

QUICK START GUIDE

GEMORO XRF Gold & Precious Metal Analyzer



GEMORO[®]

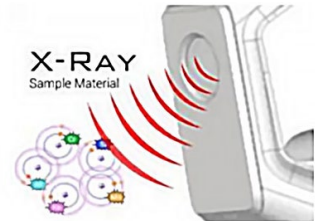
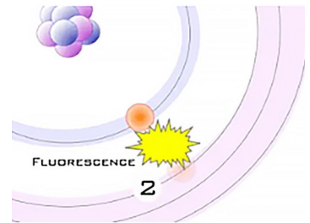
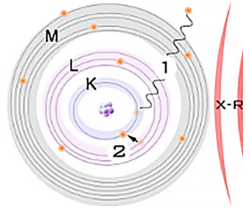
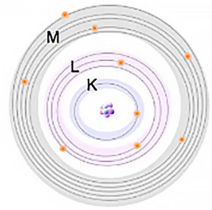
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1. HOW XRF TECHNOLOGY WORKS

Sample analysis is broken down from the atomic and instrumental level:

1. All atoms have a fixed number of electrons. These electrons are arranged in orbitals around the nucleus. Energy Dispersive XRF (EDXRF) typically captures activity in the three electron orbitals closest to the nucleus, the K, L, and M shells.
2. The primary photons from the X-ray tube have high enough energy that it knocks electrons out of the innermost orbitals, creating a vacancy (1). An electron from an outer orbital will move into the newly vacant space at the inner orbital to regain stability within the atom (2).
3. As the electron from the outer orbital moves into the inner orbital, it releases energy in the form of a secondary X-ray photon. This energy release is known as fluorescence. All elements produce fluorescence “characteristic” to themselves, meaning that the energy of the X-ray photon released is characteristic of that element.
4. From the analyzer side, high-energy primary X-ray photons are emitted from an X-ray tube and strike the sample.
5. The fluorescent photons arrive at the detector, where they are absorbed and transferred into an electrical signal. The analyzer electronics and software produce a spectrum of energies detected.
6. Results can be viewed in the form of percentages, or as spectrum. The XRF can process (digitize, count) about 200,000 or more X-rays every second. These detected X-rays form a spectrum. Each peak in the spectrum is from a characteristic X-ray that was emitted by a specific element, like Cr, or Ni, etc. The height of the peak is proportional to concentration of the element.



***Note:** While XRF analyzing technology is very precise, please recognize that this technology measures the elements present on the surface (AKA a “surface test”) and it should not be considered as a substitute for a fire assay of a core sample

2. WHAT IS INCLUDED WITH YOUR XRF



- a. Calibration Piece—used once the machine is powered on. **DO NOT LOSE THIS**—it is required every time you turn on your device.
- b. Flash Drive—this contains digital copies of both the instruction manual and application set up for your desktop computer.
- c. Replacement Camera Lens
- d. Screwdriver
- e. Power Adapter + 2 Rechargeable Batteries
- f. Computer Connecting Cable
- g. Power Cables (2) for the Power Adapter

3. GETTING TO KNOW YOUR ANALYZER



4. XRF SAFETY

4.1 GENERAL SAFETY WARNINGS:



The main compartment contains high voltage electronics. Opening the main compartment will void the warranty and could potentially be hazardous to a user.



Do not attempt to service the XRF. If there is a malfunction, contact a **GEMORO** rep for assistance. Users may replace batteries, and replace the analyzer window, but all other maintenance and repair procedures must be done with factory support or at the factory.



If the XRF is damaged, do not attempt to operate it. Contact **GEMORO**.



Ensure that the correct external power source is used for operating the analyzer or charging the battery. Voltage should be (100V-240V/50-60Hz). Do not overload an electrical outlet.

4.2 BATTERY SAFETY

The **GEMORO** XRF analyzers use a 14.4V Li ion rechargeable battery pack. Care should be taken with this battery. Avoid shorting it. Do not immerse it in water. Store in a cool, dry, and well-ventilated area. Avoid dropping.



NEVER use a damaged battery. Only charge batteries in the approved charger or in the analyzer. Never use a modified or damaged charger.

4.3 X-RAY SAFETY

Radiation Safety is up to **YOU**.

As the owner or operator of an X-Ray tube device, you are responsible for understanding the safety requirements and state regulations for using your X-ray tube equipment.

- When the X-50 is not actively testing samples, no X-rays are emitted.
- When the X-50 is energized, X-rays are emitted, through the window in the nosecone.
- X-rays are invisible to the human eye; you will not see them when they are being emitted.



