

*Technical Publication*  
**CF-1108R6**

# **Configuration**

**HF Series Generators**



## REVISION HISTORY

REVISION	DATE	REASON FOR CHANGE
0	APR 15, 2014	First Edition.
1	DEC 04, 2014	New Configuration options.
2	OCT 20, 2015	New Configuration options. Advanced options included.
3	APR 29, 2016	New Tech Service Console version and Configuration options.
4	DEC 20, 2016	New Tech Service Console version and General updates.
5	JUN 22, 2018	New Tech Service Console version and Configuration options.
6	MAR 09, 2020	Switch 3640SW6 information updated, CTSC Service mode and Dropout Time for Stitching

This Document is the English original version, edited and supplied by the manufacturer.

The Revision state of this Document is indicated in the code number shown at the bottom of this page.

## ADVISORY SYMBOLS

The following advisory symbols will be used throughout this manual. Their application and meaning are described below.



***DANGERS ADVISE OF CONDITIONS OR SITUATIONS THAT IF NOT HEDED OR AVOIDED WILL CAUSE SERIOUS PERSONAL INJURY OR DEATH.***



**ADVISE OF CONDITIONS OR SITUATIONS THAT IF NOT HEDED OR AVOIDED COULD CAUSE SERIOUS PERSONAL INJURY, OR CATASTROPHIC DAMAGE OF EQUIPMENT OR DATA.**



***Advise of conditions or situations that if not heeded or avoided could cause personal injury or damage to equipment or data.***

**Note** 

***Alert readers to pertinent facts and conditions. Notes represent information that is important to know but which do not necessarily relate to possible injury or damage to equipment.***

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## SECTION 1 INITIAL CONFIGURATION PROCEDURE

Configuration provides the initial settings and checkout procedures that must be carried out before making X-ray exposures. Functional characteristics of this Generator are defined at the time of installation.

All the Calibration and Configuration data are stored in a non-volatile memory chip (U66-EEPROM) located on the A3640-XX Control board. Other information, such as serial number, version and revision; is also stored in the EEPROM.

When the initial setup and checkout has been completed the Generator will be ready for Calibration.

*Note* 

*Make a backup copy of the configuration data in the computer once the configuration procedure is finished.*



**DO NOT SUPPLY THE MAIN POWER UNTIL SPECIFICALLY INSTRUCTED TO DO SO IN THIS DOCUMENT.**

**THE MAIN CAPACITORS OF THE HIGH VOLTAGE INVERTER RETAIN A LARGE PORTION OF THEIR CHARGE FOR APPROX. 3 MINUTES AFTER THE UNIT IS TURNED OFF.**

The Generator configuration is determined by:

- X-ray tube(s) number, model and use.
- System requirements (Bucky, Tomo, AEC...).
- Maximum kV, kW.

The Generator characteristics, power, options and allowed configuration are saved in a licence key plugged to J17 on the A3640-XX Control board.

Check that all the information, system requirements and kW power saved in the licence key are correct (*refer to Section 2.11*). In the event that the licence is not plugged or the I2C Bus access is failing, error 47 will be displayed. If the licence has not been burned or it is defective, error 61 will be displayed.

These errors are displayed when turning on the Generator. In this case, the equipment remains in demo mode with only 5 kW power. No X-ray will be allowed in demo mode.

## 1.1 GENERATOR SWITCHES

The system configuration and test switches are:

DIP SWITCH LOCATION	FUNCTION
3640SW2 - Control board	Not used for Configuration
3640SW6 - Control board	Test
3640SW7 - Control board	Not used for Configuration
S0008009S1 - Dual Speed Starter board	Not used for Configuration

### 1.1.1 3640SW2 - CONTROL BOARD

Dip switch 3640SW2 is not used for configuration but all its switches must be set to **On**.

### 1.1.2 3640SW6 - CONTROL BOARD

Dip Switches 3640SW6-2 and 3640SW6-4 can be configured with the Generator ON, there is no need to turn it OFF to modify their position. Other switches modification require to reboot the Generator to apply the changes.

Set dip switch 3640SW6 as indicated in *Table 1-1*.

**Table 1-1**  
**Test Dip Switch 3640SW6 on the Control board**

3640SW6 POSITION	OPEN (OFF)	CLOSED (ON)
1	Not used. <i>Set to OFF.</i>	Not used.
2	Normal.	Disables Hardware errors.
3	Normal.	Demo mode (no X-ray).
4	Normal.	Disables the filaments <sup>1</sup> .
5	Normal.	Disables Dosemeter.
6	Not used. <i>Set to OFF.</i>	Not used.
7	Not used. <i>Set to OFF.</i>	Not used.
8	Normal.	Initializes the EEPROM <sup>2</sup> .

*Note.— 1) This turns off the filaments so no radiation will be produced during the exposure.*

**WARNING: THE kV OUTPUT OF THE HV TRANSFORMER WILL BE WHATEVER IS SET BY THE CONSOLE. IF THE X-RAY TUBE HV CABLES ARE NOT CONNECTED INTO THE HV TRANSFORMER, FILL COMPLETELY BOTH HV RECEPTACLES WITH HV OIL.**

*2) It only initializes the EEPROM if there is no data or data is corrupted (Error E010 is displayed). All calibration and configuration data will be lost. EEPROM will be restored to default values.*

Dip Switch 3640SW6 can also be used to erase the EEPROM, the NVRAM or the configuration data. To do so:

1. Turn off the Generator and set Dip Switches 3640SW6-1 to 3640SW6-8 to ON.
2. Turn on the Generator and, once the A3640-XX Control board is powered up (the Log File screen of the Service Console shows the message *Waiting for initialization condition...*), set Dip Switches according to the procedure to be performed:
  - To erase the configuration data, set Dip Switches 3640SW6-2, 3640SW6-4, 3640SW6-6 and 3640SW6-8 to OFF. (The message *Initializing Configuration...* is shown in the Log File screen.) (*For Configuration initialization by software, refer to Section 2.9.*)
  - To erase the NVRAM, set Dip Switches 3640SW6-1 to 3640SW6-4 to OFF. (The message *Initializing NVRAM...* is shown in the Log File screen.) (*For NVRAM initialization by software and further information about the NVRAM data, refer to Section 2.10.*)
  - To erase the EEPROM, set Dip Switches 3640SW6-1, 3640SW6-3, 3640SW6-5 and 3640SW6-7 to OFF. (The message *Initializing EEPROM...* is shown in the Log File screen.) (*For EEPROM initialization by software, refer to Section 2.8.*)
3. Set all the pins in Dip Switch 3640SW6 to their previous position (usually, all to OFF).

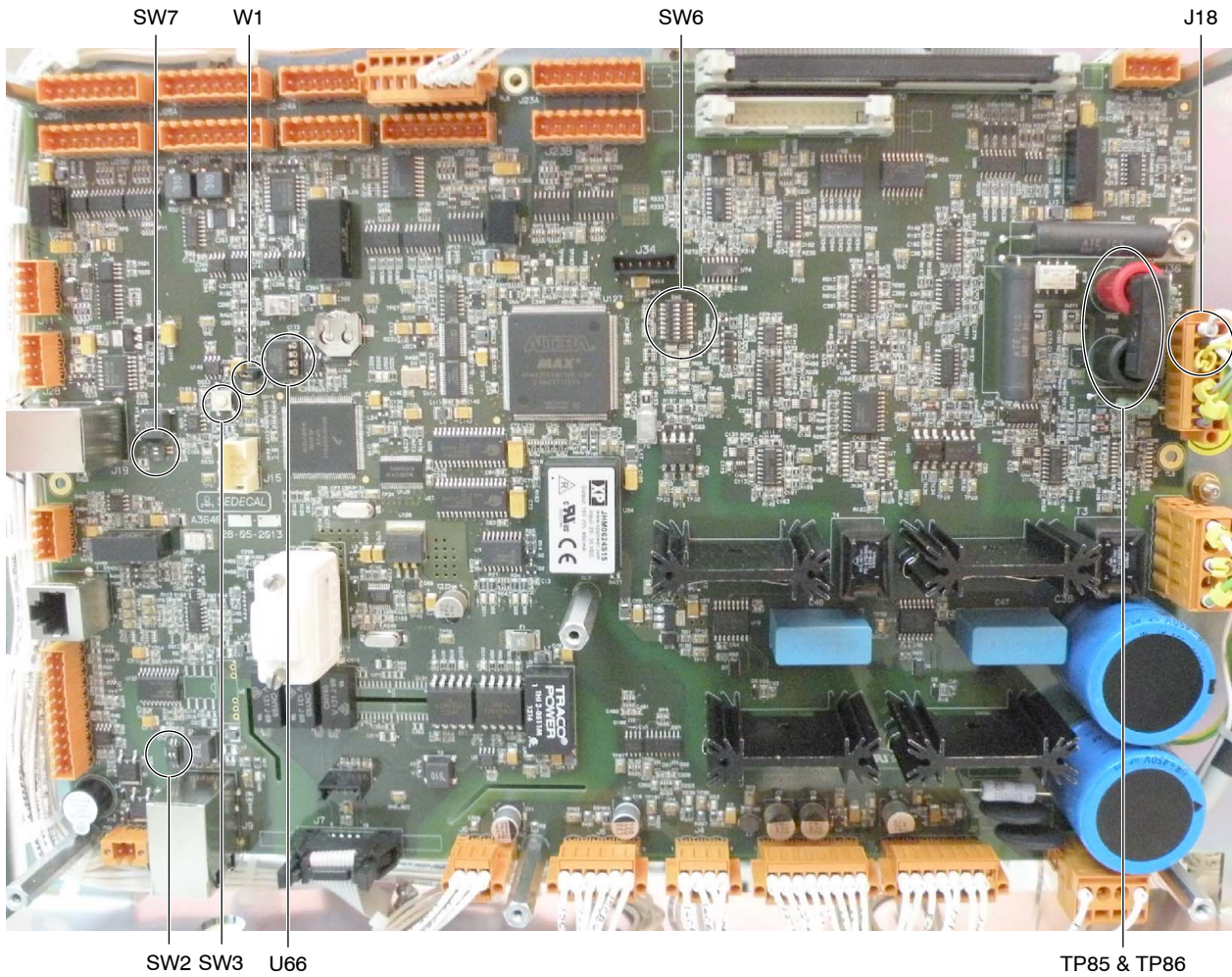
**Note** 

*Bear in mind that calibration and configuration data will be lost and restored to default values whenever the EEPROM is initialized.*

### 1.1.3 3640SW7 - CONTROL BOARD

Dip switch 3640SW7 is not used for configuration but all its switches must be set to **On**.

**Illustration 1-1**  
**Control board A3640-XX EEPROM, switches and jumpers**



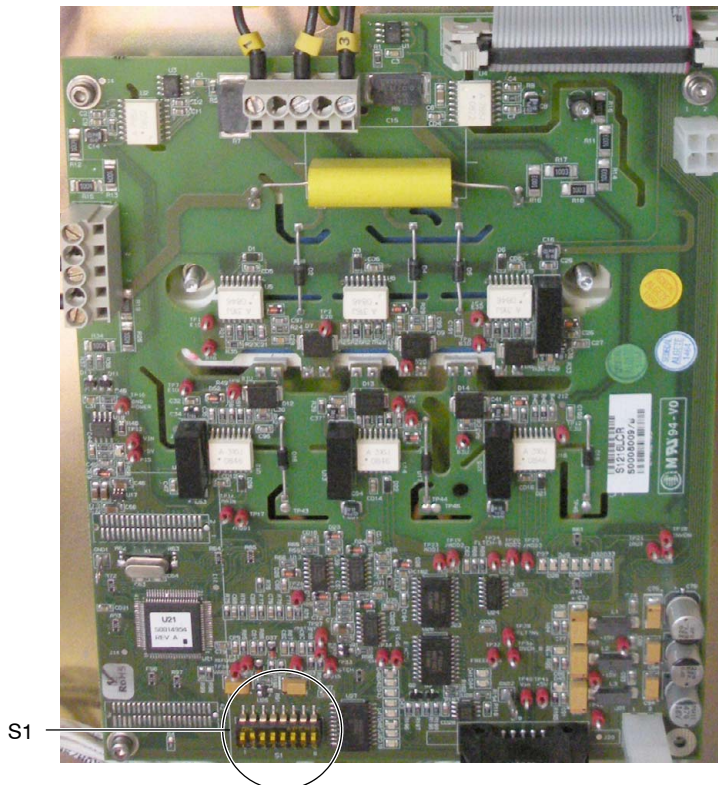
1.1.4 S0008009S1 - DUAL SPEED STARTER

Set dip switch S0008009S1 as indicated in Table 1-2.

**Table 1-2**  
**Test Dip Switch S0008009S1 on the Dual Speed Starter**

S0008009S1 POSITION	OPEN (OFF)	CLOSED (ON)
1	Not used. <i>Set to OFF.</i>	Not used.
2	Not used.	Not used. <i>Set to ON.</i>
3	Not used. <i>Set to OFF.</i>	Not used.
4	Not used. <i>Set to OFF.</i>	Not used.
5	Not used. <i>Set to OFF.</i>	Not used.
6	Not used. <i>Set to OFF.</i>	Not used.
7	Not used. <i>Set to OFF.</i>	Not used.
8	Not used. <i>Set to OFF.</i>	Not used.

**Illustration 1-2**  
**Dual Speed Starter S0008009 switches location**



## 1.2 BASIC CONFIGURATION OF GENERATOR BOARDS

The following Jumpers are factory set or removed to configure the Generator boards according to the customer order. Check the jumpers position in the Generator boards.

GENERATOR BOARDS	JUMPERS POSITION
CONTROL BOARD	W1 installed. Remove to update the software if software download has been interrupted and software can not be updated using the Downloader ( <i>refer to the Troubleshooting document</i> ).
	TP85 and TP86 installed. Remove for mAs measurement.
	J18 in "7-8" to allow the kV oscillator operation.

## SECTION 2 GENERATOR SERVICE MODE

Note 

*Generators operating with a CTSC Touch Screen Console have the Service Console program factory installed in the CTSC Console. For information on how to launch the Service Console and other Service operations with the CTSC, refer to Section 2.2.*

*For the rest of the Generators, proceed with Section 2.1.*

### 2.1 SERVICE CONSOLE INSTALLATION

To install the Service Console, plug the USB with the Software Service Tools of the Generator in the PC and click on the .exe file, *Tech Service Console Setup*. When installing the Service Console program in the computer, if the installer starts downloading .NET Framework from Internet, cancel the download and install version 4.0 (*dotNetFx40\_Full\_x86\_x64.exe*) from the folder where the main application installer is. Then, install the Service Console program.

Note 

*It might be necessary to change the port selection in the .ini file (located in the Tech Service Console folder) in case the cable is not connected to COM1 on the PC. In this case, open the ServiceConsole.ini file in the Notepad and modify the serial port selection according to the one in use, e.g. SERIAL\_PORT=COM3 (refer to Illustration 2-3).*

Start the SC program by clicking on the “Tech Service Console” desktop icon created during installation or in the path: *C:\Program Files (x86)\Sedeca\Service Tools\Tech Service Console X.X.X* (this is the path by default after installing the program). **A password is required, enter the following password in the pop-up window: 2434.** Then, the Service Console main menu is displayed on screen (refer to Section 2.3).

