

Manual No : M517-E398  
Revision : C

# **DAR-8000i**

## **IMAGE QUALITY ADJUSTMENT MANUAL**

**This document is dedicated to the service personnel.**  
**This document does not have direct relationship with daily handling.**

**SHIMADZU CORPORATION**  
**KYOTO JAPAN**

**NOTE**

In this manual, the contents and warnings including precautions and prohibitions on use are classified as follows.

**DANGER**

States a direct danger that may cause death or serious injury if it is not avoided.

**WARNING**

States an indirect or potential danger that may cause death or serious injury if it is not avoided.

**CAUTION**

States a danger that may cause slight or medium injury or may cause damage in equipment or fire if it is not avoided.

**NOTE**

States the information that helps to use the system correctly.

## Revision History

Rev.	Date	Comment
	Feb. 2, 2005	First Edition
C	Oct. 5, 2005	<p>1 has been added a description of revision numbers.</p> <p>2-(6) has been changed.</p> <p>3.2 has been changed a description from “unused” into “use”, and deleted <b>NOTE</b> from this section.</p> <p>3.3.1 has been changed a description of “Auto-Shot” into “Memory-Shot”.</p> <p>3.3.1 Parts name order has been changed.</p> <p>3.3.2 has been added <b>NOTE</b>.</p> <p>4.2 Unsupported X-ray diagnostic table has been deleted from the Table.</p> <p>4.4.2 has been added description of 16”4 FOV.</p> <p>4.7 has been added description of 16”LM.</p> <p>5.3 has been added.</p> <p>7.1.3 (4) has been added description of RSM-DSA.</p> <p>(6), (9) has been added description of YSF and 16”I.I.</p> <p>(9) has been added explanation about standard input data.</p> <p>(9) has been changed “25ms(8mAs)” into “20ms(6.4mAs)” in row of 12” on the Table.</p> <p>8 Description has been added to <b>NOTE</b>.</p> <p>8.4.1 has been changed “DR2” into “DR3” in row of [Spot] on the Table.</p> <p>8.4.3 has been changed a description of “-30” into “-50” on [Clamp Level Control].</p> <p>8.5 has been added description of set value.</p> <p>8.6.1 has been added description of YSF and 16”I.I. to the Table 8-3 and 8-4.</p> <p>8.7.3 (6) has been changed a description of 12” to maximum FOV.</p> <p>8.8.1 has been added description of YSF and DSA to the Table 8-5, and changed standard values from “1900” into “2100” on the Table 8-5.</p> <p>8.8.3 has been added adjustment method.</p> <p>9.1.1 has been changed parameter value on the Table 9-1 and 9-2.</p> <p>9.2.1,9.2.2 has been added description of DSA to the Table 9-3 and 9-4, and changed additional explanation in those Tables.</p> <p>9.2.1 has been deleted symbol of “L”, “M”, and “H” from Table 9-2.</p> <p>9.2.3 has been added description of ANGIO AVG, and changed Gamma values from “LUT3” into “LUT1” on the Table.</p> <p>10-(3) has been changed, and added value of Window/Level.</p> <p>11.3 has been added adjustment method.</p> <p>11.4 has been added “Memory Shot” table to Appendix Data Sheet, and added explanation of values for IRIS, and changed a description of 110kV into 115kV in the table of “DC-FLUO FkV-FmA”.</p>

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# 1 Introduction

This DAR-8000i Image Quality Adjustment Manual is created as data for the service personnel in charge of installation and adjustment of the DAR-8000i system. Make sure to read thoroughly this manual before starting actual installation and adjustment. Write down the adjustment data on the attached data sheet while performing adjustment.

Confirm the system configuration (the monitor composition, the I.I. type and X-ray tube type) and the presence of options (pulse fluoroscopy, real-time DSA and RSM-DSA) etc. and it is possible to work efficiently even by actual installation and adjustment.

## NOTE

| This procedure corresponds to the system of revision number 02.00.00. |

When installation and adjustment are finished, send the data sheet and the image data (whose detail is described later) to the following address.

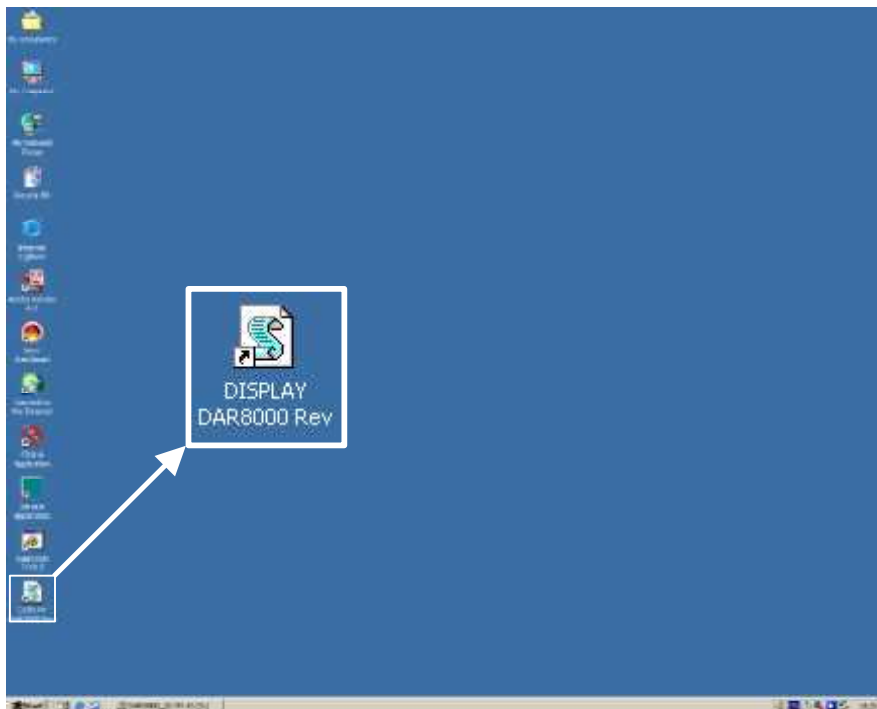
1 Nishinokyo-Kuwabaracho, Nakagyo-ku, Kyoto 604-8511, Japan  
Quality Assurance Department, Medical Systems Division, Shimadzu Corporation

**It is regarded that installation is completed when the data is received by the section above.**

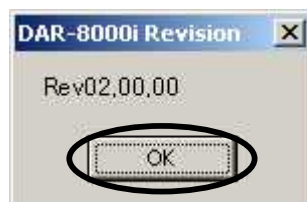
## 1.1. Confirming System Revision Number

This section explains how to confirm system revision in DAR-8000i system.

- (1) Log on with user “shimadzu”.
- (2) Click on “DISPLAY DAR8000 Rev” shortcut on desktop.



- (3) “DAR-8000i Revision” screen is displayed. Check the system revision number. Click on “OK” button.



System revision number can be checked.



## **2 Required Tools**

The following tools are required for adjustment described in this manual.

- (1) Phillips screw driver (M3, M4)
- (2) Allen wrench (1.5mm, 2mm, 2.5mm)
- (3) Adjustment screwdriver
- (4) Loupe, blower (to remove dust from optical system)
- (5) 9BCu phantom
- (6) Acryl, 23cm (In increments of 1cm)
- (7) Static electricity protector wrist-band
- (8) Dose meter
- (9) Isopropyl alcohol or lens cleaner
- (10) Cloth for lens cleaning

### 3 Component Mounting Procedure

#### 3.1. Mounting the Beam hardening Filter

Make sure that a Beam hardening filter is attached in the lead cone of the X-ray tube. The Beam hardening filter has such structure that a filter (gold foil) is adhered between two aluminum filters.

If a mounting the beam hardening filter and an aluminum filter are attached in the lead cone, an aluminum filter should be removed.

#### NOTE

Collimator F-50 has its own Beam hardening filter, so the filter in the lead cone of the X-ray tube is not necessary. According to the type of X-ray tube, an additional filter (component of F-50) is necessary in the lead cone. In detail, refer to the Installation manual of F-50.

#### 3.2. Mounting the I.I. Magnetic Shield

An I.I. magnetic shielding is composed of two parts (The shielding metal for the X-ray incidence plane and for the side). These are carried with I.I. as a standard composition at 16-inch I.I., and it is carried as an option at 12-inch I.I. **Install the shielding metal at 12-inch I.I. or 16-inch I.I.**

Attach the metal on the X-ray incidence plane so that it covers the X-ray incidence plane of the I.I. when you attach it. Then, tighten it together I.I. mounting screws provided on the X-ray incidence plane of the I.I. so that it is fixed.

(Refer to the installation manual packed up together into the I.I. magnetic shielding)

The metal of the I.I. magnetic shield on the X-ray incidence plane is extremely thin. If impacts are applied, the metal may be wrinkled or folded. Such damages can be seen on images. Pay rigid attention so that the metal is free from wrinkles, folding, flaws, etc.

### 3.3. Adjusting the Camera Head and Optical System

The optical systems used are following three types.

For OP-133: IA-12L, IA-9L series

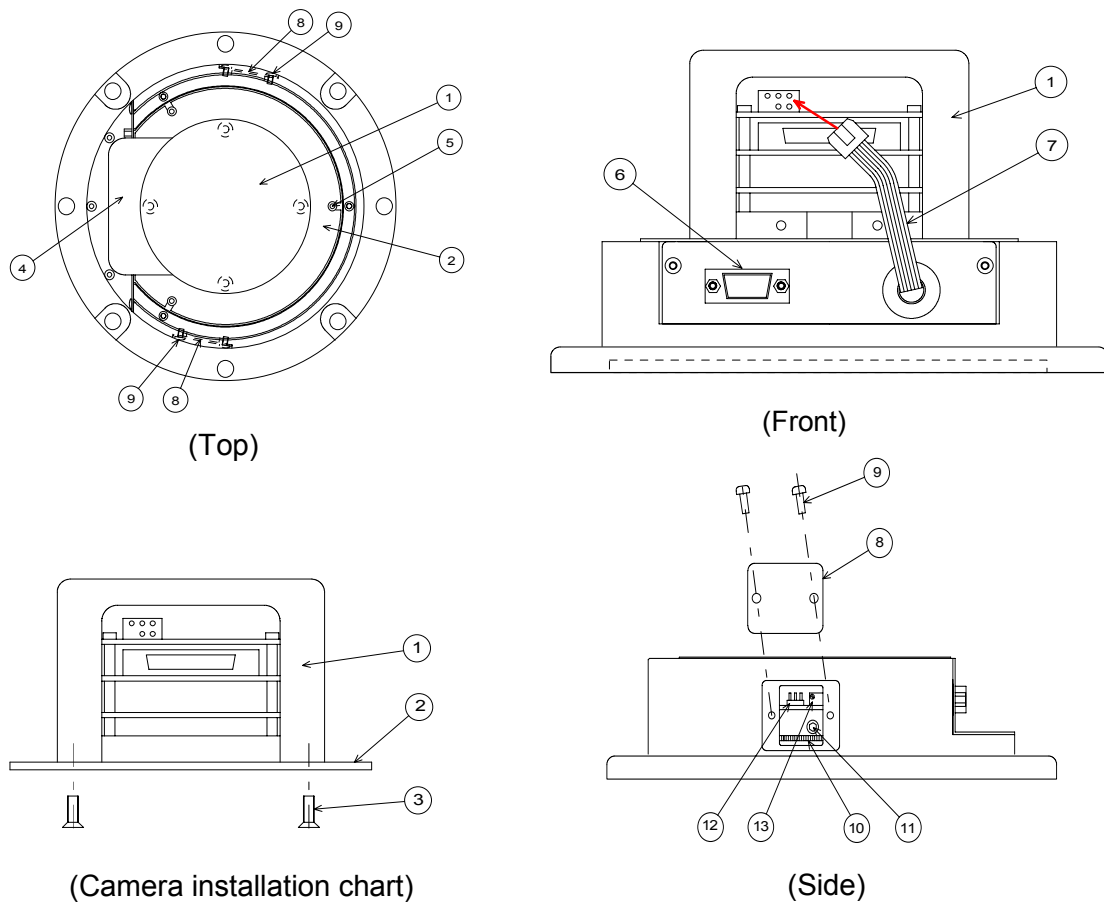
For OP-134: IA-12L/HS series

For OP-135: IA-16L/HS series

#### 3.3.1. Configuration of Camera head and Optical System

These optical systems use monocular lens and connects directly to I.I and CCD camera, optically.

Furthermore, approximately 40 % radius of I.I. output image which photo pick-up part performs center-weighted metering is integrated, allowing radiography techniques such as “Memory-shot” and “Photo-timer.”



**Figure 3-1 Camera Configuration**

The component parts on figure Figure 3-1 are as follows:

- |                                  |  |
|----------------------------------|--|
| 1. Camera Head                   | 8. Side window lid                     |
| 2. Camera mounting plate         | 9. Window lid fixation screw           |
| 3. Camera fixation screw         | 10. Focus adjustment ring              |
| 4. Camera frame side cover       | 11. Focus ring fixation screw          |
| 5. Mounting plate fixation screw | 12. Photo sensor check pin             |
| 6. Photo-cell cable connector    | 13. Photo sensor volume to adjust gain |
| 7. Iris control cable            |  |

Refer to Digital Radiography DAR-8000i Installation Manual (M517-E380) to mount camera head and optical system to X-ray diagnostic table.

### **3.3.2. Focus Adjustment**

The steps of focus adjustment in section 5.2. are as follows.

- (1) Remove the lid of the main body of the optical system (figure no. 8) in two places on the side, and loosen screw a little in two places. (figure no. 11)
- (2) Place Penetra-chart on the table and perform fluoroscopy by lowest tube voltage. Adjust iris to open.
- (3) While seeing the image on the TV monitor, rotate the focus adjustment ring (figure no. 10) to the most appropriate focus to stabilize figure no.11 in place. Attach two side window lids. (figure no. 8)

#### **NOTE**

Fix screw (figure no. 11) one after the other by little. To fix one tightly might cause deviation of the optical axis of a lens.

### **3.3.3. Optical Axis Adjustment**

The steps for optical axis adjustment performed in section 5.1. are as follows:

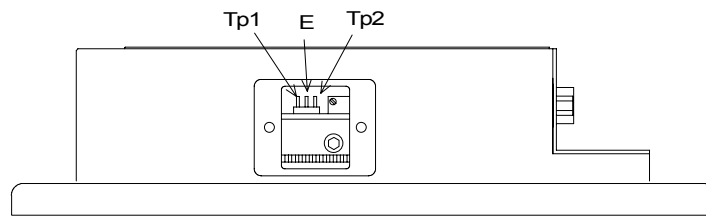
- (1) Loosen at three parts of the mounting plate fixation screw (figure no. 5) a little. Perform fluoroscopy at lowest X-ray tube voltage. Move the camera head unit little by little and adjust the axis of the optics by seeing the fluoroscopy image on the TV monitor
- (2) Fix the screws (figure no. 5) loosened once.

### 3.3.4. Photo-sensor Sensibility Adjustment

There is no necessity of adjustment in terms of installation for photo-sensor sensibility of optical system. As a reference, the adjustment of photo-sensor is as follows.

#### (1) Check pin

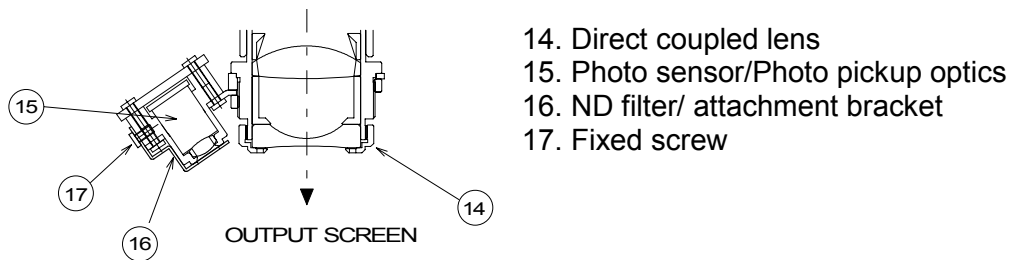
Check pins are composed from the left of three wicks Tp1, E (earth), and Tp2.



**Figure 3-2 Position of Check pin**

#### (2) ND Filter

ND Filter (figure no. 16) is attached upon factory shipment. (See figure below)



**Figure 3-3 ND filter**

Tp1 (primary voltage of the photo sensor unit) is different from each brightness of I.I and its standard value is about 0.1 to 0.3V.

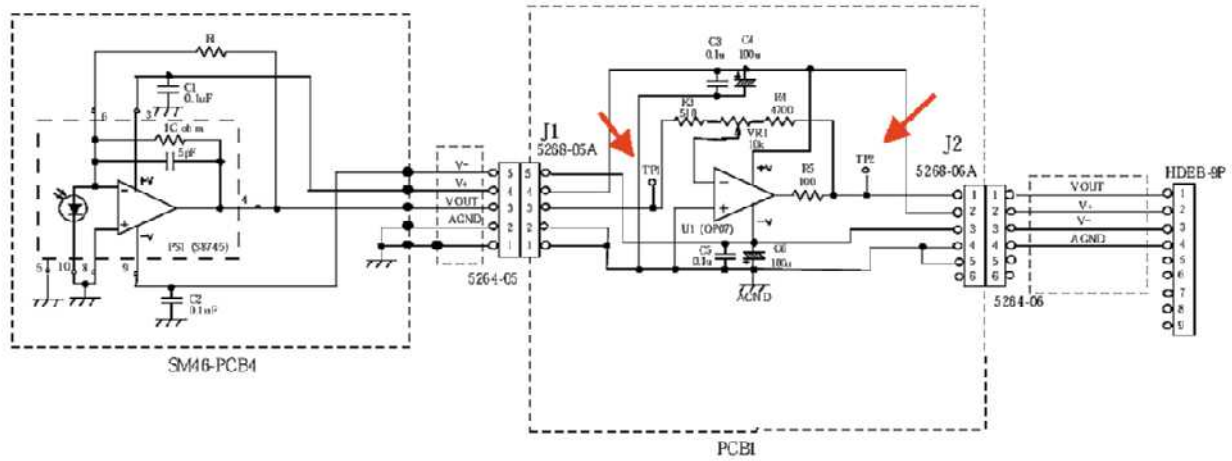
The average is approximately 0.1 to 0.3. If Tp1 is less 0.1V, please put off the ND filter (figure no. 16) for the reason of lack of the brightness of I.I. with age.

#### (3) Sensibility Adjustment

In standard radiography condition, the Tp2 (output voltage of photo sensor unit) is adjusted about 1.2V.

If the Tp2 voltage deviating from 1.2v, or put off the ND filter, it is needed to re-adjust it as follows.

As irradiating X-ray, observe the voltage waveform between Tp2-E with the oscilloscope, and adjust the sensibility with figure no. 13. (See figure 3-4 for circuit diagram)



**Figure 3-4 Photo-sensor Sensibility Control Circuit Diagram**

### 3.3.5. Lighting Area

It is designed that the area within about 40% is emphasis photometry and about 60% by lighting in this optical system. The lighting position cannot be adjusted.

## 4 Preparation Before Adjustment

### 4.1. Start-up Service Application

It is necessary to use Service Application for adjustment. How to start Service Application is shown below.

#### NOTE

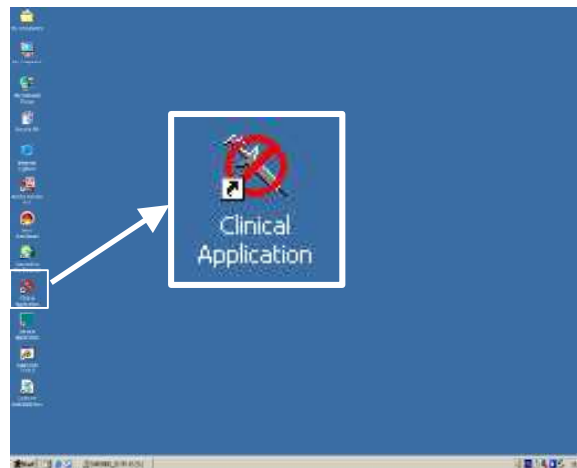
When Service Application is not started according to the following procedures, the initialization of the ARCNET communication with X-ray diagnostic table or the X-ray high-voltage generator is not normally executed. In this case, even if the FOV or the mode of fluoroscopy is changed on the operation panel of X-ray diagnostic table or the X-ray high-voltage generator, the FOV or the mode of fluoroscopy isn't changed on the calibration screen.  
Please start Service Application according to the following procedure.