BEST PRACTICES FOR SAFE OPERATION:

- Trigger finger should be the body part closest to the analyzer window
- Run tests with the XRF pointed away from other people. Pay attention to where the beam is pointed
- Don't hold samples in your hand
- Maintain control of the analyzer
- Limit operation to trained personnel

5. ELEMENTS THAT CAN BE DETECTED

- | | |
|------------------|-------------------|
| ▪ Titanium (Ti) | ▪ Zirconium (Zr) |
| ▪ Vanadium (V) | ▪ Molybdenum (Mo) |
| ▪ Chromium (Cr) | ▪ Ruthenium (Ru) |
| ▪ Manganese (Mn) | ▪ Rhodium (Rh) |
| ▪ Iron (Fe) | ▪ Palladium (Pd) |
| ▪ Cobalt (Co) | ▪ Silver (Ag) |
| ▪ Nickel (Ni) | ▪ Cadmium (Cd) |
| ▪ Copper (Cu) | ▪ Tin (Sn) |
| ▪ Zinc (Zn) | ▪ Antimony (Sb) |
| ▪ Tungsten (W) | |
| ▪ Iridium (Ir) | |
| ▪ Platinum (Pt) | |
| ▪ Gold (Au) | |
| ▪ Lead (Pb) | |
| ▪ Bismuth (Bi) | |

Does not measure for Aluminum (Al), Magnesium (Mg), or Silicon (Si).

CAUTION: TO AVOID DAMAGING THE XRF SENSOR – LIGHTLY TOUCH XRF NOZZLE TO TESTING PIECE.



6. POWERING UP THE UNIT

6.1 INSERTING THE BATTERY

The **GEMORO** XRF Gold & Precious Metal Analyzer is battery operated. The battery is part of the bottom of the handle. The battery is housed in the handle and forms the bottom of the handle. Insert the battery into the handle, until the connectors click into place. The battery is directional and keyed to only go in one way, so don't force it.



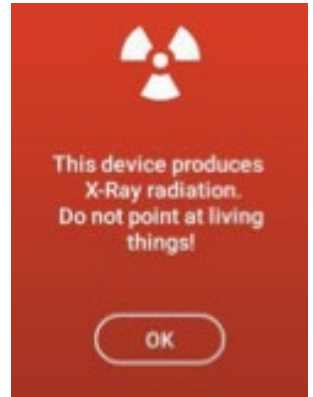
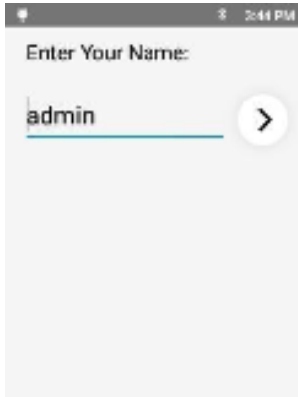
6.2 TURNING ON THE UNIT

The on/off button is on the top of the unit. Press it to turn the unit on.



7. LOGGING IN

The factory set name is **admin**. The factory set passcode is **12345**. The administrator can change this later.



The X-Ray warning screen appears.

X-Rays can cause serious harm to people and animals!

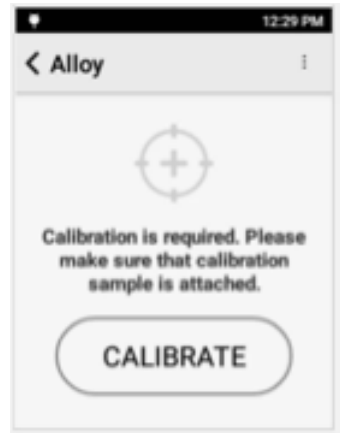
Tapping "**OK**" on this screen means you understand that, and that you will not use this XRF unit improperly.

Next, the Analyze screen appears. Tap "**Analyze**" to start your first analysis of a sample.



8. CALIBRATING THE UNIT

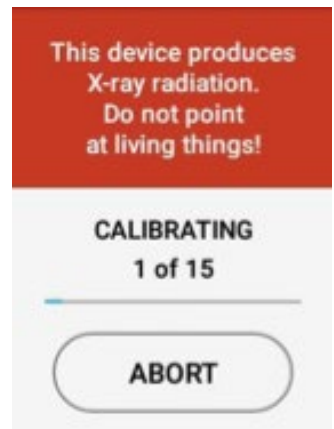
If this is the first time the unit is being used or the first time the unit being used for the day), the unit will need calibrating. If calibration is required, the unit will automatically bring up the Calibration window.



Place the 316 coupon that came with the unit on the nose. If the coupon is not available, use a clean, known 316 steel sample. Make sure the 316 coupon completely covers the analysis window. Tap "**CALIBRATE**" to begin the process.



Calibration takes 15 seconds. 1 of 15 means the first second of the 15 seconds of the calibration.



