Confidential

CXDI-1 System

CXDI-31
Service Manual

Ver.06

Jun. 2009

Medical Products
Technical Service Dept

Manual Control No.	: BY8-2251-0E6
Name of Product	: CXDI-31
Distribution Control No.	:
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Service Manual
Introduction

This service manual belongs to a series of after-sales guides Canon Inc. publishes as part of its comprehensive product quality guarantee program, and will make a useful tool in promoting the sales of the product, let alone repairing it.

This service manual consists of nine chapters; General, Installation Manual, Imaging Unit, E/O Box, Parts Catalog, and Service Manual Report.
Please fully understand the procedure for installing the product indicated in *"Installation Manual"*, the features and specifications of the product indicated in *"GENERAL"* and principle of system and operation in *"TECHNICAL INFORMATION"*
Refer to *"REPAIR GUIDE"* in order to perform repairs properly, and *"PARTS CATALOG"* and *"TOOLS"* for ordering parts and tools.
If you are using nonstandard connections or settings, refer to the related items in the *"Option Setup"* chapter and then correct the connections or settings accordingly.
If the product undergoes a large modification, a new service manual of revised edition will be sent to you.
In other cases, service manual report will be sent to you to update the manual.
If needed, utilize the related information indicated in the last chapter of Appendix.

Note 1:

This service manual is published by Canon Inc. in accordance with Article 6 (Furnishing the Referring Materials) of the Service Assignment Contract concluded with your company.
The contract prohibits the exposure of the contents of this service manual in any form to the third party without a written consent of Canon Inc.

Note 2:

This service manual is property of Canon Inc. and the company may seek to have it returned, depending on circumstances. You are expected to keep it until then.

Note 3:

Your inquiries, suggestions etc. about the contents of this service manual should be addressed to: Medical Equipment Quality Administration Division,
Technical Service Department
Canon Inc.
30-2, Shimomaruko 3-chome, Ohta-ku, Tokyo
146-8501, Japan

1. General

This chapter is devoted to the description of the product's features and specifications.

2. Installation Manual

This chapter indicates the procedure for installing the product.

3. Imagining Unit

This chapter describes unit composition, technical information and repair guide of Imaging Unit.

4. E/O Box

This chapter describes unit composition, technical information and repair guide of E/O Box.

5. Parts Catalog

This chapter consists of sections devoted to the product composition, disassembly diagrams, circuit diagrams and part number index.

5.1 Product Composition

The main unit and accessories of the product are described.

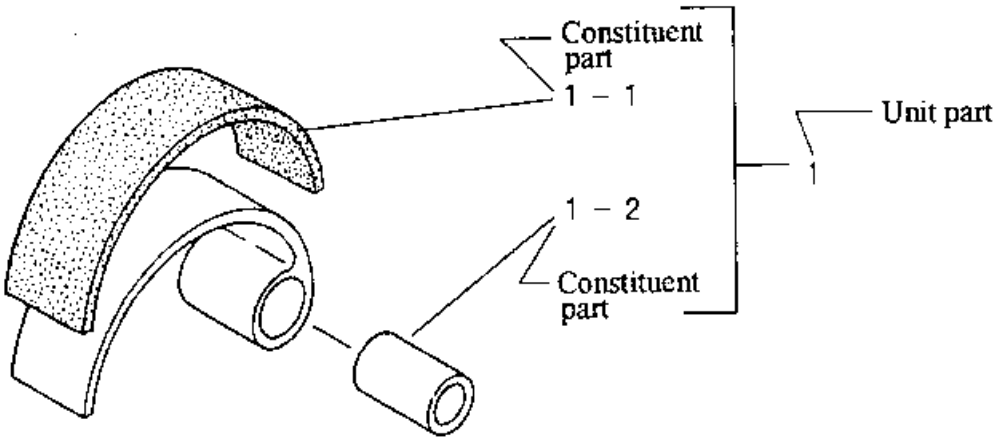
A. The accessories whose order numbers are listed in the section are available from the Sales Section as merchandise.

5.2 Disassembly Diagram

The parts specified as repair part are described, classified into groups from the function standpoint.

A. Unit Part and Its Constituent Parts

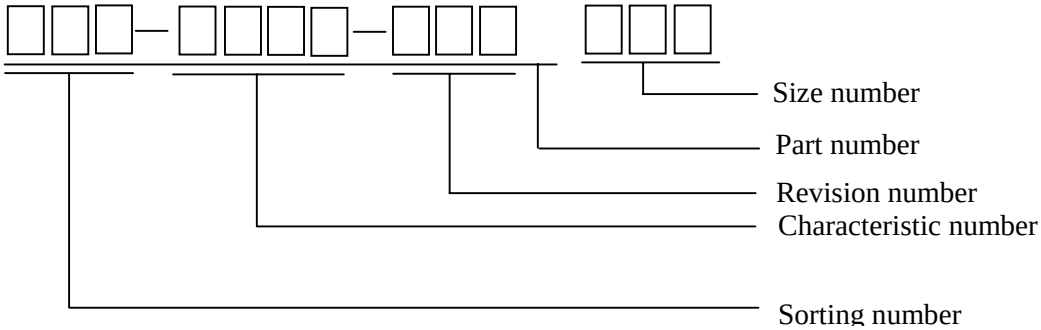
Example



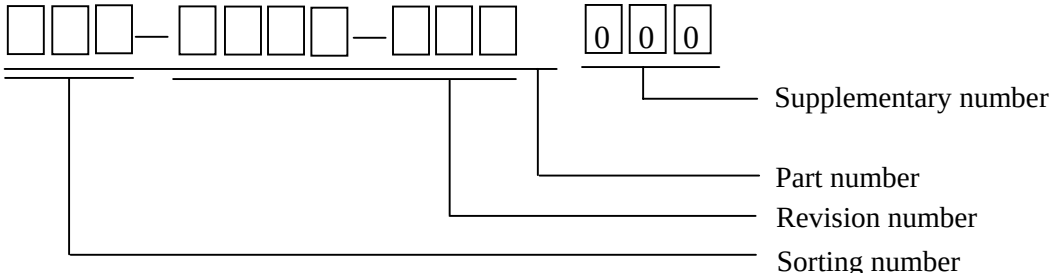
B. Part No. Column

A part number marking is as follows :

General Parts



Standard Parts (Screws, washers, resistors, capacitors, etc.) of Standard Specification



Size number:	This number is used to classify adjustment parts by size. The marking is 000 for parts which need not be classified by size.
Revision Number:	This number is used to distinguish new parts from old ones. The number advances when they cease to be interchangeable due to modification.
Supplementary number:	This is simply used to ensure the general and standard part number of the same length. The marking is always 000.
Standard number:	This is used to indicate screw diameters, resistance values, etc.

The size and supplementary number 000 marking is omitted.

The size number is given into ( ) below the part number for only adjustment parts.

Example … BA03415-000 …
(020 : t= 0.2mm
050 : t= 0.5mm
100 : t =1.0mm)

The parts whose part numbers are listed together and enclosed in ( ) are adjustment parts,

Example … (XD1-1108-221
XD1-1108-222
XD1-1108-225)

C. Q'ty Column

The number of units of parts used in the mechanism are indicated.

The marking is N for those adjustment parts which are not used in uniform quantities.

The marking is 1 for those parts whose length is not specified in the part number. Their length by standard specified is given in ( ) below the part number in the PARTS NO. column.

Example … BH-2184-000 … 1 …
(l = 20mm)

5.3 Circuit Diagram

Electrical repair parts which are difficult to be showed in disassembly diagrams are illustrated.

5.4 Part Number Index

Except for the standard parts all the repair parts showed in disassembly and circuit diagrams are listed in the order of the part number.

The page where the part is listed is found by referring its part number.

REVISION NO. – REPORT NO. Column

Informed of an advanced revision number by the Service Manual Report, the customer enters the new revision number and the report number in this column.

A. REVISION NO.-REPORT NO Column

Informed of an advanced revision number by the Service Manual Report, the customer enters the new revision and the report number in this column.

6. Service Manual Report

This report informs you of changes in the product design, etc., complete with information on the reason of the changes, their contents and repair instructions.

When you receive the Service Manual Report, you are advised to enter the necessary information in the service manual and keep the report in the report file according to the filing number.

CAUTION

Follow the safety instructions indicated below. Ignoring them may result in injury or accident.

1. Disassembly, Assembly, Adjustment and Maintenance

Disassembly, assembly, adjustment and maintenance must be done only by a service person who has attended a service training designated by Canon.

2. Removal of Covers

Be sure to turn OFF the power of the instrument before removing the covers for maintenance and repair. Also, do not touch the instrument with wet hands. Otherwise, you may get an electric shock that may result in death or serious injury.

3. Fuse

When the fuse is going to be replaced, be sure to turn OFF the power of the instrument and solve the problem which caused the fuse to blow. Be sure to replace the fuse with the specified type only. Otherwise, fire or electric shock may result.

4. Ground Wire

Be sure to ground the instrument to an indoor grounded connector. Otherwise, fire or electric shock may result due to leakage.

5. Modification

Never modify the product as it may result in fire or electric shock.

6. Waste control

The service provider is responsible for the disposal of used service parts, packing material, etc. resulting from the setup, repair or maintenance of the medical device However, the customer is responsible for the disposal of the medical device. Disposal activities must follow the regulations (=specially controlled industrial waste) of the country where the device is used.

VORSICHT

Befolgen Sie die unten angegebenen Sicherheitsanweisungen.
Mißachtung kann zu erletzungenoder Unfällen führen.

1.Zerlegung, Zusammenbau, Einstellung und Wartung

Zerlegung, Zusammenbau, Einstellung und Wartung dürfen nur von einem Wartungstechniker durchgeführt werden, der an einem von Canon vorgeschriebenen Wartungslehrgang teilgenommen hat.

2.Entfernen von Abdeckungen

Schalten Sie unbedingt die Stromversorgung des Instruments aus, bevor Sie die Abdeckungen zwecks Wartung und Reparatur entfernen.
Vermeiden Sie auch eine Berührung des Instruments mit nassen Händen.
Anderenfalls können Sie einen elektrischen Schlag erleiden, der zum Tod oder schwerer Verletzung führen kann.

3.Sicherung

Wenn die Sicherung ausgewechselt werden muß, schalten Sie unbedingt die Stromversorgung des Instruments aus, und beheben Sie die Ursache für das Durchbrennen der Sicherung.
Ersetzen Sie die Sicherung nur durch den vorgeschriebenen Typ.
Anderenfalls kann es zu einem Brand oder elektrischen Schlag kommen.

4.Erdleiter

Erden Sie das Instrument unbedingt an einer Schukosteckdose.
Anderenfalls kann es zu einem Brand oder elektrischen Schlag durch Leckstrom kommen.

5.Umbau

Jeder Umbau des Produktes ist strengstens untersagt, da dies zu einem Brand oder elektrischen Schlag führen kann.

Labels and Markings

Safety Information(CXDI-31)

For U. S. A.

Do not make any changes or modifications to the equipment unless otherwise specified in the manual.
If such changes or modifications should be made, you could be required to stop operation of the equipment.

NOTE:

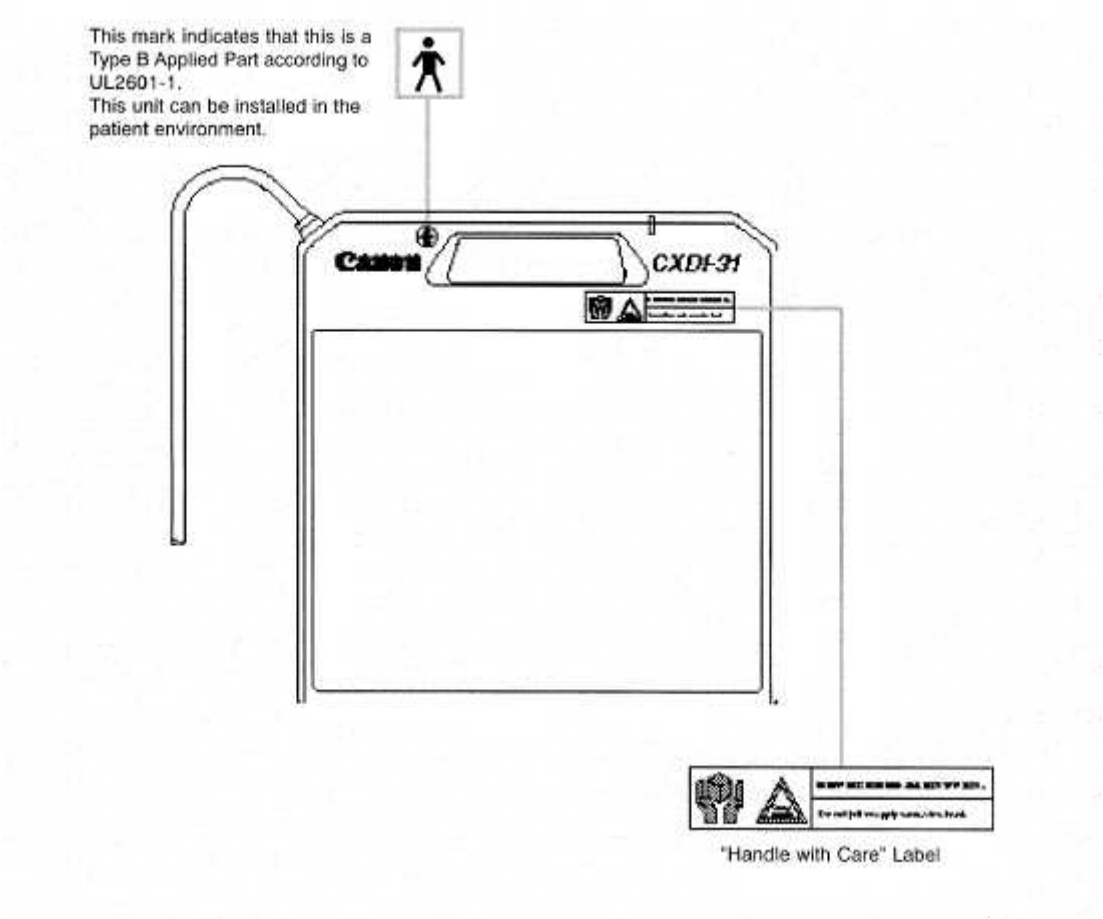
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules.
These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.
This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.
Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Use of shielded cable is required to comply with class A limits in Subpart B of Part 15 of FCC rules.

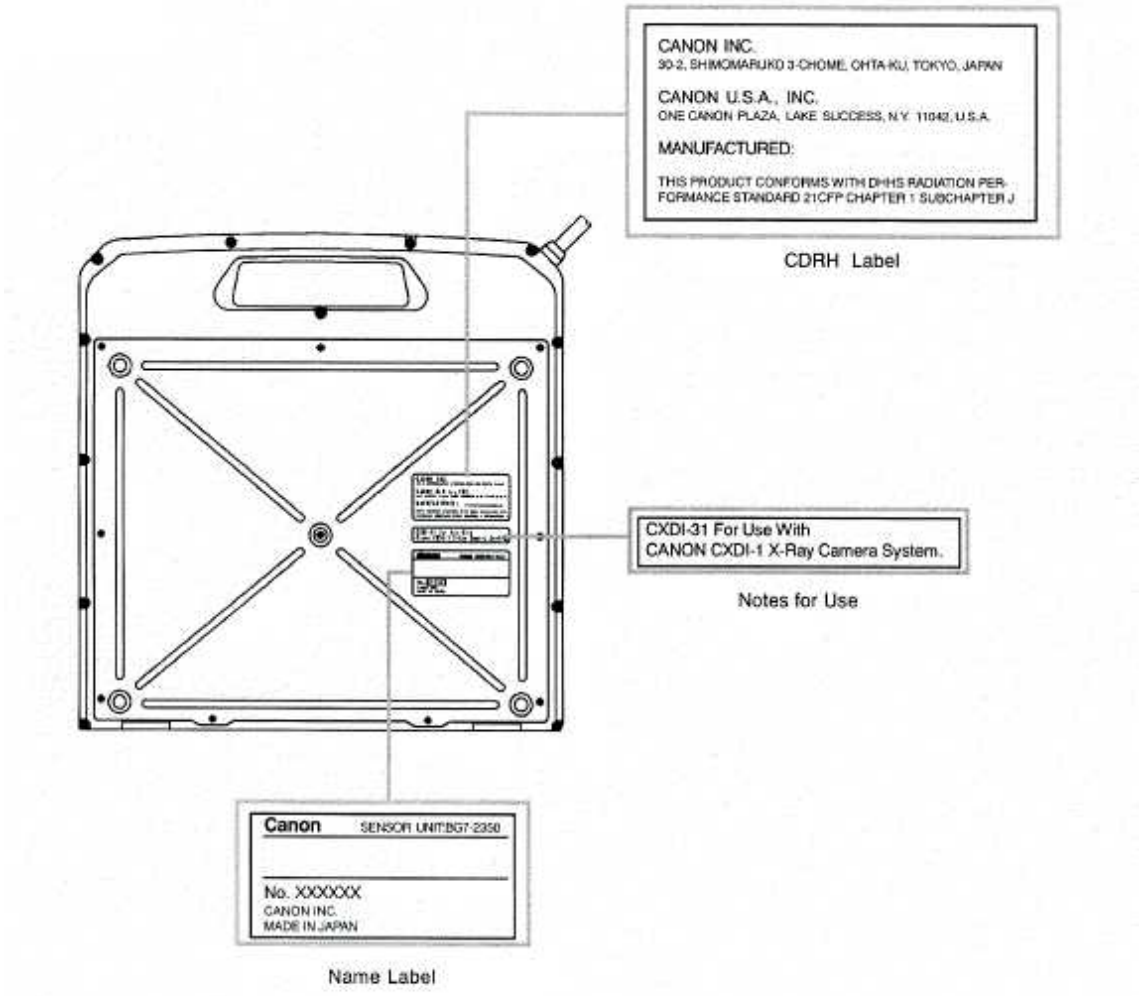
Labels and Markings on the Instrument

The CXDI-31 has a few labels and markings on it.
Contents of them and positions where they are attached are indicated below.

Front



Rear


CANON INC.
30-2, SHIMOMARUKO 3-CHOME, OHTA-KU, TOKYO, JAPAN
CANON U.S.A., INC.
ONE CANON PLAZA, LAKE SUCCESS, N.Y. 11042, U.S.A.
MANUFACTURED:
THIS PRODUCT CONFORMS WITH DHHS RADIATION PERFORMANCE STANDARD 21CFP CHAPTER 1 SUBCHAPTER J
CDRH Label
CXDI-31 For Use With
CANON CXDI-1 X-Ray Camera System.
Notes for Use
Canon
SENSOR UNIT:BG7-2350
No. XXXXXX
CANON INC.
MADE IN JAPAN
Name Label

For EU Countries

The following mark shows compliance of the instrument with Directive 93/42/EEC.

This instrument has been classified into EN55011 Group 1/Class A.

This instrument is a CLASS I EQUIPMENT according to EN 60601-1.

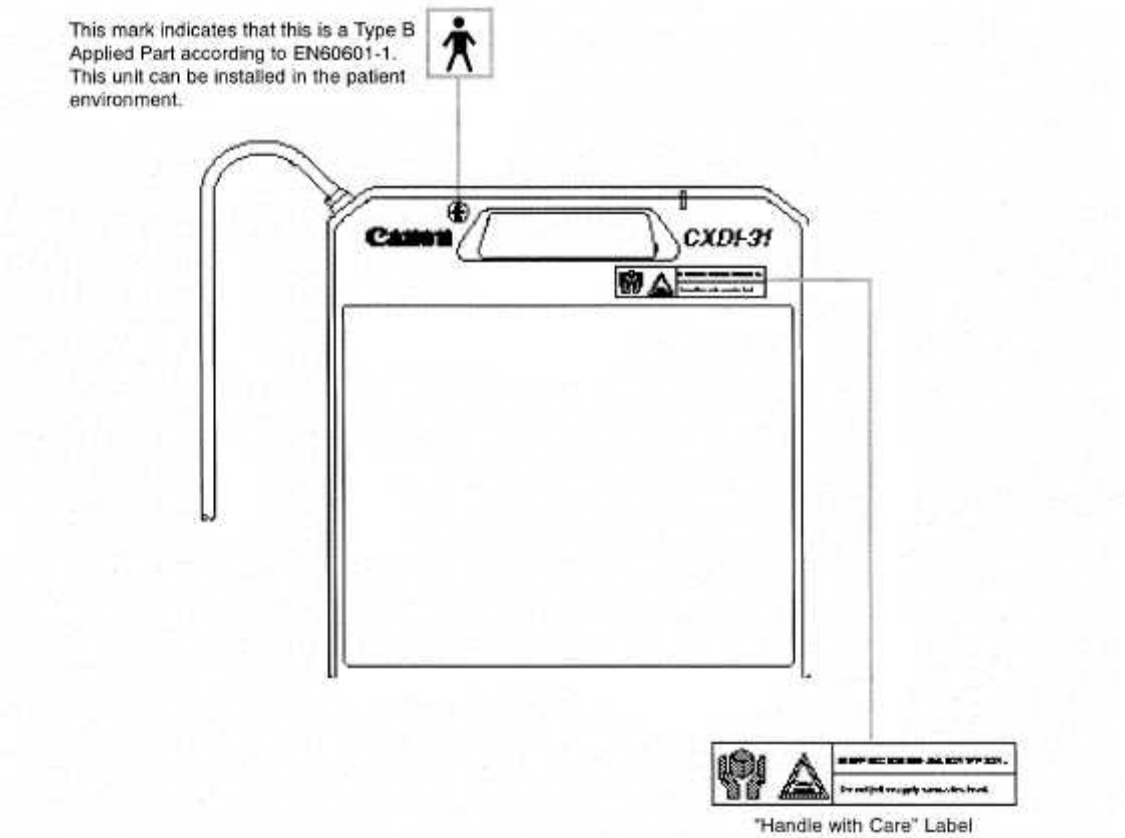
This instrument has been classified under EN60825-1:1994 and conforms to the following classes:

CLASS 1 LASER PRODUCT
LASER KLASSE 1
APPAREIL A RAYONNEMENT LASER DE CLASSE 1
APPARECCHIO LASER DI CLASSE 1
PRODUCTO LASER DE CLASE 1
APARELHO A LASER DE CLASSE 1

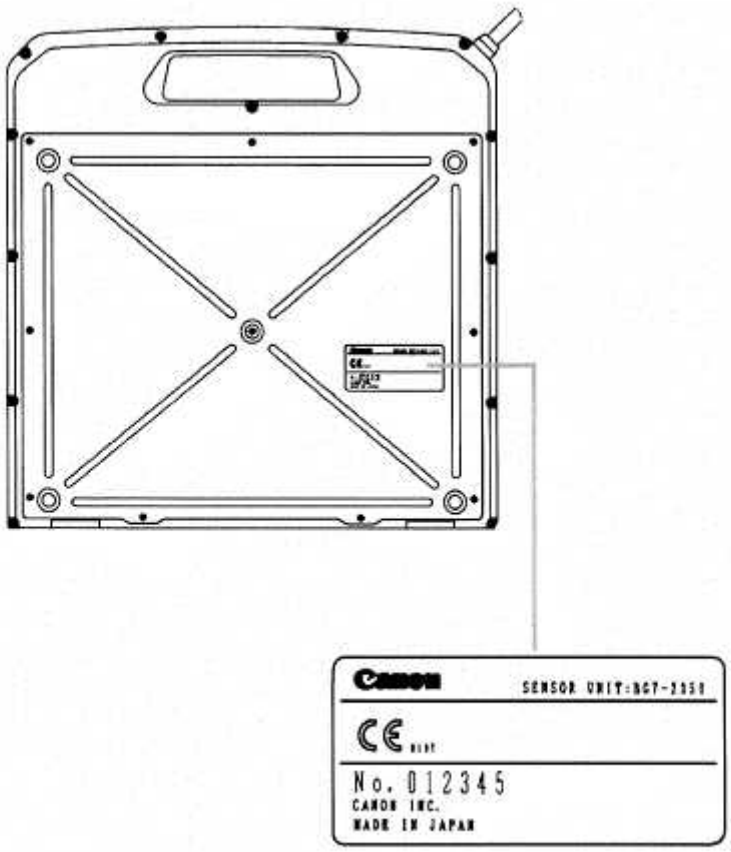
Labels and Markings on the Instrument

The CXDI-31 has a few labels and markings on it.
Contents of them and positions where they are attached are indicated below.

Front



Rear



Name Label

Safety Information(E/O Box)

For EU Countries

The E/O box has been classified under EN60825-1:1994 and conforms to the following classes:

CLASS 1 LASER PRODUCT
LASER KLASSE 1
APPAREIL A RAYONNEMENT LASER DE CLASSE 1
APPARECCHIO LASER DI CLASSE 1
PRODUCTO LASER DE CLASE 1
APARELHO A LASER DE CLASSE 1

The E/O box has been classified into EN55011 Group 1/Class A.

For U. S. A.

Do not make any changes or modifications to the equipment unless otherwise specified in the manual.
If such changes or modifications should be made, you could be required to stop operation of the equipment.

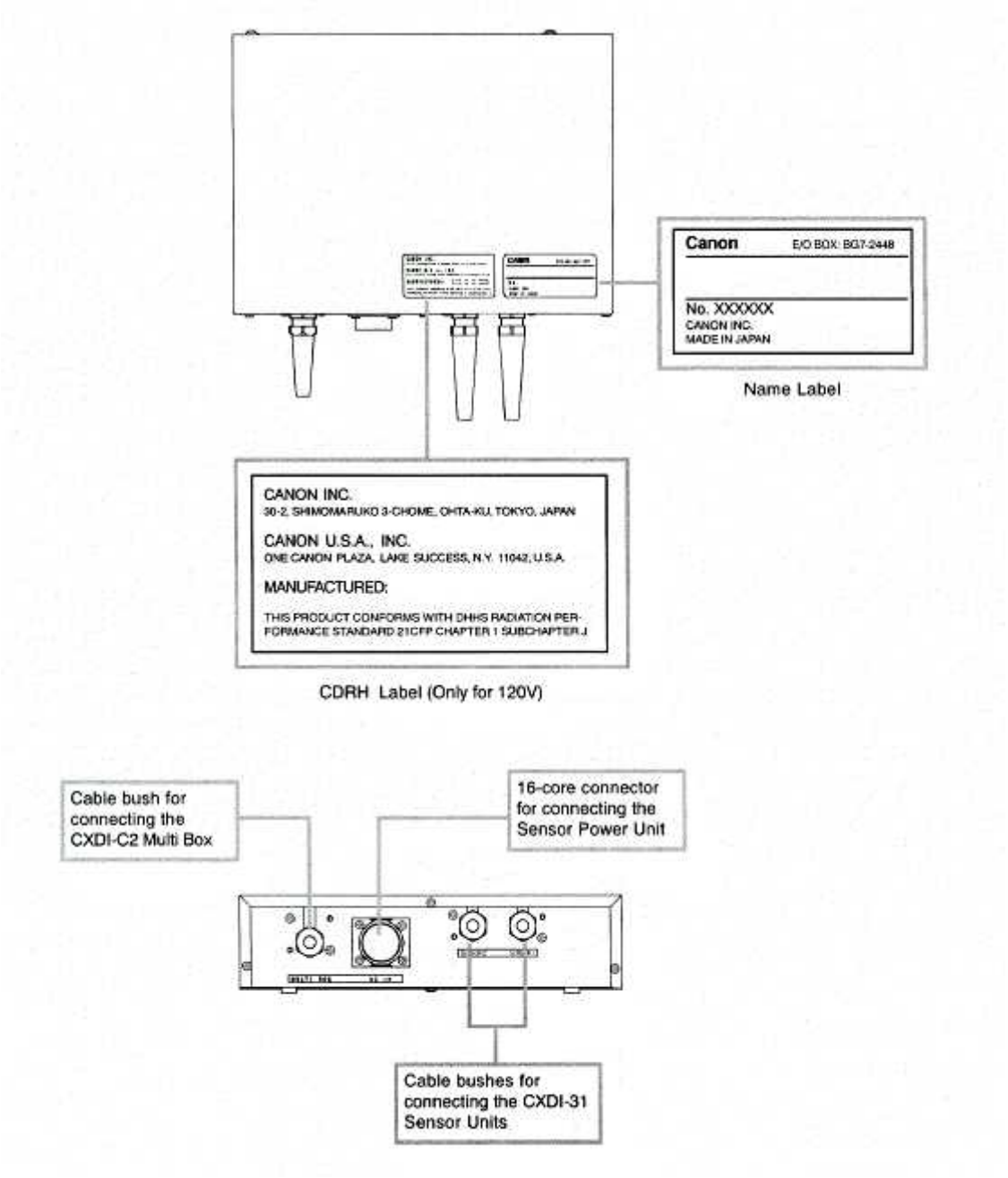
NOTE:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules.
These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.
This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.
Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Use of shielded cable is required to comply with class A limits in Subpart B of Part 15 of FCC rules.

Labels and Markings on the Instrument

The E/O box has a few labels and markings on it.
Contents of them and positions where they are attached are indicated below.



CXDI-31

1.General

Ver.01

August, 2001

Medical Products
Technical Service Dept

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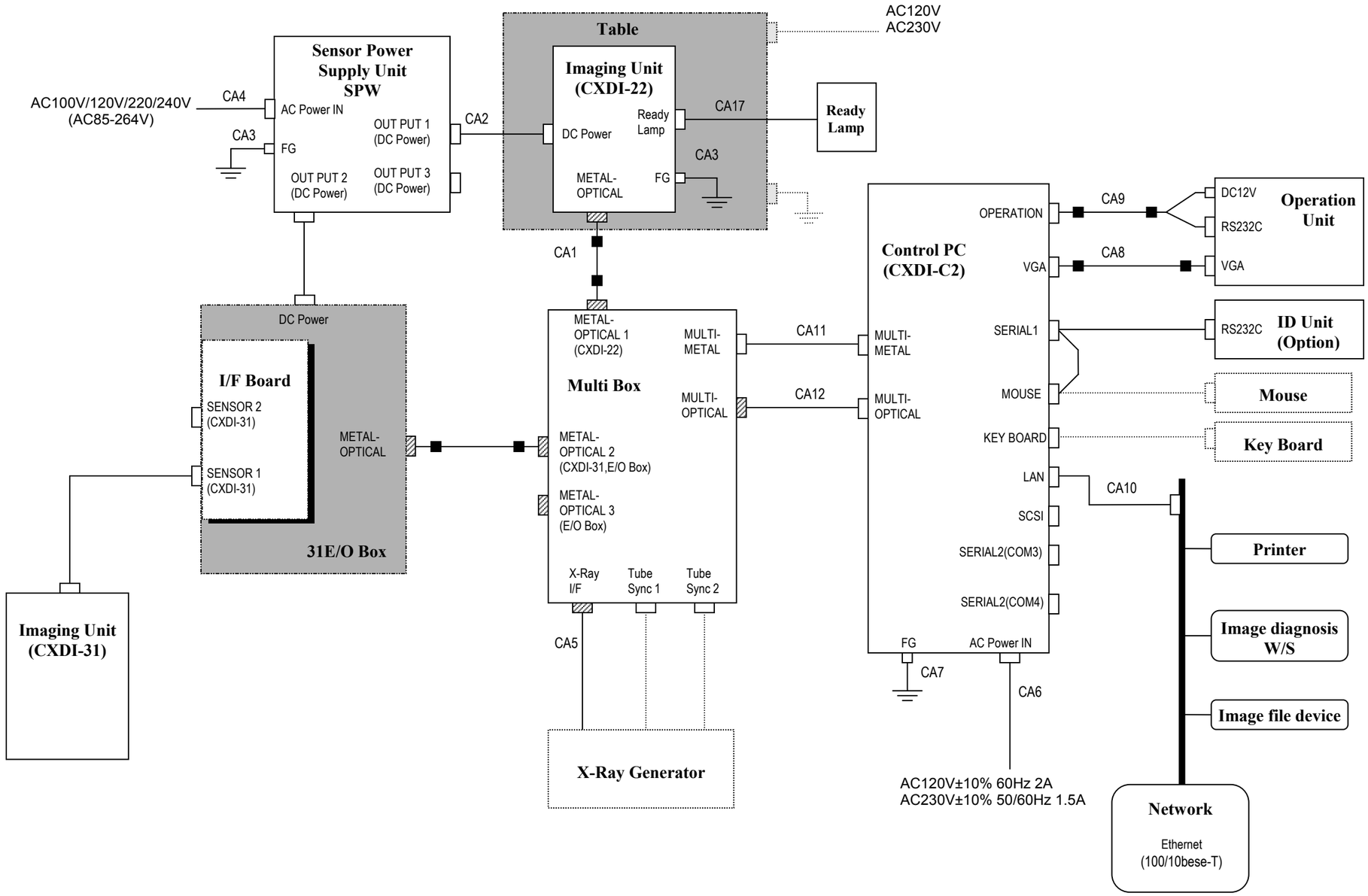
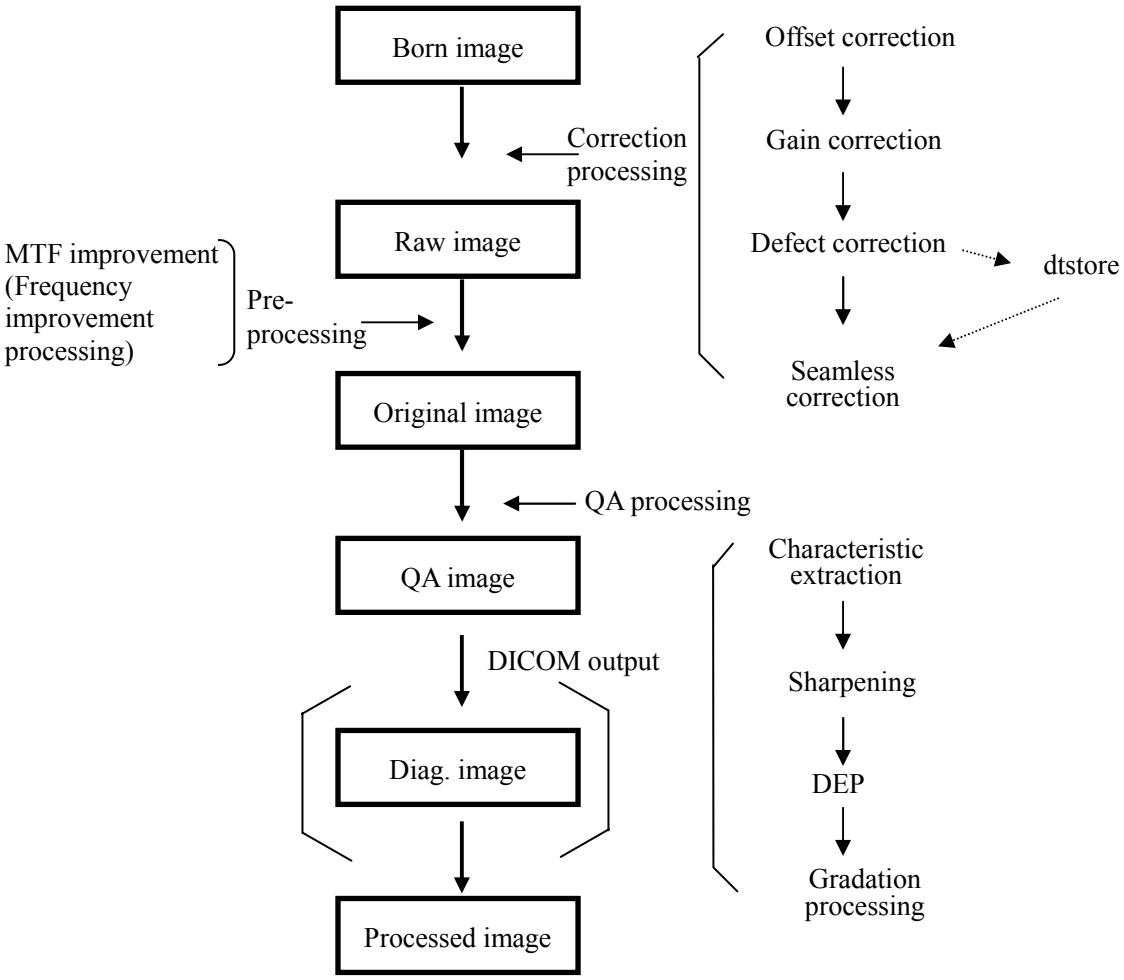
1. CXDI-1 SYSTEM BLOCK DIAGRAM (CXDI-31)

* 1. □ : Connector
* 2. ■ : Ferrite Core
* 3. ▨ : Cord Bush
* 4. ▩ : Option



2. CXDI Image Processing

2.1 Processing flow



2.2 Image types

(1) Born image

The image obtained with LANMIT before any correction is made.
Outside distribution of these images is prohibited, including dtstore images.

(2) Raw image

Born image after offset processing, gain correction, and splice processing.
This is the image with LANMIT specific characteristics corrected.

(3) Original image

Raw image after preprocessing.

(4) QA image

Original image after gradation processing, sharpening, and other processing.
The CXDI performs image processing up to this point.

(5) Diagnosis image

QA image after further image processing necessary for diagnosis.
Image processed by the user for diagnostic purposes.

(6) Processing image

Diagnosis image after post-processing.
Image modified by the user or the default processed image.

CXDI-31

2. Installation Manual

Ver.03

Aug, 2005

Medical Products
Technical Service Dept

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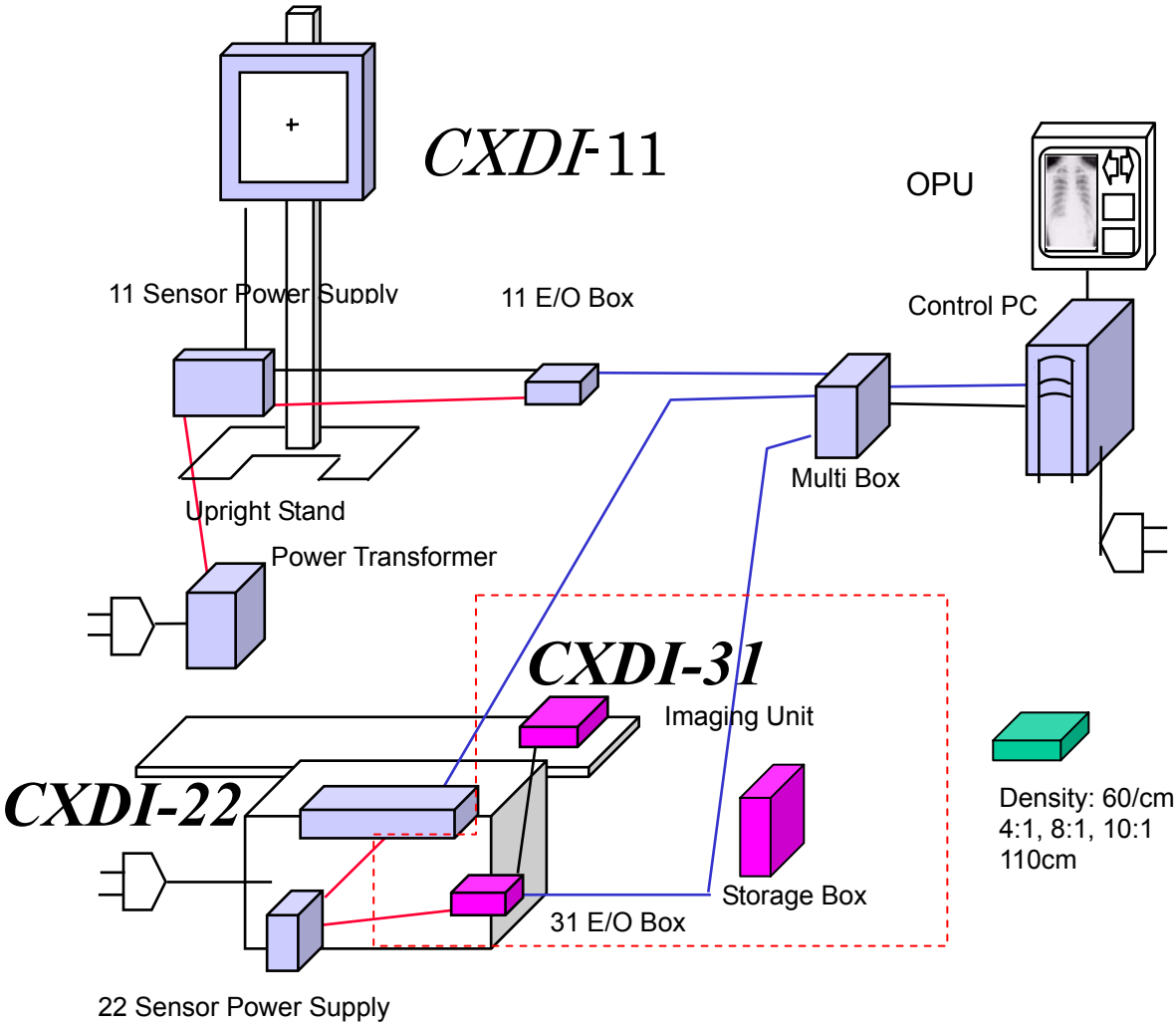
System Overview



[Fig.1]

1. Caution during operating

Please pay attention to the following points when installing the machine.

(1) If the equipment is hoisted, lowered or transported, it must be supported at both sides by a minimum of two people so there is no danger of it falling.

(2) If a forklift, etc. is used to transport the equipment, make sure there is nothing that could impede the forklift on its route to the final destination.

(3) When installing the equipment, be sure the site meets the following criteria:

1) There must be no dripping water in the area.
2) The environment must be free of harmful elements, such as humid or acidic air, air with a saline or sulfur content, where there is poor ventilation, or where air pressure or temperature is abnormal.
3) The equipment must not be placed at an angle or subjected to vibration or shock (this includes during transportation).
4) The equipment must not be kept where chemical products are stored or where gasses are generated
5) The site's power supply must be of the correct voltage and frequency for the equipment.
6) The site must be connected to a fully earthed cable with sufficient ground resistance to meet standard values.

(4) After installation, be sure to dispose of waste product packaging with care and with full respect for the environment.

(5) As the imaging unit is easily portable, take special care that it is not knocked, dropped or subjected to strong shocks.

(6) Use clamps to secure any excess cable for the imaging unit.

2. Installation

2.1. List of Tools Needed for Installation

Tools needed for new installation

No.	Tools name	Qty	Remarks
1	General tools	1 set	
2	Laptop PC	1	PC/AT compatible [OS:Windows 9X/ WindowsNT workstation 4.0 or later]
3	LAN card	1	For laptop PC [If necessary]
4	Flash1	1	Flash1 unit, accessory cable, accessory software
5	RS-232C cable	1	Straight type [For connection between Laptop PC to Flash1]
6	Capture board I/F cable	1	BY9-6484-000
7	Mouse	1	PS/2 type
8	Keyboard	1	PS/2 type
9	Hub	1	For connection between control PC to Laptop PC
10	10BASE-T cable	2	Straight type [For connection between Laptop PC to control PC]
11	Software for service maintenance	1	BY9-6489-000
12	Capture board firmware [Imaging codes]	1	Floppy disk, Ver.xxxxxx
13	Capture board firmware (Boot loader)	1	Floppy disk, Ver.xxxxxx
14	A/D board firmware (Imaging codes)	1	Floppy disk, Ver.xxxxxx
15	A/D board firmware (Boot loader)	1	Floppy disk, Ver.xxxxxx
16	CXDI application	1	Floppy disk, Ver.xxxxxx
17	CXDI software version compatibility table	1	
18	Resolution chart	1	BY9-7007-000
19	Metal net	1	BY9-6486-000
20	Mirror, oil-based marker, etc.	1	For adjusting the alignment with the X-ray
21	Electric drill	1	For opening 11 mm holes

[Table.1]

2.2. CXDI-31 system installation procedure

No.	Step	Conditions and checkpoints	Reference
1	Unpacking and checking the product's constituent parts	There must be no missing parts, damage, dents, etc.	Instruction Manual
2	To connect the image Unit and the E/O box	- Handle the instrument carefully, as it may be damaged if something is hit against it, dropped, or receives a strong jolt. - The cables must be routed in such a way that no unreasonable loads are brought to bear upon them.	Instruction Manual
3	To connect the E/O box and the sensor unit	- The cables must be routed in such a way that no unreasonable loads are brought to bear upon them.	The CXDI-C1 Service Manual
4	To connect the E/O box and the multi box	- The cables must be routed in such a way that no unreasonable loads are brought to bear upon them.	Instruction Manual
5	To connect the multi box and the control PC	- The cables must be routed in such a way that no unreasonable loads are brought to bear upon them.	The CXDI-C1 Service Manual
6	To connect the multi box and X-ray generators	- The cables must be routed in such a way that no unreasonable loads are brought to bear upon them. - The manufacturer of the X-ray generators must be asked to handle the connections with the generators.	Instruction Manual
7	Checking the software program's version	- The compatibility of the sensor unit and the control PC must be checked on the compatibility list, and the software program must be installed or upgraded as required.	Instruction Manual
10	Installing the LANMIT Image correction data		Instruction Manual
11	Identifying the imaging units and setting the number of units to be connected (inputting the sensor serial numbers)		Instruction Manual
12	Adjusting the timing with the X-ray generators	-To support a 2-tube configuration, the timing must be adjusted with each of the generators.	Instruction Manual

No.	Step	Conditions and checkpoints	Reference
13	Inserting the backup floppy disk	- It must be confirmed at re-start that backup files have been made.	Instruction Manual
14	Calibration	- No errors must be displayed. This calibration must be performed with the photo timer OFF	Operation Manual
15	Setting the Fixed ROI Areas	- If necessary, to set the ROI area.	Operation Manual
16	Connections to the network and setting the output destination		Instruction Manual
17	Startup settings		Instruction Manual
18	Radiographic testing	- Radiography must be performed after calibration. - The images must be checked using charts and phantoms. - The data must be sent to the printer and storage and the images must be checked.	Instruction Manual
19	Checking the linearity of the transferred image density		Instruction Manual
20	Operation unit gamma correction		Instruction Manual
21	Body parts settings	-The engineer in charge must be consulted prior to performing these settings.	Operation Manual
22	Checking and performing the system settings	-The engineer in charge must be consulted prior to performing these settings.	Operation Manual
23	Anchoring		Instruction Manual
24	Deleting unnecessary data		The CXDI-C1 Service Manual
25	Cleaning		
26	Explaining operation to the user		Operation Manual
27	Final parameter adjustments	-The engineer in charge must be consulted prior to narrowing down the adjustments to the final values.	Operation Manual
28	Backing up valuable data	Not necessary for the systems installed in vehicles.	Instruction Manual

[Table.2]

3. Unpacking

3.1. Product configuration

3.1.1. Digital X-ray camera CXDI-31

Configuration by item	Quantity
Imaging unit	1
E/O box	1
Optical composite cable	1
E/O box power cable	1
Storage box	1
E/O power connector guard attachment plate	1
E/O power connector guard	1
M3 screw (XB1-2300606)	1
Document set (warranty registration, inspection compliance log, operation manual)	1

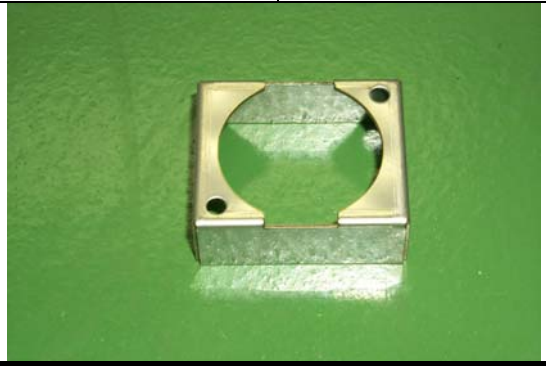
[Table 1]

3.1.2. Grid (Optional)

Configuration by item	Quantity
Grid for Canon Digital X-ray camera CXDI-31 Unit 4:1 horizontal 110cm	1
Grid for Canon Digital X-ray camera CXDI-31 Unit 4:1 vertical 110cm	1
Grid for Canon Digital X-ray camera CXDI-31 Unit 8:1 horizontal 110cm	1
Grid for Canon Digital X-ray camera CXDI-31 Unit 8:1 vertical 110cm	1
Griit for Canon Digital X-ray camera CXDI-31 Unit 10:1 horizontal 110cm	1
Grid for Canon Digital X-ray camera CXDI-31 Unit 10:1 vertical 110cm	1

[Table 2]

3.1.3. Product configuration guide

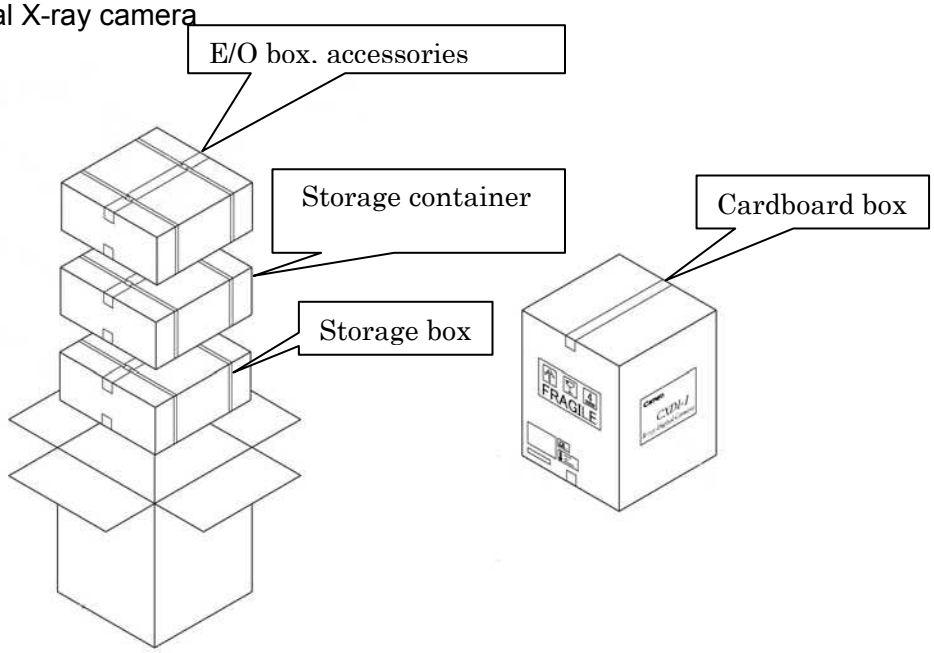
No.	1	No.	2
Name	Imaging unit	Name	E/O box for 31
Remarks	Cable attachment (4.5cm) 324x327x20.3mm 3.3kg (incl. cable)	Remarks	270x190x65mm 2.2kg
			
No.	3	No.	4
Name	Optical composite cable	Name	E/O cable for 31 Power cable
Remarks	20m	Remarks	7mm
			
No.	5	No.	6
Name	Storage box	Name	E/O power connector Guard attachment plate
Remarks		Remarks	
			

No.	7	No.	
Name	E/O power connector guard	Name	
Remarks		Remarks	
			

[Table 3]