- (1) Turn ON the power switch on operation panel of the X-ray high-voltage generator. DAR-8000i is turned ON with synchronized with the power supply of the X-ray high-voltage generator.
- (2) After disappearing the Windows Start screen during starting DAR-8000i, Windows is starting up ...Screen (Figure 4-1) is displayed. Continue to press the left [Shift] key on Windows is starting up ...Screen and display Log On to Windows screen.



**Figure 4-1 Windows is starting up... Screen**

- (3) Input user name and password for service person. User name is "shimadzu". Password is "Dar8k".
- (4) Double-clicked the icon of Clinical Application and start the Clinical Application.

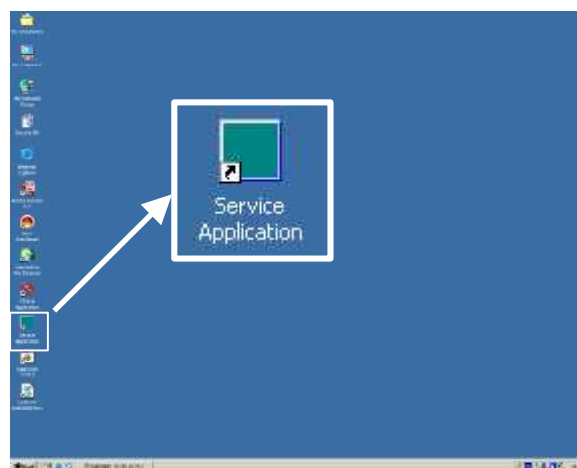


**Figure 4-2 Icon of Clinical Application**

**NOTE**

At this point, the ARCNET communication is initialized. The message, “Remote Devices are not ready...”, is displayed. In that case, please confirm the connection and the setting related to the ARCNET communication according to “M517-E397 UD-DAR8000 Connect Kit Installation Manual”. Must cancel it on the way even if an auto calibration is started.

- (5) Click “shutdown” button and finish Clinical Application.
- (6) Double-clicked the icon of Service Application and start the Service Application.



**Figure 4-3 Icon of Service Application**



## 4.2. Setting Small Format CCD Camera

Confirm “Small Format CCD camera” has been selected on Service Application, “Config” - “System Configuration” - “Interfaces” screen.

## 4.3. Setting the SID of the X-ray diagnostic table

Set the SID of the X-ray diagnostic table as shown in the table below in accordance with the model, and start image quality adjustment. When there is no model of the correspondence in the table below, adjust it based on the model, which the dimension is near.

Fluoroscopy system model	SID (mm), FFD display in X-ray diagnostic table panel
ZS-15, RS-50A	1100 (fixed)
ZS-100	1200
YSF-120/ 300	1000 (Set it in maximum SID)

#### 4.4. Adjustment of X-ray tube Focal Spot Size

The definition of large/ small focal point differs depending on the type of X-ray tube.

X-ray Tube Type	Large Focal Spot	Small Focal Spot	Remarks
0.3/0.8P323DK-85SF	0.8mm	0.3mm	Radiography, pulse fluoro: 0.8mm, DC fluoro: 0.3mm.
0.3/0.8P324DK-85SF	0.8mm	0.3mm	Radiography, pulse fluoro: 0.8mm, DC fluoro: 0.3mm.
0.6/1.2P364DK-85SF	1.2mm	0.6mm	DSA Radiography: 1.2mm, SPOT/SERIAL Radiography, DC/pulse fluoro: 0.6mm
0.4/0.7JG326D-265AT	0.7mm	0.4mm	< Unsupported >

## 4.5. Operation of the Iris

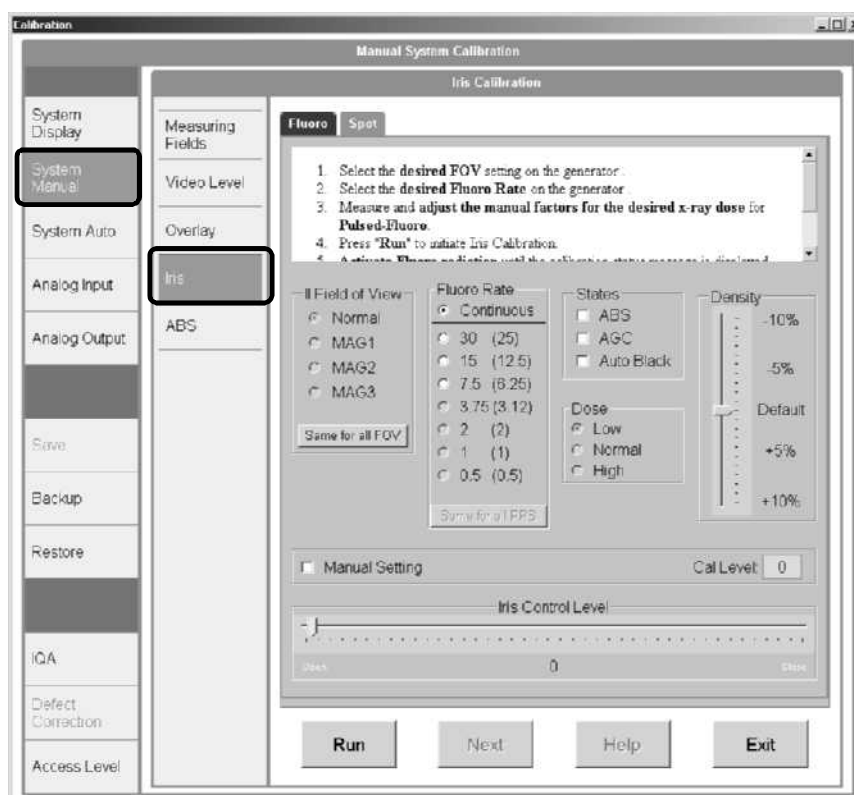
Before adjusting the focus as described in the next section, the iris is required to be fully opened. (If iris is narrowed down, the depth of field of the TV lens becomes deep, causing incorrect focus adjustment.) In this section, describes how to operate the iris for confirming focus during fluoroscopy.

### 4.5.1. Expression of Field Of View on Service Application

The expression of Field Of View (hereinafter FOV) on Service Application is as follows.

Service Application	12" 3 FOV	12" 2 FOV	16" 4 FOV	16" 3 FOV	16" 2 FOV
Normal	12 inch	12 inch	16 inch	16 inch	16 inch
MAG1	9 inch	9 inch	12 inch	12 inch	12 inch
MAG2	7.5 inch	-	9 inch	9 inch	-
MAG3	-	-	7.5 inch	-	-

## 4.5.2. Manual Operation for Fluoroscopy Iris



**Figure 4-4 Iris Adjustment Screen**

- (1) Press [Calib] button. From the most left row of the screen, select and press [System Manual] button.
- (2) Press [Iris] button, located on second left of the row,
- (3) Select [Fluoro] tab. (This procedure is unnecessary if already selected)
- (4) Set each parameter as shown on list below.

	Item	The Contents of Installation
[II Field of View]	-	Adjusting FOV <sup>*1)</sup>
[Fluoro Rate]	-	DC fluoro: [Continuous] <sup>*1)</sup> PULSE fluoro: 30(25) <sup>*1)</sup>
[Fluoro Rate]	[Same for all PPS]	Disabled
[States]	[ABS]	Checked
	[AGC]	Checked
	[Auto Black]	Unchecked
[Dose]	-	[Normal] <sup>*1)</sup>
[Density]	-	Slider is at [Default] position

<sup>\*1)</sup>These items are changed by set on the operation panel of X-ray diagnostic table or X-ray high-voltage generator.

- (5) Check [Manual Setting]. A dialog, "Are You Sure?" will display. Press [Yes] button.
- (6) Move the slider of [Iris Control Level] with the mouse and adjust Iris value. Iris will close if moved to right. Iris will open if moved to the left.
- (7) Press [Exit]. "Save changes?" dialog will display. Press [Yes]. The modified Iris value will save in the system.
- (8) "Calibration settings saved Successfully." dialog will display. Press [OK].

#### **4.6. Confirming the Fluoroscopy**

Perform fluoroscopy at 50 kV without using a phantom, and make sure the output light from I.I. can be seen on the monitor. If it is too dark to recognize, the iris maybe is over closed. Once again make sure that the iris is opened.

#### **4.7. Removing Dusts**

After image quality adjustment of the TV system is finished, dusts on the optical path may be a problem. In such a case, the camera head is required to be removed so that dusts can be removed. It means that the camera head axis should be adjusted again and the image quality should be confirmed again. To prevent such labor, it is recommended to confirm absence of dusts at the time when the auto iris and the camera head are mounted. **Do deliberately as much as possible.**

- After mounting the camera head, perform rough adjustment of the lens focus during fluoroscopy. Perform DR radiography using a flat object (acrylic 10 cm, for example), and check whether dusts can be seen on an image. At this time, the depth of field of the lens becomes deep and existence of dusts can be checked easily.

Close Iris for radiography and set the X-ray radiography condition manually (the photo-timer is turned off) so that the brightness of an image on the monitor becomes about 1500-2000 in a digital value. Then, perform SPOT acquisition.

If dusts (black spots) can be seen on an image, the CCD face and the optical system are required to be cleaned. Generally, the dust type and the place where dusts may be present are classified as follows.

Dust type		Place where dusts may be present
Dusts with clear edges	Places are unchanged without regard to FOV of I.I.	CCD elements
	Places are changed in accordance with field of view of I.I.	Input face of I.I.
Dusts with blurred edges	Places are unchanged even if TV and auto iris are rotated together by 90°.	Back focus side of CCD elements (camera head side)
	Places are changed if TV and auto iris are rotated together by 90°.	Output face of I.I. Or output side of I.I.

As to dusts on the CCD elements, the TV lens, and the output face of the I.I., blow them off using a blower, etc. The size of one pixel on the CCD elements is less than 10 micro meters. Even if the dust can be confirmed on the monitor, it may not be confirmed by visually checking the CCD surface. To observe this fine dust, use a loupe, etc.

NOTE

- Static electricity may damage the IC. Do not touch the CCD elements with bare hands; do not touch the IC pins as well as CCD image pickup surface. When it is necessary to touch the CCD elements in order to eliminate the dust, wear the static electricity preventive wristband (a device to earth the hand electrified with an electric charge) properly prior to starting work.
- When wiping the CCD elements in order to eliminate the dust, use isopropyl alcohol or commercially available lens cleaner and lens cleaning cloth. Prior to cleaning the lens, be sure to eliminate the dust as much as possible with a blower, and so on. If you repeatedly wipe with dusty cloth, the CCD image pickup surface may be scratched by the dust adhered to the cloth. When wiping, move the cleaning cloth only in one direction; change the cloth every time.

#### 4.8. Confirming the FOV of the I.I.

In the B-40/L-40, the photo voltage value can be stored for each FOV of the I.I. (Max, Large, Middle, Small). Keep in mind that the FOV size selected is not displayed on the operation panel of the B-40/L-40. Before starting the adjustment, make sure that the I.I. type (dual, triple, multi and each FOV) is compatible with the setting in the X-ray diagnostic table.

I.I.FOV	12LT	12LD	16LM	16LT	16LD
Max	12 inch	12 inch	16 inch	16 inch	16 inch
Large	9 inch	9 inch	12 inch	12 inch	12 inch
Middle	7.5 inch	---	9 inch	9 inch	---
Small	---	---	7.5 inch	---	---

#### 4.9. Confirming Each Default Setting in UD

This section will describe the items to be set in B-40/L-40 when combining B-40/L-40 and DAR-8000i.

##### 4.9.1. Default Setting [TECH]

For acquisition in DAR-8000i, create the procedure which default [TECH] is set as follows. Please refer to section 3.2.5 in “M501-E356 UD150B-40/L-40 Installation Manual” for detailed information.

Technique Code [Code]	17h (Name XDR)
Fluoroscopic System [Fluo]	0
Photo Code [PHCode]	4
Terminal Block Code [Tech System]	14

#### 4.9.2. Default Setting [FLUO]

For fluoroscopy in DAR-8000i, create the fluoro mode which default [FLUO] is set as follows. Please refer to section 8.3.1 in “M501-E356 UD150B-40/L-40 Installation Manual” for detailed information.

Fluoroscopy Preset no. (Fluoroscopy Mode)	Fluoroscopy	Fluoroscopy Mode Name	Focus	HLC	Pulsed-fluoroscopy	Max Pulse Rate (fps)	Pulse Width (msec)
0	ON	DOSE N	0 (Small)	0 (OFF)	0 (OFF)	-	-
1	ON	DOSE L	0 (Small)	0 (OFF)	0 (OFF)	-	-
2	* ON / OFF	PULSE N	1 (Large)	0 (OFF)	1 (ON)	30	6.3
3	OFF						
4	OFF						
5	OFF						
6	OFF						

\* Fluoroscopy is ON with pulsed fluoroscopy option.

#### 4.9.3. Default Setting [OPTION]

For fluoroscopy in DAR-8000i, set the default [OPTION] as follows. Please refer to section 3.2.8 in “M501-E356 UD150B-40/L-40 Installation Manual” for detailed information.

[Page 4]

IBS(DC Fluo) option            TV

IBS(Pulse Fluo) option        TV

#### 4.9.4. Default Setting [Communication]

For communication with DAR-8000i, set the default [Communication] as follows. Please refer to section 17.3.2 in “M501-E356 UD150B-40/L-40 Installation Manual” for detailed information.

DAR-6000 via Arcnet            

Used
------



## 5 Adjustment of Focus and Optical Axis of Camera

### 5.1. Adjustment of Optical Axis of Camera

Following the installment of camera head to TV lens (auto-iris), adjust the optical axis. Perform fluoroscopy at maximum I.I. FOV, and make sure that the output face of I.I. isn't in the circle blanking on the monitor. If it is, follow steps on section 3.3.3. for adjustment.

### 5.2. Adjustment of Focus

Follow the procedure below for focus adjustment of TV lens.

- (1) Fix Penetra-chart in the direction by 45° on the table of the X-ray diagnostic table.
- (2) Open fluoroscopy iris completely using the procedure described in Section 4.5. Perform fluoroscopy with 9 inch FOV or 12 inch FOV. This may result the amount of light to go over its maximum. In such case, add an appropriate absorber (acrylic 2cm, Cu panel 0.5mm, Al 5mm as indicated).
- (3) Perform fluoroscopy. Enable status in which the Penetra-chart can be seen most clearly (by adjusting the X-ray condition, Window, Level, etc.), and adjust the focus of the TV lens following section 3.3.2.
- (4) When adjustment is complete, tighten the lens stopper to fix the lens. At this point, do not tighten the stopper strongly, and make sure that the lens is not tilted.
- (5) CCD camera can focus homogeneously effective on the entire screen. Move the Penetra-chart or a grid-shape object and make sure that the focus is effective on the entire screen.

NOTE
------

When the lens or CCD element device is tilted, the lens focus up-bottom, right-left will change the position of focus. The camera will need to be replaced if it is tilted, although it is checked at the time of shipment.
---

### 5.3. Adjustment of Collimator

Adjust collimator according to the procedure of install manuals of X-ray diagnostic table and collimator.

When you adjust it, note the following points enough.

- Adjust all the FOV supported by the system.
- Adjust the collimator leaf to circle blanking for each FOV closely as much as possible.

NOTE
------

Scattered radiation greatly influences the image quality of DAR-8000i. Adjust according to the notes of the above-mentioned, and suppress the influence of scattered radiation to the minimum.
---

## 6 Adjustment of Fluoroscopy Mode

### NOTE

The adjusting SID setting differ depending on the combining X-ray diagnostic table. Refer to section 4.3. for further information.

### 6.1. Adjustment of DC Fluoroscopy

The IBS signal from the camera is used for automatic exposure for DC fluoroscopy. (To be referred to as TV IBS hereinafter) For the equipment implementing TV IBS, it is necessary to adjust the fluoroscopic iris and IBS output signal from the TV camera. Refer to section 8 for further information.

Do not use water on the homogeneous phantom. Accordingly to the shape of the container, can cause dispersion of X-ray condition adjustment.

#### 6.1.1. Confirmation of DC Fluoroscopic Tube Current

Confirm a set situation of the DC fluoroscopic tube current (FkV-FmA) by entering FVF adjustment screen from control panel of the X-ray high-voltage generator.

Adjust FVF value. (Refer to section 8.4. "Explanation about the FVF Adjust" in "M501-E356 UD150B-40/L-40 Installation Manual")

X-ray tube: 0.3/0.8P323DK-85SF

[kV]	50	60	80	90	100	115
DOSE N [mA]	0.3	0.5	1.8	2.5	2.5	2.5
DOSE L [mA]	0.15	0.25	0.9	1.25	1.25	1.25

X-ray tube: 0.3/0.8P324DK-85SF / 0.6/1.2P364DK-85SF

[kV]	50	60	80	90	100	115
DOSE N [mA]	0.3	0.5	2.3	3.3	3.0	2.7 <sup>*1)</sup>
DOSE L [mA]	0.15	0.25	1.15	1.65	1.50	1.35

\*1) When the measurement of fluoroscopy radiation dose is executed referring to 6.3. , if radiation dose exceed 50 mGy/min(5.75 R/min), lower and adjust the tube current at 115kV point.

Confirm again that radiation dose are regulated values or less in all the voltages after adjustment.

## 6.2. Adjustment of Pulse Fluoroscopy

The automatic exposure control of pulse fluoroscopy also uses IBS signal from camera. Therefore, it is necessary to perform adjustment for both fluoroscopy iris and IBS output signal of TV. Refer to section 8 for further information.

### NOTE

Starting pulse fluoroscopy with false adjustment value will lead to damage of tube. Before making any adjustment, read and follow instructions on installation manual for B-40/L-40, M501-E356 (Section 8 “Adjustment of Fluoroscopy Option”).

### 6.2.1. Confirmation of Pulse Fluoroscopy Tube Current

Adjust the tube current in pulse fluoro. Please follow the steps below by referring to “M501-E356 UD150B-40/L-40 Installation Manual”.

Enter into FVF adjustment screen by referring to section 3.6.3 “Description of FVR Adjust” in “M501-E356 UD150B-40/L-40 Installation Manual”.



Set temporarily the position of 12mA for tube focus in pulse fluoro. (normally 0.3/0.8 are large focus, others are small focus)  
(The position of each tube current like 4mA and 10mA is not needed to be added.)



Adjust FVR to become the tube current in the following Table 6.2.1 in 40kV, 60kV, 80kV, 100kV, and 125kV at the above-mentioned position of 12mA. However, please do not write the setting value. (No press **WRITE** key) Record each adjusted FVR value into the following Table 6.2.2.

Table 6.2.1 FVR value of 12mA for each tube voltage

X-ray tube: 0.3/0.8P323DK-85SF

[kV]	40	60	80	100	125
Be adjusted [mA]	12	12	12	12	12 <sup>*1)</sup>

X-ray tube: 0.3/0.8P324DK-85SF / 0.6/1.2P364DK-85SF

[kV]	40	60	80	100	125
Be adjusted [mA]	4	10	18	12	12 <sup>*1)</sup>

Table 6.2.2 FVR value of 12mA for each tube voltage

kV	40	60	80	100	125
12mA					

- \*1) When the measurement of fluoroscopy radiation dose is executed referring to 6.3. , if radiation dose exceed 50 mGy/min(5.75 R/min), the tube current at 115kV point must be lowered and adjusted. In this case, lower and adjust the value of 12mA at 125kV point.  
Confirm again that radiation dose are regulated values or less in all the voltages after adjustment.



Change the tube current position from 12mA to 0mA, and then the position is deleted.



Enter into FVF adjustment screen by referring to section 8.4 “Explanation about the FVF Adjust” in “M501-E356 UD150B-40/L-40 Installation Manual”.