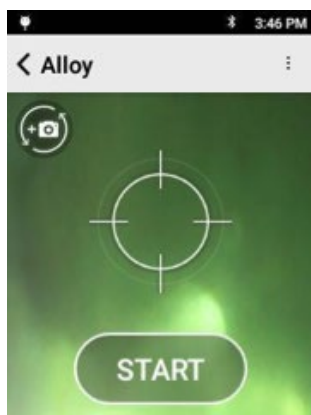
When the calibration is successful, the "START" screen appears. Remove the coupon from in front of the aperture. You can now use the instrument to test your samples. If the calibration fails, an error message will be displayed.

Confirm the piece of 316 coupon is positioned correctly in front of the window and retry the calibration.

If the calibration continues to fail, please contact **GEMORO/SY** KESSLER SALES, INC. technical support at **+1 800 527 0719**.

9. TAKING A TEST

Align a sample with the window and tap "START". Or squeeze (and release) the trigger at the top of the handle. The test will start. Ensure the sample you are testing is making direct contact (touching) with the testing window. When testing - you must test on a carbon neutral base. Utilizing the foam within the Pelican carrying will work as well.



SWITCHING BEAMS...		
Cr	16.89%	0.379%
Mn	1.43%	0.177%
Fe	69.49%	1.14%
Ni	10.60%	0.410%
Mo	1.59%	0.053%

SWITCHING BEAMS...		
Cr	16.76%	0.248%
Mn	1.39%	0.106%
Fe	69.69%	0.937%
Ni	10.47%	0.241%
Cu	0.146%	0.046%
Mo	1.56%	0.032%

TESTING...		
Si	0.108%	0.019%
Cr	16.87%	0.249%
Mn	1.39%	0.107%
Fe	69.58%	0.935%
Ni	10.37%	0.239%
Cu	0.144%	0.046%

COMPLETED			
Si	0.108%	0.019%	0.0-1.0
Cr	16.87%	0.249%	16.0-1
Mn	1.39%	0.107%	0.0-2.0
Fe	69.58%	0.935%	64.25-
Ni	10.37%	0.239%	10.0-1
Cu	0.144%	0.046%	0.0-0.7

Tests report findings in real time, so as the test continues and more information is obtained, the data on the screen will be updated. When the "COMPLETED" screen appears, the test is done and the final values are given.

10. LOOKING AT RESULTS

The top portion of the screen lists:

- 1 Test Number
- 2 Top Grade Match
- 3 Grade Match Score where 100 is a perfect score meaning that all elements measured fit within the alloy grade specification.
- 4 The first column on the left lists all detected elements. Scroll down to see additional elements.
- 5 The second column is the concentration of that element.
- 6 The third column is the confidence or uncertainty of the measurement.
- 7 The green column on the right is the Specifications column.

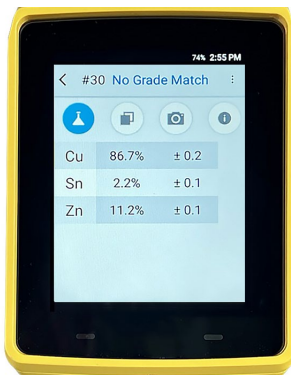
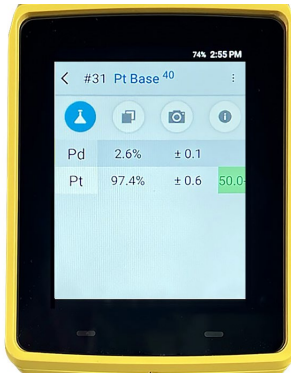
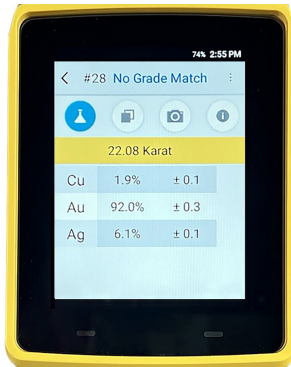
Specifications column lists the specification of the best alloy grade match for the determined chemistry of the sample.

The grade specification will be highlighted in green if a detected element is specified in the alloy grade and the amount detected is within the grade's specification.

In this example test, all elements found in the sample are in grade 316 and are within spec for that grade.

Element	Concentration	Confidence	Specifications
Si	0.108%	0.019%	0.0-1.0
Cr	16.87%	0.249%	16.0-1
Mn	1.39%	0.107%	0.0-2.0
Fe	69.58%	0.935%	64.25-
Ni	10.37%	0.239%	10.0-1
Cu	0.144%	0.046%	0.0-0.7

When Au (Gold) is present, the Karat Gold Purity level will be stated on the top of the grid making it very easy to interpret results. The top bar comment “No Grade Match” will continue to be stated as the unit is still seeking specific alloy grade matches such as Platinum. In this example, Pt (platinum) is the dominant element in the sample with a concentration of 97.4%, with a +/- 0.6 confidence/uncertainty, and a Specifications columns (green highlighted) activated which means that indeed Platinum is detected within the grade’s composition allowance (50.0+).



