PaX-Duo3D Service Manual

for the expert





Table of Contents

Chapte	er 1 PaX-Duo3D Equipment Overview	.4
1.1	Equipment Composition unit	.4
1.2	Positions of Various Boards	.5
1.3	System Configuration Block Diagram	.6
1.4	Roles of Each Boards	.7

Chapter 2 PaX-Duo3D Disassembly9

2.1	Vertical Frame and Column Disassembly	9
2.2	Rotating Unit Disassembly1	4
2.3	Handle frame Disassembly1	9

Chapter 3 Replacement Methods of Various Boards......21

3.1	Power Board Replacement	21
3.2	Tube inverter Board Replacement	24
3.3	4AXIS-1 MCU Board Replacement	25
3.4	4AXIS-2 MCU Board Replacement	26
3.5	JAW MCU Board Replacement	27

Chapter 4 Replacement Methods of Major Parts......28

4.1	Sensor Module Replacement	28
4.2	Touchpad Screen Replacement	32
4.3	Tube Head Replacement	33
4.4	Handle Frame Replacement	35
4.5	Collimator Replacement	37

Chapte	r 5 Inter-Parts Connections	8
5.1	Connection Diagram of 4AXIS1 MCU Board and Peripheral Devices	39
5.2	Connection Diagram 4AXIS2 MCU Board and Peripheral Devices	40
5.3	Connection Diagram JAW MCU Board and Peripheral Devices	41
5.4	Other Boards	41

Chapte	er 6	Diagnostics Methods for Various Boards	43
6.1	Pow	ver Board	44
6.2	Tub	e inverter Board	50
6.3	4AX	IS-1 MCU Board	56
6.4	4AX	IS-2 MCU Board (Collimator)	62
6.5	JAW	/ MCU Board	65
Chapte	er 7	Scanning Programs	69
7.1	Peri	pheral Devices Interlocking with Scanning Programs	69
7.2	Des	cription on Major Functions	69
7.3	Fold	ler Composition	71
7.4	Env	ironment Setting	74
7.5	Coll	imator Setting	79
7.6	Net	work Setting	81
Chapte	er 8	Software Interlock	82
8.1	Gate	eway Program Installation	82
8	8.1.1	Parameter Setting after Gateway Installation	
8	8.1.2	Work list Parameter Setting	
8	8.1.3	Scanning Platform Environment Setting (Environment Setting.ini. in	ncluded in the
9	Scannii	ng S/W)	85
8.2	How	<i>v</i> to Use	87
8	8.2.1	Gateway	
8	8.2.2	Work list	

Chapte	er 9 Panoramic Image Assessment	90
9.1	Collimator Setting Standards	90
9.2	Alignment Confirmation	94
9.3	Acquisition of Calibration Data	95
9.4	X-Axis Reference Value Setting/Ball Phantom Enlargement Ratio	96
9.5	Confirmation on X-ray's Transverse Distance Enlargement Ratio	98
9.6	Scan Starting Angle Setting	99
9.7	Skull Image Checking	99



Chapter	r 10 CT Image Assessment and Correction	100
10.1	Work Environment Setting	100
10.2	Frame Grabber Installation	101
10.3	Installation Procedures of Vatech Reconstruction S/W	106
10.4	Optimization of 15x13.5 and 12x8.5 Images	110
10.	.4.1 PaX-Duo3D Components	110
10.	.4.2 Confirmation on Cable Connection	110
10.	.4.3 Hardware Calibration	111
10.	.4.4 Optimization of the images	121
Chapter	r 11 Firmware Upgrade	137
11.1	Touchpad Screen Firmware Upgrade	137
11.	.1.1 Confirmation on Network Communication Connection Status betweer	n LCD and PC.137
11.	.1.2 Execution of LCD Firmware Upgrade Tool	
11.	.1.3 Error	139
11.2	PaX-Duo3D Patient Monitoring Camera Related Setting	140
11.3	4AXIS-1 MCU Board Upgrade	141
11.4	4AXIS-2 and JAW MCU Board Upgrade	147
11.	.4.1 4AXIS-2 MCU Board upgrading	148
11.		
	.4.2 JAW MCU Board Upgrade	151
Chapter	.4.2 JAW MCU Board Upgrade	151
Chapter 12.1	.4.2 JAW MCU Board Upgrade 12 Appendix FDT3.1 Installation	151 152 152
Chapter 12.1	.4.2 JAW MCU Board Upgrade 12 Appendix FDT3.1 Installation 	151 152 152
Chapter 12.1 12. 12.	 JAW MCU Board Upgrade	
Chapter 12.1 12. 12. 12.	 JAW MCU Board Upgrade	
Chapter 12.1 12. 12. 12.2 12.2 12.3	 JAW MCU Board Upgrade	
Chapter 12.1 12. 12. 12.2 12.3 12.3	 .4.2 JAW MCU Board Upgrade	

PaX-Duo3D

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Chapter 1 PaX-Duo3D Equipment Overview

1.1 Equipment Composition unit



- **LED Lamp:** Indicating the current X-Ray emission activity of unit. While it stays green when the unit is idle, led lamp turns orange when the unit is in operation
- **Emergency switch:** stop the movement of the unit when it abnormally operates.
- Sensor Module: Digital X-ray image sensor module for Panoramic and Dental CT imaging units. With its Auto-Switching sensor technology, there is no need to change sensors when imaging mode changed
- Chinrest: provide the patient comfort and rest while imaging, thus producing better image



- LCD panel: the supporting device to monitor and control the Unit activity
- Handle frame: is used for the patient to hold firmly while imaging to stabilize his or her position
- **Column:** is used to adjust the unit height according to the height of patient.



1.2 Positions of Various Boards









1.4 Roles of Each Boards

1. 4axis-1 MCU Board

- Controls with S/W between the sensor and the Rotator to ensure the rotation does not exceed the initial value when the rotator spins
- Tube inverter board X-ray Examination On/Off control
- Vertical Beam Laser Generation for Patient Alignment
- Horizontal Beam Laser Generation for Patient Alignment
- A motor to drive the equipment suitable to various arch loci. X-axial Motor moves with variable speed to correspond to the applicable arch during scanning
- Makes the Rotator to spin
- Drive the Motor to let the Sensor Rotator spin
- CAN Communication with JAW MCU
- CAN Communication with 4AXIS-2 MCU Board
- Serial communication with Touch pad screen
- Serial communication with PC

2. 4axis-2 MCU Board (Collimator)

- Power supply or cut off to Pano and CT sensor
- Vertical Beam Laser Generating Laser for Patient Alignment
- Horizontal Beam Laser Generating Laser for Patient Alignment
- Supply the voltage to drive Collimator servo motor
- CAN Communication with 4AXIS-1 Board
- CAN Communication with Tube inverter Board
- Driving Motor that moves Collimator to the left/ the right

3. 4axis-2 MCU Board (Collimator)

- Connecting the Switch to make the Column Up or Down
- Limiting Sensing Switch to prevent moving out of the minimum point and the maximum point of the Column section
- Control the motor suspension force when moving the Column up/down
- Functions as On/Off switch of Laser for Patient Alignment and in addition, functions to move to the position of lamp
- Moving the Chinrest to the left/ the right
- Moving the Chinrest up/down
- CAN Communication

- Serial communication with MP3 Board via RS-232 communication
- Serial communication with Mirror LCD Board

4. P2 power Board (Inverter power)

- Supply 300V to Tube inverter Board
- Supply 24V to Tube inverter Board
- Supply ±15V to Tube inverter Board

5. K-PJT power Board

- Supply power to CT sensor
- Supply power to Pano sensor

6. Inverter Board

- Generates Tube Voltage and Tube Current
- CAN Communication with 4AXIS-2 Board
- Functions for On/Off by receiving Exposure switching signal from 4AXIS-1 Board

7. Touch LCD controller Board

- Serial communication with 4AXIS-1 Board (for Firmware upgrade and etc)
- Exchange data with Touch LCD(6.4")
- Exchange data with PC by having Ethernet communication with external Hub

8. MP3 Board

- Serial communication with JAW MCU Board
- Drive the external stereo speaker for voice guidance during operation of equipment

9. Mirror LCD control Board

- Serial communication with JAW Board
- Exchange data with Mirror LCD(5.7")

8

Chapter 2 PaX-Duo3D Disassembly

2.1 Vertical Frame and Column Disassembly

1. Remove 4 bolts, and then disassemble Case A.



2. Remove 4 bolts, and then disassemble Case B and C.





3. Figure shown after disassembling the lower casing.



4. Remove 4 bolts, and then disassemble Case E.





5. Remove 2 bolts.



6. Turn 2 bolts and the horizontal beam adjustment bar to remove them, and then disassemble Case F.



7. Remove 2 bolts





8. After removing 2 bolts, disassemble case G.



9. Remove 6 bolts.





10. Remove 4 bolts, and then disassemble Case G.



11. Figure shown after completion of disassembling the column and the vertical casing.





2.2 Rotating Unit Disassembly

1. Separate and remove the sensor cover.



2. Remove 2 bolts.



3. Turn the sensor part slightly and remove 1 bolt that is hidden.



4. Turn the sensor part slightly and remove another 1 bolt that is hidden.



5. Figure shown after disassembling so far.



6. Remove 4 bolts, and then separate Cover B as shown in the following Figure.





7. Remove 2 bolts as shown the following Figure.



8. Remove 2 bolts, and then disassemble Case C.



9. Remove 4 bolts of each direction respectively, in total of 8 bolts.



10. Remove 2 bolts of each direction respectively, in total of 4 bolts, and then disassemble Cases D and E.



11. Remove 6 bolts, and then disassemble Case F.



12. Remove 2 bolts.





13. Remove 2 bolts, and then disassemble Case G.



14. Remove 4 bolts, and then disassemble Case H.



15. The final figure shown after completion of disassembling the rotating unit casing.



2.3 Handle frame Disassembly

1. Remove the accessories pinned in the hand frame.



2. Remove 6 bolts, and then disassemble Case A.



3. Remove 4 bolts, and then disassemble Case B.





4. Remove 2 bolts, and then disassemble Case C.



5. Remove 4 bolts, and then disassemble Case D.



6. Remove 4 bolts, and then disassemble Case F.



20





Chapter 3 Replacement Methods of Various Boards

3.1 Power Board Replacement

1. +24V SMPS Replacement

- First, separate the power supply cord that is connected to the equipment completely from the wall.
- ② Separate the cover of the column's front side. Then the inside of electric field is revealed as shown in the following figure.
- $\ensuremath{\mathfrak{I}}$ (Refer to the Column Unit Disassembly).



DC +24V/150W Output {DUO11, DUO12}

④ Remove 4 screws as shown in the following figure.



2. P2 Power Board Replacement



This power board employs large capacity condenser, therefore, even in the state that the power supply is cut off; it is possible to feel large shock when touching the static electricity that is saved in the condenser. So, extra cautions should be taken for handling this board.

- ① First, separate the power cable completely from the wall.
- ② Disconnect cables that are connected to the board
- ③ Then, remove 4 screws
- ④ After finishing replacement, reassemble in reverse sequence. At this point, be careful for the polarity of wires not to be changed.



22



3. Relay Board Replacement



- It is possible that Emergency Relay is slipped out by vibration, so the relay should be fixed by attaching the bracket for relay fixing.
- ② When wiring the relay, perform the wiring after checking on the polarity (7 , 8 +) and the contact (NO).
- ③ Check on whether the Relay LED is illuminated when switched on the power supply.



3.2 **Tube inverter Board Replacement**

- ① First, separate the power cable completely from the wall.
- ② Then, separate the following part of the Rotating unit.



- ③ Separate various cables from the board which are connected to the board.
- ④ Remove 4 screws as shown in the following figure.



(5) After finishing replacement, reassemble in reverse sequence. At this point, be careful for the polarity of cable or to ensure there are no twisting and no interference with other devices.



24

When testing after replacement, make sure that the connector is separated as shown in above figure to prevent any X-ray from dosing.

3.3 4AXIS-1 MCU Board Replacement

- ① First, separate the power supply cable completely.
- ② Then, separate the Vertical frame cover as shown in the following figure.



- ③ Separate various cables which are connected to the board.
- ④ Remove 4 screws as shown in the following figure.



(5) After finishing replacement, reassemble in reverse sequence. At this point, be careful for the polarity of cable or to ensure there is no twisting and no interference with other devices



3.4 4AXIS-2 MCU Board Replacement

- 1) First, separate the power supply cable completely.
- ② Separate the cover of the Vertical frame as shown in the following figure.



- ③ Separate various cables which are connected to the board.
- ④ Remove 4 screws as shown in the following figure.



(5) After finishing replacement, reassemble in reverse sequence. At this point, be careful for the polarity of cable or to ensure there is no twisting and no interference with other devices.

3.5 JAW MCU Board Replacement

- ① First, separate the power supply cable completely.
- ② Separate the cover of Vertical frame as shown in the following figure.



 $\ensuremath{\mathfrak{I}}$ Separate various cables which are connected to the board.



④ Remove 4 screws as shown in the following figure.

S After finishing replacement, reassemble in reverse sequence. At this point, be careful for the polarity of cable or to ensure there is no twisting and no interference with other devices.

Chapter 4 Replacement Methods of Major Parts

4.1 Sensor Module Replacement

- 1. Concord 1 Replacement (When Concord 1 Sensor is installed)
 - ① Check on concord 1 sensor as shown in the following Figure.



② Remove 6 bolts (M4 L:8), and then separate the sensor.



28





③ After removing 4 bolts (M4 L:8), and then separate the sensor from the sensor

2. When Concord 2(FOV size: 24 x15cm) is installed

 Check on the position of sensor as shown in the following figure to prepare for separation.



② Remove 4 bolts(M4 L:8) and then separate the sensor and its supporting bracket from the equipment.



③ Remove 4 bolts(M4 L:8) and then separate the sensor itself from the block.





3. Pano Sensor Disassembly

① Check on the Pano Sensor.



② After separating the front and the rear Pano sensor covers, remove the related bolts(M3 L:6 4 bolts) (M4 L:6 6 bolt) and then separate the sensor.





4.2 Touchpad Screen Replacement

① After removing four truss bolt (M4 L:6), detach the Touchpad screen Module.



② In order to assemble it, do reverse work. Be careful to combine the Touchpad screen Module with four truss bolt by making sure they are well aligned.



4.3 Tube Head Replacement

① The following figure is the one before replacing tubes.



② Separate the Collimator as shown in the following figure.



- Image: state of the state
- ③ Then Remove 6 bolts (M4 L:8), and then separate the Tube inverter board.

④ Separate the Tube Assembly Block as shown in the following figure.
 First, after removing 4 bolts (M6 L: 12), separate the Block, then remove 2 of bolt and nut (Bolt: M4 L: 10 Nut: M8 L: 20).


4.4 Handle Frame Replacement

① Check on the handle frame as shown in the following figure.



② Remove 4 bolts (M4 L: 6) as shown in the following figure.



③ After removing 4 bolts (M4 L: 6) downwards from the upper side, separate the lower cover.



④ Separate the upper cover.



4.5 Collimator Replacement



① Insert the Collimator as shown in the following figure.

2 Couple the Collimator to the tube in horizontal way and fix it by inserting socket set screws in the sequence as described in the following figure.



참고 -COLLIMATOR를 TUBE에 수평하게 결합 후 무두Bolt 삽입으로 고정.



Chapter 5 Inter-Parts Connections

-11

5.1 Connection Diagram of 4AXIS1 MCU Board and Peripheral Devices



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5.2 Connection Diagram 4AXIS2 MCU Board and Peripheral Devices



5.3 Connection Diagram JAW MCU Board and Peripheral Devices



5.4 Other Boards













Chapter 6 Diagnostics Methods for Various Boards

1. Important matters:

- When intending to perform measurement, it requires extreme caution to ensure the pin subjected to measure does not contact with adjacent pins at the same time.
- Because parts very sensitive to static electricity is installed on the electric field board, the load accumulated in the body should be discharged in prior to beginning the measurement. Putting a discharge pad on an arm is one of the methods.
- Check on the equipment whether it is earthed well.
- When separating cables from various connectors, do not overly treat them.
- When it is considered as necessary, ask for other person to held for handling the equipment.



2. Required Tools and Measuring Devices:

3. General example of connecting DMM



6.1 Power Board

1. Functions

- Supply the voltage to the inverter board
- Supply the voltage to 2 of 4 axes board
- Supply the power required for other system and driving equipment

2. Entire Power Circuit Diagram



A. K-PJT Power Board

Role: Supply the voltage to Pano and CT sensors





Block Drawing



By separating the analog ground and the digital ground, it is possible to minimize the diffusion of the noise generated from the power supply to the direction of sensors.

Herein AG: analog ground DG: digital ground

<Voltage measurement methods by each CONNECTOR and the measured value>



When measuring this board, much caution should be taken. Since very high voltage and current exist on some part of the board, if not being careful, it is possible to be exposed to electric shock.
When contacting each pin, very careful caution is required to ensure there is not short incurring from contacting with each other.

• CN3:

Role: Connection part to supply power to CT sensor and Pano sensor **Measurement Method**

- ① Set the measurement mode of multi-meter as voltage measurement.
- Set the measurement range just as it for automatic method, or within 30VDC if for manual.
- ③ After making + (Red) Probe of multi-meter contact carefully to the red line contact and – (Black) Probe to the black line, read the measured value. At this point, the values in following table should be measured.
- When measuring Pin1, make (Black) rod of DMM contact with AG (pin2) and + (Red) Probe with pin1, then perform measurement. At this point, the measured value should be +5V.

- (5) When measuring Pin3, make (Black) rod of DMM contact with DG (pin4) and + (Red) Probe with pin3, then perform measurement. At this point, the measured value should be +5V.
- 6 When measuring Pin5, make (Black) rod of DMM contact with G (pin6) and +(Red) Probe with pin5, then perform measurement. At this point, the measured value should be +7V.
- ⑦ When measuring Pin7, make (Black) rod of DMM contact with G (pin6) and +(Red) Probe with pin7, then perform measurement. At this point, the measured value should be -5V.



Use the crocodile clip to earth probe to let it engage with suitable earth point, making it as + probe, it will be useful for effective work.