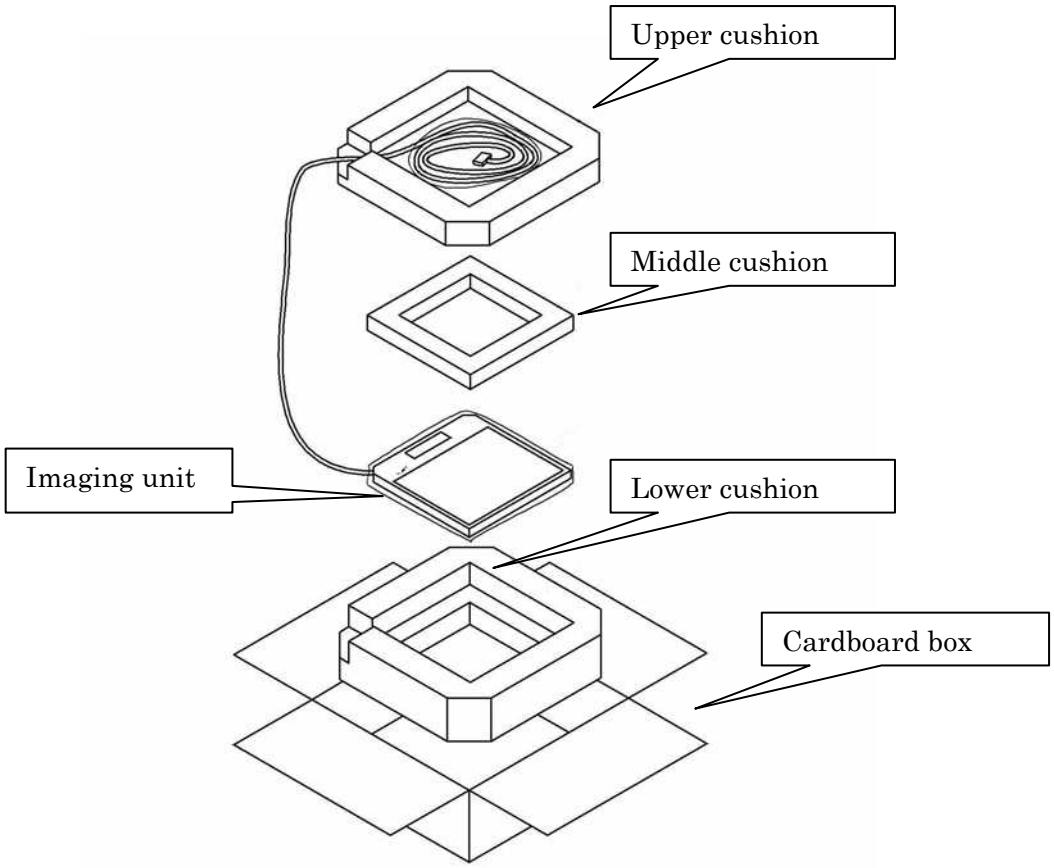
3.2. Packing diagram

3.2.1. Digital X-ray camera



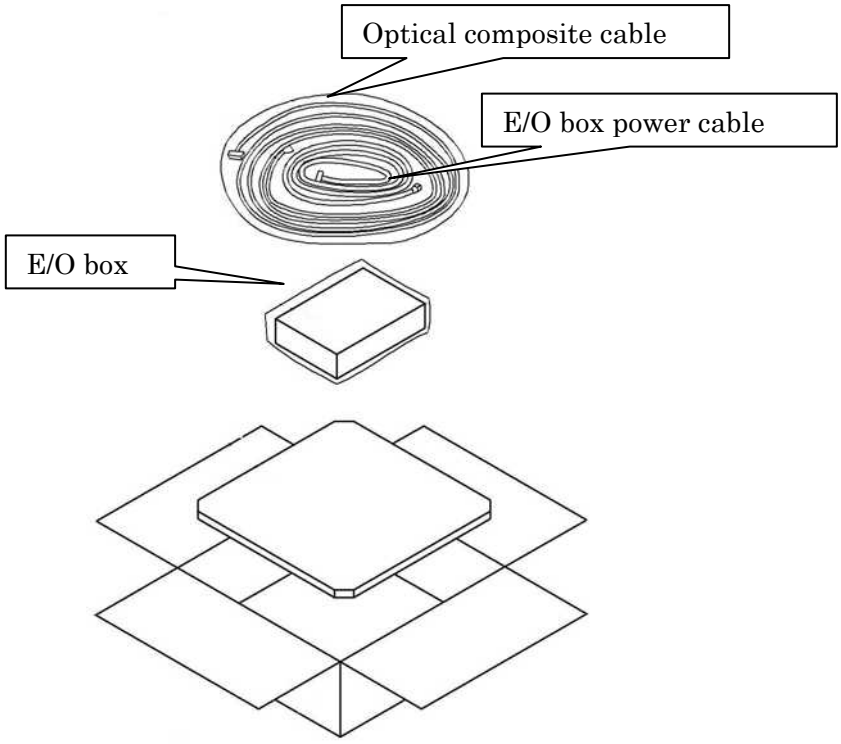
[Fig. 1]

3.2.2. Imaging unit



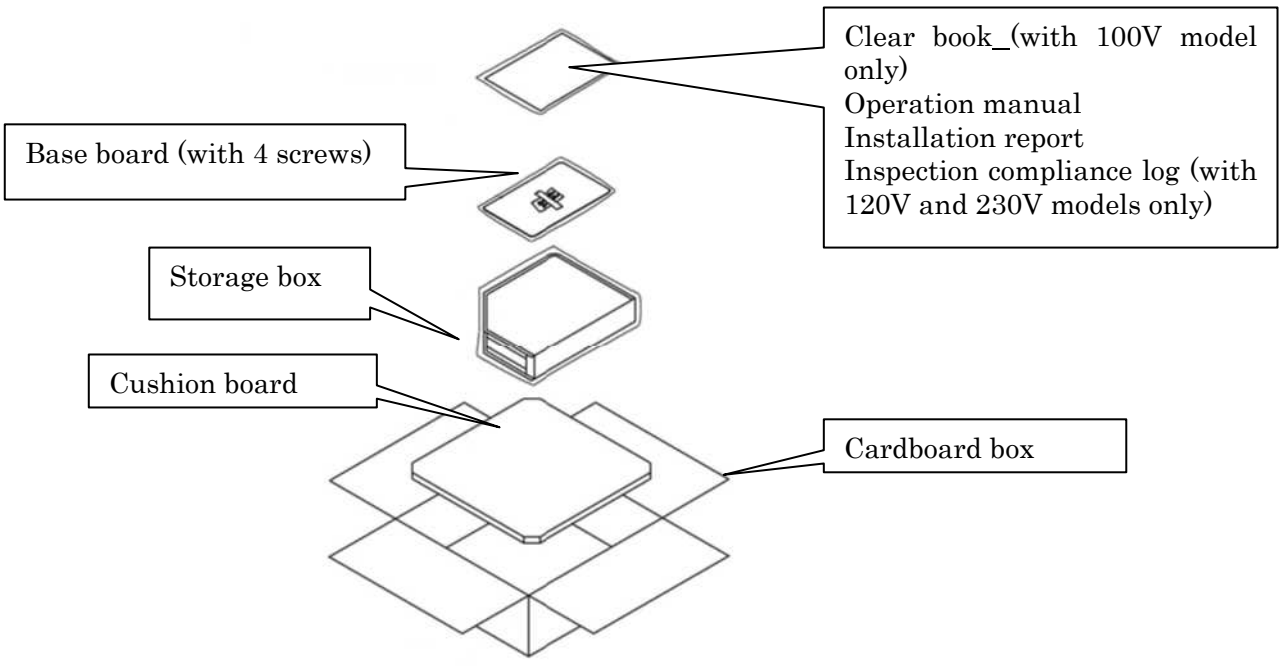
[Fig. 2]

3.2.3. E/O box



[Fig. 3]

3.2.4. Accessories (storage box)

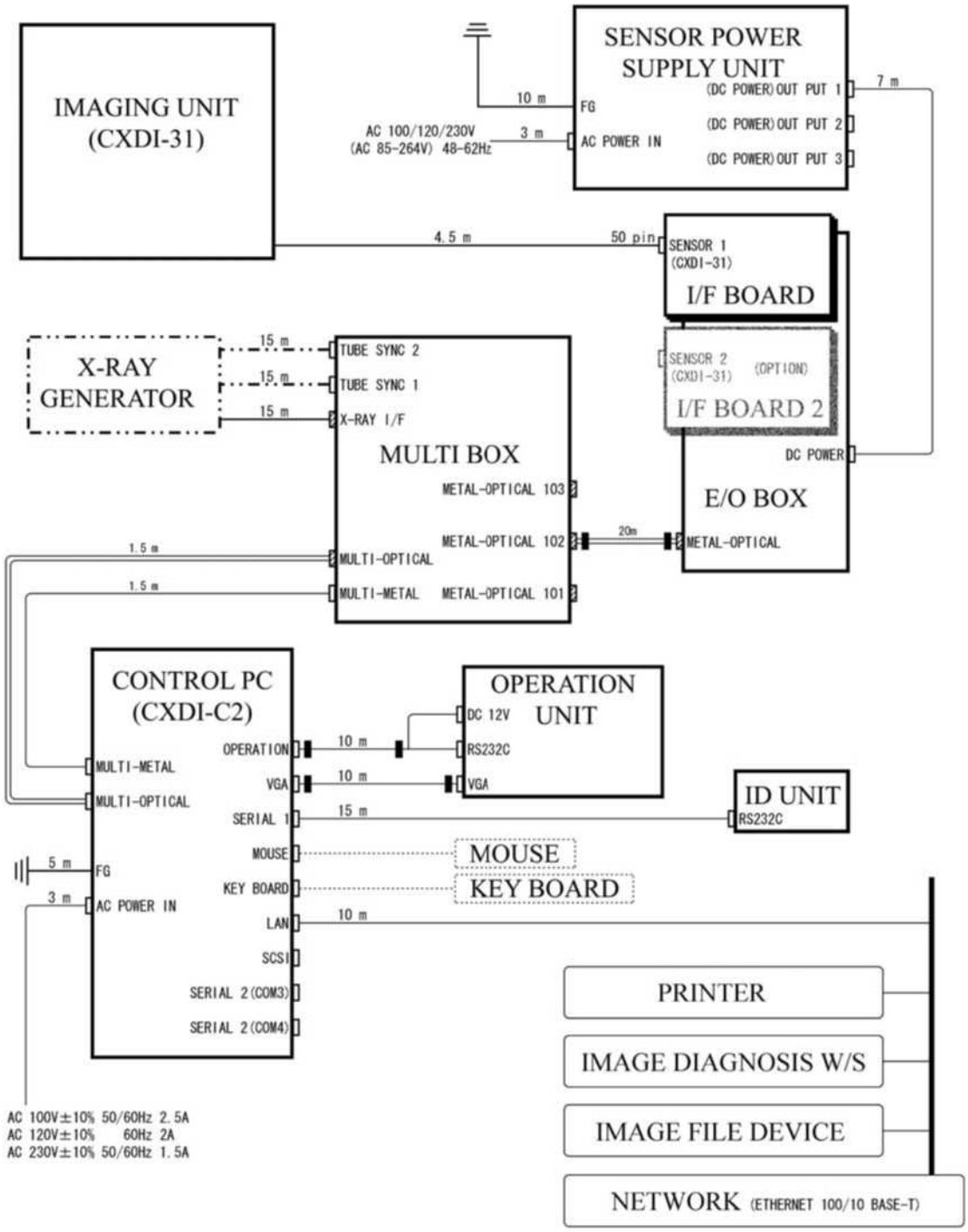


[Fig. 4]

4. Installation

4.1. Connecting the units

4.1.1. Connecting block diagram

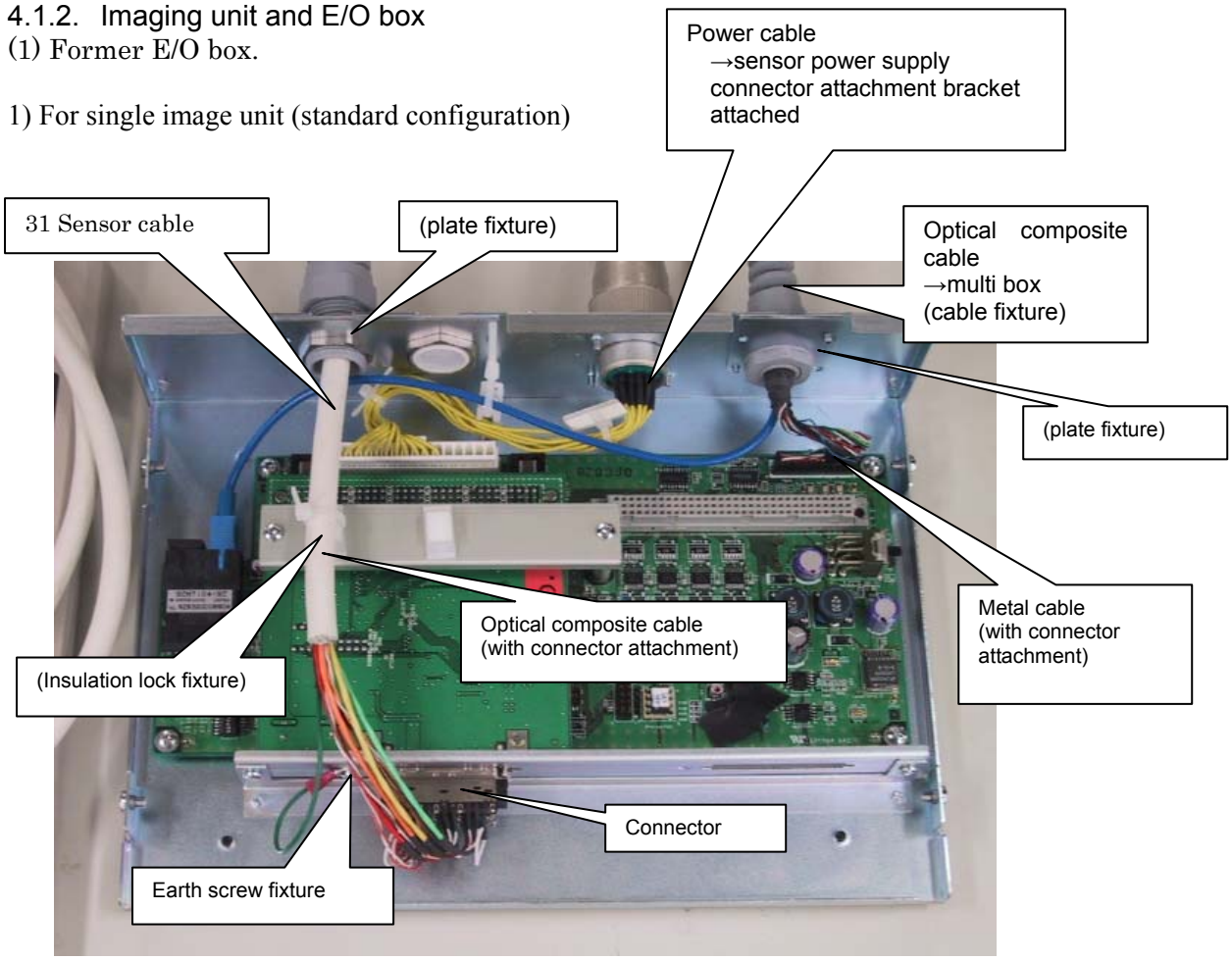


[Fig.1]

4.1.2. Imaging unit and E/O box

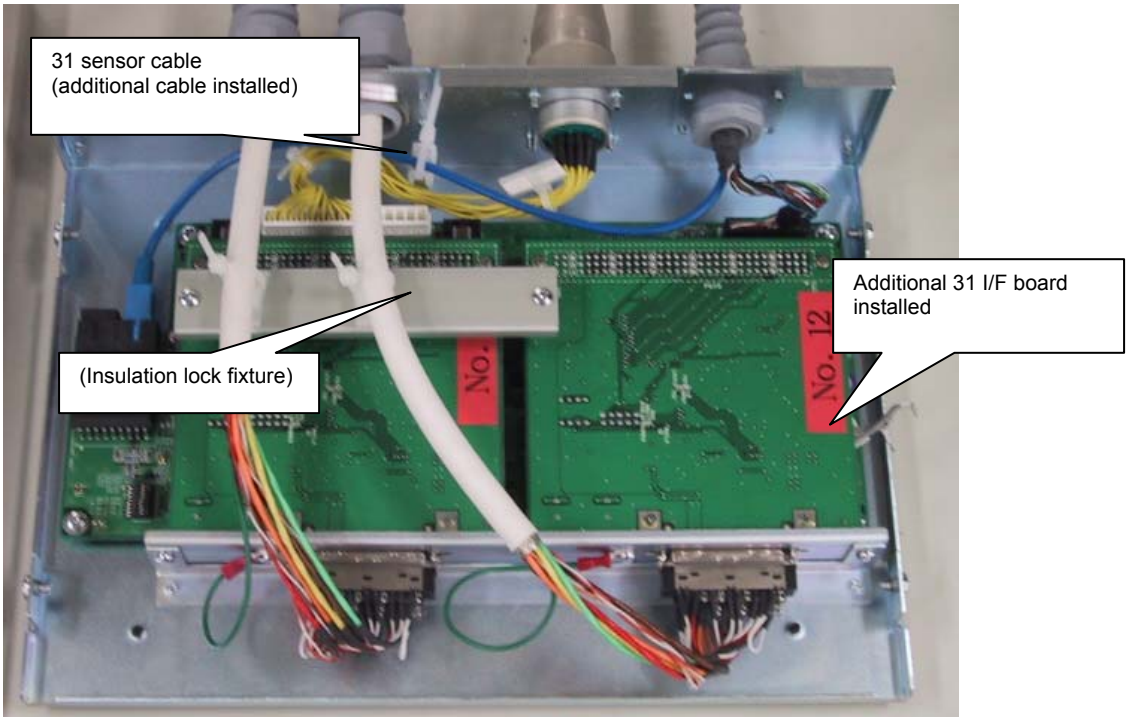
(1) Former E/O box.

1) For single image unit (standard configuration)



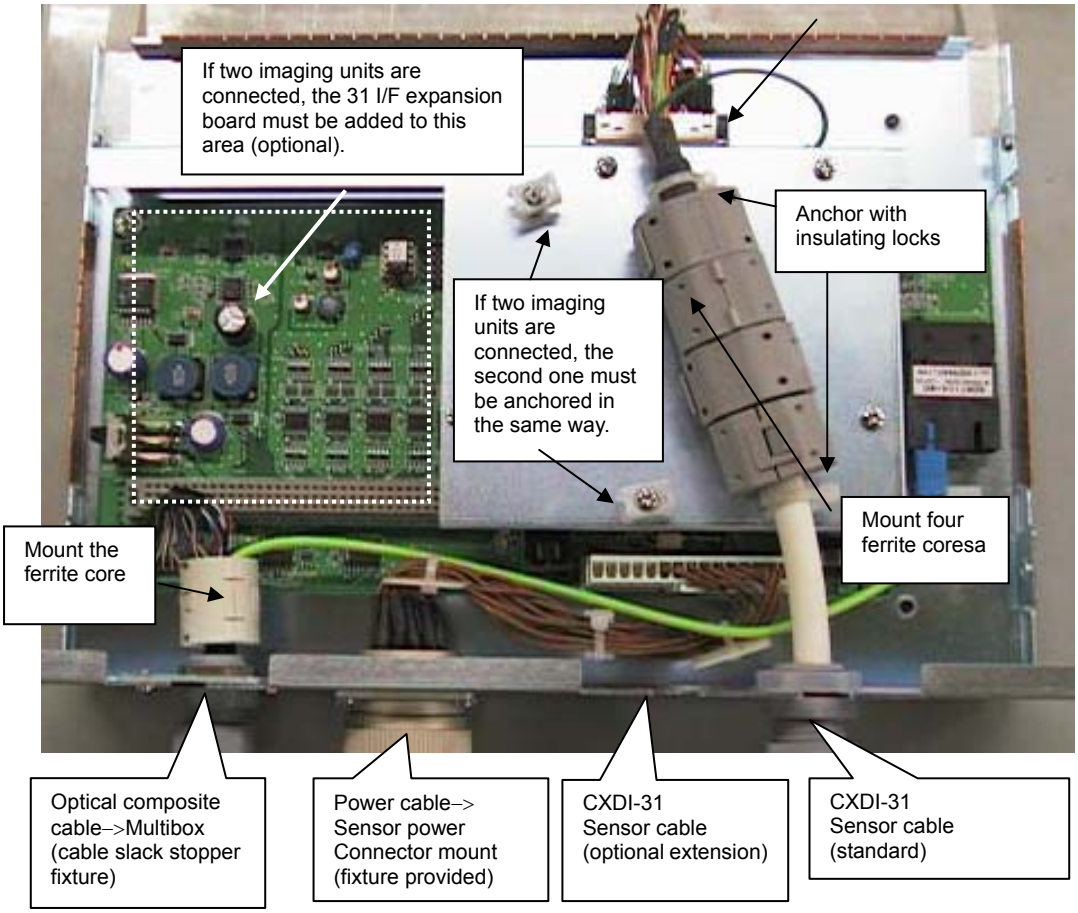
[Fig.2]

2) Imaging unit expanded for two units (optional)



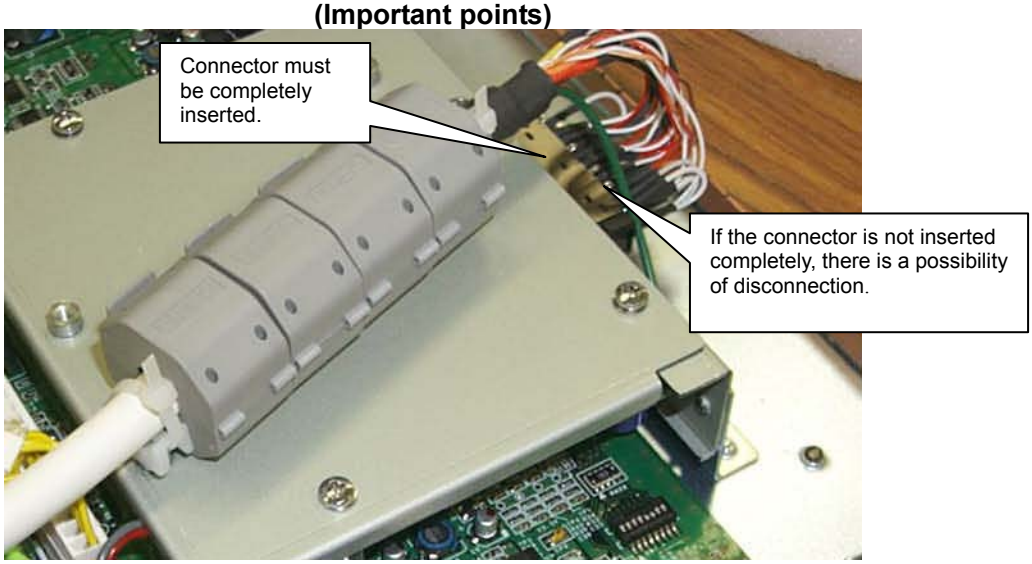
[Fig.3]

(2) New E/O box.



[Fig.2]

(Important points)



[Fig.3]

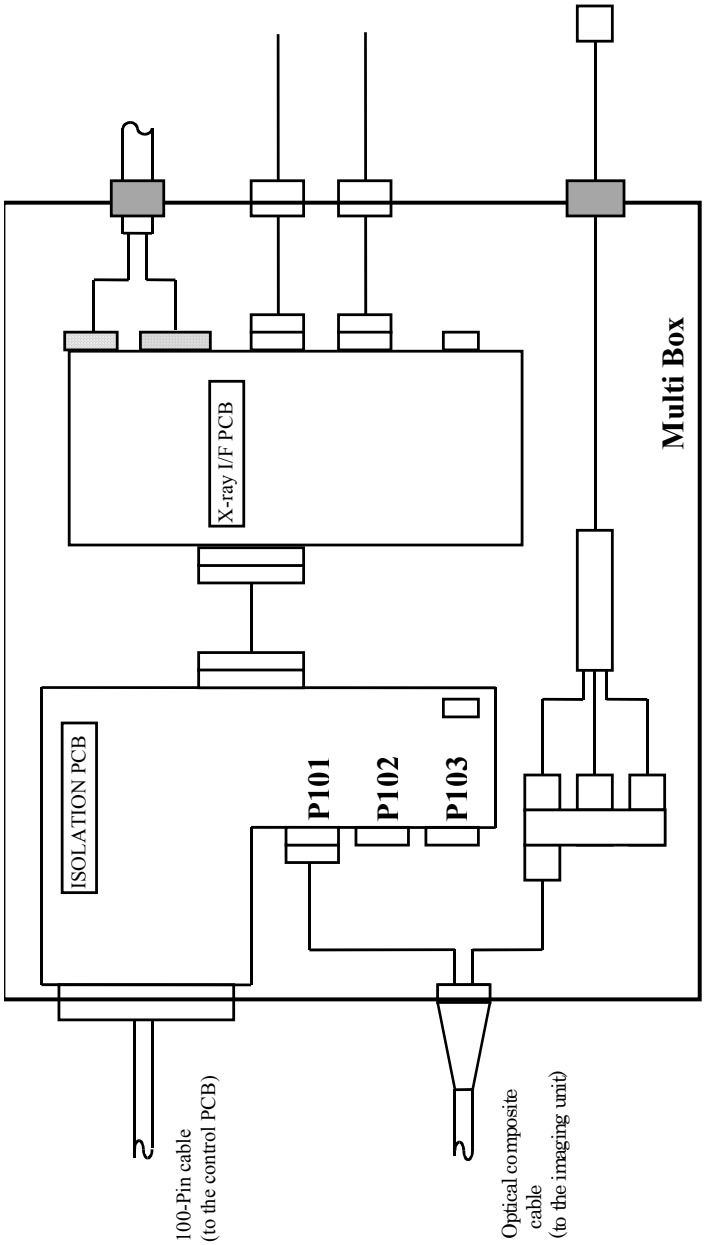
4.1.3. Imaging Unit and Multi box

(1) Relation table for connecting of between CXDI-1 series to Multibox

Imaging unit / Multi box	CXDI-11	CXDI-22	CXDI-31
P101	X	○	X
P102	○	○	○
P103	○	X	○

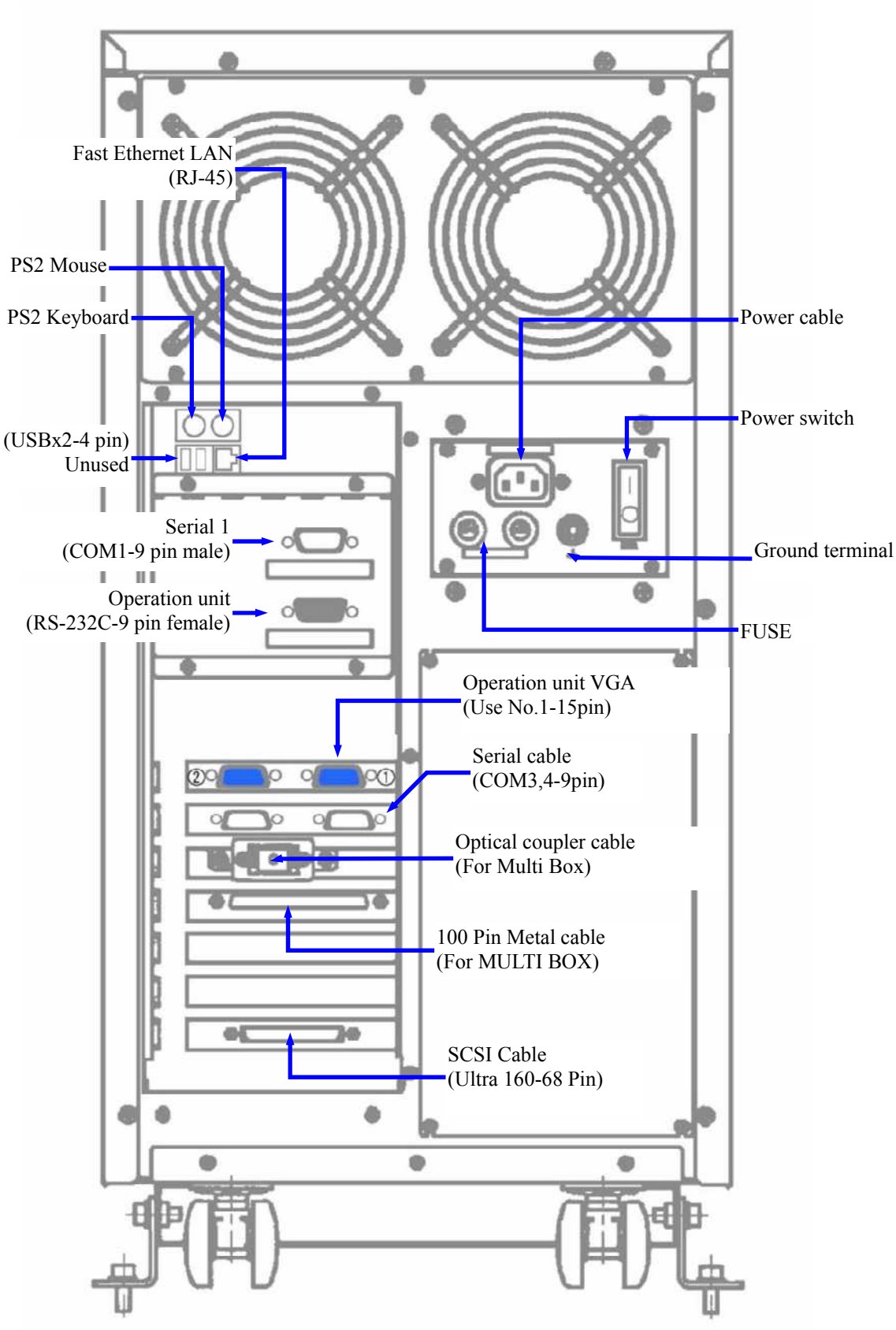
[Table 1]

(2) Multi Box Block Diagram



[Fig.4]

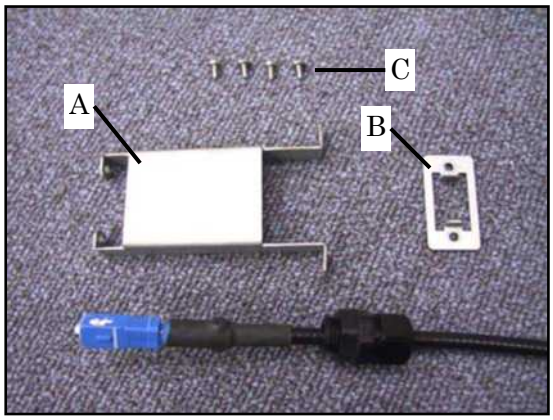
4.1.4. Control PC Rear Panel Connectors



[Fig.5]

4.1.5. Attaching photocoupler cable to the control PC unit

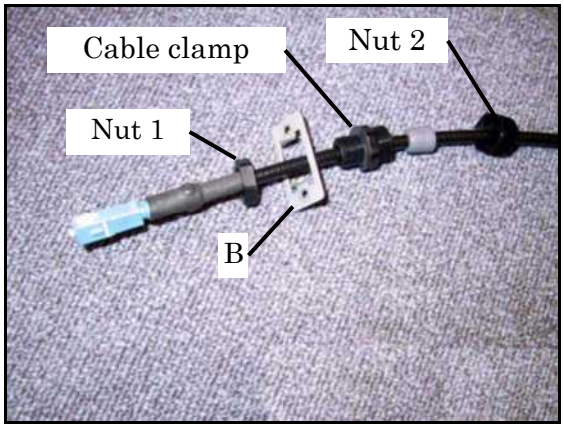
(1) Prepare the following parts (see Fig. 1):



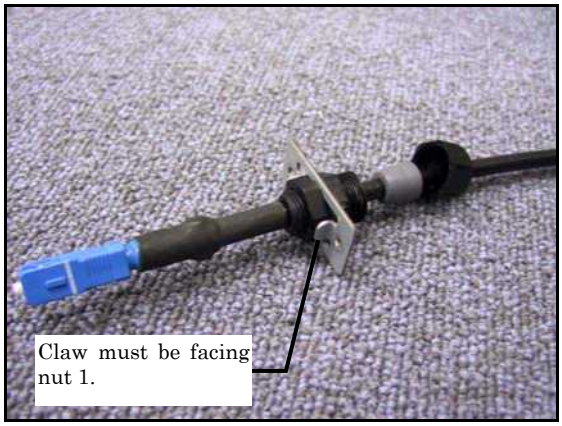
A: Photocoupler cable holding plate 1
B: Photocoupler cable holding plate 2
C: Screw (XB1-2300-506) x 4

(Fig. 1)

(2) Remove nut 1 from photocoupler cable clamp. Put part B on side of nut 1 and tighten nut 1. (Fig. 2)
Part B must be put so that the claw on part B is facing toward nut 1. (Fig. 3)

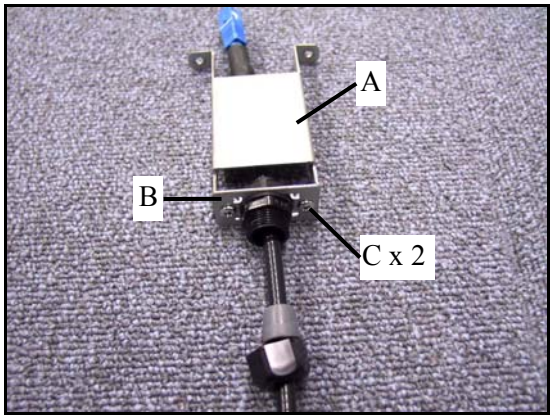


(Fig. 2)



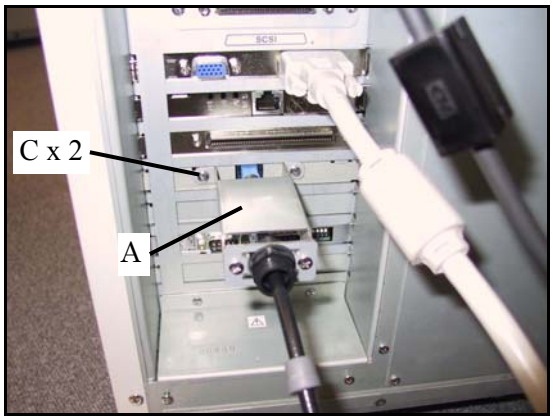
(Fig. 3)

(3) Attach part A to part B with two screws C.



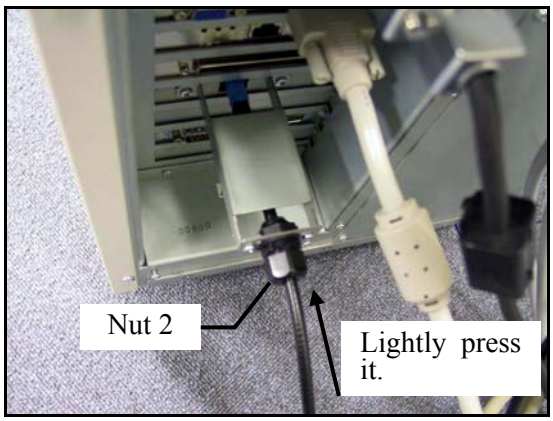
(Fig. 4)

(4) Insert the photocoupler to the back of control PC unit and attach A with two screws C. (Fig. 5) In this condition, the cable clamp is free.



(Fig. 5)

(5) Tighten nut 2 of the cable clamp while lightly pressing the photocoupler cable against the control PC unit. (Fig. 6)



(Fig. 6)

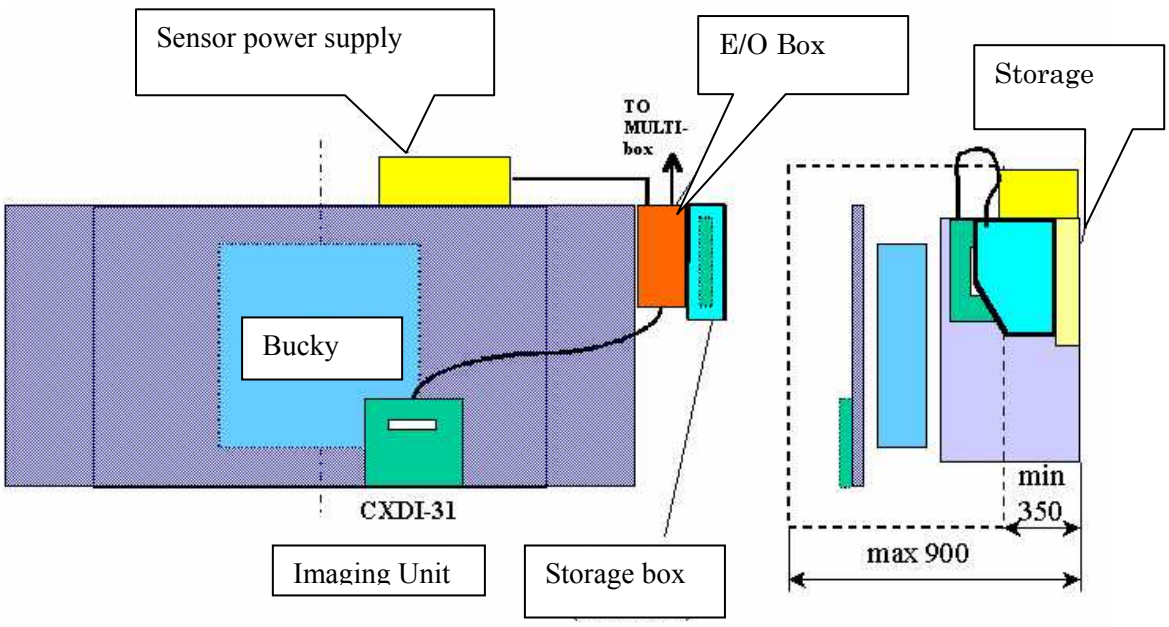
(6) After the attachment, check that the photocoupler cable is securely locked.

4.2. Methods for Securing the E/O Box

4.2.1. Simple set-up for a general-purpose table for over including Pausch's table

(1) Caution
1) The CXDI-31 operates in the entire range above the top of the table.
2) Fix the E/O box and the storage box to the base bracket.
3) Set up the main unit storage box. (This can be placed anywhere.)

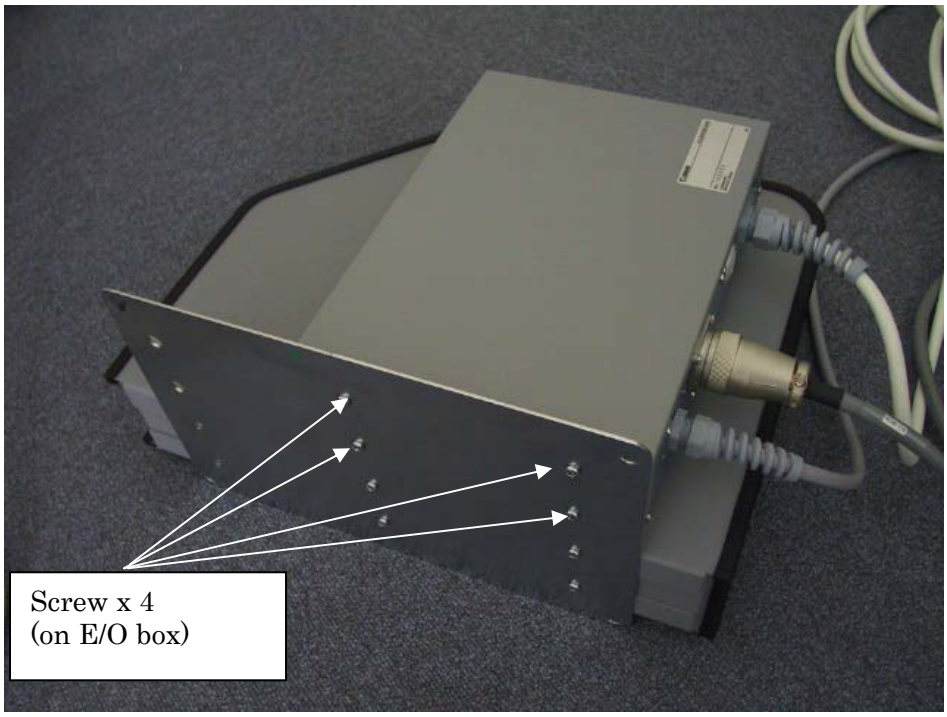
(2) Schematic diagram



[Fig.6]

4.2.2. Set up for the storage box

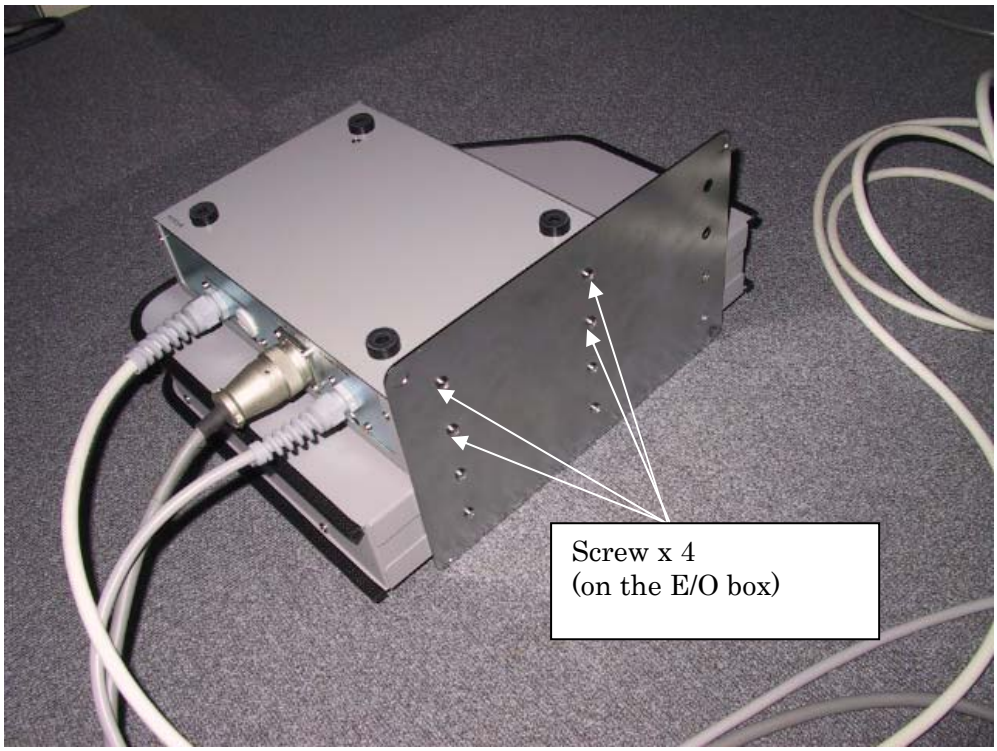
(1) Set up on the right side



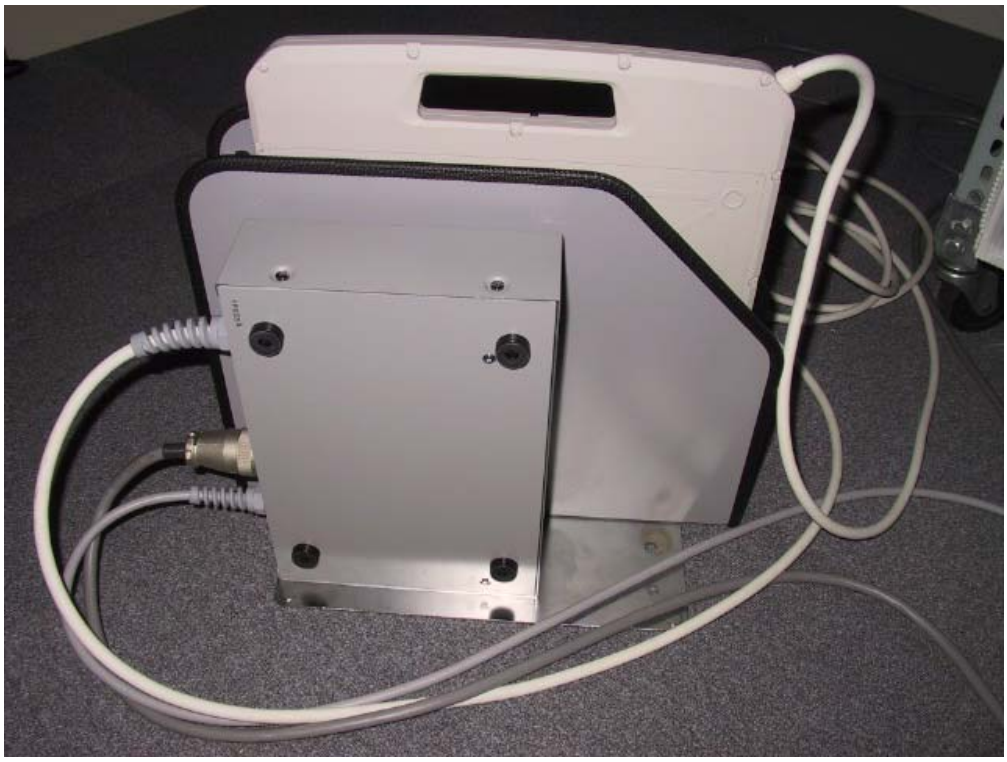
[Fig.7]

[Fig.8]

(2) Set up on the left side



[Fig.9]



[Fig.10]

4.3. Settings

4.3.1. Checking and Setting the Date and Time

(1) Purpose

The date and time is set to Japan standard time at factory shipment.
Reset the date and time to your local value as necessary.

(2) Procedure

1) Connect the keyboard and mouse to the rear of the control PC.

2) Turn on the system power and start the CXDI. (excluding stand)

3) After the CXDI application starts, press the [Tab] key while holding down [Alt] key to display the command prompt.

4) The message “Welcome to CCR” appears in the command line. If it does not appear, press [Esc] key.

5) Then enter the number [8] and press [Enter] key.

6) Minimize the command prompt window.

6) The Windows NT desktop appears.

8) Select Setting from the Start menu and open the Control Panel.

9) Click the Date and time icon to open the date and time property.
Start → Setting → Control Panel → Date and Time

10) The Date and time property contains date, time, and time zone tags. Change the values, press the Update button, and then the OK button to close the date and time property.

11) The Windows NT desktop appears.

12) Restart Windows NT.

4.3.2. LANMIT Image Correction

(1) Purpose

Image data is input to the control PC's hard disk, and software calibration is performed to correct the inherent image characteristics of the LANMIT.

(2) Notes

1) This adjustment must be performed during installation, when replacing the imaging unit (sensor) or the control PC (hard disk), or when the device combination is changed.

2) This adjustment is performed to correct the inherent image characteristics of the LANMIT. Note that the image data must be entered for each imaging unit that is connected.

3) This adjustment can be performed from only the control PC. When only the control PC is started up, a "Sensor Detect Error (-5101)" message is displayed when you open the CXDI application, but you may ignore this message and proceed with the procedure.

(3) Input of image data file

1) Take off the left-side cover of the control PC.

2) Control the keyboard and mouse to the control PC.

3) Turn on the operation unit, and then turn on the control PC and start up Windows NT.

4) Insert the "Sensor DEF Data" disk supplied with the imaging unit into the floppy disk drive of the control PC.

5) Open Windows NT Explorer from the Windows NT desktop.
Start→ Programs→Windows NT Explorer

6) Open"3½Floppy (A:)" and find the "*******.dp" file. Copy this file to the "Ccr" folder in the D drive.

7) After copying, close Windows NT Explorer, and then remove the "Sensor DEF data" disk from the floppy disk drive.

8) Exit Windows NT, and turn off the power of all equipment.

(4) Creation of Sensor DEF data (DP file) (For reference)

A floppy disk for data unique to each imaging unit usually comes with the imaging unit. However, when the data is not supplied for some reason, dealers can create the Sensor DEF data from the original data (text file) supplied by Canon. Here is the method to create the data.

1) Start up the CXDI.

2) When the ordinary imaging screen appears on the operation unit, move to the debug mode using the keyboard ([Alt] + [Tab] keys).

3) You will see the "Welcome to CCR" screen. Select '7. Debug …".

4) You will be prompted to enter a password by the message, "Please Enter Password:". Enter your password.

5) The Debug Menu appears. Select "3. IP Debug …".

6) The CCR IP Debug Menu is displayed. Select "6. Calibration Process…".

7) The "CCR IP DEBUG CALIBRATION PROCESS MENU" appears. Select "22. Hiratsuka data to Defect Pixels File".

8) You will be asked, "Save defect pattern file? [y]:" Enter "y".

9) "Save defect pattern file Path[ ]:" is displayed. Enter "d:\ccr********.dp". (For ********, enter a serial number of the sensor for which you are creating a DP file.) Enter a full path for *.

10) "Defect data for Cassette (no cross line)?[y];" is displayed. According to the sensor type, enter as follows:
For creating a DP file for CXDI-31 …….Enter "y".
For creating a DP file for CXDI-11, 22 ……Enter "n".
*** Do not mistake the entry because proper image correction is not performed if you mistake the selection.**

11) "Hiratsuka Defect File Name?[ ]:" is displayed. Enter "a:******.txt", the file name specified by Canon.

* Enter a full path for *.Here is an example when data is read from a floppy disk.

12) When a DP file is created, “defPat process success.” and “Make Bitmap image of defect pattern?[y]:” are displayed. Enter “n”.

13) You will go back to the “CCR IP DEBUG CALIBRATION PROCESS MENU”. Select “20. Edit Text Info. In Defpix File”.

14) The message below appears. From 0 to 3, select the serial number of the sensor for which you want to correct the DP file.
A/D Board No. 0-0 Serial No. ********
A/D Board No. 0-1 Serial No. ********
A/D Board No. 0-2 Serial No. ********
A/D Board No. 0-3 Serial No. ********
Select Defect Pixel File ([0-3]: AD No. Other :Specify)[0= 0x0]:

15) The message below appears. Carefully select as follows because proper image correction is not performed if you mistake the selection.
DP file for CXDI-31 …… Enter “2”. (Seamless correction not required)
DP file for CXDI-11, 22 ….. Enter “1”. (Seamless correction required)
######## Seamless-Type Part Edit ########
Edit (1) or Clear (2) Info. [1=0x1]:
* Only when you enter “1”, “Select Seamless Type 0:No 3:Type3 100:TypeH[3=0x3];” is displayed. Enter “2”. (Seamless correction required)

16) The message below appears. Enter “2”.
######## Sensitivity-Correction Part Edit ########
Edit (1) or Clear (2) Info. [1=0x1]:

17) “Do you want to save this command? (N:0, Y:1) [1=0x1]” is displayed. Enter “1”.

18) “save defect pattern files Path [********.dp]:” appears. Enter the DP file to which the correction data is to be written. Usually the file name is overwritten and you do not have to enter the name.

19) “save success.” is displayed. You will go back to the “CCR IP DEBUG CALIBRATION PROCESS MENU”. Move to “Welcome to CCR” menu and select “8. Exit” to close the CXDI application.

4.3.3. Checking the Firmware Version

(1) Purpose

1) Failing to use the proper versions of the A/D board firmware and capture board firmware with the CXDI application can result in an error, and system operation cannot be guaranteed. Therefore, the versions of the firmware must be checked to ensure that they are correct.

(2) Notes

1) This check should always be performed at installation, and if necessary, the firmware versions should be upgraded.

2) This check cannot be performed with only the control PC. Connect the imaging units and other equipment, and start up in the normal imaging status.

(3) Procedure

1) Connect the keyboard and mouse to the control PC.

2) Use the capture board interface cable to connect P1 on the capture board to PORT1 (COM3) on the serial board.
   * For more information, see “Hyper Terminal Setting”

3) Start up the CXDI system
   * Start up the CXDI application.
     Note that if the CXDI application does not start up, the version number information displayed in step 13 is the information read from the A/D board at the last startup.

4) When the normal imaging screen (ignore if an error message is displayed) is displayed on the operation unit, use the keyboard to enter debugging mode. (Use [Alt] + [Tab].)

5) “Welcome to CCR” is displayed. Select “8- Exit”

6) This returns you to Windows NT. Start up HyperTerminal, and make the settings for the new connection. For more information on connections, see “Hyper Terminal Setting”.

7) After making the HyperTerminal settings, press the [Enter] key on the keyboard.
   * In the following steps, always press the [Enter] key after making the keyboard input.

8) The Boot code menu is displayed on the HyperTerminal screen. Select “9: Misc”.

0:
1: Debug commands
2: Memory
3: Log
4:
5:
6:
7:
8:
9: Misc

9) The menu shown below is displayed. Select “9: Jump to main code”.

0: Re-fix sns port
1:
2:
3:
4:
5:
6: Initialize system timer
7:
8:
9: Jump to main code

10) A message is displayed indicating that the system has switched to main code. Press the [Enter] key.

--- CXDI-22 Capture Main Code Ver.2.0.12 for SSB ---
total operation time = *d**h**m**s***ms
MSG:[CAPT/DPR/DEC] STS reg rcv 4000
:
:
:
MSG:[LIB/DPR/TRN] DPR trn done 0001

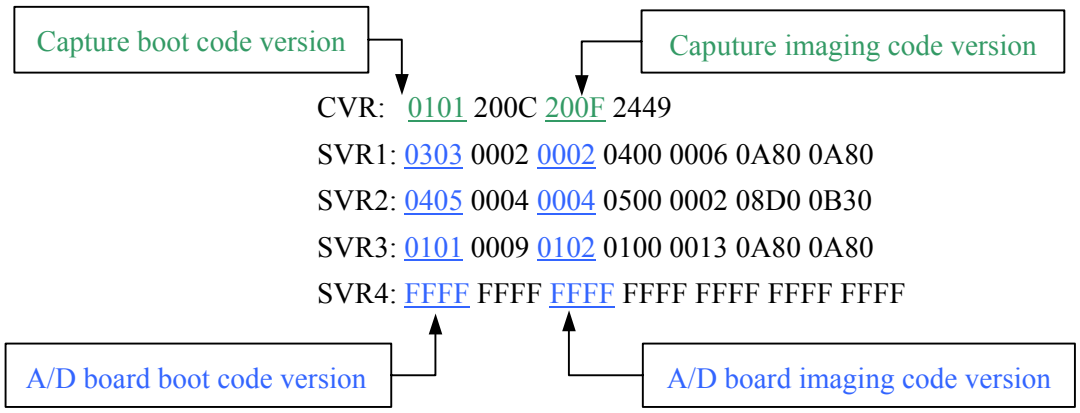
11) The Main code menu is displayed. Select “1: Debug commands”

0: Send sensor commands
1: Debug commands
2: Memory
3: Log
4:
5:
6:
7:
8:
9: Misc

12) The menu shown below is displayed. Select “5: Dump DPRAM registers”.

0: Get image from A/D
1:
2: Set read mode from capture
3: Test mode for EMC
4:
5: Dump DPRAM registers
6:
7:Drive signal line check
8: Set force Xtmo
9: Change echo level

13) The DPRAM contents are displayed. Find the item shown below in this information, and check the firmware versions.



* Channels that are not connected to the sensor are displayed as “FFFF”.

14) Once you finish checking, close HyperTerminal, shut down the control PC, and then remove the capture board interface cable.

4.3.4. Installing A/D Board Exposure Code

(1) Purpose

To write exposure code into the Flash ROM of the A/D board.

(2) Notes

Be sure to check the following items before installing the exposure code:

1 CXDI application software is installed.

2 A/D board Boot Code is installed.

3 CXDI is connected to build up the system.

(3) Procedure

1) Open the left side cover of the control PC unit.

2) Turn on the power of the whole CXDI system. Then, start Windows NT.

