Atola Insight Forensic Manual

Version: Dec 02 2025

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Quickstart

Assuming you have Atola Insight Forensic software installed and activated, let us start from zero and learn how to image an evidence device safely in Atola Insight Forensic.

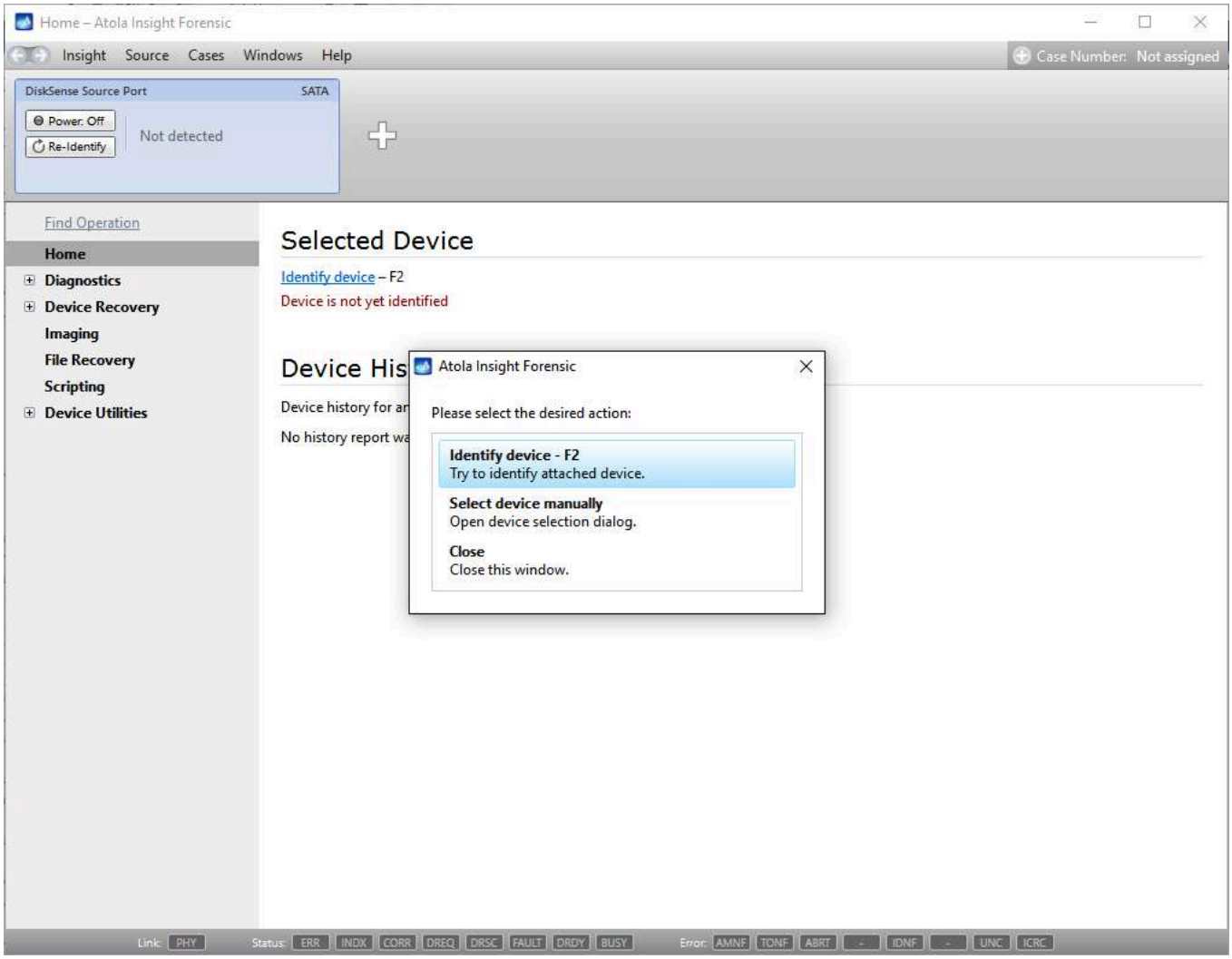
Step 1. Plug the source and target devices into the DiskSense system.

Take two SATA drives that will serve as your source and target devices. Plug them into the SATA source and SATA target ports.

Step 2. Launch Atola Insight.

Launch already installed Atola Insight Forensic software.

You will see the following window asking you to select the desired action:



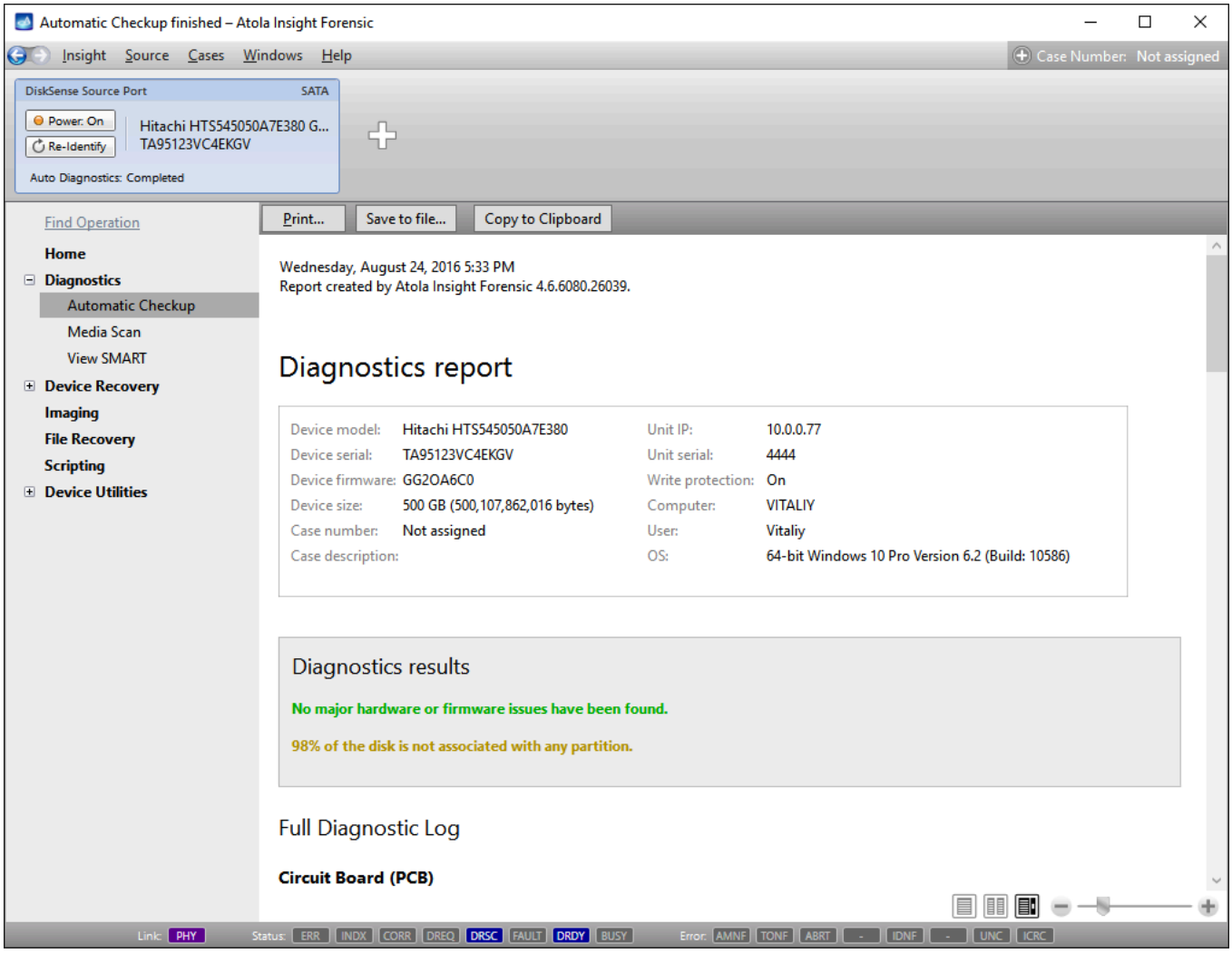
Select **Close** to avoid powering up the source SATA port for now.

Step 3. Diagnose first before imaging.

Presumably, we know nothing about the source device and its state. Maybe it is a good working drive, or maybe it is not. It may be a damaged one or it may die in a few hours. That is why we should begin with **Automatic Checkup**.

Go to **Diagnostics** > **Automatic checkup**, and then click the **Start** button.

It will take a couple of minutes to get to the Diagnostics report. In this particular case, we see that the source drive is in good state, and we can safely start imaging it.



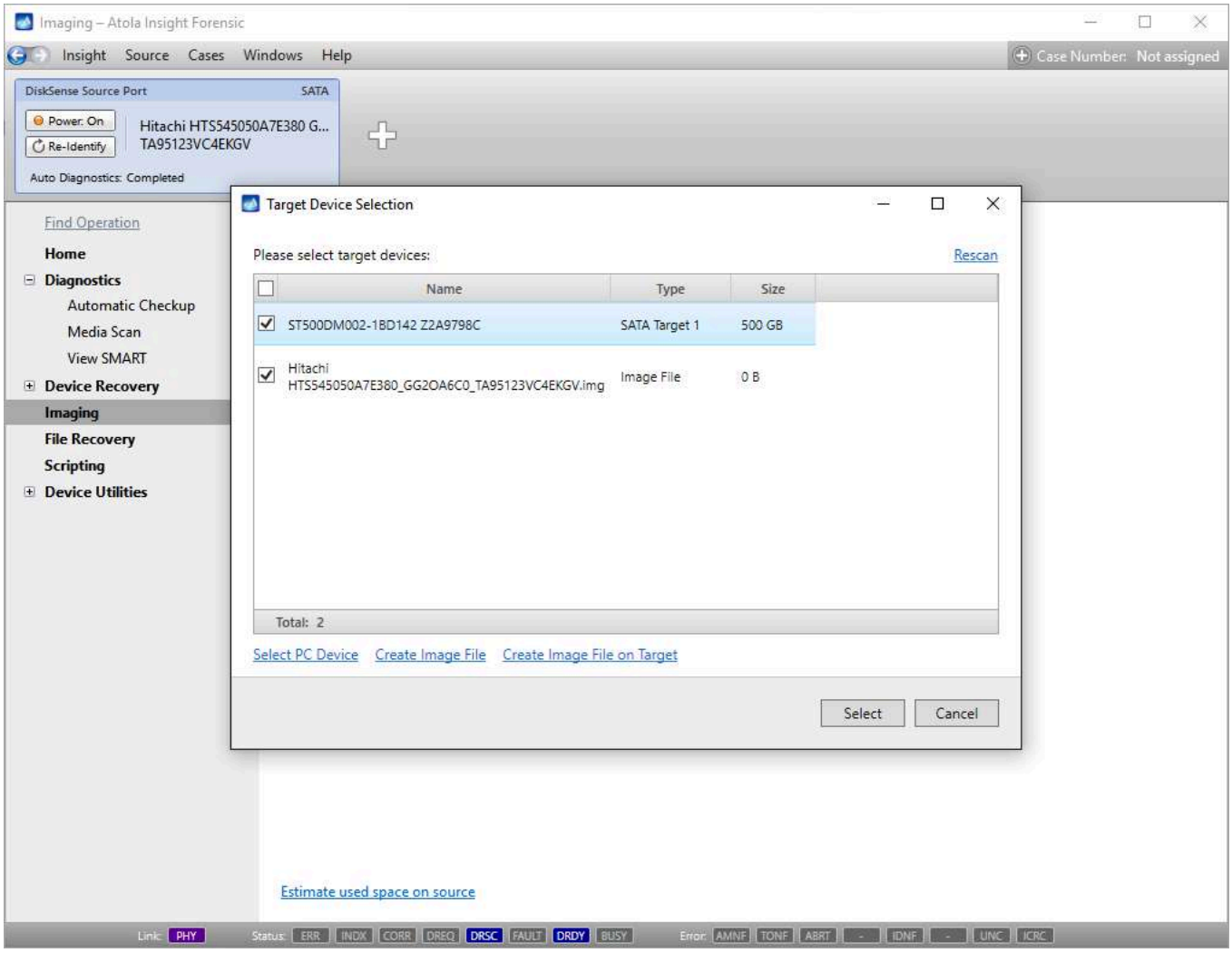
Step 4. Select the imaging targets.

On the left, click **Imaging** and then **Create New Session**. You will be asked to select the imaging targets, including the following:

- Devices plugged into SATA/USB target ports of the DiskSense system
- Image files

Let us take advantage of imaging into two targets at the same time: SATA target drive and image file.

Click **Create Image File** and then confirm a selected filename. Then tick the SATA Target 1 device. In the end, you will get a screen like this:

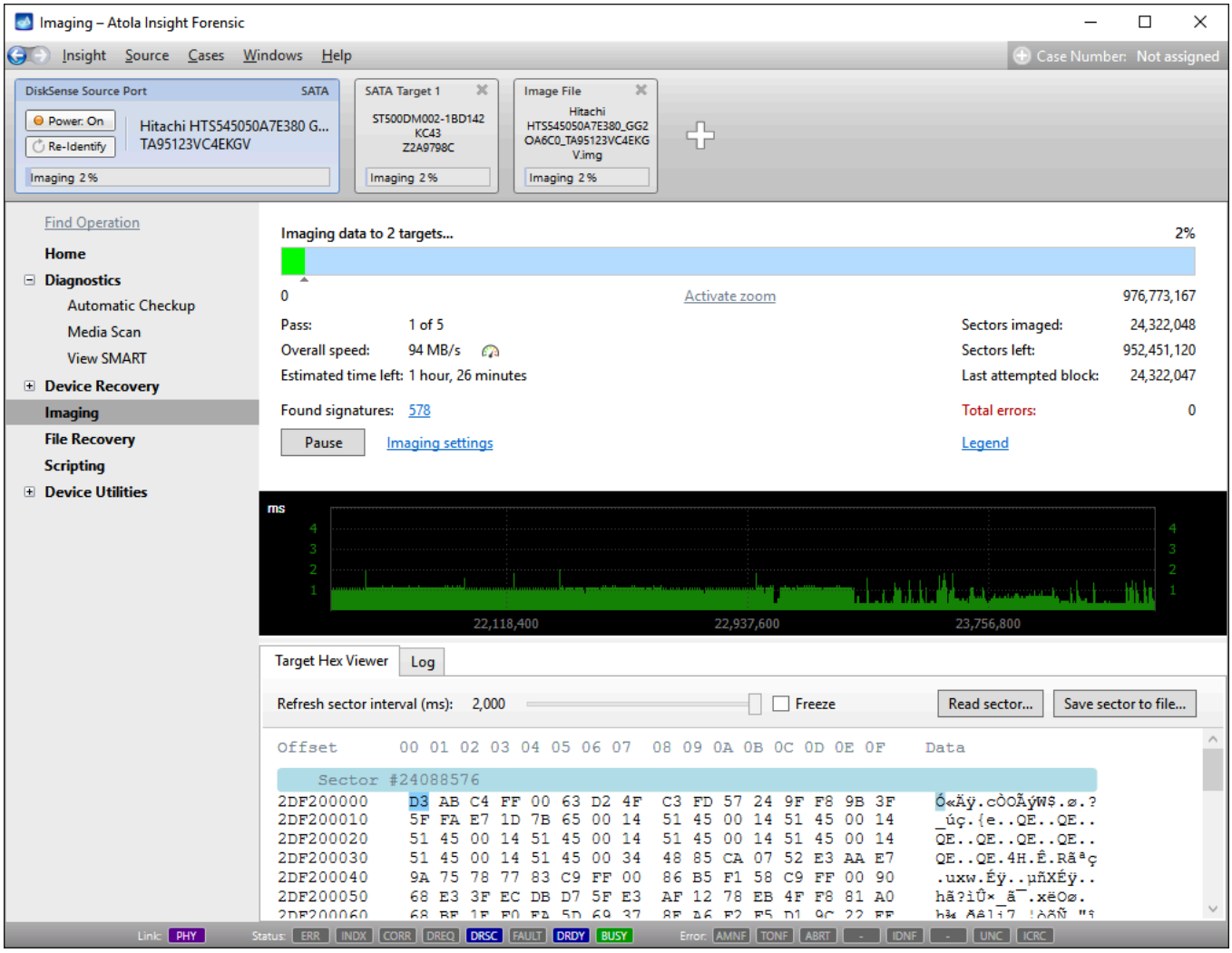


Click the **Select** button to confirm.

Step 5. Start imaging.

Imaging includes a wide variety of settings for tuning the process. Sometimes it is helpful when dealing with severely damaged evidence drives. However, the default imaging preset works great in most cases.

Here is just one button to click, **Start Imaging**, to get the imaging process running.



Bonus: Screencasts

Congratulations! You read the quickstart up to this section, and we have an award for you! :-) Here are a number of screencasts explaining specific features of Atola Insight Forensic.

- Download or watch in high-resolution on Dropbox
- Watch on Youtube

Introduction

Atola Insight Forensic offers complex data retrieval functions along with utilities for manually accessing hard drives at the lowest level, wrapped in a very simple and efficient user interface.

The tool is developed by a team of industry renowned data recovery engineers in collaboration with law enforcement agencies and forensic experts from around the globe.

Atola Insight Forensic system includes:

- Atola Insight Forensic software (runs on any Windows PC or laptop)
- DiskSense hardware unit
- Hardware extensions (optional)

Forensic and E-Discovery solution

All features of the system are designed to support damaged media. Where other Forensic data acquisition products stall or abort on media errors, Atola Insight Forensic can acquire a usable image.

When dealing with good (non-damaged) media, Atola Insight Forensic acquires data faster than any other data acquisition equipment commercially available.

The system has several key features for data capture in forensic and e-discovery cases:

- Fastest in industry imaging speed up to 500 MB/s
- High performance multipass imaging for damaged drives
- In-depth Automatic HDD diagnostics
- Extraction of unknown ATA Passwords
- Case management system prepares acquisition reports automatically
- Hash calculation: MD5, SHA1, SHA224, SHA256, SHA384, SHA512
- Forensic data erasure methods including DoD 5220.22-M, Secure Erase, NIST 800-88, Pattern Erase
- File recovery: NTFS, APFS (with encrypted volumes), XFS, ext4/3/2, exFAT, Btrfs, HFS/HFS+, FAT32, FAT16
- Support for SATA, IDE, SAS, USB media
- Support for Apple PCIe (2013 - recent models) and M.2 PCIe SSDs via Atola extension modules
- Built-in write blocker
- Optional 10Gb Ethernet via extension modules

Atola Insight Forensic workflow

Atola Insight Forensic covers all phases of the data acquisition process:

1. Media diagnosis
2. Media recovery (if needed)
3. Image creation
4. File recovery

1. Media diagnosis

Whenever you start working on a hard drive, the very first thing we recommend to do is to find out if the drive is damaged in any way, and if so, what is the extent of the damage.

The tool comes with fully automated hard drive diagnosis module. It diagnoses all hard drive components:

- printed circuit board (PCB),
- spindle motor,
- head stack,
- firmware,
- and file systems.

Diagnostics will work properly even if the drive has burnt parts or damaged head stack – the routine makes use of the current monitor that is embedded into the DiskSense unit.

After diagnostics finishes, the tool will prepare a report and let you know the exact issue with the drive; it will also suggest the next step to be able to retrieve the data.

2. Media recovery

Atola Insight Forensic can recover and/or remove unknown HDD passwords (also known as ATA-passwords). For most hard drives the unlocking process is fully automated. Some hard drives (for example, latest 2.5-inch Hitachi hard drives) require a degree of manual interference. Operator can choose whether to display the password or just remove it and unlock the drive. Both security levels (High or Maximum) are supported.

To get the list of the hard drives currently supported by automatic password recovery routine, see Supported drives.

Manual firmware recovery

If there is firmware damage that cannot be fixed automatically, you will have to proceed with manual firmware recovery procedure. Generally speaking, firmware recovery process includes of the following steps:

1. Full firmware backup
2. Diagnosis
3. Recovery

Backup is a very important part of the process. Make sure you have full firmware backup before you make any change to the firmware area.

Basic diagnostics of the firmware area is done during Automatic Diagnostics process (see **Automatic Diagnostics**). More in-depth diagnostics is done during firmware backup process, after which any firmware damage that may exist will become obvious, as damaged modules will have either "Read Failure" or "Bad Checksum" mark. Some of these damaged modules can be recovered by right-clicking them and selecting Recover (module will be re-generated and written to the drive). In some rare cases, when Atola Insight Forensic cannot regenerate the module, you would have to copy it from a donor drive (you would need to locate a similar hard drive, save that module from that drive into a file, and then copy that file into the bad drive's firmware, replacing the damaged module).

Please note: if after the full firmware backup you find that there are many unreadable firmware modules (more than 10% of total number of modules), it might be a good indication that the head stack is malfunctioning. The best thing to do in this case is to **reconfirm** that the hard drive does not have a head damage before proceeding with firmware recovery attempt. Attempting firmware recovery on a hard drive with internal damage may result in an unrecoverable damage.

3. Image creation

Before you proceed with any file recovery attempt, it is very important that you have a sector-by-sector copy of the drive. This is done with the Imaging module available in the software.

For more details, see Imaging.

4. File recovery

After you made a copy of the original hard drive, you can start recovering files. File Recovery engine is able to show status of each file in the file browser, such as what percentage of file was imaged without errors. There's also an ability to create lists of files specifying the status of each file. After creation, the list may be presented for a review.

To learn more, see File Recovery.

Package contents (DiskSense 1)

The DiskSense 1 package includes the following items:

DiskSense unit

Power supply

4x HDD eSATAp cables

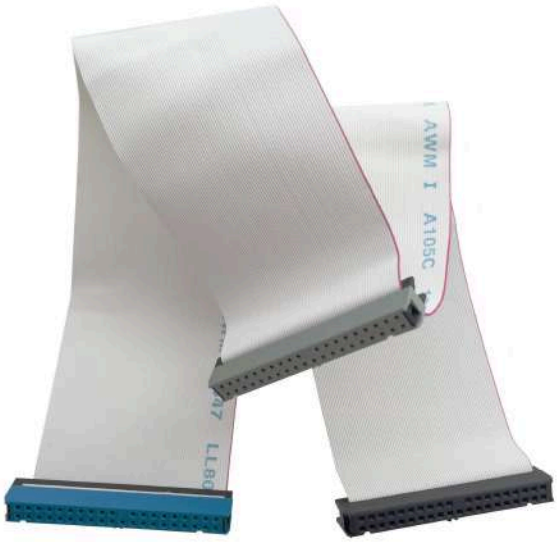
Hitachi password extraction adapter

3.5" to 2.5" IDE adapter

IDE power cable

IDE interface cable

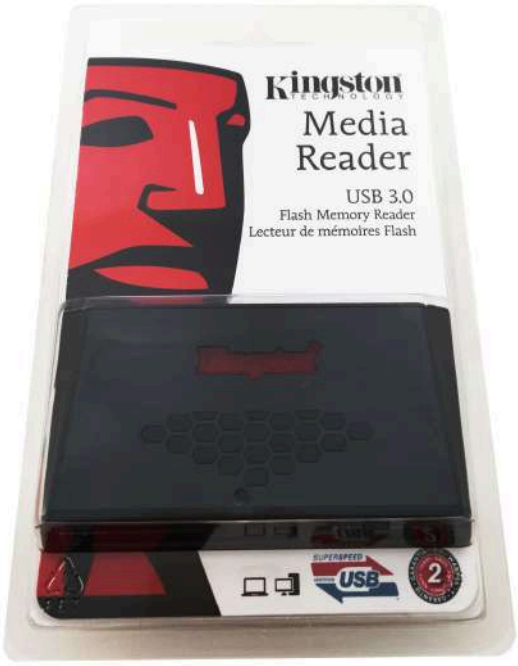
Serial cable RS-232



Ethernet cat 5e or 6 cable

USB3 to Ethernet adapter

Flash card reader



DiskSense Unit

The DiskSense Unit uses the fastest and most efficient interface connections available, and is built to last using the highest quality components one could source. It includes a built-in oscilloscope for current monitoring and write protection switch for source media.

Atola DiskSense Unit is effective for bad disk forensic imaging. To ensure high quality and efficiency of our hardware tools, we test them on hundreds of storage devices.

Technical Specifications

- Dimensions: 7.7 x 7.2 x 2.1 in (196 x 182 x 54 mm)
- Weight: 2.9 lb (1.3 kg)
- Wide working temperature range: 0°C–50°C (32°F–122°F)
- Source ports: SATA 3.0, USB 3.0, IDE
- Write protection switch for source ports

- 6 Target ports:
  - 3 SATA
  - 3 USB 3.0 (SuperSpeed)

- Extension port:
  - SAS extension
  - 10 Gbit Ethernet
  - Thunderbolt
  - Apple PCIe SSD
  - M.2 PCIe/SATA SSD

- Serial RS232 port
- Operation LEDs for all ports and a buzzer
- Two ethernet interfaces: RJ45 / 1Gbe. One of them can be used for Network Forensics.
- Internal OS: Linux running a custom kernel
- Control interface: Atola Insight Forensic (Windows application)
- Supported hard drive interfaces: SATA I/II/III, USB 1.0/2.0/3.0, IDE
- Flash card support via card reader attached to any USB port
- Power consumption: 60 Watt average, 200 Watt peak
- Supply Voltage: 100 - 240 VAC, 50-60 Hz
- RoHS compliant

DiskSense: under the hood

DiskSense is basically a very small computer running a Linux OS. However, neither normal computer's BIOS, nor basic Linux kernel are suitable for handling of damaged hard drives. It is because neither of them were designed to handle hard disk failures very well. We have invested a significant amount of R&D efforts to build a highly customized and fine-tuned Linux kernel that completely overcomes these issues. Additionally, this kernel features:

- Full low-level control over SATA, USB and IDE ports
- Full native SATA support
- Reset and SATA PHY control for best handling of severely damaged hard drives
- High-speed DMA data transfers, up to 500 MB/s
- All BIOS and standard kernel functions are disabled

DiskSense also features our proprietary circuitry for ultimate hard drive's power control:

- Current sensor for in-depth hard disk diagnosis
- Automatic overcurrent and short-circuit protection
- Overvoltage protection

These features are a must when dealing with damaged hard drives.

