to Interface Board. Check the motor control red LED's: all should lit when unit is rotating. Check X16and X17 connections.	Interface Board, X16, Core Module, X17, M3, X112
Problem with motor power. Power Supply F2 blown.	Check F2 on Power Supply Board.	Power Supply Board, F2
Unit rotates, but not enough friction between the drive wheel and friction surface	Clean the friction surface with alcohol. Use Sr 80 ro-. Adjust the spring tension.	

Problem with cephalostat lock under the rotating unit.	Check the cassette holder down position. There should be spacing between the ceph lock and lock wedge when rotating. If not adjust the cassette holder microswitches or check the cassette holder sliding rods.	Cassette holder microswitch & sliding rods, ceph lock
Problem with wiring.	Check the cables and their travel inside the rotating unit.	
Timer in Core Module may not operate	Replace Core Module	Core Module

Cassette holder top plastic plugs touching the main support.	Check the spacing, adjust cassette holder microswitches.	Cassette holder microswitch
Unit not properly released after installation.	Check the transportation bolts and rotation limiters.	

2.7.15.1 Rotation movement, principle

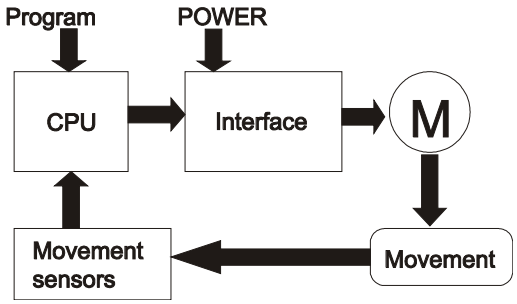


Fig 2.2. Movement control principle

Movement is generated by using a stepping motor M3, gear assembly and a drive wheel, which is forced against a friction surface of the rotation unit. There are mechanical limiters to prevent full 360? rotation and cable twisting. There are four position indicators for the rotating unit. These microswitches are located inside the main support. Rotation angle information comes from a code disk, which is located on the rotation unit, under the main support. Rotational position is indicated by four microswitches (S 11 to S 14) as follows.

The position is expressed in degrees from center position, where tubehead is at it's furthermost position from the column (= 0?). S14 is the innermost microswitch (closest to the rotation axle) in main support and S11 is the outermost switch. The switches code the rotating unit positions as follows (in parenthesis is the input and LED associated with the signal in Sr 74 IOC):

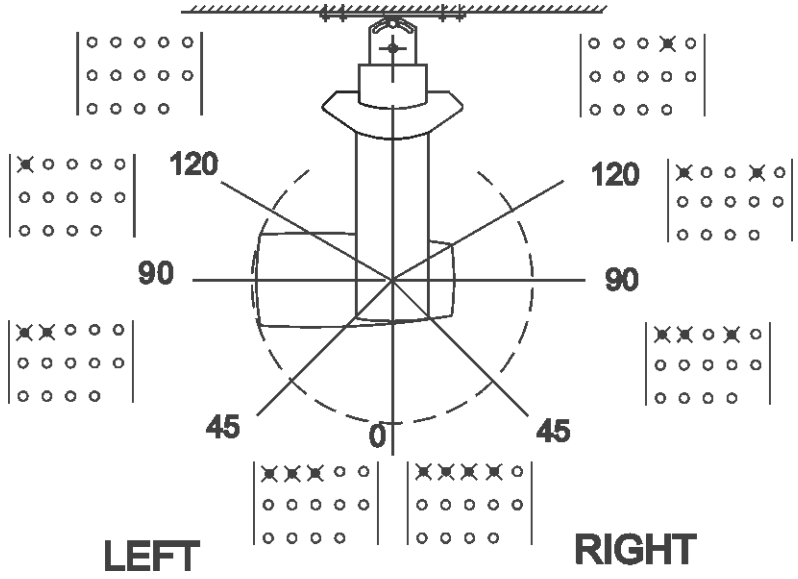


Fig 2.3. Rotation angle reference points with Sr 74 IOC LED states

S 14 ROT4SW (In5 LED8)	S 13 ROT3SW (In5 LED7)	S 12 ROT2SW (In5 LED6)	S 11 ROT1SW (In5 LED5)	TUBEHEAD POSITION
closed	open	open	open	right 120-180°
closed	open	open	closed	right 90-120°
closed	open	closed	closed	right 45-90°
closed	closed	closed	closed	right 0-45°
Open	closed	closed	closed	left 45-0°
Open	open	closed	closed	left 90-45°
Open	Open	open	closed	left 120-90°
Open	Open	open	open	left 180-120°

Open microswitch is 5 V, and closed microswitch is 0 V signal level in Core Module. A lit LED on Sr 74 Ioc indicates a closed microswitch.

2.7.16 Sy 29 PoL

Problem:	" Sy 29 PoL " error message is displayed. Why? Position error: linear movement failed during operation.
How is it detected?	This error is generated if the Core Module does not receive the correct sequence of LINLIMSW and LINMIDSW within a predefined time. Occurs also when LINLIMSW goes active during an exposure cycle (linear movement has reached one of the limit microswitches S16 or S17). Core Module assumes that the linear movement is not moving or has reached the movement limits and interrupts all movements and exposure.

