QUICK START GUIDE

GEMORO ASSAY LAB DESKTOP XRF

Gold & Precious Metal Analyzer

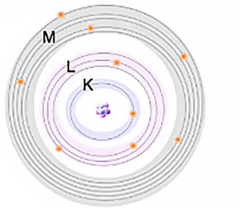
GEMORO®

TABLE OF CONTENTS

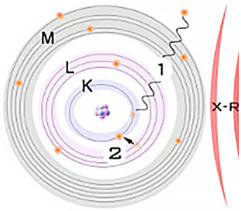
1. TECHNOLOGY

Sample analysis is broken down into four steps from the atomic level and three steps from the instrument level:

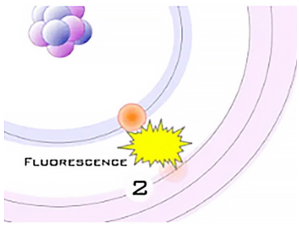
1. All atoms have a fixed number of electrons. These electrons are arranged in orbitals around the nucleus. Energy Dispersive XRF (EDXRF) typically captures activity in the three electron orbitals closest to the nucleus: the K, L, and M shells.



2. The primary photons from the X-ray tube have high enough energy to knock electrons out of the innermost orbitals, creating a vacancy. An electron from an outer orbital then moves into the newly vacant space to regain stability within the atom.

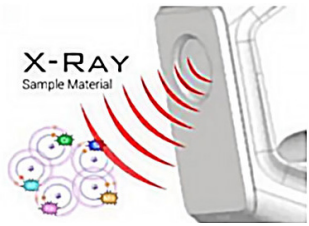


3. As the electron from the outer orbital moves into the inner orbital, it releases energy in the form of a secondary X-ray photon. This energy release is known as fluorescence. All elements produce fluorescence "characteristic" to themselves — meaning the energy of the X-ray photon released is specific to that element.

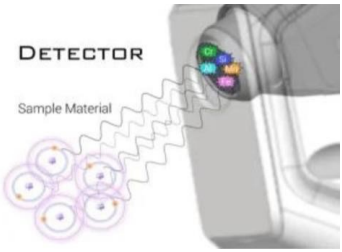


4. From the analyzer side, high-energy primary X-ray photons are emitted from an X-ray tube and strike the sample.

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 as percentages or as a spectrum. The XRF can process (digitize, count) about 200,000 or more X-rays every second. Each peak in the spectrum comes from a characteristic X-ray emitted by a specific element. The height of the peak is proportional to the concentration of that element, which is converted to a percentage or ppm via a calibration method — either fundamental parameters or factory or user-derived empirical calibrations.



2. ANALYZER COMPONENT OVERVIEW

The diagram below identifies components of the analyzer:

A. Power On/Off Button Located at the front right bottom corner of the unit.

B. Macro Camera Used to take a picture of the item you tested, post-test.

C. Display Screen Touchscreen display for operating the unit.

D. Battery/AC Power Ports Compartment Press both side releases simultaneously to open.

3. ACCESSORIES

Your **GEM**ORO Assay Lab ships with the following items:

- 316 Calibration Disc-**DO NOT LOSE THIS DISC**
- Flash Drive-contains desktop application setup
- Replacement Kapton film (3)
- Screwdriver
- Battery Charger
- Adapter for battery charger
- 2 Rechargeable Batteries
- Computer Connecting Cable
- Power Cables for the Power Adapter

4. BEFORE YOU BEGIN

Please review the following before setting up or operating your **GEM**ORO Assay Lab for the first time.

Power Source

Your unit ships with both an AC power cord and adapter, as well as two rechargeable batteries. Use only one power source at a time. DO NOT run the unit on AC power and battery power simultaneously.

Startup Warm-Up

After powering on, wait 2-3 minutes before performing calibration.

Calibration Disc

Your unit includes a 316 SS Calibration Disc. DO NOT lose this disc. It is required every time you calibrate the unit and cannot be substituted.