DiskSense Forensic Unit

For example, low-level control of the SATA, USB and IDE ports allows Atola Insight Forensic to deal with hard drives that do not properly initialize, have many bad sectors, or frequently freeze due to internal (mechanical) failures.

SATA PHY control allows resetting a frozen hard drive without a power cycle. This reduces the time while imaging, and the chance of further hard disk degradation and failure.

Current sensing allows Atola Insight to diagnose a failed hard drive even if it has electronic or mechanical damage. Please see Disk Diagnostics for more details on how this works.

Overcurrent protection detects when the hard drive draws abnormal current and stops the attached device to prevent further damage.

Overvoltage protection circuit ensures that in the unlikely event of the DiskSense unit malfunction, the attached hard drives are not damaged in any way.

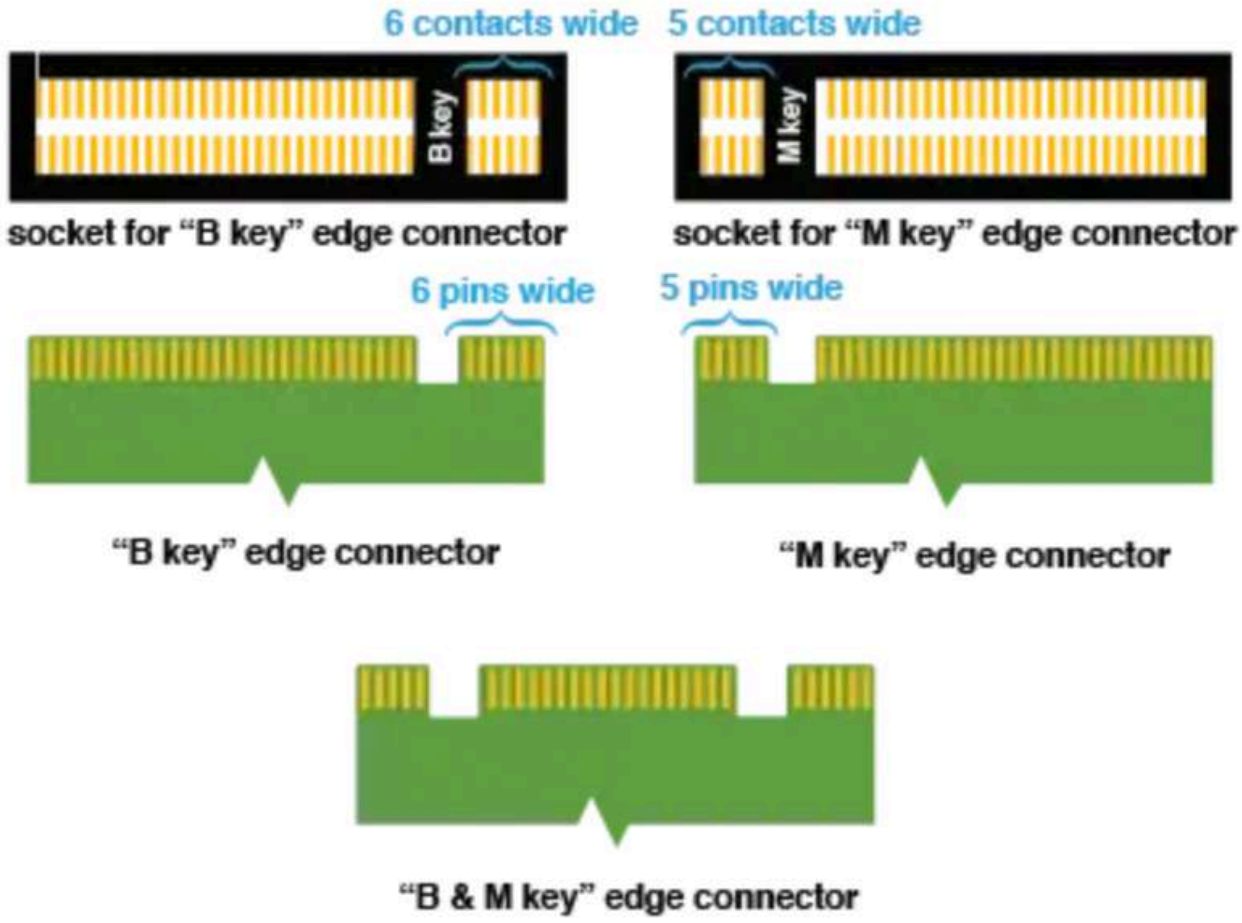
DiskSense unit is fully controlled by Atola Insight software via the Gigabit Ethernet interface, hence no Linux experience is required at all in order to operate it.

M.2 SSD extension module

You can connect PCIe AHCI M.2 and SATA M.2 solid state drives to Atola DiskSense using the M.2 SSD extension module.

M.2 extension for DiskSense currently does not support NVMe drives. To image an NVMe drive with DiskSense, see NVMe drive imaging via NVMe-to-USB adapter.

Only B & M key and M key interface drives are supported by this extension module.



M.2 SSD extension module also works with both Atola DiskSense 2 and Atola TaskForce.

Insight Forensic features supported for the M.2 SSD extension

Here are the differences in PCIe AHCI M.2 and SATA M.2 support in Atola Insight Forensic working with the DiskSense hardware unit:

All Insight operations	✓	Partial (see below)
Drive hotplug	✓	–
Power management	✓	–

M.2 PCIe SSD features supported:

- Max read/write speed: 600 MB/s
- Write protection

- Imaging
- Media scan
- Damaged drive support
- SSD Trim
- Calculate hash
- Comparison with a pattern, image files or other drives
- Device utilities:
    - disk editor
    - media recovery
    - and more

Plug and unplug the M.2 SSD extension module

DiskSense has a PCI Express port on its left side, which is labeled as *EXTENSION*. It is used to connect Atola hardware extension modules supported by Atola Insight Forensic software.

> The DiskSense hardware unit must be powered off before installing the extension module.

To connect the M.2 SSD extension module to the DiskSense hardware unit, do the following:

1. Power off DiskSense.
2. Plug the M.2 SSD extension module into the Extension port and fasten the module with 3 screws.
3. Power on DiskSense.

To disconnect the M.2 SSD extension module or replace it with another extension module, do the following steps:

1. Power off DiskSense.
2. Release the screws, which hold the module, and unplug it from the Extension port.
3. **Optional:** Plug another extension module into the Extension port and fix the module with a screw.
4. Power on DiskSense.

Connect a PCIe AHCI M.2 drive using M.2 SSD extension module

Important: Drive hotplug is not supported yet. DiskSense unit must be powered off before installing or replacing drives.

1. Power off DiskSense.
2. Remove the power cable and wait for 1 minute.
3. Unplug the M.2 extension with the M.2 drive installed and carefully plug another M.2 drive.
4. Power on DiskSense.

Connect a SATA M.2 drive using M.2 SSD extension module

When you plug a SATA M.2 drive into M.2 SSD extension module, DiskSense will light up the LED indicator on the module, next to the words "*When LED is on, plug SATA source port cable here*".

To connect a SATA M.2 drive to DiskSense, do the following steps:

1. Using the eSATAp cable, connect the M.2 SSD extension module to the SATA Source port on DiskSense.
2. In Atola Insight Forensic software, power off the SATA Source port.
3. Plug a SATA M.2 drive into the extension and fix it in place with the plastic latch.
4. In Atola Insight Forensic, power on the SATA Source port.

Work with several SATA M.2 drives in a row

For SATA M.2, drive hotplug is supported. You can connect and replace SATA M.2 drives without turning DiskSense off and on again.

For safety reasons, before replacing SATA M.2 drives, the port must be powered off by clicking the **Power** button on the source port in the Atola Insight Forensic interface.

To define if a particular M.2 drive is SATA type or not, check the markings on it or refer to the manufacturer's specifications.

Also, if your drive belongs to the SATA type, DiskSense will light up the LED indicator on the extension module, next to the words "*When LED is on, plug SATA source port cable here*".

Apple PCIe SSD extension module

Apple PCIe SSD extension lets you connect DiskSense to the PCIe SSDs with the custom proprietary M.2 interface within Apple laptops:

- MacBook Pro, Late 2013-2015
- MacBook Air, 2013-2015

Apple PCIe SSD extension module also works with both Atola DiskSense 2 and Atola TaskForce.

Insight Forensic features supported for Apple PCIe SSD extension

The following Insight operations and features are supported for the Apple drives:

- Imaging at 400 MB/s (24 GB/min)
- Write protection
- Diagnostics, media scan
- Damaged drive support
- Hash calculation and verification
- Wiping
- Device utilities:
    - disk editor

- media recovery
- SSD trim
- compare (with a pattern, image file or drives)
- and more

Plug and unplug the Apple PCIe SSD extension module

DiskSense has a PCI Express port on its left side, which is labeled as *EXTENSION*. It is used to connect Atola hardware extension modules supported by Atola Insight Forensic software.

> The DiskSense hardware unit must be powered off before installing the extension module.

To connect the Apple PCIe SSD extension module to DiskSense, do the following:

1. Power off DiskSense.
2. Align the screw on the extension module and the top screw hole on the DiskSense back panel. Firmly plug the Apple PCIe SSD extension module all the way into the Extension port and fix the module with a screw.
3. Plug Apple PCIe SSD drive into the extension and fix the drive in place with the plastic latch.
4. Power on DiskSense.

> **Important:** Drive hotplug is not supported yet. DiskSense must be powered off before installing or replacing Apple PCIe SSDs.

To disconnect the Apple PCIe SSD extension module or replace it with another extension module, do the following steps:

1. Power off DiskSense.
2. Release the screw, which holds the module, and unplug it from the Extension port.
3. **Optional:** Plug another extension module into the Extension port and fixate the module with a screw.
4. Power on DiskSense.

SAS extension module

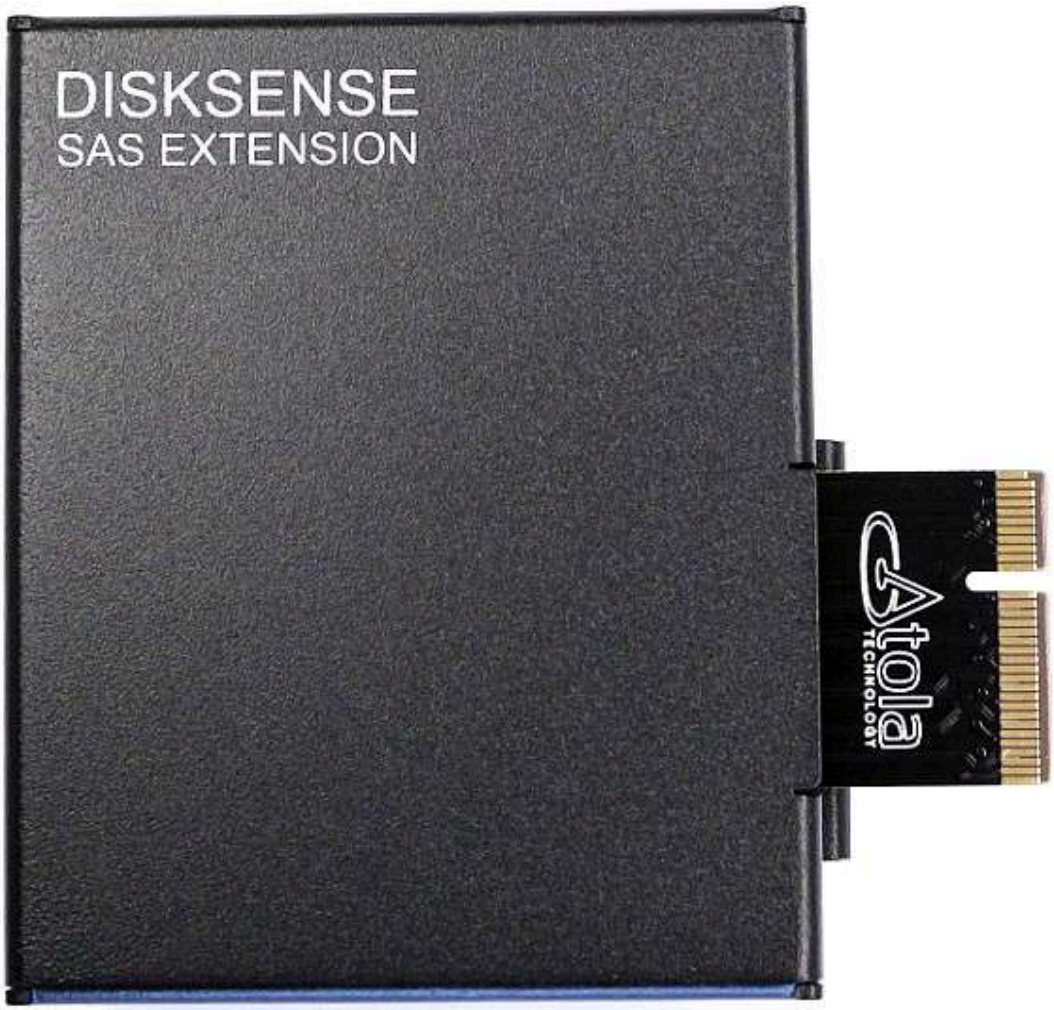
Connect SAS drives to Atola DiskSense using the SAS extension module. The main characteristics of the SAS extension module are:

- SAS interface: 6 Gbit/s.
- Max read/write speed: 500 MB/s.
- Hotplug for SAS drives is supported.

SAS extension module works with Atola DiskSense 2 as well.

Insight Forensic features supported for SAS extension

Atola Insight Forensic supports most operations for a SAS drive plugged into DiskSense:



- Write protection
- Current sensing, short circuit and overvoltage protection
- Damaged drive support
- Diagnostics, media scan
- Hash calculation and verification
- Wiping
- Device utilities:
    - disk editor
    - file recovery
    - compare (with a pattern, image file or drives)
    - and more

There are a few functions that are not available for SAS drives:

- Host Protected Area (HPA)
- Device Configuration Overlay (DCO)
- Security features

- SSD Trim
- Firmware recovery

Plug and unplug the SAS extension module

DiskSense has a PCI Express port on its left side, which is labeled as *EXTENSION*. It is used to connect Atola hardware extension modules supported by Atola Insight Forensic software.

> The DiskSense hardware unit must be powered off before installing the extension module.

To connect the SAS extension module to the DiskSense hardware unit, do the following:

1. Power off DiskSense.
2. Plug the SAS extension module into the Extension port and fix the module with 3 screws.
3. Power on DiskSense.

To disconnect the SAS extension module or replace it with another extension module, do the following steps:

1. Power off DiskSense.
2. Release the screws which hold the module, and unplug it from the Extension port.
3. **Optional:** Plug another extension module into the Extension port and fix the module with a screw.
4. Power on DiskSense.

Connect a SAS drive to DiskSense using SAS extension module

1. Plug the mini SAS connector into the extension module.
2. Plug the molex power connector into the IDE source power socket.
3. Plug the SAS connector into the drive.

Hotplug for SAS drives is supported. You can connect and disconnect SAS drives without turning DiskSense off and on.

10 Gbit Ethernet extension

The module accelerates the following operations executed with image files: Imaging, File Recovery, Compare, Write from File.

Plug a 10 Gbit Ethernet extension module

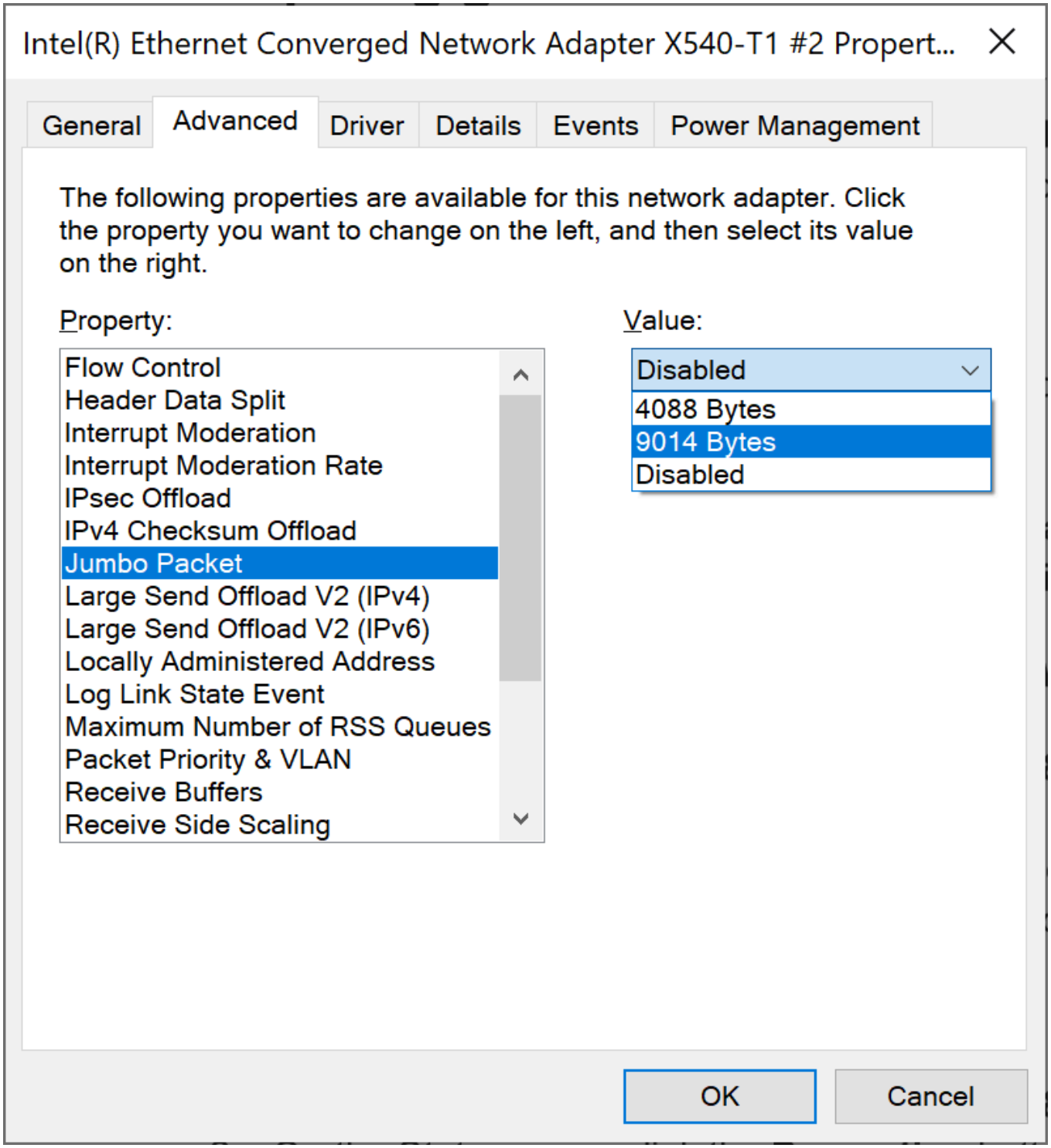
DiskSense must be powered off before plugging or unplugging the extension module:

1. Power off DiskSense.
2. Plug the extension module into the Extension port on the left side of DiskSense.
3. Power on DiskSense.

Configure for optimal performance

For optimum performance, please follow these instructions:

1. Update the 10GbE driver on the PC workstation to the latest version.
2. Link 10GbE Ethernet extension module and 10GbE PC workstation LAN adapter with a Cat6 (length < 55 meters), Cat6a, Cat7, Cat7a, or Cat8 ethernet cable.
3. In Windows, go to **Control panel** > **Network & Internet** > **Network and Sharing Center**.
4. In the **View your active networks** section, click on your Ethernet connection.
5. In the **Status** window, click **Properties**.
6. In the **Properties** window, click **Configure** and go to the **Advanced** tab.
7. On the **Advanced** tab, select **Jumbo Packet** and change its **Value** to 9014 Bytes.
8. Click **OK**.



PC motherboard quality can have an impact on the resulting network performance. Ensure that the PC drive can read/write at speeds above 300 MB/s.

Thunderbolt extension module

Thunderbolt extension enables DiskSense to work on MacBooks with the following interfaces:

- FireWire

- Thunderbolt 2
- Thunderbolt 3, 2016-2017 models

No SSD removal is necessary, the extension allows connecting DiskSense directly to a MacBook.

The extension module comes with:

- FireWire cable (comes in white or black color)
- Thunderbolt 2 to FireWire adapter (by Apple)
- Thunderbolt 3 to Thunderbolt 2 adapter (by Apple)

Thunderbolt extension module also works with both Atola DiskSense 2 and Atola TaskForce.

Insight Forensic features supported for Thunderbolt extension

Insight supports the following operations and features on MacBooks when connected through the Thunderbolt extension:

- Imaging
- Hash calculation and verification
- Write protection
- Media scan
- Device utilities:
    - file recovery
    - compare (with a pattern, image file or drives)
    - and more

Plug and unplug the Thunderbolt extension module

DiskSense has a PCI Express port on its back panel, which is labeled as *EXTENSION*. It is used to connect Atola hardware extension modules supported by Atola Insight Forensic software.

> The DiskSense hardware unit must be powered off before installing the extension module.

To connect the Thunderbolt extension module to the DiskSense hardware unit, do the following:

1. Power off DiskSense.
2. Firmly plug the Thunderbolt extension module all the way into the Extension port and fix the module with a screw.
3. Power on DiskSense.

To disconnect the Thunderbolt extension module or replace it with another extension module, do the following steps:

1. Power off DiskSense.
2. Release the screw, which holds the module, and unplug it from the Extension port.
3. **Optional:** Plug another extension module into the Extension port and fixate the module with a screw.
4. Power on DiskSense.

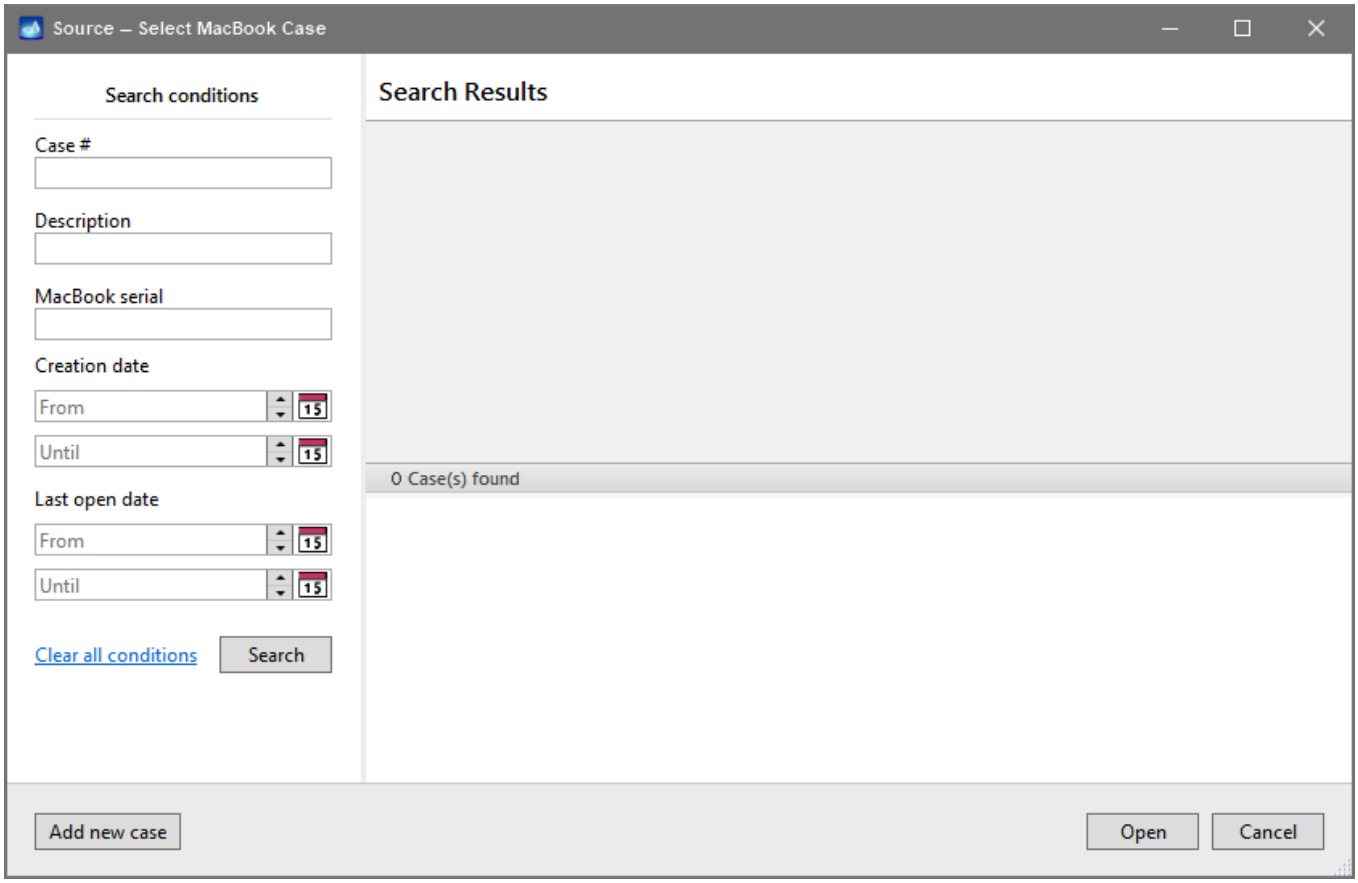
Connect MacBook using Thunderbolt extension module

First, write down or take a photo of a serial number located on the bottom side of the MacBook. It will be needed later.

Then do the following steps:

1. Turn off both MacBook and DiskSense.
2. Plug the Thunderbolt extension module into the Extension port and fixate the module with a screw.
3. Connect MacBook to DiskSense unit with the help of Thunderbolt extension and the FireWire cable. Use the adapters (included) to connect to the MacBooks with Thunderbolt 2 or Thunderbolt 3 interface.

