



**Thermo Fisher Scientific**

# **Niton XL2 Plus Analyzer**

**Version 8.5**

## **User's Guide**

**110-00156**

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# Manual Overview

## Contents

- “Warnings, Cautions, and Notes” on page 1
- “Figures” on page 2
- “Physical Buttons” on page 2
- “Other Hardware” on page 3

## Warnings, Cautions, and Notes

### Warnings

Warnings are extremely important recommendations, violating which may result in either injury to yourself or others, or damage to your analyzer and/or data. Warnings will always be identified as Warnings in the text, and will always be visually presented as follows:

**WARNING** This is a Warning.

#### Example Warning:

**WARNING** Tampering with the 5,500 ppm (Lead high) lead-in-soil standard may cause exposure to lead dust. Keep all standards out of reach of children.

### Cautions

Cautions are important recommendations. Cautions will always be identified as Cautions in the text, and will always be visually presented as follows:

**CAUTION** This is a Caution.

#### Example Caution:

**CAUTION** Never tamper with Test Standards. They should not be used unless they are completely intact

## Notes

Notes are informational asides which may help you with your analyses. Notes will always be identified as Notes in the text, and will always be visually presented as follows:

**Note** This is a Note.

### Example Note:

**Note** For defensible Quality Control, keep a record of the time and precision of every calibration

## Figures

Figures are illustrations used to show what something looks like. Figures will always be labeled and identified as Figures directly below the Figure itself, and will always be visually presented as follows:

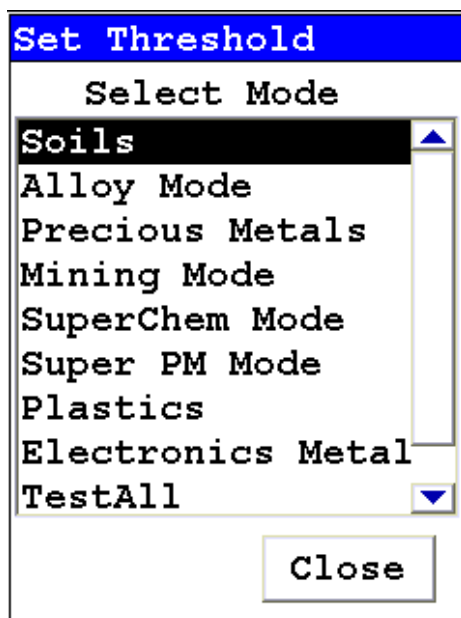


Figure 1. This is a Figure

## Physical Buttons

Physical Buttons are actual buttons on the analyzer which must be pushed to activate their function. Physical Buttons will always be identified as Buttons in the text, and will always be visually presented as follows:

### Example Physical Buttons:

On/Off/Escape Button, Clear/Enter Button, Interlock Button, and Trigger Button.



## **Other Hardware**

Other Hardware refers to any physical part of the analyzer which performs a necessary function. Other Hardware will always be visually presented as follows:

This is an example of Other Hardware.

### **Example Other Hardware:**

Battery, Touch Screen Display, Measurement Window, and USB Cable



# Using Your Analyzer

## Contents

- “Intended Use” on page 5
- “Safely and Effectively Using Your Analyzer” on page 6
- “Operational Specifications for Niton XL2 Plus Analyzer” on page 20
- “Radiation and Compliance Labels” on page 21
- “Battery Installation and Charging” on page 23
- “Hot Swap Feature” on page 26
- “Emergency Response Information” on page 26

This section discusses the basics of using your analyzer. Radiation safety is covered first, because using an X-ray based analyzer safely is very important. Secondly, we outline the daily startup procedure to ensure that your analyzer is performing properly and at its most efficient level.

## Intended Use

Get fast, accurate metal alloy verification for manufacturing quality assurance with the Thermo Scientific™ Niton™ XL2 Plus Analyzer. The XL2 Plus Analyzer provides immediate, nondestructive elemental analysis of alloy materials from titanium to nickel as well as tramp and trace element analysis. Lightweight, rugged handheld Niton XL2 Plus Analyzers are well suited for a growing list of applications including scrap metal identification, mining and exploration, and lead screening for consumer and electronic goods.

## Navigation

Use the touch screen or keypad to access XL2 Plus features.



## Safely and Effectively Using Your Analyzer

**CAUTION** Niton analyzers are not intrinsically safe analyzers. All pertinent Hot Work procedures should be followed in areas of concern.

**CAUTION** If the equipment is used in a manner not specified by Thermo, the protection provided by the equipment may be impaired.

**WARNING** Always treat radiation with respect. Do not hold your analyzer near the measurement window during testing. Never point your analyzer at yourself or anyone else when the shutter is open.

### Serviceable Parts

There are no user serviceable parts. All repairs must be performed by factory trained technicians.

## **Ergonomics**

The Niton XL2 Plus analyzer is ergonomically designed. This lightweight, compact, and balanced instrument minimizes strain on the user, especially on extended jobs. Three separate test stands provide added ergonomic support for development, calibration or anytime you need to test samples repeatedly and for long periods of time. For more information see “[Test Stands](#)” on [page 165](#).

## **Unintentional Misuse**

Take caution to avoid unintentional misuse, which is not covered on the service warranty. Examples of unintentional misuse include:

- letting the analyzer slip out of your hand in a damp environment
- standing the analyzer upright on the battery, putting it at high risk of falling off a counter or desktop

## **Radiation and General Safety**

This section covers topics related to radiation safety and general safety when using a Thermo Scientific Niton XL2 Plus analyzer. At a minimum all operators of the analyzer should be familiar with the instructions provided in this chapter in order to handle the analyzer in a safe manner. In addition to reading the information presented on the following pages, Thermo Fisher Scientific recommends that anyone operating the XL2 Plus analyzer participate in a radiation safety and operational training class. You can find courses online at <https://portables.thermoscientific.com/>. Login and search for “radiation safety training”.

## **Radiation Protection Basics**

The Niton Model XL2 Plus analyzer contains an x-ray tube which emits radiation only when the user turns the x-ray tube on. When the x-ray tube is on and the shutter is open, as during a measurement, the analyzer emits a directed radiation beam - see Figures 1-1 and 1-2. Reasonable effort should be made to maintain exposures to radiation as far below dose limits as is practical. This is known as the ALARA (As Low as Reasonably Achievable) principle. For any given source of radiation, three factors will help minimize your radiation exposure: Time, Distance, and Shielding.

### **Time**

The longer you are exposed to a source of radiation the longer the radiation is able to interact in your body and the greater the dose you receive. Dose increases in direct proportion to length of exposure.

## **Distance**

The closer you are to a source of radiation, the more radiation strikes you. Based on geometry alone, dose increases and decreases with an inverse-squared relation to your distance from the source of radiation (additional dose rate reduction comes from air attenuation). For example, the radiation dose one foot from a source is nine times greater than the dose three feet from the source. Remember to keep your hands and all body parts away from the front end of the analyzer when the shutter is open to minimize your exposure.

## **Shielding**

Shielding is any material that is placed between you and the radiation source. The more material between you and the source, or the denser the material, the less you will be exposed to that radiation. Supplied or optional test stands are an additional source of shielding for analysis. A backscatter shield accessory is also available and may be appropriate in some applications.

## **Exposure to Radiation**

Human dose to radiation is typically measured in rem, or in one-thousandths of a rem, called millirem (mrem), 1 rem = 1000 mrem. Another unit of dose is the Sievert (Sv), 1 Sv = 100 rem. The allowable limit for occupational exposure in the U.S (and many other countries) is 5,000 mrem/year (50 mSv/year) for deep (penetrating) dose and 50,000 mrem/year (500 mSv/year) for shallow (i.e., skin) dose or dose to extremities. Deep, shallow, and extremity exposure from a properly used Niton XL2 Plus analyzer should be less than 200 mrem per year, (2.0 mSv per year) even if the analyzer is used as much as 2,000 hours per year, with the shutter open continuously. The only anticipated exceptions to the 200 mrem maximum annual dose are: 1) routine and frequent analysis of plastic samples without use of a test stand, backscatter shield, or similar additional protective measures, or 2) improper use where a part of the body is in the primary beam path.

**Note** NEVER OPERATE THE DEVICE WITH A PART OF YOUR BODY IN THE PRIMARY BEAM PATH OR WITH THE PRIMARY BEAM PATH DIRECTED AT ANYONE ELSE.

Also, consider the use of protective accessories such as a shielded test stand or backscatter shield (or equivalent) when performing routine and/or frequent analysis of any of the following:

- light materials (such as plastic, wood, or similarly low density/low atomic mass samples)
- thin samples (such as foils, circuit boards, and wires)
- samples that are smaller than the analysis window.

Shown in [Table 1](#) are the typical background radiation doses received by the average member of the public. The radiation dose limits for radiation workers in the US are also shown in [Table 2](#).

**Table 1. Typical Radiation Doses Received (Source: NCRP 1987)**

Category	Dose in mrem	Dose in mSv
Average total dose in US (annual)	360	3.6
Average worker exposure (annual)	210	2.1
Average exposure for an underground miner	400	4.0
Exposure for airline crew (1,000 hours at 35,000 ft)	500	5.0
Additional from living in Denver at 5300' (annual)	25	.25
Additional from 4 pCi/l radon in home	1,000	10.0
Typical Chest X-Ray	6	0.06
Typical Head or Neck X-Ray	20	0.2
Typical pelvis/hip x-ray	65	0.65
Typical lumbar spine x-ray	30	0.3
Typical Upper G.I. x-ray	245	2.45
Typical Barium enema x-ray	405	4.05
Typical CAT scan	110	1.10

**Table 2. Annual Occupational Dose Limits for Radiation Workers (Source: Code of Federal Regulations Title 10, Part 20)**

Category	Dose in mrem	Dose in mSv
Whole Body	5000	50
Pregnant Worker (during gestation period)	500	5
Eye Dose Equivalent	15,000	150
Shallow dose equivalent to the skin or any extremity or organ	50,000	500
Maximum allowable dose for the general public (annual)	100	1.0
For a Minor	500	5.0

## Monitoring your radiation exposure

Individuals can be monitored for the radiation dose they receive by use of radiation dosimetry devices (dosimeters). Monitoring dose using a dosimeter can be a way of identifying improper use and at the same time demonstrating proper use. In some locations, dosimetry is required by regulations and in others it is optional. It is normally required when the user could reasonably be expected to receive in excess of 10% of the annual dose limit. Thermo Fisher Scientific recommends that you determine and obey the local regulatory requirements concerning radiation monitoring of occupational workers.

Two common types of dosimeters are whole-body badges and ring badges. Whole body badges are often attached to the user's torso (e.g., clipped to the collar, shirt pocket, or waist as appropriate). A ring badge is worn on the finger as a measure of maximum extremity dose. When worn, the specific location of the dosimeter should be that part of the body that is expected to receive the highest dose. This location will depend on how the analyzer is used and so it may not be the same for all users. Dosimetry services are offered by many companies. Two companies offering dosimetry services in the USA and much of the world are:

Company	Global Dosimetry Solutions	Landauer, Inc.
Address	2652 McGaw Avenue	2 Science Road
City and State	Irvine, CA 92614	Glenwood, IL 60425-9979
Website	<a href="http://www.dosimetry.com">www.dosimetry.com</a>	<a href="http://www.landauerinc.com">www.landauerinc.com</a>
Phone Number	(800) 251-3331	(800) 323-8830

**Note** Wearing a dosimeter badge does not protect you against radiation exposure. A dosimeter badge only measures your exposure (at the dosimeter location).

## Pregnancy and Radiation Exposure

International guidance documents (e.g., ICRP Publication 60 and NCRP Publication 116\*) recommend that the radiation dose to the embryo/fetus of a pregnant woman should not exceed a total of 500 mrem (10% of normal radiation worker limit) during the gestation period. While this dose limit exceeds the dose limit to a trained operator, pregnant workers may want to take special precautions to reduce their exposure to radiation. For more information see the U.S. NRC Regulatory Guide 8.13 "Instruction Concerning Prenatal Radiation Exposure" which can be found on the resource CD.

\* The International Commission on Radiological Protection, ICRP, is an independent Registered Charity, established to advance for the public benefit the science of radiological protection, in particular by providing recommendations and guidance on all aspects of protection against ionizing radiation.



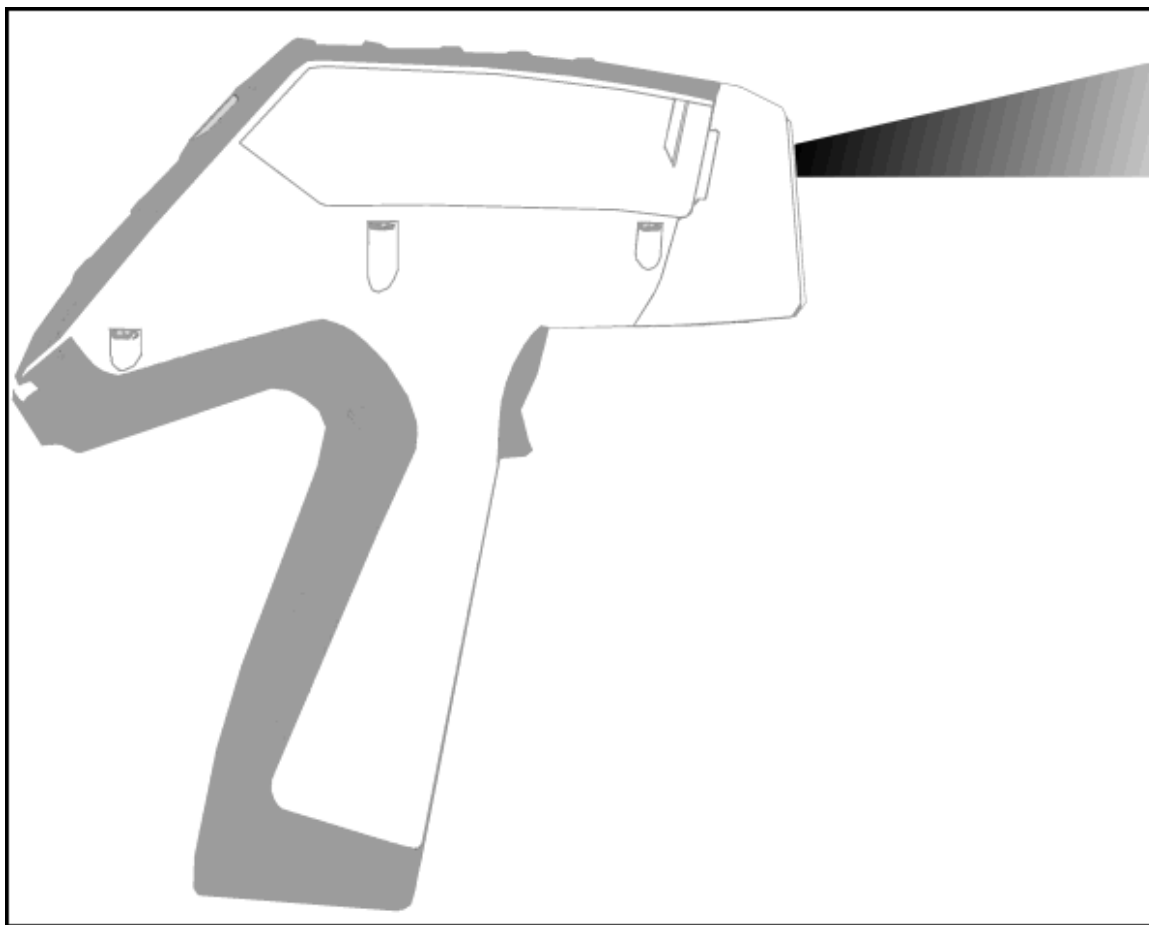
\* The National Council on Radiation Protection and Measurements (NCRP) was chartered by the U.S. Congress in 1964 as the National Council on Radiation Protection and Measurements.

## **How to Use the Niton XL2 Plus Analyzer Safely**

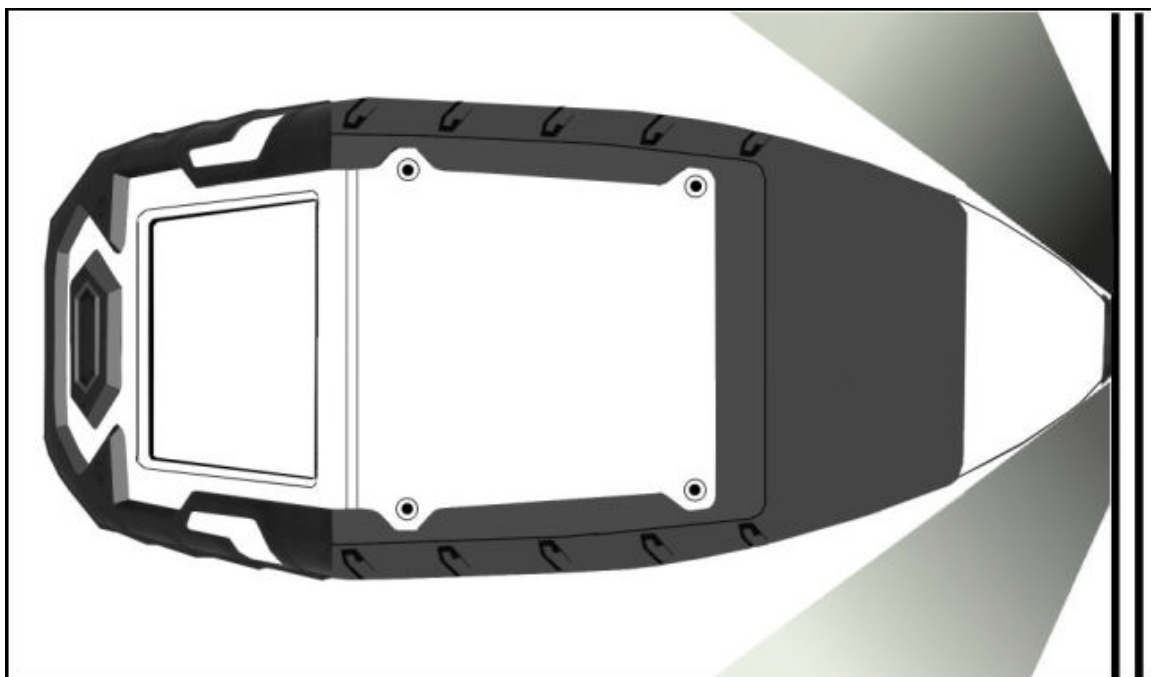
The Niton XL2 Plus analyzer is designed to be safe to operate provided that it is used in accordance with manufacturer's instructions. Under conditions of normal use, monitored operators seldom receive a measurable dose and have not been known to receive in excess of 10% of the annual occupational dose limits (a criteria that would require monitoring under regulation in the U.S.). In addition to proper use of the analyzer, it is recommended that you follow these precautions to ensure your safety and the safety of those around you.

### **Know where the beam is**

The primary beam is a directed beam out of the front of the analyzer that can have high dose rates. The secondary beam, or scattered beam, has much lower dose rates.



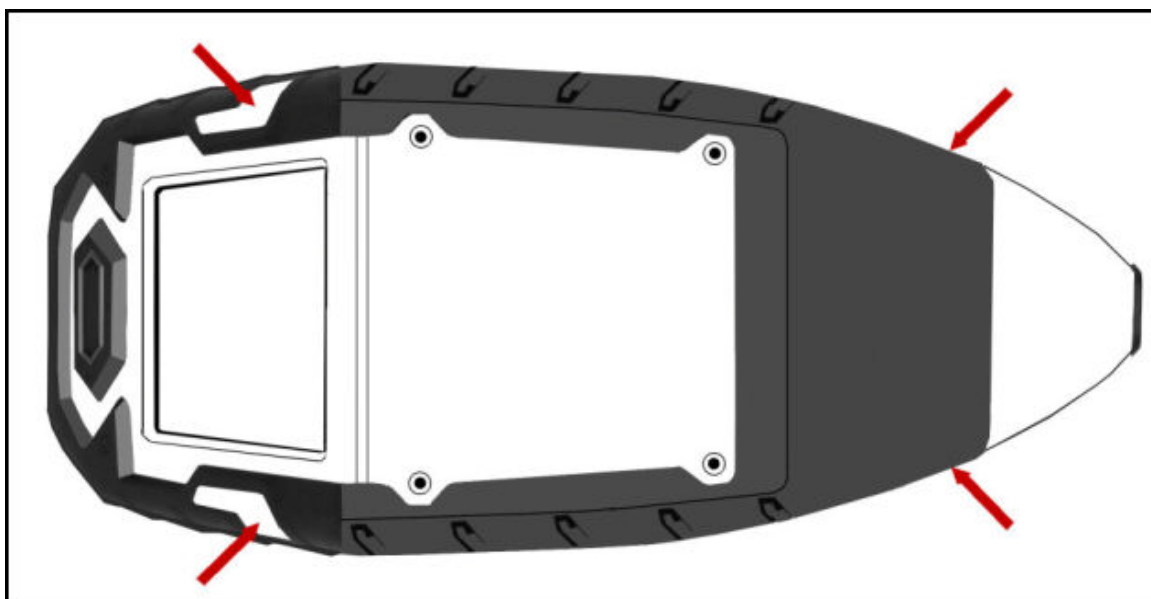
**Figure 2. Primary Beam**



**Figure 3. Secondary (Scattered) Beam**

### **The Shutter-Open Indicator Lights**

When the lights are flashing, the primary beam is on, and radiation is being emitted from the front of the analyzer.



**Figure 4. The X-ray Beam Indicator Lights**

## Handle and Use with Respect

Avoid holding the front of the analyzer when the x-ray tube is energized and the shutter is open. Never point the instrument at yourself or anyone else when the shutter is open and the x-ray tube is energized. Never look into the path of the primary beam.

## Follow a Radiation Protection Program

Your organization should establish, document, and follow a Radiation Protection Program.

## Take Proper Care of your Niton XL2 Plus

Keeping your analyzer maintained in good condition will help minimize the risk of accidental exposure. Mechanical malfunction of the shutter can be avoided by maintaining the measurement window, as described in the User Guide. This prevents foreign objects from entering your analyzer.

The XL2 Plus Analyzer is equipped with Detector ProGuard, a detector protection grid. While the Detector ProGuard helps to minimize accidental detector punctures, care must be taken to avoid introducing sharp objects to the analyzer measurement window area. *Under Manufacturer standard terms and conditions, detector punctures will not be covered under warranty.*

## Avoid Over-Exposures

Direct contact with the window could result in overexposures in the times indicated in [Table 3](#) below.

**Table 3. Potential Exposure Limit Times**

Location of Dose	Limit	Time to Reach Limit
Deep Dose / Whole Body	5 rem (50 mSv)	2.1 minutes
Shallow Dose / Extremities	50 rem (500 mSv)	0.95 minutes
Member of Public (i.e. untrained operator)	0.1 to 5 rem (1 to 50 mSv)	2.5 to 9.5 seconds

Extremity is defined by the NRC as the hand, elbow, arm below the elbow, foot, knee, or leg below the knee. Whole Body is defined by the NRC as the head, trunk (including male gonads), arms above the elbow, or legs above the knee.

## **Safe Handling of Samples**

As mentioned many times in this chapter, never place any part of your body in the path of the x-ray beam. There is always a safe way to handle samples whether they are small, irregularly shaped, or of low density. Never look into the path of the primary beam.

### **Small Samples**

A small sample would be any sample that is smaller than the measurement window. Small samples present a unique risk because they don't block the entire beam path. The difficulty with placing small samples down on a work surface to analyze them is that you may get readings from the work surface that interfere with analytical results. A test stand is an effective way of analyzing small samples accurately and safely. Never hold samples during analysis or look into the path of the primary beam.

### **Irregularly Shaped Samples**

Irregularly shaped samples may not allow the proximity button to be depressed, or they may not entirely cover the primary beam and cause additional scattering. A back scatter shield is a safe way of reducing your radiation exposure while effectively analyzing an irregularly shaped sample.

### **Light Materials (such as plastics).**

X-rays are attenuated more by denser and higher atomic mass materials, and less through lighter materials such as plastic. This causes higher dose rates in the scattered radiation. If you are frequently handling low density samples, you should consider the use of test stands, backscatter shields, or the equivalent. For more information see [“Test Stands”](#) on [page 165](#).

## Niton XL2 Plus Radiation Profile

### Radiation Meter Information

Model: Rad-Eye B20

SN: 30776

Cal Due: 08/04/2018

### Background Radiation Level

<0.01 mR/hr

**Table 4 - Scatter Measurements off various substrates - Dose Rates in mRem/hr**

<b>Table 4. Niton XL2 Plus Radiation Profile - Scatter Measurements - mRem/hr</b>						
<b>kV</b>	<b>uA</b>	<b>Range</b>	<b>Substrate</b>	<b>Max @ 5cm</b>	<b>Max @ 30 cm</b>	<b>Max @ Trigger</b>
6.2	200	Low	Aluminum	<0.02	<0.02	<0.02
6.2	200	Low	Stainless	<0.02	<0.02	<0.02
6.2	200	Low	Plastic	<0.02	<0.02	<0.02
6.2	200	Low	Soil	<0.02	<0.02	<0.02
8	200	Low	Aluminum	<0.02	<0.02	<0.02
8	200	Low	Stainless	<0.02	<0.02	<0.02
8	200	Low	Plastic	<0.02	<0.02	<0.02
8	200	Low	Soil	<0.02	<0.02	<0.02
45	44	Main	Aluminum	0.82	0.075	0.028
45	44	Main	Stainless	0.04	<0.02	<0.02
45	44	Main	Plastic	3.5	0.25	0.36
45	44	Main	Soil	1.2	0.10	0.10

**Table 5 - Scatter Measurements off various substrates - Dose Rates in  $\mu\text{Sv/hr}$**

<b>Table 5. Niton XL2 Plus Radiation Profile - Scatter Measurements - <math>\mu\text{Sv/hr}</math></b>						
<b>kV</b>	<b>uA</b>	<b>Range</b>	<b>Substrate</b>	<b>Max @ 5cm</b>	<b>Max @ 30 cm</b>	<b>Max @ Trigger</b>
6.2	200	Low	Aluminum	<0.2	<0.2	<0.2
6.2	200	Low	Stainless	<0.2	<0.2	<0.2
6.2	200	Low	Plastic	<0.2	<0.2	<0.2
6.2	200	Low	Soil	<0.2	<0.2	<0.2
8	200	Low	Aluminum	<0.2	<0.2	<0.2
8	200	Low	Stainless	<0.2	<0.2	<0.2
8	200	Low	Plastic	<0.2	<0.2	<0.2
8	200	Low	Soil	<0.2	<0.2	<0.2
45	44	Main	Aluminum	8.2	0.75	0.28
45	44	Main	Stainless	0.4	<0.2	<0.2
45	44	Main	Plastic	35	2.5	3.6
45	44	Main	Soil	12	1.0	1.0

**Notes:**

Scatter measurements were taken at a radius of 5 or 30 cm around the nose of the analyzer with the highest scatter dose rate being recorded.

**Table 6 - In Beam Measurements - Dose Rates in Rem/hr**

<b>Table 6. Niton XL2 Plus Radiation Profile - In Beam Measurements - Rem/hr</b>						
<b>kV</b>	<b>uA</b>	<b>Range</b>	<b>Contact Deep</b>	<b>Contact Shallow</b>	<b>5cm Deep</b>	<b>30cm Deep</b>
6.2	200	Low	<1.0	510,000	<1.0	<1.0
8	200	Low	24	2,000,000	4.0	<1.0
45	44	Main	58,000	200,000	9,400	860

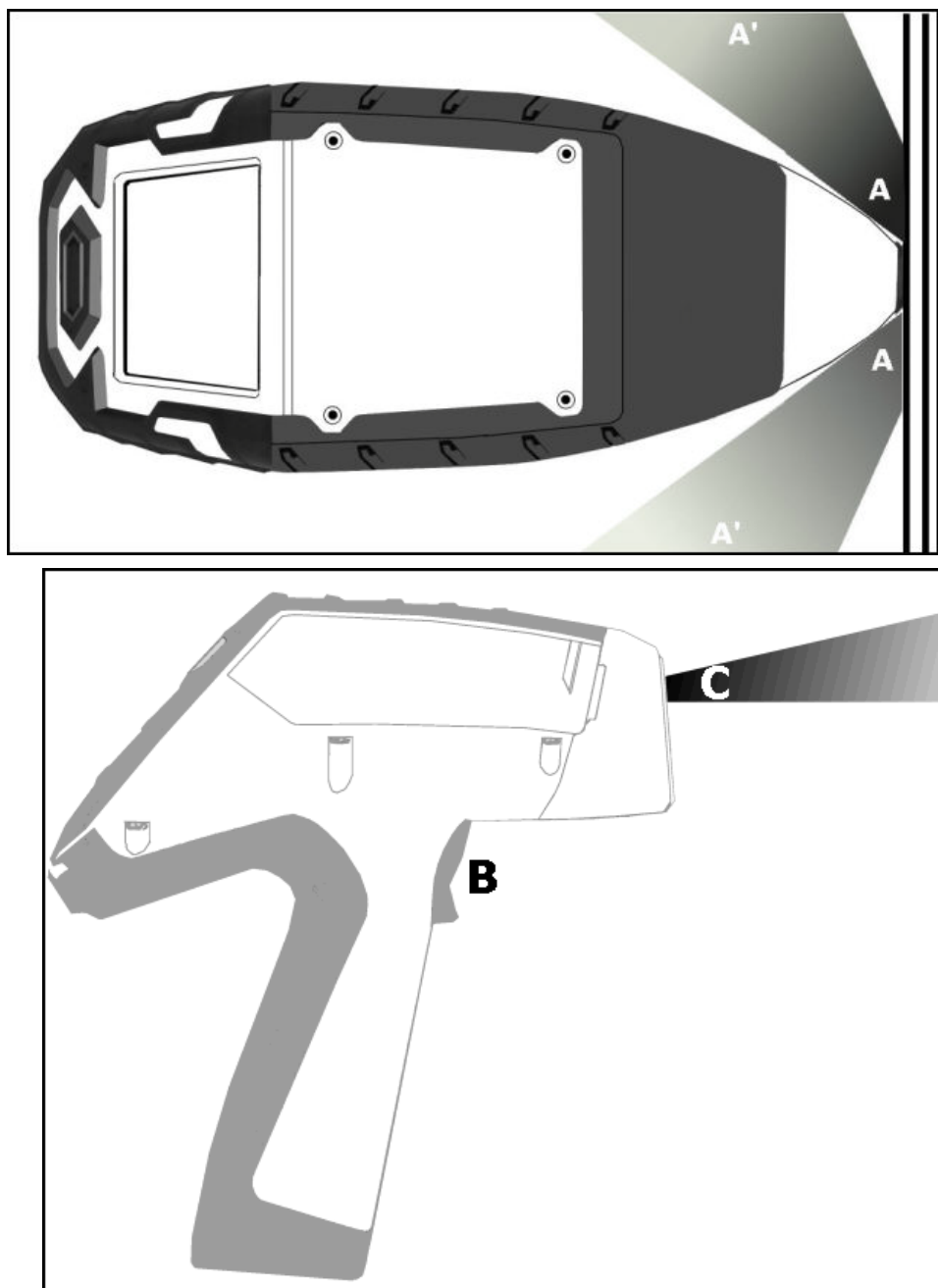
**Table 7 - In Beam Measurements - Dose Rates in mSv/hr**

<b>Table 7. Niton XL2 Plus Radiation Profile - In Beam Measurements - mSv/hr</b>						
<b>kV</b>	<b>uA</b>	<b>Range</b>	<b>Contact Deep</b>	<b>Contact Shallow</b>	<b>5cm Deep</b>	<b>30cm Deep</b>
6.2	200	Low	<0.010	5,100	<0.010	<0.010
8	200	Low	0.24	20,000	0.040	<0.010
45	44	Main	580	2,000	94	8.6

**Notes:**

In beam dose rates were measured using optically stimulated luminescent (OSL) dosimeters.

Reported results are based on measurement results that have been reduced to 2 significant digits by rounding up. For example, a measurement result of 1441 would be reported as 1500.



**Figure 5. Primary and Secondary Dose Locations (Not to Scale)**



## Primary Radiation

Primary radiation is radiation that is produced by the analyzer and emitted out through the measurement window. Individuals should never place any part of their body in the primary beam path when the x-ray tube is on. There should always be a sample in contact with the measurement window when the x-ray tube is on. The sample will absorb most of the primary-beam radiation unless it is smaller than the instrument's measurement window or of low atomic mass, low density, and/or very thin. Caution should be taken when analyzing samples that are small, thin, and/or low in atomic mass or density as they may allow much more of the primary beam to escape.

## Secondary Radiation

Under conditions of normal and proper use, individuals can be exposed to secondary (or “scattered”) radiation. Secondary radiation is low-level radiation that emanates from the sample being analyzed as a result of primary beam radiation scattering in the sample or primary beam radiation inducing fluorescent x-rays in the sample. Dose points A, A' and B in [Figure 5](#) are examples of where you can encounter secondary radiation. The magnitude of this secondary radiation is sample dependent. Higher atomic mass and density samples such as steel will emit the lowest levels as they absorb most primary and secondary radiations. Lower atomic mass and density samples such as aluminum, wood, and especially plastic, will produce higher levels of secondary radiation.


The operator is reminded that one should never hold samples during analysis, doing so will result in higher than necessary exposure to secondary radiation and could expose the operator directly to the much higher primary-beam dose rates.

## Deep and Shallow Dose

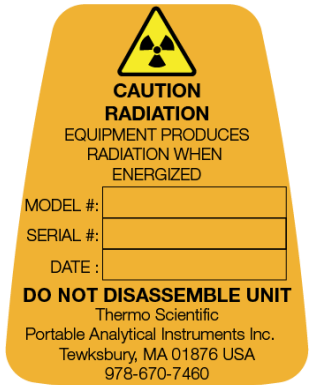
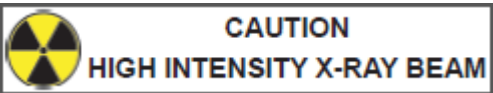

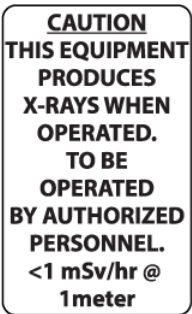
You will find in [Table 6](#) and [Table 7](#) that shallow dose rates are listed for some dose points. All dose rates listed in these four Tables are deep dose unless they are specifically identified as shallow dose. Deep dose is dose from penetrating radiation that is delivered to both skin and underlying tissues and organs and is the type most commonly referred to when describing external radiation hazards. Occupational deep dose is limited to a maximum of 5 rem (50 mSv) per year in the United States and most countries internationally. Deep dose is measured at 1.0 cm below the skin surface.

Shallow dose is often referred to as “skin dose” because it is a result of low penetrating radiation that only interacts with the skin. Shallow dose is limited to a maximum of 50 rem (500 mSv) per year in the United States and most countries internationally. Shallow dose is listed for primary in-beam dose points only because the low penetrating radiation that causes shallow dose is nearly all absorbed by a sample and does not produce any significant secondary radiation. Shallow dose is measured at a point 0.007 cm below the surface.

## Operational Specifications for Niton XL2 Plus Analyzer

Specification	Value
Weight	With battery: 3.4 lbs (1.53 kg)
Size	<ul style="list-style-type: none"> <li>Length: 10.2 inches (25.87 cm)</li> <li>Width: 3.1 inches (7.7 cm)</li> <li>Height: 10.4 inches (26.29 cm)</li> </ul>
Electrical rating	12 V DC, regulated
Power rating	12v 3A 36W
Ingress Protection (IP) rating	Tested against IEC 60529 Degrees of Protection, IP-54
X-ray Tube Max	2W, 45kV, 200uA
Library	For General Metals Mode: Niton Alloy Library v8.4C_800 and v8.4C_900
Calibration Modes	General Metals, Precious Metals, Soils, Mining, Plastics, Lead-in-Paint Industrial Analysis, Lead-in-Painted Product Analysis, Coatings, and Electronic Alloys.
Data export formats	.csv, .xls, .txt
Battery	LI-ION, 7.4V, 7.8AH
Ambient operating temperature	0-50 C
Humidity	0-80% Relative Humidity, Non-condensing
Cold Storage	-20 C
Hot Storage	70 C
Elevation	Sea level to 2600 meters (8530 ft.)
Language configuration	English, French, Spanish, Portuguese, German, Chinese, Russian, Korean, Italian, Japanese, and Czech.
Computer administration	The analyzer uses the Niton Data Transfer (NDT) suite of applications. Includes: Niton Data Transfer (NDT) and Niton Data Transfer Remote (NDTr). These applications run on a PC via a USB connection.
	<1 mSv/hr @ 1 meter
Compliance	CE, RoHS, FCC, Industry Canada, Safety to IEC 61010-1; UL61010-1, IP54

## Radiation and Compliance Labels

Labels	Description
	<p>This is the radiation caution label. It notifies you that energy from the laser exits the laser aperture. Because this radiation can harm the eyes, take care to protect your eyes suitably. The label is located on the bottom of the analyzer nose.</p>
	<p>This is the x-ray caution label. It provides a warning that the analyzer emits a high intensity x-ray beam. The label is located near the analyzer nose.</p>
	<p>This CE label certifies compliance with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.</p> <p>The label is located near the handle.</p>
	<p>This caution label warns that the instrument produces x-rays and should only be operated by authorized personnel.</p> <p>The label is located under the analyzer nose.</p>

## User Accessible Connectors on Niton XL2 Plus Analyzer

Connector	Voltage Level	Manufacturer and Part Number
USB port	5V	Molex, 56579-0576
Connector for Remote Trigger	3.3V	CUI, SJ-3523-SMT-TR
Serial port	5V	CUI, SJ-2523-SMT-TR
DC Power JACK Use Power Supply 420-011	12V	CUI, PJ-014CH-SMT-TR

## Storage and Transportation

### Storage

Regulations in nearly all locations will require that you store your analyzer locked in a secured area to prevent access, use, and/or removal by unauthorized individuals. Storage requirements will vary by location, particularly with regard to storage at temporary job sites or away from your primary storage location such as hotels and motels and in vehicles. You should contact your local Radiation Control Authority to identify the specific storage requirements in your jurisdiction.

### Transportation

There are no X-ray tube specific US Department of Transportation (DOT) or International Air Transport Association (IATA) radiation regulations regarding shipping the Niton XL2 Plus analyzer. It is recommended that you ship the analyzer in its carrying case and an over-pack to protect the sensitive measuring equipment inside the analyzer. Do NOT ship the analyzer with the battery pack connected to the analyzer.

## Lost or Stolen Instrument

**Note** THIS PAGE CONTAINS EMERGENCY CONTACT INFORMATION THAT SHOULD BE AVAILABLE TO THE OPERATOR AT ALL TIMES.

If the Niton XL2 Plus analyzer is lost or stolen, notify your Radiation Safety Officer (RSO) or the equivalent responsible individual at your company or institution immediately. Your company's RSO, as well as other important emergency contacts, are listed below. Your company RSO may need to notify the x-ray tube regulatory authority and the local police. It is also recommended that a notification is made to Thermo Fisher Scientific.

## **Damaged Instrument**

### **Minor Damage**

If the instrument is intact but there is indication of an unsafe condition such as a cracked case, a shutter mechanism failure, or the lights remain flashing after a measurement is terminated, follow these steps:

1. Stop using the instrument
2. Remove the battery. The x-ray tube can not produce radiation when the battery is disconnected. The instrument is now safe to handle.
3. Place the instrument securely in the holster.
4. Place the instrument in the carrying case that came with the instrument.
5. Notify your Radiation Safety Officer (RSO) or the equivalent responsible individual at your company or institution immediately.
6. You or your RSO should call Thermo Fisher Scientific at one of their contact numbers listed below for additional instructions and guidance.

### **Major Damage**

If the instrument is severely damaged:

1. Perform the same steps as described above for minor damage. There will be no radiation hazard as long as the battery is removed from the instrument.
2. Place all components in a plastic bag and contact Thermo Fisher Scientific.

## **Battery Installation and Charging**

Before installing your batteries for the first time in your system, please be sure that they are fully charged by following the procedure below.

**CAUTION** The battery used in this device may present a risk of fire or chemical burn if mistreated. Do not disassemble, heat above 50C, or incinerate. Replace battery with Thermo Fisher Scientific P/N 420-002 only. Use of another battery may cause fire or explosion.

Dispose of used battery promptly. Keep away from children. Do not disassemble and do not dispose of in fire.

### **❖ To install the battery**

1. Slide back the catch on the bottom of your analyzer's pistol grip and drop the battery out into your hand.

### 3 Using Your Analyzer

#### Battery Installation and Charging

2. Place the old battery aside and slide the new battery up into the cavity in the bottom of the pistol grip. The battery is keyed, and will only insert fully one way.



3. Press in until the latch resets. Do not force the battery into the cavity.

#### Power Supply and Cable

A power cable and power supply and cable are provided to power the battery charger. Both are shown below, along with their part numbers.



**Power Cable PN 420-007**



**Power Supply PN 420-011**

#### ❖ Recharging the battery pack

Fully recharging a battery pack takes approximately 2 hours.

1. Remove the battery pack from the analyzer.
2. Connect the power supply to the battery charger, and connect the power cable to an electrical outlet.

3. Place the battery pack upside down into the charger. The battery pack is keyed, and will only fit into the charger fully one way. If your battery pack is resting on the back of the charger rather than sliding all the way to the bottom, remove the battery pack, turn it around, and re-insert it into the charger.

**CAUTION** Do not force the battery into the charger!

4. The red light is on when the charger is plugged in. This is the power indicator light.
5. The yellow light indicates that the battery pack is currently being charged.
6. The green light indicates that the battery pack has finished charging and is ready for use.



Battery charger power  
specification: 12vDC, 3 A

See battery charger "Power  
Supply PN 420-011" on page 24.

**Figure 6. Checking Battery Status**

**CAUTION** Do not store battery packs or charger in direct sunlight.

**CAUTION** Do not let the battery pack recharge for excessive periods of time.

## Hot Swap Feature

Batteries for the XL2 Plus are designed to be hot-swappable. Capacitors in the unit maintain function of the instrument for 15 seconds after the batteries have been removed, so that a fresh battery can be substituted with no down time and reboot.