Battery Management
If the battery level becomes low during operation, switch to AC power or “hot swap” in a charged battery.

Shutdown
After powering down the unit, it is important to let it fully rest each night. If running on AC power, unplug the power cable from the unit. If using battery power, remove the batteries. Leaving the unit plugged in or with batteries installed, even while powered off, keeps residual electricity flowing through internal components, which can affect performance and shorten the unit's lifespan over time.

5. HOW TO SAFELY USE THE GEMORO XRF

The **GEM**ORO Assay Lab XRF is a closed beam, interlocked X-ray system. The tube will not energize if the interlocks are not properly engaged; the lid must be closed to run a test. Proper functioning of the safety LEDs is confirmed when the unit is powered up and the LEDs flash red-to-green three times consecutively. When the lid is closed and the X-ray tube is energized, the external LEDs turn red to indicate that X-rays are actively being emitted. Do not open the lid until the screen says **“COMPLETED”**. The external LED’s will remain red even after the test is completed to indicate that the machine can run a consecutive test of the sample. If your screen says **“COMPLETED”**, it is safe to open the lid.

General Safety Warnings

⚠ The main compartment contains high-voltage electronics. Opening the main compartment will void the warranty and could potentially be hazardous.

⚠ Ensure that the correct external power source is used (100V–240V / 50–60 Hz). Do not overload an electrical outlet.

⚠ Do not attempt to service the XRF. Users may replace batteries and the analyzer window only.

⚠ If the XRF is damaged, do not attempt to operate it. Contact **GEM**ORO/800.527.0719 for next steps.

Battery Safety

The **GEM**ORO XRF analyzers use a 14.4V Li-ion rechargeable battery pack. Observe the following guidelines:

- Avoid shorting the battery
- Do not immerse the battery in water
- Store in a cool, dry, well-ventilated area
- Avoid excessive physical shock or vibration
- Do not dispose of the battery in fire

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

X-Ray Safety

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

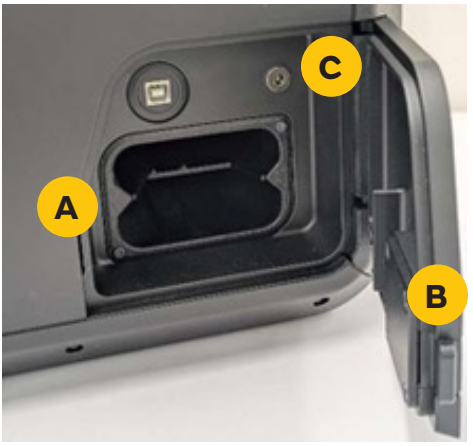
6. POWERING UP THE UNIT

Inserting the Batteries / Power Cord

The XRF comes with an AC power cord and adapter for wall outlet use, as well as a set of batteries; only one power source should be used at a time.

To run on AC power: plug the supplied power cord into the port at the top right side of the battery compartment.

To run on battery: insert a battery into either slot until the connectors sit snugly into place. The batteries are directional and keyed to go in only one way — tab to the top, groove facing down. Do not force them.



A. The unit can accommodate up to two batteries, which are housed behind the door on the bottom right side of the system.

B. Release the door latch and swing the door open towards the back of the system.

C. To run on AC power: plug the supplied power cord into the port at the top right side of the battery compartment.

Turning On the Unit
The power on/off button is located on the front right bottom corner of the unit. Press the button to turn the unit on.

The LED lights will flash three times, alternating from red to green, indicating proper functioning of the safety LEDs.

