



CuDDI™

Copper Digital Detection Imaging



User Manual

June 2024

Document Rev 1.11



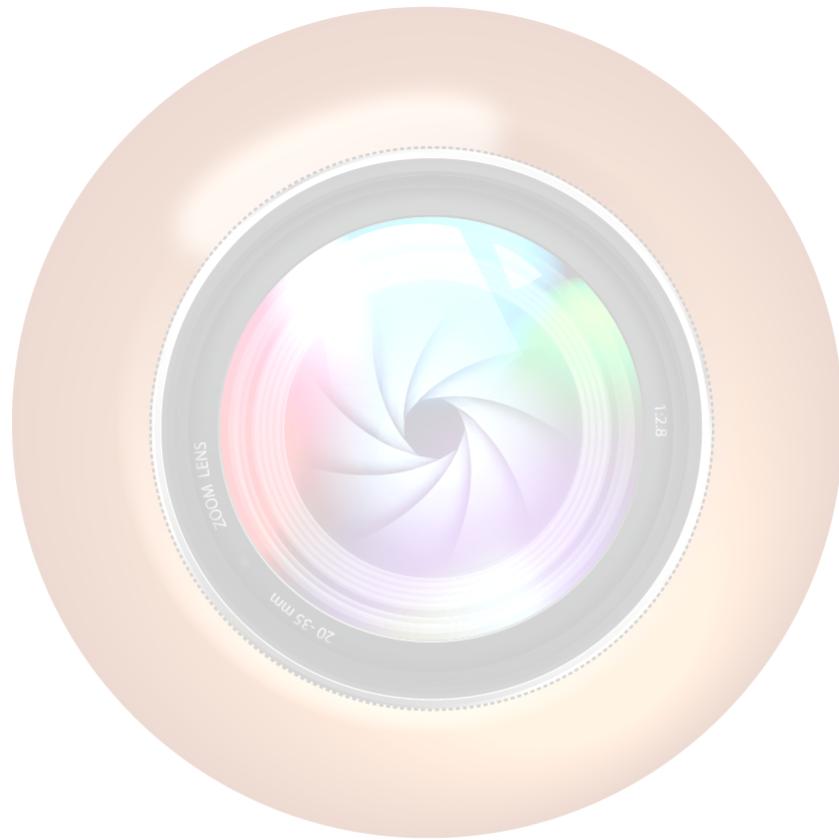
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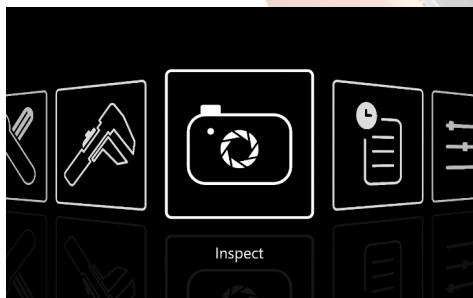
About Your CuDDI

CuDDI is the first high-tech optical powered device under Ayalytical's suite of visual testing instruments powered by sophisticated optics, VISAYA, and improves on the visual rating of methods ASTM D130, ASTM D1838 and ASTM D4048.

Copper strip testing is a critical indicator of sulfur compounds still present after the petroleum refining process. The Copper Digital Detection Imaging (CuDDI) is a new standard of copper quality analysis for the petro industry using a high-resolution camera with optical intelligence. CuDDI identifies exact levels of corrosivity present from petroleum through a 4-step automated vision algorithm and classification process. Results are then digitally recorded and seamlessly integrate with LIMS software.

CuDDI's higher precision, patent pending design eliminates guesswork and operator bias from copper corrosion detection. The digital detection imaging is achieved through a unique vision algorithm and light box that records, calculates and displays accurate corrosivity ratings in a matter of seconds. This standardized measurement of copper quality improves on current rating, method and sample handling procedures performed in current lab tests.

CuDDI's improvements over current test rating output and analysis include:



- Easy-to-use touchscreen driven software
- 1-2-3 Wizard operation
- Easy-to-load NFX Holder
- High repeatability
- USB, HDMI, Ethernet for enhanced connectivity
- Digital image logging complete with operator notes and calculated results for easy sharing of findings
- Integrated industrial computer for easy interface with network



Safety

Read this section carefully before installing and operating the instrument.

For safe and correct use of the instrument, it is essential that both operating and service personnel follow generally accepted safety procedures as well as the safety instructions given in this document, the CuDDI Handlers User's Guide.

The instruments described in this document are for test specimens and should be used for automatic Copper Corrosion operations only. They should only be used in the laboratory or similar indoor environments for analytical purposes by qualified personnel. If an instrument is used in a manner not specified by VISAYA, the protection provided by the instrument may be impaired.

When the NFX Handle is in motion, it is necessary to check that nothing hinders the movement of the instrument parts (i.e., sample, holder). Nothing should be placed in or around the field of movement of either the horizontal or drives.

Voltages present inside the instrument are potentially dangerous. If there is a problem with the instrument, the power cable should be removed until qualified service personnel have repaired it. This is to prevent anyone from inadvertently using the instrument, thus causing possible harm to themselves, or damage to the instrument itself.

The leakage current of this instrument is within the limits allowed by international safety standards for laboratory equipment. An efficient ground connection is imperative for the physical protection of the user.

Power supply cord reference 7080316106 is for use in France and Germany. Power supply cord reference 7080316105 is for use in USA and Canada. For other countries, contact your local VISAYA distributor. You must only use the type of fuse described in this document: 4.0 Amp type "T" slow blow.

Adequate protection including clothing and ventilation must be provided if dangerous liquids are used in the analytical work. In case of incidental spillage, carefully wipe with a dry cloth, taking into account the nature of the spilled liquid and the necessary safety precautions.

Cleaning, dismantling, maintenance, adjustment and repair should only be performed by personnel trained in such work, and who are aware of the possible dangers involved. These instruments must not be sterilized, using an autoclave, or any other mechanical device. When you need to clean an instrument, use one of the three following methods:

1. a clean dry cloth,
2. a cloth dampened with water, or
3. a cloth dampened with soapy water.



If a cloth dampened with soapy water is used to clean the instrument, only domestic soap may be used. No other form of detergent or chemical may be used.

Warranty

Warranties: VISAYA, Inc. expressly warrants the products manufactured by it (i) to be free from defects in material and workmanship, (ii) to be of good title, (iii) not to infringe any patent in effect in the country of its manufacture, (iv) to meet the applicable VISAYA specifications for that product.

VISAYA makes no other warranties either expressed or implied (including without limitation warranties as to fitness for a particular purpose). Purchaser retains responsibility for the application of VISAYA's products to its particular function. In addition, the following should constitute the exclusive remedies for any breach by VISAYA of its warranties. VISAYA, Inc. shall either replace or repair (at its discretion) free of charge: (i) any VISAYA manufactured product (or component or part thereof) which shall be returned to VISAYA within (1) one year from date of delivery, (ii) any VISAYA manufactured product (or component or part thereof) previously repaired or replaced under VISAYA warranty, which shall be returned to VISAYA prior to the later of the balance of the original one year warranty period or (3) three months after the date of repair or replacement, and (iii) any part (sold as such) manufactured by VISAYA which shall be returned to VISAYA within (3) three months from date of delivery, but only if such product, component or part does not comply with one of the expressed warranties stated above. All shipping or transportation charges to the factory shall be paid for by the Purchaser; return shipping will be paid for by VISAYA. Any and all such replacements or repairs necessitated by: (i) inadequate preventative maintenance, (ii) the fault of the Purchaser due to abnormal use or abuse, (iii) attack and deterioration under unsuitable environmental conditions, shall be paid for by the Purchaser. Resale Products: Shall carry the warranty offered by VISAYA to the original purchaser, unless specified otherwise in the offering or separately and specifically agreed upon in writing by VISAYA.

**To obtain warranty service, please contact VISAYA at
service@visayainc.com**

Return the instrument in its original packaging, enclosed in a new box.



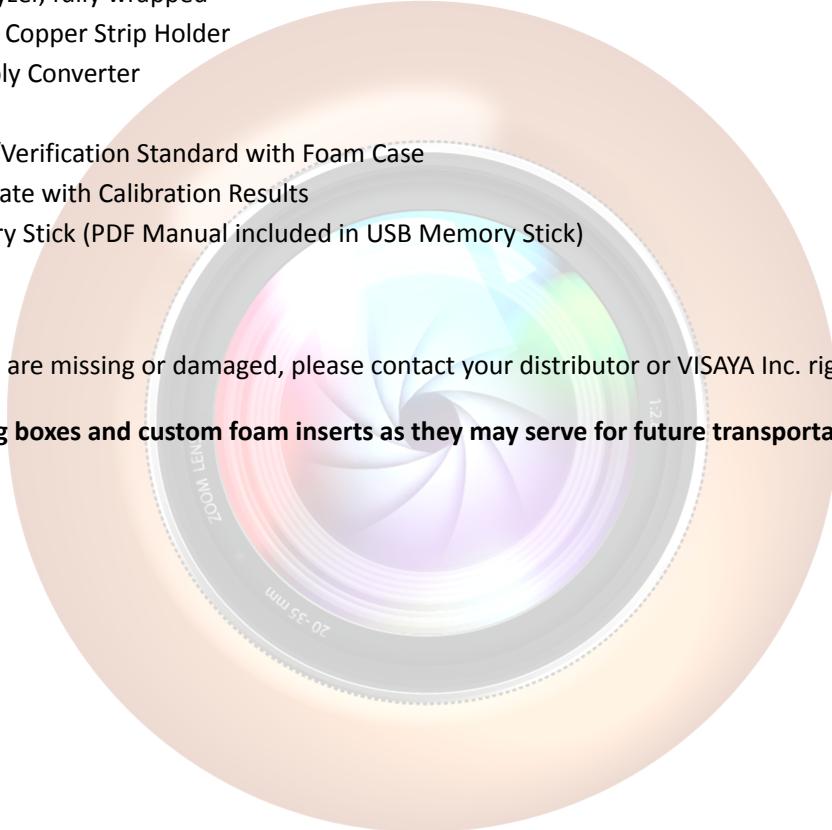
Package Contents

Your Standard CuDDI Package comes complete with all accessories necessary for a true out-of-box operation. During the unpacking procedure, please ensure no damage to analyzer and verify the following items are present:

- CuDDI Analyzer, fully wrapped
- NFX Handle Copper Strip Holder
- Power Supply Converter
- Power Cord
- Calibration/Verification Standard with Foam Case
- Test Certificate with Calibration Results
- USB Memory Stick (PDF Manual included in USB Memory Stick)

If any of these items are missing or damaged, please contact your distributor or VISAYA Inc. right away.

Please save shipping boxes and custom foam inserts as they may serve for future transportation and securing of contents.



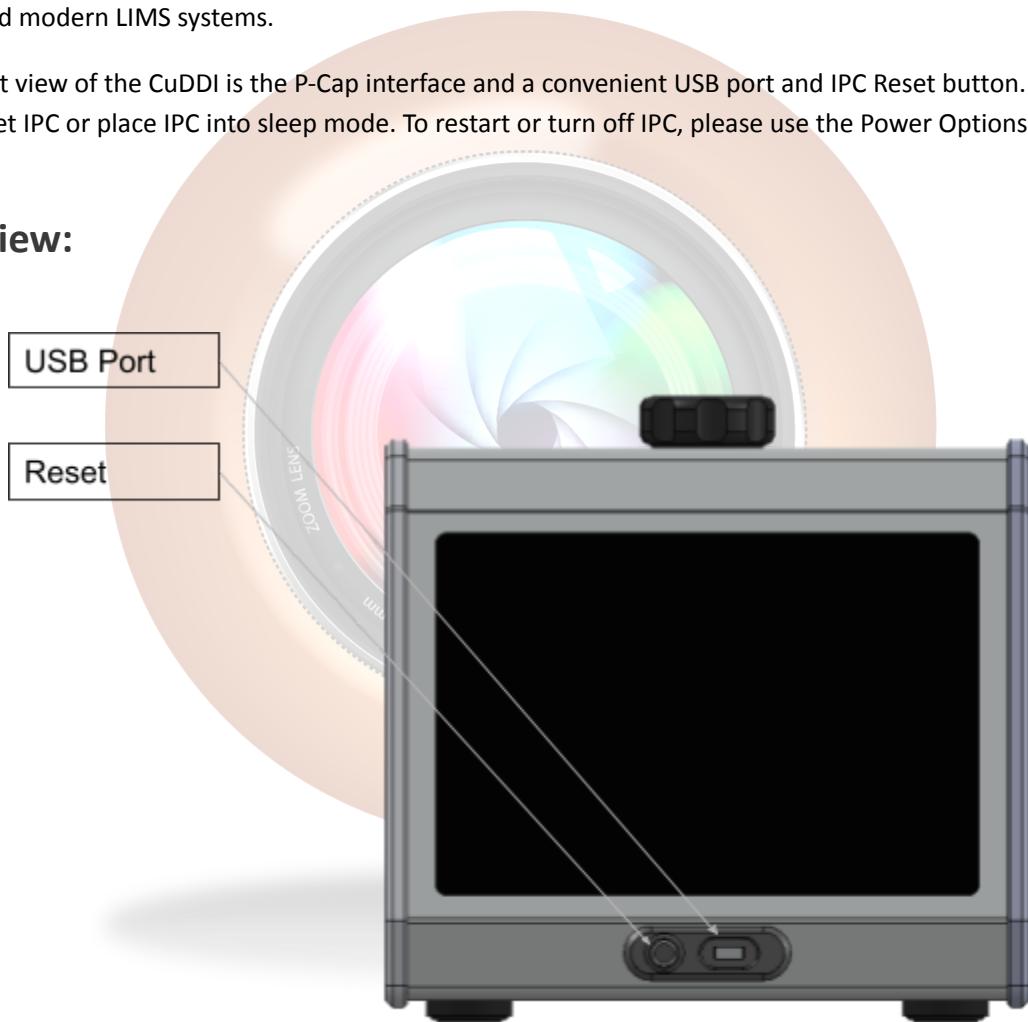


Identifying Parts and Controls

CuDDI features an embedded industrial grade computer (IPC) with easy-to-use software. Interface to the software is achieved using an industrial grade large 10.1 LCD display with integrated Projective-Capacitance (P-Cap) touch controller. The computer, which runs an embedded version of Windows 8 Professional, allows for easy integration to network and modern LIMS systems.

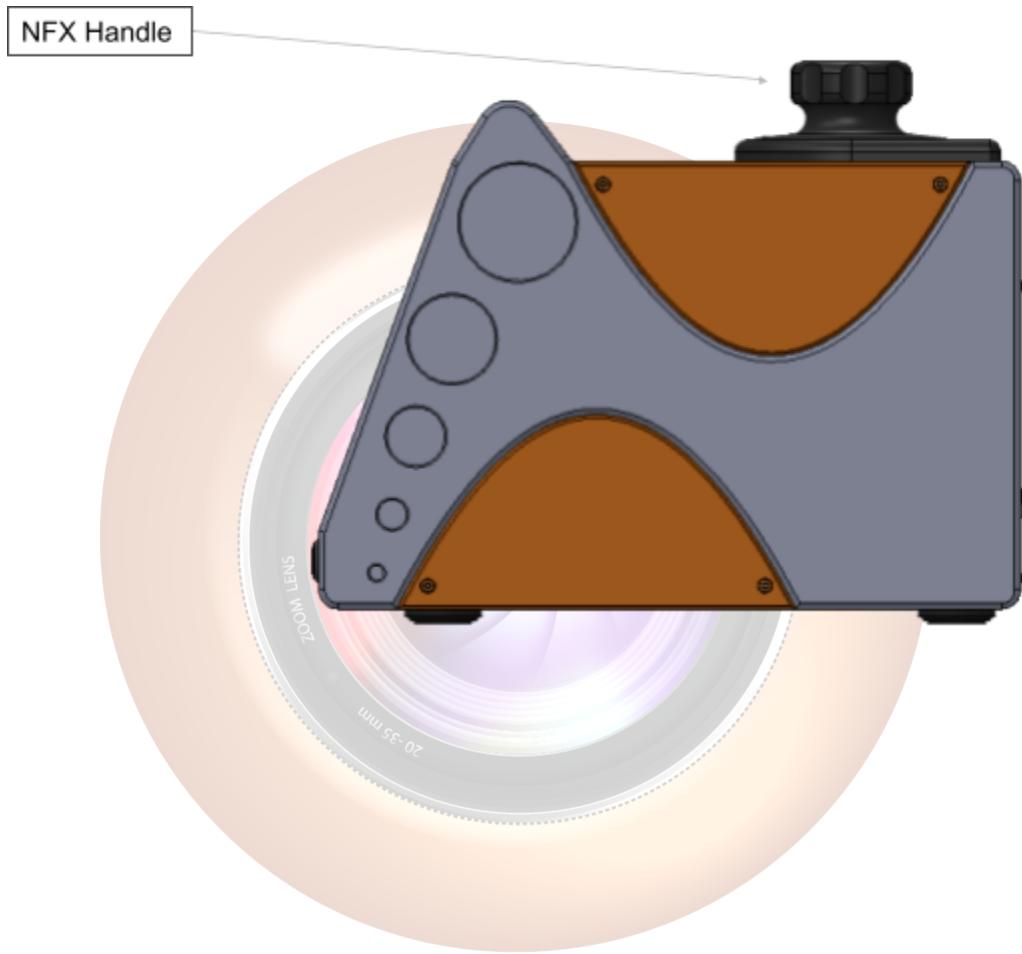
On the front view of the CuDDI is the P-Cap interface and a convenient USB port and IPC Reset button. This button is used to reset IPC or place IPC into sleep mode. To restart or turn off IPC, please use the Power Options in the software.