3) Insert <A/D Board Exposure Code> floppy disk into the control PC's floppy drive.

4) Click the Start button, point to Programs, and then click Command Prompt.

5) C:\> prompt appears. After C:\>, type the commands following the instruction below:

Type d: and press [ENTER] key.

Type cd␣ccr and press [ENTER] key. (␣ indicates space)

Type the number of the sensor to which you wish to write.

Type caploa␣d/s␣1 to input to sensor 1.

Type caploa␣d/s␣2 to input to sensor 2.

Do not press the [Enter] key here.

6) Open Windows NT Explorer at this stage in step 5). (It is better if the window is not set to full-screen display.)

Start → Programs → Windows NT Explorer

7) A file named "****.mot" is contained in 3½ Floppy (A:). Drag and drop this file to copy it to caploa␣d/s␣1, and then press the [Enter] key after selecting the Command Prompt screen.

* Display on the Command Prompt screen

d:\ccr>caploa␣d␣\s␣1␣a:****.mot ← Displayed as the full path.

8) oooooo… appears and installation starts. Wait until it stops.

9) When writing is completed, Complete! appears.

10) Remove the A/D Board Exposure Code floppy disk from the control PC's floppy drive.

11) Exit Windows NT.

12) Turn off the power of all units.

4.3.5. Checking the Sensor Serial No.

(1) Purpose

1) When the A/D boot loader is installed, the sensor serial number (image file name) written in the flash ROM of the A/D board can be erased. Therefore, the sensor serial number must be checked.

2) Also, if the sensor serial number stored in the flash ROM of the A/D board differs from the image data file name stored in the hard drive of the control PC during installation, the connected sensor can not be detected after the CXDI application is launched. In that case an error message appears.

(2) **Notes**

1) This checking procedure should always be performed in the following cases.
   1 When the A/D boot loader has been rewritten during installation.
   2 When the A/D board has been replaced.
   3 When the sensor in the imaging unit has been replaced.

2) This checking procedure cannot be performed with only the control PC.
Connect the imaging units and other equipment, and then start up in the normal imaging status.

(3) Procedure

1) Connect the keyboard and mouse to the control PC.

2) Use the capture board interface cable to connect P1 on the capture board to PORT1 (COM3) on the serial board.
   *** For more information on connections, see "Hyper Terminal Settings".**

3) Start up the CXDI system.
   *** Start up the CXDI application. If the CXDI application is not started up, you can not go to the checking steps.**

4) When the normal imaging screen is displayed on the operation unit, start up Hyper Terminal for settings.
   *** For the settings, see "Hyper Terminal Settings".**

5) After making the HyperTerminal settings, press the [Enter] key on the keyboard.
   *** In the following steps, always press the [Enter] key after making the keyboard input.**

6) The following menu appears on the Hyper Terminal screen.

0: Send sensor commands
1: Debug commands
2: Memory
3: Log
4:
5:
6:
7:
8:
9: Misc

(4) Sensor Serial No. Check

1) On the menu screen explained in (3) – 6) above, select "0: Send sensor commands".
2) When "ch idx =" appears, type the channel number of the sensor you want to check, "1" if the channel number is 1.
3) When "Cmd str=" appears, enter the command "//osvr".
   *** Make sure to type the correct command.**
4) The sensor information is displayed. Check that the sensor serial number written on the A/D board is the same as the image data name file (********.dp) entered at "Installation of LANMIT Image Correction Data".

For CXDI-11/12:
CH1: $$OS returned 0000
CH1: $$VR XXXX XXXX XXXX **0100 0017** ← Sensor serial no. written
CH1: $$CXDI-11 sensor main code

For CXDI-22
CH1: $$OS returned 0000
CH1: $$VR XXXX XXXX XXXX **0400 0019** ← Sensor serial no. written
CH1: $$CXDI-22 AD main code

For CXDI-31
CH1: $$OS returned 0000
CH1: $$VR XXXX XXXX XXXX **0500 0002** XXXX XXXX ← Sensor serial no. written
CH1: $$CXDI-31 DEB AD main code

5) If the sensor serial number of the A/D board in step 4) is correct, close HyperTerminal, and then perform the exit procedure in step (5) –9).
   If the sensor serial number is different, enter the sensor serial number here referring to step (5) below.

(5) Entering the Sensor Serial No.

1) If you press [Esc], the Main code menu is displayed. Select “9 : Misc”

0: Send sensor commands
1: Debug commands
2: Memory
3: Log
4:
5:
6:
7:
8:
9: Misc

2) The menu below appears. Select “2: Write sns serial no.”

0: Re-fix sns port
1:Re-scan sns unit
2:Write sns serial no.
3:
4:
5:
6:
7:
8:
9: Jump to main code

3) When “ch idx =” appears, type the channel number of the sensor you want to check, “1” if the channel number is 1.

4) The CXDI application shows the “Capture board control error”. Press OK.

5) The sensor information is displayed. Enter the Sensor serial no. and press [Enter].

For CXDI-11/12

serial num = ← Sensor serial no. written is not displayed.

CH1: BU

MSG:[LIB/DPR/TRN] DPR trn done XXXX **aaaa aaaa**

↑ Sensor serial no. entered

*** The serial number entered should be "space + first 4 digits + space + last 4 digits".**

For CXDI-22/31

↓ Sensor serial no. entered

serial num =

CH1: BU XXXX XXXX XXXX **0400 0001** XXXX XXXX

MSG:[LIB/DPR/TRN] DPR trn done XXXX **aaaa aaaa**

↑ Sensor serial no. entered.

*** The serial number entered should be "space + first 4 digits + space + last 4 digits".**

6) The screen displays "CH1: RE SN 0000". Close the CXDI application and return to Windows NT screen.

7) Restart CXDI application and take the step (4) Sensor serial no. check to ensure the serial number has been changed.

8) Close HyperTerminal, exit CXDI application and shut down the system.

9) Remove the capture board interface cable.

4.3.6. Set Up Startup Menu

(1) Purposes

- Adding to Start menu

To automatically start up the CXDI application when you turn on the power of the CXDI system.

- Charging the window size

To reduce the size of the window when CXDI starts up so that it is not highly visible.

- Removing from the Start menu

To prevent start up of the CXDI application when you turn on the power of the CXDI system.

(2) **Notes**

1) In the default settings, the CXDI is not set to the Start menu.
   After the installation work is completed, be sure to always add the CXDI to the Start menu.
2) The window size is an association function with the shortcut registered to the Start menu.
   Be sure to change the size of the window when setting the CXDI to start up.

(3) Adding CXDI application software onto the Start menu

1) Connect keyboard and mouse to the control PC.

2) Make sure you have already installed necessary software. Turn on the power of all devices and start Windows NT.

3) Click the Start button, point to Settings, and then click Taskbar…

4) Taskbar Properties appears. Click the Start Menu Programs and then click Add.

5) Create a shortcut appears. Click Browse.

6) Browse appears. Find a file named ccrstart.bat in drive [D:\ccr] and click Open.

7) D:\ccr\ccrstart.bat appears in the Command line. Click Next.

8) Select Program Folder appears. Select Startup folder and click Next.

9) Select a name for the shortcut appears. Type ccrstart.bat. Click Finish.

10) Close the Taskbar Properties window, and login again to Windows NT.
Start → Shut Down Windows NT → Close all programs and log off.

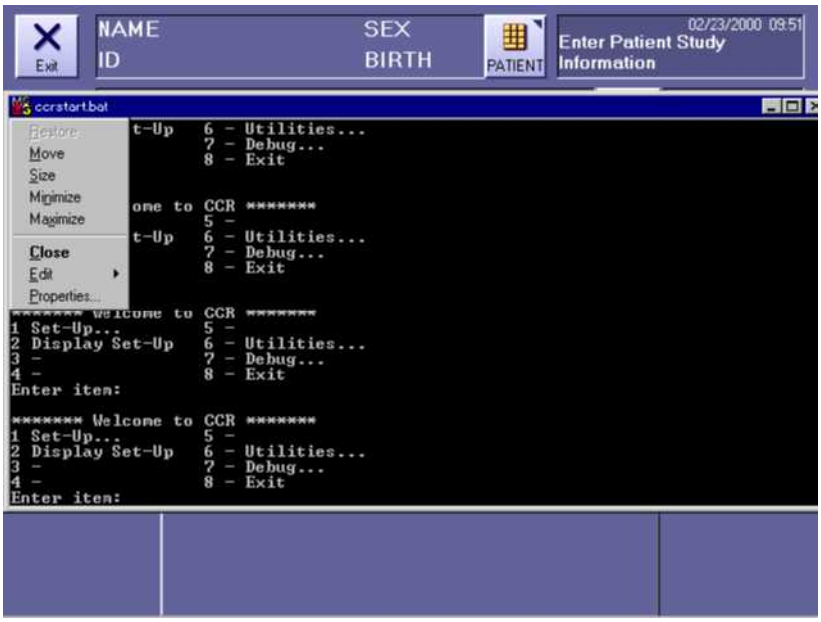
11) After restarting the computer, make sure that the CXDI application starts up.

(4) Changing the window size

1) With the CXDI application open in step 11) above, use the keyboard to enter debugging mode. (Use [Alt] + [Tab].)

2) The command prompt screen is displayed. Click the icon at the top left.

3) A drop-down menu is displayed. Select Properties from this menu. [Fig 1]



[Fig 1]

4) The screen displays “Ccrstart.bat ”Properties. Click the Font tab, and then change Size to 7x12.

5) Click the Layout tab, change Height for the Screen Buffer Size to 5000, and then click [OK].

6) The screen displays Apply Properties to Shortcut. Add a checkmark to Modify shortcut which started this window, and then click [OK].

(5) Removing CXDI application software from the Start menu

1) Connect the keyboard and the mouse to the control PC.

2) Turn on the power for all the equipment in the CXDI system, and start up Windows NT.

3) The CXDI application is started up. Use the keyboard to enter debugging mode. (Use [Alt] + [Tab].)

4) “Welcome to CCR” is displayed. Select “8 – Exit” to close the CXDI application.

5) Windows NT Desktop appears. Click the Start button, point to Settings, and then click Taskbar.

6) Taskbar Properties appears. Click Start Menu Programs tab and click Remove.

7) Remove Shortcuts/Folders dialog box appears. Double-click Startup folder.

8) Click ccrstart.bat, and then click Remove.

9) Are you sure you want to sent ‘Ccrstart.bat’ to the Recycle Bin? appears. Click Yes.

10) Confirm the file ccrstart.bat has been removed from the Start menu. Close all the windows and restart Windows NT.

11) After Windows NT has restarted, make sure that the CXDI application software will not automatically start up. Then, exit CXDI application software.

*** When the CXDI application is deleted from the Start menu due to repair or other reasons, be sure to always perform the procedures outlined in “Adding CXDI application software onto the Start menu” and “Changing the window size” when the repair is complete.**

4.3.7. Identifying the sensor units and setting the number of units to be connected

(1) Objective

1) In order for the control PC to identify the sensor units connected, the sensor serial number of each sensor unit is input to the control PC.

2) When the sensor units are connected, the number of the units which have been connected must be recognized by the control PC, and the settings are performed to this end.

(2) Checkpoints

1) These operations must always be implemented at the installation stage and when any of the sensor units or control PC (hard disk) has been replaced or when the combination of equipment has been changed.

2) The sensor serial numbers must always be input even when only one sensor unit is to be connected. These numbers are the same as what is input to the A/D board. (Refer to " Checking the sensor serial numbers".)

(3) What to have ready

Tool keyboard, tool mouse

(Refer to "System Manual" for the connection methods.)

Setting method

1) Start up the CXDI unit.

2) Once the normal sensor screen has appeared on the operation unit, use the keyboard to transfer to the debugging mode (by pressing the [ALT] + [TAB] keys).

3) "Welcome to CCR" appears. Select "1 Set-Up..."

4) "Setting Mode (0:Normal, 1:Expert)[0=0x0]:" appears. Select "1:Expert."

5) "CCR SETUP MENU" appears. Select "7 Scan Sensor Setup."

6) The "Capture Device Configuration Table" appears. By inputting the number of sensor units in the underlined section of "Max Capture Devices" below, the control PC is made to recognize the number of connected sensor units. For example, input "1" when only one sensor unit is connected, or "4" when four sensor units are connected.

7) By inputting
the serial number of sensor 1 in “A/D Board Serial Number for SensorID#1”,
the serial number of sensor 2 in “A/D Board Serial Number for SensorID#2”,
the serial number of sensor 3 in “A/D Board Serial Number for SensorID#3” and the serial number of sensor 4 in “A/D Board Serial Number for SensorID#4”,
it is possible to allocate the respective sensors to the sensor IDs displayed on the operation unit.
Check that DEF has been selected as the “Fixed Defect Pixel, DEF or NO” setting.

@@@@@@@@ Capture Device Cofigration Table @@@@@@@@
Format Version [0 = 0x0] : 0
Max Capture Devices [4 = 0x4] : 4 ..... ←**The Number of connected sensor units**
@@@@@@@@ Capture Device Configration No.0 (SensorID#1 OPU)@@@@@@@@@
------A/D Board Serial Number 0-0 -> 0x199
------A/D Board Serial Number 0-1 -> 0x2009
------A/D Board Serial Number 0-2 -> 0x123
------A/D Board Serial Number 0-3 -> 0x124
A/D Board Serial Number for SensorID# [0x199 = 409] : ___ .....← **Serial No.**
R Capture Board Index [0 = 0x0] : 0 **of sensor 1**
R A/D Board Index [0 = 0x0] : 0
R LANMIT Index [0 = 0x0] : 0
Custom Type[0:NO CUSTOM 1:STAND 2:TABLE 3:UNIV 4:CASSETTE] [0 = 0x0] : 0
White Average Min Limit [2000 = 0x7D0] : 2000
White Average Max Limit [3000 = 0xBB8] : 3000
White Diff Limit [500 = 0x1F4] : 500
Times Of The Standard Dev. [10 = 0xA] : 10
Fixed Defect Pixel, DEF or NO [DEF] : DEF..... ← **Normally DEF**

:
:
:

@@@@@@@@ Capture Device Configration No.1 (SensorID#2 OPU)@@@@@@@@@

------A/D Board Serial Number 0-0 -> 0x199

------A/D Board Serial Number 0-1 -> 0x2009

------A/D Board Serial Number 0-2 -> 0x123

------A/D Board Serial Number 0-3 -> 0x124

A/D Board Serial Number for SensorID#2 [0x2009 = 8201] : ____ .....← **Serial No.**

R Capture Board Index [0 = 0x0] : 0 **of sensor 2**

R A/D Board Index [1 = 0x1] : 1

R LANMIT Index [0 = 0x0] : 0

Custom Type[0:NO CUSTOM 1:STAND 2:TABLE 3:UNIV 4:CASSETTE] [0 = 0x0] : 0

White Average Min Limit [2000 = 0x7D0] : 2000

White Average Max Limit [3000 = 0xBB8] : 3000

White Diff Limit [500 = 0x1F4] : 500

Times Of The Standard Dev. [10 = 0xA] : 10

Fixed Defect Pixel, DEF or NO [DEF] : DEF ..... ←**Normally DEF**

:

:

:

@@@@@@@@ Capture Device Configration No.2 (SensorID#3 OPU)@@@@@@@@@

------A/D Board Serial Number 0-0 -> 0x199

------A/D Board Serial Number 0-1 -> 0x2009

------A/D Board Serial Number 0-2 -> 0x123

------A/D Board Serial Number 0-3 -> 0x124

A/D Board Serial Number for SensorID#3 [0x123 = 291] : ___ .....← **Serial No.**

R Capture Board Index [0 = 0x0] : 0 **of sensor 3**

R A/D Board Index [2 = 0x2] : 2

R LANMIT Index [0 = 0x0] : 0

Custom Type[0:NO CUSTOM 1:STAND 2:TABLE 3:UNIV 4:CASSETTE] [3 = 0x3] : 3

White Average Min Limit [2000 = 0x7D0] : 2000

White Average Max Limit [3000 = 0xBB8] : 3000

White Diff Limit [500 = 0x1F4] : 500

Times Of The Standard Dev. [10 = 0xA] : 10

Fixed Defect Pixel, DEF or NO [DEF] : DEF..... ←**Normally DEF**

@@@@@@@@ Capture Device Configration No.3 (SensorID#4 OPU)@@@@@@@@@

------A/D Board Serial Number 0-0 -> 0x199

------A/D Board Serial Number 0-1 -> 0x2009

------A/D Board Serial Number 0-2 -> 0x123

------A/D Board Serial Number 0-3 -> 0x124

A/D Board Serial Number for SensorID#4 [0x124 = 292] : ___..... ←**Serial No.**

R Capture Board Index [0 = 0x0] : 0 **of sensor 4**

R A/D Board Index [3 = 0x3] : 3

R LANMIT Index [0 = 0x0] : 0

Custom Type[0:NO CUSTOM 1:STAND 2:TABLE 3:UNIV 4:CASSETTE] [0 = 0x0] : 0

White Average Min Limit [2000 = 0x7D0] : 2000

White Average Max Limit [3000 = 0xBB8] : 3000

White Diff Limit [500 = 0x1F4] : 500

Times Of The Standard Dev. [10 = 0xA] : 10

Fixed Defect Pixel, DEF or NO [DEF] : DEF ..... ← **Normally DEF**

7) When “CCR SETUP MENU” appears, press the [Esc] key to return to “Welcome to CCR.”

8) Select “8 - Exit” from “Welcome to CCR” to exit the CXDI application.

9) Operation now returns to the Windows NT desktop screen so restart the CXDI application.

4.3.8. Entering Control PC Serial Number

(1) Purpose

To enter the product serial number for “Device Serial Number” of DICOM header.

(2) Procedure

1) Start up the CXDI system.

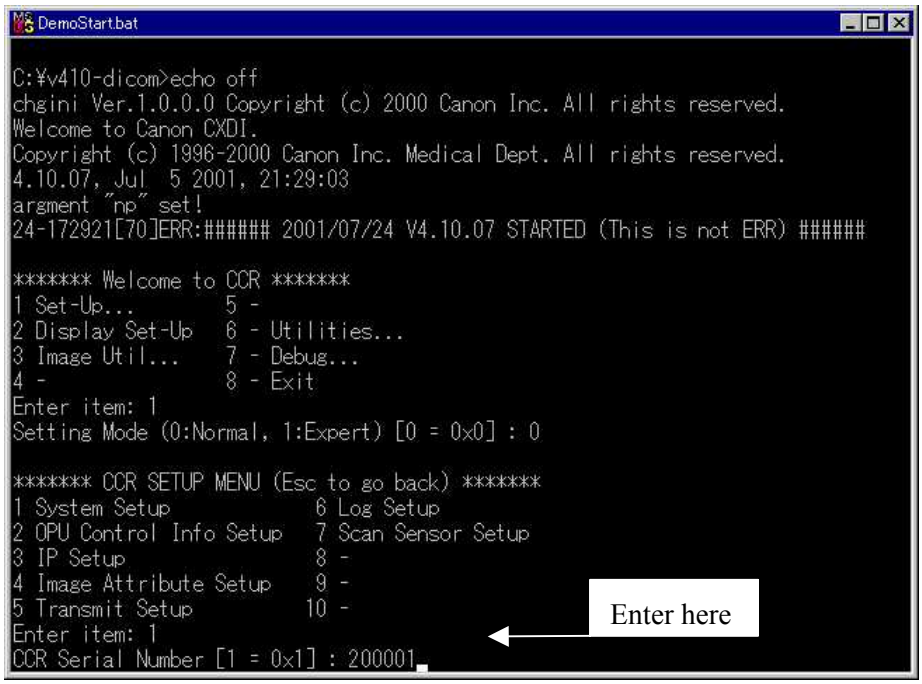
2) After the exposure screen appears on the operation unit, use the keyboard to enter Debug mode. (Use [Alt]+[Tab].)

3) “Welcome to CCR” screen appears. Select “1. Set-Up…”

4) The screen displays “Setting Mode (0: Normal, 1: Expert) [0=0×0]:” Select “0: Normal”
Note: Do not select “1: Expert”

5) “CCR SETUP MENU” appears. Select”1. System Setup”

6) “CCR Serial Number [0=0×0] : ” appears. Enter the six-digit number indicated on the naming label of the control PC unit. Press [Enter] key until “CCR SETUP MENU” appears. [Fig 1]



[Fig 1]

7) Press [Esc] key after “CCR SETUP MENU” appears to return to “Welcome to CCR” screen.

8) Select “8-Exit”to exit CXDI application software.

9) This returns you to the Windows NT desktop. Restart the CXDI application, and perform the procedure from steps 2) to 5). Check that the serial number for the “CCR Serial Number” item was entered correctly in step 6).

*** Restart the CXDI application. The screen displays the following message: Alert System Info Error (-6) A/D board info is updated. Click “OK”**

4.3.9. TABLE SETUP Settings

(1) Purpose

Adjust the CXDI operation unit's TABLE SETUP to match the exposure conditions (X-ray tube voltage, X-ray tube current, msec or mAs value) of the X-ray generator.

(2) Procedure

1) Boot the CXDI system.

2) Open the TABLE SETUP Change window from the Normal Exposure window.
System → SETUP MENU → SYS. SETUP → TABLE SETUP

3) Select the tabs to be changed and change the X-ray tube voltage, X-ray tube current, and msec or mAs value data to match the exposure conditions of the X-ray generator.
*** See the operation manual for the details of settings.**

4) After finishing the changes, return to the Normal Exposure window and check that the TABLE SETUP has been changed.

4.3.10. Performing the annotation settings

(1) Objective

1) The settings for imprinting the annotation onto the film and the settings of the characters used for the annotation are performed.

(2) Settings

1) Once the normal radiographic screen has started, open the annotation setting screen.
SYSTEM → SETUP MENU → SYS. SETUP → ANNOTATION

2) The annotation setting screen now appears. Proceed with the settings that will make it possible to print the data desired by the user.
*** See the operation manual for the details of settings.**

4.3.11. Network connections

Network settings

(1) Objective

These settings are for connecting the CXDI to the network.

1) Set the CXDI's IP address, subnet mask and default gateway in Windows NT.

2) Set the printer and storage output destinations and parameters on the user screen.

(2) Checkpoints

1) This item involves checking the details of the checks performed on network setting parameters among the pre-installation inspection details and setting these parameters.
*** Refer to "Appendix: Investigation Report" for the pre-installation investigation details.**

2) Perform the settings of this item carefully since any errors made in these settings will make it impossible for connection to be made to the network or the images to be transmitted properly, etc.

(3) Windows NT settings

1) Connect the keyboard and mouse to the control PC.

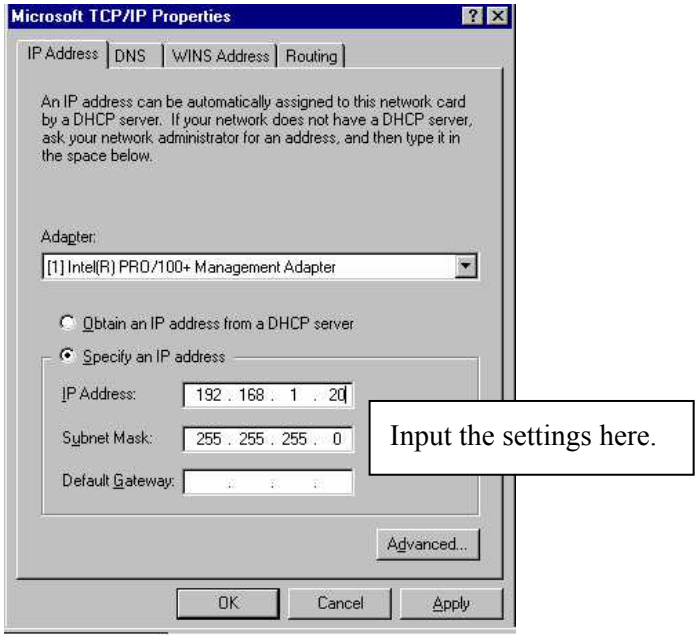
2) After turning on the operation unit's power and then the control PC's power, start Windows NT.

3) The Windows NT desktop screen appears. Right-click the [Network Neighborhood] icon, and select [Properties] from the menu.

4) "Network" appears. Click the "Protocol" tab.

5) "Protocol" appears. Click [Properties].

6) Based on the pre-installation inspection details, set the IP address, subnet mask and default gateway.



[Fig 1]

7) Upon completion of the setting, restart the WindowsNT.

8) Check the communication test in the sequence below to verify whether the CXDI is now part of the network. To check the connections at the TCP/IP level, use the "ping" command from the command prompt.

Start → Programs → Command Prompt

When the IP address of the connection destination is "173.17.7.123," for instance, the following messages will be repeated.

- **If the CXDI has been connected properly:**

  Pic:>ping 172.17.7.123 (input on the DOS screen)
  Pinging 17217.7.123 With 32 bytes of data:
  Reply from 172.17.7.123:bytes=32 time <10ms TTL=255
  Reply from 172.17.7.123:bytes=32 time <10ms TTL=255
  Reply from 172.17.7.123:bytes=32 time <10ms TTL=255
  Reply from 172.17.7.123:bytes=32 time <10ms TTL=2550

- **If the CXDI has not been connected properly:**

  Pic:> ping 172.17.7.123 (input on the DOS screen)
  Pinging 17217.7.123 With 32 bytes of data:
  Request time out
  Request time out
  Request time out
  Request time out

(4) Set the printer and storage which serves as the external output destinations.

In this case, one printer and one storage are set.

1) Printer settings

A. Open the output destination setting screen from the user menu.

System → SETUP MENU → DESTINATION → PRINTER

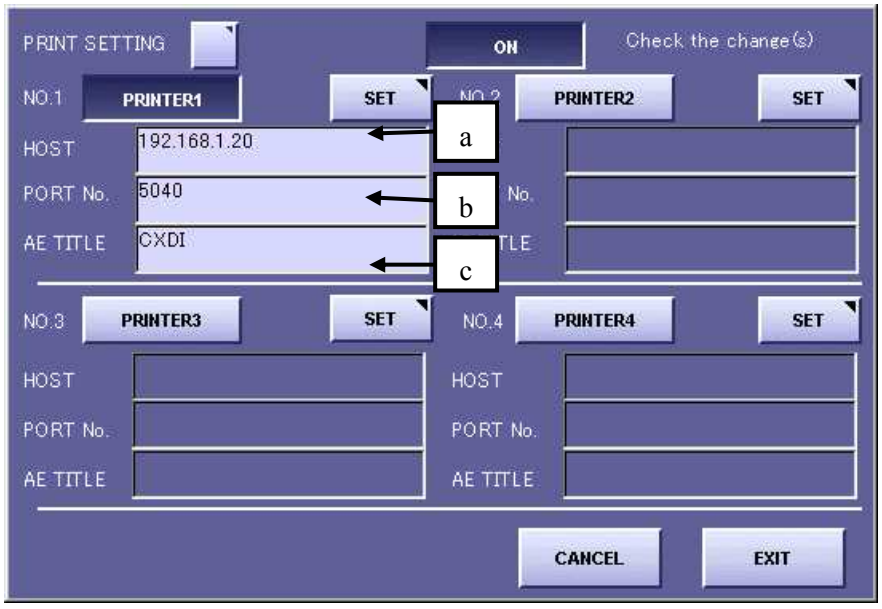
*** Up to four printers (2 of which can be used for output at the same time) can be set.**

B. Press the "Printer1" button, and input the following items based on the pre-installation investigation details.

a. Printer host name (IP address)

b. Port number

c. Transmission destination title

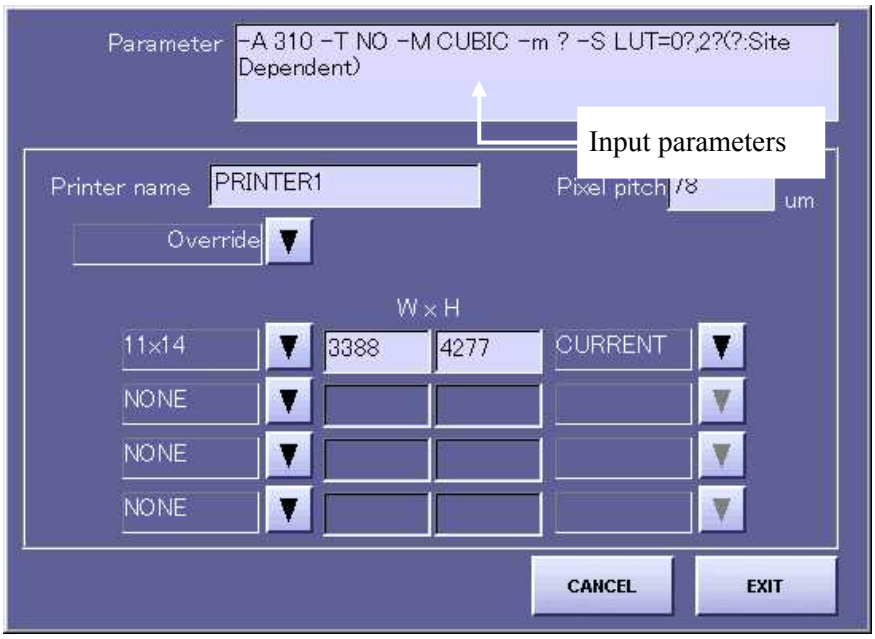


[Fig 2]

B. Press the “SET” button, and input the parameters of the printer to be connected based on the pre-installation inspection details. (Refer to the separate parameter table for details of the parameters.)

*** A space must be input between each of the parameters.**

By pressing the “Override” button, you can select a printer from all the registered printers. In this case, basically you do not have to enter parameters. However, if “?” is displayed within the parameters, you may have to enter the required parameter at the user’s site.

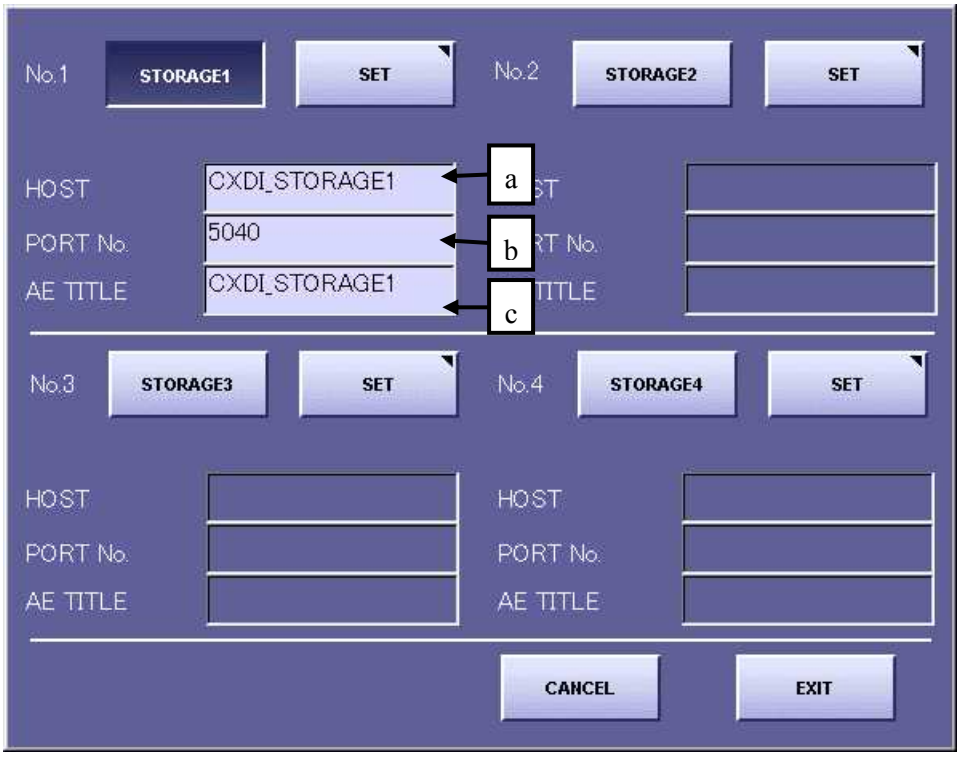


[Fig 3]

2) Storage settings

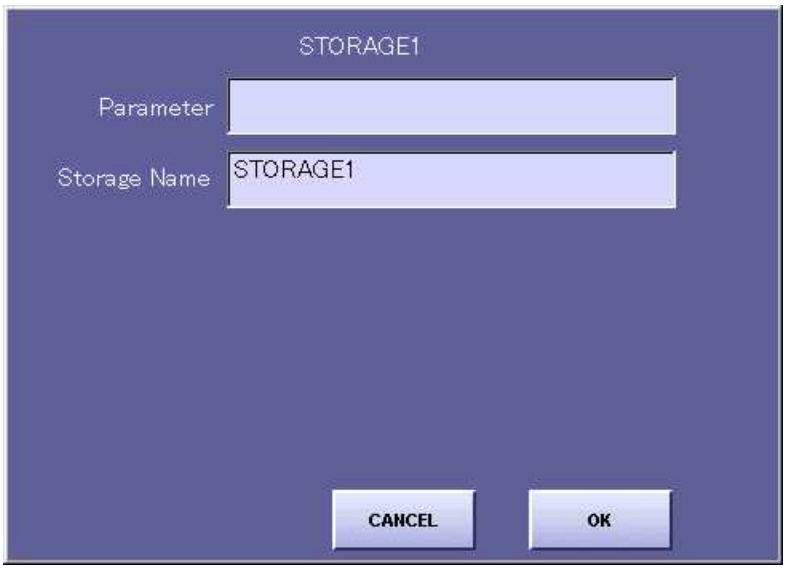
A. Open the output destination setting screen from the user menu.
System → SETUP MENU → DESTINATION → STORAGE
*** Up to four storage units (2 of which can be used for output at the same time) can be set.**

B. Press the "Storage1" button, and input the following items based on the pre-installation investigation details.
a. Storage host name (IP address)
b. Port number
c. Transmission destination title



[Fig 4]

C. Press the “SET” button, and input the parameters.
(Normally, the parameters need not be set. They must be input only when the need arises.)
*** A space must be input between each of the parameters.**



[Fig 5]

D. After setting the output destinations, follow the procedure below to check whether images can actually be transmitted. Return to the user menu, capture a sample image (one X-ray image), and transmit the image to the printer and storage. There are two errors that may result if the image cannot be transmitted:

a. “DICOM Connect Error. Cannot connect to the target. Check network or port number setting. Retry?”
b. “DICOM Transfer Error. Error occurred during the association. Retry?”

Message a indicates that connection at the TCP/IP level is not possible and that the physical connections or the subnet mask and other settings must be checked again.
Message b indicates that communication at the TCP/IP level is problem-free but that DICOM level communication has failed. In this case, check again that AE_TITLE of CXDI has been sent properly to the transmission destination and that the IP address, port number and AE_TITLE of the transmission destination which are set with CXDI have been set properly.

*** Upper-case letters are used to input “AE_TITLE” of the transmission destination.**

Parameter List (Separate Document 1)

DICOM storage device
In the CXDI, DICOM data transfer is performed using the transfer software module "send_image" .The settings for these parameters are described below.

(1) -m maxPDU
(2) -t calledTitle
(3) -c callingtitle
(4) -s SOPName
(5) -I
(6) -d FAC
(7) –v
(8) -jn
(9) –k

(1) -m maxPDU

-m maxPDU	
Maximum PDU value in byte units	
Meaning	* The CXDI automatically uses 131072 internally for operation. * Designating a specific value allows overwriting of the above value.
Description	* The DICOM standards do not allow values of 1301073 or higher to be set. * This is used when the operator of the connected storage device requests a size change. * In DICOM printing, note that the argument title changes to -u. (→ See the printing parameters.)

(2) -t calledTitle

-t calledTitle	
Called App Entity Title	
Meaning	* The AE Title setting field is automatically applied to this setting. * Designating a specific value allows overwriting of the above value.
Description	* Note that the meaning is opposite of the DICOM printing argument -c. (→See the printing parameters.) * This is used when the operator of the connected storage device requests a change in the installed identification information (version).

(3) -c callingtitle

-c callingtitle	
calling App Entity Title	
Meaning	* The CXDI automatically uses CANON_CCR internally for the operation. * Designating a specific value allows overwriting of the above value.
Description	* Note that the meaning is opposite of the DICOM printing argument -c. (→See the printing parameters.) * This is used when the operator of the connected storage device requests a change in the installed identification information (version).

(4) -s SOPName

-s SOPName	
(for reference) This parameter designates the class used for connecting the association at the start of the transfer.(CR/T/MR/NM/SC/US)	
Meaning	* This is not used in the CXDI.
Description	

(5) -I

-I	
A-RELEASE-RES is ignored.	
Meaning	* This parameter is used simply as "-I"
Description	* This is used when the error message "30012 Peer aborted Association (or never connected)" occurseven though the DICOM data transfer was successful. → This is used based on the connected storage devices.

(6) -d FAC

-d FAC	
This parameter dumps a specific facility log. (DCM/DUL/SRV)	
Meaning	* This parameter is used simply as "-d" * This parameter is used to make the transfer software display the debugging character string on the console.
Description	* This parameter does not affect DICOM data transfer. * This parameter outputs the CXDI log based on Windows NT.

(7) -v

-v	
This parameter dumps the transfer log.	
Meaning	* This parameter is used simply as "-v". * DUL and SRV are dumped. * This parameter is used to make the transfer software display the debugging character string on the console.
Description	* This parameter does not affect DICOM data transfer.

(8) -jn

-jn	
This is the time to take timeout.	
Meaning	* Sets the time to take timeout in seconds.
Description	* This parameter is to be changed when taking timeout.

(9) -k

-k	
level = 0 1 2	
Meaning	* A variety of specifications have since been needed in conjunction with DICOM modality LUT support.
Description	* If DICOM Modality LUT OD is enabled, set appropriate options to suit each output destination.

Argument : Data necessary for executing a function, subroutine, procedure, or other operation. Arguments are assigned to functions and subroutines when executed. For example, the argument in f (χ) is χ.

PDU : Protocol data unit
The types of PDUs include get-request, get-next-request, get-response, set-request, nd trap.

Note
For details about the -v parameter, see "Checking the Error Log".

Note
The parameters -v and -d display the log on the console. Therefore, be sure to always erase these parameters before operation by the user.
Note
If –k:DICOM Modality LUT OD is enabled, set appropriate options to suit each output destination.

level = 0: Do not delete (default when not specified)
1: Delete Window Center/Width
2: Delete Window Center/Width and Rescale Intercept/Slope/Type
3: Delete Rescale Intercept/Slope/Type (compatible with releases up to Ver.4.20)

Other than a loadable LUT or γ=1.0 has been specified with the output destination-specific LUT function.
For storage: Specify -k3(or -k2).
If IMG Rescale Type = 0D is unidentifiable to storage, resulting in an error: Specify -k3.
(If only one storage is connected, simply set DICOM Modality LUT OD to "Disabled.")
The implementation allows Window Center/Width with Rescale Type = 0D specified to be interpreted as "optical densityx1000."
For storage: Specify -k1.
The CXDI Window Center/ Width output value (implementation) is fixed at 2048/4096.)

Note
With AGFA impax Ver. 4.5.0, the specification of -k0 demonstrated a successful density-intensity conversion. But because the corresponding text in the DICOM specifications document is ambiguously written such that the status of implementation by other manufacturers is unknown, please be advised to consult the storage manufacturer for each connection destination or work out on a trial and error basis. Also note that an external storage option specification (if (DICOM modality LUT OD is set to "Enabled," OD tags <0028, 1052 - 1054> are assigned and Level: 0 is assumed) is not supported.

Parameter List (Separate Document 2)

DICOM printer
In the CXDI, DICOM printers are administered separately according to printer product.
The transfer software module is “print_stuff”. The settings for these parameters are described below.C

(1)-C copies
(2)-y priority
(3)-D destination
(4) -F film type
(5) -L sessionLabel
(6) -f films
(7) -l FilmSizeID
(8) -M magnification
(9) -m smoothing
(10) -S configuration
(11) -O Orientation
(12) -A max_density
(13) -a min_density
(14) -B border_density
(15) -G empty_image_density
(16) -T trim
(17) -P polarity
(18) -r pixel_pitch
(19) -N annoFmt
(20) -n annotation
(21) -u maxPDU
(22)-c calledTitle
(23) -t callingTitle
(24) -g
(25) -S
(26) -p
(27) -v
(28) -V filename
(29) -I
(30) -jn
(31) -k

(1)-C copies

-C copies	
This parameter uses a number to designate the number of copies.(1/2/...)	
Meaning	* This parameter is used in the DICOM Basic Film Session (2000, 0010). * When the number of copies is designated, film sheets are printed in the quantity specified in a single printing operation. * This parameter is necessary when printing multiple sheets for a single data transfer operation.
Description	* This parameter is set according to the user's designation. * In the DICOM library TYPE3, the value is transferred together with the tag. However, if the value is unknown, the value is either is transferred as a character string with length 0, or the element itself is not transferred. → The printer default values are used if this parameter is not entered.

(2)-y priority

-y priority	
Priority in the DICOM printer (HIGH/MED/LOW)	
Meaning	* This parameter is used in the DICOM Basic Film Session (2000, 0020). * This parameter determines where this transfer image is inserted into the queue in the DICOM printer. At HIGH, the image is printed first among the queued images.
Description	* This parameter is set according to the user's designation. * In the DICOM library TYPE3, the value is transferred together with the tag. However, if the value is unknown, the value is either transferred as a character string with length 0, or the element itself is not transferred. → The printer default values are used if this parameter is not entered. * Note this parameter does not determine where this transfer image is inserted into the CXDI queue.

(3)-D destination

-D destination	
Film destination (MAGAZINE/PROCESSOR/BIN_i)	
Meaning	* This parameter is used in the DICOM Basic Film Session (2000, 0040). * Film is sent to the output device designated by RECEIVE MAGAZINE or the automatic developer.
Description	→ The printer default values are used if this parameter is not entered. * The film is usually discharged to the default output device.

(4) -F film type

-F film type	
Film media type ("BLUE FILM" / "CLEAR FILM" / "PAPER")	
Meaning	* This parameter is used in the DICOM Basic Film Session (2000, 0030). * Film is printed as the designated film type.
Description	→ The printer default values are used if this parameter is not entered. * Although many types of films cannot be detected, the film type can be selected in the KELP2180. * In this parameter, be sure to put quotation marks (" ") around 0x20 since it comes between BLUE and FILM.

(5) -L sessionLabel

-L sessionLabel	
Film session label (character string)	
Meaning	* This parameter is used in the DICOM Basic Film Session (2000, 0050). * The label for the film session is for designation purposes only, and generally it is not displayed directly on the print image.
Description	→ The parameter is not transferred over DICOM if it is not designated. * This parameter may be displayed in some form or another depending on the installed printer. For example, it may be displayed in the Control Panel for the printer or in the corner of the film.

(6) -f films

-f films	
Number of film box to be printed	
Meaning	* Currently, this parameter is not operating.
Description	

(7) -l FilmSizeID

-l FilmSizeID	
Film size 14 inch x 17 inch / 17 inch x 14 inch / 11 inch x 14 inch / -l FilmSizeID / 10 inch x 14 inch 10 inch x 12 inch / 24 cm x 24 cm / 24 cm x 30 cm	
Meaning	* This parameter is used in the DICOM Basic Film Box (2010, 0050). * This parameter designates the size of the film to be printed
Description	→ The parameter is not transferred over DICOM if it is not designated. In this case, the printer default values are used. When this parameter is not transferred, problems can occur since unsuitable default values may be used. * Some printers do not print until a supply magazine of the designated size is loaded, and others print even though the designated size is different from the currently loaded supply magazine.

(8) -M magnification

-M magnification	
Interpolation method (NONE/REPLICATE/BILINEAR/CUBIC)	
Meaning	* This parameter is used in the DICOM Basic Film Box (2010, 0060). * This parameter designates the interpolation method since the printer has a higher resolution than the CXDI in most cases. * Generally, CUBIC provides the best results, followed by BILINEAR. The REPLICATE option is not suitable for CXDI image applications.
Description	→ The printer default values are used if this parameter is not entered. When this parameter is not transferred, problems can occur since unsuitable default values may be used.

(9) -m smoothing

-m smoothing	
Type of smoothing (character string)	
Meaning	* This parameter is used in the DICOM Basic Film Box (2010, 0080). * This parameter designates the smoothing method for the image. * In the DICOM standards, this parameter setting is valid only when CUBIC is selected for the magnification parameter above. * In the DICOM standards, value to be transferred is not predetermined. * The designation method varies according to the printer. For example, the MLP190 uses -m NORMAL.
Description	→ The parameter is not transferred over DICOM if it is not designated. In this case, the printer default values are used. When this parameter is not transferred, problems can occur since unsuitable default values may be used. * This parameter is determined by asking the printer engineer or by viewing the conformance statement.

(10) -S configuration

-S configuration	
Adjustment information (character string)	
Meaning	* This parameter sets the printer (image quality) adjustment from the SCU side. * In the DICOM standards, value to be transferred is not predetermined. * The designation method varies according to the printer. * This parameter is used in the DICOM Basic Film Box (2010, 0150).
Description	→ If this parameter is not designated, it is not transferred over DICOM. In this case, the printer default values are used. When this parameter is not transferred, problems can occur since unsuitable default values may be used. * This parameter is determined by asking the printer engineer or by viewing the conformance statement.

(11) -O Orientation

-O Orientation	
Film orientation (PORTRAIT/LANDSCAPE)	
Meaning	* In versions before 2.0, printers must operate based on this parameter. * When using image cutout from 17 x 17 inch size in the CXDI, this parameter is set and transferred automatically. * This parameter is used in the DICOM Basic Film Box (2010, 0040).
Description	→ If this parameter is not designated, it is not transferred over DICOM. In this case, the printer default values are used. * Starting from version 2.0, the image can be rotated from the CXDI side without using this parameter.

(12) -A max_density

-A max_density	
Maximum density (Dx100)	
Meaning	* This parameter designates the density of the digital value for 0 (4095 for reverse display) of the CXDI transfer data image pixels. (In the CXDI, 0 indicates black.) * In the CXDI, this parameter is used to adjust the density. Therefore, be sure to always check that it is operating.
Description	→ If this parameter is not designated, it is not transferred over DICOM. In this case, the printer default values are used. When this parameter is not transferred, problems can occur since unsuitable default values may be used.

(13) -a min_density

-a min_density	
Minimum density (Dx100)	
Meaning	* This parameter is used in the DICOM Basic Film Box (2010, 0120). * This parameter designates the density of the digital value for 4095 (0 for reverse display) of the CXDI transfer data image pixels. (In the CXDI, 4095 indicates white.) * This parameter is not transferred in many cases since the minimum density cannot be increased in most printers.
Description	→ If this parameter is not designated, it is not transferred over DICOM. In this case, the printer default values are used. When this parameter is not transferred, problems can occur since unsuitable default values may be used.

(14) -B border_density

-B border_density	
Border density (Dx100) (BLACK/WHITE/D x 100)	
Meaning	* This parameter is used in the DICOM Basic Film Box (2010, 0100). * This parameter determines the area density around the image on the film.
Description	→ If this parameter is not designated, it is not transferred over DICOM. In this case, the printer default values are used.

(15) -G empty_image_density

-G empty_image_density	
Empty image density (BLACK/WHITE/D x 100)	
Meaning	* This parameter is used in the DICOM Basic Film Box (2010, 0110). This parameter designates the density of the empty image area during multi-formatting.
Description	→ If this parameter is not designated, it is not transferred over DICOM. In this case, the printer default values are used.

(16) -T trim

-T trim	
Trimming (NO/YES)	
Meaning	* This parameter is used in the DICOM Basic Film Box (2010, 0140). * This parameter adds lines around the image. * The CXDI is normally adjusted so that the trimming does not appear.
Description	→ If this parameter is not designated, it is not transferred over DICOM. In this case, the printer default values are used. * For example, the default value for this parameter in Agfa printers is YES. Therefore, the NO option needs to be specifically designated if it is desired.

(17) -P polarity

-P polarity	
Polarity (NORMAL/REVERSE)	
Meaning	* This parameter is used in the DICOM Basic Image Box (2020, 0020). * Reverse image density
Description	→ If this parameter is not designated, it is not transferred over DICOM. In this case, the printer default values are used.

(18) -r pixel_pitch

-r pixel_pitch	
Transfer pixel pitch for designating the request image size (Pixel Pitch in um)	
Meaning	* This parameter is used in the DICOM Basic Image Box (2020, 0020). * Reverse image density * This parameter is used in the DICOM Basic Image Box (2020, 0010). * Position of the image on film * The cumulative value for the horizontal size of the image (raw) at the designated pixel pitch is used for the request image size. * The CXDI automatically uses 131072 internally for operation. * The above value can be overwritten by designating a specific value.
Description	→ If this parameter is not designated, it is not transferred over DICOM. In this case, the type of image that is printed depends on the settings at the printer side.

(19) -N annoFmt

-N annoFmt	
Annotation position (1/2/3)	
Meaning	* This parameter is used in the DICOM Basic Annotation Box (2030, 0010). * This parameter designates the position of the character string to be annotated.
Description	* If using annotation, always be sure to transfer the annotation position.

(20) -n annotation

-n annotation	
Annotation (character string)	
Meaning	* This parameter is used in the DICOM Basic Annotation Box (2030, 0020). * This parameter designates the character string to be annotated.
Description	* If this parameter is not designated, it is not transferred over DICOM. In this case, the printer default values are used. * Also, in this case, the type of image that is printed depends on the settings at the printer side.

(21) -u maxPDU

-u maxPDU	
Maximum PDU value in byte units	
Meaning	* The CXDI automatically uses 131072 internally for operation. * The above value can be overwritten by designating a specific value.
Description	* The DICOM standards do not allow values of 1301073 or higher to be set. * This parameter is used when the operator of the connected storage device requests a size change. * In DICOM storage devices, note that the argument title changes to -m.(→See the storage device parameters.)

(22) -t callingTitle

-c calledTitle	
Called App Entity Title	
Meaning	* The AE Title setting field is automatically used in this setting. * The above value can be overwritten by designating a specific value.
Description	* Note that the meaning is opposite of the argument -c for DICOM storage devices. (→See the storage device parameters.) * The entry for the OPU output device title is used here.

(23) -t callingTitle

-t callingTitle	
Calling App Entity Title	
Meaning	* The CXDI automatically uses CANON_CCR internally for the operation. * The above value can be overwritten by designating a specific value.
Description	* Note that the meaning is opposite of the argument -t for DICOM storage devices. (→See the storage device parameters.)

(24) -g

-g	
N-GET Printer compatibility mode	
Meaning	*This parameter is used simply as "-g". * In the CXDI default settings, the printer information is not designated. In this case, the printer side sends all the information that it has (DICOM official specifications). * When the -g option is added, the essential information only is collected. This information includes the Printer Status and Printer Status Info. (To prevent installation when the printer does not satisfy the above DICOM specifications.)
Description	→ Normally, this option is not used. This parameter has been provided as a remedy when a printer error occurs when optional devices are not used.

(25) -S

-s	
Silent mode	
Meaning	* This parameter is used simply as "-s". * This parameter is used to prevent the transfer software from displaying the debugging character string on the console.
Description	* This parameter does not affect DICOM data transfer. → Silent mode does not need to be designated since the CXDI automatically makes the setting internally.

(26) -p

-p	
This parameter dumps the association parameter.	
Meaning	* This parameter is used simply as "-p". * This parameter is used to set the transfer software so that the debugging character string is displayed on the console.
Description	* This parameter does not affect DICOM data transfer.

(27) -v

-v	
This parameter dumps the transfer log.	
Meaning	* This parameter is used simply as "-v" * This parameter is used to set the transfer software so that the debugging character string is displayed on the console. * Both the -p and -v parameters should be used. These settings override the -s parameter.
Description	* This parameter does not affect DICOM data transfer.

(28) -V filename

-V filename	
This parameter dumps the transfer log.	
Meaning	* The parameter is used for analysis after the transfer software saves the debugging character string displayed on the console to a file with a designated filename. It is used only when problems occur.
Description	* This parameter does not affect DICOM data transfer.

(29) -I

-I	
A-RELEASE-RES is ignored.	
Meaning	* This parameter is used simply as "-I"
Description	* This is used when the error message [130012 Peer aborted Association (or never connected)]occurs even though the DICOM data transfer was successful. → This is used based on the connected printers.

(30)-jn

-jn	
This is the time to take timeout.	
Meaning	* Sets the time to take timeout in seconds.
Description	* This parameter is to be changed when taking timeout.

(31) -k

-k	
level = 0 1 2	
Meaning	* The -k option has been implemented to normalize DICOM headers
Description	

Note
The parameters -p, -v, and -V filename display the log on the console. Therefore, be sure to always erase these parameters before operation by the user.

In the past, -k2 was used to fix troubles, but it has now been set as the default has been changed to -k2 to ensure precise compliance with the DICOM code. At sites wishing to adhere to their existing window values, -k1 should be used.

Level: 0:Do not delete DICOM tags. (Transfer all headers similar to storage.)
1:Delete Groups 0008, 0010, 0018, 0019 and 0020.
2:Delete Groups 0008, 0010, 0018, 0019, 0020 and Elements (0028,0030), (0028,1050), (0028,1051), (0028,1052), (0028,1053), (0028,1054). Default

Note
In Ver.4.21, attach -k2 expressly to produce similar output. The previous option had -k1 as its default. The k option defaults to -k2, if k option is not specified.