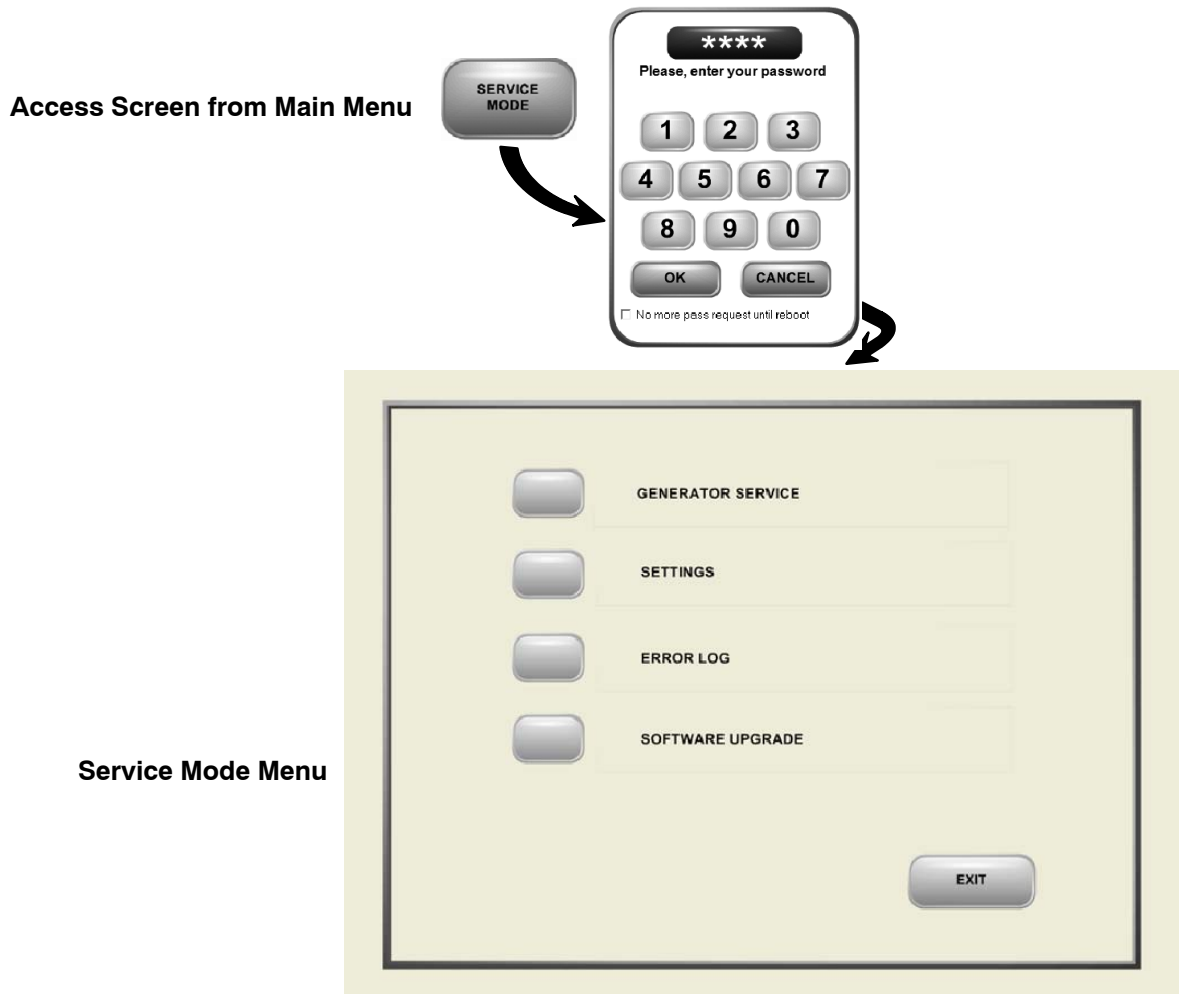
## 2.2 CTSC TOUCH SCREEN SERVICE MODE

The Service Menu includes the buttons to access to “Software Upgrade”, “Error Log”, “Settings” and “Generator Service” menus.

Access to the Service menus as follow:

1. Switch ON the System (Console + Generator) by pressing the “ON/OFF” button of the Touch Screen Console. It directly starts the application and shows the Main Menu.
2. Select the “Service Mode” button on the Main menu.
3. Enter the **Service Password (2434)** on the Service Access Panel.
4. Access to the different menus by selecting its respective button or go back to the Main Menu by pressing the “Exit” button.

Illustration 2-1  
Service Tab



### 2.2.1 SOFTWARE UPGRADE

The “**Software Upgrade**” button on the Service Mode Menu is used to close the Application Program without turning OFF the System. After pressing this button, the Console shows the PC Desktop to enable the access to the Service Console program by clicking in the “Tech Service Console” desktop icon (*refer to Section 2.3*).

**Note** 

*It is recommended to connect a Keyboard to any of the USB ports of the CTSC Touch Screen Console to operate with the Service Console.*

### 2.2.2 ERROR LOG

The Error Log Menu shows a list of the latest fifty (50) Errors with indication of: code, date, hour and error description.

### 2.2.3 SETTINGS

Settings Menu is comprised of Configuration of the Workstation Icons, Communications, Generator Options and Printer screens.

Access to these screens by selecting the respective Tab in the “Settings” menu. Press the “OK” button to apply the new selections or press “Exit” to go back to the Service menu.

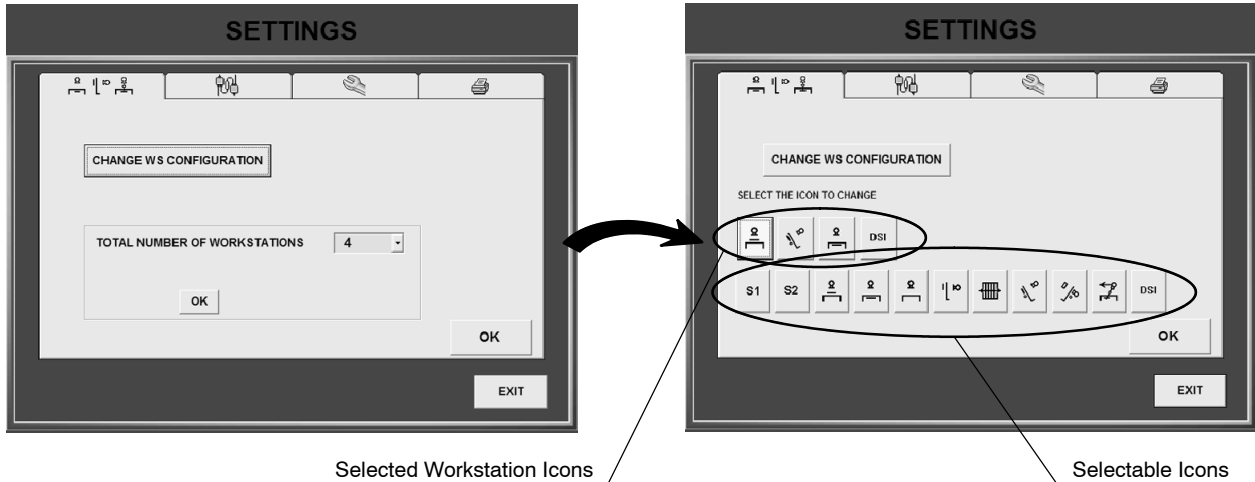
The **Workstation Icon Menu** is used for selecting the most suitable Icon for each workstation button in the System.

**Note** 

*Note in the “Data Book” the Icons configured for each Workstation. Values configured in Section 2.13.2.1 must be set according to the selected icons.*

Press the “Change WS Configuration” button and set the total number of workstations to be used. Then press the “OK” button and select the Icon for each workstation. In the new screen, Icons in the upper line correspond to the Icons that will appear for each workstation in the Application Program (operation mode).

**Illustration 2-1**  
**Settings - Workstations Menu**



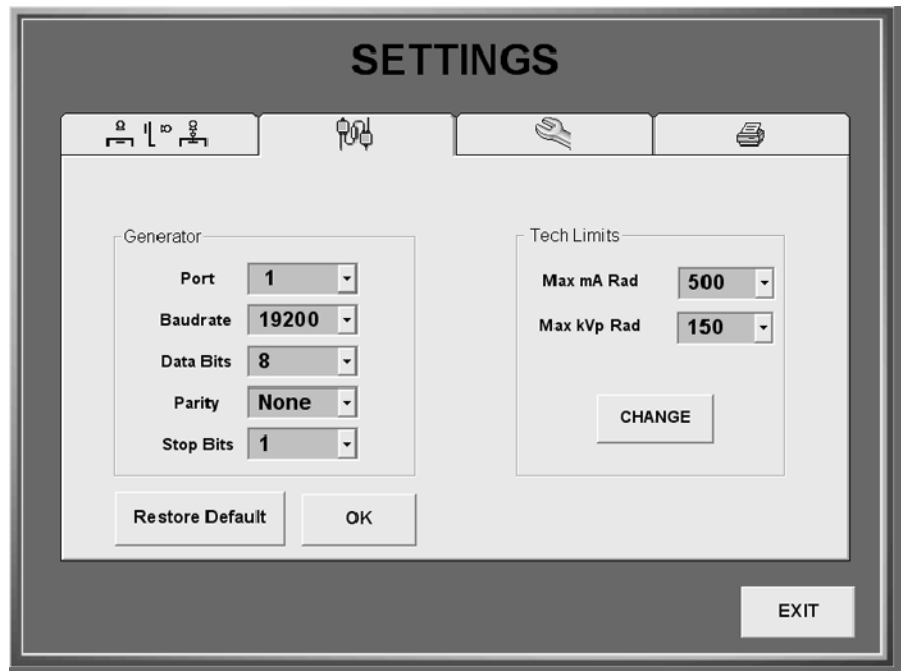
Selected Workstation Icons

Selectable Icons

The **Communications Menu** is used to configure the speed and communication port of the PC unit (inside the Touch Screen Console) where the link of the Generator Cabinet is connected, and the Technical Limits for the maximum selectable value of each parameter in the Slider of the Application Program (operation mode).

Press “Restore Default” to set the default values or modify them and press “OK” to set the new values.

**Illustration 2-2**  
**Settings - Communications Menu**



Serial communication have to be connected to the following ports of the Console (PC Unit):

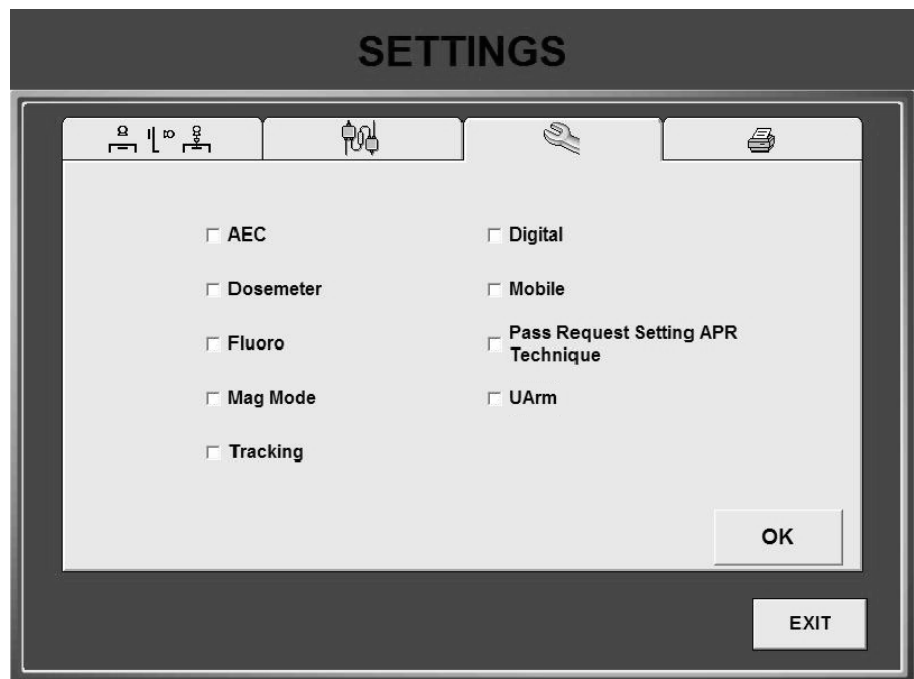
COM PORT	CONNECTION
COM 1	Generator Cabinet.
COM 2	Touch Screen (internal connection).
COM 3	Printer (optional)
COM 4	Laptop (PC)

**Note** 

*Verify that Serial Communication is properly connected to the respective Serial Ports of the Console (PC unit). If these connections are wrong during start-up, the Application Program will not work correctly.*

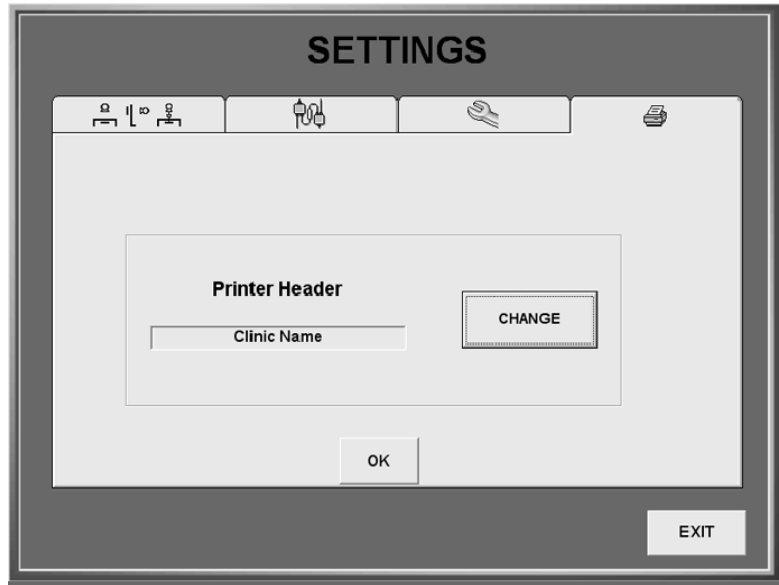
The **Generator Options Menu** is used to configure and enable/disable the controls of the indicated options in the Application Program (operation mode).

**Illustration 2-3**  
**Settings - Options Menu**



The **Printer Menu** is used for entering the Hospital or Clinic Name which is shown in all printed information. This name can be modified using the keyboard that appears after pressing the “Change” button.

Illustration 2-4  
Settings - Printer Menu

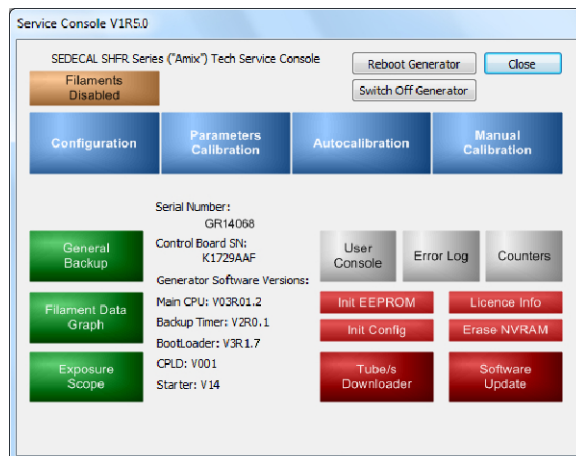


### 2.3 SERVICE CONSOLE GENERAL CONTROLS

The Service Console (SC) program allows the access to the service screens for Configuration and Calibration procedures, reading the Error Log and Exposure Counters, downloading the Tube parameters and updating the software. It also allows the access to the User Console.

The Service Console menu shows additional information such as the Generator and the Control board Serial Numbers, and the Software versions.

Illustration 2-2  
SC Menu



The different screens of the Service Console program are displayed after selecting the respective button on the Service Console main screen. Press “Close” to return to the SC menu.

**Note** 

*The minimum screen resolution required to correctly display the screen is 1024x768. A screen resolution of 800x600 can be used to display the main screens correctly but the lower part of the Exposure Scope, where +5V, +15V and +25V can be selected, will not be displayed.*

**Note** 

*Whenever the “Configuration” menu is closed (by pressing the “Close” button) after pressing the “Store Data (In SHFR)” button, a long double-beep will sound confirming the storage of the values set for each workstation. A short double beep would alert the user in case any error occurs.*

Press the “Close” button to exit from the SC program.

### REBOOT GENERATOR BUTTON

Reboot Generator

It is needed to reset the Generator when performing some of the configuration procedures in order to apply the changes. Press the “Reboot Generator” button in the Service Console menu screen and wait for the Generator to reboot.

If communication with the computer is lost, press the SW3 button in the A3640-XX Control board (*refer to Illustration 1-1*) to reset the Generator.

### SWITCH OFF GENERATOR BUTTON

Switch Off Generator

To Switch Off the Generator, press the “Switch Off Generator” button. Wait for the Generator to turn off and then close the Service Console program.

If communication with the computer is lost, press the Off button in the Interface Box or in the Control Console, depending on the System configuration, instead of using the SC.

If the microprocessor does not respond and the Generator cannot be shut down, press the Off button in the Interface Box or in the Control Console, depending on the System configuration, during 5 seconds to force the shutdown.



