

Data I/O

2D Device Mark Inspection Kit

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[INSIDE FRONT COVER PAGE]

Document History

Date	Change	Notes
March 18, 2019	Added details for Empty Pocket Detection in "UltraVim2D config.ini" section	Added <i>MarkNotFound</i> and <i>MarkTapeHole</i> details

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Chapter 1: Introduction

The 2D Mark Inspection Kit for Data I/O programming systems enables visual device inspection to validate the quality of device markings (such as a laser mark). This kit includes mounting hardware, device inspection software, an LED light, and a 5M CMOS camera.



Mark inspection involves using the software to draw a box around a known good mark. For subsequent devices, the software calculates a percentage correlation to the original mark:

- Higher percentages indicate a high-quality mark—one that matches the original mark in image quality (ex. equal clarity, sharpness, resolution, proper orientation, etc.)
- Lower percentages indicate a lower-quality mark—one that is blurry, fuzzy, improperly rotated, or otherwise distorted from the original mark

This document provides instructions for mounting the inspection camera hardware, running the UltraVim 2D inspection software, and testing the inspection system.

Safety Warnings

To avoid personal injury and equipment damage, it is required that you comply with all safety rules and regulations. Although the 2D inspection kit involves no moving parts, the camera and LED light carry an electrical charge when installed. Serious personal injury can result from high leakage electrical current from the power cable(s). An Earth (ground) connection is essential before connecting power.

The LED light flashes a bright light during device inspection. For some people, exposure to certain electric lights can cause undesirable biological effects. In extreme cases, direct or prolonged viewing of the light can cause eye injury, so make sure you install the included LED light cover/lampshade and that it is securely attached during normal operation.

The system can be dangerous if safety precautions are ignored. Do not operate the system unless you have been thoroughly trained. Do not disable or attempt to defeat any of the safety features of the system. Failure to adhere to safety warnings, operate the equipment properly under normal use, and apply safety practices constitutes a violation of your warranty agreement.



CAUTION: Electrostatic Discharge Hazard

Electrostatic discharge (ESD) may damage equipment and integrated circuits. Always discharge static electricity to a common ground. Use ESD prevention devices that contain a 1 M-ohm to 10 M-ohm current-limiting resistor.

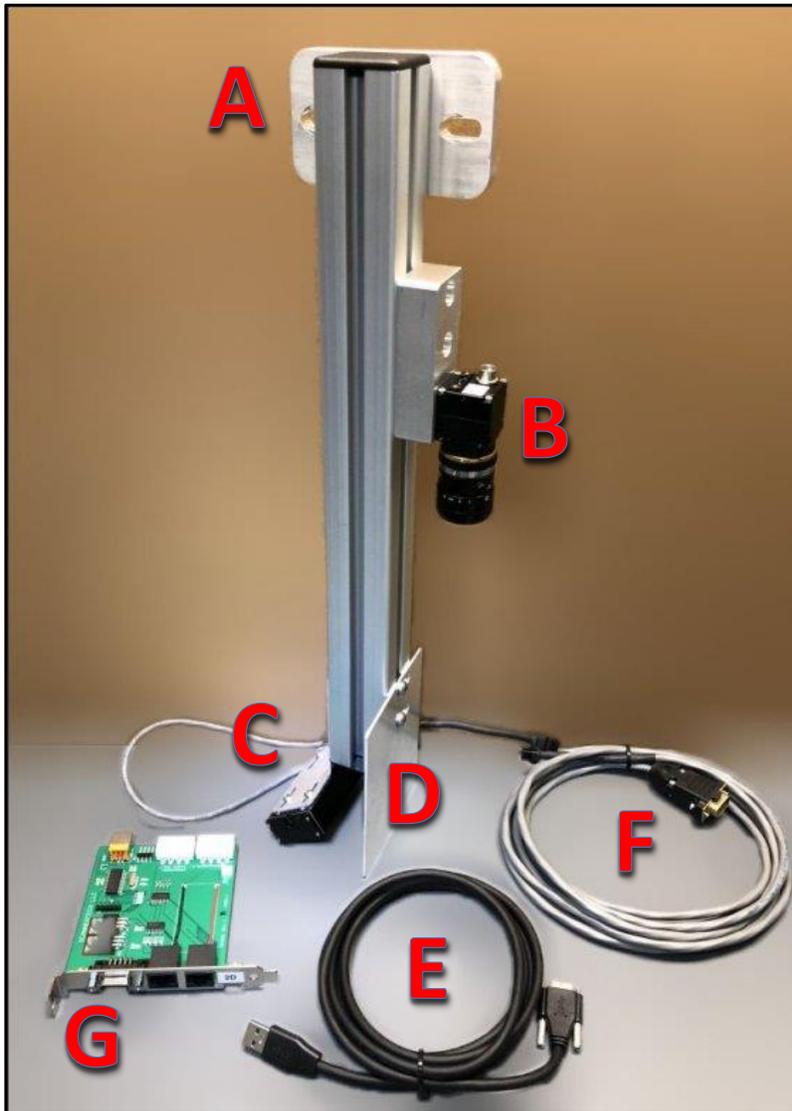


WARNING: Electric Shock Hazard!

Injury or death may result from contact to parts inside the equipment. Do not remove covers. There are no user-serviceable parts.

Data I/O is not responsible for any defects or failures in the equipment caused by user negligence, including but not limited to abuse, accident, improper maintenance, inattention, or unauthorized repair, alteration, or installation.

Package Contents



- A. Camera Bracket
- B. 5M CMOS Camera
- C. LED Light
- D. LED Light Cover/Lampshade
- E. Camera interface cable
- F. LED interface cable
- G. PC Card for LED Light

Overview of Steps

The following list provides an overview of the steps covered in this document:

- **Mount camera bracket** – Measure, mark, and drill 2 holes, then secure camera bracket to chassis
- **Install UltraVIM 2D software** – Run the setup program to install or update UltraVIM 2D
- **Configure 2D inspection settings** – Enable 2D mark inspection in TaskLink/LumenX, specify mark file
- **Establish known good mark** – Inspect mark, clarify/sharpen image, create search boxes (ex. logo)
- **Run mark inspection(s)** – Start 2D mark inspection to ensure high-quality marks
- **Modify Pass/Fail tolerance** – Adjust the tolerance level for mark Pass/Fail
- **Generate inspection report** – Export inspection results and statistics to file

Requirements

This page lists the tools and items required to install the 2D Mark Inspection Kit.

Tools

- Metric hex key set
- M8x1.25 drill bit
- Screwdriver set
- Adjustable utility wrench and/or pliers
- 6.80 mm tap (for threading holes)

Software

- ScannerTech UltraVIM 2D software version 9.4.88 or higher
- TaskLink version 8.90 or higher/LumenX version 1.5.2 or higher
- Data I/O Automated Handler (AH) version 2.7.0.3 or higher
- Driver for the LED light

Other Hardware

- Tape Take-Up reel is installed
- Carrier Tape reel is installed
- One 'known-good' device (target mark)
- Marked devices ready for inspection (compared with target)

Additional Guidelines and Considerations

Consider the following guidance when working with the 2D Mark Inspection Kit:

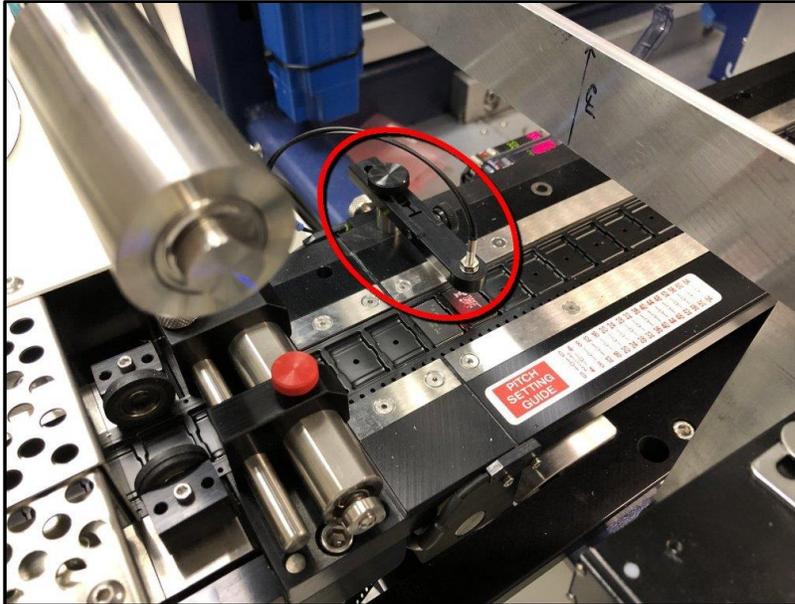
- The 2D inspection point is located beyond the reach of the Automated Handler (AH700) because the 2D camera mounts to the outside of the upper beam/main chassis of the PSV7000 (as depicted on page 3). Essentially, the inspection camera sits outside of the workspace envelope so if a mark fails inspection, AH700 cannot be used to place or remove devices at the inspection point.
- Operators must manually remove any device that fails inspection.
- Operators will never manually add a device to the Tape Output.
- Any device that fails inspection will result in an empty pocket in the Tape Output (up to a maximum number of allowed empty pockets, as defined by user in the package file).

