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# **X-Ray Ops**

# User Guide

For use with Tracer III-V<sup>+</sup>, Tracer III-SD and Tracer IV-SD

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## **Table of Contents**

Introduction	. 3
Using X-Ray Ops	. 3
Opening Communications	. 3
Altering the Voltage, Current, and Pulse Settings	. 4
Optimizing Settings	. 5
Checking X-Ray Tube Setup and Count Rates with PXRF Program	6



### Introduction

The Tracer analysis programs on the PC require preset voltage and current settings (six are stored in the instrument memory). The program **X-Ray Ops** is used to set and optimize these settings. In addition to selecting voltage and current settings, X-Ray Ops also provides pulse length and beam filter preset options for each of the voltage and current settings. Once the preset is completed, each new voltage/current and filter setting should be checked using the procedure defined on page 6, *Checking X-Ray Tube Setup and Count Rates with PXRF Program.* 

	Comm Port #		ed Comms 🛛 🔽			
	Open XRay Con				ihake 🔽	
	High Voltage Settings	Filament Current Settings	High Voltage ADC Presets		Anode Currer ADC Preset	
1		167	C 15	kV	C [36	μA
2	* 205	160	€ 40	kV	C 20	μA
3	<u>+</u> 205	160	○ 40	kV	C 20	μA
4	* 205	160	€ 25	kV	C 35	μΑ
5	<u>↓</u> 148	• 170	C 15	kV	55	μA
5	<u>*</u> 205	• 160	€ 40	kV	€ 20	μA
7	* 160	205	(* 40)	kV	· 20	μΑ

Figure 1. Tube Settings, Lines 1-7

and pulse length for a particular application. It is recommended that you use line 2 for your custom configuration.

Use X-Ray Ops to set the values for voltage, current, filter

Line 7 is the active tube settings ONLY. When the Tracer is used with the PDA, starting a measurement will change the settings stored in Line 7. The tube settings must be stored in Lines 1 to 6 (as viewed from X-Ray Ops) to be used in PXRF. *Line 7 will not be saved and can be overwritten.* 

# **Using X-Ray Ops**

#### **Opening Communications**

To open communications between the Tracer and the X-Ray Ops software stored on your computer, follow these steps:

- 1. **PLACE** the unit in a bench-top stand.
- 2. **REMOVE** the battery (if installed).
- 3. **PLUG** the AC Power supply into Power Connector located in the handle.
- 4. **PLACE** the opposite end of the Power supply into a power outlet that fits the range of the AC adapter.
- 5. **ENSURE** the unit's trigger is not activated.
- 6. TURN power on.
- 7. ALLOW the instrument to warm up for at least 60 seconds.
  - a) If using the Tracer IV, LISTEN and WAIT for filter wheel to spin and initialize.
  - b) If using the Tracer III, **ENSURE** that the correct filter is in place.
- 8. **CONNECT** the multi-pin (7-pin LEMO) connector from the download cable into the connector located on the instrument face below the PDA cradle.
  - a) To connect, **ALIGN** red dot on the LEMO connector with the red dot on the instrument.



- 9. **CONNECT** the serial connector of the download cable into the serial port of the PC or into the serial-to-USB Adapter. Ensure that the USB end of the serial-to-USB Adapter is inserted into a USB port of the PC.
- 10. **START** X-ray Ops.
- 11. **ENTER** the appropriate Comm Port number (Figure 2 A).
- 12. SELECT Hi Speed Comm B.
- 13. **CLICK** Open X-Ray Comm Port **G**. The program will read the present settings from the instrument.

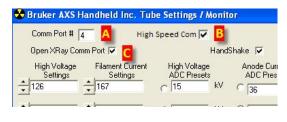


Figure 2

a) If communication fails, **VERIFY** the com port number.

#### Altering the Voltage, Current, and Pulse Settings

To create a custom setting, **ENTER** the High Voltage Setting, Filament Current Setting, High Voltage ADC Preset, Anode Current ADC Preset, Pulse Length, and Filter number on Line 2. The Pulse Length target will be  $200 \pm 2$ . The High Voltage and Filament Current settings will be approximations based on other known settings. These settings will be adjusted (see Optimizing Settings, page 5).

Comm Port #	4 High	Speed Com 🔽				Times 2	⊽ Exter	nded Actuals	Version	1:1.2
Open XRay Cor	mm Port 🔽	1	HandSh	ake 🔽			Load from file	Sa	ave settings	
High Voltage Settings 126	Filament Current Settings 167	High Voltage ADC Presets C 15	kV (	Anode Current ADC Presets		de Current Scaler	Pulse Length	Filter	Actual HV (kV) Actual HVG DAC	
	÷	0	kV		μΑ	П	В		HVG Current (mA)	0
205	÷160	○ 40	kV	20	μA	Г	199	3	Anode Current (µA) Actual FG DAC	
205	÷160	€ 40	kV	20	μA	Г	199	3	FG Current (mA)	
148	170	C 15	kV	55	μA	Г	200	2	Anode diode	4095
205	160	○ 40	kV	20	μA	Г	199	3	Cathode diode	135
214	+ 198	· 40	kV .	• 18.8	μA	Г	200	1	Input Voltage	14.7
	• <u></u> ],	-		Skip reread					Input Current	54
Length 199	Auto Mod			, Indute		1	PC Trigger	· •	Pulse Length	199
Period 254	C Tube En			ettings	Start	Update	e Actuals	Monitor Actua	ls Temp.	29.0
.og Data to File:			$\neg$				- [	Start Logging	Filter	15
Script File:			V					Start Script	Flux	0

Figure 3



#### **Optimizing Settings**

After the initial customized setting has been established, the setting will need to be optimized.