**Note** If you take more than 15 seconds to swap in a new battery, you may need to reboot the analyzer. Measurements cannot be initiated while instrument is in Hot Swap mode. Instrument must have a battery installed or must be plugged-in to a power source.

## Emergency Response Information

Please Complete the Following Emergency Response Information and Keep with the Analyzer at All Times

### NITON ANALYZER EMERGENCY CONTACT INFORMATION

The Company RSO is:\_\_\_\_\_

RSO Telephone Number:\_\_\_\_\_

Regulatory Agency Emergency Number:\_\_\_\_\_

Local Fire Department:\_\_\_\_\_

Local or State Police Department:\_\_\_\_\_

### Thermo Fisher Scientific's Niton Analyzer Contact Numbers

Main Number (USA): (800) 875-1578

Additional Radiation Emergency #'s: (978) 790-8269 or (617) 901-3125

Outside the USA - Local Niton Service Center:\_\_\_\_\_

### Europe

Niton Analyzers Europe

Munich, Germany

Phone: +49 89 3681 380

Fax: +49 89 3681 3830

Email: [niton.eur@thermofisher.com](mailto:niton.eur@thermofisher.com)



## **Asia**

Niton Analyzers Asia

Hong Kong

Phone: +852 2869-6669

Fax: +852 2869-6665

Email: [niton.asia@thermofisher.com](mailto:niton.asia@thermofisher.com)

## **Registration and Licensing**

As a user of a Niton XL2 Plus analyzer, you may be required to register or obtain a license with your local radiation control authority. In the US, if you intend to do work with your analyzer in states other than your own, you may be required to register there as well. See the Safety and Compliance Web Hub for much more information.

## **Regarding Safety Devices for the Open Beam Configuration:**

In the US, you may be required to file for an exemption, “variance letter”, with your state if there is a requirement for a safety device that would prevent entry of an extremity into the primary beam. If you need assistance with the exemption letter, you may contact the radiation safety group.



## Common Operations

### Contents

- “Setting Up Beep Times” on page 29
- “Sorting the Custom Element Display” on page 30
- “Max Measure Time” on page 33
- “Minimum Test Time” on page 33
- “Virtual Keyboard” on page 34
- “Setting Display Units” on page 36
- “Adjusting the Element Range” on page 38
- “Setting the Date and Time” on page 40
- “Calibrating the Touch Screen” on page 42

## Setting Up Beep Times

Beep times are a series of three beeps made by your analyzer at specified intervals during a reading. They can help you time your reading without watching the screen. You can disable these beeps, or change the default times.

Beep Times	
Mode	
General Metals ▼	
	Time
First Beep	30.0
Second Beep	60.0
Third Beep	180.0
<input type="checkbox"/> Beep On Grade Match	
Save	

## First Beep

This option allows you to change the seconds of delay before the First Beep. Select the screen button labeled with the number of seconds of delay for the First Beep. The Beep One Time editor will open. Clear the current number of seconds with the “C” button, then select the E button to enter the information.

## Second Beep

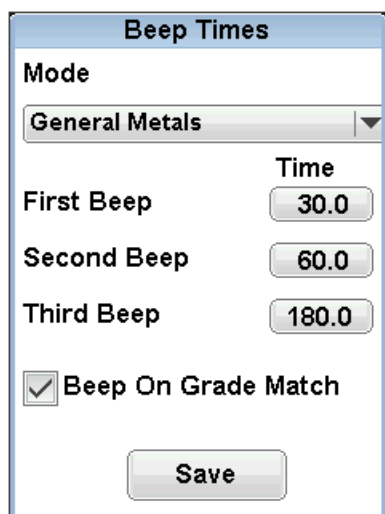
This option allows you to change the seconds of delay before the Second Beep. Select the screen button labeled with the number of seconds of delay for the Second Beep. The Beep Two Time editor will open. Clear the current number of seconds with the “C” button, then select the E button to enter the information.

## Third Beep

This option allows you to change the seconds of delay before the Third Beep. Select the screen button labeled with the number of seconds of delay for the Third Beep. The Beep Three Time editor will open. Clear the current number of seconds with the “C” button, then select the E button to enter the information.

## Beep on Grade Match

Selecting this option will enable a special beep when the reading chemistry matches an alloy grade, and put a check mark in the box. Selecting the box again will remove the check mark and turn the beep off.



The screenshot shows a window titled "Beep Times". Inside, there is a "Mode" dropdown menu currently set to "General Metals". Below this, there are three rows, each with a label and a numeric input field: "First Beep" with "30.0", "Second Beep" with "60.0", and "Third Beep" with "180.0". At the bottom, there is a checkbox labeled "Beep On Grade Match" which is currently checked. A "Save" button is located at the very bottom of the window.

	Time
First Beep	30.0
Second Beep	60.0
Third Beep	180.0

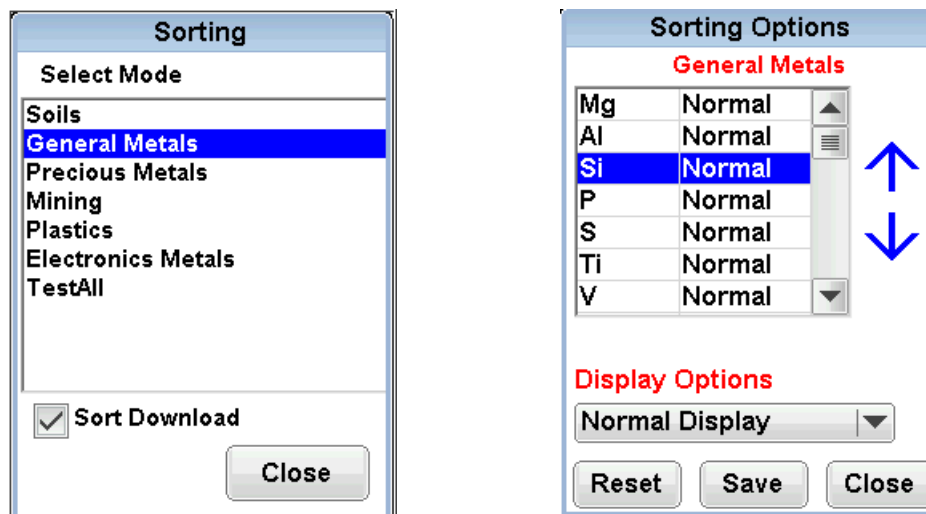
☒ Beep On Grade Match

Save

## Sorting the Custom Element Display

Select the Custom Element Display icon to configure sorting criteria used for analysis display. Select the mode you wish to change, then selecting the Custom Element Display icon opens up the Custom Element Display Screen.

On the left of the display are elements, each with its currently selected display option beside it to the right. The element list is ranked by importance, with the most important element on top, and each one lower down of less importance than the one above it.

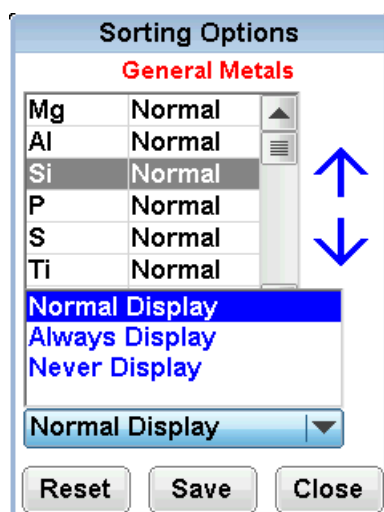


By selecting an element and using the arrow buttons to the right of the list, you can change its ranking. Use the Up Button to move an element one rank closer to the top with each click. Use the Down Arrow Button to move an element one rank closer to the bottom with each click.

## Display Options

The Display Options Drop Down Menu allows you to change the display status of any element to one of three states:

- Normal - The standard state. Element displays only when the elemental value is greater than the limit of detection.
- Always display the results for this element. Use this state for elements critical to all of your analyses.
- Never display the results for this element. Use this state for elements which are unimportant to your work. This makes your instrument display less complex.



Select the element you want to change, then select the menu option corresponding to your choice of display status. The currently selected element is displayed in white on black.

Select the Save Button to save your current status as the new default. Select the Reset button to reset the settings to the previously saved state. Select the Close button to exit the screen without saving.

## Report Settings

Under Electronics Metals, Plastics, and Test All Modes, A field called Report Settings is available. Selecting the triangle next to the Report Settings Field will open a pop up menu allowing you to choose between the three Report Settings Modes. Select the mode you wish to edit.

Changing the settings for one analysis mode will not affect the settings for other modes, and the configurations can be saved independently.

## RoHS Option

When the RoHS Option is selected, clicking on the Pass and Fail values works as it does in any other Mode.

## Detection Option

When the Detection Option is selected, Selecting the Pass/Fail field for that element acts as an On/Off Toggle, which will switch Pass/Fail mode between On and Off for the selected element. Selecting it again will reverse the toggle.

## Consumer Products Option

When the Consumer Products Option is selected, clicking on the Pass and Fail values works as it does in any other Mode. In addition, the total of Cl+Br is also calculated and used for Pass/Fail Testing.

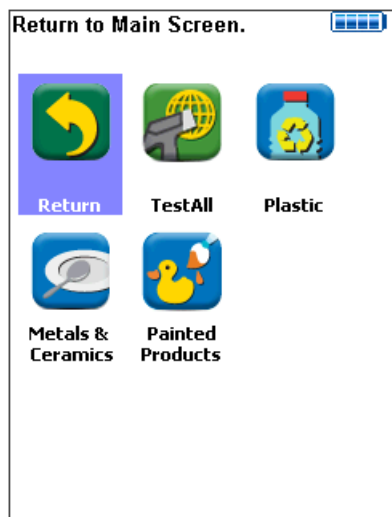
## Max Measure Time

Under the Method Setup -> Measurement Parameters option is a field called Max Measure Time. Here you can set up the maximum time your analyzer will continue to analyze the sample. Select the Max Measure Time field, and a Virtual Numeric Keypad will pop up, allowing you to input a new Maximum Measurement Time in seconds. The default Max Measure Time is set to 300 seconds.

## Minimum Test Time

Under the Method Setup -> Consumer Goods option is a field called Minimum Test Time. Here you can set up the minimum time your analyzer will continue to analyze the sample when using the Detection Option only. Select the Minimum Test Time field, and a Virtual Numeric Keypad will pop up, allowing you to input a new Minimum Test Time in seconds. The default Minimum Test Time is set to 60 seconds.

- Minimum Test Time can be set for Test All, Plastic, and Metals & Ceramics.
- Minimum Test Time *cannot* be set for Painted Products.



## Virtual Keyboard

Whenever you see the Keyboard Icon, you can select it to bring up a Virtual Keyboard on your touch screen. Generally, selecting the keys on the Virtual Keyboard will type the corresponding character into the field. The exceptions are the meta-keys Del, Clear, Left, Right, Shift, Backspace, Cancel, and Enter.

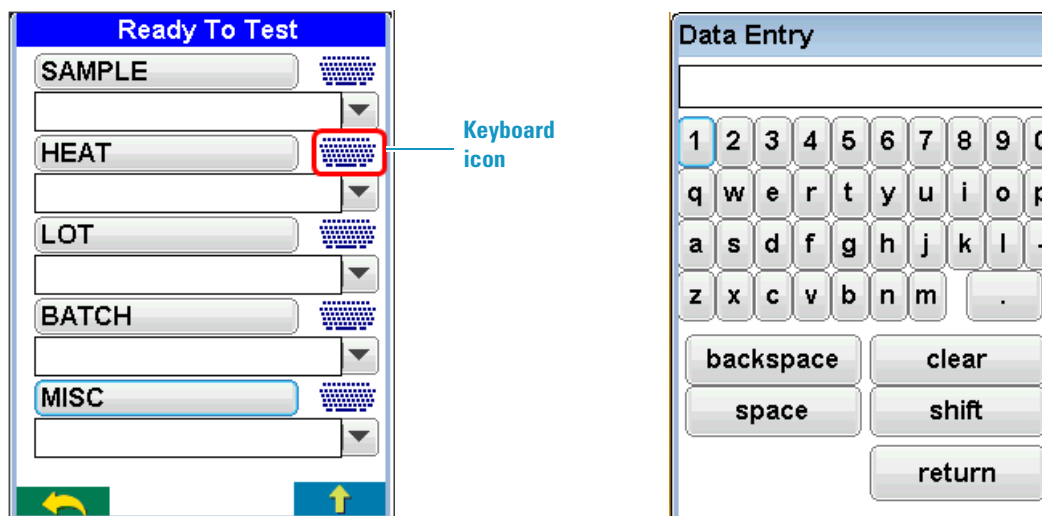


Figure 7. Virtual Keyboard



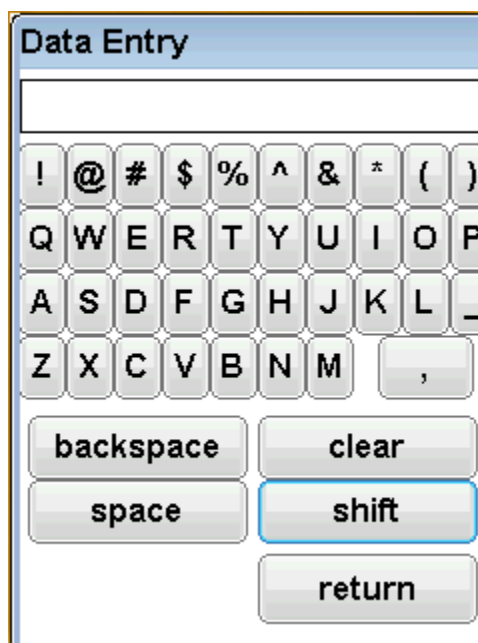


Figure 8. Shifted Virtual Keyboard

## Setting Display Units

Select the Display Units radio buttons on the Set Display Units page to choose between ppm (parts per million) and percentage (hundredths of whole) displays when taking readings, and to change the Sigma value you want for the reading.

In the Display Units area, you can select between Percent composition and Parts per Million as the units displayed in a measurement, and you can change this setting independently for any mode. You can also change the Sigma for each of these modes independently. When you have changed the display units to the appropriate values, select the Close button to save these settings for use.

## Changing Precision (Sigma Value)

Sigma is the symbol used for Standard Deviation, a measure of how much a set of numbers deviates from the mean. For example, each of the three data sets {0, 0, 14, and 14}, {0, 6, 8, and 14} and {6, 6, 8, 8} has a mean of 7. Their standard deviations are 7, 5, and 1, respectively. The third set has a much smaller standard deviation than the other two because its values are all close to 7. In a loose sense, the standard deviation tells us how far from the mean the data points tend to be. The number of standard deviations between the process mean and the nearest specification limit is given in sigmas. As process standard deviation goes up, or the mean of the process moves away from the center of the tolerance, the sigma number goes down, because fewer standard deviations will then fit between the mean and the nearest specification limit.

## Confidence Intervals

Confidence intervals assume that the data are from an approximately normally distributed population - generally, sums of many independent, identically distributed random variables tend towards the normal distribution as a limit. Using this assumption, about 68 % of the values must be within 1 standard deviation of the mean, about 95 % of the values must be within two standard deviations, about 99.7 % must lie within 3 standard deviations, and about 99.99% of the values must lie within 4 standard deviations.

The greater the sigma value of the test, the more confident you can be that the sample is as it appears, but the more difficult and time consuming the testing must be to verify this. That's why it's important to use the most appropriate sigma value for the test. By adjusting the sigma value for each type of test, you can optimize the process for your needs.

## Adjusting the Sigma Values

The sigma values are listed in the column headed with the Greek letter “sigma”. The default value is 2 sigma. You can change this value by selecting the down arrow next to the value, which opens up a drop-down menu from which you can select the desired sigma value by clicking on it.

The image shows a 'Set Display Units' dialog box with a table of settings. The table has five columns: Mode, %, PPM,  $\sigma$  (sigma), and Precision. The rows represent different measurement modes: Metals, Mining, Plastics, Precious Metals, and Soils. Each mode has radio buttons for % and PPM, a dropdown for the sigma value (currently set to 2), and a dropdown for Precision (currently set to Auto). The Mining row's sigma dropdown is open, showing options 0, 1, 2, and 3. At the bottom of the dialog are 'Save' and 'Close' buttons.

Mode	%	PPM	$\sigma$	Precision
Metals	<input checked="" type="radio"/>	<input type="radio"/>	2   ▼	Auto   ▼
Mining	<input checked="" type="radio"/>	<input type="radio"/>	2   ▼	Auto
Plastics	<input type="radio"/>	<input checked="" type="radio"/>	2   ▼	0 1 2 3
Precious Metals	<input checked="" type="radio"/>	<input type="radio"/>	2   ▼	Auto   ▼
Soils	<input type="radio"/>	<input checked="" type="radio"/>	2   ▼	Auto   ▼

Save Close

**Figure 9. Selecting the Sigma Value**

When you have changed the sigma values to the appropriate number, select the Close button to save these settings for use.

## Adjusting the Element Range

The screenshot shows a software window titled "Element Range". Inside, there is a "Mode" dropdown menu currently showing "General Metals". Below this, there are two rows of controls. The first row is for the "Main Range", featuring a question mark icon, a checked checkbox, and a "Time" field with the value "5.0". The second row is for the "Light Range", also with a question mark icon, a checked checkbox, and a "Time" field with the value "30.0". At the bottom of the window, there is a checked checkbox labeled "Autoswitch on Time Only" and a "Save" button.

**Figure 10. Adjusting the Element Range**

Multi-Range tests are used to either preferentially excite specific elements for increased sensitivity, or to cover a wider element range than one Range alone can provide. The XL2 Plus analyzer has 2 element ranges: Main and Light.

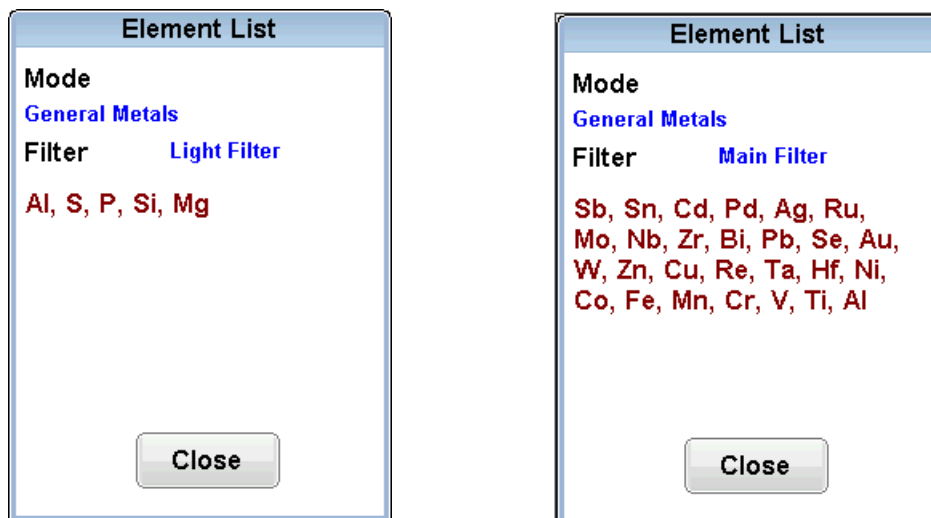
- Main Range is used for the analysis of most elements (Ti to U)
- Light Range is typically used for the analysis of light elements (Mg, Al, Si, S, P).

Select the mode you wish to configure from the Mode Menu. You can set different configurations for different calibration modes.

The Element Range Screen enables you to directly enable or disable a Range, or control the time that a Range alters the irradiation of the sample before auto-switching to another Range.

In typical metals analysis applications, Main Range is used for the analysis of most elements. You cannot deselect the Main Range in metals analysis.

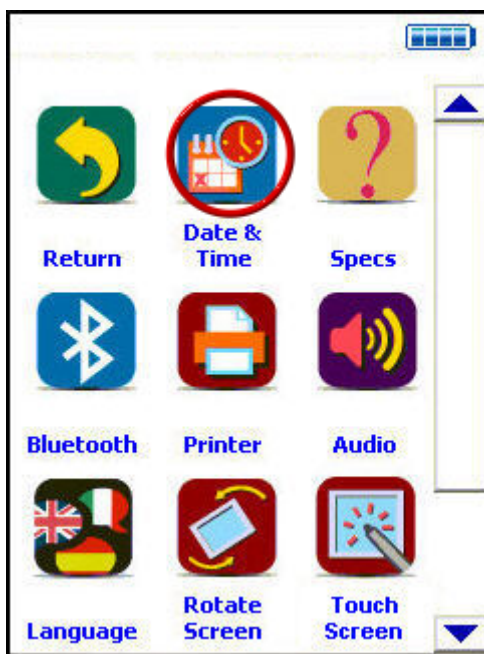
Select the Element List Button - labeled with a question mark - to display the Element List for that Range. This list shows the elements that the Range is best designed to detect.



Select the Range Time field for the intended range to change the switch time for that range. The Range Time Editor will appear. This enables you to set the number of seconds each enabled range is allotted before auto-switching will occur when needed during sample testing. Your analyzer will auto-switch from one range to another when the testing time for that range is greater than or equal to the time you have chosen, and the identified alloy is flagged as needing the switch in the Niton Alloy Library.

Select the C button to clear the current time, then from the virtual numeric key pad, select each digit you want to input, then select the E button to enter.

## Setting the Date and Time



**Figure 11. Setting the Date and Time**

From the System Menu, select the Date & Time icon from the System Screen to set the date and time as needed for different time zones, daylight savings time, or any other reason. The date and time are factory preset prior to shipping. The clock is a 24 hour clock, so add 12 to PM hours - i.e. 1:13 PM would be 13:13.

The screenshot shows a 'Date & Time' configuration screen. At the top, there are dropdown menus for the month (April) and year (2018). Below these is a calendar grid for April 2018. The days of the week are labeled S, M, T, W, T, F, S. The dates 1 through 30 are displayed. The date 25 is highlighted in red. Below the calendar, there is a time display showing 11:21. To the right of the time display are two black arrows pointing up and down. At the bottom of the screen are two buttons: 'Save' and 'Cancel'.

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

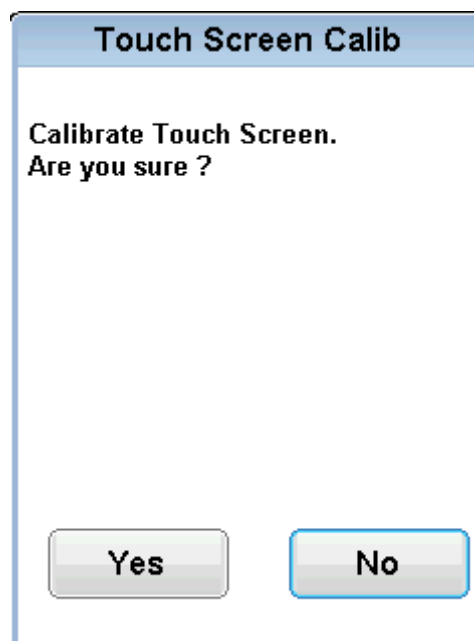
11:21

Save Cancel

**Figure 12. The Date & Time Screen**

When the Date & Time button is selected, the Date & Time Screen comes up on your analyzer's LCD Screen. You may change the Month, Year, Date, Hour, and Minute on your analyzer.

## Calibrating the Touch Screen



**Figure 13. Initiating Touch Screen Calibration**

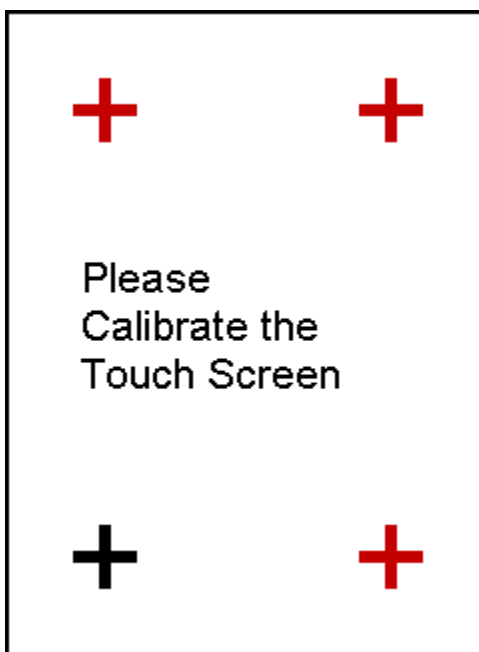
Proper calibration of the touch screen to the display is important for touch accuracy. If you find the touch screen does not respond to the buttons you touch, you should re-calibrate it.

Select the Calibrate Touch Screen button from the System Screen to re-calibrate the analyzer's touch screen display. This procedure establishes the display boundaries for the touch screen interface.

1. Select the Touch Screen icon.
2. The display will show a message asking you to confirm whether or not you want to calibrate your Touch Screen. Select the Yes button.
3. The display will show the message: "Calibrate Touch Screen". There will be a small cross in the upper left-hand corner of the display.
4. Tap on this cross with the stylus, and the cross will disappear and reappear in the upper right-hand corner of the screen.
5. Tap on the cross again, and it will reappear in the lower right-hand corner of the screen.
6. Tap on the cross again and it will reappear in the lower left-hand corner of the screen.
7. Tap on the cross once more, and you will be presented with a Confirmation Screen.



8. Select the Yes Button to confirm that the parameters are good. Select the No Button to start the process again.
9. Once you have confirmed the parameters, the System Menu will be displayed. The screen is now calibrated.



**Figure 14. Touch Screen Calibration Crosses**

The Touch Screen can be calibrated - and the system operated - with a USB mouse plugged into the USB ports in the rear of the analyzer.



# Analysis Modes

## Contents

- “Analysis Modes Descriptions” on page 45
- “Metals Analysis” on page 48
- “General Metals: Standard Operating Procedure” on page 50
- “Taking a General Metals Reading” on page 53
- “Precious Metals Analysis” on page 55

## Analysis Modes Descriptions

Your analyzer has several Analysis Modes. Which Analysis Mode you should use depends on the nature of the sample you analyze.

NOTE: Visit <https://portables.thermoscientific.com/> to get Standard Operating Procedures (SOP) for each calibration mode. In this chapter, an SOP is included for General Metals as an example.

## General Metals Mode

Use this mode to analyze typical alloys, such as iron (Fe), nickel (Ni), cobalt (Co), chromium (Cr), aluminum (Al), titanium (Ti), copper (Cu) and zinc (Zn) base metals. This is the ideal mode for any general metals analysis, such as PMI, incoming / outgoing inspections, QA / QC, and scrap metal sorting. This mode includes most common alloying constituents.

This mode will attempt to return an Alloy Grade Identification by matching the analyzed composition of the sample with the nominal composition of alloys in the analyzer's Alloy Grade Library. It will also return an elemental composition of the alloy as analyzed. Alloy Composition is output by default in terms of percent of composition by weight.

## **Electronic Metals Mode**

Use this mode to analyze metal samples typically found in electronic goods (such as printed circuit boards PCBs, wires and other manufactured components). This mode includes many common alloying constituents plus some elements used for bonding and soldering (such as Au and In).

This mode will attempt to return an Alloy Grade Identification by matching the analyzed composition of the sample with the nominal composition of electronic alloys in the analyzer's Alloy Grade Library. It will also return an elemental composition of the electronic alloy as analyzed. Electronic Metal Composition is output by default in terms of percent of composition by weight.

## **Precious Metals Mode**

Use this mode to analyze precious alloys such as those found in jewelry, gold and silver coins, and archaeological and historical samples. This mode will attempt to return an Alloy Grade Identification by matching the analyzed composition of the sample with the nominal composition of alloys in the analyzer's Precious Alloy Grade Library. It will also return an elemental composition of the precious metal sample as analyzed. Precious Alloy Composition is output by default in terms of percent (%) per million.

## **Metal Coatings Mode**

Use this mode for the determination of the thickness of 1 to 3 layers (coatings) on a metal substrate. For example, this mode may be used for the analysis of the thickness of a coated surface to ensure the material is plated consistently, or to determine that a conversion coating is of sufficient thickness. This mode does not determine the chemical composition of the sample.

## **Metals Pass/Fail Mode**

Use this mode to select alloys from an XL2 Plus Library, which are tested to meet Pass/Fail criteria during a reading.

## **Plastics Mode**

Use this mode to analyze samples composed primarily of plastic. This mode will return an elemental composition of the plastic sample as analyzed. Plastic Composition is output by default in terms of parts per million.

## Soils Mode

Use this mode to analyze samples composed primarily of soil and rock. This mode will return an elemental composition of the soil sample as analyzed. Soil Composition is output by default in terms of parts per million.

## Mining Cu/Zn Mode

Use this mode to analyze samples composed of potential metal ore - rock containing high proportions of metal - and containing Cu and/or Zn. This mode will return an elemental composition of the ore sample as analyzed. Ore Composition is output by default in terms of percent of composition by weight.

## Mining Ta/Hf Mode

Use this mode to analyze samples composed of potential metal ore - rock containing high proportions of metal - and containing Ta and/or Hf. This mode will return an elemental composition of the ore sample as analyzed. Ore Composition is output by default in terms of percent of composition by weight.

## TestAll Mode

Use this mode to analyze samples composed of unknown and/or mixed composition, such as toys and consumer products. This mode will attempt to return a general Material Identification by comparing the analysis with other general types of materials. It will select the proper sub-mode for analysis and return an elemental composition of the sample as analyzed. Material Elemental Composition is output by default in terms of parts per million.

## TestAll Geo Mode

Use this mode to analyze powder, mineral, and ore samples without first determining whether the samples would best be analyzed with Mining or Soil Mode. This mode uses both the Compton Normalization calibration (Soil) and the Fundamental Parameters calibration (Mining) to determine whether the soil calibration is acceptable or whether the total metal content is too high for Compton mode. It will then return an elemental composition of the sample as analyzed. If the sample can be analyzed via soil mode, then the analyzer will display results from both Soil and Mining Modes in one unified list. If both calibrations contain the same element, then the mode that has the lower detection limit will be displayed. Material Elemental Composition is output by default in terms of both parts per million (mg/kg) and percent of composition by weight, with 0.10% being the cutoff point.

**Note** Due to the nature of this mode, your analyzer will only use factory calibrations. User modified Cal Factors will not be available.

## Metals Analysis

To analyze metal samples, from the main menu select sample type, and then click on the Metals icon. Once in the Metals Selection Screen there will be 1 to 5 Metals Calibration Modes (depending on the model number and on optional calibrations purchased).

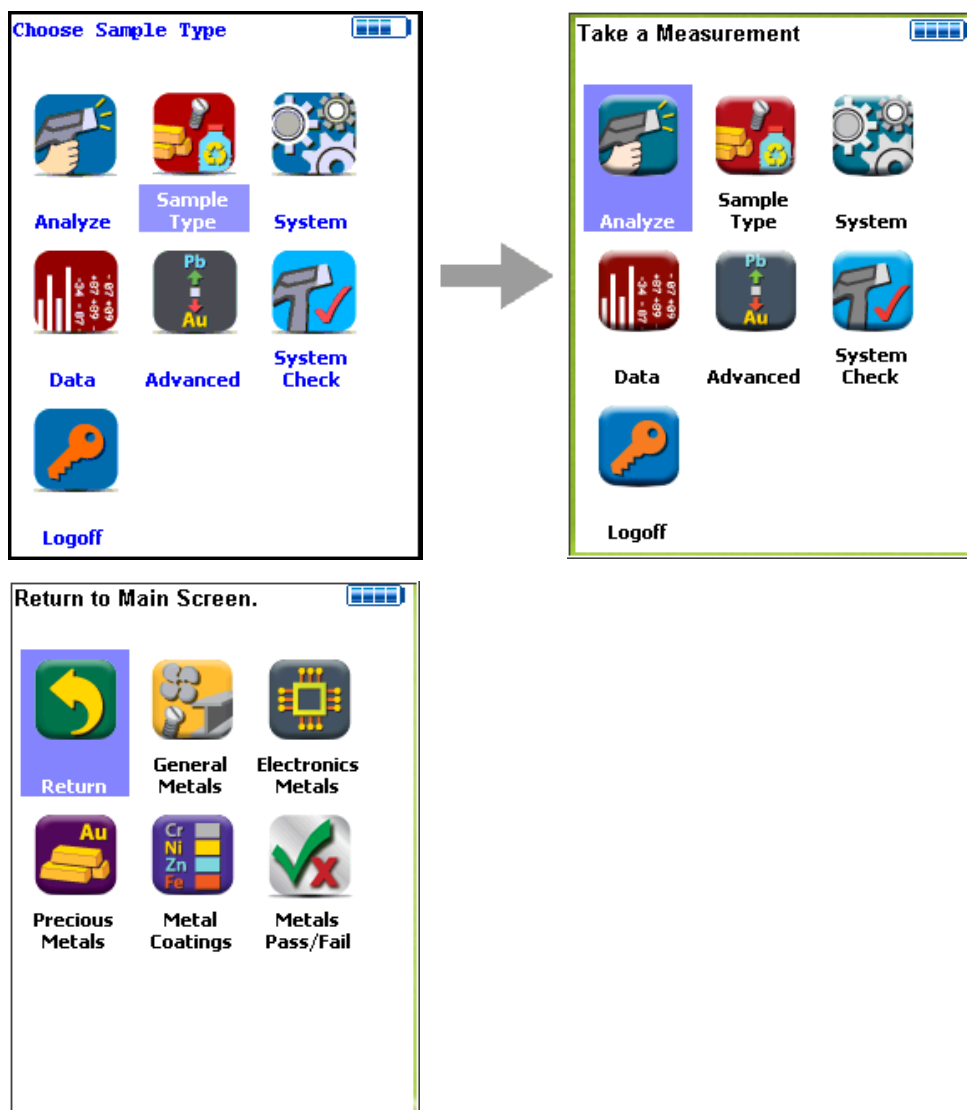


Figure 15. The Metals Analysis Menu Path (Main)

## Element Ranges and Lists

From the Element Range Screen, select the Element List Button to display the Element List for the Range you want to use. This list shows the elements that the Range is best designed to detect. See “Adjusting the Element Range” on page 66. for details.

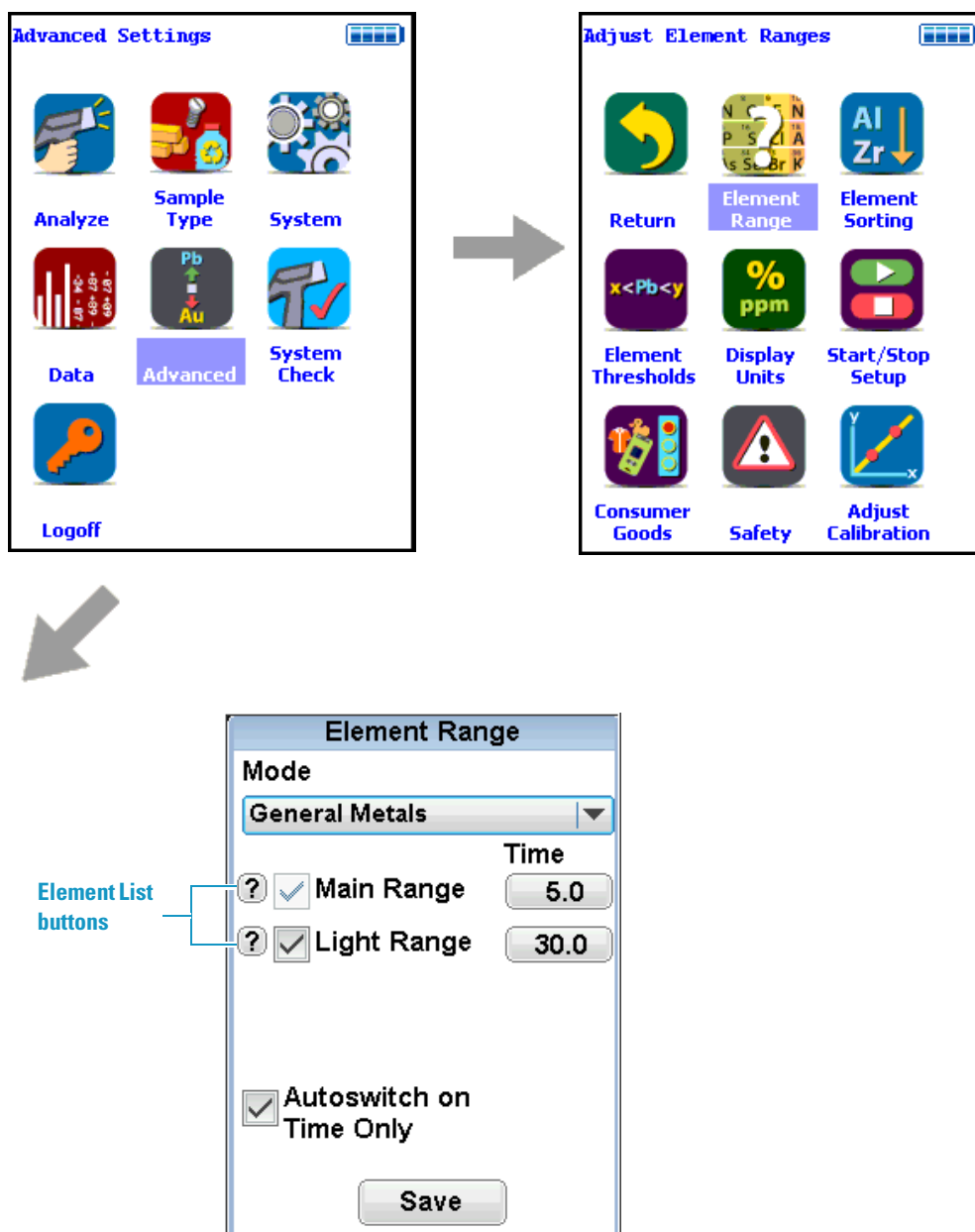


Figure 16. The Element Range Menu Path

## General Metals: Standard Operating Procedure

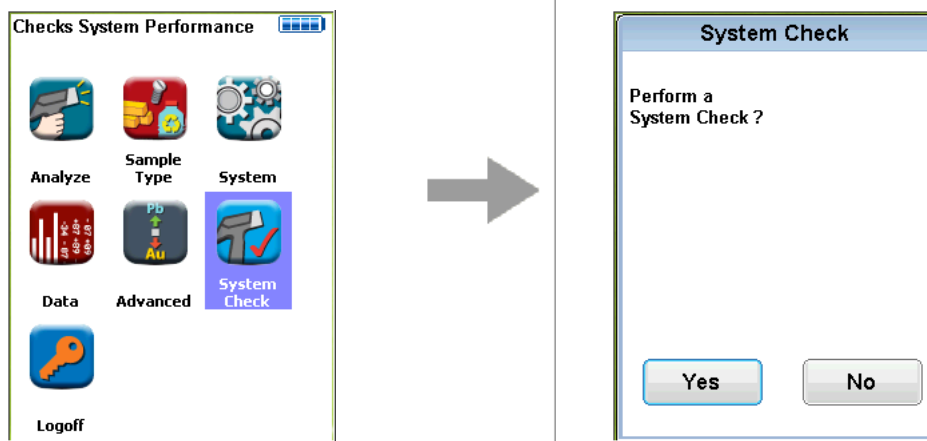
NOTE - Each user should read this User's Guide carefully before initiating measurements with the system. Users are strongly urged to attend the Thermo Scientific Niton XRF Analyzer Radiation Safety and Operations Training courses offered regularly, or the web-based trainings. For more information, visit <https://portables.thermoscientific.com/>.

### Preparatory Tasks

1. Attach a charged battery to the analyzer and turn it on. Follow the screen instructions and “Log On” as the operator using either the default password or a custom one as designated by the user in an NDU file.
2. Verify that the date is set properly for data tracking purposes.

From the Main Menu, select the System icon, then the Specs icon. The date will be displayed for verification. If the date is incorrect, correct it prior to proceeding. This can be done by “Closing” out of the Specs screen and selecting the Date & Time icon. Detailed information on this procedure is available in [Setting the Date and Time](#).

3. (Optional) Connect the analyzer to a computer via the included USB cable. (Consult “Using a USB Cable to Connect Your Analyzer” on [page 136](#) if necessary.)
4. During analysis and detector calibrations, it is important to ensure that the analyzer is not exposed to strong electromagnetic fields, including those produced by computer monitors, hard drives, cellular telephones, walkie talkies, etc. Keep a minimum two (2) feet (0.7 meters) distance between the analyzer and electronic devices.
5. From the Main Menu, select **System Check** icon then the **Yes** button.



- a. System Check calibrates the detector and verifies it is operating to specifications. After starting the process, no further user interaction is required during this operation. When the instrument is finished performing the check, the unit will show either “System OK” or one of the failure errors.



- b. If the unit shows a failure error, then perform a second System Check by clicking Recheck. If the unit still does not show a “System OK,” please contact Thermo Scientific. See [“Contact Us”](#) on [page 1](#).
6. Thermo Scientific Niton XL2 Plus analyzers are equipped with excitation filters that optimize the analyzers’ sensitivity for various elements. The “Main Range” filter provides optimum sensitivity for the elements titanium (Ti) through uranium (U). The “Light Range” filter is used to optimize sensitivity of light elements, magnesium (Mg), aluminum (Al), silicon (Si), phosphorus (P) and sulfur (S). The amount of time that the analyzer spends in each filter position is user definable, but the default settings should be used unless there is reason to change them. Please note that the analyzer will continue alternating excitation filters until the user selectable maximum analysis time is reached or the operator terminates the measurement.

Element Range	
<b>Mode</b>	
General Metals	
<input checked="" type="checkbox"/>	Main Range
<input checked="" type="checkbox"/>	Light Range
<input checked="" type="checkbox"/>	Autoswitch on Time Only
Save	

## Verify Accuracy

Verify instrument measurement accuracy using the 2 reference materials (RM) supplied with the analyzer.

- 1) Reference material (1.25Cr 0.5Mo). Test this sample for 30 sec on main range filter only
- 2) Al 6061 check sample. Test 5 sec on main range and 30 sec on light range filters.

If the sample is correctly identified and all major elements read within calculated acceptance limits (within the low and high values of factory readings found on the QC sheet, proceed to General Testing Protocol section

If the analyzer reports values outside the acceptance tolerance ranges specified in the tables, repeat the detector calibration then repeat the reference sample analysis.