Chapter 2: Mounting the Hardware

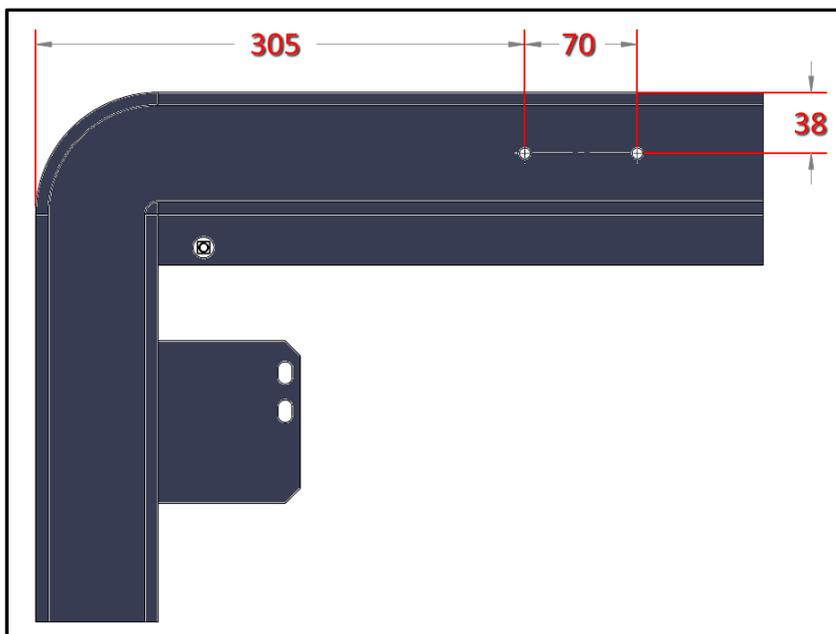
Complete the following steps to mount the hardware for the 2D Mark Inspection Kit. This process largely involves preparing the area for the camera and mounting the camera bracket to the system chassis. If your frame has pre-drilled holes (see Step 2 below), then skip to page 9 for mounting the camera.

Prepare the Mounting Area

1. Remove the Empty Pocket Sensor from the Taper by pulling the sensor up-and-out from its mounting hole (this sensor is unnecessary with a 2D inspection camera installed).



2. On the left-upper beam of the system chassis (near the rear, above the taper), measure, mark, and drill 2 holes (M8x1.25) for mounting the camera bracket. See next step for actual image.



3. Thread both holes with a 6.80 mm Tap.



Mount the Camera

1. Position the camera bracket over the 2 drilled holes, then use a 6 mm hex key to secure it to the chassis with 2 screws (M8x1.25x20mm).



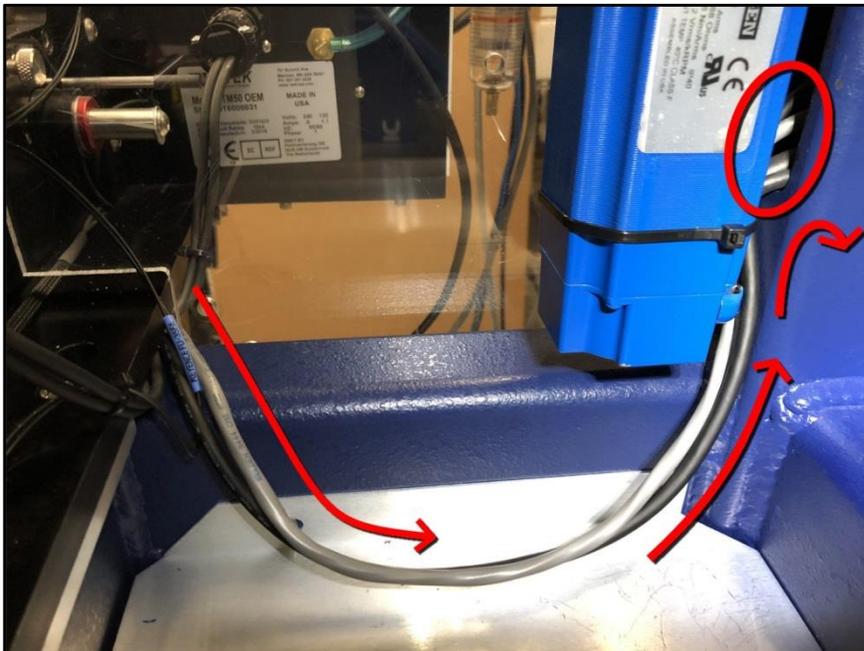
2. Connect the camera interface cable to the back of the camera.



3. Route the other end of the camera cable down, loosely pair it together with the LED Light cable, and route both cables down under the taper and into the workspace (through the clear panel opening).



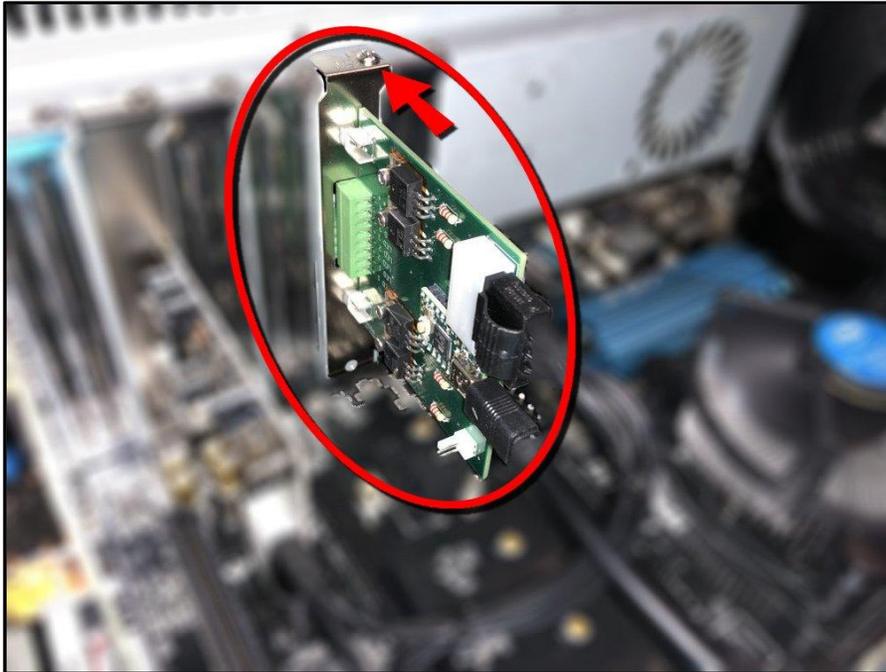
4. In the workspace interior, route the cables toward the rear corner along the base of the blue chassis beam, down into the chassis opening/cut-out in the corner, and into the UltraVIM computer.



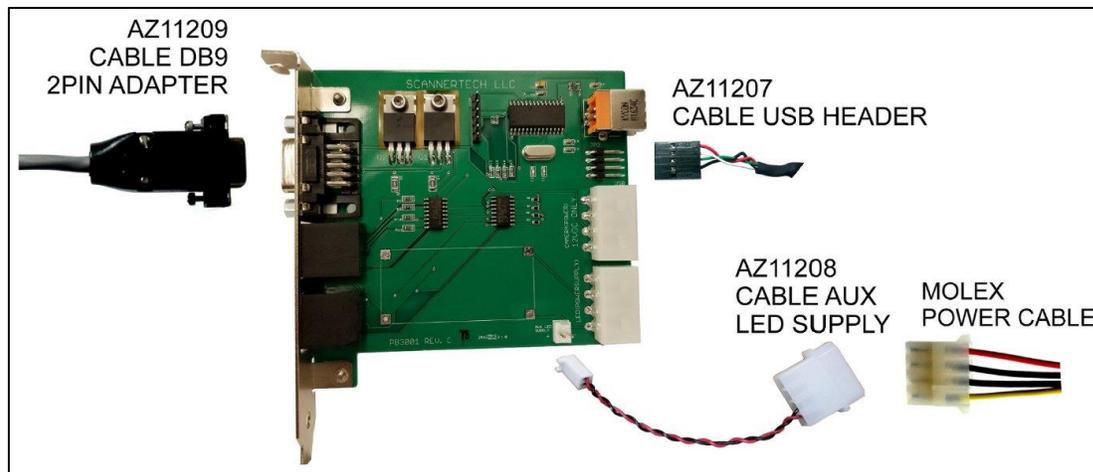
Install PC Card for LED Light

If your kit does not include a 2D inspection PC (with the PC card already installed), then complete the following steps to install the PC card that synchronizes the LED light flash with the inspection trigger.

1. Slide-out the Handler PC and open the PC case (top cover).
2. Locate an available/empty slot and install the LED lighting/AV card. For example:



3. Secure the card with the Philips screw on top, then plug-in the connectors as follows.



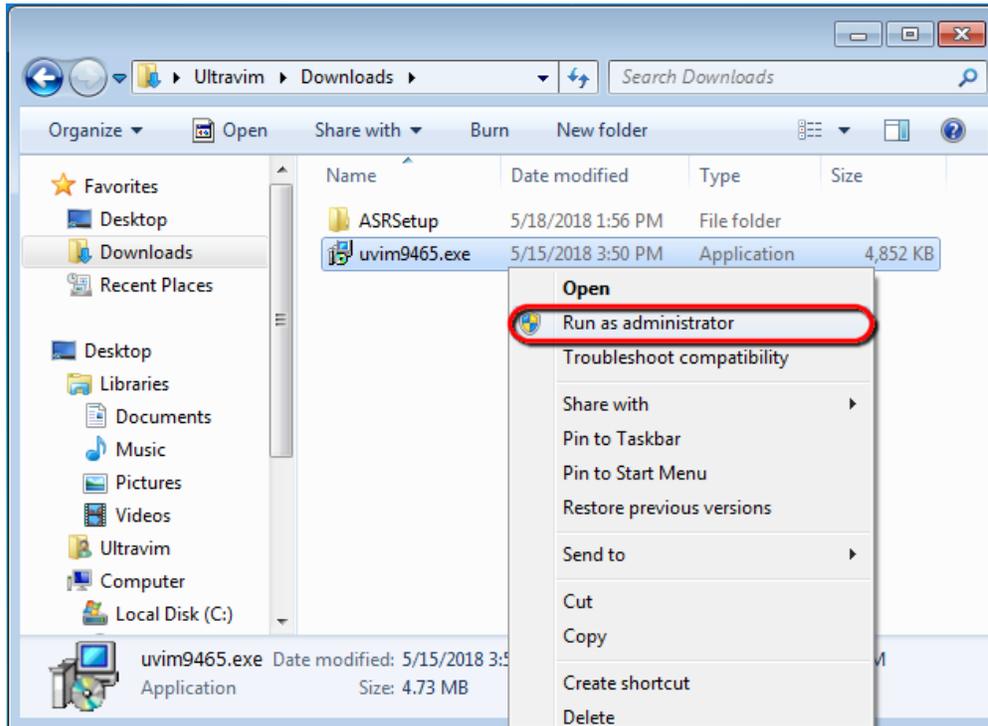
4. Route the LED Light cable between the PC card and the LED Light itself (see page 10).