To see the complete information in the Specification column, tap it. The column will expand, showing the range of the spec for the detected element for that grade. In this test, all the detected elements are both found in SS 316, and are within range for SS 316, so all the ranges are green.

Element	Percentage	Specification Range
Si	0.108%	0.0-1.0%
Cr	16.87%	16.0-18.0%
Mn	1.39%	0.0-2.0%
Fe	69.58%	64.25-75.0%
Ni	10.37%	10.0-14.0%
Cu	0.144%	0.0-0.75%

11. COMPARE RESULTS TO A DIFFERENT GRADE

The best match is always shown when a test is completed. You can look at other grades to see why they are not the best match.

Tap the "**Compare icon**". The top three (3) matches will be listed. The superscripted numbers after the grades is the grade match score for that grade.

Tapping "**Other**" will show you additional grades that have lower grade scores than the three listed.

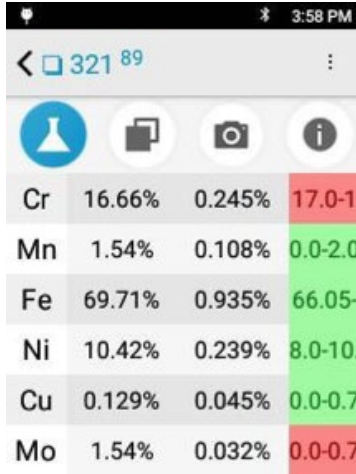
In this image, the grade match score for the top three (3) results are:
 100 for 316
 89 for 321
 87 for 303

Tap on a grade listed to see why it is not the best match.

Compare Icon

Grade	Match Score
316	100
321	89
303	87

In this example, 321 was selected. Cr and Mo are not within specification for 321.



Element	Sample %	Reference %	Specification
Cr	16.66%	0.245%	17.0-1
Mn	1.54%	0.108%	0.0-2.0
Fe	69.71%	0.935%	66.05-
Ni	10.42%	0.239%	8.0-10.
Cu	0.129%	0.045%	0.0-0.7
Mo	1.54%	0.032%	0.0-0.7

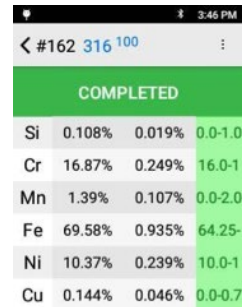
12. TAKING THE NEXT TEST

Taking additional tests is the same as taking the first test. You may start another test from the result screen or use the back button to return to the targeting screen.

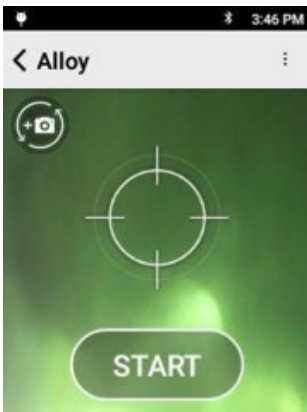
From the current result: Align a sample with the window and squeeze (and release) the trigger.

OR

From the start screen, align a sample and tap "START". Squeeze (and release) the trigger at the top of the handle. The test will start.



COMPLETED			
Element	Sample %	Reference %	Specification
Si	0.108%	0.019%	0.0-1.0
Cr	16.87%	0.249%	16.0-1
Mn	1.39%	0.107%	0.0-2.0
Fe	69.58%	0.935%	64.25-
Ni	10.37%	0.239%	10.0-1
Cu	0.144%	0.046%	0.0-0.7



Tests report findings in real time, so as the test continues and more information is obtained, the data on the screen will be updated.

When the "**COMPLETED**" screen appears, the test is done, and the final values are given.