Select the fluoro mode2 (PULSE N).



Write 50kV as FVF by creating the position between 40kV and 60kV(FVR value) as shown in Table 6.2.1.



Write 60kV and 80kV (fluoro tube voltage) as FVF in the position of 60kV and 80kV(FVR value) as shown in Table 6.2.1.



Write 90kV as FVF by creating the position between 80kV and 100kV(FVR value) as shown in Table 6.2.1.



Write 100kV as FVF in the position of 100kV(FVR value) as shown in Table 6.2.1.



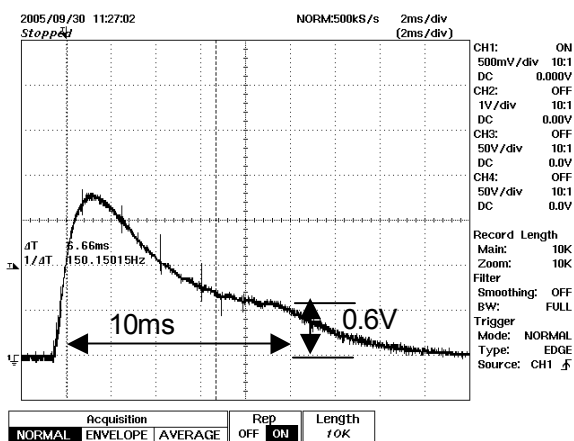
Write 115kV as FVF by creating the position between 100kV and 125kV(FVR value) as shown in Table 6.2.1.

## NOTE

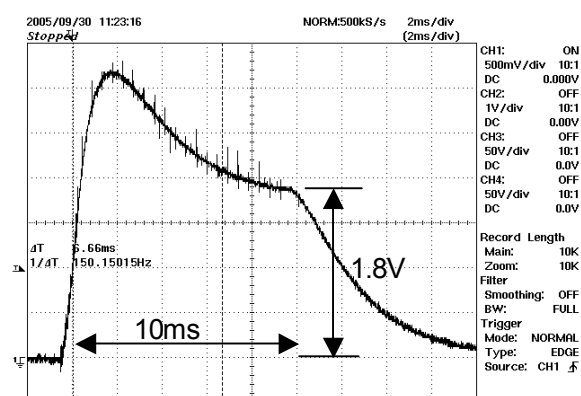
When observing waveform during pulse fluoro with CP TmA on UDCONT-2002 board, the pulse width should be expanded to about 10ms with initial setting [FLUO]. (Because the analog value of tube current is influenced by the condenser on UD CONT-2002 board. Therefore it takes some time to be able to measure this value.) Set the pulse rate to 15fps or less when you execute this, and return pulse width to 6.3ms after measurement. TmA waveform during pulse fluoro is 10mA/1V.

※There are references waveform. (Refer to numerical value at the right of waveform for the measurement)

Example of waveform of 50kV 6mA



Example of waveform of 80kV 18mA



### 6.2.2. Input Tube Current Value in Pulse Fluoro

Input the tube current value in pulse fluoro as shown in Table below. Please refer to section 8.4 "Explanation about the FVF Adjust" in "M501-E356 UD150B-40/L-40 Installation Manual".

The tube current value entried in this paragraph is only for the display. The actual tube current value depends on the FVF value referring to 6.2.1. .

X-ray tube: 0.3/0.8P323DK-85SF

[kV]	50	60	80	90	100	115
PULSE N [mA]	2.4	2.4	2.4	2.4	2.4	2.4

X-ray tube: 0.3/0.8P324DK-85SF/ 0.6/1.2P364DK-85SF

[kV]	50	60	80	90	100	115
PULSE N [mA]	1.2	2.0	3.2	2.8	2.4	2.4 <sup>*1)</sup>

\*1) When fluoroscopy radiation dose had been executed referring to 6.3. , if you lowered the tube current less than the standard values referring to 6.2.1. , input the value obtained from the following calculation equation.

<Calculation equation of the tube current>

For Example:

$$\begin{aligned} 2.4\text{mA} &= \text{tube current } 12\text{mA} \times \text{pulse width } 6.3\text{ms} \times 30\text{fps} + \text{wave tail} \\ &= (2.26\text{mA}) + \text{wave tail} \end{aligned}$$



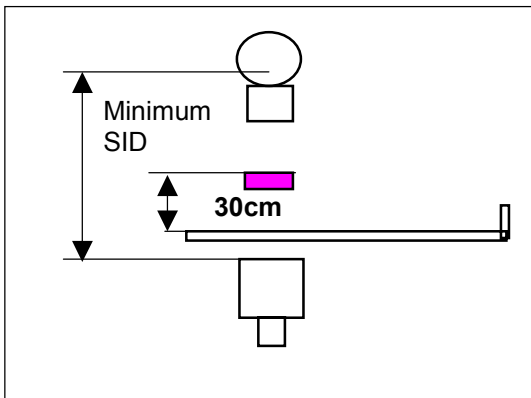
### 6.3. Measurement of Fluoroscopy Radiation Dose

Measure the skin dose at the DC and PULSE fluoroscopy as a matter related to the medical treatment method.

The figure below shows the measurement point by the structure of the fluoroscopy system. In any case, it must be measured with the dimension by which the radiation dose to the object becomes the maximum.

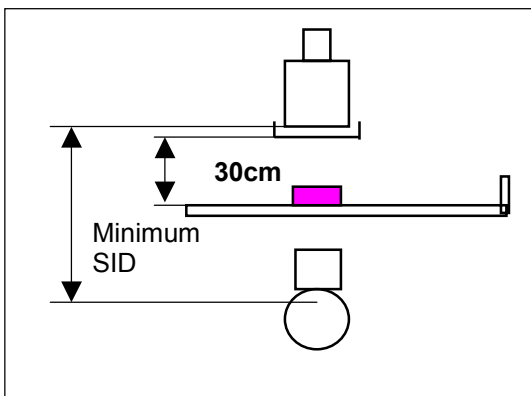
Fluoroscopy condition: 115kV

It is necessary to lower the fluoroscopic tube current when the dosimeter value exceeds regulated value. For example, 50mGy/min. (5.75 R/min) in Japan.



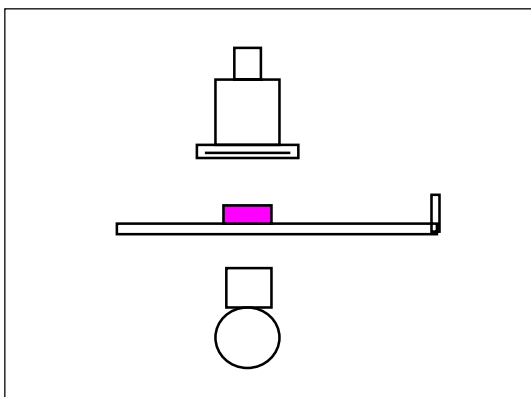
1) Radiation dosimeter arrangement with ZS Series

SID (FFD): Minimum  
Radiation dosimeter position:  
30cm on tabletop



2) Radiation dosimeter arrangement with I VS-100/110

SID: Minimum  
Radiation dosimeter position:  
30cm from the front side of I.I.  
(touch sensor)



3) Radiation dosimeter arrangement with YSF

Radiation dosimeter position:  
On table top

## 7 Adjustment of DR Radiography Mode

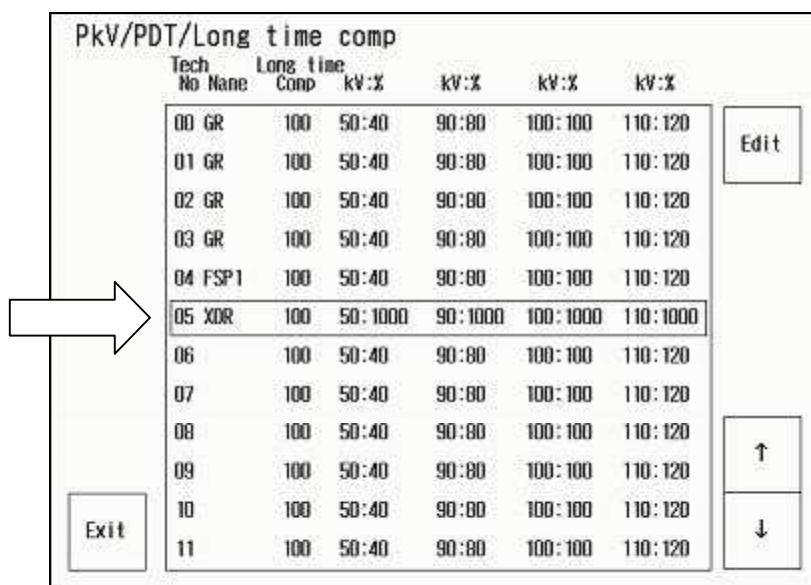
### 7.1. Photo Adjustment for DR Radiography

Photo-cell is used for photo-timer radiography. The position of Photo-cell is designed to collect approximately 60 % area, performing center-weighted collecting of 40% area in the center part of the image. The sensitivity of Photo is adjusted to standard upon shipment. If adjustment is necessary on site, refer to section 3.3.4.

Perform the following adjustment on the control panel of the X-ray high-voltage generator.

#### 7.1.1. Applying Tube Voltage Compensation

- (1) Select DR radiography registered radiography program on the control panel of the X-ray high-voltage generator. (Do not select programs installed memory shot)
- (2) Enter Service mode screen.
- (3) At Service mode selection screen, press **Adjust** key to enter adjustment screen.
- (4) At adjustment screen, press **PHOTO kV** key to display the screen below. To edit the settings, select the technique of XDR from the list by using upward or downward arrow key and press **EDIT** key.



Tech No	Name	Long time Comp	kV:%	kV:%	kV:%	kV:%
00	GR	100	50:40	90:80	100:100	110:120
01	GR	100	50:40	90:80	100:100	110:120
02	GR	100	50:40	90:80	100:100	110:120
03	GR	100	50:40	90:80	100:100	110:120
04	FSP1	100	50:40	90:80	100:100	110:120
05	XDR	100	50:1000	90:1000	100:1000	110:1000
06		100	50:40	90:80	100:100	110:120
07		100	50:40	90:80	100:100	110:120
08		100	50:40	90:80	100:100	110:120
09		100	50:40	90:80	100:100	110:120
10		100	50:40	90:80	100:100	110:120
11		100	50:40	90:80	100:100	110:120

Figure 7-1 Photo kV Setting Screen

- (5) When pressing **Edit** key, the page will switch to display the setting screen below.

PkV/PDT/Long time Comp  
Tech05:XDR

Long time Comp

100

% / 20msec

kV

50	90	100	110
%	1000	1000	1000

OK

Cancel

7	8	9
4	5	6
1	2	3
0		Back Space
-		+

**Figure 7-2 XDR Setting Screen**

- (6) Input “1000” by using the numeric keypad on the right. Make sure to have the rim next to % selected.
- (7) To set the value, press the selected rim again and accept the selection.
- (8) Following steps (6) and (7), input “1000” to all four of the % rim. (kV value is not necessary numeric value in Figure 7-2)
- (9) After setting is complete, press **OK** key. The screen will return to Photo kV setting screen.
- (10) Press **Exit** key.
- (11) A dialog to confirm the data save will display.
- To save the data and close the setting screen, press **Yes** key.
- To close setting screen without saving, press **No** key.
- To return to setting screen without saving, press **Cancel** key.

### 7.1.2. Release of correction for a short time

- (1) Turn VR2 **STC** key on PHOTO I/F-2002 board fully to C.C.W. (counterclockwise)



### 7.1.3. Photo Adjustment of Radiography mode

For the adjustment of both Photo-cell type and photo-mal type, PH/HV (DR) adjustment screen is used.

Use acrylic 19cm. Refer to section 4.3. for installation of SID.

- (1) Select registered DR radiography on the standard screen. (Do not select programs installed memory shot)

Turn "AEC" ON at operation panel of the X-ray high-voltage generator.

- (2) Enter Service mode screen.

- (3) At Service mode selection screen, press **Adjust** key and enter adjustment screen.

- (4) At adjustment screen, press **PHV-DR** key to display the screen below. To edit the settings, select the acquisition mode from the list by using upward or downward arrow key and press **EDIT** key.

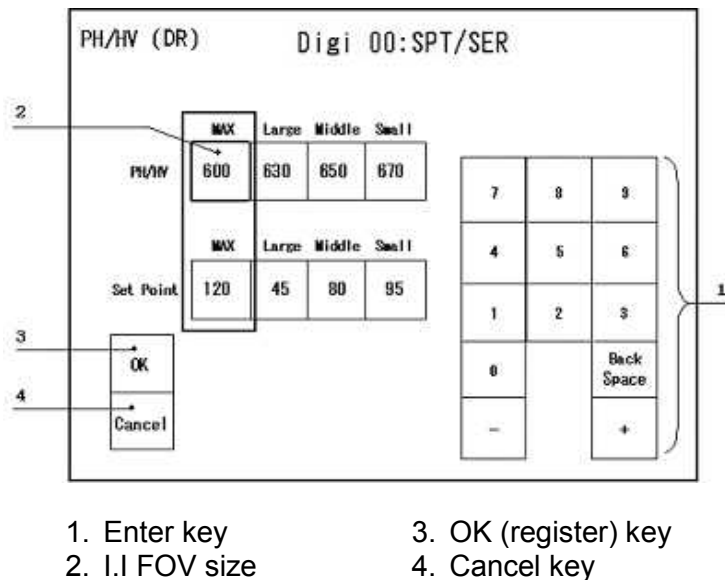
The relation between acquisition mode and display are shown below.

SPOT mode/SER mode: SPT/SER  
DSA mode : DSA/PDSA

PH/HV (DR)		PH/HV				Set Point			
Digi Label	Name	MAX	L	M	S	MAX	L	M	S
00	SPT/SER	300	300	300	300	300	300	300	300
01	DSA/PDSA	300	300	300	300	300	300	300	300
02	STEP-DA	300	300	300	300	300	300	300	300
03	RSW-DSA	300	300	300	300	300	300	300	300
04	ROT-DA	300	300	300	300	300	300	300	300
05	ROT-DSA	300	300	300	300	300	300	300	300
06	4M SP/SR	300	300	300	300	300	300	300	300
07	TOMO	300	300	300	300	300	300	300	300
08	MEAS	300	300	300	300	300	300	300	300
09	SLITSCAN	300	300	300	300	300	300	300	300
10		300	300	300	300	300	300	300	300
11		300	300	300	300	300	300	300	300

Figure 7-3 PH/HV (DR) List

- (5) Press **Edit** key. The page will switch to display the configuration screen below  
Selected FOV is surrounded with rectangle rim.



**Figure 7-4 PH/HV (DR) Edit Page**

- (6) Install tube voltage and tube current following the instructions on Table below.

ZS-15 RS-50A	85kV 320mA 100ms (Large Focus)
ZS-100	85kV 320mA 100ms(Large Focus)
YSF-120/300	SPT/SER: 80kV 200mA 100ms(Small Focus) DSA: 80kV 320mA 100ms(Large Focus)

- (7) Select the adjusting FOV size at X-ray diagnostic table.  
(8) Press the selected photo high-voltage setting and selected to bold rim.  
(9) Perform radiography to adjust the measured value make it as exposure time (mAs value) shown on the Table below. Enter the value using the enter key located on the right hand side of the screen. (If the value is increased, then the exposure time will shorten) Press the selected part to release the bold rim. (Normal input data is 50 to 150)

		16"	12"	9"	7.5"
ZS-15 RS-50A	85kV 320mA	-	20ms (6.4mAs)	31ms (10mAs)	-
ZS-100	85kV 320mA	-	25ms (8mAs)	31ms (10mAs)	-
YSF-120/ 300	SPT/SER: 80kV 200mA	20ms (4mAs)	25ms (5mAs)	30ms (6mAs)	35ms (7mAs)
	DSA: 80kV 320mA	19ms (6mAs)	25ms (8mAs)	31ms (10mAs)	34ms (11mAs)

(10) Perform steps (7) to (9) for adjustment for all FOV size.

(11) If the installation is complete, press **OK** key. The screen will return to PH-HV (DR) list screen.

(12) Press **Exit** Key.

(13) A dialog to confirm the data save will display.

To save the data, and close the setting screen, press **Yes** key.

To close setting screen without saving, press **No** key.

To return to setting without saving, press **Cancel** Key.

## 8 Auto Calibration for IRIS and IBS

Section below will describe Auto Calibration for IRIS and IBS.

### NOTE

- This system has many items to perform by Auto Calibration. Depending on a situation, Auto Calibration may fail. If so, repeat the action several times following the same steps.
- The incorrect operation might be performed during Auto Calibration, and there might be unsuccessful item even by repeating action. If so, perform Auto Calibration from the beginning. When finishing the Auto Calibration after saving the calibration data on the way, it is possible to calibrate manually by specifying each item in "System Manual" function.

### 8.1. Main Functions and Operation of Calibration Menu

Follow the below steps to start Service Application and display Calibration Menu screen.

### NOTE

When Service Application is not started according to the following procedures, the initialization of the ARCNET communication with X-ray diagnostic table or the X-ray high-voltage generator is not normally executed. In this case, even if the FOV or the mode of fluoroscopy is changed on the operation panel of X-ray diagnostic table or the X-ray high-voltage generator, the FOV or the mode of fluoroscopy isn't changed on the calibration screen.

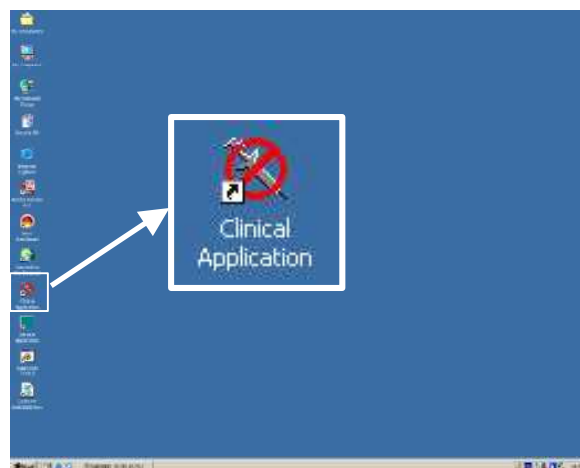
Please start Service Application according to the following procedure.

- (1) Turn ON the power switch on operation panel of the X-ray high-voltage generator. DAR-8000i is turned ON with synchronized with the power supply of the X-ray high-voltage generator.
- (2) After disappearing the Windows Start screen during starting DAR-8000i, Windows is starting up... Screen (Figure 8-1) is displayed. Continue to press the left [Shift] key on Windows is starting up ...Screen and display Log On to Windows screen.



Figure 8-1 Windows is starting up... Screen

- (3) Input user name and password for service person. User name is “shimadzu”. Password is “Dar8k”.
- (4) Double-clicked the icon of Clinical Application and start the Clinical Application.

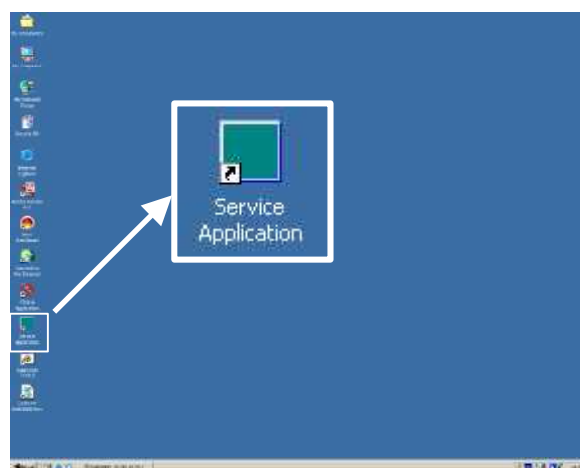


**Figure 8-2 Icon of Clinical Application**

**NOTE**

At this point, the ARCNET communication is initialized. The message, “Remote Devices are not ready...”, is displayed. In that case, please confirm the connection and the setting related to the ARCNET communication according to “M517-E397 UD-DAR8000 Connect Kit Installation Manual”. Must cancel it on the way even if an auto calibration is started.