**NEVER PRESS THE SW3 RESET BUTTON OR FORCE THE SHUTDOWN OF THE GENERATOR WHEN THE TUBE IS IN HIGH SPEED.**

### GENERATOR SERIAL NUMBER



The Generator Serial number can be modified by double-clicking on it and entering the password for advanced options (*refer to Section 2.13.7*). This option is especially useful to restore the Generator serial number if the A3640-XX Control board has to be replaced.

### ENABLING/DISABLING THE FILAMENTS



This button is used to disable and enable the filaments, just as switch 3640SW6-4 of the Control board (*refer to Section 1.1.2*). When filaments are disabled, no radiation will be produced during the exposure.

Take into account that filaments are always disabled when switch 3640SW6-4 is set to On, regardless of this selection. Filaments can be enabled/disabled by pressing this button only when switch 3640SW6-4 is set to Off.

### RESET ERROR BUTTON



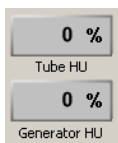
The "Reset Error" button appears when an error code or message is displayed in the lower part of the SC program and in the User Console. Press it to reset the error indication.

### EXPOSURE STATUS ICONS



Exposure status icons for "Ready" and "X-ray On" are located on the Manual Calibration, Autocalibration and User Console screens. "Ready" icon gets lighted when the Exposure Control is pressed halfway ("Prep" position) and "X-ray On" icon is lighted when the Exposure Control is pressed full way and remains lighted during the length of exposure.

### HEAT UNITS



Used Heat Units of the Generator and Tube are shown in the right bar of the Manual Calibration, Autocalibration, User Console, AEC calibration and Fluoro calibration screens.

### DATA SOURCE



Configuration, Calibration and Filament Data Graph screens show the source of the displayed data:

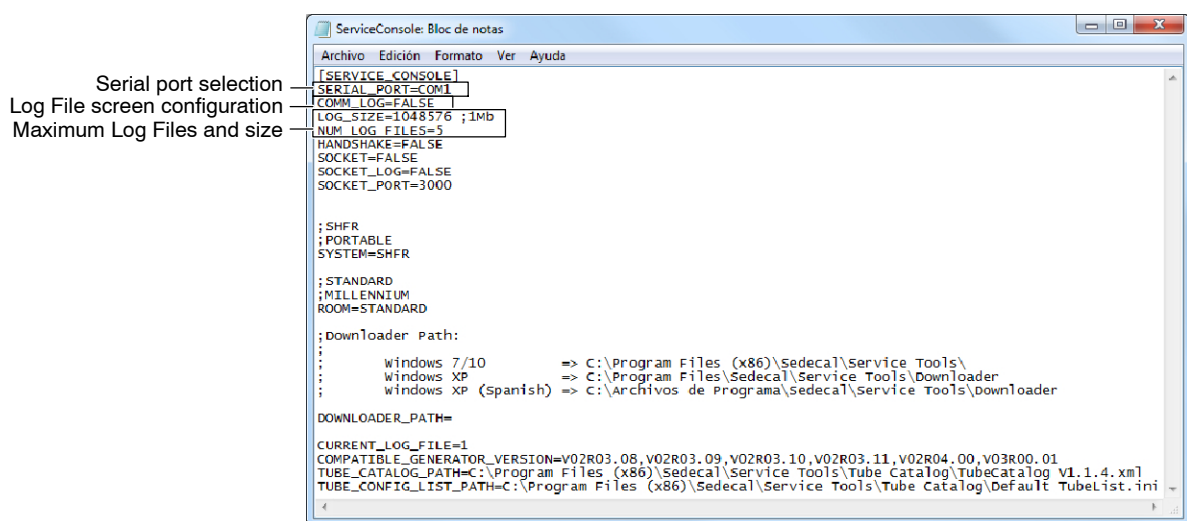
- From File: The data displayed is the data restored from a file but not necessarily saved in the Generator yet.
- From Generator: The data displayed is the data saved in the Generator.

## 2.4 LOG FILE SCREEN

The Log File screen provides the user general information about the configuration and calibration processes, errors and exposures. It also allows communication from user to system.

The Log File screen can be configured to be automatically opened along with the SC program. To do so, modify the ServiceConsole.ini file in the Tech Service folder (refer to *Illustration 2-3*).

**Illustration 2-3**  
**ServiceConsole.ini**



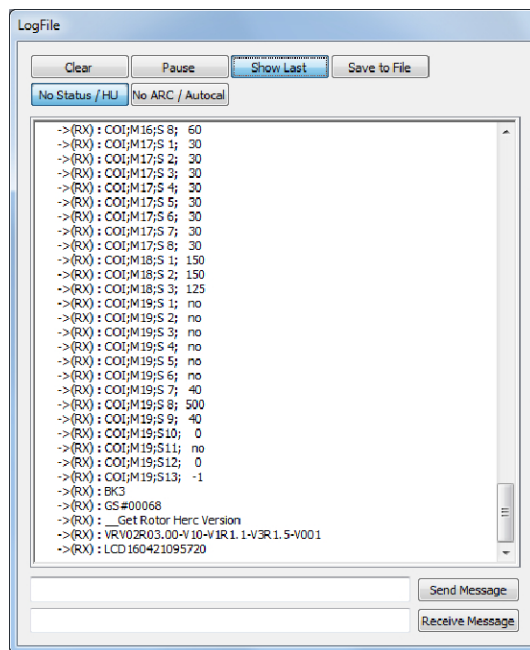
Open the .ini file in the Notepad and modify the command line parameter:

- **COMM\_LOG=FALSE:** Log File screen is not displayed.
- **COMM\_LOG=TRUE:** Log File screen is displayed when launching the SC application and a Log file is saved in the Service Console folder containing all the Log information. This file will be automatically updated with every new Log message. The number and size of Log files can be configured as follows:
  - **LOG\_SIZE.** Selects the maximum size of the Log file. It is set to 1Mb by default.
  - **NUM\_LOG\_FILES.** Selects the maximum number of Log files saved in the computer. When the maximum configured Log files is reached, the first one is overwritten. It is set to 5 by default.

### Log File screen buttons:

- Clear: deletes all the messages. The Log file saved in the Service Console folder does not lose its data.
- Pause: messages popping momentarily stops.
- Show last: when pressed, the Log File screen automatically scrolls down to show the last messages.
- Save to File: press to save a .txt file containing the messages shown in the Log File screen. It is recommended to press the “Pause” button first to make sure that the desired messages are saved in the last position, so they are easier to find. After pressing the “Save to File” button, assign a name to the file and save it in the desired folder on the computer. The message “Log File Saved” will be displayed. Press “Accept”.
- No Status/HU: it is pressed by default to hide all the status and heat units messages. When it is not pressed, this messages are shown constantly.
- No ARC/Autocal: press to hide starter and autocalibration messages.

**Illustration 2-4**  
**Log File screen**



## 2.5 GENERAL BACKUP



The “General backup” button is used to make a backup of all the data of the equipment (Configuration, Parameters Calibration, Filament Data Graph, Error Log and Counters).

Once the calibration and configuration procedures are completed, it is strongly recommended to save a general backup in the computer in case it is needed to be restored in the future. It is also possible to make a backup of just the Configuration data (*refer to Section 2.13.8*), the Parameters Calibration data or the Filament Data Graph (*refer to Calibration document*).

Error log and Counters data can also be saved independently using the “Save to file” button in their respective screens.

When the “General backup” button is pressed, several backup files are stored in the designated directory of the computer; five of them containing the saved data and a General Backup file, as named by the user, containing the Generator switches position (*refer to Section 1.1*). All the files include the Service Console version, the A3640-XX Control board serial number, the date of the backup, the date of the last calibration and the Generator software versions.



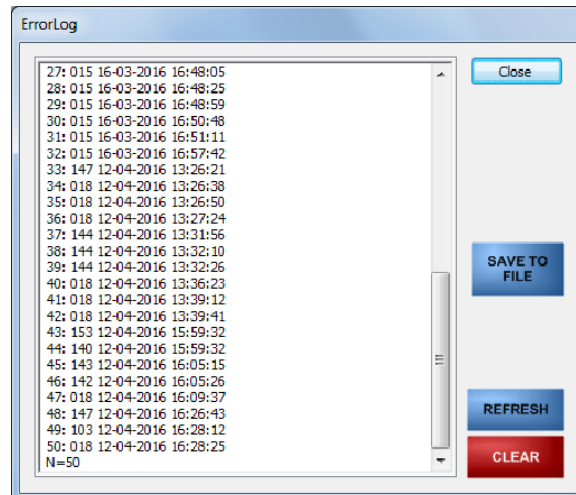
To restore the Configuration, Parameters Calibration and Filament Data Graph backup files, use the restore buttons located in their respective screens (*refer to their respective sections in this document [Configuration Window] and in the Calibration document [Parameters Calibration Window and Filament Data Calibration Checks and Backup]*).

### Note

*If the selected backup file to be restored has been created using a different version of the Tech Service Console, a warning will be displayed giving the user the option to abort the loading process.*

## 2.6 ERROR LOG

**Illustration 2-5**  
**Error Log screen**



The Error Log screen shows the list of errors encountered by the system with a description of the error and the time it happened.

To make a backup in the computer of the last errors shown (up to 50), follow the next steps:

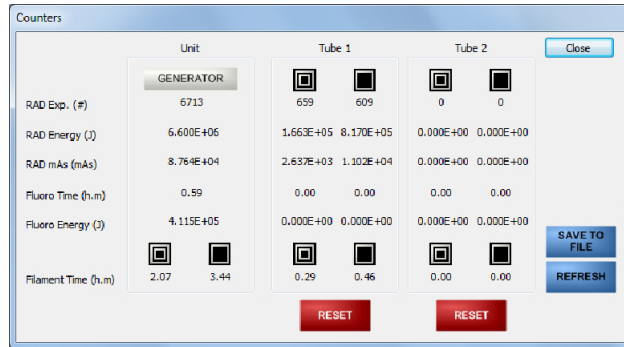
1. Press the "Save to file" button.
2. Assign a name to the file to be saved and save it in the desired folder on the computer.
3. The message "Error File Saved" will be displayed. Press "Accept".

Click "Refresh" to update values.

Click "Clear" to reset the list to zero.

## 2.7 COUNTERS

**Illustration 2-6**  
**Counters screen**



The Counters screen shows:

- The number of Rad exposures made with any of the Focal Spots of the X-ray Tube.
- The accumulated RAD Energy used by the Generator.
- The accumulated mAs used.
- The accumulated Fluoro exposure time in hours and minutes (in Generators with fluoro option).
- The accumulated Fluoro Energy used by the Generator (in Generators with fluoro option).
- Filament use time in hours and minutes.

To make a backup in the computer of the counters data, follow the next steps:

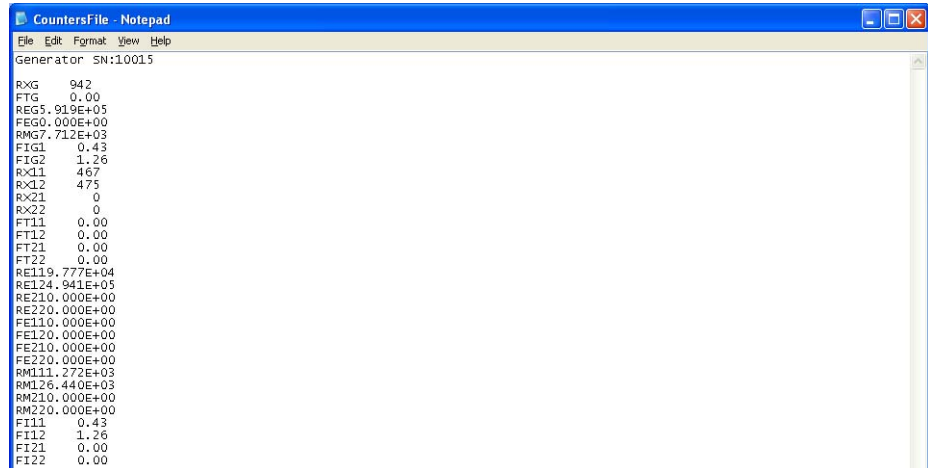
1. Press the “Save to file” button.
2. Assign a name to the file to be saved and save it in the desired folder on the computer. A .txt file will be saved in the designated folder.

Click “Refresh” to update values.

Click “Reset” to reset the tube counters to zero (Generator counters cannot be reset). To reset the tube counters a password is required. Use the password for advanced options (*refer to Section 2.13.7*).

Exit by pressing “Close”.

#### Illustration 2-7 Counters .txt file



```
CountersFile - Notepad
File Edit Format View Help
Generator SN:10015
RXG 942
FTG 0.00
REG5.919E+05
FEG0.000E+00
RMS7.712E+03
FIG1 0.43
FIG2 1.26
RX11 467
RX12 475
RX21 0
RX22 0
FT11 0.00
FT12 0.00
FT21 0.00
FT22 0.00
RE119.777E+04
RE124.941E+05
RE210.000E+00
RE220.000E+00
FE110.000E+00
FE120.000E+00
FE210.000E+00
FE220.000E+00
RML11.272E+03
RML26.440E+03
RM210.000E+00
RM220.000E+00
FI11 0.43
FI12 1.26
FI21 0.00
FI22 0.00
```

The information saved in the .txt file is shown in several sets of characters encoded as follows:

- RX: RAD Exp.
- RE: RAD Energy
- RM: RAD mAs
- FT: Fluoro Time
- FE: Fluoro Energy
- FI: Filament Time

The previous sets of characters are followed by any of this characters:

- G: Generator
- G1: Generator, Small Focal spot
- G2: Generator, Large Focal spot
- 11: Tube 1, Small Focal spot
- 12: Tube 1, Large Focal spot
- 21: Tube 2, Small Focal spot (not used)
- 22: Tube 2, Large Focal spot (not used)

## 2.8 EEPROM INITIALIZATION

**Init EEPROM**

It is possible to restore the EEPROM to default values by pressing the “Init EEPROM” button on the SC menu.

The user will be asked for confirmation and will be given the option to keep the potentiometers adjustment and mA gain values:

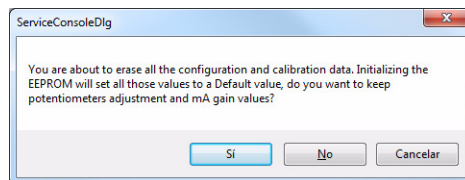
- Click “Yes” to initialize the EEPROM keeping the potentiometers adjustment and mA gain values (*refer to the Calibration document of the Service manual for further information about the calibration data*).
- Click “No” to initialize the EEPROM without keeping any stored value.
- Click “Cancel” to exit without initializing the EEPROM.

A password is needed to complete the EEPROM initialization. Use the password for advanced options (*refer to Section 2.13.7*).

**Note** 

*Bear in mind that calibration and configuration data will be lost and restored to default values whenever the EEPROM is initialized.*

### Illustration 2-8 Confirmation message



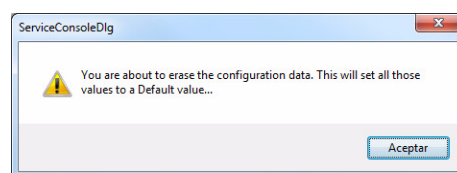
## 2.9 CONFIGURATION INITIALIZATION

**Init Config**

It is possible to restore the configuration data to default values by pressing the “Init Config” button on the SC menu.

The user will be asked for confirmation and a password is needed to complete the Configuration initialization. Use the password for advanced options (*refer to Section 2.13.7*).

### Illustration 2-9 Confirmation message



## 2.10 ERASE NVRAM

Erase NVRAM

It is possible to delete all the data stored in the NVRAM and restore it to default values. The user will be asked for confirmation and a password is needed to complete the procedure. Use the password for advanced options (*refer to Section 2.13.7*).