If the analyzer again fails to meet the acceptance tolerance ranges specified in the tables, please contact Customer Support. See [“Contact Us”](#) on [page 1](#).

## General Testing Protocol

Good surface preparation is essential for obtaining accurate test results. All non-representative material (e.g., paint, coating, scale) must be removed prior to testing. An approximately 2-inch-square section of surface should be cleaned down to the material to be analyzed. See sample preparation section under each of the analysis modes, where applicable.

The analyzer will often display a correct alloy identification and/or accurate chemistry result before the specified time interval. If the accuracy meets the user's requirements, it is not necessary to measure for the full time. Longer measurements might be necessary if low concentrations of elements must be determined.

## INSTRUMENT QC

Measure the supplied reference calibration check sample AT LEAST once a shift. If correct, continue work. If incorrect, redo System Check and re-take the past 2 hours of results.

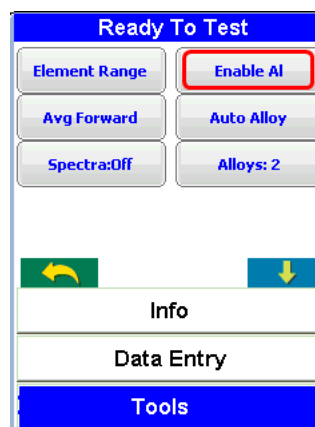
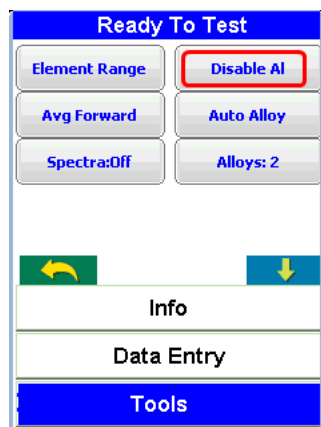
## Undersized or Non-Contact Samples

(Samples that do not make contact with or that do not fully cover the measurement aperture)

For samples that do not fully cover the measurement aperture, increase the testing time by increasing the time in inverse proportion to the decrease in percentage of aperture covered. For example: a rod only covers  $\frac{1}{2}$  of the aperture, so increase the measurement time by two (e.g., from 10 to 20 seconds per filter for alloy chemistry).

The best procedure to measure undersized samples is to use the Thermo Scientific Niton portable test stand (optional), which is shielded to prevent radiation exposure to the operator.

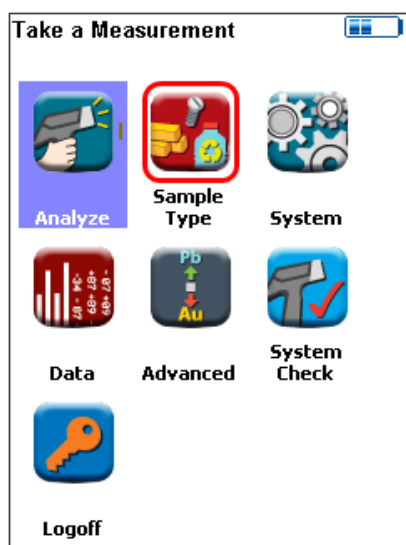
An undersized sample may alternately be measured while lying on another material. Results may be affected by the signal coming from the underlying material itself. Use only pure aluminum, pure plastic, or clean wood and employ the Disable AI feature. Use the Tools Menu, then select Disable AI, and check the underlying surface itself to be sure no metals are present. Be sure to use the Tools Menu and select Enable AI before testing aluminum alloys.



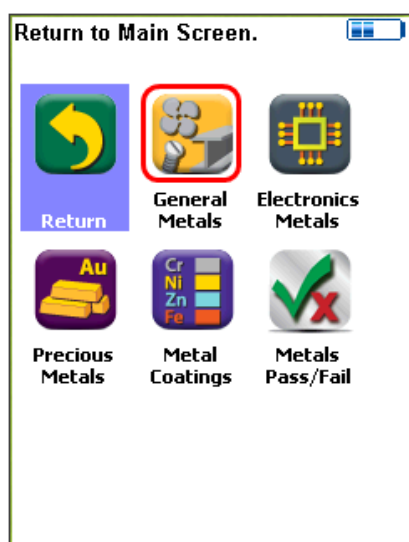
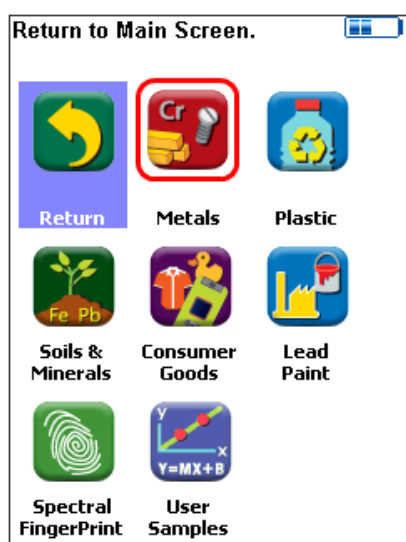
## Taking a General Metals Reading

The following example is for taking a General Metals reading.

1. Clean the sample to be analyzed so it is free of all surface contamination.
2. Place the analyzer so the sample is covered by the analysis window.



3. Select the Sample Type Icon.



4. Select Metals > General Metals from the Mode Menu.

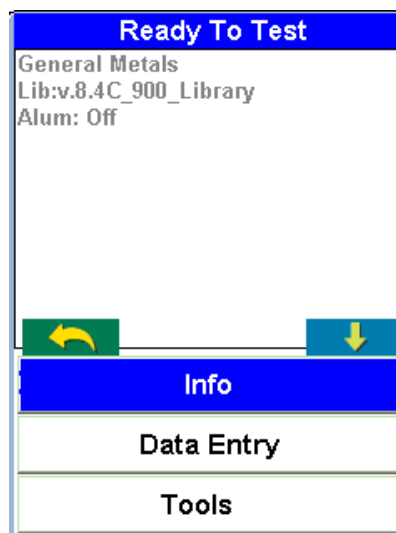
## 5 Analysis Modes

### Taking a General Metals Reading



5. Select the Analyze Icon.

The Ready to Test screen displays



- a. The Info screen lists the current mode and library being used, plus configuration info.
  - b. Select **Data Entry** if you wish to do any data entry.
  - c. Select **Tools** to configure or customize the mode.
  - d.
6. Initiate a Reading by pressing the trigger.

- When the sample has been sufficiently analyzed, release the trigger.



Ele	%	±3σ
Mn	0.82	0.094
Fe	0.62	0.069
Ni	30.75	0.40
Cu	67.70	0.42
Zr	0.050	0.016

- View the composition returned.

## Precious Metals Analysis

See “[Preparatory Tasks](#)” on [page 50](#) for a full range of tasks performed using a Standard Operating Procedure. Then use the steps below to verify the instrument

- Verify instrument measurement accuracy using the reference material (RM) supplied with the analyzer, if one is supplied.
- Test the factory-supplied standard (or other approved check sample) based on a 30s measurement. If the sample is correctly identified and all major elements read within calculated acceptance limits (within the low and high values of factory readings found on QC sheet), proceed to General Testing Protocol section
- If the analyzer reports values outside the acceptance tolerance ranges specified in the tables, repeat the detector calibration described in step 7, then repeat the reference sample analysis in step 8.1
- If the analyzer again fails to meet the acceptance tolerance ranges specified in the tables, please contact Thermo Scientific Portable Analytical Instruments Inc., or your local representative for assistance.

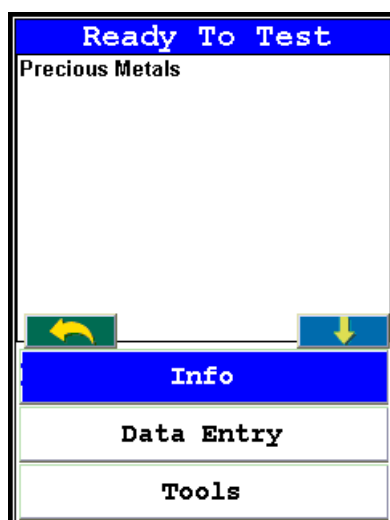
## Using the Precious Metals Mode

This is a guide to using the Precious Metals Mode.



**Figure 17. Precious Metals Mode Menu Path**

Select the Sample Type icon from the Main menu, then the Metals icon, then the Precious Metals icon to enter Precious Metals Mode.



**Figure 18. Precious Metals Mode Ready To Test Screen**

When testing metals with Au in their composition, Precious Metal Analysis returns the metal's Karat rating.

Note - in order to use the Karat analysis with the Niton XL2 Plus analyzers, you need to set up Karat as a pseudo-element first.

Ele	%	±2σ
Karat	24.00	
Au	99.99	0.34

**Figure 19. Precious Metals Analysis of 24 Karat Gold Showing Karat Rating**

When testing metals with no Au in their composition, Precious Metal Analysis returns the metal's Karat rating as nd (Not Detected).

# 3307 Precious Metals

NAV Tools

Time 6.1 sec

Ele	%	$\pm 2\sigma$
Karat	nd <	
Ag	95.35	0.69
Cu	4.65	0.16

**Figure 20. Precious Metals Analysis Showing Nd Karat Rating**

When testing metals with Au present, Precious Metal Analysis returns the metal's Karat rating as rounded to the nearest Karat at the top of the list. Where the Au is listed on the Complete List of elements, the Karat rating is displayed in full.

# 3309 Precious Metals

NAV Tools

Time 6.1 sec

Ele	%	$\pm 2\sigma$
Karat	12.08	0.12
Au	50.34	0.48
Ag	5.50	0.16
Ni	7.58	0.21
Zn	9.33	0.21
Sn	0.26	0.071
Cu	26.99	0.35

**Figure 21. Precious Metals Analysis Showing Fractional Karat Rating**

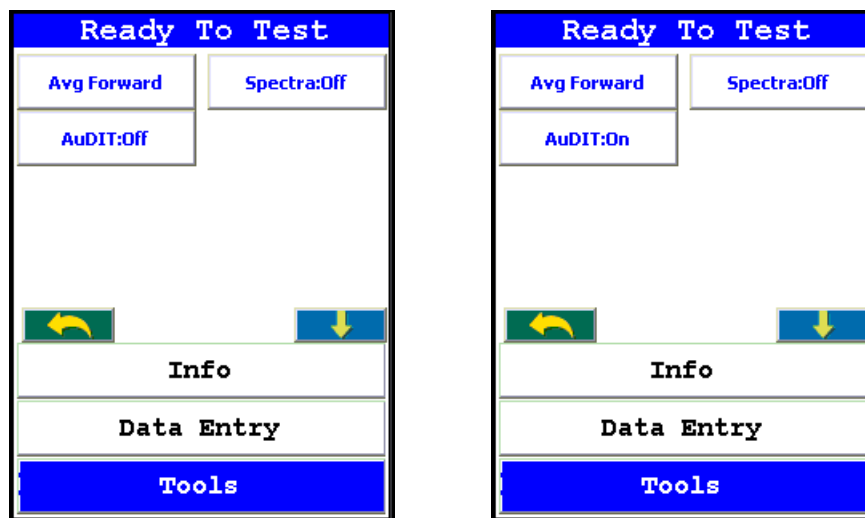
## AuDIT™

The AuDIT algorithm determines whether or not a surface is plated. AuDIT can detect plating as thick as 8µm. Since most plating is less than 2-3µm, this can usually detect plated objects. Heavily plated objects with a plating greater than 8µm thick will read as Gold Plate Not Detected.



## Starting/Stopping AuDIT

AuDIT can be toggled on or off from your Tools Menu. This toggle is only available in Precious Metals Mode. Selecting the AuDIT:Off button will turn AuDIT on, and change the button to “AuDIT:On”. Selecting the AuDIT:On button will turn AuDIT off, and change the button to “AuDIT:Off”.



**Figure 22. Precious Metals Tools Showing AuDIT:Off and AuDIT:On Buttons**

AuDIT uses four separate tests run automatically to determine whether or not a sample is plated.

1. The first test is a patent-pending method only available on Thermo Scientific Niton XRF analyzers. This is an iterative comparison of x-ray intensity signatures, which, when it fails, is the most likely indication of a plated item.
2. Nickel is often used as a pre-plate, and high proportions of Ni in a reading are a good indicator of plating.
3. Platings often have a low Karat value when averaged with the substrate, so Karat values of less than 9 are flags indicating plating.
4. A Karat rating that is not one of the standard Karat percentages - within 0.5 karat of 9kt, 10kt, 14kt, 18kt, 22kt, or 24kt (referred to as Out of Plumb) - also may indicate the presence of plating.

Ele	%	±2σ
<b>Karat</b>	<b>15.0</b>	
Au	46.11	0.38
Ag	5.69	0.12
Rh	0.056	0.019
Cd	0.072	0.026
Ni	7.48	0.16
Zn	9.88	0.17
Sn	0.20	0.057
Cu	30.51	0.29

Ele	%	±2σ
<b>Karat</b>	<b>9.0</b>	
Au	46.11	0.38
Ag	5.69	0.12
Rh	0.056	0.019
Cd	0.072	0.026
Ni	7.48	0.16
Zn	9.88	0.17
Sn	0.20	0.057
Cu	30.51	0.29

Ele	%	±2σ
<b>Karat</b>	<b>5.0</b>	
Au	46.11	0.38
Ag	5.69	0.12
Rh	0.056	0.019
Cd	0.072	0.026
Ni	7.48	0.16
Zn	9.88	0.17
Sn	0.20	0.057
Cu	30.51	0.29

Ele	%	±2σ
<b>Karat</b>	<b>11.07</b>	<b>0.091</b>
Au	46.11	0.38
Ag	5.69	0.12
Rh	0.056	0.019
Cd	0.072	0.026
Ni	7.48	0.16
Zn	9.88	0.17
Sn	0.20	0.057
Cu	30.51	0.29

**Figure 23. Precious Metals Analysis Showing Four AuDIT Tests**

Only if the sample passes all four tests is it labeled “Gold Plate Not Detected”. This does not mean that there is no plating, but that the presence or absence of plating cannot be determined by the analyzer.

## Additional Methods of Plating Detection

### Analyze the item in several different areas

Variance of more than 1-2% in Au content can be a positive indication that an item is plated.

### Look for identifying marks (hallmarks)

Compare to your results. Discrepancies may indicate that an item is plated.

Note: You may come across some Italian jewelry that has 18k gold plating over 14k gold. This is hallmarked as 14k or 585, but will likely show 16-17k on XRF.

### “Smell” the item

A metallic, copper-like smell (similar to copper-based coins such as USA pennies) indicates the possible presence of a copper substrate under gold plating.

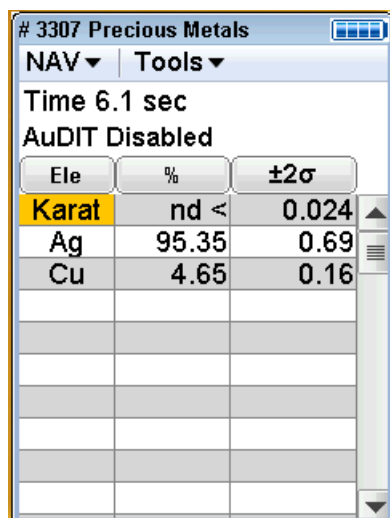
### Use a strong magnet

A magnetic draw on the item may indicate a magnetic substrate under gold plating (gold alloys are not magnetic).

### As a final and last resort...

analyze a spot, perform a deep file or grind, and then analyze the same spot again. A reduced gold content (more than 1-2%) indicates a thinning of the gold plating layer.

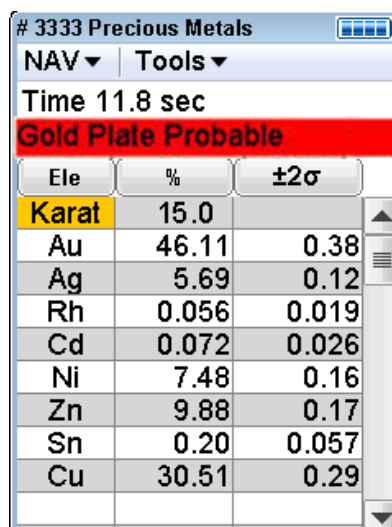
## AuDIT Messages



Ele	%	±2σ
Karat	nd <	0.024
Ag	95.35	0.69
Cu	4.65	0.16

**Figure 24. Precious Metals Analysis Showing AuDIT Disabled**

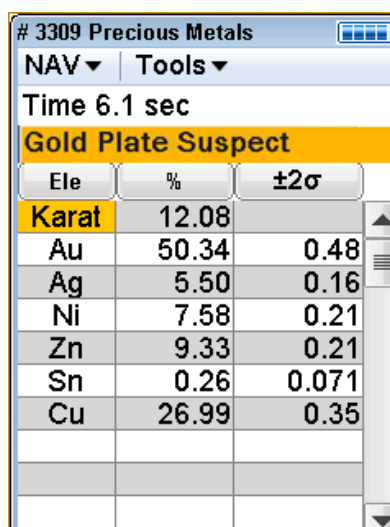
If AuDIT is not enabled, a white on black message stating “AuDIT Disabled” will display on the Results Screen while in Precious Metals Mode.



Ele	%	±2σ
Karat	15.0	
Au	46.11	0.38
Ag	5.69	0.12
Rh	0.056	0.019
Cd	0.072	0.026
Ni	7.48	0.16
Zn	9.88	0.17
Sn	0.20	0.057
Cu	30.51	0.29

**Figure 25. Precious Metals Analysis Showing Probable Plating**

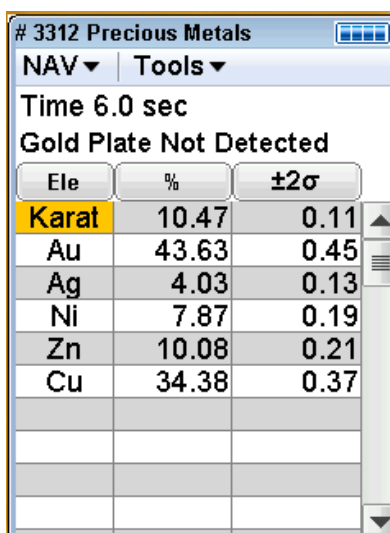
If AuDIT detects what looks like gold plating on the material, a black on red message stating “Gold Plate Probable” will display on the Results Screen.



Ele	%	±2σ
<b>Karat</b>	12.08	
Au	50.34	0.48
Ag	5.50	0.16
Ni	7.58	0.21
Zn	9.33	0.21
Sn	0.26	0.071
Cu	26.99	0.35

**Figure 26. Precious Metals Analysis Showing Suspected Plating**

If AuDIT detects what may be gold plate, but isn't sure, a black on yellow message stating “Gold Plate Suspect” will display on the Results Screen.



Ele	%	±2σ
<b>Karat</b>	10.47	0.11
Au	43.63	0.45
Ag	4.03	0.13
Ni	7.87	0.19
Zn	10.08	0.21
Cu	34.38	0.37

**Figure 27. Precious Metals Analysis Showing No/Thick Plating**

If AuDIT detects what is either unplated gold or very thickly plated gold, a black on white message stating “Gold Plate Not Detected” will display on the Results Screen.

Ele	%	±2σ
Karat	9.0	
Au	46.11	0.38
Ag	5.69	0.12
Rh	0.056	0.019
Cd	0.072	0.026
Ni	7.48	0.16
Zn	9.88	0.17
Sn	0.20	0.057
Cu	30.51	0.29

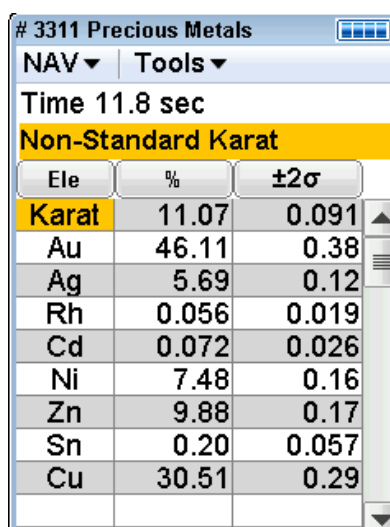
**Figure 28. Precious Metals Analysis Showing High Ni Content**

If AuDIT finds too much Nickel in the sample, a black on yellow message stating “High Ni Content” will display on the Results Screen.

Ele	%	±2σ
Karat	5.0	
Au	46.11	0.38
Ag	5.69	0.12
Rh	0.056	0.019
Cd	0.072	0.026
Ni	7.48	0.16
Zn	9.88	0.17
Sn	0.20	0.057
Cu	30.51	0.29

**Figure 29. Precious Metals Analysis Showing Low Karat**

When AuDIT finds a Karat rating less than 8.5 Karat in the sample, a black on yellow message stating “Low Karat” will display on the results Screen.



# 3311 Precious Metals

NAV ▾ Tools ▾

Time 11.8 sec

**Non-Standard Karat**

Ele	%	$\pm 2\sigma$
<b>Karat</b>	11.07	0.091
Au	46.11	0.38
Ag	5.69	0.12
Rh	0.056	0.019
Cd	0.072	0.026
Ni	7.48	0.16
Zn	9.88	0.17
Sn	0.20	0.057
Cu	30.51	0.29

**Figure 30. Precious Metals Analysis Showing Non Standard Karat**

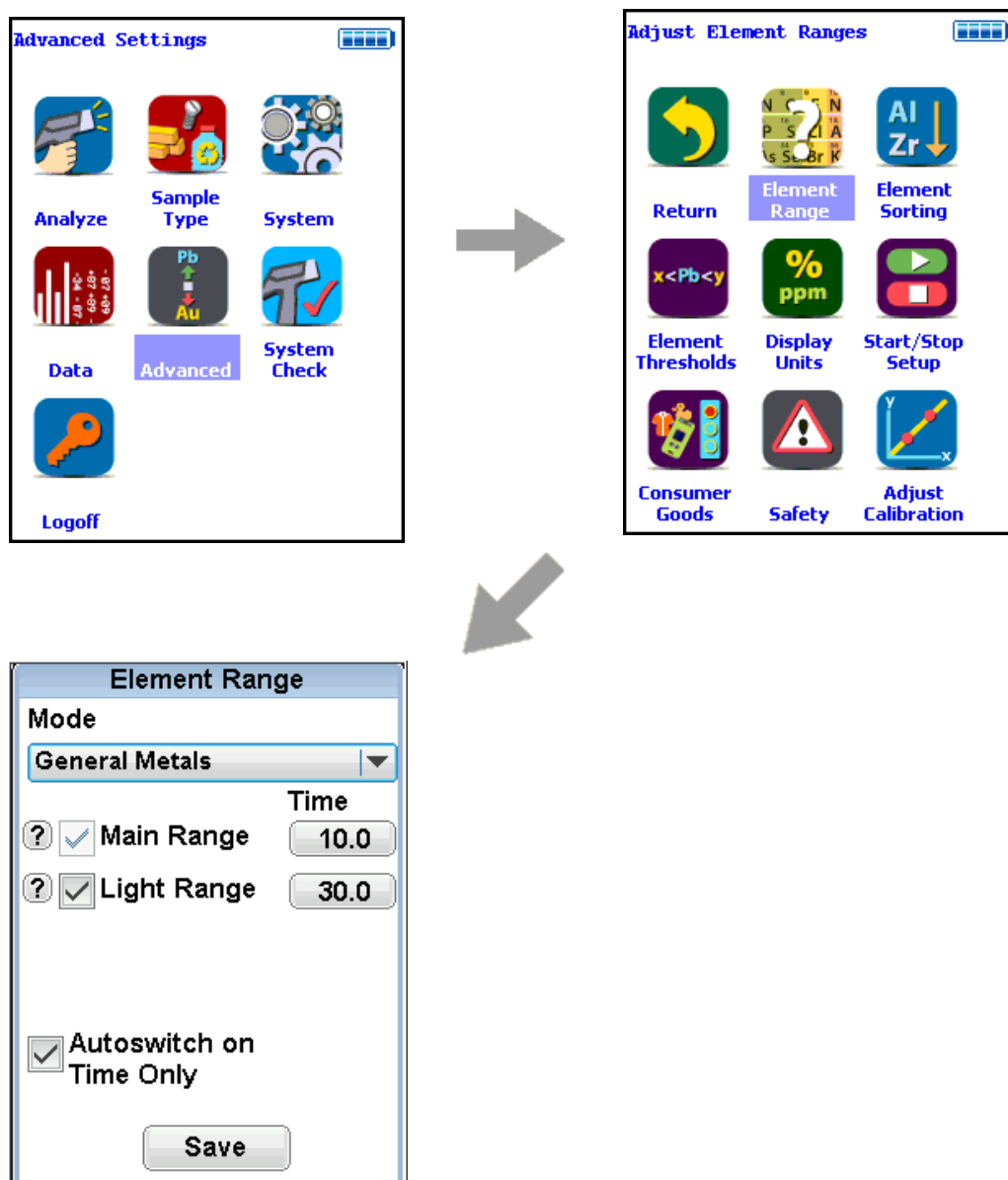
When AuDIT finds a Karat rating other than the standard Karats, a black on yellow message stating “Non-Standard Karat” will display on the results Screen.

## Advanced Settings

### Contents

- “Adjusting the Element Range” on page 66
- “Tools Menu Options” on page 72
- “NDF Files: User Data Structuring” on page 93
- “Safety Settings” on page 105
- “Camera” on page 111

## Adjusting the Element Range

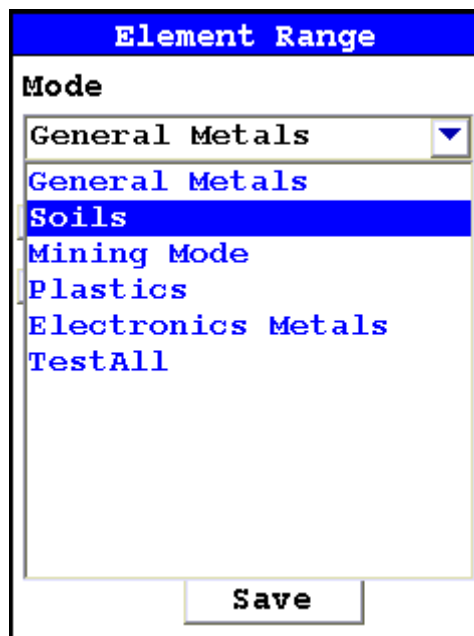


**Figure 31. The Range Menu Path (Main)**

Multi-Range tests are used to either preferentially excite specific elements for increased sensitivity, or to cover a wider element range than one Range alone can provide. Most modes, when enabled, will use two Ranges in sequence to produce a combined analysis result. In typical alloy analysis applications, Main Range is used for the analysis of most elements, Low Range is utilized for the subsequent high sensitivity analysis of V, Ti, and Cr, and Light Range is available only with 900 series GOLDD technology analyzers, and is typically used in light



element analysis. Multi-Range switching can be set to activate off time alone, or, when time switching is disabled, off settings in the General Metals grade library. In most modes, Low and Light Range add the capability to analyze light elements which cannot be efficiently excited by Mid Range.



**Figure 32. Selecting the Mode**

Select the mode you wish to configure. You can set different configurations for different modes.

The Element Range Screen enables you to directly enable or disable any Range, or control the time that a Range alters the irradiation of the sample before auto-switching to another Range.

The screenshot shows the 'Element Range' settings screen. At the top is a blue header with the text 'Element Range'. Below the header is a 'Mode' section with a drop-down menu currently showing 'General Metals'. To the right of the drop-down is a small downward arrow icon. Below the 'Mode' section are two rows of settings. The first row is for 'Main Range', featuring a checkbox with a question mark icon, a checked checkbox, and a 'Time' field set to '5.0'. The second row is for 'Low Range', featuring a checkbox with a question mark icon, a checked checkbox with a green checkmark, and a 'Time' field set to '5.0'. At the bottom of the screen is an 'Autoswitch on Time Only' checkbox, which is currently unchecked, and a 'Save' button.

Mode List

Mode

Drop Down Menu Screen Button

General Metals

Main Range

Time

5.0

Range Times

Low Range

5.0

Autoswitch on Time Only

Save

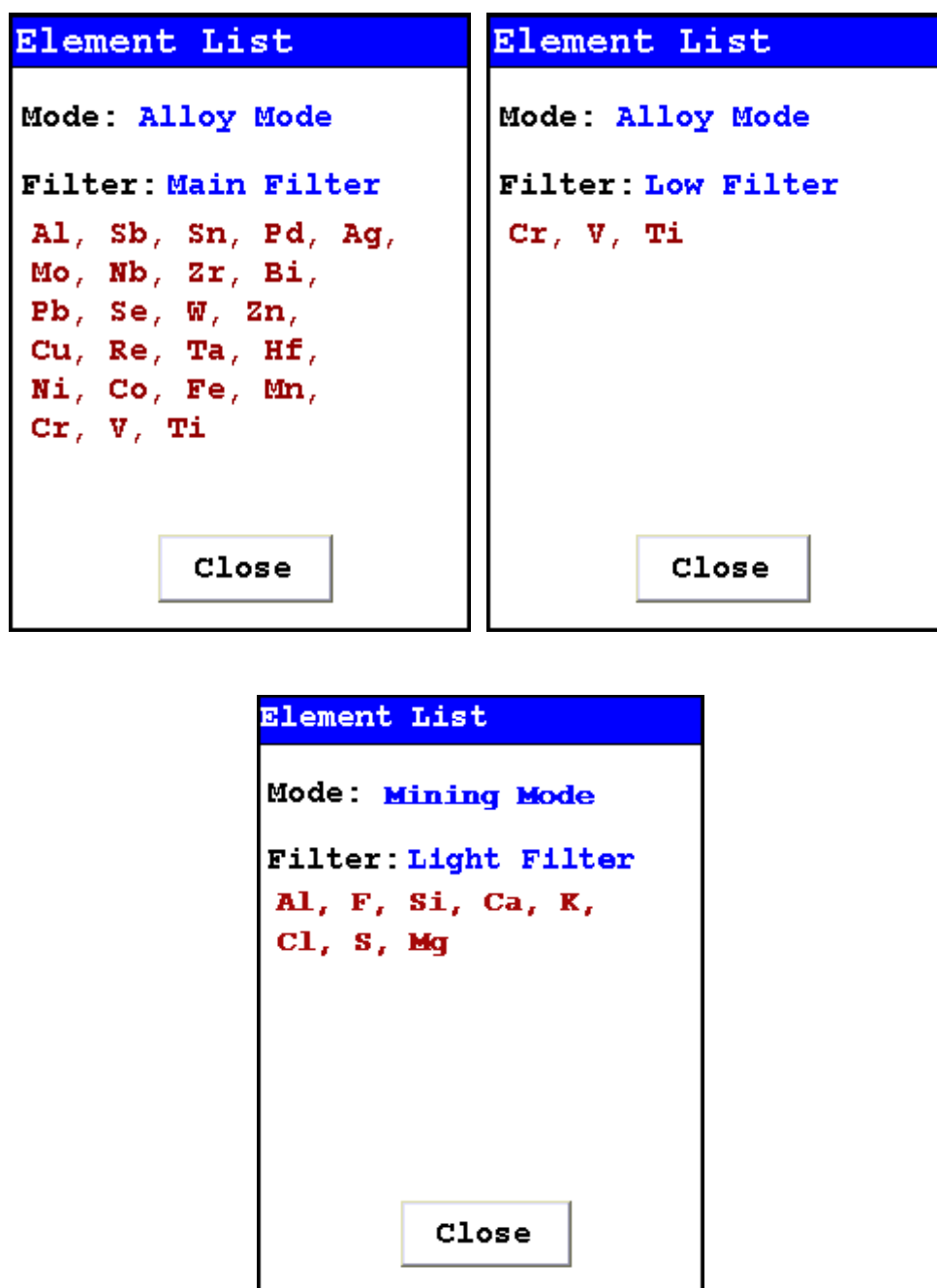
Save Screen Button

**Figure 33. The Element Checkboxes**

Select the checkbox next to the Range you want to use to determine exactly which of the Ranges contained in your Analyzer is used for sample testing. Selecting an empty checkbox will enable that range and place a check into the box as an indicator. Selecting a checked box will disable the Range and clear the box.

In typical alloy analysis applications, Main Range is used for the analysis of most elements. You cannot deselect the Main Range in alloy analysis

Low Range is utilized for the subsequent high sensitivity analysis of V, Ti, and Cr.



**Figure 34. The Range Element Lists**

Select the Element List Button to display the Element List for that Range. This list shows the elements that the Range is best designed to detect.

Element Range		
Mode		
General Metals		
		Time
? <input checked="" type="checkbox"/>	Main Range	5.0
? <input checked="" type="checkbox"/>	Low Range	5.0
<input type="checkbox"/> Autoswitch on Time Only		
Save		

**Figure 35. The Range Time Fields**

Select the Range Time field for the intended range to change the switch time for that range. The Range Time Editor will appear. This enables you to set the number of seconds each enabled range is allotted before auto-switching will occur when needed during sample testing. Your analyzer will auto-switch from one range to another when the testing time for that range is greater than or equal to the time you have chosen, and the identified alloy is flagged as needing the switch in the Niton Alloy Library.

Main Range Time

7	8	9
4	5	6
1	2	3
C	0	E
	<	.

5.00

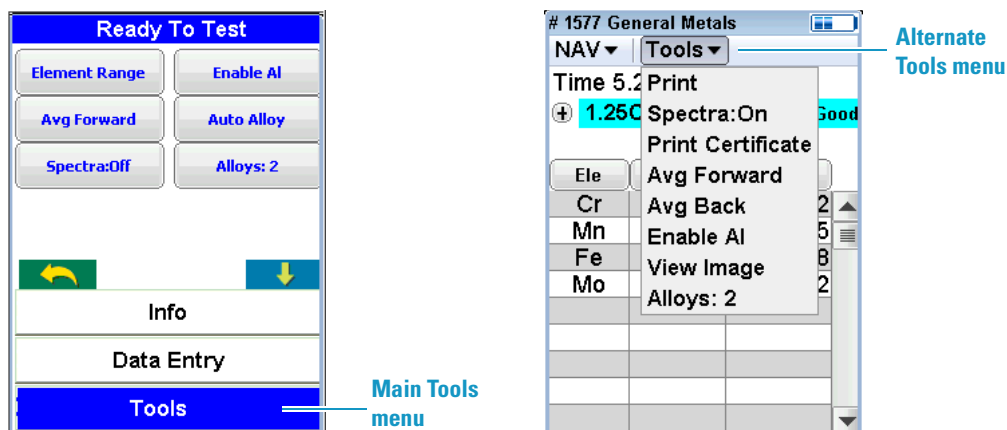
**Figure 36. The Range Time Editor**

Select the C button to clear the current time, then from the virtual numeric key pad, select each digit you want to input, then select the E button to enter.

## Tools Menu Options

The following options can be performed from the Tools Menu. Options which are only on the main Tools Menu are listed as (Main). Those which can be found only on the alternate Tools Menu are listed as (Alt).

- Main Tools menu: from home screen select **Sample Type > General Metals** (or any mode)
- Alternate Tools menu: from a reading screen select **Tools**.



## Avg Forward

Enables you to average different readings together from this analysis forward. Select the Avg Forward button to initiate future sample averaging. Avg Forward will set up an automatic personal averaging protocol to be followed until your analyzer is shut down, or this feature is disabled. To begin, select the number of readings you want to average from the virtual numeric keypad. Your analyzer will calculate an average reading after that number of tests, and continue this pattern until stopped. If you select to average forward 3 readings, and you take 3 readings, the analyzer will store the individual readings. Analyzer will then automatically calculate the average of the 3 readings and store an averaged reading.

The maximum number of readings for average forward function is 99.

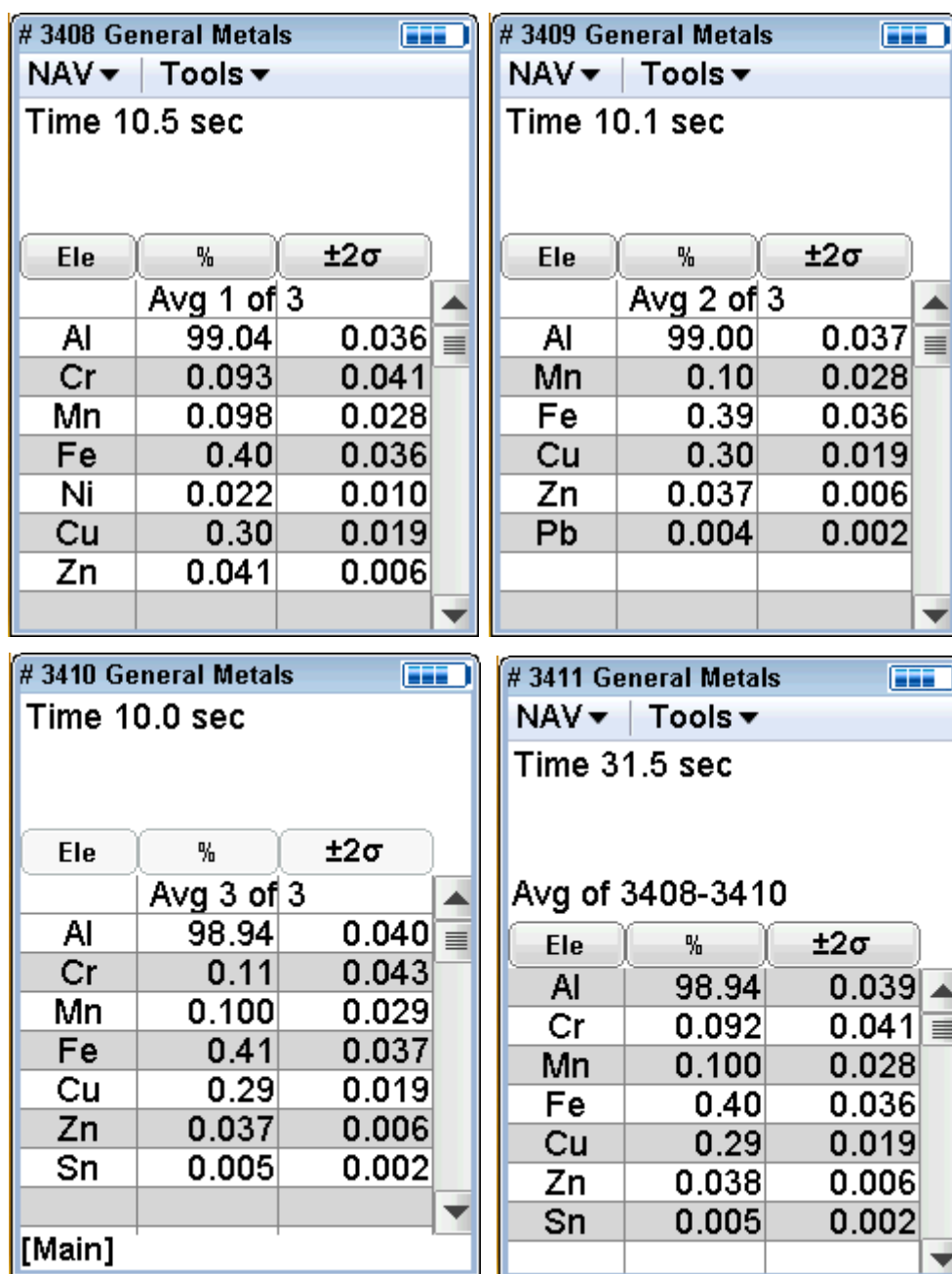


Figure 37. Example Averaging Screens

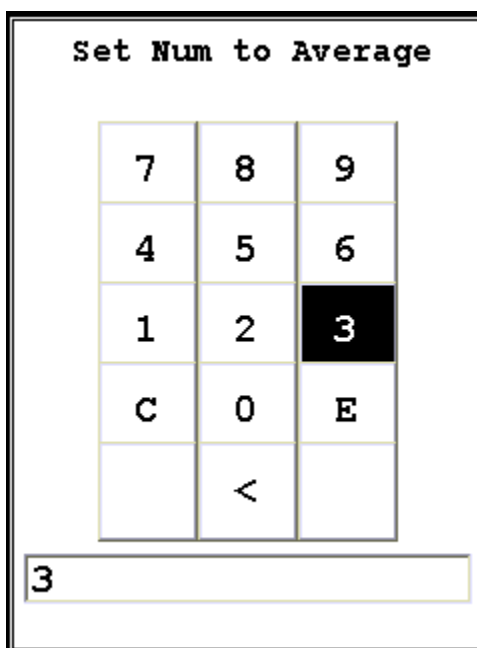
## Avg Back (Alt)

**Note** The alternate Tools Menu is only available when viewing readings, and the menu is only accessible through the touch screen interface or NDTi.

Enables you to average different readings together from this analysis backward. Select the Avg Back option to initiate backwards sample averaging. Avg Back will take the number of readings you select and average their analytical results. The range is counted from the last reading backward by the number of readings selected. If your last reading was #15, selecting 3 would average readings #13, 14, and 15. The average is calculated, displayed, and stored into memory as the next sequential reading number, in this case, #16.

The maximum number of readings for average forward function is 99.

**Note** You cannot average readings taken in different modes. Doing this will generate an error.

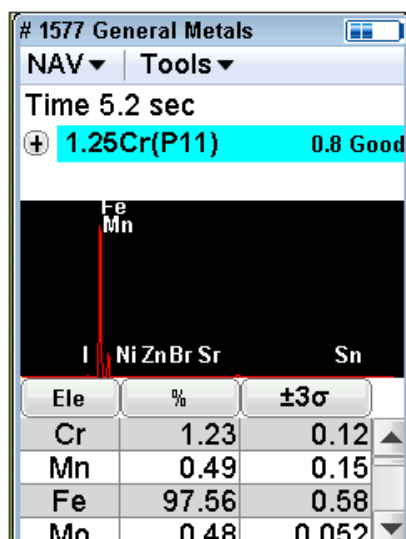


**Figure 38. The Virtual Numeric Keypad**

## **Spectrum:On/Spectrum:Off**

The Tools Menu contains a toggle option to display live spectra as sample analysis occurs.