Pin number	Pin name	Pin color	Normal Value
1	analog power	Red	+5V
2	Analog ground	Black	0
3	Digital power	Yellow	+5V
4	Digital ground	Black	0
5	CT sensor power	Brown	+7V
6	Ground	Black	0
7	CT sensor	Blue	-5V

• CN9:

Role: Connection part of signal to on/off the K-PJT power from 4AXIS-2 board

Measurement Method

- ① Set the measurement mode of multi-meter as voltage measurement.
- Set the measurement range just as it for automatic method, or within 30VDC if for manual.
- ③ Measure Pin 1. +5V(VCC) is to be supplied through this pin to the board.
- ④ Measure Pin 2. On/Off control signal is connected through this pin.



Under normal condition, the measurement values are as shown in following TABLE.

Pin number	Pin name	Pin color	ON Measured Value	OFF
1	VCC	Yellow	+5VDC	+5V
2	EX2	Black	0	Over +4.5V

B. Inverter power(P2 power)

Role: Supply the power to tube inverter board



<Measurement Method by each connector and the measured value>



When measuring this board, much caution should be taken. Since very high voltage and current exist on some part of the board, if not being careful, it is possible to be exposed to electric shock.

• XP102:

Role: Connection part for power supply (300V DC) to the Tube Inverter Board **Measurement Method**

- ① Set the measurement mode of multi-meter as voltage measurement.
- Set the measurement range just as it for automatic method, and within 600V DC if for manual.
- ③ After making +(Red) Probe of multi-meter contact carefully to the red line contact and –(Black) Probe to the black line, read the measured value. At this point, the values in following table should be measured. At this point, the measured value should be about +300V DC.

④ If measured less than 280V, it is considered as the defect of the board so it should be replaced.



Use the crocodile clip to earth probe to let it engage with suitable earth point, making it as + probe, it will be useful for effective work.

Pin number	Pin name	Pin color	Normal Value
1	Inverter power	Red	+300VDC
2	NC	NC	
3	Ground	Black	0

• XP110:

Role: Connection part for power supply to the Inverter Board (Connected with CN 109 of Tube inverter board)

Measurement Method

- ① Set the measurement mode of multi-meter as voltage measurement.
- ② Set the measurement range just as it for automatic method, and within 30V DC if for manual.
- ③ Measure Pin 1. Through this pin, 15V is to be supplied to the inverter/generator board.
- ④ Measure Pin 2. Through this pin, the earth ground is connected.
- (5) Measure Pin 3. Through this pin, -15V is to be supplied to the inverter/generator board.
- 6 Measure Pin 5. Through this pin, +24V is to be supplied to the tube inverter board.



48

Use the crocodile clip to earth probe to let it engage with suitable earth point, making it as + probe, it will be useful to work effectively.



Under normal condition, the measurement values are as shown in following TABLE.

Pin number	Pin name	Pin color	Normal Value
1	Inverter/generator	Yellow	+15VDC
2	Ground	Black	0
3	Inverter/generator	Blue	-15VDC
4	Ground	Black	0
5	Inverter Board	Orange	+24VDC

6.2 Tube inverter Board

1. Role

Electro-magnetic circuit to generate the tube voltage (several 10 kVp) that is impressed between anode and cathode of X-ray tube.

2. Location of Board connector



3. Measurement Method by each connector and the measured value



50

This board operates with very high voltage which is impressed to some part; therefore extreme caution should be taken when performing check up at the field. When being not careful, it can cause very severe shock to the human body.

The measured voltage value by each pin is normal when they are as shown in the Table.

• CN104

Pin number	Pin name	Pin color	Normal Value
1	Power supply	Red	+24VDC
2	Ground	Black	0



• CN105

Pin number	Pin name	Pin color	Normal Value
1	Inverter power	Red	+300VDC
2	NC	NC	
3	Ground	Black	0

• CN109

Pin number	Pin name	Pin color	Normal Value
1	Power	orange	+15 VDC
2	Ground	yellow	0
3	Power	green	-15VDC
4	Ground	Black	0
5	Pano sensor	white	24VDC

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4. Judgment on Failure Cause according to the Error Message

A. Inverter LED and TP Point

The followings are the figure of Daughter board installed to the inverter board.





• X-Ray On LED

No.	LED	Color	Action	Description
1	D17	YELLO	LED illuminated when X-	LED to check on X-Ray
		W	Ray is irradiated	irradiation status

• LED Indication by Error and the Cause

Error LED Status		ErrorList	Description	
Α	В	С		Description
Lightod	d		Intor Lock	When the Cable connected to Connector
Ligitied				is disconnected.
-	Lighted	-	OCP	When current value at the primary side of mono tank is higher than the tolerable value.
Flash	-	-	kV Ref.	When kV Ref. value has difference of ±10kV.
-	Flash	-	mA Ref.	When mA Ref. value has difference of ±0.5mA.
Flash	Flash	-	kV Feedback	When kV Feedback value has difference of ±20kV.
-	-	Flash	mA Feedback	Incurs when the tube current is higher or lower than the set point.
Lighted	Lighted	-	Temp. Error	When the mono tank temperature is higher than the tolerable value.
-	-	Lighted	Current Error	When current value at the primary side of mono tank is over +1A higher than the reference value.
Lighted	-	Lighted	X-Ray On Error	When there is no X-Ray On Command in the System even though X-Ray Switch is On.
-	Lighted	Lighted	X-Ray Off Error	When there is no X-Ray Off Command in the System even though X-Ray Switch is Off.

5. The method to confirm on whether the CAN communication with Inverter Board is working

 Execute the exe. file of VAKCAP from My Computer C:\>PaXPrimo>pano (Also confirmable by using the Hyper-terminal)

🔊 libfftw3f-3.dll	2009-04-16
📄 log	2009-02-16
💓 PatientInfo	2009-02-22
SliceList	2009-01-12
🚳 VAJ2K.dll	2009-04-16
🚳 VAJ2Kdll	2008-08-19
O VAKCAP	2009-04-16
VAKCAP	2009-05-22
🕖 VAKPAR	2009-02-27
VAKPAR.TSF	2009-03-06
VAKPAR_5X5.TSF	2009-02-13
VAKPAR_14X12.TSF	2009-02-17
MUAKDAR DLVC	2000 01 24

② VAKCAP Window is to be displayed as follows.

🗿 Settings 🛛 😰 Panorama 🛛 🚳 Soft Calib 🛛 🥵 Logs/About 🗎	
Port COM1: is opened File capture, raw	
	>
Capture #0: Model) (22sec.	
,	
_ Scan parameters	
Voltage <0,1kVp> 500	
Current <0,01mA> 500	
1	
Rotation time <0,1s> 220	
I Normal arc	Send commands to MCU 🔽
[spm_tmp?]	▼ Send
Operations	View Conversion
	V Proj
Capture Moving Dark Moving Bright	V Pan
Stop Kill	



③ Input "[SPM_TMP?]" in the command input window, then click "Send".

Then, the next window will be displayed, indicating the current internal temperature of the Tube. And also it shows the CAN communication with the inverter board is normally working. But if there is no response, it indicates that the CAN communication is not being performed.

🕐 VATech PaxPrimo		
🕒 Settings 😲 Panorama 🚳 Soft (Calib 🔀 Logs/About	
Port COM1: is opened >[spm_tmp?] <[epm_tmp?_003] <tube temperature="24,2</th"><th>File capture, raw</th><th>></th></tube>	File capture, raw	>
	Capture #0: Mode0 (22sec ~30	0 fps) 💌
	Scan parameters Voltage <0,1kVp> 500 = Current <0,01mA> 500 =	3
	Rotation time <0,1s> 220	Send commands to MCU 🔽
	[spm_tmp?]	Send
Operations Canture Moving Dar	k Moving Bright	ewConversion V Proj V Pan
Stop		
		확인 취소

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6.3 4AXIS-1 MCU Board

1. Function

- Serial communication with PC in use of RS232
- X-Ray irradiation function in use of irradiation switch
- Generate vertical and horizontal laser beam for column.
- Detecting the limiting of Rotating unit
- Serial communication with Touchpad
- CAN communication with JAW MCU and 4AXIS-2

2. Exterior of Board



Service Manual for the expert



3. Description on Pin Allocation Table

Pin	Function	Description
number	T directori	Description
CN2	Rotator limit	Function to control between the sensor and the
		Rotator with S/W to ensure the rotation does not
		exceed the initial value when the rotator spins
CN7	Tube inverter	Tube inverter board X-ray irradiation On/Off control
CN8	Column V	Vertical Beam Laser Generating Laser for Patient
	Laser1	Alignment
CN10	Column H	Horizontal Beam Laser Generating Laser for
	Laser2	Patient Alignment
CN14	X_MOTOR	Motor to drive the equipment corresponding to
		various arch loci. X-axial motor moves with variable
		speeds, corresponding to the applicable arch
		during scanning.
CN15	R_MOTOR	Functions to turn the Rotator
CN16	S_R_MOTOR	Motor to spin the Sensor Rotator
CN18	CAN1	Connector for CAN communication with JAW MCU
CN19	CAN2	Connector for CAN communication with 4AXIS-2
		MCU Board
CN21	TOUCH LCD	Connector for Serial communication with Touchpad
	RS232	Screen
CN23	PC RS232	Connector for Serial communication with PC

4. Measurement Method and the measured value

• CN2

Measurement Method

- ① Set DMM as DC measurement mode.
- ② Pin 8 is GND, put the black lead rod at Pin 8 and measure Pin 1.
- ③ At this point, +24V is to be measured at all times.
- ④ When limit is detected, 0V is input to the board at Pin 2.

Measured value

Pin Number	Role	Equipment idling	Equipment operating
1	24V power supply	24V	24V
2	Signal	24V	0V
8	GND	0	0

CN7

Measurement Method



- ① Send "[XOF]" in use of MCS.
- ② As shown in above figure, make (-) Lead rod of DMM (Digital Multi Meter) contact to GND① while making (+) Lead rod contact to Pin ① of CN20.
- ③ After checking on the voltage at Normal Status shown in the Table, then Press the irradiation switch to measure at operation status.

The measurement result value is equal to the values as shown in following table at normal status.

PIN Number	PIN NAME	Normal Status	Operating Status
1	EXPO_SW	Over about 20V	Less than about 2V
2	GND	0V	0V

CN8

Measurement Method

- ① Execute MCS and then input the command "[SPM_PANO]".
- ② When inputting the command "[SPM_LON_]", the vertical and the horizontal lasers of the equipments turn ON.



- ③ Make (-) Lead rod of DMM contact to GND①, then 0V is to be measured from Pin ③ of CN1 Connector on (+) Lead rod.
- ④ Input the command "[SPM_LOF_]", and the Laser turns off. At this point, if measuring Pin ③, it is possible to confirm that it becomes 4.5V.

At Pin 1, 5V is to be measured at all times.

PIN Number	PIN NAME	Idle Status	Operating Status
1	VCC	Over about 4.5V	About 4.5V
2	signal	Over about 4.5V	Less than about 1V

• CN10



Measurement Method

- ① Execute MCS and then input the command "[SPM_PANO]".
- ② When inputting the command "[SPM_LON_]", the vertical and the horizontal lasers of the equipments turn ON.
- ③ Make (-) Lead rod of DMM contact to GND①, then 0V is to be measured from

Pin \bigcirc of CN1 Connector on (+) Lead rod.

④ Input the command "[SPM_LOF_]", and the Laser turns off. At this point, if measuring Pin ③, it is possible to confirm that it becomes 4.5V.

At Pin 1, 5V is to be measured at all times.

PIN Number	PIN NAME	Idle Status	Operating Status
1	VCC	Over about 4.5V	About 4.5V
2	signal	Over about 4.5V	Less than about 1V

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• CN14



Measurement Method

 When the power is ON, Pin 1 and Pin 2 of CN8 Connector present about 23V output at all times.

VR2 (RUN) performs its function to control the RUN Current (Motor's rotational strength) of X-axis motor.

- 2 Set the Arrow mark to "7" as shown in above figure.
- ③ VR1 (STOP) performs its function to control STOP Current (The force when the motor is stopped) of X-axis motor.
- ④ Set the Arrow mark to "3" as shown in above figure

PIN Number	PIN NAME	Idle Status	Operating Status
1	VCC24	Over about 23V	Over about 23V
2	VCC24	Over about 23V	Over about 23V
(1)		Over about 18V	Over about 18V
9	A_MOTOR_A	(Frequency)	(Frequency)
A		Over about 20V	Over about 18V
		(Frequency)	(Frequency)
Ē		Over about 20V	Over about 18V
	A_moroit_b	(Frequency)	(Frequency)
(6)	A MOTOR B/	Over about 20V	Over about 18V
		(Frequency)	(Frequency)



• CN15



Measurement Method

- When the power is ON, Pin 1 and Pin 2 of CN 103 Connector present about 23V output at all times.
- 2 VR103 and VR102 are the parts to let Rotate Unit drive. Adjust them referring to above figure.
 (RUN '7' / STOP '3')

PIN #	PIN NAME	Normal Status	
1	VCC24	Over about 23V	
2	VCC24	Over about 23V	
3	A_MOTOR_A	FREQUENCY	
4	A_MOTOR_A/	FREQUENCY	
(5)	A_MOTOR_B	FREQUENCY	Immeasurable with
6	A_MOTOR_B/	FREQUENCY	



RUN VR: Variable resistance that controls the revolution rate of Motor. STOP VR: Variable resistance for Torque size regulation when Motor is stopped.

6.4 4AXIS-2 MCU Board (Collimator)

1. Functions

- Adjusting the Position of Collimator
- CAN communication with 4AXIS-1 MCU Board
- CAN communication with TUBE inverter board
- CT/PANO power on/off

2. Exterior of the Board





3. Pin Allocation and Description of Functions

Pin number	Function	Description
CN2	CT/PANO	Power supply or cut-off to Pano and CT
	power on/off	sensors
CN8	Sensor V	Vertical Beam Laser Generating Laser for
	Laser1	Patient Alignment
CN10	Sensor H	Horizontal I Beam Laser Generating Laser for
	Laser2	Patient Alignment
CN11	Collimator	Connection to supply voltage for driving of
	servo motor	Collimator servo motor
CN14	CXR_motor	
CN15	CYR_motor	Motor Connection Part to move Collimator to
CN16	CXL_motor	the left/the right
CN17	CYL_motor	
CN18	CAN1 4AXIS-1	CAN communication with 4AXIS-1 Board
CN19	CAN2 Tube	CAN communication with Tube inverter board

4. Connector Measurement Method and the Measured Values

• CN2

Role: Connection part to supply power to the sensors corresponding to each scanning mode.



Measurement Method

- (1) Connect the black color lead rod of DMM to Θ and + lead rod to each pin subjected to measurement.
- ② When scanning by Panoramic, Pin 6 drops near to about 0V.
- ③ When scanning by CT, Pine 7 drops near to about 0V.

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Pin Number	Pano Scanning	CT Scanning	At Equipment Idling
1	24V	24V	24V
6	About 0V	Float	Float
7	Float	About 0V	Float

• CN8 and CN10

- ① Execute MCS and then input the command "[SPM_PANO]".
- ② When inputting the command "[SPM_LON_]", the vertical and the horizontal lasers of the equipments turn ON.
- ③ Make (-) Lead rod of DMM contact to GND① and then 0V is to be measured from Pin ③ of CN1 Connector on (+) Lead rod.
- ④ Input the command "[SPM_LOF_]", and the Laser turns off. At this point, if measuring Pin ③, it is possible to confirm that it becomes 4.5V.

At Pin 1, 5V is to be measured at all times.

PIN Number	PIN NAME	Idle Status	Operating Status
1	VCC	Over about 4.5V	About 4.5V
2	signal	Over about 4.5V	Less than about 1V



6.5 JAW MCU Board

1. Functions

- Up/Down SW function
- Column Motor Drive
- Communication of Data with MP3 and Mirror LCD in use of Rs232 communication
- CAN communication with 4axis-1 board
- Adjust the height by driving Chin rest motor

2. Exterior of the Board



3. Pin Allocation and Description of Functions

PIN	Connector	Description
Number	name	Description
CN1	UP/DOWN SW	Switch connection part to move the Column Up or Down.
CN2	UP/DOWN Limit SW	Limiting sensing switch to prevent moving out of the minimum and the maximum points of Column.
CN5	Column Motor	Control the motor suspension power when moving the Column up/down.
CN8	Laser	Switch to on/off the laser for patient alignment. And have additional function to move to the location of lamp.
CN10	Chinrest	Chinrest movement to the left/ the right
CN11	Chinrest	Chinrest movement upward /downward
CN12	4ASXIS-1	CAN communication
CN14	MP3 board	Serial communication with MP3 Board through RS-232 communication.
CN16	Mirror LCD	Serial communication with Mirror LCD Board
CN17	Duo LED	
CN18	VR board	

4. Connector Measurement Method and the Measured Values

• CN1 (UP/DOWN SIGNAL OUTPUT)

Connector that receives the up/down signals when pressed the switch for equipment up/down,

(As pressed the up switch from the Up/Down switch, from Pin 1 of CN1, the Voltage of less than about 2V is measured and the green LED is illuminated at D2 (UP SWITCH INPUT LED). When release the Up switch, from Pin 1, again the voltage over about 20 V is measured and the light on D2 LED disappears.)





Measurement Method

- ① Press the Up part from the Up/Down switch.
- ② When putting + part of tester to Pin 1 of CN1 connector and contacting part to GND, the voltage less than about 2V is measured.
- ③ At that point, if the equipment moves upward, it is considered as the switch operating normally.

PIN	PIN	Pin	Idle Status	Operatir	ng Status
NUMBER	NAME	color		Up	Down
1	UP SW	Green	Over about	Less than about	float
2	DW SW	White	Over about	float	Less than about
3	GND	Brown	0V	0V	0V

• CN2 (UP/DOWN LIMIT SWITCH SENSING)

The connector receives the upper and the lower limits detecting signals when moving the column UP/DOWN.

(When the column is detected from the highest point by UP LIMIT SWITCH, about 2V of low voltage is impressed to Pin 1 of CN2 connector, so the column does not go up any more, and on the contrary, when it is detected from the lowest point by DOWN LIMIT SWITCH, about 2V of low voltage is impressed to Pin 3 of CN2 connector so the column does not go down any more. At normal status, the high voltage over about 20V is being impressed.