Note 

*This option is specially useful to reset these data to default values when the A3640-XX Control board has been repaired.*

Press this button to erase the following data:

- Counters. Resets the Generator and Tube counters to 0.
- Error logs. Erases all the errors saved in the Error Log of the Generator.
- Tubes data. Erases the list of Tubes of the Generator. *Refer to Section 2.12* for information on how to load Tubes in the Generator.
- Calibration date. Erases the date of the last calibration, which is displayed in the Filament Data Graph screen and included in the backup files that can be stored in a computer. A default date will be displayed instead of the real date.
- Fluoro curve. Erases the Fluoro curve stored in the Generator and sets the default one, where all the values are the same.
- Filament enable. Disables filaments in the main screen button in case they were enabled.
- Power limit percentage. Sets the Power Reduction of the User Console to 100%.
- Tube thermal status. Sets the Tube Heat Units to 0%.
- Inverter thermal status. Sets the Generator Heat Units to 0%.



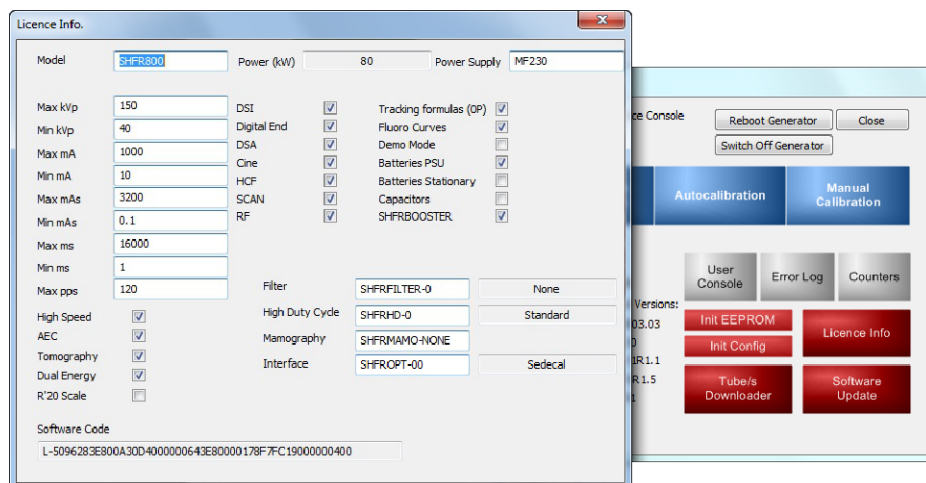
**TAKE INTO ACCOUNT THAT IF THE GENERATOR HAS BEEN IN USE PRIOR TO THE NVRAM RESET, THE TUBE AND/OR GENERATOR THERMAL STATUS MAY NOT GUARANTEE THE SAFETY USE OF THE GENERATOR EVEN THOUGH THE HEAT UNITS HAVE BEEN RESET TO 0%. IN THIS CASE, WAIT FOR THE TUBE AND/OR GENERATOR TO COOL DOWN BEFORE MAKING ANY X-RAY EXPOSURE.**

## 2.11 LICENCE INFO



Press this button to display a window showing all the information (Generator characteristics, power, options and allowed configuration) stored in the licence plugged to J17 on the A3640-XX Control board.

**Illustration 2-10**  
Licence Info screen



## 2.12 TUBES DOWNLOADER

**Note**

Connect the serial cable between COM1 port on the PC and J28 on the A3640-XX Control board if the computer is not connected already to the Generator through the Interface Box or through the Control Console.

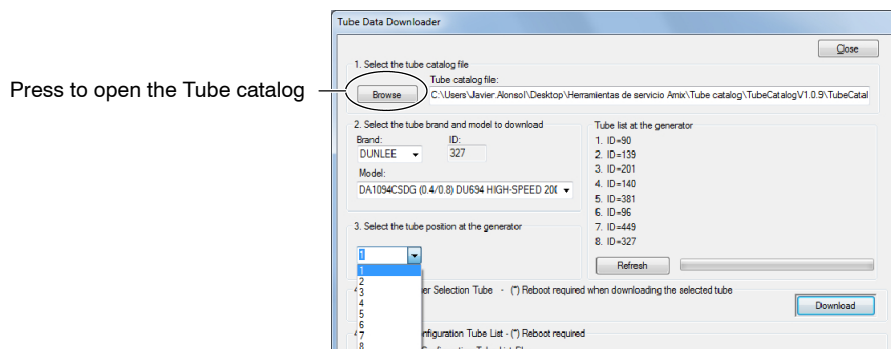
It might be necessary to change the port selection in the .ini file located in the Tech Service folder in case the cable is not connected to COM1 on the computer (refer to Illustration 2-3). In this case, open the ServiceConsole.ini file in the Notepad and modify the serial port selection according to the one in use.



1. Launch the Tubes Downloader from the Service Console by pressing the “Tube/s Downloader” button. A list of the tubes loaded in the Generator is displayed, showing only their IDs.

2. **To download the Tubes one by one, follow the procedure explained below:**
  - a. Press “browse” to select the folder of the USB with the Software Service Tools that contains the .xml Tube catalog and open the file (select the file and press “Open” or double click on it). Once the Tube catalog has been opened and the “Refresh” button is pressed, some other information is shown in the “Tube list at the generator” column along with the IDs of the downloaded tubes:
    - Nominal focal spot value.
    - Brand and model of the tube.
    - Starter name or type.
    - Date or revision of the tube catalog: some of the tube specifications may change from one revision to another. Make sure that the revision of the selected tube matches the installed one.
  - b. Select the Tube Brand and Model to be downloaded and assign an Index position to it. Up to eight Tubes can be downloaded from the Tubes Catalog (the selected tubes are stored in the non-volatile RAM).
  - c. Start the transfer by clicking on the “Download” button and wait until the process ends and the Tube ID and model is displayed in the Status screen.
  - d. Repeat the process for all the Tubes to be downloaded.
  - e. Finally, press the “Close” button and reboot the Generator.

**Illustration 2-11**  
**Tube and index selection**



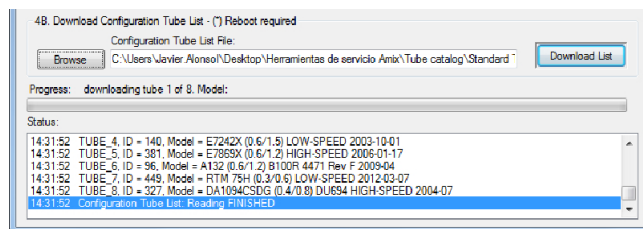
3. **To download a complete list of tubes instead of downloading the tubes one by one, follow the procedure explained below:**

**Note** 

*It is needed a .ini file containing a list of eight tubes with their ID and model to perform this procedure.*

- a. Press “browse” to select the folder of the USB with the Software Service Tools that contains the .xml Tube catalog and open the file (select the file and press “Open” or double click on it).
- b. Press the “browse” button in the section 4B (Download Configuration Tube List) of the screen to select the folder containing the Tube’s list (.ini file) and open it (select the file and press “Open” or double click on it).
- c. Start the transfer by clicking on the “Download List” button and wait until the process ends and the Tubes IDs and models are displayed in the Status screen.
- d. Finally, press the “Close” button and reboot the Generator.

**Illustration 2-12**  
**Tube list download**



## 2.13 CONFIGURATION WINDOW

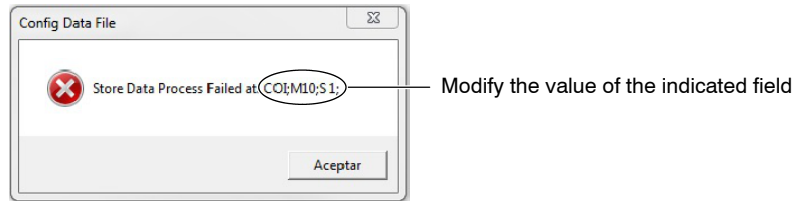


Press the “Configuration” button to launch the Configuration window. This window has several tabs to access the different configuration screens (Configuration Main Page, Workstations and Starter, Tubes, Generator behavior, Date and Time and Fluoro).

When all the configuration parameters are set on each screen, press the “Store Data (In SHFR)” button to save the changes. If any value is later modified, press the “Store Data (In SHFR)” button to save the changes. It is required to reboot after saving the changes when modifying any of the parameters marked with an asterisk.

If an error is detected when trying to save the entered data in any of the Configuration screens, a pop-up message is shown containing information about the field of the screen where the error is detected. Modify the incorrect value and press the “Store Data (In SHFR)” button again to save the changes.

#### Illustration 2-13 Configuration error



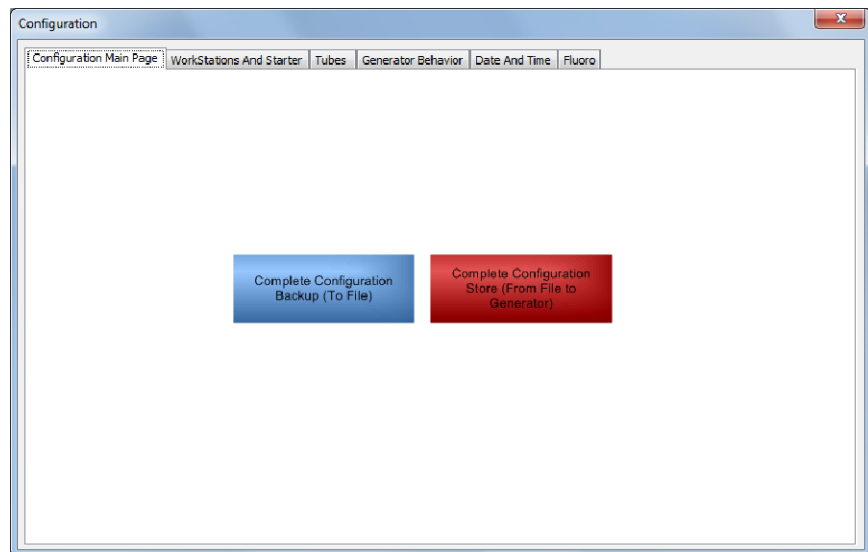
To check if a value has been properly saved, click on the “Refresh (From SHFR)” button. Values can be recovered from the Generator using the “Refresh (From SHFR)” button.

#### 2.13.1 CONFIGURATION MAIN PAGE

The Configuration window initially displays the Configuration main page, with two options:

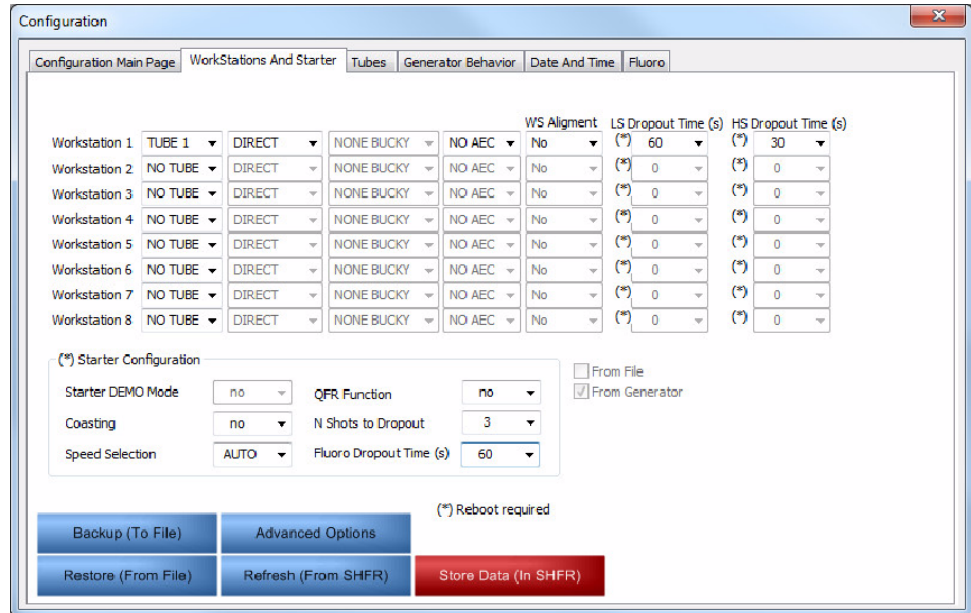
- **Complete Configuration Store (From File To Generator):** Click to restore the configuration data previously saved in a computer.
- **Complete Configuration Backup (To File):** Use this option once the Configuration process is completed (*refer to Section 2.13.8*).

#### Illustration 2-14 Configuration main page



2.13.2 WORKSTATIONS AND STARTER

Illustration 2-15  
Workstations and Starter configuration screen



2.13.2.1 WORKSTATIONS CONFIGURATION

WORKSTATIONS PARAMETERS

The workstations can be configured according to the customer preferences. If a workstation is configured with the value “No Tube”, it can not be selected during operation.

Set the respective values of each Workstation to be configured (select the new value by clicking on the corresponding option). Up to 8 Workstations can be configured.

Note

*When selecting an option that is not compatible with any of the other selectable options for that workstation, unsupported values will appear shaded. For example, if direct workstation is selected, bucky options are automatically blocked.*

**Illustration 2-16**  
**Workstation configuration**

Workstation 1	TUBE 1	BUCKY	BUCKY 1	NO AEC
Workstation 2	NO TUBE	DIRECT	NONE BUCKY	NO AEC
Workstation 3	TUBE 1	BUCKY	BUCKY 1	AEC 1
Workstation 4	TUBE 1	TOMO	BUCKY 2	AEC 2
Workstation 5	TUBE 1	STD R&F	BUCKY COM	NO AEC
Workstation 6	TUBE 1	DSI	NONE BUCKY	NO AEC
Workstation 7	TUBE 1	DSA	NONE BUCKY	NO AEC
Workstation 8	TUBE 1	CINE	NONE BUCKY	NO AEC
Workstation 9	TUBE 1	HCF	NONE BUCKY	NO AEC
Workstation 10	TUBE 1	DIRECT	NONE BUCKY	NO AEC
Workstation 11	TUBE 1	DIRECT	NONE BUCKY	NO AEC

**Note** 

Some of the values are not configurable depending on the Generator model. Before exiting the Workstations and Starter screen, make sure that all the configured and saved parameters are allowed by the licence plugged to J17 of the A3640-XX Control board (refer to Section 2.11). Otherwise, error 2 will be displayed on screen.

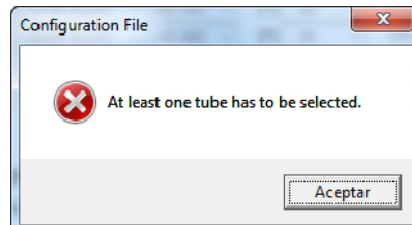
**Note** 

“BUCKY COM” can be selected in more than one Workstation when several Bucky/Detectors are connected to the serial port (wired or wireless). The operator must assign each Bucky/Detector to its corresponding Workstation later in the user interface.

**Note** 

If “Tube 1” is not selected in, at least, one Workstation, operation will not be allowed. A pop-up window will be displayed alerting the user when trying to save the values.

**Illustration 2-17**  
**Workstation configuration error message**



### WORKSTATION ALIGNMENT INTERLOCK

Two interlocks can be configured for the Table and Wall Stand Workstations in order to allow the X-ray exposure only when the X-ray Tube is aligned with the selected positioner.

These hardware signals correspond to the same signals used for Interlock 1 and 2 of the general interlocks that can be configured in the Generator Behaviour tab (*refer to Section 2.13.4 and to the schematics document*).

**Illustration 2-18**  
**Workstations Interlocks**

Workstation 1	TUBE 1	BUCKY	BUCKY 1	NO AEC	WS Alignment
Workstation 2	NO TUBE	DIRECT	NONE BUCKY	NO AEC	No
Workstation 3	NO TUBE	DIRECT	NONE BUCKY	NO AEC	Int 1
					Int 2

### DROPOUT TIME

Select the Tube Dropout Time for High speed and Low speed depending on the tube requirements on each workstation according to the technique to be used.

**Note** 

*If the Low Speed Dropout Time is longer than the High Speed one, Dropout Time will be always the selected value for Low Speed, even in High Speed.*

**Note** 

*The selected Dropout Time does not apply to fluoro operation. There is another field for Fluoro Dropout Time configuration.*

The anode rotation continues during the selected time when the Exposure Control is pressed to preparation position a predetermined number of times in less than one minute, as set in the “N Shots to Dropout” field.