Possible causes:	Check or test	Parts related
Linear movement, but microswitches S 15 to S 17 may not operate properly. Signals LINMIDSW and LINLIMSW.	Use Sr 74 IOC. Test the signals, rotate fly wheel by hand or press switch actuator arms.	S15 - S17, C11, X6, Core Module
Problem with motor control. Linear stepping motor or motor driving circuitry in Interface Board may not operate properly.	Check the control from Core Module to Interface Board. Check the motor control red LED's: all should lit when unit is rotating. Check X16 and X17 connections.	Interface Board, X16, Core Module, X17, M2, X111
Problem with motor power. Power Supply F2 blown.	Check F2 on Power Supply Board.	Power Supply Board, F2
Friction with linear movement.	Check the movement. Adjust the spring tension. motor axle, fly wheel, linear actuator and linear plate alignment.	

Problem with wiring.	Check the cables and their travel inside the main support. Check that cable bundle is not pressing S16.	
TIMER Digital I/O may not operate	Replace Core Module	Core Module
Unit not properly released after installation.	Check the transportation bolts and rotation limiters.	

2.7.16.1 Linear movement, principle

Movement is generated by using a stepping motor, a linear actuator and a linear plate. There are three position indicators for the linear movement of the rotating unit. These microswitches are located inside the main support. Notice that S 16 is mounted in mirror orientation compared to S 15 and S 17.

LINLIMSW

Two microswitches (S 17 and S 16) to indicate either end of the linear movement. These limit switches are connected in parallel. S 17 is the reference point to all imaging movements and it is also used to align x-ray tube (and field) for cephalometric imaging. If S 17 is moved or replaced, the panoramic layer and cephalostat beam alignment must be verified and adjusted if needed.

LINMIDSW

S 15 is for the mid position of the linear movement, also indicating front and rear segments of the movement. It is used to set OP200 rotating unit for patient positioning (Programs 1 to 4 and 6 to 9) and it serves as a reference point for TMJ pointer movements in TMJ imaging (Programs 6 to 9) and linear tomography (Programs 11 and 12).

Linear movement position is indicated to Core Module as follows.

S 16, S 17 LINLIMSW In0 LED4	S 15 LINMIDSW In0 LED5	MOVEMENT POSITION (view towards the column)
closed	closed	Front (= column) end
open	closed	Front half
open	open	Rear half
closed	open	Rear end

2.7.17 Sy 31 PoU

Problem:	" Sy 31 PoU " error message is displayed.
Why?	Position error: vertical carriage movement failed during operation.
How is it detected?	This error is generated if the Core Module does not receive the ZLIMSW or ZMIDSW within a predefined time while the carriage motor is running. Core Module assumes that the vertical carriage is not moving and interrupts the movement.

Possible causes:	Check or test:	Parts related:
Microswitches. S 4 or S 5 may not operate properly. Signals ZLIMS and ZMIDSW.	Use Sr 74 IOC. Test the signals. Move the carriage by hand. Switches must trigger before mechanical limit.	S4, S5, X117, C11, X9, Core Module
Problem with motor control. Signals ZENA and ZDIR, Z-MOTOR 1 & 2.	Check the signals and wiring.	Core Module, X16, Interface Board, X18, C12, X102, SC2, X103, C3, X104, M1
Wall mount assembly too low.	Check the switch operation. Adjust the detent pieces.	Wall mount

Possible causes:	Check or test:	Parts related:
Detent pieces. Microswitches trigger in wrong order.	Check the top detent pieces: longer one higher than short one.	Short & long detent piece
No motor power. 12VDC missing. Problem with Interface Board.	Check the Power Supply & Interface Board LED's.	X16, Interface Board, X15, Power Supply Board
Motor operates all the time. Motor or diving circuitry shorted. Positioning panel key problem.	Motor wiring. Interface Board relay. If problem with panel key, it gives first Er 45 INP.	Motor M1, C3, X16, Interface Board
Clutch. Motor operates, but slow or no carriage movement	Check the motor clutch tension. Adjust with 14mm wrench.	Clutch at column top
Mechanical. Counter weight trims are too many/few or they are touching the column interior. sliding carriage roller movements	Check the amount of trims: OP200 4 smalls & 7 big trims, OC200 4 small & 23big ones.	Trim weights
Mechanical. Problem with sliding carriage rollers.	S/N 70xxx: adjust with shim plates. From S/N 71xxx: adjust the roller slack.	Sliding carriage.

2.7.17.1 Carriage movement, principle

Movement is generated by using a DC motor, gear assembly and pulleys. Vertical carriage and counter weight are connected to pulleys with steel cables.

There are two position indicators for the vertical carriage movement. These microswitches are located inside the rear support assembly, at the rear of the column unit. The height of the vertical carriage is detected by two short detent pieces located in the groove of the column. These pieces are adjusted at the factory so that they will stop the carriage 10 - 20 mm before the mechanical limits.

The height of the cassette holder can be limited by lowering the cassette holder to the half way up position. When this feature is activated, cassette holder is lowered when S4 is actuated by the long detent piece located in the right groove of the column (looking from behind the column). This piece is adjusted at the factory so that the cassette holder always stays below the height of the column. This feature is activated by user program “Pr 56 HLI” -> “on”. Note that the longer detent piece is also used to distinguish the difference between upper and lower limits.

ZLIMSW

One microswitch (S 5) to indicate either end of the vertical carriage movement

ZMIDSW

One microswitch (S 4) to indicate cassette holder height limiting area of vertical carriage movement, also indicating upper limit together with the ZLIMSW-signal.