Chapter 3: Running the Software

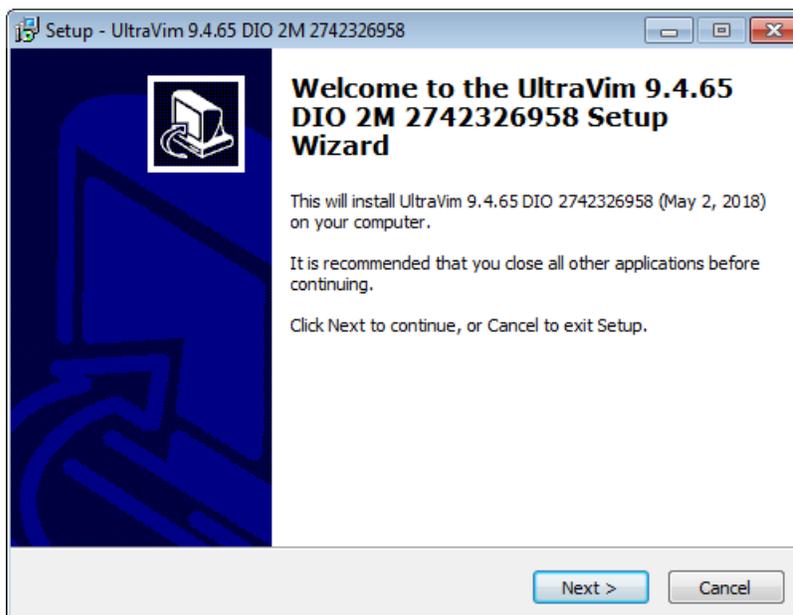
With the inspection camera installed and ready to go, now install and run the UltraVim 2D software to interface with the camera and inspect device markings.

Install/Update the UltraVim 2D Software

1. Run the UltraVim 2D setup program to install or update UltraVim 2D.



2. Proceed through the setup wizard and complete the installation.



Configure Settings for 2D Mark Inspection

With the hardware and software installed, now configure settings that enable the system to communicate properly with the installed hardware.

WinAH400.ini

In **C:\AH700\WinAH400.ini**, enable 2D inspection by ensuring that the **TapeOut2DInspection** entry:

- Is added in the **WinAH400.ini** file and is not commented-out (prefixed by a semi-colon).
- Is set to **DAIO**, and takes the format below--

TAPEOUT2DINSPECTION=DAIO xxx.xxx.xxx.xxx:5151

(where xxx.xxx.xxx.xxx is the IP address or network name of the UltraVim 2D PC, which by default is **192.168.5.1:5151**)

Mark Inspection File Reference

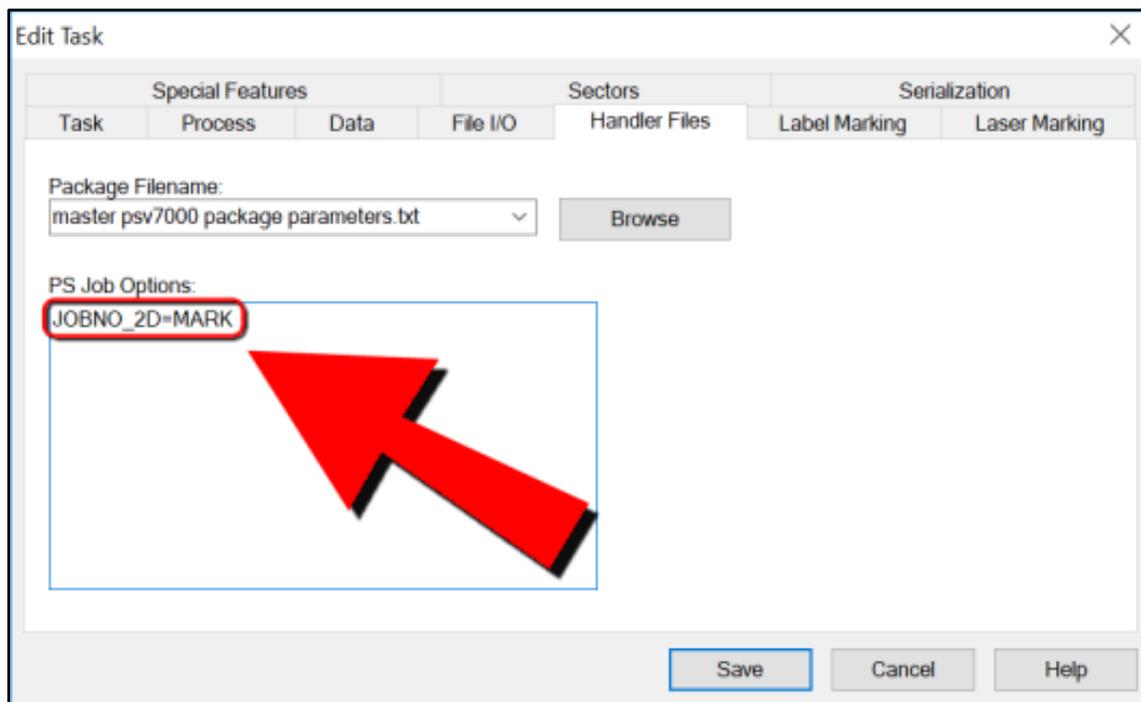
With 2D Inspection enabled in the system/Handler PC, now direct the job software to the “golden” mark inspection file (known good mark by which subsequent inspections will be measured and compared).

In TaskLink

- Edit the task, click the **Handler Files** tab, and in the **PS Job Options** box, type:

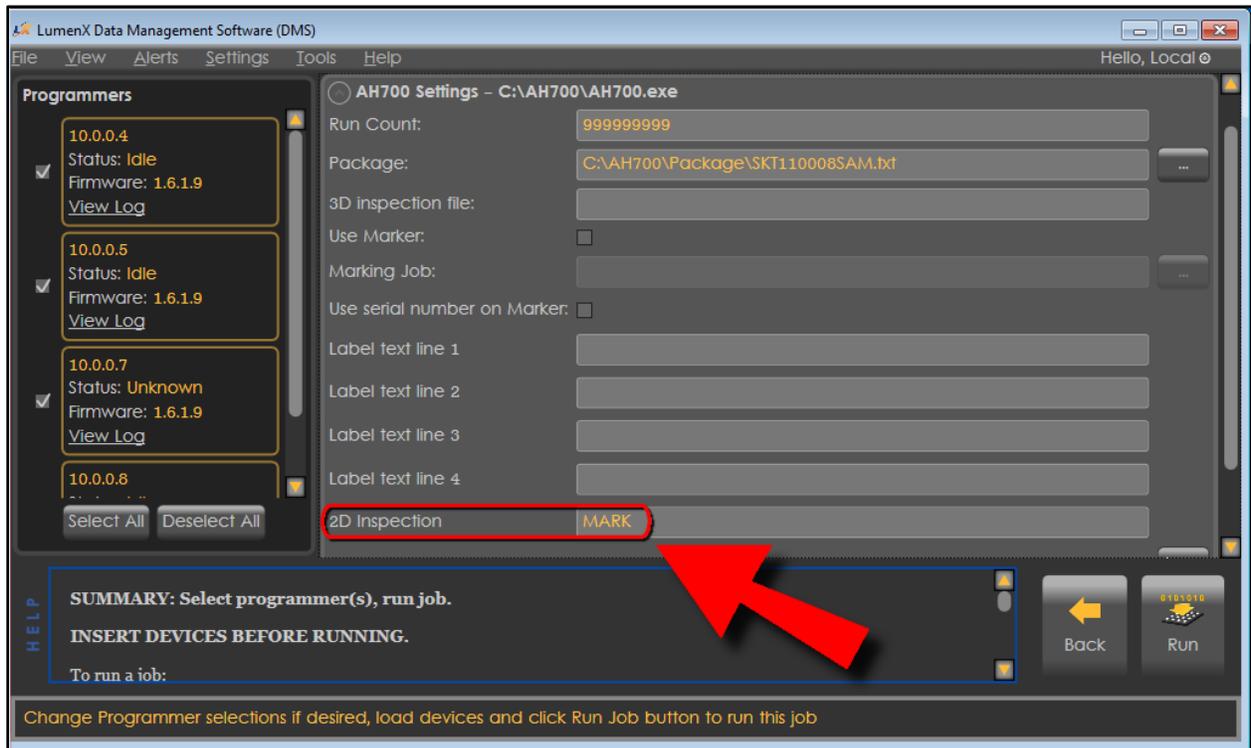
JOBNO_2D=xx

(where xx is the name of the 2D inspection file)



In LumenX Data Management Software (DMS)