Measurement Method

- ① Position the column at the highest point.
- ② If testing Pin 1 of CN2 connector, the voltage less than about 2V is measured.
- This indicates the UP LIMIT SWITCH of column at that time operates normally.
 (On the contrary, with same operation, for DOWN, perform the measurement and confirm it)

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PIN NUMBER	PIN NAME	Pin color	Normal Status	Operating Status
1	UP LIMIT	Orange	Over about 20V	Less than about 2V
2	GND	Gray	0V	0V
3	DW LIMIT	Black	Over about 20V	Less than about 2V
(4)	GND	White	0V	0V



Chapter 7 Scanning Programs

7.1 Peripheral Devices Interlocking with Scanning Programs

Part		Version	Remarks	
Scanning SW		1.0.1.1		
LCD		1.20		
Firmware	P-B'd	1.0045	Using 4-Axes Board	
	S-B'd	1.0018	Using 4-Axes Board	
	J-B'd	1.0017	Using 2-Axes Board	
	-	-	-	
Panorama Sensor		-	Xmaru1501CF (Any	
			Pano):	
CT Sensor		-	Xmaru1215CF(Concord	
			1)	
			Xmaru1524CF(Concord	
			2)	

7.2 Description on Major Functions

1. CT

FOV Size

Xmaru1215CF: [120 X 85], [85 X 85], [85 X 80], [50 X 50] Xmaru1524CF: [150 X 135], [120 X 85], [85 X 85], [50 X 50]

2. Panorama

Standard Mode: Standard, Fast, TMJ Open, TMJ Close, Front, Left, Right, Sinus Special Mode: Maxillary Clear Right, Maxillary Clear Left, Canal Clear Right, Canal Clear Left, Incisor Clear, Orthogonal

3. Major Functions of Scanning Program

Major Functions	Description on Major Functions	
Mode Select	Provides UI that selects the Sub-mode of Each	
	Panorama Modes such as Standard / Special /	
	TMJ / Sinus	
Capture Sequence	Performs overall controls such as the direct	
	control on the equipment and image acquisition,	
	Image processing, DB saving	
Parameter Calculation	When the set point is changed by input of UI,	
	calculates the parameters required for scanning	
Equipment Control	Control the equipment through pre-agreed	
	command.	
LCD Interlock	Interlocks the UI indication with LCD S/W	
	through pre-agreed command.	
Image Acquisition	ion Acquires X-ray images in use of VAKPAR~. EXE,	
	VAPAN~.EXE Module	
Image	Restructures the acquired image in 3D	
Restructuring(CT)	information in use of VAKPAR~. EXE Module	
DICOM	Converts the Slice Image restructured in 3D	
Conversion(CT)	information to the DICOM Standard	
	Specifications	
Image Optimization	Improves the quality of acquired image by	
(Panorama)	emphasizing the features of each section in use	
	of VAPAN~. EXE Module	
Image Viewer	Provides the optimized CT and Panorama Image	
	Viewers.	
DB Saving	Supports SDK and Easy Dent 4.xx version	
Service Manual for the expert



7.3 Folder Composition









- 1. PROJ images scanned by the scanning S/W are saved automatically in folders by CT/PANO from Proj_Back_0 to Proj_Back_10.
- For saving sequence, the initial scanned images are transferred from PROJ folder to Proj_Back_0 folder, and at the 2nd time scanning, Proj_Back_0 is transferred to Proj_Back_1 folder, recording the information on images at BackLog.txt files inside each folder.

[Capture Mode]
Capture=CT_SHOT
mA=400
kVp=850
[Patient Info]
Name=Vatech
Chart Num=6838
Gender=F
Age=30
[System Log]
LogFileName=C:\PaxReve3D\Log\20090106_130702.log

7.4 Environment Setting

The following screen is the initial screen of scanning program in the PC.

Click "Setting" at the right upper side and a small dialog box is to be displayed as shown in following figure.



Password: Input **vatech** (input with small characters) and click login, then a communication window is to appear as shown in the following figure.



0.25	T T	8	[150X135] - Left - Right [[120X85]]	0.00	mm mm	- Top	0.00	m
0.25	▼ ▼ mm	8	- Left - Right [120X85]_	0.00	mm mm	- Top	0.00	n
0.25	mm	•	- Right [[120X85]	0.00	mm	- Bottom	0.00	
0.25 0.20	mm	0	[120X85]				0.00	m
0.25 0.20	mm					'		
0.20			-Left [0.00	mm	- Top	0.00	
	mm		Disks [0.00		- Top	0.00	
0.20	mm		- Right	0.00	mm	- Bottom	0.00	1
0.20	mm	0	[85X85]_					_
0.20			-Left [0.00	mm	- Top	0.00	ſ
			- Right	0.00	mm	- Bottom	0.00	r
		0	[50X50]					
			-left [0.00		- Top	0.00	
			and a	0.00		100 J	0.00	[
			- Right	0.00	mm	- Bottom	0.00	ſ
		==		====[Pa	noran	na]====:		-
			[Pano]					-
		9	-Left	19.00	mm	-Тор Г	18.00	m
			- Right	17.00	mm	- Bottom	20.00	m
			Ini	itial		Cap	pture	
	0.20		9 0.20 mm	0.20 mm - Left - Right C [50X50] - Left - Right C [Pano] 9 - Left - Right 1 - Right -	0.20 -Left 0.00 -Right 0.00 -Right 0.00 -Right 0.00 -Left 0.00 -Right 0.00 -Right 0.00 -Right 0.00 -Right 0.00 -Right 0.00 -Right 17.00 Initial Initial	-Left 0.00 mm -Right 17.00 mm -Right 17.00 mm	0.20 mm -Left 0.00 mm -Top -Right 0.00 mm -Bottom C [50X50] -Left 0.00 mm -Top -Left 0.00 mm -Top -Right -Right 0.00 mm -Top -Right 0.00 mm -Top -Right -Right -Right -Top 9 -Left 19.00 mm -Top -Right 17.00 mm -Bottom	0.20 mm -Left 0.00 mm -Top 0.00 - Right 0.00 mm -Bottom 0.00 - Left 0.00 mm -Top 0.00 - Left 0.00 mm -Top 0.00 - Right 0.00 mm -Top 0.00 - Right 0.00 mm -Top 0.00 - Right 19.00 mm -Top 18.00 - Right 17.00 mm -Bottom 20.00 Initial Capture Capture Capture

1. Setting

- Panorama: Function to Enable Panorama function
 When the check is revoked, the canceled function is no longer usable.
- Dental CT: Function to Enable CT function When the check is revoked, the canceled function is no longer usable.
- Comport: Communication Port setting for serial communication with the equipment.
- Baud rate: Communication speed setting for RS232 communication with the equipment (Default: 19200bps)
- Model Name: Function to set the Equipment name that is to be indicated on the taskbar.
- In case of equipments sold to overseas such as PaxDuo3D, Picasso Duo and etc, the model name of equipment is separately classified in respect to the certification, therefore, it is added to be changed depending on the selling country.
- RS232: Terminal Interface Utility Program capable of direct commanding on the communication details of the equipment



This program can be used on behalf of HyperTerminal.



B\$232C				
$\label{eq:response} \begin{array}{ llllllllllllllllllllllllllllllllllll$		Command Queue	Echo	Static Serial Port : COM 1 Baudrate : 19200 Close Open Display Serial Data Send Command []>> Receive Command []<<
		Send Cle	ear	[Exit
		\		
Echo Window	Command	Input Window	W	

2. DB setting

• Link type: Setting to interlock the scanned image information with the patient management program

Easy Dent 4.x For Domestic Use → Support

Easy Dent 4.x For Overseas Use → Addition in progress

Easy Dent 3.x For Domestic Use \rightarrow Addition undetermined

Easy Dent 3.x For Overseas Use → Addition undetermined

SDK Link → Support

- Capture Message: Global Message required for SDK interlocking
- Write path [CT]: CT Image Saving Path for SDK interlocking
- Write path {Pano/ceph}: Panorama, Cephalo Image Saving Path for SDK interlocking
- Path [patient info]: Location of Patient Information File for SDK interlocking (Provided from the Patient Management Program)
- File name: Patient Information File Name for SDK interlocking

3. Multi language

• File name: Setting the language file to support the multi-language For Domestic Use: Mti_Lng_Kor.ini

For Overseas Use Mti_Lng_Eng.ini
Currently supports Korean and English only

4. Image setting

- Storage path: Function to set the backup position for acquired images.
 Save raw images and bmp images of acquired images in the folder arbitrarily defined by the user.
- Storage period: Storage Period of Backup Images.
 User can set this considering the capacity of hard disc drive.
 Basically, store the images for 15 days.
- JPEG2000: Function to JPEG Compacting of outputting DICOM images.
 Unusable because the current patient management program does not support.

5. CT setting

- CT sensor selection
 Xmaru1215CF: Implementation of Max. 120 X 85 FOV Size
 Xmaru1524CF: Implementation of Max. 150 X 135 FOV Size
 ## When selecting the FOV sensor, automatically transformed into FOV ##
- CT frame grabber selection
 National Instrument: supports PCI 1424 and PCI 1422
 Any Grabber: support In-house Grabber
- CT image viewer selection Supports Dicom Viewer Supports EzImplant Supports Ez3D, Ez3D2009

6. Voxel setting

120X85 FOV (When selecting Xmaru1524CF sensor 150 X 135) Voxel size setting 85X85 FOV (When selecting Xmaru1524CF sensor 120 X 85) Voxel size setting 85X50 FOV (When selecting Xmaru1524CF sensor 85 X 85) Voxel size setting 50X50 FOV (When selecting Xmaru1524CF sensor 50 X 50) Voxel size setting

7. FOV size setting

120X85 FOV (When selecting Xmaru1524CF sensor 150 X 135) Enable function 85X85 FOV (When selecting Xmaru1524CF sensor 120 X 85) Enable function 85X50 FOV (When selecting Xmaru1524CF sensor 85 X 85) Enable function

50X50 FOV (When selecting Xmaru1524CF sensor 50 X 50) Enable function

8. Collimator setting[CT]

See 7.5

9. Collimator setting[Pano]

See 7.5



7.5 Collimator Setting



For initialization for Collimator setting, select the collimator of desired mode to change, and click No. 8 Button of Environment Setting. Then the equipment starts preparation for image acquisition.

When preparatory task is completed, the No. 30 Button of Environment Setting is to be activated, and when clicking this button, the image viewer is to be executed.

After confirmed images through the image viewer, set No. 27 item (CT) and No. 29 item (Panorama) of Environment Setting. The setting methods are as follows.

Find the value corresponding to the reference by changing the position of each collimator in manual way.



The unit is 0.1 mm that is the distance of collimator's actual movement. The base of all collimators is the center, and its value is 0. Set the distance being alienated from the center in positive number unit. When it is negative number, the collimator moves in opposite direction (Necessary for Panorama)

No. 27 item and No.28 item of Environment Setting

- Left
- ➔ Coordinates of Left side collimator
- Тор
- → Coordinates of Upper side collimator
- Right
- ➔ Coordinates of Right side collimator
- Bottom
- → Coordinates of Lower side collimator

80

7.6 Network Setting

Click in sequence of [Start] \rightarrow [Setup] \rightarrow [Control Panel] \rightarrow [Network Connect], and the screen as follows is to appear. Double click the Lan card to connect to the equipment with mouse.

📱 영상서버 속성		
네트워킹 공유		
연결에 사용할 장치:		
😰 Broadcom NetXtreme Gigat	bit Ethernet #2	
이 연결에 다음 항목 사용(0): ☑ 및 Microsoft Networks용 클라 ☑ 및 QoS 패킷 스케줄러 ☑ 및 Microsoft 네트워크용 파일 □ ▲ 인터넷 프로토콜 버전 6(TC ☑ ▲ 인터넷 프로토콜 버전 4(TC ☑ ▲ 연결 계층 토폴로지 검색 매 ☑ ▲ 연결 계층 토폴로지 검색 위 설치(N) 제거(구성(C) 이인 Double Click 및 프린 광유 P/IP/1 P/IP/1 퍼 I/O 드라이버 답자 (U) 속성(R)	
접송 컨트롤 프로토를/인터넷 프 크 프로토콜로, 다양하게 연결된 다.	로토콜, 기본적인 광역 네트워 네트워크에서 통신을 제공합니 확인 취소	
인터넷 프로토콜 버전 4(TCP/IPv4) 일반	8	
네트워크가 IP 자동 설정 기능을 지원하 할 수 있습니다. 지원하지 않으면, 네트위 을 문의해야 합니다.	면 IP 설정이 자동으로 할당되도록 직크 관리자에게 적절한 IP 설정값	
◎ 자동으로 IP 주소 받기(<u>0</u>)		
● ● 다음 IP 주소 사용(<u>S</u>); □ □ 조太()):	102 168 1 99	
·····································		1. Select the following IP
제도것 마으크(만)	200,200,200,0	Address.
기존 개이드웨이(만)		2. Set the IP Address as
 자동으로 DNS 서버 주소 받기(B) 다음 DNS 서버 주소 사용(E): 기본 성정 DNS 서버(P): 		shown in the Figure. 3. Leave all columns of DNS
보조 DNS 서버(<u>A</u>):		server as blank
	고급(⊻)	

Chapter 8 Software Interlock

The image scanning program is basically to work with EasyDent and Ez3D2009. However, in order to interlock the image scanning program and other application programs, the environment should be setup in following sequence.



8.1 Gateway Program Installation

1. Relieve the compaction program provided to suitable directory.



- 2. Click "Setup.exe" to begin installation.
- 3. After a few steps, complete the installation.
- When the installation is successfully completed, 2 subdirectories are to be created inside C:\Pacs_Utils as follows.

(2	PACS_Utils 💳 🗢	2	Gateway	P	Worklist

82

8.1.1 Parameter Setting after Gateway Installation

Click C:\Pacs_Utils\Gateway\Gateway_Setup.exe, and following screen is to appear.

🔏 Gateway_Se	tup	X
	Gatew	ay Setup
Dicom Header In	formation	Path Settings
Hospital Name :	VATECH 1	Capture S/W Path Find C:\DCT_Pro 5
Pano Modality :	Pano 2	Pano_Ceph DCM Path Find
Ceph Modality :	Ceph	C:\DCT_Pro\Backup
CT Modality :	ст	CT or ECT Path Find C:\DCT_Pro\CT 7
Storage Server In	fomation	Capture S/W Setting Capture S/W INI File Find
3 AE Title :	Master3D	C:\DCT_Pro\DCT_Pro.ini
IP Address :	localhost	KillProcess Capture S/W exe file Find
Port :	3000	9
Local AE Title :	PACS	3DViewer Find
Pano Sending Op PACS EasyDent3 Eng EasyDent3 Kor CT Sending Optic PACS	g ♥ EasyDent4 Eng B EasyDent4 Kor	Ceph Sending Option ✓ PACS ☐ EasyDent3 Eng ☐ EasyDent4 Eng ☐ EasyDent3 Kor ☐ EasyDent4 Kor
EasyDent3 Eng	g 🔄 EasyDent4 Eng v 🗹 EasyDent4 Kor	
	Save 10	Cancel

- ① Hospital name: Designate the clinic name to save in Dicom
- 2 Dicom header information: Select Modality (Equipment name) of Pano, Ceph, CT
- ③ **Storage server information:** Write the server information to which the image is to be transmitted.

④ **Pano sending option:** Select the program that Gateway is to transmit (Double selection possible)

It is possible to designate the program to transmit by classifying with Modality

- 5 Capture s/w path: ROOT folder where the scanning program is installed.
- 6 **Pano DCM path:** Designate the folder where the Pano image is to be acquired.
- ⑦ **CT or ECT path:** Designate CT (ECT) folder where Vakpar.exe is enclosed.
- (8) **Capture software setting:** Scanning software environment setting file.
- (9) Kill Process: End the S/W to scan and Review at the time of Sending (Not required to set in general circumstances)
- 10 **Save:** Save all set values.

8.1.2 Work list Parameter Setting

Click C:\PACS_Utils\Worklist\worklist_Setup.exe, and following screen is to appear.

🔏 Query/Retieve Information 🛛 🛛 🔀										
	Worklist Setup									
Í	Path Settings	Capture S/W Path Find								
	C:\DCT_Pro\DCT_Pro.exe									
	Patientinfo.ini file Path Find									
	C:\DCT_Pro\PatientInfo.ini									
	Query/Retrieve Information									
	AE Title :	Master3D								
	IP Adress :	localhost								
	3 Port :	104								
	Local AE Title :	PACS								
	Default Modality : Master3D 4									
	5 Save	Cancel								



- ① **Path setting:** Designate the execution file of scanning S/W.
- 2 Patientinfo.ini path: Designate the patient information record file of scanning S/W.
- ③ **Query/Retrieve information:** Set the Work List Server which will receive the Order information.
- ④ Default Modality: Select Default Modality of Work list. (Initial Modality when executing Work list)

8.1.3 Scanning Platform Environment Setting (Environment Setting.ini. included in the Scanning S/W)

The following figure is an example of **.ini** file of DCT_Pro equipment and is same with other equipments.

Therefore, it can be applied just as it is.



- ① **Mode=1:** Set as 1 to import the patient information from .INI file.
- 2 LinkMode=4: Set as 4 to use SDK.
- ③ **ImageCapMessage=Gateway:** Set the message to send when calling SDK from Scanning S/W as gateway.
- ImagSaveName=Image.dcm: Change Image.bmp to image. DCM to allow the Pano and Ceph Images to be produced as DICOM file.

Cautions for Scanning S/W

1. The version of Scanning S/W should support the SDK Mode.

(Check whether the item of ImgCapMessage is in the set file (ini))

- It should be the version capable of producing the images of Pano and Ceph as dcm. (Check whether the item of ImgSaveName is in the set file (ini))
- 3. The Scanning S/W should be capable to be driven in SDK Patient Information File (Patientinfo.ini) without the patient's name information (FNAME, LNAME)
- 4. SliceList.txt, MarList.txt files should be incorporated to SliceList.txt.



8.2 How to Use

8.2.1 Gateway

- Gateway does not require the user's manipulation since it is executed and operates as background when necessary.
- Select the Save After Scanning button from Scanning S/W, and the progressive bar is to appear in the Gateway as shown in following figure.



This is a process to write the patient information selected from Work list into DICOM file.

PACS Sending		
64	/ 384	

This is a process to transmit the image to PACS file server

The time consuming to send CT differs depending on the total volume of the sending image, the internal network environment of the clinic (Transmission speed, Network traffic control method like QOS), and Receive speed of PACS Storage Server.