Vertical movement position is indicated to Core Module as follows:

S 5 ZLIMSW In5 LED4	S 4 ZMIDSW In5 LED3	CARRIAGE POSITION
closed	Closed	upper limit
open	Closed	upper segment (height limit area)
open	Open	lower segment
closed	Open	Lower limit

2.7.18 Er 40 Core Module

Problem:	Er 40 CPU error message is displayed.
Why?	Core Module error: Core Module processing failure
How is it detected?	Software has detected internal Core Module RAM failure.

Possible cause:	Parts related:	Check or test:
Core Module processing failure. Processor circuit ICD 31 may be defective.	Switch off. Try again. If error comes again, replace the Core Module.	Core Module.

2.7.19 Er 41 Core Module

Problem:	Er 41 CPU error message is displayed.
Why?	Core Module error:RAM check failure
How is it detected?	Softare has detected external RAM failure.

Possible cause:	Check or test:	Parts related:
Problem with RAM write and read operation. RAM circuit ICD 30 in Core Module may be defective.	Switch off. Try again. If error comes again, replace the Core Module.	Core Module.

2.7.20 Er 42 Core Module

Problem:	Er 42 Core Module error message is displayed.
Why?	Core Module error: check-sum failure.
How is it detected?	EPROM check-sum is verified at power up. If the calculated check-sum varies from the written check-sum in the EEPROM, an error is generated indicating a memory problem.

Possible cause:	Check or test:	Parts related:
Problem with EEPROM circuit. ICD 28 or 29 may be defective.	Replace the circuit. Use only those obtained from the manufacturer. Try again. If error, replace the Core Module.	EEPROM, Core Module
Problem with Core Module wiring or component.	Try again. If error, replace the Core Module.	Core Module

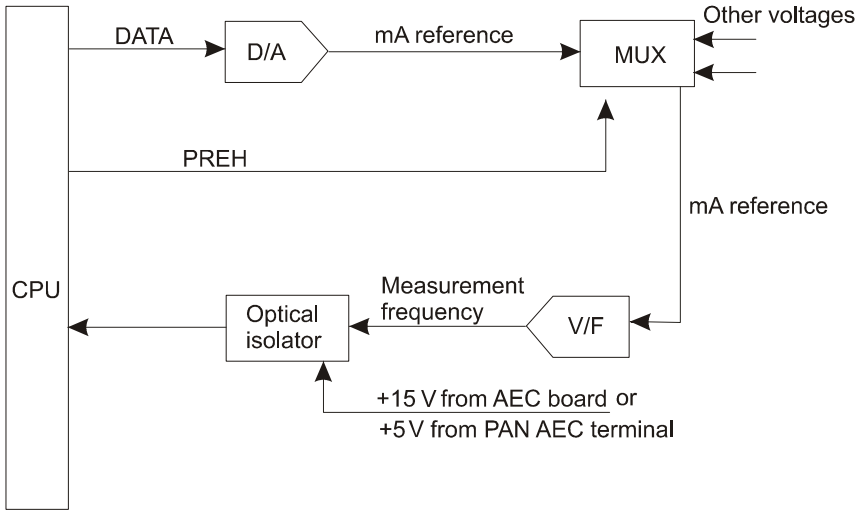
2.7.21 Er 43 ***

Problem:	Er 43 *** error message is displayed. *** is a number.
Why?	Wrong line voltage selection. Approximate measured line voltage (***) is shown in time display.
How is it detected?	Core Module monitors the line voltage switch signal **MAINS** from Power SupplyBoard. Switch is in incorrect position. This error is generated during power up sequence if the line voltage (derived from the +25V supply) is under 160 volts for 230V selection or over 160 volts for 110V selection.

NOTE! *When the unit is connected to 230V line with 110V settings, fuses normally blow before this error is displayed.*

Possible cause:	Check or test:	Parts related:
Line voltage switch in wrong position.	Check all four switches in Power Supply Board: they must be switched to the same position, left or right, depending on the nominal line voltage: 110 Vac: S1-S4 turned left 230 Vac: S1-S4 turned right	Power Supply Board
Incorrect position of 110/230 switch may cause serious damage to the electrical circuits.	If the replacement of Power Supply Board did not help, replace the Core Module.	
Filament Control Board not operating, or not connected to Core Module (signal MAFRQ).	Check the wiring. Replace the board.	

2.7.21.1 Filament Control Board self check principle



1. Core Module sets maximum mA reference.
2. Core Module activates PREH signal to connect mA reference to the V/F-converter.
3. Core Module measures the frequency coming from the V/F-converter. If the frequency is not high enough, Er 44 FIL is displayed.

NOTE! *If +34VDC is missing also +5VDC from PAN AEC terminal is missing resulting Er 44 Fil. This is possible by pressing emergency stop switch.*

2.7.22 Er 44 FIL

Problem:	**Er 44 FIL error message is displayed.**
Why?	FILAMENT: Tube head preheating circuit not operating
How is it detected?	During the power up sequence the Core Module checks the operation of the D/A-converter in the Filament Control Board by monitoring signal MAFRQ while connecting the output of the D/A-converter to the input of the V/F-converter (this connection is made when PREH is active and PREHREL is inactive). If the feedback from V/F-converter does not correspond to data written to the D/A-converter Er 44 FIL is generated and the operation of the unit is prevented. MAFRQ signal is fed to the Core Module via an optoisolator (ICD34 on Core Module) that receives the operating voltage from the AEC Board (voltage FILT5, derived from the +5V on the PAN AEC Terminal).