Image Pixel Spacing (0028,0030)
Window Center (0028,1050)
Window Width (0028,1051)
Rescale Intercept (0028,1052)
Rescale slope (0028,1053)
Rescale Type (0028,1054)

For groups 0008, 0010, 0018, 0019, 0020, refer to DICOM manifesto.

Examples of parameters used with different makers and types of printers (reference)

• Kodak MLP190	
Default Parameters	-A 320 -T NO -M CUBIC –m NORMAL -S CS000 (entered in param member) 80 (entered in pixelPitch member) 14 x 17 4096 (entered in W member) 5120 (entered in H member)
Significance	• Trimming OFF • Cubic spline interpolation • Smoothing: normal • Maximum density: 3.20 • Curve shape 0 (density linear) as Config Info

• Kodak KELP2180 + Kodak Print Spooler Model 100	
Default Parameters	-A 320 -T NO -M CUBIC –m NORMAL -S CS000 (entered in param member) 79 (entered in pixelPitch member) 14 x 17 4090 (entered in W member) 5120 (entered in H member) 11 x 14 3194 (entered in W member) 4096 (entered in H member)
Significance	• Trimming OFF • Cubic spline interpolation • Smoothing: normal • Maximum density: 3.20 • Curve shape 0 (density linear) as Config Info

• Agfa DryStar 3000	
Default Parameters	-A 320 -T NO -M CUBIC -m 140 -S “PERCEPTION_LUT=200” (entered in param member) 80 (entered in pixelPitch member) 14x17 4256 (entered in W member) 5174 (entered in H member)
Significance	• Trimming OFF • Cubic spline interpolation • Smoothing: slightly sharp (edges emphasized) • Maximum density: 3.20 • S “PERCEPTION_LUT=LINEAR” (If the output fails to be linear with “LINEAR”, on-site adjustments with the printer manufacturer must be performed.

• Kodak DryView 8700 + Pacs LINK IMN 9410	
Default Parameters	-A 310 -T NO -M CUBIC -m ? -S LUT=0?, 2? (?: Site Dependent) (entered in param member) 78 (entered in pixelPitch member) 14x17 4096 (entered in W member) 5220 (entered in H member)
Significance	• Trimming OFF • Cubic spline interpolation • Smoothing must be adjusted at the user's site. • Maximum density: 3.10 • LUT = m, n is designated as the Config Info but m and n are adjusted on-site by the Kodak service engineer. Basically, adjustment is performed to achieve a linear output.

• Kodak DryView 8700 + GW	
Default Parameters	-A 310 -T NO -M CUBIC -m ? -S LUT=?, ? (?: Site Dependent) (entered in param member) 78 (entered in pixelPitch member) 14x17 4096 (entered in W member) 5220 (entered in H member)
Significance	• Trimming OFF • Cubic spline interpolation • Smoothing must be adjusted at the user's site. • Maximum density: 3.10 • LUT = m, n is designated as the Config Info but m and n are adjusted on-site by the Kodak service engineer. Basically, adjustment is performed to achieve a linear output.

• Kodak DryView 8700+8800	
Default Parameters	-A 320 -T NO -M CUBIC –S "LUT=m, n"-m (on-site adjustment) (entered in param member) 78 (entered in pixelPitch member) 4096 (entered in W member) 5220 (entered in H member)
Significance	• Trimming OFF • Cubic spline interpolation • Maximum density: 3.20 • LUT = m, n is designated as the Config Info but m and n are adjusted on-site by the Kodak service engineer. Basically, adjustment is performed to achieve a linear output. • The Kodak service engineer is responsible for setting the smoothing type on-site since it can be changed with each printer. • The rest is done by the printer itself.

• Kodak DryView 8700+9440	
Default Parameters	-A 320 -T NO -M CUBIC –S “LUT=m, n”-m (on-site adjustment) (entered in param member) 78 (entered in pixelPitch member) 4096 (entered in W member) 5220 (entered in H member) The model 8800 has a rotation function but we understand that Imation has not publicly acknowledged the use of this function.
Significance	• Trimming OFF • Cubic spline interpolation • Maximum density: 3.20 • LUT = m, n is designated as the Config Info but m and n are adjusted on-site by the Kodak service engineer. Basically, adjustment is performed to achieve a linear output. • The Kodak service engineer is responsible for setting the smoothing type on-site since it can be changed with each printer. • The rest is done by the printer itself.

• Kodak Dry View 8500+	
Default Parameters	-A 310 -T NO -M CUBIC -m ? -S LUT=0?, 2? (?: Site Dependent) (entered in param member) 78 (entered in pixelPitch member) 14x17 3388 (entered in W member) 4277 (entered in H member)
Significance	• Trimming OFF • Cubic spline interpolation • Smoothing must be adjusted at the user’s site. • Maximum density: 3.10 • -S LUT = m, n is designated as the Config Info but m and n are adjusted on-site by the Kodak service engineer. Basically, adjustment is performed to achieve a linear output.

• Nishimoto EL2000N	
Default Parameters	-A 320 -T NO -M CUBIC -S 15 (entered in param member) 80 (entered in pixelPitch member) 4444 (entered in portraitW member) 5296 (entered in portraitH member) 5296 (entered in landscapeW member) 4444 (entered in landscapeH member) “Prepare images using CXDI” : Yes A simple calculation yields a resolution of 4444 x 5400 for the display area of the model EL2000. However, 5376@80 μm is set in the perpendicular direction of the model EL2000 since the maximum size of the CXDI images is 2688@160 μm. In this case, a small non-image area should be output as the border in the up/down direction on the film according to the calculation. In actual fact, however, the image will protrude in some cases depending on how the transport speed and other factors have been adjusted. The specifications are as follows although they cannot be set at the present time: 14" x 14" : W=4444, H=4444 (for portraits) 11" x 14" : W=4444, H=3660 (for portraits)
Significance	• Trimming OFF • Cubic spline interpolation • Maximum density: 3.20 • “15” in Config Info is linear. • The rest is done by the printer itself. Up to 5376 pixels can be set for H.

• Fuji CR-DPL/LPD/FM-DPL + FN-PS551	
Default Parameters	-A 300 -T NO -M CUBIC -m MEDIUM -S –P NORMAL –B BLACK –k 2 –S ? (Site Dependent) (entered in param member) 14x17 3520 (entered in W member) 4280 (entered in H member) 14x14 3520 (entered in W member) 3490 (entered in H member) 11x14 2540 (entered in W member) 3600 (entered in H member)
Significance	• Trimming OFF • Cubic spline interpolation • SHARP, MEDIUM or SMOOTH can be selected from among the presettings as the smoothing type. An AVR of 0.8 or so is appropriate. The setting is performed for each printer on-site. • -S should be adjusted at the user's site. • LUT can be selected from among the eight presettings 1 through 8 using Config Info. The setting is performed for each printer on-site. • With -k 2, the Window Center/Level for DICOM TAG (0028,1050) and (0028, 1051) are also deleted. • Maximum density: 3.00 A density of 3.20 cannot be designated. For this reason, a non-linear LUT is required.

• Konica Drypro 722 + Printlink	
Default Parameters	-A 320 -T NO -M CUBIC -m 2 -S "KC_LUT=1" –O PORTRAIT –P NORMAL –B BLACK (entered in param member) 80 (entered in pixel pitch member) 14x17 4424 (entered in W member) 5324 (entered in H member) 14x14 4424 (entered in W member) 4372 (entered in H member) 11x14 3436 (entered in W member) 4424 (entered in H member)
Significance	• Trimming OFF • Cubic spline interpolation • Smoothing type 1: BILINEAR 2: Sharp by spline interpolation 3: Slightly weak by spline interpolation 4: Weaker by spline interpolation • Maximum density: 3.20 Maximum density 3.20 could not be achieved before.

• Konica Li-62P + Printlink	
Default Parameters	-A 320 -T NO -M CUBIC -m 2 -S "KC_LUT=1" –O PORTRAIT –P NORMAL –B BLACK 80 (entered in pixel pitch member) 14x17 4268 (entered in W member) 5108 (entered in H member) 14x14 4268 (entered in W member) 4104 (entered in H member) 11x14 3204 (entered in W member) 4268 (entered in H member)
Significance	• Trimming OFF • Cubic spline interpolation • Smoothing type 1: BILINEAR 2: Sharp by spline interpolation 3: Slightly weak by spline interpolation 4: Weaker by spline interpolation • Maximum density: 3.20 Before, maximum density 3.20 could not be achieved.

Printer Model Specifications (Reference)

• Kodak MLP190	
Maxmum equivalet area in CXDI	2048 x 2560 (@160 μm)
Specifications	80μm x 4096 x 5120

• Kodak KELP2180 + Kodak Print Spooler Model 100	
Maxmum equivalet area in CXDI	2018 x 2528(@160 μm)
Specifications	79 μm x 4090 x 5120 (value after passing through the print spooler) • The above settings are the size of the effective area when the image passes through the print spooler and the image is plotted up to the annotation area. In other words, these settings do not display an annotation area, instead handling it as an image area. • If the data is transferred without setting [Image creation in CXDI], the Requested Image Size setting is used in DICOM. In this case, the annotation area is automatically displayed in the 2180 printer. As a result, a maximum image area of 79 um x 4090 x 4996 must be designated. In this case, the CXDI relies on the 2180 for image rotation (Film Orientation), but images larger than 1.7 MB cannot be rotated by the 2180. Therefore, operation without the setting for [Image creation in CXDI] cannot be performed in the 2180. (Although operation is possible by setting Requested Image Size only for using DICOM without the setting for [Image creation in CXDI], this option is not installed in the CXDI.) • Although the resolution of the printer itself is 79 um x 4090 x 5260, this complete resolution cannot be used when the image passes through the spooler. When "_" is used in AE Title, the association is rejected. Use the Disable function for N-EVENT-REPORT to disable this setting. The FilmSize parameter can be used. The MediaType (BLUE, CLEAR) parameter is also supported. • Although the Film Orientation parameter is supported up to 1.7 MB, in actuality, DR images cannot be rotated. Like the DryView8700, the images must be rotated by the CXDI side. • When Requested Image Size is expanded, the maximum plotting size is limited (79 um x 4090 x 4996) so that the annotation area can be obtained. When a Requested Image Size expansion error occurs, the image is interpolated and printed at the suitable size. In this case, the error does not return to the CXDI side. For example, the image is printed at 310 mm even if 326 mm is designated. • If an expansion error occurs in the spooler when Multi Display Format is used, the print queue cannot be processed. • The system is in a critical state when a Failure status is indicated. A user message is displayed indicating this state, and images are no longer transferred. (Fully installed)

	• During the Warning status, image transfer is performed while the user message is displayed (Fully installed). • If operation is aborted due to an error, a new association could not be established when the data was resent from the CXDI. GW was reset to recover the error. • Inserting annotations in the image can lead to problems at the hospital. In the QCW, use annotations that are outside of the image. • The designated film size is 11 x 14 inch film, and automatic selection of the magazine and printing has been confirmed. • Annotations in the image are problematic in the US and EU. Thus, although DICOM annotation was used, it was not printed. Although annotation can be transferred without any errors in DICOM, an annotation error occurred in the log when transferring from the gateway to the 2180, and printing was not performed. Data was transferred from KCR to the validation tool, and the DICOM transfer method was compared to CXDI. However, the only differences were in the image size, aspect ratio, and annotation position. • Although the annotation position is 1 in terms of conformance, it is 0 as sent from KCR. The result did not change even after the change.

• Agfa DryStar 3000	
Maxmum equivalet area in CXDI	2128 x 2587 (@160 μm)
Specifications	80 μm x 4256 x 5174 • In the standard Agfa system, the annotation option is selected. Therefore, the full image area will not be printed correctly unless you ask the serviceman to deselect the annotation option.

• Imation DryView 8700+8800	
Maxmum equivalet area in CXDI	1996 x 2544 (@160 μm)
Specifications	78 μm x 4096 x 5220 Note: The 8700 printer cannot display in landscape orientation. Also, the maximum density is 3.1. If the 8800 box is not added, this printer cannot be used by the CXDI. However, it can be used starting from CXDI version 2.0. • If there is an Imager Pixel Spacing tag (0018, 2264), the imager will fail.

<table>
<tr><th colspan="2">• Fuji CR-DPL /FM-DPL + FM-PS551</th></tr>
<tr><td>Maxmum equivalet area in CXDI</td><td>2200 x 2675 (@160 μm)</td></tr>
<tr><td>Specifications</td><td>100 μm x 3520 x 4280 (value after passing through the print spooler)
• The above settings are the allowable area size in a configuration not using annotation.
• Annotation will be supported from the next version. Annotation in currently possible in US-ASCII only. IDs are designated 1 to 6 and correspond to the top left, top center, top right, bottom left, bottom center, and bottom right, respectively. The maximum area size with annotation support is 3500 x 4170 for 35 cm x 43 cm and 2538 x 3522 for B4.
• Use the Disable function for N-EVENT-REPORT to disable this setting.
• A function is provided for disabling the returning of warning messages.

0107 (Attribute list error) Return/Not return
0116 (Attribute Value out of Range) Return/Not return
B604 (Image has been demagnified) Return/Not return

• The Film Size parameter can be used. The Media Type (BLUE, CLEAR) parameter can also be used.
• The Film Orientation parameter is fully supported.
• The following presets are made so that LUT has the DMAX = 3.2D equivalent curve required by CXDI.
Gamma type #17 (SAR system)

Density Shift Contrast
Point 1 1.57 0.10 1.00
Point 2 2.29 0.15 1.00</td></tr>
</table>

Error Return Values and Log Output for print_stuff (Reference)

Error example	Return value and log output
Success	Return value: 0x00 There is no log output in this case.
Invalid parameter	Return value: 0x00000001 CXDI description : DICOM connection error (CCRTRANS_ERR_DICOMPARAM) The log output in this case is shown below. ---------- ** -s Silent mode; do not print results of all print commands ** -v Use verbose mode for DUL and SRV facilities ** x Canon Hidden Special Mode node The host name that is running a print server port TCP/IP port number of print server file One or more files that contain preformatted images for printing ----------
The server has not started up.	Return value: 0x00180012 CXDI description : DICOM connection error (CCRTRANS_ERR_NOT_CONNECT) ---------- The log output in this case is shown below. 18-135933[d2]ERR: d0012 Attempt to connect to unknown host: test 18-135933[d2]ERR: 130012 Peer aborted Association (or never connected) 18-135933[d2]ERR: 180012 Failed to establish association ----------
After a command request was sent to the server, an error was returned in response.	Return value: 0x10 CXDI description: DICOM response error (CCRTRANS_ERR_RESP) The log output in this case is shown below. ---------- (Not determined) ----------
After a command request was sent to the server, a warning was returned in response.	Return value: 0x18 CXDI description : DICOM response warning (CCRTRANS_WRN_RESP) The transfer process was successful, but a warning was returned fromthe server. The log output in this case is shown below. ---------- (Not determined) ----------
The printer status has returned an error.	Return value: 0x20 CXDI description : DICOM printer status error (CCRTRANS_ERR_PRN_STATUS) The log output in this case is shown below. ---------- (Not determined) ----------

The printer status has returned a warning.	Return value: 0x28 CXDI description: DICOM printer status warning (CCRTRANS_WRN_PRN_STATUS) The transfer process was successful, but a warning was returned as the printer status. The log output in this case is shown below. ---------- (Not determined) ----------
Other errors	Return value: Values other than those above CXDI description : DICOM communications error (CCRTRANS_ERR_DICOM_TRANSE) The log output in this case depends on the specific error. A typical example is shown below. ---------- 18-140933[d2]ERR : c0082 SRV Send (DATA SET) failed in SRV_SendDataSet 18-140933[d2]ERR : 190082 SRV Request failed in SRV_NCreateRequest 18-140933[d2]ERR : 70012 NULL_key passed to routineDUL_ReleaseAssociation ----------

Precautions for connecting the server (reference)

Equipment	Restrictions on connections
Kodak Miil	Transmitting the 0019 shadow group causes a failure, and the group is not received properly with the default. Its reception is enabled by setting the strictValidation parameter to Off in Miil.
Fujitsu Dr. ABLE	• Transmission is currently performed with the "1 study multi series/1 series 1 image" setting. However, since a multi format is used for the screen displays for each series under the Dr.ABLE specifications, the switching operations are a hassle. The user will find it more convenient if it is at all possible to change the setting to "1 study 1 series/1 series multi image." (These unusual data specifications were requested with the full understanding of their unusualness.) • With DICOM, the body parts (such as the abdomen and head) and their directions (such as PA and AP) belong to the series information. It therefore follows that a different series is required for a different body part or body part direction. This aspect is restricted by the DICOM standard rather than by the installation and other steps taken by us. To put it the other way around, multiple images with different body parts and their directions cannot be put together as a series. To remedy this problem, devising a way of enabling the viewers to reference different series at the same time at some future point in time will be helpful.
Hitachi	• Transmission is currently performed with the "1 study multi series/1 series 1 image" setting. However, since a multi format is used for the screen displays for each series, the switching operations are a hassle. The user will find it more convenient if it is at all possible to change the setting to "1 study 1 series/1 series multi image." • This problem arises with the Fujitsu equipment as well. Refer to the section on Fujitsu.

send_image error return values and log output (reference)

Example of error	Return value and log output
Successful	Return value: 0x00 No log output at this time
Invalid parameter exists.	Return value: 0x00000001 CXDI interpretation: DICOM connect error (CCRTRANS_ERR_DICOMPARAM) See below for the log output at this time: ---------- -t Set called AE title to title in Association RQ -v Place DUL and SRV facilities in verbose mode node Node name for network connection port TCP / IP port number of server application image A list of one or more images to send ----------
Server fails to start.	Return value: 0x00180012 CXDI interpretation: DICOM connection error (CCRTRANS_ERR_NOT_CONNECT) See below for the log output at this time: ---------- 18-132600[127]ERR: 60012 TCP Initialization Error: Invalid argument 18-132600[127]ERR: 130012 Peer aborted Association (or never connected) 18-132600[127]ERR: 180012 Failed to establish association ----------
As a result of providing the server with a command request, an error was returned as response.	Return value: 0x10 CXDI interpretation: DICOM response error (CCRTRANS_ERR_RESP) See below for the log output at this time: ---------- (To be determined) ----------
As a result of providing the server with a command request, a warning was returned as response.	Return value: 0x18 CXDI interpretation: DICOM response warning (CCRTRANS_WRN_RESP) The transmission processing was successful but a warning was returned from the server. See below for the log output at this time: ---------- (To be determined) ----------
Other errors	Return value: other than above CXDI interpretation: DICOM communication error (CCRTRANS_ERR_DICOM_TRANSE) The log output is many and varied. It depends on the error. One example is shown below. ---------- 18-140933[d2]ERR: c0082 SRV Send (DATA SET) failed in SRV_SendDataSet 18-140933[d2]ERR: 190082 SRV Request failed in SRV_NCreateRequest 18-140933[d2]ERR: 70012 NULL key passed to routine: DUL_ReleaseAssociation ----------

Concerning the Dry View 8700 (reference)

LUT (Lookup Table)

- Image adjustment parameters that can be changed by users
  Density : This can be set up to the maximum density of 3.1D.
  Contrast : This can be set from 1 to 15.

- Image adjustment parameters that cannot be changed by users
  Lookup tables called TFTs (Transfer Function Tables) are provided internally, and changes can be made only in the service mode.
  Fifteen types of characteristic curves are registered in one of these TFTs, and users can change one of these curves as the contrast.
  Over 30 TFTs are registered in the printer, and a name is allocated to each one.
  For instance, 15 types of linear straight lines are registered in the TFT called “WRKST2A.”

By setting this WRKST2A TFT, adjustments can be made by combining 15 types of linear straight lines (which cannot be changed by users) with 15 types of characteristic curves (which can be changed by users).

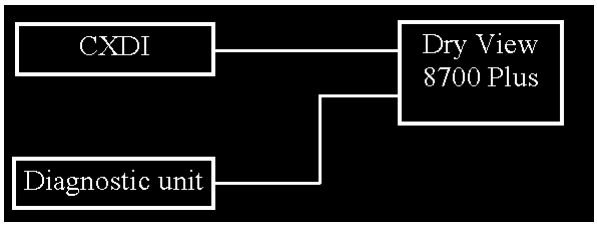
Concerning connections
Two types of the Dry View 8700 are available.

- Dry View 8700 Plus
  The 8700 Plus is a printer which can be connected to two diagnostic units.When used in combination with the 8800 multi input manager, it can be connected to up to eight diagnostic units. Images are processed as described above.

- Dry View 8700 Dual
  It is possible to connect two 8700 Dual units to the 8800 multi input manager.By using these in combination, up to seven diagnostic units can be connected.The 8700 Dual does not come with image processing functions

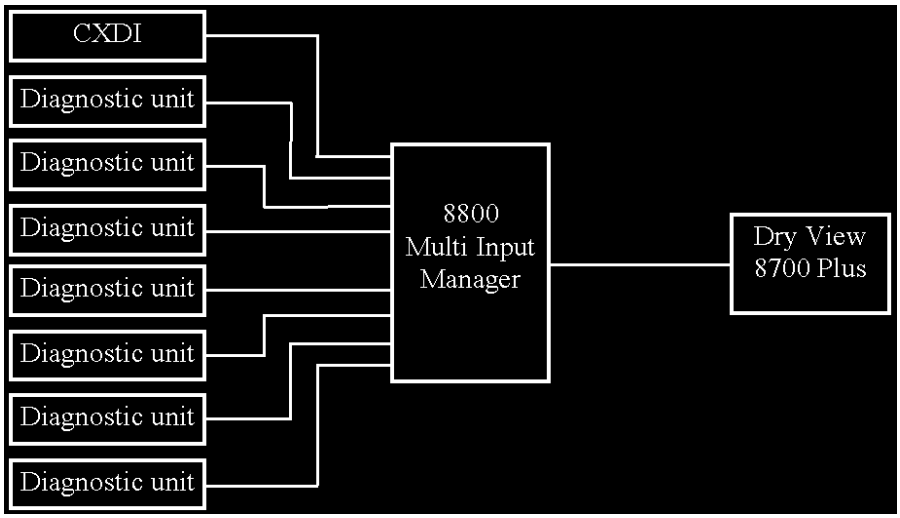
Dry View 8700 Plus

Up to 2 units can be connected.



Dry View 8700 Plus + 8800 Multi Input Manager

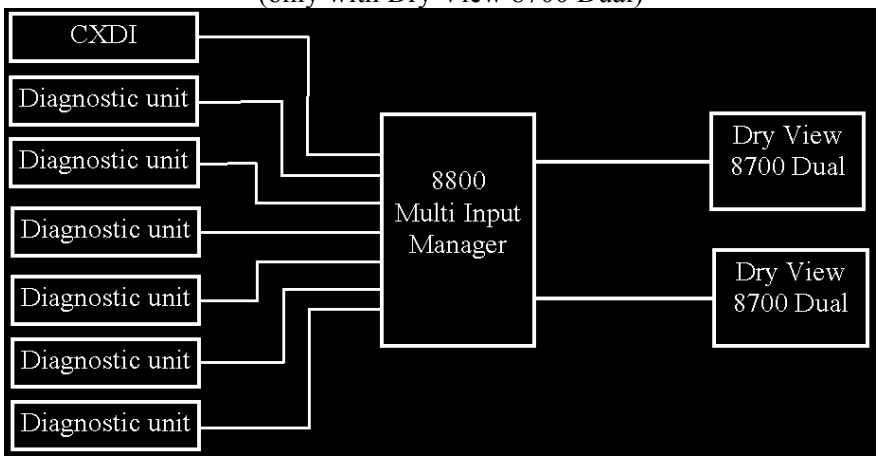
Up to 8 units can be connected.



Dry View 8700 Dual + 8800 Multi Input Manager

Up to 2 printers can be connected (only with Dry View 8700 Dual)

Up to 7 units can be connected.



4.3.12. Linearity Check of Transfer Image Density

(1) Purpose

An SMPTE image is used to check whether the density linearity of the image printed out by the printer and the image displayed on the high-definition monitor matches the density linearity of the image transferred by the CXDI.

(2) Notes

1) This checking procedure should be performed before the procedure in the section of "Operation Unit Gamma Correction".

2) The adjustment and checking procedures below should be completed before performing this procedure.

A) The printer and high-definition monitor connections and setting adjustments should be completed. The printer and monitor image output settings should be set to LINEAR. For example, if the KODAK MLP190 is connected, the printer parameter "-S configuration" must be set to "-S CS000". For other printers, refer to "Printers and Parameter Examples Reference" in "Network Connections", and set so that the curve shape is 0 (density linear).

B) Be sure to calibrate the printer and high-definition monitor units separately before performing this procedure.

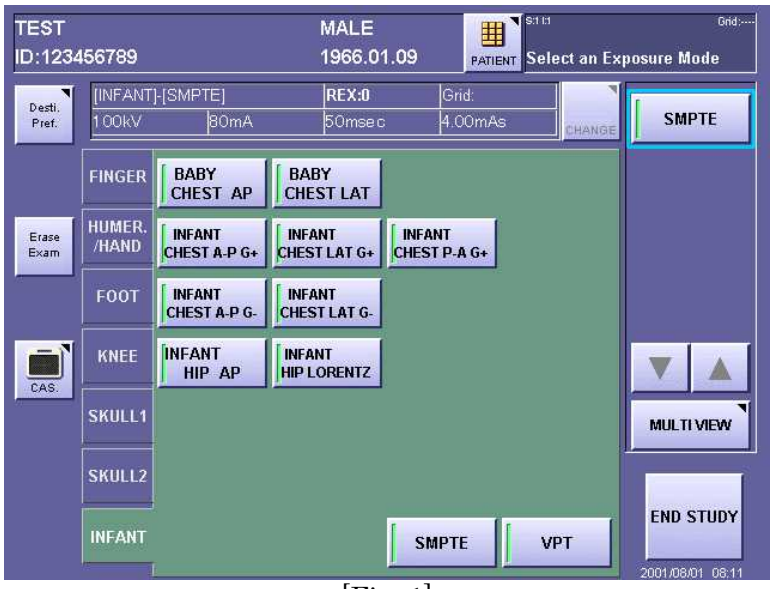
C) When the imaging screen is "tray type", change it to "category type" by selecting: **System → SETUP MENU → CUSTOMIZE DISPLAY.**

(3) Rough adjustment

1) Start up the CXDI system.

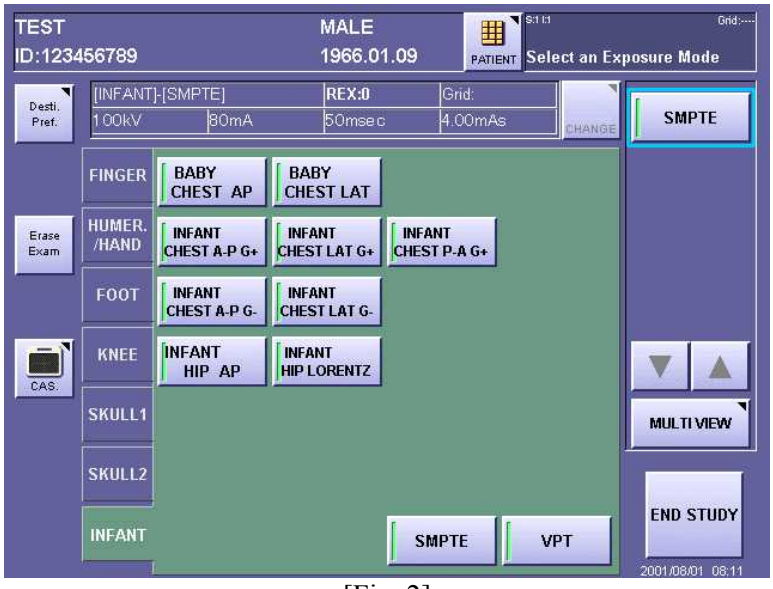
2) Using the two knobs at the rear of the operation unit, adjust the brightness and contrast of the touch panel screen for optimum visibility.

3) On the exposure screen, select the exposure mode “SMPTE” and wait until “READY” appears. [Fig. 1]



[Fig. 1]

4) Press the exposure switch on the X-ray generator, and after the exposure, press the END STUDY button. Transfer the SMPTE pattern image to the printer or the high-definition monitor. [Fig. 2]

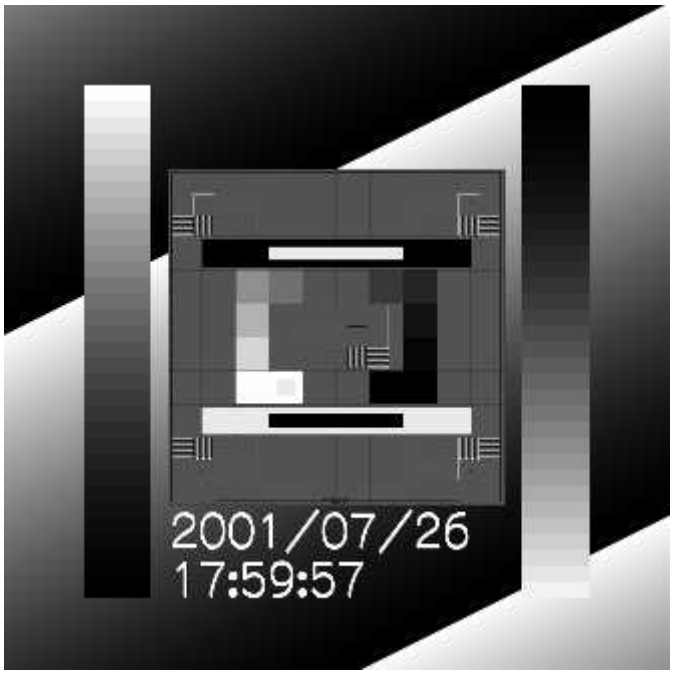


[Fig. 2]

5) Measure the densities of the 11 locations (0% to 100%) of test image grayscale on the film or on the monitor. [Fig. 3]

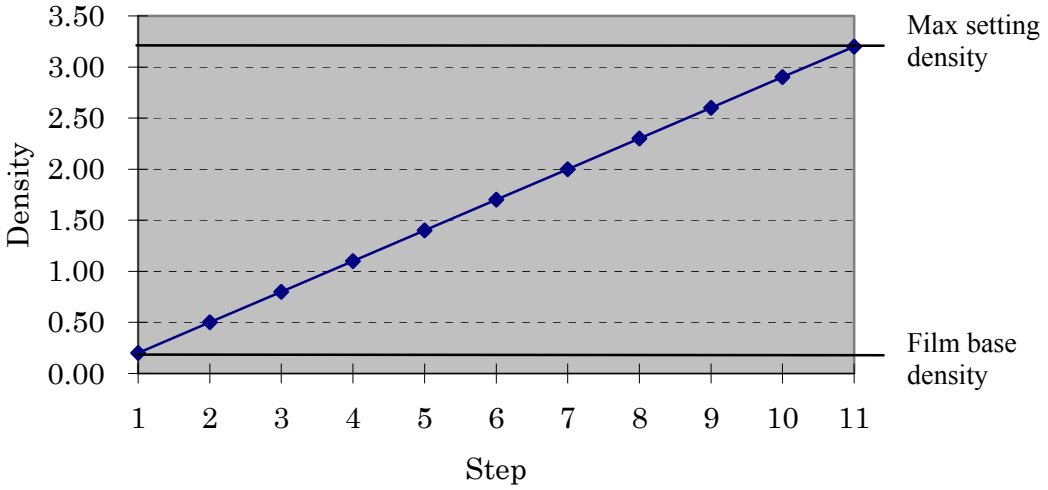
* Measure the SMPTE image density on the film is measured using a densitometer. Measure the SMPTE image density on the high-definition monitor using the gradation analysis software.

* The data for the SMPTE test image grayscale transferred by the CXDI are the values for the maximum density (3.20 in the case of the MLP 190) in the printer settings which have been changed in 11 uniform steps.



[Fig. 3]

6) Create the graph below based on the data measured in step 5).



As shown in the above graph, the measurement values need only to nearly form a straight line
from the minimum density to the maximum density.
The important point here is that the measurement values make a straight line and a maximum
density corresponding to the settings is output.
If the measurement values deviate too far from the straight line and a maximum density corresponding to the settings is not output, printer and monitor output linearity settings, calibration, and other adjustments are necessary.

* The above graph is an example of measurements when the maximum density is set to 3.2 D and the printed film is measured with a densitometer. Refer to the data below when the maximum density is set to 3.1 D, or when gradation analysis software is used to take measurements on the monitor.
* The LINEAR output cannot be set for some printer models.
In this case, try to select an output setting as close as possible to LINEAR.

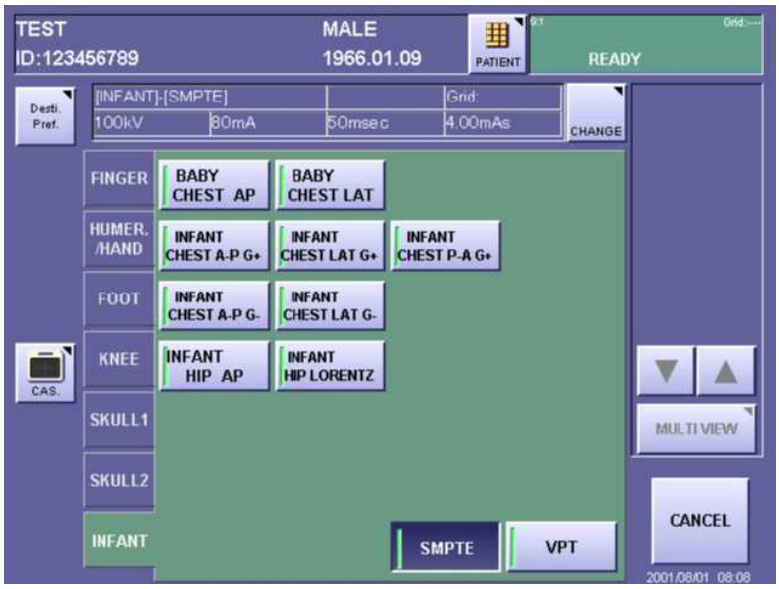
Ideal density values in LINEAR LINE

Step	1	2	3	4	5	6	7	8	9	10	11
3.2 D	0	0.32	0.64	0.96	1.28	1.60	1.92	2.24	2.56	2.88	3.20
3.1 D	0	0.31	0.62	0.93	1.24	1.55	1.86	2.17	2.48	2.79	3.10
12 Bit	0	410	819	1229	1638	2048	2457	2867	3276	3686	4095
8 Bit	0	26	51	77	102	128	153	179	204	230	255

Possible causes of non-linearity in measurement values:
Inadequate calibration of printer and high-definition monitor
Inadequate settings for CXDI printer parameters
Faults in printer or high-definition monitor

(4) Fine adjustment

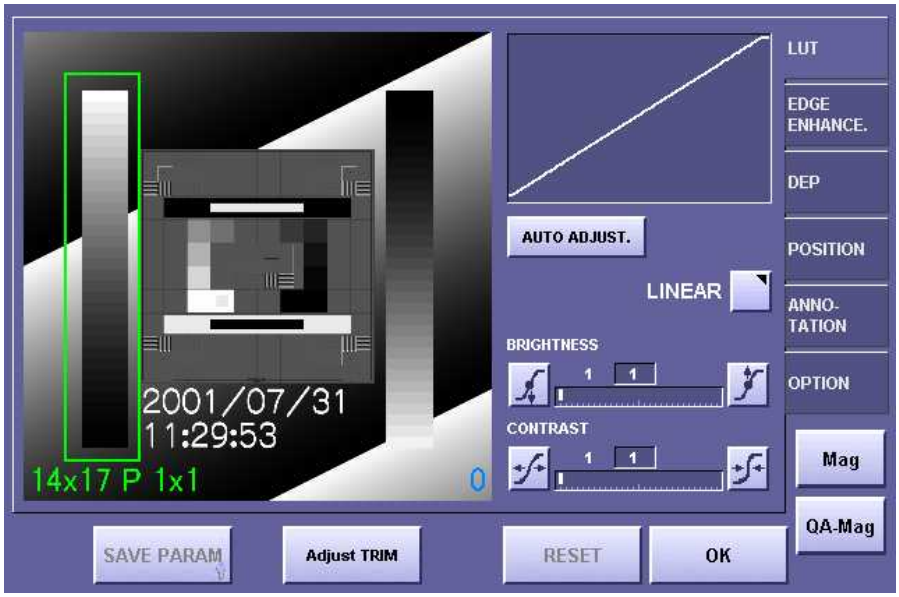
1) As the step (3)-3) above, make the system “READY” by selecting the exposure mode “SMPTE” on the exposure screen.[Fig. 4]



[Fig. 4]

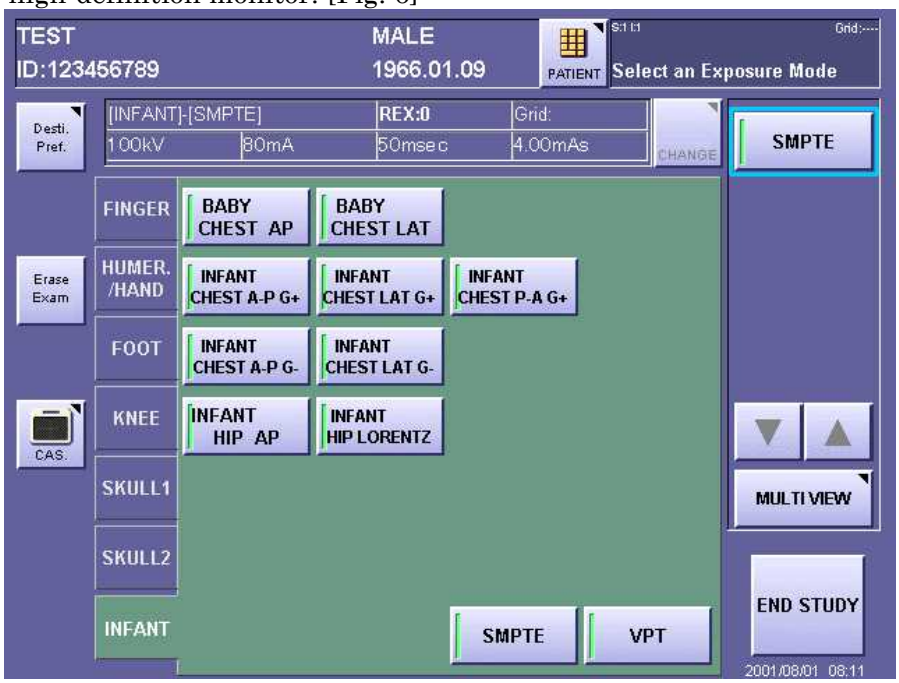
2) On the X-ray generator, press the exposure button. After the exposure, adjust the trim so that the gray scale may be located in the center of the image. [Fig. 5]

* For correct density measurement of the 32-step chart, the gray scale must be printed in the center of an image to eliminate the shading feature.



[Fig. 5]

3) Select the END STUDY and transfer the SMPTE pattern image to the printer or the high-definition monitor. [Fig. 6]

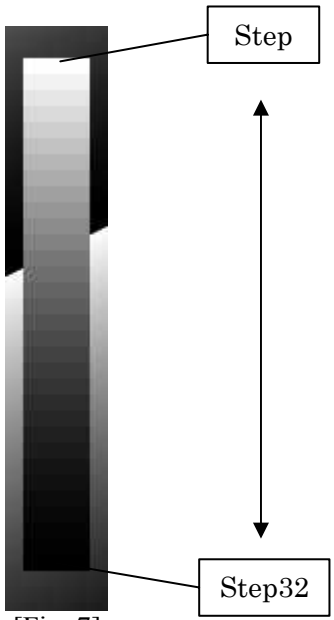


[Fig. 6]

4) On a printed film or on the monitor, measure the density of 32 steps of the grayscale on the test image. [Fig. 7]

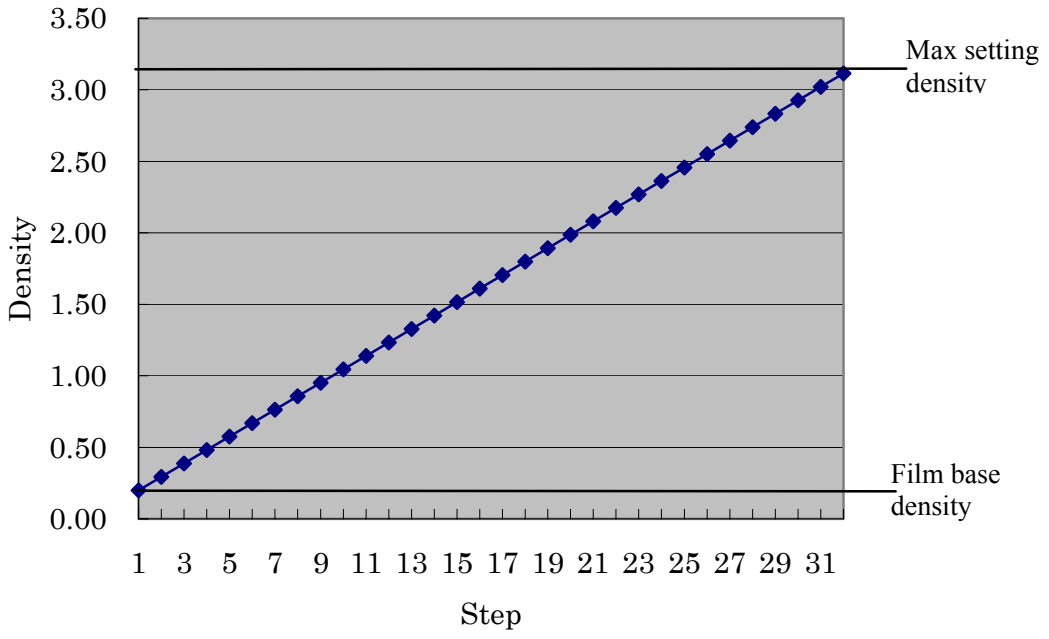
*1: Measure the SMPTE image density on the film using a densitometer. The SMPTE image density on the high-definition monitor is measured using the gradation analysis software.

*2: The data for the SMPTE test image grayscale transferred by the CXDI are the values for the maximum density (3.20 in the case of the MLP 190) in the printer settings which have been changed into 32 uniform steps.



[Fig. 7]

5) As the step (3)-6), create a graph based on the data measured in step 4), and make sure that the data from the minimum density to the maximum density nearly form a straight line.



Ideal Density Data for Linear Line

Step	1	2	3	4	5	6	7	8	9	10	11
3.2 D	0	0.10	0.21	0.31	0.41	0.52	0.62	0.72	0.83	0.93	1.03
3.1 D	0	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00
12 Bit	0	132	264	396	528	660	792	924	1056	1188	1320
8 Bit	0	8	16	24	32	41	49	57	65	74	82

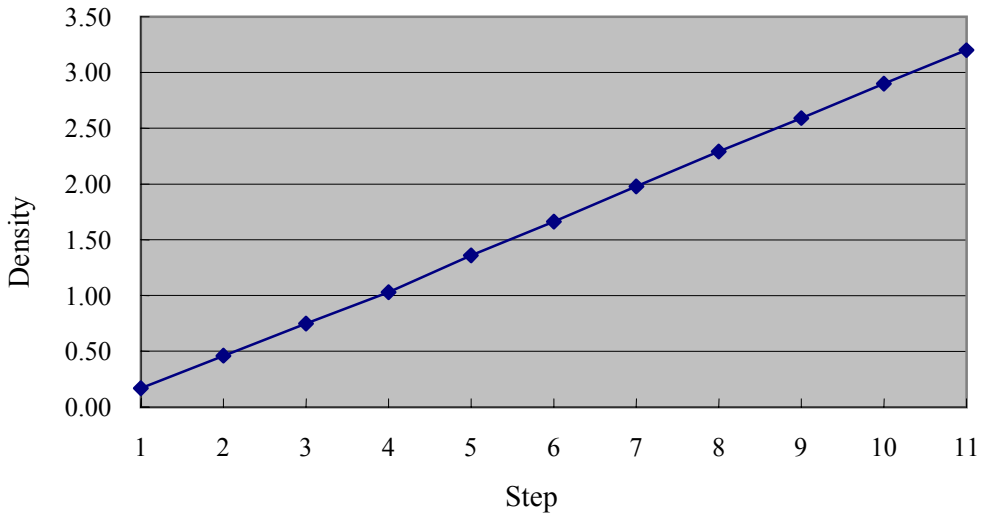
Step	12	13	14	15	16	17	18	19	20	21	22
3.2 D	1.14	1.24	1.34	1.45	1.55	1.65	1.75	1.86	1.96	2.06	2.17
3.1 D	1.10	1.20	1.30	1.40	1.50	1.60	1.70	1.80	1.90	2.00	2.10
12 Bit	1453	1585	1717	1849	1981	2113	2245	2377	2509	2641	2774
8 Bit	90	98	106	114	122	131	139	147	155	164	172

Step	23	24	25	26	27	28	29	30	31	32
3.2 D	2.27	2.37	2.48	2.58	2.68	2.79	2.89	2.99	3.10	3.20
3.1 D	2.20	2.30	2.40	2.50	2.60	2.70	2.80	2.90	3.00	3.10
12 Bit	2906	3038	3170	3302	3434	3566	3698	3830	3962	4095
8 Bit	180	188	196	205	213	221	229	238	246	255

Reference 1
In the data and graph below, the data was obtained by setting the Kodak MLP 190 to curve shape 0 (density linear), a maximum density of 3.20, the SMPTE test image was printed out, and the image data was measured.
As shown in the graph, the data from the minimum density (film base density) to the maximum density nearly form a straight line.

SMPTE Density

Step	1	2	3	4	5	6	7	8	9	10	11
Percentage	0	10	20	30	40	50	60	70	80	90	100
Density (D)	0.17	0.46	0.75	1.03	1.36	1.66	1.98	2.29	2.59	2.90	3.20

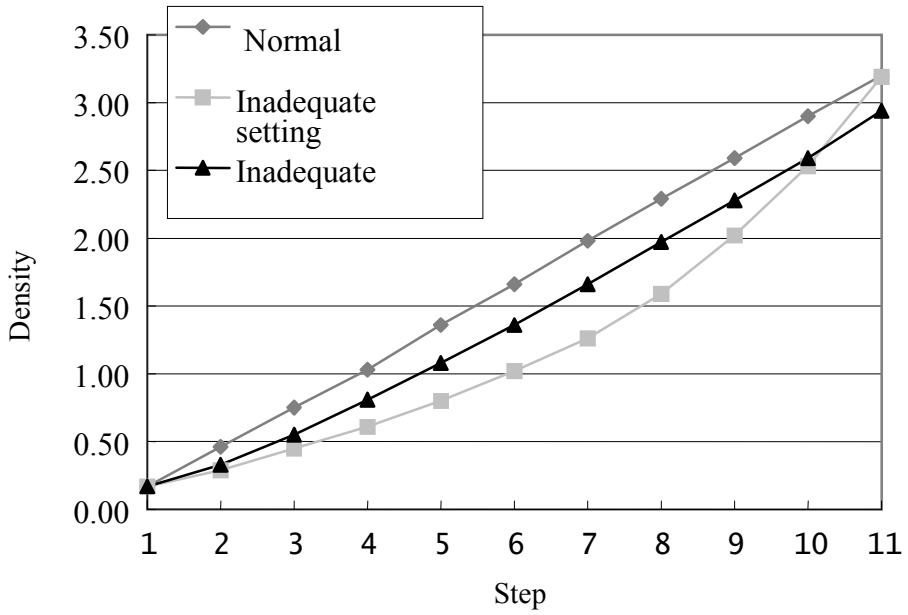


* The printer parameter settings in this case are:
-A 320 -T NO -M CUBIC -m NORMAL -S CS000

Reference 2
Example when the graph does not from a straight line
In the data and graph below, the data was obtained by using the Kodak MLP 190 to print out the SMPTE test image, and the image data was measured.
(1): Shows normal data.
(2): Shows the case when the CXDI printer parameters are not set linearly.
(3): Shows the case when the printer was not calibrated properly.

SMPTE Density

Step	1	2	3	4	5	6	7	8	9	10	11
Percentage	0	10	20	30	40	50	60	70	80	90	100
(1) Normal	0.17	0.46	0.75	1.03	1.36	1.66	1.98	2.29	2.59	2.90	3.20
(2) Inadequate parameter settings	0.17	0.29	0.45	0.61	0.80	1.02	1.26	1.59	2.02	2.53	3.19
(3) Inadequate	0.17	0.33	0.55	0.81	1.08	1.36	1.66	1.97	2.28	2.59	2.94



* For improper parameters, the printer parameter “-S CS000” was not entered.
* For the inadequate calibration, the printer calibration data was set too low.

4.3.13. Operation Unit Gamma Correction

(1) Purpose
This procedure is performed so that the image that is printed out or displayed on a high-definition monitor conforms exactly to the exposure image on the operation unit.

(2) Notes
1) The procedure in “Linearity Check of Transfer Image Density” must be completed.

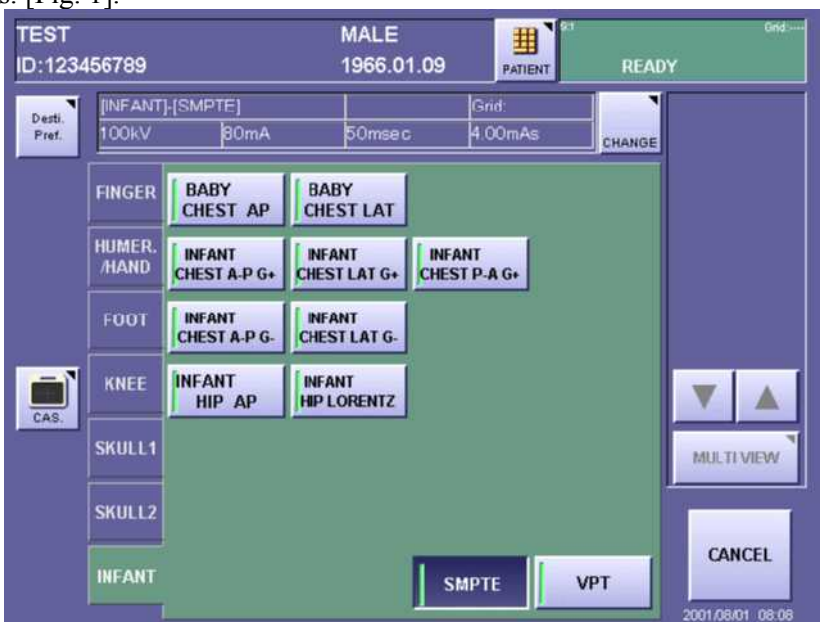
2) If image adjustment for the printer or high-definition monitor has not been made, adjust the gamma correction for the high- definition monitor image to the same setting as the printer image.

3) Gamma correction is an image correction process for monitors and film. It is different from the contrast setting or grayscale setting.
This procedure is simply a visual adjustment. As a result, differences may occur depending on the operator performing the procedure. Therefore, be sure to consult with the responsible technician before performing this adjustment.

(3) Compare the image on the operation unit with the image shown on the printed sheet and monitor.
1) Start up the CXDI system.

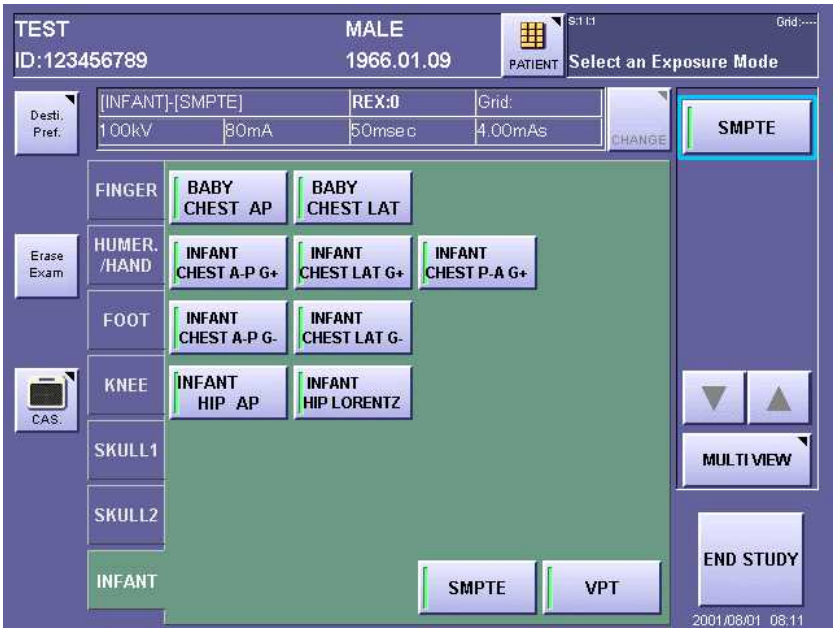
2) Use the two adjustment knobs at the rear of the operation unit to adjust the brightness and contrast of the touch panel screen for optimum visibility.

3) On the exposure screen, select the exposure mode “SMPTE” and wait until “READY” appears. [Fig. 1].