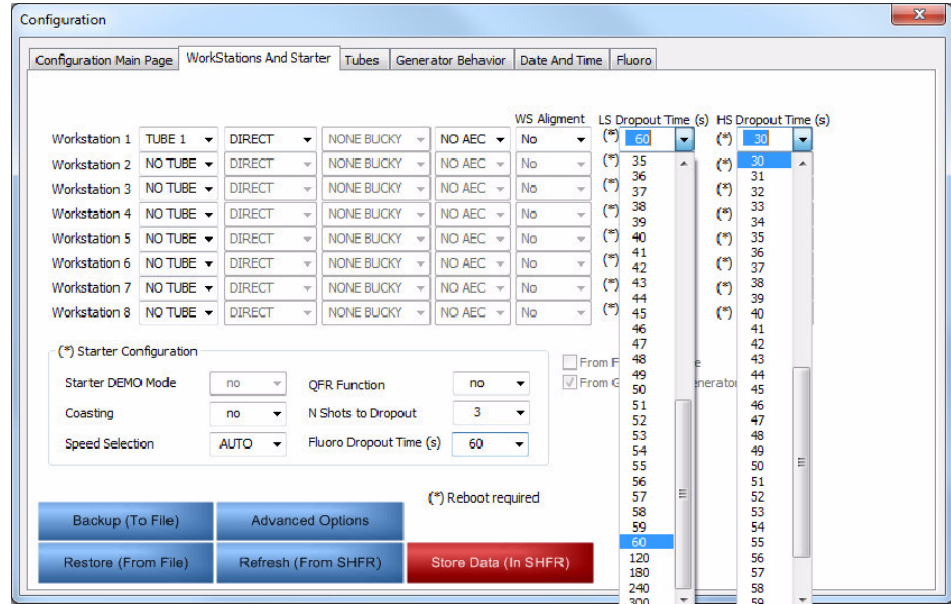
If the Exposure Control is pressed during Dropout Time, the Tube anode will continue rotating to complete a whole new Dropout Time cycle.

Low speed Dropout Time is factory set to 60 seconds.

High speed Dropout Time is factory set to 30 seconds.

Maximum Dropout Time is 300 seconds for both Low and High speed and 0 means no Dropout Time.

**Illustration 2-19**  
Dropout Time configuration



**2.13.2.2 STARTER CONFIGURATION**

**COASTING**

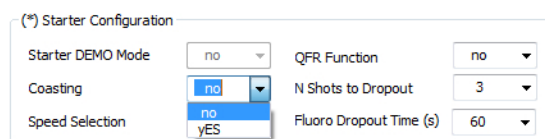
Select the required option according to the tube manufacturer recommendations.

- “Yes”: Select to deactivate the Low speed brake.
- “No”: Select to activate the Low speed brake.

*Note*

*High speed brake is always active. If the Tube is in High speed, it first reduces to Low speed regardless of the selected option.*

**Illustration 2-20**  
Coasting configuration

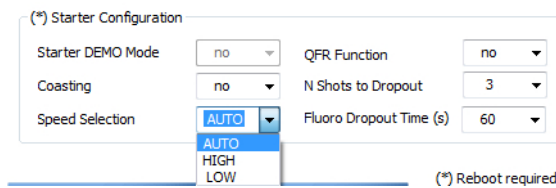


**SPEED SELECTION**

Generator can be set to work permanently in high speed, whenever the Tube allows it, or in low speed.

This option is set by default to “Auto”, so high speed is only used when the exposure parameters can not be achieved in low speed. Set it to “High” to work always in High speed or to “Low” to work always in Low speed, depending on the customer preferences.

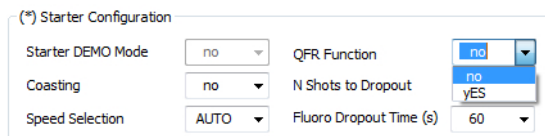
**Illustration 2-21  
Tube Speed selection**



**QFR FUNCTION**

When Quick Fluoro Ready Function is selected, the ready signal is sent as soon as the fluoro minimum preparation time is completed, that is, the selected value for “Fluoro Filament Setting Time” in the Fluoro screen (*refer to Section 2.13.6*), so the Fluoro technique can be started even if the Tube has not reached its final speed. This is possible because fluoro does not require high speed rotation of the anode. Nevertheless, if the right speed is not reached within the time it should take, exposure is immediately aborted.

**Illustration 2-22  
QFR Function configuration**

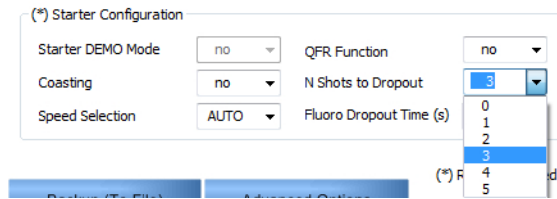


### NUMBER OF SHOTS TO DROPOUT

Select the desired number of times the Exposure Control has to be pressed in less than one minute in order to start the Dropout Time, as set in the “Dropout Time” field in the Workstations and Starter screen (refer to Section 2.13.2.1).

0 means no dropout time.

**Illustration 2-23**  
**Number of Shots to Dropout selection**

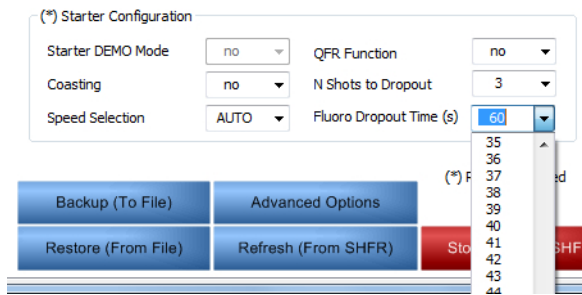


### FLUORO DROPOUT TIME

Select the Tube Dropout Time for fluoro depending on the tube requirements. The time is set in seconds, up to 300, and 0 means no Fluoro Dropout Time.

The anode rotation continues during the selected time every time the fluoro pedal is released.

**Illustration 2-24**  
**Fluoro Dropout Time configuration**



Press the “Store Data (In SHFR)” button to save the changes before exit the Workstations and Starter screen.

2.13.3 TUBES

**TUBE INDEX CONFIGURATION**

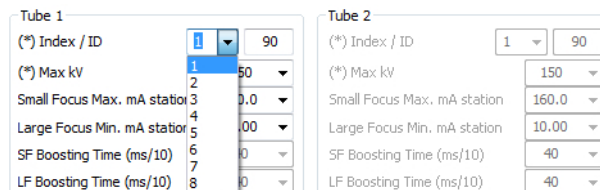
An Index position (1 to 8) is assigned to the tubes when they are downloaded from the Tubes catalog (refer to Section 2.12).

Select the corresponding Index position of the Tube to be used and check that its ID matches the installed Tube in the system.

*Note* 

*If the selected Tube does not match the installed one in the system, an error message will be displayed when turning on the Generator and exposure will not be allowed.*

**Illustration 2-25**  
**Tube position selection**

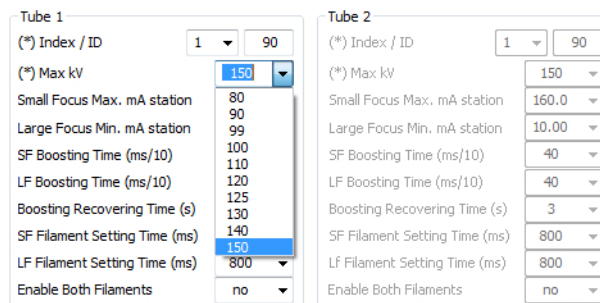


**MAX kV**

Maximum kV of the equipment can be limited from the maximum allowed by the licence down to 80. This option is especially useful when the X-ray Tube is not working properly at high voltage techniques.

This selection sets the maximum kV for both Rad and fluoro operations, no matter if the selected value for Fluoro Max kV is higher.

**Illustration 2-26**  
**Maximum kV selection**



Reboot Generator

If the Max kV value is modified, it is needed to reset the Generator to apply the changes. Press the “Reboot Generator” button.

**Note** 

*If the Generator is switched off after saving, changes will be applied next time the Generator is switched on.*

#### **mA STATIONS CONFIGURATION**

This configuration determines the highest mA station for the Small Focal Spot and the smallest mA station for the Large Focal Spot. Small and Large Focal Spots can overlap each other, so it is possible to configure all the mA stations for the Large Focal Spot.

The smallest mA station for the Large Focal Spot must be selected according to the customer preference. If Small and Large Focal Spots overlap each other, the Focal Spot change must be always performed manually. On the contrary, if they are not overlapped, the Focal Spot change will be made automatically when increasing or decreasing mA. When the mA stations are configured, a pop-up message alerts about the Focal Spot change condition, which can be automatic or non-automatic.

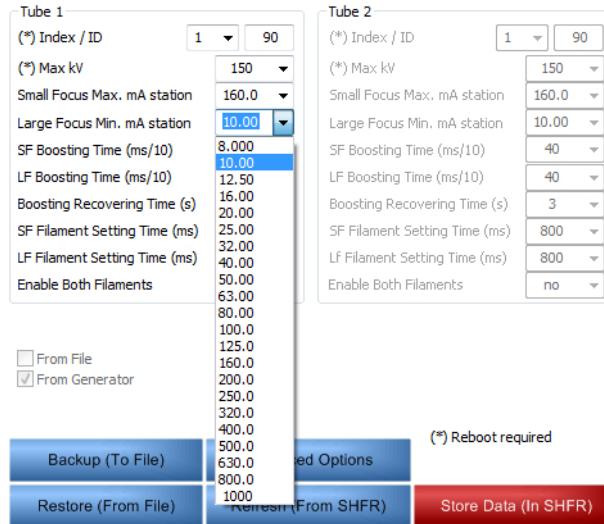


***If more mA stations are selected for any of the Focal Spots after performing the calibration procedure, calibration of the new mA stations must be completed before using the equipment. Otherwise, the X-ray tube could be damaged.***

1. Select the maximum mA station for the Small Focal Spot. If the maximum mA station configured for the Small Focal Spot exceeds the limits allowed by the X-ray Tube, it will be limited by software. The value will not be reachable in the User Console.

2. Select the minimum mA station for the Large Focal Spot.

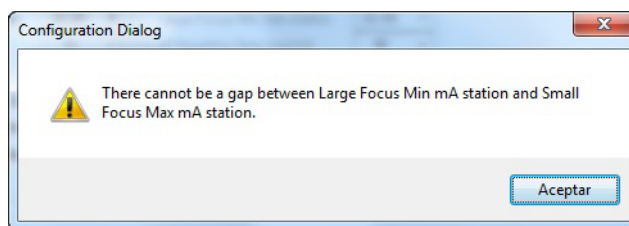
**Illustration 2-27**  
mA Stations Configuration



**Note** 

*If the mA stations selection is not correct, a pop-up message is shown alerting about it and the selection will not be modified.*

**Illustration 2-28**  
mA stations configuration error



### FILAMENT SETTING TIME

This option is used to set the minimum preparation time. Filament Setting Time for both Focal Spots is configurable, so it can be modified, if needed, depending on the tube characteristics.

**Illustration 2-29**  
**Filament Setting Time Configuration**

Tube 1	Tube 2
(*) Index / ID: 1   90	(*) Index / ID: 1   90
(*) Max kV: 150	(*) Max kV: 150
Small Focus Max. mA station: 160.0	Small Focus Max. mA station: 160.0
Large Focus Min. mA station: 10.00	Large Focus Min. mA station: 10.00
SF Boosting Time (ms/10): 40	SF Boosting Time (ms/10): 40
LF Boosting Time (ms/10): 40	LF Boosting Time (ms/10): 40
Boosting Recovering Time (s): 3	Boosting Recovering Time (s): 3
SF Filament Setting Time (ms): 800	SF Filament Setting Time (ms): 800
LF Filament Setting Time (ms): 800	LF Filament Setting Time (ms): 800
Enable Both Filaments: 800	Enable Both Filaments: no
<input type="checkbox"/> From File	
<input checked="" type="checkbox"/> From Generator	

### ENABLE BOTH FILAMENTS

“Yes” is selected to preheat both filaments of the X-ray Tube. This option is especially useful for Fluoro operation, so faster transitions from RAD to Fluoro, and vice versa, are allowed.

Select “No” to preheat only the selected filament.

**Illustration 2-30**  
**Filaments heating options**

Tube 1	Tube 2
(*) Index / ID: 1   90	(*) Index / ID: 1   90
(*) Max kV: 150	(*) Max kV: 150
Small Focus Max. mA station: 160.0	Small Focus Max. mA station: 160.0
Large Focus Min. mA station: 10.00	Large Focus Min. mA station: 10.00
SF Boosting Time (ms/10): 40	SF Boosting Time (ms/10): 40
LF Boosting Time (ms/10): 40	LF Boosting Time (ms/10): 40
Boosting Recovering Time (s): 3	Boosting Recovering Time (s): 3
SF Filament Setting Time (ms): 800	SF Filament Setting Time (ms): 800
LF Filament Setting Time (ms): 800	LF Filament Setting Time (ms): 800
Enable Both Filaments: no	Enable Both Filaments: no

Store Data (In SHFR)

Press the “Store Data (In SHFR)” button to save the changes before exit the Tubes screen.

2.13.4 GENERATOR BEHAVIOR

**MAX POWER (kW)**

The maximum kW of the Generator is factory set according to the Generator performance. Generator kW can be limited to a lower value in 1 kW steps, from full power to 1 kW.

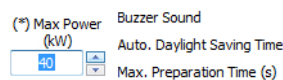
This reduction is applied to the Generator not only in user mode, but also during calibration. Bear in mind that the power reduction selected in the User Console (refer to Section 2.14.1) is applied to the limit set in this configuration field.

**Note** 

*This limit can be set to a lower value to match the maximum Generator power to the Line power, due to a high line impedance (refer to Pre-installation document).*

Press the “Increase” or “Decrease” button to modify the value.

**Illustration 2-31**  
**Generator Max Power selection**



**PEAK POWER LIMITATION**

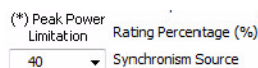
The maximum power of single phase Generators can be limited for X-ray exposures which take longer than 20 ms.

**Note** 

*This field will be shaded in gray for three-phase Generators.*

Select the maximum kW for this limitation, which will only be activated when the selected time for the X-ray exposure is higher than 20 ms.

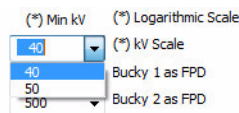
**Illustration 2-32**  
**Power Limit for Single-phase Generators**



**MIN kV**

Minimum kV of the Generator is 40. However, it can be limited to 50, so the 40 kV station will not be calibrated during the autocalibration procedure and 50 kV will be automatically picked by the Generator as the minimum kV station available.

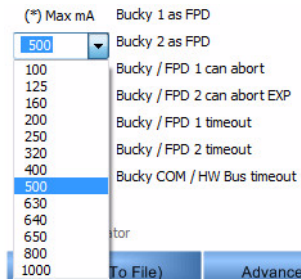
**Illustration 2-33**  
**Min kV selection**



**MAX mA**

Maximum mA can be limited down, so the mA stations over the established limit will not be calibrated during the autocalibration procedure.

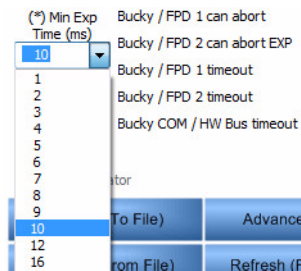
**Illustration 2-34**  
**Max mA selection**



**MIN EXPOSURE TIME**

Minimum exposure time can be set to any value from the minimum allowed by the licence up to 40 ms. This is especially useful for AED panels, so the minimum exposure time can be set according to the minimum acquisition time of the panel.

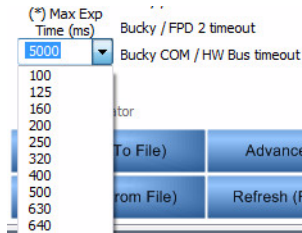
**Illustration 2-35**  
**Min Exposure Time selection**



**MAX EXPOSURE TIME**

Maximum exposure time can be limited down to 100 ms, to make sure it is not higher than the maximum acquisition time of the digital panel.

**Illustration 2-36**  
**Max Exposure Time selection**



**BUZZER SOUND**

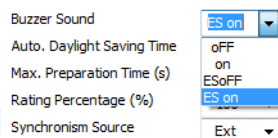
Buzzer sound is, at least, 500 ms long. It lasts as long as the exposure time when the exposure is longer than 500 ms, except for DSI, in which case it lasts as long as the pulse to avoid a continuous beep.