Possible cause:	**Check or test:**	**Parts related:**
Broken Filament Control Board.	Replace Board	

Possible cause:	Check or test:	Parts related:
Problem with MAFRQ signal at powerup.	Check mafrq signal wiring and brds related. Check that emergency stop switch is not pressed. Check that panoramic unit has ceph cable replacement (5144984) in ceph connectors.	PAN AEC terminal brd and Cam supply brd Emergency stop switch Digital I/O brd Filament brd Cables (check wiring diagram)
Problem with wiring	Power - Core Module - Filament - PAN AEC	C67, X4, X38
Problem with operating voltages. Signal FILT5.	Check Filament control Board, or PAN AEC Terminal Board +5V signal.	
Broken Core Module. Optoisolator. Wire.	Replace Core Module.	
Power Supply Board switches SW1-SW4 in incorrect position. Error message sometimes barely seen.	Power off. Check the switch positions. Check the main fuses.	Power Supply Board

2.7.23 Er 45 InP

Problem:	Er 45 InP error message is displayed.
Why?	Input error: keyboard or exposure button failure.
How is it detected?	This error is generated if the Core Module detects that 1) any position panel or 2) ceph panel claslit button or 3) control panel button other than the OK-switch or 4) one of the exposure switches is pressed (active) during the power-up sequence.

Possible cause:	Check or test:	Parts related:
One of the control panel keys (up-right-down-left) pressed or short-circuited	Power off. Disconnect coiled cable X105 or C9 X1. Power on. If error then check C9 or other input signals. Use Sr 74 IOC.	Control panel, SC3, X105, C9, X1, Core Module
Exposure switch pressed or short-circuited on control panel. Signal PNLEXPSW.	Power off. Select PAN collimator. Disconnect coiled cable X105. Power on. Check if the occlusion adjustment led is blinking: - If it is blinking then error is with the control panel. Check switch,C9 or other input signals. Use Sr 74 IOC.	
Remote exposure switch pressed or short-circuited. Signal EXPSW.	Power off. Disconnect remote cable. Power on. - If error then check signal wiring. Use Sr 74 IOC.	Switch, X103, SC2, X102, C12, X3
One of the positioning panel keys pressed or short-circuited.	Power off. Disconnect panel cables. Power on. If error then check wiring or other input signals. Use Sr 74 IOC.	Positioning panel, X47L/R, X48L/R, C10, X7
Claslit key pressed or short-circuited.	Power off. Disconnect ceph up/down panel cable X251. Power on. If error then check the wiring. Use Sr 74 IOC.	Up/Down panel, X251, X234, X236, X8 C50, X67

Possible cause:	Check or test:	Parts related:
Installation: connectors X102 and X117 under the lower shelf are incorrectly connected.	Check the connection.	X102, X117

2.7.24 Er 46 PAy

Problem:	Er 46 PAY error message is displayed after power-up.
Why?	The number of allowed exposures for equipment leasing and testing purposes has been exceeded.
How is it detected?	Limited free exposures feature was used for equipment leasing or customer trial purposes and a programmed limit (from 1 to 990 exposures) has been reached. OP200 does not allow more exposures and the unit cannot be used.

Possible cause:	Check or test:
All OP200 operations have been halted by software.	See Service program Sr 71 PAy for details. Increase the limit or disable this feature.

2.8 Indicators and test points

2.8.1 Led-indicators

All LED indicators can be identified from the schematics and printed circuit boards by the name of the signal and the component number of the LED: eg. LED for + 5 V voltage in the Core Module is marked H1 +
5 V.

All supply voltages are indicated by green LED's, and the most important or critical signals are indicated by red LED's in the printed circuit boards.

When the LED is lit, it means that the supply voltage is available or that the signal is active.

2.8.2 Test points

All test points can be identified from the schematics and printed circuit boards by the name of the signal and the TP number: eg. the test point for PROJLIT signal in the Interface Board is marked **TP1 PROJLIT**.