Front View:



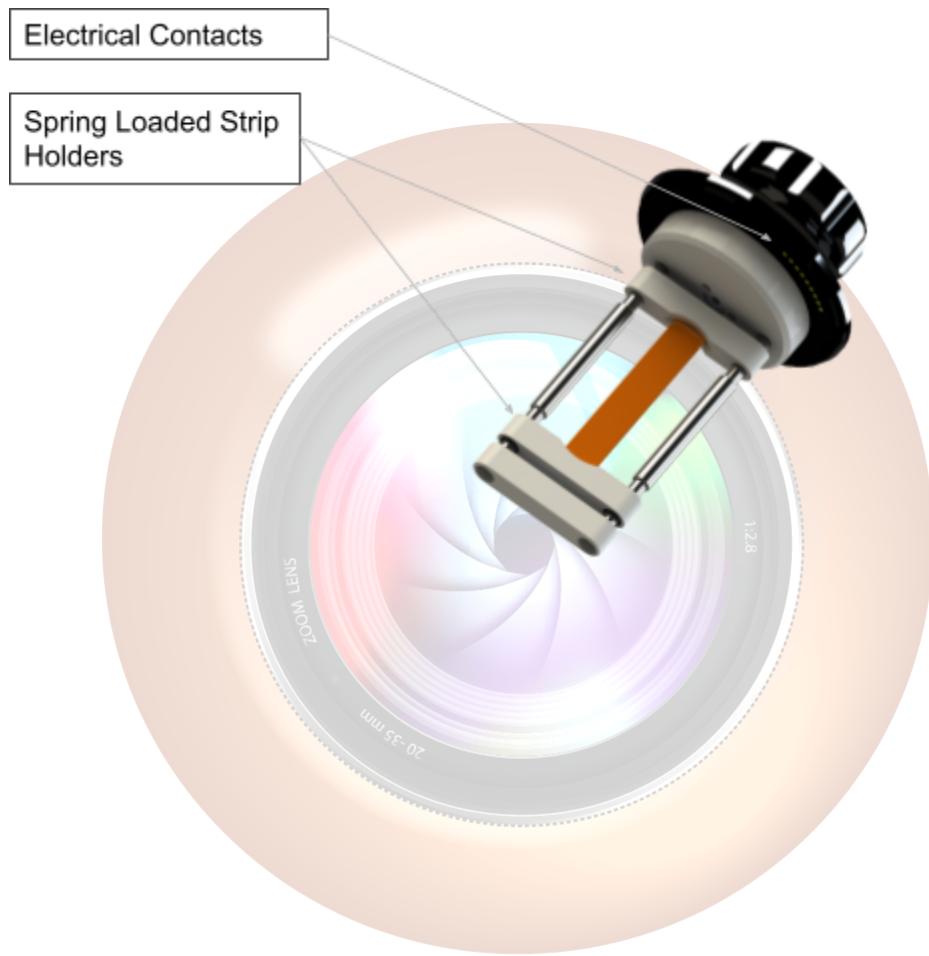


Side View:





NFX Handle:



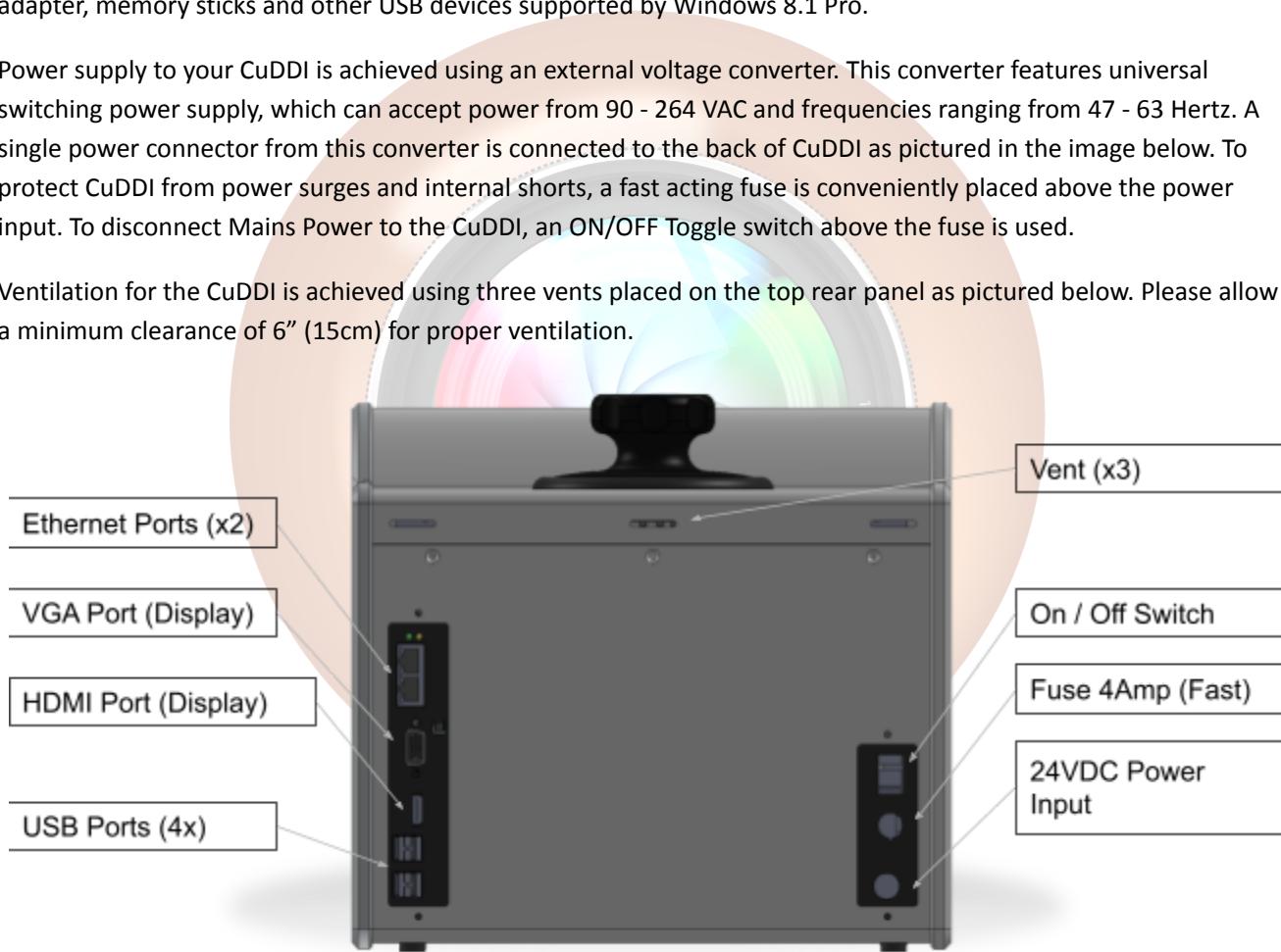


Rear View:

CuDDI's modern high-end IPC features two Ethernet (RJ-45) ports, VGA & HDMI display ports and four individual USB ports. Dual Ethernet ports allow simultaneous dedicated LIMS network connectivity, while allowing the second port to be used for traditional network or internet access. Display ports can be used to output display for external presentations, or for dual monitor support. USB ports can be used to connect external keyboards, printer, Wi-Fi adapter, memory sticks and other USB devices supported by Windows 8.1 Pro.

Power supply to your CuDDI is achieved using an external voltage converter. This converter features universal switching power supply, which can accept power from 90 - 264 VAC and frequencies ranging from 47 - 63 Hertz. A single power connector from this converter is connected to the back of CuDDI as pictured in the image below. To protect CuDDI from power surges and internal shorts, a fast acting fuse is conveniently placed above the power input. To disconnect Mains Power to the CuDDI, an ON/OFF Toggle switch above the fuse is used.

Ventilation for the CuDDI is achieved using three vents placed on the top rear panel as pictured below. Please allow a minimum clearance of 6" (15cm) for proper ventilation.





Setting Up Your CuDDI

When setting up your new CuDDI, select a location away from heat, smoke, electrical interference and avoid any electrostatic discharges (ESD) to the analyzer unit. The bench top should be a level surface and free of vibration.

Ensure that the vent holes of the analyzer are not obstructed. The analyzer requires an environment with ambient room temperature in the range of 10°C to 45°C with 30-80% RH non condensing.

CAUTION! Before making any connections, make sure that the power cable at the back of the analyzer is not plugged into an electrical outlet. Only one set-up utility is required: an A.C. electrical outlet. It is recommended that the analyzer is plugged into its own circuit to avoid power line interference and voltage surges or drops, which may occur if the circuit is shared with devices with high electrical draw.

Connect the power plug to the input on the back of the CuDDI (see picture below). Move ON/OFF toggle switch to the ON Position. Power to the IPC can be confirmed via the two LED indicator lights. Green LED light is active when power is successfully applied, and Yellow LED light will blink during normal IPC CPU usage and operation.

Additional connections such as Ethernet or printers can be done at this point. NOTE: certain printers may require drivers, which can be loaded by an administrator. Please contact your distributor or VISAYA for more instructions.





About your NFX Handle

The patent pending NFX Handle was designed to hold your copper strip in the optimal position for viewing within CuDDI's optical bench. The innovative handle features an integrated motor and electronics for precise positioning of the strip. This ensures repeatable and accurate positioning while allowing for quick serviceability on electronics and drive.

Using the NFX Handle

Your NFX Handle was engineered to allow quick and easy loading of your copper strips with minimal effort. Loading can typically be done in less than 5 seconds after sufficient practice.

The NFX Handle is comprised of 4 major components:

- Rotating Handle (electronics enclosed within)
- Adapter for Copper Strip
- Vertical Shaft
- Spring Loaded End Blocks





Steps to Loading a Copper Strip:

1. Properly clean and pat dry your strip according to your methodology
2. Hold the NFX Handle with one hand, and use your thumb to press up on the end block towards the adapter plate
3. While continuing to press down, carefully insert copper strip into bottom block at a slight angle
4. Position copper strip in line with the top end block, and then release your thumb that is holding the block to secure the block in place
5. Carefully position the strip to ensure it is straight

Note: Depending on polishing procedures, strip may not be square and therefore may be at a slight angle within the holder. This will not cause any issues, as software accurately determines angles and compensates for this.

6. Spin handle to ensure proper operation of mechanics
7. Handle and sample are then ready for normal testing
8. Insert handle into top opening of CuDDI, taking note to align the gold pins with pins on bulkhead opening.

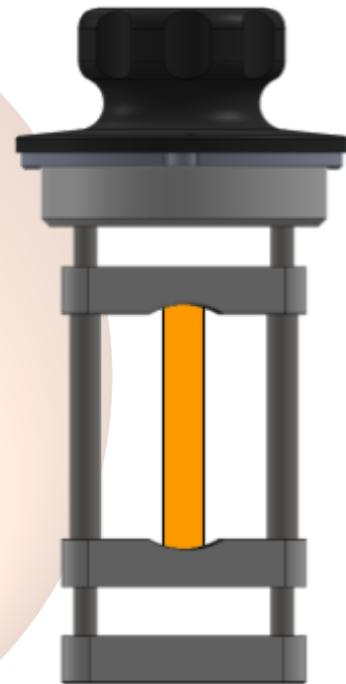




Caring for NFX Handle

The NFX Handle is an integral part of your new CuDDI. Care must be taken to ensure proper operation and accurate rating determinations. Please adhere to the following guidelines:

- Ensure proper handling, and refrain from dropping the NFX Handle on the laboratory floor. In the event the handle is accidentally dropped, ensure proper rotation by spinning the handle. One can also check operation in the Diagnostic menu of software to ensure mechanics and electronics are responding correctly. Small dents and scratches will not affect the operation of CuDDI.
- Never attempt to load a strip into the handle without properly drying the strip. Despite careful selections of components used within the NFX Handle, prolonged exposure to some chemicals may shorten the life of your NFX Handle.
- Do not lubricate shafts or springs. The NFX Handle is engineered in a way as to not require the need for lubrication.
- The NFX Handle is engineered to handle a variety of copper strip dimensions. Never try to force a strip into the end blocks if it does not fit. If the strip does not easily fit between the blocks, the strip is too long and outside of the specifications. Please consult VISAYA or the appropriate method for further details.
- After some use, it may be necessary to clean the end blocks. Using a mild detergent, carefully clean the blocks using a non-abrasive cloth. Pat dry with a clean cloth when completed. Do not immerse the handle in liquids.



Please see the Troubleshooting section of this manual for more information. Your NFX Handle is designed to operate worry-free for years. In the event your handle needs to be replaced, a replacement can be done quickly in the field with a software-driven calibration procedure.



Software Navigation

Your new CuDDI was designed with an internal high-end industrial PC, which allows for the latest advancements in graphical user interfaces. Using a P-Cap screen, interfacing with the software and data entry is easily achieved. The intuitive software typically only requires a few minutes of training for routing operation. Using a unique Wizard-driven sample set-up, CuDDI guides you through many of the routine tasks for rating copper strips. Please consult the following sections for a detailed explanation of all elements of the software.

Main Screen

After proper installation of your CuDDI, software will automatically boot onto the main screen. The software is divided into five main sections, with each section represented by an icon. Each icon visually describes the sub-menu and also is labeled accordingly below. Navigating within these icons is done by a simple swipe left to right against the icons. One can also use the drag and drop function of an external mouse if preferred. To enter one of these sub-menus, simply use a single touch or single click. To return to the main menu, use the arrow placed conveniently at the top right portion of the screen.



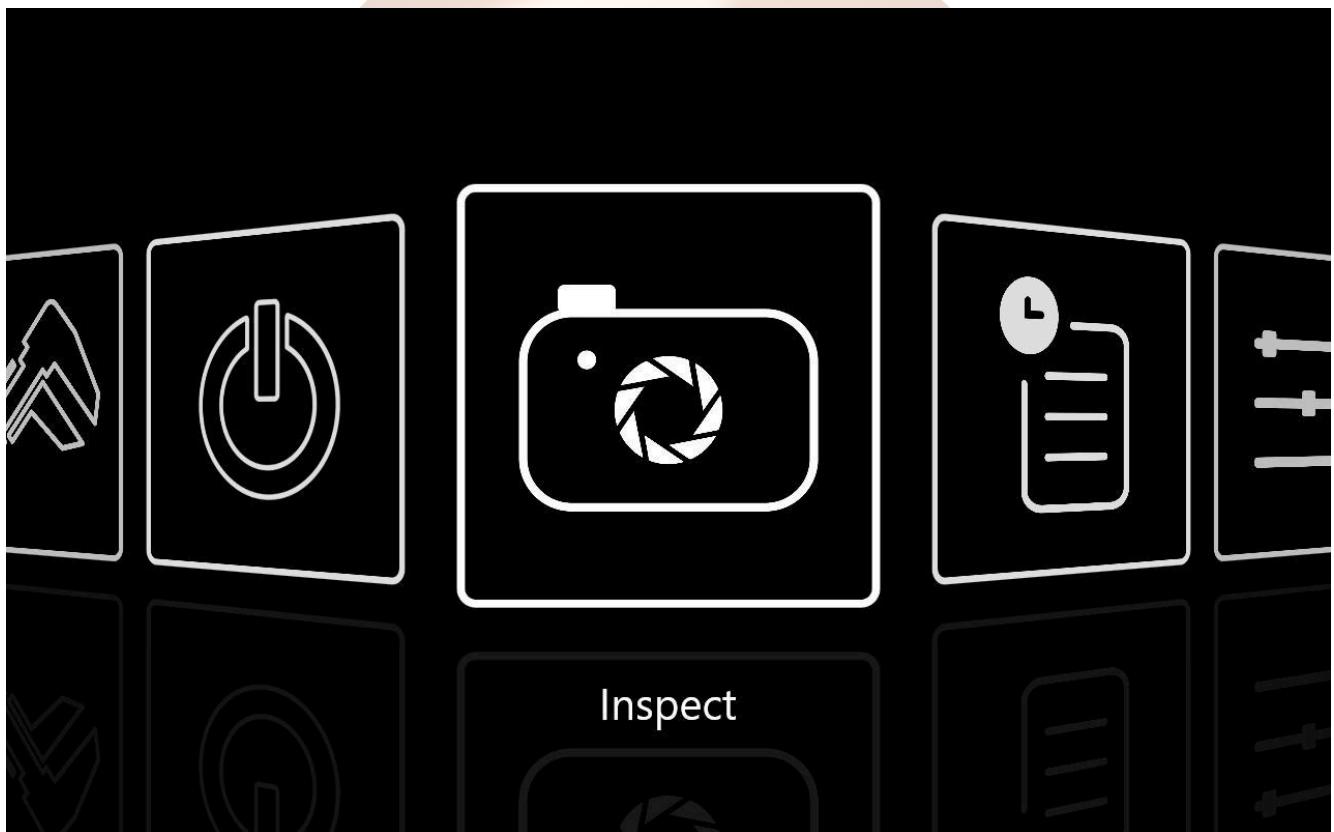
Main screen navigation is briefly described below and described in detail in subsequent sections:

- **Inspect:** Screen to begin inspection and rating of copper strips.
- **History:** Archive and database of previous results
- **Settings:** General settings such as date, time, language, LIMS, network, etc.
- **Diagnostics:** Screen to check mechanical, electrical and I/O of CuDDI
- **Calibration:** Menu to verify daily QC and to recalibrate the VISION system of CuDDI



Inspect Screen

The inspect screen is where an operator would perform the automated inspection of an unknown strip. To start an inspection, simply tap on the Inspect icon from the main menu. Depending on the configuration of the analyzer, the operator would have the ability to run in fully automated mode or the semi-automatic mode. The semi-automatic mode prompts the user for the manual rating, prior to displaying the automated color rating. This mode is critical for methodology that does not fully recognize the CuDDI algorithm for color determinations.





Running an Analysis

Running an inspection is achieved using a simple Wizard-driven menu. Upon entering the Inspect menu, the user is presented with the option to enter a sample name. CuDDI conveniently displays the last 12 entered sample IDs for re-use. Alternatively, the user can click or tap in the sample ID section to display an onscreen keyboard for entry of a new sample ID. The keyboard allows the entry of up to 255 characters and accepts standard ASCII characters. Changes and deletion of text can also be made using the keyboard.

After successful entry of a valid sample ID, the Next button will become activated. Confirmation of the sample ID is confirmed using the Next button located at the top-right hand corner.

needed. Once satisfied with the selection, the Next button will be present to allow entry into the next step of the Wizard.

The next option presented is the optional Description or comments of a sample inspection. This field is used to enter other information such as notes, Tank ID, etc. To enter a description/comments, simply tap or click on the white entry box to display an onscreen keyboard.

Once complete, press the Next button to proceed with the inspection of your copper strip.

After completing all the necessary sample identifiers (sample ID, operator name, test method and optional

After pressing the Next button, the operator is presented with options to enter a Test Method and Operator Name.

Methods are fixed and selected using a dropdown box.

Operator names are fixed and selected using a dropdown box. To add new operator names, please consult the Settings section of this manual.

CuDDI conveniently holds the last selection from the previous runs. Operators can change these selections as

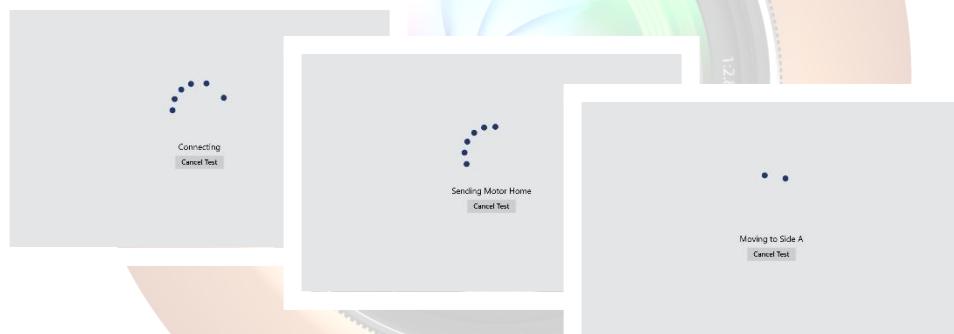


description), the automated visual analysis is started. CuDDI will automatically run through the following sequence during this phase:

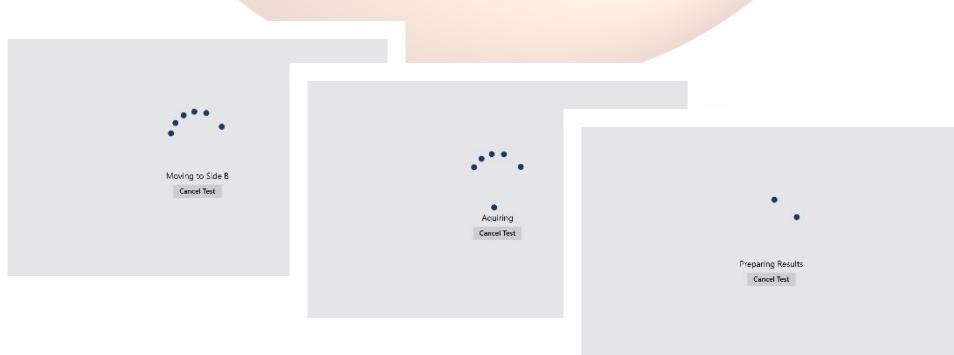
- CuDDI connects to the hardware, which includes the Imaging Device and Drive
- CuDDI homes positions to both drive systems to ensure accurate and repeatable positions
- CuDDI moves strip to Position A, which is the first side of the copper strip
- CuDDI then moves to Position B, which is a 180 degree rotation of position A
- For both positions, CuDDI scans the entire strip to develop a high-resolution image of the copper strip
- After positioning and scanning, CuDDI enters into the third phase of the algorithm, which classifies the color ratings using predetermined quadrants

The preceding steps are briefly illustrated in the images below:

Start:



..cont.:





After successful completion of an inspection, CuDDI will display the following data:

- Images of both sides of strips A & B
- Sample identifiers as entered along with date & time
- Rating along with description and warnings
- Clicking on “*See more information...*” will display:
- Measurement and determination of whether strip dimensions are within tolerance
- Individual ratings for each side

Analyze Results

Side A Side B

Sample Name: Sample Test-6
Date: 6/15/2015 12:10:29 PM
Test Method: ASTM B130
Operator: John Doe
Description:

Rating: 4a

The highest percentage ranking found (0) was overwritten with 4a because it was more corrosive.