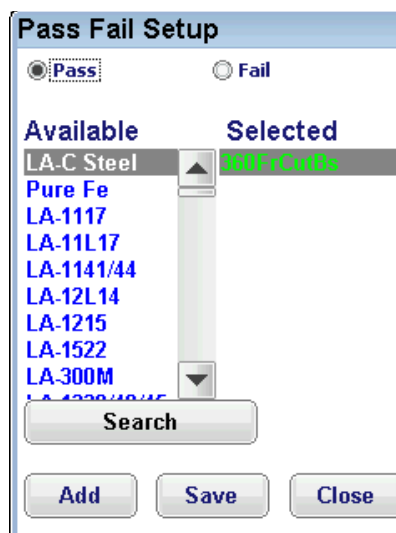
**Figure 39. Example Analysis Screen Showing Live Spectrum**

## Print (Alt)

Select the Print option from the Tools Menu to print the current analysis screen to any attached Bluetooth printer. If you do not have a portable printer attached to your analyzer, nothing will happen.

## Set Pass/Fail

You can set up your analyzer to sort on a pass/fail basis. Pass/Fail uses the chemistry of a user-generated list of alloys in the library as a basis for comparison. If the sample analysis is entirely within the specifications for one of these alloys, a PASS result is given, otherwise a FAIL result is returned. To turn on Pass/Fail, select the Tools Menu and select Set Pass/Fail from the menu. The Pass/Fail Setup Screen will come up.



**Figure 40. Set Pass/Fail Screen**

### **Add/Remove (Toggle)**

Select alloys from the Available list and then the Add Button to move the alloy to the Selected List. Select alloys from the Selected list and then the Remove Button to remove the alloys from the Selected List.

### **Pass**

Select the Pass Single button to initiate Pass Mode. Use Pass Mode when you have a desirable match. If the alloy being analyzed matches one of the alloys in the selected list, the alloy will Pass the analysis.

### **Fail**

Select the Fail button to initiate Fail Mode. Use Fail Single Mode when you have an undesirable match. If the alloy being analyzed matches one of the alloys in the selected list, the alloy will Fail the analysis.

### **Setting the Reference Alloys for Pass or Fail**

Before you use Pass or Fail mode, you need to set the Reference Alloys. Select the alloy or alloys from the slide down menu on the Pass Fail Setup Screen, then select the Add button.

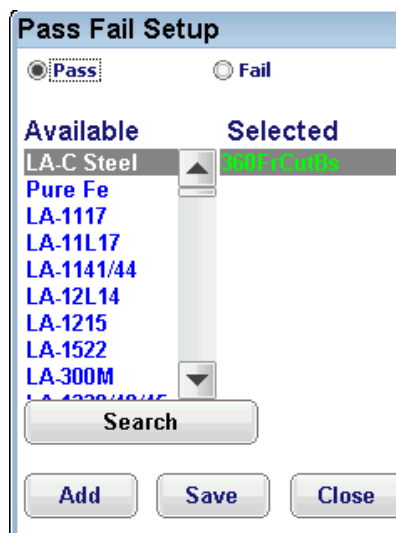


Figure 41. The Pass Fail Setup Screen

### Searching for Reference Alloys

Select the Search button to search the library for the alloy you want as your Reference Alloy.

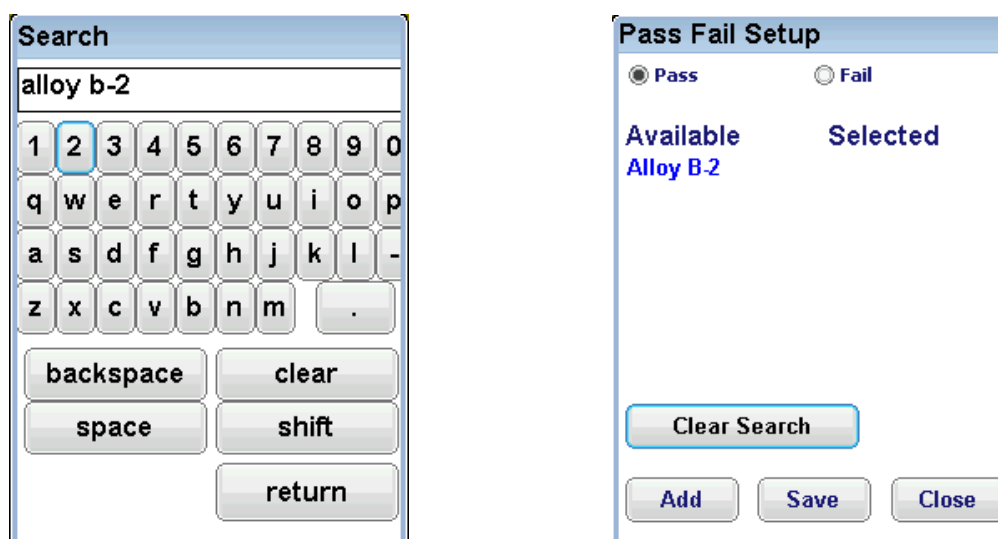


Figure 42. Using the Search Function

Type the name of your reference alloy into the Virtual Keyboard, and the left column will display any matches. Select the match you want and the Add button to make it your reference alloy.

## How Pass/Fail Works

To reach Metals Pass/Fail go to **Home screen > Sample Type > Metals > Metals Pass/Fail**.

Pass/Fail compares the chemistry to that of the alloy(s) selected, using the cutoff you selected. When the sample analysis reaches a match with the chemistry of any one of the alloys on the Selected list, a PASS or FAIL notice is generated as appropriate.

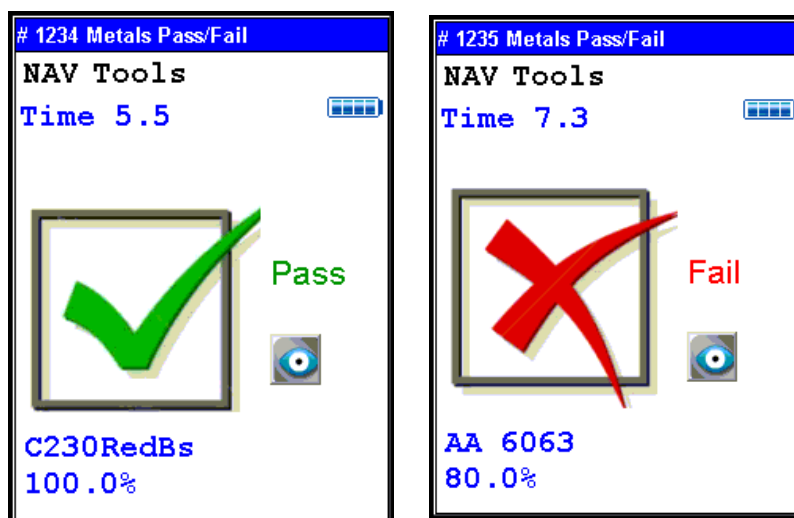


Figure 43. Metals Pass and Fail Screens

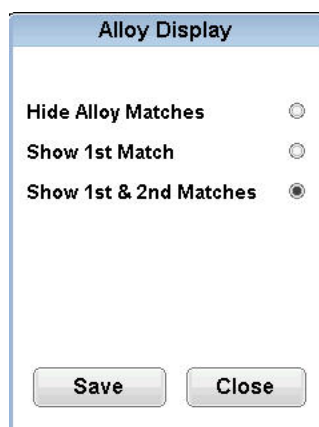
## Alloy Display

The Alloy Display selection allows you to display the number of alloy library matches displayed during analysis and in readings.

- **Hide Alloy Matches** - displays no match at all
- **Show 1st Match** - displays the best alloy match
- **Show 1st & 2nd Matches** - displays the 2nd alloy match when the match quality between the 2 alloys is close in value

### ❖ To set alloy display

1. Select a mode to edit.
2. Select **Tools** from the Ready to Test screen.
3. Select **Alloy Display**, then choose a display setting.



4. Save your changes.

The alloy display can also be changed after a reading completes.

## Match Quality

When Alloy Display is set to show matches, the match quality is color coded as shown below.

<b>AA 1000</b>	0.05	Excellent 0 - 0.5
	Excellent	
<b>AA 6063</b>	1.43	Good 0.5 - 1.5
	Good	
<b>AA 6063</b>	1.82	Possible 1.5 - 2.5
	Possible	
<b>AA 7104</b>	3.58	Poor 2.5 - 4
	Poor	
<b>No Match</b>		No Match > 4 (number is displayed)

## Switch Library (Main)

Switch Library is available only on General Metals mode. There are 2 libraries: 800 Alloy Library and 900 Alloy Library.

## Enable/Disable AI

Normally, the collective amount of unquantifiable light elements in alloy analysis - the “balance” - is assumed to be aluminum and labeled as such in the analysis. Selecting the Disable AI button from the Tools Menu will delete this “aluminum” from the analysis results, showing only the quantified elements. Selecting the Enable AI button, the default state, will label this “balance” as “aluminum”.

## **Thickness Correction**

Thickness Correction is used only in Plastics mode. Plastics, and polymers in general, unlike metals or soil, are very weak absorbers of X rays. This is because polymers are composed mainly of very light elements such as carbon and hydrogen. While just half a millimeter of steel will completely stop 23.1 keV energy X rays of cadmium, for example, it takes at least 10mm of plasticized PVC and as much as 100mm of polyethylene (PE) to do so. Fortunately, polymers that may contain cadmium (Cd), lead (Pb) and other restricted elements would also contain considerable quantity of elements such as antimony (Sb), bromine (Br), titanium (Ti), etc. Their presence results in much stronger absorption of X rays which means that, instead of 100mm, it takes only about 15mm of compounded PE to achieve saturation thickness for these X rays. If the thickness of analyzed polymer sample is less than 5mm for PVC or less than about 9mm for a “typical” PE, the measured intensity of X rays will be a function of both analyte concentration and sample thickness. This is why measurements performed on thin samples (less than saturation thickness) need to be corrected for thickness.

### **How to apply Thickness Correction.**

In order for the instrument to apply thickness correction to the measured concentration results, the user must be using the Thickness Correction screen and enter the thickness of the analyzed plastic object expressed in [mm] before the measurement is initiated. The thickness may be entered with precision to the second decimal place, although in practice only one decimal place is sufficient for effective correction.

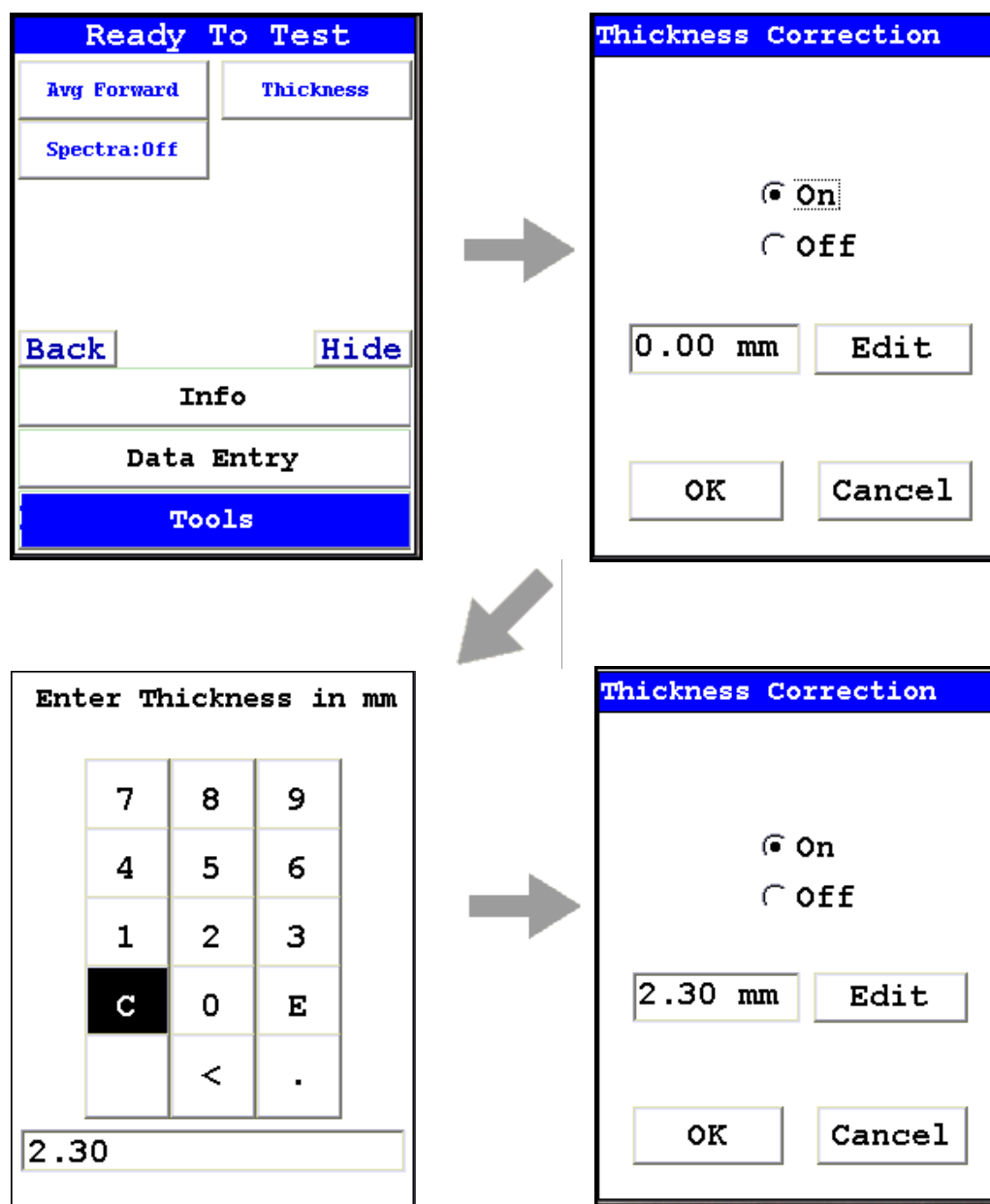


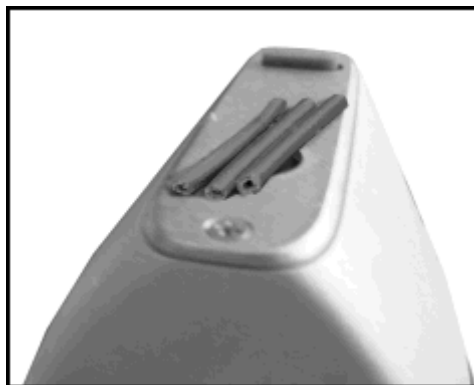
Figure 44. How to Enable and Adjust Thickness Correction for Plastics Analysis

## **When to use Thickness Correction**

Thickness Correction should only be used during the analysis of plastic (polymer) objects. It has been experimentally verified that the correction algorithm will yield satisfactory results, for a 60 second minimum testing time, for samples as thin as 0.3mm. Nevertheless, the recommended range of use of the correction is from 1mm upwards. It is imperative that this correction is not used for thin films such as single foils and plastic membranes; analysis of thin films is performed using the Thin Sample Mode. Contact Thermo Scientific or your local Niton Analyzers representative for information on this testing mode.)

Whenever possible, one should analyze as thick a sample as available. For example, if the analyzed object is a piece of heat-shrink tubing with wall thickness of 0.3mm, the best way to analyze it is to obtain several pieces of the tubing (four for example) and stack them like a flat sandwich, with the thickness correction set to 1.2mm. Doing so makes for faster and more precise analyses. While it would be possible to analyze just a single layer of the tubing with correction at 0.3 mm, by stacking several layers we reduce the relative error of measurement (by a factor approximately equal to the square root of the number of layers). Conversely, when analyzing thinner samples, we need to extend the measurement time fourfold (by the number of layers) in order to maintain the same relative error of measurement. We can see how quickly measurement time would escalate to impractical levels for thinner samples.

Examples: The most frequent instances in which thickness correction would be called for are analyses of plastic sheeting or plastic insulation on wires and/or cables and heat shrink tubing. Flat plastic sheeting or plastic enclosures pose no problems. We can either analyze an object “as is”, or stack several layers of it before analysis. Plastic insulation such as that on wiring or cables requires a little more sophisticated approach. First, the wire must be removed so that only insulation is analyzed. Then, the insulation should be flattened for analysis, and a thickness correction should be applied that is equal to double the wall thickness. Alternatively, if the insulation is stiff, it should be cut lengthwise into strands which are placed on the instrument for analysis. The applied thickness correction should be equal to the wall thickness of the sleeve. Both operations are shown in Figure 37 and Figure 38.



**Figure 45. Wire Insulation Cut Into Strands**





**Figure 46. PVC Wire Insulation With Conductor Removed**

A piece of large diameter heat shrink tubing presents an interesting case. It is tempting to analyze this object as is - see Figure 39. However, one needs to know that while lead or bromine or chromium X-rays from the upper wall of tubing will not contribute to the signal measured, X rays of such elements as cadmium, antimony, tin or barium in the upper wall will significantly contribute to overall signal. It is therefore imperative to either flatten the tubing for analysis or cut it in pieces and then analyze as shown in Figure 40.



**Figure 47. Incorrect Way to Measure Heat Shrink Tubing**



**Figure 48. Correct Way to Measure Heat Shrink Tubing**

**WARNING** Thickness correction is only for use with plastic/polymer samples.

## **Enable/Disable Paint**

Selecting the Enable Paint option from the Tools Menu will enable the Painted Products mode and toggle the option to Disable Paint. Selecting the Disable Paint option will disable Painted Products mode and toggle the option to Enable Paint.

## **Action Level**

Action Level is available only from the Lead Paint modes. Selecting the Action Level option from the Tools Menu will enable you to change the action level used for qualitative testing.

## **Print Data**

Selecting the Print Data option from the Tools Menu will print the currently displayed data to the optional attached printer. See “[Print \(Alt\)](#)” on [page 75](#) for details.

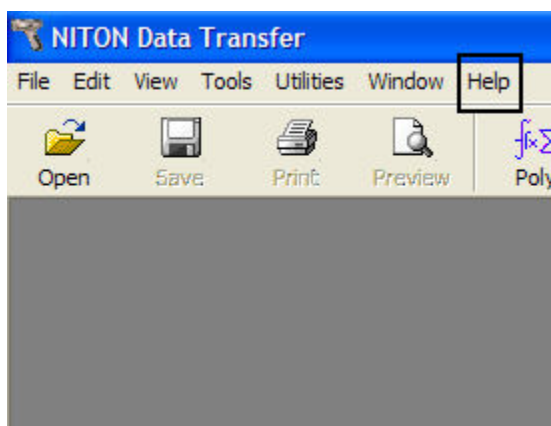
## **Coatings Method**

Metals are sometimes coated with various materials. If you wish to analyze the coating, select the Coatings Method. Coatings Analysis Mode is an optional mode which can be purchased and added to your analyzer.

## Passwords and User Privileges

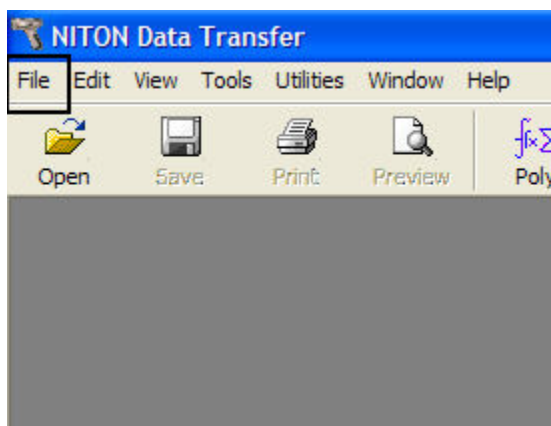
For a list of user privileges see the screen in [Figure 56](#). Install the latest version of Niton software (NDT) on your PC, if possible. You may obtain the latest version of NDT by contacting service at 800-875-1578.

1. You can check the version number by opening NDT, selecting the Help menu, then selecting “About Niton Data Transfer”



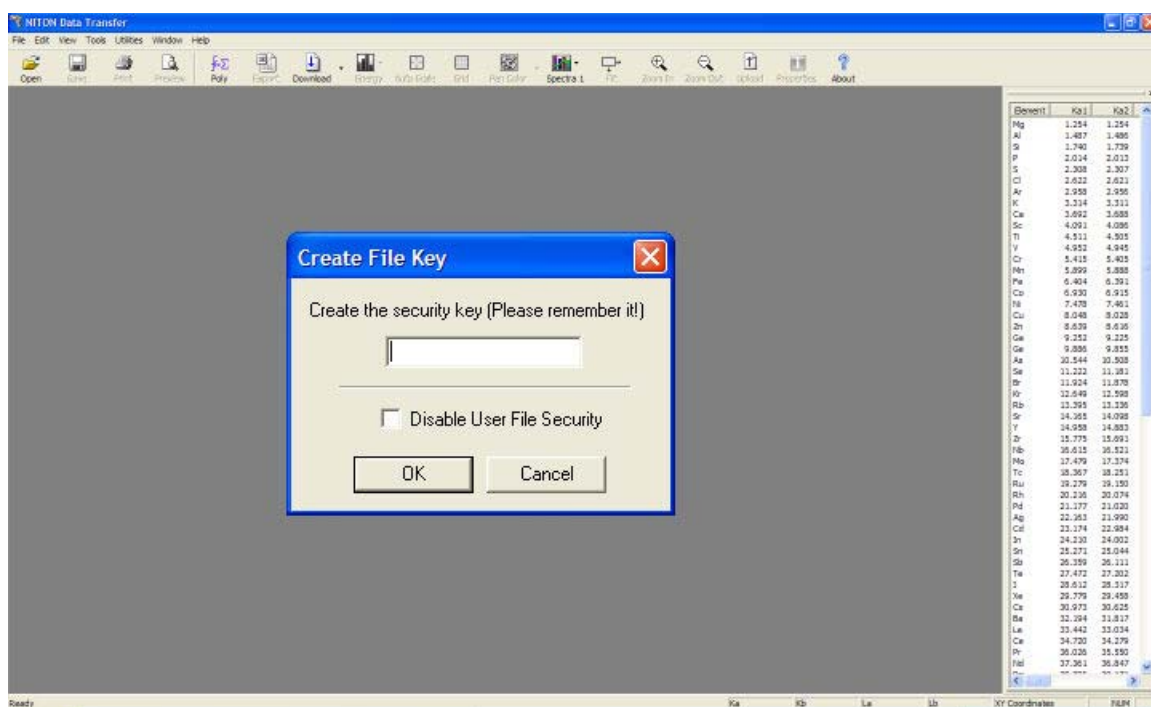
**Figure 49. Selecting Help**

2. Select the File menu



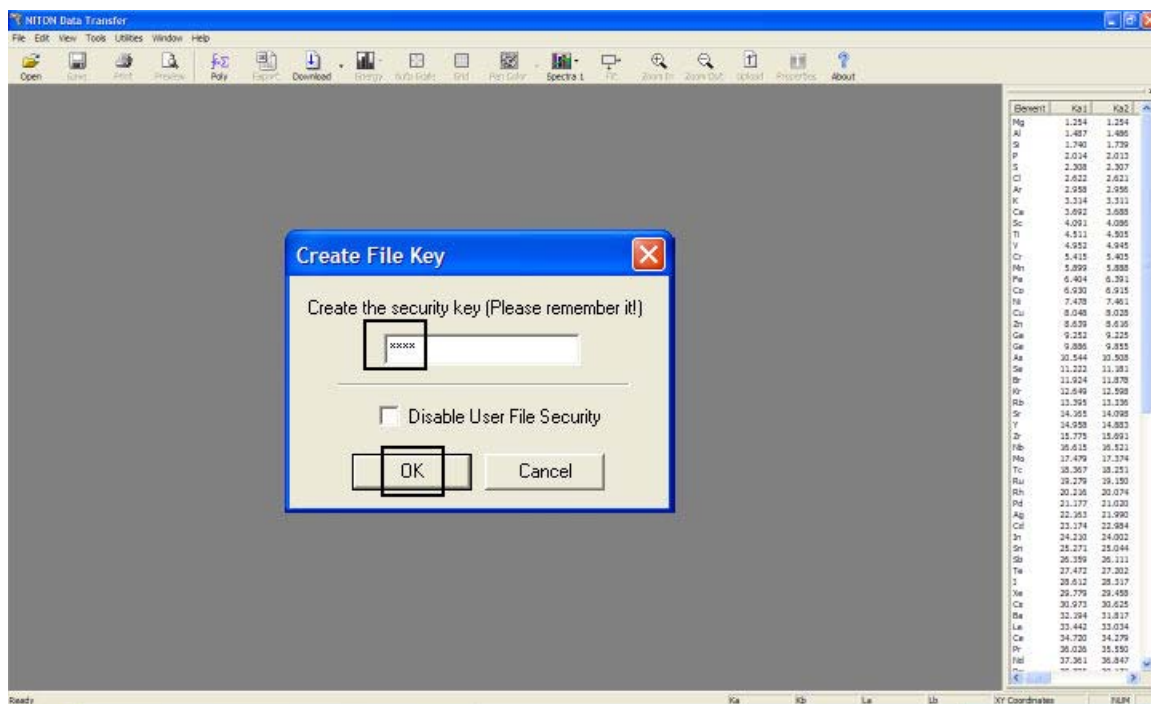
**Figure 50. Selecting File**

3. Select “New” then “New Password File”. Your screen should look like this:



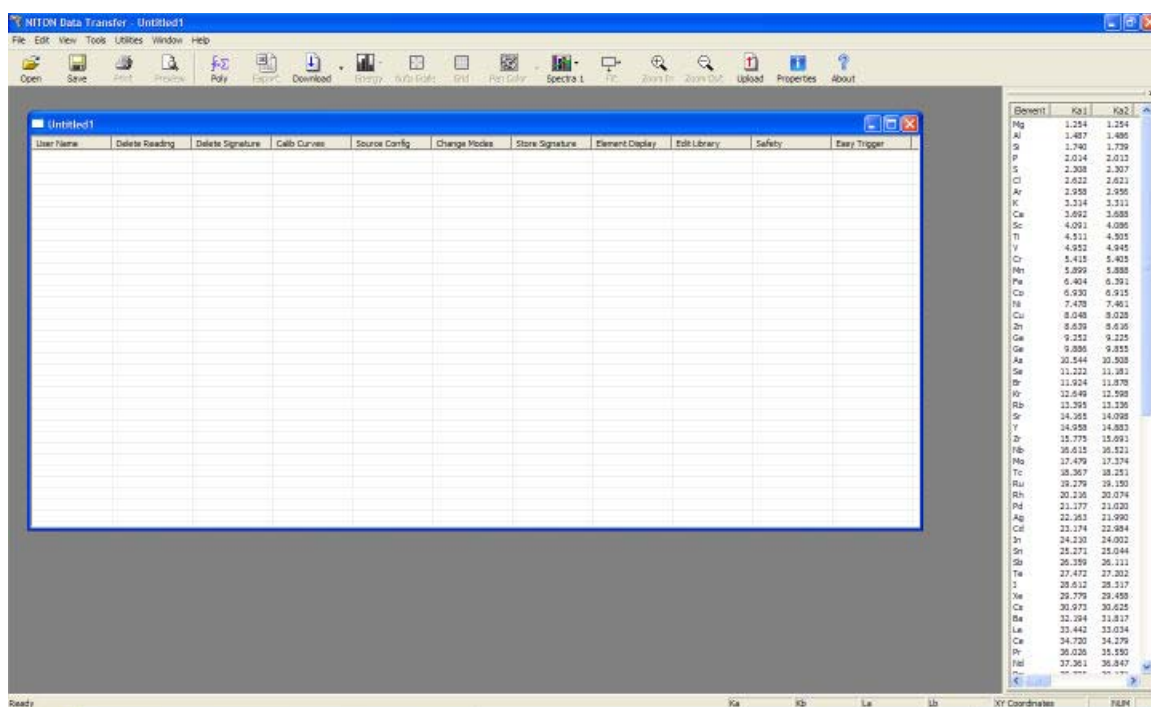
**Figure 51. Creating the Security Key**

4. Create a unique security key, then select the OK Button



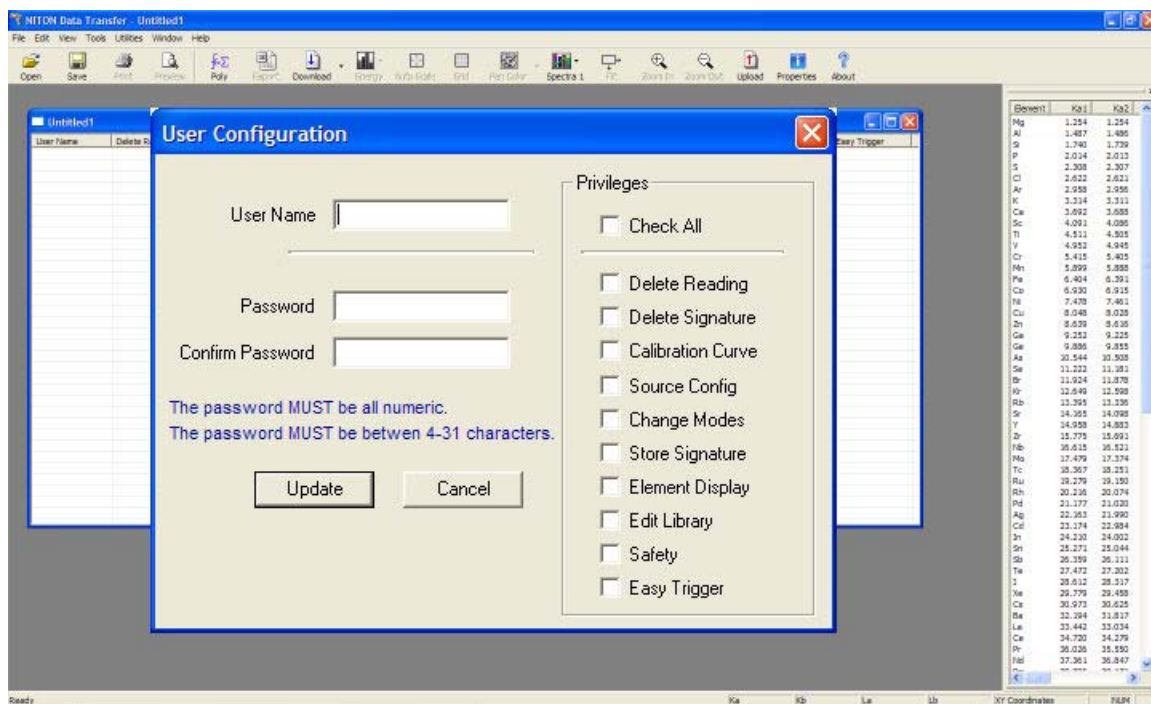
**Figure 52. Security Key**

5. Your screen should look like this:



**Figure 53. User Account Creation Screen**

6. Right click, then select “New User”



**Figure 54. User Creation Dialog Box**

7. Enter a user name and password, then select the privileges assigned to this user. Selecting the Check All check box will result in enabling all features.

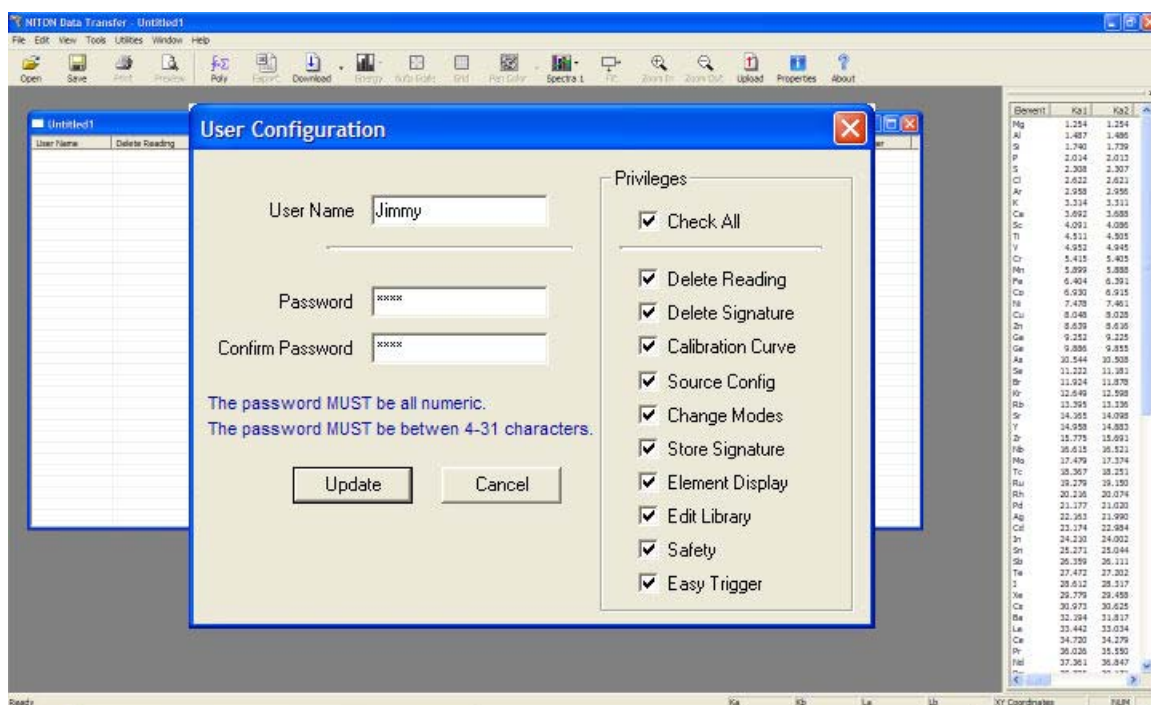


Figure 55. . Creating a User

**WARNING** it is recommended that only users at the highest level have access to the “Safety” feature. This should be unchecked for all other operators.

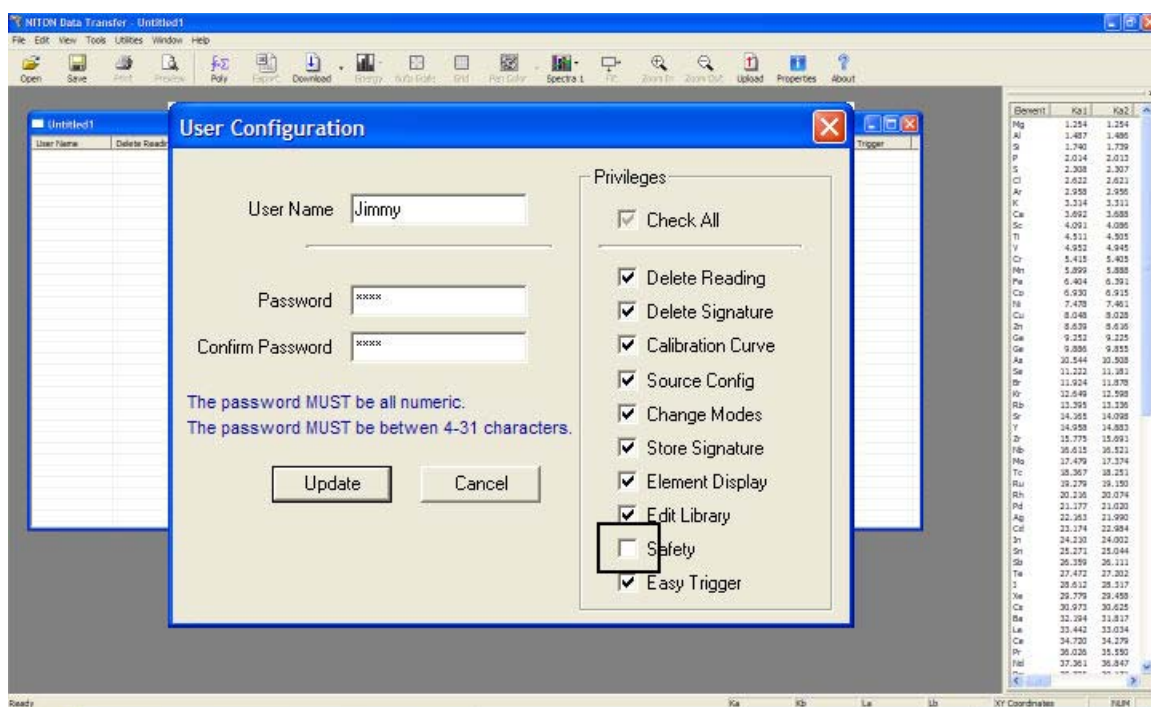


Figure 56. Unchecking Safety

8. Select the Update Button

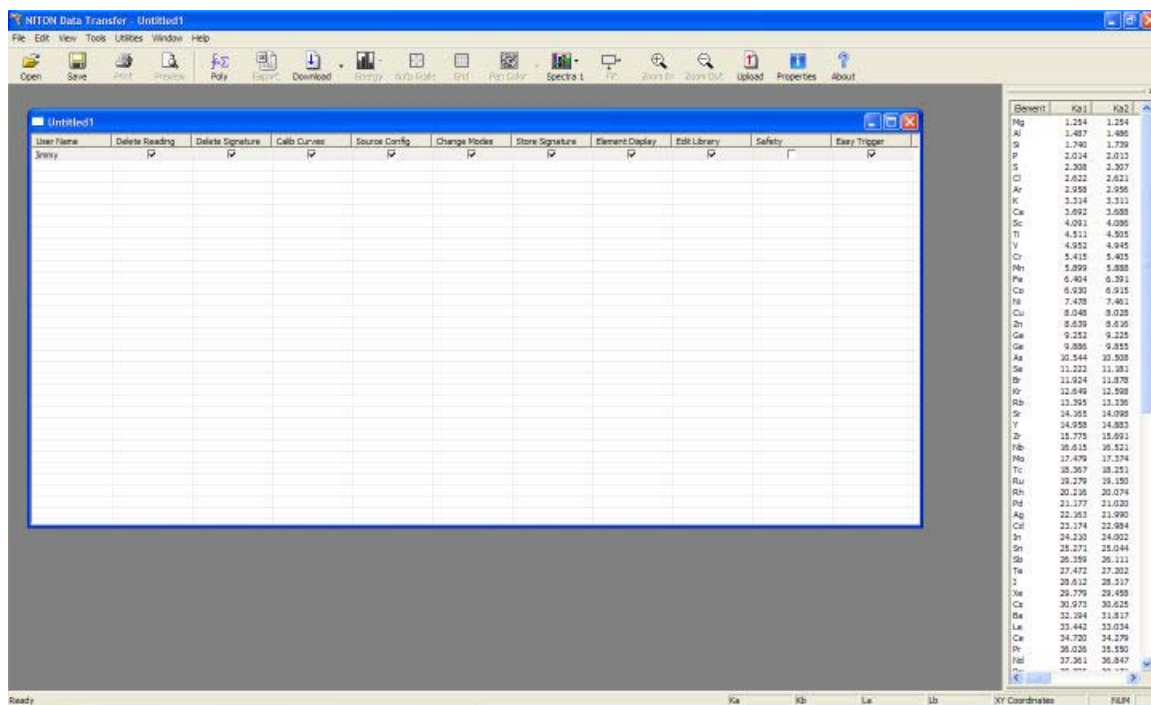
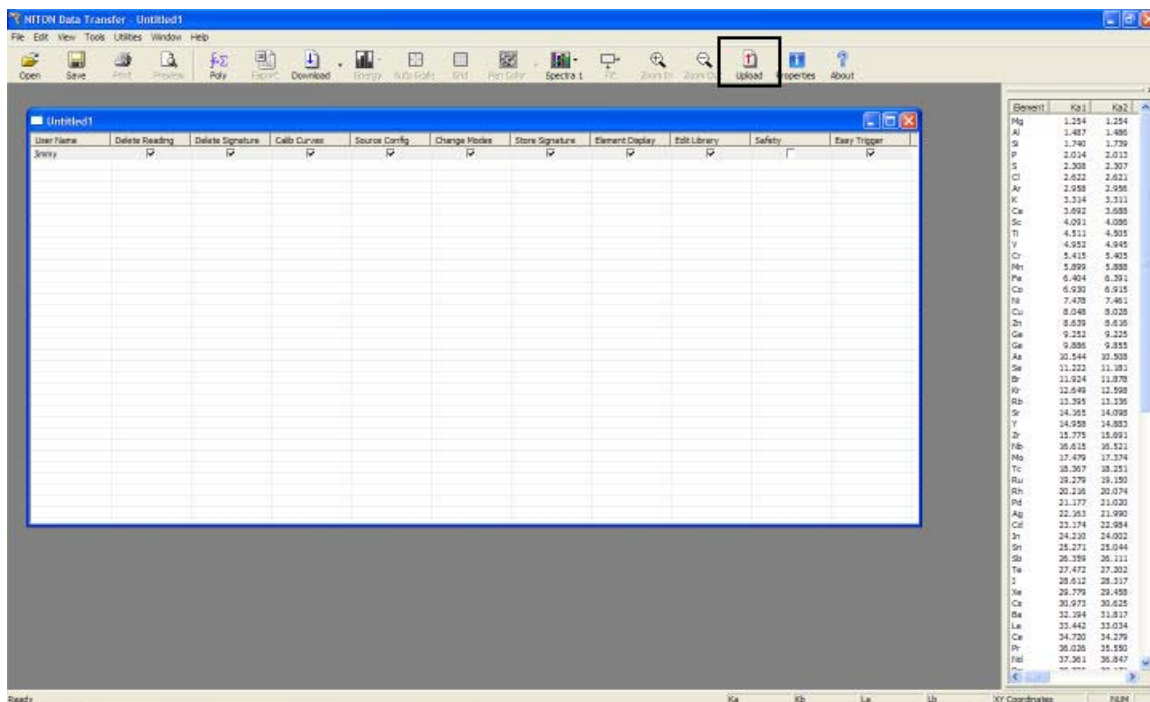


Figure 57. User is Created

a. You are now ready to upload your password file to the analyzer.