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8.2.2 Work list

1. Order Search

AETitle		Modality	*	Patien	t's ID	Patient's Name				
	Master3D		~	i i				Set 2009-	01-09 💌 🚺 (2009-01-09 🤉	Search
UM	ID SC-I1 SC-I1	NAME One*Secondary Capt One*Secondary Capt	Birthday	Sex 0 0	Modality OT OT	DATE 20090109 20090109	TIME 114018 114018	Accession	Physician	Description
5432	SC-I3 SC-I3 SC-I3 SC-I3 SC-I3	Three Secondary Ca, Three Secondary Ca, Three Secondary Ca, Three Secondary Ca,		0000	MR MR MR CT	20090109 20090109 20090109 20090109	114018 114018 114018 114018			
9	SC-12 SC-12 SC-12 SC-12 SC-12	Two Secondary Ca, Two Secondary Capt Two Secondary Capt Two Secondary Capt Two Secondary Capt		00000	CT	20090109 20090109 20090109 20090109	114018 114018 114018 114018 114018			
6543	SC-11 SC-11 SC-11 SC-11 SC-11	One Secondary Capt One Secondary Capt One Secondary Capt One Secondary Capt		0000	OT OT OT	20090109 20090109 20090109 20090109	114018 114018 114018 114018			
1	pidP645	One-Secondary Capt	19800716	М	MA	20050105	114018		Chiet Hadiologist"First	CSPINE
							-	3.		
							_			
					1	Information				
g jent l jents dality hedu	D s Name Birth Date	Da pid On 198 M4 re Step Start Date 200	ta P645 e^Secondary 00716 90109	/ Captur	e Image					Capture
Scheduled Procedure Step Start Time 114018 Accession Number 00000187 Referring Physician's Name Chief Badiologist'First'Middle ^{^^} Scheduled Procedure Step Description CSPINE CSPINE										Manual Capture
dy In nedu	Instance UID Indistation A Indistation N	E title CA lame FIL	46,670589,16 LLED_AE MDIGITIZE	12,2,1,1	176,53460,621	32,20070126,	102459, 1			Backup Da

- Modality: When executing Work list, Default Modality (Select from the environment setting for Work list) is to be indicated.
- ② Search: Press the Search button to search Order.
- ③ **Order selection:** Click and select the Order subjected to scan from the list using mouse.
- ④ **Capture:** Start the scanning of selected Order.
- S Manual capture: Use this when scanning by direct input of patient information, not selecting the Order from the list.
- 6 **Backup data:** Manage the backup data of scanned images.

88



2. Backup Data Management

- After scanning, back up the scanned images in C:\PACS_Utils\Backup in prior to Sending.
- The backed up information can be checked with Backup Data of Work list and can be resent.

WorkListVie	w		1.11.			1			1	0.1.0.1		
AE Liti Master	e	M	odality	~	Patient s ID		Patien	t s Name	Set 2009	Study Date 3-02-05 💌 to 20	09-02-05 💌	Search
NUM	3ackup Da	ata									Đ	Descripti
015 S 014 S 013 S 012 S	Patin	et ID	Patinet	Name	Accession	Number		Ba	ckup Date	009-02-05 🔍	SEARCH	
011 S 010 S 009 S 008 S	L][Backup	Data L	ist	2		1	
007 S	NUM	II)	NAME		Aae	Sex	DATE	TIME	Accession	Modality	
JUG S	5	123	004	3		23	м	20090204	220700		PANO	
04 S	4	123	003	3		23	м	20090204	220612		PANO	
103 S	3	123	003	3		23	м	20090204	220341		PANO	
101 pid	2	123	002	2		23	M	20090204	214549		PANO	CSPIN
ag											3	Capture
	Resend 4	ling	Delete	Set	tting							Manual Capture
												Backup Da

- ① **SEARCH: Backup:** Search the backed up data.
- (2) **Backup Date:** Select the storage period of backup data.
- 3 Backup data list: List items of backup data
- Resending: Perform Resending the selected backup data to PACS Storage Server.
 Perform the Sending to the designated place for transmitting to Gateway_setup.ini.
- 5 **Delete**: Delete the selected backup data.

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Chapter 9 Panoramic Image Assessment

9.1 Collimator Setting Standards

Following figure is the confirmation screen of Proj file



Confirmation screen of Proj file



Above screen shows the confirmation screen (above) of Proj file



Above screen shows the confirmation screen (below) of Proj file



1. Collimator Requirements



Collimator Drawings Standards

Above and Below: Apply 4% Cut.

PaX-Duo3D Collimator Standards Setting									
	Equipment Set	Point Height	Equipment Set	Point Width	Domorko				
	(Apply 4	% Cut)	(Apply 4	Remarks					
Remarks	Тор	Bottom	Left	Right					
i tomanto	15.2 mm	1.8 mm	0.3 mm						
Total	17.0	mm	1.0r						

- Each Collimator (Top, Bottom=17.0mm, Left, Right=1.0mm) values of equipments is to be the default value. The width is fixed as 1mm, and the height can be changed within 17±1mm depending on the tolerance of device.
- When setting the height, the standard of 4% Cut is based on the area that its Pixel level is less than 1000, as each 20 ~ 40 pixel for top and bottom respectively. (Because it did not use the copper filter, the X-ray irradiated areas are mostly over 4000 Level)

In Child mod, Collimator does not needs separate child mode Collimator setting because the upper part of image is being cut by 20% automatically without any individual adjustment.

[Cautions]

When setting the Collimator value, the top and bottom values are the matters of device tolerance. Therefore, when there is difference of values, the longitude default value 17mm can be changed within the range of ±1mm.



Confirmation Screen of Proj. File (Left, Right)

Confirmation Screen of Proj file (Left, Right)





2. Visual Confirmation on Collimator Distance

Confirmation on Collimator Distance

	K-Rav
- Collimator Setting	
C [120X85]	
- Left 2.90 mm - Top 10.00 mm	
- Right 11.50 mm - Bottom 5.80 mm	
C [85X85]	
-Left 2,90 mm -Top 10,00 mm	
- Right 8.20 mm - Bottom 5.80 mm	
C [85X50]	
- Lert 2,90 mm - Top 4,40 mm	Panorama
G (Trouge)	
- Pight 4 op mm - Bottom 5 op mm	Dontal CT
	Dentar Cr
• [Pano]	
- Left 0.30 mm - Top 15.30 mm	
- Right 0.70 mm - Bottom 1.80 mm	
Initial Capture	
Save EXIT	Confirm
	Commin /

3. Saving the Completion of Setting

As shown in above figure, when the Collimator setting is completed, press the "save" button to save the values.

9.2 Alignment Confirmation

- 1. Execute VAKCAP.exe in C:\PaXReve3D\CT folder.
- Check whether the Imaging interface is selected as 3.IMAQ-Pano from Settings Tab.
 Panorama Mode
- 3. Select the Capture as #3: Mode4 (13sec~200fps) from Panorama Tab, and set the Scan parameter as Voltage: 700, Current: 900.
- 4. Input [spm_pano] at Command window.
- 5. When clicking 'Capture', the Panorama scan command is sent automatically, and the Vapan window is to be activated. Then press the irradiation switch.
- 6. From Vie, click V Proj, and then View16 is to be executed. Check whether X-ray is irradiated with uniformity on applicable projection data.

Following figure is an example of image with correct X-ray Align.

🛞 0018.raw 60x14	180	×
0016.raw	60x1480 / C:\Documents and Settings\Owner\바탕 화면\H사의뢰데이터♥』 br	<u>w</u>
0017.raw	<u>∠</u> 1 <u>×</u> <u>×</u> 33 <u>×</u> <u>¥</u> 1058 <u>×</u> <u>M</u> S <u>▼</u> BP <u>M</u>	
0019.raw 0020.raw	ave 4356.8 dev 44.7 min 4270 max 4499 val 4326	
0021.raw	30 31 32 33 34 35 3	6
0022.raw		9
0023.raw		31
0024.raw	1056 4351 4341 4284 4270 4381 4350 431	9
0025.raw	1057 4349 4322 4305 4287 4324 4389 434	13
	1058 4311 4324 4327 4326 4362 4362 439	7
opn <u>d</u> el <u>b</u> mp	1059 4364 4346 4278 4310 4332 4357 434	16
10 1 6000 1	1060 4329 4359 4314 4348 4350 4342 435	8
	1061 4327 4372 4402 4382 4341 4397 439	9
10 - 0 -		<u> </u>
	1063 4435 4368 4411 4421 4384 4497 438	
□ <u>I</u> -hist 8000	1	
[∐] 500 ÷ 0 ÷		
max 4665		
e ave 4257.5		
min 3786		
	×	
8-		
-		
261 -		
P -		



9.3 Acquisition of Calibration Data

Reference: This method is similar to the acquisition method from CT images.

- 1. Check on Clause 12.1, 1 and 2.
- 2. From **Soft Calib** Tab, click **dark**, then the dark data is acquired automatically and is saved as **60x1480d.raw** inside **C:\PaXReve3D\CT\Cal** folder.
- The acquired dark data can be confirmed through View16, with its Average(ave)
 Level should belong to the range of 310 ± 30.

🚯 60x1480d.raw 6	D×148	0						-	
60×1480b00220A.raw 60×1480b00809A.raw 60×1480b02078A.raw	60×14 <u>∠</u> 1	80 / C: \Docu	ments : 25	and Setti	ngs\Owne	sr\바탕 3 - M	타면\1105 S	: Ell : 💌	br <u>w</u> BP <u>M</u>
60x1480b04222A.raw 60x1480d.raw capture(ball).raw		ave 326.6	dev 22	1.0 23	min 32	5 m	a× 329 26	val : 27	28
		692 693 694	325 325 326	326 326 326 225	326 327 326	327 326 327 226	328 327 328	328 327 328	328 327 328 227
opn del bmp		696 697 698	325 325 325 326	325 326 326	327 326 327	327 327 327 327	327 327 328	328 328 328	328 328 329
		699 700 701	325 325 325	325 326 326	326 326 326	326 326 326	327 327 327	327 328 327	327 328 328
I-hist 8000	×	702	325	326	326	326	327	327	328
± 500 ÷ 0 ÷									
ave 314.8 med 315 min 274	10								
	18								
200									

- 4. When clicking '**Bright**' from **Soft Calib** Tab, the command is sent automatically and when **Vapan** window is activated and by pressing the irradiation switch for about 1 second, the applicable bright date is to be acquired.
- 5. Since it use 4 point calibration in total, 4 of bright data are required. Also Vapan window is activated for 4 times, and when pressing the irradiation switch for 4 times, then, 4 of bright data is to be acquired.
- The 4 bright data acquired is to be saved with following names.
 60x1480b0XXXXA.raw: 60x1480→ File size, b→bright, 0XXXX→ Average level value



Ex) **60x1480b00220A.raw** \rightarrow bright, means that the average level is 220

9.4 X-Axis Reference Value Setting/Ball Phantom Enlargement Ratio

- 1. After confirmation on Dogtooth /Vertical/Horizontal laser and the Ball Phantom Horizon, Scan the ball phantom in normal mode.
- 2. Using View16 program, import capture.raw into C:\PaXReve3D\CT\Pan.
- 3. Set the measuring position precisely to the center of vertical length of Ball.
- 4. As measured each of 4 balls on their respective horizontal length, adjust the X-axis value to be in the range of **50~51 pixel**.
- 5. [spm_xpst_1380] → default value, [spm_xp?_] → Current xp value confirmation command
 - For the size of ball > 52 pixel, reduce [xpst] value
 - For the size of ball < 50 pixel, increase [xpst] value
- 6. The horizontal lengths of 4 balls are equal as in the range of 50~52 pixel, the X-axis reference value setting is to be completed.



Screen at the time of measuring

Horizontal Length of Ball: 51 pixel (1222 ~ 1273)





9.5 Confirmation on X-ray's Transverse Distance Enlargement Ratio

- 1. Import the ball phantom image acquired by setting the X-axis reference value under Clause 12.3 in use of View16.
- 2. Using aforementioned image, measure the transverse distances between both side pins having the center pin as the standard point.
- 3. The length of transverse distance should be equal within the error limit of **10 pixel**.
- 4. If any error over 10 pixels incurs, it means the transverse distances from standard point at the center to the left and to the right are difference, resulting the one side enlargement in the final image.
- 5. When an error over 10 pixel incurs, input [spm_vp?_] and confirm on the current value, then make adjustment using [spm_vpst_10xxx] command.
 - 10xxx → The front 2 digits presents the direction
 (10→Left side direction, 00→Right side direction)
 - 10xxx → The rear 3 digits presents the shift value
- 6. In the measured result, value A and value B should be equal as shown in following figure.





9.6 Scan Starting Angle Setting

- When set XP value and VP value based on above 3)~4), and if the center pin of ball phantom is not positioned at the median center, or if the sizes of 2 ball images in the center are different, the scan starting angle should be set.
- Use [spm_hf?_] to confirm on the current value, then make adjustment by using [spm_hfst_0000] command.
- 3. Even when the scan starting angle is changed, the lengths of a and b do not change, but only the starting position is to change as well as the sizes of two ball images become equal.
- 4. After setting the scan starting angle, scan the ball phantom as final, and make final confirmation on whether XP value and VP value are normal

9.7 Skull Image Checking

- 1. 20 Standards Mode : For Normal/Wide/Narrow/Child Arch, check on the normal operation of modes such as Normal, Fast, Left, Right and Center and the final image.
- 2. 2 Standards Mode (Use a special chinrest)
- 3. TMJ: Confirm on the open/close continuous scanning and reconstruction.
- 4. Sinus: Image confirmation after adjusting the dogtooth beam.
- 5. 6 Specials Mode: check on the normal operation of modes such as Orthogonal, Canal(left/right), Molar(left/right), Incisor Clear and the final image.



Chapter 10 CT Image Assessment and Correction

10.1 Work Environment Setting

1. Pax-Duo3D Install Software Composition List

- VAKPARH.exe: V 7.3.7.8
- (Pax-Duo3D CT Image Acquisition and Reconstruction Program)
- VAKCAP.exe: V 7.3.7.8 (Program for Engineering Test)
- VAKRecon.dll: V 8.2.0.0 (GPU Reconstruction Program)
- HASP driver: V 5.22.0 (Hardware Key Driver)

2. Hardware Composition for CT Image Tasks

- Sensor (Xmaru1524CF[™] Model)
- RS232 Cable
- Frame Grabber (Any Frame Grabber)
- HASP key (For 3D Viewer and Reconstruction)
- Exposure Switch
- PC Minimum Specification

Component	FOV size: 15x 13.5	FOV size: 12x 8.5	Remarks
CPU	Intel Quad core 2.50	Intel Xeon® CPU	
CFU	GHz	E5420@2.50 GHz	
RAM	2GB	2GB	Recommendable
		500GB 1EA (S-ATA2	PC: HP Work
HDD	1TB (500GB 2EA))	Type, C:\ 100GB,	Station XW
		D:\ 400GB)	4600(12x 8.5)
VGA	GeForce GTX260	ATI HD 3870 (RAM	XW 8600(15x
VOA	(RAM 1GB)	512MB)	13.5)
Operation	Window XP	Window XP	
System	professional SP2	professional SP2	

<u>1,2 When the applicable environment is prepared and ready, it is possible to</u> install VATECH program according to the Install Process.



10.2 Frame Grabber Installation

※ Caution: The network should be connected to the internet because it must get the Authenticity Certification

1. Searching the installation file

Execute autorun.exe in the Frame grabber folder.



2. Frame grabber setup



<Setup Preparation Screen>



<Start the Frame grabber setup>



For starting Frame grabber, click "Next" icon.

<Check on the selection of S/W installation



After confirmation on the installation folder, click "Next".

<Setup Initial Screen>

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<Select the installation file>

Features Select the features to install.	
	Driver software for National Instruments image acquisition plug in devices and NI 17xx smatt cameras.
	This feature will be installed on the local hard drive.
	This feature and its selected subcomponents may require up to 61.6 MB of disk space.
irectory for NI-IMAQ 4.0 C:\Program Files\National Instruments\NI-IMAG	Biowse

After confirmation on the file to install, click "Next".

<S/W License Agreement>



After selecting I agree for the License Agreement, click "Next".

NI Vision 8.5.1 Acquisition Software

Driver Software Installation

Always that software from National Instruments

This Installer includes driver software signed by National Instruments, Leave the box below checked for an uninferrupted installation, if you uncheck the box, your installation may be interrupted by one or more Microsoft Windows security dialogs,

Image: Always that software from National Instruments Corporation.

(
(Always that software from National Instruments Corporation.

Image: Corporation

(
(Always that software from National Instruments Corporation.

(

(
(
Back
Next >>
Cancel

<Confirmation on Agreement for S/W Use>

After selecting S/W Use Agreement, select "Next".

<Confirmation on S/W Installation file>

Review the following summary before continuing.	
Addina or Changing NII-INAQ 40 NII-INAQ 40 NII-INAQ 1/0.2.1 NII-INAQ 1/0.2.1 NI Measurement & Automation Explorer 4.3	
k the Next button to begin installation. Click the Back button to change	the installation settings.

After checking S/W Installation File, select "Next".

<S/W Installation>

NI Vision 8.5.1 Acquisition Software	
Overall Progress	
Currently installing NI VC2005MSMs x86, Part 2 of 82,	
C Back	Next >> Cancel
CC Educ	How 2

S/W Installation in progress



<Confirmation on the completion of Installation>



After confirmation on the installation complete, select "Next".

<Confirm on the Frame grabber Certification Stage>



After selecting the Frame grabber certification method, select "Next".

<Input the Serial Number>

NI 정품인증 마법사 — Vision Acquisition Software 8.5 정품인증	X
제품에서 제공된 시리얼 번호를 입력하십시오.	
시리얼 변호 [M71X29447]	
시리열 번호는 제품의 소유권 인증서 또는 패키징에서 찾을 수 있습니다.	
452 052 5% 5%	IQ: 시리열 변호가 없음
도움말 (〈뒤로 [다음>> 취소

After entering the serial number on the Frame grabber CD, select "Next"

<Input the user information>

			INSTRUME
人会	다음 정보는 제품의 정 서	품인증에 필요합니다. 미르	
vatech	va	tech	
□ 제품을 등록하여 기술 을 확인합니다.	지원을 용이하게 하고, Nationa	il Instruments로부터 중요한 업데이!	트를 받는 것
국가			÷
우편번호 도	, Al		
주소			
주소 (연속)			
[E-메일	전화	팩스	
	National Instruments DI # 0		

After entering the user information, select "Next".

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<Confirm on Send the Authenticity

Certification Mail>

NI 정품인증 마법사 — Vision Acquisition Software 8.5 정품인증	X
미 이 정봉민증의 확인 E-메일을 발송합니다.	
돈-메일	
도움말 (《뒤로 다음	>> 취소

For "Do not select Send the Authenticity Certification Mail", click 'Next'

<Certification Completed>



Authenticity Certification completed.