It is recommended to use the “ON” option (all sound enabled). Nevertheless, exposure or other sounds can be disabled for customers which use their own sounds.

Select the desired option in accordance to the customer preferences:

- OFF: Sound is disabled.
- ON: Sound is enabled.
- ES OFF: Exposure sound is disabled. Every other sound is enabled.
- ES ON: Exposure sound is enabled. Every other sound is disabled.

**Illustration 2-37**  
**Sound configuration**



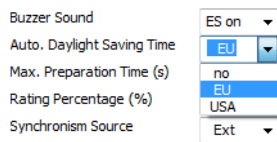
### AUTOMATIC DAYLIGHT SAVING TIME

This option sets the clock to be automatically adjusted for summer time in those countries that are observing Daylight Saving Time.

Select:

- “EU” or “USA”, depending on your location, for Automatic Daylight Saving Time.
- “No” to turn this option off, so the clock will not be set forward by one hour in the summer.


**Illustration 2-38**  
**Automatic Daylight Saving Time configuration**



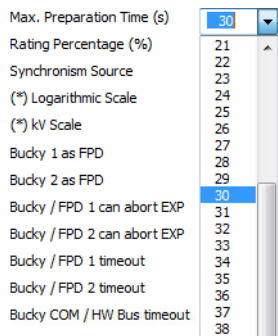
### MAXIMUM PREPARATION TIME

A maximum preparation time can be established to protect the Tube filament. When the Exposure control is pressed halfway (“Prep” position), the X-ray Tube is ready for the exposure. If the handswitch remains pressed in “Prep” position longer than the maximum preparation time, the Filament will be automatically switched to stand-by position.

Select a value from 10 to 50 seconds.

*Note*  The maximum preparation time is reset between stitching procedures.

**Illustration 2-39**  
**Maximum Preparation Time selection**

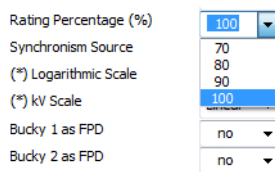


**RATING PERCENTAGE**

The X-ray Tube power can be limited from 100% to 70% in 10% steps for operating modes “0P” (Zero Point), “1P” (One Point) and “2P” (Two Points). When the Tube power is decreased, exposure time will be automatically increased as needed to properly perform the X-ray exposure.

Set the X-ray power limit in the “Rating Percentage (%)” field.

**Illustration 2-40**  
**Tube Power configuration**



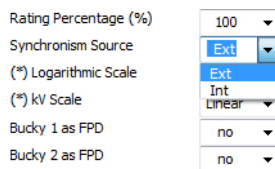
**SYNCHRONISM SOURCE**

Select “Ext” when using an external synchronism source or “Int” for internal synchronism source. This option applies both for Rad (DSI) and Fluoro.

Pulse width is set to 3 ms when internal synchronism source is selected.

For Fluoro calibration purposes select internal synchronism source.

**Illustration 2-41**  
**Synchronism Source selection**



### LOGARITHMIC SCALE

The logarithmic scale defines the steps for the mA and exposure time selection. It is set based on the Generator model and its characteristics, and on the customer preferences as well.

Logarithmic scale is factory set, but it can be modified by selecting the desired value (63, 64 or 65).

**Illustration 2-42**  
**Logarithmic Scale selection**

Rating Percentage (%)	100
Synchronism Source	Ext
(*) Logarithmic Scale	63
(*) kV Scale	63
Bucky 1 as FPD	64
Bucky 2 as FPD	65
	no

Reboot Generator

It is needed to reset the Generator to apply the changes. Press the “Reboot Generator” button.

**Note** 

*If the Generator is switched off after saving, changes will be applied next time the Generator is switched on.*

### kV SCALE

kV selection for the exposure can be made using the linear scale (40, 41, 42, 43, 44...) or the renard scale (40, 41, 42, 44, 46...).

**Illustration 2-43**  
**kV scale selection**

Rating Percentage (%)	100
Synchronism Source	Ext
(*) Logarithmic Scale	63
(*) kV Scale	Linear
Bucky 1 as FPD	Linear
Bucky 2 as FPD	Renard
	no

Reboot Generator

It is needed to reset the Generator to apply the changes. Press the “Reboot Generator” button.

**Note** 

*If the Generator is switched off after saving, changes will be applied next time the Generator is switched on.*

### BUCKY AS FPD

Select “Yes” for Bucky 1 and/or Bucky 2, if any of them is configured as Flat Panel, when using a Flat Panel Detector. In this case, the Generator limits the maximum exposure time to 2.5 seconds.

The maximum exposure time set by default can be modified using the customer’s application. It can be increased up to the maximum allowed for each detector model.

**Illustration 2-44**  
**Bucky as FPD Configuration**

Bucky 1 as FPD	no
Bucky 2 as FPD	no
Bucky / FPD 1 can abort EXP	yes
Bucky / FPD 2 can abort EXP	no
Bucky / FPD 1 timeout	10
Bucky / FPD 2 timeout	10
Bucky COM / HW Bus timeout	10

### BUCKY OR FPD CAN ABORT EXP

Bucky/Detector RX\_ORDER (Acknowledge) signal could be continuous or one pulse only.

- For continuous signal Buckys/Detectors:
  - When “Yes” is selected, if the RX\_ORDER (Acknowledge) signal is stopped before the exposure is completed, it will be immediately aborted.
  - Select “No” to finish the exposure even if the Acknowledge signal is stopped before the exposure is completed.
- For one pulse signal Buckys/Detectors always select “No”. Otherwise, exposure will always be aborted from the very first moment as soon as the Acknowledge signal turns off.

**Illustration 2-45**  
**Bucky or FPD can abort EXP Configuration**

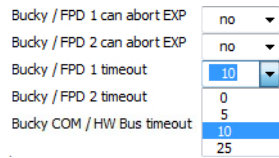
Bucky 1 as FPD	no
Bucky 2 as FPD	no
Bucky / FPD 1 can abort EXP	no
Bucky / FPD 2 can abort EXP	no
Bucky / FPD 1 timeout	yes
Bucky / FPD 2 timeout	10
Bucky COM / HW Bus timeout	10

**BUCKY/FPD TIMEOUT**

“Bucky/FPD Timeout” sets the elapsed time since the RX\_RQ (Request) signal is sent from the Generator until the RX\_ORDER (Acknowledge) signal is sent back from the Bucky/Detector. If no answer is received from the Bucky/Detector within the designated time, exposure will not be initiated and error 24 will be displayed.

Time is set in seconds and “0” means no waiting, so the Acknowledge signal from the Bucky/Detector must be received immediately.

**Illustration 2-46**  
**Bucky Timeout Configuration**

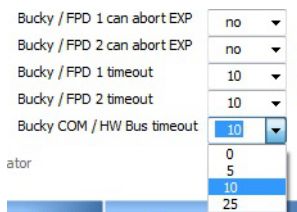


**BUCKY COM / HW BUS TIMEOUT**

“Bucky COM / HW Bus timeout” sets the time for the Bucky COM selection or Hardware Bus connected devices to be ready for the exposure.

Time is set in seconds and “0” means no waiting.

**Illustration 2-47**  
**Bucky COM Timeout Configuration**



### X-RAY KEY INTERLOCK

The Generator Control board can be provided with a key interlock to abort exposure. Select “Yes” when this option is used.

**Illustration 2-48**  
Key Interlock selection

X-Ray Key Interlock	<input type="button" value="no"/>	<input type="button" value="no"/>
Door Open Switch Interlock	<input type="button" value="no"/>	<input type="button" value="no"/>
Door Open can abort EXP	<input type="button" value="yES"/>	<input type="button" value="yES"/>
Tank Presostat Interlock	<input type="button" value="no"/>	<input type="button" value="no"/>
Interlock 1	<input type="button" value="no"/> can abort	<input type="button" value="no"/>
Interlock 2	<input type="button" value="no"/> can abort	<input type="button" value="no"/>

### DOOR OPEN SWITCH INTERLOCK

Select “Yes” when using a switch for door open detection. This will prevent the user from making any exposure whenever the door is open.

This option shall be always set to “No” in portable Generators.

**Illustration 2-49**  
Door Open Switch Interlock selection

X-Ray Key Interlock	<input type="button" value="no"/>	<input type="button" value="no"/>
Door Open Switch Interlock	<input type="button" value="yES"/>	<input type="button" value="no"/>
Door Open can abort EXP	<input type="button" value="no"/>	<input type="button" value="yES"/>
Tank Presostat Interlock	<input type="button" value="no"/>	<input type="button" value="no"/>
Interlock 1	<input type="button" value="no"/> can abort	<input type="button" value="no"/>
Interlock 2	<input type="button" value="no"/> can abort	<input type="button" value="no"/>

### DOOR OPEN CAN ABORT EXP

If the Generator is provided with a switch for door open detection:

- Select “Yes” to interrupt the exposure when the door is opened during an exposure.
- Select “No” to continue with the exposure even if the door is opened once the exposure has been started.

**Illustration 2-50**  
Exposure interruption selection

X-Ray Key Interlock	<input type="button" value="no"/>	<input type="button" value="no"/>
Door Open Switch Interlock	<input type="button" value="yES"/>	<input type="button" value="no"/>
Door Open can abort EXP	<input type="button" value="yES"/>	<input type="button" value="yES"/>
Tank Presostat Interlock	<input type="button" value="no"/>	<input type="button" value="no"/>
Interlock 1	<input type="button" value="no"/> can abort	<input type="button" value="no"/>
Interlock 2	<input type="button" value="no"/> can abort	<input type="button" value="no"/>

### TANK PRESOSTAT INTERLOCK

Select “Yes” if the Generator is equipped with a presostat which is intended to be used as an Interlock when the tank gets automatically opened due to overheat.

Note 

*If the Generator is not equipped with a presostat and “Yes” is selected, error 34 will be displayed when pressing the Handswitch to prep position.*

**Illustration 2-51**  
**Tank Presostat selection**

X-Ray Key Interlock	no	▼			
Door Open Switch Interlock	yES	▼			
Door Open can abort EXP	yES	▼			
Tank Presostat Interlock	no	▼			
Interlock 1	no	▼	can abort	no	▼
Interlock 2	no	▼	can abort	yES	▼

### INTERLOCKS

Up to four general inputs can be used for Interlock devices (*refer to the schematics document*). Select “Yes” in all the general Interlock inputs that are going to be used by the customer.

**Illustration 2-52**  
**Interlocks selection**

Interlock 1	yES	▼	can abort	no	▼
Interlock 2	no	▼	can abort	no	▼
Interlock 3	yES	▼	can abort	no	▼
Interlock 4	no	▼	can abort	no	▼

Along with the Interlocks selection, it is possible to configure whether the selected interlocks can abort the exposure once it has been started or not.

**Illustration 2-53**  
**Interlocks operation**

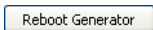
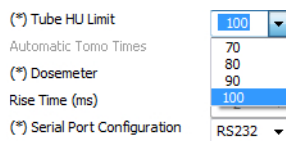
Interlock 1	yES	▼	can abort	yES	▼
Interlock 2	no	▼	can abort	no	▼
Interlock 3	no	▼	can abort	yES	▼
Interlock 4	no	▼	can abort	no	▼

### TUBE HEAT UNITS LIMIT

The maximum heating of the Tube in respect to its capacity can be limited to a lower value in 10% steps, from 100% to 70%.

The Heat Units value will always be displayed to the user in a scale from 0 to 100, with 100 being the maximum value set in this field.

**Illustration 2-54**  
**Tube HU Limit configuration**



It is needed to reset the Generator to apply the changes. Press the “Reboot Generator” button.

**Note** 

*If the Generator is switched off after saving, changes will be applied next time the Generator is switched on.*

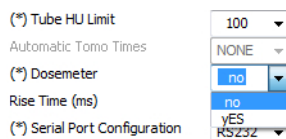
### DOSEMETER

Serial port J28 is available for general use unless “Yes” is selected in the “Dosemeter” field, thus becomes only available for the Dosemeter.

When “No” is selected, J28 can be used to connect a second Control Console, touch screen or computer.

Even if “Yes” is selected, J28 can be used for general use by switching dip switch 3640SW6-5 to On (*refer to Section 1.1.2*).

**Illustration 2-55**  
**Dosemeter configuration**



### SERIAL PORT CONFIGURATION

Configure the serial communications port (J25) for RS232, RS422 or RS485 standard in the “Serial Port Configuration” field.

**Illustration 2-56**  
**Serial port configuration**

(*) Tube HU Limit	100
Automatic Tomo Times	NONE
(*) Dosemeter	no
Rise Time (ms)	2
(*) Serial Port Configuration	RS232

### AEC RAPID TERMINATION

Rapid Termination is a Safety device that cuts the X-ray exposure in case of an error with the selected Ion Chamber or if the selected parameters (short backup time) are not appropriate for an exposure with AEC.

When selected, AEC Rapid Termination compares the AEC ramp with 30% of the final value at 30% of the Backup Time. It is activated after 30% of the exposure back-up time and after 10 ms of exposure, both conditions have to be fulfilled.

For a proper operation of the Rapid Termination feature, the operator must select an exposure back-up time higher or equal to 40 ms whenever the AEC is ON. Anyway, the back-up time must be selected according to the examination and patient, this exposure time is slightly higher than the worse case expected.

When AEC Rapid Termination is activated, Error Code “E070” is shown on the Service Console.

**Illustration 2-57**  
**AEC Rapid Termination configuration**

AEC Density	±4
AEC Rapid Termination	no
Dose Reduction Tank	no
ALOE Dig. Min. Length (ms)	yES 1
Auto Off timeout (min)	0
RAD Sync timeout (s)	2

### DOSE REDUCTION TANK

Select the corresponding option depending on how the Generator is equipped.

**Illustration 2-58**  
Dose Reduction Tank selection

AEC Density	±4
AEC Rapid Termination	no
Dose Reduction Tank	no
ALOE Dig. Min. Length (ms)	no
Auto Off timeout (min)	YES
RAD Sync timeout (s)	2

### ALOE MINIMUM LENGTH

A minimum length of the pulse that indicates the X-ray on condition is required in certain systems. The value set in this field determines the minimum length of this pulse.

Set the needed value according to the equipment characteristics to ensure that, no matter how short the exposure is going to be, the mentioned pulse is going to be received.

If the selected time is longer than the exposure to perform, the pulse will last as long as established. If the selected time is shorter than the exposure to perform, ALOE pulse will last as long as the exposure. Either way, the length of ALOE will not affect the length of the exposure.

**Illustration 2-59**  
ALOE dig. min. length configuration

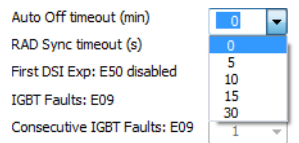
ALOE Dig. Min. Length (ms)	1
Auto Off timeout (min)	1
RAD Sync timeout (s)	2
First DSI Exp: E50 disabled	3
IGBT Faults: E09	4
Consecutive IGBT Faults: E09	5
Rest after IGBT Fault	6
Spare In 0 Functionality	7
Spare In 1 Functionality	8
	9
	10
	11
	12
	13

**AUTO OFF**

The Generator can be programmed to automatically shut down when not in use. This option is especially useful for battery powered generators.

Time is set in minutes and “0” means infinite waiting.

**Illustration 2-60**  
**Automatic shut down configuration**

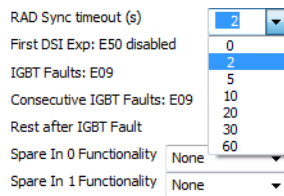


**RAD SYNCHRONISM TIMEOUT**

This field is used to select the maximum time waiting for DSI synchronism pulses from the system to the equipment before error 54 is displayed.

Time is set in seconds and “0” means infinite waiting.

**Illustration 2-61**  
**Rad Synchronism Timeout selection**

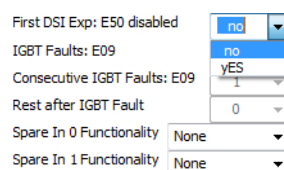


**FIRST DSI EXP: E50 DISABLED**

When “No” is selected, if the handswitch is released during the first exposure of DSI, exposure is aborted and error 50 is displayed. If it is released during the second exposure or later, the current exposure is completed and DSI process is finished then.