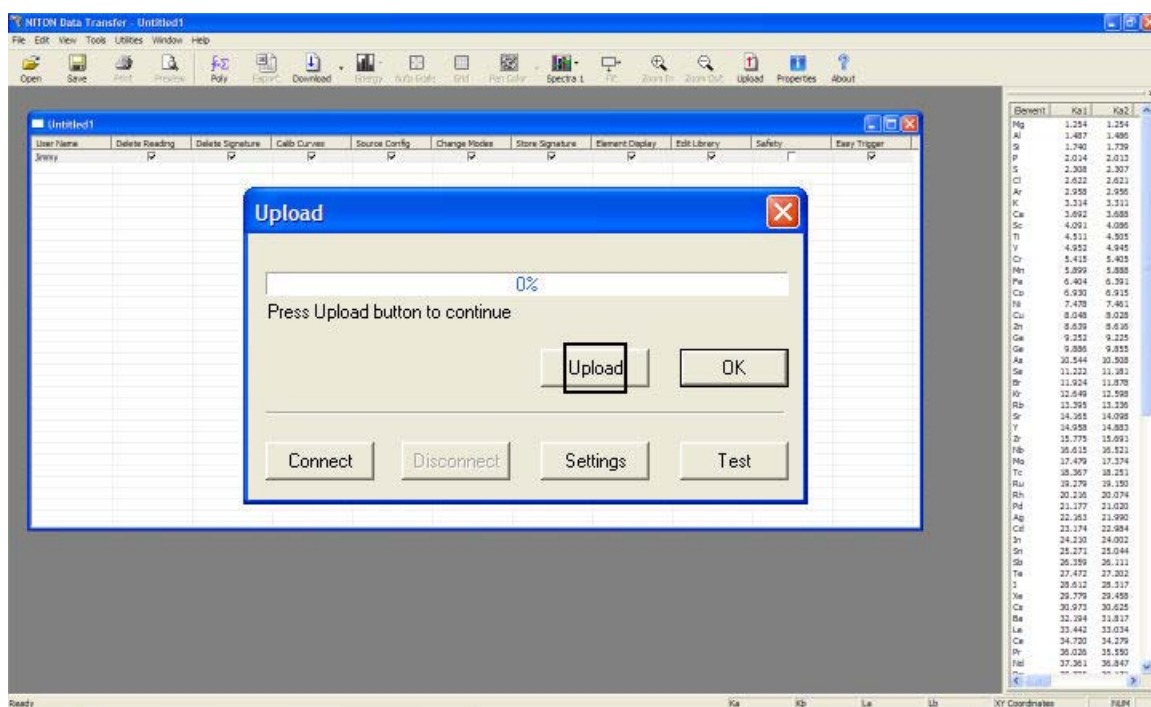
9. Be sure the analyzer is switched on; connect the analyzer using USB or serial connection.
10. Select the Upload icon.



**Figure 58. Selecting Upload**

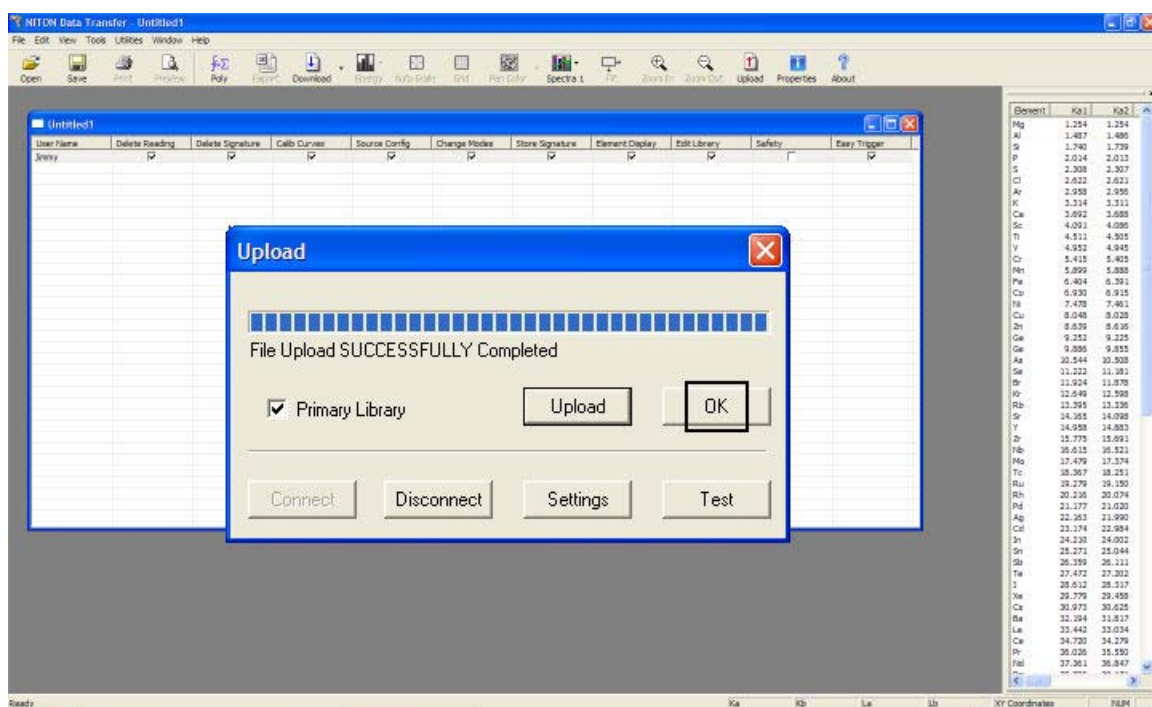
11. Your screen should look like this:





**Figure 59. Selecting Upload**

12. Select the Settings Button and choose the comm port that your analyzer is connect to.
13. Select the Connect Button, then the Upload Button.
14. Upon completion, you will receive a “File Upload Successfully Completed” message.
15. Click the OK Button; save your password file at this time by selecting the File icon then “Save As.



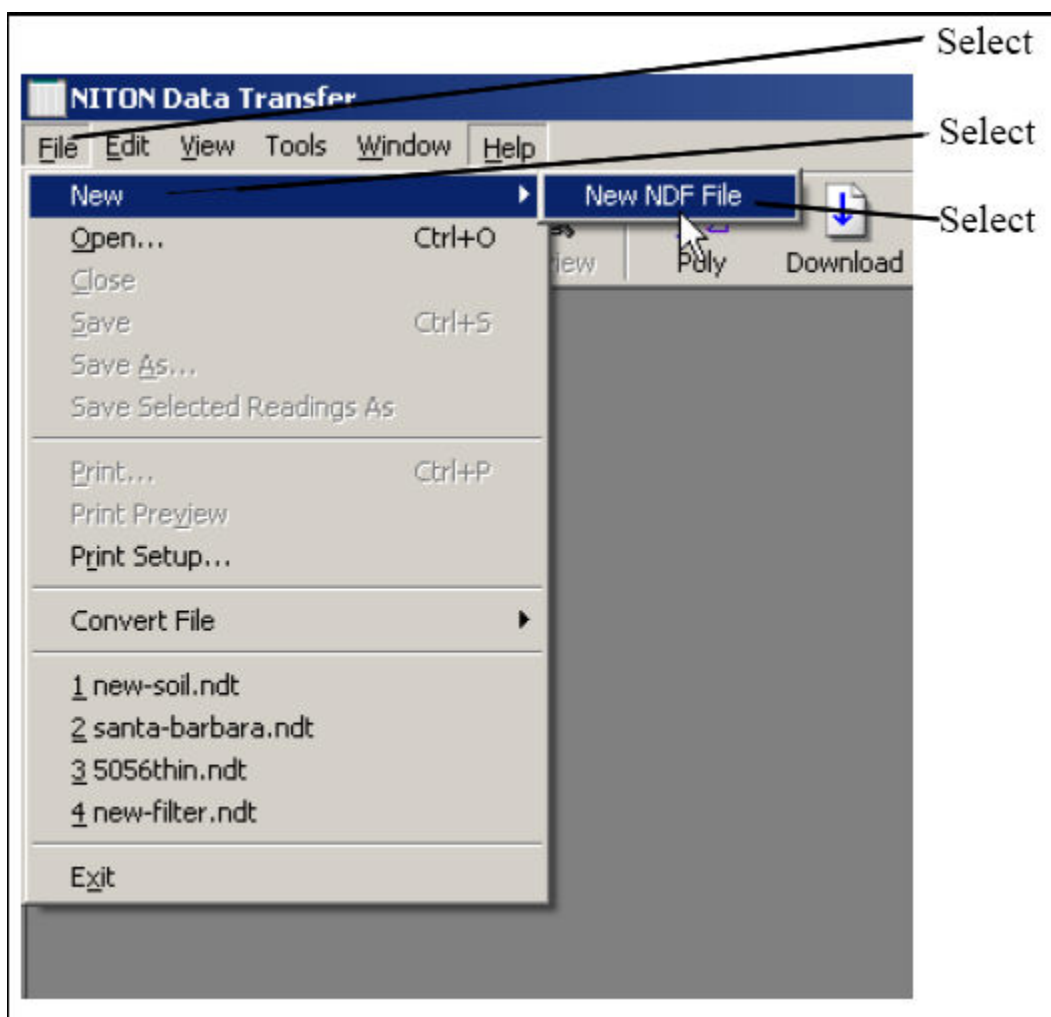
**Figure 60. Successful Installation Message**

16. Restart your analyzer; your password file should be successfully installed.

## NDF Files: User Data Structuring

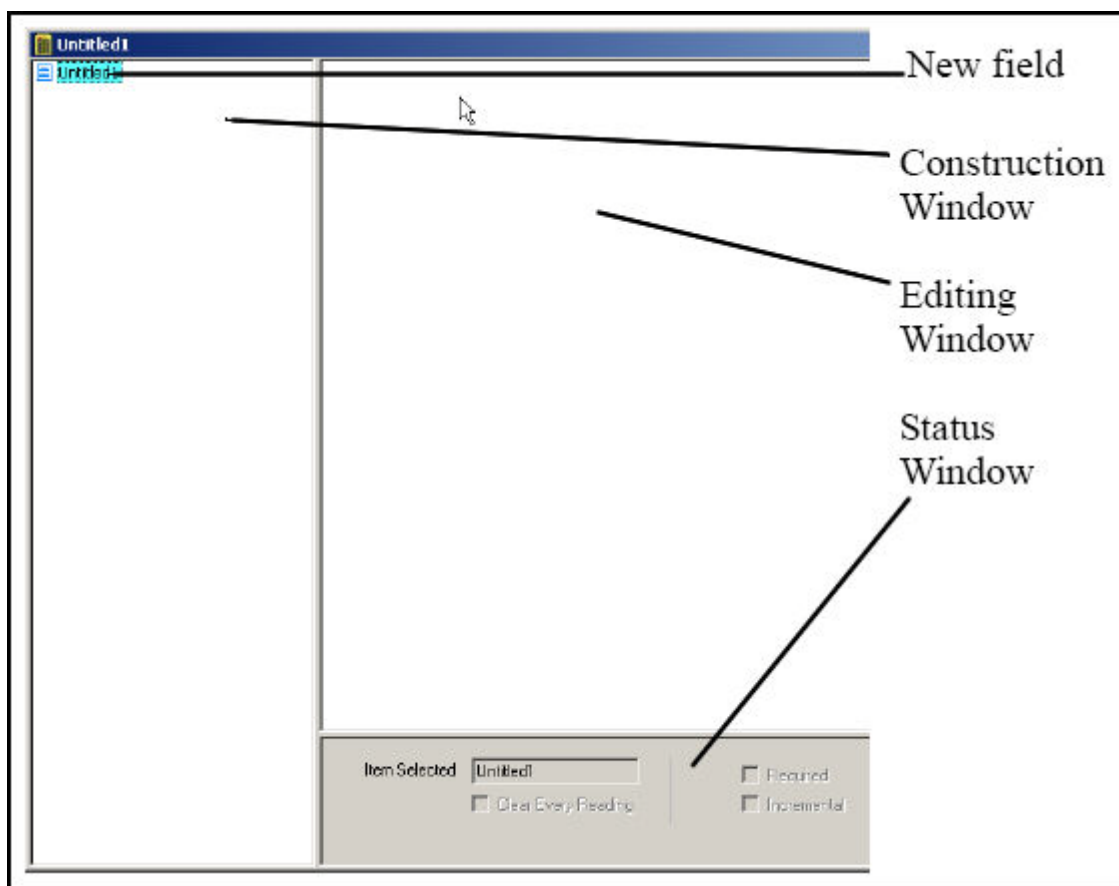
### Creating New User-Defined Fields

You can create your own data entry fields for your Niton analyzer customized to your own needs and usage. These fields are saved in a special format called an NDF (Niton Data File) file. To create a new NDF file, select the File menu, then select New, then select New NDF File.



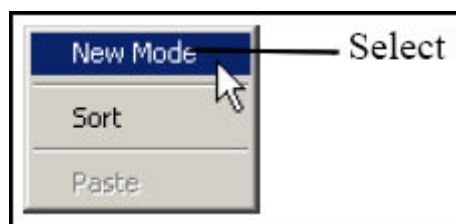
**Figure 61. Creating a New NDF File**

This will create a new window in which you can create your own fields, and specify their structure and parameters. The new window will appear with a single box, called “Untitled.”



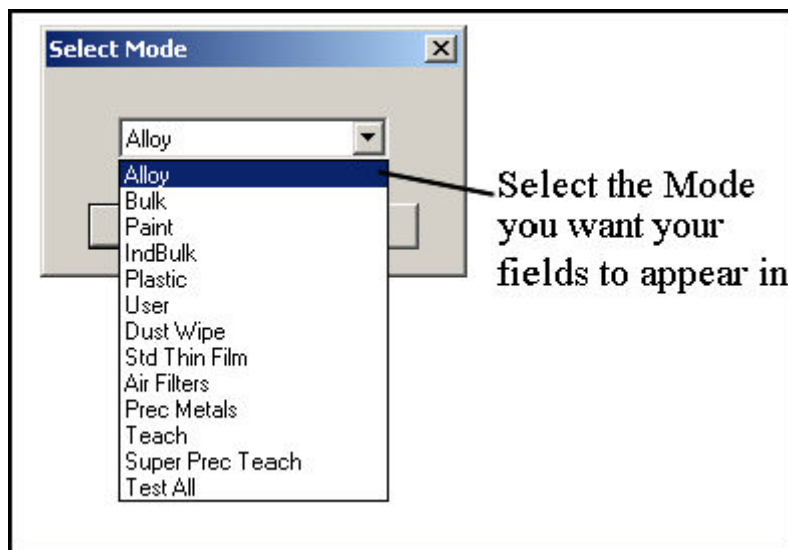
**Figure 62. NDF File Work Area**

By right-clicking on this box, you can access a pop-up menu allowing you to set the mode of the new data fields. Select New Mode to access the menu.



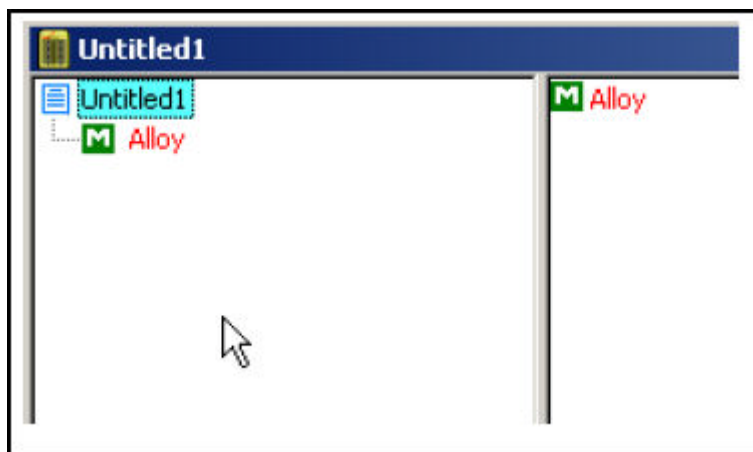
**Figure 63. Selecting New Mode**

The Mode you select will be the Mode within which the new data entry fields will appear. If you have multiple Modes enabled on your analyzer, the new fields will only be available from the Mode you select. Only the default fields will be available from the other Mode or Modes.



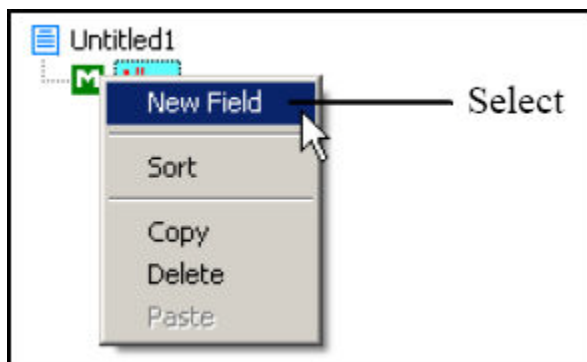
**Figure 64. Selecting Mode**

When you select the Mode for the new data fields, the Construction Window will change to look like this:



**Figure 65. Working within a Mode**

The “M” indicates the mode you have chosen - in this case Alloy Mode. Right click on the Mode name to access a pop-up menu.



**Figure 66. Mode Pop-Up Menu**

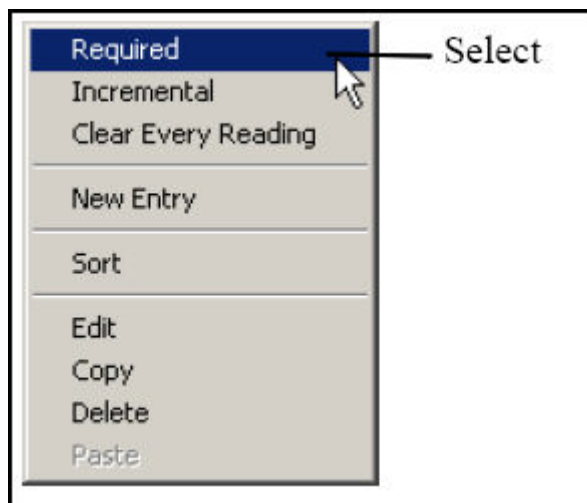
Select New Field from the menu, and a blank new field will appear in the construction window.



**Figure 67. Adding a New Field**

Right clicking on the New Field box will bring up another pop-up menu. This menu gives you various options for using the field in your operations.

Selecting Required makes it mandatory that the new field be filled in prior to taking a measurement. This is very useful for necessary descriptors which vary from measurement to measurement, such as lot numbers, condition descriptors, locations, etc.

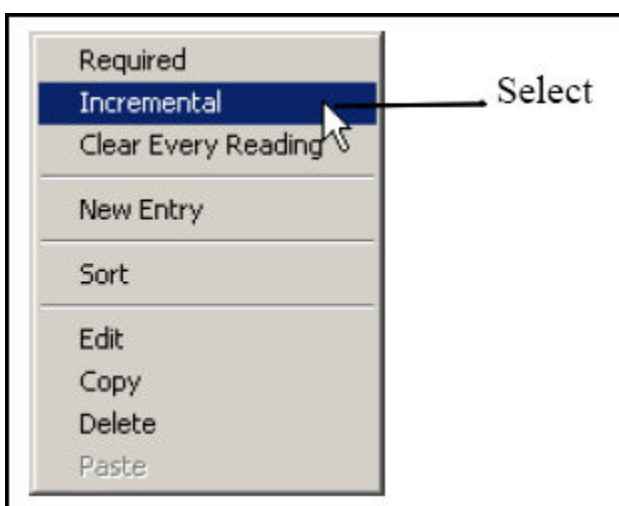


**Figure 68. Making Fields Required**

Selecting the Incremental option sets up a field which increments the field descriptor by one for each measurement taken. This option is handy for measuring several items with identical descriptors, such as samples within a single lot, or several instances of the same part number, because it appends the incremental number to the descriptor.

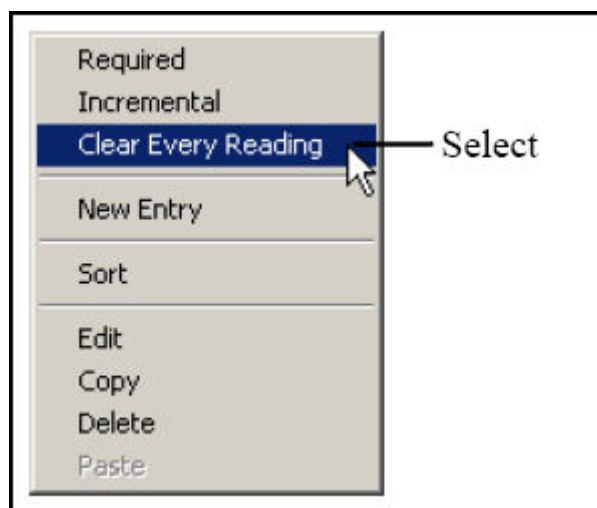
For example: P/N 455A2-1, P/N 455A2-2, P/N 455A2-3.

Another Example: Impeller-1, Impeller-2, Impeller-3.



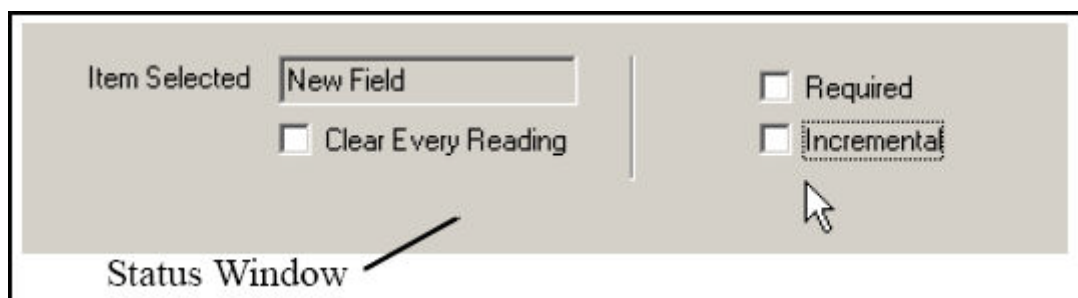
**Figure 69. Making Fields Incremental**

Selecting Clear Every Reading will toggle between two states. By default, the field will fill with the data which was input during the last reading. By selecting Clear Every Reading, you tell the instrument to clear the data from the field for each new reading, insuring that the person taking the reading must input new data each time. This is very useful for times when the data descriptor is expected to vary widely between readings.



**Figure 70. Clearing Data for New Readings**

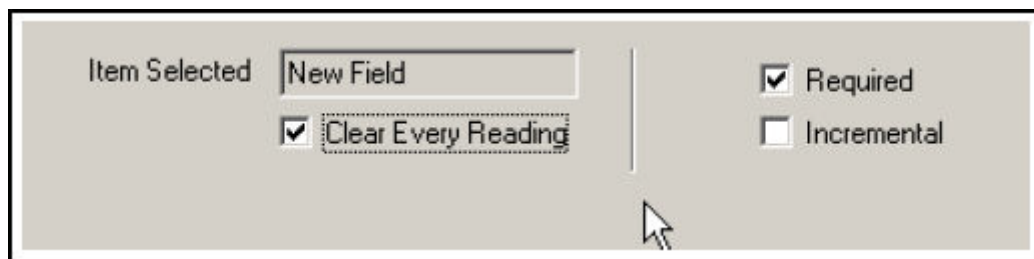
The state of each of these options can be seen in the Field Status Window at the bottom of the Construction Window. All options in effect for the field selected are checked.



**Figure 71. Field Status Window - Default**

This shows a field with no options in effect, the default configuration. This is a field that will present the previous reading's data for this field - which may be changed by the user - without incrementing it, but does not require the user to input any data if there is none already there from a previous reading.

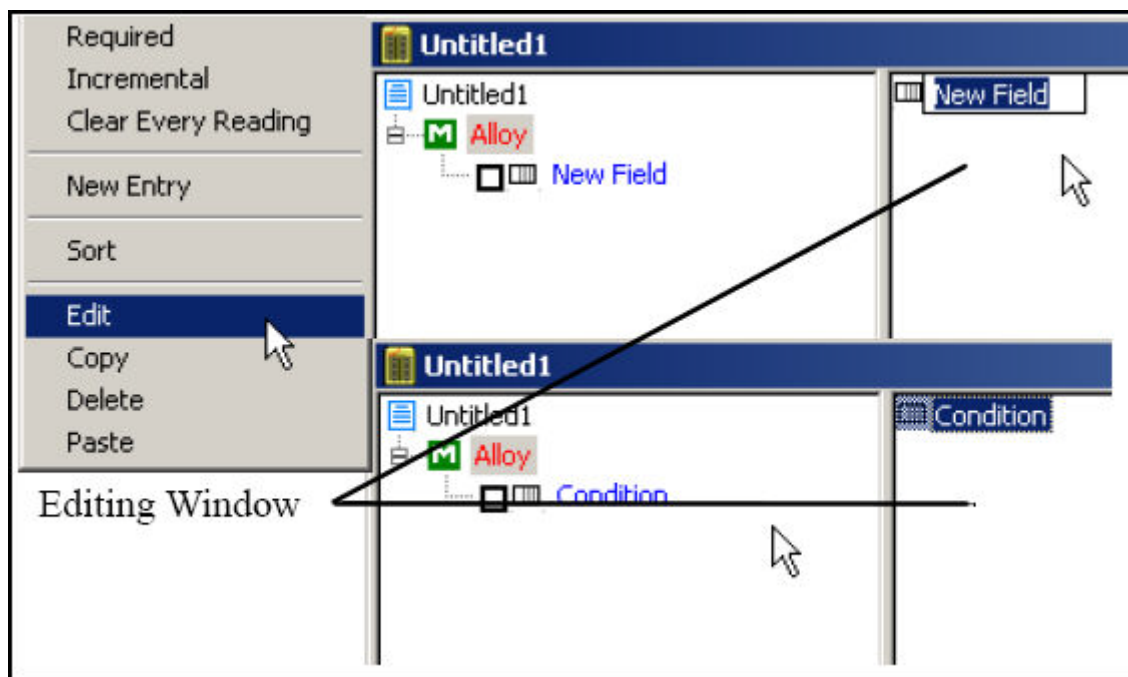




**Figure 72. Field Status Window - Options Enabled**

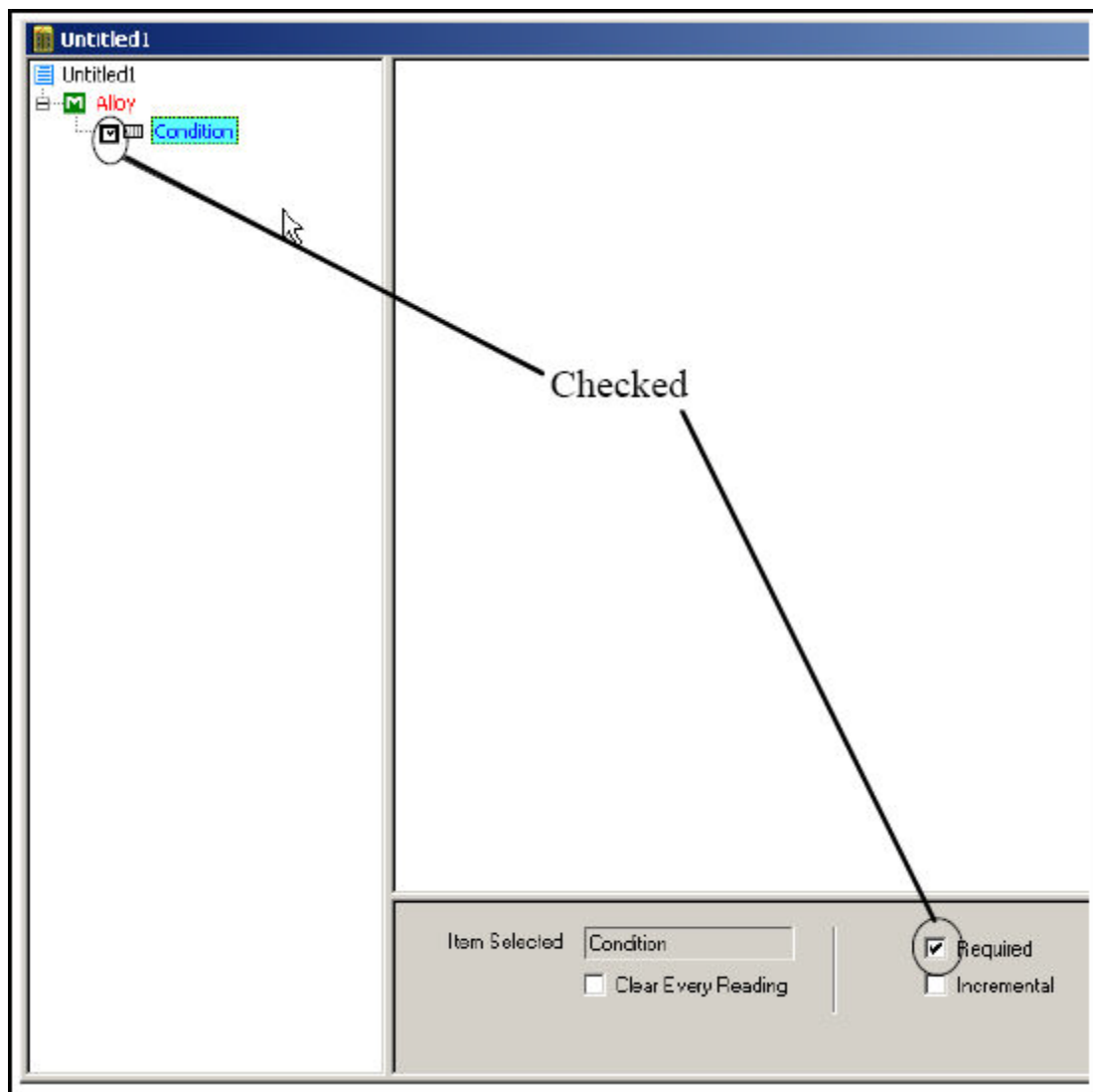
This shows a field with both Required and Clear Every Reading options in effect. This presents a field that is cleared for each reading, and must be filled in by the user before a reading is taken.

Selecting Edit from the pop-up menu allows you to edit the name of the field in the Editing Window to the right of the Construction Window.



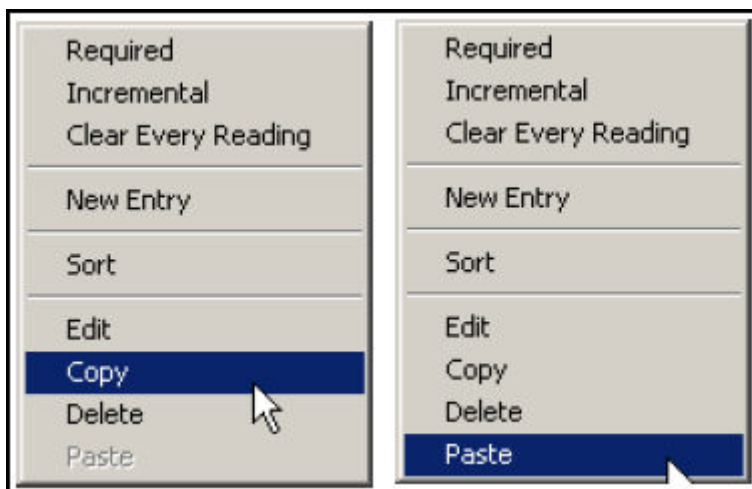
**Figure 73. Editing the Field Name**

Selecting the box to the left of the field toggles the Required option on or off.



**Figure 74. Toggling the Required Option**

Selecting Copy from the pop-up window allows you to copy the currently selected field.



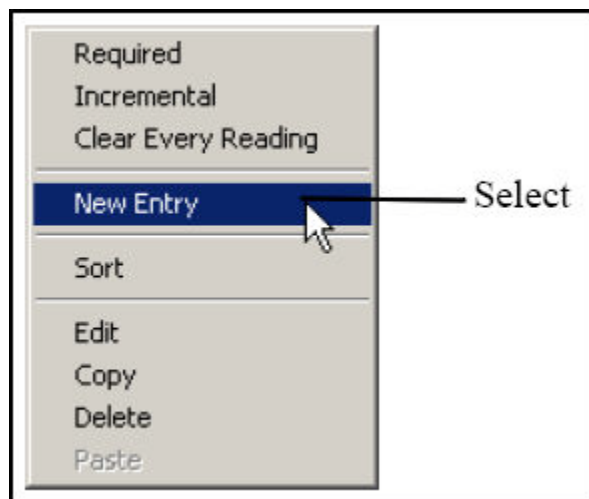
**Figure 75. Copying the Current Field**

Once you copy a field, the Paste option can be selected to paste the copied field into the Construction Window.



**Figure 76. Pasting a Copied Field**

Selecting the New Entry option from the pop-up menu allows you to define a choice for the user for this field.



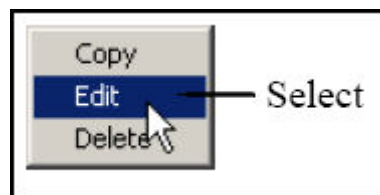
**Figure 77. Creating a New Entry**

This is a New Entry in the Construction Window.



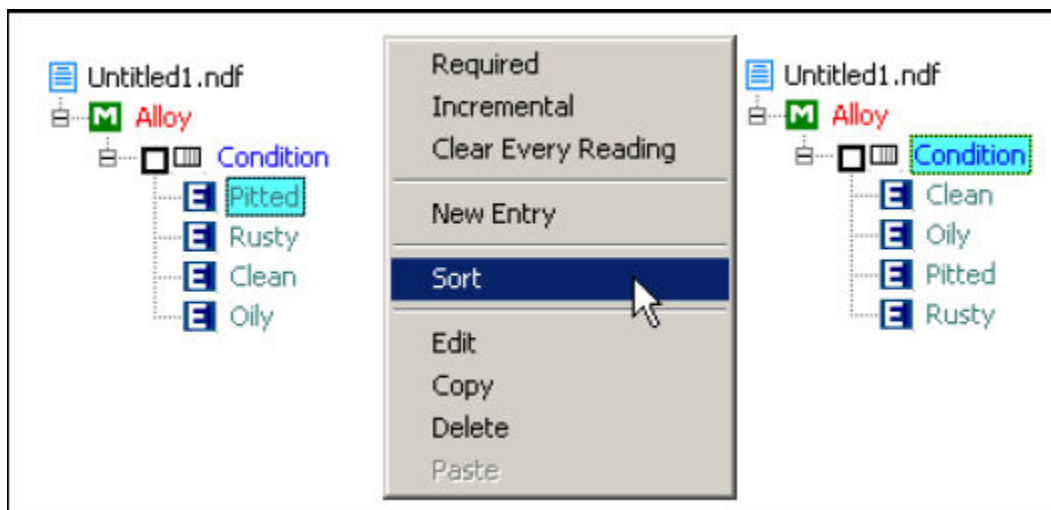
**Figure 78. New Entry in the Construction Window**

The “E” is for “Entry.” You can edit the entry once it is created, the same way as you edit the field name. Right click on the entry name, and choose Edit from the pop-up menu.



**Figure 79. Editing the New Entry**

You can sort your entries by name, alphanumerically, by right clicking on the field and selecting “Sort” from the pop-up menu.



**Figure 80. Sorting Entries**

To delete a field or entry, just right click on the item you wish to delete, and select Delete From the pop-up menu.



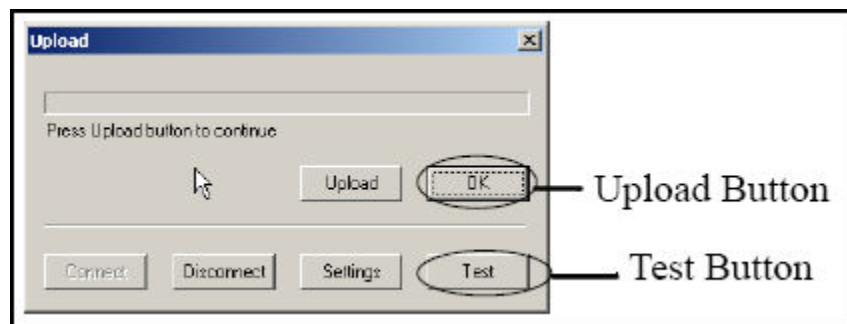
**Figure 81. Deleting Fields and Entries**

When you are finished creating your new NDF file, Upload it to your instrument using the Upload icon.



**Figure 82. Uploading the NDF File**

Make sure the instrument is connected to your computer by testing the connection first. Use the Test button on the Upload Window.



**Figure 83. Testing the Upload Connection**

## Safety Settings

Access to the Safety Settings Screen is blocked unless the user logging in has explicitly been granted Safety access. The default login of 1234 does not have Safety access. See Passwords and User Privileges.

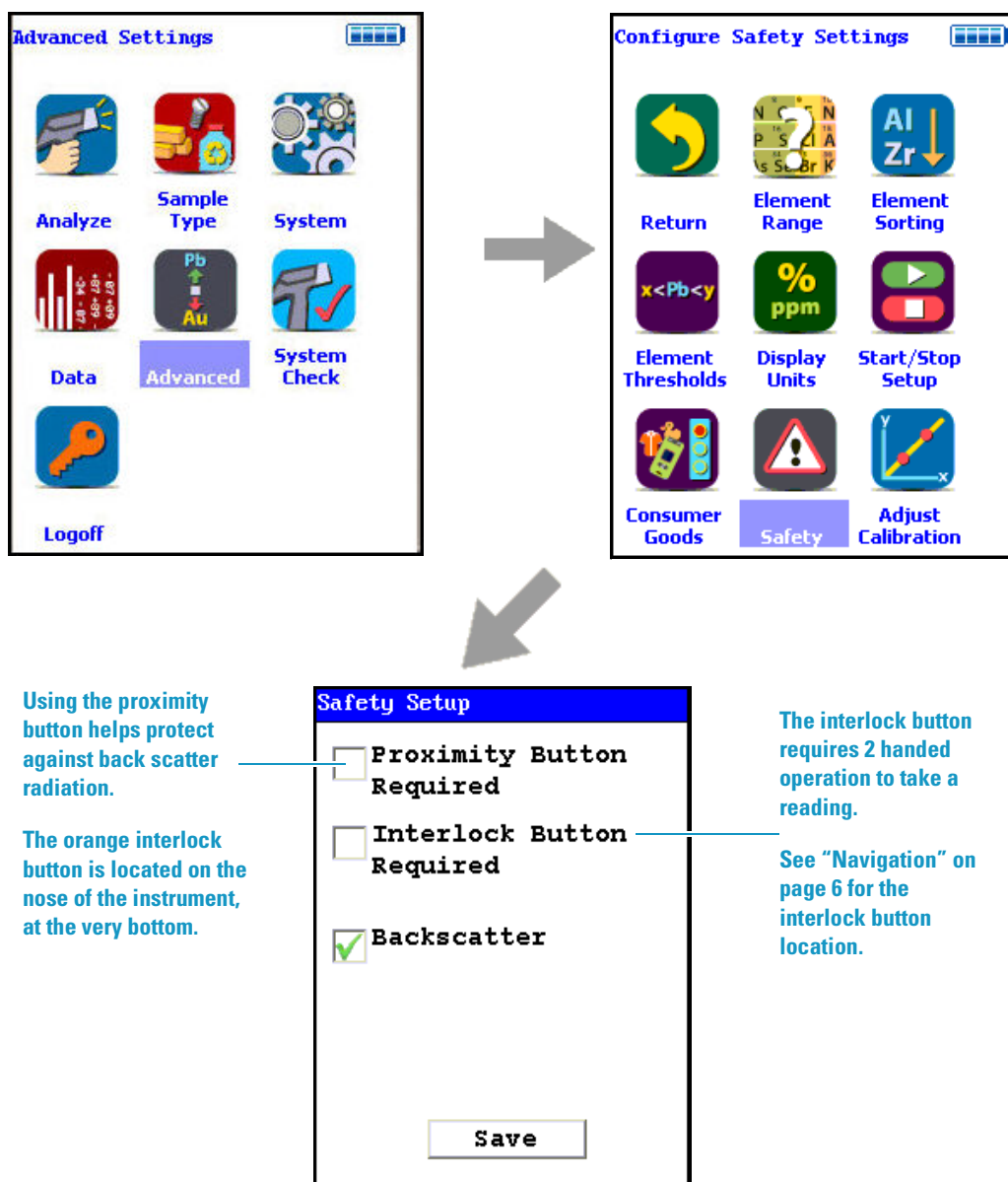


Figure 84. Safety Settings Menu Path

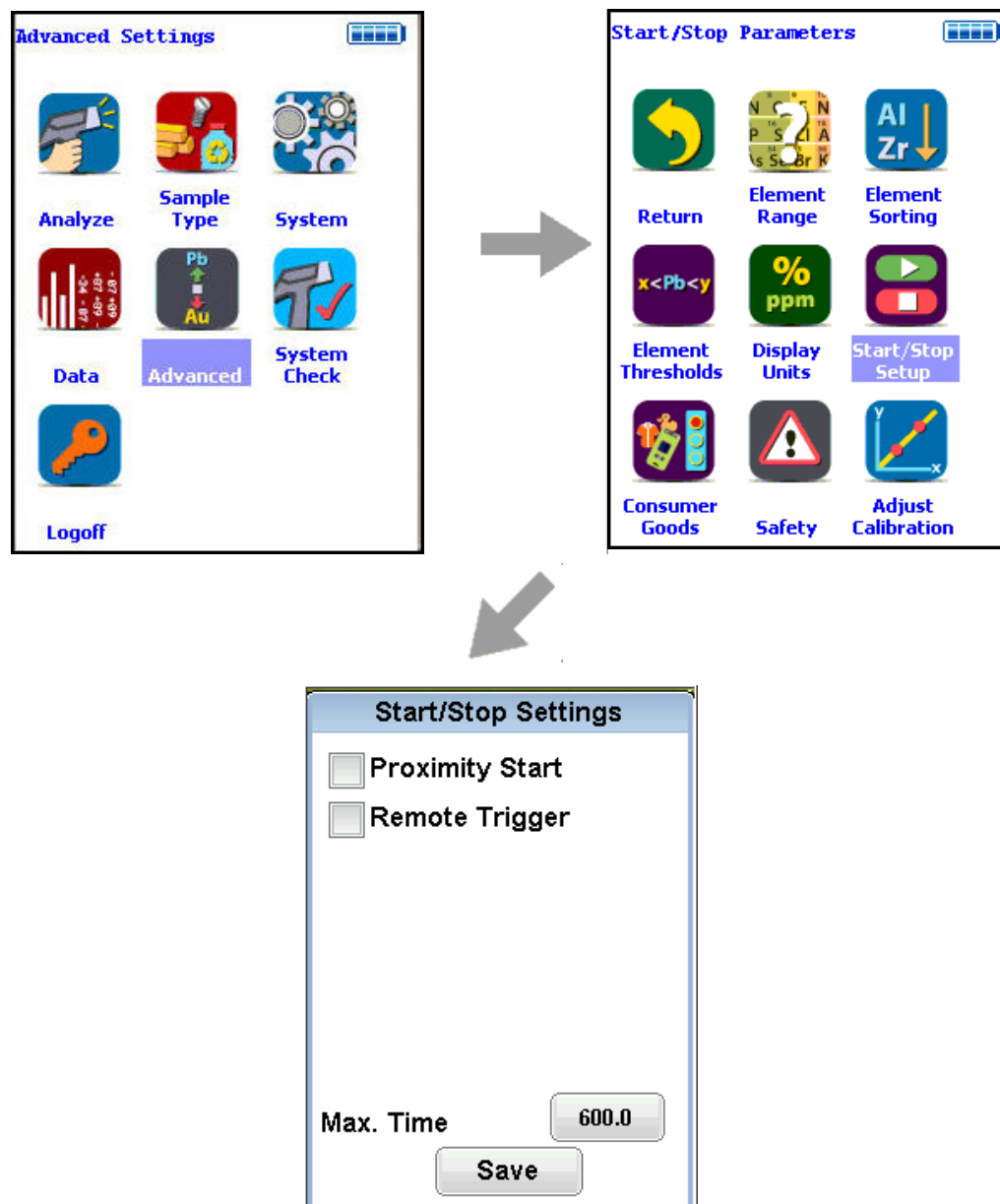
The Safety Settings Screen enables you to change the Method of Operation for your analyzer. Each checkbox on the screen enables or disables the safety device named for purposes of the preconditions for operation. For example, checking the Proximity Button Required checkbox sets the engagement of the Proximity Sensor as a precondition for operation. Checking the Proximity Button Required checkbox and the Interlock Button Required checkbox sets the engagement of both the Proximity Button and the Interlock Button as preconditions for operation.