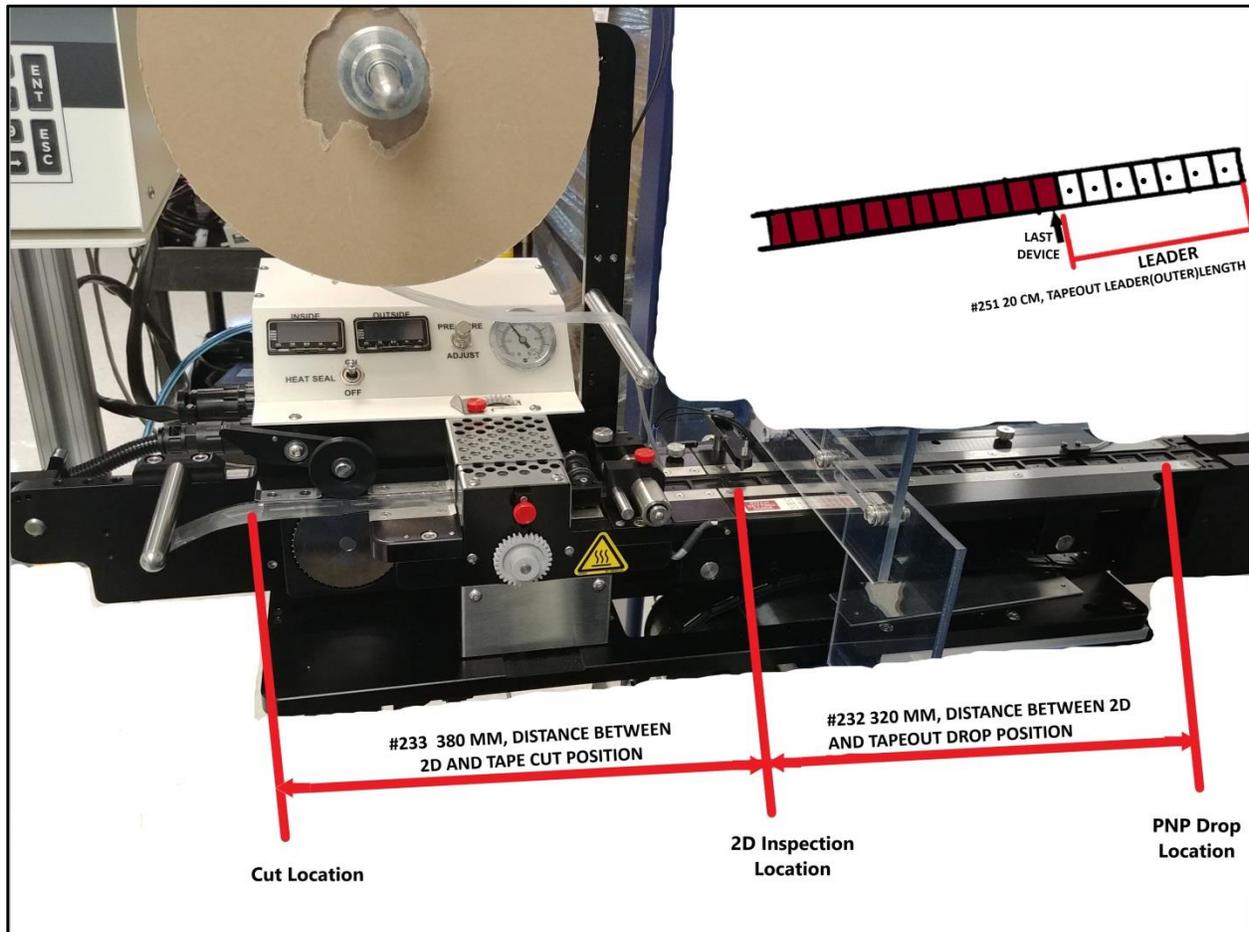
- Select the job from the Jobs list, and in the **2D Inspection** field, type the name of the mark file.



MachineParameters.txt

In C:\AH700\package\MachineParameters.txt, add or update the following line entries:

- #232 320 MM, DISTANCE BETWEEN 2D INSPECTION PT AND TAPEOUT-DROP POSITION
- #233 380 MM, DISTANCE BETWEEN 2D INSPECTION PT AND TAPE-CUT POSITION



Package File

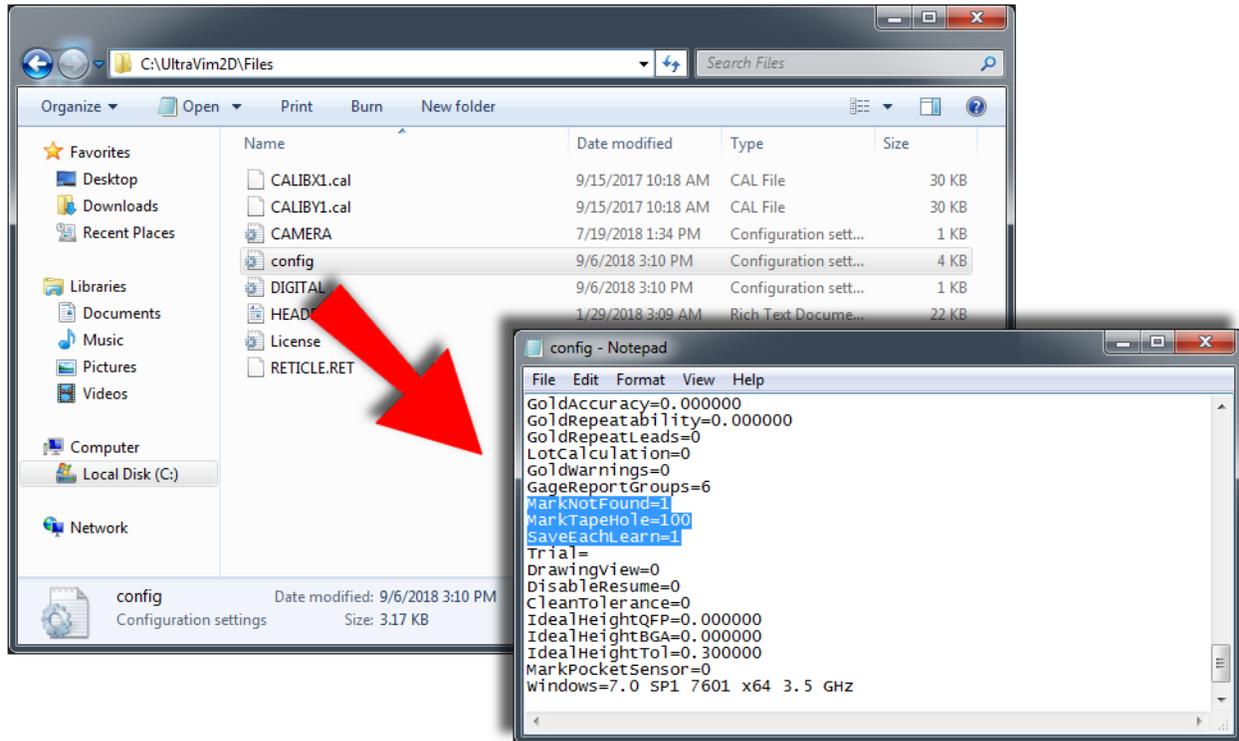
In C:\AH700\package, open your device/package text file, and update the following line entries for 2D:

- #249 4 HOLE QTY, TAPEOUT POCKET PITCH
- #252 10 NUMBER OF ALLOWED EMPTY POCKETS IN TAPEOUT PER LOT
- #253 0 NUMBER OF ALLOWED CONSECUTIVE EMPTY POCKETS IN TAPEOUT PER LOT

UltraVim 2D Config.ini

In C:\UltraVim2D\Files\config.ini, add or update the following line entries:

- MarkNotFound=1
- MarkTapeHole=100
- SaveEachLearn=1



For the **MarkNotFound** line entry:

- Setting *MarkNotFound=0* disables empty pocket detection based on mark correlation.
- Setting *MarkNotFound* to any other positive integer raises the system's tolerance for empty pocket detection; the system returns NFND when the measured/inspected mark has lower correlation than the integer.

For example, if *MarkNotFound=20*, then the system returns NFND for any devices with mark correlation lower than 20%.

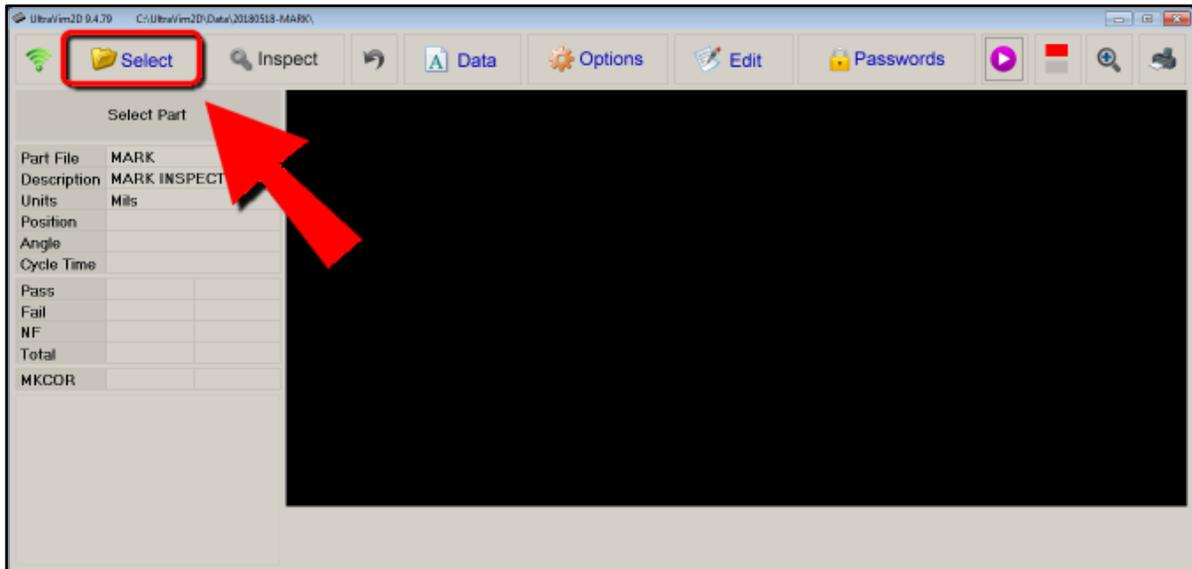
For the **MarkTapeHole** line entry:

- Setting *MarkTapeHole=0* disables empty pocket detection based on tape hole detection.
- Setting *MarkTapeHole* to any positive integer specifying the tape hole diameter (in pixels) enables the system to return NFND when it detects the empty pocket tape hole.