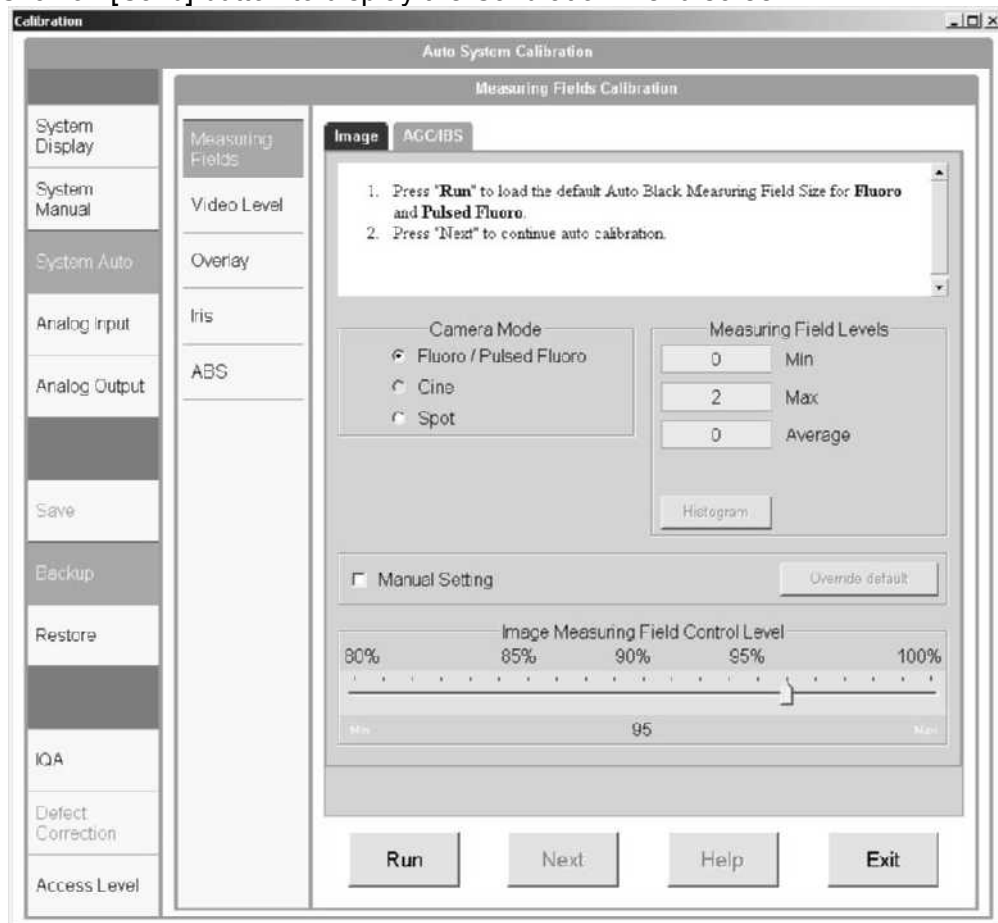
- (5) Click on [shutdown] button and finish Clinical Application.
- (6) Double-clicked the icon of Service Application and start the Service Application.



**Figure 8-3 Icon of Service Application**



(7) Click on [Calib] button to display the Calibration Menu screen.



**Figure 8-4 Calibration Menu Screen**

The following function is available on each item of Calibration menu.

Item	Contents of Configuration
System Display	Display the adjusted value on Calibration
System Manual	Calibration is performed each by manually selecting
System Auto	Calibration is performed automatically at each item
Analog Input	Unsupported
Analog Output	Unsupported
Save	Save the calibration data
Backup	Back up the calibration data
Restore	Restores the calibration data
IQA	Unsupported
Defect Correction	Unsupported
Access Level	Unsupported

**Table 8-1 Calibration Menu**

The following table shows the adjustable calibration item, which allows on System Display, System Auto, System Manual.

Item	Contents of Configuration
Measuring Fields	Adjustment of data measurement area for AGC/IBS control
Video Level	Adjustment of appropriate LUT or GAIN/Black Level of the camera
Overlay	Adjustment for size of circle blanking
Iris	Adjustment for fluoroscopy/radiography iris
ABS	Adjustment for Level/Response of ABS (IBS)

**Table 8-2 Calibration Item**

## 8.2. Starting Calibration

This system performs calibration with the use of System Auto function. Select [System Auto] from Calibration menu and make sure that Figure 8-4 will display. Calibration will be performed according to the menu.

## 8.3. Adjustment of Measuring Fields

Use System Auto to perform adjustment of Measuring fields (Image, AGC/IBS).

- (1) As Calibration item, confirm that [Measuring Fields] and [Image] tab is selected.
- (2) Press [Run] button.
- (3) When the adjustment is complete, "Calibration Step: SUCCESSFUL" dialog will display. Press [OK] button.
- (4) Press [Next] button to move to the next item. (To repeat the calibration on the item, press [Run] button instead of [Next])
- (5) Repeat steps (2) to (4) and adjustment for following item is performed automatically.

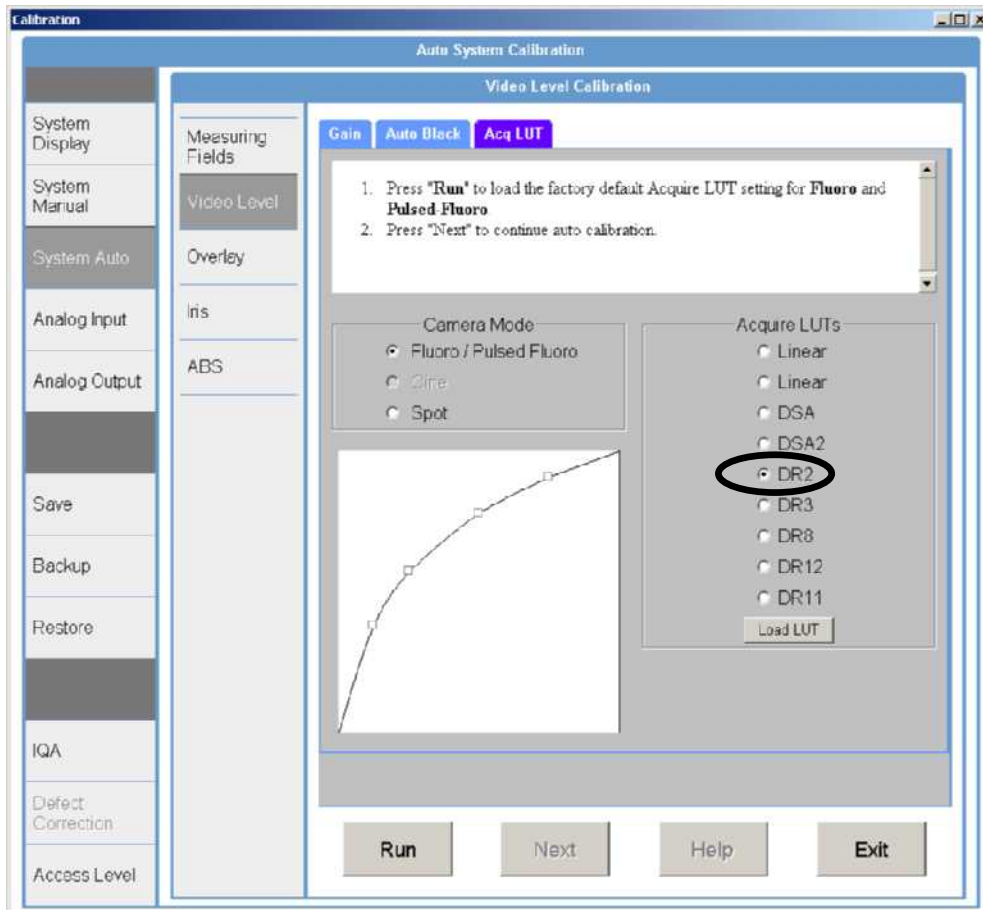
[Measuring Fields]	
[Image] tab	(1)[Fluoro/Pulsed Fluoro] (2)[Spot]
[AGC/IBS] tab	(1)[Fluoro/Pulsed Fluoro] (2)[Fluoro/Pulsed Fluoro IBS-1] (3)[Fluoro/Pulsed Fluoro IBS-2] (4)[Fluoro/Pulsed Fluoro IBS-3] (5)[Spot]

- (6) When pressing the [Next] button finally, move to "8.4.1. Adjustment of Video Level (Acq LUT)".

## 8.4. Adjustment of Video Level

### 8.4.1. Adjustment of Video Level (Acq LUT)

Use System Auto to perform adjustment of Video Level (Acq LUT).



**Figure 8-5 Video Level (Acq LUT) Setting Screen**

- (1) As Calibration item, confirm that [Video Level] and [Acq LUT] tab is selected.
- (2) As Camera Mode, confirm that [Fluoro/Pulsed Fluoro] is selected.
- (3) Check the below LUT at [Acquire LUTs].

X-ray diagnostic table	LUT Setting
ZS-15, RS-50A YSF-120/ 300, ZS-100	DR2

- (4) Press [Load LUT] button.
- (5) When the adjustment is complete, "Calibration Step: SUCCESSFUL" dialog will be displayed. Press [OK] button.
- (6) Press [Next] button to move to the next item.

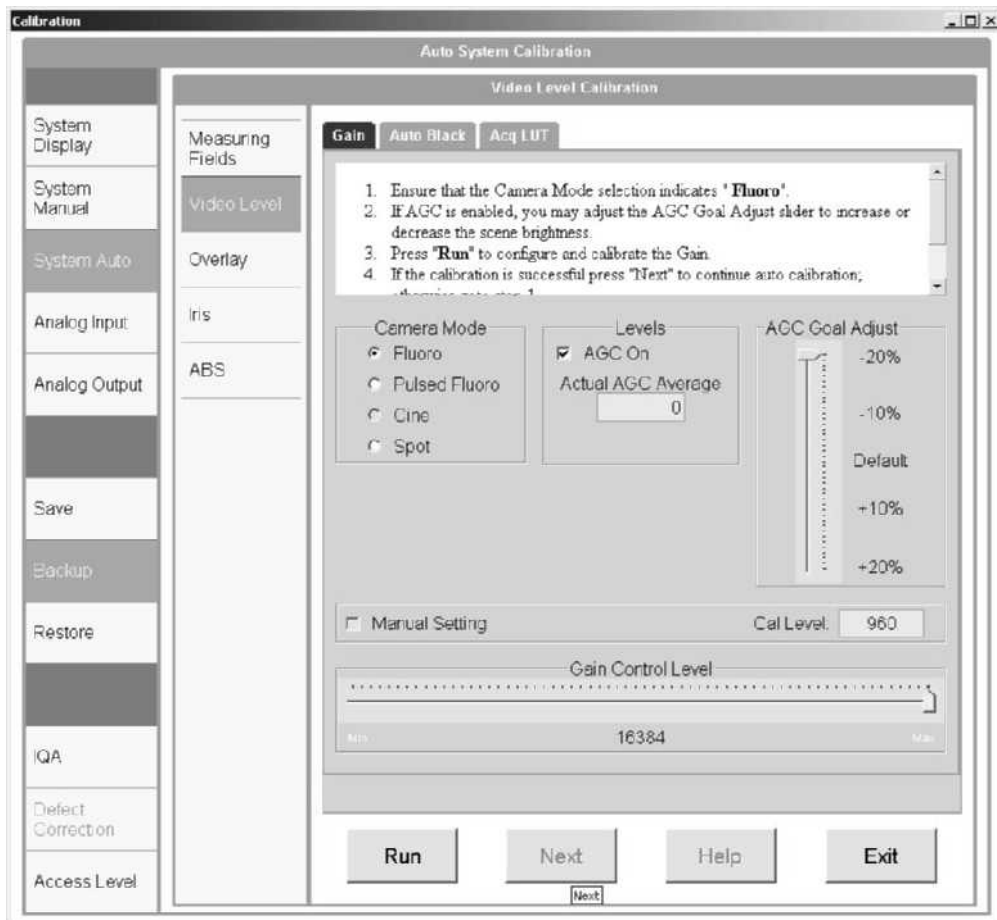
- (7) As Camera Mode, confirm that [Spot] is selected.
- (8) Check the below LUT at [Acquire LUTs].

X-ray diagnostic table	LUT Setting
ZS-15, RS-50A	DR3
YSF-120/ 300, ZS-100	DR8

- (9) Press [Load LUT] button.
- (10) When the adjustment is complete, “Calibration Step: SUCCESSFUL” dialog will be displayed. Press [OK] button.
- (11) When pressing the [Next] button finally, move to “8.4.2. Adjustment of Video Level (Gain)”.

#### 8.4.2. Adjustment of Video Level (Gain)

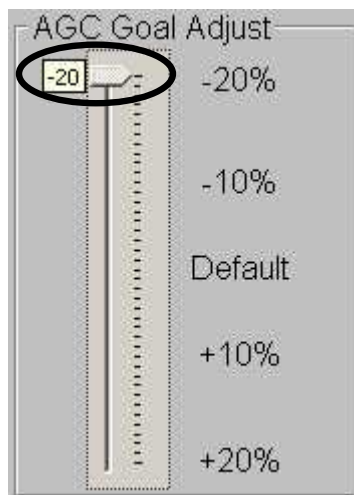
Use System Auto to perform adjustment of Video Level (Gain).



**Figure 8-6 Video Level (Gain) Setting Screen**

- (1) As Calibration item, confirm that [Video Level] and [Gain] tab is selected.
- (2) If items [Fluoro] and [Pulsed Fluoro] are checked, check [AGC On] on the check box.
- (3) Press [Run] button.
- (4) When the adjustment of the selected item is complete, "Calibration Step: SUCCESSFUL" dialog will display. Press [OK] button. (To repeat the calibration on the item, press [Run] button again.)

- (5) If items [Fluoro] and [Pulsed Fluoro] are checked, control slider on [AGC Goal Adjust] to make the number on slider tab to become “-20%”. (If items [Spot] is checked, keep the slider to “Default”.)



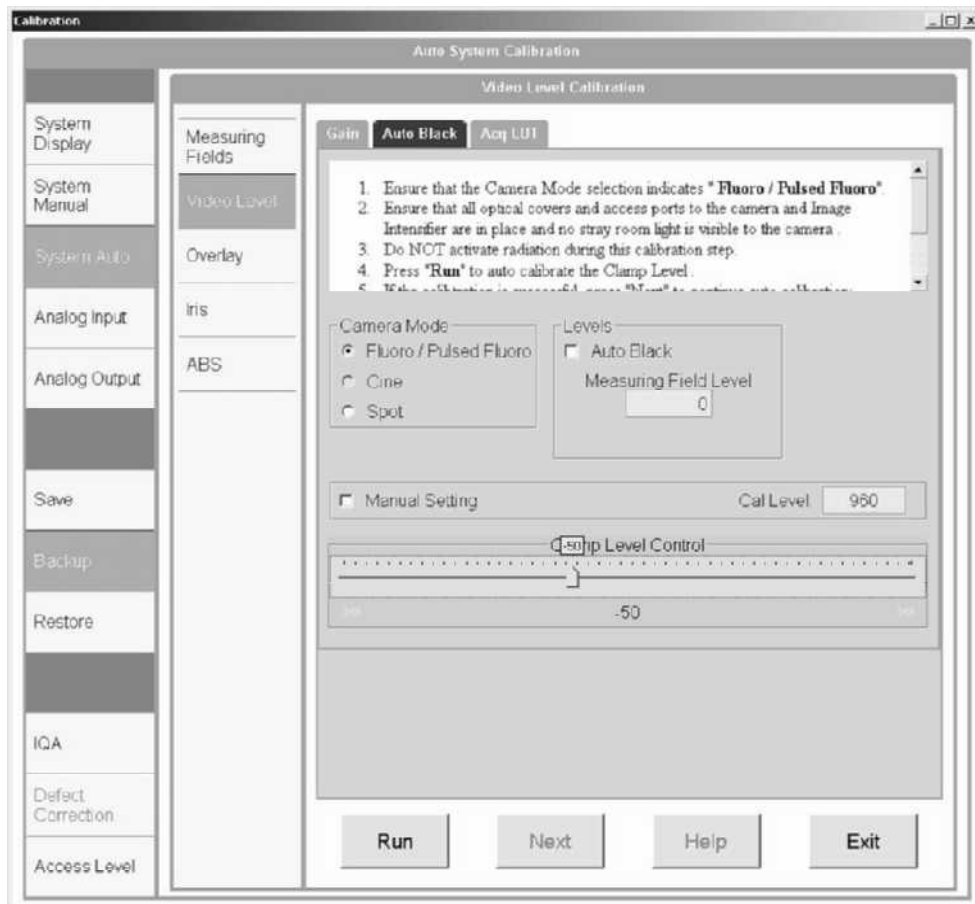
- (6) Press [Next] button to move on to the next item.
- (7) Repeat steps (2) to (6), and adjustment for following item will be performed automatically.

<b>[Video level]</b>	
[Gain] tab	(1)[Fluoro] (2)[Pulsed Fluoro] (3)[Spot]

- (8) When pressing the [Next] button finally, move to “8.4.3. Adjustment of Video Level (Auto Black)”.

### 8.4.3. Adjustment of Video Level (Auto Black)

Use System Auto to perform adjustment of Video Level (Auto Black).

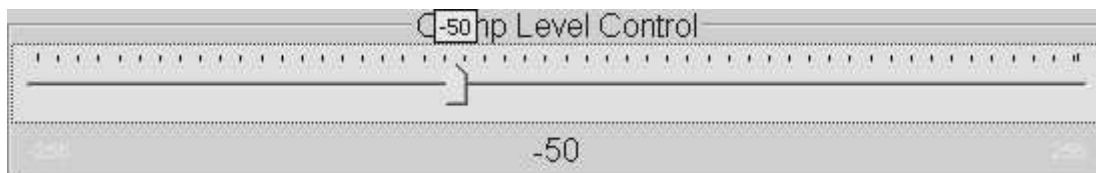


**Figure 8-7 Video Level (Auto Black) Setting Screen**

- (1) As Calibration item, confirm that [Video Level] and [Auto Black] tab is selected.
- (2) If [Fluoro/Pulsed Fluoro] is selected, uncheck [Auto Black] on the check box.
- (3) Press [Run] button.
- (4) When the adjustment of the selected item is complete, "Calibration Step: SUCCESSFUL" dialog will display. Press [OK] button. (To repeat the calibration on the item, press [Run] button again.)
- (5) Check [Manual Setting] on the check box.
- (6) A dialog "Are You Sure?" will display. Press [Yes].



- (7) Control slider on [Clamp Level Control] to make the number on slider tab to become “-50” (The value is displayed when the slider is dragged.)



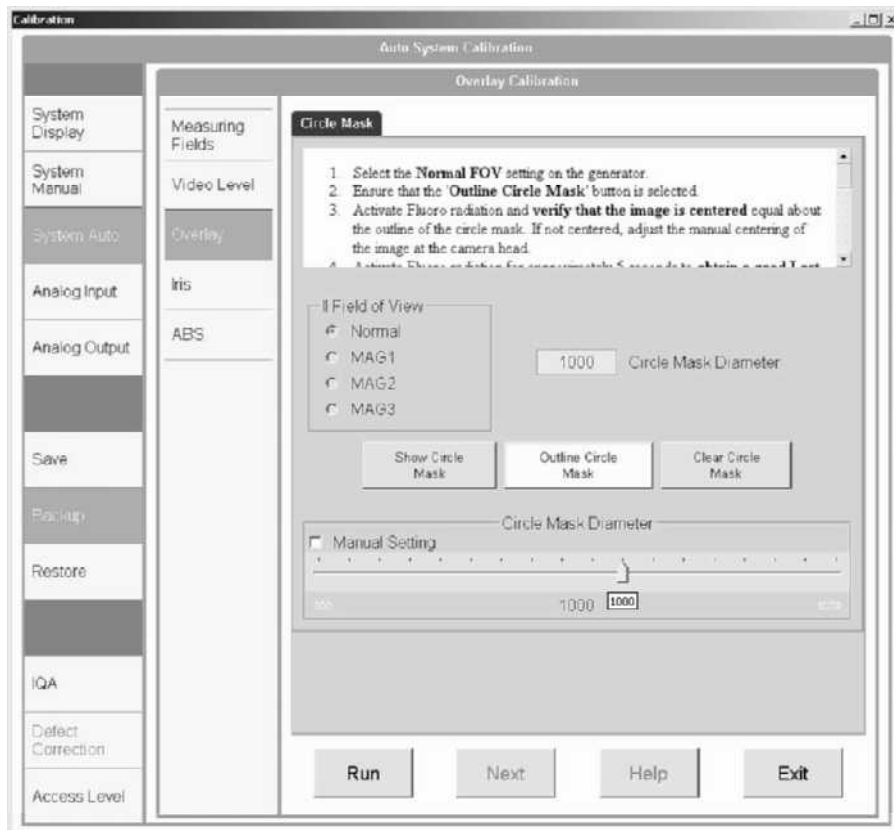
- (8) Press [Next] button to move on to the next item.
- (9) Repeat steps (2) to (8). Adjustment for following item will be performed automatically.