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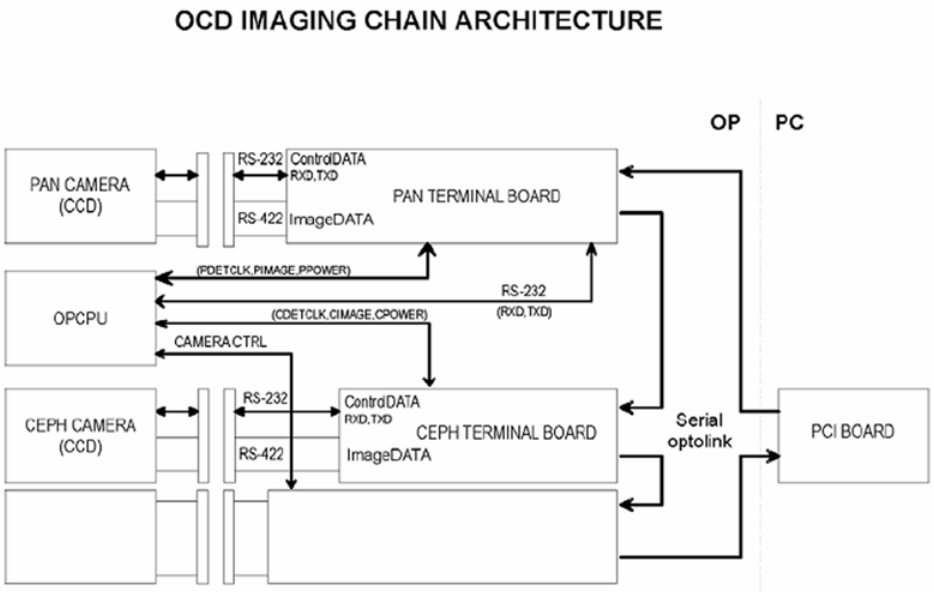
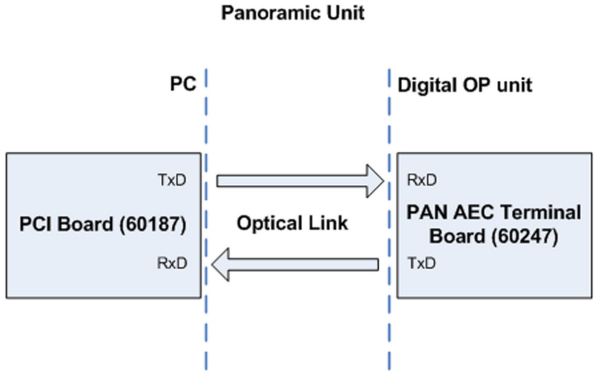
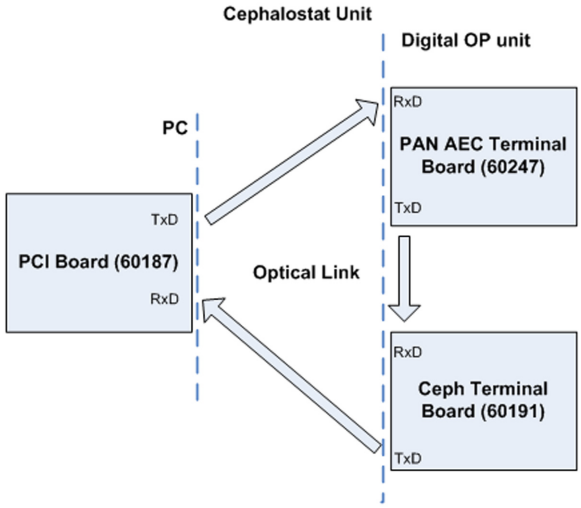
3 Appendix A: Optical Link Test







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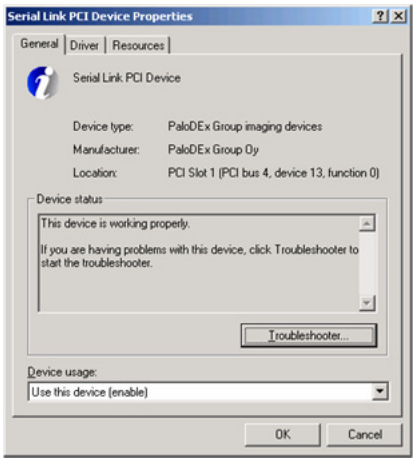
3.1 PCI board driver check

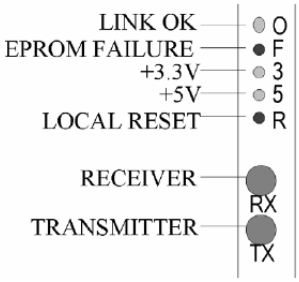
Use Windows Control Panel ⇒ System ⇒ Hardware ⇒ Device Manager to check:

- PCI board is visible for the operating system.
- Driver is installed (check driver version compatibility with the used CliniView version).
- Device/driver status: Working properly.

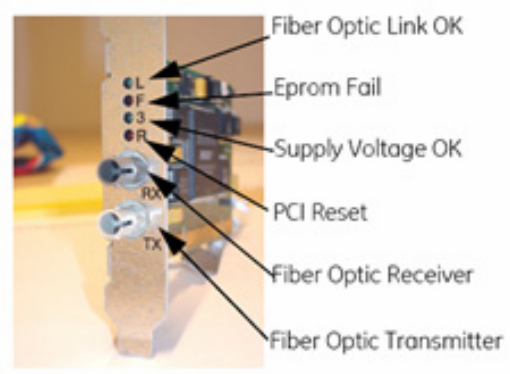


3.2 PCI board, PAN-AEC Terminal board and Ceph Terminal board leds status check

3.2.1 Standard PCI board



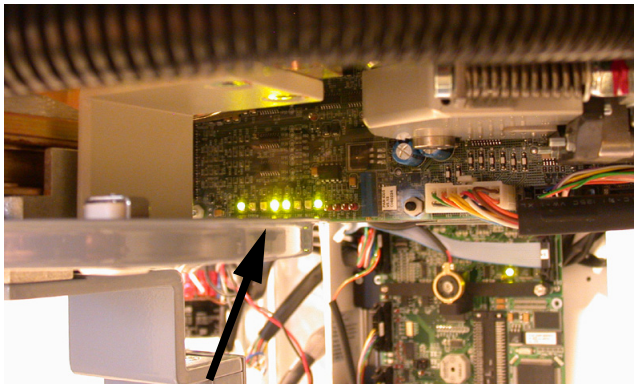
3.2.2 Low profile PCI board (combined supply voltage led)



3.2.3 PCI board (60187) leds status check

Led/signal	Status Color	Unit Ready	During Exposure
H1 (LINK OK)	green	ON	ON
H2 (EPROM FAILURE)	red	OFF	OFF
H3/(H4) (SUPPLY VOLTAGE)	green	ON	ON
H5 (RESET)	red	OFF	OFF