After completing the product certification,

reboot the PC for ending the process.



3. Copying of Camera file

Confirm on Camera file as follows

➢ EWoo Concord2 camerafile Ele Edit <u>V</u>ew Favorites Tools <u>H</u>elp 🕞 Back 🐑 🕑 😁 🌮 Search 陵 Folders 🛄 🖛 🖌 🏹 Go dress 🛅 C:\Documents and Settings\Administrator\Desktop\EWoo Co EWoo Concord2_EXT NI-IMAQ Concord2_EXT 3 KB File and Folder Tasks Make a new folder Publish this folder to the Web a File Generato 00.00 . Share this folder Other Places ᢙ Desktop 6 Details

Check on NI frame grabber Setting.

Configuration	🖬 Save 🔐 Rovott 🕩 Snap 🕨 Grab 🔣 Histogram 📓 Save Image	📌 Hide He
Control and and a second secon	And	Canada Ca
	50 tot Ceremon Anthones Composition Restore Datant Composition Restore Datant Composition Restore Datant	Agent Centeration Bentra Landbare
		and than dick the zoom tool. • To zoom out,

Copying the EWoo Concord2_EXT.icd Camera File.

Path: Copy it in C:\ My Document \Shared Document \National Instruments\NI-IMAQ\data.

XSelect Measurement & Automation on

Background Screen

G C · · · · · National Inst	ruments + NI-IMAQ + Data +	▼ ◆ → 24		Q
💊 구성 🔻 🏢 보기 👻 🚮 공유 설정 () 굽기			0
즐겨찾기 링크 다 사진	이름 Reference 25 Hz Progressive Scan.icd	수정한 날짜 2008-10-21 오전 10:29 2007-07-30 오후 2:50	유형 파일 롤더 NI-IMAQ Camera De	크기 ^
 문서 죄근에 변경된 파일 기타 » 	25 Hz Progressive Scan(1 25 Hz Progressive Scan(1 30 Hz Progressive Scan.Icd	2007-07-30 오후 2:50 2007-07-30 오후 2:50 2007-07-30 오후 2:50	NI-IMAQ Camera De NI-IMAQ Camera De NI-IMAQ Camera De	
문 공용 공용 Crease 공용 Crease N-IMAQ Camera Support Camera S	30 H2 Progressive Scan(L, 30 H2 Progressive Scan(L, 40 H2 Progressive Scan(L,	2007-07-30 Q = 2:50 2007-07-30 Q = 2:50	NI-IMAQ Camera De. NI-IMAQ Camera De.	
▶ 문 곳은 비디오 271개 항목	• •	m		•

10.3 Installation Procedures of Vatech Reconstruction S/W

1. HASP Driver(V 5.22) Install

Execute the file, HASPUserSetup.exe to begin the driver installation.



Select options in following figures and install S/W.



Confirm on the preparation screen for driver Setup.

Select the language.





After confirming on Version, select "Next".



After selecting the Agreement accept, select "Install".


Install in progress-----

Installin	g drivers	6	
æ	Please wa	it.	
	Device Device		
HASP HL	Device Drive	er	X
	S P	HASP HL Drivers successfully installed.	
			[

After completing installation, select "Finish".

2. License Manager(V8.31.5.24) Install

Execute the file, Imsetup.exe to begin the License Manager Installation

🗀 HASP_License_Manage	er 📃	
파일(E) 편집(E) 보기(⊻)) 즐겨찾기(<u>A</u>) 도구(<u>I</u>) 도움말(<u>H</u>)	<i>.</i>
🕞 뒤로 🛛 🕤 - 🏂 🍃	🔎 검색 📂 풀더 💷 -	
주소(D) 🛅 F:₩HASP₩HASP	P_License_Manager 🗾 🗲	미동
	현재 CD에 있는 파일	
CD 쓰기 작업		
🎯 파일을 CD에 쓰기	Imsetun exe) readme txt	
	human har and har a second her a	
파일 및 즐더 약입	*	
💋 여기에 새 풀더 만들기	1	
🚳 폴더를 웹에 게시		
기타 위치	*	
👝 HASP		
🔚 내 문서		
🔚 공유 문서		
🐳 내 네트워크 환경		
자세히	*	

Confirm on License Manager Install Folder

Select options in following figures and install S/W.



Confirm on the preparation screen for License Manager Setup

Select Language	×
Please select the language that installation.	you would like to use during the
U.S.English Deutsch	
ОК	Cancel

After selecting U.S. English, select "OK".

PaX-Duo3D

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After confirming on the version of HASP License Manager, select "Next".



After selecting the Agreement accept, select "Install"



After selecting Service, select "Next".



After checking Installation File, select "Next".



After confirming on Aladdin/HASP License Manager, select "Next".

\lambda Device Driver Installa	tion
HASP	HASP License Manager needs a HASP HL Device Driver version which is not currently installed on this system.
	HASP HL Driver Version: 5.24
Aladdin	This driver will be installed now.
	Next >

After confirming on HASP HL Driver Version, select "Next".







3. DirectX (V4.9.0.904) Install

Execute DirectX Installation Program to start installing DirectX.



Confirm on DirectX Installation folder



After selecting the Agreement accept, select "Next".



Select "Next" to start installation

Microsoft(R) DirectX(R) 설치				
진행률 설치 프로그램에서 다음 작업을 완료하는 동안 잠시 기다려 주십시오.				
▶ 구성 요소 설치하는 중				
업데이트된 DirectX 란타임 구성 요소를 검색하고 필요한 경우 업데이트 합니다. 몇 분 정도의 시간이 소요됩니다				
파일 복사 중				
d3dx9.27,dll				
< 뒤로(B) [다음(N) >] 취소				

S/W Install in progress



After completing installation, select "Finish".

10.4 Optimization of 15x13.5 and 12x8.5 Images

10.4.1 PaX-Duo3D Components

- Sensor
 CT sensor: E-WOO Company
 - FOV size 15x 13.5: Xmaru1524CF
 - FOV 12x8.5: Xmaru1215CF
- Frame grabber
 Use National Instruments frame grabber
 Any frame grabber
- Frame grabber cable
 PC to CT sensor connection
 10m
- Serial card
 System Base社 PCI Comport Board
- HASP key
 Image Reconstruction Key
 3D viewer (EzImplant) Key
 3D viewer (Ez3D2009) Key: 12 x 8.5

10.4.2 Confirmation on Cable Connection

- Confirmation on Sensor power cable connection
 Confirm on whether the power cable is well connected between Sensor and power supply.
- Confirmation on Frame grabber cable connection
 Confirm on whether the frame grabber cable is well connected between CT sensor and PC's frame grabber.
- Confirmation on RS 232 cable connection
 Confirm on whether the RS 232 cable is well connected between PaxDuo3D equipment and PCI board of PC.
- Confirmation on Irradiation Switch connection
 Confirm on whether the irradiation switch cable is well connected to PaxDuo3D equipment.



10.4.3 Hardware Calibration

• Laser beam alignment

- ① Confirm on Laser Beam Strength/Direction.
- ② Align the vertical laser to the align line of collimator whereas align the horizontal laser for the upper side of the left sensor and the upper side of the right side serbo motor to be horizontal.
- ③ Align each laser, referring to the following figure.



• X-ray alignment

- ① Alignment standards for collimator
- ② Align collimator to the standard line as shown in the following figure.



③ CP value setting(CT P Axis Standard Value)
 Commands to be used for CP value setting:

[SPM_CP?_]

- After entering the command at Hyper-Terminal, confirm on the current value.
- As shown in the following figure, enter the command in [SPM_CPST_0000] Hyper-Terminal to position the vertical laser at the center of bite, and set the CP value to bring the vertical laser to the center of Bite as shown in the following figure.



- (4) Collimator Adjustment
 - A. As shown in the following figure, execute the scanning program and click 'SETTING' at the right upper side. Then input VATECH as Password for login.



- B. Confirm on Com Port first from Control Panel and then on whether it is set as Baud rate 19200.
- C. Perform the Setting of Sensor and Frame Grabber type from CT Setting as shown in the following figure.
 - Sensor : Xmaru1524CF(15x13.5), Xmaru1215CF(12x8.5)
 - Frame Grabber : National Instrument, Any Grabber

Setting	CT Setting	Collimator Setting
✓ Panorama Com Port: COM 1 ✓ ✓ ✓ ✓ Pental CT Baudrate: 19200 ✓	Sensor : Xmaru1524CF	С [150X135]
Model Name : Implagraphypro	Frame Grabbed: National Instrument 3D Viewer: DicomViewer	-Left 2.40 mm -Top 12.30 m
DB Setting	Voxel Setting [150X135] High Quality 0.20 mm	-Right 11.30 mm -Bottom 3.40 m C [120X85]
Capture Message PaxDuo3D Captured	[150X135] Normal 0.20 mm [120X85] High Quality 0.20 mm [120X85] Normal Quality 0.20 mm	-Left 2.40 mm -Top 12.30 m -Right 8.20 mm -Bottom 3.40 m
[CT] Write Path c: WPaxDuo3DWctWdcmW [Pano/Ceph] c: WPaxDuo3DWdcmW [Patient Info] c: WPaxDuo3DWdcmW	[85X85] High Quality 0.20 mm [85X85] Normal Quality 0.20 mm [50X50] High Quality 0.20 mm	C [85X85] - Left 2.40 mm - Top 6.50 m - Right 8.20 mm - Bottom 3.40 m
[Patient Info] File Name Multi Lange	[50X50] Normal Quality 0.20 mm	C [50X50] -Left 2.40 mm -Top 6.20 m -Right 4.00 mm -Bottom 3.40 m
File Name : Mti_Lng_kor.ini Image Setting	Sensor Area Sensor C Line Sensor	
Storage Path : c:\#PaxDuo3D\#ImageBackup\#	Sensor IP Setting 192 . 168 . 1 . 99 Gain [A] : 1	- Left 0.90 mm - Top 18.00 mm - Right 0.30 mm - Bottom 0.70 mm
Storage period : 15 Day	Gain [B] : 1 Gain [C] : 1	Initial Capture
		Save EXIT

- D. Check on [150x135] at Collimator Setting and enter the values of left/right/Up/down. Then click 'Initial', and the equipment is to operate in CT mode.
- E. When completed the operation in CT mode, select 'Capture' to acquire the image and adjust the collimator at the same time.

Setting	CT Setting	Collimator Setting
Panorama Com Port: COM 1 RS232C	Sensor : Xmaru1524CF	[CT]
Dental CT Baudrate : 19200	Frame Grabber : National Instrument	[150X135]
Model Name : Implagraphypro	3D Viewer : DicomViewer -	-Left 2.40 mm -Top 12.30 mm
DB Setting	Voxel Setting	- Right 11.30 mm - Bottom 3.40 mm
Link Type : EncyDent4 x Kor	[150X135] High Quality 0.20 mm	C [120X85]
Link Type . Lasyberter. A Kol	[150X135] Normal 0.20 mm	-Left 2.40 mm -Top 12.30 mm
Capture Message PaxDuo3D Captured	[120X85] High Quality 0.20 mm	- Right 8.20 mm - Bottom 3.40 mm
[CT] Write Path c:\#PaxDuo3D\#ct\#dcm\#	[120X85] Normal Quality 0.20 mm	C [85/85]
[Pano/Ceph]	[85X85] High Quality 0.20 mm	left or mm - Top or mm
Write Path	[85X85] Normal Quality 0.20 mm	Bight and mm Retter and mm
Path	[50X50] High Quality 0.20 mm	- Right 8,20 min - Bottom 3,40 min
[Patient Info] PatientInfo.ini File Name	[50X50] Normal Quality 0.20 mm	C [50X50]
		-Left 2.40 mm -Top 6.20 mm
Multi Lange	Pano Setting Sensor	- Right 4.90 mm - Bottom 3.40 mm
File Name : Mtj_Lng_kor.ini	Area Sensor	[Panorama]
Image Setting	C Line Sensor	([Pano]
Storage Path :	Sensor IP Setting	
c:₩PaxDuo3D₩ImageBackup₩	192 . 168 . 1 . 99	-Left 0.90 mm -Top 18.00 mm
	Gain [A] : 1	- Right 0.30 mm - Bottom 0.70 mm
Storage period : 15 Day	Gain [B] : 1	
D JPEG 2000	Gain [C] : 1	Initial Capture
		Save EXIT

- F. Adjust the left/right/up/down values of collimator to present the image as shown in the following figure.
- G. Make the section marked with black color to be within 5 Pixel.
- H. From [120x85], [85x85], [50x50] FOV Mode, perform the processes of D to G repeatedly, and set each collimator within Active area 5 pixel.
 (FOV size: for 12x8.5 : from [85x85], [85x50], [50x50] FOV Mode, perform the process of D to G repeatedly, and set each collimator within Active area 5 pixel)



(5) Confirmation on the operation status of Aluminum Filter. When operating in CT mode, Confirm on whether the 5mm Al Filter comes into the alignment line and whether the opened collimator by each FOV are all covered from the scanning program.





• Calibration of Sensor

① AI Filter Attachment

As shown in above figure, attach 5 mm Al Filter in front of Collimator as basic, and put 1mm Copper Filter on it in addition .

(For FOV size 12x 8.5 : <u>As shown in above figure, basically 5 mm Al Filter is</u> <u>attached to the front of Collimator therefore it is not necessary to attach Al Filter</u> <u>additionally</u>)

- 2 Checking on Setting Files
 - A. After selecting VAKPAR_ORG.tsf file that is corresponding to the model, click'Selection' icon to prepare for Calibration of Sensor.

[Settings]

InterfaceName=img0/2	:Frame	grabber	setup	port	(setup	after
confirmation)/Sensor (0:9250, 1:Co	lumbus, 2	:Concord1	I, 3: Co	ncord2	2, 4: Con	cord4,
5: Ham9252)						
CommPortName=COM1	:RS232 c	communica	ation po	rt		
HomeDir=C:\ PaxDuo3D\CT\	: Image S	Saving Pat	th			
PrjWidth=700	: Sensor	Transvers	e Pixel	size		
PrjHeight=1114	: Sensor	Longitude	Pixel s	ize		
PrjLeft=0						
PrjTop=90						
Rotation=0						
Flip=0						
CalBSkip=5	: Initial B	Bright Fra	me Skij	p		
CalBAve=60	: Bright A	Acquisitio	on Fram	ne		
CalDSkip=5	Skip=5 : Initial Dark Frame Skip					
CalDAve=30	: Dark Ac	cquisition	Frame)		
DarkCalibration=1						
BrightCalibration=1						
UseAutoBadPixMap=1						
ManualBright=0						
UseManBadPixMap=1						
Minimized=1						

PaX-Duo3D

The Best Solution with 2 in 1 for Implant Specialists

ShowSmallWindow=3	
LinesReCalib=1	: Whether to apply LinesReCalib
ForceTriggerInt=0	
NumAcqAfterDark=0	
ScanProtocol_SpecVer=0	
[ProjFilter]	
Median=1	
Smooth=5	
Gamma=0	
AddConst=200	: Back Ground Level Default Value
AddConstLeft=0	
LinesReCalibR=516,3	: LinesReCalib Applied Transverse
	directional Pixel and Area size
LinesReCalibC= 71,2 72,2 143	,2 144,2 215,2 216,2 287,2 288,2
LinesButC=0	
LinesButR=516	
[Overrides]	
Enable=0	: Overrides Application
	0: Not applied, 1: Applied
ROILeft=0	: PrjLeft Change Value
ROITop=790	: PrjTop Change Value
ROIWidth=285	: Prjwidth Change Value
ROIHeight=426	: PrjHeight Change Value
CubeSizeXY=248	
CubeSizeZ=248	Reconstruction.vxm File Change Value
CubePitchXY=0.2	
CubePitchZ=0.2	

U E-WOO Pax-Duo3D	
🚳 Settings 🕼 Capture/Recon 🖗 Soft Calib 🕲 Logs/About	
Acquisition configuration file 14_eng_1ho\CT\VAKPAR, TSF	Serial port COM3: 💌
:****** FOV 12x8.5 cm Picasso-Duo****** // 0:9250.1:Columbus.2:Concord1.3:Concord2.4:10500D, 5:C9252DK, // 0:9250.1:Columbus.2:Concord1.3:Concord2.4:Concord4,5:Ham9252-14DK for VAKF // C1 = 608 × 720 // C2 = 1216 × 720 // 9252 = 1248 × 624 [Settings] InterfaceName=1/2 CommPortName=COM3: HomeDir=C:WPaxDuo3DWCTW PriMeight=720 PriLeft=0 PriTop=0 Rotation=1 Elin=1	Old Utilities Names Imaging interface I.PLX-CT Acquisition program I4_eng_1ho\CT\VAKPAR,EXE Acquisition VAKPAR,TSF VAKPAR,TSF
DarkCalibration=1 BrightCalibration=1 UseAutoBadPixMap=1 ManualBright=0 UseManBadPixMap=1 Minimized=0 NumAcqAfterDark=0 SliceRotation=0 SliceRip=0 ShowSmallWindow=0 ScanProtocol_SpecVer=0 LinesReCalib=1 WaitBrFrameSecT0=120 // 0 LVDS_1:Sedes,2:Fiber Optic,3:Test pattern1, 4: Test Pattern2 EGTVTupe=0	Reconstruction reconstruction_HSH,vxm reconstruction_HSH_org,vxm
External TriggerMode=1	View Geo >> ><
Save Save as	Properties
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- B. At the Bright Calibration Setting of Setting Window, Set the NumPoints as 1 basically.
- C. The number of Bright Calibration data to acquire is 6 Point, and by attaching the **copper filter with 1mm thickness** to X-ray source, acquire by 1 point each.
- D. For Bright Calibration, it is recommended to adjust mA to correspond to the Target requirements.

③ Dark Calibration

From Tab menu of VAKPAR.exe, click [DARK] of Soft Calib section to execute Dark Calibration.

🔱 E-WOO Picasso-Duo 📃 🗖 🔀					
😉 Settings 🐵 Capture/Recon 🧐 Soft	Calib 🔯 Logs/	'About			
Port CDM3: is opened					
		•	Send Max 4095	-	
Dark V >> ><	×1 73 • ×2 146 •	y ¹ 101 ÷	+		
Bright	x3 210 ×	u3 202 •			
Check	··· 213 ···				
	*4 292 ÷	⁹⁴ 404 🛨			
Re-Calib	x5 365 🔟	y5 505 📑			
			OK Ca	ncel	

- (4) Bright Calibration
 - A. From Tab menu of VAKPAR.exe, click [BRIGHT] of Soft Calib section to execute Bright Calibration (Execute Bright Calibration in the condition that collimator is covered by the attachment of Al filer with 5 mm thickness and the copper filter with 1 mm thickness.)