Safety settings always override start-stop settings. If your safety setting requires the use of the Proximity Button, you cannot set start-stop settings which ignore the Proximity Button. For example, the Easy Trigger start-stop setting must have the Backscatter safety setting enabled. While using Easy Trigger, you cannot disable Backscatter.

**WARNING** The backscatter sensor is enabled by default and acts as a recommended safety feature for most applications. Some sample types, however, cannot be analyzed when this feature is enabled. Samples that present very little mass to the analysis window, such as certain thin films, thin layers of plastic, and very thin wires, may not be of sufficient mass to allow the analysis to continue while backscatter is enabled. One should disable the backscatter feature only when necessary to analyze such low mass samples, and re-enable the feature when finished with these sample types. These samples also provide very little absorption of the primary x-ray beam so it is typically most appropriate to analyze these samples in a test stand when possible.



## Start/Stop Setup



**Figure 85. The Start/Stop Settings Menu Path**

The Start/Stop Setting Screen enables you to change the preconditions for operation at a lower level than the Safety level. See Safety Settings for more information. Start/Stop settings cannot contradict Safety settings.

The Start/Stop parameter options are Proximity Start and Remote Trigger. There is also a field to set the maximum time for sample analysis before the analysis stops.

## Proximity Start

Select the Proximity Start checkbox to use the Proximity Start parameters. Using Proximity Start, once the reading has been started, release of the Proximity Button will immediately stop the analysis. You cannot use Proximity Start with Easy Trigger.

## Remote Trigger

Select the Remote Trigger checkbox to use the Remote Trigger parameters. Remote Trigger is used with the Extend-a-Pole accessory to control the analysis. With the Extend-a-Pole's input cable connected to the analyzer's Remote Trigger port, you can initiate and stop analysis remotely from the Extend-a-Pole's handle trigger. You can use Remote Trigger with either Proximity Start or with Easy Trigger.

## Max Time Field

**Max Test Time**

7	8	9
4	5	6
1	2	3
C	0	E
	<	.

600.00

**Figure 86. The Max Test Time Editor**

Select the Max Time field to change the maximum analysis time parameter.

## Methods of Operation

**CAUTION** After being powered on, your Niton Analyzer will perform an internal re-calibration before an analysis is initiated.

There are six different methods of operation for taking a sample measurement, and your analyzer will be configured to use one of those methods for alloy samples, depending on the regulatory requirements of your locality. These methods are:

- **Trigger-Only method.** With the Trigger-Only method, you only need to place the measurement window flush with the sample to be analyzed and pull the trigger for sample analysis to be initiated.
- **Trigger-and-Proximity-Sensor method.** With the Trigger-and-Proximity-Sensor method, you must place the measurement window against the sample to be analyzed to engage the proximity sensor on the front of the analyzer, then pull the trigger for sample analysis to be initiated.
- **Momentary-Trigger-Touch-and-Proximity-Sensor method.** With the Momentary-Trigger-Touch-and-Proximity-Sensor method, you must place the measurement window against the surface to be analyzed to engage the proximity sensor on the front of the analyzer, then pull the trigger. The trigger may be released and the reading will continue until you release the proximity button, or other criteria (such as Max Time) are reached.
- **Trigger-and-Interlock method.** With the Trigger-and-Interlock method, you need to place the measurement window close to the sample to be analyzed, press and keep pressing the interlock button at the rear of the analyzer with your free hand, then pull the trigger for sample analysis to be initiated. The interlock button is located at the very center of the keypad, in between the left/right, up/down arrows.
- **Trigger-Interlock-and-Proximity-Sensor method.** With the Trigger-Interlock-and-Proximity-Sensor method, you must place the measurement window against the sample to be analyzed to engage the proximity sensor on the front of the analyzer, press and keep pressing the interlock button at the rear of the analyzer with your free hand, then pull the trigger for sample analysis to be initiated.
- **Easy Trigger method.** With the Easy trigger method, you need only place the measurement window against the sample area and pull the trigger once to initiate a sample analysis. Your analyzer will continuously sample the backscatter, using a complex internal algorithm, to determine if the measurement window is against a sample or pointing to the empty air. If it finds that there is no sample directly against the measurement window, the analyzer will stop directing radiation through the window as soon as this determination is made.

The analyzer is constantly checking the backscatter characteristics to determine if a sample is against the measurement window, whether or not the Easy Trigger method is being used, and will shut off any radiation directed through the window if it determines that there is no sample present.

With any of these methods, analysis will stop if any one of the preconditions are violated. For example, with the Trigger-Interlock-and-Proximity-Sensor method, if the trigger or the Proximity Sensor or the Interlock is released, the reading will stop immediately, and the X-ray tube will shut down.

After your analyzer is calibrated, initiate a sample reading using the appropriate method. If you attempt to initiate a sample reading using a different method, the analyzer will inform you that one or more of the preconditions need to be met in order for sample analysis to begin.

**Note** The LED lights will blink whenever the x-ray tube is on.

**WARNING** The nose should not be touched during sample testing and calibration. If an ESD event occurs during measurement, the instrument may terminate the testing in progress and automatically reset to LogOn screen. Any test data collected prior to reset will be lost and the testing may have to be repeated.

**WARNING** The preconditions for operation must be continued for the duration of the reading. If the preconditions are violated, the x-ray tube will turn off, the calibration shutter will close, and the measurement will end. The LED lights will stop blinking when the measurement is ended. The flashing of the LED lights is not synchronized to minimize power consumption.

To end the test, simply release the trigger mechanism, or any other applicable preconditions.

## Camera

The Camera feature is only usable with properly configured analyzers.

If your analyzer is equipped with an internal video camera, you can turn that camera on and off, and turn the saving of images with the readings on and off through an interface. When the camera is on, the image will show in the Ready to Test screen. If the camera is off, saving of images will also be off. If the camera is on and the image saving function is also on, the images will automatically be saved with the reading. Saving images will curtail the maximum number of readings stored.

### How to Use the Camera

When a Camera equipped analyzer is in the Ready to Test screen, the video feed appears live on the analyzer's touch screen. This is the image that can be saved with the sample analysis. When you take a measurement, if you choose to do so, the bitmap image will be saved on the analyzer along with the analysis results. The interface is accessible through the System menu.

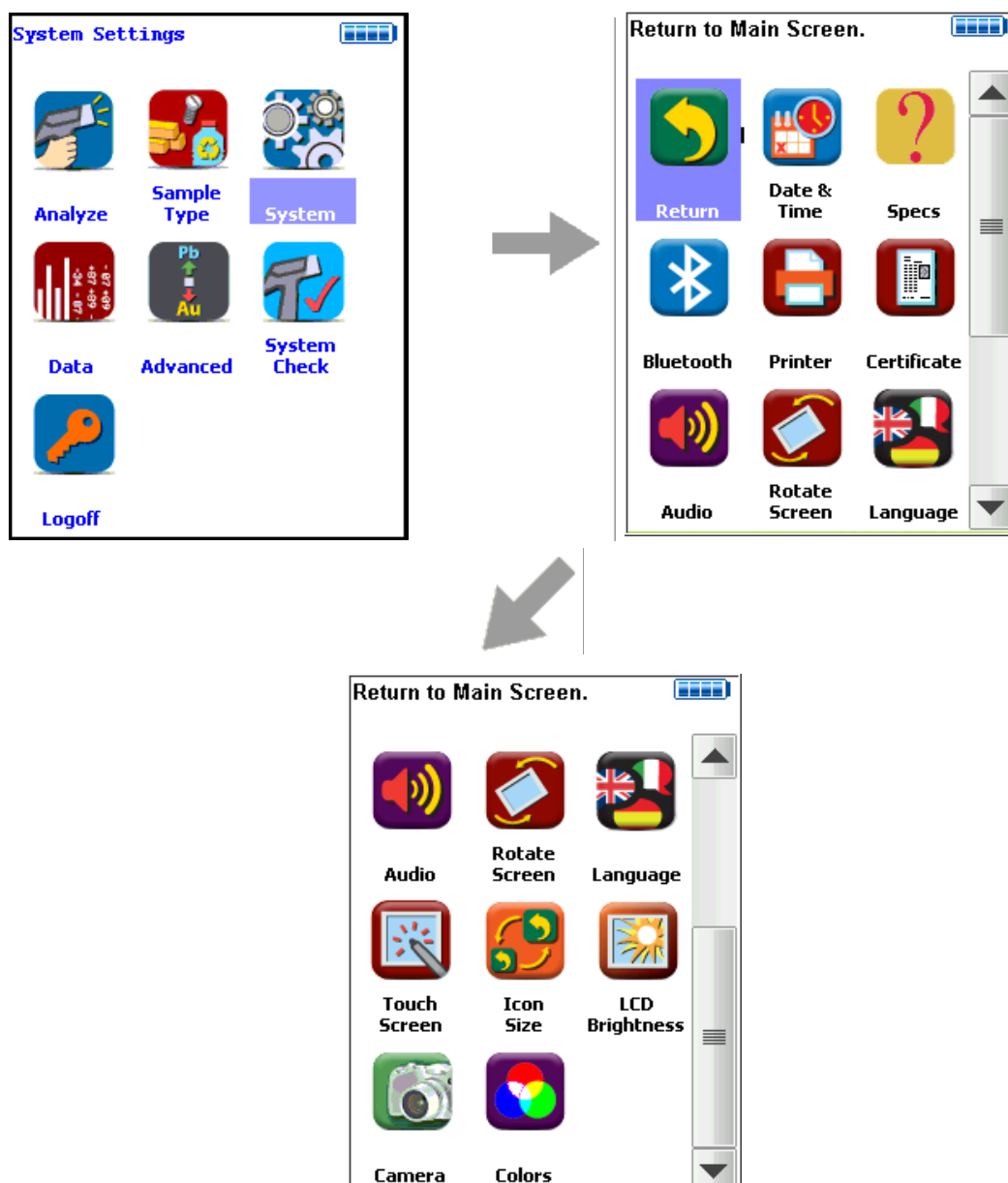
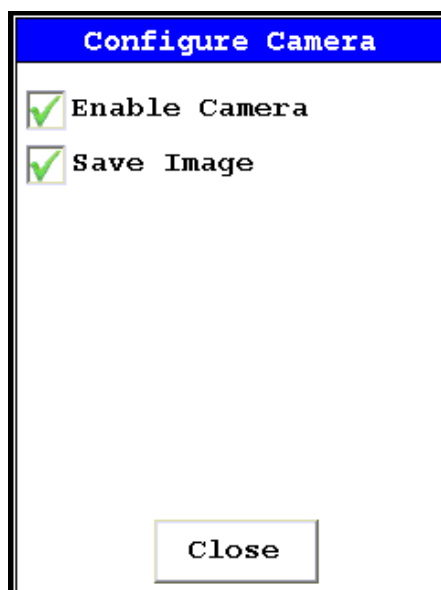


Figure 87. The Camera Menu Path



**Figure 88. Setting Up the Camera View and Image Saving**

Selecting the empty checkbox next to Enable Camera will turn the internal camera on, displaying the camera view in the Ready to Test screen. Selecting the checkbox again turns the camera off. Enable Camera is enabled by default.

Selecting the empty checkbox next to Save Image will enable image saving with the analysis. Selecting the checkbox again will disable automatic saving of image data. Save Image is enabled by default.

Stored camera images from previous measurements can be viewed on the analyzer.



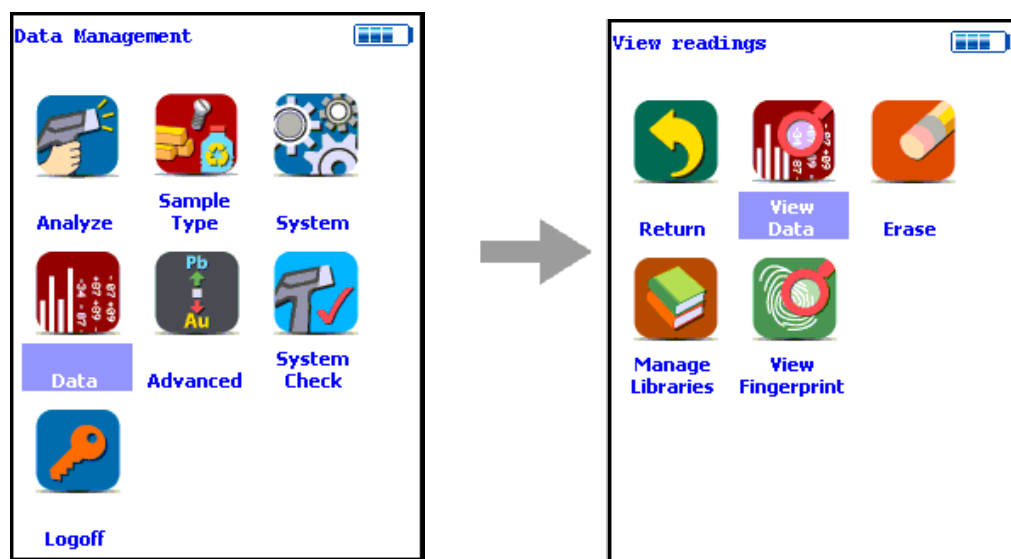


## Data Management

### Contents

- “Viewing Data” on page 115
- “Viewing Fingerprints” on page 122
- “Erasing Data, Readings, or Fingerprints” on page 123
- “Managing Libraries” on page 125

## Viewing Data



**Figure 89. The View Data Menu Path**

Use the Data Screen to view previously taken test result readings. When the View Data icon is selected, the Results screen of your most recent test is shown on the Touch Screen.

# 1575 General Metals

NAV Tools

Time 40.3 sec

AA 6061 0.0 Excellent

Ele	%	±3σ
Al	97.09	0.66
Mg	nd <	1.22
Si	0.48	0.095
Cr	0.20	0.077
Mn	0.13	0.050
Fe	0.42	0.057
Cu	0.33	0.027
Zn	0.072	0.011
Pb	0.006	0.003

**Figure 90. The View Data Screen**

Using the buttons on the control panel, you may view different readings or additional data for individual readings. Your analyzer will display the standard screen analysis. Pressing the Down Button on the 4-way touch pad will display a complete scrolling elemental chemistry listing. Each press of the Down Button scrolls the screen down to the next element. You can also use the scroll bar along the right side to scroll or page through the elements.

## Scrolling Down Through the Complete Listing of Elements

Pressing the Left Button on the 4-way touch pad of your analyzer will display the previous reading, or if the first reading is currently displayed, the last reading. Pressing the Right Button on the 4-way touch pad will display the next reading, or if the last reading is currently displayed, the first reading in memory. Your analyzer can store up to 10,000 readings. You can also look at the complete x-ray spectra for each reading stored in the analyzer's memory.

## Sorting Elements

You can sort element rows by various criteria in order to view your data in the manner you prefer. The Sort Buttons, which double as column headings, can be used to re-sort the data in different ways. The default data screen displays the standard sort, as defined on “Advanced Settings / Element Sorting”. Selecting the appropriate Sort Button once toggles the sort order to High-to-Low. Selecting the Sort Button again toggles the sort order to Low-to-High. To return to the Standard Sort, select the Sort Button a third time.

Ele	%	±3σ
Al	97.09	0.66
Mg	nd <	1.22
Si	0.48	0.095
Cr	0.20	0.077
Mn	0.13	0.050
Fe	0.42	0.057
Cu	0.33	0.027
Zn	0.072	0.011
Pb	0.006	0.003

Ele	%	±3σ
Al	97.09	0.66
Mg	nd <	1.22
Si	0.48	0.095
Fe	0.42	0.057
Cu	0.33	0.027
Cr	0.20	0.077
Mn	0.13	0.050
Zn	0.072	0.011
Pb	0.006	0.003

Ele	%	±3σ
Pb	0.006	0.003
Zn	0.072	0.011
Mn	0.13	0.050
Cr	0.20	0.077
Cu	0.33	0.027
Fe	0.42	0.057
Si	0.48	0.095
Mg	nd <	1.22
Al	97.09	0.66

Figure 91. Standard, High-to-Low, and Low-to-High Composition Sorts

## Element Sorts

Element sorts are performed alphabetically based on the element symbol.

## Composition Sorts

Composition sorts are performed numerically based on the percentage of composition, i.e. from lowest to highest concentration, or by toggling again, from highest to lowest.

## Error Sorts

Error sorts are performed based on the size of the error in the reading, i.e. from largest to smallest error, or by toggling again, from smallest to largest.

# 1714 General Metals			# 1714 General Metals			# 1714 General Metals		
NAV Tools			NAV Tools			NAV Tools		
Time 12.4 sec			Time 12.4 sec			Time 12.4 sec		
Ele	%	$\pm 2\sigma$	Ele	%	$\pm 2\sigma$	Ele	%	$\pm 2\sigma$
W	0.080	0.030	Fe	68.82	0.26	Ti	0.131	0.048
V	0.076	0.035	Cr	16.79	0.15	V	0.076	0.035
Ti	0.131	0.048	Ni	10.12	0.19	Cr	16.79	0.15
Sn	0.014	0.006	Mo	2.42	0.04	Mn	1.06	0.11
Pd	0.010	0.003	Mn	1.06	0.11	Fe	68.82	0.26
Ni	10.12	0.19	Co	0.359	0.138	Co	0.359	0.138
Mo	2.42	0.04	Ti	0.131	0.048	Ni	10.12	0.19
Mn	1.06	0.11	Cu	0.105	0.044	Cu	0.105	0.044
Fe	68.82	0.26	W	0.080	0.030	Mo	2.42	0.04

Figure 92. Element, Composition, and Error Sorts

## Spectrum Graph

For any reading result, simply use the NAV Menu to gain access to the reading's spectrum graph. Selecting Spectra will show a graphed spectrum of this reading, called SpectraView. SpectraView can be a useful tool for rapid, qualitative analysis of a sample. See [Viewing the Spectrum](#) for details.

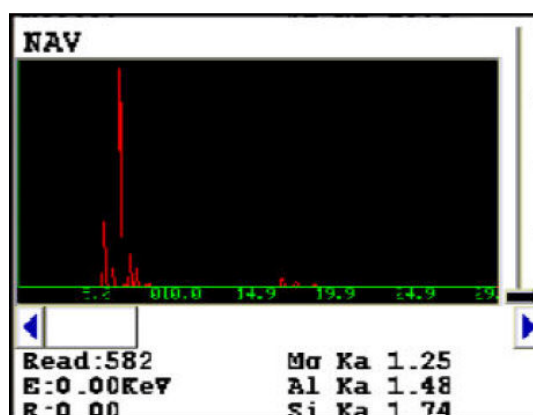


Figure 93. The SpectraView Screen

## Viewing the Spectrum

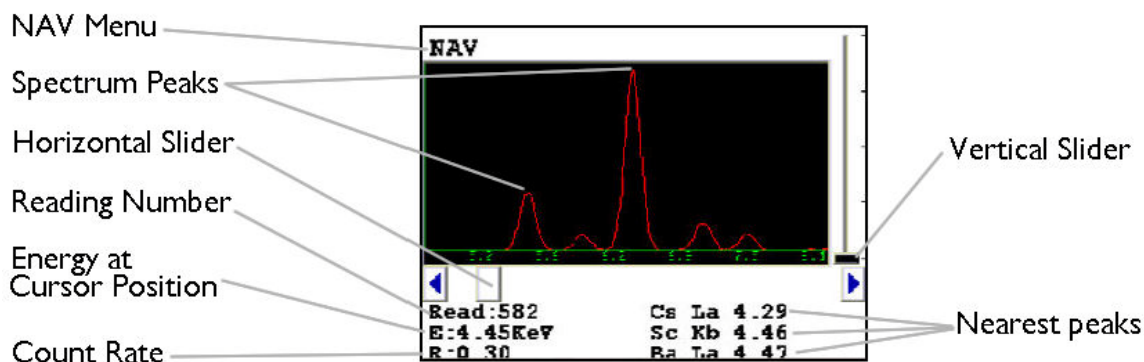
### SpectraView

SpectraView enables you to visually inspect the fluorescent x-ray peaks obtained from any sample and qualitatively identify them using the on-board software. In SpectraView Mode, the spectrum is displayed using a linear energy scale along the x-axis, with the count rate autoscaled logarithmically on the y-axis so that the highest peak on the screen reaches the top of the scale.

### How to Use SpectraView

You can access the SpectraView screen after taking a measurement in any mode, or while viewing a previous measurement, by selecting Spectra from the NAV Menu. Once you are in SpectraView, you can use the up and down positions of the 4-way touch pad to scroll through the spectrum, or you can tap on the spectrum display with the stylus to place the cursor at the point you tapped. The vertical cursor line indicates the current position along the spectrum.

### Viewing the Information in SpectraView Mode



**Figure 94. The SpectraView Screen**

By default, the following information is shown along with the spectrum:

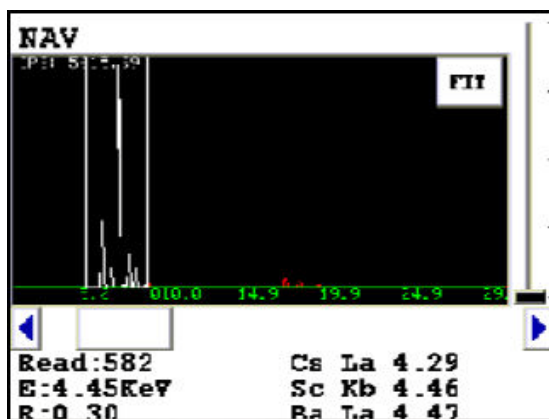
- The Reading number (Bottom Left) in the form “Read:x”, where x is the Reading number.
- The position of the cursor on the energy scale (Bottom Left, under the Reading number), in the form “E: x.xx KeV”, where KeV is kilo electron volts.
- The count rate (Bottom Left, under the energy position), in the form “R:x.xx”.

- Ka, Kb, La, Lb, and/or Lg peaks of the three elements closest to where your cursor is positioned on the energy scale (Bottom Right). This information is written with the element symbol first, followed by either Ka (K shell alpha peak), Kb (K shell beta peak), La (L shell alpha peak), Lb (L shell beta peak), or Lg (L shell gamma peak). An example would be "Al Ka 1.48." To determine if a given element is present, look at the count rate at that cursor position.

**Note** SpectraView cannot be used to determine exact element percentages in a sample.

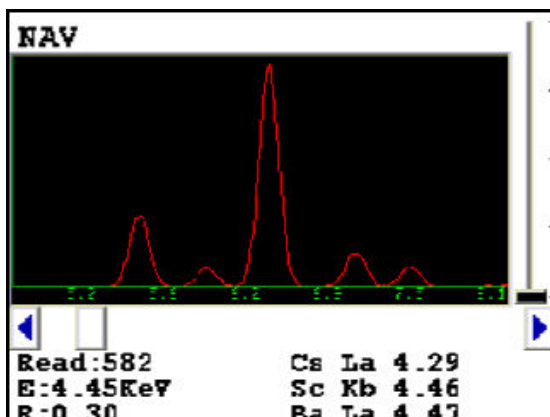
## Fitting the Spectrum

By using the touch screen, you can select parts of the displayed spectrum and zoom in. Touch and hold the stylus to the screen immediately before the area of the spectrum you wish to enhance, then - still holding the stylus to the screen - sweep it across the area of the spectrum you wish to see closer, lifting the stylus from the screen when you pass the end of the area of interest. The screen will display vertical lines to either side of the area of interest, delineating the boundaries of the area.



**Figure 95. Delineating the Area of Interest**

Select the FIT button in the upper right hand corner of the Spectrum to fit the area of interest to the display area.



**Figure 96. Area of Interest Fit to the Display**

The view of the spectrum will change to show only the area of interest.

## Multiple Ranges

SpectraView can display any individual spectra, including those obtained from multiple Ranges (filters) if you are using more than one Range. Use the NAV Menu to select which spectrum to view.

The Spectra1 choice will display the spectrum produced by the first Range.

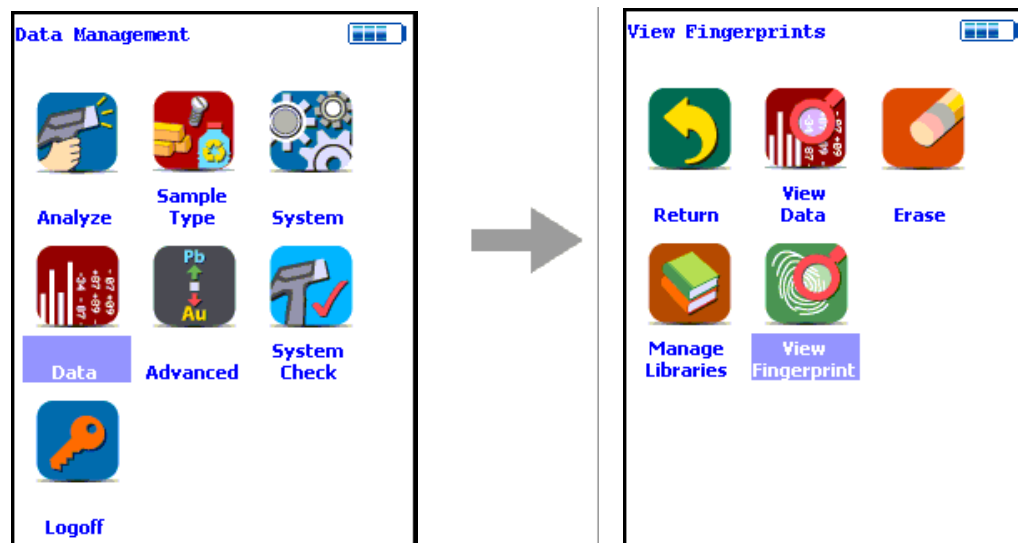
The Spectra2 choice will display the spectrum produced by the second Range.

## SpectraView Navigation

Use the left button on the 4-way touch pad to expand the spectrum, centered on the position of the cursor.

Use the right button on the 4-way touch pad to contract the spectrum, centered on the position of the cursor.

## Viewing Fingerprints



**Figure 97. The View Fingerprints Menu Path**

Select the View Fingerprints icon to view data saved as reference sample Fingerprints in Teach Fingerprint Mode. When the View Fingerprints icon is selected, the Results Screen of your most recent Teach Fingerprint is shown on the Touch Screen display.

# 2 Teach Fingerprint	
NAV Tools	
Time	30.9 sec
Brass 1228-AR P	
Ele	cps/uA
Sb	0.31
Sn	0.35
Pd	0.06
Ag	0.12
Al	0.25
Mo	1.52
Nb	0.72
Zr	0.21
Bi	0.05

**Figure 98. The View Fingerprints Screen**



## Erasing Data, Readings, or Fingerprints

The Erase screens are shown below.

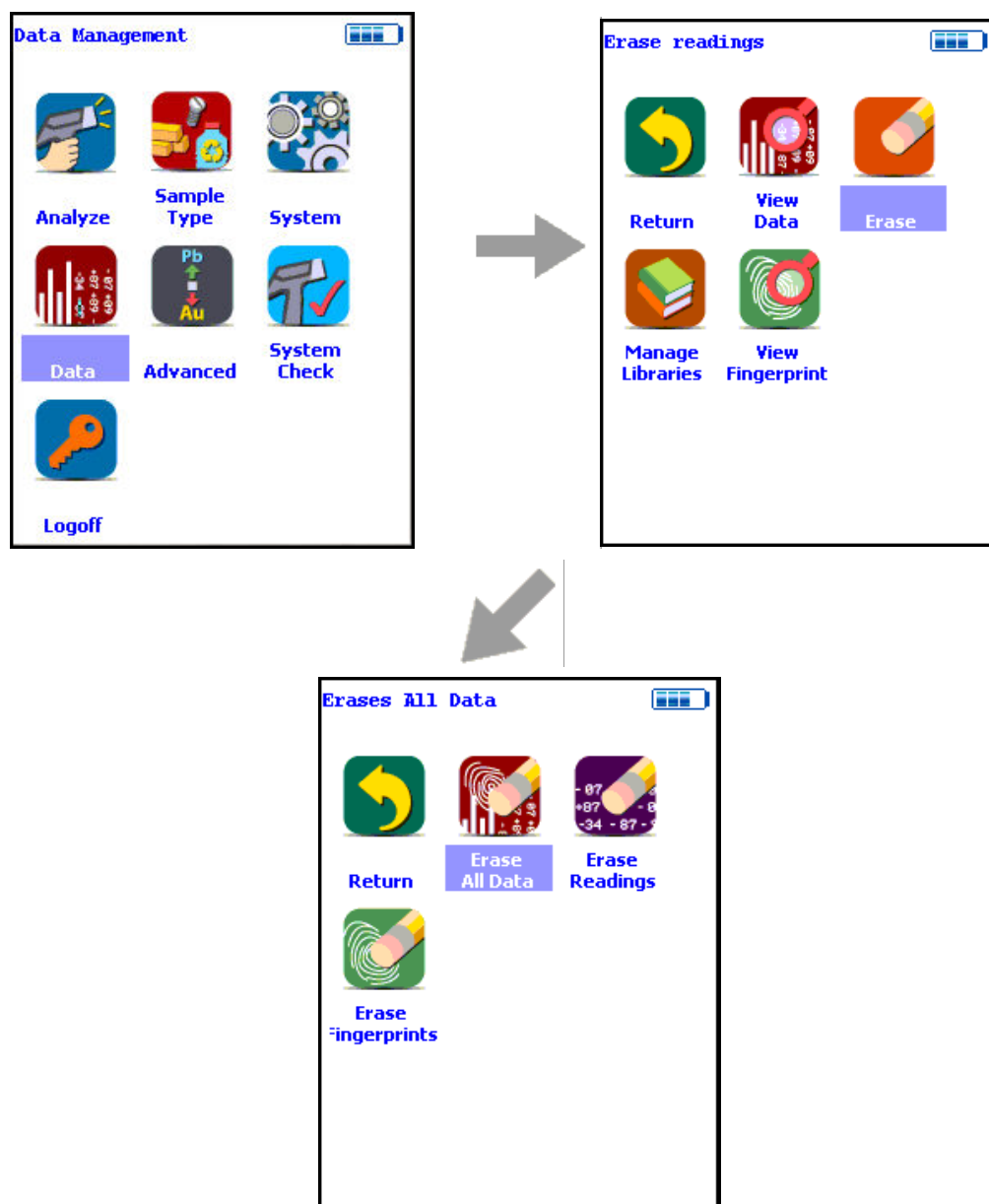


Figure 99. The Erase All Data Menu Path

## **Erase All Data**

Select the Erase All Data icon to **erase all data, including signatures and readings**, from your analyzer. Selecting the Erase All Data icon will bring up a confirmation screen asking you “Are you sure?” with options to select “YES” or “NO”. Selecting the Yes Button will erase all data from your analyzer. Selecting the No Button will return you to the Erase Menu.

## **Erase Readings**

Select the Erase Readings icon to **erase all accumulated test readings** from your analyzer. Selecting the Erase Readings icon will bring up a confirmation screen asking you “Are you sure?” with options to select “YES” or “NO”. Selecting the Yes Button will erase all test reading data from your analyzer. Selecting the No Button will return you to the Erase Menu.

## **Erase Fingerprints**

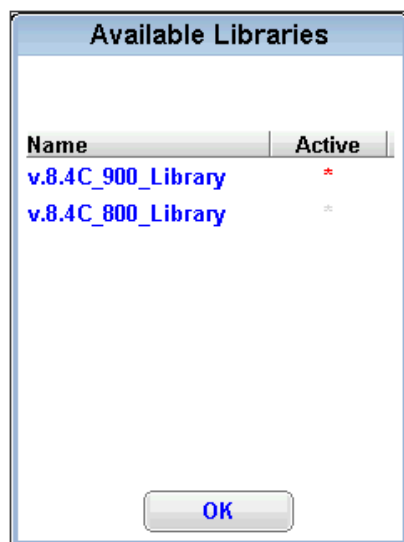
Select the Erase Fingerprints icon to **erase all accumulated alloy fingerprints** from your analyzer. Selecting the Erase Fingerprints icon will bring up a confirmation screen asking you “Are you sure?” with options to select “YES” or “NO”. Selecting the Yes Button will erase all fingerprint data from your analyzer. Selecting the No Button will return you to the Erase Menu.

## Managing Libraries



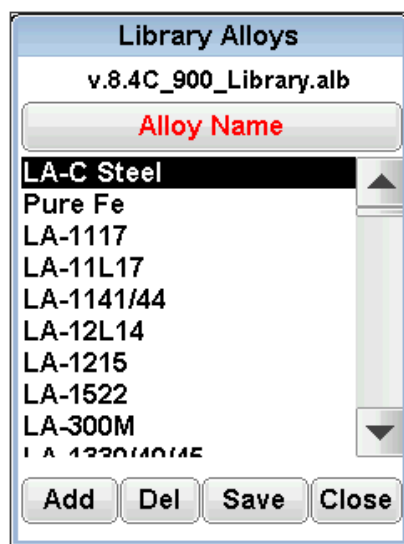
**Figure 100. The Manage Libraries Menu Path**

Select the Manage Libraries icon to access the Library Management Menu. The Library Management Menu allows you to view and modify data in the Primary Library as well as the currently loaded alternate libraries. Just select the library you wish to view or edit from the list on screen.



**Figure 101. Viewing the Libraries**

The entries in the Grade Library serve as a reference for chemistry based analysis. The library entries allow the analyzer to work properly “out of the box” without needing time-consuming pre-analysis.



**Figure 102. The Library Editor**

## Using the Library Editor

The Library Editor enables you to edit any library to conform to your specifications.

### Alloy Name Button

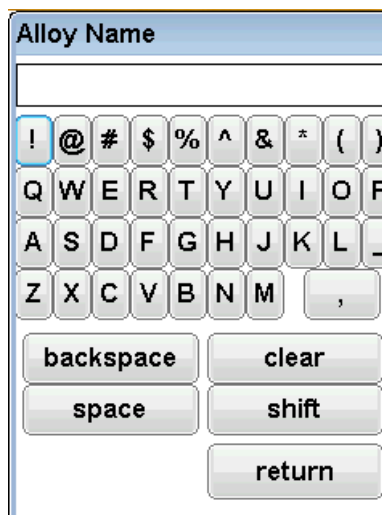
Selecting the Alloy Name Button sorts the alloy list alphanumerically.

### (Name in List)

Selecting the actual name of the alloy - i.e. "Fe/CS" - will bring up the Element Specification Screen.

### Add Button

Selecting the Add Button will add a new alloy to the Library. First the Alloy Name Editor will appear, enabling you to enter the name of the new alloy.

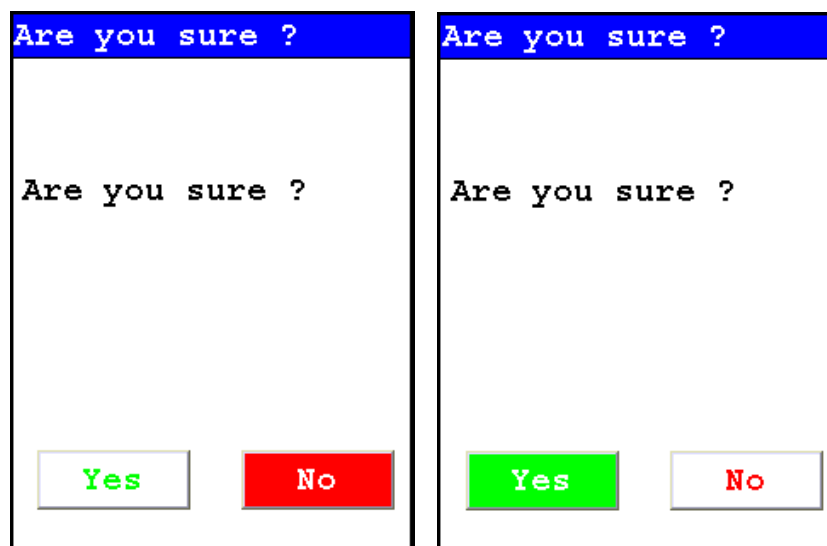


**Figure 103. The Alloy Name Editor**

The Alloy Name Editor is a standard Virtual Keyboard. Use it as you would any Virtual Keyboard. Hitting the return key enters the name into the alloy list. Select the name of the new alloy to bring up the Element Specification Screen and enter the specification of the alloy.

### Del Button

Selecting the Del Button will delete the currently selected alloy. First a confirmation screen appears.

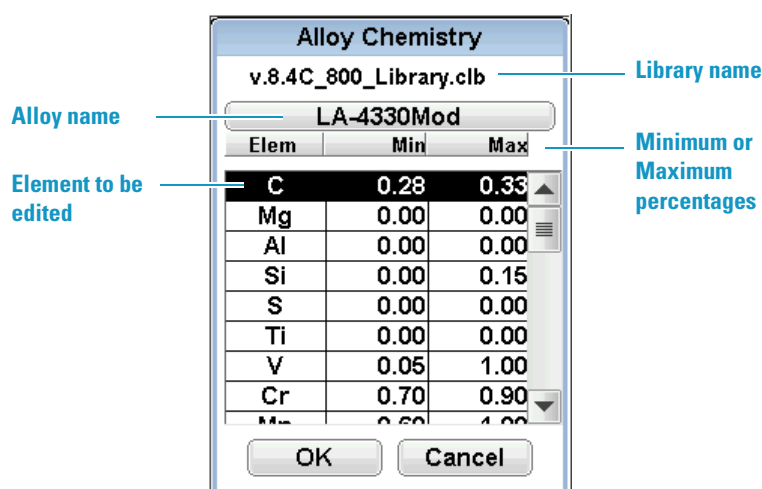


**Figure 104. Confirmation Screen**

Selecting the Yes Button will delete the alloy from the list. Selecting the No Button will return you to the Alloy List.

## The Element Specification Screen

The Element Specification Screen allows you to edit the elemental content of any alloy.



**Figure 105. The Element Specification Screen**

### **Library Name**

This is the name of the library you are editing. Make sure you are editing the correct library before proceeding further.

### **Alloy Name**

This is the name of the alloy you are editing. Make sure you are editing the correct alloy before proceeding further.

### **Element to be Edited**

This is the element you need to edit for this alloy.

### **Minimum Percentage**

This is the lowest amount of the element in question you want to be in the alloy. If the element in the analyzed sample is any lower, the sample will not be recognized as this alloy. Selecting the element minimum will open the Minimum Editor.

### **Maximum Percentage**

This is the highest amount of the element in question you want to be in the alloy. If the element in the analyzed sample is any higher, the sample will not be recognized as this alloy. Selecting the element maximum will open the Maximum Editor.





## Connectivity

### Contents

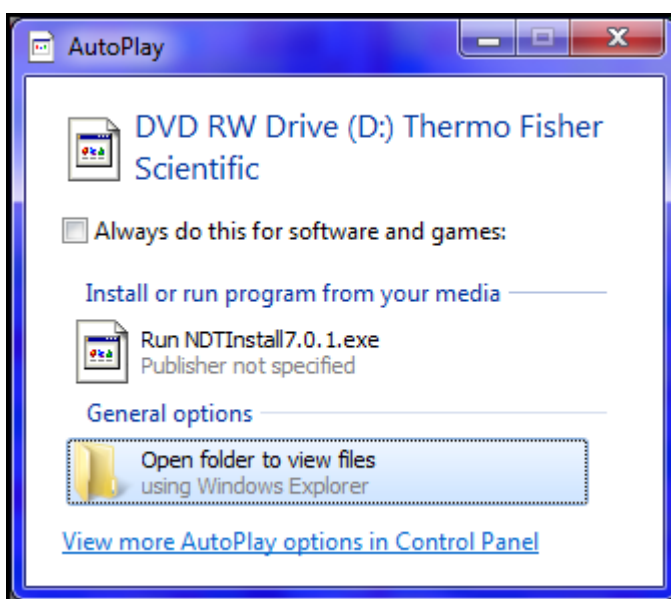
- “Installing the Windows 7 USB Driver” on page 131
- “Using a USB Cable to Connect Your Analyzer” on page 136
- “Downloading Data” on page 136

This section discusses how to connect your computer and your analyzer, for data transfer and integration, translation to other formats, data storage and security, as well as controlling your analyzer remotely through your computer. Connection can be achieved via USB.