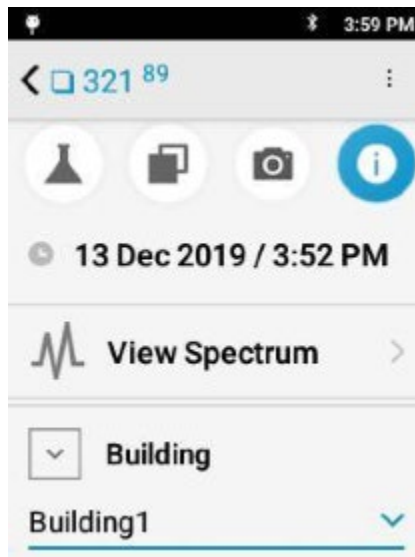
Cr	16.89%	0.379%	Cr	16.76%	0.248%	Si	0.108%	0.019%	Si	0.108%	0.019%	0.0-1.0
Mn	1.43%	0.177%	Mn	1.39%	0.106%	Cr	16.87%	0.249%	Cr	16.87%	0.249%	16.0-1
Fe	69.49%	1.14%	Fe	69.69%	0.937%	Mn	1.39%	0.107%	Mn	1.39%	0.107%	0.0-2.0
Ni	10.60%	0.410%	Ni	10.47%	0.241%	Fe	69.58%	0.935%	Fe	69.58%	0.935%	64.25-
Mo	1.59%	0.053%	Cu	0.146%	0.046%	Ni	10.37%	0.239%	Ni	10.37%	0.239%	10.0-1
			Mo	1.56%	0.032%	Cu	0.144%	0.046%	Cu	0.144%	0.046%	0.0-0.7

13. INFORMATION ABOUT THE TEST

Tap the "i" icon to see the available information about the specific test.

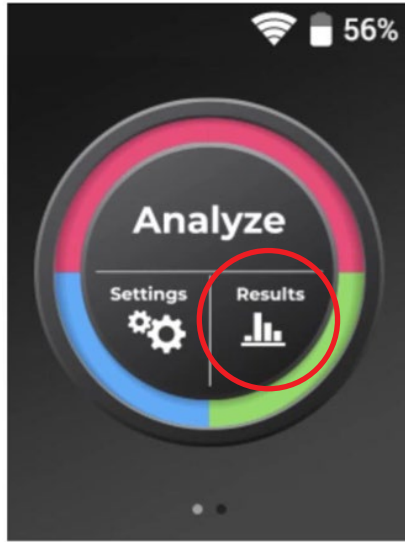
You can view:

- Date and time
- Spectrum
- Other user-created information of the test



14. EXPORTING TESTS

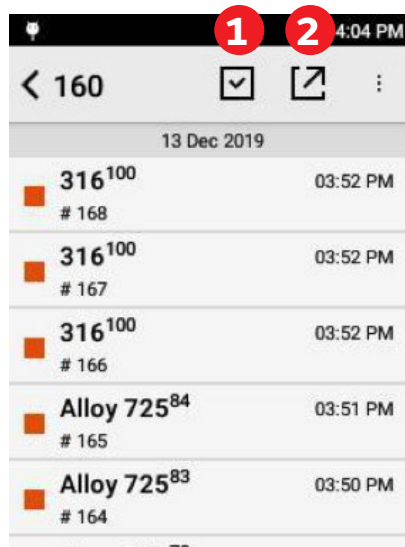
From the Home Screen, tap "Results"



The default screen will list all of the tests taken on the instrument.

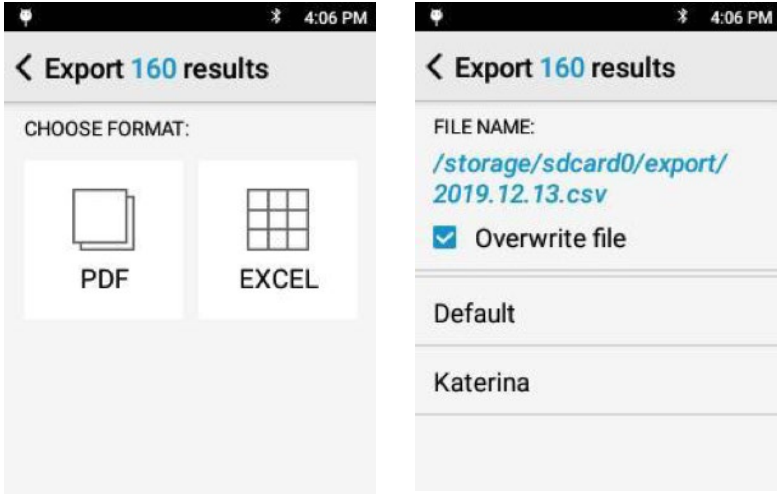
Tap the Menu button to open additional export options, including "Filter by Date" for quickly exporting a batch of results.

Tap the Checkbox button **1** to individually select multiple tests for export.
Tap the Export button **2** when ready to finalize the export.



Tap to select the desired export format.

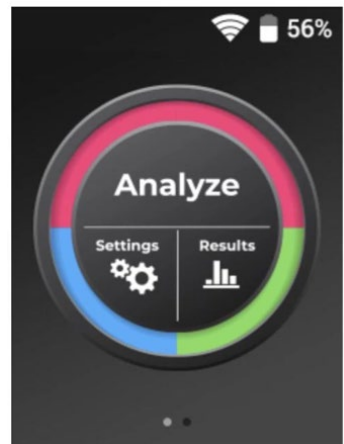
Tap the filename to change the export location or tap the template name (Default) to finish the export.