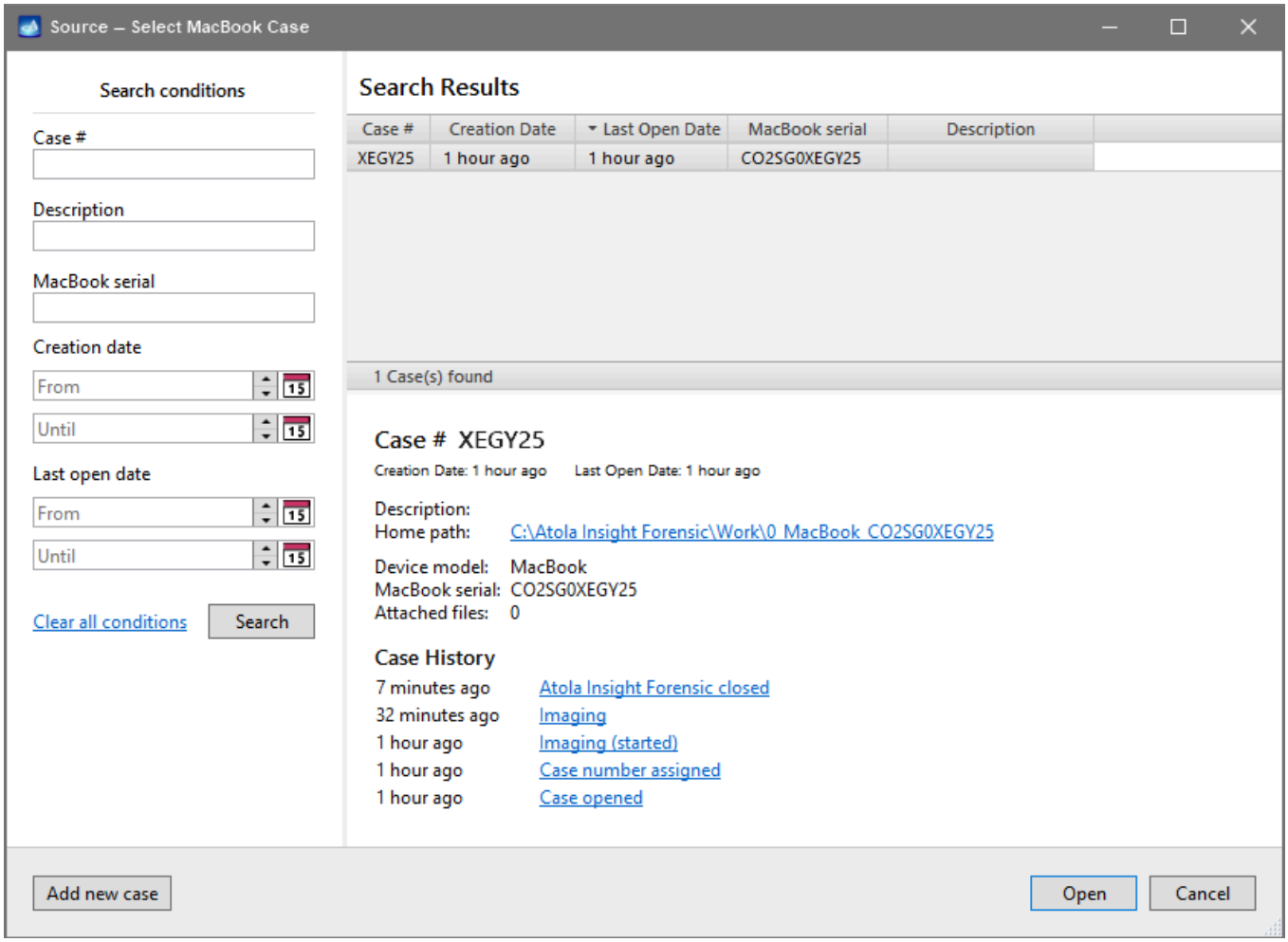
4. Boot MacBook in Target Disk Mode. To do that, start it up while holding down the T key. You should see a Firewire or Thunderbolt icon displayed on the screen, signifying that Target Disk Mode is detected and working.
5. Power on the DiskSense hardware unit.
6. Launch Atola Insight Forensic on your computer.
7. In the pop-up window, select **Identify device**.
8. In the **Source – Select MacBook Case** window, click **Add new case**.



Select MacBook Case

9. If it is the first time this MacBook is identified by Insight, in the **Enter MacBook serial** window, enter the serial number located on the bottom side of the MacBook, and then click **OK**.

   When the MacBook is connected to Insight next time, you can simply select the appropriate case from the table.



Opening an existing MacBook case from the Select MacBook Case window.

First use guide for Atola DiskSense

Here's how to install Atola Insight Forensic software and connect Atola DiskSense hardware unit for the first time to start imaging evidence devices.

Step 1. Download and install Atola Insight Forensic software

Atola Insight Forensic software requires a PC with Windows 10/11 (64-bit). Check minimum and optimal hardware requirements before installing the software.

1. Go to the Atola Insight Forensic Downloads page and download the latest version of the full installation package.
2. Run the installer and proceed with setup steps.
   If Windows warns you about an unrecognized app, click Run anyway and allow the app to make changes to your device.

3. **Optional:** If you don’t have Microsoft .NET and Microsoft SQL Server on your computer, the installer prompts to install these components.
4. After the installation is finished, reboot your computer. Don’t launch Atola Insight Forensic software yet.

Step 2. Configure your network

DiskSense is pre-configured to use a static IP address.

If your computer has no Ethernet port, you can use the USB-to-Ethernet adapter included in the package. Connect it to your computer before configuring a network.

Use a static IP address

1. In Windows, open **Network Connections**: press *Win+R*, enter *ncpa.cpl* and click **OK**.
2. Right-click your Ethernet adapter, and then select **Properties**.
3. Select **Internet Protocol Version 4**, and then click **Properties**.
4. Enter the following network settings:
    - **IP address:** 10.0.0.*XXX*, where *XXX* can be any number from 1 to 254 except for 188.
      Default IP addresses of the DiskSense unit are 10.0.0.188 and 192.168.0.188. The IP address of your PC's Ethernet card must be different from that of the DiskSense unit.
    - **Network mask:** 255.0.0.0.
      If your PC and the DiskSense unit belong to different subnets, the connection can’t be established.
    - **Gateway** and **DNS server** can be left empty or set to any value.
5. Click **OK**.

Step 3. Connect DiskSense

1. Before setting up and connecting DiskSense, write down or take a photo of the **Device serial number**. It is located on the bottom of the DiskSense unit. You will need the Device serial number on **Step 5** to activate the Atola Insight Forensic software.
2. Plug the power supply cable to the **DC IN** socket on the back of the DiskSense hardware unit.
3. Connect an Ethernet cable to DiskSense **ETH1** port.
4. Connect the other end of the Ethernet cable to your PC or router.

Step 4. Power on DiskSense

1. Make sure that there are no USB devices attached to the DiskSense hardware unit.
2. Using the **PWR** switch on the back panel of DiskSense, power on the unit.
3. Wait for the **Unit Status** LED on the back of the unit to stop blinking. It can take up to 30 seconds.

Step 5. Launch and activate Atola Insight Forensic software

To activate Atola Insight Forensic software, you need the **Device serial number** of the DiskSense hardware unit. It is located on the bottom of the DiskSense unit.

1. Launch Atola Insight Forensic.
2. To prevent blocking communication between the software and DiskSense hardware unit, in your firewall and anti-malware, allow access for *insight.exe*.

There are three options to activate Atola Insight Forensic:

1. Online activation. Choose this option if your computer has an internet connection.
2. Offline activation. Choose this option if your computer does not have an internet connection, but you can use a USB drive.
3. Offline activation by code. Choose this option if your computer does not have an internet connection and you cannot use USB or any other removable drive.

Online activation

To activate Atola Insight Forensic online, you need to have an internet connection on your computer.

1. In the **Activation dialog**, choose **Online activation** and click **Continue**.
2. Fill out all fields in the **Activation form** and click **Continue**.
3. Atola Insight Forensic confirms that activation has been successfully completed. Click **Finish**.

Offline activation

To activate Atola Insight Forensic offline, you need another PC with internet connection and a flash memory stick.

1. In the **Activation dialog**, choose **Offline activation** and click **Continue**.
2. Fill out all fields in the **Activation form** and click **Continue**.
3. Save the *Activation****.aa* file to a USBstick.
4. Using another computer connected to the internet, go to activation.atola.com.
5. Click **Choose File** to upload the *Activation****.aa* file from the USB stick, enter your email and click **Submit**.
6. Atola sends you an email with an Activation response file: *Response****.ar*. Save this file to your USB stick.
7. In the Insight **Activation dialog**, submit the *Response****.ar* file from the USB stick and click **Continue**.
8. Atola Insight Forensic confirms that activation has been successfully completed. Click **Finish**.

Offline activation by code

To activate Atola Insight Forensic offline by code, you need another device with internet connection (PC or mobile).

1. In the **Activation dialog**, choose **Offline activation by code** and click **Continue**.
2. Enter **Device serial number** located on the bottom of the DiskSense unit and click **Continue**.
3. Save the following information from the Insight Activation dialog:
    - Hasp ID
    - Insight version
    - Checksum
4. Using another device connected to the internet, go to the Atola licensing webpage: activation.atola.com/ActivateByCode.
5. Fill out all the fields on the Atola licensing webpage, including:
    - Device serial number (from the bottom of the unit).
    - Hasp ID, Insight version, Checksum (from the Insight Activation dialog).
    - Your email, phone number, and organization.
6. Click **Submit**. Atola licensing webpage generates an **Activation code** and also sends it to the email address you provided.
7. On your computer, go back to the Insight **Activation dialog**, enter your **Activation code** and click **Continue**.
8. Atola Insight Forensic confirms that activation has been successfully completed. Click **Finish**.

Run Atola Insight Forensic on several computers

Activation details are stored in the DiskSense unit itself. If you decide to install the Atola Insight Forensic software on another computer, there's no need to reactivate it.

It is permitted to install multiple copies of the software on many computers and use a centralized database for convenience. See Network database setup.

Change or reset an IP address of DiskSense

Change an IP address

To change the IP address of the DiskSense unit, choose one of the following:

- Run Atola Insight Forensic and go to **Insight** > **Modify DiskSense Unit IP**
  Or,
- Use DS Unit Update Tool, by running the *DSEthernetUpdate.exe* file located in your Atola Insight Forensic folder.

Reset an IP address

1. Power on the DiskSense hardware unit.
2. While the unit is booting, press and hold the small **IP RST** button on its back side.
3. Still holding the **IP RST** button, wait until the **Unit Status** LED stops blinking.

Now the unit has default IP addresses: *10.0.0.188* and *192.168.0.188*.

10Gb network connection

For saving time when imaging to a network folder, we recommend using a 10Gb Ethernet extension module.

Extend subscription offline

Atola products come with a complimentary 1-year subscription. It covers regular software updates, includes training and technical support from our in-house team of developers, and secures a lifetime warranty.

To extend your subscription for another period, you need to buy and then reactivate it. You can reactivate your subscription even in a network-free environment.

> If your subscription has not yet expired, you can still purchase and activate a new one. The new subscription period will commence the day following the current subscription's expiration date.

Buy subscription

There are two ways to order an Atola Insight Forensic subscription for another period:

- **From a sales representative:** the Atola sales rep or the reseller that sold you the unit. For contact information, see Where to buy.
- **Online** on the Subscriptions page on the Atola website.

After you have purchased the subscription for another period, you need to **reactivate it**.

Reactivate subscription

You can reactivate the subscription even if your computer does not have an internet connection. There are different options to reactivate a subscription offline, depending on how you buy it.

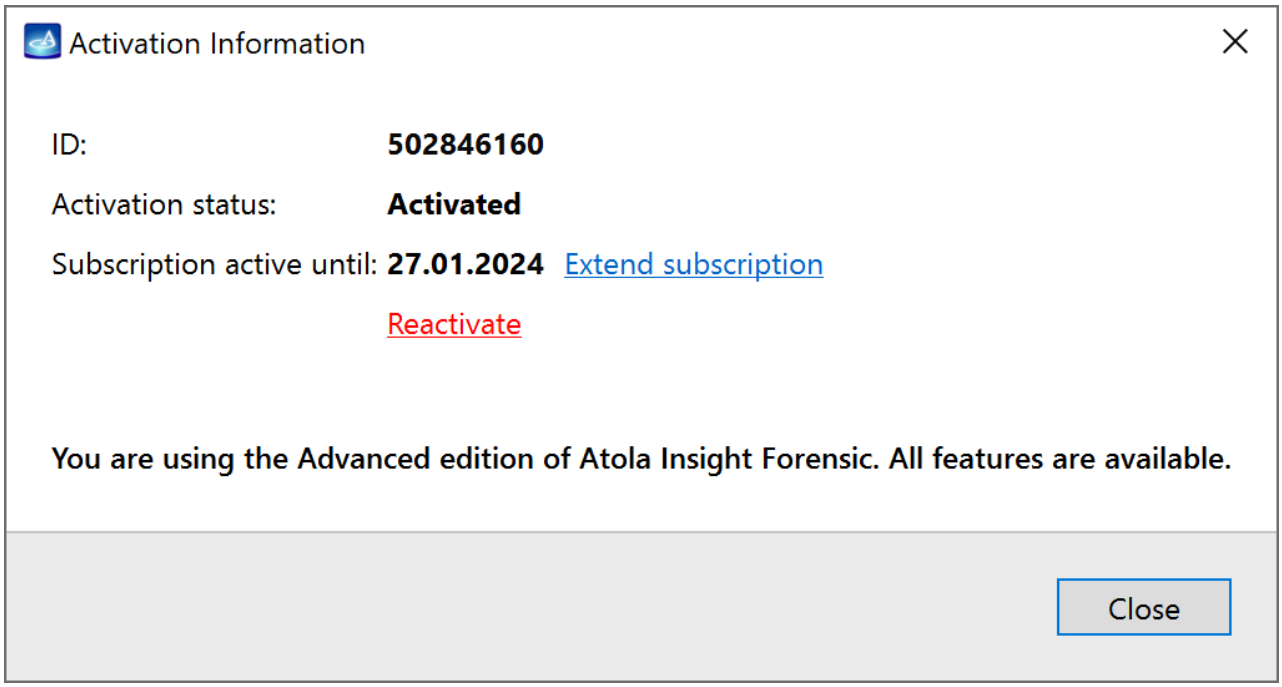
Offline by code

You will need:

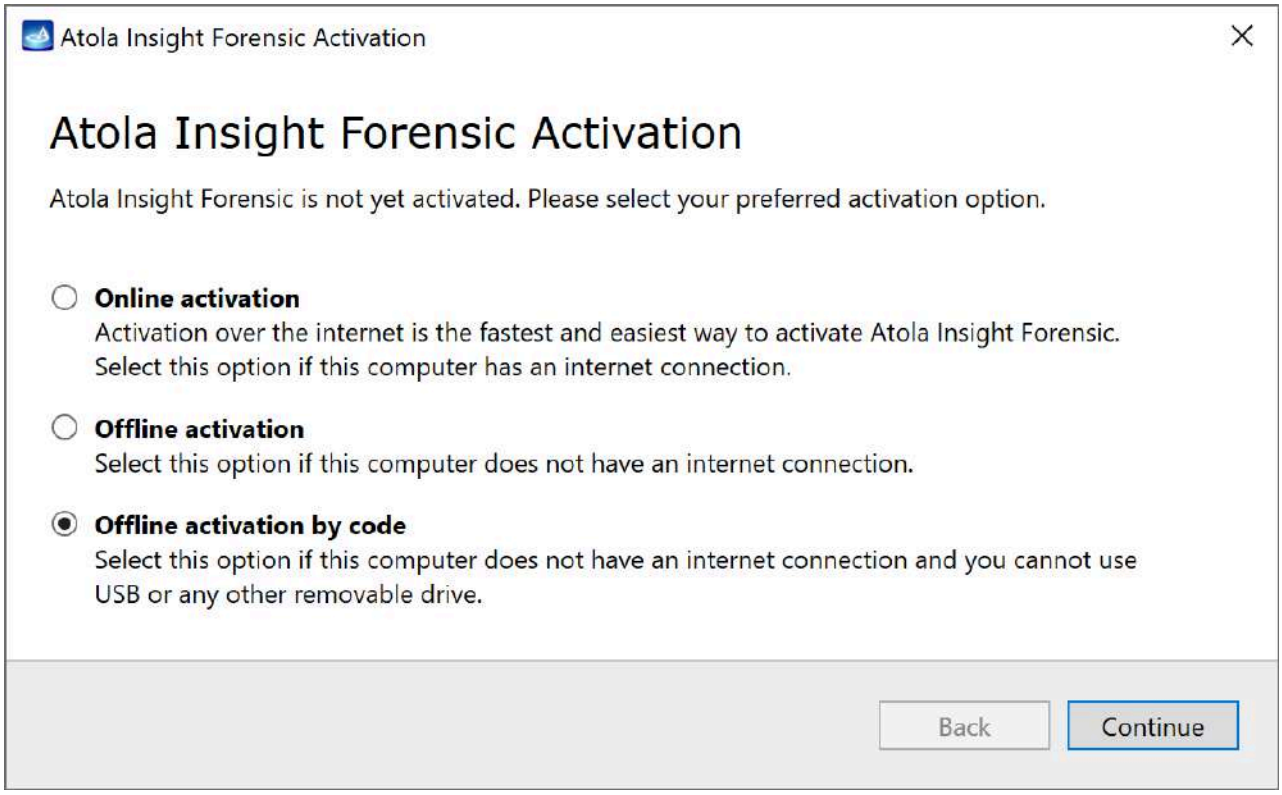
- another device with an internet connection (PC or mobile)
- the **Device serial number** located on the bottom of the DiskSense hardware unit

To activate Insight offline by code, do the following:

1. In Insight Forensic, open the **Help** menu and select **Activation status**.
2. Click the **Reactivate** link.



3. In the **Activation** dialog, choose **Offline activation by code** and click **Continue**.



4. Enter the **Device serial number** located on the bottom of the DiskSense unit and click **Continue**.
5. Save the following information from the Insight Activation dialog:
    - Hasp ID
    - Insight version
    - Checksum

6. Using another device connected to the internet, go to the Atola licensing webpage: activation.atola.com/ActivateByCode.
7. Fill out all the fields on the Atola licensing webpage, including:
    - Device serial number (from the bottom of the unit)
    - Hasp ID, Insight version, Checksum (from the Insight Activation dialog)
    - Your email, phone number, and organization
8. Click **Submit**. The Atola licensing webpage generates an Activation code and also sends it to the email address you provided.
9. On your computer, go back to the Insight Activation dialog, enter your Activation code and click **Continue**.
10. Insight confirms that reactivation has been successfully completed. Click **Finish**.

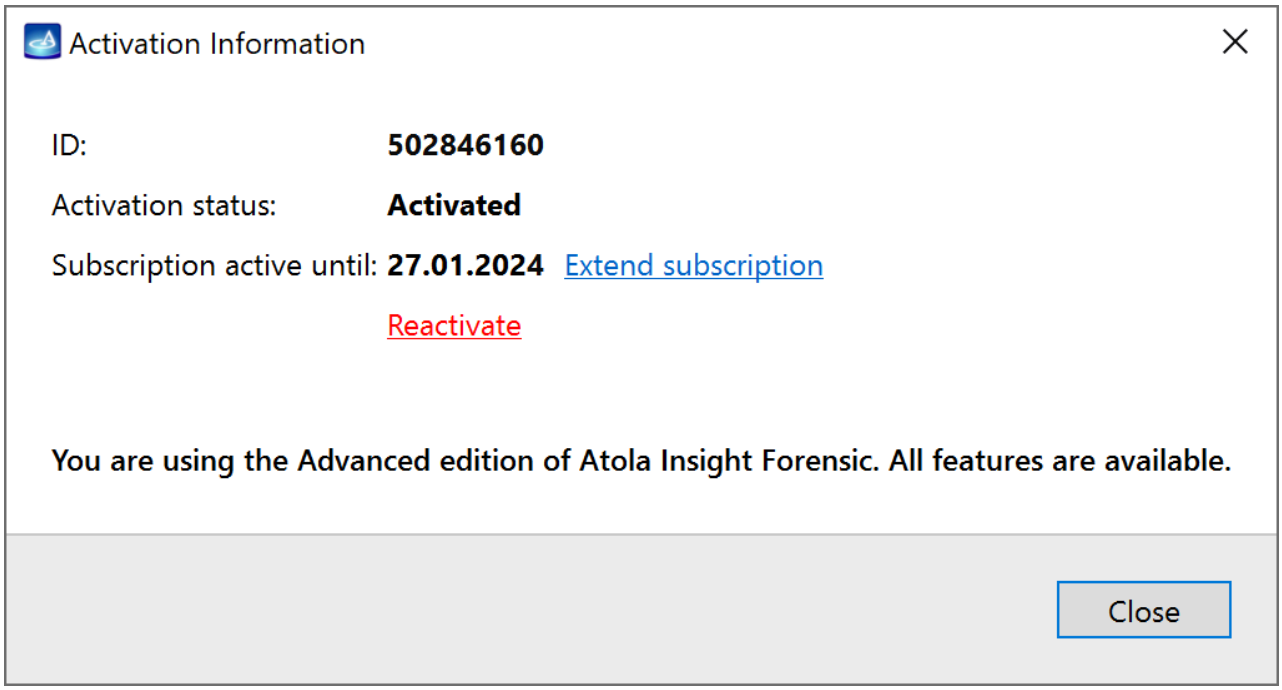
Offline with a USB flash drive

You will need:

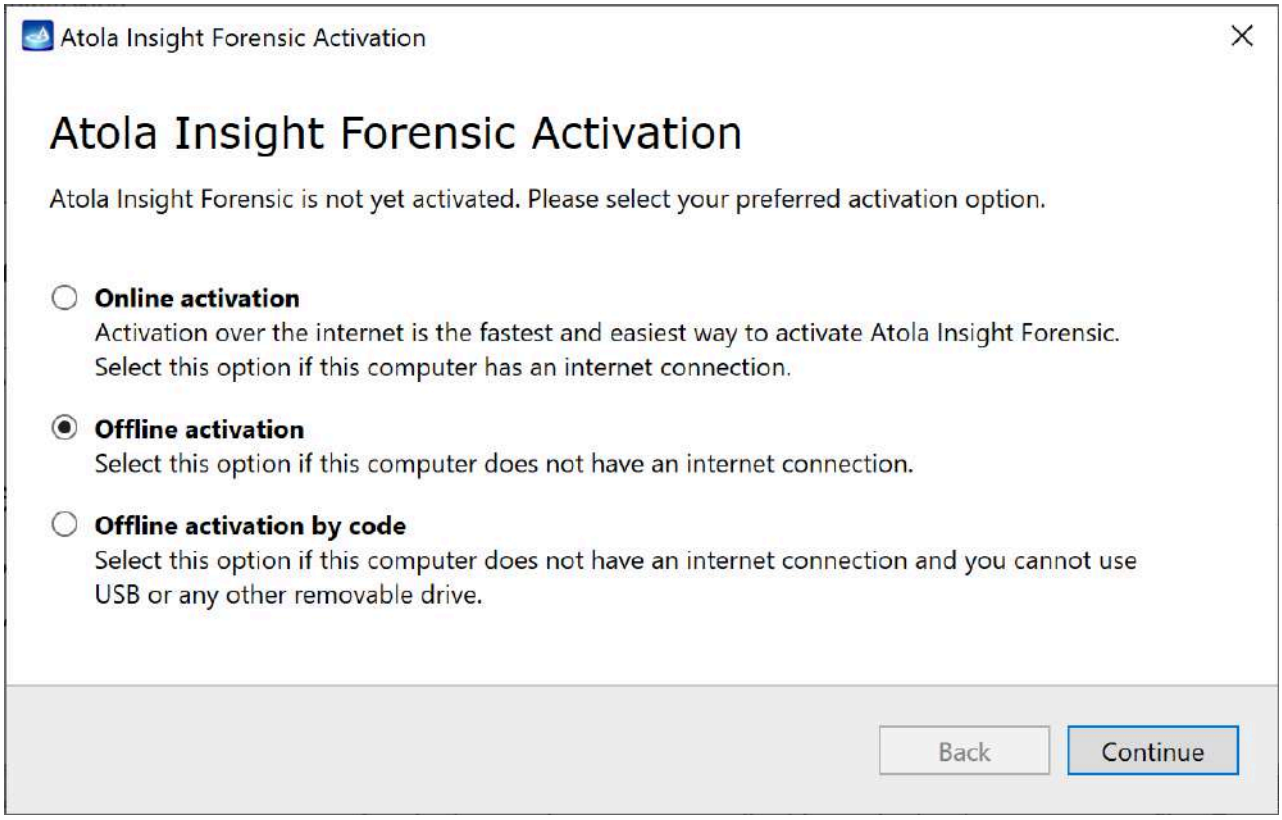
- another device with an internet connection (PC or mobile)
- a USB flash drive
- the **Device serial number** located on the bottom of the DiskSense hardware unit

To activate Insight offline with a USB flash drive, do the following:

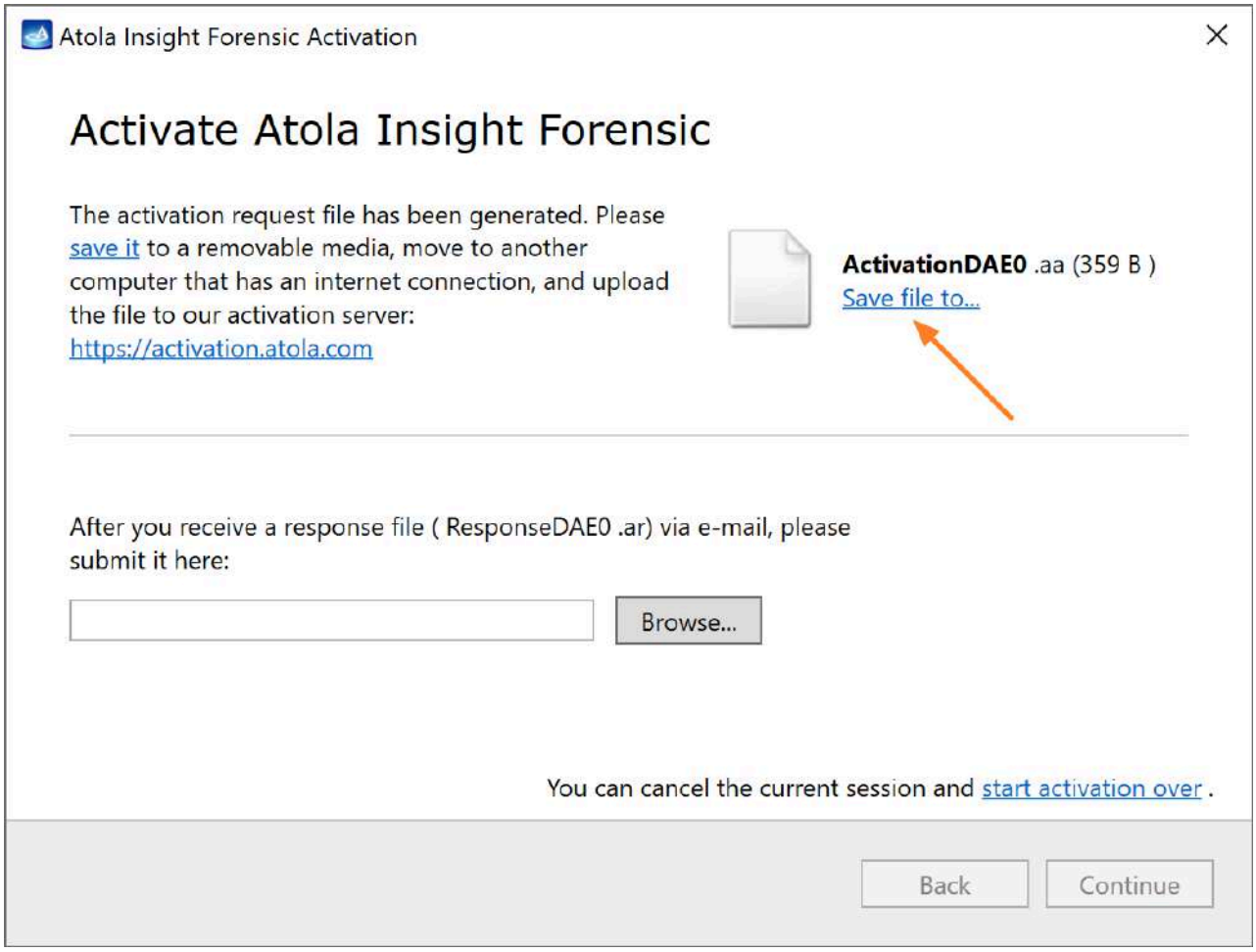
1. In Insight Forensic, open the **Help** menu and select **Activation status**.
2. Click the **Reactivate** link.