[Video level]	
[Auto Black] tab	(1)[Fluoro/Pulsed Fluoro] (2)[Spot]

- (10) When pressing the [Next] button finally, move to “8.5. Adjustment of Overlay”.

## 8.5. Adjustment of Overlay

Use System Auto to perform adjustment of Overlay.



**Figure 8-8 Overlay Setting Screen**

- (1) As Calibration item, confirm that [Overlay] and [Circle Mask] tab is selected.
- (2) Select the maximum FOV at X-ray diagnostic table.
- (3) Press [Run] button.
- (4) When the adjustment of the selected item is complete, "Calibration Step: SUCCESSFUL" dialog will display. Press [OK] button. (To repeat the calibration on the item, press [Run] button again.)
- (5) Check [Manual Setting] on the check box.
- (6) A dialog "Are You Sure?" will display. Press [Yes].
- (7) Control the slider on [Circle Mask Diameter] to make the number under slider tab become "1000". (The value is displayed when the slider is dragged.) (Adjust the value within the range of between "960" and "1000" when the optical axis is off the point.)
- (8) When pressing [Next] button, move to "8.6.1. Preparation for Fluoroscopy Iris Adjustment".

## 8.6. Adjustment of Fluoroscopy Iris

### 8.6.1. Preparation for Fluoroscopy Iris Adjustment

Perform fluoroscopy iris adjustment.

Use an acrylic 19 cm as a homogeneous phantom. Turn IBS "OFF".

Condition regards to use of fluoroscopy adjustment is as follows.

X-ray tube: 0.3/0.8P323DK-85SF

	Mounted I.I.	16"	12"	9"	7.5"
ZS-15 RS-50A	12" I.I.	-	86kV	86kV	-

X-ray tube: 0.3/0.8P324DK-85SF, 0.6/1.2P364DK-85SF

	Mounted I.I.	16"	12"	9"	7.5"
ZS-100	12" I.I.	82kV	83kV	86kV	90kV
YSF120/300	12" I.I.	-	78kV	78kV	-
	16" I.I.	78kV	78kV	82kV	82kV

**Table 8-3 Condition of DC Fluoroscopy Iris Adjustment Preparation**

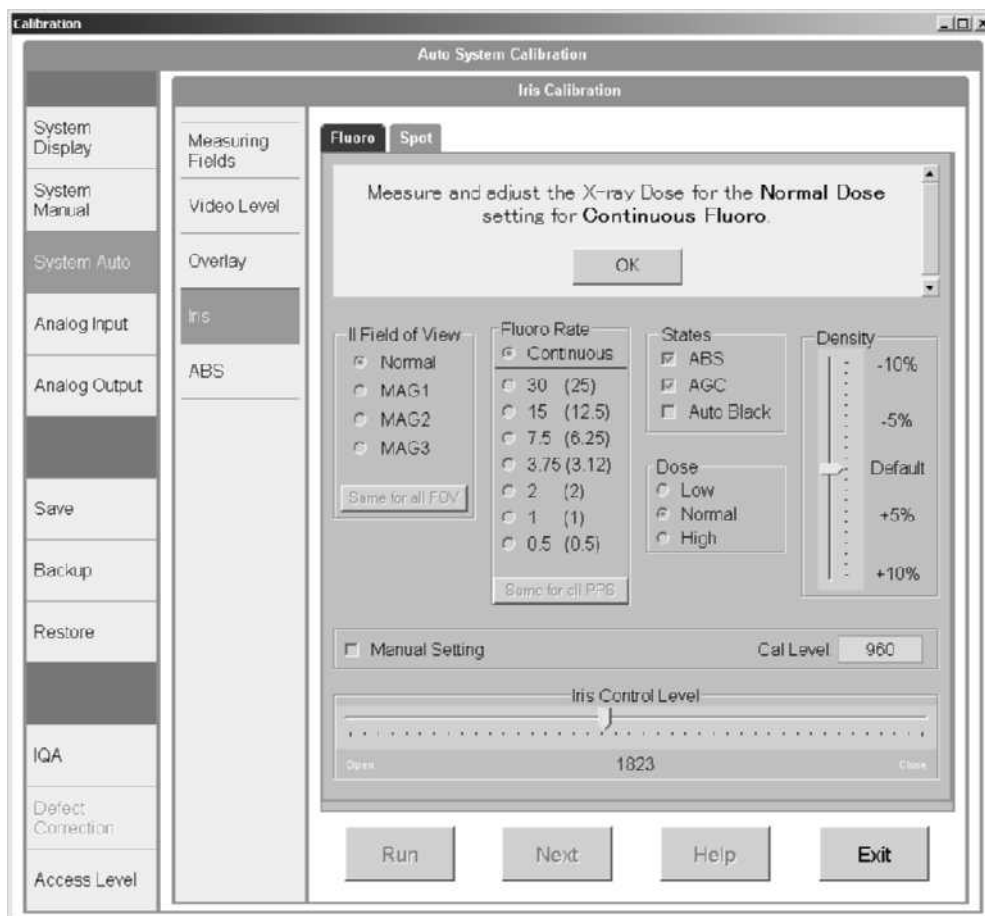
X-ray tube: 0.3/0.8P323DK-85SF

	Mounted I.I.	16"	12"	9"	7.5"
ZS-15 RS-50A	12" I.I.	-	88kV	88kV	-

X-ray tube: 0.3/0.8P324DK-85SF, 0.6/1.2P364DK-85SF

	Mounted I.I.	16"	12"	9"	7.5"
ZS-100	12" I.I.	85kV	86kV	88kV	90kV
YSF120/300	12" I.I.	-	80kV	80kV	-
	16" I.I.	80kV	80kV	84kV	84kV

**Table 8-4 Condition of PULSE Fluoroscopy Iris Adjustment Preparation**



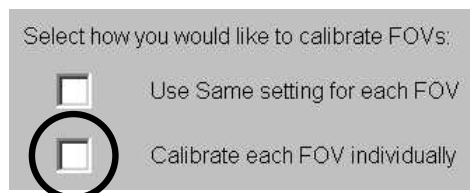
**Figure 8-9 Fluoroscopy Iris Adjustment Screen**

	Item	Contents of Configuration
[II Field of View]	-	Adjusting FOV
[Fluoro Rate]	-	DC fluoroscopy: [Continuous] PULSE fluoroscopy: 30(25)
	[Same for all PPS]	Disabled
[States]	[ABS]	Checked
	[AGC]	Checked
	[Auto Black]	Unchecked
[Dose]	-	[Normal]
[Density]	-	Slider is positioned on [Default]

### 8.6.2. Adjustment of DC Fluoroscopy Iris

Use System Auto to perform Iris adjustment of DC fluoroscopy (DOSE N).

- (1) As Calibration item, confirm that [Iris] and [Fluoro] tab is selected.
- (2) A dialog, "Measure and adjust the X-ray Dose for the Normal DOSE setting for Continuous Fluoro." will display.
- (3) On Calibration screen, press [OK].
- (4) On the control panel of the X-ray high-voltage generator, select [DOSE N].
- (5) On the control panel of the X-ray high-voltage generator, follow Table 8-3 to configure the fluoroscopy tube voltage manually. (IBS is OFF)
- (6) As FOV, select the adjusting FOV on X-ray diagnostic table.
- (7) Confirm that the adjusting FOV is selected on [II Field of View] and [Continuous] is selected on [Fluoro Rate].
- (8) Make sure that [ABS] and [AGC] is checked in [States]. Confirm that [Auto Black] is unchecked in [States].
- (9) Press [Run] button ("Please activate..." will display.) and then start fluoroscopy. The slider on [Iris Control Level] will move and automatic adjustment will be conducted to allow [Cal Level] to become approximately 200.
- (10) When the adjustment is complete, "Calibration Step: SUCCESSFUL" dialog will display. Stop the fluoroscopy and press [OK] button. (To repeat the calibration on the item, press [Run] button again.)
- (11) Press [Next] button to move on to the next item.
- (12) "Select how you would like to calibrate FOVs" dialog will display. Select [Calibrate each FOV individually].



- (13) Repeat steps (4) to (11) on each FOV.

(14) When pressing the [Next] button finally, “Select Normal FOV on the generator” dialog will display. At X-ray diagnostic table, select the maximum FOV size as FOV size. Move to “8.6.3. Adjustment for Pulse Fluoroscopy”.

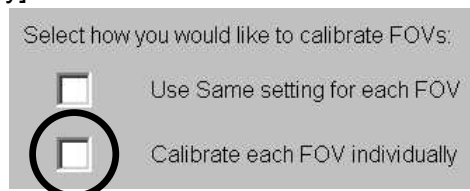
**NOTE**

[DOSE L] is for thin object (for infant and plastic surgery). It is set to make fluoroscopy mA a half, raising the balance point, and preventing kV from dropping to Extremities and the baby or infant too much. In this case, iris uses as same value as DOSE N. Therefore iris adjustment for DOSE L is unnecessary.

### 8.6.3. Adjustment for Pulse Fluoroscopy

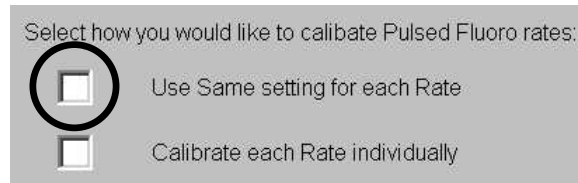
Continuing from DC fluoroscopy iris adjustment, use System Auto to perform iris adjustment of PULSE fluoroscopy.

- (1) As Calibration item, confirm that [Iris] and [Fluoro] tab is selected.
- (2) A dialog, "Measure and adjust the X-ray Dose for the Normal DOSE setting for Pulsed- Fluoro at 30pps (25pps)." will display.
- (3) On Calibration screen, press [OK].
- (4) On the control panel of the X-ray high-voltage generator, select [PULSE N] and [30fps].
- (5) On the control panel of the X-ray high-voltage generator, follow Table 8-4 to configure the fluoroscopy tube voltage manually. (IBS is OFF)
- (6) As FOV, select the adjusting FOV on X-ray diagnostic table.
- (7) Confirm that the adjusting FOV is selected on [Il Field of View] and [30(25)] is selected on [Fluoro Rate]. ([30(25)] may not be selected. If so, [30(25)] will be selected when starting Fluoroscopy.)
- (8) Make sure that [ABS] and [AGC] is checked in [States]. Confirm that [Auto Black] is unchecked in [States].
- (9) Press [Run] button. (Please activate...will display) After that, start fluoroscopy. The slider on [Iris Control Level] will move and automatic adjustment will be conducted to allow [Cal Level] become approximately 200.
- (10) When the adjustment of selected item is complete, "Calibration Step: SUCCESSFUL" dialog will display. Stop the fluoroscopy and press [OK] button. (To repeat the calibration on the item, press [Run] button again.)
- (11) Press [Next] button to move on to the next item.
- (12) "Select how you would like to calibrate FOVs" dialog will display. Select [Calibrate each FOV individually].



- (13) Repeat steps (4) to (11) on each FOV.

(14) “Select how you would like to calibrate Pulsed Fluoro rates” dialog will display.  
Select [Use Same setting for each Rate].



**NOTE**

When the adjustment for the iris of the PULSE fluoroscopy is performed by using the System Manual function, all rates cannot be set at a time. Please record the value of “Iris Control Level” when performed the adjustment for 30fps, and set the recorded value by Manual Setting about other rates.

(15) Move to “8.7.1. Adjustment of IBS Response (For X-ray high-voltage generator)”.



## 8.7. Adjustment of IBS (ABS)

### 8.7.1. Adjustment of IBS Response (For X-ray high-voltage generator)

Follow the procedure below for adjustment of IBS response on X-ray high-voltage generator.

Please refer to “M501-E356 UD150B-40/L-40 Installation Manual” for detailed information.

Enter into FVF adjustment screen by referring to section 8.4 “Explanation about the FVF Adjust” in “M501-E356 UD150B-40/L-40 Installation Manual”.



FVF  
DOSE N

Fluo  
0

MANUAL

WRITE  
50kV

Exit

FkV	measured	IBS	Feed Back
60kV	0. 5mA	OFF	OFF

50kV	60kV	80kV	90kV	100kV	115kV
0. 30	0. 50	2. 20	2. 50	2. 50	2. 50
FVF 2. 80	2. 88	3. 10	3. 13	3. 12	3. 11

IBS\_RES\_up

10

[1-100] [10]

IBS\_RES\_down

10

[1-100] [10]

Focus : small

HLC : OFF

Pulse : OFF

Rate : —

Width : —

+

—

↑

←

→

↓

Adjust numerical value of IBS\_RES\_up and IBS\_RES\_down to the below value in each fluoroscopy mode (Fluo 0 to 2 etc).

Fluo0: 50

Fluo1: 50

Fluo2: 25

(The above value show standard value. If you want to change the response, adjust it referring to section 8.4.4 “Explanation about the IBS” in “M501-E356 UD150B-40/L-40 Installation Manual”.)

### 8.7.2. Preparation for adjustment of IBS (ABS)

Perform IBS (ABS) adjustment.

Use an acrylic 19 cm as a homogeneous phantom.

#### NOTE

Make sure that the adjustment of IBS is performed at maximum FOV size.  
Error may occur if other FOV size used.  
Adjust it with DOSE N. Adjustment with DOSE L is unnecessary.

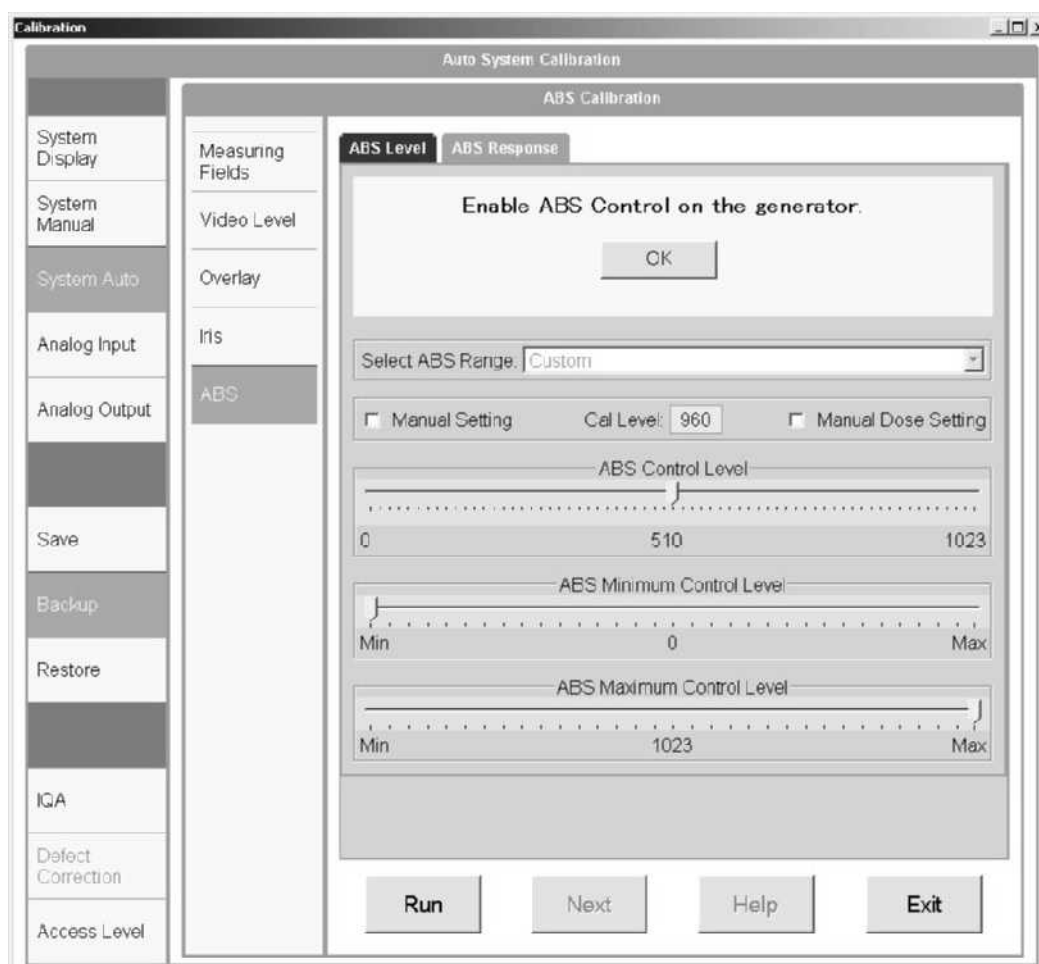


Figure 8-10 IBS(ABS) Adjustment Screen

### 8.7.3. Adjustment of IBS (ABS) Level

Use System Auto to perform adjustment of fluoroscopy IBS (ABS).

- (1) As Calibration item, confirm that [ABS] and [ABS Level] tab is selected.
- (2) On the control panel of the X-ray high-voltage generator, select DC fluoroscopy as DOSE N.
- (3) On the control panel of the X-ray high-voltage generator, set IBS ON.
- (4) A dialog, "Enable ABS Control on the X-ray high-voltage generator." will display. Press [OK].
- (5) Select maximum FOV on X-ray diagnostic table.
- (6) Press [RUN] button. ("Please activate..." will display). Start fluoroscopy. After the adjustment is complete, "Calibration Step: SUCCESSFUL" dialog will be displayed. Make sure the fluoroscopy tube voltage is within  $\pm 2\text{kV}$ , following Table 8-3 after that, stop fluoroscopy and press [OK] button.
- (7) If the voltage is over  $\pm 2\text{kV}$ , reconfirm the condition of procedure (2), (3), and (5), and perform procedure (6) again. If it is still out of line, perform the below step manually and adjust the ABS Level value.

Check [Manual Setting] from the check box.

A dialog, "Are You Sure?" will display. Press [Yes].

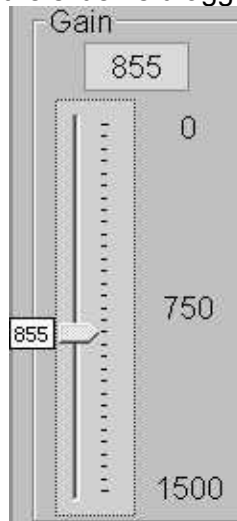
While performing fluoroscopy, adjust manually the [ABS Control Level] slider. Make the adjustment to become predefined fluoroscopy tube voltage.

- (8) When pressing the [Next] button finally, move to "8.7.4. Adjustment of IBS (ABS) Response (For Digital system)".

#### 8.7.4. Adjustment of IBS (ABS) Response (For Digital system)

Use System Auto to perform adjustment of fluoroscopy IBS (ABS).

- (1) As Calibration item, confirm that [ABS] and [ABS Response] tab is selected.
- (2) On the control panel of the X-ray high-voltage generator, select DC fluoroscopy as DOSE N.
- (3) On the control panel of the X-ray high-voltage generator, set IBS ON.
- (4) Select maximum FOV on X-ray diagnostic table.
- (5) Perform fluoroscopy for approximately one second. [Fluoro] check box will automatically be checked.
- (6) Press [RUN] button. After the adjustment is complete, "Calibration Step: SUCCESSFUL" dialog will display. Press [OK] button.
- (7) Check [Manual Setting] from the check box.
- (8) A dialog, "Are You Sure?" will display. Press [Yes].
- (9) Move [Gain] slider to make the number on the slider tab to become "855".  
(The value is displayed when the slider is dragged.)