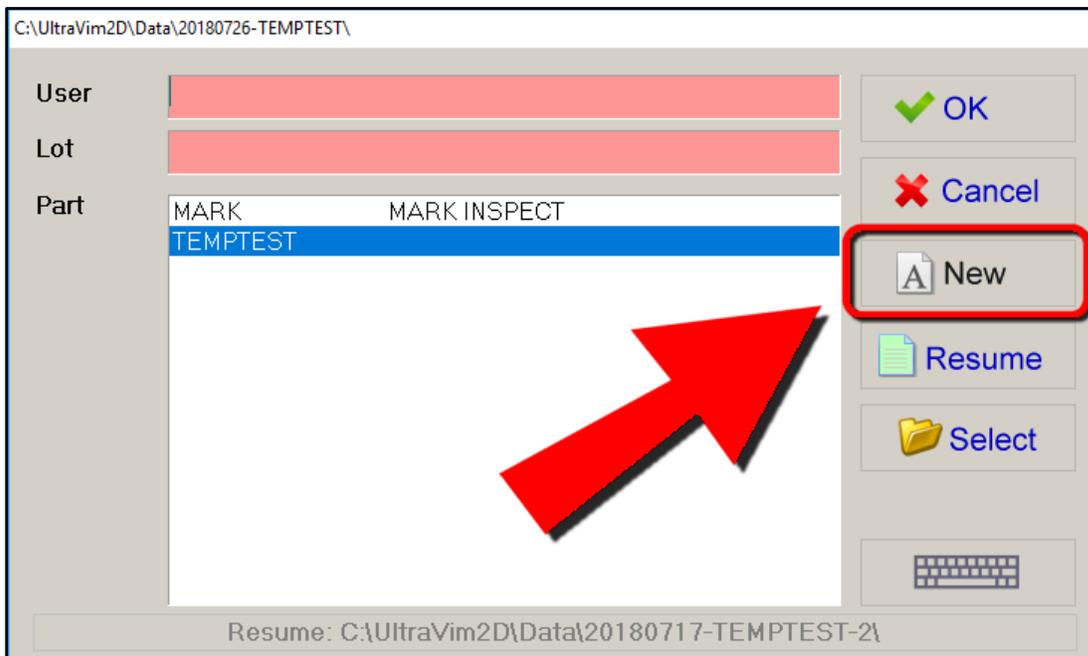
Establish Known Good Mark in UltraVim 2D

Place a device with a known good mark in the Tape-Out/inspection pocket, then train UltraVim 2D to look for this mark on subsequent inspections.

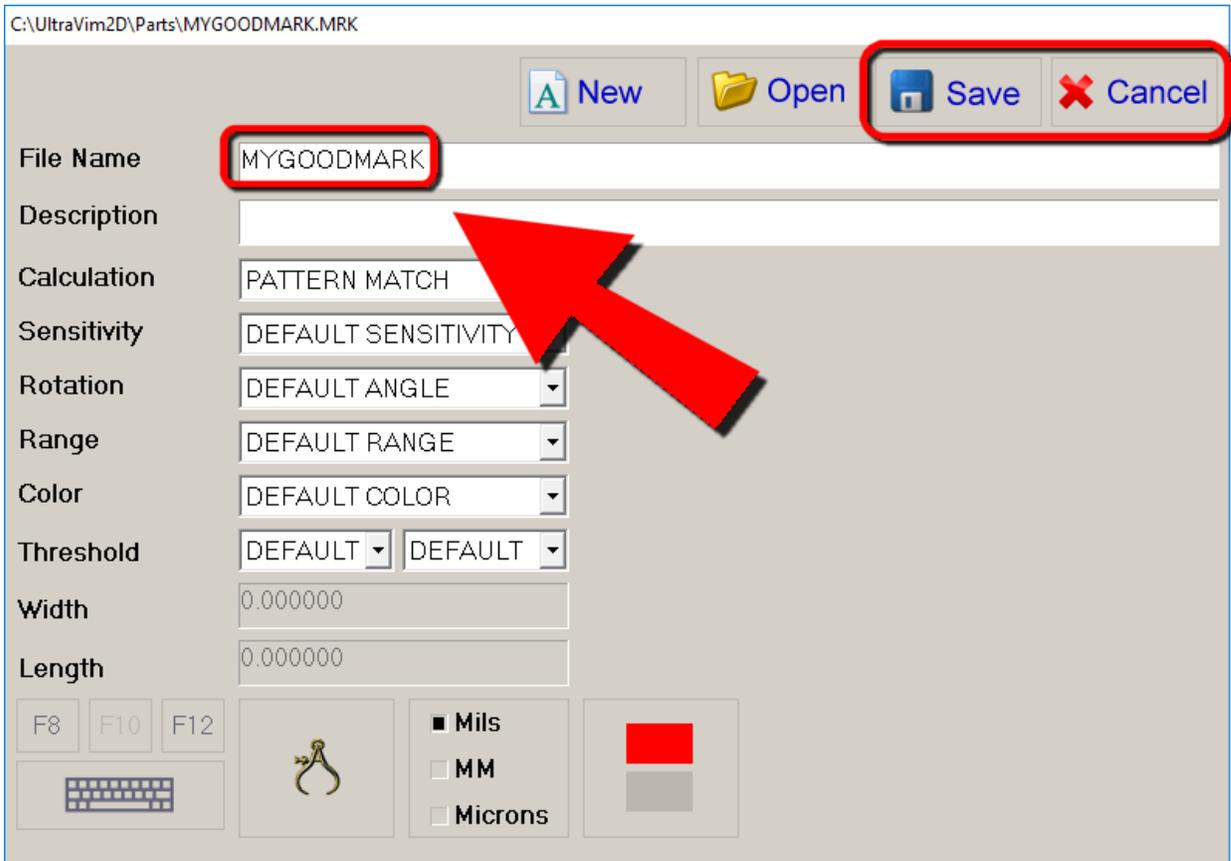
1. Start the UltraVim 2D software program and assume User Level 3:
 - Near the upper-right corner, click **Passwords**, type **3**, and then press ENTER.
2. Click **Select** (upper-left corner) to load a mark inspection file.



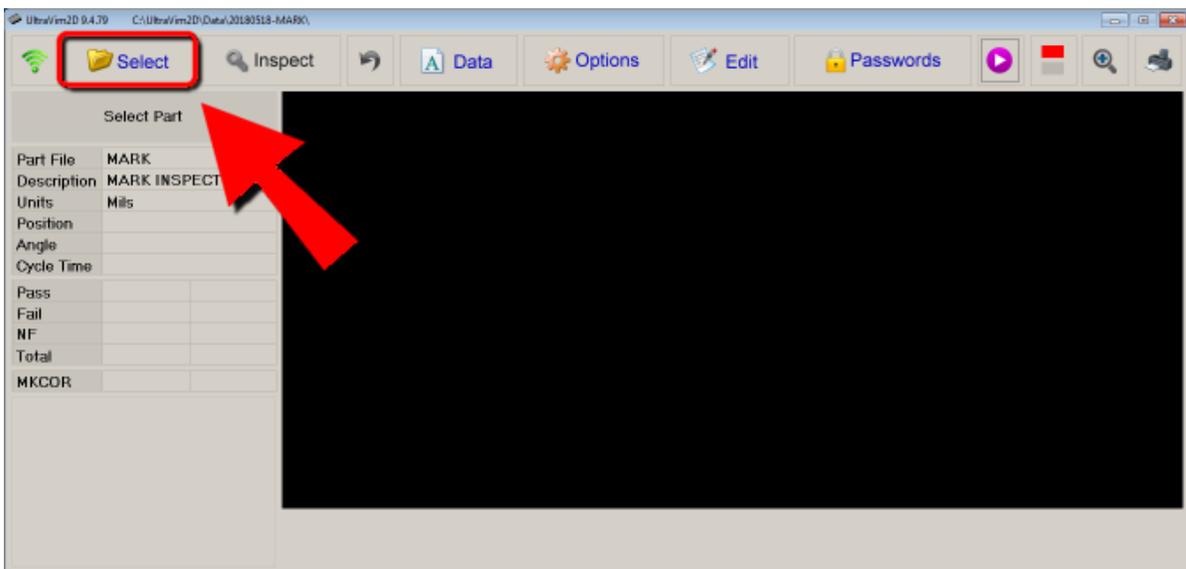
3. Now click **New** to create a new mark inspection file.



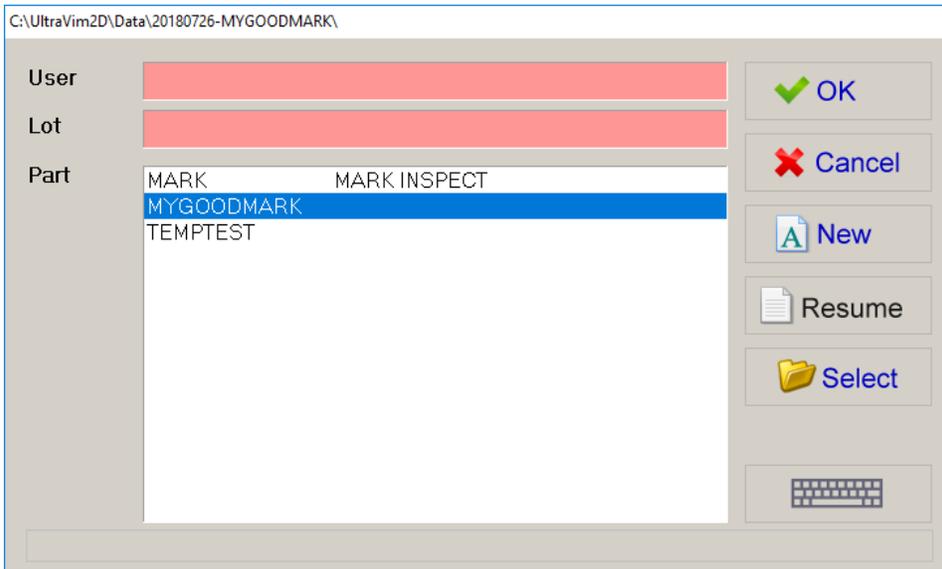
- 4. Type a name for the good mark, click **Save**, and then click **Cancel**.