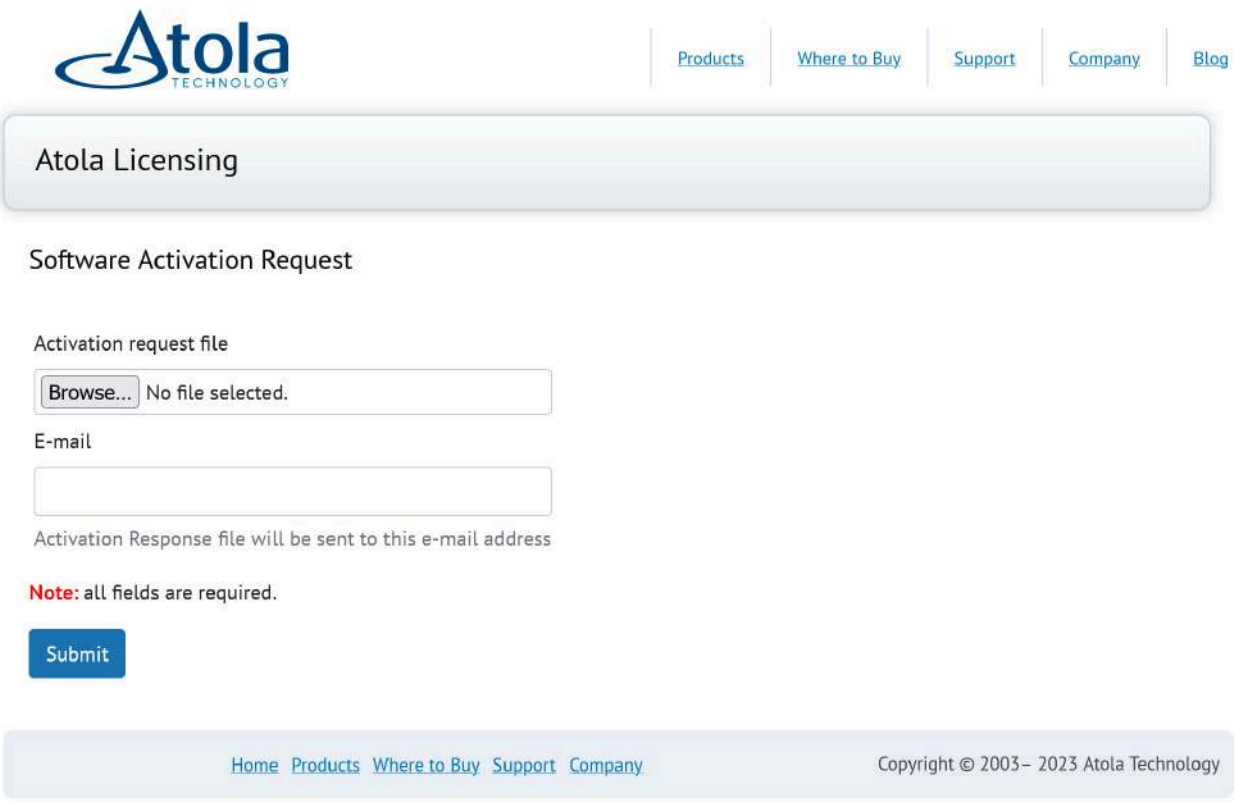
3. In the **Activation** dialog, choose **Offline activation** and click **Continue**.



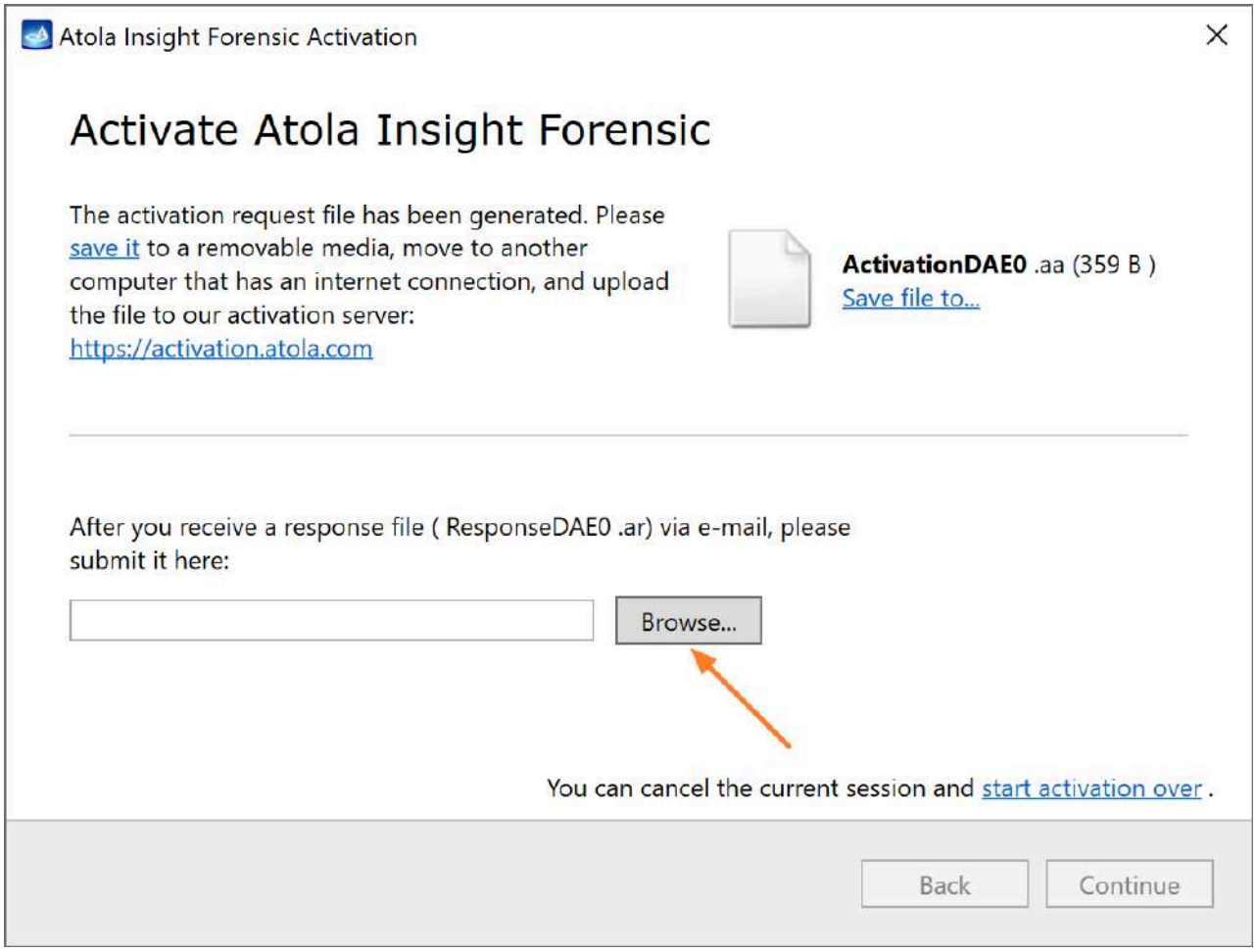
4. Fill out all fields in the **Activation form** and click **Continue**.
5. Save the *Activation****.aa* file to a USB stick.



6. Using another computer connected to the internet, go to activation.atola.com.
7. Click **Browse** to upload the *Activation****.aa* file from the USB stick, enter your email and click **Submit**.



8. Atola sends you an email with an Activation response file: *Response****.ar*. Save this file to your USB stick.
9. In the Insight **Activation dialog**, submit the *Response****.ar* file from the USB stick and click **Continue**.

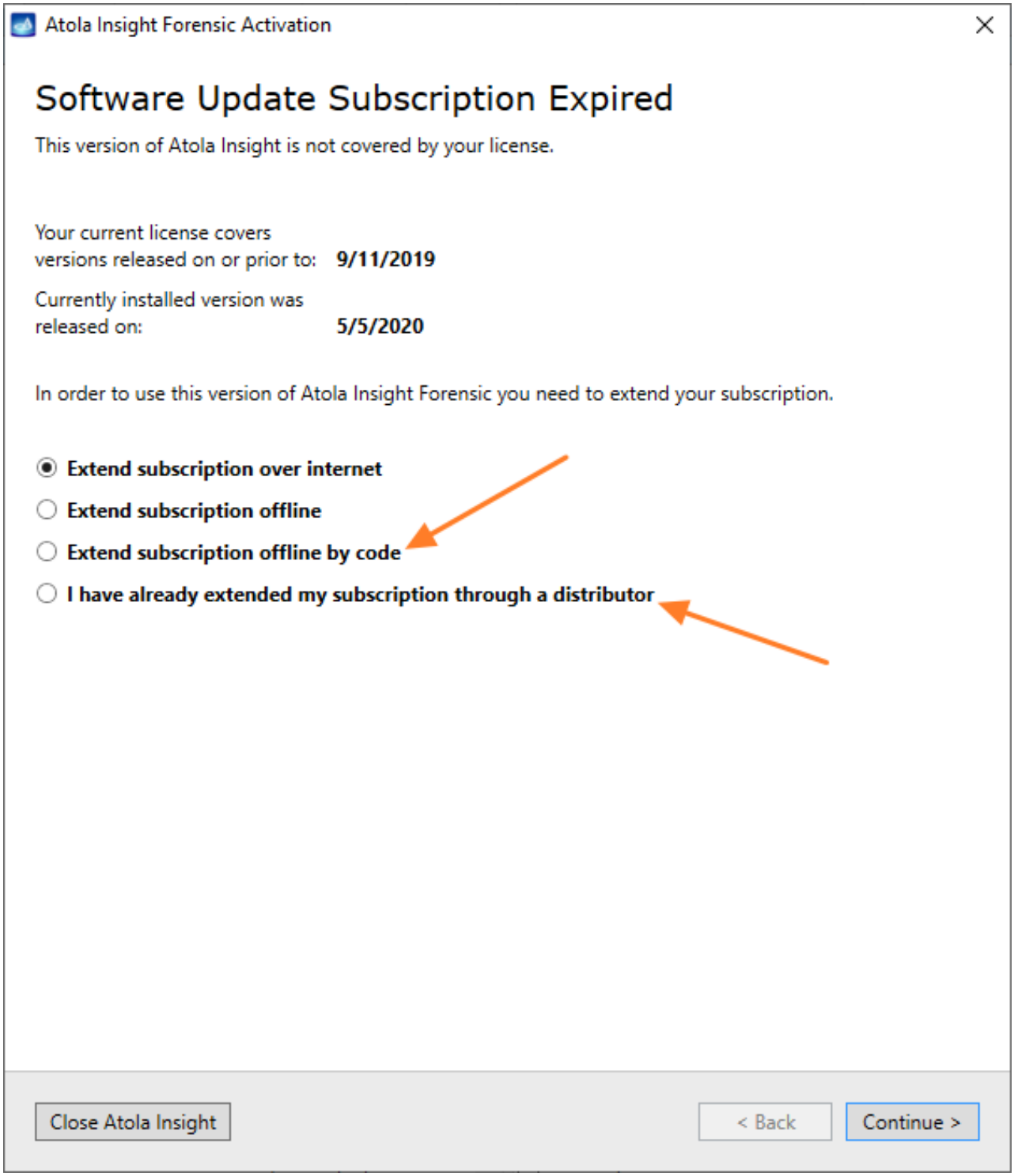


10. Insight confirms that reactivation has been successfully completed. Click **Finish**.

When Insight software update is not covered by subscription

If your subscription expired but you installed a version of Insight software that is not covered by your expired subscription, you can do one of the following:

- Return to an earlier version of the software and go through the steps outlined earlier in this article to activate the new subscription and update the software to the new version afterward.
- When you launch Insight software you will get the screen below and choose the third or the fourth options, which will then take you through the steps outlined above in this article.



Hardware and OS requirements

Minimum hardware specs:

- Intel Celeron 2GHz/AMD Sempron CPU

- 4 GB of RAM
- one 100 MBit Ethernet port
- 2 GB of free disk space

Recommended hardware specs for optimal performance:

- Intel or AMD dual core CPU
- 8 GB of RAM
- one 1000 MBit (Gigabit, 1000BASE-T) Ethernet port
- 10 GB of free disk space
- Firewall and especially antivirus software disabled

Supported OS:

- Windows 10/11 64 bit

DiskSense / HASP connection issues

The DiskSense hardware system includes an internal HASP USB dongle. It contains unique activation and subscription information.

"Too many connections" and "Cannot locate DiskSense unit" errors

Having more than one DiskSense system in your network may result in HASP-related conflicts. These conflicts usually manifest as "*Too many connections*" or "*Cannot locate DiskSense unit*" errors.

The issue is caused by behavior of the HASP discovery system which by default picks a random HASP dongle on the network. In other words, one Atola Insight Forensic instance may establish the connection with one DiskSense system, however it will "use" the HASP dongle of another (random) system available on the network.

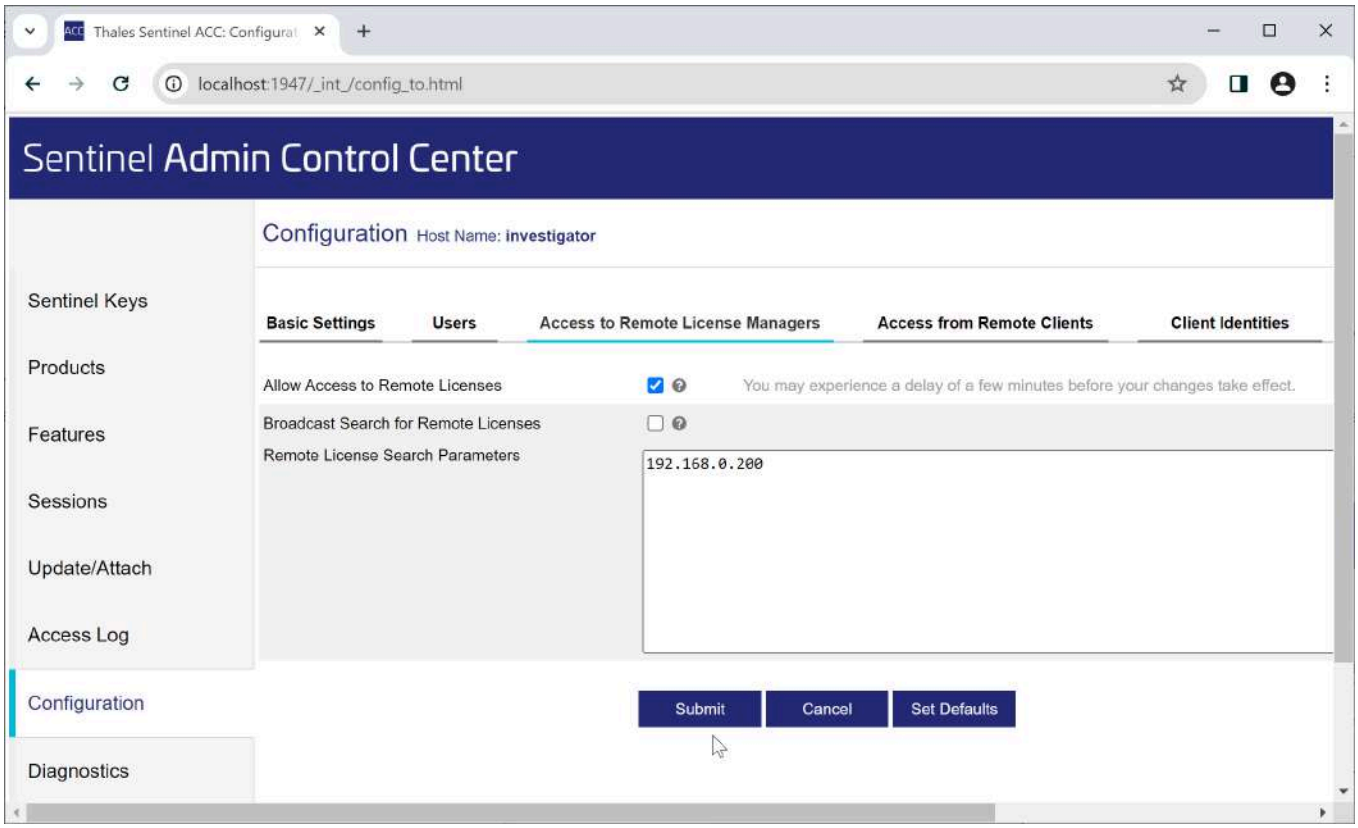
How to resolve multiple HASP connection issues

HASP discovery system offers a web administration tool where one can easily set up an IP filter specifying HASP dongle search locations.

1. In Atola Insight Forensic, go to **Insight menu** > **DiskSense Information** and copy the DiskSense unit IP address.
2. In your browser, go to http://localhost:1947. The **Sentinel Admin Control Center** page opens.
3. On the left, click **Configuration**.
4. Go to the **Access to Remote License Managers** tab.

5. Clear the **Broadcast Search for Remote Licenses** checkbox.
6. In the **Remote License Search Parameters** field, enter the DiskSense unit IP address specified in Atola Insight Forensic.
7. Click **Submit**.

After you perform the actions, the final screen should look like this (*192.168.0.200* is used as an example):

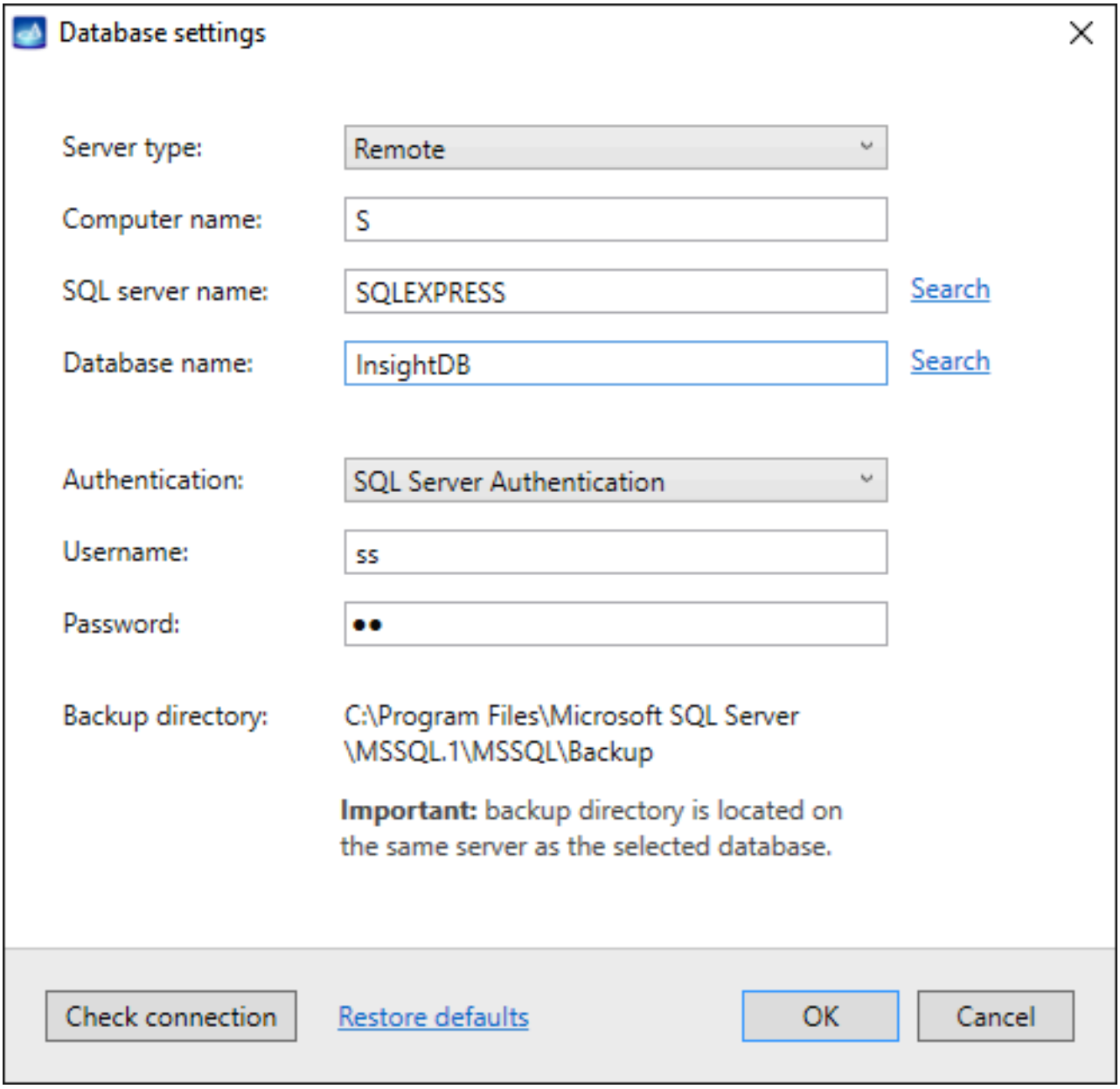


The Access to Remote License Managers tab with the correct settings.