See more information... Override rating...

Strip width (mm)	Pass/Pass	Side A: 30.9 mm x 166.0 mm / Side B: 30.8 mm x 166.8 mm
Side A rating	4a	Corrosion
Side B rating	4a	Corrosion
Overall rating	4a	Corrosion

Print Export Data Done

Analyze Side B

Side A Side B

Rating: 4a Corrosion

0	53%	Faintly Tarnished
1a	0%	Slight Tarnish
1b	0%	Slight Tarnish
2a	17%	Moderate Tarnish
2b	7%	Moderate Tarnish
2c	0%	Moderate Tarnish
2d	0%	Moderate Tarnish
2e	0%	Moderate Tarnish
2f	0%	Moderate Tarnish
2g	0%	Dark Tarnish
2h	0%	Dark Tarnish
3a	21%	Corrosion
3b	0%	Corrosion
3c	0%	Corrosion
3d	0%	Corrosion

Activate zoom... Go to PC... Go to camera...

For each side, a user can tap on an image to show a zoomable image within a pop-out window. To zoom in and out, simply pinch and zoom or, using a mouse and keyboard, hold the Ctrl key to scroll onto the image. This view will also display the tabulated results for each rating as determined by the algorithm. This tabulation is used to logically determine ratings based on a specific set of criteria and weighting system. To exit this view, simply click on the “X” at the top right-hand corner

CuDDI uses a sophisticated algorithm for determining color and ratings of copper strips. In the rare occasion that the user does not agree with the rating, the user is able to click on the “Override rating...” button to bring up a familiar looking chart, which can be used to manually select a rating as determined visually. CuDDI will then store this data together with the original automated rating.

Analyze F Manual Override Rating

Side A Side B

Rating: 4a Corrosion

Corrosion Standards: Select the most similar rating

0 1A

Confirm () Cancel

The highest percentage ranking (0) was overwritten with 4a because it was more corrosive.

Override rating... Side A: 30.9 mm x 166.0 mm / Side B: 30.8 mm x 166.8 mm



Semi-Automatic Mode

Semi-automatic mode allows laboratories that require manual interpretation of results, but still want the convenience of CuDDI's many features, such as LIMS connectivity and a cross-verification of ratings. If activated in the Settings menu, CuDDI features the ability to prompt the user for the manual external rating prior to CuDDI displaying its automated rating. This works similar to the preceding override function, but selection must be made prior to a run as to not be influenced by CuDDI's rating.

Just like the fully automated Wizard, which prompts for a sample ID, method, operator and optional description prior to a run, the user is presented with an additional option: simply select the manual rating, which is confirmed by a tap or click. If selected incorrectly, click on a selection until satisfied. Once complete, click the Run button to initiate a run.

CuDDI will then run its analysis using the same method as fully automated mode, however, the display of data will be different. These differences include:

- Rating display box will show the Manual Rating along with the Automated Rating
- Final Rating Selection, which is done by selecting either Manual or Auto
- Override Rating can also be used in this mode.

Analyze

Expected Rating: 2c

0 1a 1b 2a 2b 2c 2d 2e 3a 3b 4a 4b 4c

Go to PC settings to activate Windows.

Analyze Results

Side A	Side B	
Sample Name: Sample Test-6	Date: 6/16/2015 12:09:20 PM	
Test Method: ASTM D130	Operator: John Doe	
Description:		
See more information...		
Strip within steps?	Pass/Pass	Side A : 30.8 mm x 160.9 mm / Side B : 30.9 mm x 167.9 mm
Side A rating	4a	Corrosion
Side B rating	4a	Corrosion
Overall rating	4a	Corrosion

Rating: **1A** **4a**

The highest percentage ranking found (0) was overwritten with 4a because it was more corrosive.

Final: **Manual** **Auto**

Override rating...

Print Report Done

Operator has the ability to select either the Manual or Auto rating as the final rating.



Saving and Options

After analysis, the user is presented with the following options at the bottom bar:

- Done: Saves results to database and returns to Analyze screen for next analysis. If LIMS function is activated, analyzer will also write LIMS results at this time.
Note: See LIMS Settings
- Delete: Deletes result and does not store to database.

Analyze Results

Side A Side B

Sample Name: Sample Test-6
Date: 6/15/2015 12:08:20 PM
Test Method: ASTM D130
Operator: John Doe
Description:

Rating: Manual 1A Auto 4a
The highest percentage ranking found (1A) was overwritten with 4a because it was more corrosive.

Final Manual Auto
Override rating...

Print Export Delete Done

Analyze Results

Side A Side B

Name: r123
Date: 01/09/2016, 2:48 PM
Method: ASTM D130
Operator: Rig 2
Description:

Rating: 3b
The highest percentage ranking found (1b) was overwritten with 3b because it was more corrosive.

See more information...

LIMS USB E-mail

Print Export Delete Done

- Print: Sends results page and images to predefined printer. Results will be printed in a similar format as PDF output.

Note: See Printer Settings

Export:

- Export to LIMS: Manual export to LIMS
- Export to USB: Manual write to an external USB memory or location on hard disc for easy sharing of results.
- Email: Send results as a PDF output to an email address. User will be prompted to enter an email address.

Note: See Email Settings

Analyze Results

Side A Side B Name: r123 Rating:

Do you want to delete selected item(s)?

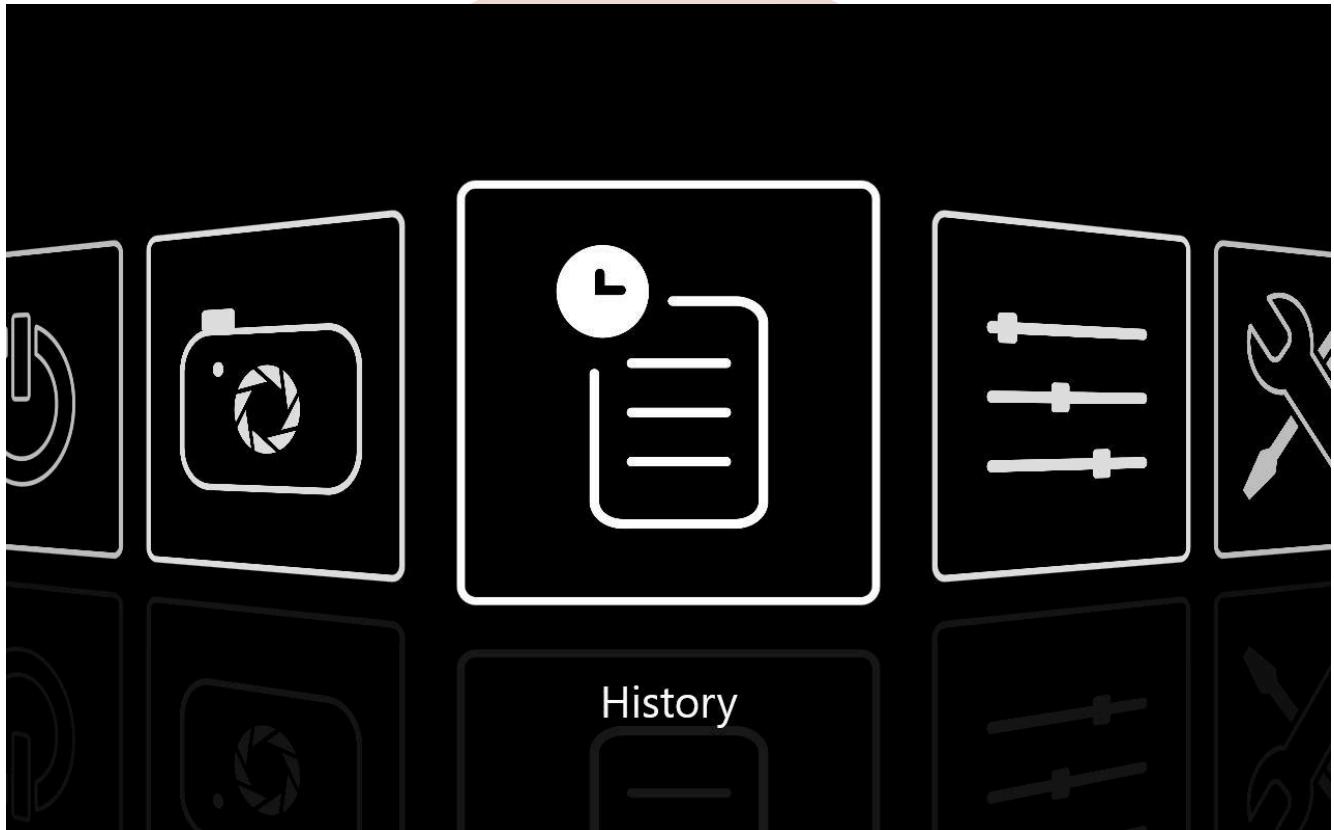
Yes No

Print Export Delete Done



History

The History screen is where an operator can view stored results in the database. Operator also has the ability to filter results, export, print, and delete results from the database. CuDDI's intuitive software allows the capability to export multiple results.





View Database Results

Entering the History database, you will be presented with a list view of all the saved results. Using the summary list view, operator has the ability to quickly see the sample ID, date, operator, method and overall rating.

Results shown under rating column with a (**), represent the automatic or manual rating that was overridden. If the semi-automatic mode is activated, the user will also be presented with three different icons to represent the operator's selection: Fully Auto, Semi-Auto, or Manual Override.

⌚ History

Sample Id	Date	Operator	Method	Rating
Sample Test-6	6/16/2015, 9:12 AM	John Doe	ASTM D130	1B (4a)
Sample Test-5	6/16/2015, 9:11 AM	John Doe	ASTM D130	1B (4a)
Sample Test-4	6/16/2015, 8:56 AM	John Doe	ASTM D130	2D (4a)
Sample Test-3	6/16/2015, 8:55 AM	John Doe	ASTM D130	2C (4a)
Sample Test-2	6/16/2015, 8:54 AM	John Doe	ASTM D130	1B (4a)
Sample Test-1	6/16/2015, 8:50 AM	John Doe	ASTM D130	1B (4a)

🖨️ Print
📤 Export
🗑️ Delete
👁️ View
🕒 Clear filters
🕒 Clear selection
🌐 Select all

Clicking the View button will display results similar to the results page displayed after a test analysis. Operator has the ability to perform print, export and delete functions, as well as zoom in to images. To ensure data integrity, the following options are not available:

- Change sample identifiers
- Change method
- Override or change final rating

Note: See Saving and Options

⌚ History

Sample Id	Date	Operator	Method	Rating
Sample Test-6	6/16/2015, 9:12 AM	John Doe	ASTM D130	1B (4a)
Sample Test-5	6/16/2015, 9:11 AM	John Doe	ASTM D130	1B (4a)
Sample Test-4	6/16/2015, 8:56 AM	John Doe	ASTM D130	2D (4a)
Sample Test-3	6/16/2015, 8:55 AM	John Doe	ASTM D130	2C (4a)
Sample Test-2	6/16/2015, 8:54 AM	John Doe	ASTM D130	1B (4a)
Sample Test-1	6/16/2015, 8:50 AM	John Doe	ASTM D130	1B (4a)

🖨️ Print
📤 Export
🗑️ Delete
🕒 Clear filters
🕒 Clear selection
🌐 Select all

To view more information:

- Simply click to highlight a row
- Tap to click the View button at the bottom action bar. *Note that the View button is only available when a single sample row is selected. Selecting more than one row at a time will remove the ability to use the View option.*

⌚ Analyze Results

Side A

LIMS
USB
E-mail

Side B

Name: r123
Date: 01/09/2015, 2:48 PM
Method: ASTM D130
Operator: Rig 2
Description: [See more information ...](#)

Rating: 3b

The highest percentage ranking found (1b) was overwritten with 3b because it was more corrosive.

🖨️ Print
📤 Export
🗑️ Delete
🕒 Done



Setting Filters

Within the History screen, the operator has the ability to filter data shown in the columns. This ability allows the operator to:

- Quick search and find results
- Sort by a particular method or rating
- Sort and display results from a specific date range
- Filter a specific data set for export and analysis

The following filter options are available:

- Filter by sample ID: Open as a search box that allows you to enter values to search by
- Date: Displays data by a specific date or range of dates
- Operator: Displays list of stored operators to filter results from a specific operator
- Method: Displays list of methods by which to filter
- Rating: Filters by specific rating and analysis mode

Note: Activating any of the filters will change the color of the Filter icon for each column from white to blue

Activating any of the filters will display only relevant data if available. Otherwise, CuDDI will display a blank screen.

Multiple rows or a single row can be selected to export, print or further filter. In addition to these options, the operator also has the ability to:

- Clear all filters to return all results to the screen
- Clear selection to start over
- Select all to easily select all filtered results

Sample Id	Date	Operator	Method	Rating
Sample Test-6	6/16/2015, 11:46 AM	John Doe	0 1A 1B 2A 2B 2C 2D 2E	Confirm Clear
Sample Test-6	6/16/2015, 11:12 AM	John Doe	3A 3B 4A 4B 4C	Confirm Clear
Sample Test-5	6/16/2015, 11:11 AM	John Doe		
Sample Test-4	6/16/2015, 10:56 AM	John Doe		
Sample Test-3	6/16/2015, 10:55 AM	John Doe		
Sample Test-2	6/16/2015, 10:54 AM	John Doe	ASTM D130	1B (4a)
Sample Test-1	6/16/2015, 10:50 AM	John Doe	ASTM D130	1B (4a)

Sample Id	Date	Operator	Method	Rating
Sample Test-6	6/16/2015, 11:46 AM	John Doe	0 1A 1B 2A 2B 2C 2D 2E	Confirm Clear
Sample Test-6	6/16/2015, 11:12 AM	John Doe	3A 3B 4A 4B 4C	Confirm Clear
Sample Test-5	6/16/2015, 11:11 AM	John Doe		
Sample Test-4	6/16/2015, 10:56 AM	John Doe		
Sample Test-3	6/16/2015, 10:55 AM	John Doe		
Sample Test-2	6/16/2015, 10:54 AM	John Doe	ASTM D130	1B (4a)
Sample Test-1	6/16/2015, 10:50 AM	John Doe	ASTM D130	1B (4a)

Sample Id	Date	Operator	Method	Rating
x1	12/17/2015, 11:19 AM	Rig 2	ASTM D130	3b
x1	12/17/2015, 10:37 AM	Rig 2	ASTM D130	3b
x1	12/15/2015, 11:46 AM	Rig 2	ASTM D130	3b
x1	12/15/2015, 11:27 AM	Rig 2	ASTM D130	3b
x10	12/02/2015, 3:15 PM	Rig 2	ASTM D130	3b
x1	12/02/2015, 2:09 PM	Rig 2	ASTM D130	3b
x10	12/02/2015, 1:54 PM	Rig 2	ASTM D130	3b



Export & Data Options

Filtered results as well as unfiltered results displayed on the History screen can be exported, printed, emailed and deleted, among some of the available functions. The operator, upon selection of a result either from default or filtered results, can perform the following:

- Manual export to LIMS
- Save to USB or hard disk space
- Email to user

Note: see Saving and Options sections for more details

Sample Id	Date	Operator	Method	Rating
x1	12/17/2015, 11:19 AM	Rig 2	ASTM D130	3b
x1	12/17/2015, 10:37 AM	Rig 2	ASTM D130	3b
x1	12/15/2015, 11:46 AM	Rig 2	ASTM D130	3b
x1	12/15/2015, 11:27 AM	Rig 2	ASTM D130	3b
x10	12/02/2015, 3:15 PM	Rig 2	ASTM D130	3b
	12/02/2015, 2:09 PM	Rig 2	ASTM D130	3b
	12/02/2015, 1:54 PM	Rig 2	ASTM D130	3b

Buttons at the bottom: Print, Export, Delete, Clear Filters, Clear Selection, Select All.

History

Sample Id	Date	Operator	Method	Rating
<i>Do you want to delete selected item(s)?</i>				
x1	12/02/2015, 2:09 PM	Rig 2	ASTM D130	3b
x10	12/02/2015, 1:54 PM	Rig 2	ASTM D130	3b
...	12/02/2015, 12:20 PM	Rig 2	ASTM D130	3b

Buttons at the bottom: Yes, No.

The operator, upon selection of a result either from default or filtered results, can delete entries from the database. To delete an entry, simply select a single or multiple results from list view and tap the delete button. The operator will then need to verify the deletion of results on a confirmation screen.

Note: Deletion is permanent and cannot be un-done. Please turn on administrator mode for restrictions.

The operator, upon selection of a result either from default or filtered results, can print entries from the database. To print, simply select a single or multiple results from list view and tap the print button. CuDDI offers the convenient ability to print simple or multiple results at the same time.