#### CAUTION

- The Filament Current must not exceed 250.
- Modify the Pulse Length (Figure 3 3) to match the actual Pulse Length A.
- DO NOT LEAVE Pulse length B at 200 unless it is the actual pulse length A from the right hand column.
- DO not change the Pulse Period C. It should remain set at 254.
- Auto Mode D should always be checked.
- 1. **CHECK** the *High Voltage* and *Anode Current* radial buttons (see Figure 3) for the row you wish to update (generally, this will be Line 2).
- 2. ACTIVATE PC Trigger TO START X-rays.
- 3. CLICK Monitor Actuals.
- MONITOR the actual readings (see far right column of figure below). Optimal High Voltage, Filament Current, and Pulse Length are achieved when, within 1-2 seconds of trigger pull, the ACTUAL voltage and current are obtained and remain stable to within ±0.5 kV and ±1.0 µA for 2 minutes.

*	Bruker /	XS Ha	indheld Inc. T	ube Se	ttings / I	Moni	tor							
	Comm Po	ort # 4	High S	peed Co	mms 🔽					Times 2	Exte	nded Actuals	Version	:1.2.14
	Open XR	ay Comm	n Port 🔽			Hand	IShake	~			Load from file		Save settings	
	High Vol Settin	gs	Filament Curren , Settings		igh Voltage DC Preset			de Curren C Presets		iode Currei Scaler	<sup>nt</sup> Pulse Length	Filter	Actual HV (kV)	40.00
÷	126	1	167	c	15	kV	03	6	μA	Г	200	2	Actual HVG DAC	206
+	205		160	C	40	kV	C 2	0	μA	Г	199	3	Hiva Current (mA)	288
	205	— I	160	cl	40	kV	C 2	0	μA	Г	139	3	Anode Current (µA)	18.70
1.00	2	5	-				-		-	_			Actual FG DAC	161
-	205	3	160	C	40	kV	02	0	μĄ	Г	199	3	FG Current (mA)	80
+	148		170	C	15	kV	05	5	μA	F	200	2	Anode diode	5
-	205		160	C	40	kV	2	0	μΑ	Г	200	3	Cathode diode	4095
-	206 📥	_	161	•	40	kV	• 1	8.8	μA	Г	199	1	Input Voltage	14.5
Ť		-						p reread			1		Input Current	211
Puls	e Length	199	Auto M	lode	Re-Rea	d Í	Upda			1	1.6	<u> </u>	Pulse Length	199
Puls	e Period	254	Tube E	nabled	Setting		Settin		Start	Upd	ate Actuals	Monitor Actu	ials Temp.	35.5

- 5. **REPLACE** preliminary numbers with actual numbers in each of the three fields.
- 6. UNCHECK PC Trigger.
- 7. CLICK Monitor Actuals to stop monitoring process.
- 8. CLICK Update Settings.
- 9. CLICK *Re-Read Settings* **TO ENSURE** that the settings have been updated.



- 10. **REPEAT** steps 3 through 9 for each row you wish to optimize.
  - a) **TO ADJUST** pulse length up or down, **VARY** the filament current down or up until a value of 200±2 is reached.
  - b) **CONTINUE TO MODIFY** the above settings <u>UNTIL</u> the voltage and current are stable at the desired flux <u>AND</u> the settings match the actual values.

#### Checking X-Ray Tube Setup and Count Rates with PXRF Program

- 1. **EXIT** X-Ray Ops.
- 2. **START** the PXRF Program.
- 3. **SELECT** Setup/Instrument Setup.
- 4. **REFER** to the PXRF User Guide (Bruker Document 030.0006) **TO CHECK** the following setup parameters:
  - a) 1024 Channels for Tracer III-V, and 2048 for Tracer III-SD and Tracer IV-SD
  - b) 2 Bytes per channel
  - c) Advanced Header (under Setup menu/DPP Board)
  - d) Accumulation Mode
  - e) Ensure "S1 TURBOSD LE Mode" is NOT selected
  - f) PC Trigger (this allows the Start/Stop to activate the X-ray tube)
  - g) The PC Port number (under Download)
  - h) A Baud Rate of 57,600 for Tracer III-V (under Download); for Tracer III-SD and Tracer IV-SD, Baud Rate is 115,200
- 5. **ENSURE** the trigger is not activated/squeezed.
- 6. **PLACE** your desired sample on the aperture of the instrument.
  - a) **ENSURE** the sample is centered over the aperture.
  - b) **ENSURE** the sample covers the entire opening located in the center of the instrument's nosepiece.
- 7. PLACE the Sample Radiation Shield Cover on the nose of the instrument.
- 8. On the PXRF menu, **CHECK** the color of the radial dial indicator under the File Menu.



a) If radial dial is green, then communication with the unit is open.



- b) If radial dial is red, then communication with the unit is not taking place. **CLICK** the radial dial. If it does NOT turn green, **CHECK** setup and download settings.
- 9. From the PXRF menu, **SELECT** Tube, then **SELECT** *Read*.
- 10. SELECT your custom setting (generally Line 2)
- 11. **CLICK** Start button in PXRF. (The button should change from <u>Start to Stop</u>).
- 12. Press and hold the trigger.
- 13. **OBSERVE** the spectrum of the Setup Standard in the PXRF Program.
  - a) If a spectrum does not appear, **ENSURE** the radial dial is green.
- 14. **RELEASE** the trigger and check the Raw and Valid count rates.
- 15. **EXIT** PXRF and **RE-OPEN** X-ray Ops, and then **ADJUST** current to achieve desired count rate.
  - a) **OPTIMIZE** tube settings.
  - b) **REPEAT** as necessary.
- 16. CLICK Save Settings.
- 17. SAVE file.