The **GEMORO** XRF Gold and Precious Metal Analyzer uses an embedded SD card to store the test results. The SD Card can be accessed by connecting the analyzer to a computer using the micro USB cable. Once connected, the analyzer's SD Card will show as a new drive from the computer's file explorer. Navigate to the export location selected at time of export (default export location is SD card export). Drag the exported files over from the SD Card to the desktop to save copies locally on the computer.

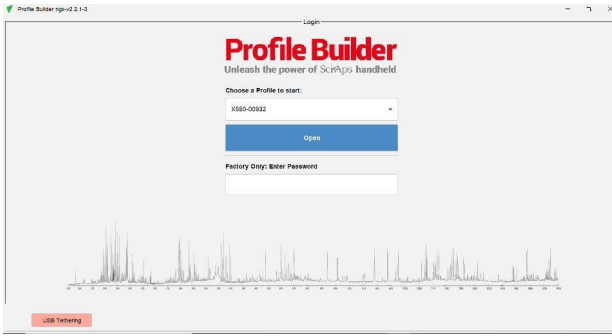
15. CONNECTING ANALYZER TO PROFILEBUILDER SOFTWARE

1. Connect the instrument to the computer via USB cable. The USB port on the instrument is located on the underside of the instrument, below the touch screen. This software is not compatible with Apple devices. Please only use a Windows based device.
2. Power on the analyzer using the power button located near that end of the snout by pressing one time.
3. Log into the analyzer using the "admin" profile and password 1-2-3-4-5. If other profiles and passwords have been established on the analyzer, those can be used as well.
4. Agree to the X-Ray radiation caution screen by pressing "OK" on the analyzer screen.
5. This will bring you to the Analyze screen shown here:
6. At this point, open

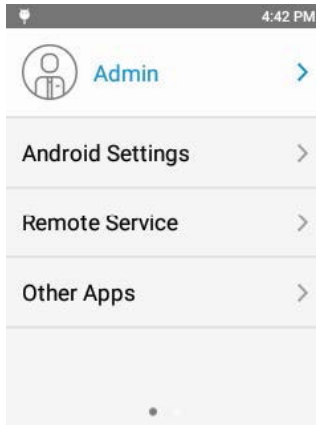


Profile Builder software on the computer.

[Link to download software.](#) (link will automatically download)

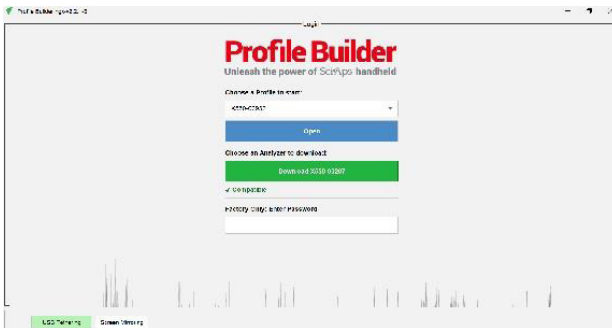


7. Back on the analyzer, swipe your finger from right to left to go to this screen:



8. Select “Remote Service”

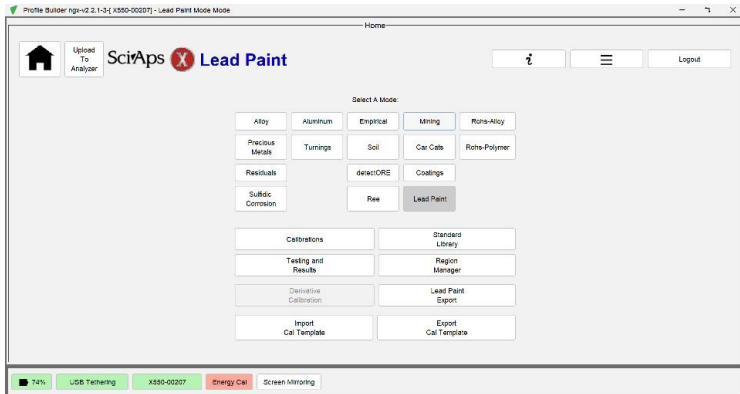
9. On the Profile Builder software, you should now have the option to select your analyzer for downloading, and the “USB Tethering” area should be green.