When “Yes” is selected, if the handswitch is released during the first exposure of DSI, although the exposure is aborted, no error is displayed.

**Illustration 2-62**  
**E50 configuration**

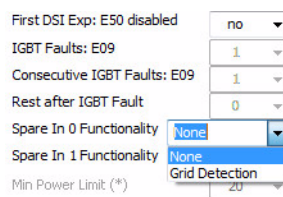


**SPARE INPUT 0 FUNCTIONALITY**

When “Grid Detection” is selected, the Generator detects automatically whether the grid is inserted or not. If the grid is not inserted, a message is sent to the User Console to alert the user about the situation. This signal is located in J11-2 of the A3640-XX Control board.

To use this functionality, connect the Grid’s cable to J11-2 and J11-3 and place a jumper between J20-1 and J20-2.

**Illustration 2-63**  
Spare input 0 configuration

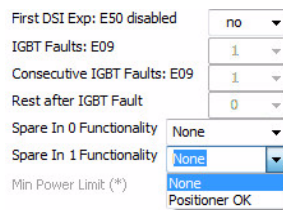


**SPARE INPUT 1 FUNCTIONALITY**

Select “Positioner OK” when this hardware bus signal is going to be used as an interlock or set this option to “None” if this signal is not in use.

This signal is located in TS1-7 of the A3674-XX Interface board. When the A3674-XX Interface board is connected to the A9599-XX board, connect to J1 or J2 of the A9599-XX Hardware BUS - Ethernet-CAN - SHFR Adaptation board to use this functionality.

**Illustration 2-64**  
Spare input 1 configuration



### MIN POWER LIMIT

Select the power derating to be applied in single phase Generators expressed as a percentage of the nominal power of the equipment. The maximum power allowed for exposures longer than 100 ms will be calculated according to a linear reduction from the nominal power at 100 ms to the selected percentage at 1 second.

**Note** 

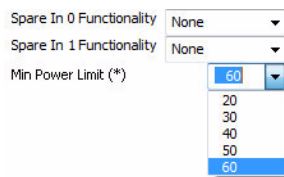
*This field will be shaded in gray for three-phase Generators.*

For example, in a 40 kW single phase Generator with a selected value of 50%, an exposure of 100 ms or shorter will allow to select a technique of a maximum power of 40 kW, an exposure of 550 ms will allow to select a technique of a maximum power of 30 kW and an exposure of 1 second or longer will allow to select a technique of a maximum power of 20 kW.

The power derate can be set from 60% to 20% in increments of 10%.

### Illustration 2-65

#### Power derating configuration



Spare In 0 Functionality: None  
Spare In 1 Functionality: None  
Min Power Limit (\*): 60

**Store Data (In SHFR)**

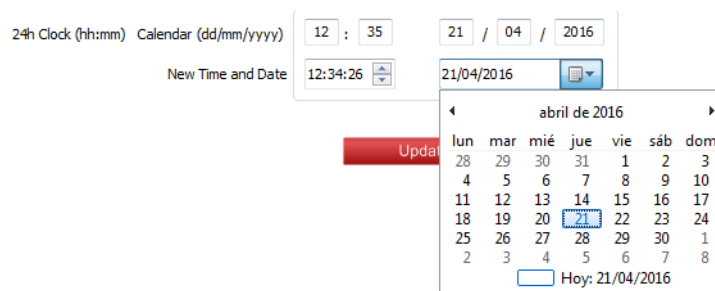
Press the “Store Data (In SHFR)” button to save the changes before exit the Generator Behavior screen.

2.13.5 DATE AND TIME

The “Date and Time” screen contains a digital clock and a calendar to ensure that the date gets entered into the database in the correct format.

The first line shows the time and date stored in the Generator while the second line shows the time and date fields that can be used to modify the “Real Time Clock” of the Generator.

**Illustration 2-66**  
**Time and Date**



1. To adjust the time, click on the group to be modified (hour, minutes or seconds). The numbers are now highlighted. Click on the increase/decrease buttons to modify the value or use the cursor movement keys to navigate and modify the values.
2. To adjust the date, click on the group to be modified (day, month or year). The numbers are now highlighted. Click on the increase/decrease buttons to modify the value or use the cursor movement keys to navigate and modify the values.
3. The date can also be adjusted using a drop-down calendar. Click on the “down arrow” button on the right of the date to drop down the calendar.
  - a. Use the cursor movement keys to navigate through the calendar and press Enter to exit or
  - b. Modify the date using the mouse:
    - Press the left/right arrow buttons and click on the desired date or
    - click on the name of the month or in the year displayed on top of the calendar to select a different month/year or
    - click on the “Today” area on the bottom of the calendar to set the date to today’s date.
4. Press the “Update RTC (In SHFR)” button to save the changes before exit.

Update RTC (In SHFR)

2.13.6 FLUORO

FLUORO MAX kV

Maximum kV of the equipment for fluoro operation can be limited down from 125 to 80 kV. But, despite the value set in this field, The maximum kV for both Rad and fluoro operations is set in the “Max kV” field, even if the “Fluoro Max kV” selection is higher.

Illustration 2-67  
Fluoro Maximum kV selection

(*) Fluoro Max kV	125	Fluoro Focus	SMALL
Fluoro Fil. Setting Time (ms)	80	Fluoro Sync timeout (s)	2
Synchronism Division (Ext.)	90	ABC Update Period (ms)	0
High Dose Filament Level	99	ABC Input Selection	None
High Dose Auto Off	100		
	110		
	120		
	125		

Reboot Generator

If the Fluoro Max kV value is modified, it is needed to reset the Generator to apply the changes. Press the “Reboot Generator” button.

Note

*If the Generator is switched off after saving, changes will be applied next time the Generator is switched on.*

FLUORO FILAMENT SETTING TIME

This option is used to set the minimum preparation time in fluoro. Fluoro Filament Setting Time is factory set to 800 ms but it can be modified if needed. The selection starts in 500 ms because this is the minimum time for fluoro ready.

This value affects the QFR function (Quick fluoro ready) (refer to Section 2.13.2.2). The selected time is also the time needed for the ready signal, when QFR is activated, to start the Fluoro technique before the Tube reaches its final speed.

Illustration 2-68  
Fluoro Filament Setting Time Configuration

(*) Fluoro Max kV	125	Fluoro Focus	SMALL
Fluoro Fil. Setting Time (ms)	800	Fluoro Sync timeout (s)	2
Synchronism Division (Ext.)	500	ABC Update Period (ms)	0
High Dose Filament Level	700	ABC Input Selection	None
High Dose Auto Off	800		
	1000		
	1200		
	1500		
	2000		
	2500		
	2700		

From File  
 From Generator

### SYNCHRONISM DIVISION

Using an external synchronism source, select “Yes” to divide the pulses according to the PPS selection if needed, depending on the system characteristics. E.g. If 15 is selected while working with 30 PPS, the equipment will make one exposure every two pulses.

**Illustration 2-69**  
Synchronism Division configuration

(*) Fluoro Max kV	125	Fluoro Focus	SMALL
Fluoro Fil. Setting Time (ms)	800	Fluoro Sync timeout (s)	2
Synchronism Division (Ext.)	no	ABC Update Period (ms)	0
High Dose Filament Level	no	ABC Input Selection	None
High Dose Auto Off	no		

### HIGH DOSE FILAMENT LEVEL

This option affects the Boost fluoro performance.

- Select “Yes” to perform Boost fluoro using a higher filament level.
- Select “No” to perform Boost fluoro increasing the pulse width.

**Illustration 2-70**  
High Dose Filament Level configuration

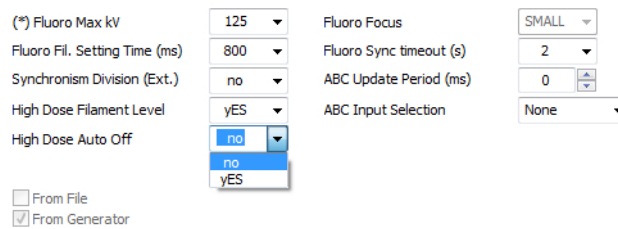
(*) Fluoro Max kV	125	Fluoro Focus	SMALL
Fluoro Fil. Setting Time (ms)	800	Fluoro Sync timeout (s)	2
Synchronism Division (Ext.)	no	ABC Update Period (ms)	0
High Dose Filament Level	YES	ABC Input Selection	None
High Dose Auto Off	no		
	YES		

### HIGH DOSE AUTO OFF

The options NO or YES can be selected in this menu. NO is selected by default.

- If YES is selected, the High Dose (or Boost) button can be used only when the Fluoro pedal is pressed and, after releasing the Fluoro pedal, the High Dose button is grayed out automatically.
- If NO is selected, the High Dose (or Boost) button is always enabled.

**Illustration 2-71**  
**High Dose Auto OFF**

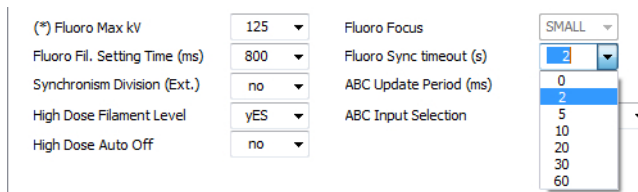


### FLUORO SYNCHRONISM TIMEOUT

This field is used to select the maximum time waiting for fluoro synchronism pulses from the system to the equipment before error 53 is displayed.

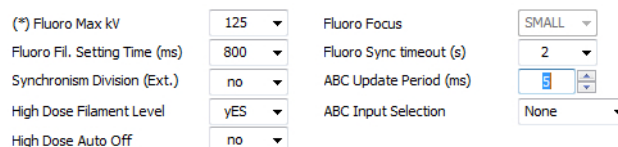
Time is set in seconds and “0” means infinite waiting.

**Illustration 2-72**  
**Fluoro Synchronism Timeout selection**



### ABC UPDATE PERIOD

Use this field to specify the update period of the ABC System (in ms), so the kV are updated according to it instead of being updated with every pulse.



### ABC INPUT SELECTION

If the Generator is interfaced with an ABC System, select the input source (“Analog”, “kV ±” or “Digital”). Otherwise, select “None”.

- None: Select this option when the system is not interfaced with an ABC System or to keep the kV constant when calibrating fluoro to make possible the mA reading.
- Analog: Select this option when using a voltage window comparator.
- kV ± : The customer’s system sends the signals to adjust the kV.
- Digital: The generator uses an ADC to read the brightness and it adjusts the kV accordingly.
- Analog Fast: Same as the “Analog” option, but using a faster algorithm that allows to achieve the final value sooner.
- kV ± Fast: Same as the “kV ±” option, but using a faster algorithm that allows to achieve the final value sooner.

**Illustration 2-73**  
**ABC input selection**

(*) Fluoro Max kV	125	Fluoro Focus	SMALL
Fluoro Fil. Setting Time (ms)	800	Fluoro Sync timeout (s)	2
Synchronism Division (Ext.)	no	ABC Update Period (ms)	0
High Dose Filament Level	yES	ABC Input Selection	None
High Dose Auto Off	no		None
			Analog
			kV ±
			Digital
			Analog Fast
			kV ± Fast

From File  
 From Generator



Press the “Store Data (In SHFR)” button to save the changes before exit the Fluoro screen.

2.13.7 ADVANCED OPTIONS



Press the “Advanced Options” button located in the different Configuration screens and enter the **password 5365** to activate the hidden options.



Press the “Store Data (In SHFR)” button to save the changes before exit any of the Configuration screens.



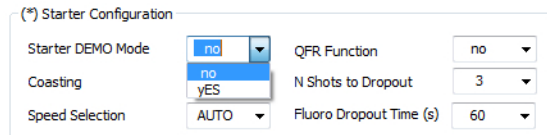
**THIS SETTINGS SHOULD NOT BE MODIFIED UNLESS WELL AWARE OF THE EQUIPMENT. OTHERWISE, IT IS RECOMMENDED TO USE THE FACTORY SET VALUES.**

2.13.7.1 WORKSTATIONS AND STARTER ADVANCED OPTIONS

**STARTER DEMO MODE**

When “Yes” is selected, some errors related to the Starter are disabled. This option is useful for some troubleshooting procedures and shall not be used during normal operation of the equipment.

**Illustration 2-74  
Starter Demo Mode**



2.13.7.2 TUBES ADVANCED OPTIONS

**BOOSTING TIME**

Filament current boosting time is factory set for both Small Focal Spot and Large Focal Spot. Although it is editable, it is recommended to use the default value to maximize X-ray Tube life.

The boosting time values are shown in the drop-down menu divided by 10, so they have to be multiplied by 10 to obtain the real value in ms; e.g. when selecting 40 in the drop-down menu, the boosting time will be 400 ms.



***Set to 0 the SF Boosting Time when using X-ray Tubes with Small Focal Spot smaller than 0.6.***

**Illustration 2-75**  
**Boosting Time Configuration**

Tube 1		Tube 2	
(*) Index / ID	1   90	(*) Index / ID	1   90
(*) Max kV	150	(*) Max kV	150
Small Focus Max. mA station	160.0	Small Focus Max. mA station	160.0
Large Focus Min. mA station	10.00	Large Focus Min. mA station	10.00
SF Boosting Time (ms/10)	40	SF Boosting Time (ms/10)	40
LF Boosting Time (ms/10)	31	LF Boosting Time (ms/10)	40
Boosting Recovering Time (s)	32	Boosting Recovering Time (s)	3
SF Filament Setting Time (ms)	33	SF Filament Setting Time (ms)	800
LF Filament Setting Time (ms)	34	Lf Filament Setting Time (ms)	800
Enable Both Filaments	35	Enable Both Filaments	no
	36		
	37		
	38		
	39		
	40		
	41		
	42		
	43		
	44		

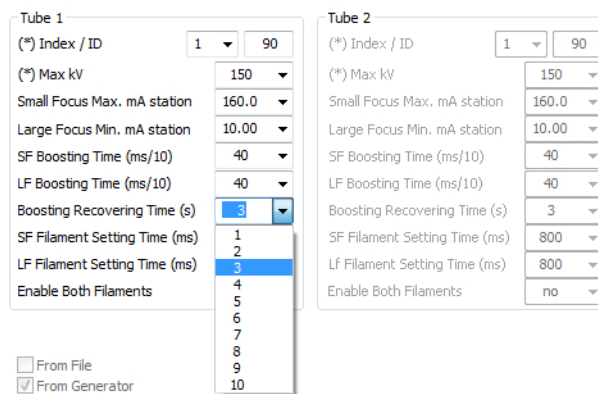
From File  
 From Generator

### BOOSTING RECOVERY TIME

Boosting Recovery Time is the minimum time needed (in seconds) to perform a complete boost since the last time the filament was in emission state. Boosting time will be automatically reduced if boosting recovery time is not observed.

Boosting recovery time can be modified to select any value within 1 and 10 seconds.

**Illustration 2-76**  
**Boosting Recovery Time Configuration**



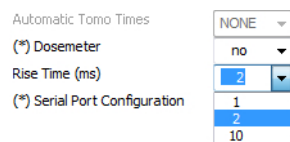
### 2.13.7.3 GENERATOR BEHAVIOR ADVANCED OPTIONS

#### RISE TIME

It is possible to select the desired rise time for voltage. Available options are 1, 2 and 10 ms, but it is strongly recommended to use the default value.

Rise time is automatically set to 10 ms when the filament current is disabled. Once the filaments are enabled again, kV rise time is set to the configured value again.

**Illustration 2-77**  
**Rise Time selection**



**IGBT FAULTS: E09**

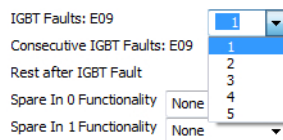
Select how many IGBT faults should occur during the whole scan in order to show Error 9 and abort the sequence.

When 1 is selected, the sequence is aborted and Error 9 is displayed after the first IGBT fault.

*Note* 

*Bear in mind that all the pulses with IGBT fault are aborted, no matter if Error 9 is displayed on screen or not.*

**Illustration 2-78**  
**IGBT Faults configuration**



**CONSECUTIVE IGBT FAULTS: E09**

Select how many consecutive IGBT faults should occur in order to show Error 9 and abort the sequence.