[Fig. 1]

4) On the X-ray generator, press the exposure button, and after the exposure, select “END STUDY”. Transfer the SMPTE pattern image to the printer or the high-definition monitor. [Fig. 2]



[Fig. 2]

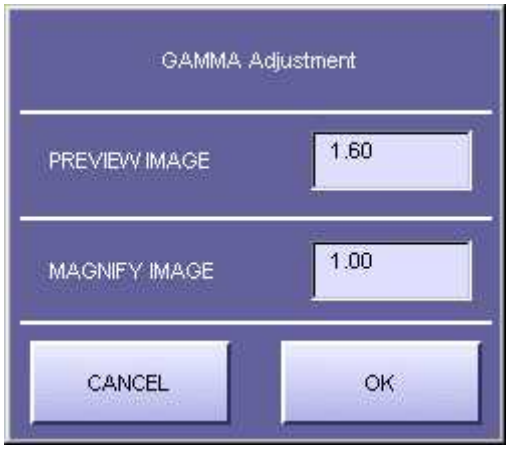
Take the SMPTE pattern image again. On the QA screen, compare the image displayed on the operation unit screen with the film image printed in Step 4) above or with the image on the high-definition monitor. Make sure there is no difference in contrast and gradation between those images. Check both preview and magnify images.
If there are any differences between these images, perform the procedure described in "(4) Operation Unit Image Gamma Correction" on the next page.
If there are no differences between these images, the steps are complete.

(3) Operation Unit Image Gamma Correction

1) On the QA screen displayed on Step (3) 5) above, select the "Option" tab and press the "Gamma Adjustment" button. [Fig. 3]

[Fig. 3]

2) The “Gamma Adjustment’ window appears. Change the value for the PREVIEW IMAGE, and press OK. The gamma correction for the operation unit screen is performed. [Fig. 4]
(Make sure the gamma value for the test image has changed on the operation unit screen.)
The gamma value is adjustable between 1.00 and 2.50.
When the image on the operation unit is lighter (whiter) than the film image, increase the value. On the contrary, if the image on the operation unit is darker (blacker) than the film image, decrease the value. The default gamma value is 1.60.



[Fig. 4]

3) When the gamma value for the preview image is adjusted, then adjust the gamma value for the magnify image. The default gamma value for the magnify image is 1.00.

4) The correction steps are complete.

4.3.14. Changing the Total Image Count

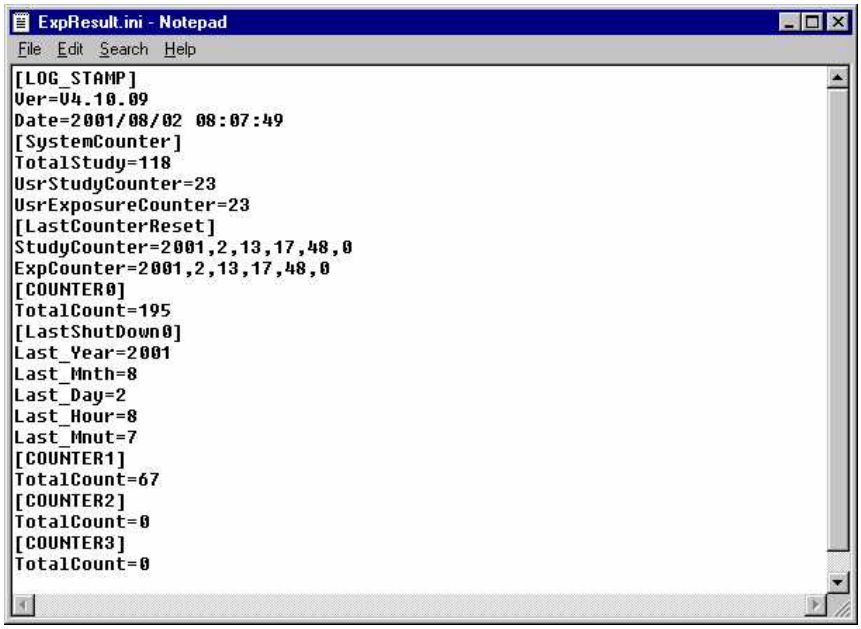
(1) Purpose
When the imaging unit is replaced (including the replacement of the LANMIT) for servicing, the total image count displayed on the user screen can be returned to “0”if necessary.

(2) **Notes**
1) The CXDI is connected by the system.
2) Set the CXDI application so that it does not start up.
3) Files are overwritten, and so be careful when performing the procedure.
4) As an extra precaution, write down the numerical values before overwriting them.
5) The overwritten counter becomes valid the next time that the CXDI is started up.

(3) Procedure
1) Turn on the control computer, and then start up Windows NT.

2) Open Windows NT Explorer.
Start → Programs →Windows NT

3) A file called “ExpResult.ini” is contained in the CCR folder.
Open this file. (D:\CCR\ExpResult.ini) [Fig 1]



[Fig 1]

4) Changing the items below contained in the file allows you to change the settings for the counter in the user screen.

ExpResult.ini file	Screen Display	Note
[SystemCounter]		
TotalStudy=	TOTAL STUDIES	
UsrStudyCounter=	STUDY COUNTER	Can be overwritten at the user screen
UsrExposure=	IMAGE COUNTER	Can be overwritten at the user screen
[LastCounterReset]		
StudyCounter=	Year, month, day, hour, minute	
ExpCounter=	Year, month, day, hour, minute	
[COUNTER 0]		
TotalCount=	Total number of images obtained with sensor unit 1.	
[COUNTER1]		
TotalCount=	Total number of images obtained with sensor unit 2.	
[COUNTER2]		
TotalCount=	Total number of images obtained with sensor unit 3.	
[COUNTER3]		
TotalCount=	Total number of images obtained with sensor unit 4.	

5) After overwriting the values, overwrite the file “ExpResult.ini” and save.

6) Close all windows that are open on the Desktop, and then start up the CXDI application.

7) Open the “System Information” screen, and check that the changed items have been set correctly.[Fig 2]
“TOTAL IMAGES” indicates the total number of images obtained with all the sensor.

[Fig 2]

4.3.15. Backing Up When Installing

(1) Purpose
The necessary files should be backed up so that the exposure position and other parameters can be returned to the status immediately after setup when reinstalling the CXDI application.

(2) Necessary items
1) Laptop PC (OS: Windows95, 98 or NT)
***1 When using Windows NT, separate access settings must be made.**
***2 The laptop PC should have a network card and driver installed, and should allow network connections using TCP/IP.**
***3 The backed-up files are approximately 30 MB in size, so secure empty hard disk capacity of about 50 MB to ensure sufficient margin.**

2) 10BASE-T cross cable or straight cable
*** This is used for a 1-to-1 connection between the control PC and the laptop PC. When using a straight cable, the separate tool HAB is necessary.**

(3) Notes
1) Before performing backup, delete any exposure mode keys and image data exposed for tests.
Deleting image data: Refer to the “Deleting Data” item.
Deleting exposure mode keys: Refer to the CXDI Series Operation Manual.

2) Backup should be performed immediately before handing over the product to the customer only for new installations.

3) The backup described in this section is only a temporary measure. If the data is stored on the laptop PC's hard disk, the data may be lost or other trouble may occur.
Storage on high capacity media (MO, Jaz, Zip, CD-R, etc.) or other measures should be taken at the customer's responsibility.

4) Backup is performed using a 1-to-1 connection between the control PC and the laptop PC. Therefore, when the system is connected to a network inside the hospital, it should be disconnected from this network before starting the backup work.

(4) Connections

1) Check that all equipment is turned off.

2) Connect the keyboard and mouse to the control PC.

3) Connect the laptop PC and the network card of the control PC using a 10BASE-T cross cable.
*** When using a straight cable, connect the PCs via the tool HUB.**

(5) Settings

1) Turn on the operation unit power and then the control PC power.

2) The CXDI application starts. Press the [Alt] + [Tab] keys to switch the program to the Command Prompt screen.

3) The message “Welcome to Canon CXDI” appears. Input [8] and press the [Enter] key. (Select “8 Exit”.)

4) The Windows NT desktop screen appears.

5) Turn on the laptop PC power.
*** This section describes the backup procedure using Windows95 as the OS.**

6) Windows95 starts. Click [Network Neighborhood] with the right button of the mouse, then click [Properties].

7) The [Network] window appears. Click the [Access Control] tag and set [Control access to shared resources using:] to [Share-level access control].

8) Click the [Identification] tag and input the following items.

Computer name :	The name is optional, but must be input.
Work group :	Set the same as the control PC.
Computer Description :	Input is optional.

9) Click the [Configuration tag], then click [TCP/IP] under the [The following network components are installed] item and click [Properties].

10) The [TCP/IP Properties] window appears. Click the [IP Address] tag, set to [Specify an IP address], and input the following items.

    IP Address : Input the address just before or after the control PC's IP address.
    (Example) Control PC: 192.168.1.19 Laptop PC: 192.168.1.18 or 20
    Subnet Mask: Set the same as the control PC.

11) Click the [WINS Configuration] tag and set to [Disable WINS Resolution].

12) Click the [DNS Configuration] tag and set to [Disable DNS].

13) Click [OK].

14) The screen returns to the [Network] window. Click [OK].

15) The [System Settings Change] window appears. Click [Yes] and reboot the computer.

16) After rebooting, the [Enter Network Password] window appears. Click [Cancel].

17) The Windows95 desktop screen appears. Open [My Computer].

18) The [My Computer] window appears. Click the hard drive to which the control PC data is to be backed up with the right button of the mouse, then click [Sharing].
    *** This section describes the backup drive as "C".**

19) The [(C:) Properties] window appears. Set to [Shared As:] and then set [Access Type:] to [Full].
    *** Do not set a password.**

20) Click [OK].

21) Open [My Computer] from the Windows NT desktop screen of the control PC.

22) The [My Computer] window appears. Open the "D"drive in this window.

23) Open [Network Neighborhood] from the Windows NT desktop screen of the control PC.

24) The [Network Neighborhood] window appears. Open the optional computer name assigne in step 8) in this window.

25) A window appears on the laptop PC screen. Open the “C” drive in this window.

26) The “D” drive in the [My Computer] window contains a “Ccr” folder. Drag and drop this folder to the “C”drive opened in step 25) to copy the folder.
*** Be sure to only copy the folder at this time; do not move the folder.**

27) The [Copying] window appears. Wait until the copying finishes.

28) When the copying finishes, the [Copying] window closes. Close all windows opened on the Windows NT desktop screen.

29) Open the “D”drive of the laptop PC.

30) Check that the “Ccr” folder has been copied.

31) Close all windows on the laptop PC.

32) Shut down the control PC and laptop PC and turn off the power.

4.3.16. Backing up Important Setting Data

(1) Purpose

"Important setting data (setting information which differs for each customer.)" is backed up to floppy disks and hard disks in consideration of possible setting data loss, hard disk corruption or other data errors.

In the event that setting data is lost or the hard disk is corrupted, this "Important setting data" can be quickly restored to the condition before the trouble occurred by copying from the backup data.

(2) **Notes**

1) Performing this backup work means that the CXDI system will be used with the floppy disk inserted in the floppy disk drive.

When changing the layout or otherwise moving the control PC, be sure to first eject the floppy disk to avoid damaging the floppy disk drive.

Likewise, when mounting the system in a vehicle, vibrations may cause damage to the floppy disk drive.

Therefore, after backing up the latest data to the floppy disk, be sure to eject the floppy disk.

2) Based on the reason in note 1) above, do not perform backups in an environment that is exposed to vibrations. Therefore, never perform backups when the control PC is loaded in a car.

In V4.0 and later versions, the default FD-Buck Up setting is ON. When backup to a floppy disk is not allowed, set it to OFF.

3) In the product default settings, "Boot/1. Removable Device" in the system BIOS settings is set to "Disabled". However, as a precaution, check that "Boot/1. Removable Device" is actually set to "Disabled". If the setting is changed to "Legacy Floppy", the control PC may not start properly when a floppy disk is inserted.

For more information, see "System BIOS Settings"

4) Be sure to always format the floppy disk that you are using before performing backups.

5) The backup procedure described here covers the case when backing up for the first time after installation. For the second and subsequent times, data is automatically backed up to the floppy disk whenever the user selects backup. It is recommended that you make a backup whenever changing the exposure mode buttons or other settings.

6) This backup procedure cannot be performed with just the control PC. Connect the imaging units and other equipment, and start up in the normal exposure status.

(3) Procedure

1) Remove the left side cover of the control PC.

2) Insert a formatted floppy disk (1.44 MB) in the floppy disk drive.
   * Make sure the write protect of the floppy disk is unlocked at this time.

3) Reattach the left side cover of the control PC.

4) Start up the CXDI system. If you have changed the parameters including the exposure mode button, back up all ini files to a floppy disk when you restart the system again.
   * When you first back up the files, the back up operation may take some time because there are many files to be copied.

5) Make sure that all files have been copied and switch off the CXDI system. The files copied to a floppy disk are “C:\ccrbup”, and they are the latest backup data. If the data store in the drive D is damaged and there is no trouble in drive C, restore the CXDI setting data using the data in “C:\ccrbup”.

4.3.17. Tool Modes

(1) Purpose

The tool modes (startup options) are intended in order to check operation, and are used to launch the CXDI application on the control PC by itself, and to display items that are not normally displayed.

(2) Preparation

1) Connect the keyboard and the mouse to the control PC.

2) Delete the “ccrstart.bat” file from Startup.

3) Disconnect the imaging unit from the control PC.

(3) Notes

Perform the following operation before using the /np mode. Especially, be sure to back up the exposure mode names and the customized settings before the operation.

1) When using /np with the same settings as that of the connected sensor unit
BodyPart**.ini file can be used as it is.
Example

	Connection	/np setting
Sensor1	Table	Table
Sensor2	Stand	Stand

2) When using /np with different settings from that of the connected sensor unit
Move the BodyPart**.ini file in the BodyParts folder to the desktop, etc. However, do not move the Reference folder. If the BodyPart**.ini file is left in the BodyParts folder, system will not be able to be started, as the sensor type of the BodyPart and the settings do not match.

(3) Startup method

1) Start up Windows NT.

2) Launch “ccrstart.bat” which is located in “D:\ccr”

***When the CXDI application is launched, the message Sensor not connected appears. Click [OK].**

3) When the exposure screen appears on the operation unit, press [Alt] + [Tab] on the keyboard to enter debugging mode.

4) When Welcome to CCR appears, select “1. Set-Up...”.

5) When Setting Mode (0: Normal, 1: Expert) [0=0x0]: appears, select “1: Expert.”

6) When CCR SETUP MENU appears, select “7 Scan Sensor Setup”.

7) When Capture Device Configuration Table appears, enter dummy serial numbers for the items indicated below.

The dummy serial numbers are as follows:

Upright stand	Serial Number	00000199
Patient table	Serial Number	00002009
Universal	Serial Number	0000123
Cassette	Serial Number	0000302

*** Be sure to write down the correct sensor serial numbers before entering the dummy serial numbers.**

For example, when the upright stand model is connected to Sensor 1, and the table model is connected to Sensor 2:

Enter “0000199” for “A/D Board Serial Number for Sensor ID#1”

Enter “00002009” for “A/D Board Serial Number for Sensor ID#2”

The CXDI application can now be launched on the control PC with the same conditions in effect as if an imaging unit were connected.

@@@@@@@@ Capture Device Configuration Table @@@@@@@@
Format Version [0 = 0x0] : 0
Max Capture Devices [4 = 0x4] : 4 **←Number of imaging units connected**
@@@@@@@@ Capture Device Configuration No.0 (SensorID#1 OPU)@@@@@@@@
------A/D Board Serial Number 0-0 -> 0x199
------A/D Board Serial Number 0-1 -> 0x2009
------A/D Board Serial Number 0-2 -> 0x123
------A/D Board Serial Number 0-3 -> 0x3002
A/D Board Serial Number for SensorID#1 [0x199 = 409] : ___ **←Dummy serial no. for**
R Capture Board Index [0 = 0x0] : 0 **Sensor 1**
R A/D Board Index [0 = 0x0] : 0
R LANMIT Index [0 = 0x0] : 0
Custom Type[0:NO CUSTOM 1:STAND 2:TABLE 3:UNIV 4:CASSETTE] [0 = 0x0] : 0
White Average Min Limit [2000 = 0x7D0] : 2000
White Average Max Limit [3000 = 0xBB8] : 3000
White Diff Limit [500 = 0x1F4] : 500
Times Of The Standard Dev. [10 = 0xA] : 10
Fixed Defect Pixel, DEF or NO [DEF] : DEF
:
:
:
@@@@@@@@ Capture Device Configuration No.1 (SensorID#2 OPU)@@@@@@@@
------A/D Board Serial Number 0-0 -> 0x199
------A/D Board Serial Number 0-1 -> 0x2009
------A/D Board Serial Number 0-2 -> 0x123
------A/D Board Serial Number 0-3 -> 3002
A/D Board Serial Number for SensorID#2 [0x2009 = 8201] ___ **←Dummy serial no. for**
R Capture Board Index [0 = 0x0] : 0 **Sensor 2**
R A/D Board Index [1 = 0x1] : 1
R LANMIT Index [0 = 0x0] : 0
Custom Type[0:NO CUSTOM 1:STAND 2:TABLE 3:UNIV 4:CASSETTE] [0 = 0x0] : 0
White Average Min Limit [2000 = 0x7D0] : 2000
White Average Max Limit [3000 = 0xBB8] : 3000
White Diff Limit [500 = 0x1F4] : 500
Times Of The Standard Dev. [10 = 0xA] : 10
Fixed Defect Pixel, DEF or NO [DEF] : DEF
:
:
:

@@@@@@@@ Capture Device Configuration No.2 (SensorID#3 OPU)@@@@@@@@@
------A/D Board Serial Number 0-0 -> 0x199
------A/D Board Serial Number 0-1 -> 0x2009
------A/D Board Serial Number 0-2 -> 0x123
------A/D Board Serial Number 0-3 -> 0x3002
A/D Board Serial Number for SensorID#3 [0x123 = 291] : __ **←Dummy serial no. for**
R Capture Board Index [0 = 0x0] : 0 **Sensor 3**
R A/D Board Index [2 = 0x2] : 2
R LANMIT Index [0 = 0x0] : 0
Custom Type[0:NO CUSTOM 1:STAND 2:TABLE 3:UNIV 4:CASSETTE] [3 = 0x3] : 3
White Average Min Limit [2000 = 0x7D0] : 2000
White Average Max Limit [3000 = 0xBB8] : 3000
White Diff Limit [500 = 0x1F4] : 500
Times Of The Standard Dev. [10 = 0xA] : 10
Fixed Defect Pixel, DEF or NO [DEF] : DEF
:
:
:
@@@@@@@@ Capture Device Configuration No.3 (SensorID#4 OPU)@@@@@@@@@
------A/D Board Serial Number 0-0 -> 0x199
------A/D Board Serial Number 0-1 -> 0x2009
------A/D Board Serial Number 0-2 -> 0x123
------A/D Board Serial Number 0-3 -> 0x3002
A/D Board Serial Number for SensorID#4 [0x3002 = 12290] :___ **←Dummy serial no. for**
R Capture Board Index [0 = 0x0] : 0 **Sensor 4**
R A/D Board Index [3 = 0x3] : 3
R LANMIT Index [0 = 0x0] : 0
Custom Type[0:NO CUSTOM 1:STAND 2:TABLE 3:UNIV 4:CASSETTE] [0 = 0x0] : 0
White Average Min Limit [2000 = 0x7D0] : 2000
White Average Max Limit [3000 = 0xBB8] : 3000
White Diff Limit [500 = 0x1F4] : 500
Times Of The Standard Dev. [10 = 0xA] : 10
Fixed Defect Pixel, DEF or NO [DEF] : DEF
:
:

8) When CCR SETUP MENU appears, press the [Esc] key to return to Welcome to CCR.

9) In Welcome to CCR, select “8 – Exit” and quit the CXDI application.

10) After returning to the Windows NT desktop, call up the command prompt.
Start → Program → Command Prompt

11) When C:\> appears, type “d:” on the keyboard, and then press the [Enter] key.

12) When D:\> appears, type “cd␣ccr’” on the keyboard, and then press the [Enter] key.
* “␣” indicates a space.

13) When D:\ccr> appears, type “ccr****␣/np” on the keyboard, and then press the [Enter] key.
(“****” varies according to the version of the CXDI application.)

14) When the CXDI application program is starting up, message “There is no BodyPart for SensorID#1. Create STAND TYPE BodyPart If you need to change the type, push cancel button, set custom type in the console 1-1-7setting menu and restart.” will be displayed if /np mode is used with a different setting. Click [OK].
(* differs according to the type of the sensor.)

(4) Going out of /np mode
Connect the sensor unit to the control PC.
Before using the system in normal condition, perform the following steps:

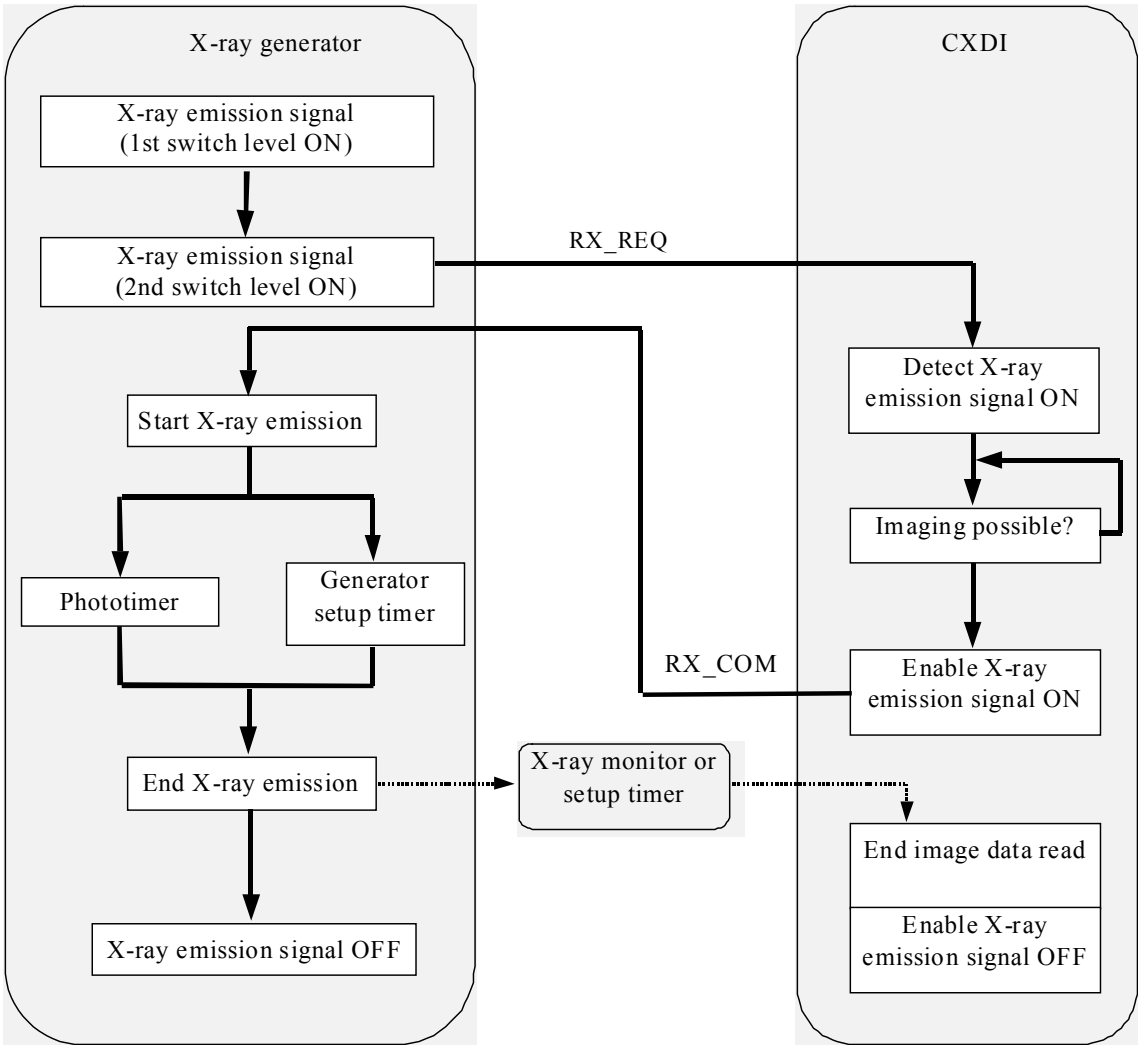
1) Return the items changed in step 7) to their original settings.

2) If /np mode has been used with a different setting as that of the connected sensor, as mentioned in “(3) Notes”, delete the BodyPart**.ini file made in the BodyParts folder, and return the BodyPart**.ini file which has been moved into the BodyParts folder.

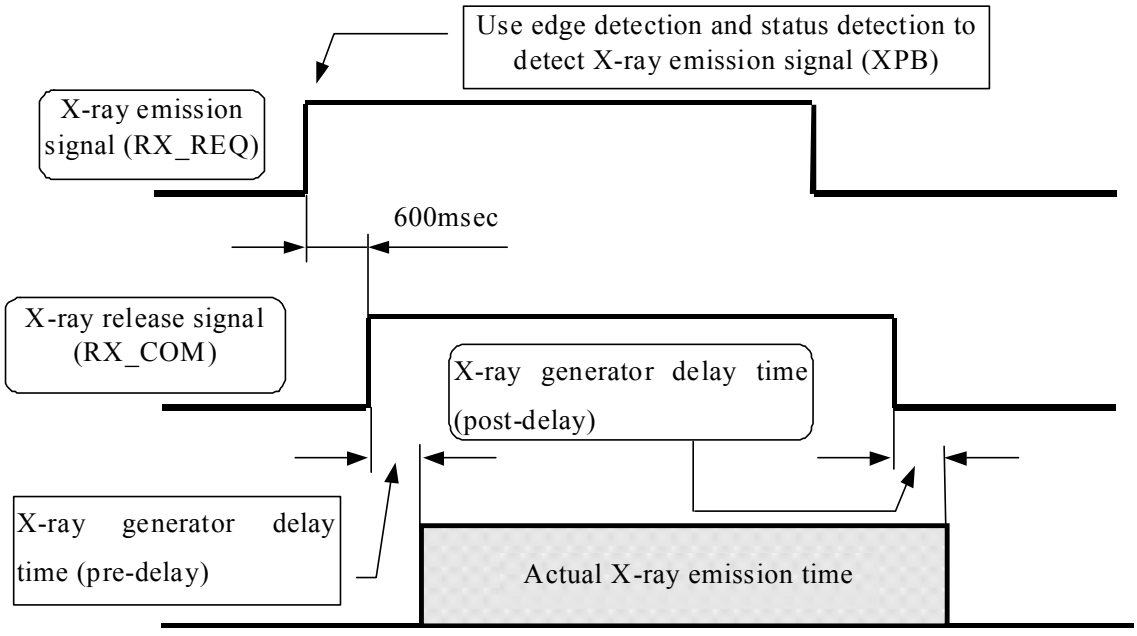
3) Register the ccrstart.bat file to the StartUp.

5. X-ray Controller Interface

5.1. Interface Signal Description



[Fig.1]



[Fig.2]

5.2. Signal Names and Functions in X-ray Generator Connections

(1) X-ray synchronization signals

Signal	Function
RDY_REQ1 RDY_REQ2 RDY_REQ3	X-ray emission signal (1st switch level)
RX_REQ1 RX_REQ2 RX_REQ3	X-ray emission signal (2nd switch level) Indicates that the X-ray generator has issued an X-ray emission command. This signal must continue for at least an interval “a”. If it is less than the interval “a”, the enable X-ray emission signal (RLS) is not output. The interval between the receiving of the X-ray emission signal from the X-ray generator until the output of the enable X-ray emission signal must be 600 ms minimum. The X-ray emission signal must be held at least during this interval. If the X-ray emission signal is terminated during this interval, at least 1 second is required before operation is enabled again.
RX_COM1 RX_COM2 RX_COM3	**X-ray release signal** After receiving the X-ray emission signal (RX_REQ) from the X-ray generator, the CXDI checks whether it is ready for imaging. If it is ready, it sends this signal to the X-ray generator.
ACT_XRAY	**X-ray emission in progress signal** This signal is sent from the X-ray generator to the CXDI while the X-rays are actually being emitted.
TER_XRAY	**X-ray cutoff signal output** Not used
RDY_ACK	**CXDI setup signal** Not used
INTERLOCK	**CXDI interlock signal** This signal is sent to the X-ray generator while the CXDI interlock is activated so that X-ray emission is not performed.
FG	Casing ground

[Table,1]

5.3. Ratings and Performance for Relays and Photocouplers

(Installed on X-ray Interface Board)

(1) RL1 to RL5 (Power Relay/Plug-in Terminal Type)

1) Rating (operation coil)

Class	Rated voltage	Rated current (mA)		Coil resistance	Coil conductance (H)		Operating voltage	Return voltage	Max. allowed voltage	Power consumption
	(V)	50Hz	60Hz	(Ω)	Contact released	Contact operating	(V)	(V)	(V)	(VA,W)
Twin Contact type	DC12	43.6		275	1.15	2.29	70% or more	15% or less	110%	Approx. 0.53

[Table.2]

2) Rating (open-close unit/contact unit)

Class	Twin contact type	
Number of pole	1	
Load	Resistance load (COSϕ = 1)	Induction load (COSϕ = 0.4, L/R = 7 ms)
Contact type	Twin	
Contact material	AgCd0	
Rated load	AC250V 5A DC 30A 5A	AC250A 2A DC 30A 3A
Rated current	5A	
Maximum contact voltage	AC380V,DC125A	
Maximum contact current	5A	
Maximum open-close capacity (reference value)	AC1250VA DC 150W	AC500VA DC 90W

[Table.3]

3) Performance

Item		Description
Number of poles		1
Contact resistance		30 mΩ or less
Operation time		15 ms or less
Return time		AC 10 ms or less DC 5 ms or less
Maximum open-close frequency	Mechanical	18,000 times/hour
	Rated load	1,800 times/hour
Electric strength		Between coil contacts : 1 minute at AC 5000 V 50/60 Hz Between same poles: 1 minute at AC 5000 V 50/60 Hz
Vibrations	Withstand	10 to 55 Hz double amplitude 1.5 mm
	Malfunction	10 to 55 Hz double amplitude 1.5 mm
Service life	Mechanical	AC: More than 1,000,000 times DC: More than 2,000,000 times (open-close frequency of 1,800 times/hour)
	DC	More than 100,000 times (at rated load and open-close frequency of 1,800 imes/hour)
Ambient temperature		-40 to +70°C (no freezing or condensation)
Ambient humidity		35 to 85% RH

[Table.4]

(2) RL6 to RL25 (Mini-relay/Single Stable Type)

1) Rating (operation coil)

Class	Rated voltage (V)	Rated Current (mA)	Coil resistance (Ω)	Operating Voltage (V)	Return Voltage (V)	Max. allowed voltage(V)	Power Consumption (MW)
Single stable type	DC12	23.3	514	8.4	1.2	18	Approx. 280

[Table.5]

2) Rating (open-close unit/contact unit)

Class	Single stable type	
Number of pole	2	
Load	Resistance load (COS ϕ = 1)	Induction load (COS ϕ = 0.4, L/R = 7 ms)
Contact type	Crossbar twin	
Contact material	Agpd + Au clad	
Rated load	AC125V 0.3A DC 30A 1A	AC125A 0.2A DC 30A 0.5A
Rated current	3A	
Maximum contact voltage	AC250V,DC220A	
Maximum contact current	1A	2A
Maximum open-close capacity (reference value)	AC125VA DC 60W	AC62.5VA DC 30W

[Table.6]

3) Performance

Item		Description
Number of poles		2
Contact resistance		50mΩ or less
Operation time		5 ms or less
Return time		3 ms or less
Electric strength		Between coil contacts : 1 minute at AC 2000 V 50/60 Hz Between different poles: 1 minute at AC 1000 V 50/60 Hz Between same poles: 1 minute at AC 1000 V 50/60 Hz
Vibrations	Withstand	10 to 55 Hz double amplitude 5 mm
	Malfunction	10 to 55 Hz double amplitude 3.3 mm
Service life	Mechanical	AC: More than 100,000,000 times (at no contact load and open-close frequency of 36,000 imes/hour)
	DC	More than 500,000 times (at rated load and open-close frequency of 1,800 imes/hour)
Ambient temperature		-40 to +70°C (no freezing or condensation)
Ambient humidity		35 to 85% RH

[Table.7]

(3) PC1 to PC10 (Photocoupler)

1) Maximum rating (Ta=25°C)

Item		Symbol	Value
Input side	Forward current	I_F	50 mA
	Maximum forward current	I_{FM}	1 A
	Reverse current	V_R	6 V
	Allowable loss	P	75 mW
Output side	Collector-Emitter voltage	V_{CEO}	35 V
	Emitter-Collector voltage	V_{ECO}	6 V
	Collector current	I_C	20 mA
	Collector loss	P_C	75 mA
Insulation electric strength		V_{iso}	5 kVrms
Operating temperature		T_{opr}	-25 to 85°C
Storage temperature		T_{stg}	-40 to 100°C

[Table.8]

2) Electrical characteristics (Ta=25°C)

Item			Symbol	Measurement condition	Min	Standard	Max	Unit
Input side	Forward current		V_F	I_F = 20 mA	-	1.2	1.4	V
	Maximum forward current		V_{FM}	I_{FM} = 0.5 A	-	3	4	V
	Reverse current		I_R	V_R = 3 V	-	-	10	μA
	Capacity between terminals		C_t	V = 0, f = 1 kHz	-	50	250	pF
Output side	Collector-emitter breakdown voltage		B V_{CEO}	I_C = 0.1 mA I_F = 0	35	-		V
	Emitter-collector breakdown voltage		B V_{ECO}	I_E = 10 μA I_F = 0	6	-		V
	Dark current		I_{CEO}	V_{EC} = 20 V I_F=0	-	-	100	nA
Transfer characteristics	Collector current		I_C	I_F = 20 mA V_{CE} = 5 V	2	-	20	mA
	Collector-emitter saturation voltage		$V_{CE(sat)}$	I_F = 40 mA I_C=1mA	-	-	0.4	V
	Insulation resistance		R_{ISO}	DC 500 V 40 to 60% RH	10^{12}	-		Ω
	Cutoff frequency		f_C	V_{CE} = 2 V, I_C= 2 mA R_L = 100Ω, -3 dB	12	80	20	kHz
	Response time	Rise time	t_r	V_{CE} = 2 V, I_C= 2 mA R_L = 100Ω	-	3	20	μS
		Fall time	t_f		-	4	30	μS

[Table.9]

5.4. Adjusting the Timing with the X-ray Generator

(1) Adjusting the Timing

1) Purpose

Adjust the parameters to synchronize the X-ray generator radiation timing with the CXDI.

2) Tools used

· Keyboard

· Mouse

· Timing adjustment software (Xpress)

3) Precautions

· The Xpress software application will automatically be installed if the application is Version 4.10 or later..

· When connecting two or more X-ray tubess, the timing must be adjusted and the parameters input for each X-ray tube.

4) Procedures

This work is broadly divided into the following tasks.

A: Preparing for measurement

B: Checking the Pre Delay time stability and setting the internal parameters

C: Measuring with a tentative Pre Delay

D: Checking with the measured Pre Delay and Post Delay

(1) Preparing for measurement

A) There are nine files in the D:[ccr] folder as Xpress software as indicated below.

Xpress.exe	phase1.sc	phase1.ini
Callcapt.dll	phase2.sc	phase2.ini
Comdlg32.ocx	phase3.sc	phase3.ini

(Xpress.exe is the execution file)

B-1) Set the X-ray generator to the following imaging conditions and align the exposure position with the imaging unit.

[Imaging conditions]	X-ray tube voltage:	100 kV
	X-ray tube current:	50 mA
	Irradiation time:	50 msec
	Focal distance:	Align with the grid used
	Phototimer:	Disabled (OFF)

*If the phototimer is not disabled, an accurate Pre Delay and Post Delay cannot be set.

B-2) Only mAs will be displayed according to the X-ray generator being used. In this case, set the exposure conditions as follows.

[Imaging conditions]	X-ray tube voltage:	100 kV
	X-ray tube current:	50 mA
	mAs:	Set the mAs value between 2.0mAs and 4.0 mAs
	Focal distance:	Align with the grid used
	Phototimer:	Disabled (OFF)

*If the phototimer is not disabled, an accurate Pre Delay and Post Delay cannot be set.

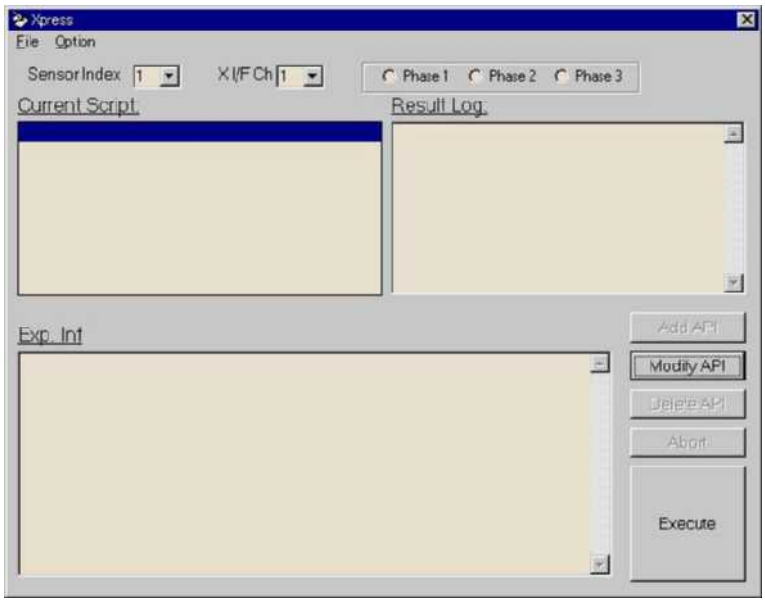
(2) Checking the Pre Delay time stability and setting the internal parameters

* If imaging must be stopped for some reason during the work, select the [Abort] button and stop the work.
* If the [Modify API] button is pressed, the sequence and parameter data can be changed. However, this may make accurate measurement impossible, so this button should not be touched.

A) Start up the [Xpress.exe] file and set the sensor numbers to be used for [Sensor Index] and the X-ray I/F Channel to be used for [X I/F Ch].

* The Sensor Index and I/F Channel settings should not be changed after selecting the Phase.

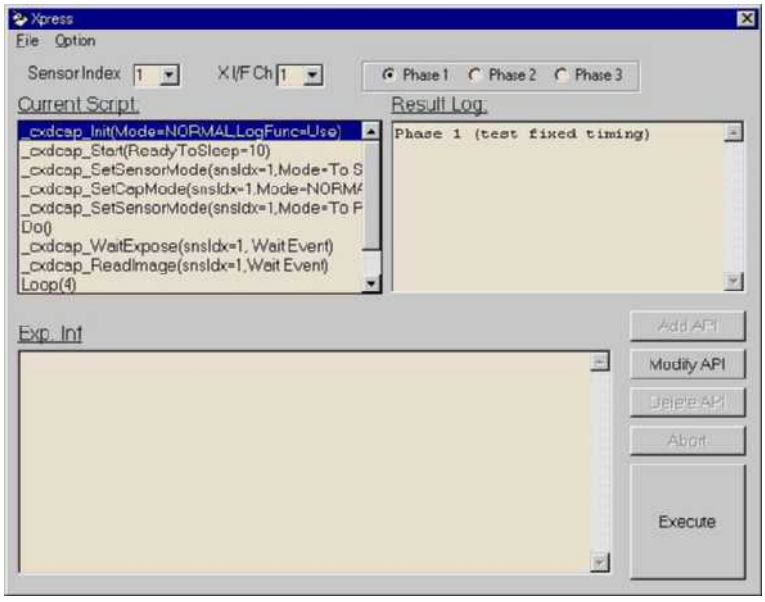
[Screen when starting up the application]



[Fig.3]

B) Select the [Phase1] button to display [Current Script].

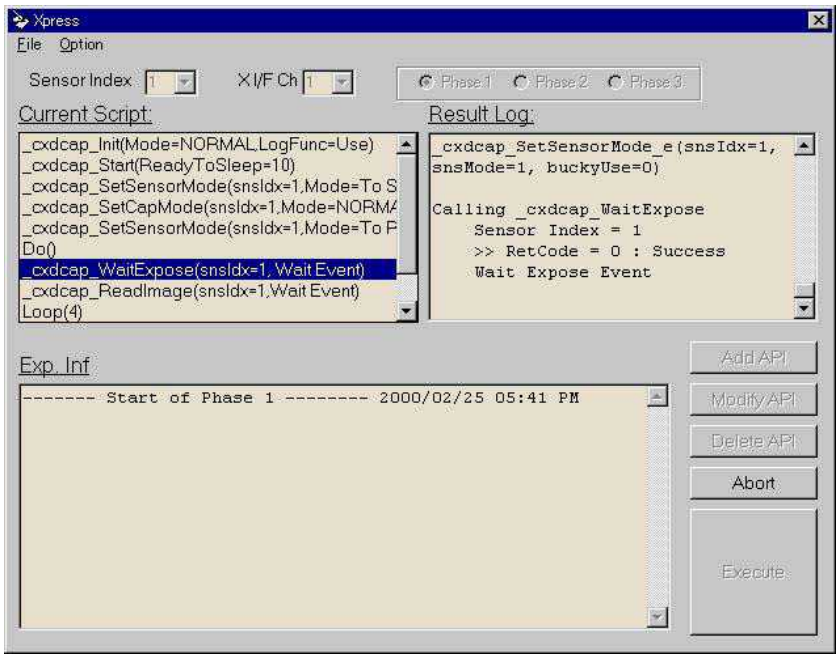
[Screen when starting Phase1]



[Fig.4]

C) Select the [Execute] button to set the sensors to READY status, then press the [Expose] button on the X-ray generator to irradiate X-rays.

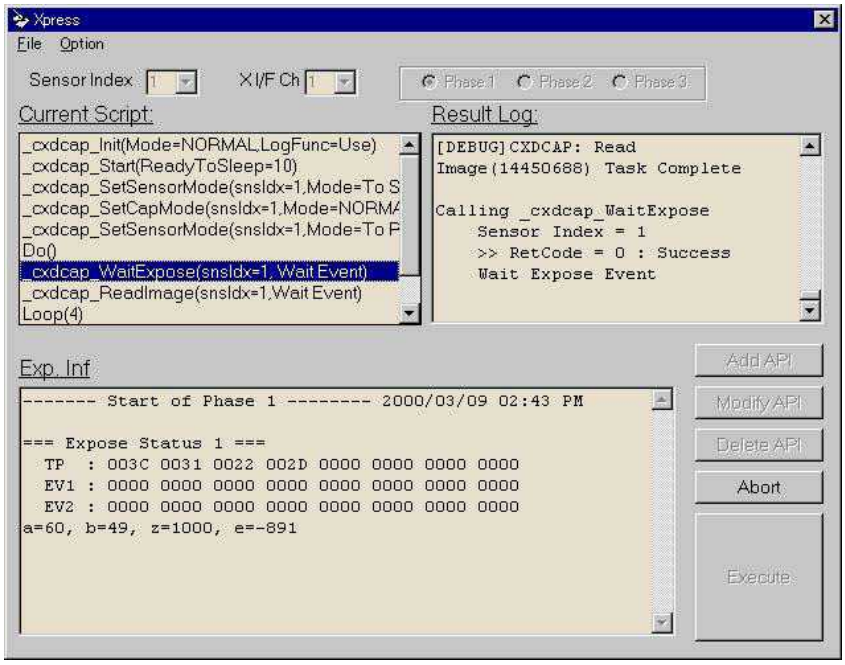
[Irradiation standby status]



[Fig.5]

D) When the first irradiation ends, the measurement results are displayed in [Exp. inf].

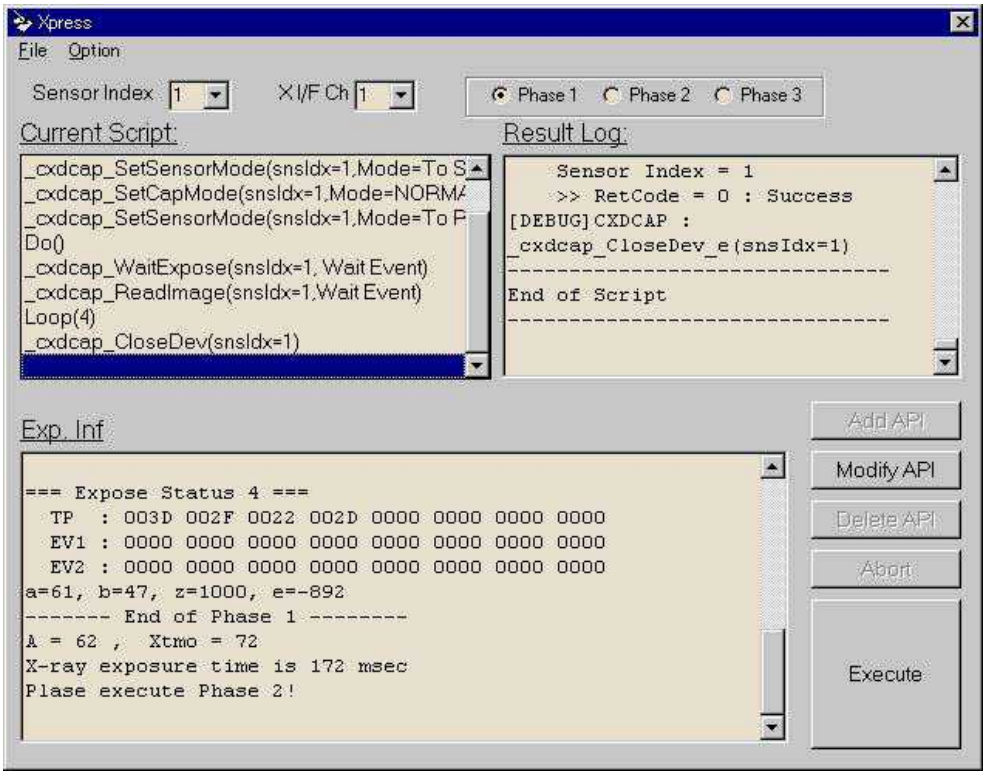
[Screen after Phase1 exposure]



[Fig.6]

E) The sensors are set to READY status a few seconds after the first irradiation ends, so continue and perform the second, third and fourth irradiations.
(Perform four irradiations to test whether the Pre Delay time is stable in Phase1.)

[Phase1 complete screen]



[Fig.7]

Check the stability of the pre-delay in Phase1 and determine the X-ray time-out value (internal parameter) to be used for Phase2.
(The Phase1 measurement results are saved in the [phase1.ers] file.)
This example shows the X-ray irradiation time to be used in Phase2 as 172 msec, but the irradiation time often cannot be set on the X-ray generator side in such fine increments.
In these cases, set the closest value (180 or 200 msec) that can be used for irradiation.

A = maximum Pre Delay measurement value
Xtmo = A + 10 msec
Irradiation time used in Phase2 = Xtmo + 100 msec

(3) Measuring with a tentative Pre Delay

When the Phase2 button is selected, Pre Delay = 0, Post Delay = 255 is automatically set internally.

A-1) Set the X-ray generator to the following imaging conditions.

[Imaging conditions]	X-ray tube voltage:	100 kV
	X-ray tube current:	50 mA
	Irradiation time:	Value close to the value obtained in Phase1 (180 or 200 msec in the example in B-5)
	Focal distance:	Align with the grid used.
	Phototimer:	Disabled (OFF)

A-2) Only mAs will be displayed according to the X-ray generator being used. In this case, set the exposure conditions as follows.

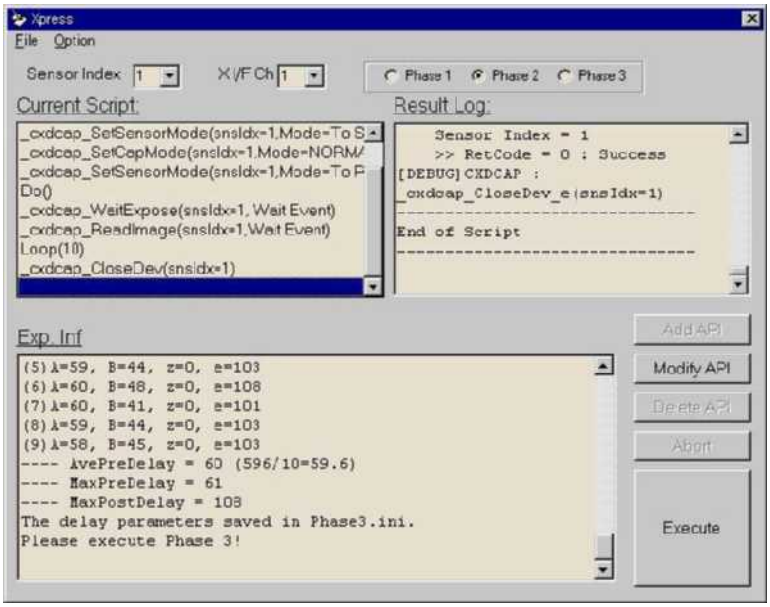
[Imaging conditions]	X-ray tube voltage:	100 kV
	X-ray tube current:	50 mA
	mAs:	Set the mAs vale between 2.0mAs and 4.0mAs
	Focal distance:	Align with the grid used.
	Phototimer:	Disabled (OFF)

B) Select the [Phase2] button and select the [Execute] button like Phase1 to set the sensors to READY status. Then press the [Expose] button on the X-ray generator to irradiate X-rays.

After 10 irradiations in Phase2, [Pre Delay time] and [Post Delay time] are automatically calculated and displayed.

(The Phase2 measurement results are saved in the [phase2.ers] file.)

[Phase2 complete screen]



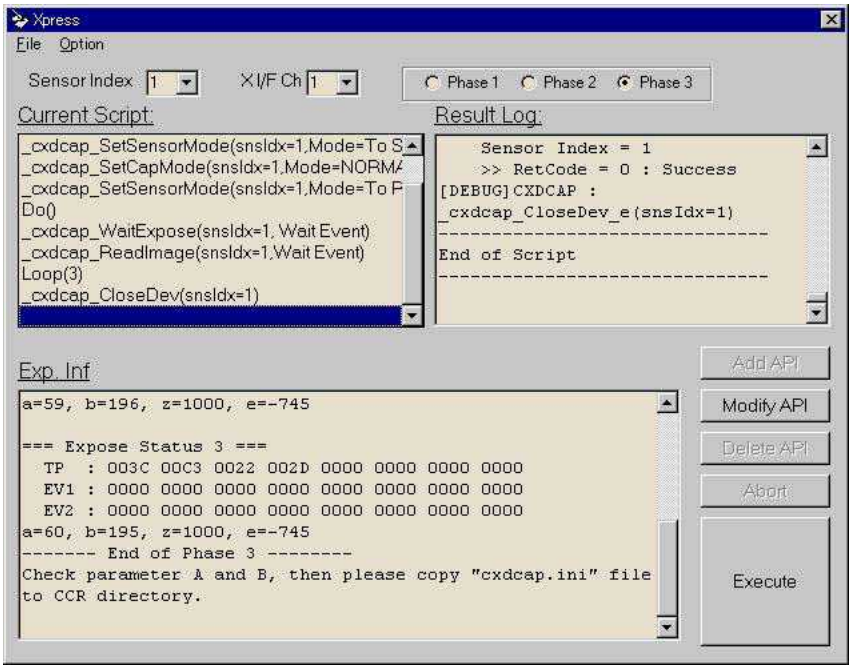
[Fig.8]

(4) Checking with the measured Pre Delay and Post Delay

When the Phase3 button is selected, the Pre Delay and Post Delay measured in Phase2 are automatically set.

A) Select the [Phase3] button and select the [Execute] button like Phase2 to set the sensors to READY status. Then press the [Expose] button on the X-ray generator to irradiate X-rays. Phase3 ends automatically after 3 irradiations in Phase3.
At this time, check that a value close to the Pre Delay measured in Phase2 is output to [a], and a value close to the irradiation time set by the X-ray generator is output to [b].

[Phase3 complete screen]



[Fig.9]

6. Image Quality Check

(1) Purpose

This procedure is used to check the final image quality of the CXDI.

The settings for the image parameters are made to attain the desired image quality.