10. In the middle of the screen, select Download

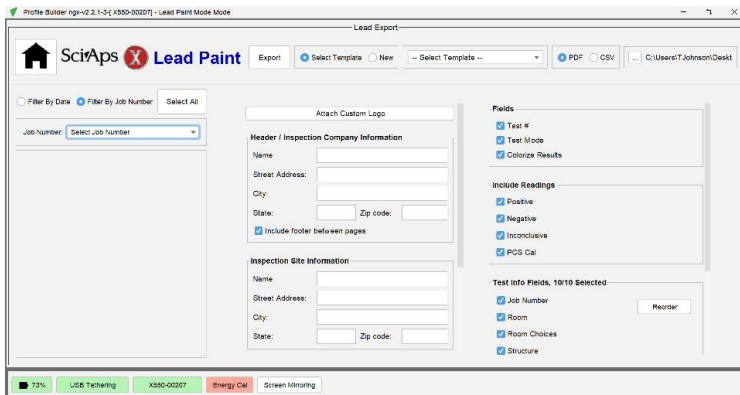
11. The download time will depend on the size of the database being downloaded.

12. When complete, this page will be displayed



13. Select “Lead Paint Export”

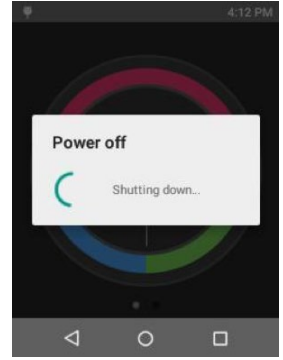
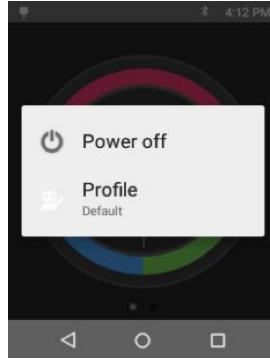
14. The screen should now look similar to this:



From this screen, you can select what results you wish to view by filtering by date or job number on the left side. The middle of the screen is information on who performed the work and the inspection site. The right side allows the user to select the information they would like displayed.

16. TURNING OFF THE UNIT

Press and hold the on/off button for 2 seconds. The Power off screen appears. Tap "**Power off**". The unit will power off.



17. HOW TO SAFELY USE GEMORO XRF GOLD & PRECIOUS METAL ANALYZER.

Radiation Safety is up to you. As the owner or operator of an X-Ray tube device, you are responsible for understanding the safety requirements and state regulations for using your X ray tube equipment. When the **GEMORO** XRF Gold and Precious Metal Analyzer is not actively testing samples, no-X

rays are emitted. When the **GEMORO XRF Gold and Precious Metal Analyzer** is energized, X rays are emitted, through the window in the nosecone. X-rays are invisible to the human eye; you will not see them when they are being emitted.

STAY SAFE WHEN USING HANDHELD XRF INSTRUMENTS

Best Practices for Safe Operation

Trigger finger should be the body part closest to the analyzer window.

Run tests with the XRF pointed away from other people

Pay attention to where the beam is pointed

Don't hold samples in your hand

Maintain control of the analyzer

Limit operation to trained personnel

18. HOW TO REPLACE THE XRF WINDOW COVER

1. Using a small Phillips head screwdriver, loosen the four screws holding the analyzer's wear plate in place. Note: The screws are retained in the wear plate to avoid misplacement

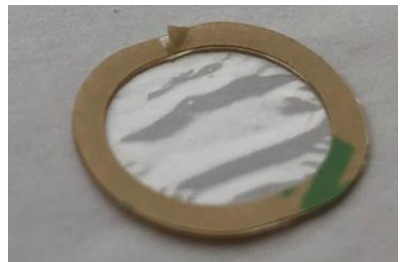


2. The old window will be stuck to the inside of the wear plate. Peel and discard.

3. Remove backing from fresh window and adhere to the inside of the wear plate. Be careful to align properly and press down firmly along the edges to get a good adhesion. Avoid touching the center of the window to prevent contamination.



4. Replace wear plate and retighten four screws



19. HOW TO CLEAR THE CACHE

Clearing The Existing Test Data and Show Battery Life Remaining

Start at the Circle Analyze Screen

Go to Results in the lower right of the circle

Go to the three dots in the upper right corner

Select delete all

20. IDENTIFYING GOLD PLATED MATERIAL

Understanding Element Concentration Ranges by Gold Type

Why This Is Critical for Accurate Precious Metal

Identification with Your GEMORO XRF

To ensure accurate analysis and avoid misidentifying **gold-plated materials**, it's important to understand how **karat gold alloys** are composed and how the **GEMORO XRF** interprets them.

All XRF analyzers, including your **GEMORO XRF**, are **surface testers**—they scan only the outermost layer of the material being analyzed. The **GEMORO XRF** provides a **detailed elemental breakdown**, showing each element detected at the surface and its **percentage concentration**.