Note: see Setting - Printing sections for details on defining printers

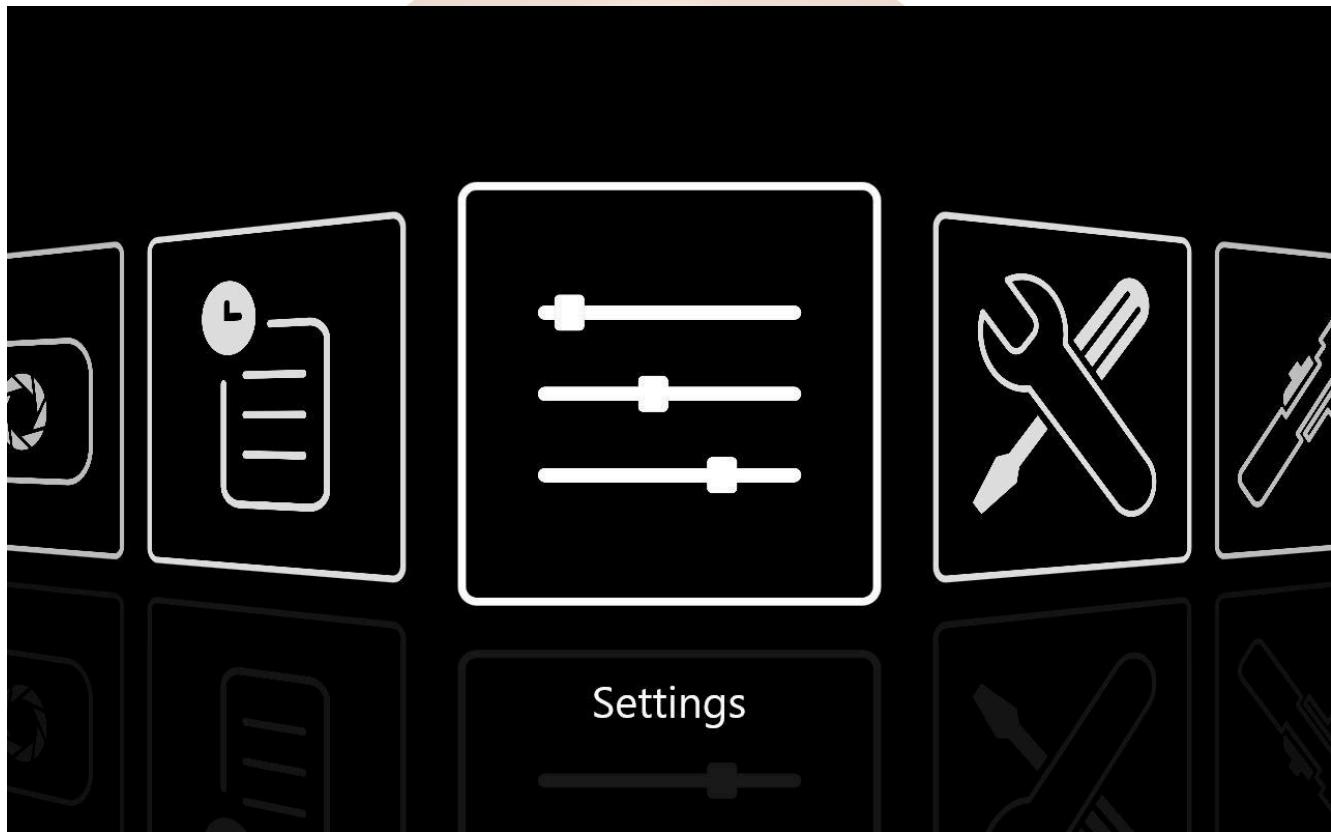
Sample Id	Date	Operator	Method	Rating
<i>Printing ...</i>				
x1	12/02/2015, 2:09 PM	Rig 2	ASTM D130	3b
x10	12/02/2015, 1:54 PM	Rig 2	ASTM D130	3b
...	12/02/2015, 12:20 PM	Rig 2	ASTM D130	3b

Buttons at the bottom: Print, Export, Delete, Clear Filters, Clear Selection, Select All.



Settings

The Settings screen is CuDDI's central location for defining system-wide parameters such as users, date, e-mail, LIMS, printing, etc. Changes, additions and navigation are easily performed using the integrated touchscreen and onscreen keyboard. Protection against critical functions of the software are defined within the Settings, using an Admin password.

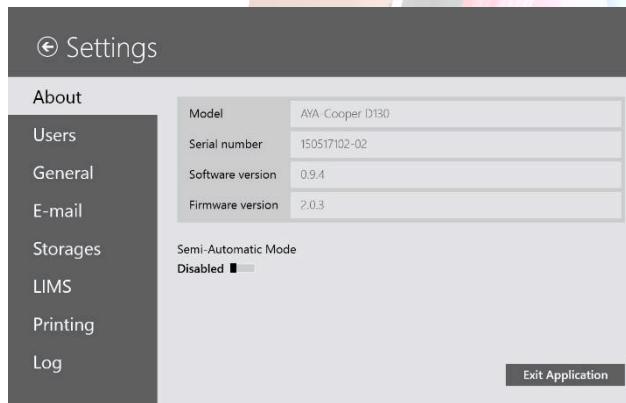
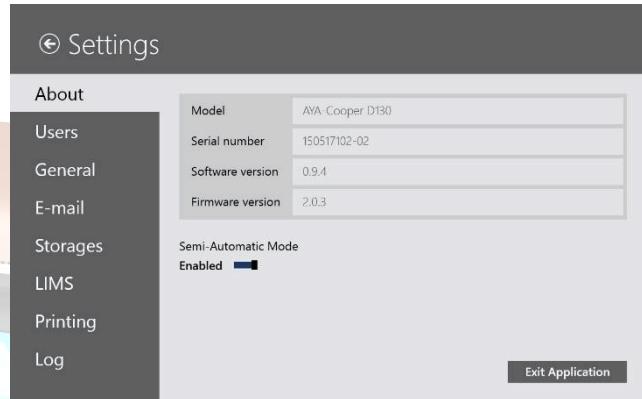




About

The About screen displays basic information about your CuDDI analyzer:

- Model Number: Displays model number and hardware version of your analyzer
- Serial Number: Displays serial number, which also appears on back of analyzer
- Software Version: Software version of GUI or Interface
- Firmware Version: Hardware control software



Semi-Automatic Mode can be activated with the About screen option, as detailed in section Inspect Screen – Semi-Automatic Mode. To activate or deactivate this mode:

- Tap to toggle the mode to Enabled to activate
- Tap to toggle the mode to Disabled to deactivate
- There is no Save button to confirm this change – settings will update automatically

Note: See Inspect Screen section for more Details.

CuDDI is operated in a protected mode called KIOSK or Assigned Access mode. This mode is critical to protect against changes to the software and operating system, as well as to prevent the ability to run malicious programs on CuDDI. This operating mode allows only the approved CuDDI software to run.

It may be necessary to exit this mode to allow access to the administrator account to perform functions such as Adding to Domain, Defining Network Printers, and IP Address functions. To exit CuDDI's operating mode, press the Exit Application button and allow the administrator to access a CuDDI Admin account. Please contact VISAYA for more information on making changes and the password of VISAYA Admin account.

Note: The Exit Application Mode button is only available when operating when no Admin Password is activated.



Users

Operators, for use within the Inspect analysis screen and filtering options detailed in History, are defined in this section. To create a new operator:

- Click the + next to New Operator
 - User will be prompted to enter a new Name
- Note: Name must be unique from other operators and can be alpha-numeric*
- Click Confirm to confirm a new entry

New User will be displayed in Operators List. Once created, an Operator Name can be edited and deleted. To edit and delete a user:

- Click on the Edit Icon next to the Operator you wish to edit
- Click on the Delete Icon next to the Operator you wish to delete
- It is not necessary to confirm these changes using the Confirm button. All edits are permanent.

Operator	Edit	Delete
John Doe		

Edit operator

Name: Operator

Confirm Cancel

LIMS Printing Log

CuDDI's software provides an easy-to-use Admin mode to prevent access to critical parts of the software. Any critical functions can be locked with a prompt for password to allow access and/or changes. To activate this function, simply type a password in the Change Admin fields. Password must be entered a second time to confirm entry. To activate this function, it is necessary to confirm using the Confirm button at the bottom of the screen. Alternately, you can press cancel to start all over with a new password.

Operator	Edit	Delete
John Doe		
Juan Ayala		



Once this feature is activated, any attempt to enter critical parts of the software will be prompted with a request to enter a password. Operator can enter Admin password to enter, or cancel to exit screen. Admin Mode prevents changes to the following screens:

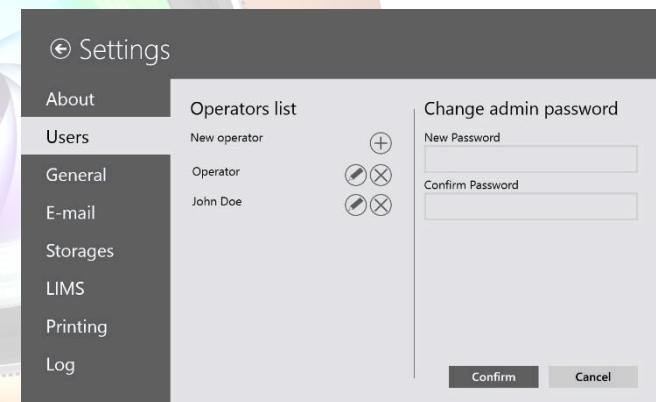
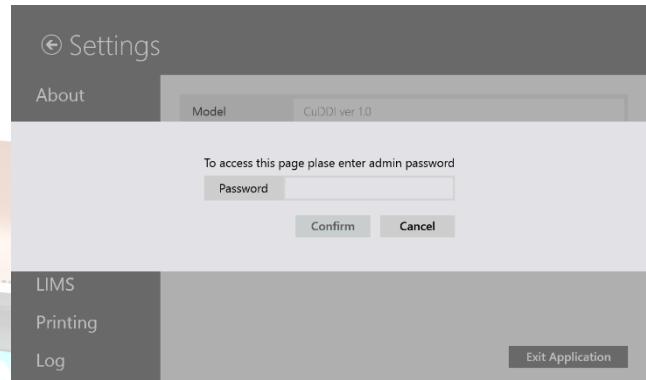
- Enter Settings screen
- Calibration Advance screen
- User will still have ability to perform a Calibration Verification

Admin Mode provides an easy-to-use protection mode without the need for complex usernames and passwords with various user rights and access levels.

To remove Admin Mode, simply:

1. Enter Settings Page
2. Enter Admin Password when prompted
3. Enter Users section and
4. Erase password from both “New Password” & “Confirm Password” fields
5. Press the “Confirm” button to accept removal of admin mode

Note: If Admin password is lost, please contact VISAYA Service for master password to regain access to your system.





General

The General section of the Settings page is used to view current system time, change date format and select language.

Date/Time Options:

- Short Date/Time Format: Displays data in reports and list views used in History
- Long Date/Time Format: Displays data in LIMS and database

⌚ Settings

About	9:18:12 AM, Tuesday, June 16, 2015
Users	Short date format M/d/yyyy
General	Current language English (United States)
E-mail	Long date format dddd, MMMM d, yyyy
Storages	Short time format h:mm tt
LIMS	Long time format h:mm:ss tt
Printing	
Log	

Confirm **Cancel**

⌚ Settings

About	7:03:47 PM, Sunday, January 24, 2016
Users	Short date format MM/dd/yyyy
General	Current language English (United States)
E-mail	Long date format dddd, MMMM d, yyyy
Storages	Short time format h:mm tt
LIMS	Long time format h:mm:ss tt
Printing	
Log	

Confirm **Cancel**

CuDDI's software features the ability to display in a growing number of languages. To change language files, simply select desired language from dropdown box. Upon selection of a new language, the software will reset within seconds, displaying the software in the new language.

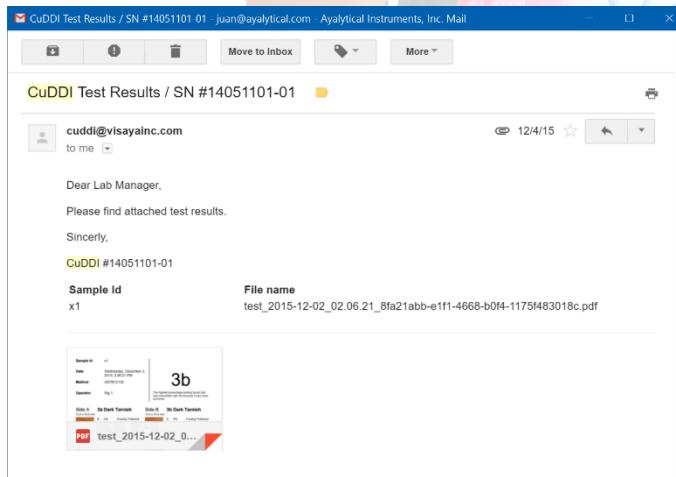
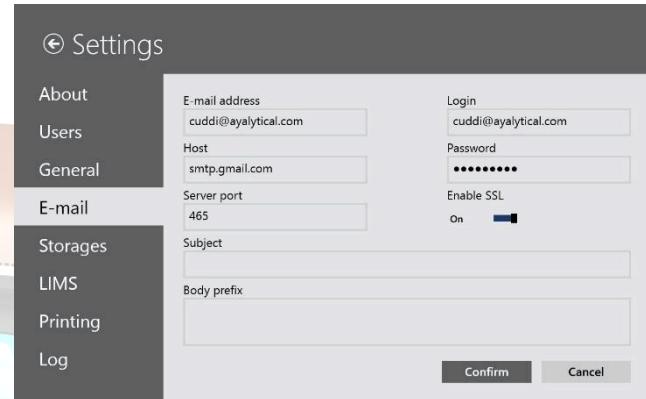


Email

CuDDI has the ability to send an email upon request via the Results view screen, history and log files.

Configuration of the email server settings must be defined before using this service.

- Email: Unique Address
- Host: SMTP or IMAP Email Server
- Server Port: Server Software Port
- Login: User Name
- Password: Password for User
- SSL: SSL – Turn On/Off



Email Subject and Body text defaults to the following when left blank:

Subject:

"CuDDI Test Results / SN #XXXXXXXX-XX"

Body Text:

"Dear Lab Manager, Please find attached..."

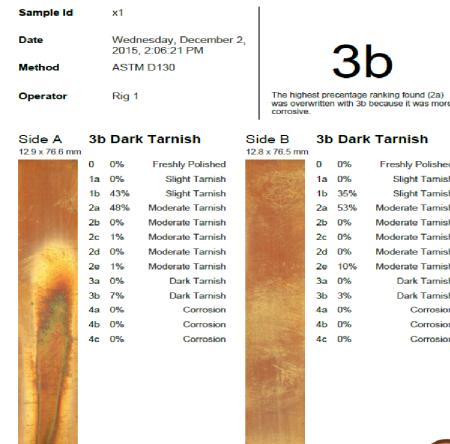
Sincerely, CuDDI Test Results / SN #XXXXXXXX-XX

Sample ID - Filename ID"

If you prefer to use a unique subject line and body text, simply fill in the corresponding fields with custom content.

Within the email, CuDDI will embed a PDF document containing all the test results along with images. Final rating and messages are also included.

- Sample ID
- Date
- Method
- Operator
- Individual Side Ratings
- Percentages for Rating Classification
- Descriptions for each type of rating

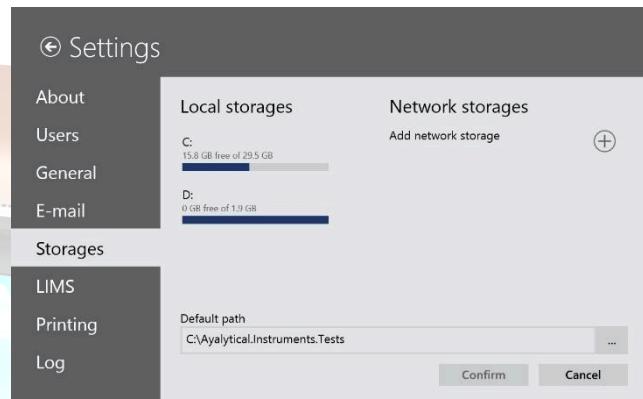




Storages

CuDDI works within a specialized industrial application in a Windows-embedded OS, which uses a solid state hard drive for the storage of test results.

- The blue progress bars show the storage space remaining on the SS hard drive, always designated by location: C
- Any additional external hard drives or USB memory devices will also be shown here
- The Default Path displays the default storage location for test results. If needed, the location can be changed by clicking the button at the end of the file path field
- Normally the integrated hard drive is sufficient. In the event the administrator needs to change the storage location, the ability to add a network storage location, such as a network share, is allowed. Clicking on the Add Network Storage button opens a dialogue page to allow this function. If needed, Default Path for storage results can be changed to this new location.



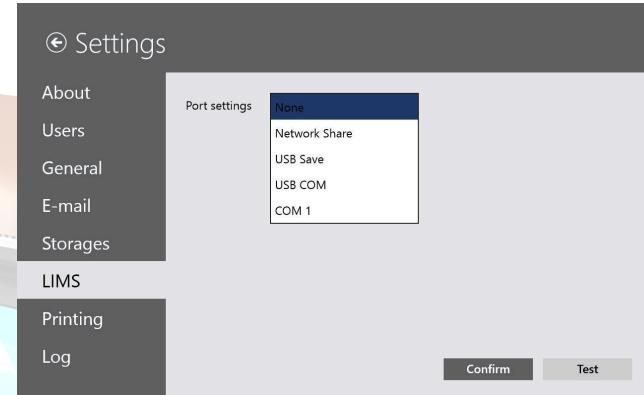


LIMS

CuDDI features full LIMS integration with a variety of options to fit virtually every LIMS system and allows for flexibility in the connections options:

- Network Share: Network storage or share
- USB Save: Using a USB as a share
- USB COM: USB port communication
- COM 1: Serial communications

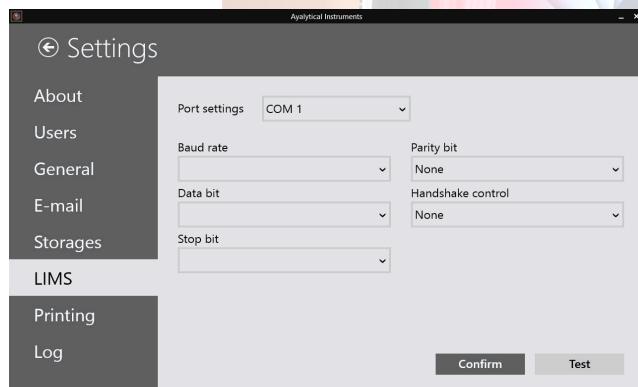
Using the dropdown selection box, simply select the desired mode of communications to access more options pertaining to that mode.



USB COM and COM 1 LIMS communications work in a similar fashion. COM Communications allows a serial output

of the data in a fixed format using a standard 9 PIN RS-232 connection, and USB COM uses a standard USB connection to communicate in a serial fashion. The following parameters need to be defined:

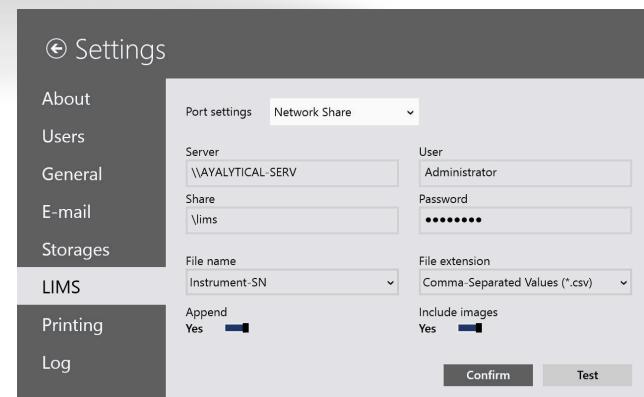
- Baud rate
- Data bit
- Stop bit
- Parity bit
- Handshake control



Note: Serial port has to be installed for COM 1. Contact VISAYA service for more details.