1) Resolution check

Tools used

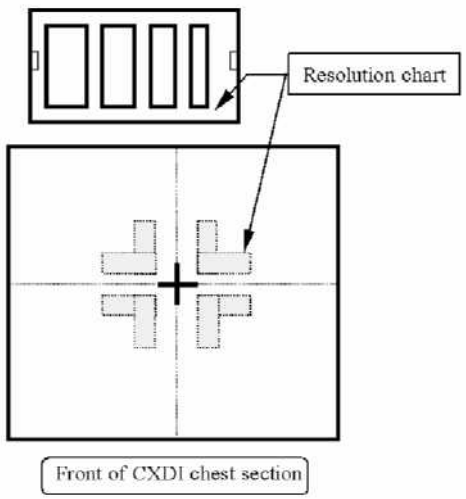
(1) Resolution chart

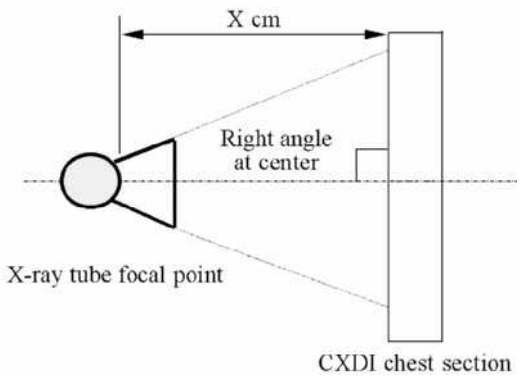
(2) Grid chart

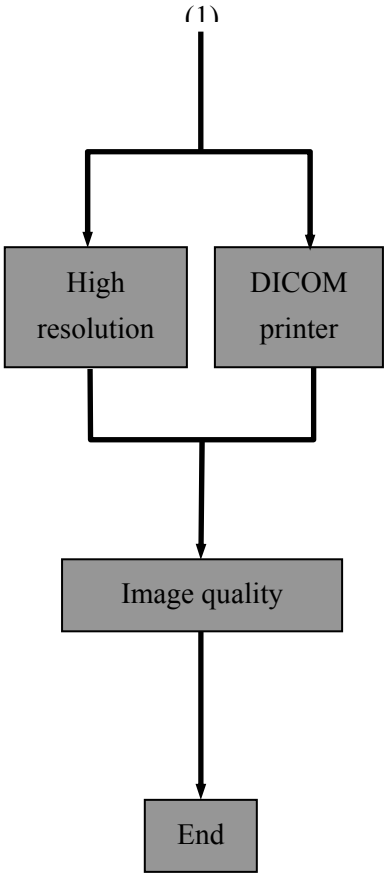
(3) Image analysis software (currently under development and testing)

(4) High-resolution monitor or DICOM printer

Procedure

Procedure/Steps	Description/Conditions
5.1. Start	1. Attach the resolution chart to the imaging unit (chest section) as described below. **Attachment locations: Attach the charts in the horizontal and vertical directions near the center of each quadrant (quadrants 1 to 4).** · The resolution charts are attached securely to the CXDI chest section. · Although a single resolution chart is sufficient, the use of charts in a total of eight locations (one vertical and horizontal in each quadrant) are recommended. 

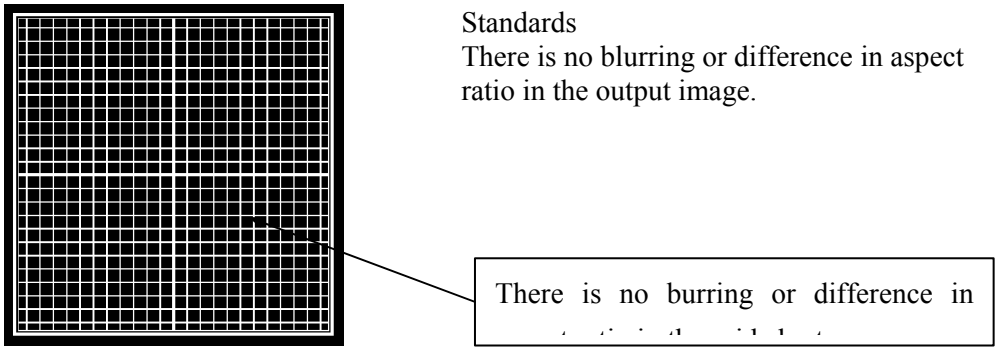
Procedure/Steps	Description/Conditions
Setting of X-ray exposure conditions ↓ <Positioning> Positioning between the X-ray tube and CXDI ↓ Setting of the exposure conditions ↓ Exposure ↓ Image output ↓ (1)	2. X-ray exposure conditions (reference value at actory shipping) X-ray tube voltage : 100 kV X-ray tube current : 50 mA Time : 50 msec X-ray tube focal point ←→CXDI chest section X cm (Set according to the grid used)  3. Tube focal point ←→ CXDI chest section ·Align so that the CXDI chest section and X-ray tube form a right angle at the center. ·The distance is determined by the setting conditions during installation. 4. Make the settings for the operation unit according to the exposure procedure. 5. Perform X-ray exposure, and then load the image onto the CXDI. 6. Output the loaded image to a high-resolution monitor or DICOM printer.

Procedure/Steps	Description/Conditions
	7. Use the respective operation manual to make the settings for the high-resolution monitor and DICOM printer. 8. Standards The resolution varies depending on the monitor or DICOM printer that is used.

2) Grid chart check

Procedure

Securely attach the grid chart to the CXDI imaging unit in the same way as the resolution chart, and then perform steps (1) to (8).
The X-ray exposure conditions are the same as for the resolution chart.
* Blurring and difference in aspect ratio can result if the grid chart is sticks out from the imaging unit.



(2) Connection with the DICOM printer

1) Overview

The CXDI has been designed for connection to printers from a wide variety manufacturers, including those already installed and newly added.
Be aware that the final image quality may vary slightly based on the printer performance and specifications.
Although the following DICOM printers are recommended for connection with the CXDI, generally, any DICOM-certified printer can be connected to the CXDI.
Also, be sure to inquire at the respective PACS manufacturer when printing with PACS. In some cases, old non-DICOM printers may be supported.

+. Kodak MLP190
· Grayscale: 4096 x 5120 12-bit printer

+. Imation DryView8700
· Grayscale: 4096 x 5120 12-bit printer

2) Connection with the Kodak MLP-190

As a general guide for printer connections, this section describes the procedure for directly connecting the Kodak laser printer MLP-190 to the CXDI, and then printing out the loaded image.

See the MLP-190 Operation Manual for the specific operating procedures for the Kodak MLP-190 (such as the mode settings, calibration, and printout procedures).

1. Required equipment

a. Hub

b. Ethernet cables (straight): 2

c. Kodak DICOM printer MLP-190

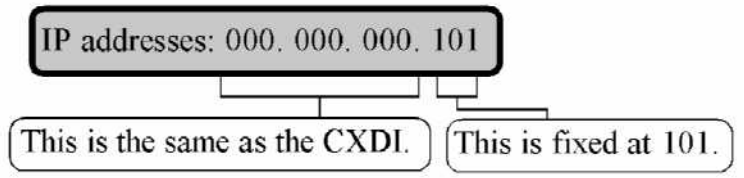
2. Connection

Use Ethernet cables (straight) to connect the CXDI to the MLP-190 by passing through the hub as shown in the figure below.

3. MLP-190 settings

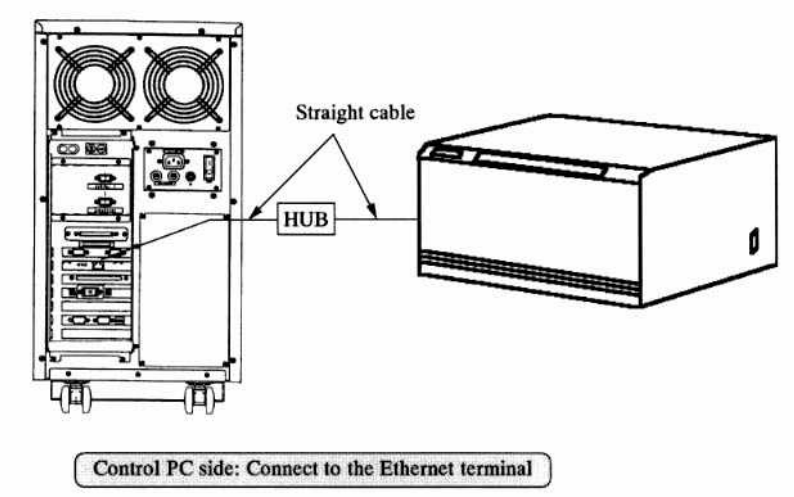
(1) Setting the IP addresses and ports

Make the settings for the MLP-190 IP addresses and ports as shown below.



Example: 172. 17. 9. 101

(2) DICOM port: 5040 (fixed)



Refer to the CXDI Series Operation Manual (“Customizing the Image Output Settings” to make the printer and storage settings.

7. Post-installation checks

7.1. Check sheet

Checkpoint	Checkpoint details	Check
Checking the software version	Check that the CXDI application, A/D board firmware and capture firmware versions all match.	☐
Inputting the control PC serial number	Input the serial number of the control PC to be used.	☐
Identifying the imaging units and setting the number of units connected	Set the number of sensors to be used.	☐
	Register the serial numbers of the sensors in the terminal.	☐
Checking the operation unit	Set the contrast.	☐
	Set the brightness.	☐
	Set the gamma correction.	☐
Inputting the image compensation data	Input the image compensation data.	☐
	Check the serial numbers of the sensors.	☐
	Perform the settings for multiple sensors are used.	☐
Checking the date and time	Set the date.	☐
	Set the time.	☐
	Set the time zone.	☐
Checking the timing with the X-ray generators	Adjust the pre-delay and post-delay.	☐
	Delete the X-rayed image obtained at the adjustment stage.	☐
	Delete the body part buttons used for adjustment.	☐
	Perform the settings for each of the X-ray tubes when more than one X-ray tube is used.	☐
Inserting the backup floppy disk and checking the backup files	Create the backup files in floppy drive by re-starting. (Cannot be used in automobile)	☐
Checking the radiographic condition table	kV	☐
	mA	☐
	msec or mAs	☐
Network connections	IP address	☐
	Subnet mask	☐
	Default gateway	☐
Preparations prior to X-raying	Perform calibration.	☐
	Perform self-diagnosis.	☐
Checking the annotation	Checking that the setting have been made in accordance	☐
Performing the setting and checks for image transmission to external memory	Checking that the setting have been made in accordance	☐
Checking the image quality	Use SMPTE pattern to check the density on a linear chart.	☐

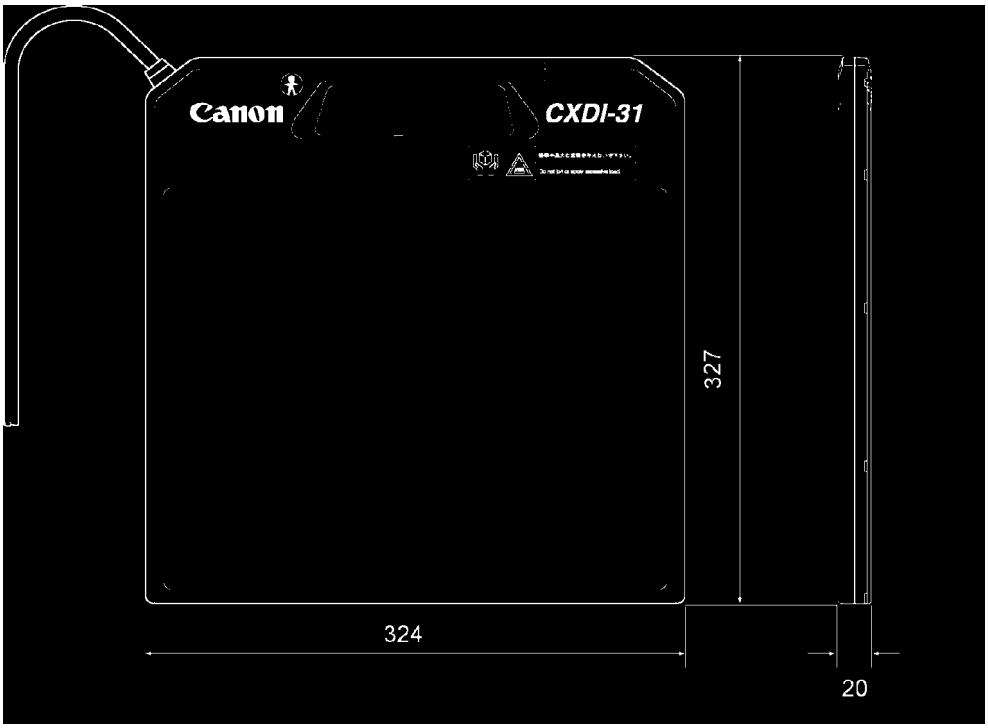
Checkpoint	Checkpoint details	Check
Deleting unnecessary data (there must be no unnecessary data such as the images used for testing)	dtque	☐
	dtstore	☐
	dttmp	☐
	old	☐
	Windows NT trash box	☐
Checking the window displays (no unnecessary windows must appear; the same applies after rebooting)	Operate from the Windows NT desktop.	☐
	Taskbar	☐
Backing up the data in the notebook PC	Copy the d:ccr folder.	☐
Registering in startup	Check that the CXDI application starts.	☐
	Check that no /d, /np or other flags have been raised.	☐
Communication with X-ray generators	kV, mA, msec, body part settings, etc.	☐

[Table.1]

8. External Dimensional Diagram

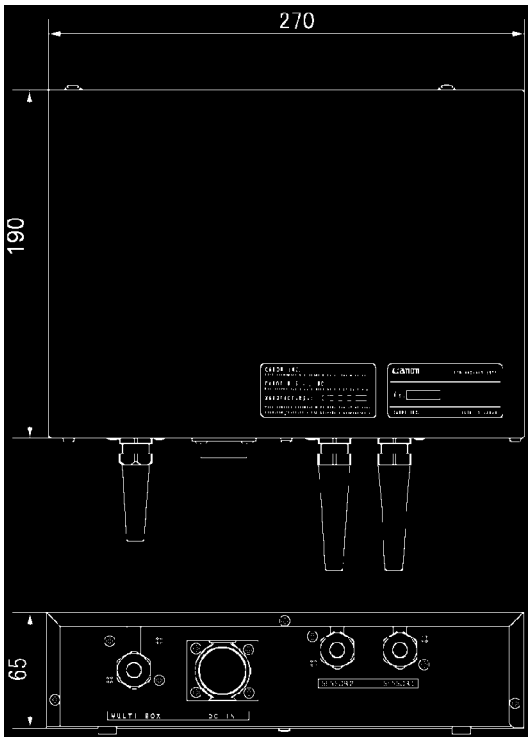
8.1. CXDI-31

8.1.1. Imaging unit



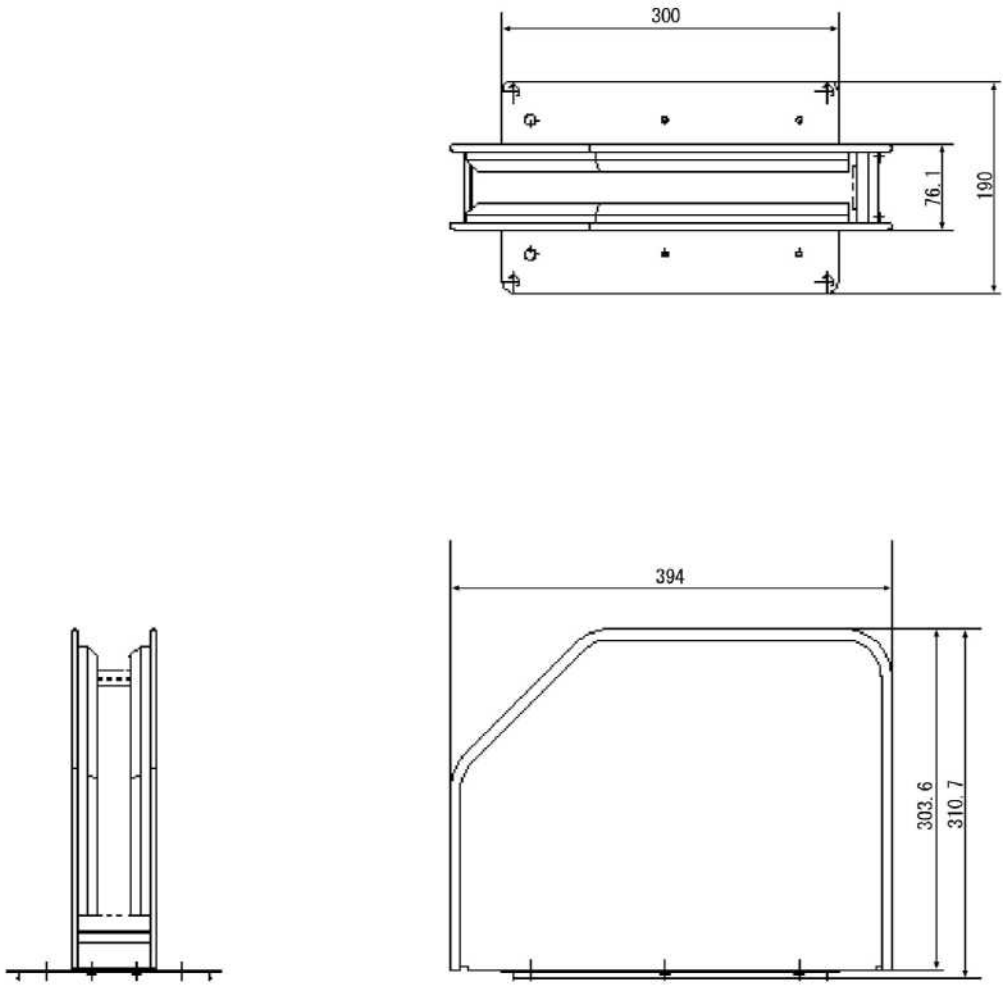
[Fig.1]

8.1.2. E/O Box



[Fig.2]

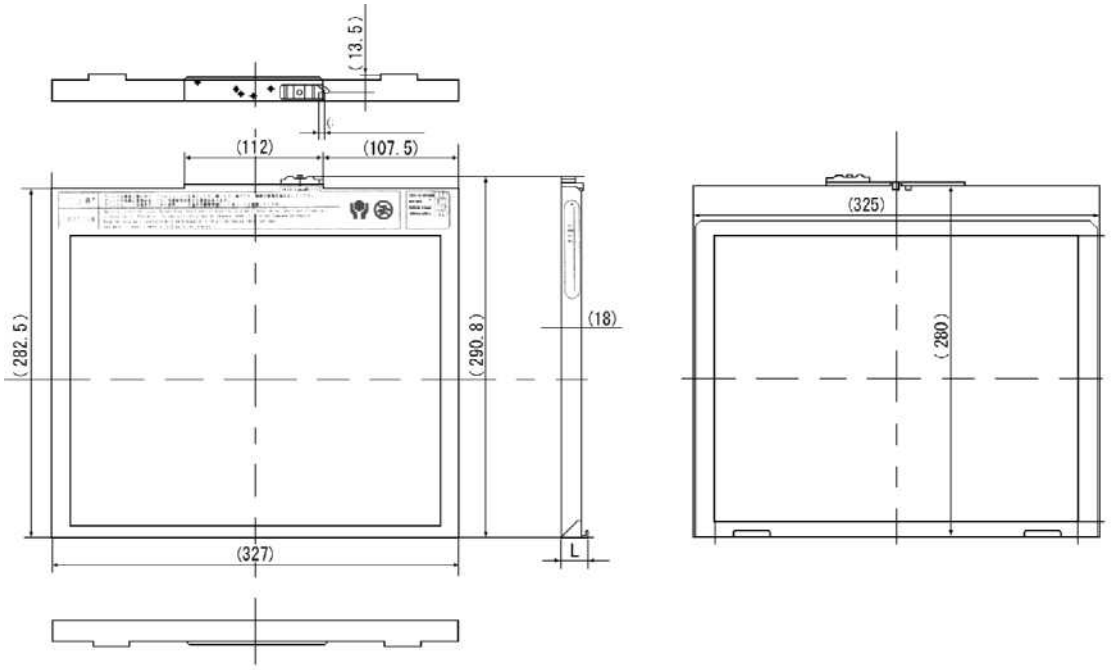
8.1.3. Storage Box



[Fig.3]

8.2. Option

8.2.1. Grid



L:21.8mm(4:1)
22.3mm(8:1)
22.5mm(10:1)

[Fig.4]

9. Specifications & Standards

9.1. Specifications

9.1.1. Imaging unit

The Imaging unit consists of a sensor, a built-in sensor power supply, an A/D board and a cover, etc. X-rays are read electronically as image signals by the sensor, according to changes in visible light from the fluorescent screen. Captured image signals undergo A/D conversion and pass through the 31EO box and the multi box for transmission to a PC.

Item	Details	Remarks
Object	General shooting	
X-ray sensor	Scintillator and Amorphous Silicon (a-Si) sensor	LANMIT sensor
Effective filming range	226mm x 288mm	
Pixel matrix size	2256 x 2878	Unit pixel
No. of pixels	About 6.5 million	
Pixel size	100 μm	
Sensor output gradation	16,384	14 bit
Output gradation	4,096	12 bit
Interface	DICOM3.0 (Ethernet)	Via control PC
Grid type	Fixed grid	6 options
System control unit	Control PC, multi box	Sold separately
E/O box	Provided	Bundled
Sensor cable	Length: 4.5m (Dia.: 10mm)	
X-ray monitor	1 location	Built in
Sensor DC-DC power supply	Built in	
Grit detection	Provided	Present/not present only
Position detection	None	
Status display	Built in LED	Color (Green and Red)
Power consumption	Max. 45W (av. 12W)	
External dimensions	324(W) x 327(L) x 20.3(H)mm	
Weight	2.8kg	(cable: 0.5kg)

[Table 1]

9.1.2. E/O box

There is a cut-off function for the film camera unit's transmission signal and power supply.

Transmitted signals are converted from electrical into optical signals.

The CXDI-31 can be connected to two E/O boxes.

Item	Details	Remarks
External dimensions	270(W) x 190(L) x 65(H)mm	
Weight	2.2 kg	

[Table 2]

9.1.3. Grid (optional)

Item	Details	Remarks
Type	Fixed type (removable)	External, with lock
Density	60/cm	
Grit ratio	4:1, 8:1, 10:1	
Alignment	Off the vertical, horizontal	Compatible with all grit ratios
Coverage distance	110 cm	110 cm
External dimensions	327(W) x 290.8(L) x (H*1)mm	*1:21.8mm (4:1) 22.3mm (8:1) 22.5mm (10:1)
Weight	0.6 kg (4:1) 0.8 kg (8:1) 0.9 kg (10:1)	

[Table 3]

9.1.4. Shooting environment

Item	Content	Remarks
Possible X-ray exposure	Within 1 sec.	With/without grit
Standard shooting time	Within 10 secs.	
X-ray exposure delay	0.30 secs. or under	
Image display time	About 3 secs.	Minimum
Shooting cycle time	About 15 secs.	Minimum

[Table 4]

9.1.5. Environment-related operating parameters

Item	Details	Remarks
Operating environment	Temperature: +10 - +35°C	
	Humidity: 30% - 75%	
Temp. and humidity for storage/transportation	Temperature: -30 - +50°C	
	Humidity: 10% - 95%	
	Pressure: 61.3 - 101.3hPa	

[Table 5]

9.2. Standards

9.2.1. Limit of Load

Item	Details
Uniform Load	150kg over the whole area of sensor unit surface
Local Load	100kg on an area 40mm in diameter

[Table 6]

CXDI-31

3. Imaging Unit

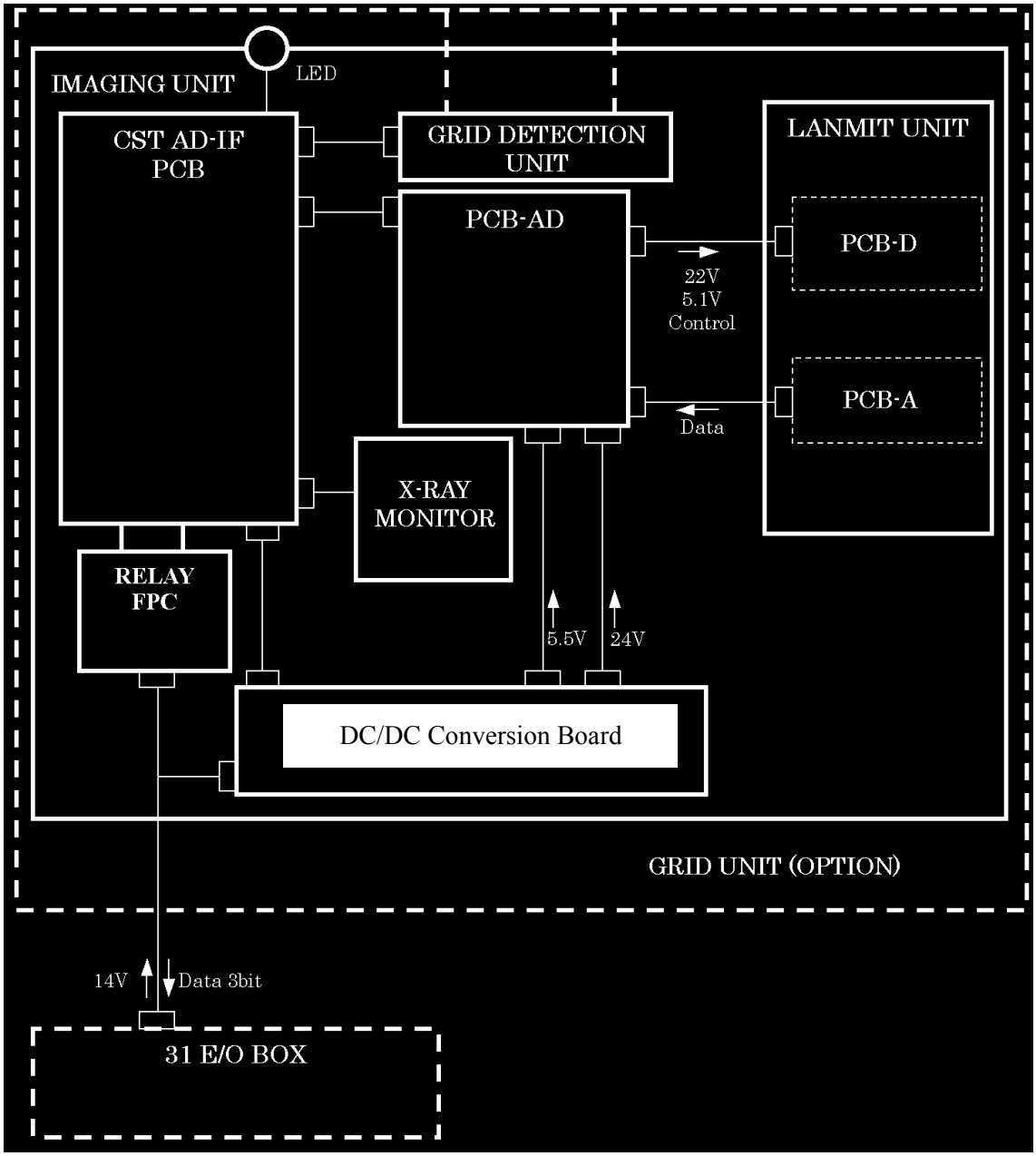
Ver.03

Jun, 2009

Medical Products
Technical Service Dept

CONTENTS

1. Unit Diagram

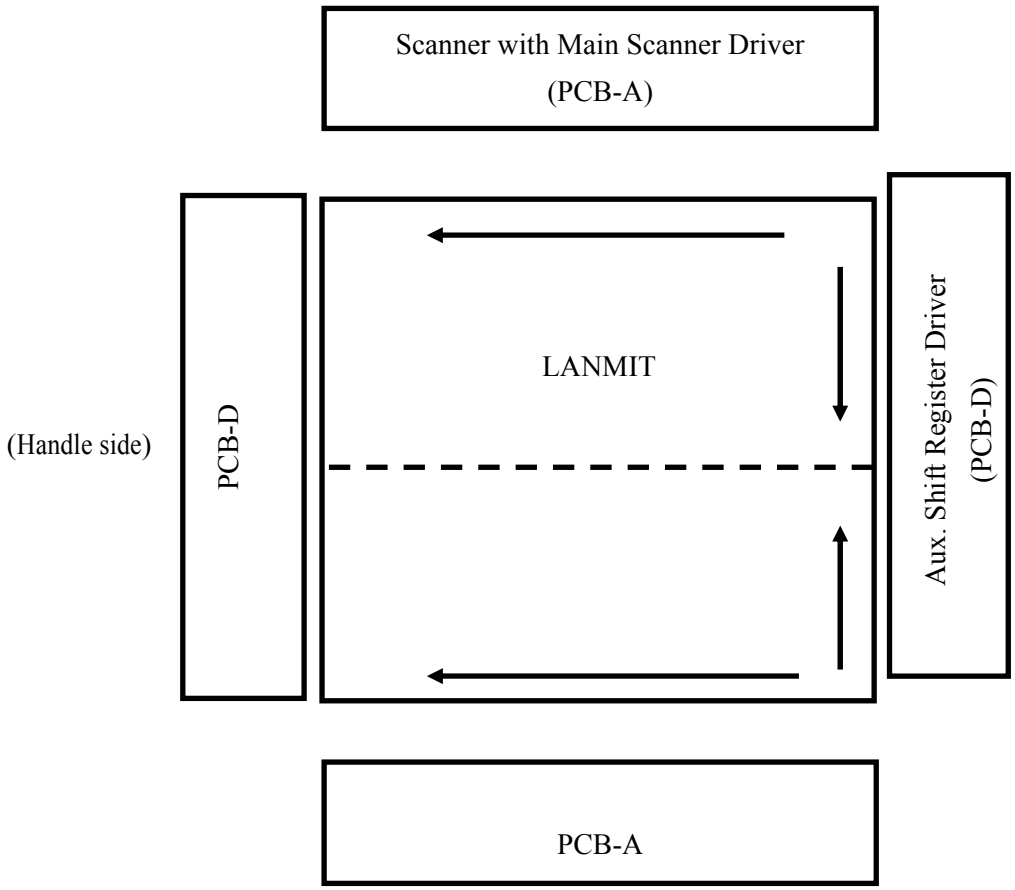


[Fig.1]

2. Function

2.1. LANMIT UNIT

The LANMIT UNIT consists of the Sensor Panel (LANMIT), the Scanner with the Main Scanner Driver (PCB-A) and the Aux. Shift Register Driver (PCB-D).
This unit includes 2 units of PCB-A and PCB-D, respectively, as one Sensor Panel unit works as two dummy panel units. Figure 2 shows the profile of the LANMIT UNIT. (→: direction of scanning)



(Front view)

[Fig.2]

2.2. PCB-AD

The PCB-AD receives power from the power supply unit in the DC/DC Conversion board (DC-DC Converter), and generates the driving power at the Regulator to supply the power to the LANMIT UNIT. It also converts the analog image signals input from the LANMIT UNIT to digital signals at the A/D Converter to output them to the AD-IF Board.

2.3. CST AD-IF Board

The CST AD-IF Board can perform the following functions:

(1) LANMIT UNIT drive
Transmits the control signals to drive the LANMIT UNIT to the PCB-AD.

(2) Image signal reception
Receives digital image signals (14bit) from the PCB-AD.

(3) Image transmission
Transmits the digital image signals to the Control Station.

(4) X-ray synchronization
Synchronizes the X-ray generation and Sensor driving timings.

(5) X-ray detection(X-ray Monitor Unit
Detects the X-ray radiation through the X-ray Monitor Unit.

(6) Temperature check
Checks the temperature inside the Imaging Unit by using the Temperature Sensor IC.

(7) Grid detection
Every 20 ms, the Grid Detector Unit checks whether the fixed grid is placed on the Imaging Unit or not. Grid On/Off is judged by five succeeding On/Off results.

(8) LED control

Sensor conditions are shown as [Table.1] below.

Color / Condition	Orange	Green
Sleep	On	Off
Ready	Off	On
Sleep to Ready	Off	Blink (every 500ms)
Error	Off	Irregular blink (100ms Blink → 100ms Off →100ms Blink →500ms Off)

[Table.1]

(9) Serial communication

Performs the serial communication with the Control Station, C2 by using the SCI (Serial Communication Interface) to control the total operation of the CST AD-IF Board.

(10) Recording logs

Saves the logs related to the total power-on time, number of images taken and the driving sequence of the LANMIT UNIT to the built-in flash memory.

(11) Remote update

Allows to update the imaging codes and the codes for driving the LANMIT UNIT from the Control Station C2.

(12) Control line check

Checks whether each control line operates properly according to the commands by the Capture Board.

2.4. DC/DC Conversion Board

Receives the 14V power from the E/O BOX 31 IF Board and supplies the PCB-AD2 LANMIT UNIT and IC with the driving power.

3. Repair Guide

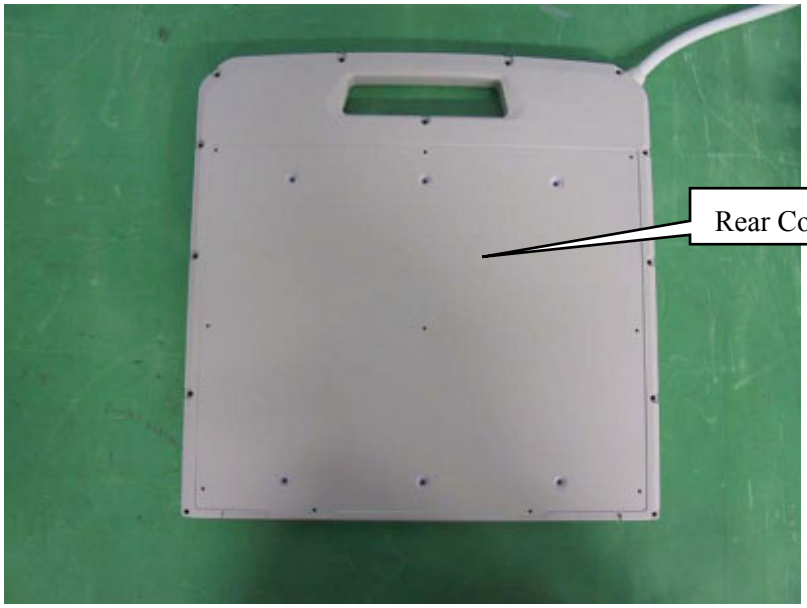
3.1. Notes

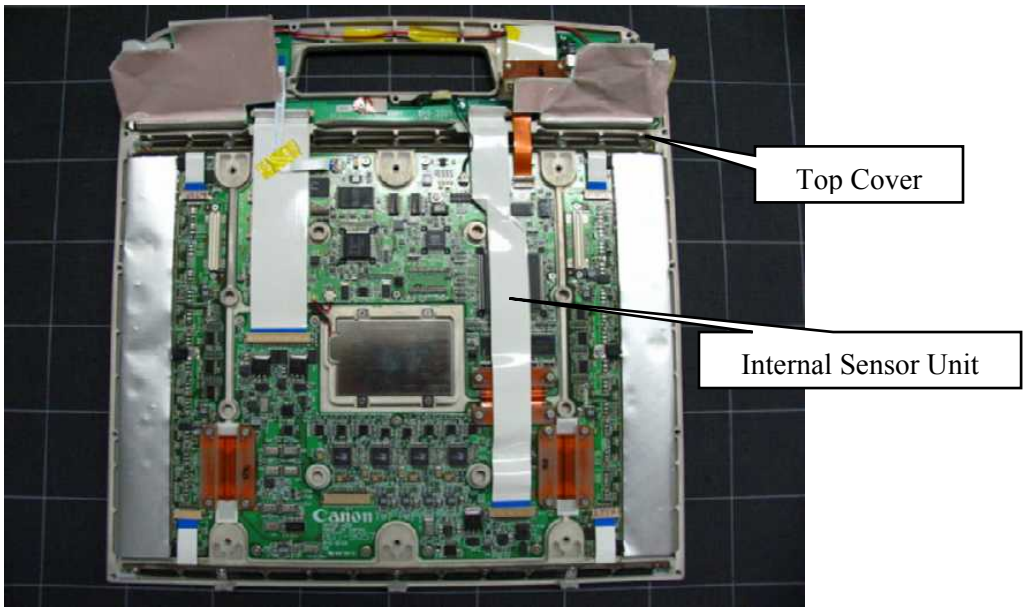
3.1.1. Notes on removing the rear cover

The internal sensor unit is fixed with the top cover with rear cover screws. Therefore, it gets free when the rear cover is removed. With this state, if the sensor unit is set up or tilts, the internal sensor unit drops or shifts down.

The damaged internal sensor unit cannot be repaired. So always keep the unit flat after removing the rear cover to prevent the displacement or dropping of the unit.

The internal sensor unit and the PCBs are easily damaged by static electricity. Before proceeding with removing the rear cover, ensure that the static accumulated in the bodies and the desks is discharged.

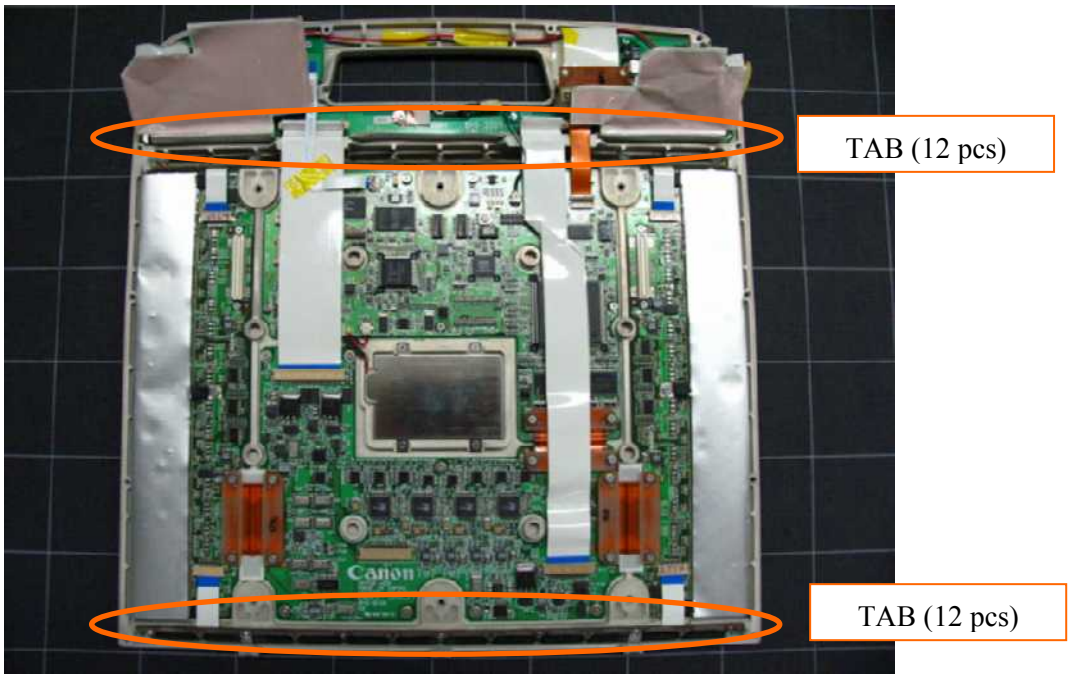


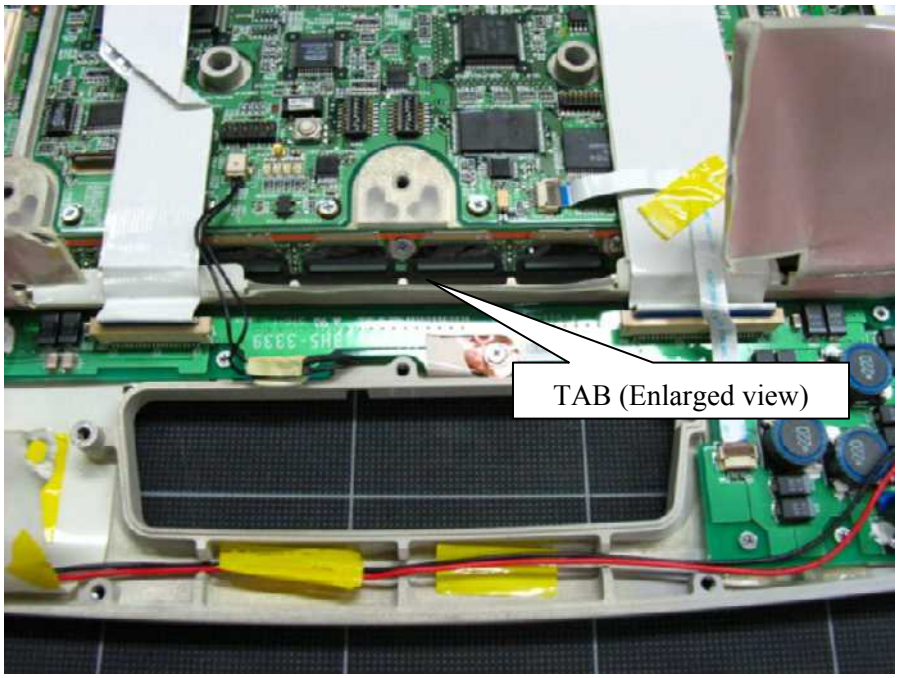


Maintain the unit in a horizontal position and do not move the unit after removing the rear cover

3.1.2. Notes on the TABs exposed on the internal sensor unit

Never touch the TABs when disassembling or reassembling the unit. The TABs toward the grip are exposed on the internal sensor unit when the base cover is removed. Touching TABs may cause to damage them and hinder to scan an image appropriately. Besides they cannot be individually replaced or repaired.





3.1.3. Notes on installing the rear cover

To avoid from pinching the power cable by the rear cover, the adhesive tape and the fixing method have been changed. **Once removing the rear cover, make sure to change the fixing method as follows.** Also, ensure the power cable is not pinched when installing the rear cover.

(1) Tape to be used

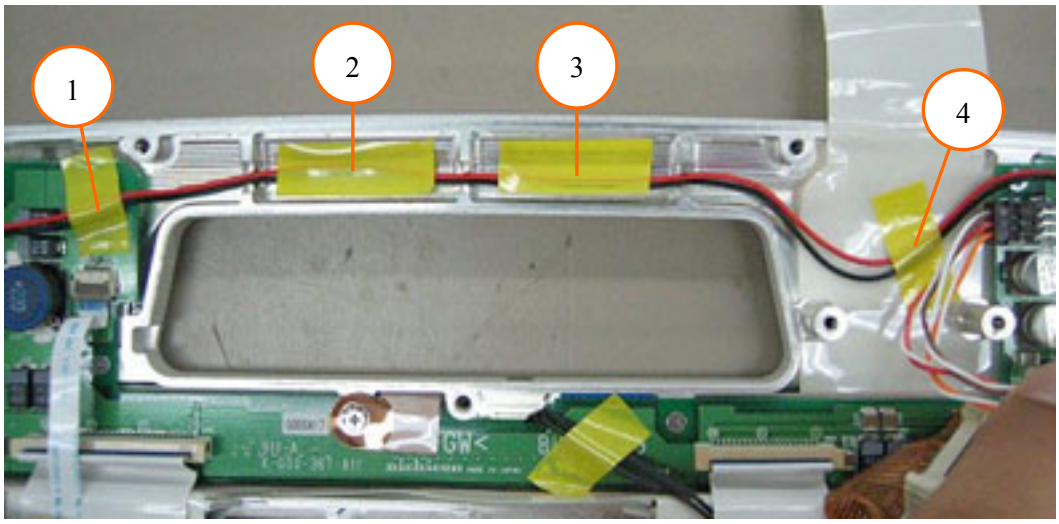
Prepare the tape listed below.

Manufacturer name	Product name	Product number	Remark
Nittou Denko	Acetate Adhesive Tape	No.156A	Black

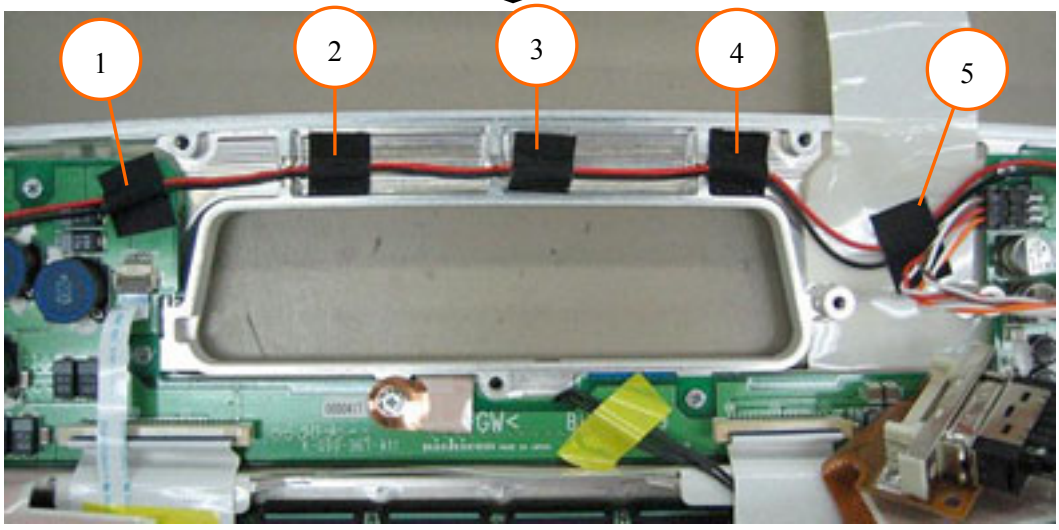
URL: http://www.nitto.com/product/datasheet/e_parts/044/

(2) Changing the power cable fixing method

The previous way of fixing the cable (The factory shipment state)



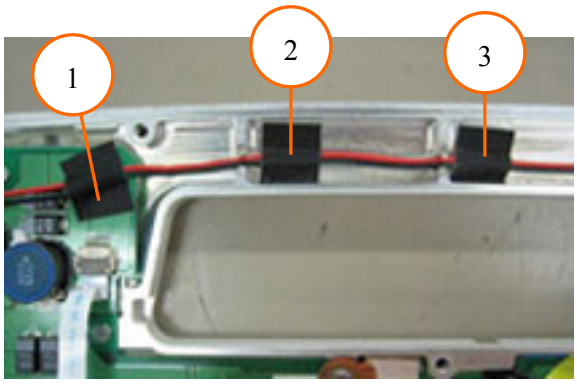
The modified way of fixing the cable

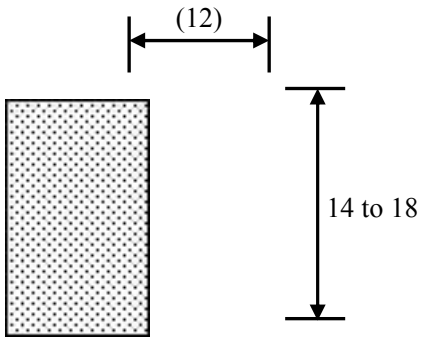


*The numbers from 1 to 5 above indicate the tape application order described in the next section "(3) Power cable fixing method).

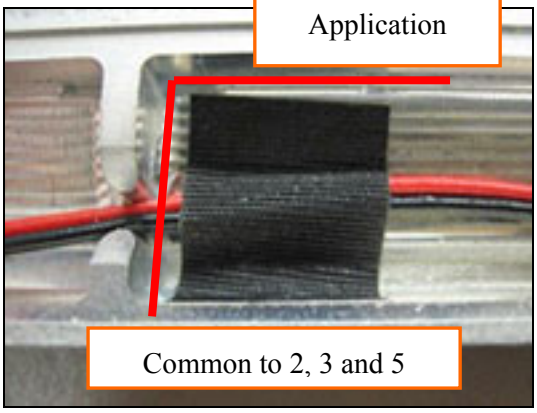
(3) Power cable fixing method

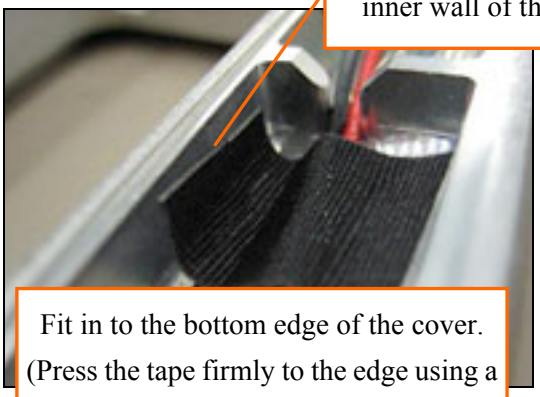
1) Remove the yellow tapes from the power cables.
2) Apply the tape to the position indicated 1 to 3 below in order. Before applying the tape, straighten the cable so that there is no slack. Do not pull on the cables at this time. When applying the tape, press the tape surface with a cotton swab or so to apply it firmly. (Do not use a tool with a thin tip such as metal tweezers to avoid making damage on the cable).





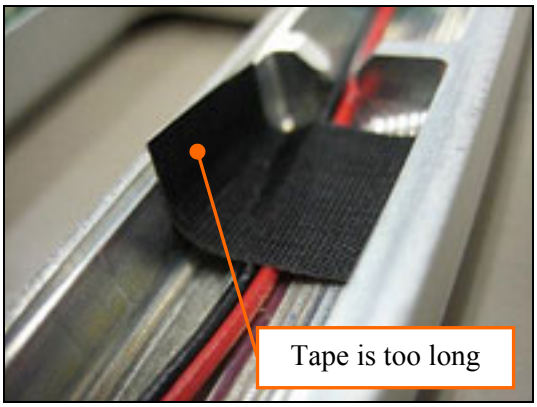
Recommended tape size (unit: mm)



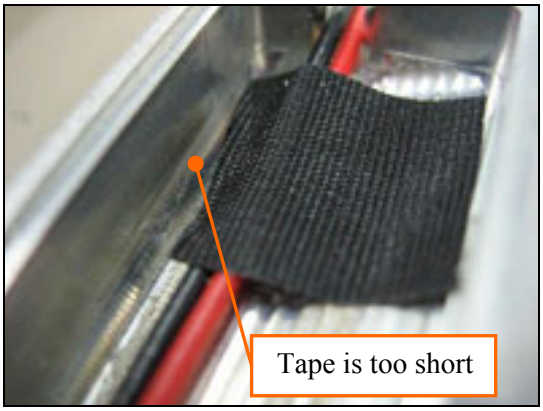


Examples of Failure Application

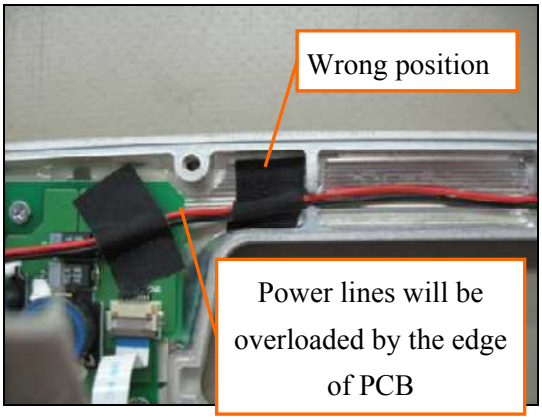
Tape is hang out over the cover edge

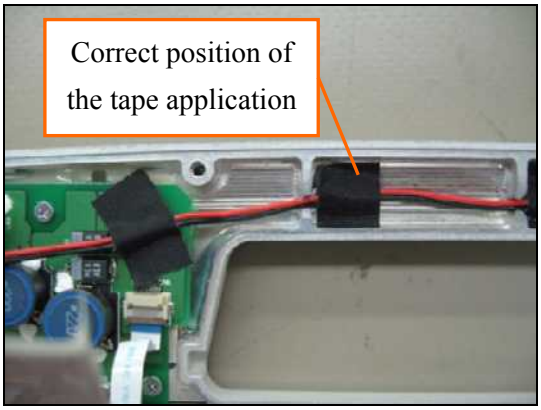


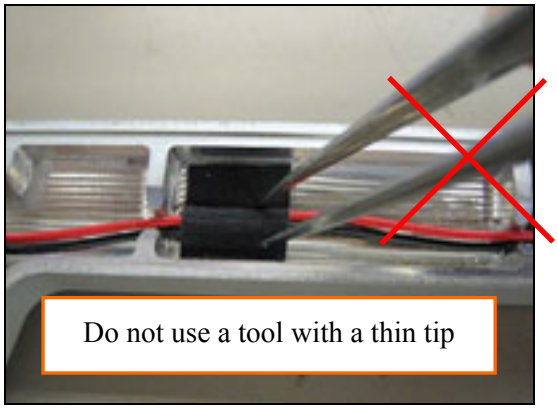
Tape does not cover the inner wall of the rim



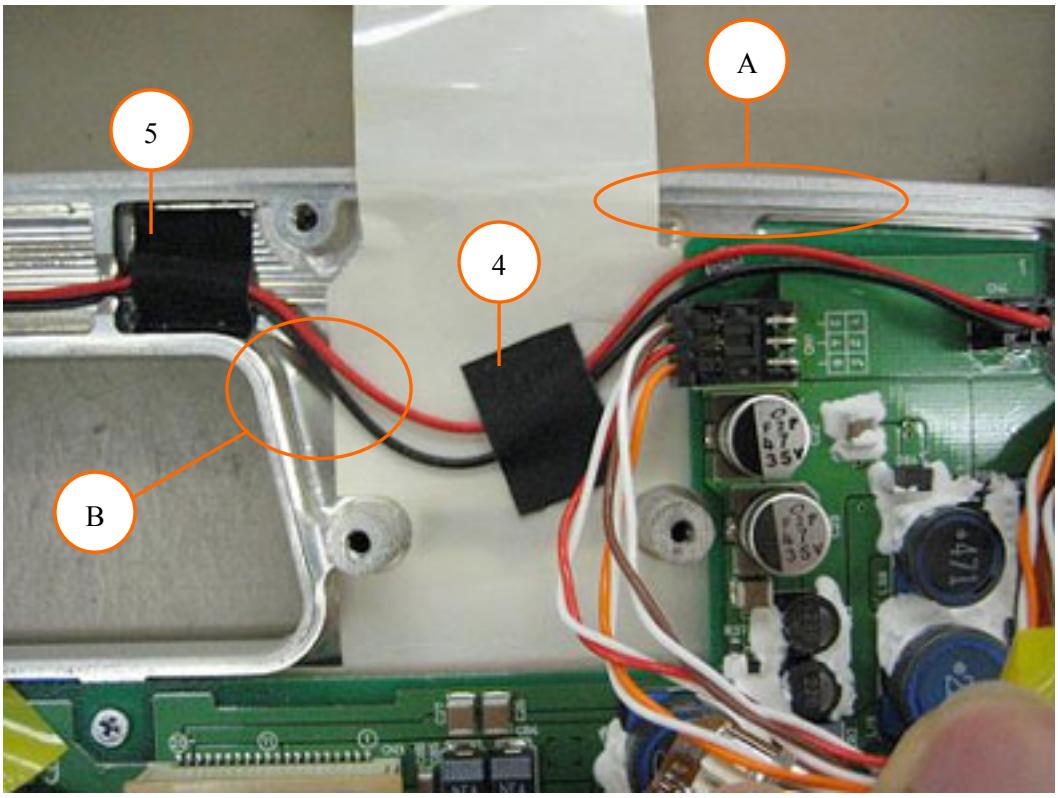
For the position 2, if you apply the tape in a wrong position, the power lines will be overloaded by the edge of PCB.