Network database setup

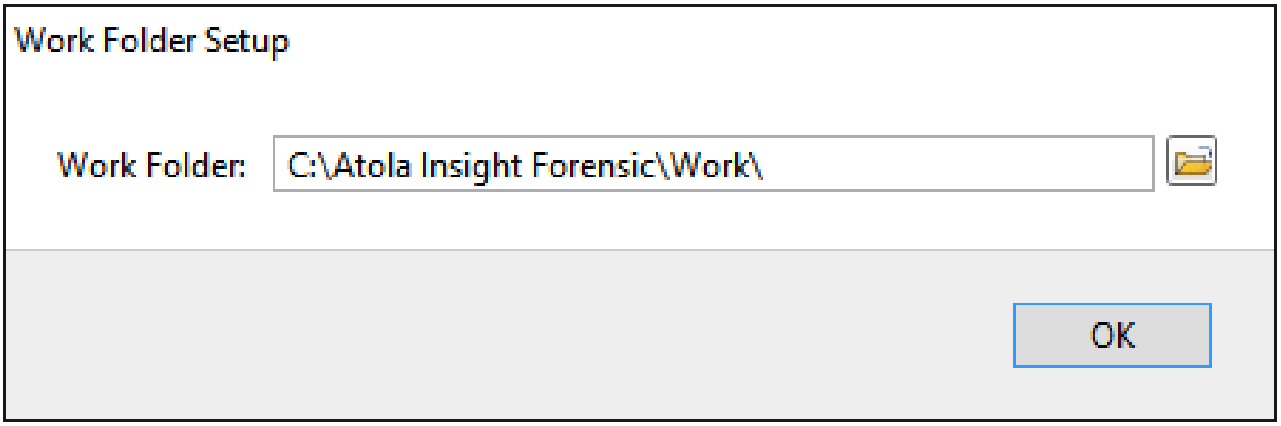
Atola Insight Forensic enables working with remote database shared between many users. Here is the scenario how to setup such a network database and connect different PCs with Atola Insight to it:

1. On the network server PC, pre-install SQL Server 2012-2022.
2. On the user PC, launch Atola Insight Forensic.
3. On the menu bar, go to **Insight** > **Database Connection Settings**.
    - Select Server type: Remote.
    - Specify network server name, select SQL server instance and database names.
    - Enter SQL server login and password as shown in the picture below:



4. Click **OK** and re-launch Atola Insight Forensic on the user PC.

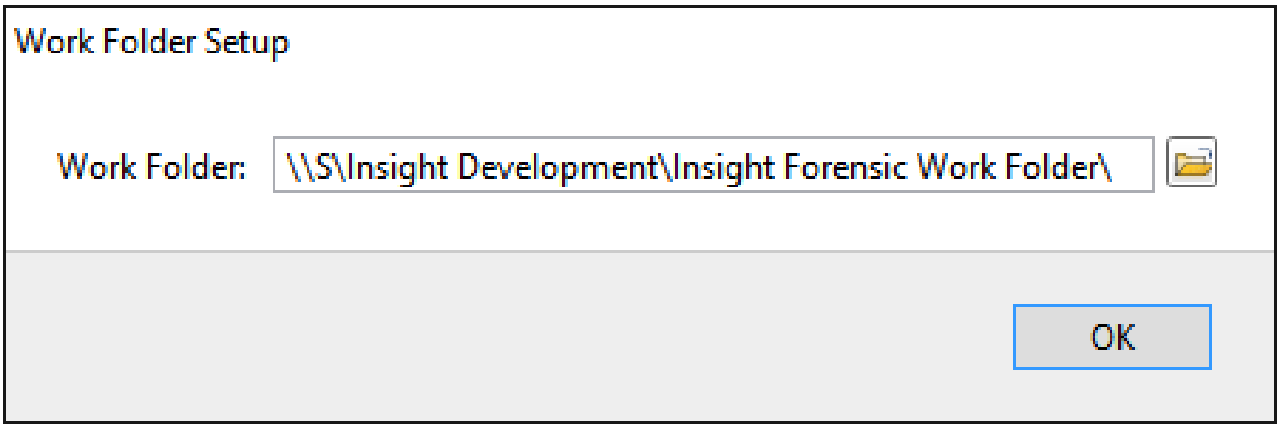
5. It will create the remote database and ask for the Work Folder name:



Work Folder is necessary to store large files that do not fit into the database: imaging maps, logs, file recovery

hash lists.

6. Change the **Work Folder** to the shared folder on the network server PC.



Now you have Atola Insight network database prepared for remote use! You can connect Atola Insight Forensic software from the other PCs. Just set up the same database settings as you did in the step 3. No need to specify Work Folder anymore given Atola Insight will load it from the remote SQL server on the network server PC.

The only limitation: Two users will not be able to work on the same case simultaneously.

Atola Insight Forensic: Database backup and restore

To be able to backup and restore Atola Insight Forensic database, you will need Microsoft SQL Server Management Studio Express. You can download it **here**.

Backup

To backup the database, please follow these steps:

1. Launch Microsoft SQL Server Management Studio Express.
2. Establish database connection (with default settings).
3. Select **Databases** folder on the tree.
4. Right-click **AtolaInsightForensic** and select **Tasks** > **Back Up**.
5. Check the backup destination and change it if desired.
6. Click **OK**.

Restore

This procedure will work only if you did not move backup file (for example, from another PC). If you are moving the database over to another PC, see Restore when moving.

1. Launch Microsoft SQL Server Management Studio Express.
2. Establish database connection (with default settings).
3. Select **Databases** folder on the tree.
4. Right-click **AtolaInsightForensic** and select **Tasks** > **Restore** > **Database**.
5. Select the desired backup file.
6. Click **OK**.

Move

To move the database from one PC over to another, please follow these steps:

1. Backup your database on the source PC.
2. Copy backup file over to destination PC.
3. Restore the backup file on the destination PC (see Restore when moving below).

Restore when moving

1. Launch Microsoft SQL Server Management Studio Express.
2. Establish database connection (with default settings).
3. Right-click **Databases** folder on the tree and select **Restore Database**.
4. In the **To database** field enter *AtolaInsightForensic*.
5. In **Source for restore**, select **From device**.
6. Point to the database backup file.
7. Click **OK**.

If you only have .mdf and .ldf files

This may happen if your operating system has crashed and you are reinstalling everything from scratch. In this case you would need to copy AtolaInsightForensic.mdf and AtolaInsightForensic_log.LDF files from the old hard drive over to the new one. You may find these files in:

- "*C:\Users*USERNAME**\AppData\Roaming\Atola\Insight Forensic*", if (localdb)\V11.0 instance is used (default).
- "*C:\Program Files\Microsoft SQL Server\MSSQL.1\MSSQL\Data*", if SQLEXPRESS instance is used.

After you have copied the database files, follow these steps:

1. Launch Microsoft SQL Server Management Studio Express.
2. Establish database connection (with default settings).
3. Right-click **Databases** folder on the tree and select **Attach**.
4. Click **Add** and select **AtolaInsightForensic.mdf**.
5. Click **OK**.

Supported Drives

Atola Insight Forensic supports all 1.8-inch, 2.5-inch, 3.5-inch IDE, SATA and USB hard drives, USB Flash media as well as SD, Compactflash, and Memory Stick cards via a generic USB Card Reader.

To ensure high quality and efficiency of our tools, we test them on hundreds of storage devices.

Atola Insight Forensic can also work with the following drive types using proprietary Atola extension modules:

- SAS drives
- M.2 NVMe/SATA/PCIe SSDs (M interface key only)
- PCIe SSDs from Apple MacBooks (2013 - 2015)
- Soldered Macbook SSDs (up to 2017)

Remote image acquisition can be performed via iSCSI protocol. For that, a drive on another PC has to be exposed as an iSCSI target.

Most functions of Atola Insight Forensic will work with any hard drive or flash card with either IDE, SATA-1/2/3 or USB-1/2/3 interface (including those attached via adapters).

However, there are three functions that only work with specific hard drive model families:

- Automatic password removal
- Head selection in Imaging and Media Scan
- Full firmware access

1. Automatic password removal works for the following HDD models

- SATA and IDE Seagate hard drives (including F3 series) with exception of some models released since 2018
- SATA and IDE Western Digital hard drives with exception of some models released since 2018
- SATA and IDE Toshiba hard drives: MG, MK, MQ, DT families with exception of some models released since 2018
- SATA and IDE Maxtor hard drives
- SATA and IDE Samsung hard drives with exception of old hard drives made prior to 2004 and some latest models
- SATA and IDE Fujitsu hard drives with exception of latest models (MHW and newer)
- The following Hitachi hard drives are supported: HCxxxxxxxA7A3xx, HDxxxxxxxCLA3xx, HTxxxxxxxA9A3xx, HTxxxxxxxA9E3xx, HTxxxxxxxA9E6xx, HTxxxxxxxB9A3xx, HTxxxxxxxG9ATxx, HTxxxxxxxG9SAxx, HTxxxxxxxH9ATxx, HTxxxxxxxH9SAxx, HTxxxxxxxJ9ATxx, HTxxxxxxxJ9SAxx, HTxxxxxxxK9ATxx, HTxxxxxxxK9SAxx, HTxxxxxxxL9SAxx, HTxxxxxxxM9ATxx, HTS72xxxxA7E6xx, HUxxxxxxxCLA3xx, IC25NxxxATMRxx
- The following Hitachi DK hard drives are supported: DK23DA, DK23EA, DK23FA.
- The following Hitachi Endurastar hard drives are supported: J4K50 (HEJxxxxxxF9ATxx), N4K50 (HENxxxxxxF9ATxx).

Please note that due to the wide variety of firmware revisions released by hard drive manufacturers, it is impossible to guarantee that the password removal will always work. Hence, password removal may fail on a small percentage of hard drives.

2. Head selection works for the following HDD models

- SATA and IDE Seagate hard drives (including F3 series)
- SATA and IDE Western Digital, HGST hard drives with exception of some models released since 2018
- SATA and IDE Hitachi hard drives
- SATA and IDE Toshiba hard drives: MG, MK, MQ, DT, HD families with exception of some models released since 2018

3. Full firmware access (HDD only)

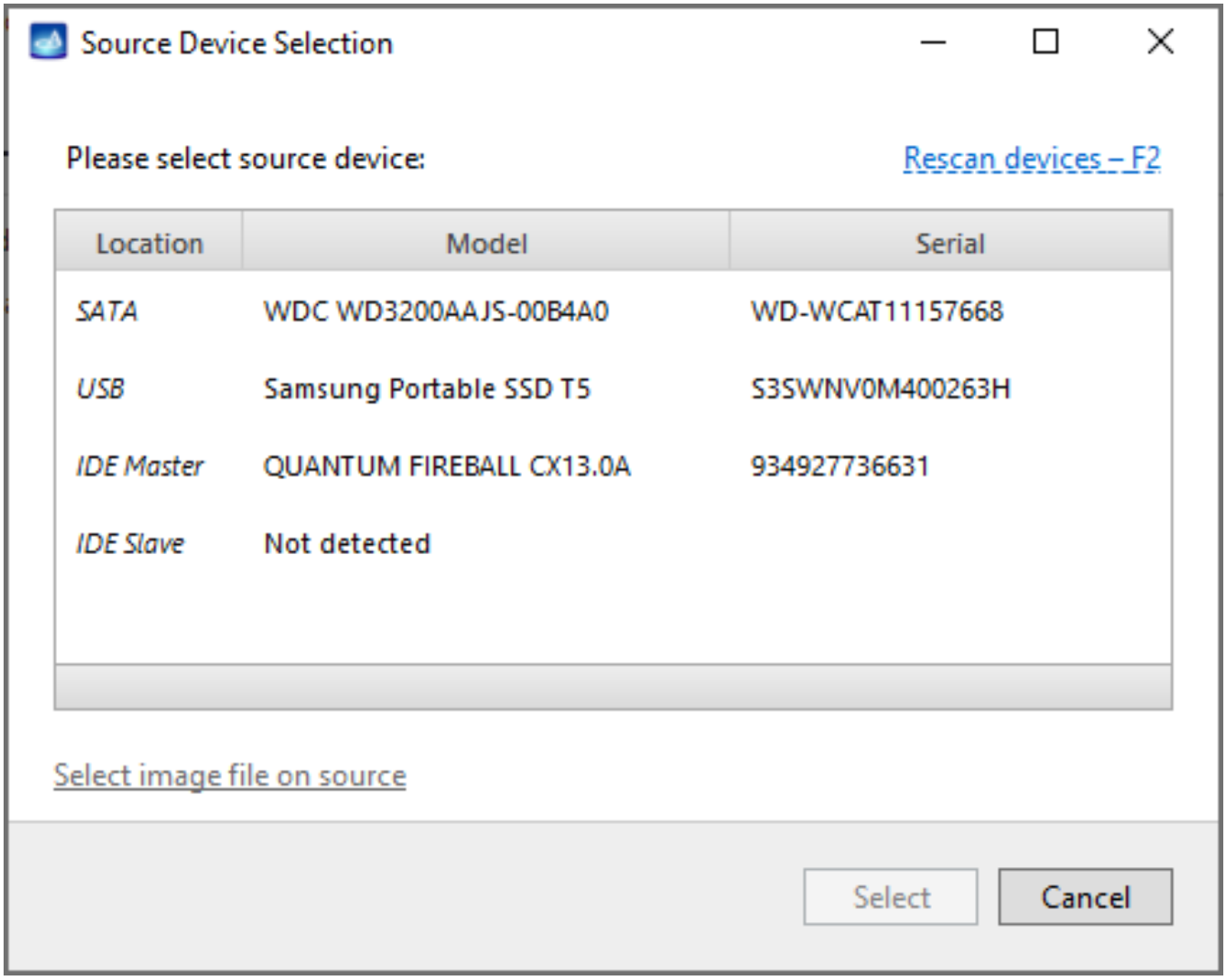
- Western Digital hard drives: all IDE and SATA models are supported with exception of latest models released since 2018
- Fujitsu hard drives: all IDE and SATA models are supported
- Samsung hard drives: all IDE and SATA models are supported with exception of old hard drives made prior to 2004
- The following Hitachi hard drives are supported: A7A3, A9A3, A9E3, A9E6, ALA6, ATCS, ATDA, ATMR, AVER, AVV2, AVVA, AVVN, B9A3, CLA3, DADA, DARA, DBCA, DCXA, DHEA, DJNA, DJSA, DKLA, DLA3, DLAT, DPTA, DTCA, DTLA, DTTA, G9AT, G9SA, H9AT, H9SA, J9AT, J9SA, K9AT, K9SA, L9SA, M9AT, PLA3, PLAT, VLAT
- Toshiba hard drives supported: DT family only

Connecting devices and starting Atola Insight Forensic

The purpose of this page is to provide information on Atola Insight Forensic start up procedure.

Source Device Selection dialog

The **Source Device Selection** dialog is available from the menu bar (**Source** > **Select Source**) or via **F3** shortcut key:



Source device selection

At this point you can select the port you'd like to work with (SATA, USB, IDE Master, IDE Slave).

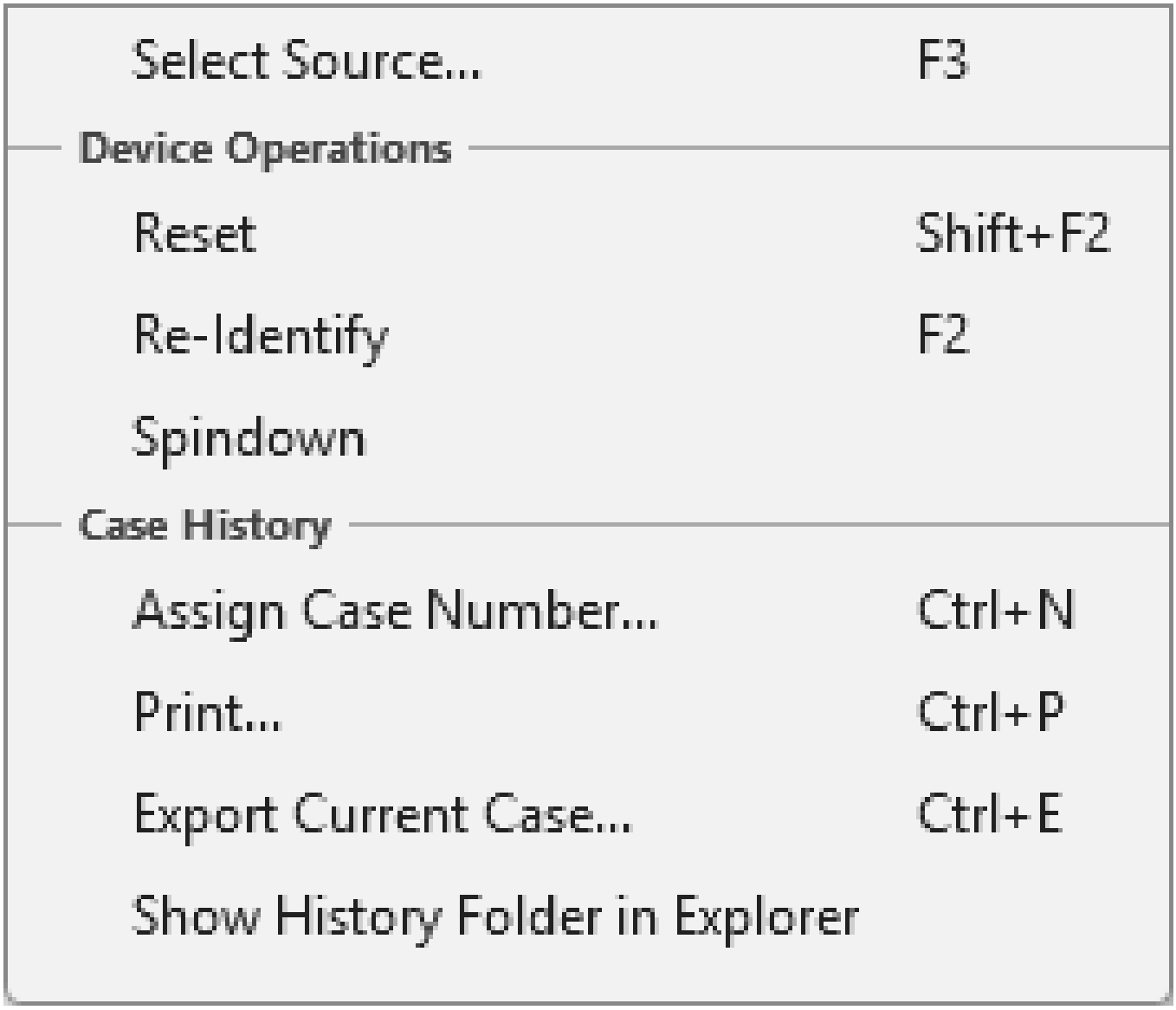
After you select the device, Atola Insight Forensic switches to the main application window.

Attaching and detaching hard drives

You can attach and remove hard drives at any time without restarting the software or hardware unit.

When replacing hard drives, Atola Insight Forensic detects the change automatically. However, if you'd like to manually re-identify a hard drive, you can do one of the following:

- Use the Source Port **Re-Identify** button or press **F2**.
- Use **Source** > **Select Source** menu item.

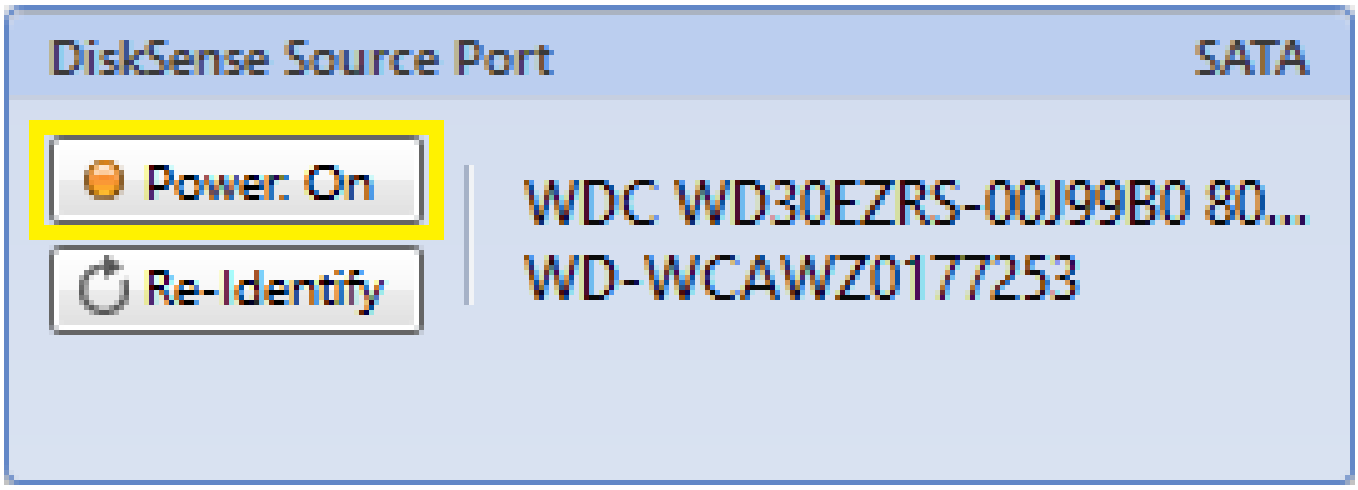


Source device menu

The difference is that re-identification works only when the attached hard drive can return at least some identification data. When the hard drive has significant damage (for example, a burnt PCB) and therefore won't return identification data, Atola Insight Forensic will fail to automatically recognize such hard drive.

In this case you would have to use **Source** > **Select Source** menu item to manually select the device. Atola Insight Forensic will still be able to diagnose a hard drive that is "completely dead" by relying on the current sampling.

Before disconnecting hard drives from the unit, we recommend to use the **Power Off** button in Atola Insight Forensic software to properly shut down the drive:

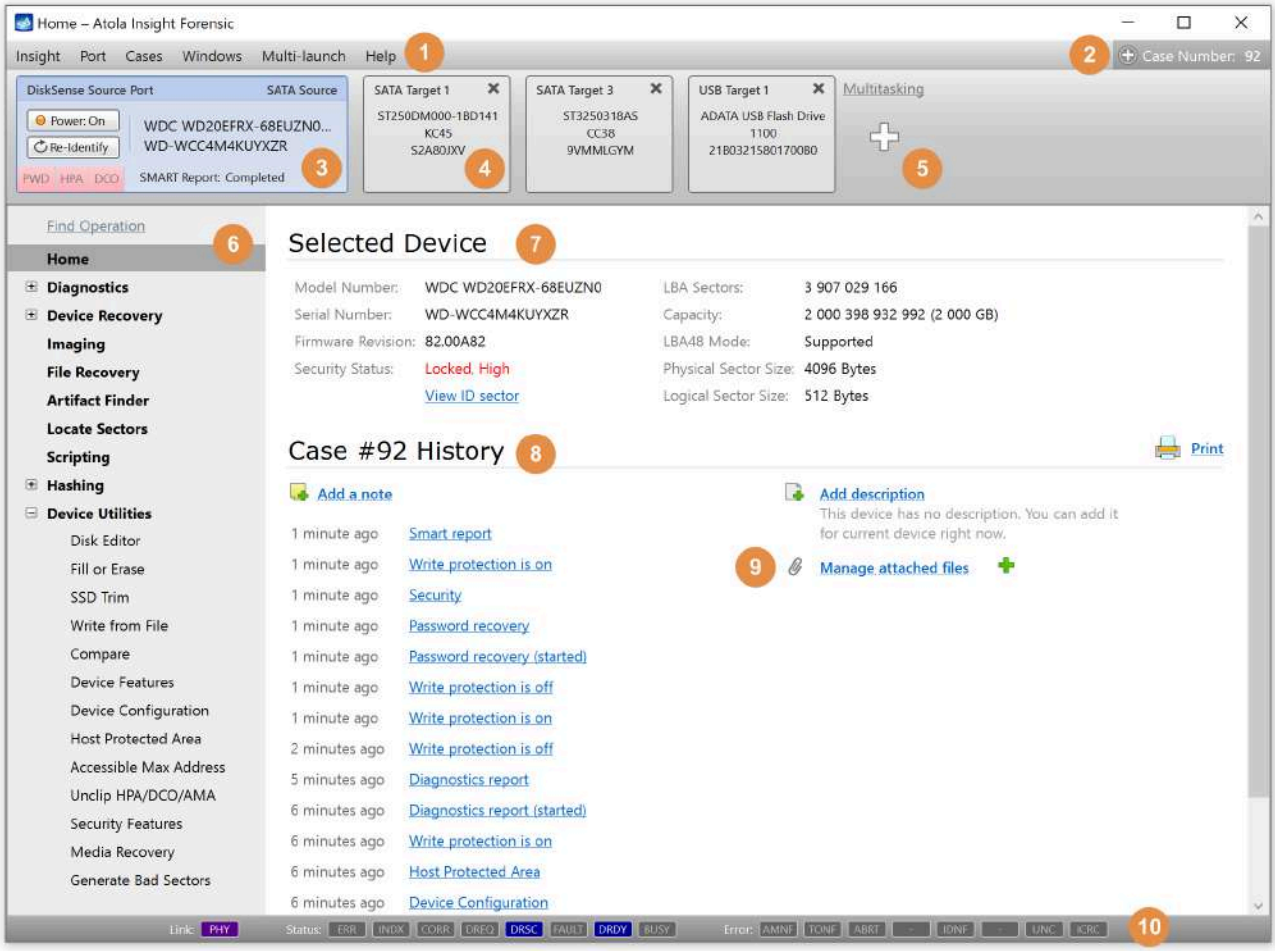


Source power button

Main window and controls

This page provides information on basic Atola Insight Forensic controls:

1. Menu bar
2. Case panel
3. Source port controls and indicators
4. Target port controls and indicators
5. Plus icon
6. Sidebar
7. Selected device information
8. Case history
9. Attached files
10. ATA Registers bar



1. Menu bar

The **Menu bar** contains Insight Forensic commands grouped in six menus:

- Insight
- Port
- Cases
- Windows
- Multi-launch
- Help

Insight menu

- **Change DiskSense Unit:** Lets you switch between the different DiskSense hardware units connected to your local network or PC.
- **Modify DiscSense Unit IP:** Configures a network address and hostname of the DiskSense hardware unit.
- **DiskSense Information:** Shows unit's serial number, firmware version, IP and MAC address, as well as network speed. Keyboard shortcut: *Ctrl+D*.

- **Manage SSH Root Password:** Lets you remotely access the device's operating system for additional maintenance.
- **Preferences:** Configures system settings, such as work folder path, system language, case management and file recovery settings etc. Keyboard shortcut: *Ctrl+Q*.
- **Database Connection Settings:** Sets up server path and database name, authentication method and credentials, as well as the path for backups.

Port menu

- **Select Source:** Allows choosing another source device (SATA/IDE/USB). For details, see Connecting hard drives. Keyboard shortcut: *F3*.
- **Reset:** Resets a hard drive's interface. Keyboard shortcut: *Shift+F2*.
- **Re-Identify:** Should be used after you replace the drive. Keyboard shortcut: *F2*.
- **Spindown:** Sends the 'Spindown Immediate' ATA command to the drive.
- **Detect All Devices:** Sends identification commands to all devices connected to the DiskSense hardware unit and displays all detected devices on the Device panel. Keyboard shortcut: *F6*.
- **Assign Case Number:** Allows assigning a specific number to the open case. Keyboard shortcut: *Ctrl+N*.
- **Print:** Prints or saves to a file the whole case history. For details, see Printing reports in a case. Keyboard shortcut: *Ctrl+P*.
- **Export Current Case:** Saves the entire case history into a single file. Keyboard shortcut: *Ctrl+E*.
- **Show History Folder in Explorer:** Opens the file folder of the current case in Windows Explorer.