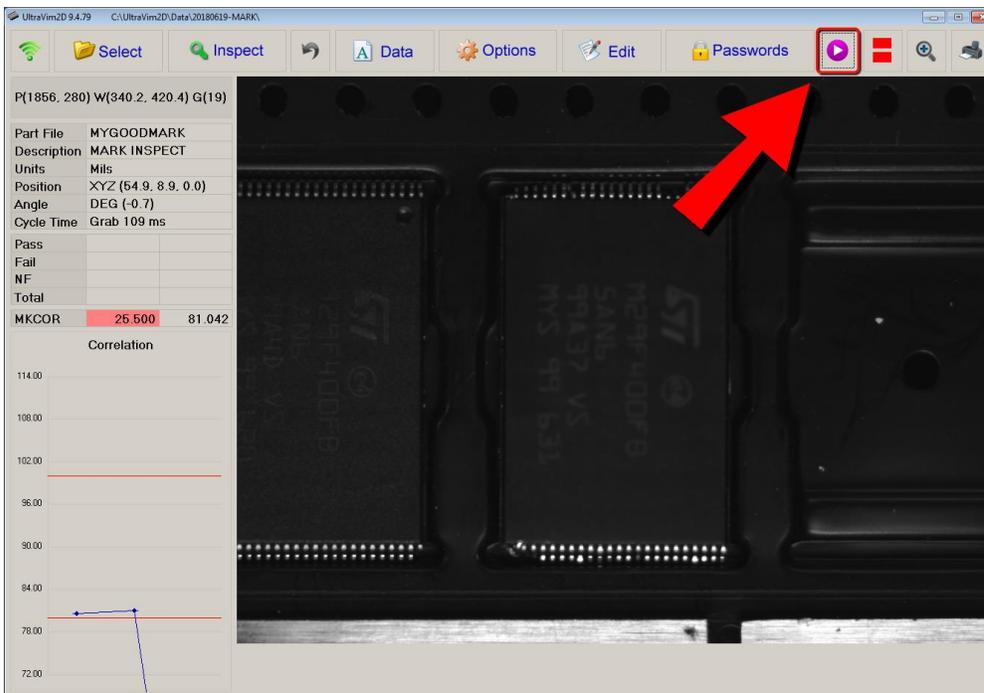
- 5. Click **Select** (upper-left corner) to load the new/good part file.



- Now select the new/good part file, and then click **OK**.



- If prompted to confirm the part file loading, click **OK**.
- Now click the **Play** icon/button (at the top) to acquire a visual image.

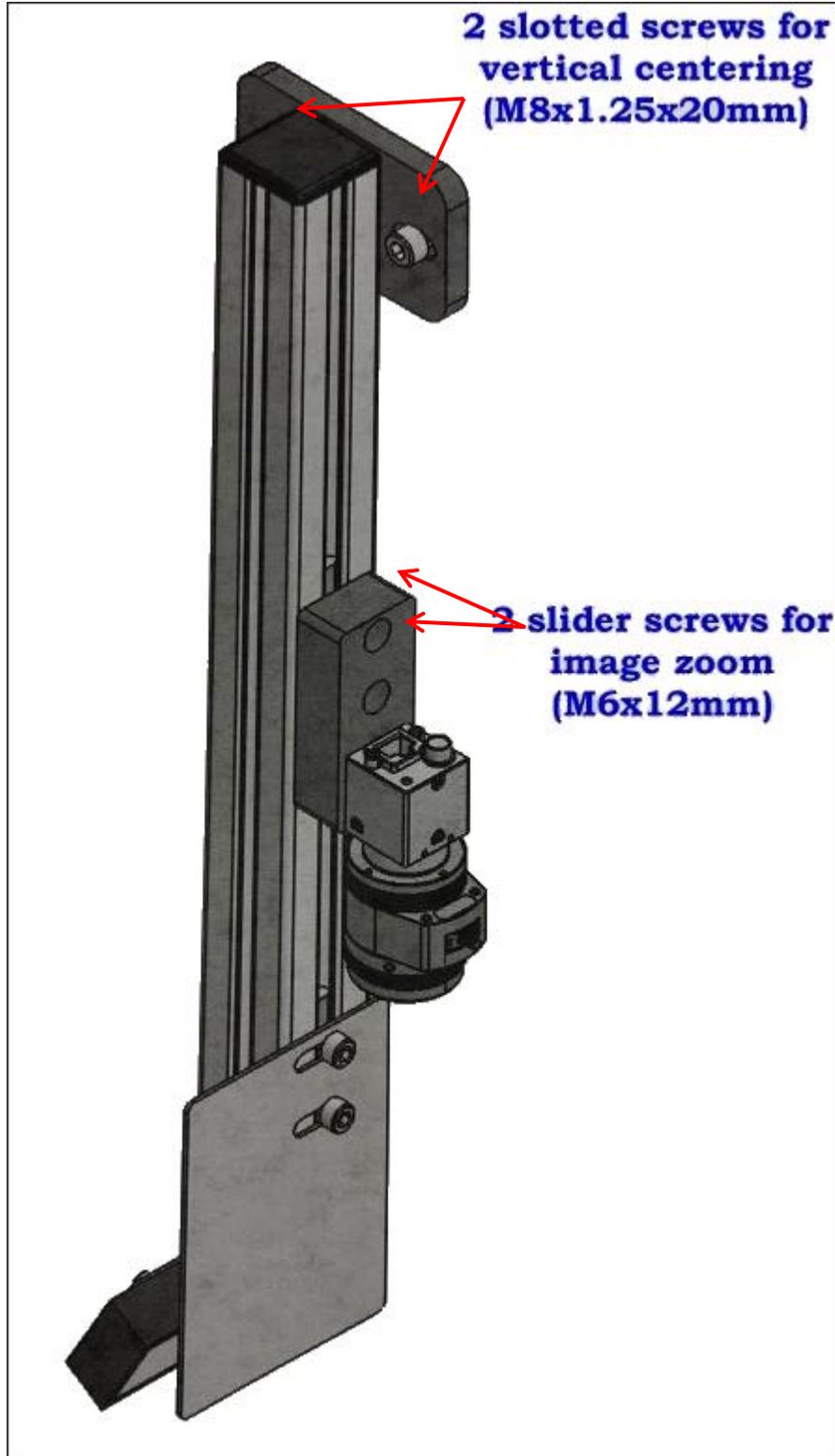


9. Ensure the image/markings is as clear as possible (all subsequent mark inspections are compared to this original image). See next step to adjust camera.



10. To center the part in the image:

- To center horizontally, advance the taper by joggng it forward or backward.
- To center vertically, use a 6 mm hex key to loosen the 2 [bracket screws](#) (M8x1.25x20mm), adjust bracket position to center image in software, then re-tighten the 2 bracket screws.
- To adjust zoom (raise/lower the camera), use a 5 mm hex key to loosen the 2 slider screws (M6x12mm), adjust the camera height to center image in software (factory default height is 168 mm from bracket top), re-tighten the 2 screws.



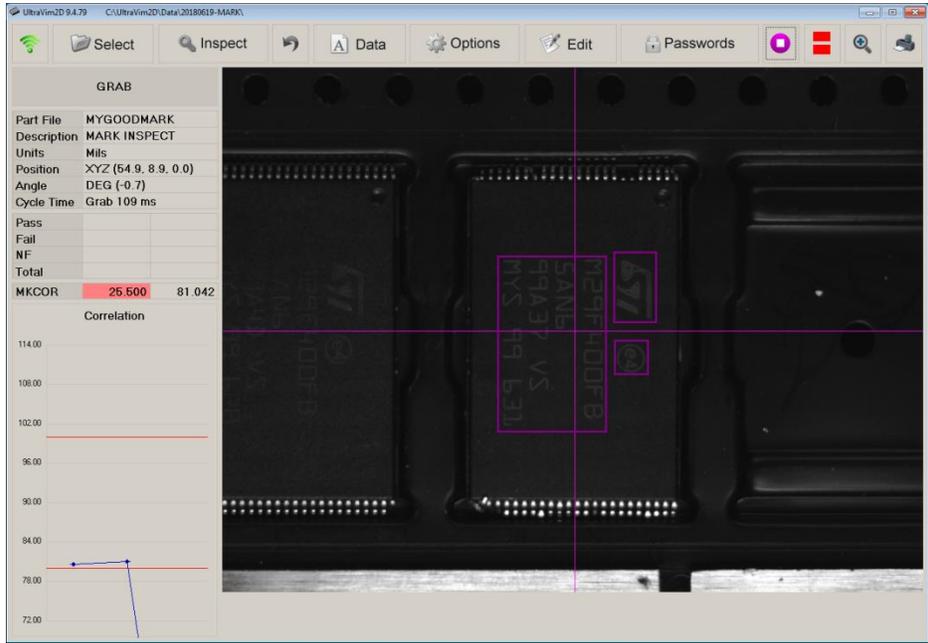
11. To adjust the camera exposure/focus, loosen one of the 2 set screws and rotate the camera lens.



12. Tighten the set screw(s) after adjusting exposure/focus.

13. Click and drag the mouse to create a focus area/search box for mark inspection. The first box drawn should encompass all marks on the device so the system can FAIL any devices that are flipped or otherwise have the wrong mark (inspected marks will have almost no correlation with the original known good mark). Minimally, the first box must encompass the area over the pocket hole, so the system can FAIL any devices that are absent (empty pockets cause a 'device not found' result).

14. Create additional search boxes around desired/critical mark features. You can create multiple search boxes for granular inspection, where the system calculates the mark correlation for each box separately. Although not shown below, it is a good practice to create a search box for PIN1 so the system can FAIL any devices that are improperly rotated.