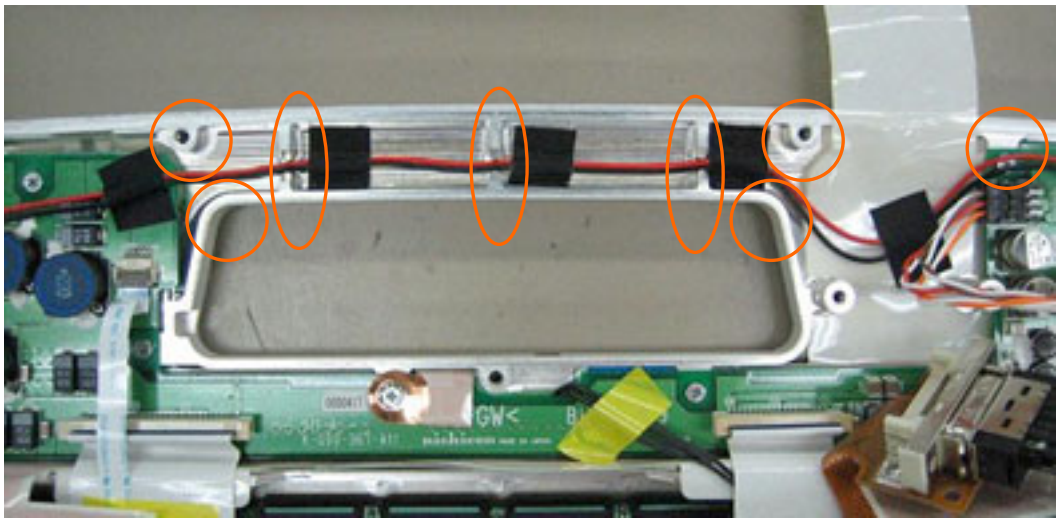




3) Route the cables carefully so that they are not stranded to the rim of the cover (Position A below). Put the tape on the position 4. Adjust the length of the cable at position B. Put the tape on the position 5. (The same criteria as the position 2 and 3 can be applied here)

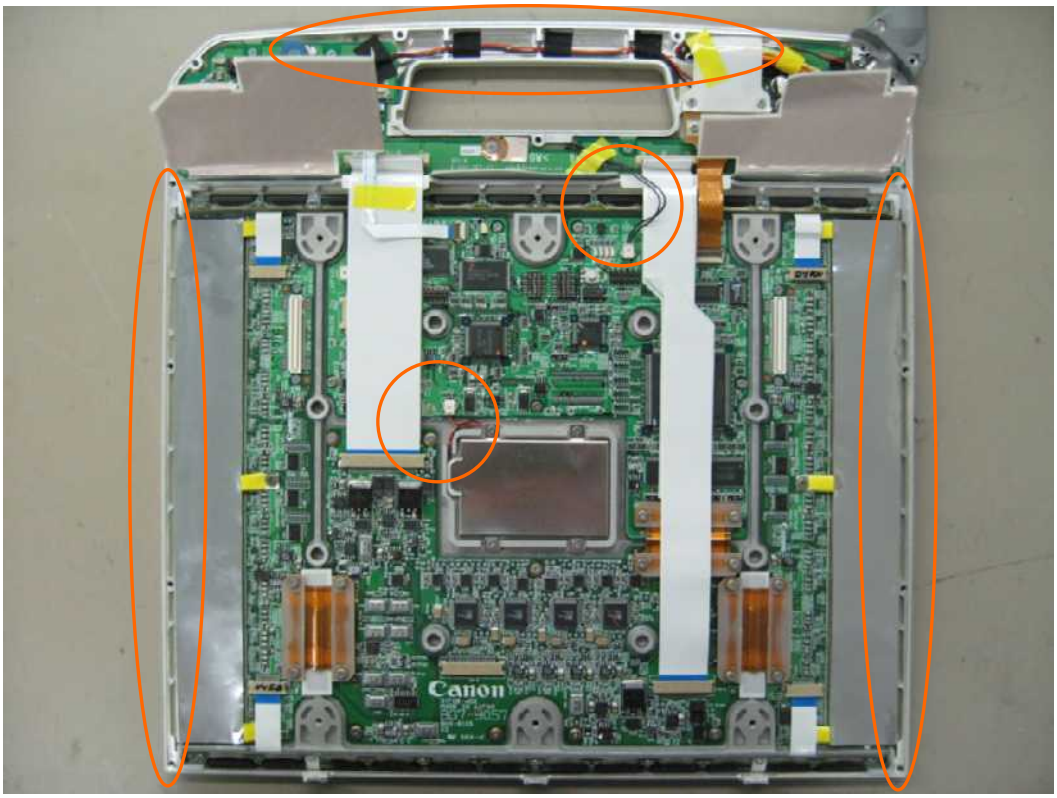


4) Make sure the tape is not peeled off, not pasted in the wrong position, or the cable is not stranded to the rim of the cover (especially on the position circled below).
***If the tape is applied to the wrong position, the cable may be damaged. Therefore, make sure you put the tape on the correct position.**



(4) Checking when installing the rear cover

Before installing the rear cover, make sure that there is nothing pinched or sandwiched between the front cover and rear cover in the areas circled below.



3.1.4. Tightening screws when replacing parts

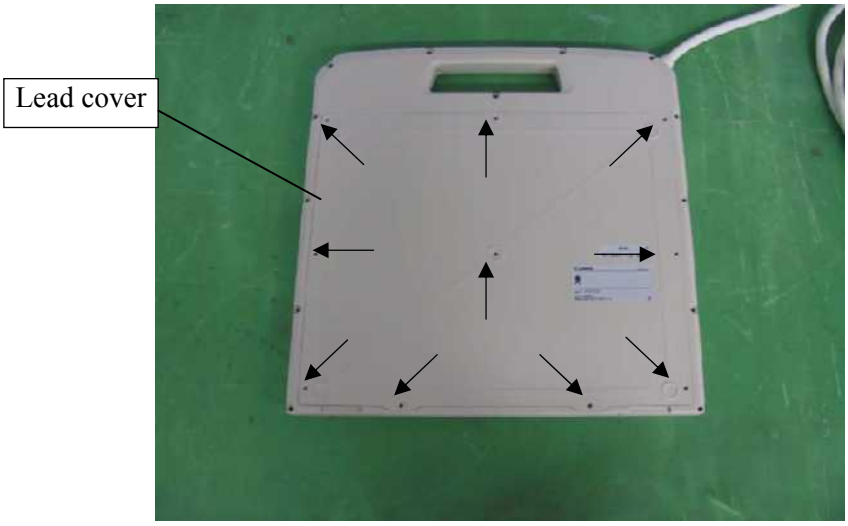
For the screw tightening torque for each parts replacement, refer to the following service information and observe the instructions described there.

SIDR-09-006 Tightening Torque for Parts Replacement

3.2. Replacing parts

3.2.1. Replacing the sensor rear cover

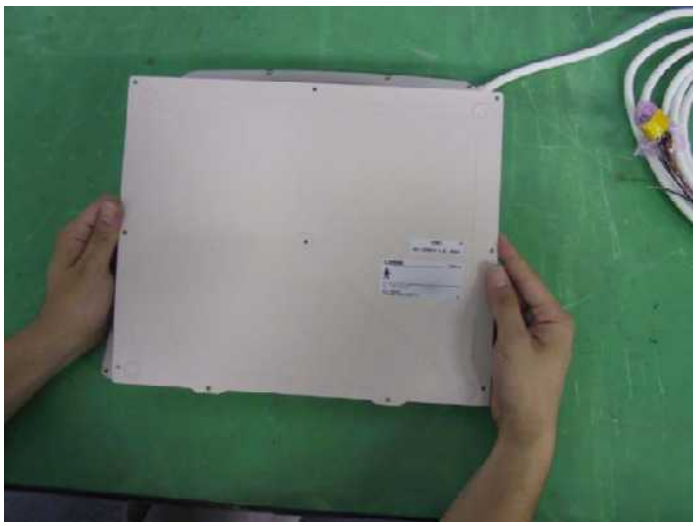
(1) Remove the 10 screws from the rear lead cover.



[Fig 1]

Note: The screws are painted in the same color as the cover. Remove the screws carefully as their paints get easily removed.

(2) Detach the cover by hand as shown in [Fig 2].



[Fig 2]

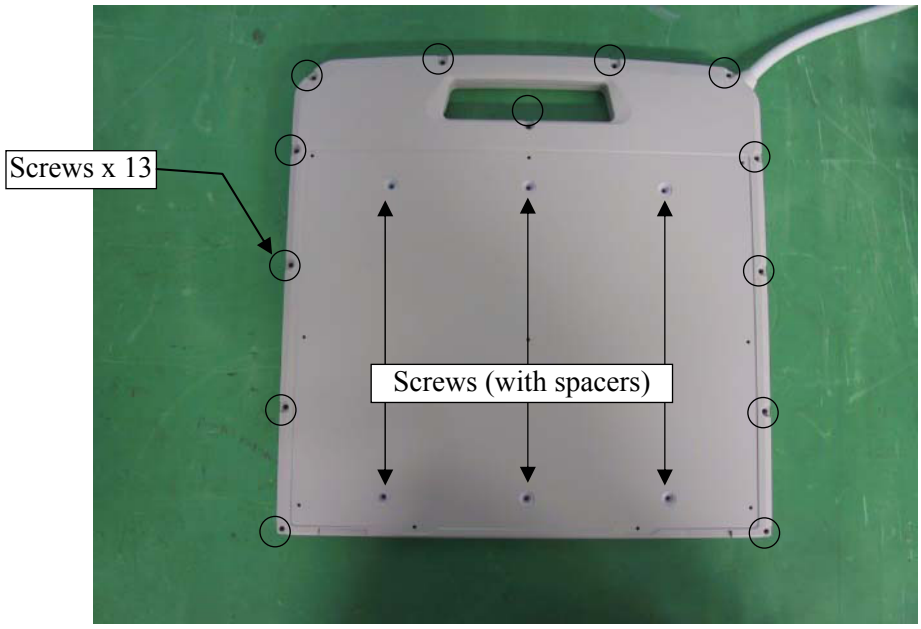
Note: Hold the lead cover by hand when detaching it.
Detaching the lead cover with a screwdriver or any other tool inserted could damage the covers (lead cover or rear cover) and should never be done.

(3) Remove 13 screws.

(4) Remove six screws with spacers.

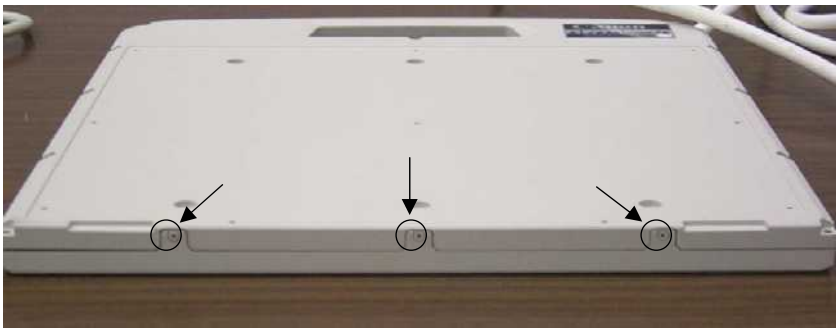
(5) Remove six spacers. (See *Note* below)

(6) Lift off the lower cover by hand.



[Fig 3]

(7) Remove the six bottom screws.



[Fig 4]

(8) Remove the rear cover.

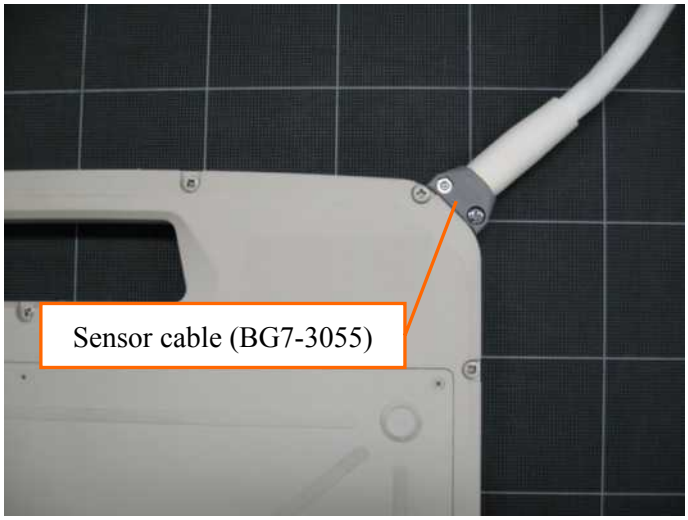
Note:

1. *When lifting off the rear cover by hand, never put your hand inside to avoid possible contact with PCB or the electrical parts, etc.*
2. *Holding the rear cover upside down when removing it might let the spacers fall out position easily. Otherwise remove the spacers before removing the rear cover.*

3.2.2. Replacing the sensor cable

3.2.2.1. Replacing the new sensor cable(BG7-3055)

Follow the instructions below to replace the new sensor cable (BG7-3055).

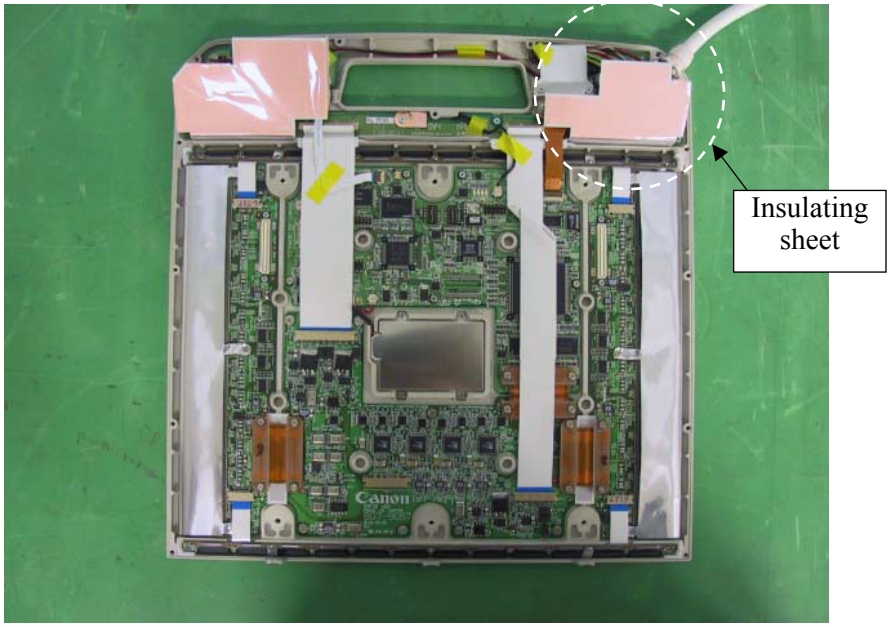


[Fig.1]

(1) Remove the rear cover by following the steps in "3.2.1 How to replace with the sensor cable without cable clamp".

Note:
When replacing the rear cover, be careful not to touch the internal TAB. For details, refer to "3.1.1 Notes on the tabs exposed on the internal sensor" in the section 3.1 "Notes".

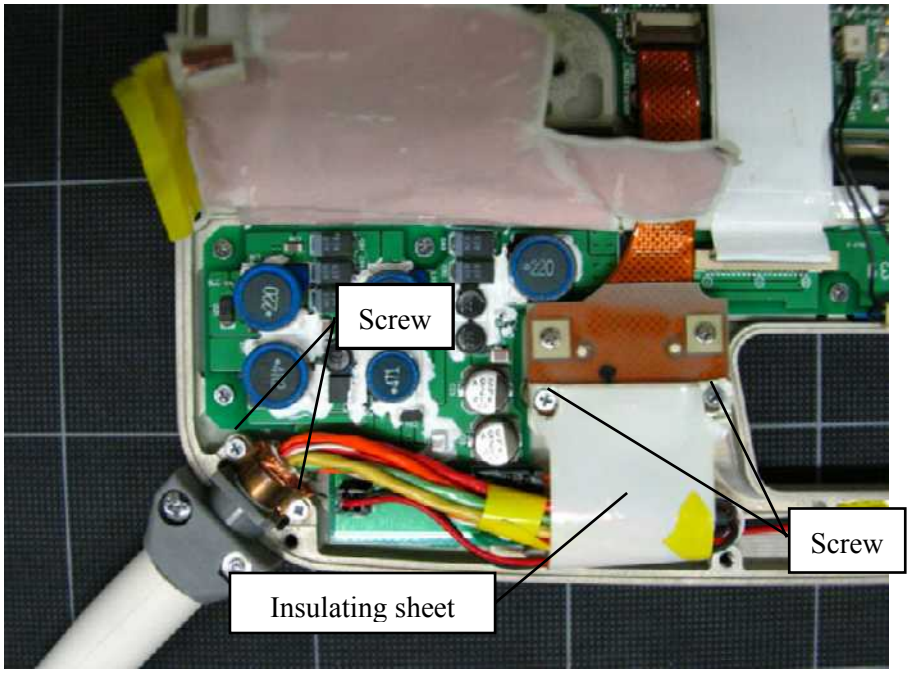
(2) Raise the insulating sheet shown in [Fig.2] to front to make the cable connection visible.



[Fig 2]

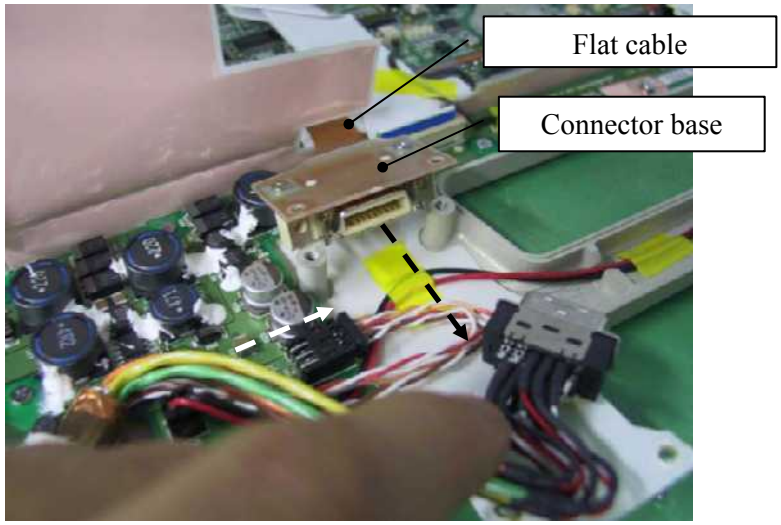
(3) Remove the two screws from the connector-insulating sheet as shown in [Fig.3] below.

(4) Remove the two cable clamp screws as shown in [Fig.3] below.



[Fig 3]

(5) Remove the sensor cable and the connector connected to PCB in the direction shown by the arrow.



[Fig.4]

Note:
Be sure not to remove the connector on the opposite side of the flat cable when removing and attaching the sensor cable to the connector base.

(6) Replace the cable and connect the connector.

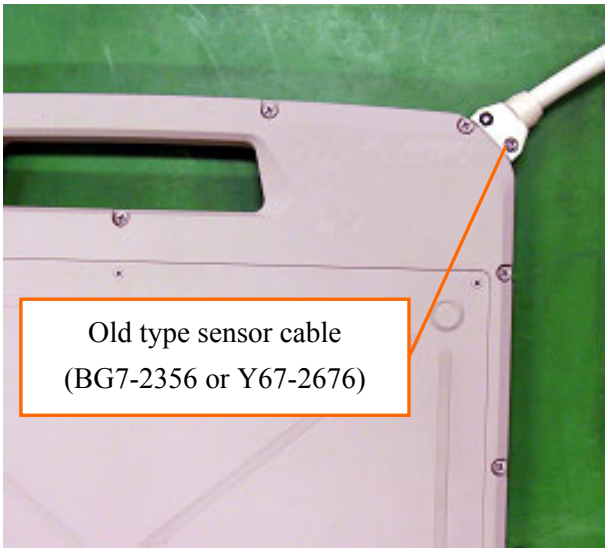
(7) At reassembly, reverse the steps (1) to (5) above.

Note:
The exterior cover is made of a magnesium alloy. Remember that tightening the screws with excessive force could strip the nut.

Note:
When attaching the rear cover, be careful not to pinch the power cables and the others with the covers. Refer to "3.1.3 Notes on installing the rear cover in "3.1 Notes".

3.2.2.2. Replacing the former sensor cable with the new sensor cable (BG7-3055)

Follow the steps below to replace the old type sensor cable (BG7-2356 or Y67-2676) with the new type sensor cable (BG7-3055). The cable replacement requires the following parts in set, which are listed in the Key no. 20, 32, 33, 34 in the [Table.1] below.

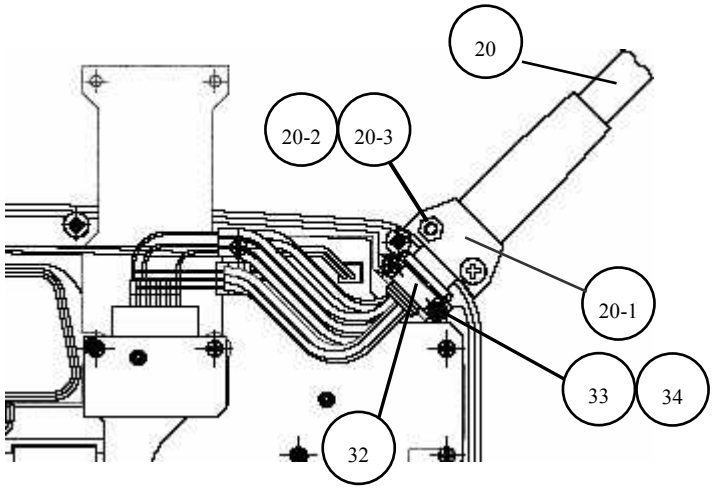


[Fig.1]

Parts list

Key No.	Description	Former Part No.	New Part No.	Q'ty	Remark
20	Cable Unit, Imaging (Sensor)	BG7-2356-000 Without CLAMP Y67-2676-000 With CLAMP	BG7-3055-000	1	With CLAMP
32	Clamp, Cable	BA4-0567-020	BA4-2364-000	1	
33	Screw	XA1-1260-406	XA1-1260-606	2	M2.6x6mm
34	Washer	-	XD1-1102-625	2	Newly Added

[Table.1]

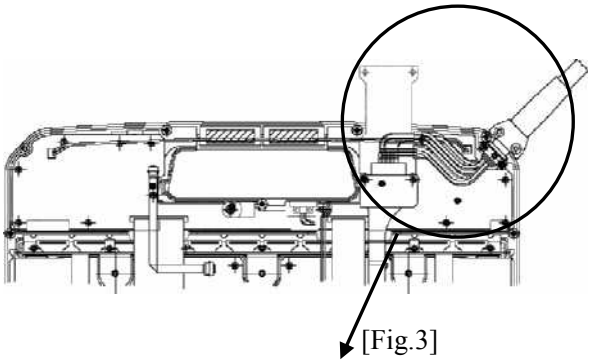


[Fig.2]

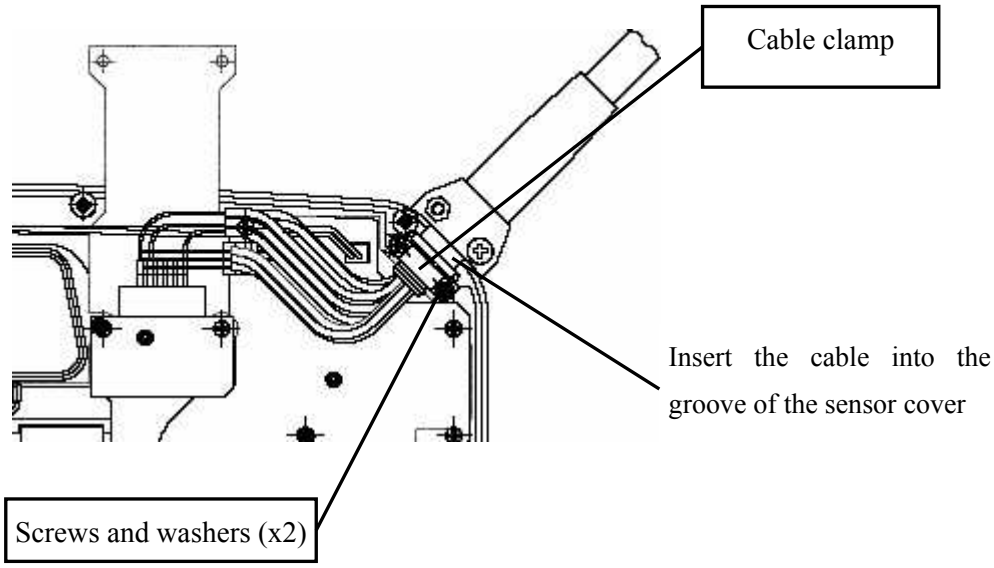
(1) Follow the steps (1) to (5) in "3.2.2.1 Replacing the new sensor cable (BG7-3055) to remove the rear cover and the cable.

(2) Insert the cable into the groove of sensor unit cover.

(3) Secure the cable with the cable clamp (BA4-2364), two screws (XA1-1260-606) and two washers (XD1-1102-625).



[Fig.3]



[Fig.4]

(4) At reassembly, reverse the steps (1) to (5) in "3.2.2.1 Replacing the new sensor cable (BG7-3055).

Note:
The exterior cover is made of a magnesium alloy. Remember that tightening the screws with excessive force could strip the nut.

Note:
When attaching the rear cover, be careful not to pinch the power cables and the others with the covers. Refer to "3.1.3 Notes on installing the rear cover in "3.1 Notes".

3.2.3. Replacing the DC/DC conversion board

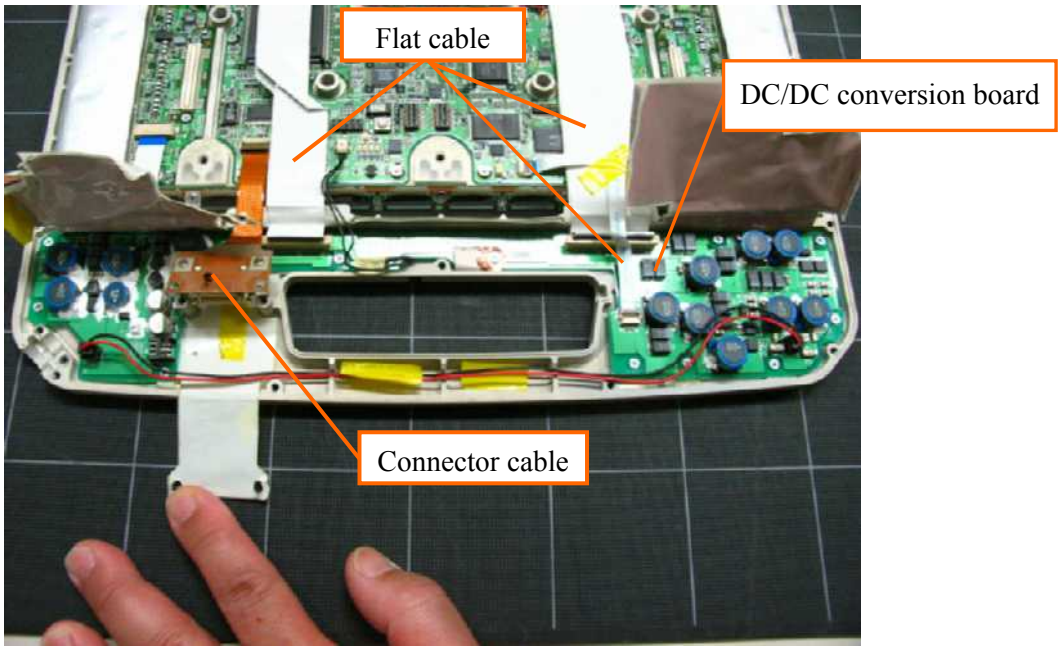
(1) Follow the steps (1) to (5) in "3.2.2.1 Replacing the new sensor cable (BG7-3055)" to remove the rear cover.

Note:
When replacing the rear cover and the parts, be careful not to touch the internal TAB. For details, refer to "3.1.1. Notes on removing the rear cover" and "3.1.2. Notes on the TAB exposed on the internal sensor" in the section "3.1. Notes".

(2) Raise the three insulating sheets to front to make the DC/DC conversion board visible.

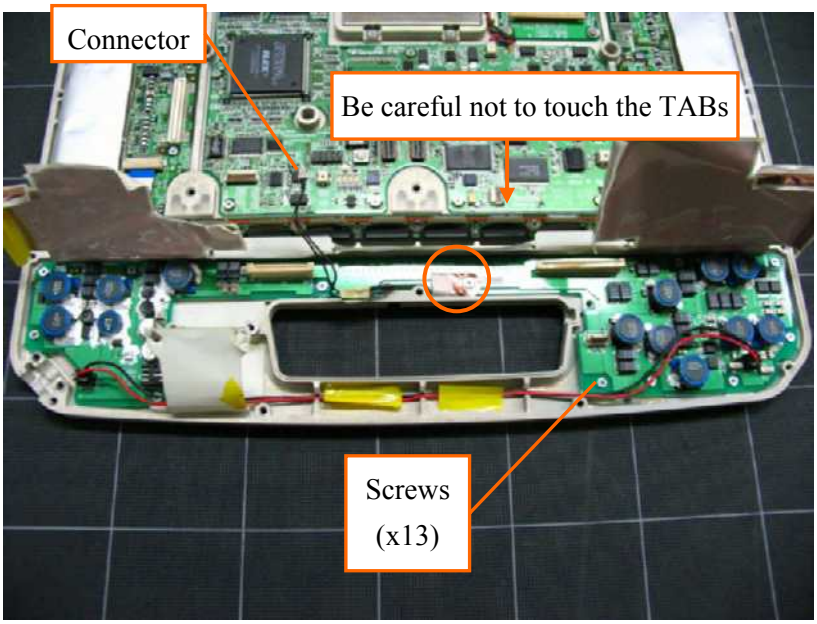
(3) Remove the connector cable and the three flat cables from each connector.

Note:
The old flat cable cannot be reused. Replace with the new one.
Be careful not to damage the connector.



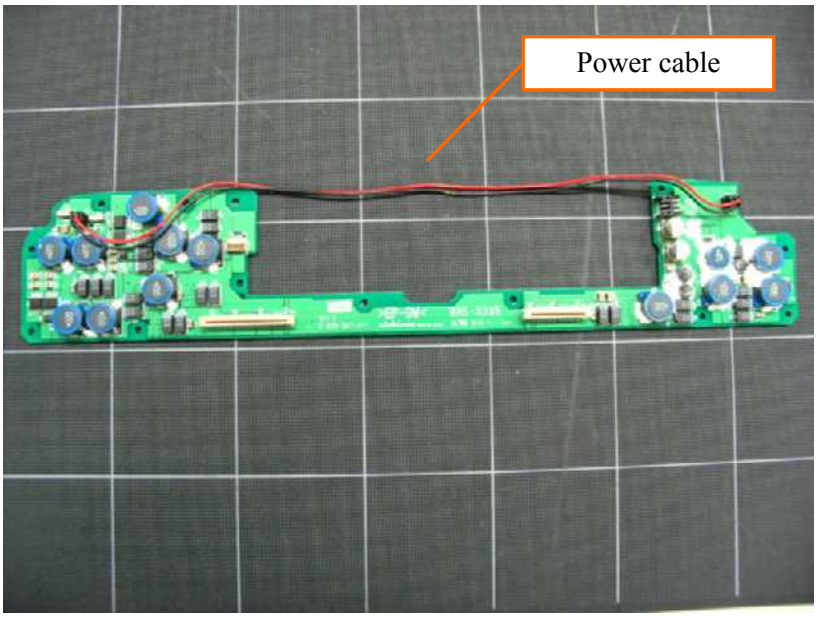
[Fig.1]

(4) Remove the connector of the magnet switch and the 13 screws (XA1-1260-406) to remove the DC/DC conversion board from the imaging unit.



[Fig.2]

(5) Connect the power cable to the new DC/DC conversion board and then connect it to the imaging unit.



[Fig.3]

(6) At reassembly, reverse the steps (1) and (4) above.

Note:
The exterior cover is made of a magnesium alloy. Remember that tightening the screws with excessive force could strip the nut.

Note:
When attaching the rear cover, be careful not to pinch the power cables and the others with the covers. Refer to "3.1.3 Notes on installing the rear cover in "3.1 Notes".

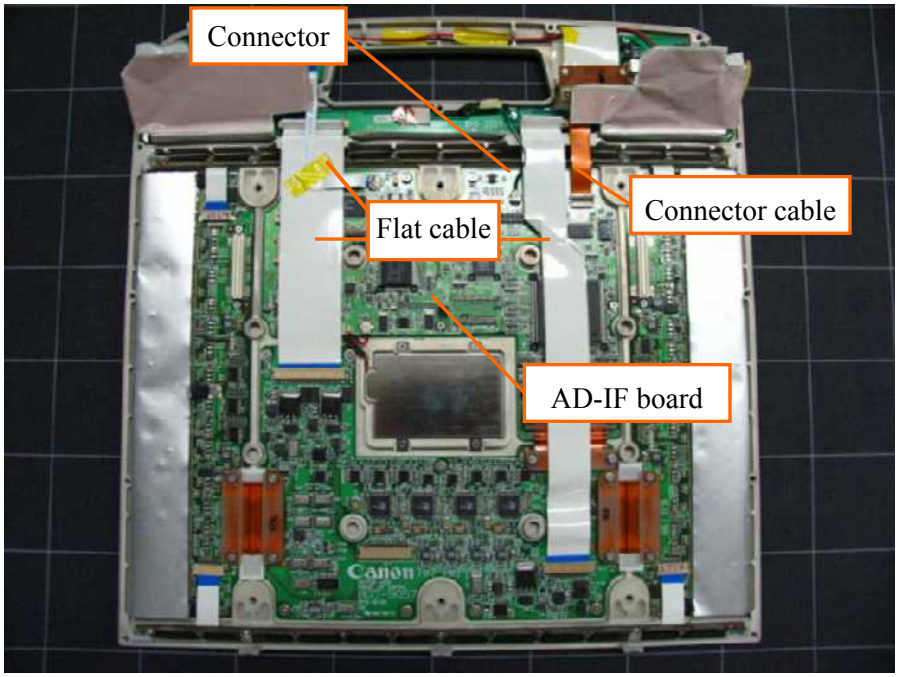
3.2.4. Replacing the CST A/D-IF board

(1) Remove the rear cover by following the steps in "3.2.1. Removing the sensor rear cover".

Note:
When replacing the rear cover and the parts, be careful not to touch the internal TAB. For details, refer to "3.1.1. Notes on removing the rear cover" and "3.1.2. Notes on the TAB exposed on the internal sensor" in the section "3.1. Notes".

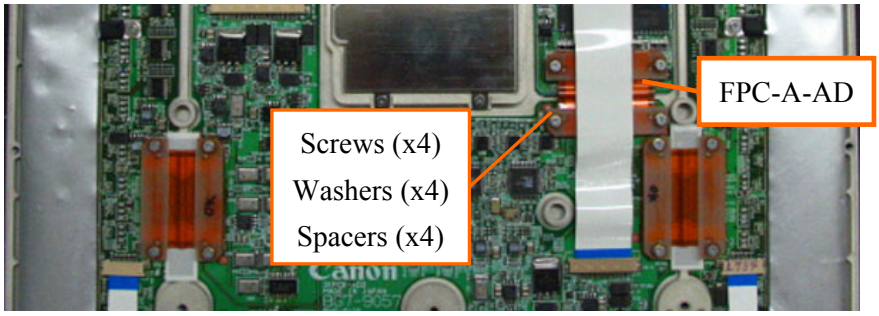
(2) Remove the connector of the magnet switch, the connector cable and the three flat cables from the respective connectors.

Note:
The old flat cable cannot be reused. Replace with the new one.
Be careful not to damage the connector.



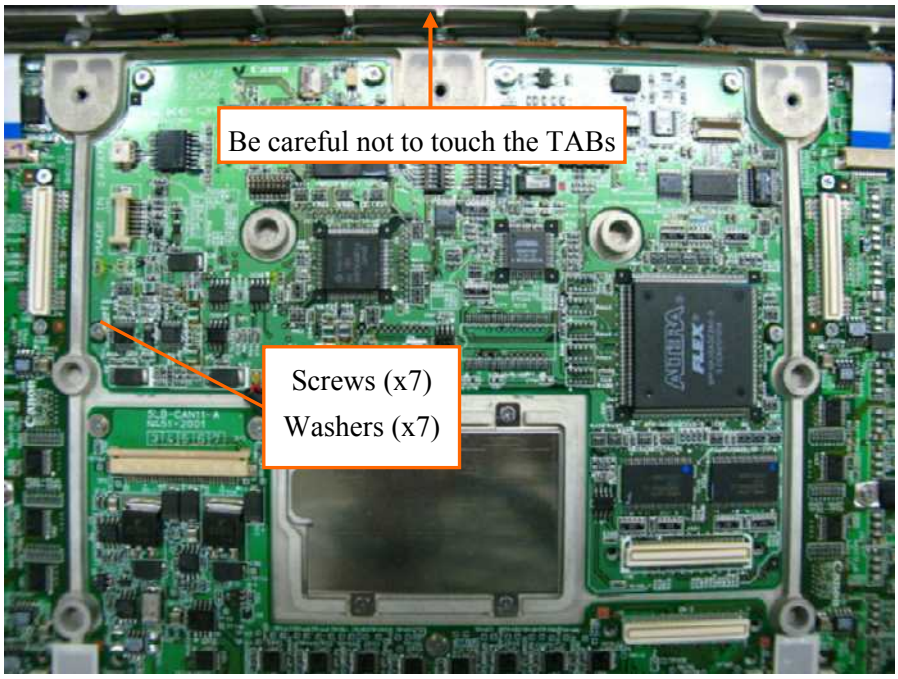
[Fig.1]

(3) Remove the four screws (XA1-1260-806) and the four washers (XD1-1102-625) to remove the flat cable (FPC-A-AD). Be aware of the spacers (BA4-0566) behind the flat cable.



[Fig.2]

(4) Remove the seven screws (XA1-1260-406) and the seven washers (XD1-1102-625) to remove the CST AD-IF board from the sensor unit.

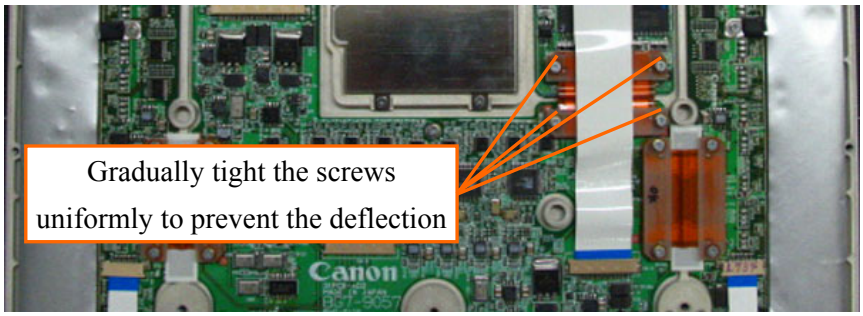


[Fig.3]

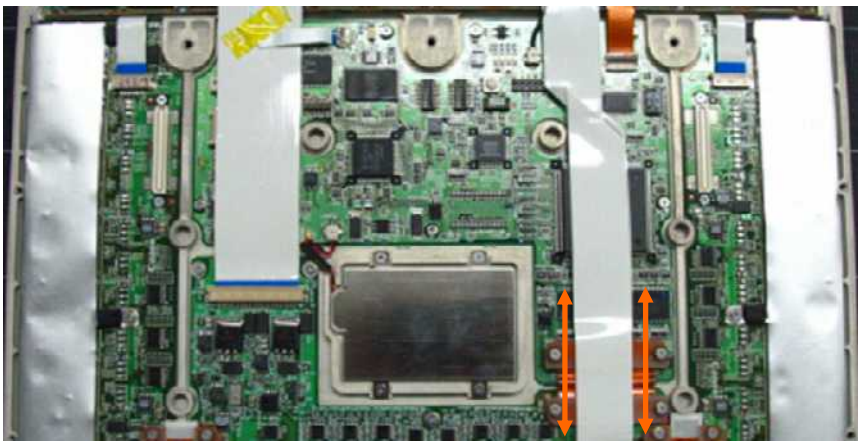
(5) Attach the new CST AD-IF board to the sensor unit. Temporary tight the seven screws (XA1-1260-406) and the seven washers (XD1-1102-625) so that the CST AD-IF board can move.

(6) At installation of the flat cable (FPC-A-AD), reverse the step (3). Make sure the dust and any foreign materials are not attached to the connector. Gradually tighten each of the screws uniformly to prevent the deflection of the connector.

Note:
The flat cable (FPC-A-AD) has multiple pins (120 pins) with high density. Be aware that the dust in the connector and the deflection of the connector may cause the connection failure.



(7) Flat cable (FPC-A-AD) spreads well. Put the CST AD-IF board in place so that the tension will be applied uniformly to the flat cables (FPC-A-AD). Fully tighten all the screws, which were temporary tightened in the step (5) above.



(8) At reassembly, reverse the steps (1) and (2) above.

Note:
The exterior cover is made of a magnesium alloy. Remember that tightening the screws with excessive force could strip the nut.

Note:
When attaching the rear cover, be careful not to pinch the power cables and the others with the covers. Refer to "3.1.3 Notes on installing the rear cover in "3.1 Notes".

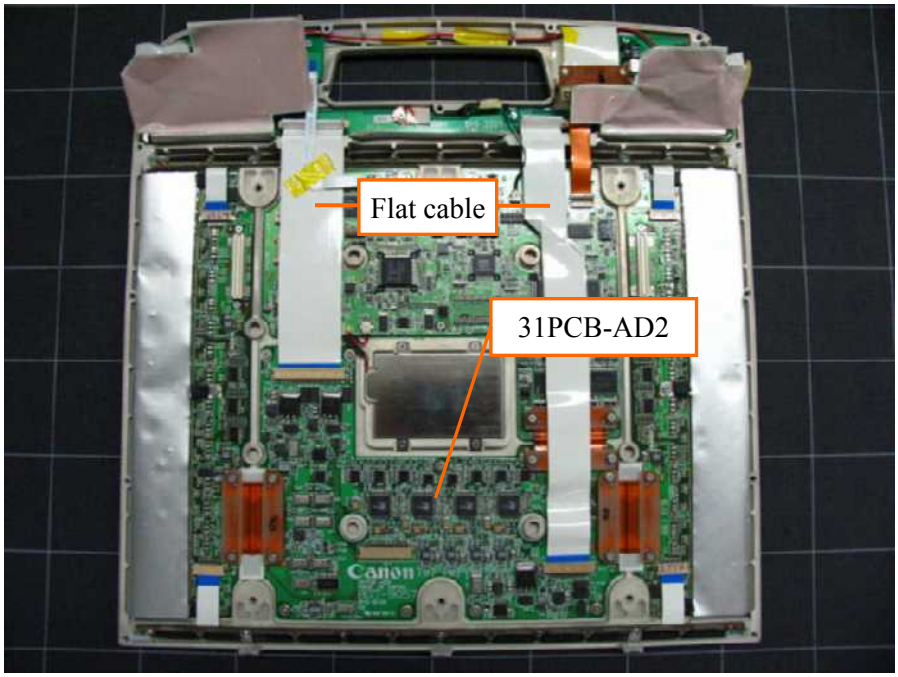
3.2.5. Replacing the 31 PCB-AD2

(1) Remove the rear cover by following the steps in "3.2.1. Removing the sensor rear cover".

Note:
When replacing the rear cover and the parts, be careful not to touch the internal TAB. For details, refer to "3.1.1. Notes on removing the rear cover" and "3.1.2. Notes on the TAB exposed on the internal sensor" in the section "3.1. Notes".

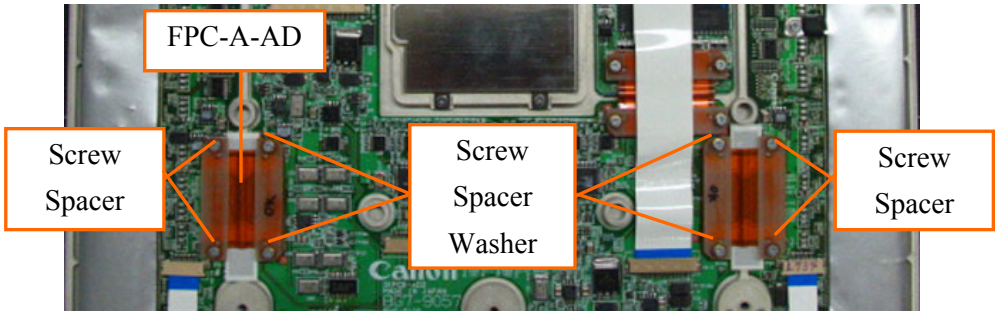
(2) Remove the connector cable and the two flat cables from each connector.

Note:
The old flat cable cannot be reused. Replace with the new one.
Be careful not to damage the connector.



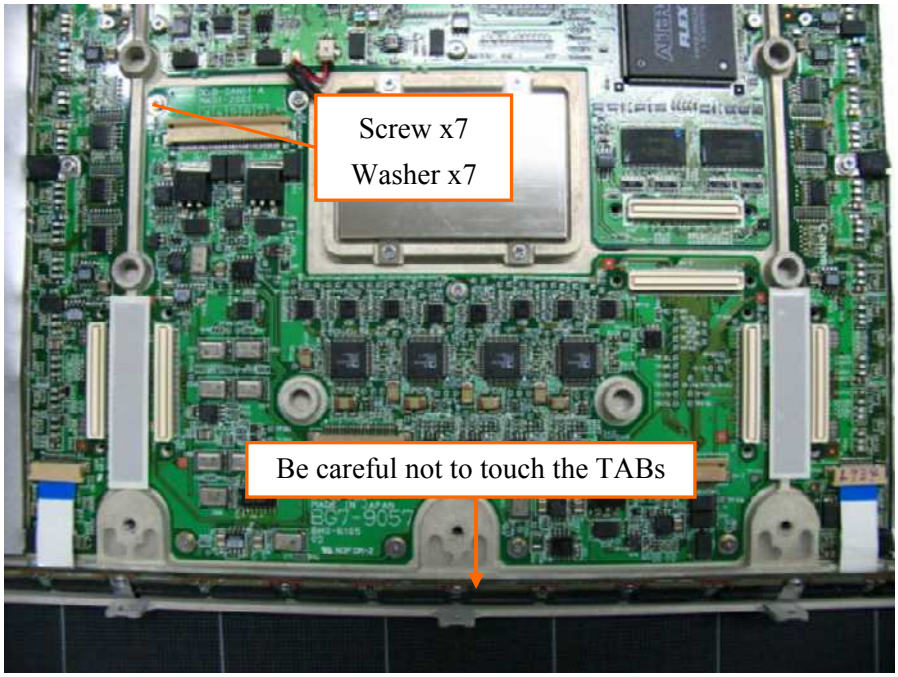
[Fig.1]

(3) Remove the four screws (XA1-1260-806) and the four washers (XD1-1102-625) to remove the flat cable (FPC-A-AD). Be aware of the spacer (BA4-0566) behind the flat cable.



[Fig.2]

(4) Remove the seven screws (XA1-1260-406) and washers (XD1-1102-625) to remove the 31PCB-AD2 from the sensor unit.

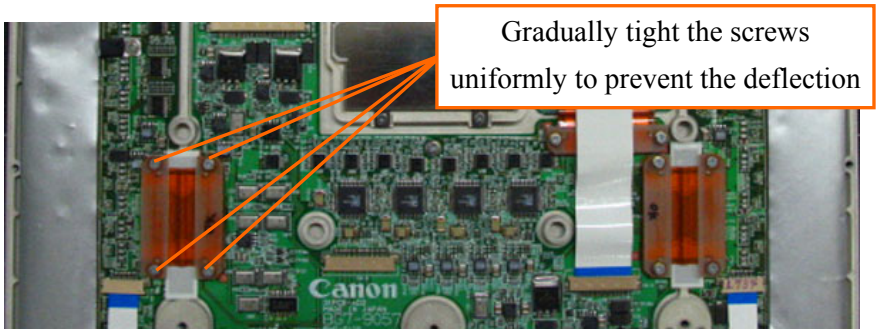


[Fig.3]

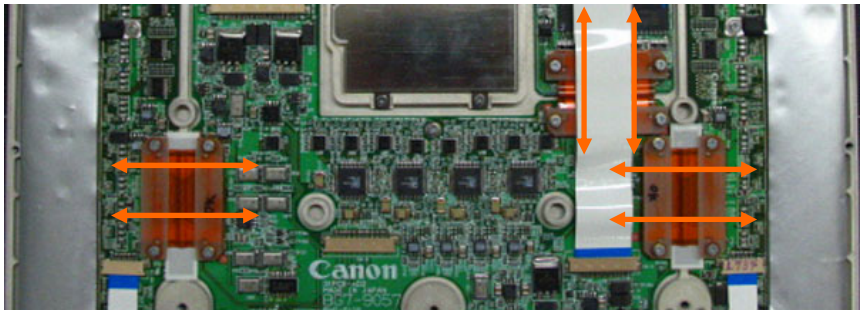
(5) Attach the new 31PCB-AD2 to the sensor unit. Temporary tight the seven screws (XA1-1260-406) and the seven washers (XD1-1102-625) so that the 31PCB-AD2 can move.

(6) At installation of the flat cable (FPC-A-AD), reverse the step (3). Make sure the dust and any foreign materials are not attached to the flat cable (FPC-A-AD) and the connector. Gradually tighten each of the screws uniformly to prevent the deflection of the connector.

Note:
The flat cable (FPC-A-AD) has multiple pins (120pins) with high density. Be aware that the dust in the connector and the deflection of the connector may cause the connection failure.



(7) Flat cable (FPC-A-AD) spreads well. Put the 31PCB-AD2 in place so that the tension will be applied uniformly to the flat cables (FPC-A-AD). Fully tighten all the screws, which were temporary tighten in the step (5) above.



(8) At reassembly, reverse the steps (1) and (2) above.

Note:
The exterior cover is made of a magnesium alloy. Remember that tightening the screws with excessive force could strip the nut.

Note:
When attaching the rear cover, be careful not to pinch the power cables and the others with the covers. Refer to "3.1.3 Notes on installing the rear cover in "3.1 Notes".

CXDI-31

4. E/O Box

Ver.03

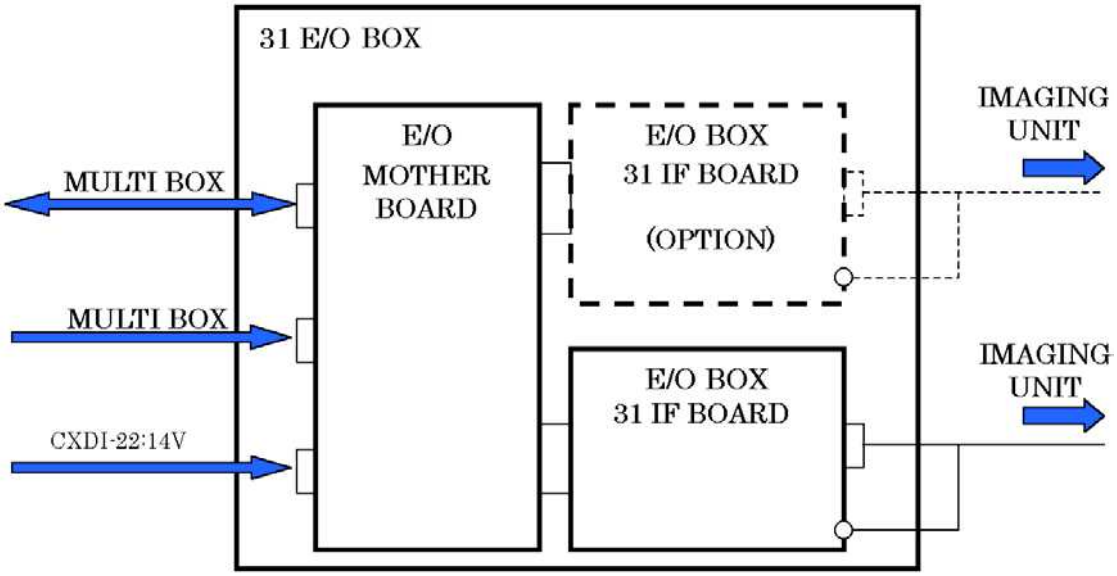
Aug, 2005

Medical Products
Technical Service Dept

CONTENTS

1. CXDI-31 E/O Box

Unit Diagram



[Fig.1]

2. Functions

2.1 E/O Mother Board

(1) The Board performs the multiplex processing on the image data transmitted from the Imaging Unit through the E/O Box 31 IF Board. It then converts the image data to optical signals by using the optical transmission module and sends them to the Multi-Box OE Board.