E-WOO Picasso-Duo			For FOV: 12x8.5
Settings Capture/Recon Soft	Calib 🔞 Logs/About		(Covering
			Collimator with
			AI filter of 5 mm
			thickness that
			operates as
			serbo motor,
			execute the
			Briaht
			Calibration)
		Send Max 4095	Canoration
	x ¹ 73 · y ¹ 101 ·	+	
Check 442x606d.raw	x ³ 219 ÷ y ³ 303 ÷		
	×4 292 * y4 404 *		
Re-Calib	×5 365 ÷ y5 505 ÷		
		OK Cancel	

- B. Before performing Bright Calibration, create a new folder inside CAL folder.
- C. Immediately prior to perform Bright Calibration, acquire Dark and then execute Bright Calibration.
- D. When the message [Hold the button for 3 sec~] is displayed, keep pressing the irradiation switch continually.
- E. After acquiring Bright Calibration, save it in the new folder.
- F. Make it come in the following standards of Bright Calibration.
- G. By implementing the processes of C to E repeatedly, acquire Bright Calibration data of 6 Point and then copy the Bright data saved in the new folder again back to the CAL folder.

FOV: 15x13.5

Cal point	Standard Level
Point 1(60Kvp 2mA)	100±20
Point 2(70Kvp 2mA)	350±100
Point 3(80Kvp 2mA)	800±100
Point 4(90Kvp 2mA)	1600±100
Point 5(90Kvp 4mA)	2800±200
Point 6(90Kvp 8mA)	5600±20

FOV: 12x8.5

Cal point	Standard Level
Point 1	70±20
Point 2	300±50
Point 3	750±100
Point 4	1600±200
Point 5	3200±200
Point 6	5200±300
Point 7	7700±300

(5) Power calibration

FOV size: 15x13.5

Detient Seenning Mode	Irradiation	Back Ground Level Standards	
Fallent Scanning Mode	Requirements	(Gray Level of Air section)	
Adult Mode	90k\/n/2 7mA	10500+200	
(Adult)	00100020110	100001200	
The Weak and the			
Elderly Mode	90kVp/2.5mA	9500±200	
(Weak)			

FOV size: 12x8.5

Datiant Saanning Mada	Irradiation	Back Ground Level Standards
Fallent Scanning Mode	Requirements	(Gray Level of Air section)
Adult Mode	85kVp/5.0mA	10500±200
(Adult)	•	
The Weak and the		
Elderly Mode	85kVp/4.5mA	9500±200
(Weak)		



- A. In above standards, when matching to the Back Ground Level Standard, correct mA among the irradiation requirements for matching.
- B. When found mA value that satisfies the standard, write the result in following files.

Model	tsf File Name
12×8.5	C:\PaxDuo3D\user_settings\PwrParam.ini

10.4.4 Optimization of the images

1. Image Scanning

From Tab menu of VAKCAP.exe, click [Capture] of Capture/Recon section to execute the image scanning.

2. DETOFFSETYY Value Measurement

- A. Scanning Hole Phantom
 - ① Put Hole **Phantom on the Jig with well set horizon** and scan the image.
 - ② From Tab menu of VAKCAP, click [Pano] icon at the right lower side of [Capture/Recon] section.
 - ③ From Pano Util window, click [Process] icon of Average section at the left middle area to create_average.raw file.
 - ④ After clicking [V Proj] at the right lower side of [Capture/Recon] from Tab menu, select _average.raw from View window.
 - (5) Select R from M section at the right upper side.
 - 6 Click the rotary center of the image and read **ofs value** as shown in following figure.

PaX-Duo3D

The Best Solution with 2 in 1 for Implant Specialists



B. DETOFFSETYY Value application

Save ofs value measured from step 1 into the image reconstruction parameter file Applicable parameters are as follows.

Model	Parameter File Name
15×13 5	reconstruction_HSH.vxm
10^10.0	reconstruction_HSH_org.vxm
12x8 5	reconstruction_HSH.vxm
12.0.0	reconstruction_HSH_org.vxm



3. DETOFFSETZZ Value Measurement

A. Specifications of Bead Phantom



- B. Bead Phantom Alignment Standards and Scanning
 - ① Balance the horizon of Jig on which Chinrest or Bead Phantom is to be put.
 - 2 Put Bead Phantom on Jig or Chinrest.
 - ③ Align the scanned image to be up/down symmetric centering on the layer without Bead as shown in following figure.
 - ④ Scan for 24 seconds.
 - S After scanning the image, from Tab menu of VACAP, click [V Proj] icon at the right lower side of [Capture/Recon] section to display the scanned image.

PaX-Duo3D

The Best Solution with 2 in 1 for Implant Specialists

() 0000.RAW 720x1114		
0000.RAW	720x1114 / C:\PaxDuo3D\CT_0401_연구소\PROJ_bead*.RAW	→ brw
0002.RAW 0003.RAW 0004.RAW	- 1 · · · · · · · · · · · · · · · · · ·	
0005.RAW 0006.RAW	ave 9019.6 dev 459.8	Min 200
0007.RAW 0008.RAW 0009.RAW	max 9823 min 7515 0 val 8683	
opn del bmp	28 48	68
10 • 9865 • •		
▼ T-hist 4095 -		
H 500 1 1	<mark>8</mark>	
e max 10091 ave 9225.5 med 9490	g	
min 3371		
2000	<mark>8</mark>	
•	100 million 100	

- 6 Select C from M section at the right upper side.
- Find the position that the Bead part is placed in straight linearity horizontally in the scanned Bead Phantom image, and read ofs value from the upper side of Project Viewer window.
- C. DETOFFSETZZ Value application

Save ofs value measured from step ① into the image reconstruction parameter file.

Applicable parameters are as follows.

Model	Parameter File Name
15x13 5	reconstruction_HSH.vxm
10/10.0	reconstruction_HSH_org.vxm
12x8 5	reconstruction_HSH.vxm
12:0.0	reconstruction_HSH_org.vxm

4. Implementation of Geometry correction

- A. Creation of Geometry correction parameter
 - After scanning Bead Phantom, select [Settings] of Tab Manu and then click Properties button at the right lower side.

U E-WOO Pax-Duo3D	
🚳 Settings 🚳 Capture/Recon 🚳 Soft Calib 🔞 Logs/About	
Acquisition configuration file #PaxDuo3D#CT#VAKPAR, TSF	Serial port COM1: 💌
:++++++ FOV 13x8,5 cm Picasso-Duo3D++++++ // 0:9250.1:Columbus.2:Concord1.3:Concord2. 4:10500D. 5:C9252DK.	🗂 Old Utilities Names
// 0:9250,1:Columbus,2:Concord1,3:Concord2,4:Concord4,5:Ham9252-14DK for VAKF // 0: Hamanatsu(10500D) 1:AnyPano - for VAKPAN_PLX,exe	Imaging interface
//C1 = 503 % 720 //C2 = 1216 % 720 // 9252 = 1248 % 624	2,IMAQ-CT
[Settings]	PaxDuo3DWCTWVAKPARH,EXE
InterfaceName≕mgty3 CommPortName=COM1: HomeDir=CtWPaxDuo3D₩CT₩	
PriWidth=720 PriHeight=1114	Acquisition
PriLett=U PriTop=90 Botation=0	
Flip=0 DarkCalibration=1	.
BrightCalibration=1 UseAutoBadPixMap=1 ManualBrinht=0	< <select>> ><</select>
UseManBadPixMap=1 Minimized=0	
NumAcqAtterDark=0 SliceRotation=0 SliceBia=0	reconstruction HSH yxm
ShowSmallWindow=0 ScanProtocol_SpecVer=0	reconstruction_HSH_org,vxm
LinesReCalib=1 WaitBrFrameSecT0=120 // 0.1 VPC Visitedes 2:55ex Ontio 2:Test patters1_4: Test Datters2	
FGTxType=0	View Gen >> ><
Save Save as	Properties
	확인 취소

② In use of default offset, reconstruct the scanned image.

V Cone-Beam Reconstruction Librray	×
R Reconstruction A About	
Parameter file C:\PaxDuo3D\CT\REC\reconstruction_HSH.vxm	Browse
Set fields below empty/zero to use values from Parameter file	Edit
Projections C:\PaxDuo3D\CT\PROJ\	Browse
Vum Proj 98 🕂 Generate GEO	
Slices C:\PaxDuo3D\CT\SLICE\	Browse
3 Reconstruction	
Proj complete	
MSec/Proj MAR	
Slices dumped Used proj	
Time GEO	
Last result Pass	
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Select VXM file from ① for Reconstruction. (Example: C:\PaxDuo3D\CT\REC\reconstruction_HSH.VXM)



When implementing Geometry correction, set the parameter of VXM file as STARTANGLE=0, and after completing the implementation of Geometry correction, correct to STARTANGLE=40 and save it.

Select PROJ folder from (2) for Reconstruction.

(Select bead phantom scan folder)

Select the folder to save the SLICE reconstructed from ③.

As aforementioned, after setting the accurate folder, click reconstruction icon of ④ to perform reconstruction.



If Bead is appeared in the form of letter U, this indicates that DETOFFSETYY is not optimal, therefore adjust the value and perform the reconstruction again.



As shown in above figure, set the difference of each window level as 1, and as changing the level, confirm on the proper threshold value that shows all of 8 beads on one slice.



Input the confirmed threshold value in the BEADTHRES section of reconstruction_HSH.VXM file, and save it.

After entering the threshold value of Bead, click Generate GEO of (5), and then, Geometry correction parameter file is to be saved in C:\PaxDuo3D\CT\PARA\ folder with display of brief report on result as shown in following figure.

Cone-Be	am Reconstruction Librray	×
♪	Mean of offsetYY: -95.820610 pixels Mean of offsetZZ: 146.706467 pixels Mean of angle interval: 0.496023 degree	es
	ОК	

- B. DETOFFSETYY/ DETOFFSETZZ Value Reconfirmation
 - 1 Execution of View Geo Menu

After executing VAKCAP, click "View Geo" button at the right lower side.

🚳 Settings 🚳 Capture/Recon 🚳 Soft Calib 🔞 Logs/About	
Acquisition configuration file	Serial port COM1: 💌
(******* FOV 13x8,5 cm Picasso-Duo3D****** // 0:9250 1:Columbus 2:Concord 1 3:Concord 2 4:105000 5:C92520K	Old Utilities Names
// 0:9250 1:Columbus 2:Concord 1.3:Concord 2,4:Concord 4,5:Ham9252-14DK for VAKF // 0: Hamamatsu(10500D) 1:AnyPano - for VAKPAN_PLX,exe	aging interface
//C1 = 608 × 720 //C2 = 1216 × 720	IMAQ-CT
// 9252 = 1240 × 624 AC	xDuo3D\CT\VAKPARH,EXE
InterfaceName=img0/3 CommPortName=COM1:	
HomeDir=C:₩PaxDuo3D₩CT₩ PrjWidth=720	quisition
Prineignt=1114 PriLeft=0 PriTon=90	
Rotation=0 Flip=0	
DarkCalibration=1 BrightCalibration=1	· · · · · · · · · · · · · · · · · · ·
UsePutoBadPixMap=1	< <select>> ><</select>
Minimized=0 Re	construction
SliceFlip=0	construction_HSH,vxm
ScanProtocol_SpecVer=0	conductionencorg, with
WaitBrFrameSecTO=120 // 0 LVDS,1:Sedes,2:Fiber Optic,3:Test pattern1, 4: Test Pattern2	· · · · · · · · · · · · · · · · · · ·
FGTxType=0 -	
Save Save as	Properties
-	확인 취소

2 Geometry parameter file loading

Click ">>" button next to the address bar at the upper side to call out each of Uoffset.bin and Voffset.bin from following path and confirm on the mean value.





3 DETOFFSETYY, DETOFFSETZZ Value application

Apply each respective mean value of Uoffset.bin and Voffset.bin that are measured at Step B as DETOFFSETYY and DETOFFSETZZ in following files. Applicable parameter files are as follows.

Model	Parameter File Name	
15x13 5	reconstruction_HSH.vxm	
10410.0	reconstruction_HSH_org.vxm	
12×8.5	reconstruction_HSH.vxm	
12:0.0	reconstruction_HSH_org.vxm	



5. Inspection of Image and Offset Adjustment

- A. The height of Chinrest
 - Using the scanning program, scan the Skull in High quality, Normal reconstruction Mode, and then perform the image reconstruction. At reconstruction, use following files.

Model	Parameter File Name	
15×13.5	reconstruction_HSH.vxm	
12×8.5	reconstruction_HSH.vxm	

- Click [V vol] icon at the right lower side of [Capture/Recon] section from Tab Manu of VAKCAP for image loading.
- Confirm on whether the lower side of Chinrest is positioning at the lower side of image, and if not, adjust the value of **CUBEORIGINZ** to match the height.

CUBEORIGINZ Adjustment	Result	
Increase the value	The reconstructed image shifts upward	
Reduce the value	The reconstructed image shifts downward	

• When finished the confirmation on the image, apply the confirmed CUBEORIGINZ value to all parameter files.

B. Reconstructed Image Inspection

Inspect the matching of the image's disposition, or on distortions



- 6. CT number Calibration
 - A. tsf File name and path that is being used
 C:\PaxDuo3D\user_settings\PaxDuo3D.tsf
 - B. Phantom jig attachment

For Mounting CT Phantom Jig, mount Jig in accordance with the User Manual.



[Example Photo of CT Phantom Mounting on Implagraphy Equipment]







[Figure 2. Drawing for Align method after mounting CT Phantom Jig]

- Scan the CT Phantom Image in the Adult mode and the Weak Mode, and acquire the respected Slice file for each mode.
- Measure the mean value of air and water from the reconstruction Slice file, and write them down in the respective file corresponding to each model. Refer to following figure.

C. Measurement Point and Method

Measure the mean value of air and water from the reconstruction Slice file, and write them down in the respective file corresponding to each model. Refer to following figure.







Open Tsf file and write the measured values of each substance as Input Value and save them. For Adult and TMJ, enter the equal measured value and for Weak and Child, enter the equal value. See the figure file (Enter the values of applicable measured substances in the circle (input) and save them)





For WindowParam16 adult section, scan the CT Phantom in the Adult Mode, and the average values of each measured substances, that are air and water, should be recorded. Also, for WindowParam16 child, scan CT Phantom in the Weak Mode, and the average values of each measured substances should be recorded for use.

D. CT number correction inspection and image confirmation

In use of scanning program, check and inspect the accuracy of CT numbers of CT Phantom.







According to aforementioned procedures, confirm and check whether CT number Calibration has been performed in normal way, then finish CT number Upgrade

CT Number reference

Measured Substance	CT Number Reference	Remarks
Water	0 ± 20	
Air	-1000 ± 100	
Teflon	855 ± 100	

CT Number Adjustment Method

Using CT Number Phantom, after completing CT Number Calibration, the CT number values of water and air that are measured from 3D View deviate from their references, perform CT Number Correction by using following method.

Measured Substance	PaxDuo3D.tsf Input Value	Measured CT Number value	Corrective Method
Water	InputWater = 588	-40	 About -40 lower against the reference value. Calculation: 588 – 40 = 548 Correction of InputWater = 548 Input
Air	InputAir = 265	-870	 + 230 higher against the reference value Should set lower than - 950 Calculation: - 950 + 870 = - 80 265 + 80 = 345 Correction of InputAir= 345

Ex) CT Number Correction

Chapter 11 Firmware Upgrade

11.1 Touchpad Screen Firmware Upgrade

First, check the version of currently installed firmware from the upper right side of front side LCD Panel and make record on it.



Touchpad LCD main GUI

11.1.1 Confirmation on Network Communication Connection Status between LCD and PC

Start from PC by clicking Start \rightarrow Execute, then click in following sequence.

🥭 Internet Explorer	赺 내 문서	
🏐 Outlook Express	☐ 내 최근 문서(D) →	
🛃 EditPlus 3	🖄 내 그림	
<u> 메모</u> 장	🧭 내 음악	
Microsoft Office Word 2003	💭 내 컴퓨터	
V2 Run VNC Viewer	SUBUE 위크 화경	
👏 하이퍼터미널		
💽 명령 프롬프트	🔂 제어판(<u>C</u>)	
🧭 Microsoft Visual Studio 2,	♂ 기본 프로그램 설정	
	🈂 프린터 및 팩스	
	⑦ 도움말 및 지원(H)	실행 옷 옷 옷
	$\widetilde{ ho}$ 검색(<u>S</u>)	프로그램, 폴더, 문서, 또는 인터넷 리소스 이름을 입력하십시오.
모든 프로그램(₽) ▶	// 실행(<u>B</u>)	열기(<u>Q</u>): ping 192,168,1,100 💌
	로그오프(L) 🚺 컴퓨터 끄기(U)	
赶 ዘ작 🛛 🚱 🥭 🗿 » 🛛 🖉 🗤	/atech & E-Woo Gro 🛛 🖭 3-1.LC	CD 확인 취소 찾아보기(B)



🖙 C:\WINDOWS\system32\ping.exe	∞ C:₩WINDOWS₩system32₩ping.exe
inging 192.168.1.100 with 32 bytes of data:	Pinging 192.168.1.100 with 32 bytes of data
Reply from 192.168.1.100: bytes=32 time=10ms TTL=64 Reply from 192.168.1.100: bytes=32 time<1ms TTL=64 Reply from 192.168.1.100: bytes=32 time<1ms TTL=64 Reply from 192.168.1.100: bytes=32 time<1ms TTL=64	Request timed out. Request timed out. Request timed out.
Normal Connection	Unconnected

11.1.2 Execution of LCD Firmware Upgrade Tool

1. Impress the power supply to the equipment and perform the confirmation on the normal operation of Touch LCD and Ping Test as well.

2. Execute LCD_Update[v3.0]. exe

Following window is to appear.

¥	LCD S/W Update	[v3,0]		×
			OPEN	
		Update	Exit	

Basic Tool

3. Press [Open] button, and fine the patch file of its extension is script, then press [Open] button.

🐺 LCD S/W Update [v3,0]	×
	OPEN
Update	Exit





Press [Update] button of the program, then a dialog box will pop up, asking whether to continue patch and begins the patch processing. When patch is completed, a dialog box pops up again to notify on the completion, then, the program finishes.

