START-UP PROCEDURES FOR THE PW1830 GENERATOR

Overview

When the XRD is not in use, the generator should normally be left powered up, but in stand-by mode with the tension set to 40 kV and the current turned down to 10 mA. This keeps the vacuum intact and the tube anode temperature lowered. Also, the shutters should be closed. From this stand-by state, all that is required is to turn up the current; follow procedure A. However, if the generator is off, the start-up procedure is more complicated and will require approximately 30 minutes. Procedure B describes how to turn on the generator, breed the tube, and set the tension and current to normal operating values.

A. If the generator is on (X-rays On), but in a stand-by state (tension set to 40 kV, current set to 10 mA, shutters closed), proceed as follows:

Slowly turn up the current to the required operating value (40 mA) over the period of 5 to 10 minutes. *Wait at least 1 minute between each 5-mA increment.*

While turning up the current, the operator can load the sample and/or configure the software for analysis

WARNING: DO NOT EXCEED THE RATED kV AND mA VALUES SHOWN ON THE X-RAY TUBE INSTRUCTION CARD.

The Cu tube (PW2773/00) is rated for a maximum of 2,200 watts at 60 kV.

Routine analyses should be performed using considerably less than 2,000 watts; 40 kV and 40 mA (1600 watts) are normally sufficient.

Assuming that you are otherwise ready to scan (X-ray optics and software appropriately configured, and sample loaded), you are ready to open the shutter.

B. If the generator is off (X-rays off, HT off, Power off) and the water chiller is off, proceed as follows:

0. Open water valves (the valve for tap water to the water chiller and the two levers on the back of the chiller).
   These valves should be left open. Be certain that they are open.

1. Turn on the water chiller and ensure that there is water flow to the generator (1.3 GPM).

2. Set the circuit breaker, at the rear of the generator, to the ON position.
   This should be left in the ON position.

   Be sure that nothing obstructs the low-angle travel of the goniometer. The goniometer will reset itself to $2\theta = 5°$ after the POWER ON button is pressed.

3. Press the POWER ON push-button, checking that the lamp in the push-button as well as the lamps in the shutter push-buttons (the ones with the ∞ sign on their tops) are lit.

NOTE: If there is no water flow or if the flow rate/pressure is incorrect, the NO WATER FLOW lamp on the front panel will be lit.

4. Turn the HT LOCK key to the position where the key cannot be withdrawn.

5. Set the tension (kV) and current (mA) switches to their minimum settings (10 kV, 10 mA).

6. Press the HT ON push button.

   You may hear a high-voltage "snap" and the kV and mA LED indicators may "spike" initially.

   Check that the kV and mA LED indicators show minimum values and that the X-RAYS ON lamps are lit.

NOTE: If no HT is present, check the red warning lamps on the front panel. These lamps represent the following conditions:

kV-mA NOT LOW	kV and mA switch not in their minimum settings.
X-RAY ON LAMPS	X-RAY ON lamps defective or not connected.
SAFETY CIRCUIT	Safety circuit loop open or defective.

7. **Tube breeding.**

The following (steps 7.1 to 7.7) is a tube breeding procedure. This procedure clears impurities from the X-ray tube and helps to insure that a stable vacuum is achieved. It should be followed any time the X-ray tube has not been used for more than 24 hours.

If a tube flash or any fluctuation in the tension (kV) occurs during this procedure, go back one step and wait 10 minutes before proceeding. If tube flashes or fluctuations in the tension persist, contact the principal operator of the instrument (J. Mies).

7.1	Check that the minimum kV and mA readings (from step 5) are stable.	Wait 3 minutes.
7.2	Slowly turn up the tension to 30 kV; leave the current at 10 mA.	Wait 3 minutes.
7.3	Slowly set the tension to 40 kV; leave the current at 10 mA.	Wait 3 minutes.
7.4	Set the tension to 45 kV; leave the current at 10 mA.	Wait 3 minutes.
7.5	Set the tension to 50 kV; leave the current at 10 mA.	Wait 3 minutes.
7.6	Set the tension to 55 kV; leave the current at 10 mA.	Wait 3 minutes.
7.7	Set the tension to 60 kV; leave the current at 10 mA.	Wait 3 minutes.

8. Slowly turn down the tension from 60 kV (step 7.7) to the required operating value (40 kV) over the period of a several minutes.
Wait 1 minute between each 5-kV increment.

9. Slowly turn up the current from 10 mA (step 7.7) to the required operating value (40 mA) over the period of several minutes.
Wait 1 minute between each 5-mA increment.

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