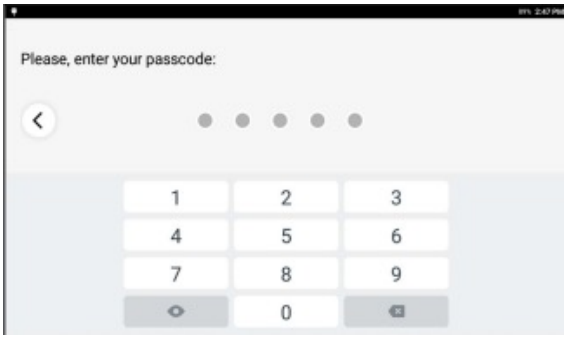
Open the unit by first switching the locking latch from red to green, then lifting the lid. The lid will stay open until you push it down and latch it closed again.

7. LOGGING IN

Steps to Login

The factory-set username is: **admin**

Press the arrow next to **"admin"** to proceed.



Enter the factory-set passcode: **12345**

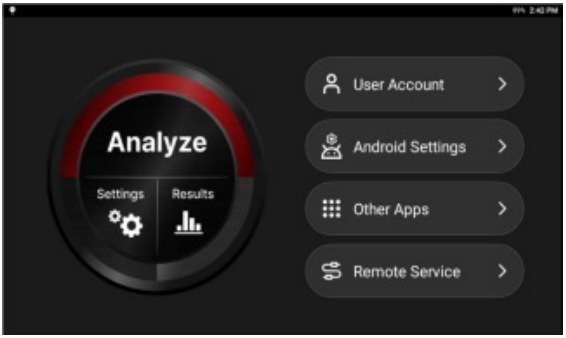
When logging in for the first time, you will be prompted to enter the password twice. After the password is verified, you will be directed back to the beginning screen showing "admin."

Press the arrow next to "admin" and enter the passcode one final time.

The X-Ray Warning screen will appear.

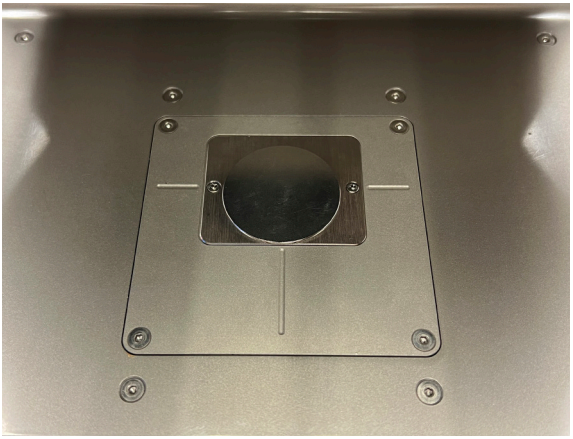
Tapping OK confirms that you understand the X-ray safety requirements for operation.

8. CALIBRATING THE UNIT



The Analyze screen will appear. Tap **"Analyze"** to begin.

If this is the first time the unit is being used that day, you must calibrate it before running tests.



Place the 316 calibration disc (included with your unit) onto the analysis area platform.

Make sure the disc completely covers the analysis window.

Close the lid and tap **"Calibrate."**

The calibration progress screen will appear. The process takes approximately 15 seconds.

9. TAKING A TEST

When calibration is complete, the Start Screen appears.

Remove the 316 Calibration Disc from the analysis area. The unit is now ready for testing.

Place the sample to be tested over the analysis window.

If you need to target a specific part of the sample, you can use the internal camera to position it accurately.

When you are satisfied with the sample placement, close the lid and tap **"Start."**

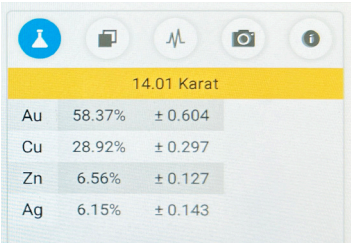
Elements That Can Be Detected

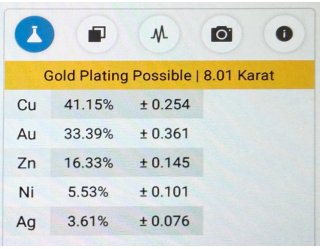
- Titanium (Ti)
- Vanadium (V)
- Chromium (Cr)
- Manganese (Mn)
- Iron (Fe)
- Cobalt (Co)
- Nickel (Ni)
- Copper (Cu)
- Zinc (Zn)
- Tungsten (W)
- Iridium (Ir)
- Platinum (Pt)
- Gold (Au)
- Lead (Pb)
- Bismuth (Bi)
- Zirconium (Zr)
- Molybdenum (Mo)
- Ruthenium (Ru)
- Rhodium (Rh)
- Palladium (Pd)
-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