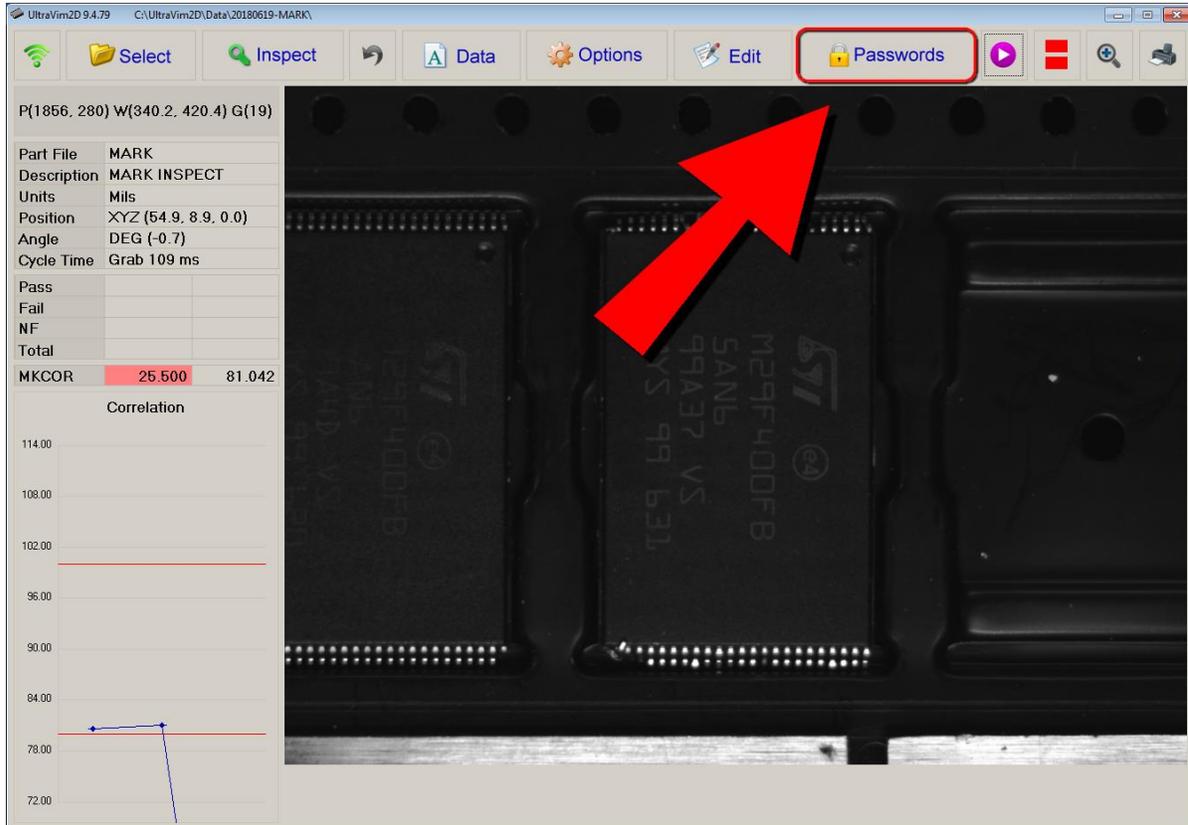
15. Save the configuration by clicking **Edit** (at the top), and then click **Save**.

Designate any pre-existing mark as a **Logo** to increase its tolerance against any fresh markings (the system is more forgiving on passing Logo marks). If a pre-existing mark is blurry or fuzzy, it may fail the [overall] mark inspection if you do not designate its search box as a Logo. For example, if you want to focus the inspection on a fresh mark of a serial number rather than an existing label or brand logo, then right-click the search box around the label/logo and select **Logo**.

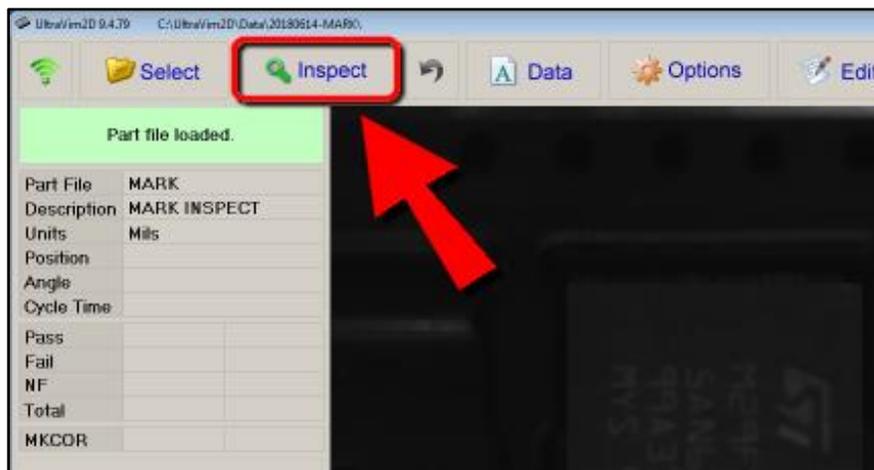


Run Mark Inspection(s) in UltraVim 2D

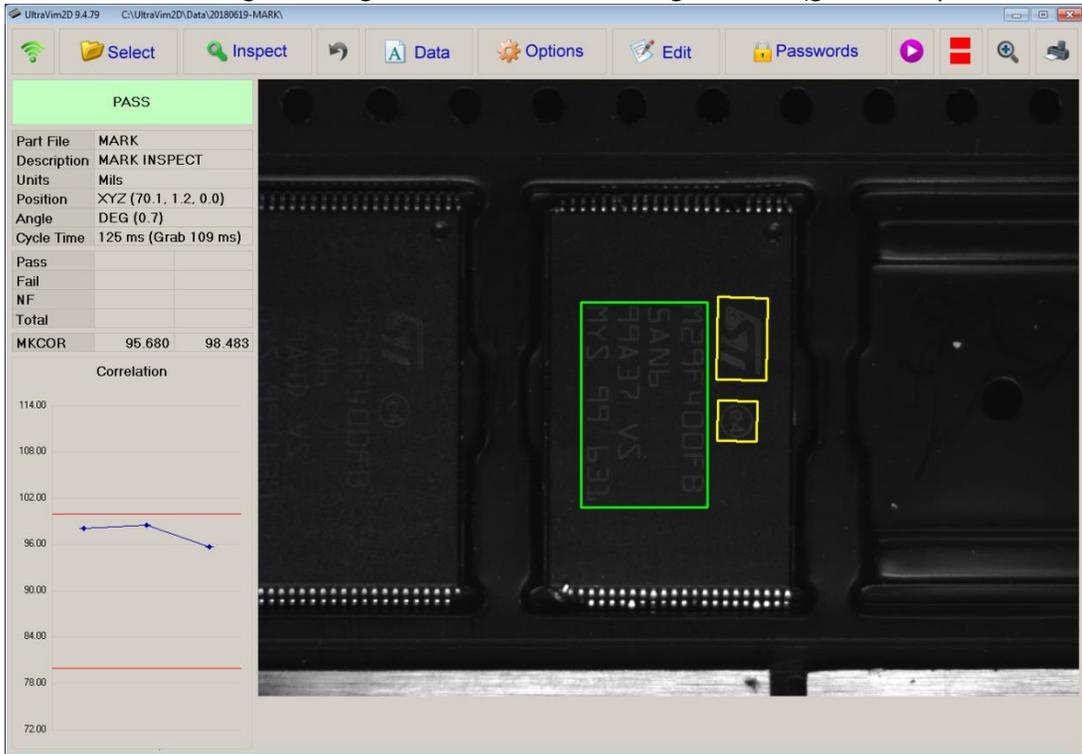
1. On the taper/Handler PC, advance the pocket to the first part/device to inspect.
2. Start the UltraVIM 2D software program and assume User Level 1:
 - Near the upper-right corner, click **Passwords**, type **1**, and then press ENTER.



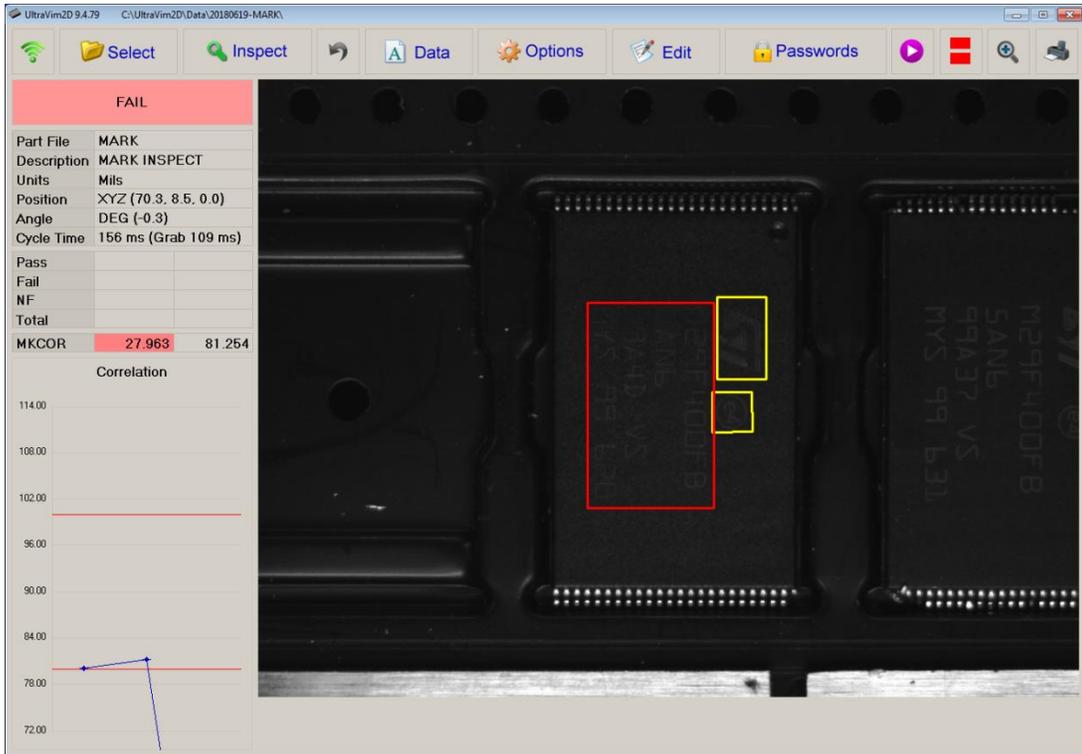
3. Click **Inspect** (at the top), and review the inspection results.