(2) Data conversion: Parallel communication data → Serial communication data
The Board converts the parallel communication data received from the Imaging Unit through the E/O Box 31 IF Board to the serial data to allow the serial communication with the Isolation Board of the Multi-Box.

(3) Data conversion: Serial communication data → Parallel communication data
The Board converts the serial communication data received from the Isolation Board of the Multi-Box to the parallel data to allow the communication with the Imaging Unit through the E/O Box 31 IF.

(4) Imaging unit connection check
The Board converts the connection check signal for the Imaging Unit received from the Isolation Board of the Multi-Box to the signals recognized by the E/O Box 31 IF. It also transmits the Imaging Unit data received from the E/O Box 31 IF to the Isolation Board.

(5) Driving power for the 31 E/O Box
The power for the Sensor for the CXDI-11, or the same for the CXDI-22 can drive the 31 E/O Box. See [Table.1] for selection of the driving power.

Settings for SW3	Driving power	Power supply
11 POW side (silk mark on the substrate)	Not used	Not used
22 POW side (silk mark on the substrate)	Power supply for CXDI-22 Sensor	14V(*1)

[Table 1]

*1) The 14V power for the CXDI-22 Sensor is regulated to the 5V power.

(6) Control Line Check mode
Each control line is checked if it properly works according to the commands by the Capture Board.

2.2 E/O Box IF Board

(1) Image data transmission
Performs the multiplex processing of the image data received from the Imaging Unit so that the E/O Mother Board can receive it, and then transmits it to the Mother Board.

(2) Sensor data transmission
Transmits the information on sensor connection based on the sensor connection check signals received from the E/O Mother Board.

(3) Communication data control
Controls the communication data between the Imaging Unit and the Multi-Box Isolation Board based on the sensor connection data.

(4) Signal line check
Checks the image signal line from the Imaging Unit. A command from the Imaging Unit can shift the Board to the Signal Line Check mode.

3. Repair Guide

3.1 Assembly/Disassembly

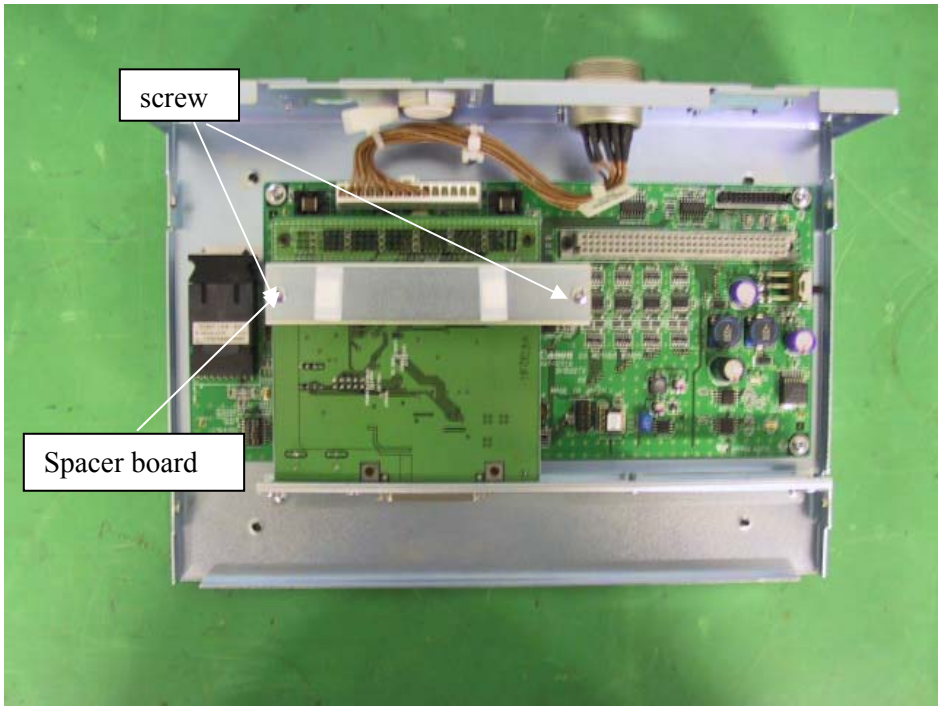
Reversing the steps of disassembly gives the procedure for assembly.

3.1.1 Former E/O box

(1) CST-IF-PCB

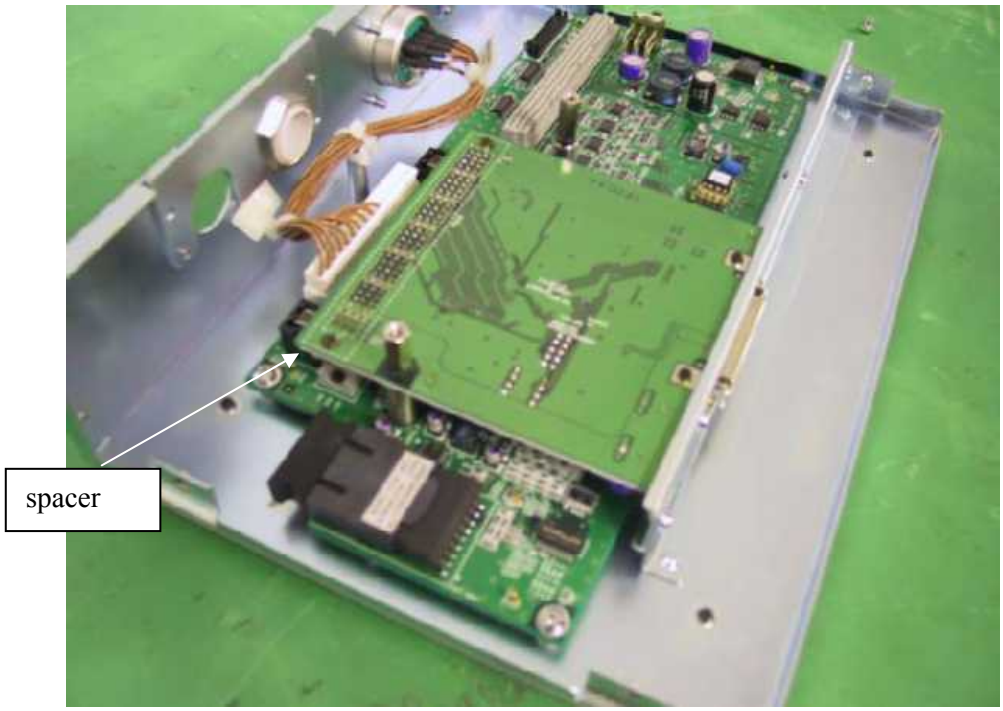
1.Remove screw(x 2)

2.Remove spacer board



[Fig.8]

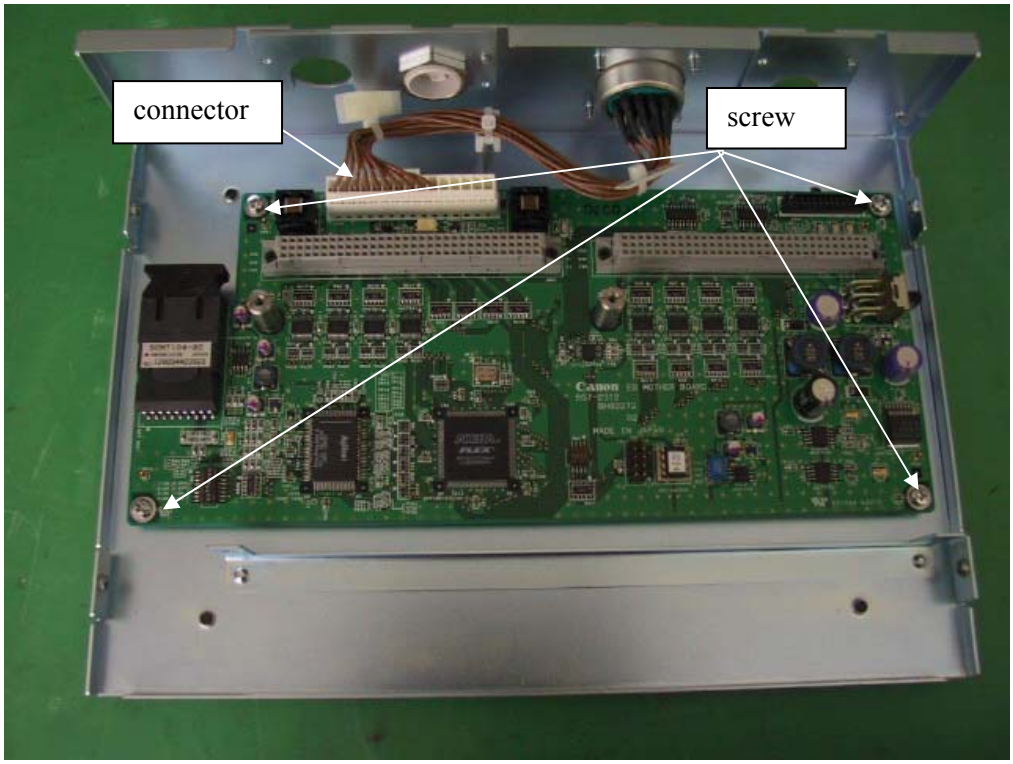
(2) CST-IF-PCB
1.Remove spacer



[Fig.9]

(3) E/O Mother board
1.Remove connector

2.Remove screw(x4)

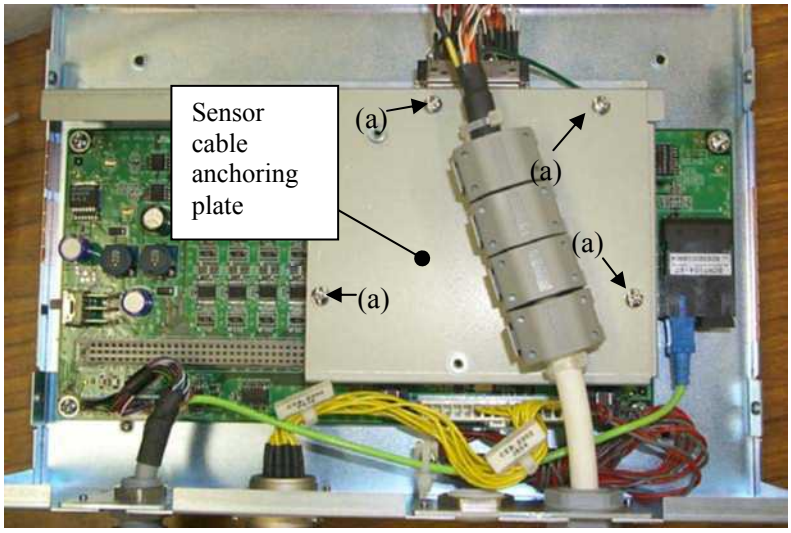


[Fig.10]

3.1.2 New E/O box

(1) E/O Box 31 IF board
1. Remove the top cover.

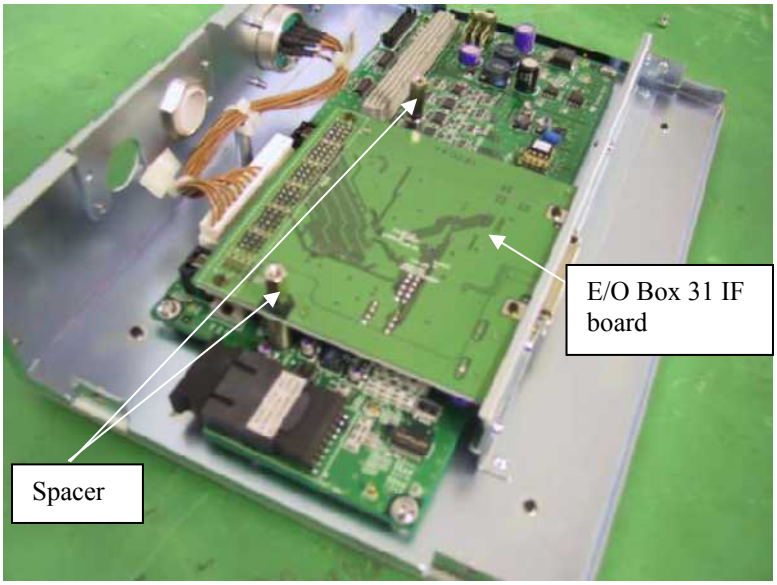
2. Remove the screws (marked by (a) in the picture), and dismount the sensor cable anchoring plate.



[Fig.1]

3. Remove the spacers.

4. Dismount the E/O Box 31 IF board.

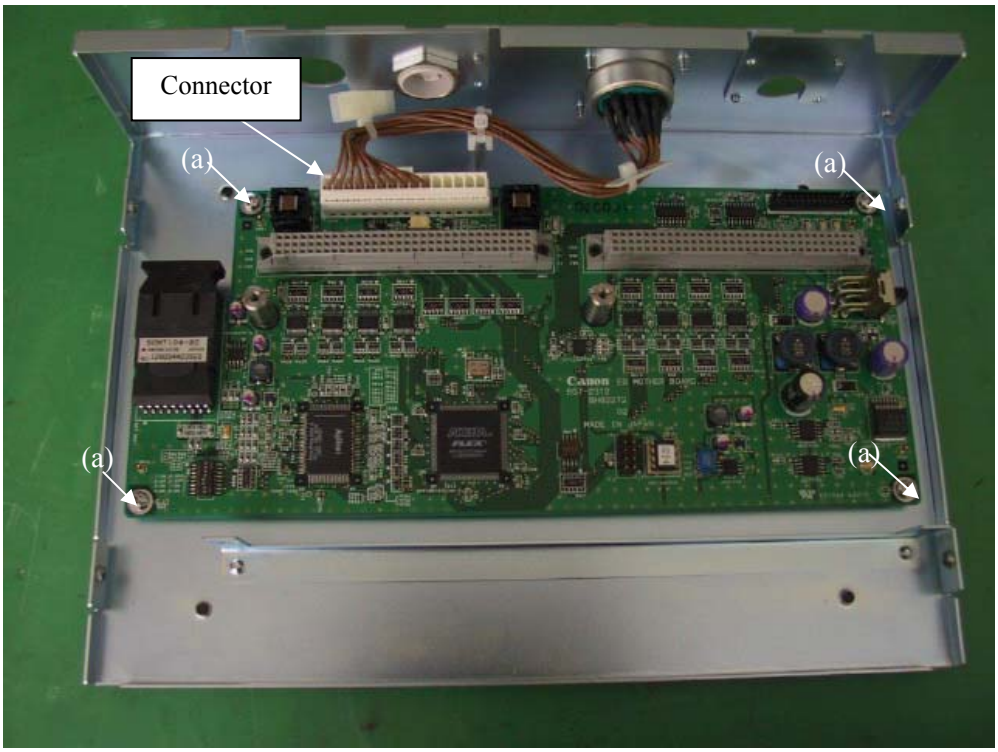


[Fig.2]

(2) E/O motherboard

1. Remove the connector.

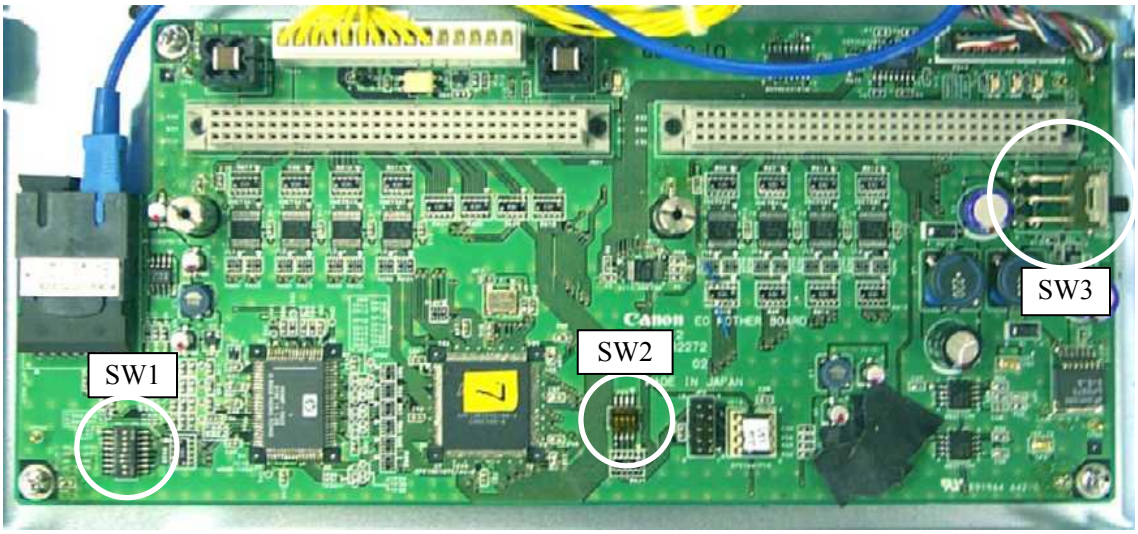
2. Remove the screws (marked by (a) in the picture), and dismount the E/O motherboard.



[Fig.3]

3.2 PCB Switch Setting

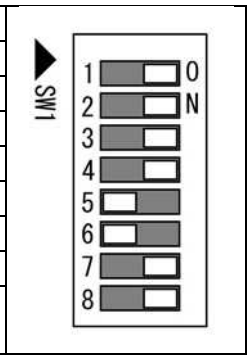
(1) CXDI-31 E/O Mother Dip Switch



[Fig.1]

Factory setting
(No change)

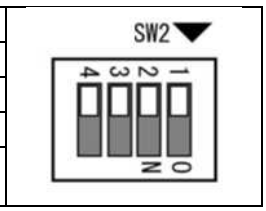
SW 1	
1	ON
2	ON
3	ON
4	ON
5	OFF
6	OFF
7	ON
8	ON



[Fig.2]

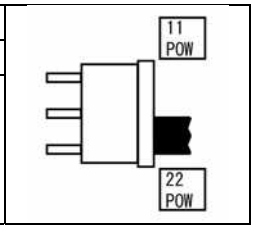
(No change)

SW 2	
1	OFF
2	OFF
3	OFF
4	OFF



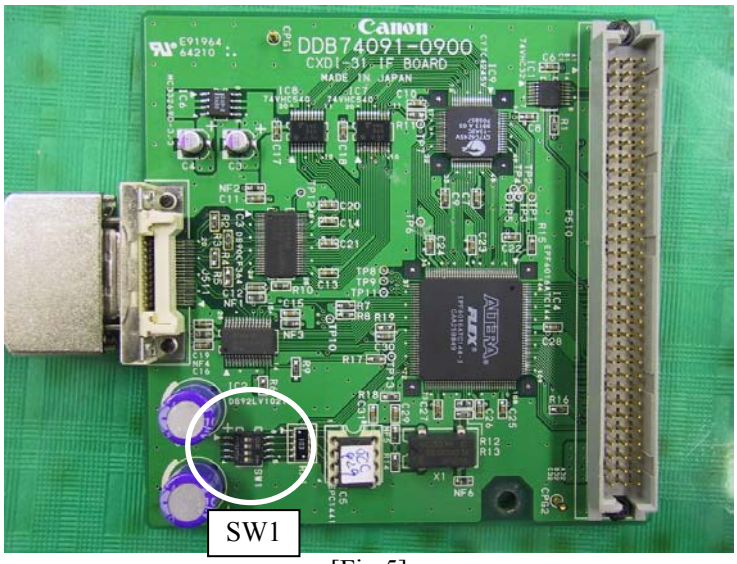
[Fig.3]

SW 3		
11 POW	Not used	
22 POW	(Factory Set)	From CXDI-22 sensor Power supply



[Fig.4]

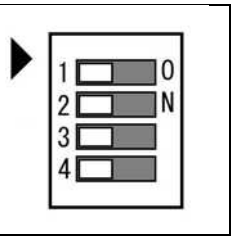
(2) CXDI-31 I/F PCB Dip Switch



[Fig.5]

(No change)

SW 2	
1	OFF
2	OFF
3	OFF
4	OFF

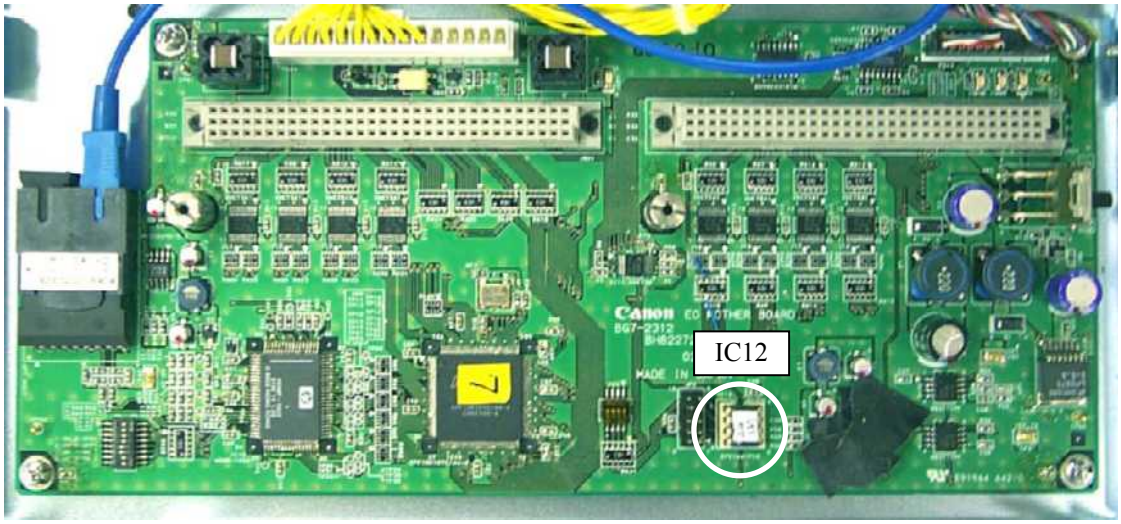


[Fig.6]

3.3 PCB parts replacement procedures

(1) E/O motherboard

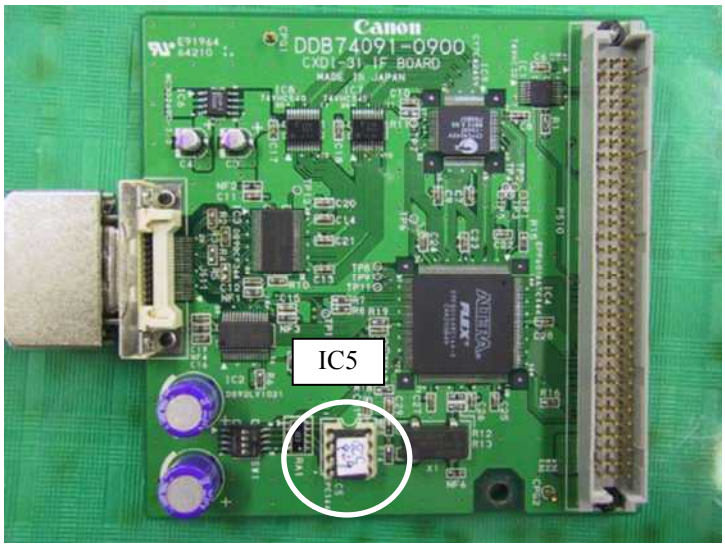
ROM replacement: IC12
(For more information on the initial settings of the DIP-switches, please refer to the “PCB settings list” in the previous section.)



[Fig.1]

(2) E/O Box 31 IF board

ROM replacement: IC5
(For more information on the initial settings of the DIP-switches, please refer to the “PCB settings list” in the previous section.)



[Fig.2]

CXDI-31

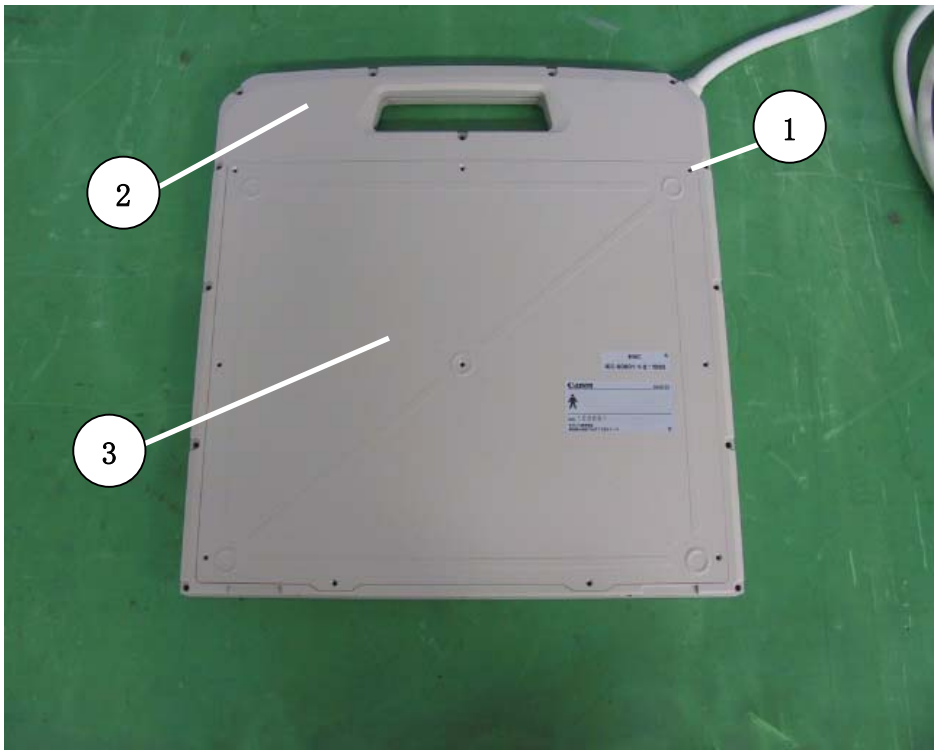
5. Parts Catalog

Ver.03

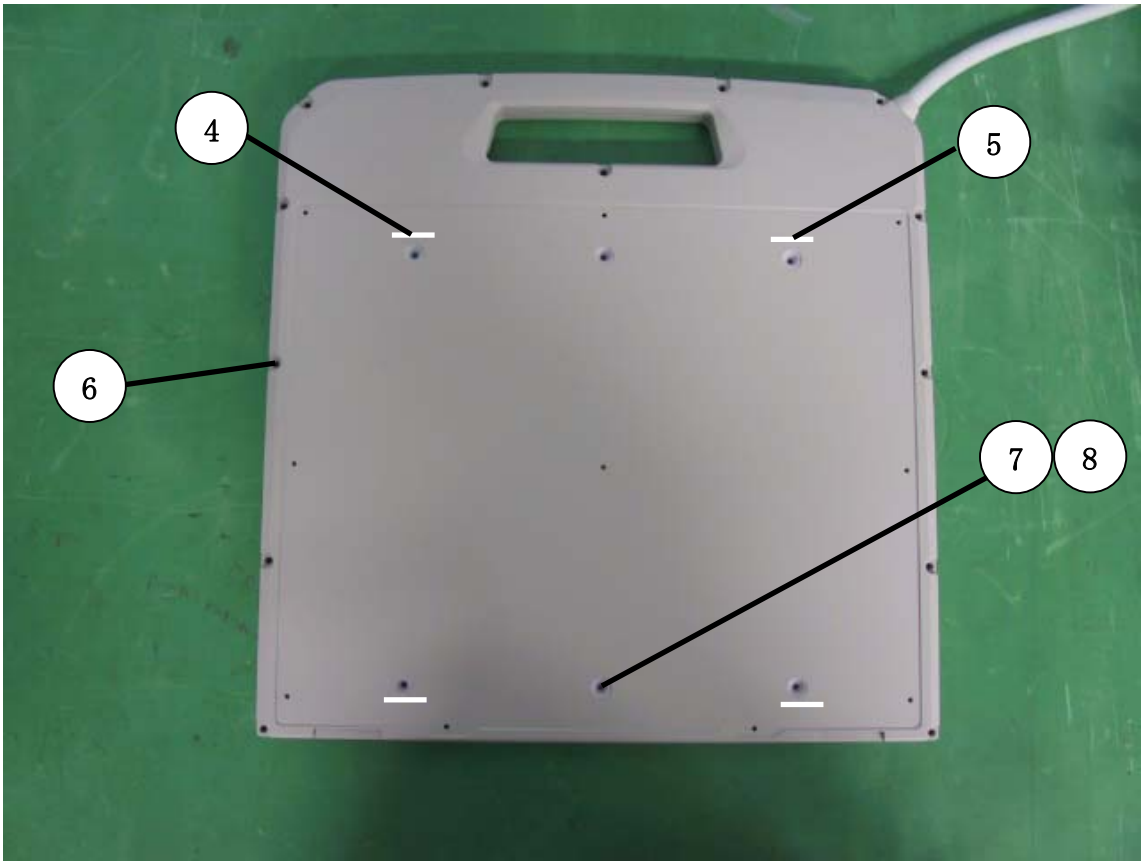
Jun, 2009

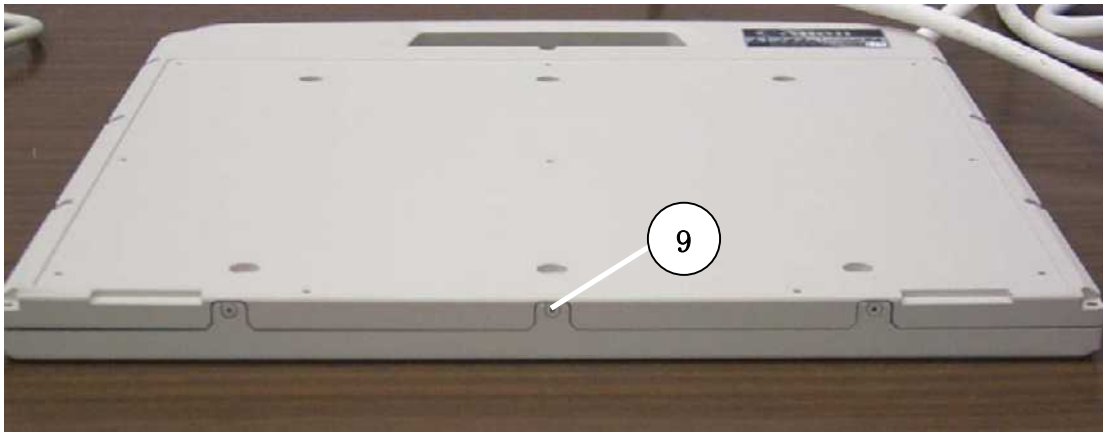
Medical Products
Technical Service

KEY NO.	PARTS NO.	Q'TY	DESCRIPTION	MEMO
1	BA4-0935-020	10	Screw	M2.6×4mm
2	Y67-2582-000	1	Cover, Base	W/O Shock Sensor
3	BF0-5235-000	1	Cover, Rear	

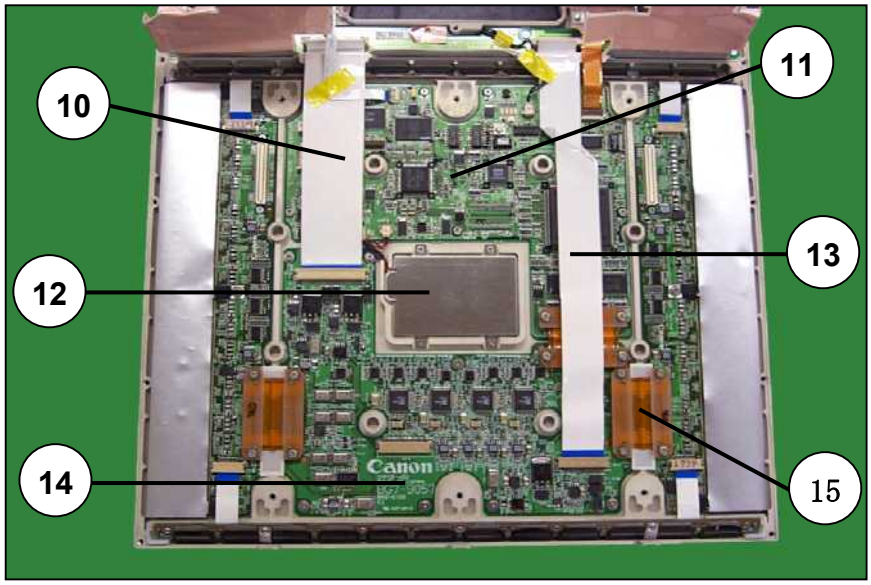


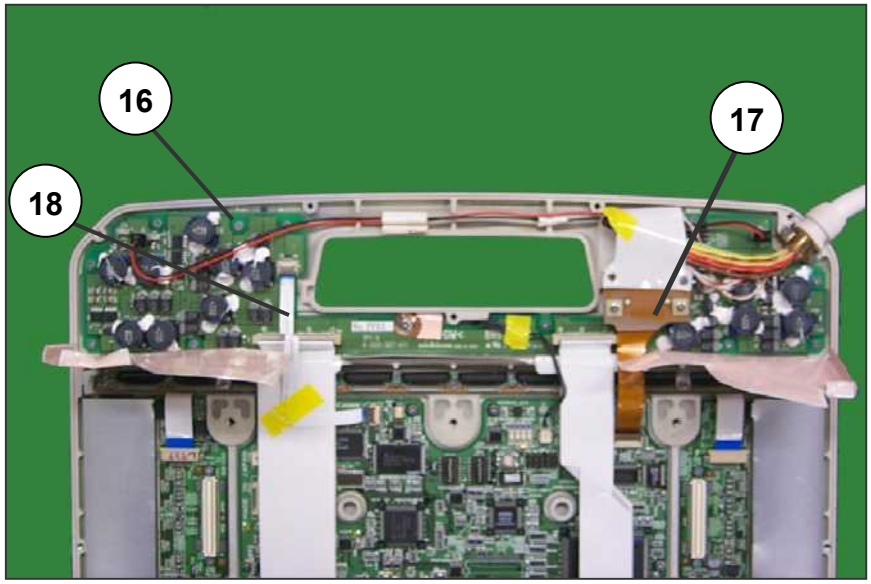
KEY NO.	PARTS NO.	Q'TY	DESCRIPTION	MEMO
4	BA4-1158-000	1	Shock Sensor	T-45 (SUMITOMO 3M)
5	BA4-1157-000	3	Shock Sensor	T-35 (SUMITOMO 3M)
6	BA4-0594-020	13	Screw	M3×12mm
7	XB1-2300-806	6	Screw	M3×8mm
8	BA4-0591-030	6	Spacer	
9	BA4-0595-020	3	Screw	M2.6×4mm



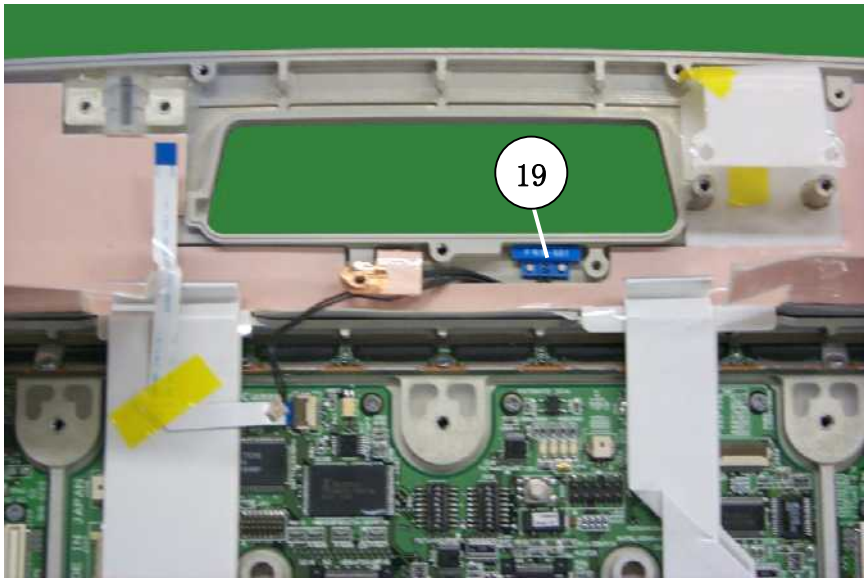


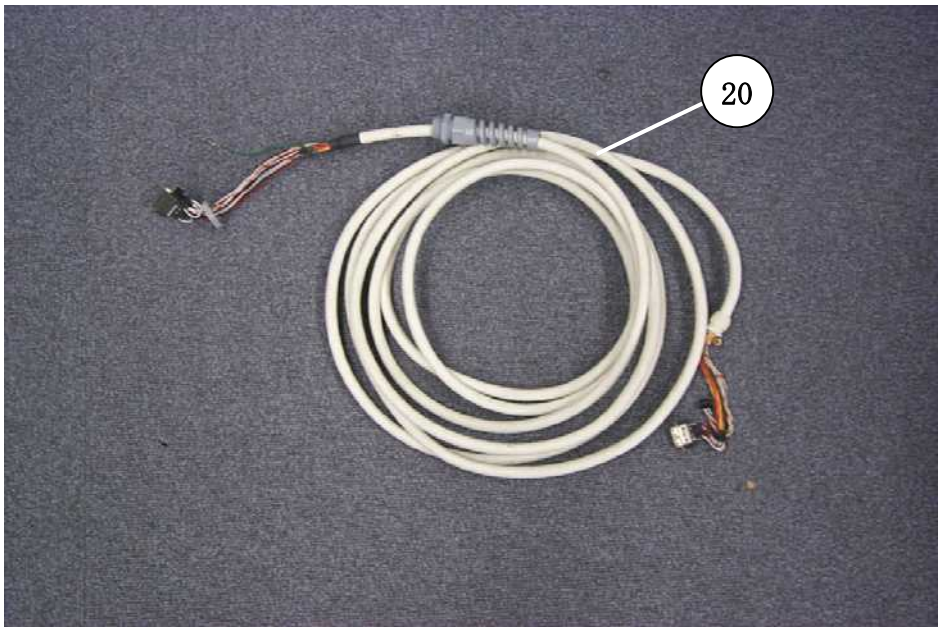
KEY NO.	PARTS NO.	Q'TY	DESCRIPTION	MEMO
10	BH6-3020-030	1	Flat Cable	
11	BG7-2359-030	1	PCB Unit, AD-IF	
12	BG7-2360-050	1	X-Ray Monitor	
13	BH6-3019-030	1	Flat Cable	
14	BG7-9057-030	1	PCB Unit, AD2	
15	BG7-2361-020	3	Flat Cable	
16	BG7-2355-020	1	PCB Unit, DC/DC Converter	
17	BG7-2363-000	1	Flat Cable	
18	BH6-3021-040	1	Flat Cable	



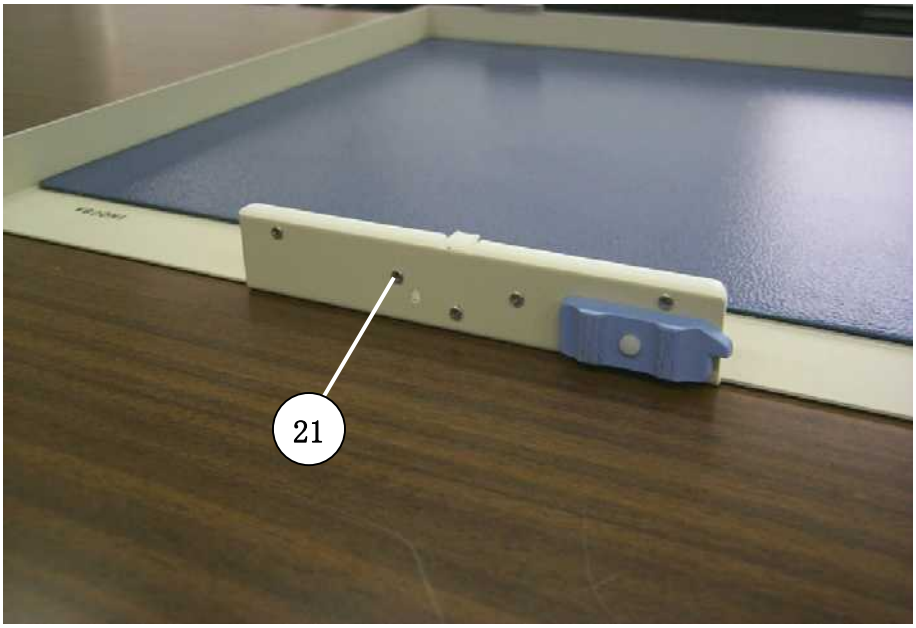


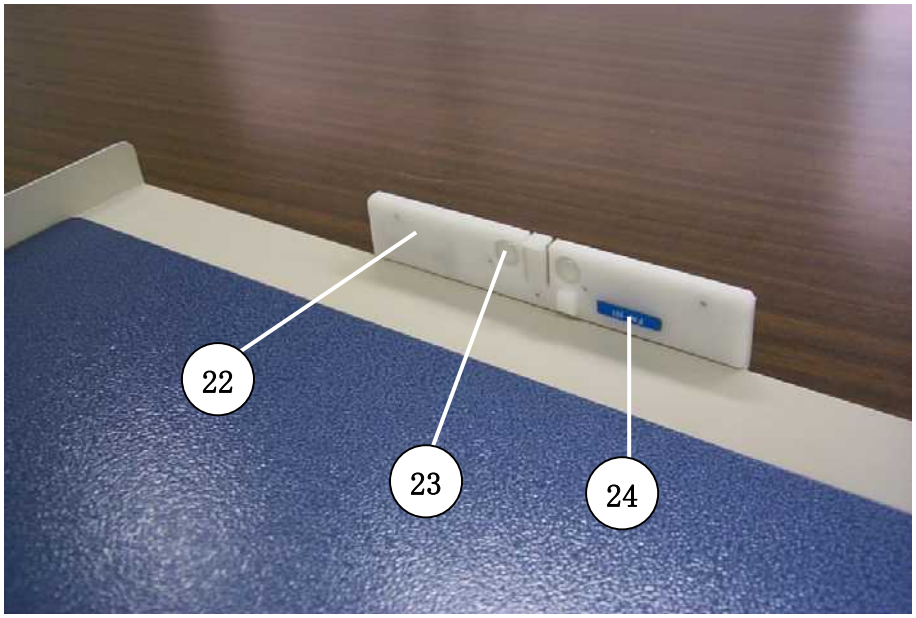
KEY NO.	PARTS NO.	Q'TY	DESCRIPTION	MEMO
19	BG7-2364-000	1	Switch,Magnet	
20	BG7-2356-000	1	Sensor cable unit	



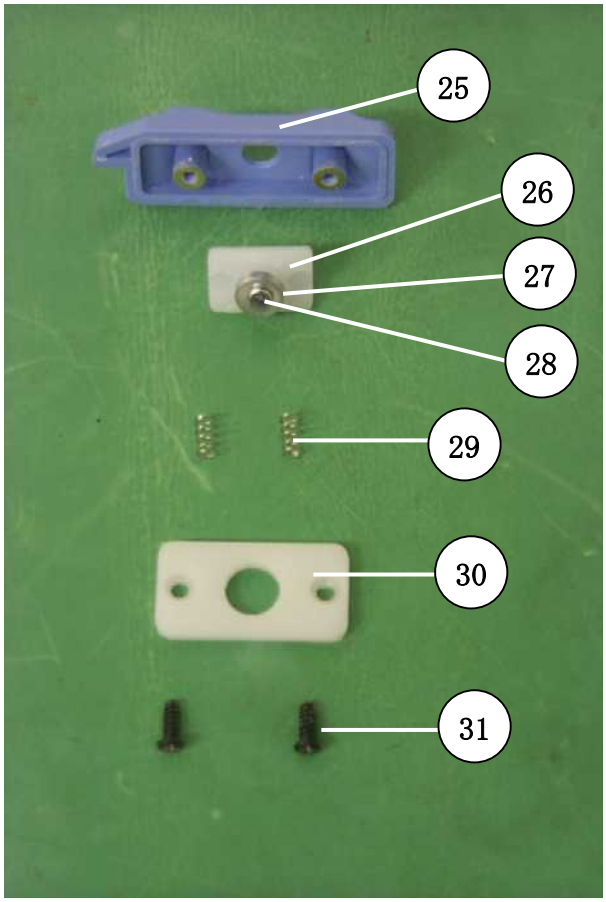


KEY NO.	PARTS NO.	Q'TY	DESCRIPTION	MEMO
21	XA4-1200-406	5	Screw	M2×4mm
22	BA4-0960-020	1	Cover,Lock Unit	
23	BA4-0961-000	2	Pad,Rubber	
24	BA4-0954-000	1	Magnet	



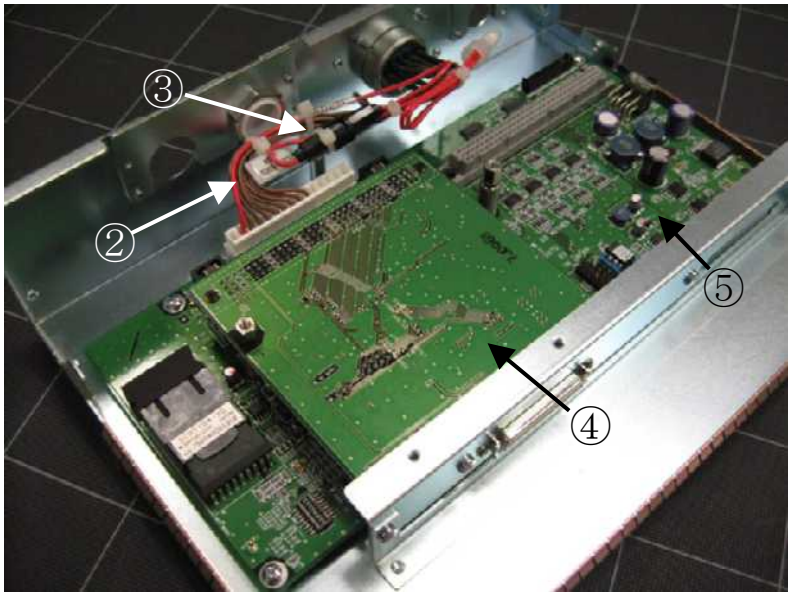


KEY NO.	PARTS NO.	Q'TY	DESCRIPTION	MEMO
25	BA4-0955-020	1	Lever,Slide	
26	BA4-0956-020	1	Button,Lock	
27	BA4-0957-000	1	Washer	
28	XA4-1200-406	1	Screw	M2×4mm
29	BA4-0959-000	2	Spring	
30	BA4-0958-020	1	Plate,Slide	
31	XA4-1200-509	2	Screw	M2×5mm

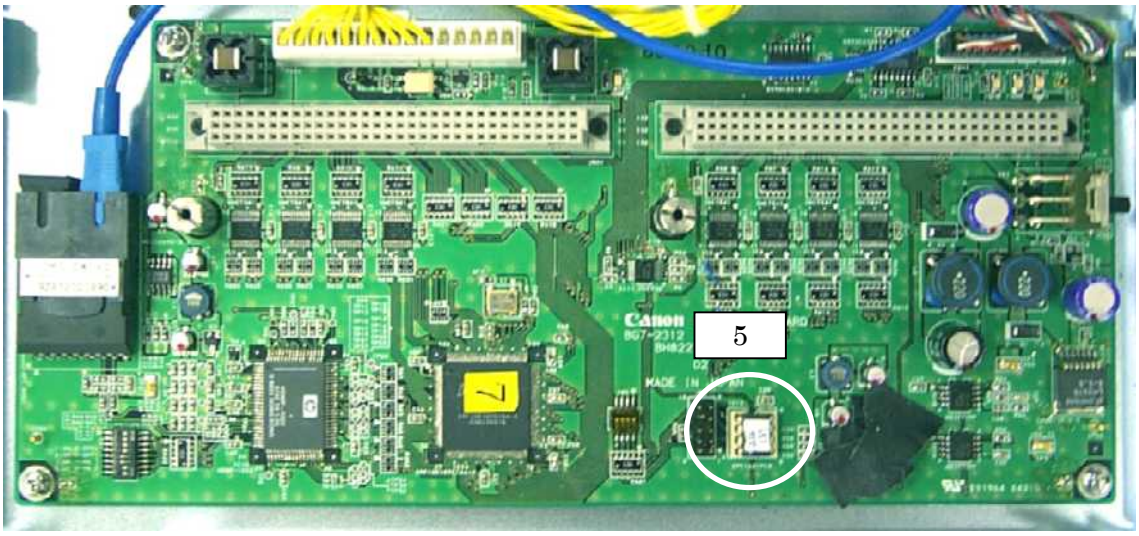


KEY NO.	PARTS NO.	Q'TY	DESCRIPTION	MEMO
1	Y67-2508-000	1	E/O Box	W/O Rating Plate
2	Y61-4621-020	1	Cable, connector	W/O FUSE
3	VD7-3855-001	1	FUSE	250V 5A
4	Y67-2410-000	1	Mother board	W/O P-ROM
5	Y67-2573-000	1	31 IF board	W/O P-ROM

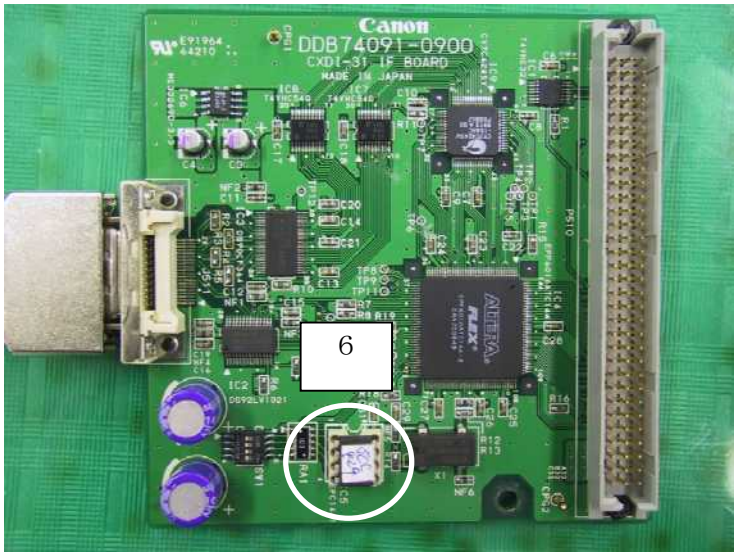
EO Box Internal View



KEY NO.	PARTS NO.	Q'TY	DESCRIPTION	MEMO
5	Y58-1260-000	1	P-ROM	IC12
6	Y58-1276-000	1	P-ROM	IC 5

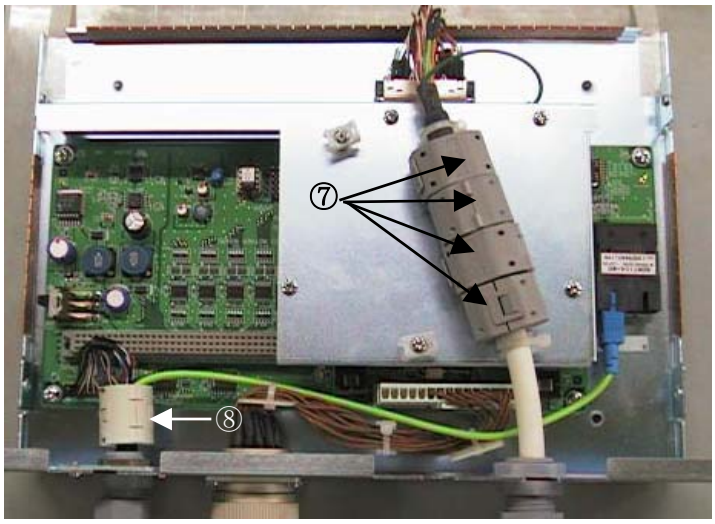


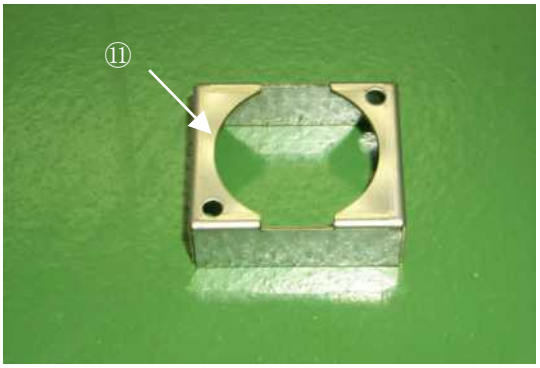
Mother board

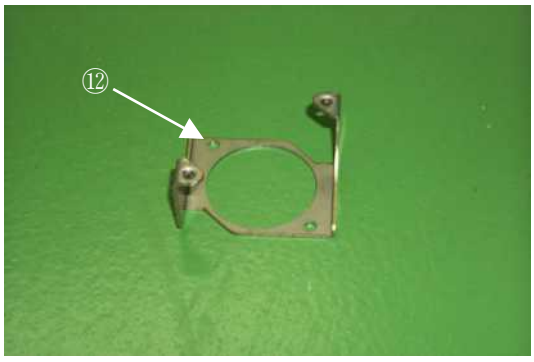


CST I/F board

KEY NO.	PARTS NO.	Q'TY	DESCRIPTION	MEMO
7	WE8-5969-000	4	Ferrite, core	
8	WE8-5847-000	1	Ferrite, core	
9	BG7-2250-000	1	Cable unit, composite	
10	BG7-2485-000	1	Cable unit, power supply	
11	BA4-1003-000	1	Base plate, connector guard	
12	BA4-1004-000	1	Guard, connector	







KEY NO.	PARTS NO.	Q'TY	DESCRIPTION	MEMO
13	BG7-2368-000	1	Relay clamp unit	For CXDI-T2

CXDI-31

6. Service Manual Report

Ver.01

Aug, 2005

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