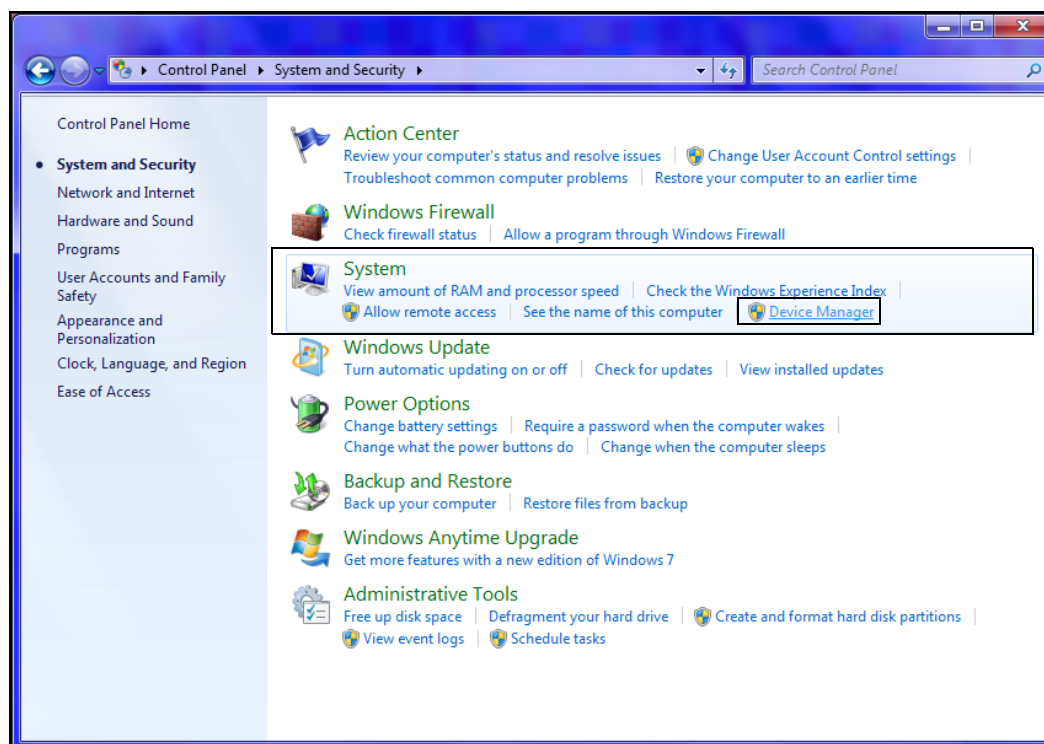
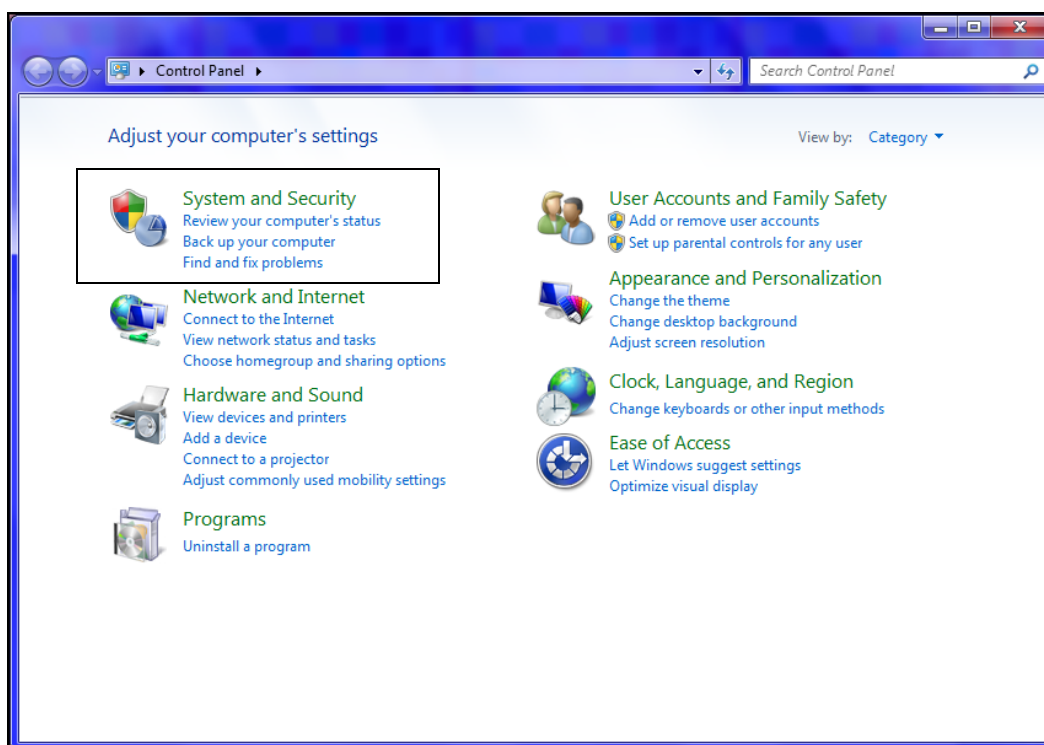
## Installing the Windows 7 USB Driver

NOTE: Other versions of the Windows Operating System do not require the USB driver.

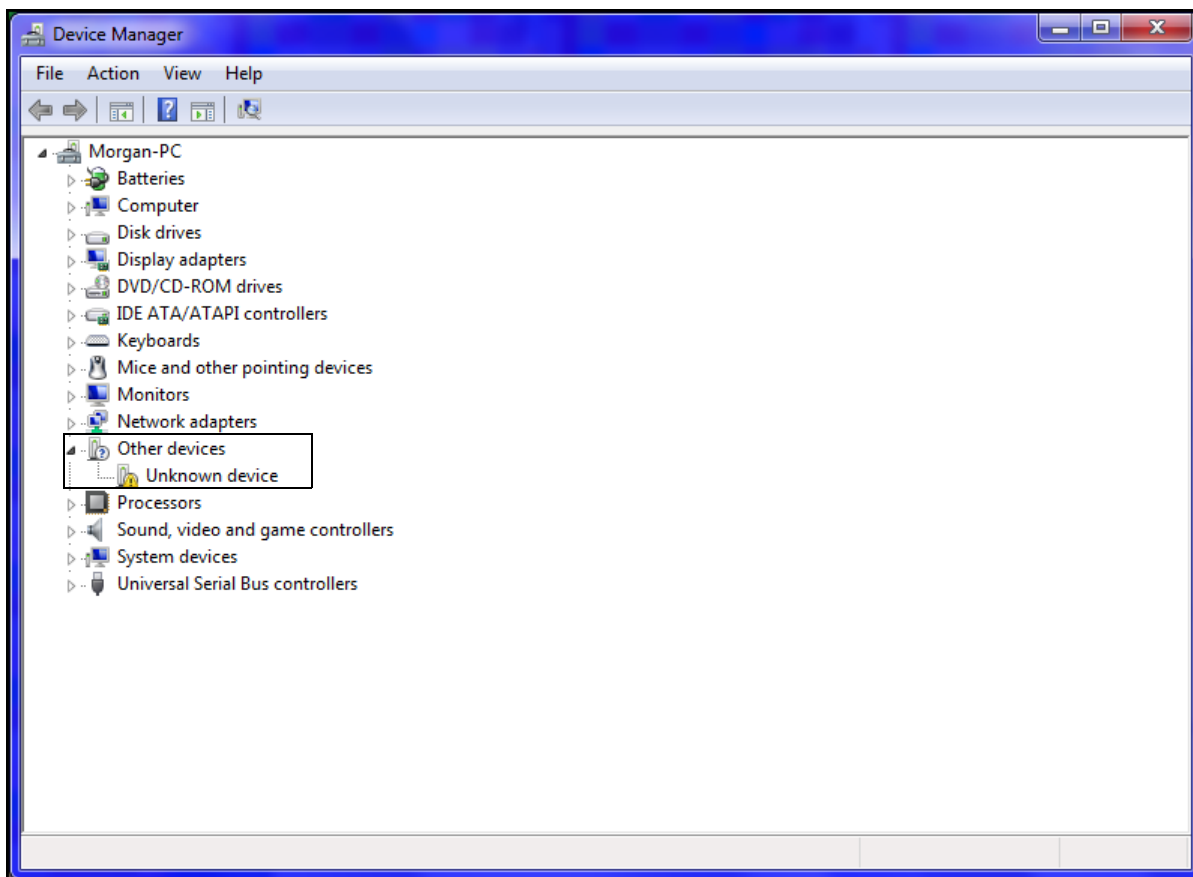
1. Insert the NDT CD and close out any dialogue box that pops up. The driver is located on this disk.



2. Click on “Control Panel” and locate the “Device Manager”. If it is not available directly under “Control Panel”, look under “System and Security” then “System”.

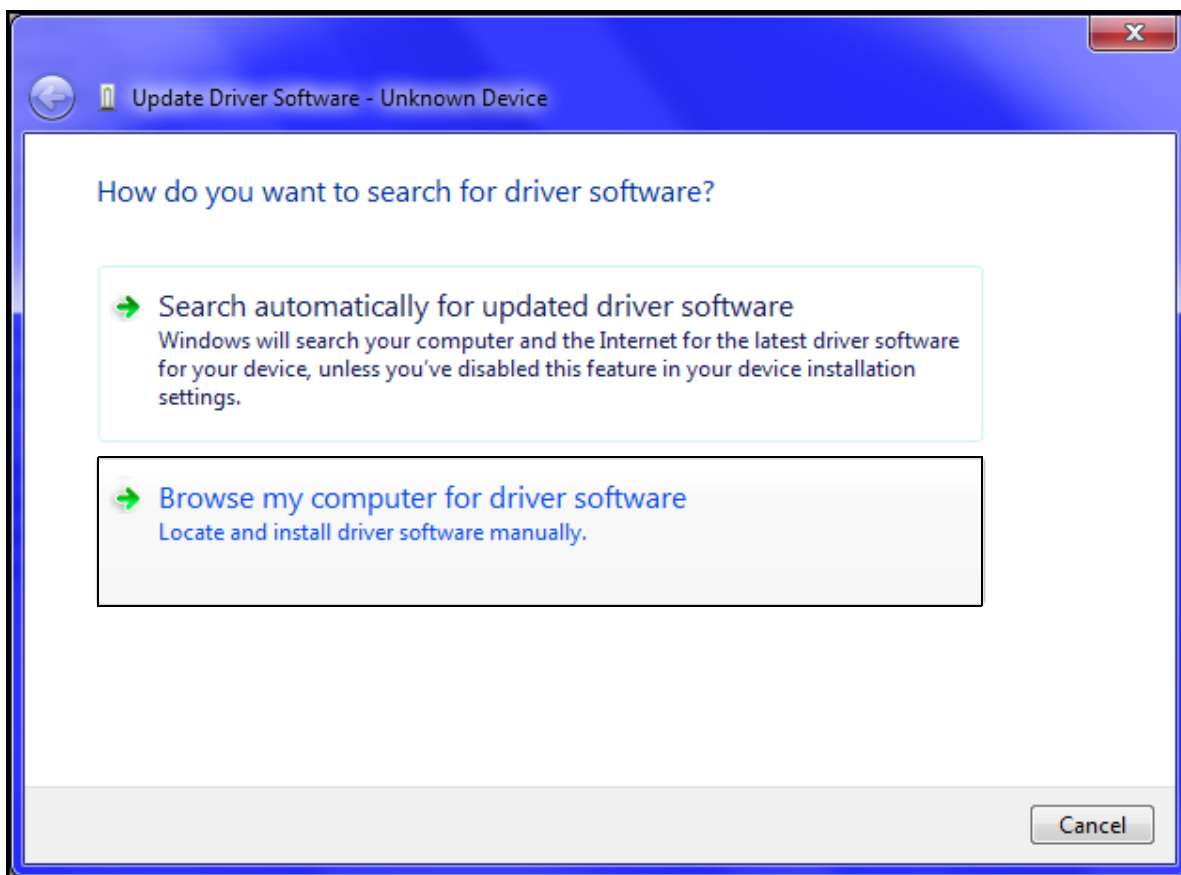


3. Open “Device Manager”
4. Plug in instrument using the USB cable provided
5. Message will appear “Device Driver Software Not Successfully Installed”
6. In “Device Manager”, “Unknown Device” will appear under “Other Devices”

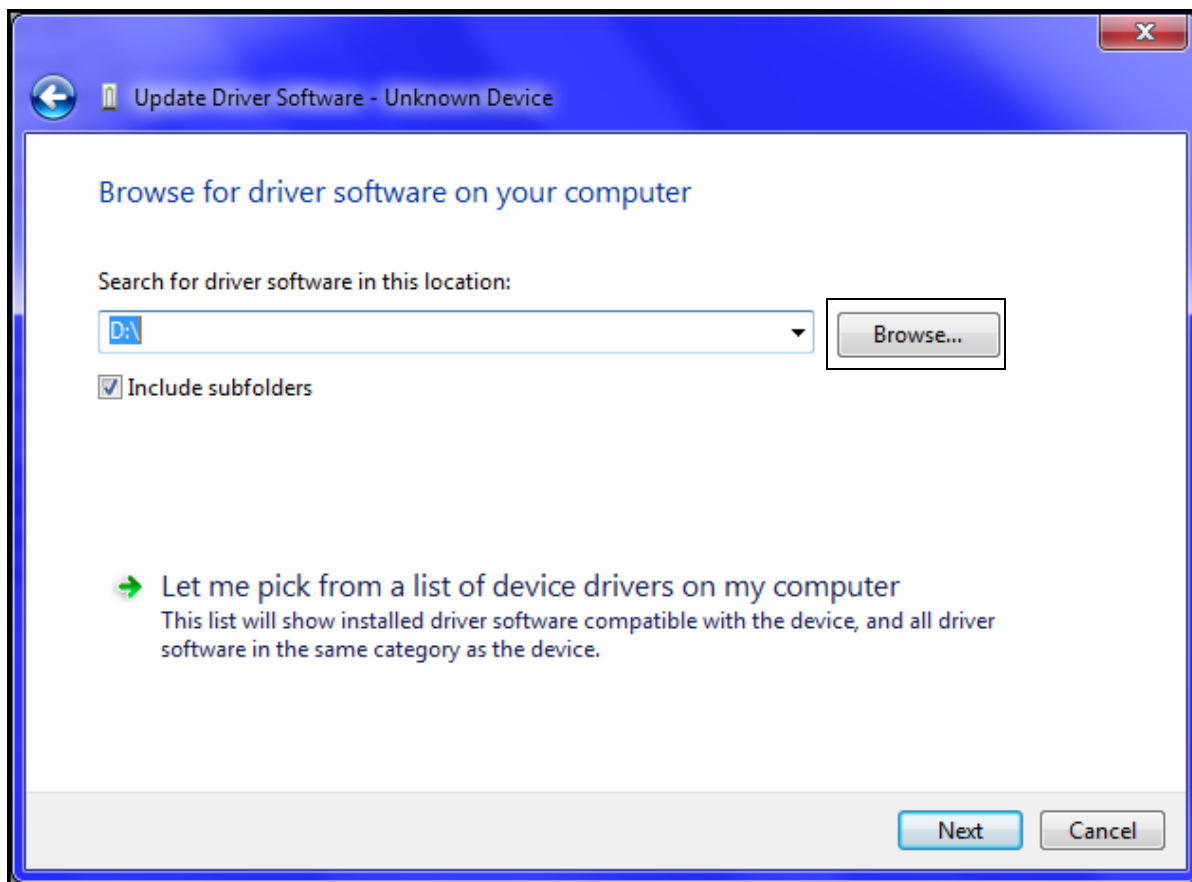


7. Right click on “Unknown Devices”; select “Update Driver Software”

8. Click on “Browse My Computer for Driver Software”

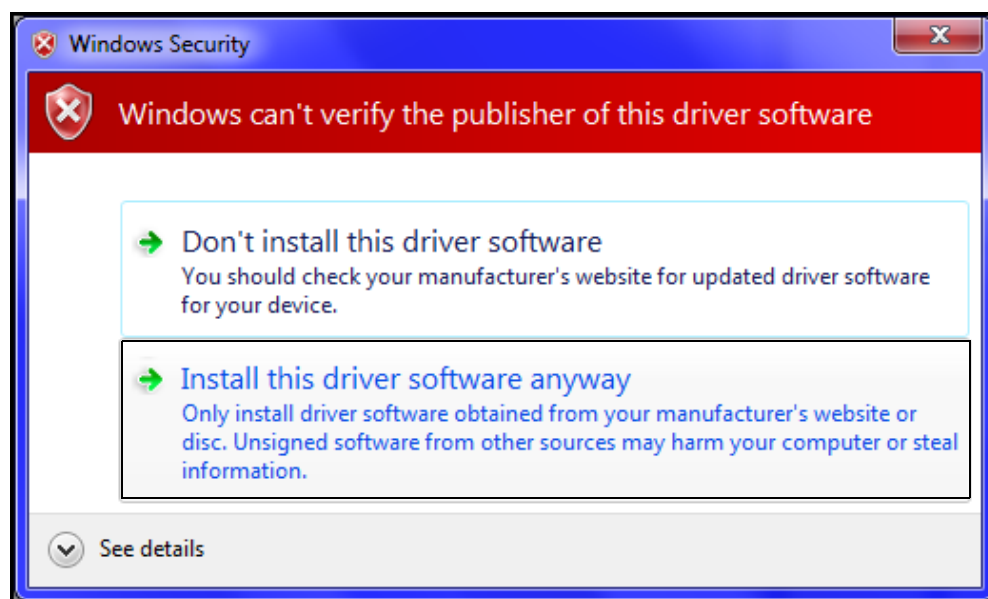


9. Click “Browse” button; select CD drive or the location of the driver if you are not installing from the NDT CD (recommended).



10. Click “OK”
11. Click “Next”

12. A Security Dialog Box will appear. Select “Install This Driver Software Anyway?”



13. Driver will install; close out.

## Using a USB Cable to Connect Your Analyzer

### To connect the XL2 Plus Analyzer to your PC using the USB cable:

1. Insert the Standard USB connector on the USB cable into a USB port on your computer.
2. Open the Port Cover on the XRF Analyzer.
3. Turn on the analyzer and insert the mini USB connector on the USB cable into the USB port in the handle of the XRF Analyzer.

## Downloading Data

### Standard Download

To download data you have collected off line:

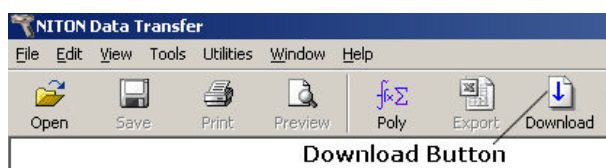
1. Make sure that the XRF Analyzer is connected to your computer.
2. Turn on the XRF Analyzer.

**Note** Wait at least 30 seconds after turning on the XRF Analyzer to begin downloading files. The System Start screens do not allow downloading.

3. Start Niton Data Transfer.

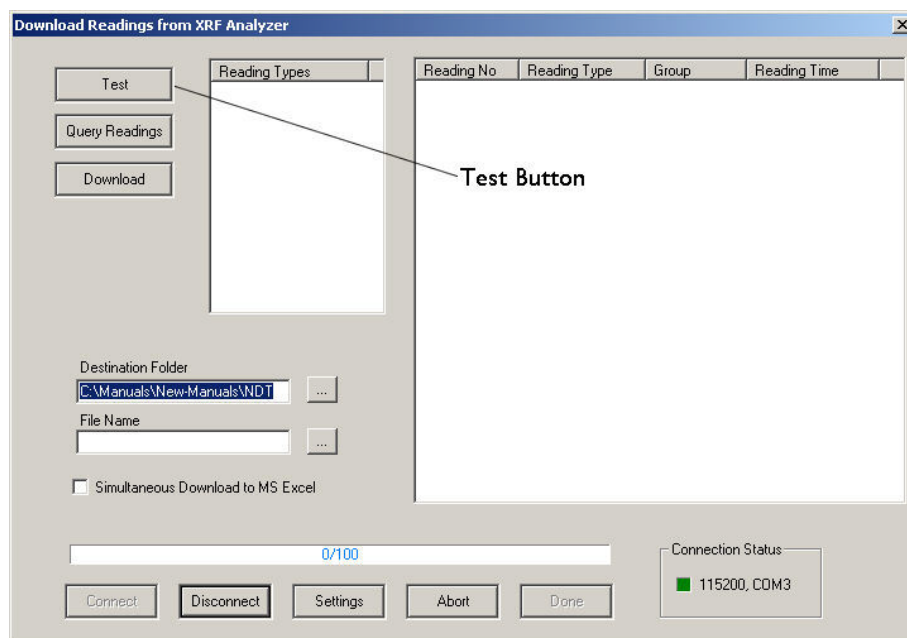
**NOTE:** Niton Data Transfer and NDTTr cannot both be open at the same time.

4. Click the Download button. The Download dialog box will open.



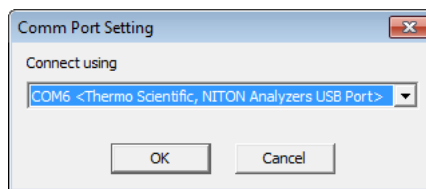
**Figure 106. The Download Button**

5. In the Download dialog box, Select the Test button to test the serial connection to the Analyzer.



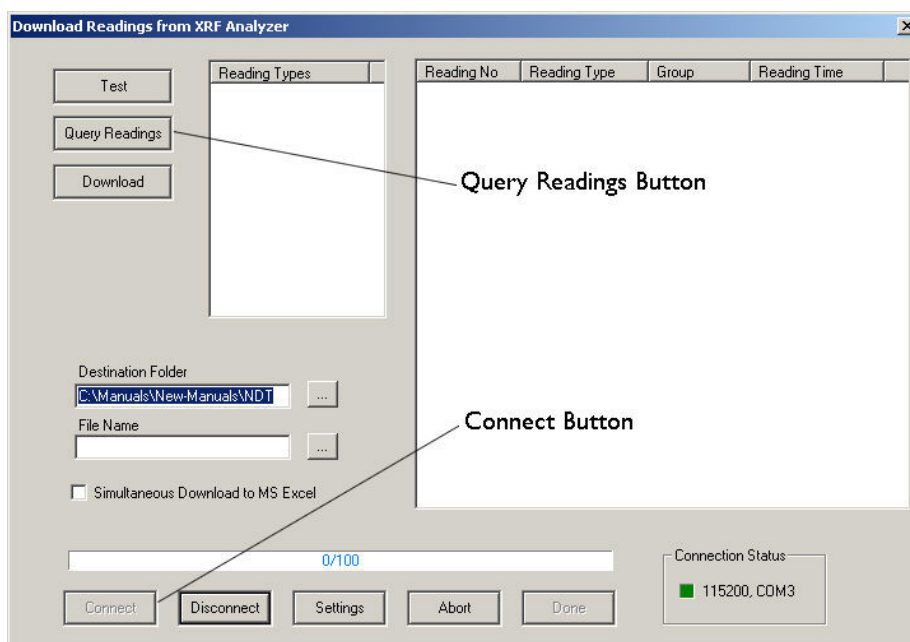
**Figure 107. The Test Button**

6. You should get a pop-up window informing you that the connection tested successfully. If the test fails, there is a problem with your serial port setup. Click Settings and select another communication port.



**Figure 108. Communication Port Window**

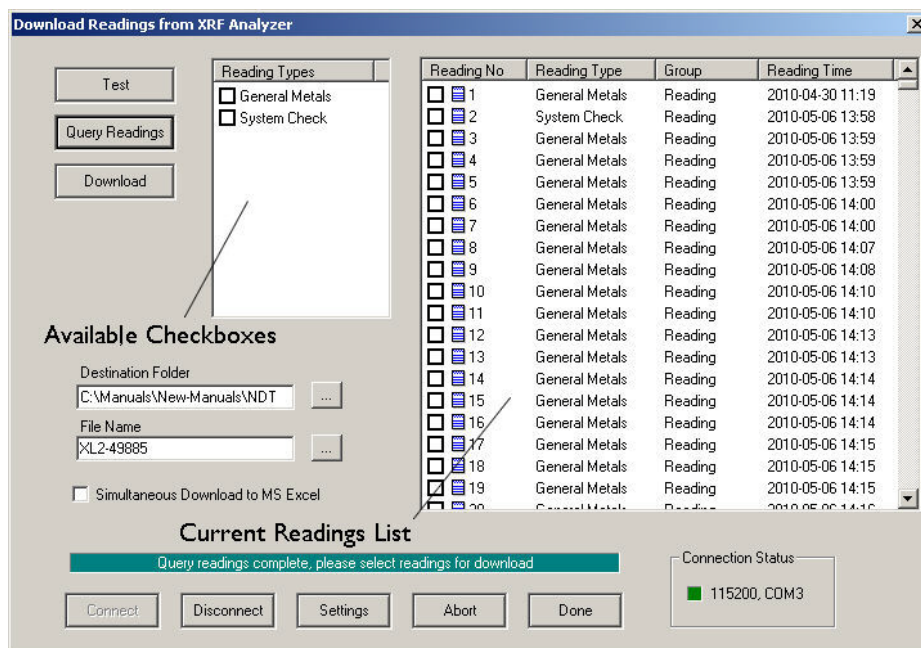
7. In the Download dialog box, click the Connect button.



**Figure 109. The Connect Button**

8. Click the Query Readings button. This will return a list of all current readings on your analyzer. The list appears in the large white box in the Download dialog box.





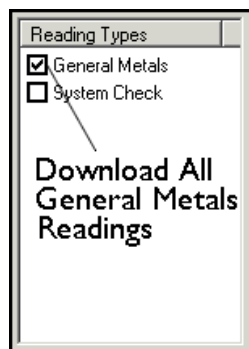
**Figure 110. Current Reading List**

9. Select the readings that you want to download. There are two ways to do this.
  - a. Click the boxes next to each of the reading numbers to select or de-select individual readings. You can select a range of readings by pressing the shift key, then selecting the first and last reading in the range. All readings from the first reading selected to the last will then be selected.



**Figure 111. Selecting Readings**

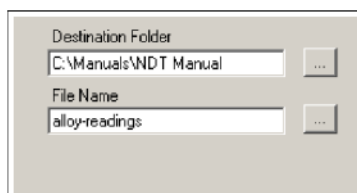
- b. Click the boxes on the left to select or de-select all the readings of a specific type. You can also use the Shift-Click method of selecting a range of readings as described above.



**Figure 112. Using Check Boxes**

10. The download generates a data file containing the selected readings. To save the file for later use:

- c. Enter the path for the file in the Destination Folder field. You can use the ... button to browse.

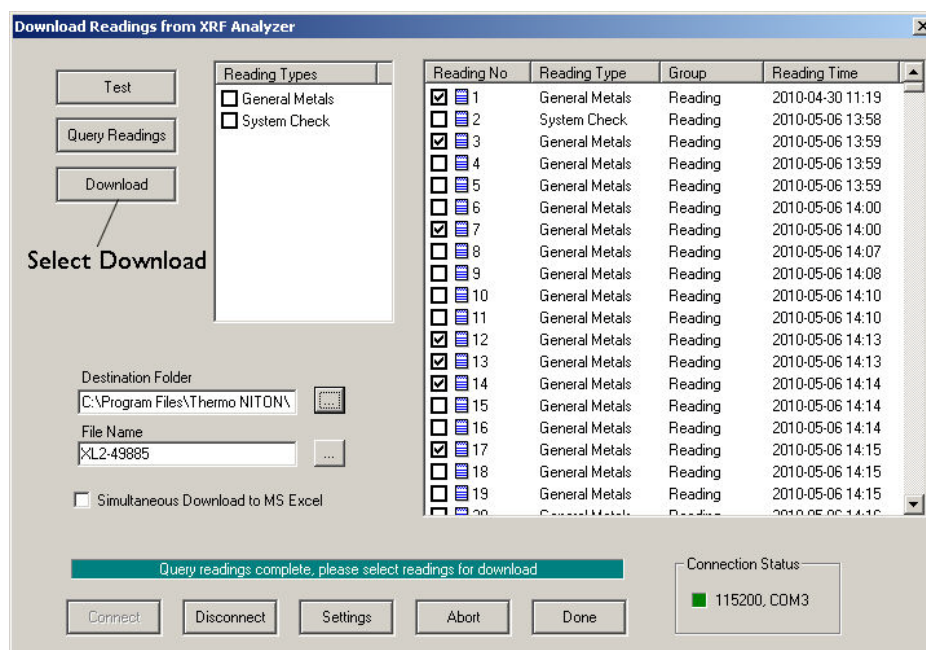


**Figure 113. The Browse Button**

- d. Enter a name for the file in the File Name field.

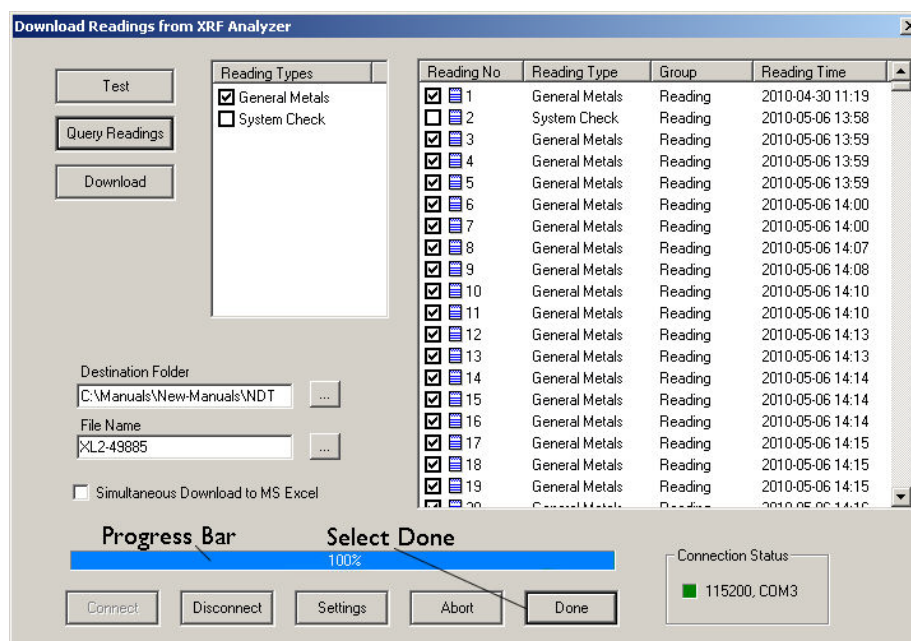
**CAUTION** Some characters are not allowed in the file name. Characters such as the “#” sign will cause an error. Niton recommends using only alphanumeric characters “-”, “\_” and the space character when naming a file.

- e. Click the Download button.



**Figure 114. The Download Button**

When the progress bar shows that all the readings are downloaded, click the Done button.



**Figure 115. The Progress Bar**

You should now see the readings you selected for download displayed, one reading per horizontal line. The data has been saved to the folder and filename you indicated prior to downloading. If an error message has appeared, see the following section.

You can also automatically save reports in .csv format for importing into Excel or other programs. [Simultaneous Save as CSV File](#)

**Table 8: Error Messages while Downloading**

Error Message	Action
Couldn't open \\.\COM7 Error Code: 2	Select another COM port.
The port \\.\COM2 is in use	Select another COM port.
Please Open the Port	Click the Connect button.
Hardware Not Responding or Hardware Not Ready	Turn on the XRF Analyzer. If you are using a serial cable, check that the cable is inserted snugly. If you are using a serial cable, select the other COM port. If you are using the wireless USB adapter, connect the serial port. See the “Installing and Using Bluetooth” manual for complete instructions on setting up the Bluetooth adapter to work with your analyzer. Check that the spare battery is fully charged.
The Serial Port connection failed: RFCOMM connection failed	Check that the battery is fully charged.
WARNING: 38400 baud rate not supported.	This indicates a potential problem. Test the serial port. If there is a problem connecting, switch baud rate on both the analyzer and the NDT software to 115200.
Incorrect Data in reading # XXX. Reading will be skipped. Error code: BOUNDARY_ERROR1.	This indicates a version mismatch between your instrument code and the NDT code running on your computer. Use a version of NDT that matches the version number of the software on your analyzer.
Incorrect Data in reading # XXX. Reading will be skipped. Error code: BOUNDARY_ERROR2.	This indicates a version mismatch between your instrument code and the NDT code running on your computer. Use a version of NDT that matches the version number of the software on your analyzer.
Incorrect Data in reading # XXX. Reading will be skipped. Error code: BOUNDARY_ERROR3.	This indicates a version mismatch between your instrument code and the NDT code running on your computer. Use a version of NDT that matches the version number of the software on your analyzer.

**Table 8: Error Messages while Downloading**

WARNING: 115200 baud rate not supported.	This indicates a potential problem. Test the serial port. If there is a problem connecting, switch baud rate on both the analyzer and the NDT software to 38400.
SH4 Successfully Communicating Result: SUCCESS	This indicates a normal connection.

**Note** When using the wireless USB adapter, if the serial port repeatedly disconnects, check that the battery is fully charged.

## Live Download (Automatic Save)

If desired, your Niton XL2 Plus analyzer has the capability to download and store each reading to the PC in real time to a file of your choice. To enable this feature, you must do the following:

- Your Niton analyzer must be turned on and connected to the PC. See [Using a USB Cable to Connect Your Analyzer](#).
- The NDTTr program module must be running and connected to your analyzer. See [Operating Your Analyzer Remotely](#).
- The Download icon in the NDTTr toolbar must be selected.



Download Icon

**Figure 116. Live Download Icon**

The file created is in a format readable by the NDT program module, has an extension of .ndt, and looks identical to a file of manually downloaded readings - see [Standard Download](#). It can also create a simultaneous .CSV file. [Simultaneous Save as CSV File](#).

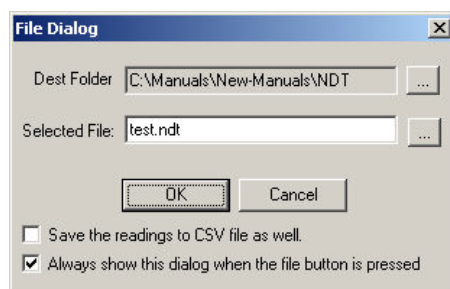
### Please note the following:

1. When the instrument is unplugged, selecting the Download icon does nothing.
2. When you disconnect, then reconnect, your analyzer, Download appends future readings to same file.

3. Live Download does not overwrite any previous readings in the file. If you want to do this, you must first explicitly erase the file before initiating Live Download.
4. Live Download does not retroactively add any readings taken while your analyzer was disconnected.

## Changing the Filename for Live Download

Once you have selected the Download icon, a dialog box appears as shown below:



**Figure 117. File Dialog Box**

You can change the destination file or folder by clicking in the appropriate text box and typing in the new file name, or by clicking on the browse button (...) to the right of the text box and selecting a different pre-existing filename. To implement these changes, click the OK button.

Your instrument serial number is associated with the file. If a different instrument is connected and Live Download is started, a message will appear saying that the connected instrument and file instrument do not match, and Live Download will not start. Saving the session as a new file will alleviate this issue.

## Simultaneous Save as CSV File

By clicking on the checkbox labeled “Save the readings to CSV file as well” you can enable simultaneously saving the data as a standard CSV (Comma Separated Value) file for use with other programs.







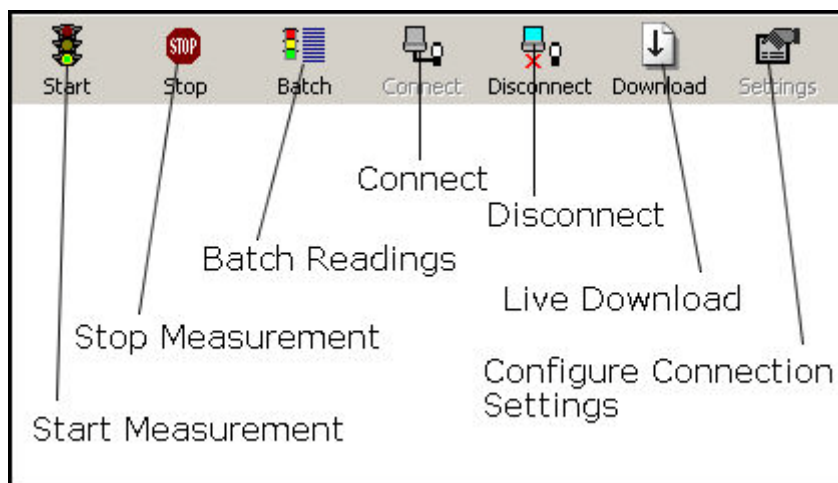
## Controlling Your Analyzer From Your PC

The NDTTr program allows you to completely control your Niton analyzer remotely, from your computer. It works over serial or USB connection over the supplied connector, or Bluetooth wireless communication. See [Using a USB Cable to Connect Your Analyzer](#) for details on how to connect your Analyzer and PC.

### The NDTTr Toolbar

The NDTTr Toolbar is a string of icons along the top of the NDTTr window. It looks like this:

NOTE: NDTTr and Niton Data Transfer cannot both be open at the same time.



**Figure 118. The NDTTr Toolbar**

#### Start Measurement

Clicking this icon will initiate a measurement in whatever mode the analyzer is in currently.

#### Stop Measurement

Clicking this icon will halt any ongoing measurement on the analyzer.

### Configure Connection Settings

Clicking this icon will allow you to change your configuration settings.

### Connect

Clicking this icon will attempt to establish a connection between your computer and your analyzer.

### Disconnect

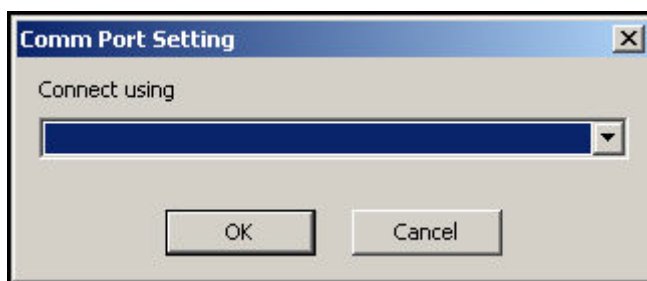
Clicking this icon will disconnect your computer from your analyzer.

### Live Download

See [Live Download from NDT<sub>r</sub>](#)

### Configure Connection Settings

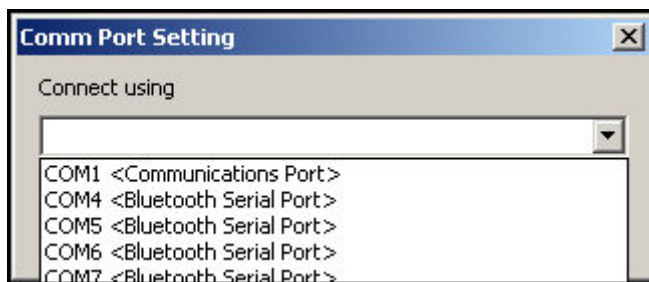
Clicking on the Configure Connection Settings icon allows you to change the Com Port for connecting your computer to your analyzer. Once you click on the icon, a settings dialog box will appear.



**Figure 119. Connection Settings Dialog Box**

### Selecting the Com Port

Selecting the down arrow in the “Connect Using” field will display the various Com Ports on the computer that the analyzer can connect through.

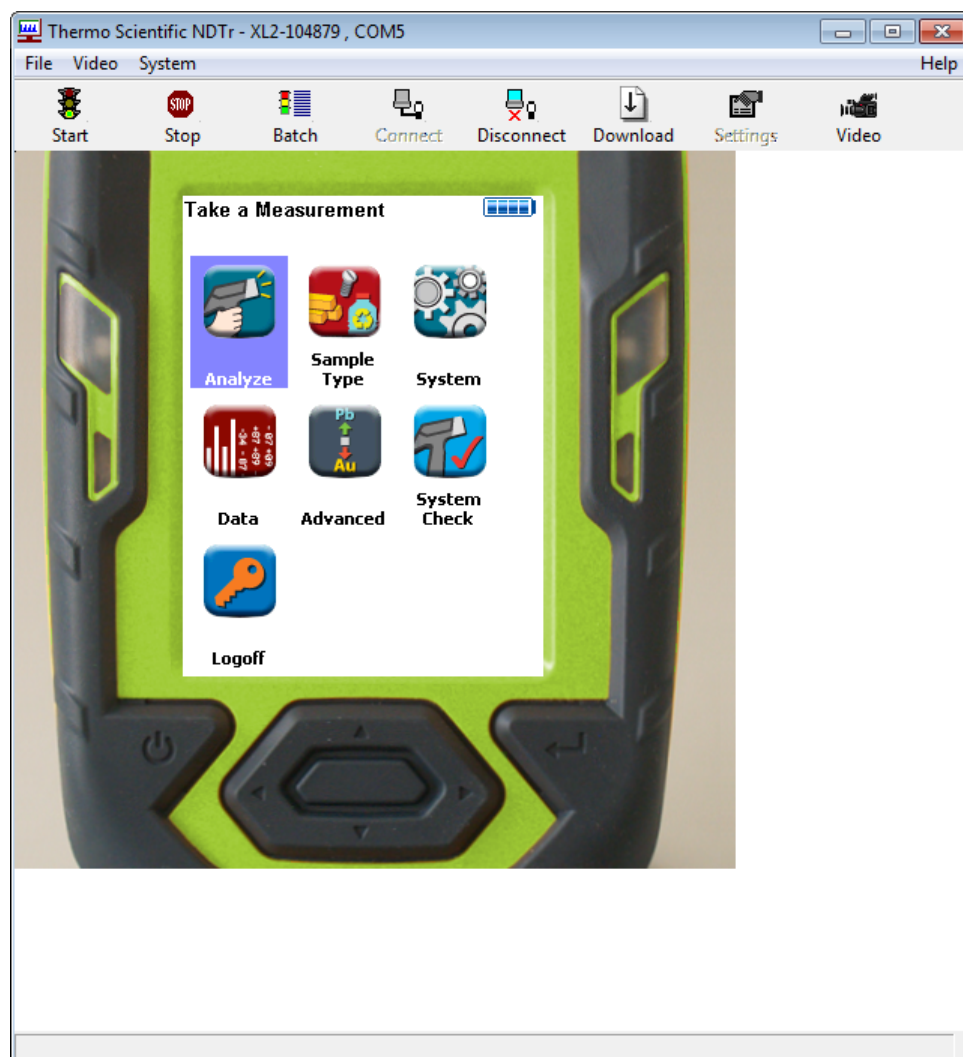


**Figure 120. Selecting the Com Port**

Select the proper com port from the list, then select the OK Button.