SPOT FILING HELPS REVEAL HIDDEN LAYERS

Since XRF reads surface composition, plated items—especially gold-plated silver, copper, or base metals—can appear to be solid gold if only the outer layer is analyzed. To improve accuracy:

Test the original surface first

Then, file a small spot and re-test that exact location

This second test gives the analyzer better **penetration through any plating** allowing you to measure **Zinc (Zn), Copper (Cu), Nickel (Ni), or Silver (Ag)** that may be **present in higher-than-normal concentrations** that exceed the typical manufacturing standards. In addition to elevated Zn, Cu, Ni, or Ag concentrations to indicate potential plating, one must also be cognizant if/when Tungsten (W) is present at any concentration as this is a direct indicator that the sample is plated. Tungsten is widely used for gold-filed materials.

If these elements show up in levels **exceeding typical manufacturing standards**, it strongly indicates that the item is **not solid gold**—but rather **gold-plated**.

ELEMENT CONCENTRATION RANGES BY GOLD TYPE

Below are general industry standards for the elemental composition of commonly used gold alloys. These ranges are used in manufacturing but may vary slightly based on manufacturer, country, or formulation. Use these charts as a **reference point when interpreting GEMORO XRF results**:

ELEMENT CONCENTRATION RANGES BY TYPE

These are approximations used in jewelry manufacturing and can vary slightly by manufacturer or country.

14K Yellow Gold (Nickel-Free)

Gold Content: 58.5%

Element	% Range
Au (Gold)	57% – 59%
Ag (Silver)	8% – 12%
Cu (Copper)	27% – 33%
Zn (Zinc)	2% – 4%
Ni (Nickel)	0%
Pd (Palladium)	0%
Rh (Rhodium)	0%

14K Yellow Gold (Nickel-Containing)

Gold Content: 58.5%

Element	% Range
Au (Gold)	57% – 59%
Ag (Silver)	5% – 10%
Cu (Copper)	25% – 32%
Zn (Zinc)	2% – 5%
Ni (Nickel)	1% – 5%
Pd (Palladium)	0%
Rh (Rhodium)	0%

14K White Gold (Nickel-Free)

Gold Content: 58.5%

Element	% Range
Au (Gold)	57% – 59%
Ag (Silver)	8% – 12%
Cu (Copper)	4% – 10%
Zn (Zinc)	1% – 3%
Ni (Nickel)	0%
Pd (Palladium)	18% – 25%
Rh (Rhodium)	Trace (usually surface-plated only: <0.1%)

14K White Gold (Nickel-Containing)

Gold Content: 58.5%

Element	% Range
Au (Gold)	57% – 59%
Ag (Silver)	3% – 6%
Cu (Copper)	8% – 12%
Zn (Zinc)	3% – 6%
Ni (Nickel)	12% – 20%
Pd (Palladium)	0%
Rh (Rhodium)	Trace (surface plating common: <0.1%)

ELEMENT CONCENTRATION RANGES BY TYPE

These are approximations used in jewelry manufacturing and can vary slightly by manufacturer or country.

18K Yellow Gold (Nickel-Free)

Gold Content: 75%

Element	% Range
Au (Gold)	74% – 76%
Ag (Silver)	4% – 10%
Cu (Copper)	12% – 20%
Ni (Nickel)	0%
Zn (Zinc)	1% – 4%
Pd (Palladium)	0%
Rh (Rhodium)	0% (not used or plated)

18K Yellow Gold (Nickel-Containing)

Gold Content: 75%

Element	% Range
Au (Gold)	74% – 76%
Ag (Silver)	4% – 8%
Cu (Copper)	10% – 18%
Ni (Nickel)	1% – 5%
Zn (Zinc)	1% – 3%
Pd (Palladium)	0%
Rh (Rhodium)	0% (not used or plated)

18K White Gold (Nickel-Free)

Gold Content: 75%

Element	% Range
Au (Gold)	74% – 76%
Ag (Silver)	5% – 9%
Cu (Copper)	3% – 6%
Zn (Zinc)	1% – 3%
Ni (Nickel)	0%
Pd (Palladium)	12% – 20%
Rh (Rhodium)	Trace (surface plated: <0.1%)

18K White Gold (Nickel-Containing)

Gold Content: 75%

Element	% Range
Au (Gold)	74% – 76%
Ag (Silver)	3% – 6%
Cu (Copper)	5% – 10%
Zn (Zinc)	2% – 5%
Ni (Nickel)	10% – 15%
Pd (Palladium)	0%
Rh (Rhodium)	Trace (surface plating common: <0.1%)

GEMORO[®]

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