3.2.4 PAN AEC Terminal board (60247) leds status check



Led/signal	Status Color	Unit Ready	During Panoramic Exposure
H1 (+2.5V)	green	ON	ON
H2 (+3.3V)	green	ON	ON
H3 (EPROM failure)	red	OFF	OFF
H4 (CAM +5V)	green	ON	ON
H5 (CIMAGE)	green	OFF	ON (delayed)
H6 (+5V)	green	ON	ON
H7 (LINK OK)	green	ON	ON
H8 (RESET)	red	OFF	OFF
H9 (AEC +15V)	green	OFF	ON
H10 (AEC -15V)	green	OFF	ON

3.2.5 Ceph terminal board (60191) leds status check (optional)

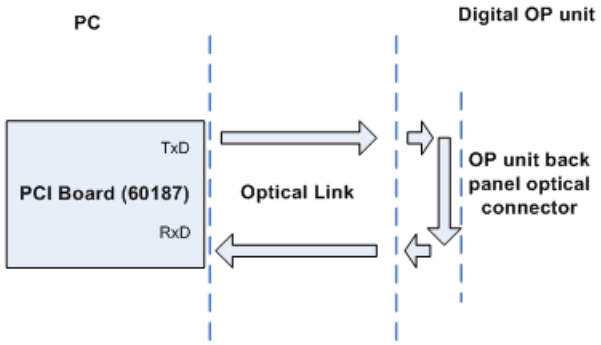
Led/signal	Status Color	Unit Ready	During Panoramic Exposure
H1 (+2.5V)	green	ON	ON
H2 (+3.3V)	green	ON	ON
H3 (EPROM failure)	red	OFF	OFF
H4 (CAM +5V)	green	ON	ON
H5 (CIMAGE)	green	OFF	ON (delayed)
H6 (+5V)	green	ON	ON
H7 (LINK OK)	green	ON	ON
H8 (RESET)	red	OFF	OFF
H9 (AEC +2V)	green	ON	ON

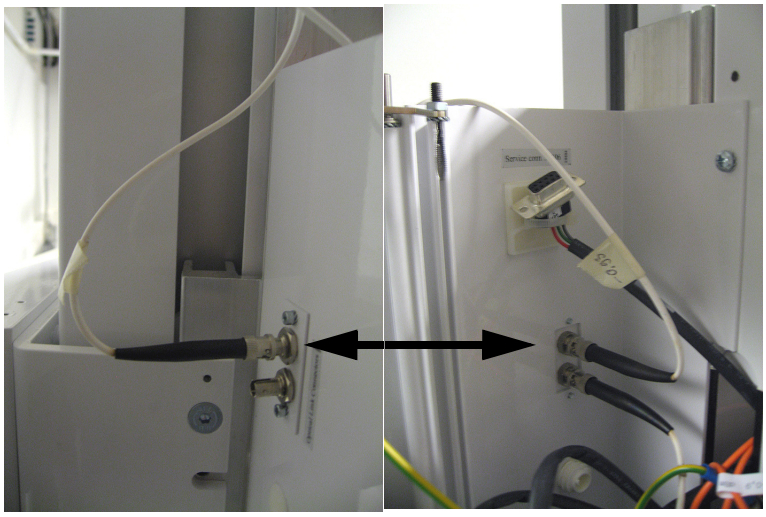
3.3 PCI Board Fiber Test

– Open the OP unit carriage side cover (side where the fiber optic cables are connected to the unit)

– Remove carefully the fiber optic cables and re-connect the cable connecting the PCI board and the OP unit as a loop by using the OP unit back panel connecting terminals.

– PCI Board optical link loop created (RXD <-> TXD).

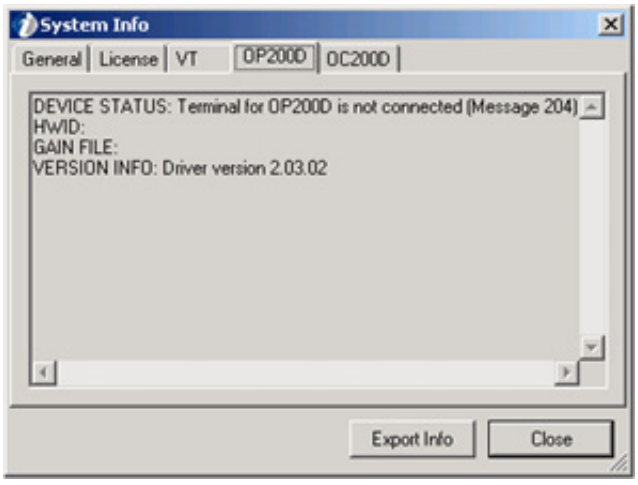




– PCI Board Fiber Test

PCI board LINK OK (H1/L) led should be lit.

Open CliniView ⇒ Help ⇒ System Information ⇒ OP200D sub-tab: Error message ‘Terminal for OP 200D is not connected (Message 204)’ should be displayed.