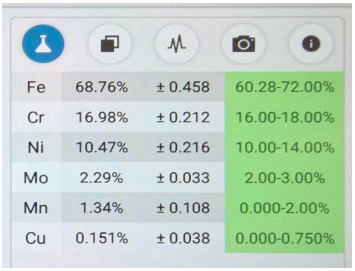
Note: Does not measure for Aluminum (Al), Magnesium (Mg), or Silicon (Si).

10. UNDERSTANDING YOUR RESULTS

The results screen displays three columns:







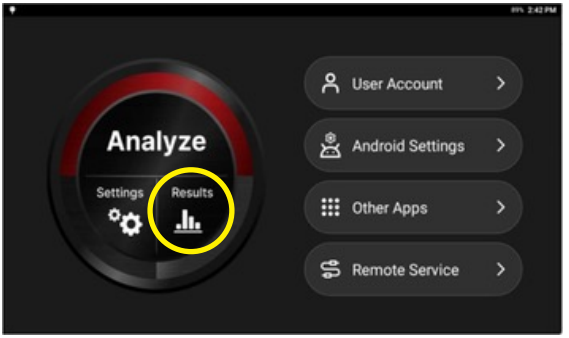
- Column 1 — lists all detected elements
- Column 2 — shows the concentration of each element
- Column 3 — shows the "confidence" or measurement uncertainty (±)
- Column 4 — shows the specifications of the best alloy grade match for the determined chemistry of the sample

Taking a Picture of Your Sample

From the results screen, tap the **camera icon** to capture a photo of your sample and save it to your test record.

11. EXPORTING TEST RESULTS

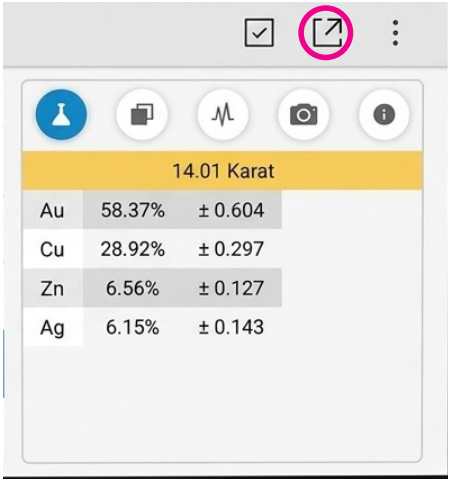
From the home screen, tap **"Results."**



The results page lists all tests taken on the instrument.

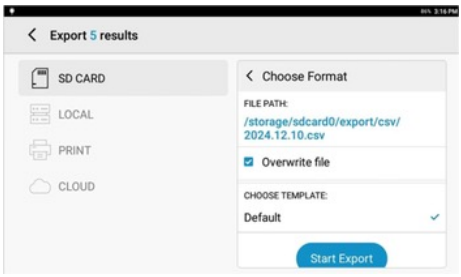
Tap the **Menu button (three dots top right corner)** to open export options, including a "Filter by Date" option for batch exports.

Tap the **Checkbox** to individually select multiple tests for export.