LIMS communication via Network Share and USB Save allows CuDDI to write results to Network Share or location to a remote server. Prior to communication with a Network Share, the following parameters must be default:

- Server: Address location of server
- User: User name credentials
- Password: Password of user
- Share: File path or share location





Settings

- About
- Users
- General
- E-mail
- Storages
- LIMS
- Printing**
- Log

Port settings: Network Share

Server: \\VAYALYTICAL-SERV	User: Administrator
Share: \lims	Password: *****
File name: Method Name	File extension: Comma-Separated Values (*.csv)
Instrument-SN	Include images: Yes
LIMS	

Confirm **Test**

The File Name can be changed to suit the needs of various LIMS systems:

Method Name: Test method name (i.e. ASTM_D130.csv)

Instrument-SN: Uses serial number of analyzer

LIMS: Automatically assigns LIMS as file name

Select Append to Yes for CuDDI to write a new data line to the existing file.

Select Append to No for CuDDI to erase and write a new file for each sample test result.

Select Include Images to Yes to send images to an images folder with a serialized ID.

A file format is selectable for best compatibility with various LIMS systems. CuDDI has the ability to export and select from a variety of formats using dropdown menu:

- Text Document: Simple plain text format with file delimited with a comma
- CSV Format: Comma separated values with file delimited with a comma
- XML Format: XML output with full markup and identifiers of each field. Best option to use for building custom PDF with images.

Settings

- About
- Users
- General
- E-mail
- Storages
- LIMS
- Printing**
- Log

Port settings: Network Share

Server: \\VAYALYTICAL-SERV	User: Administrator
Share: \lims	Password: *****
File name: Method Name	File extension: Comma-Separated Values (*.csv)
Append: Yes	Include images: Yes

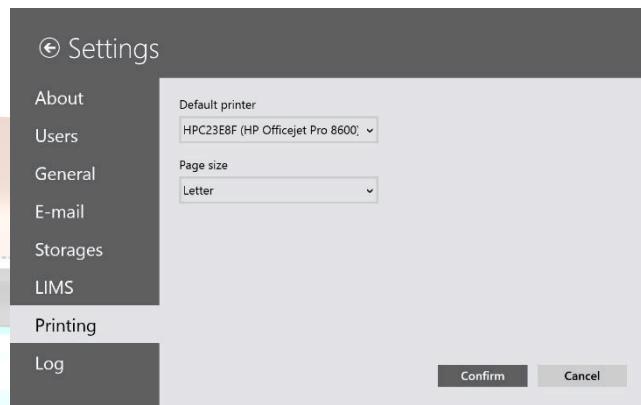
Confirm **Test**



Printing

After an analysis or via the History view, an operator has the ability to print to any network or USB printer. Some settings may require administration assistance, such as driver or network installation.

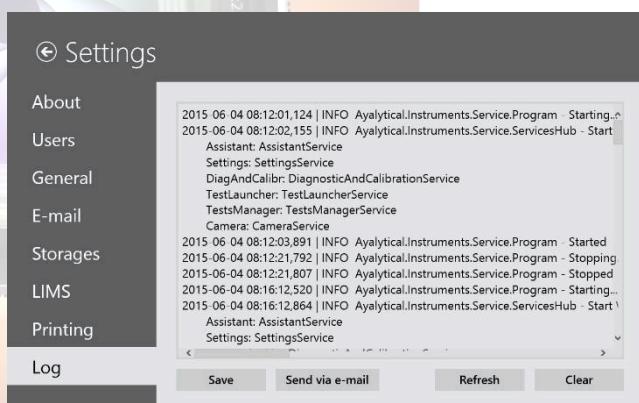
- Default Printer: User selectable printer. Displays all available printers either shareable via network or installed.
- Page size: Letter and A4 selectable file formats for both PDF and printer pages.



Log

CuDDI features a Log file which stores all the communications between the hardware firmware and software. This log can be viewed, saved and sent via email.

- Save: Saves Results to hard drive or external USB memory
- Send via email: Opens dialogue box to enter email address to send log file
- Refresh: Updates display with the latest log entries
- Clear: Clears screen and log to display only the latest entries

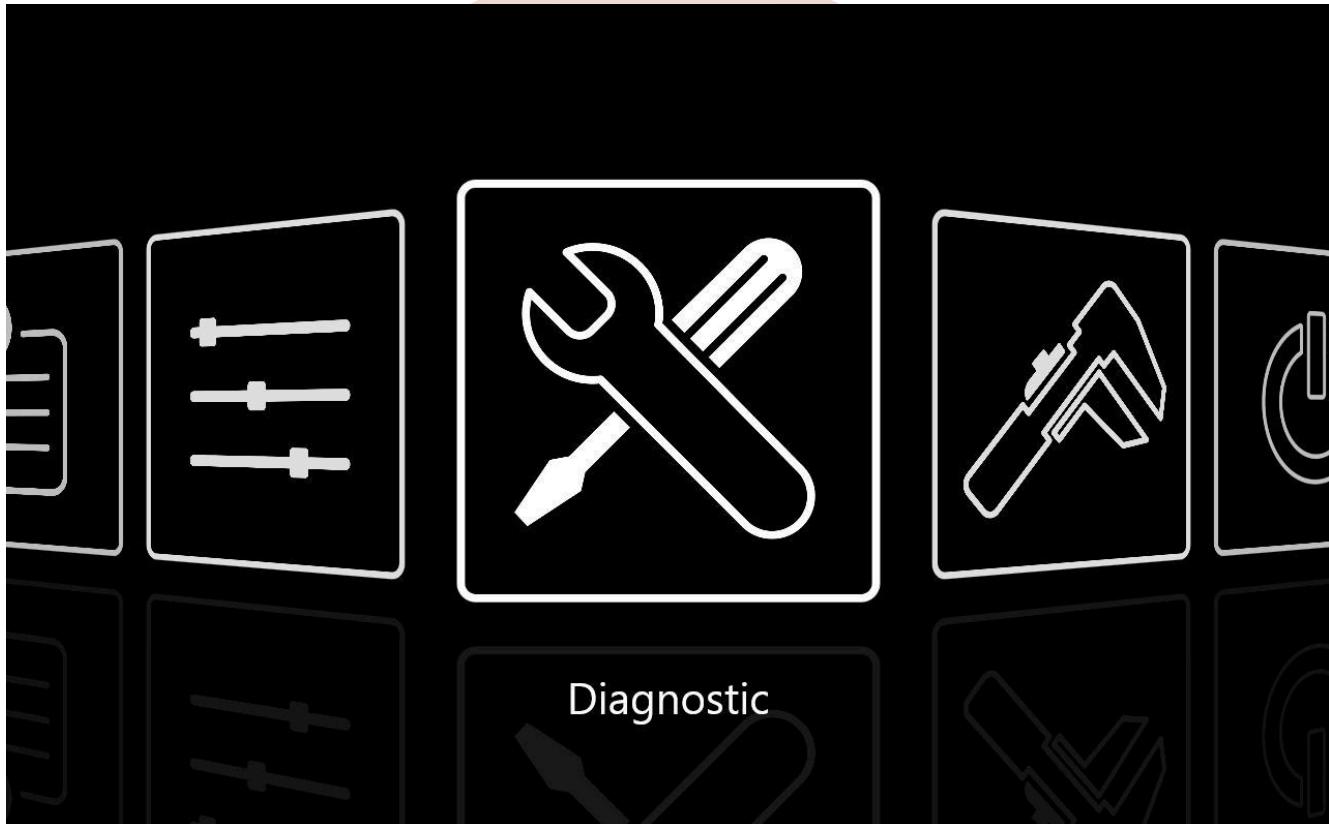


Note: To send via email, Email Settings must be defined. See Email Settings.



Diagnostics

CuDDI's software includes an easy-to-use diagnostics screen for troubleshooting and manual operation/verification of CuDDI's electro-mechanical devices. This screen is useful for both identifying the source of a fault and for manually demonstrating the functions of your CuDDI.





Camera

Camera portion displays a live view as seen by CuDDI and advises if the Camera is communicating with the CuDDI software. This image is updated a few times per second and can be used for manual visual verifications and to ensure the image is displaying correctly.

The toggle light button allows you to manually turn the light On/Off. By default, the light turns on when you enter this screen.

Located at the bottom right of the image is an export button. This button will export the current view to a select folder/share for sharing or troubleshooting.



Live View toggles the live video mode On/Off. Toggling this button allows the use of the scan button, as noted on the image on the left. This button is only activated when live mode is Off.

Scan is activated by pressing the scan button, and CuDDI will scan and display the full image of the entire specimen side. Image can then be viewed and exported, as detailed in the preceding section.

Note: Ensure specimen is in correct position. See Drive section of manual.



Drive

The Drive section displays the current status of the drive. Any faults are detected by this status indication. Under all normal operating conditions, the message will display "Connected."

The Drive controller also functions as the indicator and controller of CuDDI's Inputs & Outputs (IO). This screen was designed to allow the operator or technician to easily view status of the various IOs.

The Drive section also has the ability to move CuDDI's two stepper motors manually. The camera motor controls the scanning motor of the camera. The NFX motor controls the NFX handle, which operates the positions of the specimen. This control ensures the copper strip is always in the correct and optimal position for proper analysis of the unknown samples. Manual operation of these drives can be achieved using the controls, as labeled in the

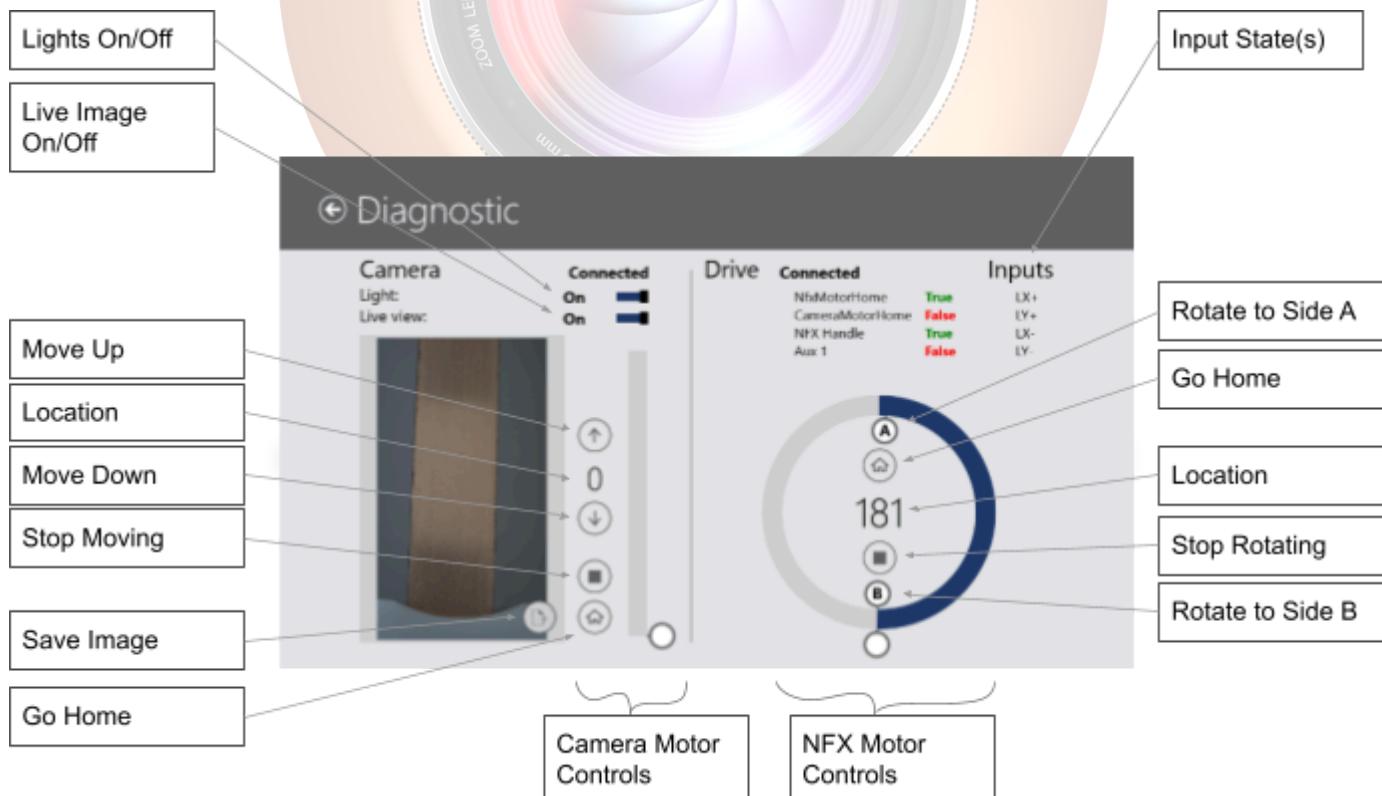
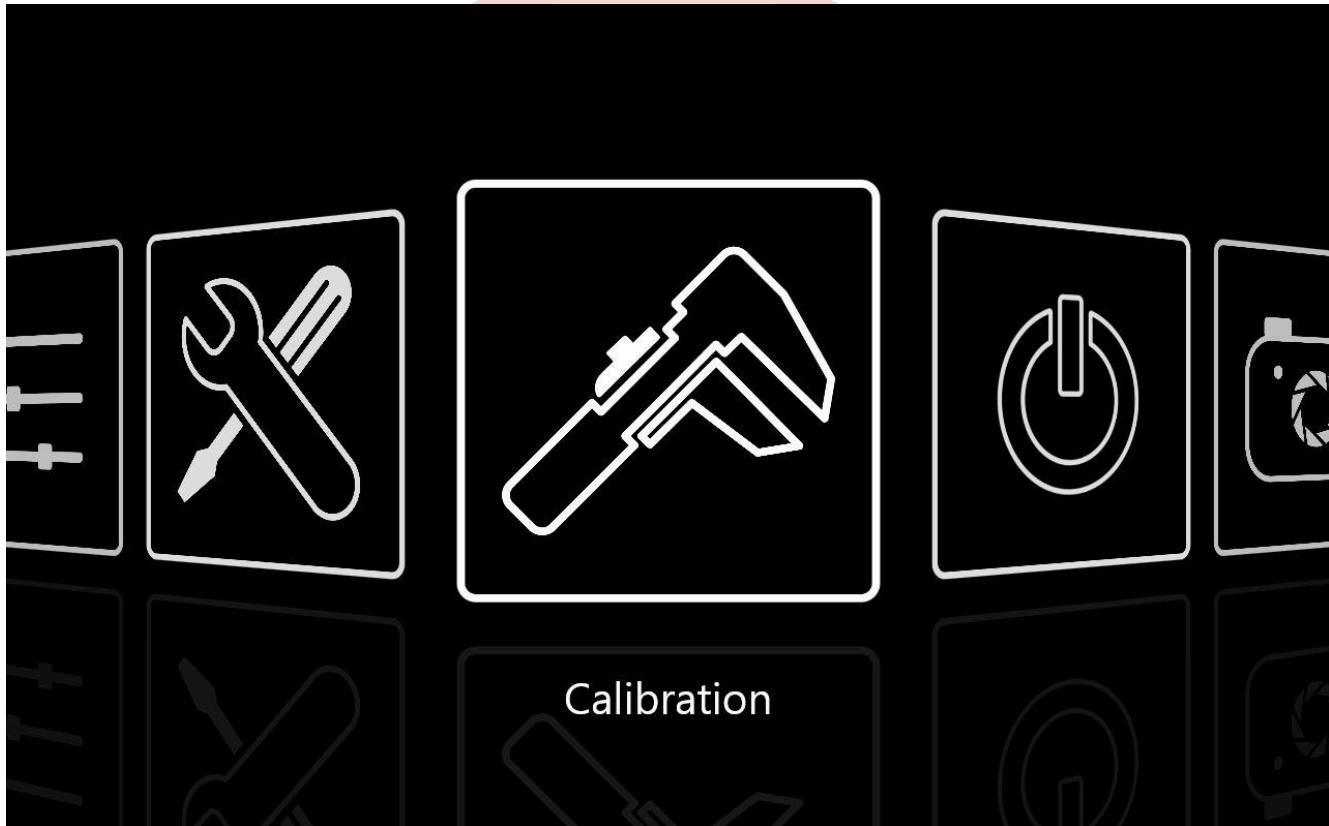


image below.



Calibration

Calibration and verification of your CuDDI is easily achieved via the Calibration screen of the software equipped with the supplied calibration standard. Using an intelligent automated 2-step process, the software automatically determines if calibration is required after a quick verification.

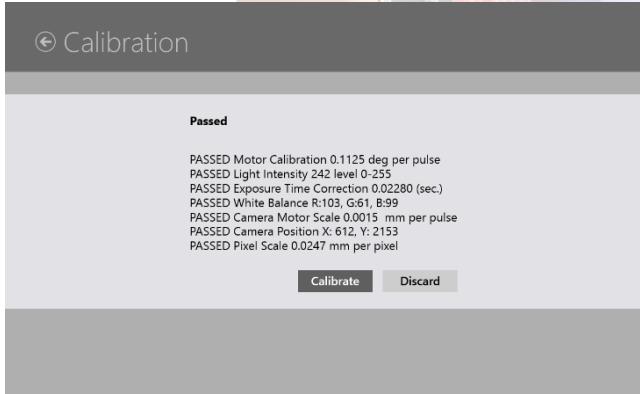
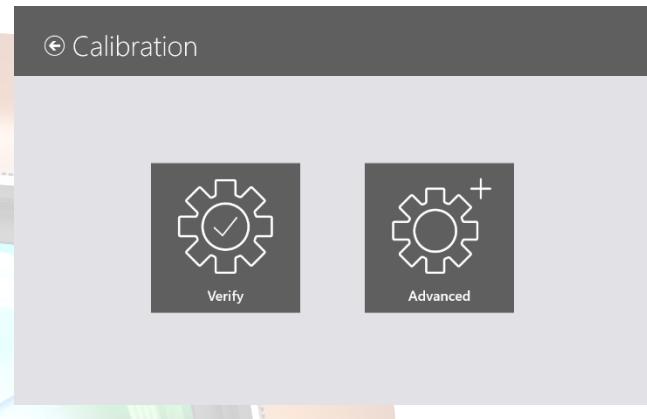




Verification and Calibration

Calibration is performed in three steps:

1. Insert the CuDDI calibration strip into the NFX Handle. The software will automatically determine the white versus black side of the strip.
2. Click Verify to start a sequence of system checks and calibrated set-points. This process can be executed at any given frequency (once per day) to verify CuDDI is working properly.
3. Once Verify is performed, the new calibration set-points can be applied by pressing the "Calibrate" button. If any of the points fail, the option to calibrate will be disabled.



Running a Verify Calibration sequence is the preferred step towards diagnosing rating errors. This will typically identify any failures, such as a dirty camera lens, or a damaged NFX Handle.

Discard the calibration result to continue without calibrating the CuDDI.