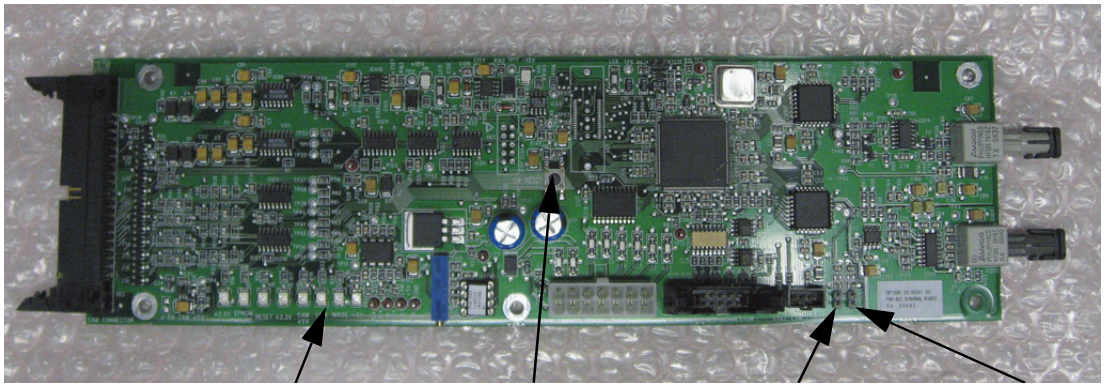
3.4 PAN AEC Terminal Board (60247) Fiber Test

– Create optical cable loop for the cables connected to the PAN AEC Terminal Board by using the OP unit back panel optical connection terminals.

– Locate PAN AEC Terminal Board FIBER TEST jumper terminal (J2) ⇒ install jumper.

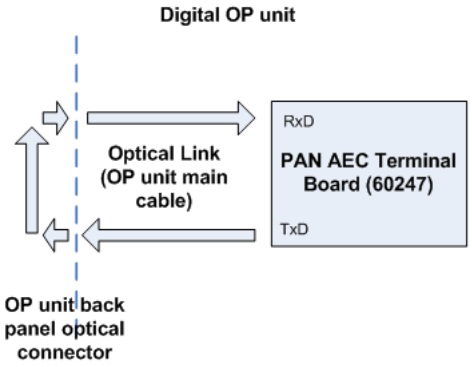
– Press once PAN AEC Board reset button ⇒ If the PAN AEC Terminal Board LINK OK led (H7) starts blinking ⇒ the PAN AEC Terminal board optical link transmitter-receiver and optical cables (including the one attached to the OP unit main cable) are OK.

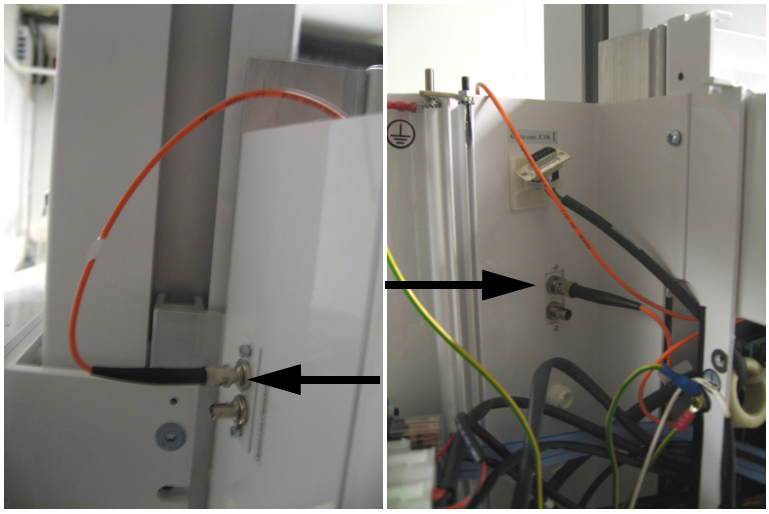
– Finally remove the jumper J2 and re-connect the optical cables original way.



LINK OK led (H7) | RESET button | Select RxD Port Jumper (J3) | FIBER TEST Enable Jumper (J2)

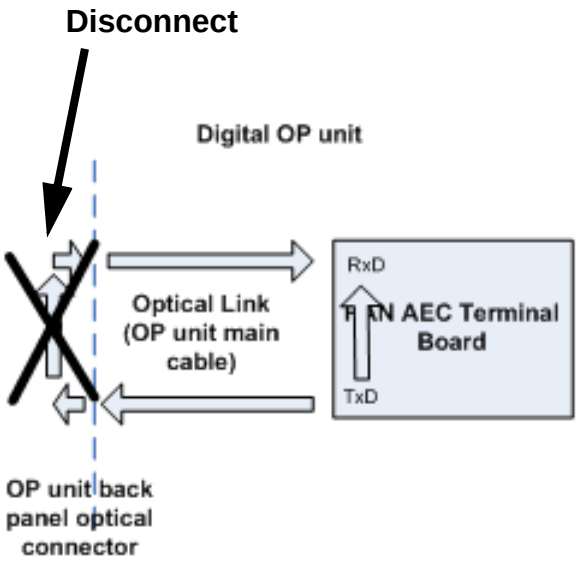
– PAN AEC Terminal Board optical link loop created (RXD <-> TXD)





If the LINK OK led was not lit during the optical link loop test: Perform the PAN AEC Terminal Board internal transmitter – receiver pair test.

– Dismantle (if still exists) the optical cable loop created for the optical link loop test e.g. by removing one of the optical link connectors from the OP unit back panel.



– Locate the PAN AEC Terminal Board FIBER TEST jumper terminal (J2) ⇒ Install jumper.

– Locate the PAN AEC Terminal Board RxD Port selection jumper J3 ⇒ Install jumper.