## Operating Your Analyzer Remotely

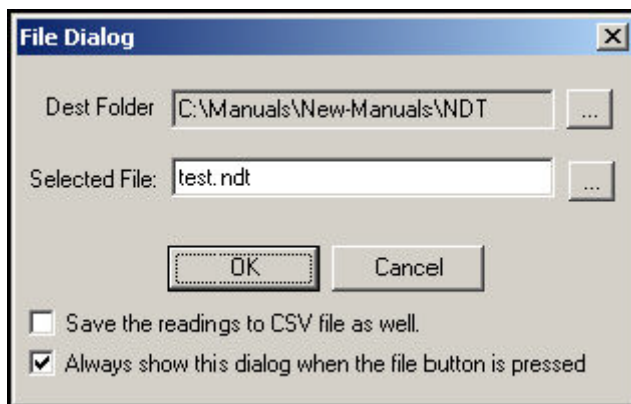
NDTr version 7 and above virtual interface operates exactly as the analyzer would. Selecting the buttons, icons and menus with your mouse works exactly as if you were selecting them with your finger or stylus on the real analyzer.



**Figure 121. Niton XL2 Plus Virtual Interface**

### Live Download from NDTTr

Once you have connected to your analyzer using NDTTr, click on the Download icon on the NDTTr toolbar. When you click the Download icon, a Download dialog box will appear.



**Figure 122. File Dialog Box**

### **Dest Folder**

This field shows the last used save folder, defaulting to the folder where NDT is installed.

### **... (Browse Folders) Button**

Selecting this button enables you to select a different folder for saving the file. This will change the Dest Folder Field.

### **Selected File**

This shows the filename the reading will be saved to unless you change it.

### **... (Browse Files) Button**

Selecting this button enables you to select a different file name by browsing the file listing. The file extension “.ndt” will be appended to the name - i.e. File name “file” will be saved as “file.ndt” and the file will be in the NDT format.

### **Save the Reading to CSV File as Well Checkbox**

Selecting this checkbox enables you to create a second autosave file with CSV format for importing into spreadsheets such as Excel. This file will have the same name as the NDT file above, but with the file extension “.csv” instead - i.e. “test.ndt” will be saved as “test.csv” as well. The checkbox is selected when there is a check in it, and deselected when it is empty.

### **Always Show this Dialog Box when the File button is Pressed Checkbox**

Selecting this checkbox will enable you to change the filename whenever you want. Deselecting this checkbox will save the file under the same name in the same folder every time. The checkbox is selected when there is a check in it, and deselected when it is empty.



## Instrument Maintenance and Support

### Contents

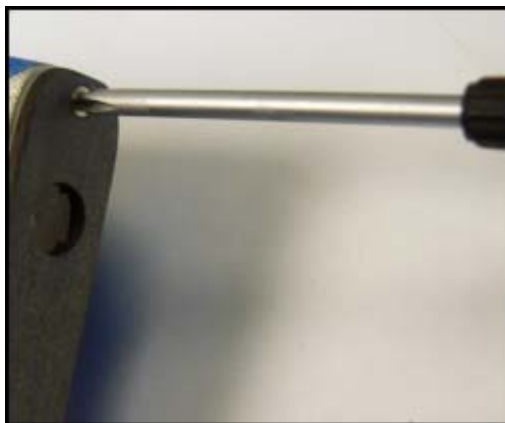
- “Replacing the Measurement Window” on page 153
- “Tips and Troubleshooting” on page 156
- “Storing and Transporting Your Niton XL2 Plus Analyzer” on page 162

This section of the User guide is about getting the most out of your analyzer. We cover troubleshooting your analyzer by using the Specs screen. We also cover advanced topics like setting thresholds, using the Tools menu, correcting for light elements in the sample composition, setting up pass/fail analysis, changing safety and start/stop parameters, and many other special situations you may need. We have also included a number of documents for reference, so you can learn more about XRF analysis if you are so inclined.

## Replacing the Measurement Window

**WARNING** Before you begin, remove the battery from your analyzer!

- Remove the two screws holding the Measurement Window Bracket to the nose of your analyzer.



**Figure 123. Removing the Window Bracket Screws**

- Remove the Measurement Window Bracket from the analyzer, and turn it over, exposing the back with seal and Measurement Window.

- Remove the old Measurement Window from the bracket.



**Figure 124. Removing the Old Window**

- Clean the Window bracket area thoroughly, using a clean, guaranteed lint-free cloth and isopropyl alcohol.
- Measurement Window for XL2 Plus is clear Prolene (P/N 447-33771).



Pick one



**Figure 125. Prolene Window P/N 447-33771**



- When the bracket is clean, remove the backing from the Measurement Window. Place the window on the Bracket gently. Make sure the opaque portions of the window do not intrude over the large measurement hole in the Bracket.



**Figure 126. Removing the Backing from Prolene Window (Left) and Applying Window to Bracket (Right)**

**CAUTION** Do not use fingers to press window into place! Use a smooth, hard surface such as back of tweezers.

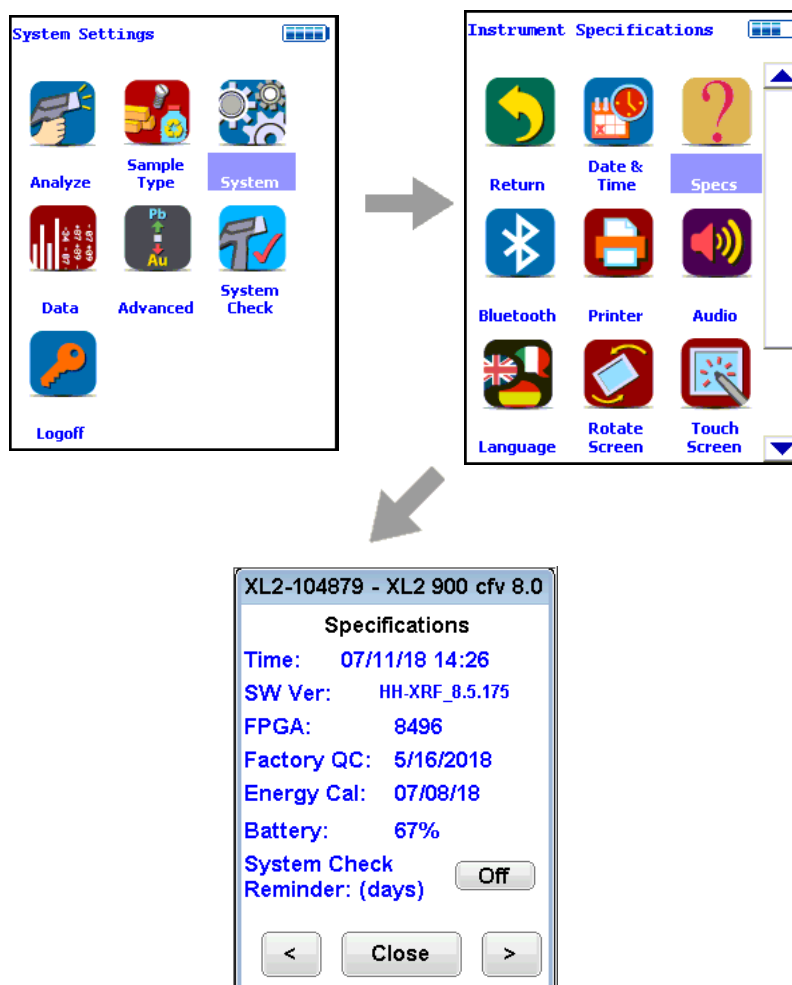


**Figure 127. Measurement Window Replaced**

- Replace Window Bracket on the front of your analyzer, then insert screws.

## Tips and Troubleshooting

### The Specs Screen



**Figure 128. The Specs Screen Menu Path**

Select the Specs icon from the System Menu to display the analyzer's specifications. These specifications include your analyzer's serial number, software and firmware versions, and other data. Press the Close Screen Button to return to the previous menu. Press the ">-" Screen Button to go to the Diagnostic Menu, and press the "<-" Screen Button to return to the Specifications Screen.



**Figure 129. The Specifications Screen**

On the Specs Screen, standard information on the state of your analyzer is shown for your reference. This information should be reported to Service if there is a problem.

## Specs Information

The following is the information supplied on the Specs Screen:

### Instrument Specific Serial Number

This is located in the left part of the blue band at the top of the screen.

### Model Number

This is located in the right part of the blue band at the top of the screen.

### Date And Time

This is the current Date and Time. This is particularly important for date stamping.

### SW Version

This is the currently loaded software version, which should be reported to Service if there is any problem.

## FPGA

This is the currently loaded FPGA software version, which should be reported to Service if there is any problem. FPGA versions are always a four digit number. Any other number of digits may be a sign of a problem in the FPGA code.

## Factory QC

This is the date that the machine was QCed at the factory.

## Energy Cal

This line notes the last time a System Check was performed.

## Battery

This line gives the proportional charge remaining to the battery.

## System Check Reminder

Select the OFF Screen Button after “System Check Reminder” to set a reminder to calibrate your analyzer. Selecting the button will open the Cal. Reminder Editor. Select the number of days you want between reminders with the numeric keys. Of the other screen buttons, C = Clear All, E = Enter, and OFF shuts off the Reminder Function. Selecting the E button will enter the current value as the reminder interval and return to the Specs Screen.

The screenshot shows a screen titled "Cal. Reminder (Days)". It features a 5x3 grid of buttons. The first four rows contain numeric keys 7-9, 4-6, 1-3, and C, 0, E respectively. The fifth row contains OFF, <, and an empty space. Below the grid is a display area showing the number 0.

Cal. Reminder (Days)		
7	8	9
4	5	6
1	2	3
C	0	E
OFF	<	

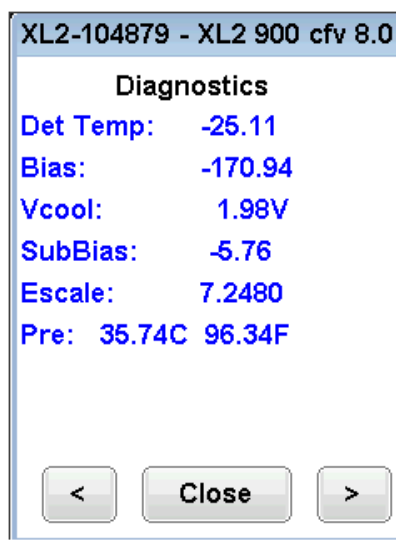
0

**Figure 130. Cal Reminder Editor Screen**

## Diagnostics

Select the “->” Screen Button to load the Diagnostics Screen. The Diagnostics Screen shows Detector Temperature, Bias, Cooler Voltage, SubBias, Energy Scale, and Temperature in C and F scales.

The Diagnostics Screen can be of great utility in assuring proper operation of your analyzer.



**Figure 131. The Diagnostics Screen**

The proper ranges of operational values on the Diagnostics Screen follow.

### **Det Temp:**

Detector Temperature should be within this range:

- 25 + or - 5 degrees

### **Bias:**

Bias should be within this range:

175 + or - 10

### **VCool:**

VCool will vary with the ambient temperature.

**SubBias:**

SubBias should be within this range:

-11 + or - 3

**Escale:**

Escale should be within this range:

6.6 through 9.0

**Preamp:**

Preamp value should only be noted, and reported to Service if there is a problem.

## **Registration and Licensing FAQ**

As a user of a Niton XL2 Plus analyzer, you may be required to register or obtain a license with your local radiation control authority. In the US, if you intend to do work with your analyzer in states other than your own, you may be required to register there as well. Below is a list of commonly asked questions that come up when filling out registration forms.

### **FAQ**

Q: What is the max mA, max kVp, and max power?

A: Maximum mA is 200 uA

Maximum kVp is 45 kVp

Maximum power: 2 watts

Q: What is the accelerator voltage or MeV?

A: This should be filled out as not applicable N/A as it does not apply to Niton XL2 Plus analyzers.

Q: What is the radioisotope?

A: There are no radioactive isotopes in Niton XL2 Plus analyzers.

Q: What category is the Niton XL2 Plus?

A: States differ greatly in their categories; the following is a list of common categories:

- X-Ray Fluorescence
- Analytical or Analytical XRF
- Open Beam or Open Beam Analytical
- Portable Gauge or Portable XRF
- Industrial Analytical or Non-Destructive Testing

When selecting the category make sure that you don't select medical or radiographic.

Q: How many tubes are in the Niton XL2 Plus?

A: One.

Q: What is the analyzer serial number?

A: The serial number of the tube can be found on the Calibration Certificate that is included in the shipping case with your analyzer.

Q: What is the tube serial number?

A: The serial number of the tube can be found on the Calibration Certificate.

Q: What is the type of X-Ray Processing?

A: None. Niton XL2 Plus analyzers do not use film.

Q: How often do I need to perform leak tests on the Niton XL2 Plus?

A: Never. Leak tests are only required for analyzers with radioactive isotopes. Niton XL2 Plus analyzers do not have radioactive isotopes.

## Storing and Transporting Your Niton XL2 Plus Analyzer

All Niton Analyzers are transported in waterproof, drop-resistant, fully padded carrying cases with padlocks. In most countries, Niton XRF analyzers may be transported by car or plane or shipped as an *ordinary* package. For most courier services, no special labels are required on the outside of the Niton analyzer case or on additional packaging.



**Figure 132. The Niton Carrying Case**

All padlocks are shipped with a default combination of “0-0-0”. If you change this combination, please inform Thermo of the new combination if you return the unit for service.

To change the combination:

1. Dial the default combination to open the lock, and pull out the shackle.
2. Rotate the shackle 180 degrees and push it down as far as it can go.
3. While holding the shackle down, rotate it 90 degrees back in either direction and release shackle.
4. Change the dial settings to the desired combination, record the combination, and without disturbing the dials, rotate the shackle back 90 degrees to the position it had in step 2.



5. Pull shackle out and rotate it 180 degrees and secure it. Your lock now has its own secret combination.

**CAUTION** Always transport the unit in its padded carrying case, and store the Niton Analyzer in its case whenever it is not being used.

**CAUTION** In most cases, no notification is required if transporting within state boundaries. This may not be the case when entering federal properties.

**CAUTION** Within the United States, always keep a copy of the US DOT compliance statement in your Niton analyzer case at all times. A copy is included with your analyzer.

**CAUTION** Always follow all pertinent local and national regulations and guidelines, wherever your analyzer is transported or used.

**CAUTION** Always obtain a Return Authorization (RA) number from Thermo Fisher Scientific's Service Department in the United States, toll free, at (800) 875-1578, or outside the United States, at +1-978-670-7460 before returning your analyzer to the Service Department or to your local Authorized Niton Analyzers Service Center.

**CAUTION** If you return your Niton analyzer without the carrying case, you will void your warranty in its entirety. You will be billed for a replacement case plus any repairs resulting from improper shipping.

**CAUTION** Always remove the battery pack when transporting or storing your analyzer.



## Test Stands

### Contents

- “The Portable Test Stand” on page 165
- “The Mobile Test Stand” on page 173
- “Configuring the Analyzer for the Test Stand” on page 175
- “The Field Mate Test Stand” on page 181
- “Configuring the Analyzer for the Test Stand” on page 189

## The Portable Test Stand

Shielded test stands are useful accessories to use to analyze the following types of samples:

- light materials (such as plastic, wood, or similarly low density/low atomic mass samples)
- thin samples (such as foils, circuit boards, and wires)
- samples that are smaller than the analysis window.

See “[Safe Handling of Samples](#)” on [page 14](#) for more details.



Test Stand power  
specification:  
12vDC, 1A

See test stand  
"Power Supply PN  
420-011" on  
page 24.

**Figure 133. The Portable Test Stand: PN 420-017**

## User Accessible Connectors on Test Stand

Connector	Voltage Level	Manufacturer and Part Number
DC Power JACK	12V	CUI, PJ-014CH-SMT
Remote Trigger	3.3V	CUI, SJ-3523-SMT
USB port	5V	Molex, 56579-0576

## Setting Up the Portable Test Stand

1. To set up the Portable Test Stand, place the folded stand on your bench top with the scissored legs down.

**CAUTION** When setting up and taking down the Portable Test Stand, be aware of possible pinch points.

2. Lift up the top part of the Portable Test Stand. As you do so, the scissored legs will rise up and come together.

3. Hook the notch in the back, flat part of the top over the bar between the rear legs, as in [Figure 134](#).



**Figure 134. Hooking Over the Bar**

4. The Portable Test Stand is now ready for use.

[Figure 135](#) shows a Portable Test Stand ready for use.



**Figure 135. The Test Stand All Set Up**

## Taking down the Portable Test Stand

1. First, unhook all cables from the instrument and/or test stand.
2. To take down the Portable Test Stand, unhook the back, flat part of the top section of the Test Stand. The hood locks shut with a sliding tab for transportation.  
**CAUTION** When setting up and taking down the Portable Test Stand, be aware of possible pinch points.
3. The air pistons between the scissors legs will let the top down slowly.
4. Support the top until the legs have fully collapsed. [Figure 136](#) shows a Portable Test Stand fully collapsed.



**Figure 136. The Portable Test Stand Collapsed**

## Connecting the Portable Test Stand to your Analyzer

Use the included Remote Trigger Cable to attach the Portable Test Stand to your Analyzer. By connecting the Test Stand, your analyzer knows whether the protective lid is open or closed, and thus whether it is safe to initiate a test, as in [Figure 141](#). If unplugged, the instrument will not be able to initiate a reading.



**Figure 137. Plugging the Remote Trigger Cable Into the Portable Test Stand**

## Attaching the Remote Trigger Cable

Insert one end of the Cable into the Remote Trigger Port on your Portable Test Stand, and the other end to the Remote Trigger Port on your Analyzer, as in [Figure 137](#) and [Figure 138](#). Do not plug the cable into the Serial Ports.



**Figure 138. Plugging the Remote Trigger Cable Into the Analyzer**

## Powering the Test Stand via USB

Plug the USB cable into your computer's open USB port as in [Figure 139](#). Plug the other end into the Test Stand's USB Port. The Test Stand can draw what power it needs from your computer.

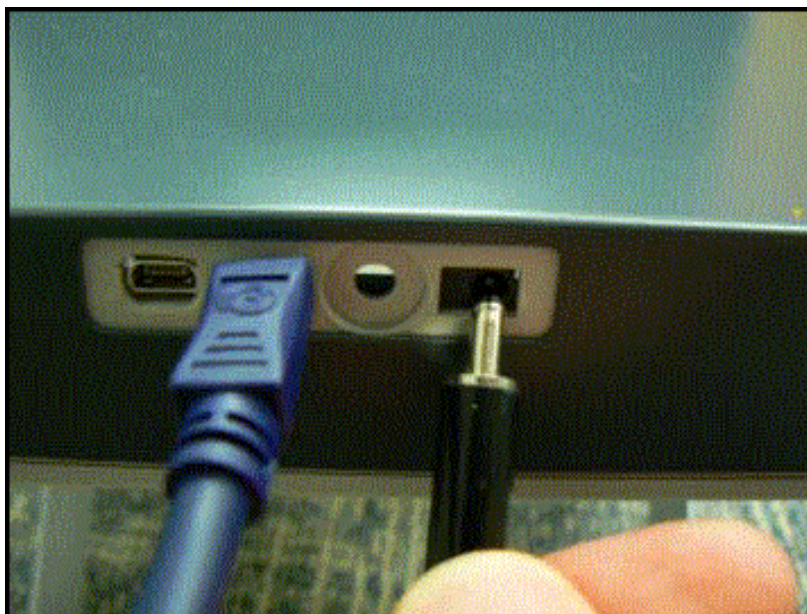


**Figure 139. Plugging the USB Cable into the Portable Test Stand**

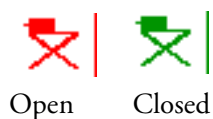
## Powering the Test Stand Via Separate Power Cable

You may also use the power adaptor to power up the test stand. Plug the power adapter into the power port on your Portable Test Stand, and the other end into the wall outlet.





**Figure 140. Plugging the Power Cable into the Portable Test Stand**



**Figure 141. Test Stand Open and Closed Icons**

## How to Use the Portable Test Stand

When the Portable Test Stand is fully set up, insert the front of your analyzer into the cone under the floor of the top part of the stand, as in [Figure 142](#). Push firmly until the analyzer seats with an audible click.

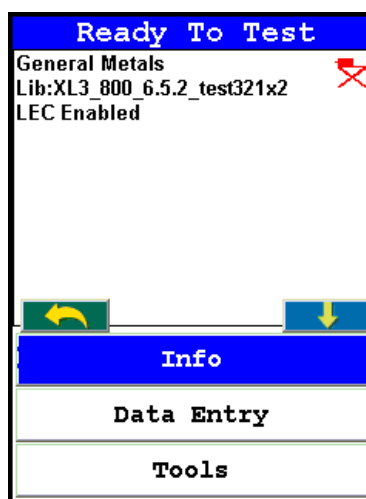


**Figure 142. Portable Test Stand with Analyzer Attached**

Your analyzer cannot be inserted fully in any orientation but the correct orientation, with the touch screen towards the front.

To remove your analyzer, simply squeeze the tabs on either side of the cone and pull the analyzer down, gently but firmly, until it separates from the cone.

When the hood is lifted, your analyzer will display a red icon at the top of the touch screen, as in [Figure 143](#).



**Figure 143. Portable Test Stand Open Icon**

Your analyzer will not take a reading unless the hood is shut and the green icon is on.

## The Mobile Test Stand

### How to Assemble the Mobile Test Stand (PN 430-032)

#### Attaching the legs to the main body

1. Orient the pop-up peg on the leg with the hole in the main body
2. Push the pop-up peg in with your thumb as shown in [Figure 144](#).



**Figure 144. Pushing in Peg**

3. Slide the leg into the main body until the pop-up peg snaps into the matching hole as shown in [Figure 145](#).



**Figure 145. Attaching Leg**

4. Repeat for each leg
5. Adjust the height of each leg by screwing or unscrewing the feet to allow a level platform

## **Fitting your Niton analyzer into the Mobile Test Stand**

6. Set the test stand so that the hinge is away from you, and you have access to the test chamber when it is open.
7. Place your analyzer underneath the Mobile Test Stand so that the nose points up and the touch screen is facing you, as in [Figure 146](#).



**Figure 146. Inserting Analyzer into Portable Test Stand**

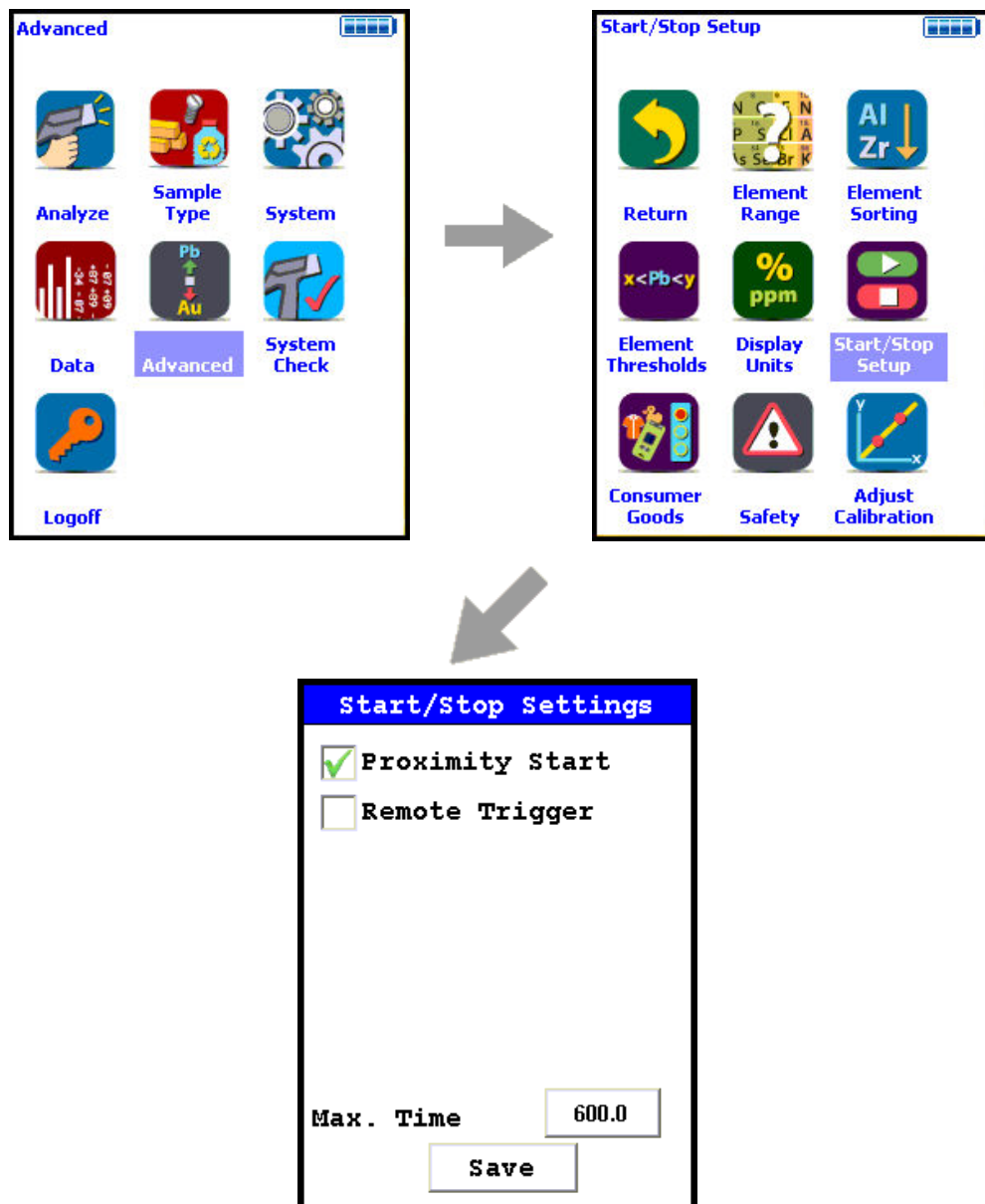
8. Lift your analyzer firmly up into the recess until the clips snap solidly into place on both sides of the analyzer's front end.

## **Configuring the Analyzer for the Test Stand**

The test stand contains an RFID chip, which automatically configures your analyzer to properly work with the test stand.

## Proximity Start Feature

A feature you can optionally use is to set the analyzer to Proximity Start.



**Figure 147. Menu Path to Set Proximity Start**

Press the trigger to initiate the reading, and disengage the Proximity Button by opening the cover to stop the reading. With this feature enabled, you do not need to hold the trigger down while the sample is being analyzed.



**Figure 148. Stopping the Analysis by Opening the Cover**

You can always use standard operation, as well as remote operation via NDT<sub>r</sub>.

## Measuring Small Parts and Components

To measure electronic parts and components, place the part to be measured directly on the measurement window of the analyzer, shut the hinged top firmly, and take a measurement. See [Figure 149](#) for an example of placing electronic parts.



**Figure 149. Measuring Electronic Parts**



To measure small alloy parts and samples, place the part to be measured directly on the measurement window of the analyzer, shut the hinged top firmly, and take a measurement.

## Measuring Bulk Samples in Sample Cups

To measure bulk materials in sample cups, place the Sample Cup Holder into the Mobile Test Stand so that it rests on the lip of the oval cutout. See [Figure 150](#) to see how the Sample Cup Holder is oriented.



**Figure 150. Inserting the Sample Cup Holder**

Then place the sample cup to be analyzed into the sample cup holder, shut the hinged top firmly, and initiate a measurement. See [Figure 18](#) for an example of placing sample cups into the Sample Cup Holder.





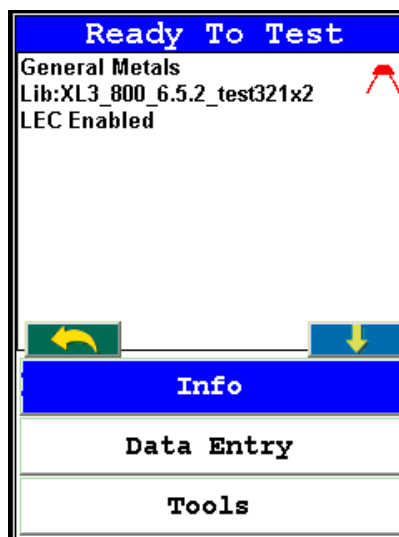
**Figure 151. Inserting Sample Cup**

## Measuring Bulk Samples in Bags

To measure bulk materials in plastic bags, make sure the material to be tested is at least 1.5 cm deep over the measurement window of the analyzer. The cover of the test stand must be shut completely before taking a reading, which limits the maximum size of the bagged sample to that of the capacity of the test stand cavity.

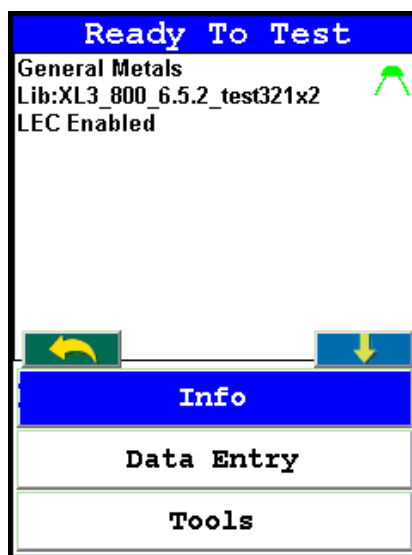
Place the sample bag into the test stand, shut the hinged top firmly, and take the measurement.

When the hood is lifted, your analyzer will display a red icon at the top of the touch screen, as in [Figure 152](#).



**Figure 152. Mobile Test Stand Open Icon**

When the hood is shut, your analyzer will display a green icon at the top of the touch screen, as in [Figure 153](#).



**Figure 153. Mobile Test Stand Closed Icon**

Your analyzer cannot make an analysis unless the icon is green. To remove your analyzer from the Mobile Test Stand, simply squeeze the tabs on either side of the cone and pull the analyzer down, gently but firmly, until it separates from the cone.

## The Field Mate Test Stand

The Field Mate Test Stand is a multi purpose, ultra portable test stand. It is optimized for field analysis of 32mm sample cups and small bagged samples.

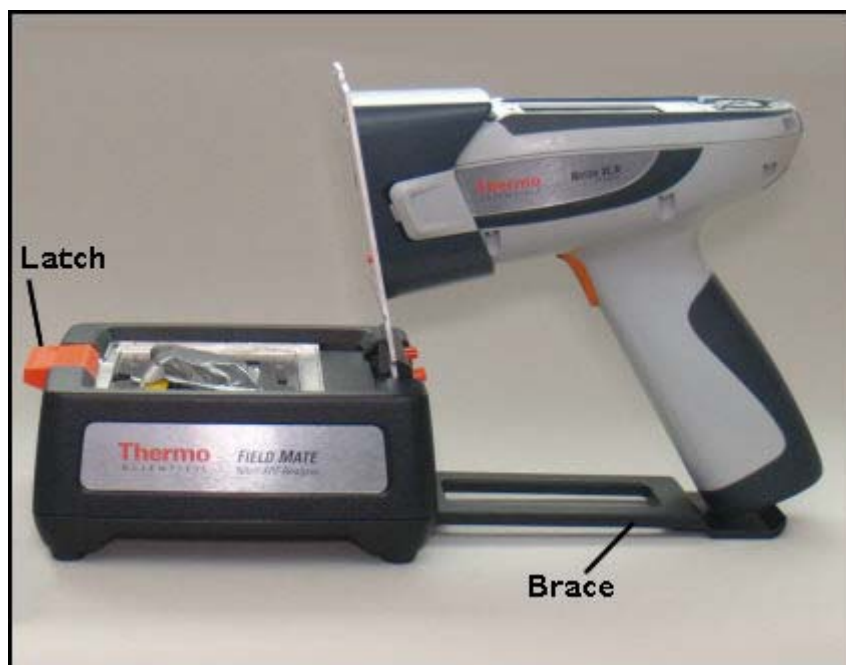


**Figure 154. The Field Mate**

The Field Mate has a pivoting top plate which covers a shielded cavity inside which the sample is placed. There are two insets which fit inside the cavity, optimized for the two most common sample types - bagged bulk samples and sample cups.

There is a brace to support the analyzer on the underside of the base. Gently but firmly unsnap the brace by pushing down on the protruding black tab. The brace will pivot out and down 180 degrees. The brace helps compensate for the off-center weight of the analyzer when clipped into the pivoting top plate.

To place your analyzer into the Field Mate, fit your analyzer's nose firmly up into the mating cone until the clips snap solidly into place on both sides of the analyzer's front end.

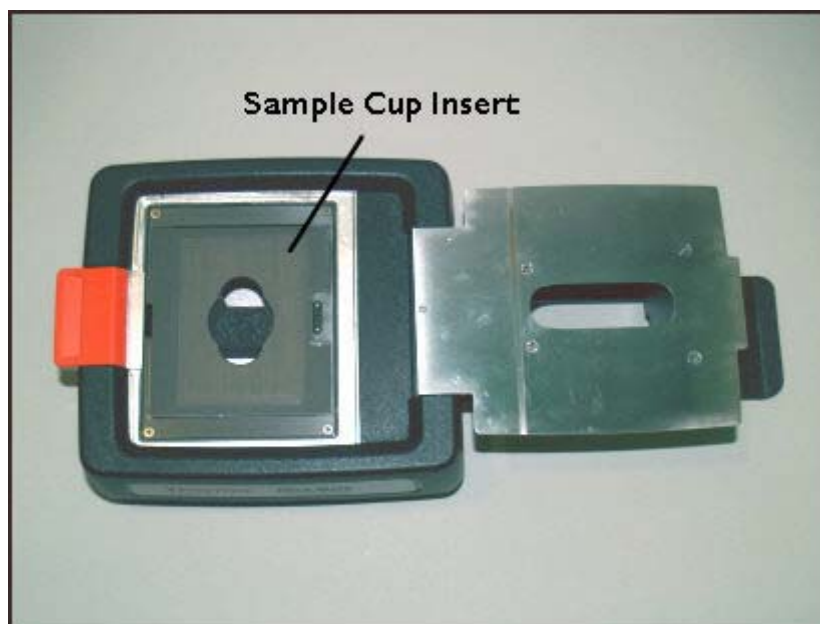


**Figure 155. The Field Mate with Top Plate Opened**

The top plate is opened by pressing the large orange latch on the base. Inserts can be placed into the cavity, and samples can be placed into the inserts. The insert for bagged bulk samples (shown in [Figure 156](#)) has a spring loaded inner plate which pushes the sample up to contact the underside of the top plate for proper analysis. The insert for sample cups (shown in [Figure 157](#)) holds the cup at the proper height for analysis with a soft foam support. Tilt the top plate back until it latches with an audible click for analysis. This can be done with or without your analyzer clipped into the cone.



**Figure 156. The Field Mate Bagged Sample Insert**



**Figure 157. The Field Mate Sample Cup Insert**

The top plate can also be completely removed by pressing the two small hinge tabs together towards the middle of the plate and lifting the plate from the base. This can be done with or without your analyzer mounted into the cone.



**Figure 158. The Top Plate Removed from the Base Unit**

Removed from the base, the plate can be placed into the Test Guard, for soil screening in-situ.



**Figure 159. The Test Guard**

To insert the plate into the Test Guard, slide the front tab on the plate under the tab of the Test Guard.



**Figure 160. Inserting the Top Plate into the Test Guard**

The interlocking tabs secure the front of the Test Guard to the plate.



**Figure 161. The Front Tab**

Squeezing the Hinge Tabs together, lower the back of the plate into the Test Guard. Release the tabs so the Hinge Tab Pins protrude through the holes on either side of the Test Guard. This secures the rear of the plate to the Test Guard.



**Figure 162. The Hinge Tab Pins**

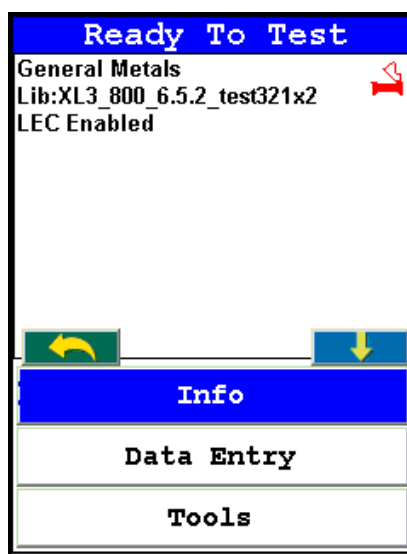
At this point, you can fit your analyzer into the cone. It may now be used for soil screening.





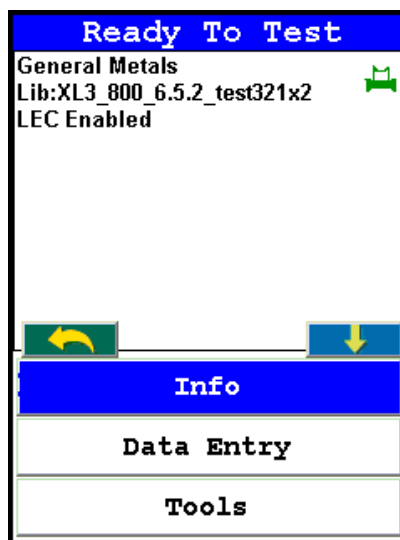
**Figure 163. The Top Plate Removed from the Base Unit**

When the top plate is lifted, your analyzer will display a red icon at the top of the touch screen, as in [Figure 164](#).



**Figure 164. Field Mate Open Icon**

When the plate is shut, your analyzer will display a green icon at the top of the touch screen, as in [Figure 165](#).



**Figure 165. Field Mate Closed Icon**

Your analyzer cannot make an analysis unless the icon is green.

To remove your analyzer from the Field Mate Test Stand, simply squeeze the tabs on either side of the cone and pull the analyzer up, gently but firmly, until it separates from the cone.

## Configuring the Analyzer for the Test Stand

The test stand contains an RFID chip, which automatically configures your analyzer to properly work with the test stand.

### Proximity Start Feature

A feature you can optionally use is to set the analyzer to Proximity Start.

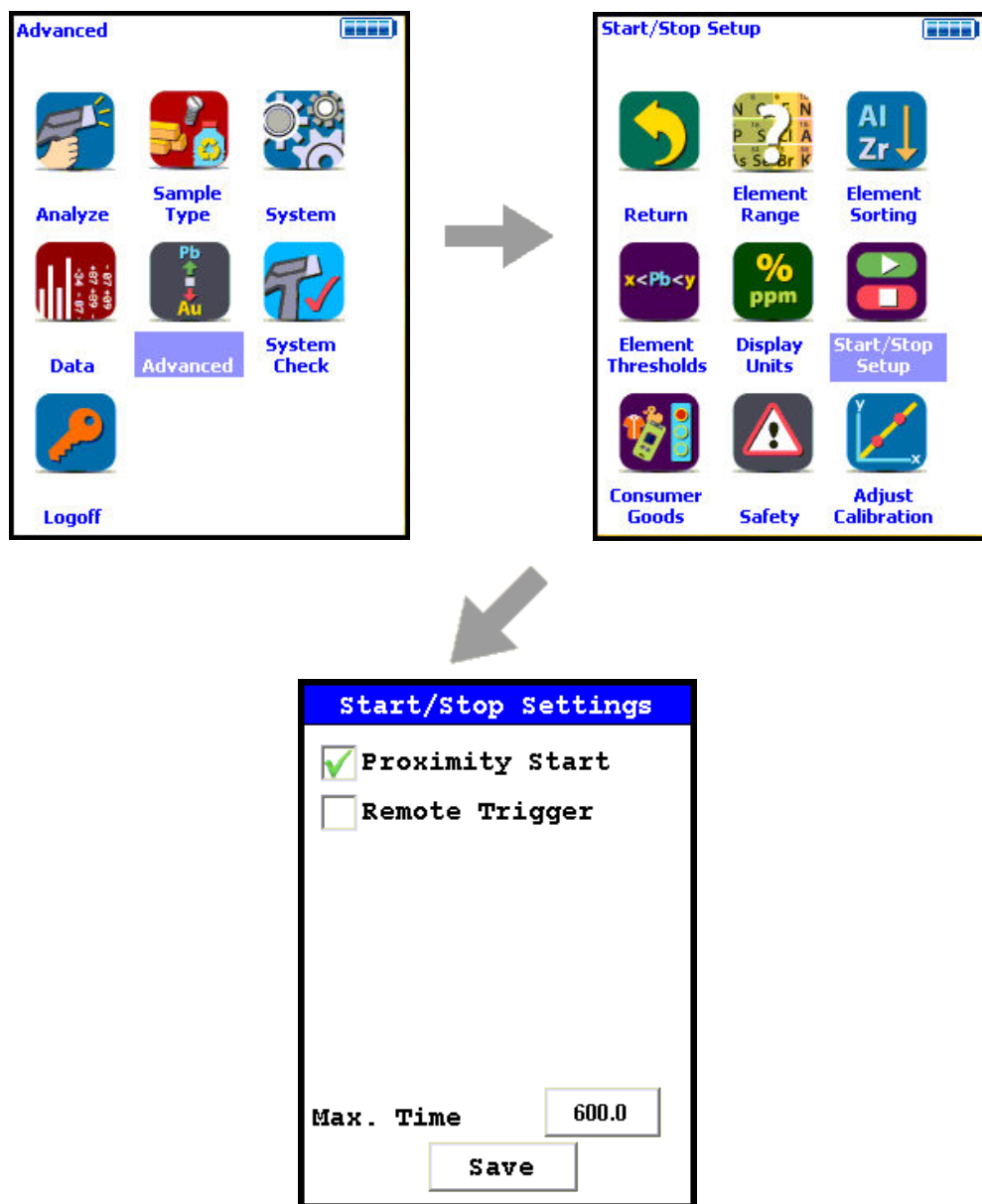


Figure 166. Menu Path to Set Proximity Start

Press the trigger to initiate the reading, and disengage the Proximity Button by pressing the Latch and opening the plate to stop the reading. With this feature enabled, you do not need to hold the trigger down while the sample is being analyzed.



**Figure 167. Stopping the Analysis by Opening the Plate**

You can always use standard operation, as well as remote operation via NDTi.