- (10) On the control panel of the X-ray high-voltage generator, select PULSE fluoroscopy as 30fps.
- (11) Perform steps (3) to (5), and then perform steps (9) without pressing [Run] button.
- (12) When pressing [Next] button, move to "8.8.1. Preparation for Adjustment of Radiography Iris".

#### NOTE

The error occurs when the [RUN] is pressed with the PULSE fluoroscopy, and the calibration is not done successfully.  
Please set it with Manual Setting.

## 8.8. Adjustment of Radiography Iris

### 8.8.1. Preparation for Adjustment of Radiography Iris

Perform radiography iris adjustment

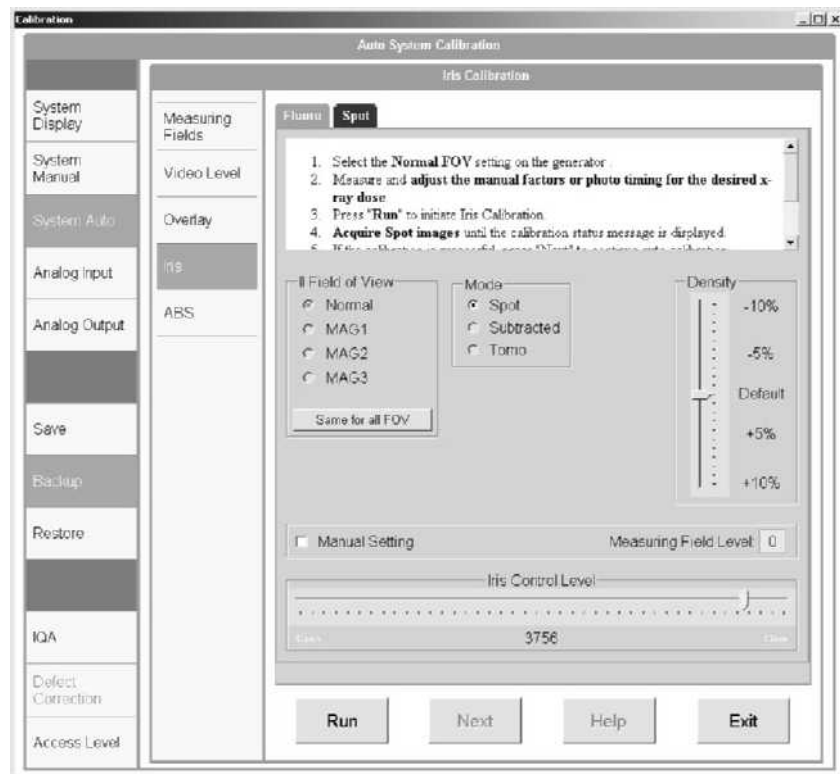
Use an acrylic 19 cm as a homogeneous phantom.

The adjustment of radiography iris is performed by each radiography mode and FOV size mode.

The condition used for radiography iris adjustment and the level used for photo-timer radiography is as follows:

	Radiography Mode	RkV	RmA	Rmsec	AEC	16"	12"	9"	7.5"
ZS-15	SPOT	85kV	320mA	100ms	ON	2100	2100	2100	2100
RS-50A	DSA	85kV	320mA	100ms	ON	2500	2500	2500	2500
ZS-100	SPOT	85kV	320mA	100ms	ON	2250	2250	2250	2250
	DSA	85kV	320mA	100ms	ON	2500	2500	2500	2500
YSF-120	SPOT	80kV	200mA	100ms	ON	2250	2250	2250	2250
/300	DSA	80kV	320mA	16":19ms 12":25ms 9":31ms 7.5":34ms	OFF	2500	2500	2500	2500

**Table 8-5 Condition of Radiography Iris Adjustment Preparation**



**Figure 8-11 Radiography Iris Adjustment Screen**

	Item	The Contents of Installation
[II Field of View]	-	Adjusting FOV
[Mode]	-	Spot: [Spot] DSA: [Subtracted]
[Density]	-	Slider is at [Default] position

### 8.8.2. Adjustment of SPOT Radiography Iris

Use System Auto to perform Iris adjustment of SPOT radiography Iris.

- (1) As Calibration item, confirm that [Iris] and [SPOT] tab is selected.
- (2) "Measure and adjust the X-ray Dose for SPOT." will display. Press [OK] button.
- (3) On the control panel of the X-ray high-voltage generator, follow Table 8-5 to configure tube voltage, tube current, exposure time and "AEC".
- (4) At X-ray diagnostic table, select the adjusting FOV size as FOV size.
- (5) Confirm that the adjusting FOV is selected on [II Field of View] and [SPOT] is selected on [Mode].
- (6) Press [RUN] button. ("Please acquire..." will display). After that, keep exposure switch pressing, SPOT radiography is repeatedly done. The slider on [Iris Control Level] will move and automatic adjustment will be conducted to allow [Measuring Field Level] become approximately 1000.
- (7) When the adjustment is complete, "Calibration Step: SUCCESSFUL" dialog will display. Stop the radiography and press [OK] button. (To repeat the calibration on the item, press [Run] button again.)
- (8) Confirm the level value of this radiography image.

Follow the steps below to confirm that "white pixel" is just disappeared from the monitor when the Level value is set following Table 8-5 and "Edge" to 0, "Window" to 48.



See to it that this extent of white pixel can be viewed.

- (9) Make iris adjustment following steps below if it does not become as shown on Table 8-5.

Check [Manual Setting] from the check box.

"Are You Sure?" will display. Press [Yes].

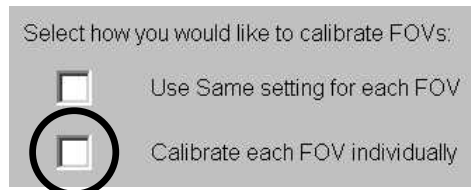
Adjust manually the [Iris Control Level] slider and perform radiography in order to make the value to become as shown on Table 8-5.

**NOTE**

To stabilize iris position after using slider manually, please make sure to perform fluoroscopy for one second, perform radiography, and then confirm the brightness.

(10) Press [Next] button to move on to the next item.

(11) “Select how you would like to calibrate FOVs” dialog will display. Select [Calibrate each FOV individually].



(12) Repeat steps (3) to (10) for each FOV.

(13) When pressing the [Next] button finally, “Select Normal FOV on the generator” will display. At X-ray diagnostic table, select the maximum FOV size as FOV size. Move to “8.8.3. Adjustment of DSA Radiography Iris”.



### 8.8.3. Adjustment of DSA Radiography Iris

#### NOTE

Perform this section only for the system with DSA option.

Use System Auto to perform Iris adjustment of DSA radiography Iris.

- (1) As Calibration item, confirm that [Iris] and [SPOT] tab is selected.
- (2) "Measure and adjust the X-ray Dose for Spot Subtract." will display. Press [OK] button.
- (3) On the control panel of the X-ray high-voltage generator, follow Table 8-5 to configure tube voltage, tube current, exposure time and "AEC".
- (4) At X-ray diagnostic table, select the adjusting FOV size as FOV size.
- (5) Confirm that the adjusting FOV is selected on [II Field of View] and [Subtracted] is selected on [Mode].
- (6) Press [RUN] button. ("Please acquire..." will display). After that, keep exposure switch pressing, SPOT radiography is repeatedly done. The slider on [Iris Control Level] will move and automatic adjustment will be conducted to allow [Measuring Field Level] become approximately 1000.
- (7) When the adjustment is complete, "Calibration Step: SUCCESSFUL" dialog will display. Stop the radiography and press [OK] button. (To repeat the calibration on the item, press [Run] button again.)
- (8) Confirm the level value of this radiography image.

Follow the steps below to confirm that "white pixel" is just disappeared from the monitor when the Level value is set following Table 8-5 and "Edge" to 0, "Window" to 48.



See to it that this extent of white pixel can be viewed.

- (9) Make iris adjustment following steps below if it does not become as shown on Table 8-5.

Check [Manual Setting] from the check box.

“Are You Sure?” will display. Press [Yes].

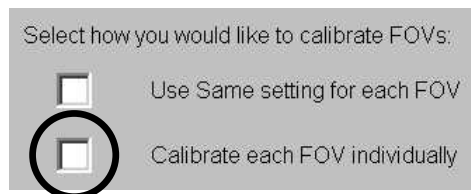
Adjust manually the [Iris Control Level] slider and perform radiography in order to make Level value to become as shown on Table 8-5.

**NOTE**

To stabilize iris position after using slider manually, please make sure to perform fluoroscopy for one second, perform radiography, and then confirm the brightness.

- (10) Press [Next] button to move on to the next item.

- (11) “Select how you would like to calibrate FOVs” dialog will displayed. Select [Calibrate each FOV individually].



- (12) Repeat steps (3) to (10) for each FOV.

## **8.9. Finish Auto Calibration**

After Iris adjustment for radiography is complete, following message will display. Finish Auto calibration.

- (1) A dialog "AutoCalibration is complete" will display.
- (2) Press [Save] button to save the data.
- (3) A dialog "Calibration settings saved successfully" will display. Press [OK] button.
- (4) Press [Exit] and close Calibration screen.

### **8.10. Adjustment of DIBS (ABS)**

Use System Manual to perform adjustment of fluoroscopy DIBS.

- (1) Select [System Manual] from Calibration menu. As Calibration item, select [Video Level].
- (2) Select [Gain] tab.
- (3) Press [Set Limits] button located on [DIBS].
- (4) Input "5" for [Low Percent], "40" for [High Percent]. Press [OK] .

## **8.11. Close Calibration and Backup and Restore of Calibration Data**

### **8.11.1. Close Calibration**

Follow steps below to close Calibration.

- (1) Press [Exit] on Calibration screen,
- (2) A dialog "Save Changes?" will display. Press [Yes].
- (3) A dialog "Calibration setting saved successfully" will display. Press [OK].

### **8.11.2. Backup of Calibration Data**

After Calibration, follow steps below to backup the adjusting data.

- (1) From Calibration menu, select [Backup].
- (2) A dialog "Are You Sure?" will display. Press [Yes].
- (3) The system will ask for the file name to be saved and backed up. Input default file name and press [Save] button.

#### **NOTE**

Be sure to save the file name for Backup data.  
As a default filename, the data of saved time/date will be added to Backup data. Therefore, by recording the time of backup, it allows to specify the file of Backup data used to restore.

### **8.11.3. Restore of Calibration Data**

If wish to return the back up Calibration data to the system, follow steps below to Restore.

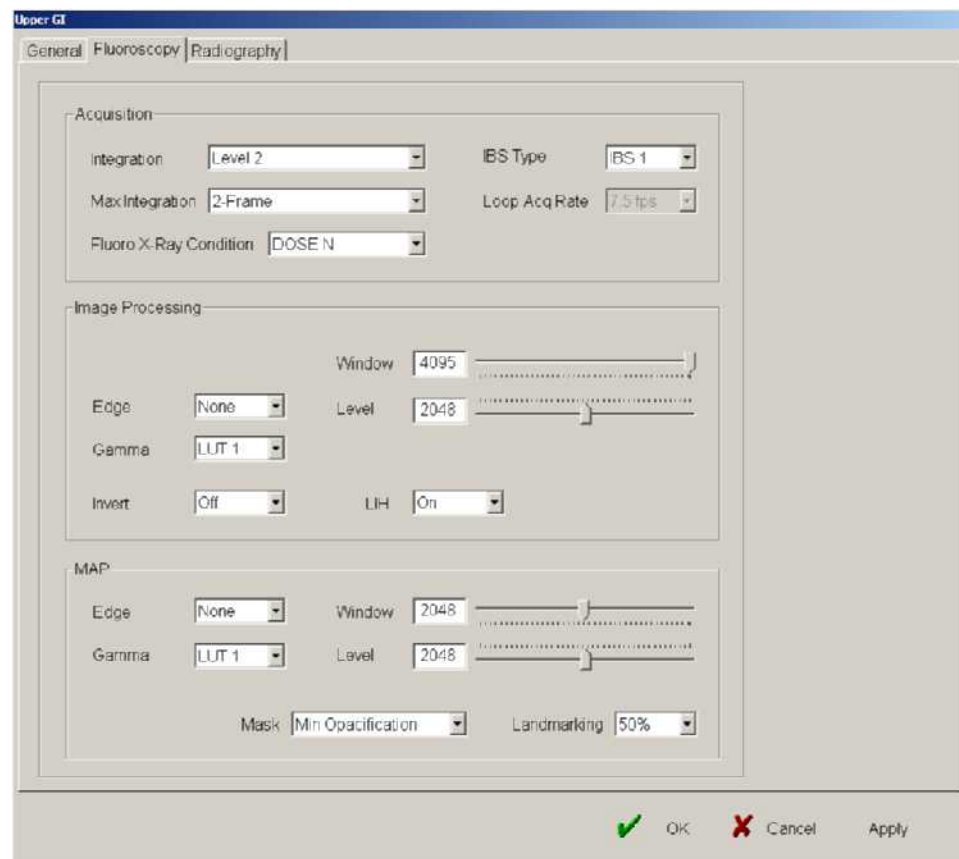
- (1) Select [Restore] from Calibration menu.
- (2) A dialog "Are You Sure?" will display. Press [Yes].
- (3) The system will ask for the file name to be restored. Select the Backed up file.
- (4) Press [Open].

# 9   Predefined Data for Fluoroscopy and Radiography

Exit Service Application and Start Clinical Application. Confirm APR setting.

## 9.1. Recommended Parameter for Fluoroscopy

### 9.1.1.   APR Setting for Fluoroscopy



**Figure 9-1 APR Fluoroscopy Screen**

The following table explains regarding to selected parameter and description of content on APR fluoroscopy screen.

Parameter		Description of Parameter
Acquisition	Integration	None: No Recursive Level1: K=2.0 / Level2 : K=2.3 Level3: K=2.6 / Level4 : K=3.0
	IBS Type	IBS1: measuring area is Large IBS2: measuring area is Medium IBS3: measuring area is Small DIBS: Use Dynamic IBS
Image Process	Edge	None: No Edge Enhancement Low Edge 1-2-3-4 High Edge
	Gamma	LUT1~LUT10: All Linear
Roadmap	Edge	None: No Edge Enhancement Low Edge 1-2-3-4 High Edge
	Gamma	LUT1~LUT10: All Linear

**Table 9-1 Parameter of APR Fluoroscopy**

Make sure that the below recommended parameter is configured at APR fluoroscopy screen.

	Acquisition				
APR Cell title	Integration	Max Integration	IBS Type	Loop Acq Rate	Fluoro X-Ray Condition
UpperGI Esophagus GI/IVR/Myelo Angio AVG <sup>*1)</sup>	Level2	2-Frame	IBS1	7.5fps	DOSE N

	Image Processing				
APR Cell title	Edge	Gamma	Window /Level	Invert	LIH
UpperGI Esophagus GI/IVR/Myelo Angio AVG <sup>*1)</sup>	None	LUT1	4095 /2048	Off	On

	Roadmap				
APR Cell title	Edge	Gamma	Window /Level	Mask	Landmarking
Angio AVG <sup>*1)</sup>	None	LUT1	2048 /2048	Min Opacification	50%

<sup>\*1)</sup> Set this Cell when DSA option is installed.

**Table 9-2 Fluoroscopy Predefined Endorsement Parameter**

## 9.2. Recommended Parameter for Radiography

### 9.2.1. Condition Setting of Memory Shot

Input data on memory shot setting of B-40/L-40 (DR radiography). Table 9-3 and 9-4 describes the recommended radiography condition. Regards to fluoroscopy balance condition, Confirm regards to fluoroscopic balance condition (FkV) to each actual acrylic thickness and input IBS condition. (Confirm each DOSN: Dose Normal, DOSL: Dose Low, PUL: Pulse)

X-ray tube: 0.3/0.8P323DK-85SF, 0.3/0.8P324DK-85SF

R-T curve						Photo	
Program name	Acrylic Thickness	kV	mA	sec	Focus	Speed	Density
M-SHOT SPOT	9cm	68kV	200mA	200ms	Large (0.8)	M	0
	18cm	80kV	400mA				
	23cm	93kV	400mA				
	28cm <sup>*1)</sup>	96kV	400mA				
M-SHOT SERIAL	9cm	68kV	200mA	100ms	Large (0.8)	M	0
	18cm	80kV	400mA				
	23cm	93kV	400mA				
	28cm <sup>*1)</sup>	96kV	400mA				
M-SHOT SER15FPS	9cm	68kV	200mA	20ms	Large (0.8)	M	0
	18cm	80kV	400mA				
	23cm	93kV	400mA				
	28cm <sup>*1)</sup>	96kV	400mA				
M-SHOT DSA	9cm	58kV	200mA	100ms	Large (0.8)	M	+2
	18cm	73kV	400mA				
	23cm	93kV	400mA				
	28cm <sup>*1)</sup>	96kV	400mA				
SERVICE		85kV	320mA	100ms	Large (0.8)	M	0
	(Photo-Timer,Not Memory shot)						

(\*1) In 28cm point, turn on 115FkV by each FOV size without measuring steady IBS point.

**Table 9-3 Standard Memory Shot (0.3/0.8 X-ray tube)**



X-ray tube: 0.6/1.2P364DK-85SF

R-T curve						Photo	
Program name	Acrylic Thickness	kV	mA	sec	Focus	Speed	Density
M-SHOT SPOT	9cm	68kV	200mA	200ms	Small (0.6)	M	0
	18cm	80kV	200mA				
	23cm	87kV	200mA				
	28cm <sup>*1)</sup>	88kV	200mA				
M-SHOT SERIAL	9cm	68kV	200mA	100ms	Small (0.6)	M	0
	18cm	80kV	200mA				
	23cm	93kV	200mA				
	28cm <sup>*1)</sup>	95kV	200mA				
M-SHOT SER15FPS	9cm	68kV	200mA	20ms	Small (0.6)	M	0
	18cm	80kV	200mA				
	23cm	93kV	200mA				
	28cm <sup>*1)</sup>	95kV	200mA				
M-SHOT DSA	9cm	58kV	200mA	100ms	Large (1.2)	M	+2
	18cm	73kV	400mA				
	23cm	93kV	400mA				
	28cm <sup>*1)</sup>	96kV	400mA				
SERVICE		85kV	200mA	100ms	Small (0.6)	M	0
	(Photo-Timer, Not Memory shot)						

(\*1) In 28cm point, turn on 115FkV by each FOV size without measuring steady IBS point.

**Table 9-4 Standard Memory Shot (0.6/1.2 X-ray tube)**

### 9.2.2. Photo-timer Radiography Condition Setting

Often demands are made from the customers, asking for X-ray condition to be fixed while performing radiography. The reason for this request is to keep the same X-ray condition (especially for kV) while radiography is once again performed on the same patient.

If requests are made upon setting of kV fix of radiography condition for upper GI, make sure to set the condition described on Table 9-5. KV value can be changed upon request from the customers.

Radiography Condition					Photo	
Program name	kV	mA	sec	Focus	Speed	Density
60kV	60kV	200mA	200ms	Large <sup>*1)</sup> (0.8)	M	0
85kV	85kV	400mA <sup>*2)</sup>	200ms	Large <sup>*2)</sup> (0.8)	M	0
80kV	80kV	400mA <sup>*2)</sup>	100ms	Large <sup>*2)</sup> (0.8)	M	0

(\*1) In case of 0.3/0.8P, set Large focus. In case of 0.6/1.2P, set Small focus.

(\*2) In case of 0.3/0.8P, set Large focus & 400mA. In case of 0.6/1.2P, set Large focus & 400mA.