Calibration Troubleshooting

Running a Verify Calibration sequence is the preferred step towards diagnosing rating errors. This will typically identify any electrical or mechanical failures. Below is a list of checkpoints and their typical causes:

TEST	PERFORMED	FAILURES
LIGHT INTENSITY & EXPOSURE TIME CORRECTION	The light intensity is measured on the center of the white colored side of the strip	<ul style="list-style-type: none"> • LED lights are not functioning • Camera lens or light box is not clean • Calibration strip is not clean
PIXEL SCALE	Pixel scale is determined by measuring the overall height and width of the black colored side of the strip, and the small black dot located on the white side.	<ul style="list-style-type: none"> • Calibration strip is not loaded correctly • Calibration strip is out of spec • Camera Lens is out of focus
CAMERA TRANSFORM	Camera transform is determined by the black dot's location relative to the camera - while the camera is moving vertically.	<ul style="list-style-type: none"> • Mechanical misalignment (internal) of the vertical camera axis or the camera's mount.
CAMERA SCAN OFFSET	Camera scan offset is determined by the black dot's location relative to the camera - while the camera is moving vertically.	<ul style="list-style-type: none"> • The camera's length of travel is not correct and could be the result of worn bushing or lead screw. Consult factory about a replacement of the "Z" Drive.
CAMERA POSITION	Camera location is determined by identifying the X and Y locations of the strip using the black colored side of the strip	<ul style="list-style-type: none"> • Calibration strip is not loaded correctly • Mechanical misalignment (internal)
NFX MOTOR SCALE	The NFX Motor is calibrated by rotating a complete 360 degrees	<ul style="list-style-type: none"> • NFX Handle is not loaded correctly • NFX Handle is not making good electrical contact
CAMERA MOTOR SCALE	The camera motor is calibrated by viewing certain features on the black colored side of the calibration strip	<ul style="list-style-type: none"> • Calibration strip is not loaded correctly • Calibration strip is out of spec • Camera lens is out of focus • Mechanical misalignment (internal)

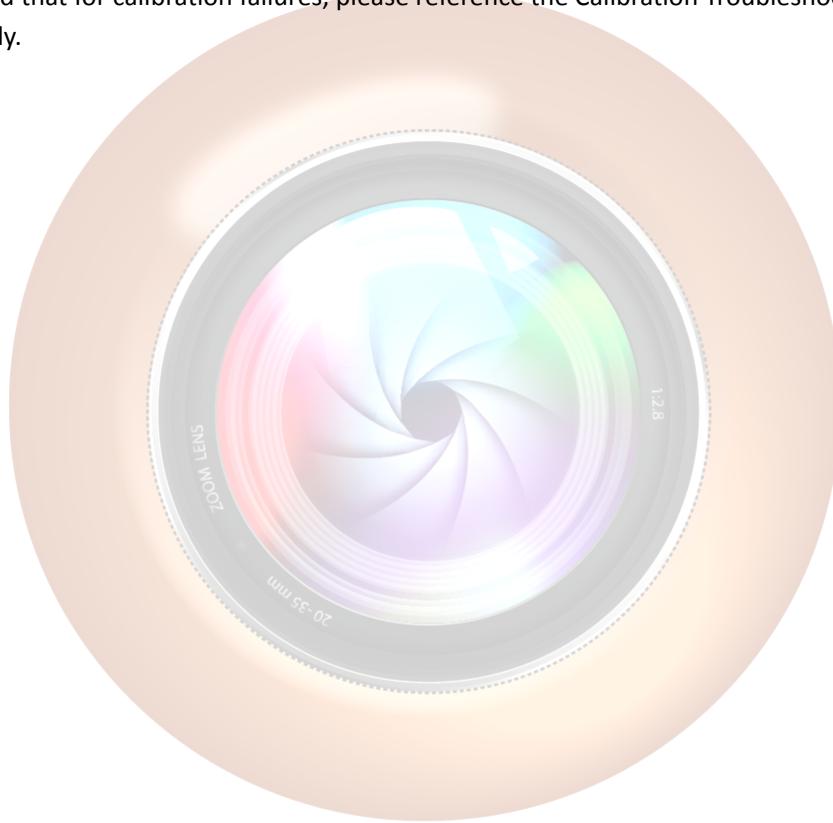
Contact VISAYA Service if any of the calibration points persistently fails.



Advanced Calibration

The Advanced Calibration page can be used to further diagnose calibration failures. This page provides real-time feedback of camera focus and light intensity. Please consult with the factory for more information about this screen.

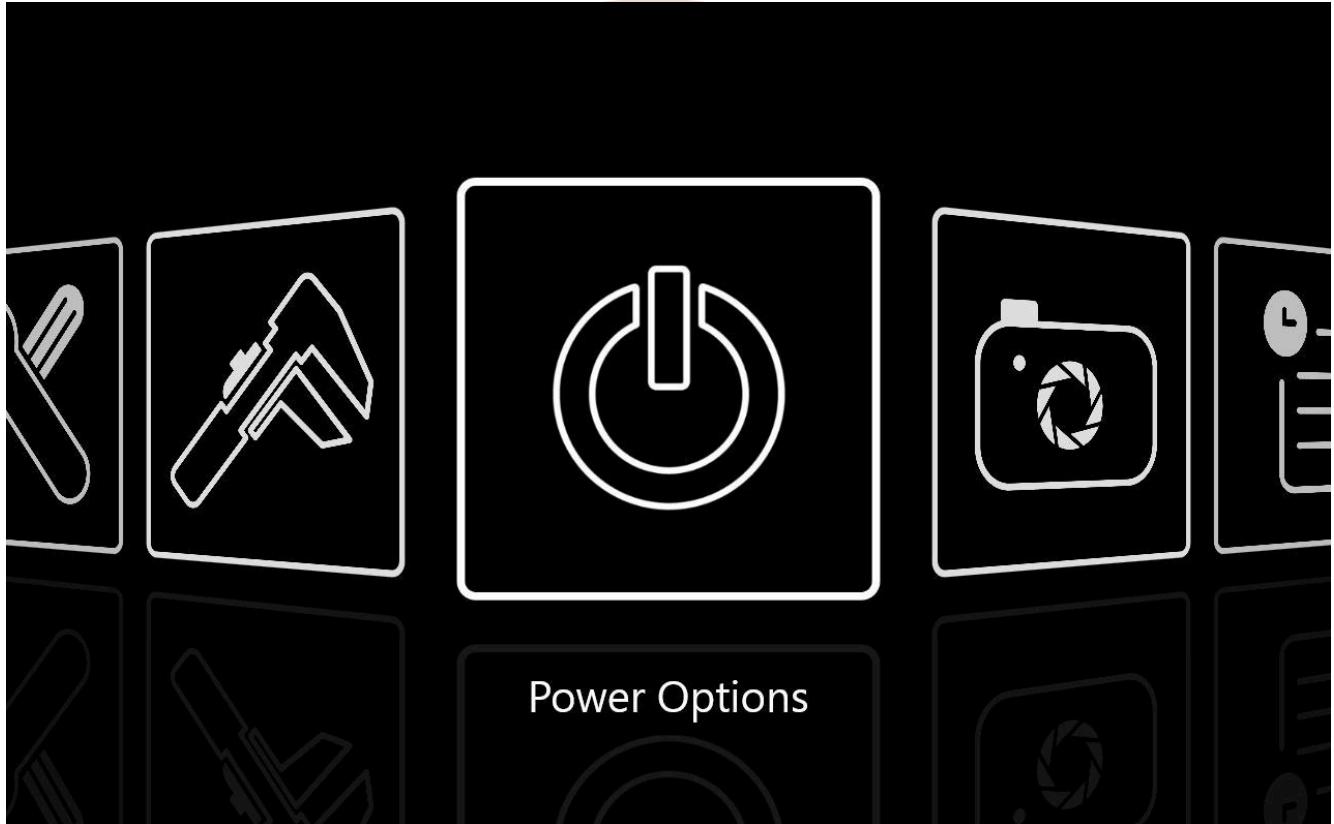
It is currently advised that for calibration failures, please reference the Calibration Troubleshooting and the Service Section(s) for remedy.





Power Options

CuDDI can be easily powered down and restarted using the Power Options screen. Due to an embedded OS controlling your CuDDI, it is important that CuDDI is properly shut down and restarted.



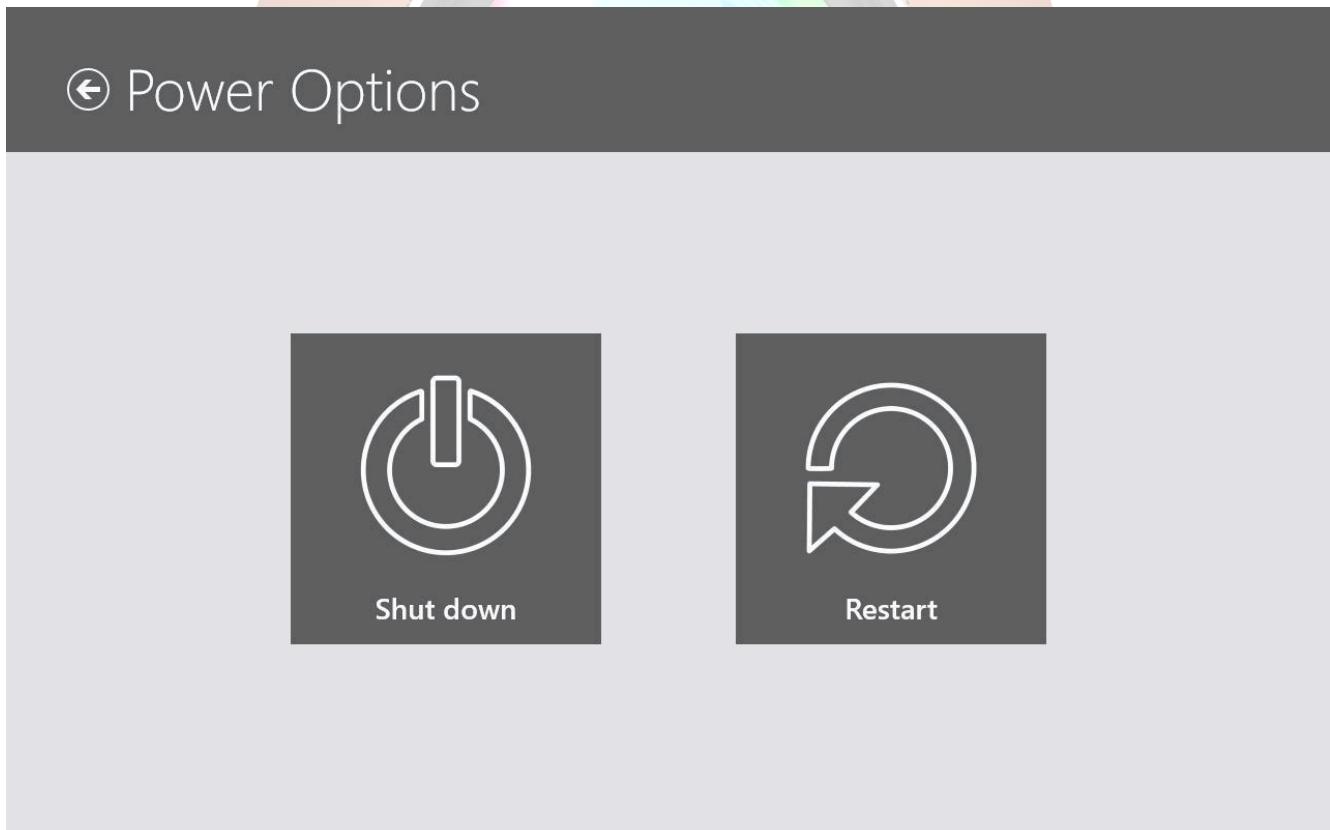


Shut Down

To shut down your CuDDI, press the Shut Down button. You will be alerted with a screen to confirm you would like to shut down the unit. Press the OK button to proceed. This process takes approximately 10 seconds to complete. The rear Power button can now safely be used to completely turn off the unit. To restart your CuDDI, press the Power Reset button on the front panel

Restart

To restart the OS and software, simply press the Restart button. You will be prompted to confirm restart. Press OK to proceed. This will restart CuDDI software.





Troubleshooting

Section	Error Message	Correction
Calibration	The Camera Motor failed to go home	Contact VISAYA Service
Calibration	Canceled	Contact VISAYA Service
Calibration	Failed to acquire an Image	Contact VISAYA Service
Calibration	Failed to calibrate the Camera Motor	Contact VISAYA Service
Calibration	The motor failed to calibrate	Contact VISAYA Service
Calibration	Failed Camera Motor Scale {0} mm per pulse Valid range is {1} to {2}	Contact VISAYA Service
Calibration	Failed Camera Position X: {0}, Y: {1} Valid range is X:{2} to {3}, Y: {4} to {5}	Contact VISAYA Service
Calibration	Failed to identify dark vs light side of the calibration strip	Contact VISAYA Service
Calibration	Failed Light Intensity {0} level 0-255 Valid range is {1} to {2}	Contact VISAYA Service
Calibration	Failed to locate the calibration strip due to an unknown error	Contact VISAYA Service
Calibration	Failed Motor Calibration {0} deg per pulse Valid range is {1} to {2}	Contact VISAYA Service
Calibration	Failed Pixel Scale {0} mm per pixel Valid range is {1} to {2}	Contact VISAYA Service
Calibration	Failed to scan	Contact VISAYA Service
Calibration	Failed to Verify Light Intensity due to an unknown error	Contact VISAYA Service
Calibration	Failed White Balance R:{0}, G:{1}, B:{2}	
Calibration	Valid range R:{3} to {4}, G:{5} to {6}, B:{7} to {8}	Contact VISAYA Service
Calibration	The motor failed to go to position	Contact VISAYA Service
Calibration	The handle is either not present, or may not be properly seated	Contact VISAYA Service
Calibration	The NFX Motor failed to go home	Contact VISAYA Service
Calibration	Calibration is already running	Contact VISAYA Service
Calibration	Verification is already running.	Contact VISAYA Service
Diag Scan	Canceled	Contact VISAYA Service
Diagnostics	Failed to start recording	Contact VISAYA Service
Diagnostics	Camera not found	Contact VISAYA Service
Diagnostics	Camera's snapshot is unavailable	Contact VISAYA Service
Email	Failed to create an attachment with PDF document	Contact VISAYA Service
Email	Failed to send email	Contact VISAYA Service
GeneralError	An error has occurred. Contact your system administrator.	Contact VISAYA Service



NetDrive	Access is denied	Contact VISAYA Service
NetDrive	The local device name is already in use	Contact VISAYA Service
NetDrive	The network name cannot be found	Contact VISAYA Service
NetDrive	The network path was not found	Contact VISAYA Service
NetDrive	The specified username is invalid	Contact VISAYA Service
NetDrive	The device is in use by an active process and cannot be disconnected.	Contact VISAYA Service
NetDrive	Fail to get access to a network resource	Contact VISAYA Service
NetDrive	Fail to mount a network drive	Contact VISAYA Service
NetDrive	Fail to retrieve a list of mounted network drives	Contact VISAYA Service
NetDrive	Fail to unmount a network drive	Contact VISAYA Service
NetDrive	The specified network password is not correct	Contact VISAYA Service
NetDrive	The user name or password is incorrect	Contact VISAYA Service
	The network path was either typed incorrectly, does not exist, or the network provider is not currently available. Please try retying the path or contact your network administrator.	
NetDrive	The network is not present or not started	Contact VISAYA Service
Printer	Print operation is timed out	Contact VISAYA Service
Printer	Fail to set default printer	Contact VISAYA Service
Printer	Printer is not installed	Contact VISAYA Service
Settings Date/Time	All date format strings must be non-empty	Contact VISAYA Service
Settings Email	E-mail address is invalid	Contact VISAYA Service
Settings Email	Port number is invalid	Contact VISAYA Service
Settings Email	Address, host, login and password must be non-empty strings	Contact VISAYA Service
Settings Language	Unknown language	Contact VISAYA Service
Settings Lims	Baud rate must be set	Contact VISAYA Service
Settings Lims	Data bit must be set	Contact VISAYA Service
Settings Lims	Stop bit must be set	Contact VISAYA Service
Settings Lims	Server and share must be non-empty strings	Contact VISAYA Service
Settings Lims	Folder location must be non-empty string	Contact VISAYA Service
Settings Operators	Operator's name cannot be empty	Contact VISAYA Service
Settings Operators	Operator with the same name already exists	Contact VISAYA Service
Settings Storage	Directory not found	Contact VISAYA Service
Settings Storage	You do not have access to write to this directory	Contact VISAYA Service
Settings Storage	Drive letter and network path must be non-empty strings	Contact VISAYA Service
Settings Storage	Path must be non-empty string	Contact VISAYA Service
Test	Camera Motor failed to go home	Contact VISAYA Service
Test	Checking NFX Handle	Contact VISAYA Service
Test	Failed to analyze	Contact VISAYA Service
Test	Failed to scan	Contact VISAYA Service



Test	NFX is not present.	Contact VISAYA Service
Test	NFX Motor failed to go home.	Contact VISAYA Service
Test	NFX Motor failed to go to position.	Contact VISAYA Service
Test	Test canceled	Contact VISAYA Service
Test	Test failed.	Contact VISAYA Service
Test	Test failed: {0}	Contact VISAYA Service
Test	Canceled	Contact VISAYA Service
Test	Error	Contact VISAYA Service
Test	Failed to locate the sample	Contact VISAYA Service
Test	There is no test to report progress	Contact VISAYA Service
Test	Test is already running	Contact VISAYA Service
Test Results Screen	Export target is not supported	Contact VISAYA Service
Test Results Screen	You must load test data to change its rating	Contact VISAYA Service
Test Results Screen	Access to the directory '{0}' is denied	Contact VISAYA Service
Test Results Screen	Could not find test data	Contact VISAYA Service
Test Results Screen	Test's save directory not found	Contact VISAYA Service
Test Results Screen	Test's save directory is not specified	Contact VISAYA Service



Specifications

Applicable Test Methods	ASTM D130, D1838, D4048, IP411, IP145, ISO2160, ISO6251
Corrosion Detection Range	1a, to 4C
Display Units	Color, ASTM Rating and Strip Size
Detection Method	Patent Pending CCD Digital Detection
Precision	+/- 0.25% of Raw Reading
Optical Design	Patent Pending Optical Arrangement
Light Source	LED 3,7000K (White), >90% CRI
Measuring Time	< 30 Seconds per Side (90 Seconds Max)
Calibration	Vision Calibration with Standard
Display	10.1" Projective Capacitance Touch (Multi Touch)
Interface	Ethernet x2, USB 3.0 x1, USB 2.0 x4, HDMI, VGA, USB Printer, USB Mouse and Keyboard
Memory / Storage	64 GB SSD Storage
Temperature Range	10° to 35° C
Humidity	Up to 85% Non-Condensing
Power	Auto-switching 90 ~ 264VAC, 47 ~ 63Hz, 280 Watt Power Supply
Space Requirements	80 mm (3") on Sides and Back
Dimension	350x300x270mm (14x12x11")
Gross Dimensions & Weight	Weight 10 Kg. (22 lbs.) 400x350x530mm, 15 Kg. (15x14x21" 33lbs.)



Maintenance

The CuDDI requires little maintenance, but a quality inspection for the instrument should be performed regularly. The self-verification feature allows an operator to perform this check on a daily basis. Alternatively, the user can run a Freshly Polished specimen to ensure the system is still operating normally.

Cleanliness is important and likely going to require attention. This frequency will be dependent on how well samples are prepared BEFORE entering the instrument.

Alignment will maintain after the instrument is set in place, but over time may require some of the adjustment procedures explained here in this section. Moving the instrument (e.g. shipping) may also trigger the need to make an adjustment.