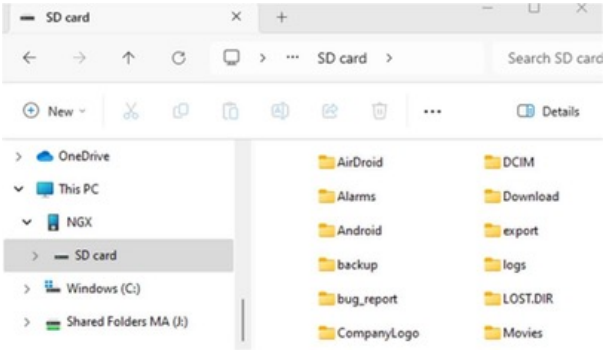


Tap the **Export button** to finalize the export.

Choose your export destination (SD Card, Local, Print, or Cloud) and format (PDF or CSV), then tap **Start Export**.



Transferring Files to Your Computer



The XRF uses an embedded SD card to store test results.

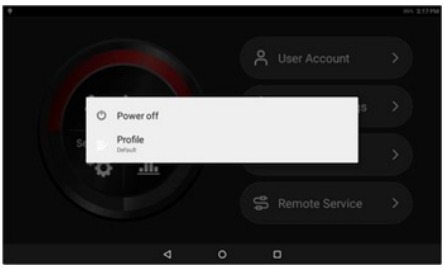
To access the SD card, connect the analyzer to a ***Windows computer*** using the included USB-B to USB-A cable.

The analyzer's SD card will appear as a new drive in File Explorer, named **NGX**. Navigate to the export location selected at the time of export (default: SD card\export).

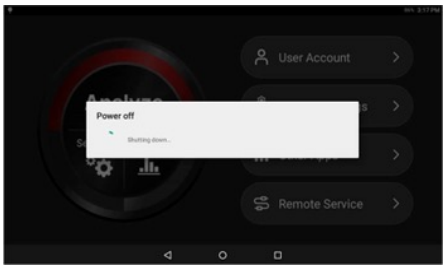
Drag the exported files from the SD card to your desktop to save copies locally.

12. TURNING OFF THE UNIT

Press and hold the power button for 2 seconds.



The Power Off screen appears. Tap **Power Off.**



The unit will shut down and power off.

13. UNDERSTANDING XRF CAPABILITIES

Identifying Gold-Plated Material

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

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

Spot Filing to 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.
- 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 exceeding typical manufacturing standards.

In addition to elevated Zn, Cu, Ni, or Ag, be alert to the presence of Tungsten (W) at any concentration — this is a direct indicator that the sample is plated. Tungsten is widely used in gold-filled materials.

If these elements appear in levels exceeding typical manufacturing standards, the item is strongly indicated to be gold-plated rather than solid gold.

The following tables show general industry standards for elemental composition of common gold alloys. These are approximations used in jewelry manufacturing and may vary slightly by manufacturer, country, or formulation.

Element Concentration Ranges — 14K Gold

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)	3%–6%
Cu (Copper)	8%–12%
Zn (Zinc)	3%–6%
Ni (Nickel)	12%–20%
Pd (Palladium)	0%
Rh (Rhodium)	Trace (<0.1%)

14K White Gold (Nickel-Free)
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-Containing)
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 (<0.1%)

Element Concentration Ranges — 18K Gold

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%

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%

18K White Gold (Nickel-Free)
Gold Content: 75%

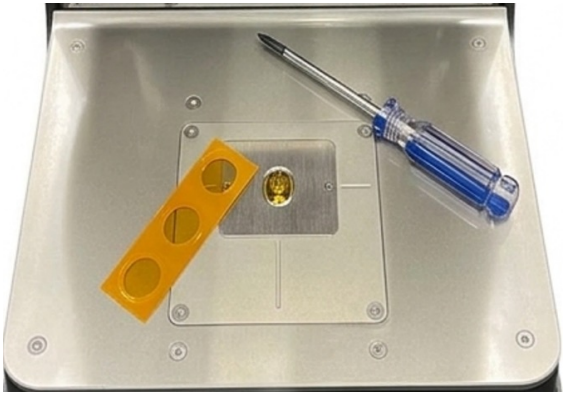
Element	% Range
Au (Gold)	74%–76%
Ag (Silver)	5%–9%
Cu (Copper)	3%–6%
Zn (Zinc)	1%–3%
Ni (Nickel)	12%–20%
Pd (Palladium)	Trace
Rh (Rhodium)	Trace (<0.1%)

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 (<0.1%)

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

14. WINDOW REPLACEMENT



***GEM**ORO only recommends replacing the Kapton film if the film is extremely wrinkled or worn.*

Using the 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 prevent misplacement.*

The old window will be adhered to the inside of the wear plate. Peel it off and discard it.