Check the right upper side of main GUI again and confirm on whether the correct version is installed.

11.1.3 Error

1. Appearance of Error

- When it fails Ping Test, confirmation should be made on whether the network function is operating in normal conditions as well as on whether the network setting is changed.
- If the update program is not being executed, it indicates that Microsoft .NET Framework v2.0 is not installed yet.

2. Ping Test Failure

- Check on whether power supply is impressed to the equipment as well as whether Touch LCD is operating in normal conditions.
- Check on the connection status between PC and Ethernet cable of the equipment.
- Refer to Clause 7 to confirm on the IP address setup, and if it is not the default value, make correction on the update script file with reference to Clause 6-3, then attempt the update again.

3. Other Patch Failure and Causes for Malfunctioning

- Check on whether Touch LCD is operating in normal conditions.
- Check on whether the version of patch is correct and applicable to the model.
- Check on whether the patch is processed from the old version to the latest version in orderly way.

11.2 PaX-Duo3D Patient Monitoring Camera Related Setting

- 1. Input the command into [Start]-[Execute] window and bring the DOS window for display.
- Input 'ipconfi' to confirm IP. Perhaps 2 IP addresses would be identified.
 ex) IP 1: 192.168.1.88
 IP 2: 192.168.0.88
- 3. When the 3rd IP is No. 1 among 2, it is usually the IP address of Ethernet Card connected to the equipment.
- 4. If both of them are indicated as 192.168.1.xxx, pull out the Ethernet cable that is connected to the clinic network for disconnection, and check the remaining addresses.
- 5. Input 'route print'.
- 6. If either of 224.0.0.0 or 224.168.10.102 is seen in the array of lists and permanently designated items below, input the following commands.
- 7. Input either one of 'route delete 224.0.0.0' or 'route delete 224.168.10.102', or Input both of them to correct the contents of Table.
- Input 'route print' and check once more. If the route still exists, repeat the process under No. 5.
- 9. Input 'route add 224.168.10.102 192.168.1.88 -p'.
- -p command designates the permanent route so that it can be maintained even after rebooting.
- Also, the 2nd IP address should be the address being connected with the equipment which was checked under No. 2.
- 10. Finally, execute the scanning S/W and check on whether images are being acquired. In prior to commence this kind of setting, check on whether the communication with Touch LCD is undertaken always well by inputting ping 192.168.1.100 once again, and if it doesn't work still, remove the clinic network cable and perform the test again.
- 11. If all of aforementioned attempts still do not solve the problem, then, check again on the entire cable line of Ethernet that is connected including even the equipment.



11.3 4AXIS-1 MCU Board Upgrade

In order to upgrade X -axis MCU Board, it needs FDT tool installed already as described in Appendix A-1 (See the Appendix A-1.)



Location of 4Axis-1 MCU Board

For 4AXIS-1 MCU PCB Upgrade, Flash Development Toolkit(=FDT) is used only, therefore, if FDT is not installed in the computer, "Firmware Uploading Tool (=FDT) Installation" and "Firmware Uploading Tool's Work Environment Setting" should be performed. Confirmation is required for pre-task version and post-task version, using the *Hyper-Terminal* for accurate upgrade (See: "How to Use Hyper-Terminal" in Appendix)

For this MCU PCB Upgrade, the upper case of vertical frame needs to be separated.

In communication between PaX-Duo3D and the computer, use the communication port that is installed as addition and confirm the name of additionally installed communication port.

Select in sequence of **Start > Control Panel > System**, then the window for 'System Registration Information" will be displayed. From this window, select **'Hardware'** tab and then select "Device Manager".

From 'Device Manager' window, check on the communication port that is connected with the equipment.



When it is extension of 1 communication port, usually it appears as "Com3" For more than 2 communication ports extension, it is possible to distinguish by checking the manufacturer and product name of the extension card.





Execute the Firmware upgrade in following sequence.



1. Separate the Vertical frame cover and check the MCU Board


2. Connect PC and COM port in the Board of the equipment by using RS 232 Cable.



- 3. Turn DIP Switch No.1 on X-axis Board to the position of "On".
- 4. As shown in above figure, press "Reset" button to refresh.
- 5. Execute HyperTerminal, confirm & record the current version.

The command used at this time is **[xver?]**. This process is to confirm whether the firmware is upgraded exactly as intended. *Make sure to close HyperTerminal*

e Bill Jan Cy Janque Gab		
i¥ ≈ 3 € 8 8 8		
ack_r2 [lwwr7] PANDhi3D System F/W version:[X_axis 0/1120] Pano position[cp]=2508 Ccph position[cp]=22576 Cf position[cterg]=22576 Cf position[terg]=12521 DhinRest VE[chvr]=885 [X-8997 ON]		
	 star beinde	

6. Execute FDT.

16 •	Programs Favorites	. 3	Accessories Internet Explorer Windows Messenger	'		_		
E.	Documents		Renesas	•	Plash Development Too	8.3.1	Flash Development Tool#t 3.1	
	Settings	. 8	Acrobat Distiller 7.0			_	1	1
10155	Search	.0	Adobe Acrobat 7.0 Professional Adobe Designer 7.0					Ę
Profe	Help and Support		BOEACMIN XDR					
2	Run	6	XDR_User Manuals					
e D	Log Off Administrator	0	Microsoft Web Publishing	;				
ă 💽	Turn-Off Computer	0	Morosoft Platform SDK February 2003	'				

7. Press [Open] button from following figure.

FDT Simple Interface		
Project : H8S 2612	Back to Project	
Device : H8S/2612F Port : COM1	Exit	
C Download Project Image	C Both	
© Download File		[Open] Button
Program Elash	Disconnect	

8. As the new version which was downloaded, select **'Uni3D_x_axis_V1.12.mot'** file among the firmware files. And click 'Open" (here, the exampled case is Uni3D, and for other equipment, others are equal except the file name is different.

Project :		H85 2612			E
Open					? 🔀
Look in: 🗀	EPX-Impla_rotator		•	ا 🎦 🗈	HH •
Uni3D_ro	otator_V1.15.mo	t			
Uni3D_se	ensor_v1.07.mot		_		
UNI_x_a	kis_V1.12.mot				
				- C	
File name:	UNI_x_axis_	V1.12.mot			Open
Files of type:	Project Files			-	Cancel
					10

- 9. Select 'Program Flash', then the new firmware uploading to MCU begins.



Project :		H8S 2612		Back to Proj
Device :	H85/2612F	Port :	COM1	Exit
		Download File Are	a	
Download Proje	ct Image	🖲 User Area	C User Boot Area	C Both
Download File	C.₩Documents an	d Settings₩Admini	strator@Deskton@EP	Simpla E
Download File	C:WDocuments an	id Settings₩Admini	strator₩Desktop₩EP>	Gimpla_F
Download File	C.₩Documents an	id Settings₩Admini	istrator₩Desktop₩EP>	Gimpla_F
Download File	C.WDocuments an	d Settings₩Admini Cancel	strator₩Desktop₩EP>	Hmpla_F
Download File	C:₩Documents an	d SettingsWAdmini	strator₩Desktop₩EP>	Simpla_F
Download File wnloaded the oper time image to device	C.WDocuments an	d Settings/WAdmini	istrator₩Desktop₩EP>	Hmpla_F
Download File wnloaded the oper ting image to device ting image to device	C.WDocuments an etion module re (0x0000000 - 0 re (0x0000000 - 0	d Settings/#Admini Cancel 38% w0000007F] w0000007F]	stratorWDesktopWEP?	Simpla_F

11. After the uploading of X-axis MCU new firmware is completed, select 'Disconnect' button.

Project :		H8S 2612		Back to Proj
Device :	H85/2612F	Port :	COM1	Exit
		Download File Ar	rea	
C Download Projec	t Image	User Area	C User Boot Area	C Both
G Demokratiska [C.WDeeumente a	nd Cottingottt Admin	sistento dal Dissilatore dal ELES	/ Incla E
Oownload File	C:₩Documents a	nd Settings₩Admir	nistrator₩Desktop₩EP>	<-Impla_F
Download File	C:₩Documents a	nd Settings₩Admir	nistrator₩Desktop₩EP>	<-Impla_F
☞ Download File	C:₩Documents a	nd Settings₩Admir Program Flash	nistrator₩Desktop₩EP>	<-Impla_F
☞ Download File	C:₩Documents a	nd Settings₩Admir Program Flash	nistrator₩Desktop₩EP>	K-Impla_F
Download File	C:\#Documents al	nd Settings₩Admir Program Flash	nistrator₩Desktop₩EP>	K-Impla_F
Download File	C:₩Documents ai [117F Length : H 11FF Length : H	Program Flash	nistrator₩Desktop₩EP>	<-Impla_F
Download File	C:\#Documents an [117F Length : H 11FF Length : H 147F Length : H 147F Length : H	Program Flash	nistrator₩Desktop₩EP>	<-Impla_F

12. As final, Change DIP switch of X-axis MCU Board to "**OFF**'. (Very important). This means returning to the initial position.



Make sure to return DIP switch to its original position.

- 13. **Reset** the power supply of System (PaX-Uni3D) to ensure that the new firmware is applied.
- 14. Input "[xver?]" at Hyper Terminal window, using the keyboard and check the task of firmware upgrade of X-axis MCU is being done in correct way, then close the HyperTerminal Window. (* This task should be performed about 10 seconds after since the system power supply is reset)

🎨 jack - HyperTerminal	
Ele Edit View Gell Transfer Help	
ack.r2 [xver7] PANUNi30 System F/W version:1K axis VI.12] Pano position1xp1-7500 Coch position1cp1-22576 CT position1corg1-22576 TOMO position1teorg1=28551 ChinRest VRIchvr1-805 [X-RHY ON]	
	×



11.4 4AXIS-2 and JAW MCU Board Upgrade



4AXIS-2 MCU and JAW MCU Boards use **EzCAN (Version: 1003)** program to implement the firmware upgrade.

Therefore, the method of 4AXIS-2 MCU Board Upgrade is to be described in specific details and for the upgrade of other boards, only the different parts is to be described.

For **EzCAN** function and the method to use, see the Appendix.



11.4.1 4AXIS-2 MCU Board upgrading

1. Click **EzCAN.exe** to execute it. Then, following screen will be displayed.

Rotator	Tube	Sensor
Jaw	Ceph	X Axis
UIIIauuui		
Start EzCAN F Select Rotator device Wait ACK => OK	Program <<<<<	
>>>>> Start E2CAN F Select Rotator device Wait ACK => OK rogress	Program (<<<<	
Start EzCAN I Select Rotator device Wait ACK => OK rogress elected File	Program (<<<<	

 Select Rotator from Device Select. Thereafter, if the communication with the equipment is successful, "Wait ACK=>OK" will appear after a few seconds on the Information window.



At initial connection between Rotator MCU Board and EzCAN, there should be "OK" response to the Information window in order to say the communication is achieved successfully. If there is no "Ok" response, it means the failure of communication, and it should not progress further. This issue should never be overlooked. This issue is applied to all MCU Boards that use EzCAN.

3. Set COM port and bps value

Com Port Set Value can be different for each computer.

- 1 Set the com port value
- ② Set the communication speed to "19200"
- ③ Click **[Apply]** and save the input values. (After application of "**Apply**", the absence of anything from display is normal.)
- ④ Click [File Sel].





When clicked [Apply] to save the parameters after setting, it is normal when no appearance is indicated.

Rotator	Tube	Sensor
Jaw	Ceph	X Axis
formation		
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>	Program <<<<<<	
Select Rotator device Wait ACK => OK	Program <<<<<	
vormauon Select Rotator device Wait ACK => OK rogress	Program <<<<	
Solution Solution Wait ACK => OK rogress	Program <<<<<	

4. Select Uni3D_rotator_V1.15.bin, and click "Open".

Open		2 🔀
Look in:	Firmware 💌 🗢 🖻 💣 🗊-	
My Recent Documents Desktop My Documents	Illi3D_jaw_v1_07_bin Uli3D_rotator_V1.15,bin I Uli3D_sensor_v1,U7,bin	
My Network Places	File name: Uni3D_rotator_V1, 15, bin	n :el

5. Press [START] button to begin upgrading.

🐉 EzCAN - Rotator Upgrade	2	X
Device Select		
Rotator	Tube	Sensor
Jaw	Ceph	X Axis
_ Information		
> Select Rotator device > Wait ACK => OK		
Progress		
Selected File		
Control	✓ Apply	File Sel, START





6. **Reboot** the system to apply the new firmware version.

Jevice Select		
Rotator	Tube	Sensor
Jaw	Ceph	X Axis
nformation		
>> Write Upgrade zone	N Program <<<<<<	
>> Completed upgrade;	1	
>> Completed opgrade; >> Reboot Device		
>> Completed opgrade; >> Reboot Device)	
Completed upgrade, >> Reboot Device Progress)	
>> Completed opgrade; >> Reboot Device Progress)	
Completed opgrade; >> Reboot Device Progress Selected File)	
Completed opgrade; >> Reboot Device Progress Gelected File)	
Completed apgrade; Selected File Control)	

7. Open HyperTerminal and send the command [rver?] to check whether the upgrade is being successful.

🌒 jack - HyperTerminal Ele Edit View Çall Iransfer Help D 🚅 🐲 🕉 ≡D 🗃 🛱					
Irver?] PaX_lbi30_System Rotator MCU Ver1.15 Retotar Half(HALF)= Pano_lch_collimator Ceph_lch_collimator FAST_Ceph_LT_1ch_co TAST_Ceph_FT_1ch_co TOMO_lch_collimator Pano_start_offsetIo Cephalo Not Use ack_r	30172 [PSV]=38300 [CSV]=63858 11imator[FSV]=7 11imator[FFSV]= [TSV]=12000 ffset]=4400	1449 66499			
Connected 0:04:50 Auto detect	19200 8-N-1 SCROLL	CAPS NUM	Capture Pr	int echo	 <u> </u>

8. Close HyperTerminal. (Important)



11.4.2 JAW MCU Board Upgrade



The method is almost the same with the aforementioned 4AXIS-2 MCU Board Upgrade method.

Difference is to click "JAW" button after executing EzCAN.

- 1. First, execute HyperTerminal, then check and record the current version.
- 2. Close it.
- 3. Execute EzCAN.
- 4. Click JAW from Device Select.
- 5. Input various set values as aforementioned.
- The rest of processes are the same. The file name of new firmware selected at this point is Uni3D_jaw_V1.07.bin.
- 7. As final, execute HyperTerminal once again to check whether the new firmware is successfully installed. At this point, the command to use is **[jver?]**.



When clicked [Apply] to save the parameters after setting, it is normal when no appearance is indicated.

Chapter 12 Appendix

- 12.1 FDT3.1 Installation
- 12.1.1 FDT Installation
- Prepare a new version of Firmware Should check that the version is the newest firmware version before installation.
- 2. Firmware Download Tool(Flash Development Toolkit)Installation: FDT
 - Execute "fdt3_1.exe" file, then a message window "Welcome" will appear.

Click "Next" button.

Renesas Flash Develop	ment Toolkit Installation 🛛 🔀
	We I come ! This installation program will install the Renesas Flash Development Toolkit v3.1. Press the Next button to start the installation. You can press the Cancel button now if you do not want to install the Renesas Flash Development Toolkit at this time. <u>Read Release Notes</u>
	< <u>B</u> ack <u>Next</u> Cancel

2 Click "Yes" from next window.



③ The "Select components" window appears, the click " Next" button.

Renesas Flash Develop	oment Toolkit Installation	$\mathbf{\Sigma}$
	Select Components	
ser	Choose which components to install by checking the below.	boxes
512 23	✓ Application	23534 k
	🔽 Kernels - Protocol B & C	9142 k
Zar	Microsoft System Files (C:\W/INDOWS\system3;	3380 k
	Disk Space Required: 32676 k Disk Space Remaining: 35945999 k	
	< <u>B</u> ack	ancel

④ If there is anything to install additionally, check the applicable button, and Click "Next" button.

Renesas Flash Develop	ment Toolkit Installation 🛛 🔀
	Additional Information Additional Information (Application) If there are entities for this product already present in the registry, clearing these entities will provide a clean installation. Install USB drivers Adds support for FDM and USB Direct mode programming.
	Begister online Opens your default browser at a web page to register this product. < <u>Back</u> Cancel



(5) Cancel checking on other items except H8S/2600, and select "Next" button.

Renesas Flash Develo	pment Toolkit Install	ation	×
	Additiona (Kernels	l Infor - Prot.	mation B/C)
serve	Select kernels to install	(all selected by de	efault):
	F H8S/2100	1198 k	Devices
25/3	F H85/2200	1758 k	Devices
	F H85/2300	1231 k	Devices
	I H8S/2600	1578 k	Devices
	(TT H8	2377 k	Devices
است ا	F SH	1000 k	Devices
	-		
	< <u>B</u> ack	<u>N</u> ext >	Cancel

6 Select the folder where to install, and click "Next". At this point, it is possible to change the location of folder

Renesas Flash Develop	ment Toolkit Installation	\mathbf{X}
	Select Destination Directory Development Tookit files are to be installed Tree Disk Space After Install is based on or selection of these to install. An engative numb there is not enough disk space to install the specified drive.	on eas Flash sur current er indicates that application to the
	C:\Program Files\Renesas\FDT3.1	Browse
	Current Free Disk Space:	35976460 k
	Free Disk Space After Install:	35943667 k
	< <u>B</u> ack <u>N</u> ext >	Cancel

⑦ Select the backup folder and select "Next" button.



(8) Select Start menu group and then select "Next" button.

Renesas Flash Develop	ment Toolkit Installation 🛛 🔀
3 74	Select Start Menu Group Enter the name of the Start menu group to add the Renesas Flash Development Toolkit icons to: Renesas/Flash Development Toolkit 31
2 Por	Accessories Administrative Tools Broadcom Games HASP License Manager HP Cool Tools HyperSnap-DX 4 Intel(R) Matrix Storage Manager National Instruments Rea/NUC
	C Add shortcut to Desktop
	< Back Cancel

9 Select "Install" button".



This shows the status of installation in progress.



 When the installation is completed, the "Installation completed" window displays, and select "Finish" button.



12.1.2 Work Environment Setting for Flash Development Toolkit

When executing FDT for the first time, the work environment for new project should be set. Process in following sequence.