Cases menu

- **Search/Open:** Lets you find a case according to specific criteria and open it. For details, see Finding and opening a case. Keyboard shortcut: *Ctrl+O*.
- **Export:** Brings the window with all available cases, in which you can select cases and export them to a defined folder. For guidance, see Exporting and importing cases.
- **Import:** Imports a case from another computer into the Insight Forensic database. For guidance, see Exporting and importing cases. Keyboard shortcut: *Ctrl+I*.

Windows menu

- **Current Oscilloscope:** Helps to keep track of hard drive power consumption levels and can be especially useful for damaged hard drive diagnostics. Keyboard shortcut: *Ctrl+U*.
- **Terminal:** Helps in accessing the firmware area of certain hard drive models for manual firmware recovery. Keyboard shortcut: *Ctrl+K*.

Multi-launch menu

This menu lets you quickly launch the following operations on multiple devices at once:

- Automatic Checkup (drive diagnostics)
- Fill or Erase
- SSD Trim
- Artifact Finder
- Calculate Hash
- Locate Sectors

Help menu

- **Manual:** Opens a single-page user manual for Insight Forensic in your web browser. Keyboard shortcut: *F1*.
- **Keyboard Shortcuts:** Opens a PDF file with a list of all keyboard shortcuts used in Insight Forensic.
- **Send Feedback:** Redirects to a contact form on the Atola Technology website.
- **Extend Subscription:** Provides variants of extending your software subscription for another period, either offline or online.
- **Activation Status:** Shows information about your current subscription: subscription ID, activation status, subscription due date.
- **About:** Provides information about your current Insight Forensic firmware version and the serial number of your DiskSense hardware unit.

2. Case panel

This panel shows the current case number. To add or change the case number and description, click the small plus icon.

3. Source port controls and indicators

The source port consists of several parts:

- **Power button:** Allows to manually apply power to the hard drive attached to the DiskSense unit.
  - When power is on, a single button click sends a spin-down command first and then performs power-off.
  - When power is on, you can click the button a second time during spin-down to instantly power the device off.
- **Re-Identify button:** Used when you replace the hard drive.
- **HDD model, firmware, and serial number:** Hard drive identification info.
- **Device interface type:** Can be SATA, USB, or IDE.
- **DCO tag:** Indicates whether Device Configuration Overlay (DCO) is activated.
- **HPA tag:** Indicates whether the Host Protection Area (HPA) is activated.
- **PWD tag:** Indicates if the hard drive is locked with an ATA password.

Source port context (right-click) menu

- **Select Source:** Allows choosing another source device (SATA/IDE/USB). For more information, see Connecting hard drives.
- **Select source file:** Allows choosing a raw image file located on a source device.
- **Reset:** Resets a hard drive's interface.
- **Re-identify:** Should be used after you replace the drive.
- **Spindown:** Sends 'Spindown Immediate' ATA command to the drive.
- **Current Oscilloscope:** Brings up the oscilloscope window.
- **Terminal:** Brings up RS-232/serial terminal window.
- **Assign Case Number:** Allows assigning a specific number to the open case.
- **Print:** Prints or saves the whole case history to a file. For details, see Printing reports in a case.
- **Export:** Saves the entire case history into a single file.
- **Import:** Imports case history from a previously exported file.

4. Target port controls and indicators

The Target port has all the features of the Source port. The Target port allows to work with one of the following:

- A device attached to the hardware target port (SATA or USB).
- Image file: Raw, E01, AFF4.

Target port context (right-click) menu

Along with the commands that are identical to the ones in the Source port context menu, the Target port context menu has an additional one:

- **Remove port:** Powers down the selected port and removes it from the Device panel.

5. Plus icon

To start another operation, add another target drive port for:

- SATA device
- USB device
- Image file
- Image file on target
- Multiple devices of any type

Detect All Devices: Sends identification commands to all devices connected to the DiskSense hardware unit and displays all detected devices on the Device panel.

6. Sidebar

This sidebar helps to navigate through operations and different software modules of Insight Forensic.

7. Selected device information

Shows detailed information about the device currently attached to the selected port:

- Model number
- Serial number
- Firmware version
- Security status
- Number of LBA sectors
- Device capacity
- LBA48 mode support
- Physical and logical sector size

The **View ID Sector** link will open the full information on the ID sector returned by the hard drive.

8. Case history

Lists all actions that were done to the selected device. To get a detailed report on an action, click on its name.

9. Attached files

Insight Forensic lets you attach files to the case. Whenever you attach a picture, a thumbnail is added to the Home screen.

To attach an image or file to the current case, click the green plus icon. For details, see Add a document or an image to the case.

10. ATA Registers bar

Displays raw contents of Link, Status, and Error ATA registers in real time. To learn more about each register, see ATA registers: what they mean.

ATA registers: what they mean

Link Register

PHY: It's only enabled when port powered on, device presence detected and physical layer communication established.

Status Register

This register contains hard drive status information. It is updated after every single command sent to the drive.

ERR: means last command failed to execute. In this case the Error register contains more details on the specific error.
INDX: obsolete, used to trigger after each spindle revolution
CORR: obsolete, used to trigger after a bad sector was automatically corrected by ECC
DREQ (Data Request): is asserted when hard drive wants to exchange data with the host controller (in either direction)
DRSC (Device Seek Complete): is obsolete; always asserted on modern hard drives
FAULT (Write Fault): is obsolete
DRDY (Device Ready): is obsolete; always asserted on modern hard drives
BUSY: indicates that the hard drive is busy executing a command OR initializing (after power on or reset)

Error Register

Error register provides more details if the last command failed. This register is only valid when **ERR** bit of the Status Register is asserted.

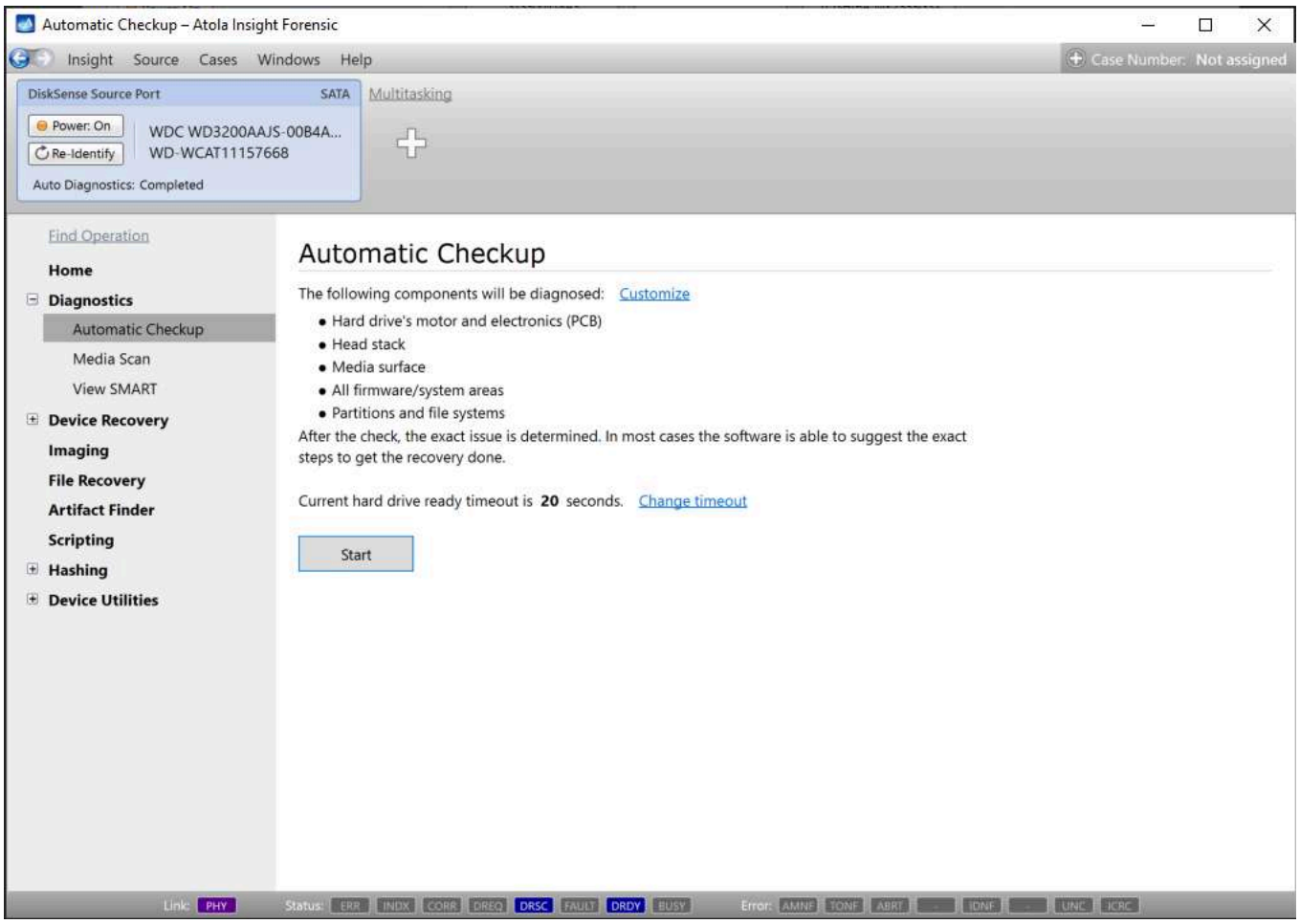
AMNF: means Address Mark Not Found (usually occurs on failed read attempt)
T0NF (Track 0 Not Found): obsolete
ABRT: command aborted (unsupported command or other failure)
IDNF: sector ID not found (usually occurs on failed read attempt)
UNC: uncorrectable read error; the hard drive was unable to read data even after applying ECC recovery algorithms
ICRC (Interface CRC error): there was CRC error while transferring data between host and the hard drive (usually indicates bad interface cable)

Automatic Diagnostics

Automatic Checkup feature diagnoses the following hard drive components:

- Electronics (circuit board)
- Motor
- Heads

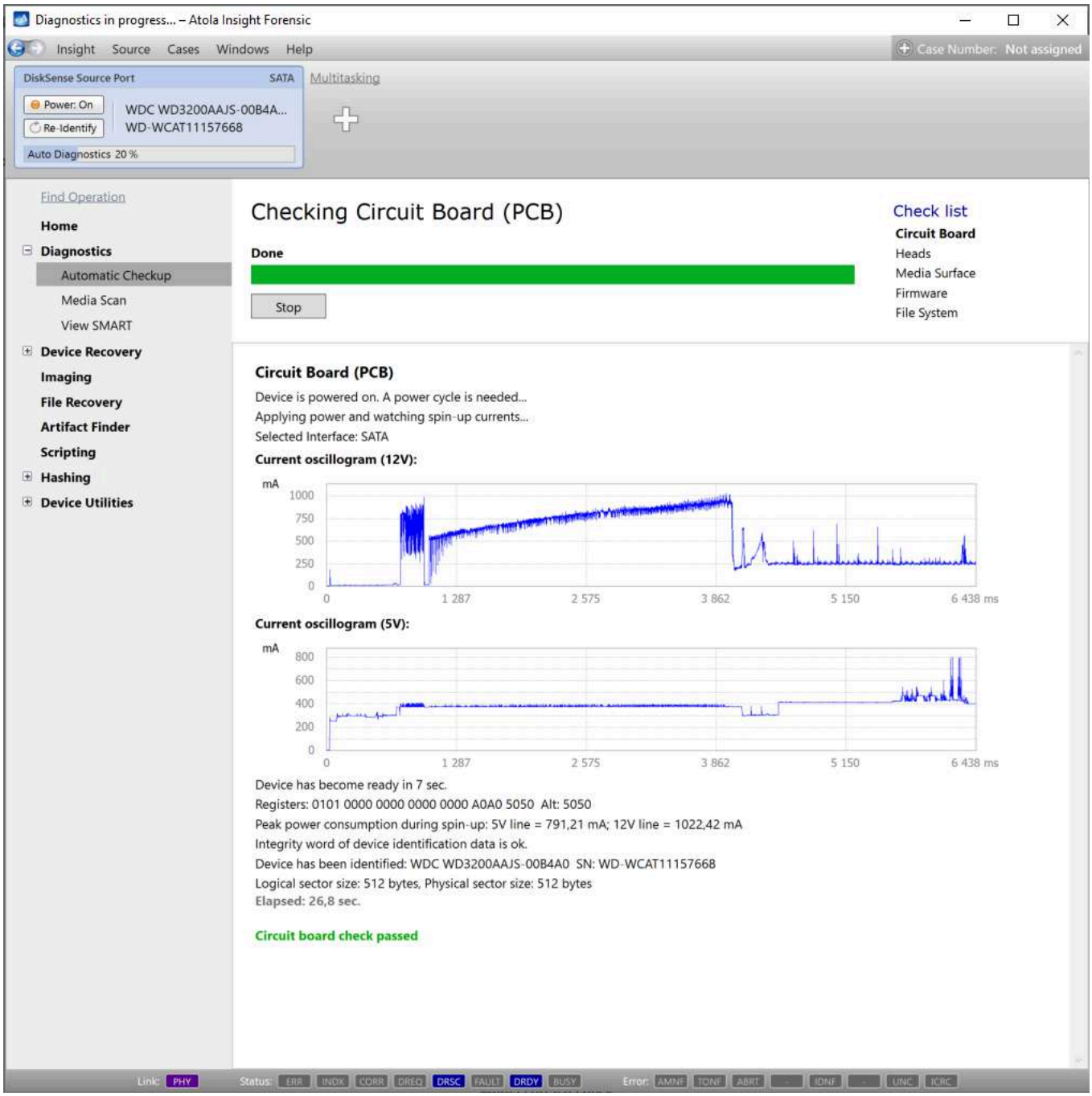
- Media surface
- Firmware area
- Partitions and file systems



One-button start of Diagnostics

First, hard drive's **electronics** (printed circuit board or PCB) is diagnosed. The system applies power to the device and records and analyzes spin-up current curve. This allows to detect most issues with the PCB and the motor.

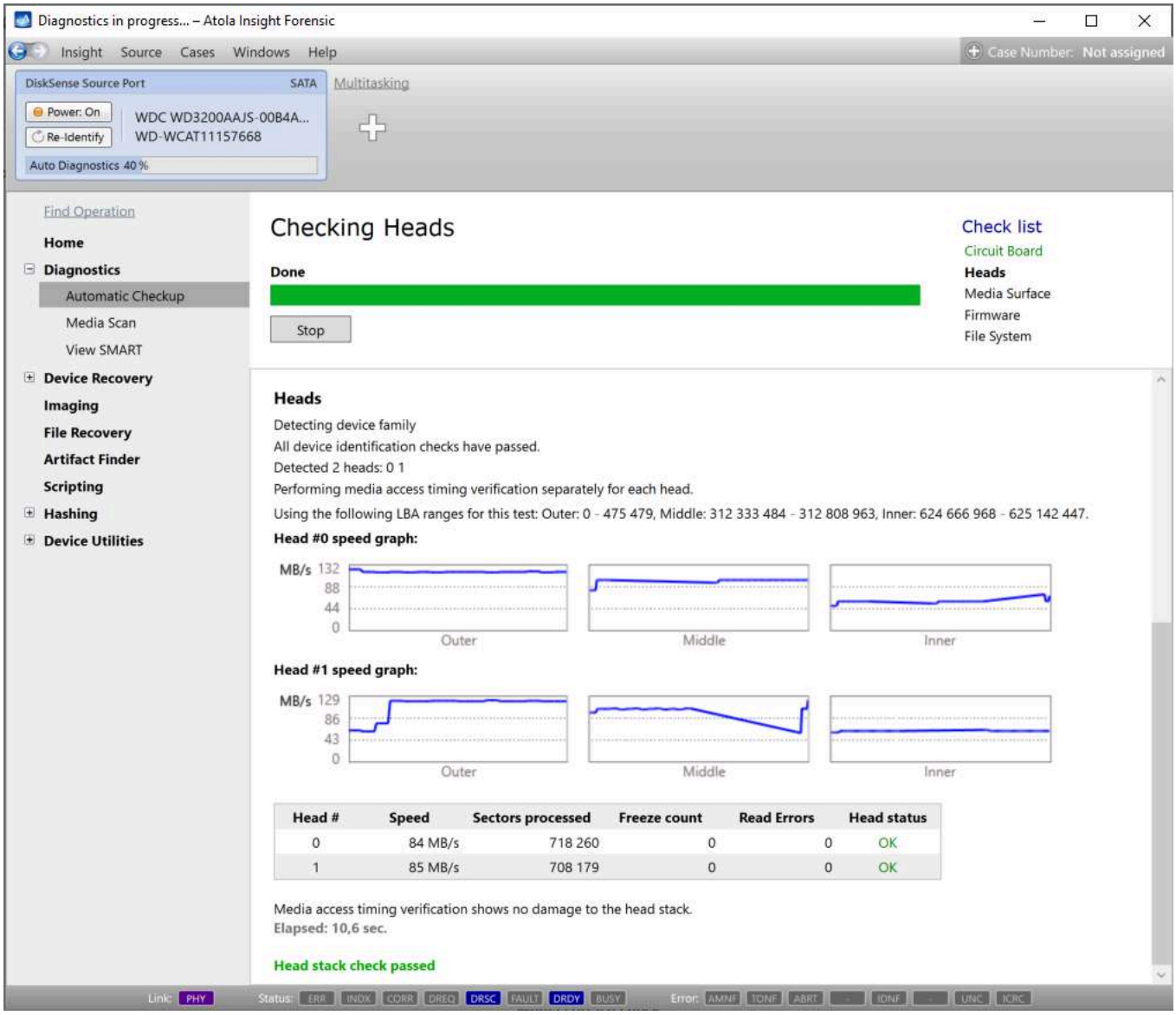
Then, the contents of the hard drive's **ATA registers and device identification sector** are being analyzed.



Measuring hard drive's currents

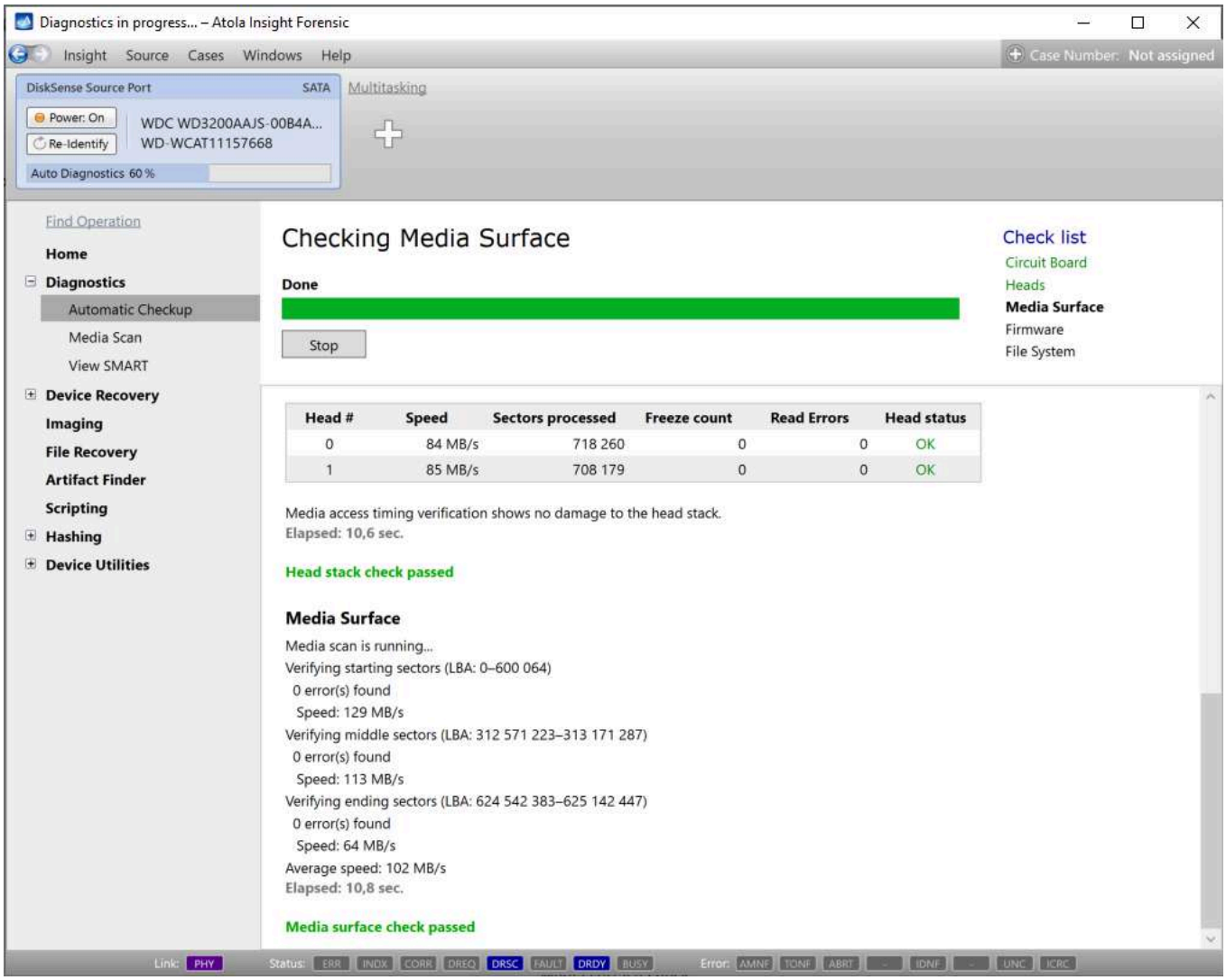
After that, the **head stack** is tested. Several factors are taken into consideration when diagnosing heads:

- media access time for each head,
- power consumption curves,
- and internal hard drive's error reporting systems.



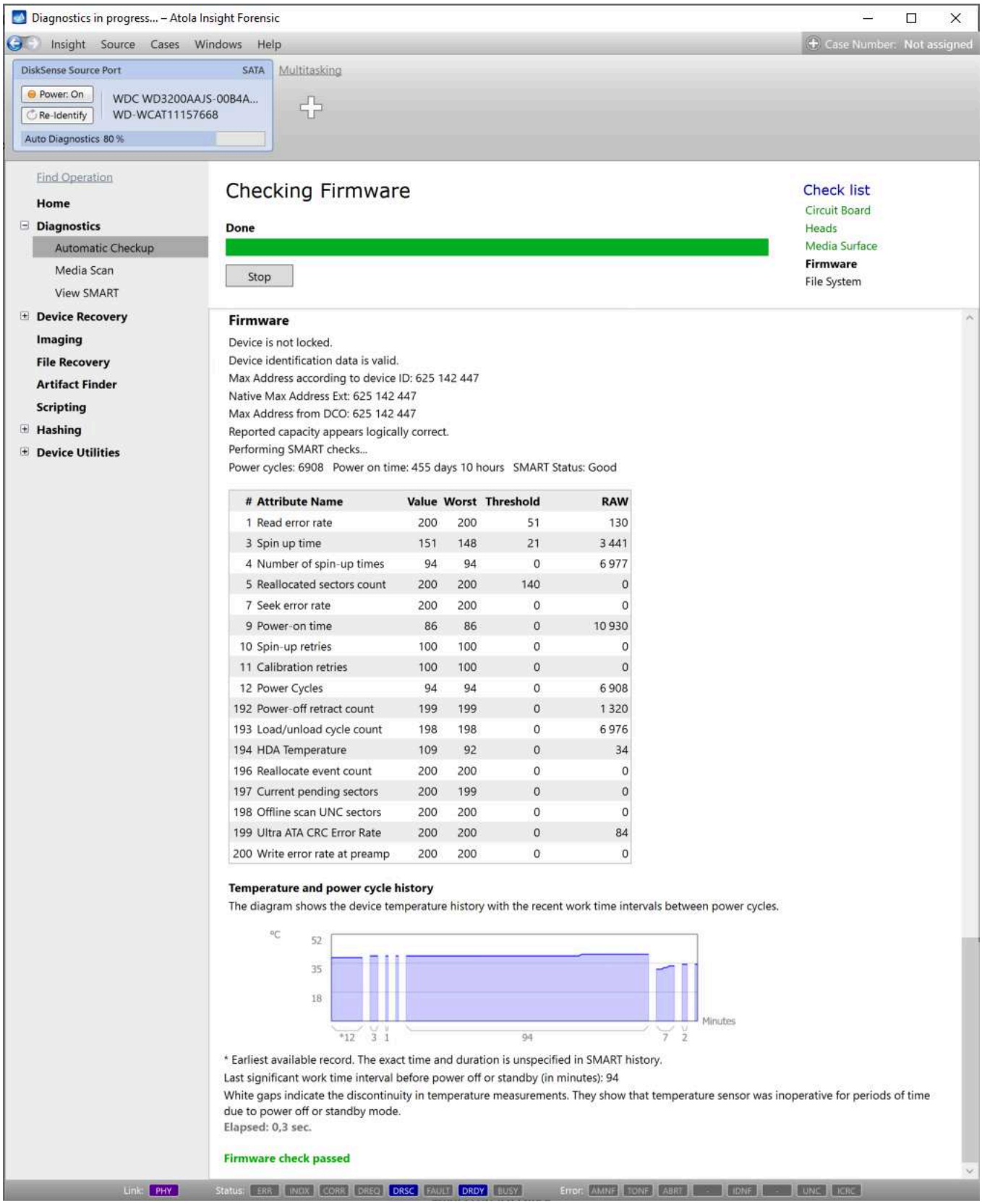
Head stack test

If head stack looks good, the system performs a short **media scan**. The purpose of this scan is to find out how many "bad sectors" (if any) there are on the surface:



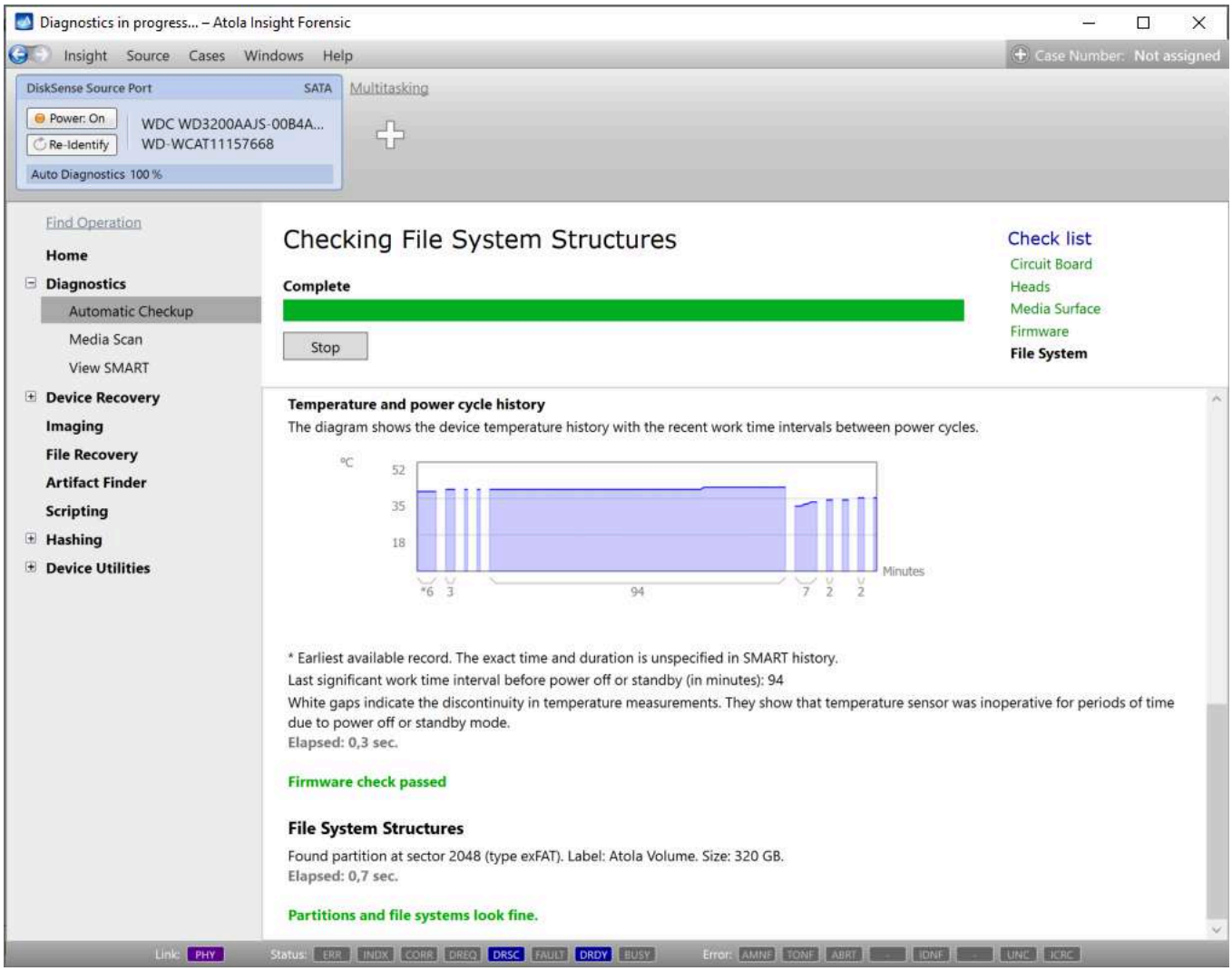
Checking media surface for bad sectors

Then, several **firmware tests** are performed:



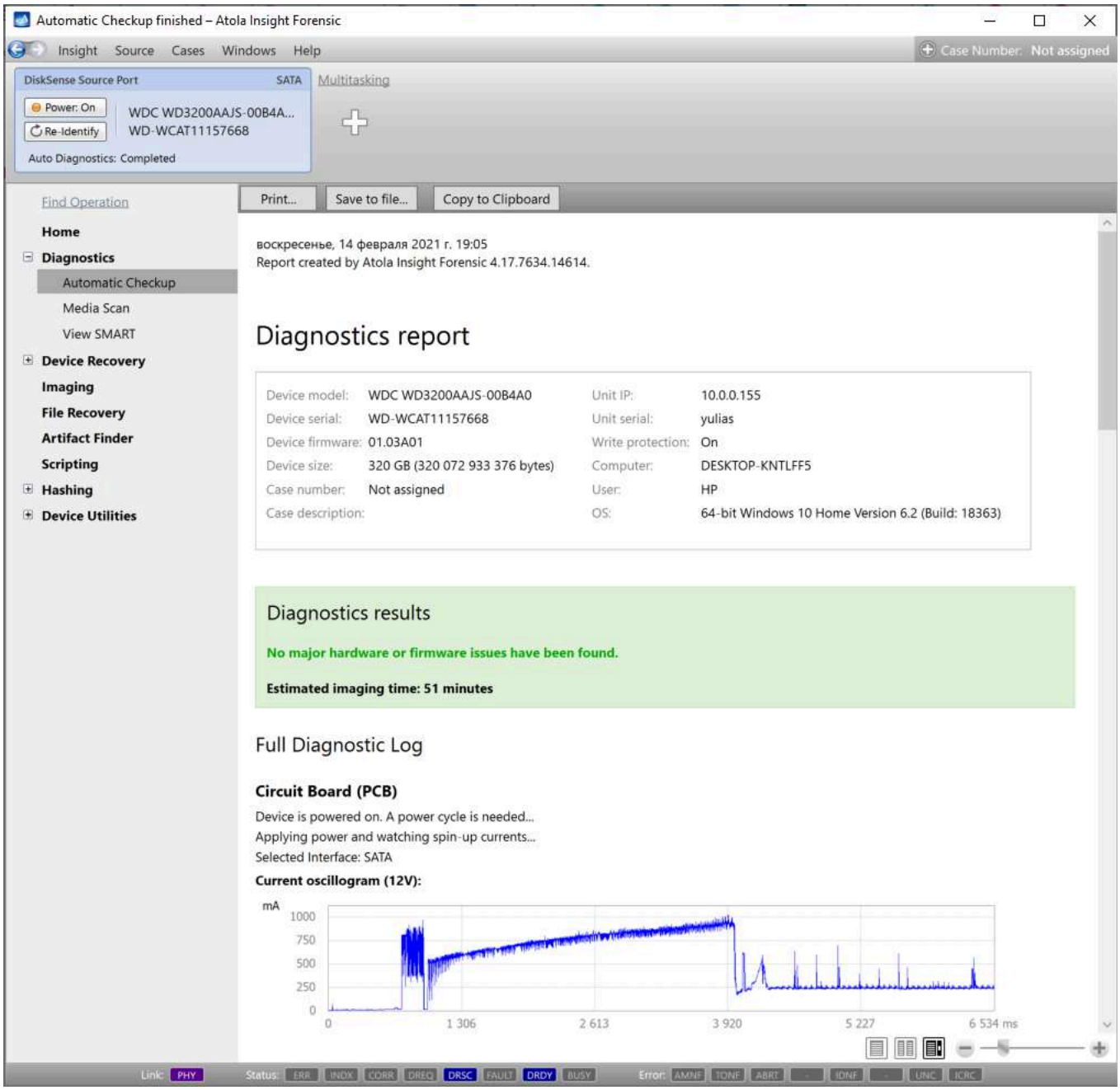
Firmware checks

If no issues found up to this point, a **file systems checkup** is performed:



Short analysis of filesystems

After all tests are done, Atola Insight Forensic will display the full report. The **Diagnostics result** message box contains a short summary of all tests:



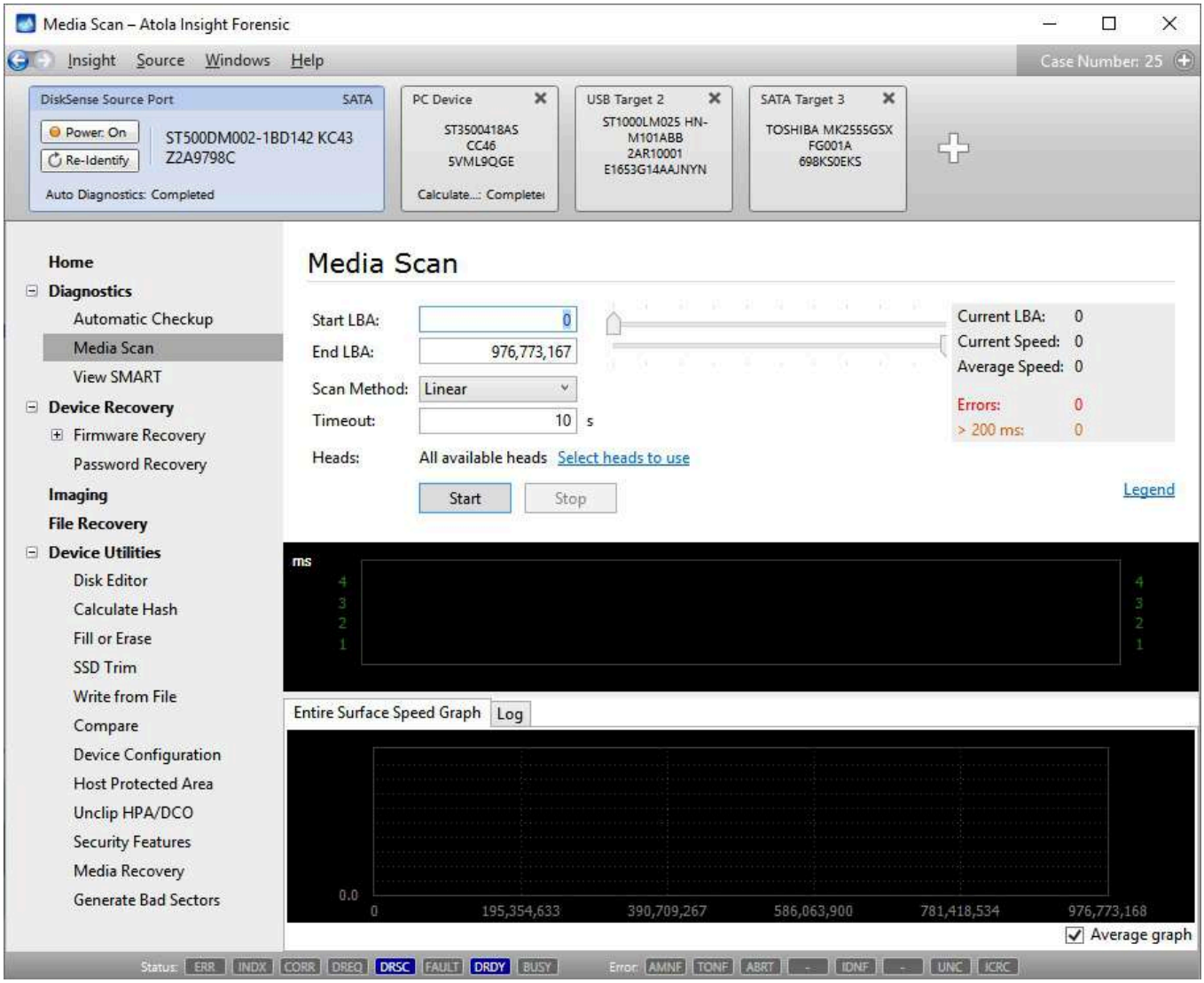
Final diagnosis

Media Scan

Media scan can help detect two kind of hard drive damage:

- Head stack damage
- Read errors ("bad sectors")

Media scan can also be used to determine general condition of the hard drive's surface.

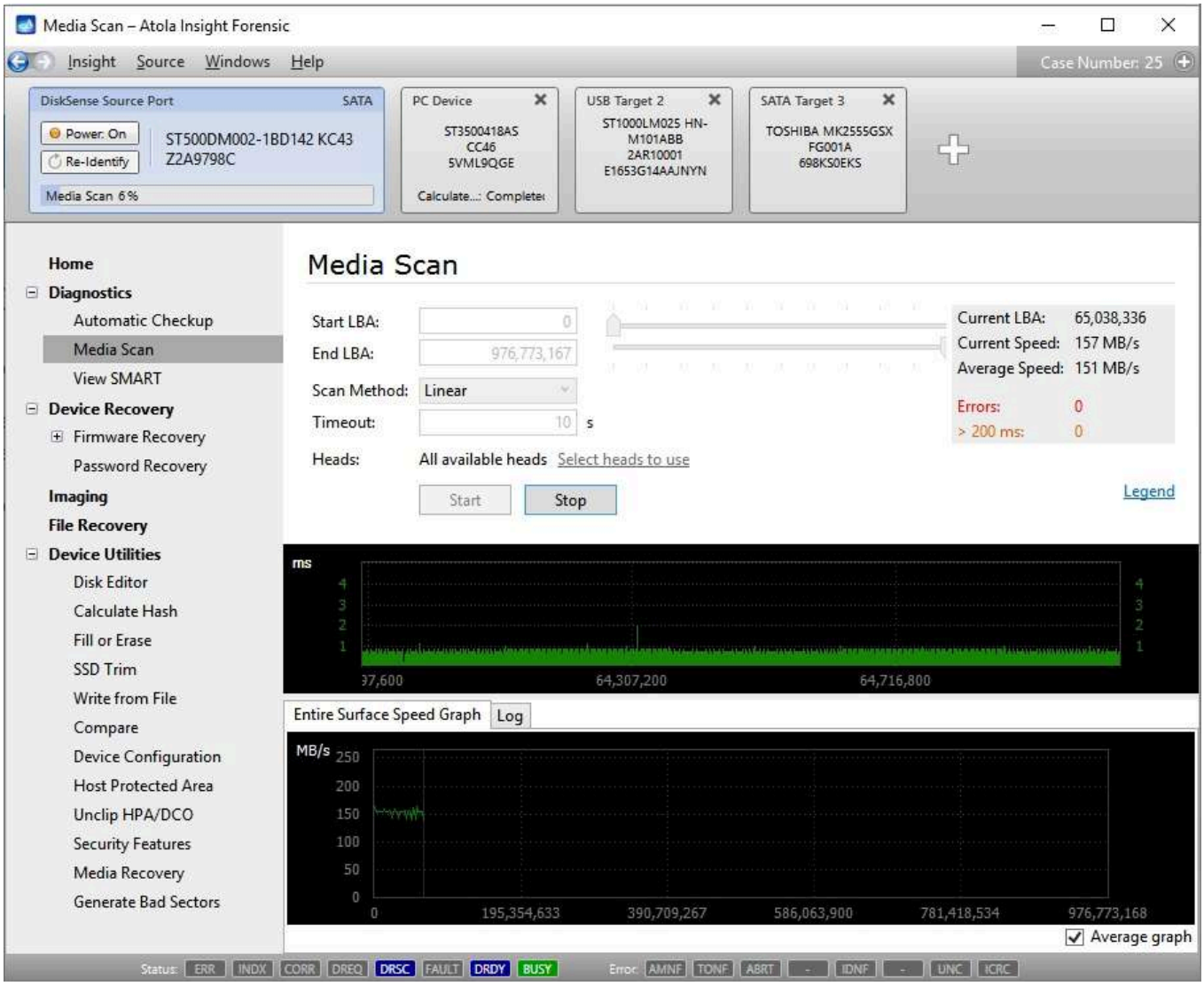


There are three methods of scanning:

- Linear — from start LBA to end LBA.
- Backward — from end LBA to start LBA (in reverse).
- Fast — from start LBA to end LBA. Please note that in this mode the software skips large numbers of sectors; this mode is to be used only to get a quick overview of the entire surface.

Let's scan a good hard drive and see what we get.

Good hard drive

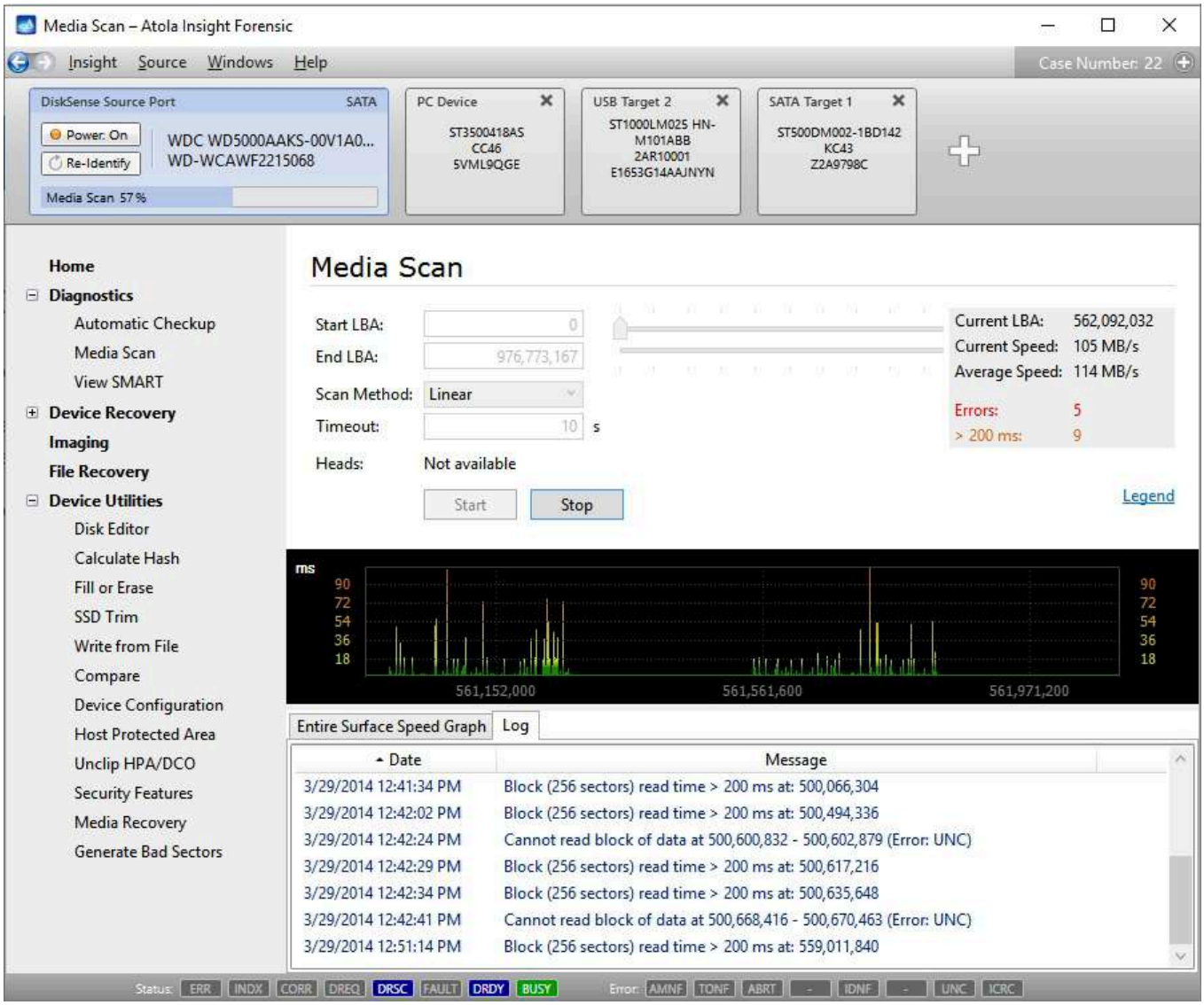


Drive without bad sectors

There are two graphs; the top graph represents single block read time (one block is 2048 sectors which equals to 1 megabyte), and the bottom graph represents read speed for the entire surface.

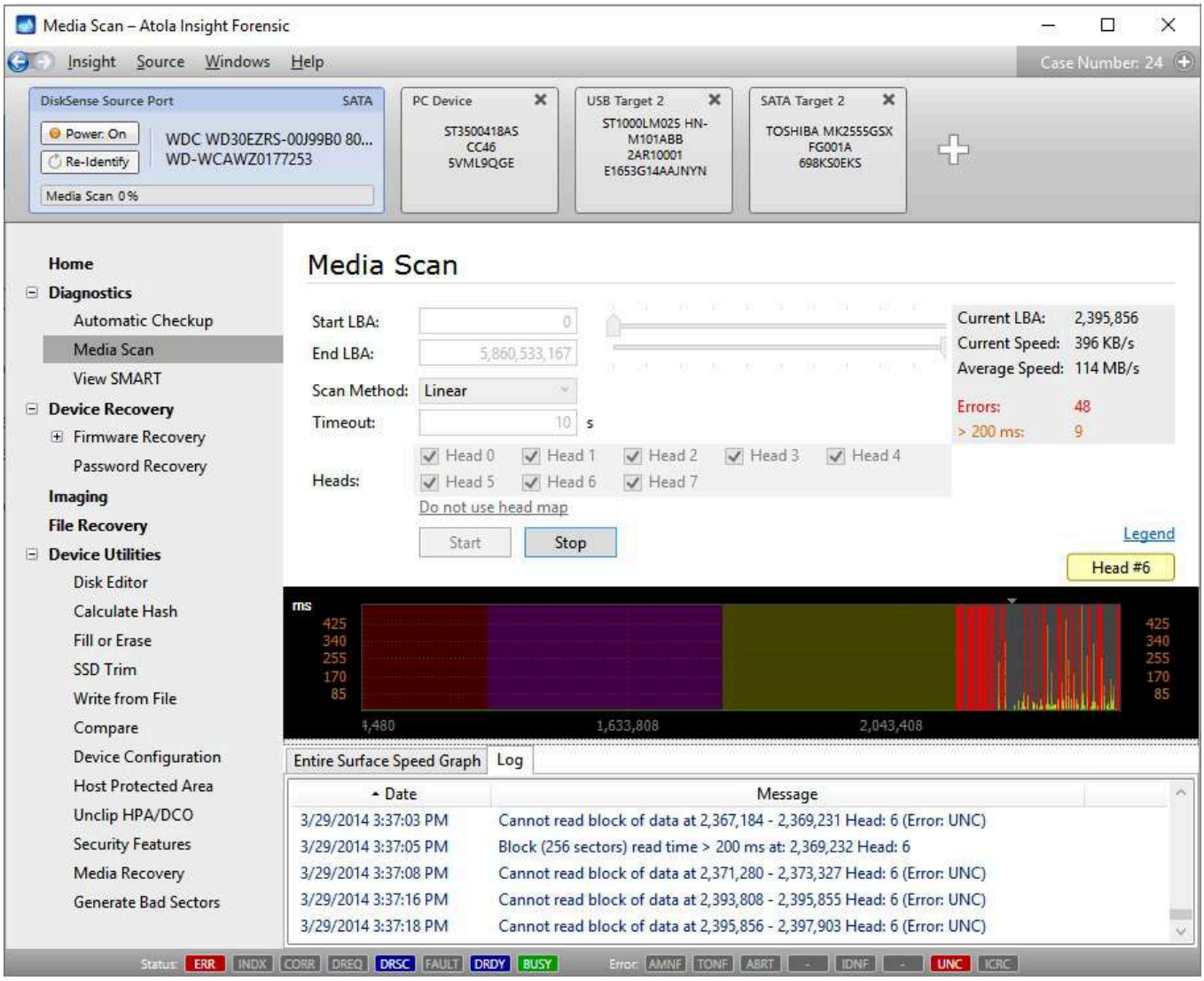
Now let's have a look at some graphs taken from damaged hard drives.

Unstable hard drive



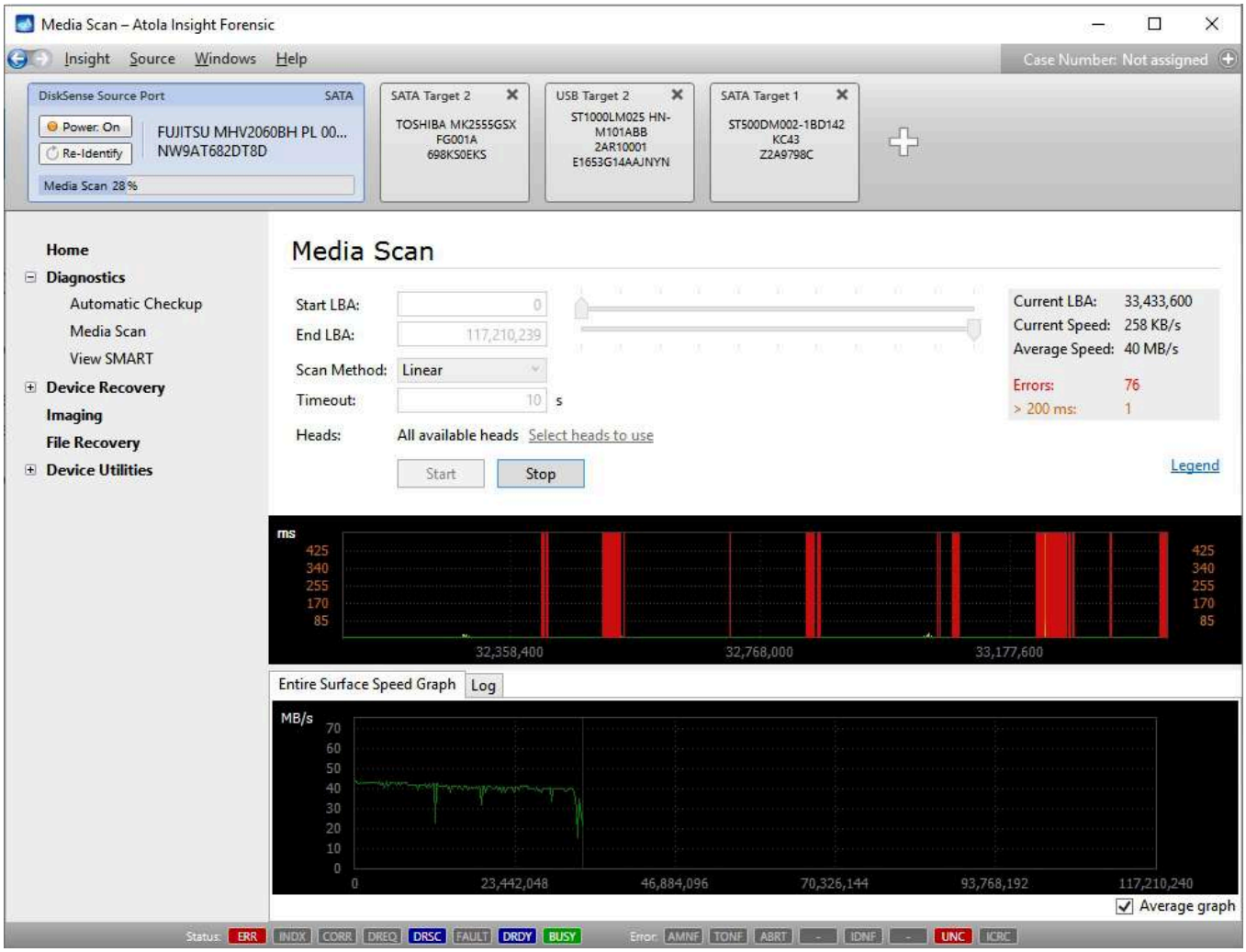
We call such hard drives "unstable". They usually do not have read errors, but at the same time media access times are very high and change sporadically. In most cases it is possible to create a clean image of such drive.