Remove the backing from the fresh replacement window and adhere it to the inside of the wear plate. Align carefully and press firmly along the edges for a good seal. Avoid touching the center of the window to prevent contamination.

Replace the wear plate and retighten the four screws.

15. HOW TO CLEAR THE CACHE

Clearing Existing Test Data

1. Start at the Circle Analyze Screen.
2. Tap Results (lower right of the circle).
3. Tap the three dots in the upper right corner.
4. Select Delete All.

16. BEST PRACTICES FOR USE & CARE OF YOUR GEMORO ASSAY LAB

*Recommended best practices to ensure accurate results, extend the life of your **GEM**ORO Assay Lab, and prevent avoidable damage. While the unit is compact and portable, it is a precision, lab-grade instrument and should be handled accordingly.*

Startup and Calibration

- When powering on the Assay Lab at the beginning of the day, allow the unit to fully complete its startup sequence.
- Wait approximately 2–3 minutes after startup before performing calibration.
- Use the included 316 SS Calibration disc to perform a calibration check after startup.

These steps allow internal electronics and the SDD detector to stabilize, supporting accurate and repeatable results with long-term reliability.

Daily Shutdown and Storage

- Power down the instrument at the end of each day.
- If running on battery, remove the battery after shutdown and store the unit without the battery installed.
- When running on AC power, unplug the adapter at the end of the day.

User Access and Handling

- Use the built-in passcode feature to manage and limit user access.
- Fewer operators reduce the risk of accidental damage or misuse.
- Ensure all users are properly trained before operating the unit.

Care of the Testing Chamber and Lid

- The most sensitive components of the Assay Lab are housed inside the fully shielded lid and testing chamber.
- Always close the lid fully before initiating a test. The safety interlock is designed to prevent X-ray emission unless the lid is properly secured — never attempt to bypass this feature.
- Do not place items on top of the closed lid or apply pressure to it.
- Keep the full-view leaded glass window clean and free of debris.

Proper Sample Placement

- Place the item to be tested directly on the testing surface inside the chamber, centered within the 3mm testing area.
- Use the built-in camera to confirm sample positioning before running a test.
- Avoid placing wet, oily, or chemically treated items in the chamber without first wiping them clean. Residue can interfere with readings and damage internal surfaces.

Battery Care and Power Management

- The Assay Lab supports both battery and AC power operation.
- Each rechargeable battery provides up to 6 hours of use. Two batteries are included.
- Avoid allowing the battery to die while installed in the unit. If battery level is low, switch to AC power or swap to a charged battery.
- Store batteries separately from the unit when not in use for extended periods.

Transporting the Unit

- Use the built-in handle when moving the unit. Do not carry it by the lid or cord.
- At 19 lbs, the unit should be lifted with care. Use two hands when moving it.

17. SUMMARY

Treat your **GEM**ORO Assay Lab as the precision instrument it is. Proper startup, calibration, careful sample handling, controlled user access, and attention to the testing chamber will help ensure consistent performance, accurate results, and a long service life.

GEMORO XRF

GOLD & PRECIOUS METAL ANALYZERS

MADE IN THE USA. ENGINEERED. ASSEMBLED. SUPPORTED.
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SY KESSLER SALES, INC.
10455 Olympic Drive
Dallas, TX 75220 USA

www.sykessler.com

For technical support:

800.527.0719 or 214.351.0380
sales@sykessler.com