		Schedule
Clean	Inspect Lightbox and NFX Handle for dirt and debris.	Daily
Validation	Load a Freshly Polished strip and run the CuDDI normally and ensure that the rating has resulted in Freshly Polished. If the rating fails, the system may need to be re-calibrated.	1-7 Days
Calibration	Load the calibration piece and use the Calibration Screen to "Verify" the instrument. Verify all parameters have passed, and then press the "Calibrate" button to apply the new parameters.	1 year*
Re-Alignment	Camera Alignment Horizontal, Vertical, and Angle	1 year
Lubricate	Lubricate the Camera Actuator	3-5 year

* The Calibration frequency suggested is one year. However, it is suggested that the system be calibrated if it is either transported or moved.



Cleaning

Exterior

The exterior enclosure of the instrument can be cleaned using a mild detergent and non-abrasive cloth. Do not use any detergent on the touchscreen surface.

Touchscreen

Use a soft, lint-free cloth (either dry or dampened with water or eyeglass cleaner or a screen cleaning wipe to gently wipe the screen. Do not use glass or other chemical cleaners on the touchscreen surface.

NFX Handle

After some use, it may be necessary to clean the end blocks on the NFX handle. Using a mild detergent, carefully clean the blocks using a non-abrasive cloth. Pat dry with a clean cloth when completed. Do not immerse handle in liquids.

Do not lubricate shafts of springs. The NFX Handle is engineered in a way as to not require the need for lubrication.



Use “contact cleaner” or reagent-grade isopropyl alcohol to clean the electrical contacts on the NFX Handle and the NFX Bulkhead Receptacle on the instrument.

Lightbox

Only if necessary, the reflector panels can be spot cleaned using a long swap. The material used for the reflector

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panels are chemically resistant with most common cleaning solutions including ammonia, 409, soap solutions; **not compatible with bleach or caustic.** Do **not** attempt to replace this film without consulting the factory, since this film is special for camera & lighting color balancing.

Camera Lens

Only if necessary, the camera lens can be cleaned using the following tools and procedure.

-
- The diagram illustrates the internal structure of a camera lens, showing multiple lens elements and coatings. It also displays several cleaning tools: a red bulb blower, a white lens cleaning brush, a small silver cotton swab, a stack of four lens cleaning tissues (blue, light blue, purple, and green), and a stack of four cotton swabs (orange, brown, purple, and green).
- 1) Before wiping the lens to remove a smudge or fingerprint, remove any dust using a blower or a lens cleaning brush. Avoid using compressed air.
 - 2) Smudges and/or fingerprints can be cleaned using a lens cleaning tissue or cotton swab. If necessary, use reagent-grade isopropyl alcohol or de-ionized water. When whipping, apply only enough pressure to remove the smudge.



Servicing

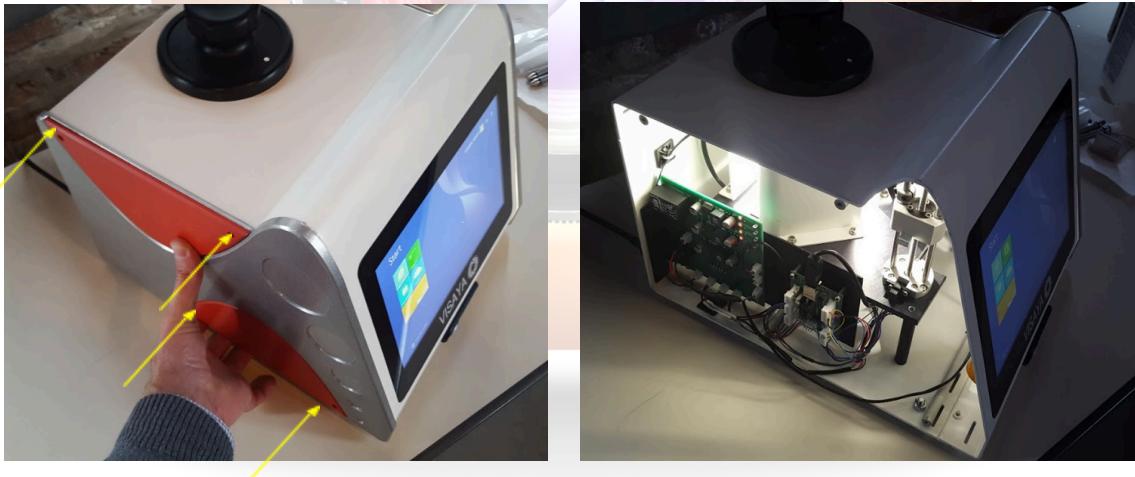
ATTN: Please review the Safety and Warranty sections of this document before attempting to perform any of the service procedures described in this manual.

Opening & Closing the Instrument for Service

This section explains how to properly open and close instrument by using the Removable Side Panels. The instrument is designed to function properly without the side panels in place.

To Remove the Side Panels:

- 1) Locate and remove the 4 screws holding the “Left” side panel in place.



- 2) Completely removing the left side panel assembly (with posts connected) is optional depending on the service performed.



To Restore the Side Panels:

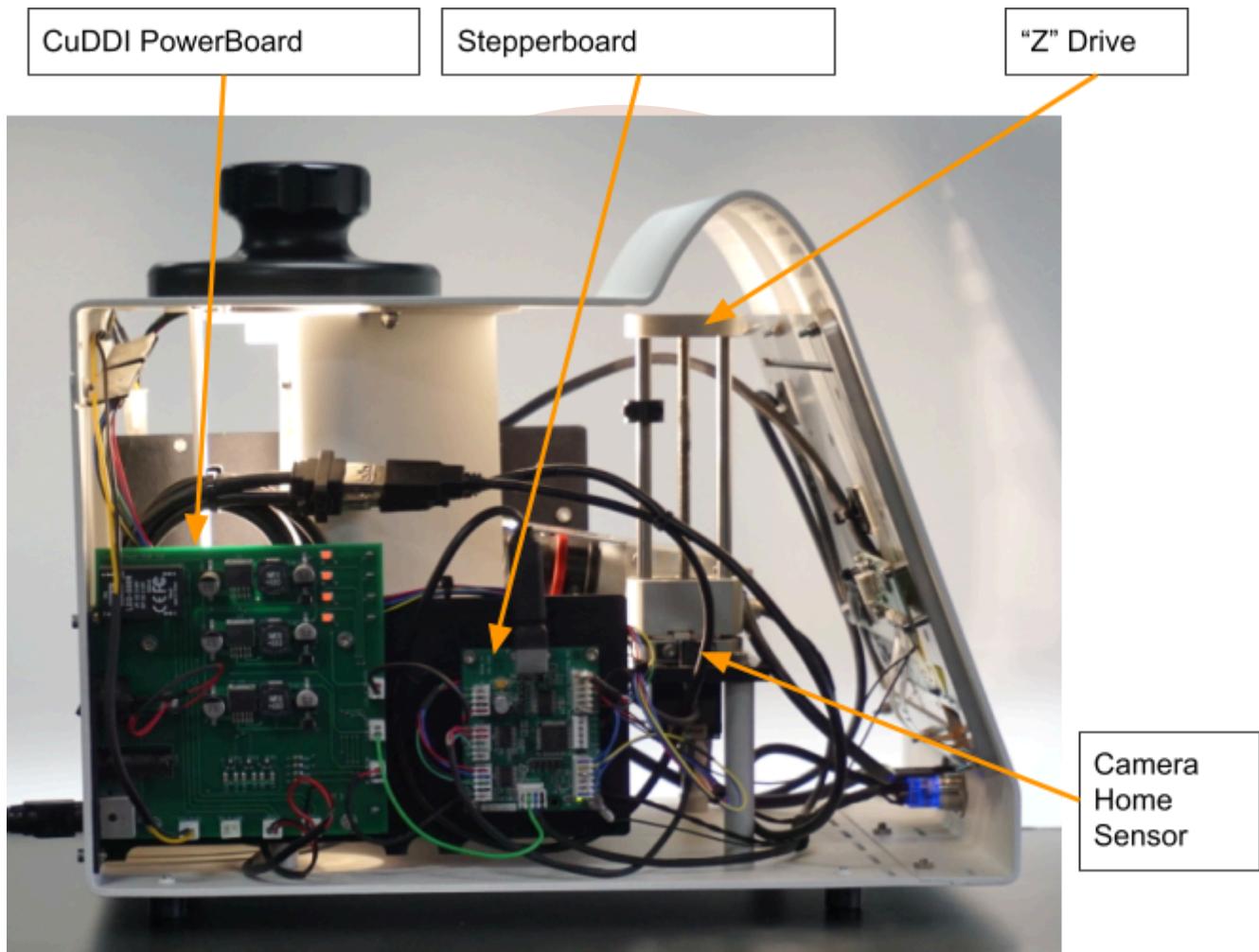
- 1) If the right-side panel was completely removed, be careful of wiring getting in the way of all four posts. DO NOT FORCE – carefully move cables out of the way.

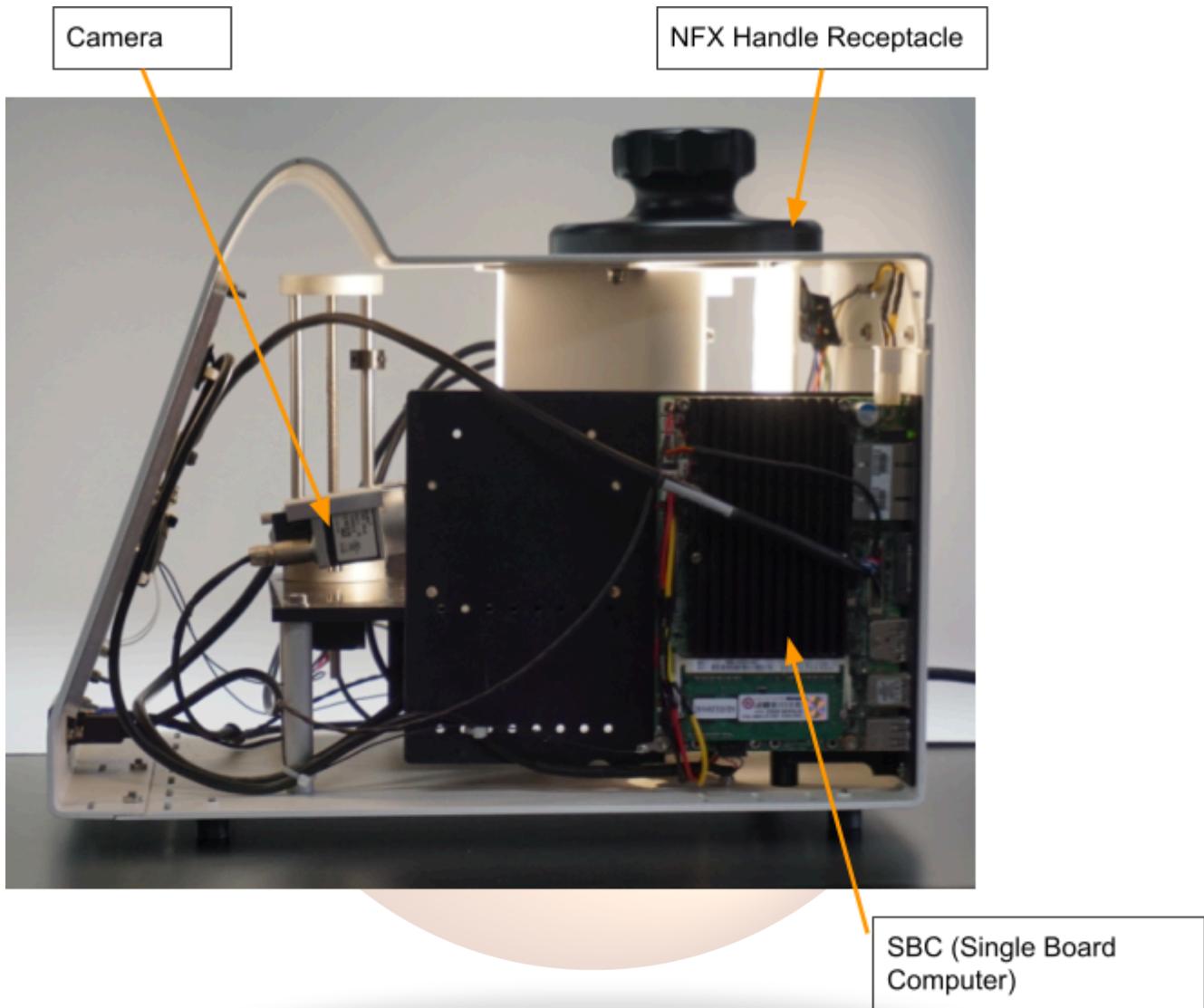


- 2) Lay the instrument completely on its right side, then install the left side panel.



Identifying Internal Components







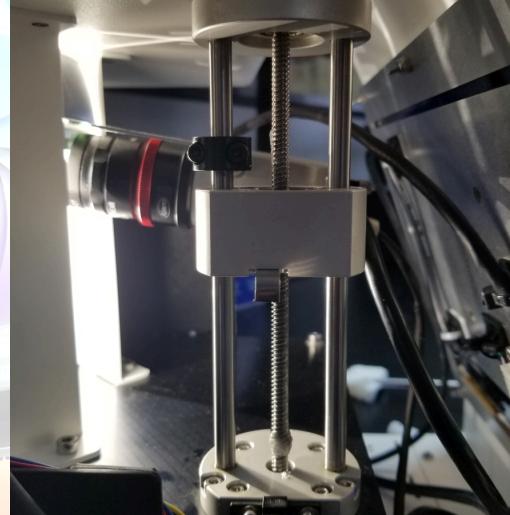
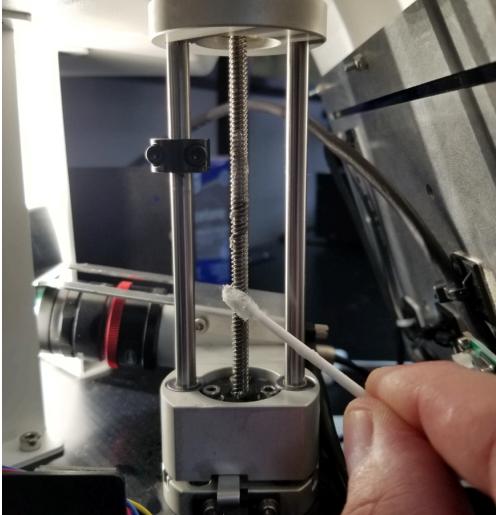
Lubricate Camera Actuator



Lubricate the actuator's ball screw by applying a small amount of grease across the threads along the middle section of the screw where the camera would travel across. A moderately soft grease (NLGI Grade 2) is recommended.



Do not lubricate the two outside shafts, since these shafts use a greaseless bearing.





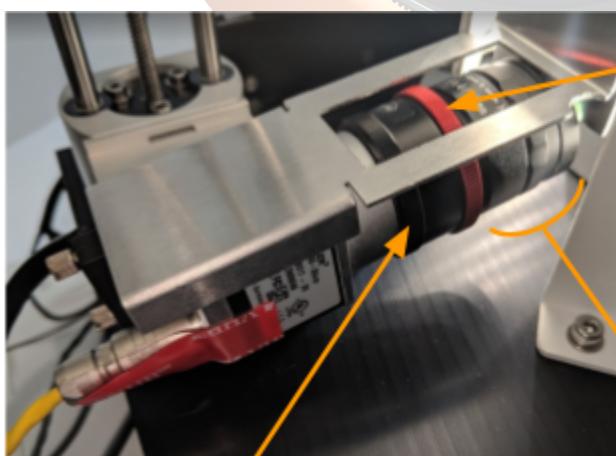
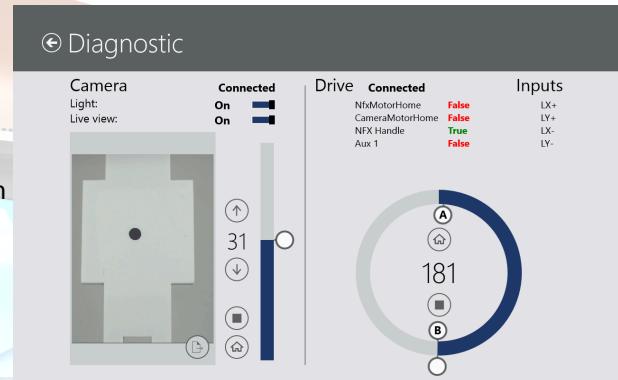
Camera Focus & Alignment

Load the Calibration Piece to both focus and align the camera.

Adjust Focus

The camera focus is adjusted manually and uses the calibration strips black dot as the target surface.

- 1) Using the diagnostics screen, position the camera in the middle of its stroke.
- 2) Continue to use the screen control and orientate the calibration strip such that the dot is in the center of the camera's view.
- 3) Reaching inside the instrument, locate the lens mounted to the front of the camera. Now, locate the RED colored ring – and gently loosen it. The RED colored ring is a locking nut used to hold the focus in place.
- 4) Once loosened, the whole front of the lens can rotate in/out to adjust the focus. Monitor the live feedback on the diagnostics screen while rotating the lens in/out.
- 5) Once the focus is complete, carefully rotate the RED colored ring until it stops against the part of the lens that is closest to camera. The focus is now locked.



Red Colored Locking Ring
Used to lock/unlock the focus ring

Lens Rear
Only loosen to remove the lens

Lens Front
Rotate to change focus



Camera Vertical Angle Alignment

The camera is mounted at an +11 degrees angle towards the sample and is defined using the bottom edge of the camera bracket. There is no target on the strip that is used for tuning the camera angle, only the bottom of the bracket. The vertical location of the camera relative to the sample can be tuned using the Home Sensor (see *Camera Vertical "Home Sensor" Adjustment*).

- 1) Locate the two fasteners that hold the camera in place.

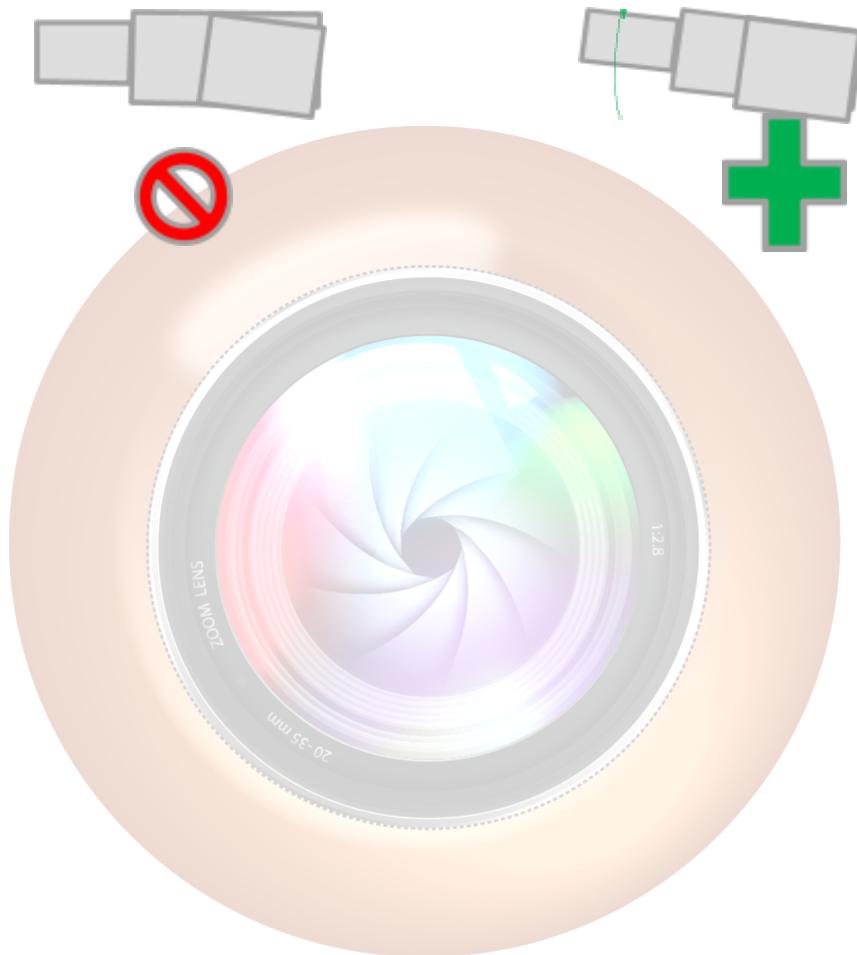


- 2) With your right hand controlling the camera location, gently twist the camera upward until it stops. With your left hand, carefully tighten the two fasteners.