 Select Start > Program > Renesas > Flash Development Toolkit3.1 > "Flash Development Toolkit 3.1" to execute it.

	i:	Programs •		Accessories Internet Explorer	•			
	2	Favorites •	12	Windows Messenger				
		-	Ē	Renesas	•	🛅 Flash Development Toolkit 3.1 🔸	7	Flash Development Toolkit 3.1
	3	Documents •		RealWNC	۲		ß	Help
a	12	Settings >	1	Acrobat Distiller 7.0				×
ior	-		×	Adobe Acrobat 7.0 Professional				
SSS	P	Search +	C	Adobe Designer 7.0				
tofe	0	Help and Support	2	BDEADMIN				
a.	•	nep and support	<u>A8</u>	XDR				
Ϋ́		Run	0	XDR_User Manuals				
NS	-	1		Microsoft Visual Studio 6.0	۲			
ę	P	Log Off Administrator		Microsoft Web Publishing	۲			
Win	0	Turn Off Computer		Microsoft Platform SDK February 2003 ¥	•			

 Then following window is to appear. From this window, select "Create a new project workspace" to create the work environment of new project, and then select "OK" button



3. Enter **'H8S2616'** in Workspace Name and Project Name, using Keyboard, then select "OK" button.

New Project Workspace		? 🛛
Projects		
FDT Project Generator	Workspace Name: H8S 2612	
	Project Name: H8S 2612	
	, Directory: C:₩Program Files₩Renesas₩FDT3.1₩Work	Browse
	CPU family: All Flash Devices	
	Tool chain:	
Properties		
	ŌK	Cancel



Workshoce Workshoce Industrial Co Display Target files Comms mot Comms mot Device Image Comms mot Device Image Target files Device Image Target files Device Image Target files Device Image	FLASH devices. Select the device you wish to use will Select Device: H8/3022F H8/3694F H8/3694F H8/3694F H8/3024F Kernel Versit H05/2615F H05/2623F H05/2626F H05/2628F	nesas\FDT3.
	<	3

4. Select 'H8S/2612F' device, and press "Next" button.

In the communication between PaX-Duo3D and the computer, the additionally installed communication port name, using the newly attached communication port in addition to the computer.

Select **Start > Control Panel > System** and the 'System Registry Information' window are to appear. From it, select "Hardware" tab and select "Device Manager" button.

From "Device Manager" window, check the communication port that is connected to the equipment.

When it is extension of 1 communication port, usually it appears as "Com3" For more than 2 communication ports extension, it is possible to distinguish by checking the manufacturer and product name of the extension card.

L 74 3	5.012	\$LE9104		LLAPE	an oi			01.21
87	디이움	01=7401	꼬급	시끄럼	특권	사망 답네	미드	권덕
망치 관리	자 장치 관 열거합[변경할	리자는 사용 니다. 장치 4 수 있습니다	자 컴퓨 인자를	터에 설치 사용하여	된 하님 각 장	E웨어 장치 치의 속성네	D)	
					-			_
	드라이날 확인할 연결하는	배 서명으로 수 있으며 또 = 방법을 설	설치된 라이버 정할 수	드라이버기 검색을 위 있습니다	가 Win Iol Wi	dows와 호 ndows Up	환되) date(티지
	5	라이버 서당	!(S)		Wind	ows Updat	te(₩)	
							_	_
바드웨어	프로필							
कम⊑श्रा0। <i>ब्र्ज्ज</i> े	프로필 하드웨(저장함	번 프로필은 수 있는 방법	사용자기 1을 제공	가 다른 하 합니다.	드웨0	I 구성을 설	정하.	D
sh⊆910i	프로필 하드웨(저장할	비 프로필은 수 있는 방법	사용자기 1을 제공	바다른하. 합니다.	드웨이 하드	I구성을 설 웨어 프로	정하. 필(<u>P</u>)	2
하드웨어 《	프로필 하드웨(저장할	버 프로필은 수 있는 방법	사용자기 1을 제공	방 다른 하 합니다.	드웨이 하드	1 구성을 설 웨어 프로	정하. 필(<u>P</u>)	2



 Check and select the communication port between the equipment and the computer (=Comport).

Select "Next" button.



 Select 'Automatic' for the device protection level and 'Advanced' for message notification level, then select "Finish" button.

	The FLASH Development Toolkit offers a device protection
7 2A 9A 21 0A 40 5D 19 3E	system, plus an advanced messaging level for use with hardware and kernel development.
Workspace'Industrial	What level of device protection would you like?
B OC EC + Device Image	Protection • Automatic • None
0 00 00 00 00 00 00 00 00 00 00 00 00 0	When programming the device, any blocks found to have been written previously will automatically be erased.
Motor Control Device Image	What level of messaging would you like?
8 92 1A 20 01 CDrive, mot	C Standard • Advanced
6 FO 58 FD 58 FD 56 FB 64 65 97 E 5D 9A DE 45 55 64 65 97 8 24 D4 4D 75 54 AD 2D F6 3 8 4F EF 64 BO 63 6F 67 1E 1	The Toolkit will display verbose messages whenever it is communicating with the Target device. This mode is useful for Interface hardware development, and Kernel development.



 Select the connection type as 'BOOT Mode', then select "Next" button.





12.2 EazyCAN1003 Installation

PaX-Duo3D Equipment exchanges the information from each board through CAN (controlled area network) with each other and share the details on current status. This program is used when upgrading the Firmware of the Boards performing CAN communication.

But it should be noted that when upgrading Firmware upgrade, 4AXIS-1 MCU Board do not use **Easy CAN** but uses, **fdt3_1.exe**.

1. EzCAN Program Execution

Double click **EzCAN.exe** and the following screen is to appear.

Rotator	Sensor	JAW
Ceph	Tube	X Axis
ormation		
3 3 3 3 3 3 1 1 I E C ANL		
>>>>>> Start EzCAN	Program <<<<<	
>>>>>> Start EzCAN	Program <<<<<<	
ogress	Program <<<<	
ogress	Program <<<<<	
>>>>> Start EzCAN ogress		

2. EzCAN Functional Explanation

First, describe the role by each function

Device Select panel: there are 3 boards possible for upgrade.

- Rotator: Button for Rotator Unit Upgrade
- **Tube:** Use then on for Tube System Upgrade (Not being used)
- Sensor: Use the Sensor MCU Board Upgrade
- Jaw: Use Jaw MCU Board Upgrade for Chinrest Unit
- Ceph: Use Ceph MCU Board Upgrade (Not being used)
- X-Axis: Use X-Axis MCU Board Upgrade (Not being used)



Information panel: Indicates the upgrade progress of each stage .

Ezcan v1.0.0.3		×
Device Select		
Rotator	Sensor	JAW
Ceph	Tube	X Axis
Information		
>>>>>> Start EzCAN P	rogram <<<<	
Progress		
Selected File		
Control	▼ Apply	File Sel, START

Progress panel: Indicates the ratio of progress

EzCAN v1.0.0.3		
Device Select		
Rotator	Sensor	JAW
Ceph	Tube	X Axis
Information		
>>>>>> Start EzCAN	Program <<<<<	
>>>>>> Start EzCAN	Program <<<<<<	
>>>>>> Start EzCAN	Program <<<<<	
>>>>>> Start EzCAN Progress	Program <<<<<	
>>>>>> Start EzCAN Progress Selected File Control	Program <<<<<	

Control panel

Com port: Serial Com port to be used

Bits per second: Use bps "19200" as the speed to use (Default Value 38400)

Apply: Save the input parameter values.

File Sel (file select): Select the Upgrade file ". bin".

START: Begin the downloading of Upgrade.



Rotator	Sensor	JAW
Ceph	Tube	X Axis
ormation		
>>>>>> Start EzCAN	Program <<<<<<	
>>>>>> Start EzCAN	Program <<<<<<	
>>>>>> Start EzCAN	Program <<<<<	
>>>>>> Start EzCAN	Program <<<<<	
ogress	Program <<<<<	
ogress	Program <<<<<	



The following examples are the files related to the Firmware Upgrade of PaX-Uni3D equipment and for PaX-Duo3D equipment, similar type files are to be provided.

Firmware files related to Upgrade: These files are in :\Firmware_with_EzCAN\Firmware.





Jni3D_sensor_v1.07.bir

Uni3D_jaw_v1.07.bin: Firmware files for Chinrest Uni3D_rotator_v1.15.bin: Firmware files for Rotator Uni3D_sensor_v1.07.bin: Firmware files for Sensor

12.3 PaX-Duo3D Equipment Commands Sets

12.3.1 Command Usage Format

Command is a collective set of series of predetermined language protocol between the equipment and PC, to be used through PC in order to drive the equipment, upgrade the firmware of the equipment, and to maintain the optimal status.

1. Communication protocol

Uses HyperTerminal

Predetermined communication protocol is in following format.

• Communication setting

All commands used for PaX-Duo3D uses **HyperTerminal** (RS232 communication) to input data and communication setting parameters are as follows.

parameter	Set value
Baud(Speed)	19200bps
Data bit	8bit
Stop bit	1bit
Parity	None
Stream Control	None

• Command format

The command format is

[Command Value]



Example: [SPM_HV___0800]: Tube Voltage Setting Command





There are rules that comprise the commands

- 1. It should be consisted of 4 letters
- 2. No delimit between Capital/Small letters.
- 3. S: Send, P: Scanning Program S/W, L: LCD, M: firmware.
- 4. But, backspace does not work when input the command.

12.3.2 Commands Sets

1. Common Commands

Command	Description		
[SPM_LMP_]	Lamp position set	Command for Initial Position Shift of the	
		Equipment	
[SPM_RET_]	Return position set	Command for Scanning Position shift of	
		the Equipment	
[SPM_ERDY]	Expose Switch ready	Command for Ready to press the	
	set	irradiation switch	
[SPM_PANO]	PANORAMA mode	Command for enter into Panorama Mode	
	set		
[SPM_CT_]	CT mode set	Command for enter into CT Mode	
[SPM_HV0000]	Tube kVp set	Command for Tube voltage strength	
		setting	
[SPM_HA0000]	Tube mA set	Command for Tube current strength	
		setting	
[SPM_LON_]	Laser On	Turn on the Laser	
[SPM_LOF_]	Laser Off	Turn off the Laser	
[SPM_CPON]	sensor power on	sensor power on	
[SPM_CPOF]	sensor power off	sensor power off	
[SPM_PVER]	P axis version	To identify P-axis board version	
[SPM_SVER]	Sensor version	To identify sensor board version	
[SPM_JVER]	Jaw version	To identify chinrest board version	
[SPM_TUTS]	Tube Test	Tube feedback test with expose switch.	
[SPM_BKON]	sensor tilting Break on	Turn on sensor tilting brake	
	set		
[SPM_BKOF]	sensor tilting Break off	Turn on Sensor tilting brake	
	set		
[SPM_VOCH]	Voice Child	Set as child voice	
[SPM_VOMA]	Voice Man	Set as man's voice	
[SPM_VOWO]	Voice Woman	Set as women's voice	

Service Manual for the expert



2. Pano Mode related Commands

[SPM NOR]	normal capture mode	Normal Mode
	loft conturo modo	Normal Mode (Left)
[SPM_RIG_]	right capture mode	Normal Mode (Right)
[SPM_CEN_]	center capture mode	Normal Mode (Center)
[SPM_FNO_]	fast normal capture mode	Fast scan mode
[SPM_TMO_]	TMJ open capture mode	TMJ (Open)
[SPM_TMC_]	TMJ close capture mode	TMJ (Close)
[SPM_SIN_]	sinus capture mode	Sinus
[SPM_ORT_]	orthogonal capture mode	Orthogonal
[SPM_ICC_]	incisor capture mode	Incisor
[SPM_MCR_]	molar right capture mode	Right side of molar
[SPM_MCL_]	molar left capture mode	Left side of molar
[SPM_CCR_]	canal right capture mode	Right side of canal
[SPM_CCL_]	canal left capture mode	Left side of canal
[SPM_STAN]	standard arch capture mode	Standard Arch
[SPM_NARR]	narrow arch capture mode	Narrow Arch
[SPM_WIDE]	wide arch capture mode	Wide Arch
[SPM_CHIL]	child capture mode	Children
	PANO Dark calibration	Dark
נסי ואבט-אוגוען	capture	
	PANO Bright calibration	Bright
[37IV]_338_]	capture	

3. CT related Commands

	Ct mode y axis move value	y-axis shift value setting in CTMode
[SPM_CTCY_0000]		setting(1000 digits is for direction, less
		than 100 digits is shift value.)
	Ct mode x axis move	x-axis shift value setting in CTMode
[SPM_CTCX_0000]	value	setting (1000 digits is for direction,
		less than 100 digits is shift value.)
	Ct mode z axis move	z-axis shift value setting in CTMode
[SPM_CTXZ_0000]		setting(1000 digits is for direction, less
	value	than 100 digits is shift value.)
ISDM SCTM 00001	Speed of ct capture	CT mode scanning speed setting.
	Speed of ci capture	Default as 22.464 sec. (~)
[SPM_CTB_]	CT bright	Begin Bright calibration in CT Mode.
[SPM_K_UP]	CT jaw up	Chinrest Up in CT Mode
[SPM_K_DN]	CT jaw down	Chinrest down in CT Mode.
[SPM_K_ED]	CT jaw end	Chinrest stop in CT Mode
ISPM TA 1	CT short scan mode	Short scan mode set (185 degree) in
	set (185 degree)	CT Mode

4. Service related Commands

[SPM_HF?_]	Half value request	Request for currently setting half value
[SPM_HFST_0000]	Half value set	Half value setting (1~28125)
		Setting Half automatically (Put the
[SPM_HFRN]	Half auto Run	reference point on the straight line
		with column and input command
ISDM YDST 00001	PANO X axis position	x-axis position setting in panorama
	value set	mode (1~1999)
	PANO X axis position	Request x-axis position value in
	value request	panorama mode
ISPM CPST 00001	CT X axis position	x-axis position value setting in CT
	value set	mode



	CT X axis position	Request x-axis position value in CT
	value set	mode
		Save Scan rotator starting value and
		offset value in Pano Mode (Five digits
	PANO rotator offset	10000: The highest is direction) The
	value save	first front digit is "1, then clockwise
		direction, if it is +""0 is clock-reverse
		wide direction +"
	PANO rotator offset	Request Scan rotator starting value
	value request	and offset value in Pano Mode
[SPM_XON_]	x ray on	Enable the X-ray irradiation
[SPM_XOF_]	x ray off	Disable the X-ray irradiation
	Tubo Tomp2 request	Request the Tube Temperature
		(Usable Tube communication check)
	Tube ready? Request	Request on the Tube Initialization
	Tube ready : Request	Completion
		Chinrest Vertical Position (Up/down)
[SPM_CTOZ_00000]	Jaw Horizontal Set	Center Standard value setting
		(1~19999) Default value is 2000
ISPM C72 1	Jaw Horizontal value	Request Chinrest Vertical Position
	request	(Up/down) Center Standard valu
		Chinrest Vertical Position (Up/down)
[SPM_JVST_00000]	Jaw Vertical Set	Center Standard value setting
		(1~19999) Default value is 16320
	iaw vertical value	Request Chinrest Vertical Position
[SPM_JV?_]	request	(Up/down) Center Standard setting
	request	value
ISPM CHST 00001	Chinrest VR value	Set the Chinrest dogtooth position
	reference value set.	value as the standard point
ISPM CHV21	Chin rest VR value	Request the current chinrest dogtooth
	Unin rest VR value	position value.
	Tube Pulse mode	Tube Pulse Mode Setting. (0:continue
	Enable	mode, 1:pulse mode(default))
[SPM_VOLU_0000]	Volume value set	MP3 Volume Adjustment.(0~82)



		Collimator Servo Motor On Time
		setting (75~223): When input the
	Sonyo Dulao On Timo	value in Pano Mode, it is saved as
[3PM_3PO1_0000]	Servo Pulse On Time	shift vale when it is Pano Mode, when
		input the value in CT Mode, it is saved
		as shift value in CT Mode.
	Servo Pulse Total	One Cycle Time of Collimator Servo
[3FW]_3FTT_0000]	Time	Motor (default 500)
[SPM_PR?_]	Parameter print	p-axis related parameter output
	ct sensor lamp offset	Read the CT sensor tilting offset value
	request	
ISPM CLSTI	ct sensor lamp offset	CT sensor tilting offset value setting
	set	
	pano sensor lamp	Read the PANO sensor tilting offset
	offset request	value
	pano sensor lamp	PANO sensor tilting offset value
	offset set	setting
	X axis Left Collimator	Adjust Left side Value of Collimator.
	Frequency value set	1000 digits is direction (0001 ~ 1300)
	(Immediate	
	Response)	
	X axis Right	Adjust Right side Value of Collimator .
	Collimator Frequency	1000 digits is direction (0001 ~ 1300)
	value set(Immediate	
	Response)	
	Y axis Top Collimator	Adjust Upper Side Value of Collimator
ISPM VTEV 00001	Frequency Value	(0001 ~ 1400)
	set(Immediate	
	Response)	
	Y axis Bottom	Adjust Lower side Value of Collimator
	Collimator Frequency	(0001 ~ 1400)
	Value set(Immediate	
	Response)	
ISPM XI ST 00001	Collimator XL ref	//Collimator XL Value setting
	value set.	

Service Manual for the expert



	Collimator XL ref	//Collimator XL Default Position Value
	value request.	
ISDM YDST 00001	Collimator XR ref	//Collimator XR value setting
	value set.	
ISPM XR2 1	Collimator XR ref	//Collimator XR Default Position Value
	value request.	
ISPM YTST 00001	Collimator YT ref	//Collimator YT Value setting
	value set.	
ISPM YT? 1	Collimator YT ref	//Collimator YT Default Position Value
	value request.	
ISPM YBST 00001	Collimator YB ref	//Collimator YB Value setting
	value set.	
ISPM YB? 1	Collimator YB ref	//Collimator YB Default Position Value
	value request.	
[SPM_FOVO]	Collimator all open	//Collimator All Open
		Automatically set the current
[SPM FOVS]	Collimator auto set.	Collimator position as the Default
		Position (Similar function with Half
		Auto Run)
		Set the frequency rate that is supplied
[SPM FREQ 0000]	Frequency speed set	to the CT sensor/tube. (Varies
	in ct mode.	depending the image solution.
		default:25Hz)
		Set the frequency duty ratio that is
[SPM DUTY 0000]	Frequency duty set in	supplied to the CT
	ct mode.	sensor/tube.(Varies depending the

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