**Table 9-5 Photo Timer**

9.2.3. APR Setting for Radiography

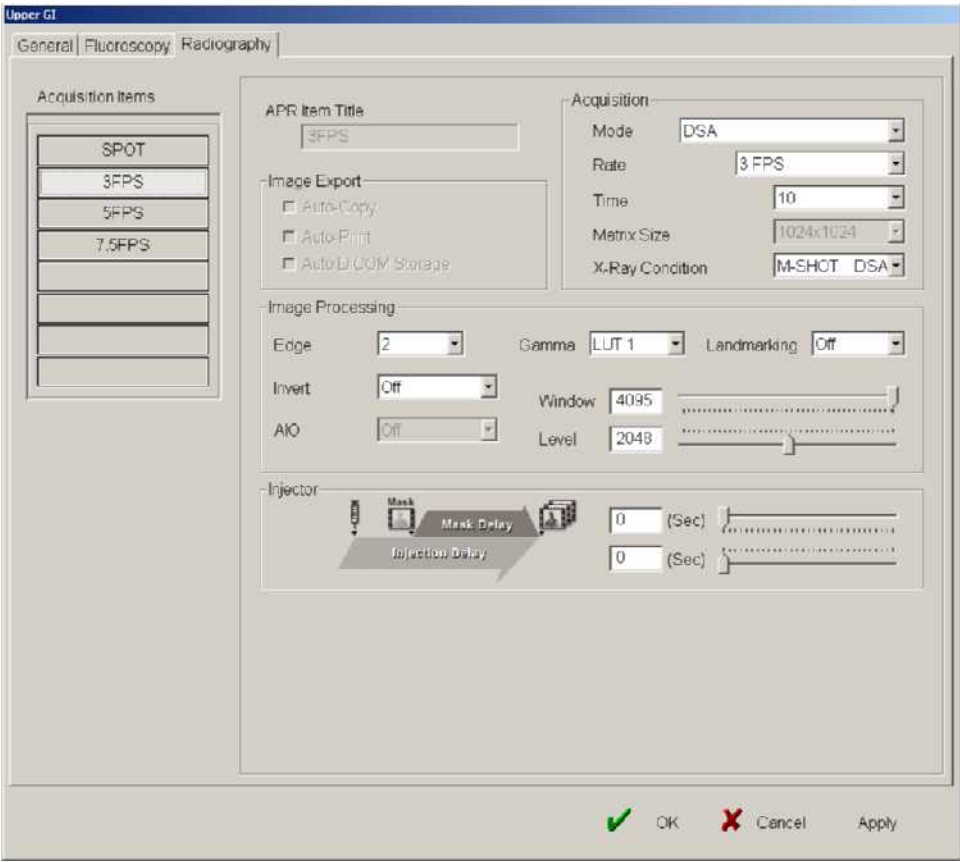
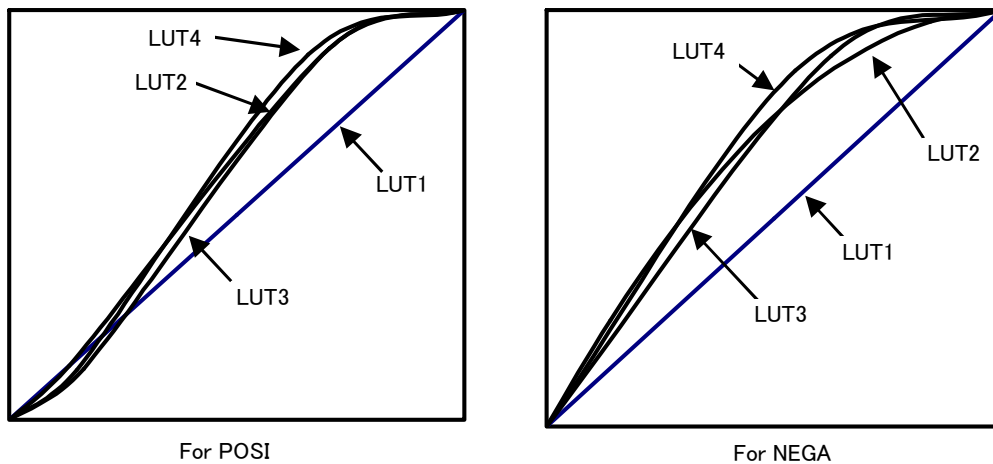


Figure 9-2 APR Radiography Screen

Table 9-6 explains regarding to selected parameter and description of content on APR radiography screen.

Parameter		Description of Parameter
Image Process	Edge	None: No Edge Enhancement Low Edge 1-2-3-4 High Edge
	Gamma	LUT1: Linear LUT used at standard LUT2~LUT4: Convex superior LUT LUT5~LUT10: Linear
	AIO	“Contrast ++”: For low contrast area, such as Myelo (Contrast enhancement is strong) “Contrast +”: For low contrast area, such as Myelo (Contrast enhancement is weak) “Normal”: Standard “Contrast -”: For high contrast area such as magen (Contrast enhancement is strong) Window doesn’t become too narrow. “Contrast --”: For high contrast area such as magen (Contrast enhancement is weak) Window doesn’t become too narrow.

**Table 9-6 Parameter of APR Radiography**



**Figure 9-3 Gamma curve for Radiography**

Make sure that the following recommended parameter is configured at APR radiography screen.

APR Cell Title	Acquisition Item <sup>*2)</sup>	Acquisition				
		Mode	Rate	Time (Sec)	Matrix Size	X-Ray Condition <sup>*3)</sup>
UpperGI	SPOT	SPOT	-	-	-	M-SHOT SPOT
	3FPS	Serial	3FPS	10	-	M-SHOT SERIAL
	5FPS	Serial	5FPS	10	-	M-SHOT SERIAL
	7.5FPS	Serial	7.5FPS	10	-	M-SHOT SERIAL
Esophagus	SPOT	SPOT	-	-	-	M-SHOT SPOT
	3FPS	Serial	3FPS	10	-	M-SHOT SERIAL
	5FPS	Serial	5FPS	10	-	M-SHOT SERIAL
	15FPS	Serial	15FPS	10	-	M-SHOT SER15FPS
GI	SPOT	SPOT	-	-	-	M-SHOT SPOT
	3FPS	Serial	3FPS	10	-	M-SHOT SERIAL
IVR	SPOT	SPOT	-	-	-	M-SHOT SPOT
	3FPS	Serial	3FPS	10	-	M-SHOT SERIAL
Myelo	SPOT	SPOT	-	-	-	M-SHOT SPOT
Angio AVG <sup>*1)</sup>	SPOT	SPOT	-	-	-	M-SHOT SPOT
	3FPS	Serial	3FPS	20	-	M-SHOT SERIAL
	DSA3	DSA	3FPS	20	-	M-SHOT DSA
	DSA5	DSA	5FPS	10	-	M-SHOT DSA
	DSA7.5	DSA	7.5FPS	10	-	M-SHOT DSA

\*1) Set this Cell when DSA option is installed.

\*2) In case of combined with RS-50A, maximum rate is 5FPS. Delete the Items with the 7.5FPS rate or more.

\*3) X-ray condition may differ depending on the condition registered on the X-ray high-voltage generator.

**Table 9-7 Radiography Predefined Parameter (Acquisition)**

APR Cell Title	Acquisition Item <sup>*2)</sup>	Image Process					
		Edge	Gamma	Window /Level	Invert	AIO	Landmarking
UpperGI	SPOT 3FPS 5FPS 7.5FPS	2	LUT1	4095 /2048	On	Off	-
Esophagus	SPOT 3FPS 5FPS 15FPS	2	LUT1	4095 /2048	On	Off	-
GI	SPOT 3FPS	2	LUT1	4095 /2048	On	Off	-
IVR	SPOT 3FPS	2	LUT1	4095 /2048	On	Off	-
Myelo	SPOT	2	LUT1	4095 /2048	On	Off	-
Angio AVG <sup>*1)</sup>	SPOT 3FPS	2	LUT1	4095 /2048	Off	Off	
	DSA3 DSA5 DSA7.5	2	LUT1	800 /1800	Off	Off	100

\*1) Set this Cell when DSA option is installed.

\*2) In case of combined with RS-50A, maximum rate is 5FPS. Delete the Items with the 7.5FPS rate or more.

**Table 9-8 Radiography Predefined Parameter (Image Process)**

APR Cell Title	Acquisition Item <sup>*2)</sup>	Injector	
		Mask Delay	Injection Delay
UpperGI	SPOT	-	-
	3FPS	-	0
	5FPS 7.5FPS		
Esophagus	SPOT	-	-
	3FPS	-	0
	5FPS 15FPS		
GI	SPOT	-	-
	3FPS	-	0
IVR	SPOT	-	-
	3FPS	-	0
Myelo	SPOT	-	-
Angio AVG <sup>*1)</sup>	SPOT	-	-
	3FPS	-	0
	DSA3 DSA5 DSA7.5	0	0

\*1) Set this Cell when DSA option is installed.

\*2) In case of combined with RS-50A, maximum rate is 5FPS. Delete the Items with the 7.5FPS rate or more.

**Table 9-9 Radiography Predefined Parameter (Injector)**

#### **9.2.4. APR Setting on X-ray high-voltage generator**

NOTE
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<p>In case of YSF system, don't register the different technique in a program tab. There is a possibility to change the technique without the intension.</p>
--



## 10 Laser Imager Density Adjustment Procedure

Display the SMPTE pattern and adjust the density in the laser imager (LI) so that the density of 0 to 100% becomes linear on the film.

- (1) Connect the LI to the DAR-8000i.
- (2) On DAR-8000i, select patient name [TestPattern] and display the SMPTE image.
- (3) Set gamma : 1(Linear), Window :4095 and Level :2048.
- (4) Print out the SMPTE pattern by the LI.
- (5) Adjust the film density so that each density of the SMPTE pattern meets a value shown in Figure 10-1 (film base density = 0.20). The allowable range of adjustment error is +/-0.1 for the density 0 to 40%, and +/-0.05 for the density 50 to 100%.
- (6) After adjustment, measure each density, and repeat the adjustment procedure until the error meets the allowable range. As the measurement result, make sure to write values and draw graphs on the data sheet.
- (7) Write parameters (interpolation method, smoothing type, etc.) of the LI also on the data sheet.

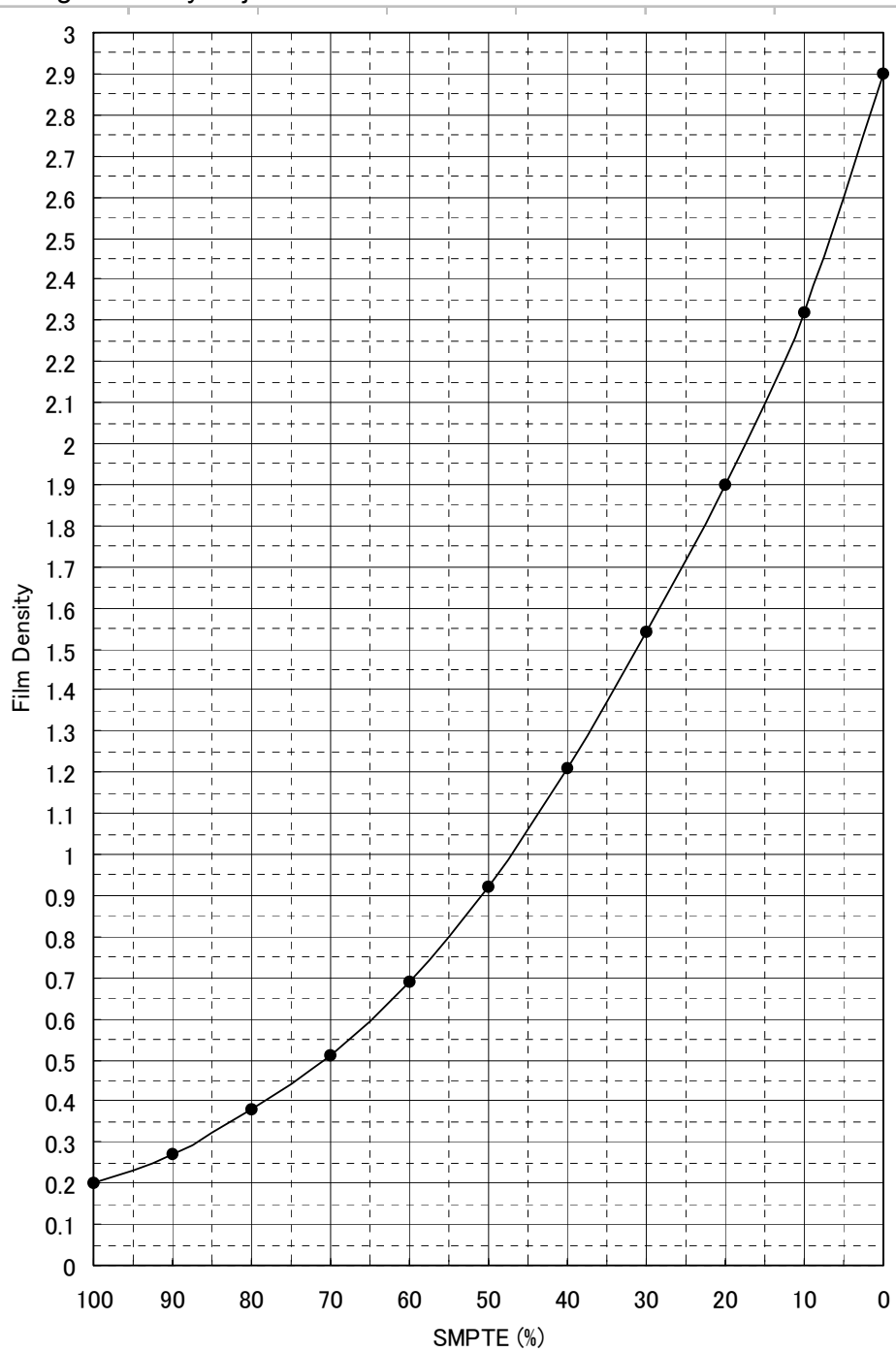
### NOTE

The max/min value for film density (Dmax/Dmin) can be configured on "Config" - "Printer Devices" screen of Service Application.  
Refer to Digital Radiography DAR-8000i Installation Manual (M517-E380) for detailed information about the configuration.

### NOTE

- Use cubic spline for memory interpolation in the LI.
- Because an image displayed on the monitor is smoothed on the monitor, an image on the film of the LI digitally connected seems sharper. In the LI equipped with the spatial frequency processing, use the smoothing mode.
- In case of Fuji DRYPIX1000, 3000, due to thermal film is used for those imager, density cannot be measured by ordinary densitometer. To measure proper density, it is required to use exclusive densitometer by Fuji.

< Laser Imager Density Adjustment Standard >



**Figure 10-1 Laser Imager Density Adjustment Standard**

%	100	90	80	70	60	50	40	30	20	10	0
Density (Std.)	0.20	0.27	0.38	0.51	0.69	0.92	1.21	1.54	1.90	2.32	2.90
Adj.											

## 11 Image Quality Evaluation

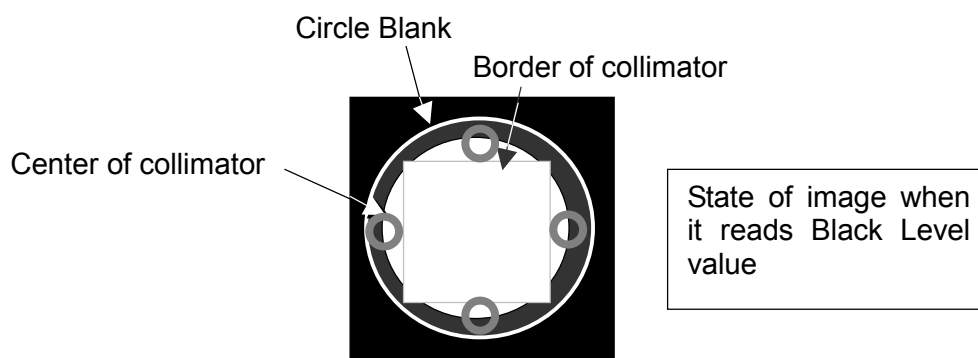
Evaluate the image quality and record the data on Clinical Application as follows.

### 11.1. Image Quality Evaluation by Fluoroscopy

#### 11.1.1. Confirmation of Black Level

Use the acrylic 19cm as an object. Narrow down the collimator to the position inscribed at the circle blank. Confirm the black level of the image (see Figure 11-1).

Turn the IBS on and perform fluoroscopy. Make sure that black level located on the center of collimator is under approximately 200.



**Figure 11-1 Image Condition at Reading Black Level**

### 11.1.2. Confirmation of Resolution

Set the FOV to 9-inch (or 12-inch). Fix the Penetra-chart on the table for over tube system or on the front of I.I. for under tube system so that the Penetra-chart can be seen as shown in the left figure on Figure 11-2. Perform fluoroscopy manually.

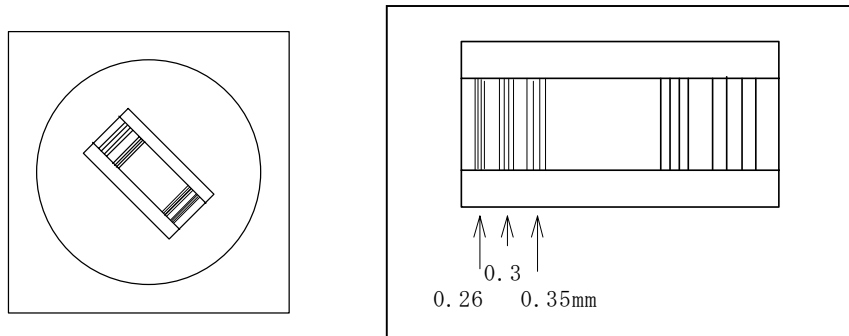
The aimed resolution value is 0.3 mm (or 0.35 mm for 12-inch FOV) while fluoroscopy is performed without an acrylic using the X-ray diagnostic table and an image is observed in 9-inch FOV (or 12-inch FOV). (Set manually the X-ray condition so that images can be seen easily.) Make sure that homogeneous resolution is realized even in the peripheral area of an image.

Perform the evaluation of fluoro image with following parameters on APR fluoroscopy screen for image processing.

(Image processing parameters)

Integration: 1

Edge : 1



**Figure 11-2 Resolution Measurement**

## **11.2. Image Quality Evaluation by Radiography**

### **11.2.1. Confirmation of Black Level**

Use the acrylic 19cm as an object. Narrow down the collimator to the position inscribed at the circle blank. Confirm the black level of the image (see Figure 11-1 ).

Turn Photo on and perform radiography. Make sure that black level located on the center of collimator is under approximately 200.

### **11.2.2. Confirmation of Resolution**

- (1) Place a flat phantom (acrylic 19 cm) upon the Penetra-chart set on the table. Make sure that the Penetra-chart is displayed on the monitor as described in Figure 11-2.
- (2) Perform DR photo-timer radiography in the same condition as described in Section 8.8. "Adjustment of Radiography Iris" while setting the FOV to 9-inch (or 12-inch).
- (3) The aimed resolution value is 0.3 mm (or 0.35 mm for 12-inch FOV). Make sure that the resolution is homogeneous even in the peripheral area. At this time, image processing for the evaluation of radiography image should be "Edge: 1" on APR radiography screen.

### 11.2.3. Confirmation of contrast

(Confirmation in the high contrast status)

- (1) Place a 9BCu phantom in the center of the field of view. Adjust the magnification (the height of phantom) to make center part (a) to 30% diameter of circle blank. Perform acquisition under following X-ray condition.