– Press once the PAN AEC Board reset button ⇒ If the PAN AEC Terminal Board LINK OK led (H7) starts blinking ⇒ the PAN AEC Terminal board transmitter-receiver pair is OK.

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– Finally remove the jumpers J2 and J3 and re-connect the optical cables original way.

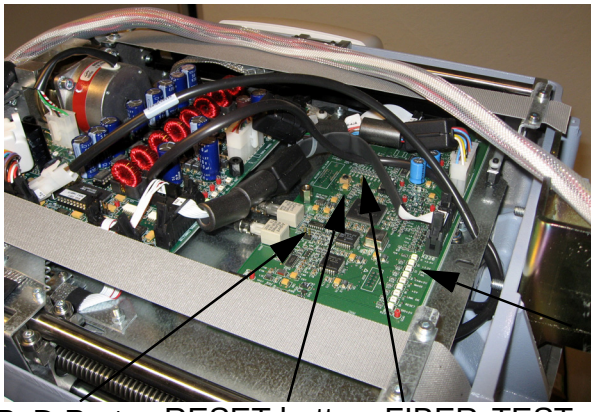
3.5 Ceph Terminal Board (60191) optical loop test (optional)

– Create optical cable loop for the cables connected to the CephTerminal Board by using the OP unit back panel optical connection terminals.

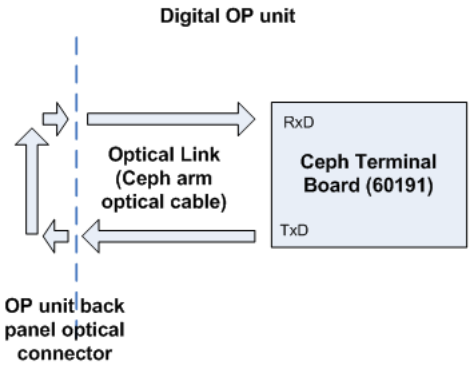
– Locate the Ceph Terminal Board FIBER TEST jumper terminal (J2) ⇒ install jumper.

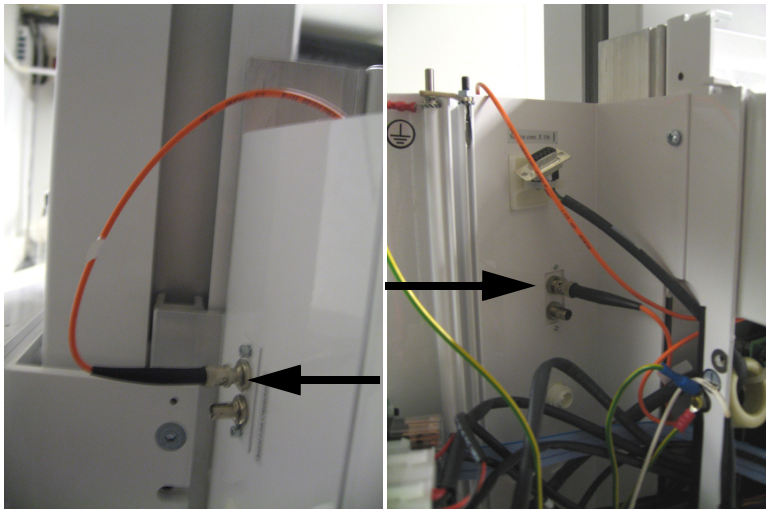
– Press once the Ceph Terminal Board reset button ⇒ If the Ceph Terminal Board LINK OK led (H7) starts blinking ⇒ the Ceph Terminal board optical link transmitter-receiver pair and the optical cables inside the ceph arm are OK.

– Finally remove the jumper J2 and re-connect the optical cables original way.



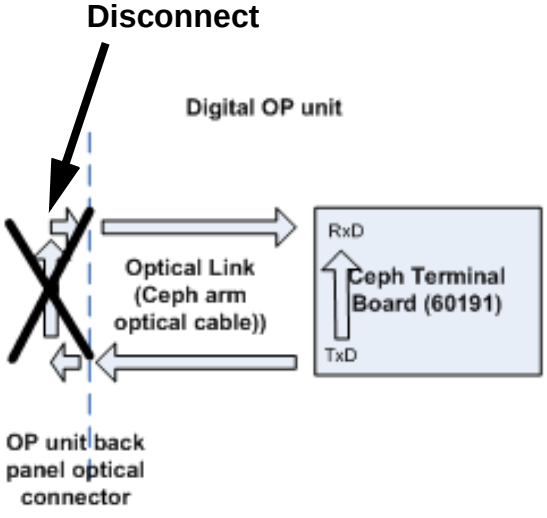
– Ceph Terminal Board optical link loop created (RXD <-> TXD)





IF the LINK OK led was not lit during the optical link loop test: Perform Ceph Terminal Board internal transmitter – receiver pair test.

– Dismantle (if still exists) the optical cable loop created for the optical link loop test e.g. by removing one of the optical link connectors from the OP unit back panel.



– Locate the Ceph Terminal Board FIBER TEST jumper terminal (J2) ⇒ Install jumper.

– Locate the Ceph Terminal Board RxD Port selection jumper J3 ⇒ Install jumper.

– Press once the Ceph Board reset button ⇒ If the Ceph Terminal Board LINK OK led (H7) starts blinking ⇒ the Ceph Terminal board transmitter-receiver pair is OK.

– Finally remove the jumpers J2 and J3 and re-connect the optical cables original way.

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Orthoceph® OC200 & OC200 D
Troubleshooting Manual, English

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