- Good device markings have high correlation with the original mark (green and yellow boxes):

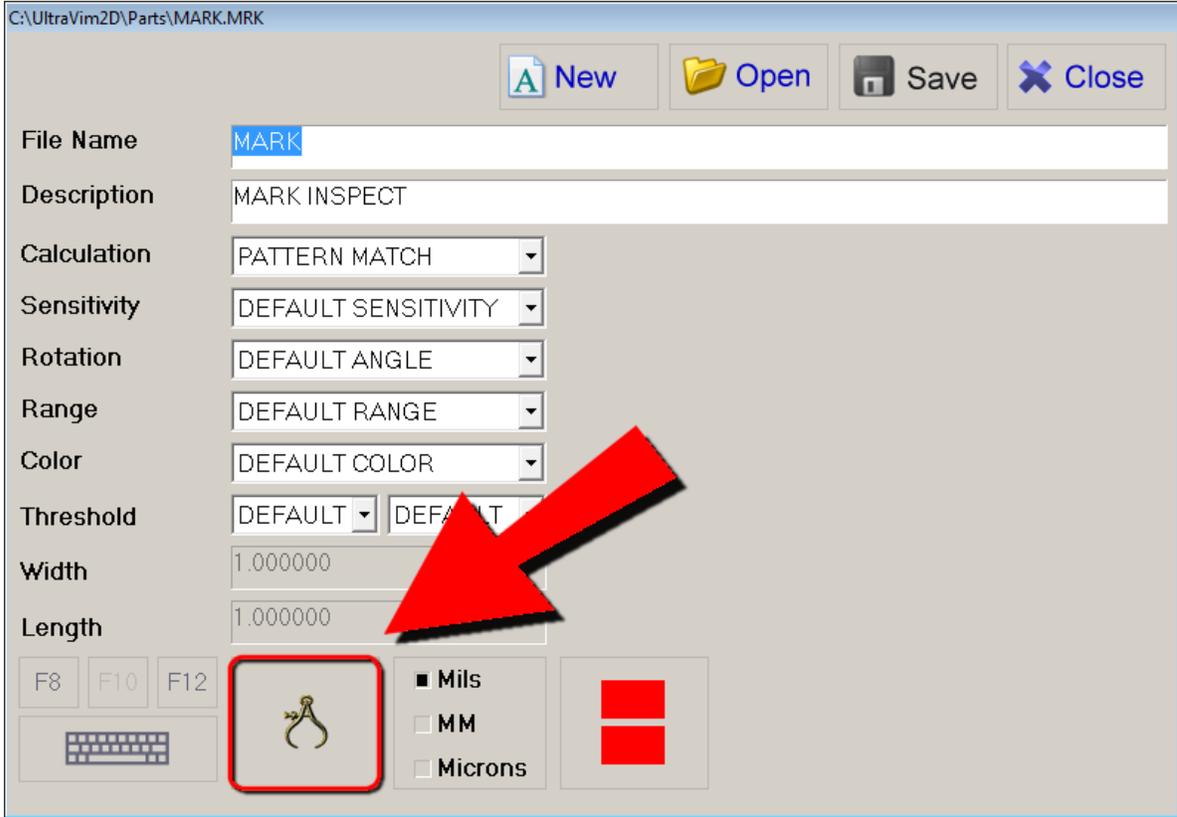


- Poor device markings have low correlation with the original mark (red boxes):

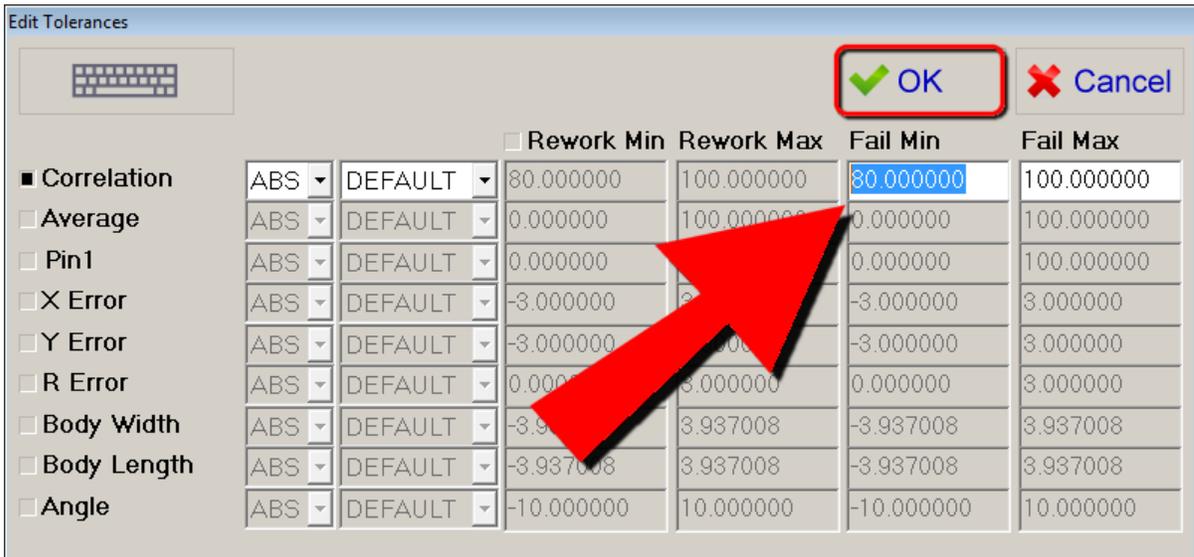


Modify Pass/Fail Tolerance

- To modify the PASS/FAIL tolerance, assume User Level 3:
 - Near the upper-right corner, click **Passwords**, type **3**, and then press ENTER.
- Click **Edit** (at the top), and then click the **Caliper** icon/button.

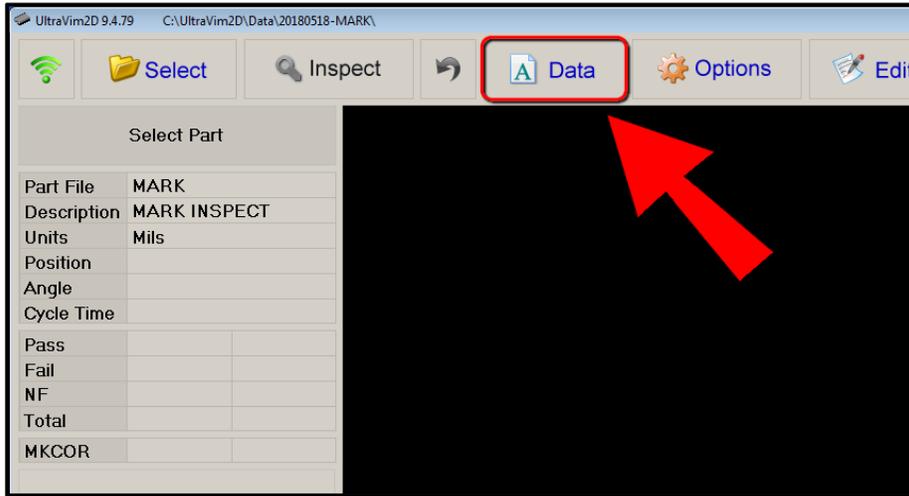


- Change the **Correlation** value for **Fail Min**, and then click **OK**.

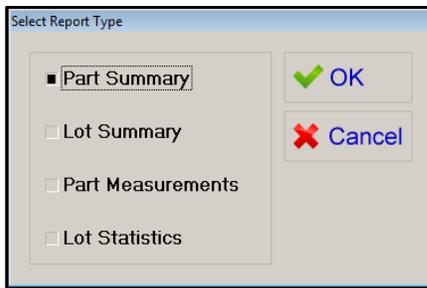


Chapter 4: Generating an Inspection Report

1. To generate an inspection report, click the **Data** icon/button at top.



2. In the **Select Report Type** dialog box, select the type of report to generate, and then click **OK**.



3. The generated report opens. Review and verify that its contents look appropriate.

PART SUMMARY						
Machine:	2742326958	Part:	MARK			
Units:	MILS	Lot:				
Date:	2018/6/22 5:03 PM	User:				

	Label	Min	Result	Label	Max	Result
MKCOR	M2	96.525		M1	98.067	

	Pass	Rework	Fail	NF	Pass%	Fail%
MKCOR	2	0	0	0	100.0%	0.0%

Chapter 5: Operational Overview

The following table summarizes the error-handling behavior and operational design of the 2D Mark Inspection system.

Inspection Result	System Behavior	Operator Action	Result
PASS	<ul style="list-style-type: none"> Index the Tape-Out Inspect next device 	None.	Devices with good marks are counted and sealed into the Tape-Out reel.
FAIL	<ul style="list-style-type: none"> Display message that the mark failed inspection Instruct Operator to remove FAILED device Request Operator to confirm device removed Inspect pocket to confirm empty Resume inspection after confirmation 	Remove FAILED device and confirm that pocket is now empty.	Devices with poor marks are removed and excluded from being taped. The AH700 software keeps track of the number of failed devices, but the taper does not currently keep this count.
Pocket Empty	<ul style="list-style-type: none"> Request Operator to confirm pocket is empty Inspect pocket to confirm empty Resume inspection after confirmation 	Remove device from pocket (if not truly empty); confirm that pocket is now empty.	Pockets without devices are properly accounted for/excluded from the count of PASSED devices.
Unexpected Device	<ul style="list-style-type: none"> Display message that pocket is not empty Instruct Operator to remove device Request Operator to confirm device removed Inspect pocket to confirm empty Resume inspection after confirmation 	Remove device from pocket and click Retry .	At the start or end of a lot, the Tape-Out leader/trailer is properly accounted for.
Time-Out	<ul style="list-style-type: none"> Display message that a Timeout has occurred for 2D Mark Inspection 	Click Retry .	2D measurement timeouts and issues are re-tried.
Finish	<ul style="list-style-type: none"> Display message that the lot is done Instruct Operator to cut/remove Tape-Out reel 	Acknowledge message and cut/remove Tape-Out reel.	PASSED devices are properly accounted for and sealed in the Tape-Out reel.