In case of ZS-15/RS-50A/ZS-100 :

85kV, 320mA, 8msec

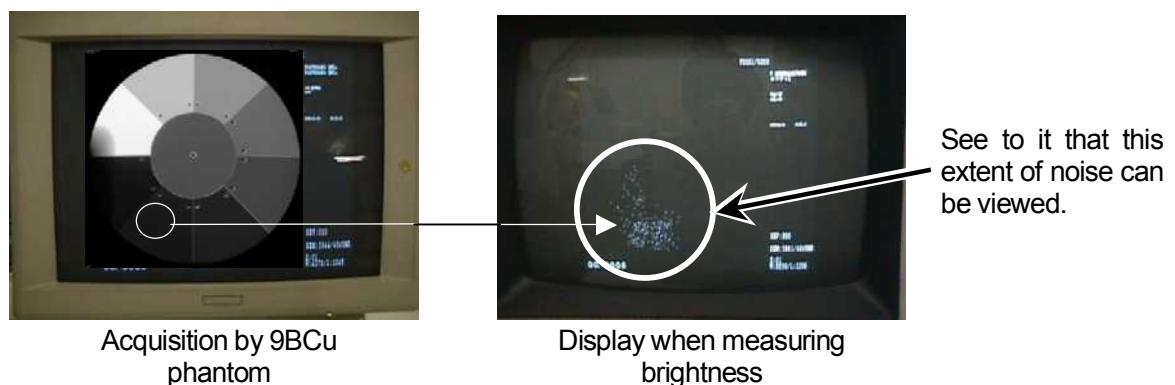
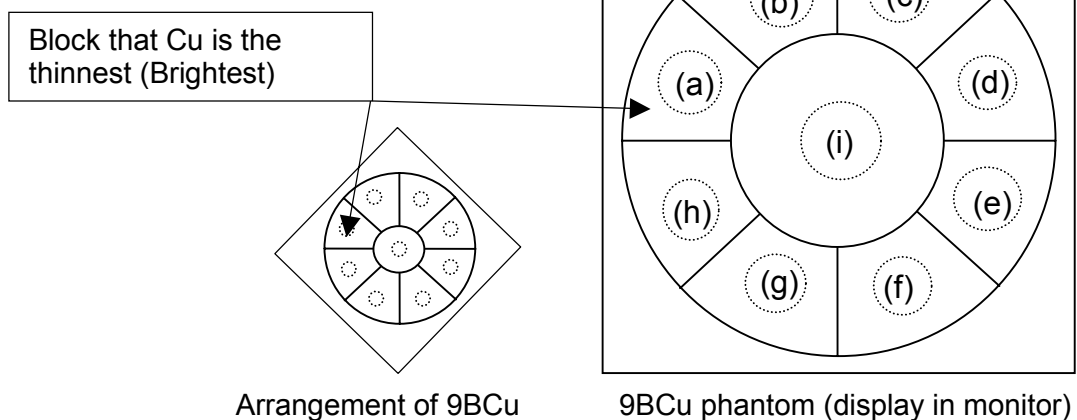
In case of YSF-300/120:

80kV, 200mA, 8msec

- (2) Record radiography condition.
- (3) Measure the digital brightness value of each Cu thickness. Set "Window" to 48 using the mouse and decrease "Level" from 4095. Measure the Level value at the time when the center looks white in the steps. Measure the portion indicated in dotted line of the 9BCu phantom shown in Figure 11-3. (The record sheet is attached on a later page)

Right figure

- (a) Part where Cu is the thinnest.
- (h) Part where Cu is the thickest.



**Figure 11-3 Measurement by 9BCu Phantom**

Brightness Value of each block in 9BCu phantom

Block	(a)	(b)	(c)	(d)	(i)	(e)	(f)	(g)	(h)
Reference value	3930	2700	2030	1600	<b>1500</b>	1350	720	660	550
Measurement value									

↑  
(i) - Center block of 9BCu Phantom

NOTE

The above value should be considered as a rough target. Confirm that there is a difference of the brightness for each block.

(Confirmation in the low contrast status)

- (1) Place aluminum equivalent 1 mm upon the 9BCu phantom in each Cu block (Place it in portions indicated in dotted line in Figure 11-3.). Place the phantom in the same position as that for radiography in the high contrast status. Perform photo-timer radiography in 9-inch FOV (or 12-inch FOV) under the following X-ray conditions.

In case of ZS-15/RS-50A/ZS-100:

85kV, 320mA, 8msec

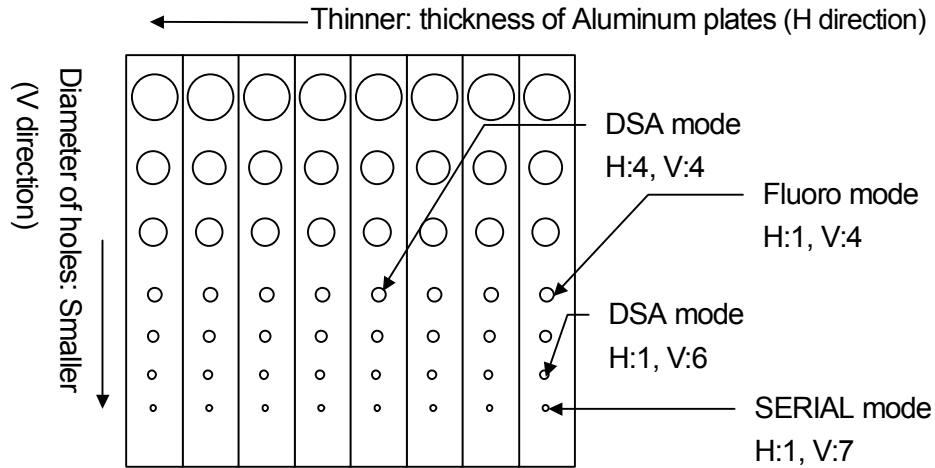
In case of YSF-300/120:

80kV, 200mA, 8msec

- (2) Record the range in which the aluminum piece described above can be recognized by eyes. (The record sheet is attached on a later page. To write record, use the symbols (a) to (i) indicating blocks of the 9BCu phantom block shown in Figure 11-3.)

### 11.3. Image Quality Evaluation by DSA

If system has DSA function, confirm the low contrast resolution by rose-phantom.



Acquisition Condition Acrylic:19cm

Place Rose-Phantom at about 10cm distance from installation surface of I.I.

X-ray Condition: 85kV Photo-timer acquisition

#### Measurement

- (i) Record which hole in H1 can be seen in fluoroscopy.
- (ii) Record which hole in H1 can be seen in Serial mode.
- (iii) Record which hole in H1 can be seen in DSA mode.
- (iv) Record which hole in H4 can be seen in DSA mode.

#### Image processing parameters for observation

	Integration	Edge	Window	Level
Fluoro	1	1	2048	2048
Serial	-	1	2048	2048
DSA	-	1	200	2048



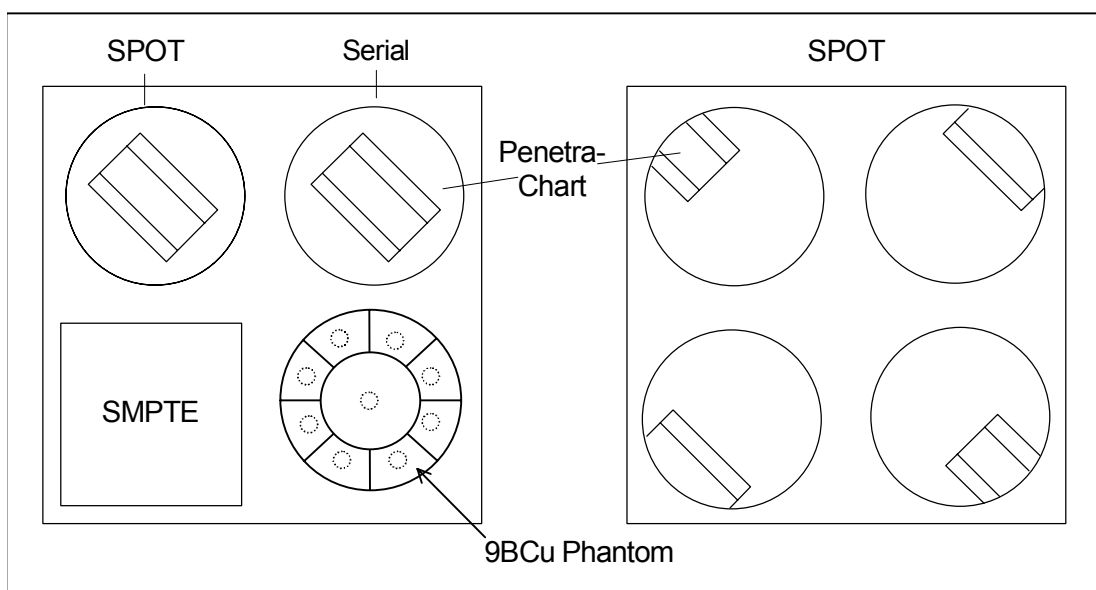
## 11.4. Creating the Data Sheet

Create the data sheet so that the operating status of the system installed in the customer's can be checked. Acquire three types of data as follows.

- (1) Data sheet
- (2) Film data by laser imager
- (3) Laser imager density adjustment data sheet

As to (1), copy the data sheet attached, and writes down all adjustment data.

As to (2), create the film data while referring to the format shown below.



**Figure 11-4 Film Data**

As to (3), write the SMPTE density distribution on the data sheet in accordance with the laser image density adjustment procedure in "10 Laser Imager Density Adjustment Procedure".

- For performing radiography of the Penetra-chart, select 9-inch FOV and set the SID according to the table in section 4.3. In the case of over tube, place the Penetra-chart upon the table. In the case of under tube, place the Penetra-chart on the front face of the I.I. Acquire data for the case in which a phantom (standard object: acrylic 19 cm) is used and the case in which a phantom is not used.
- As to the data used to check the peripheral area of an image, make sure that the resolution per 0.26 to 0.4 mm can be checked.
- As to the data on a phantom exclusively, insert the collimator leaf at the top and the bottom as well as on the left and the right of an image so that the black level of radiography can be checked. Print the data while setting "Window" to 4095, "Level" to 2048 and "Edge" to 0.

In addition, data such as magen phantom is a reference. Please send it at the same time.

When installation and adjustment are finished, prepare the data (1) to (3) and send it to the following address.

1 Nishinokyo-Kuwabaracho, Nakagyo-ku, Kyoto 604-8511, Japan  
Quality Assurance Department, Medical Systems Division, Shimadzu Corporation

It is regarded that installation is completed when the data is received by the section above.

## Appendix. Data Sheet

**Hospital Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Name (Service person):** \_\_\_\_\_

**R/F Table:** \_\_\_\_\_

**I.I. Type:** \_\_\_\_\_

**X-ray Generator:** \_\_\_\_\_

**Using SID:** \_\_\_\_\_

**X-ray Tube:** \_\_\_\_\_

**MAX. SKIN DOSE**      **DC FLUO :** \_\_\_\_\_ **mGy / min (      R / min)**  
                                  **Pulse FLUO :** \_\_\_\_\_ **mGy / min (      R / min)**

**DC-FLUO·IBS**

Acrylic:19cm

F.O.V.	Balanced Condition		PHVF	IRIS <sup>*)</sup>	Level(Window:48)
16	Normal	kV      mA			Bright:
	Low	kV      mA			Black:
12	Normal	kV      mA			Bright:
	Low	kV      mA			Black:
9	Normal	kV      mA			Bright:
	Low	kV      mA			Black:
7.5	Normal	kV      mA			Bright:
	Low	kV      mA			Black:

\*) Fill in the value of "Iris control level" on the calibration screen as "IRIS".

**DC-FLUO   FkV-FmA**

FkV(kV)	50	60	70	80	90	100	115
FmA(mA) : Normal							
FmA(mA) : Low							

**Pulse-FLUO   IBS   (30 FPS)**

Acrylic:19cm

F.O.V.	Balanced Condition		PHVF	IRIS <sup>*)</sup>	Level(Window:48)
16	kV	mA			Bright:      black:
12	kV	mA			Bright:      black:
9	kV	mA			Bright:      black:
7.5	kV	mA			Bright:      black:

\*) Fill in the value of "Iris control level" on the calibration screen as "IRIS".

**Pulse-FLUO   FkV-FmA   (30 FPS)**

FkV(kV)	50	60	70	80	90	100	115
FmA(mA)							

**Phototimer Radiography.****SPOT / SER**☐ Large Focus☐ Small Focus

Acrylic:19cm

F.O.V.	X-ray	PHVR	IRIS <sup>*)</sup>	Bright level	Black level
16	kV      mA      ms				
12					
9					
7.5					

\*) Fill in the value of "Iris control level" on the calibration screen as "IRIS".

**DSA**☐ Large Focus☐ Small Focus

Acrylic:19cm

F.O.V.	X-ray	PHVR	IRIS <sup>*)</sup>	Bright level	Black level
16	kV      mA      ms				
12					
9					
7.5					

Level on MASK images

\*) Fill in the value of "Iris control level" on the calibration screen as "IRIS".

**RSM-DSA**☐ Large Focus☐ Small Focus

Acrylic:19cm

F.O.V.	X-ray	PHVR	IRIS <sup>*)</sup>	Bright level	Black level
16	kV      mA      ms				
12					
9					
7.5					

\*) Fill in the value of "Iris control level" on the calibration screen as "IRIS".

**Memory Shot****SPOT**

Thickness	FkV(N)	kV	mA	ms

**SERIAL**

Thickness	FkV(N)	kV	mA	ms

**DSA**

Thickness	FkV(N)	kV	mA	ms

**Resolution**☐ I.I. : 9 inch

Mode		With Phantom		Without Phantom	
		Center	Around	Center	Around
Fluo	DC	mm	mm	mm	mm
	Pulse	mm	mm	mm	mm
DR		mm	mm	mm	mm

With Phantom : With Acrylic 19 cm or Water 20 cm.

Without Phantom : Only chart.

**High Contrast** (9BCu-Phantom brightness)☐ I.I.: \_\_\_\_\_ inch

X-ray \_\_\_\_\_ kV \_\_\_\_\_ mA \_\_\_\_\_ msec

thickness (mm)	0.5t	1.0t	1.5t	2.0t	2.3t	2.5t	3.5t	3.6t	4.0t
	(a)	(b)	(c)	(d)	(i)	(e)	(f)	(g)	(h)
Level									
(Typical Value)	3930	2700	2030	1600	<b>1500</b>	1350	720	660	550

**Low Contrast** (9BCu-Phantom with Al pieces)

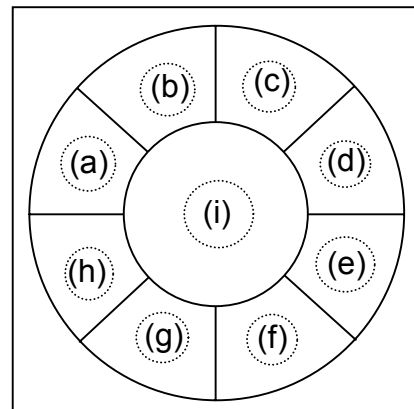
			Standard	Measurement
Block # (Al pieces : visible)	Fluo	DC	(a)-(d) & (i)	
		Pulse (30 FPS)	(a)-(e) & (i)	
	DR (spot)		(b)-(f) & (i)	

Valuation under the condition,

WINDOW : 4095

LEVEL : 2048

EDGE : 1



**Low Contrast :DSA** (Rose-Phantom with Acrylic:19cm)

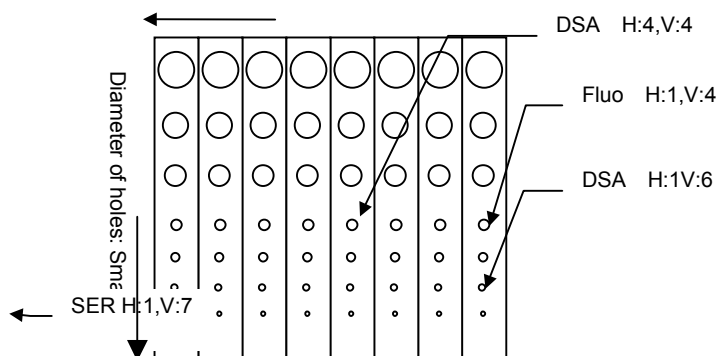
□ I.I.: \_\_\_\_\_ inch

X-ray \_\_\_\_\_ kV      mA      msec

			Standard	Measurement
Position ( holes : visible )	Fluoro	DC	H:1, V:4	H:1, V:
		Pulse (30 FPS)		
	DR ( <b>Serial</b> )		H:1, V:7	H:1, V:
	DSA		H:1, V:6 H:4, V:4	H:1, V: H:4, V:

Valuation under the condition,

	Fluo / Serial	DSA
WINDOW :	2048	200
LEVEL :	2048	2048
EDGE :	1	1
Recursive :	1	---



Thinner: thickness of A

**I.I. High Voltage**

I.I. Type :

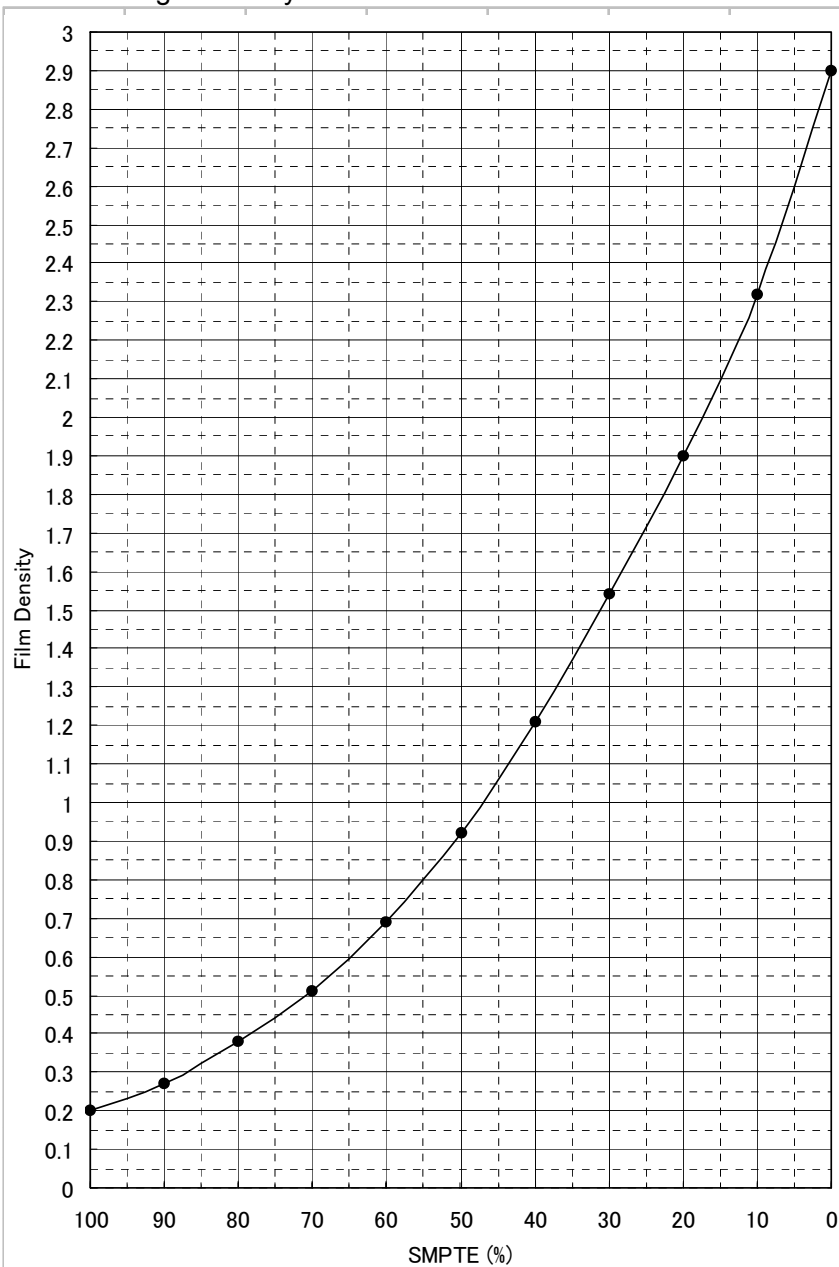
S/N:

F.O.V.	HV	MV	G1	G2	G1a
16					
12					
9					
7.5					

**CCD Camera**

S/N : \_\_\_\_\_

## &lt; Laser Imager Density Data &gt;



Parameters of  
Laser Imager

%	100	90	80	70	60	50	40	30	20	10	0
<b>Density (Std.)</b>	0.20	0.27	0.38	0.51	0.69	0.92	1.21	1.54	1.90	2.32	2.90
Adj.											

**LI** Manufacturer :

**Shimadzu**

Model :

Model : DAR-8000i

Service person :

Service person :