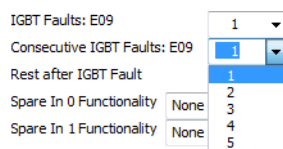
If 1 is selected in this option or in the “IGBT Faults: E09” option, the sequence will be aborted and Error 9 will be displayed after the first IGBT fault.

Other selection means that the sequence will be aborted and Error 9 will be shown after the specified number of consecutive IGBT faults.

*Note* 

*Bear in mind that all the pulses with IGBT fault are aborted, no matter if Error 9 is displayed on screen or not.*

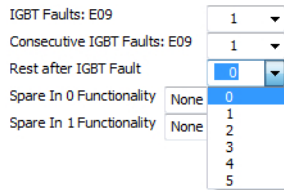
**Illustration 2-79**  
**Consecutive IGBT Faults selection**



**REST AFTER IGBT FAULT**

Select the number of pulses to be ignored after an IGBT Fault. During the selected number of pulses, there will not be X-ray exposures.

**Illustration 2-80**  
**Rest after IGBT Fault selection**

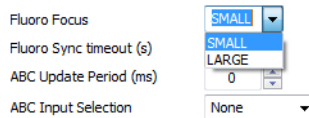


**2.13.7.4 FLUORO ADVANCED OPTIONS**

**FLUORO FOCUS**

Select the Focal spot to be used for Fluoro operation.

**Illustration 2-81**  
**Focal spot for Fluoro selection**



Press the “Store Data (In SHFR)” button to save the changes before exit any of the screens.

## 2.13.8 BACKUP AND RESTORE DATA

Once the Configuration process has finished, it is recommended to make a backup copy of the Configuration data. It is possible to save a backup of all the Configuration data or just a part of it.

### COMPLETE CONFIGURATION BACKUP AND RESTORATION



To save all the configuration data in the computer, go to the Configuration Main Page and press the "Complete Configuration Backup (To File)" button. A file containing the configuration data will be created in the designated directory of the computer.

To restore a complete configuration:



1. Go to the Configuration Main Page and press the "Complete Configuration Store (From File to Generator)" button.
2. Select the folder that contains the file with the data and open it.
3. Wait until the confirmation message is displayed on screen.

This is especially useful to restore an old configuration or to copy the configuration data to the U66-EEPROM of a new Generator instead of removing the EEPROM from the socket of the old Generator to fit it in the new one.

### PARTIAL CONFIGURATION BACKUP AND RESTORATION



To save just part of the configuration data, go to one of the Configuration screens and press the "Backup (To File)" button to save in the computer the configuration data contained in that screen. A file containing the configuration data will be created in the designated directory of the computer.

#### Note

*It is recommended to press the "Refresh (From SHFR)" button before pressing the "Backup (To File)" button to ensure that the created backup file matches exactly the configuration of the generator.*

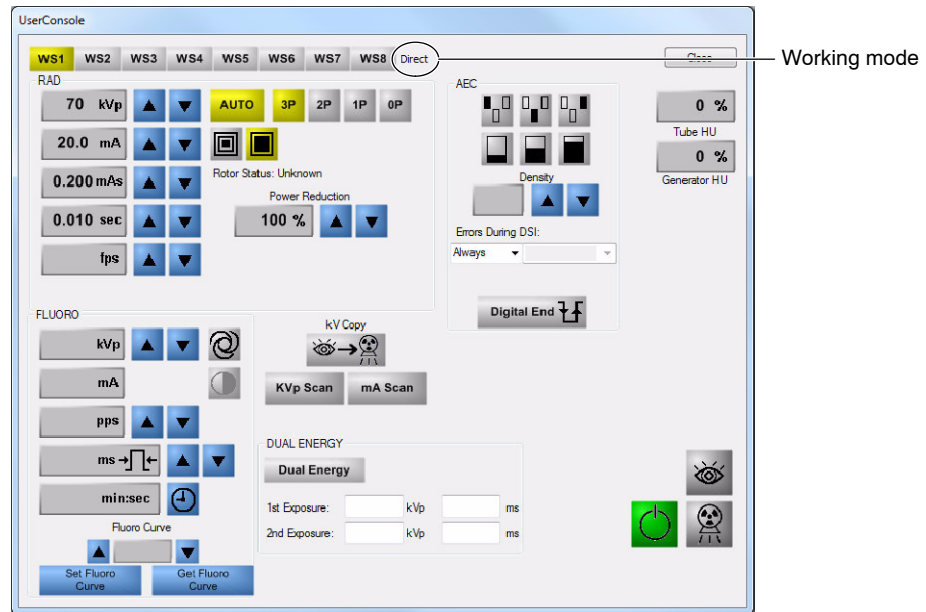
To recover the data saved on the file:



1. Press the "Restore (From File)" button.
2. Select the folder that contains the file with the data and open it.
3. Check that the restored file contains the desired data and press the "Store Data (in SHFR)" button to apply the changes.

## 2.14 USER CONSOLE

**Illustration 2-82**  
User Console

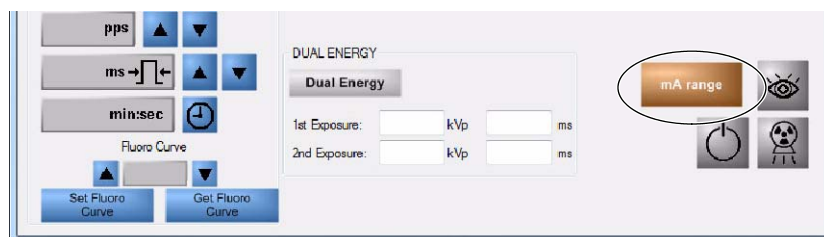


Up to 8 workstations can be selected, depending on how many have been previously configured. AEC and Fluoro can be selected according to the Generator characteristics and to workstations configuration.

The working mode (Direct, Bucky, Tomo, etc.) is displayed on the right of the Workstation selection panel.

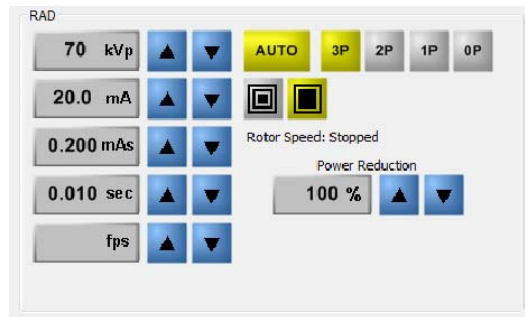
A warning is displayed in the bottom right corner if any of the Generator limits is reached while modifying the technique parameters. When this happens, the modified parameter is blocked. Warnings related to AEC are displayed in the AEC area.

**Illustration 2-83**  
Radiographic Parameters selection warning



2.14.1 RADIOGRAPHY

Illustration 2-84  
RAD Parameters



The RAD controls show the kVp, mA, mAs and exposure time (sec) values, Working Modes, Focal Spot selection, Rotor speed and the Generator power reduction.

**RADIOGRAPHIC PARAMETERS**

The Radiographic Displays show the kVp, mA, mAs and exposure time (sec) values:



- kVp: The radiographic kVp value selected for the technique.
- mA: The radiographic mA value selected for the technique.
- mAs: The radiographic mAs value selected for the technique.
- sec: The time value (in seconds) selected for the technique.
- fps: Frames per second selected for DSI, DSA, CINE and HCF Workstations.

#### WORKING MODES

Four different RAD Working Modes can be selected according to the parameters to be controlled:

**Illustration 2-85**  
**Working Modes**



- **Three Point Mode (3P):** kVp, mA and sec are controlled independently, without any relationship between them. The mAs value can not be modified directly.
- **Two Point Mode (2P):** kVp and mAs are controlled independently. The mAs selection sets the highest mA value available for the selected Focal Spot and the respective exposure time (sec). The mA and sec values can be modified directly by the user, keeping constant the selected mAs value.
- **One Point Mode (1P):** This mode requires the operation with the AEC (when available). When 1P is selected, AEC field is activated and the mAs value is automatically set to the maximum value available. The kVp value is directly controlled by the user. mAs, mA and sec are controlled as described for 2P.
- **Zero Point Mode (0P):** This mode requires the operation with Fluoro and AEC (when available).

When “AUTO” is selected (lighted in yellow), every value (kVp, mA, mAs and sec) can be modified. The working mode switches automatically from 3P to 2P and vice versa depending on the selected value.

#### FOCAL SPOT ICON AND FILAMENT CURRENT



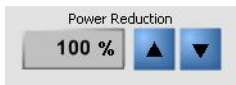
The Focal Spot icons allow the user to select the small or large focal spot by clicking on the desired one.

To shut down the Filament current of both Focal Spots press the selected Focal Spot icon (lighted in yellow). The message “Filament power down mode” is shown in the screen until a Focal Spot is selected or the Handswitch is pressed.

#### ROTOR SPEED

When the tube is not rotating, this indicator shows the message “Rotor Speed: Stopped”. Once the handswitch is pressed, it indicates whether it is rotating in high speed or low speed.

**POWER REDUCTION**



The maximum kW of the Generator is factory set according to the Generator performance. Generator kW can be limited to a lower value in 10% steps, from 100% (full power) to 10%.

**Note**

*This reduction percentage only applies when in user mode. Bear in mind that it is applied to the limit set in the “Max Power” field of the Configuration screen.*

1. Press the “Increase” or “Decrease” button to modify the value (e.g. a 40 kW Generator limited to 80% of its maximum power will perform as a 32 kW Generator).

**Note**

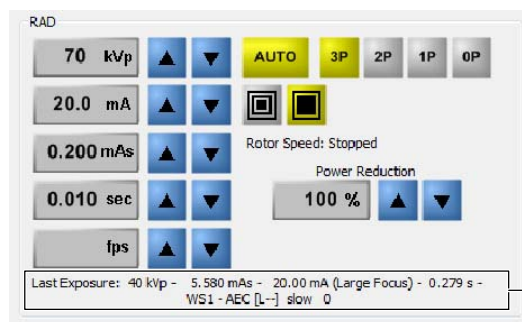
*An intermittent beep might sound when reducing the Generator power due to an excessive kVp/mA selection. Reduce the technique parameters or increase the Power percentage.*

2. Check that mA and kVp selection can be done in accordance to the new Power Reduction.
3. Press “Close” to save and leave.

**LAST EXPOSURE PARAMETERS**

When an exposure is made from the User Console, the last exposure parameters are also shown in the Radiography area.

**Illustration 2-86**  
**Last Exposure Parameters**



— Radiographic parameters of the last exposure

2.14.2 FLUOROSCOPY

Illustration 2-87  
Fluoro Parameters

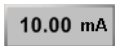


FLUORO PARAMETERS

The Fluoroscopy Displays show the kVp, mA, pps, pulse length (ms) and exposure time (min:sec) values:



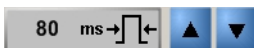
- kVp: The fluoroscopic kVp value selected for the technique.



- mA: The current fluoroscopic mA value used for the technique.



- pps: The fluoroscopic pulses per second selected for the technique. Select 0 for continuous fluoro.



- ms: The fluoroscopic pulse width selected for the technique. This field is not available when using a Fluoro Curve.



- min:sec: It shows the elapsed fluoro time. It turns red after five minutes, its frame turns red as well after nine minutes and Fluoroscopy automatically turns off after ten minutes time.

It also resets the Fluoro timer by pressing the clock icon.

Note

*The Fluoro mA values are tied up with the Fluoro kVp values (when the Fluoro kVp increases, the Fluoro mA increases). Fluoroscopic mA are set during calibration so they do not exceed the maximum Entrance Skin Exposure (ESE) dose rate on the patient.*

**FLUORO CURVE (OPTIONAL)**



To achieve the best adaptation to the technique to be used, this option allows to link every kVp level with a different pulse width, so the image quality can be improved. The pulse width is controlled by the kVp value, so every time it is modified, the pulse width varies as well. This allows a huge flexibility to increase the radiation level from minimum to maximum. The increase of the mA and kV levels can be established according to the needs of the technique.

When the Generator is connected to a computer, it is possible to load a Fluoro Curve in the Generator from an external file (Set Fluoro Curve) and to save to Fluoro Curve from the Generator to the computer (Get Fluoro Curve).

**ABC**



The Automatic Brightness Control maintains the brightness of the image by automatically adjusting the exposure factors according to the density and contrast. ABC is active when its icon is highlighted.

**BOOST**



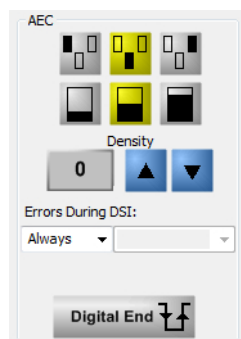
Boost permits the maximum skin dose to reach higher fluoroscopy levels than normal fluoroscopy. Boost is active when its icon is highlighted.

The tube current increases (high mA) to obtain more contrast in the image during the fluoroscopic exam and consequently the radiation dose is increased.

Boost fluoro can be selected only if ABC has been previously selected.

**2.14.3 AEC**

**Illustration 2-88  
AEC Parameters**



The AEC comprises the controls for activating the AEC, the Sensitivity, the Density and the Digital End.



#### FIELD SELECTION

Each control indicates its related physical location of the selected field in the AEC Exposure Detector, and it may be selected or deselected by pressing it. Any combination of fields can be selected and the color of controls change (highlighted) when active.



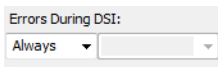
#### SENSITIVITY

Sensitivity allows the adjustment of the mAs in relation to a programmed Film/Screen Combination that can be Slow, Medium or Fast. Press to select the desired Sensitivity.



#### DENSITY

To configure the AEC Density indicate a value from -4 to +4.



#### ERRORS DURING DSI

This option is linked to AEC and Digital End related errors. The possible selections are:

- Always: Any error detected during DSI is reported and aborts the exposure.
- Never: The DSI procedure is never aborted.
- First Pulse: If any error is detected during the first pulse of DSI, the exposure is aborted. Any other errors detected during the rest of the procedure do not abort the exposure.
- No info: No errors are reported.
- At the end: Once the DSI procedure has finished, the detected errors are reported to the operator.



#### DIGITAL END (OPTIONAL)

Although included in the AEC menu, Digital End is not strictly an AEC functionality, it is an option available upon request used for DSI.

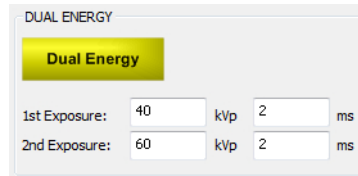
When active, the Generator performs kind of as with AEC, so the end of the pulse establishes the end of the exposure. Therefore, if different pulse widths are selected, the equipment can alternate between them.

Backup time set in the User Console must be long enough to avoid the exposure from ending before the pulse width is completed. Otherwise, an error message will be displayed since the equipment is waiting for the pulse to end the exposure.

2.14.4 OTHER PARAMETERS

**DUAL ENERGY (OPTIONAL)**

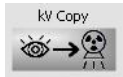
**Illustration 2-89**  
**Dual Energy fields**



kVp and ms values are entered in their respective fields for two different exposures and the equipment will alternate between one and the other while the handswitch remains pressed.

This option allows to vary the contrast for DSI in zones where it is needed to obtain images of two different elements (e. g. bone and tissue).

**kV COPY**



This option activates the 0P mode in workstations with Fluoro and AEC. Automatic Brightness Control is also activated automatically when kV Copy is selected.

The RAD kVp value is automatically adjusted according to the Fluoro kVp value, and the other RAD factors are automatically set when the Generator stops the Fluoro exam.

**kVp SCAN (OPTIONAL)**



When active, it activates an analog input that indicates the kVp value on every Fluoro/DSI pulse.

Combined with the Digital End option, it allows the synchronism pulse to control the end of the exposure. So, it is possible to alternate between different width pulses with different kVp values for each pulse.

**mA SCAN (OPTIONAL)**



Only for DSI. It activates an analog input that allows to vary the mA with every pulse, but it is not possible to change the focal spot or the mA scale.

Combined with the Digital End option, it allows the synchronism pulse to control the end of the exposure. So, it is possible to alternate between different width pulses with different mA values for each pulse.

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