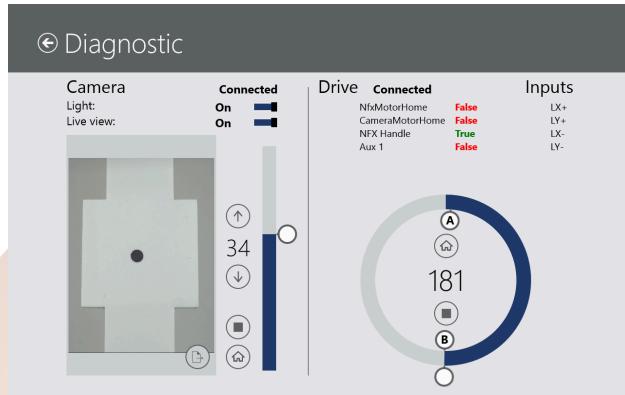
- Add Loctite compound to each screw (one at a time) if accessible.



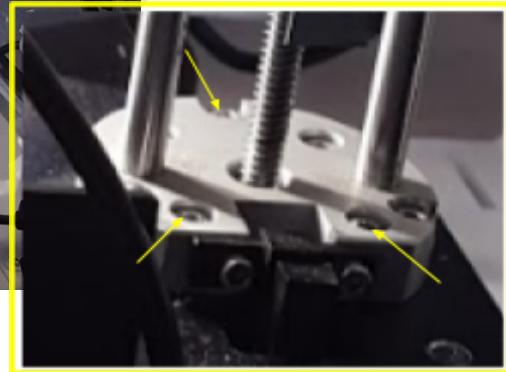
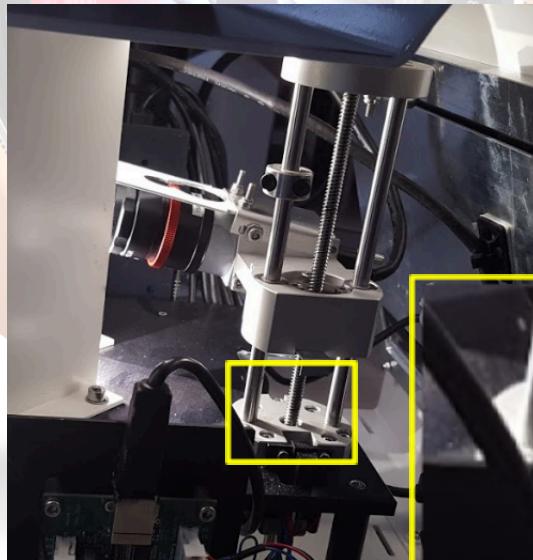


Camera Horizontal Alignment

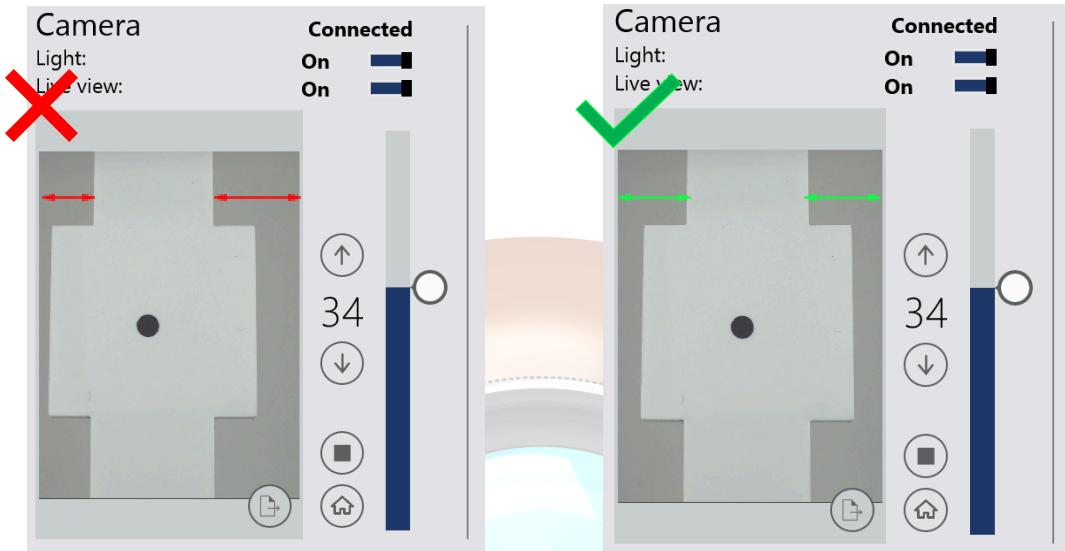
The camera horizontal alignment is used to center the sample from left to right in the camera's FOV (Field of View).



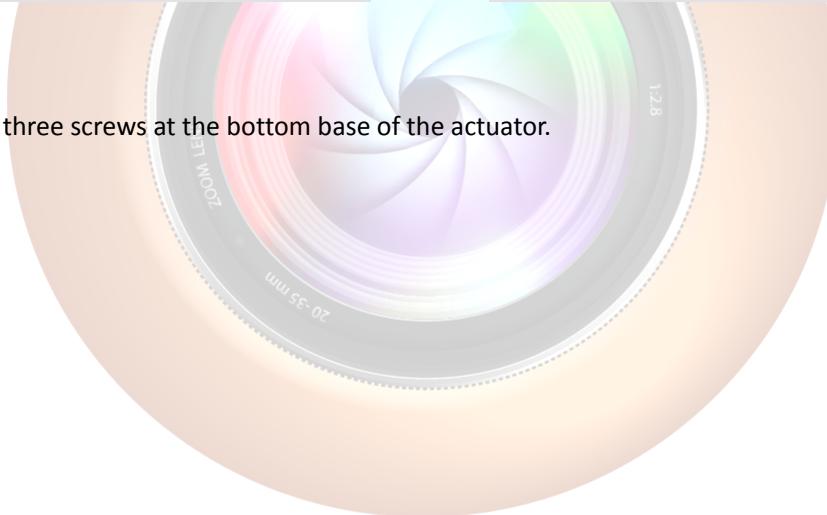
- 1) Using the diagnostics screen, position the camera to the middle location.
- 2) Locate the three fasteners that hold the camera actuator at its bottom base.



- 3) Loosen each fastener, such that the entire camera and actuator assembly can rotate left and right. Using the live view in diagnostics – aim the camera such that the calibration strip is in the center of the camera's Field of View.



- 4) Tighten the three screws at the bottom base of the actuator.





Camera Vertical Stop Location Adjustment

The camera will travel ~55mm from the bottom location to the top. This entire 55mm stroke should be centered *vertically* along the sample to ensure the entire part is imaged correctly. When in the bottom location, the bottom of the sample must be visible PLUS extra space below. When in the top location, the top of the sample must be visible PLUS extra space above.

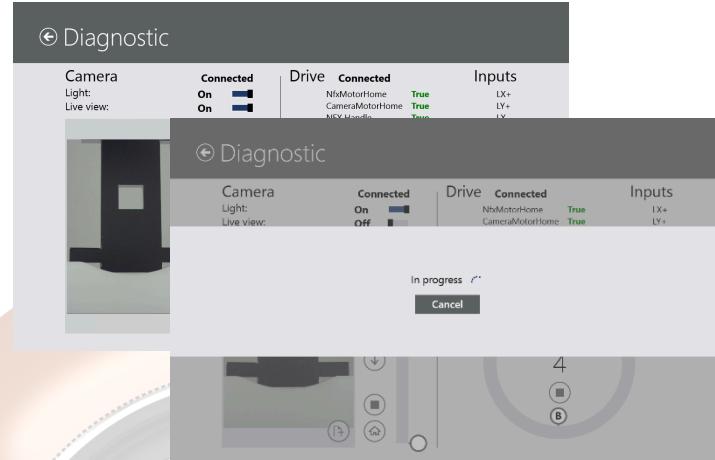
The bottom location (aka HOME location) is defined by a physical sensor and flag:



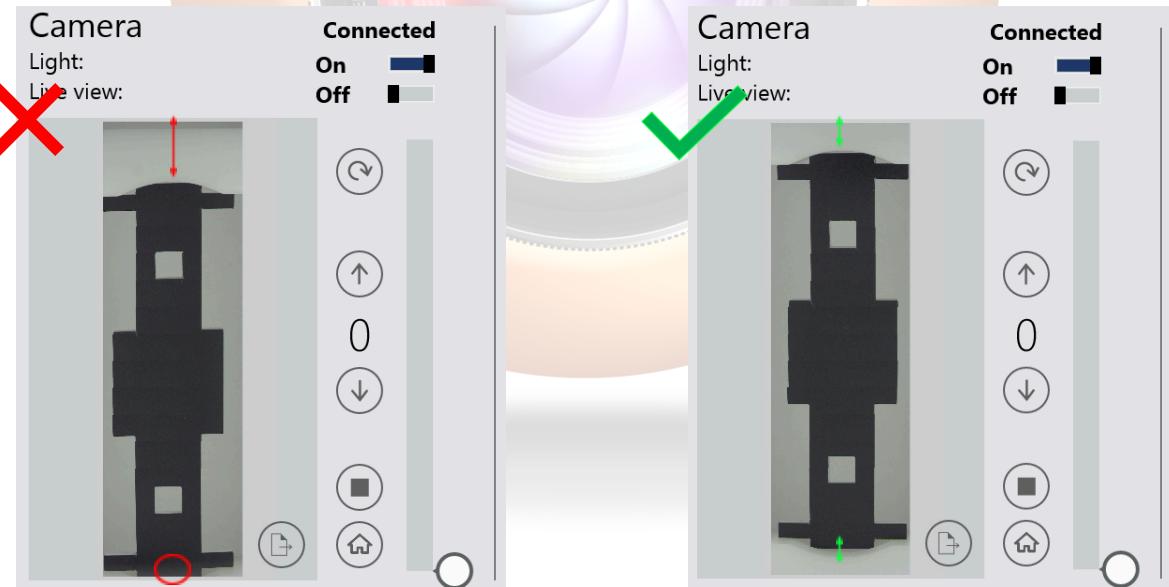
During the Camera Homing Routine, the actuator will lower the camera *slowly* until the flag triggers the HOME sensor. The location of this sensor & flag is set at the factory during production. But, in the event a component was replaced: realignment may be necessary. The flag may be adjusted using a file to shorten, or a pliers to bend and lengthen.

- Making the flag longer = will move the entire 55mm stroke used for the scan up.
- Making the flag shorter = will move the entire 55mm stroke used for the scan down.

- 1) Using the diagnostics screen, disable the Live view and press the Scan button:



- 2) Review the results:

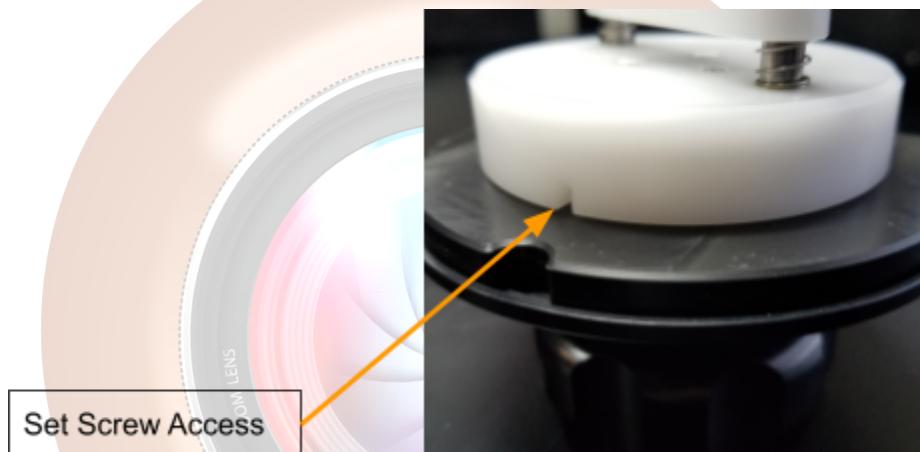


- 3) To make an adjustment, you can raise the camera off the bottom location using the up/down slider on the diagnostics screen. Then, repeat the scan and verify the new location.

NFX Handle

Adjustments

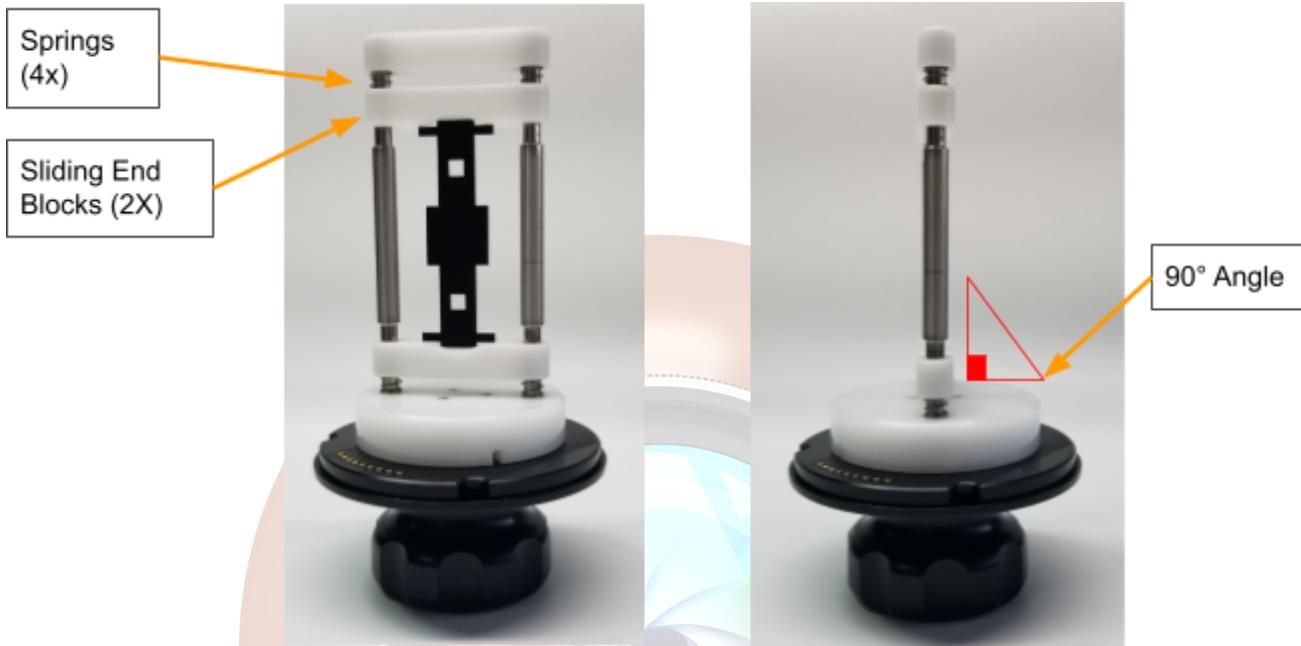
The only adjustment on the NFX Handle is the adapter connection to the handle. A 1mm gap should be maintained between the handle and adapter, and is held using a set-screw. The set-screw is assessable via a small notch on the adapter.



Inspecting for Proper Functionality

The NFX Handle can be inspected for proper functionality:

- ✓ Springs and shaft: The qty 4 springs should be present and strong enough to center the sample inside the carrier. No spring-loaded end block should **not bind** while moving up/down and move freely with the spring. When a sample is inserted, they should tightly grab and secure the sample.
- ✓ Angle: When viewing the adapter sideways, the adapter should sit 90° from the handle.
- ✓ Spring-loaded end block: the two end blocks that retain the sample should be free of scratches and contamination. These areas are used during the inspection to help register the sample location and size. Marks or dirt on these features may confuse the instrument and result in “Unable to locate the sample” error.



If either of these qualities are not maintained, the NFX Handle may be damaged and need replacement.





Replacement Parts

Part. No.	Description	1 Year Spares
-	Copper Digital Detection Imaging	
AYA-10-88580	CuDDI - Automated Copper Strip Rater 110/240VAC 50/60Hz	
	Spares & Consumables	
AYA-52-05793	Copper Strip - Extra Thick, Longer Lasting	x
AYA-52-50072	Copper Strip - Extra Thick, Longer Lasting /with Hanging Hole	x
AYA-52-50496	Polishing VISE - Holds 6 Strips	
AYA-51-05788	Test Tubes, 25-mm x 150-mm, Dozen	x
AYA-51-05789	Viewing Test Tube, Each	x
AYA-52-05794	Test Pressure Vessels, For use with Volatile Samples	
AYA-52-50061	Test Pressure Vessels, for LPG Samples, Two Valves	
AYA-52-05798	Silicon Carbide Sheets, 150-Grit, 50 Pack	x
AYA-52-05797	Silicon Carbide Sheets, 240-Grit, 50 Pack	x
AYA-52-50456	Silicon Carbide Grains/Powder, 150 mesh, 450 grams	x
AYA-55-05791	ASTM Color Standard (Method Requires Two)	x
AYA-13-88580	Replacement NFX Handle (Integrated Motor)	
AYA-13-88581	Replacement Glass Overlay - VISAYA	
AYA-13-88582	Replacement Power Board - Universal Input	
AYA-13-88583	Replacement Z-Drive - Supplied with Camera Mount	
AYA-13-88670	Desktop AC Adapter DC Power Supply 160W 24V 6.67A R7B plug Level VI	
AYA-15-00020	CuDDI calibration standard. Used as daily QC/Validation and calibration of camera & motor position. Supplied in storage case with certificate valid for one year.	x



Document Revisions

Date	Version Number	Document Changes
08/02/2015	0.1	Initial Draft
1/24/2016	1.1	2 nd Revision, added updates to semi-automatic mode and calibration
2/18/2016	1.2	3 rd Revision, Diagnostic and Specifications Table updated.
5/3/2016	1.3	4 th Revision, Formatting and typo fixes. JA.
6/12/2017	1.5	Removed motor settings, changed limits on focus range.
8/10/2018	1.6	Update Specifications
9/14/2018	1.8	Added Service Section
11/4/2021	1.9	Revised Calibration Troubleshooting
9-28-2023	1.10	Formatting
6-21-2024	1.11	Calibration Frequency & Verification