Hard drive with damaged head



You can observe patterns of delays which indicate head damage. However, please note that although the head is damaged, it can still read *some* sectors without errors, therefore it is possible to create a relatively good image of such hard drive by imaging data off good heads first, and then off the bad head.

Read errors



Read errors are displayed as vertical red bars. Please note that when scanning, Atola Insight Forensic shows the entire block as bad even when only one sector in that block is damaged.

Tracking SMART table status before/after imaging

Being able to evaluate the drive's state before it has exhausted its resources can make all the difference between a case won or a case lost in a court of law.

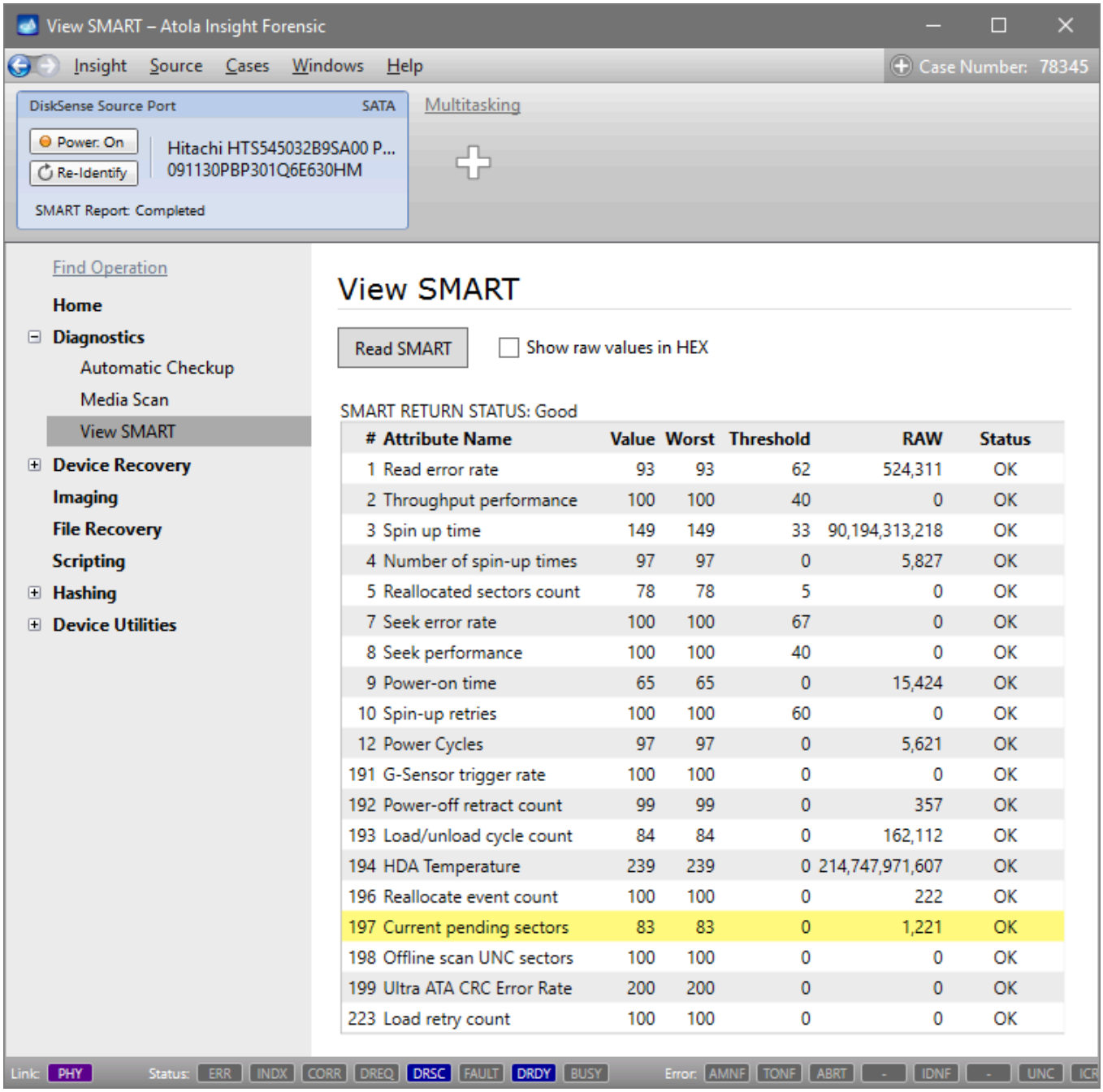
SMART table is a valuable source of information about a hard drive's health. SMART (Self-Monitoring, Analysis and Reporting Technology) provides stats of a drive's operation, thus helping predict its future failure.

Making a definitive conclusion based on the indices in SMART table is not easy: not all parameters are critical, it is usually a combination of bad values of a few parameters that point to a trouble, time factor plays a role too (how fast has the state of the drive been deteriorating).

View SMART table

To view SMART table of a drive:

1. In the sidebar, go to **Diagnostics** > **View SMART**.
2. Click **Read SMART**.



Hitachi drive with 1221 pending sectors

SMART table attributes may differ depending on the drive manufacturer. The most critical attributes are:

- Reallocated sectors count

- Current pending sector count
- Uncorrectable sector count

When RAW value of any of these attributes is greater than zero, Insight highlights it in yellow.

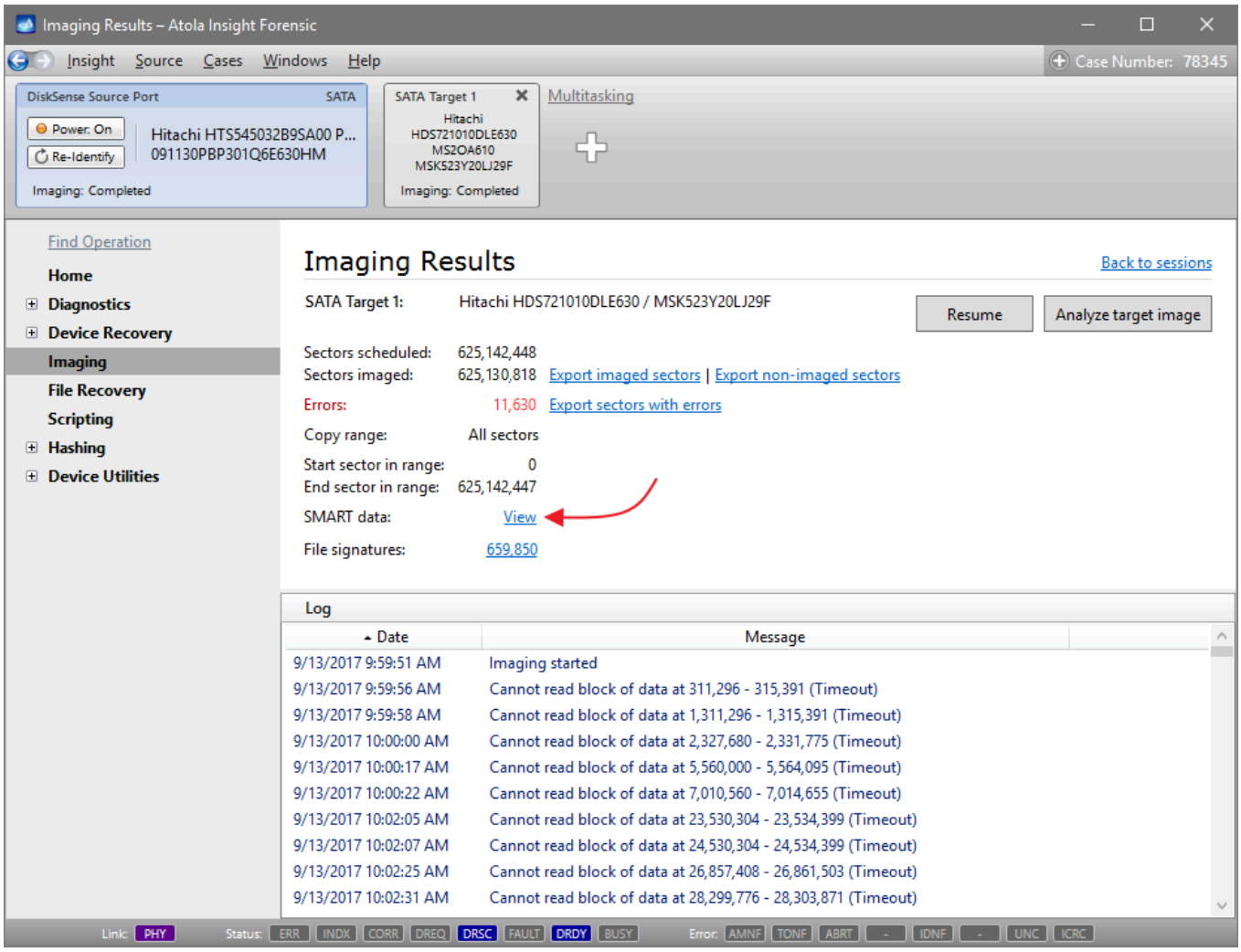
The worse the values, especially in these critical attributes, the more carefully the drive needs to be treated.

Compare SMART tables

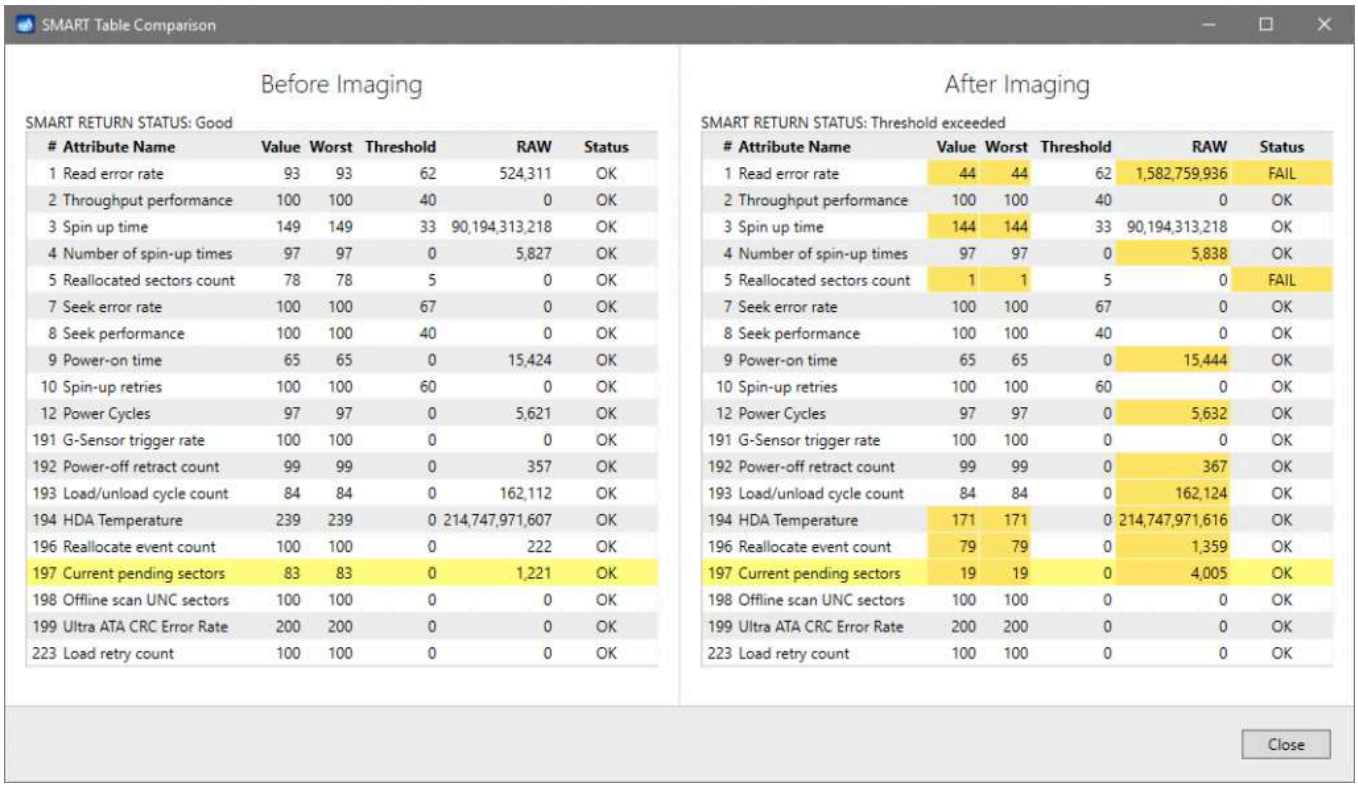
To keep track of the changes occurring to the attributes of the SMART table, Insight records SMART table indices prior and after each imaging session.

To open both SMART tables for side-by-side comparison:

1. After the imaging is completed, check the **Imaging Results**.
2. In **SMART data** line, click the **View** link.



By comparing the two tables, operator can evaluate whether the health of a drive has been deteriorating throughout the imaging session and thus assess how quickly its health has been getting worse.



How SMART table state changed after image acquisition

Whenever you need to evaluate how the state of the drive has been changing long-term, you can go to previous imaging sessions and look up SMART table. Insight stores this information in its case management system.

Image to a file on a target device

Atola Insight Forensic with the DiskSense hardware unit supports imaging to a file on a target device. You can save a bit-by-bit image of a source device to a file on a target device in one of the following formats:

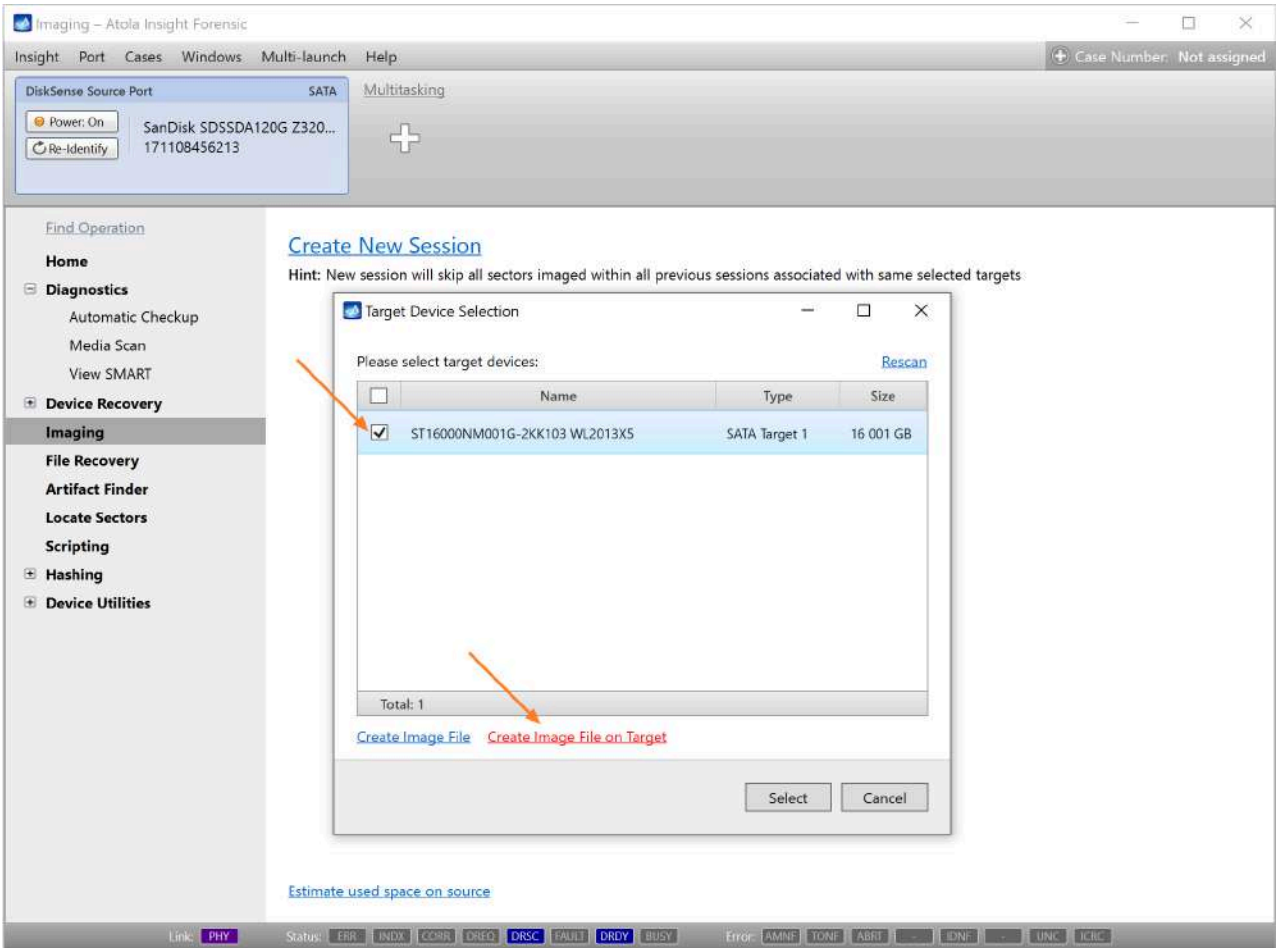
- Raw image file (growing)
- Preallocated raw image file
- E01 file

In order to create an image file on a target device, Atola Insight Forensic formats that device and creates a single exFAT partition with 32 MB cluster size.

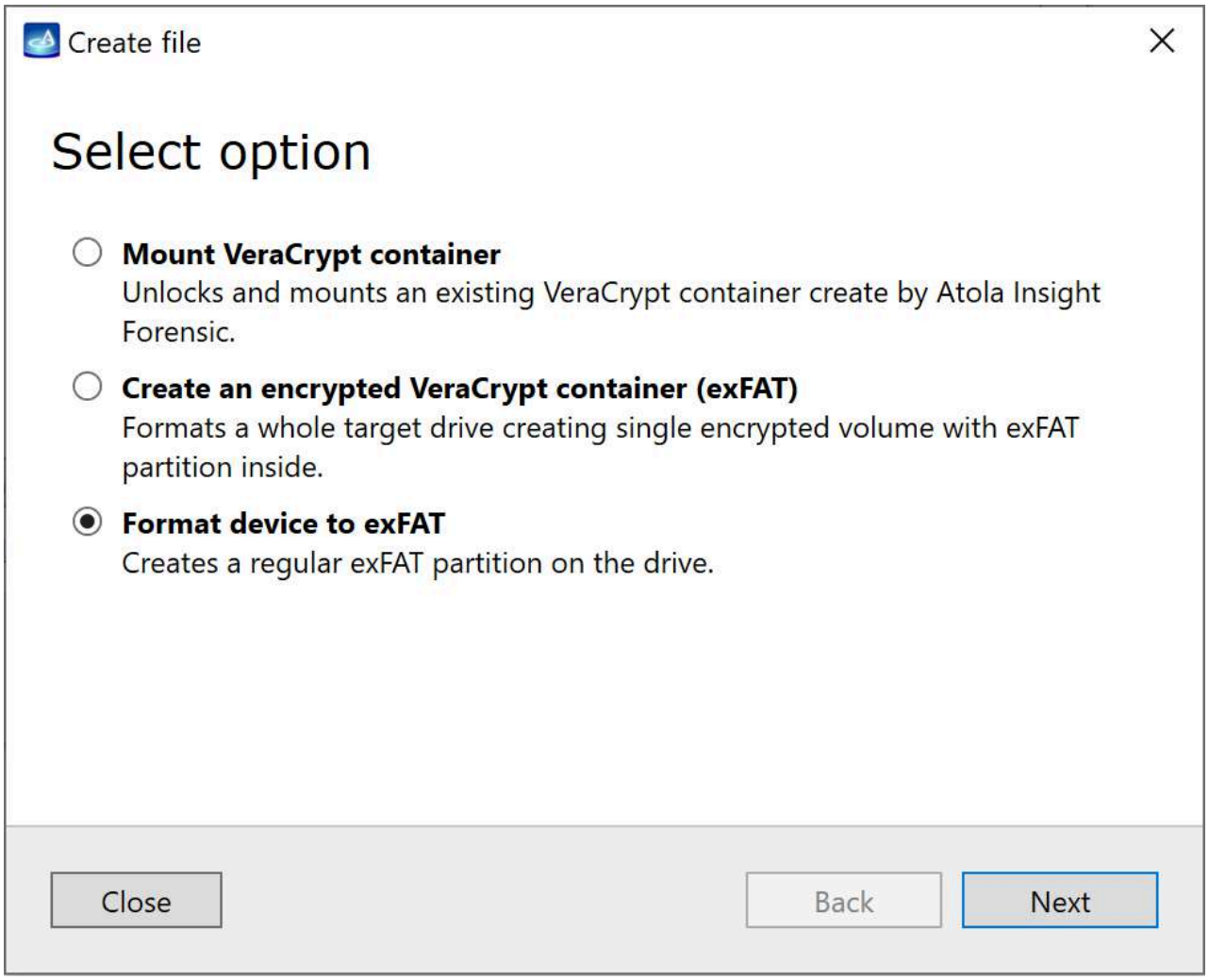
To image a source device to an image file on a target device, do the following:

1. Connect source and target devices to the DiskSense hardware unit.
2. In the sidebar, go to **Imaging**.
3. Click **Create New Session**.

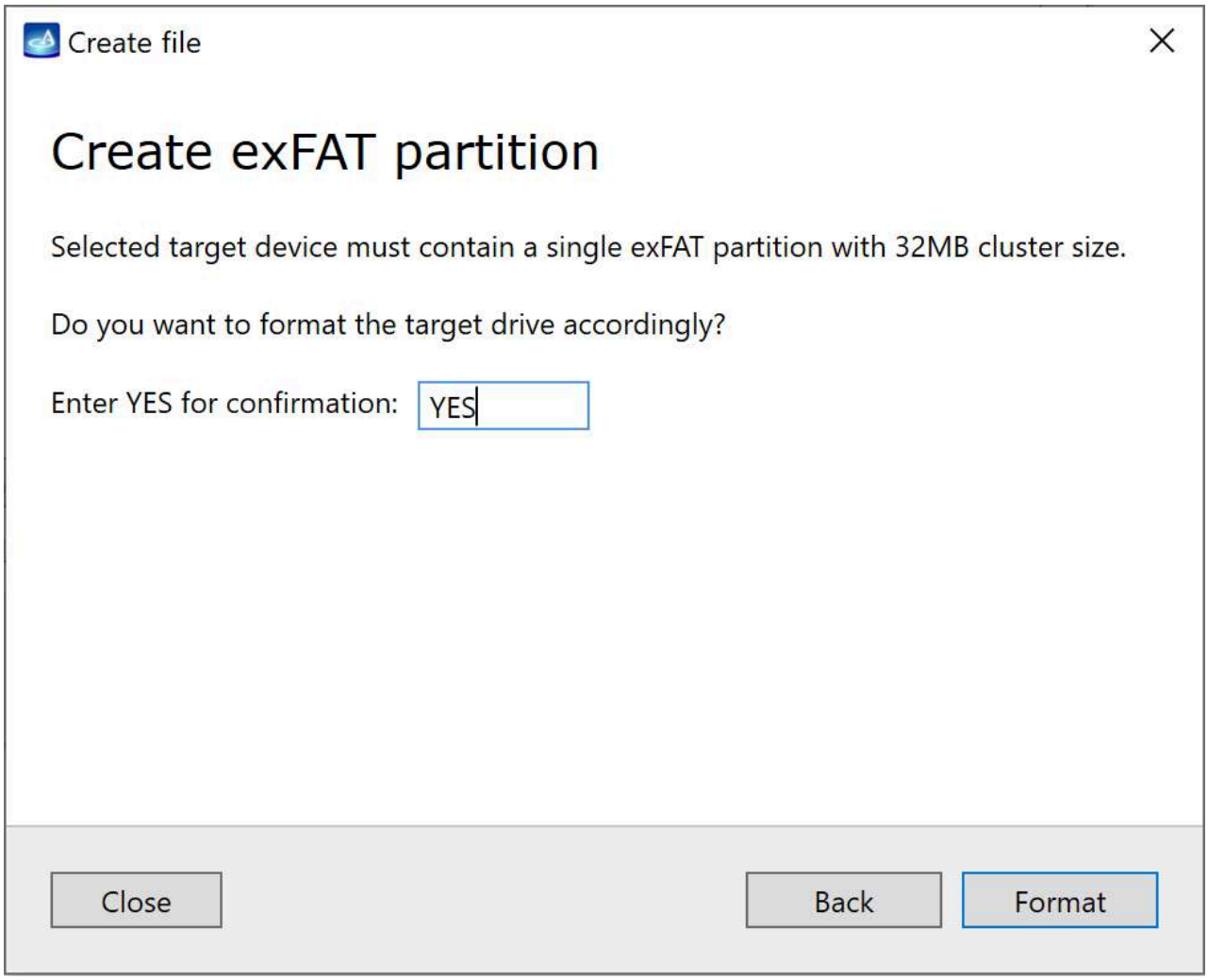
4. In the **Target Device Selection** dialog, select target device and then click **Create Image File on Target** link.



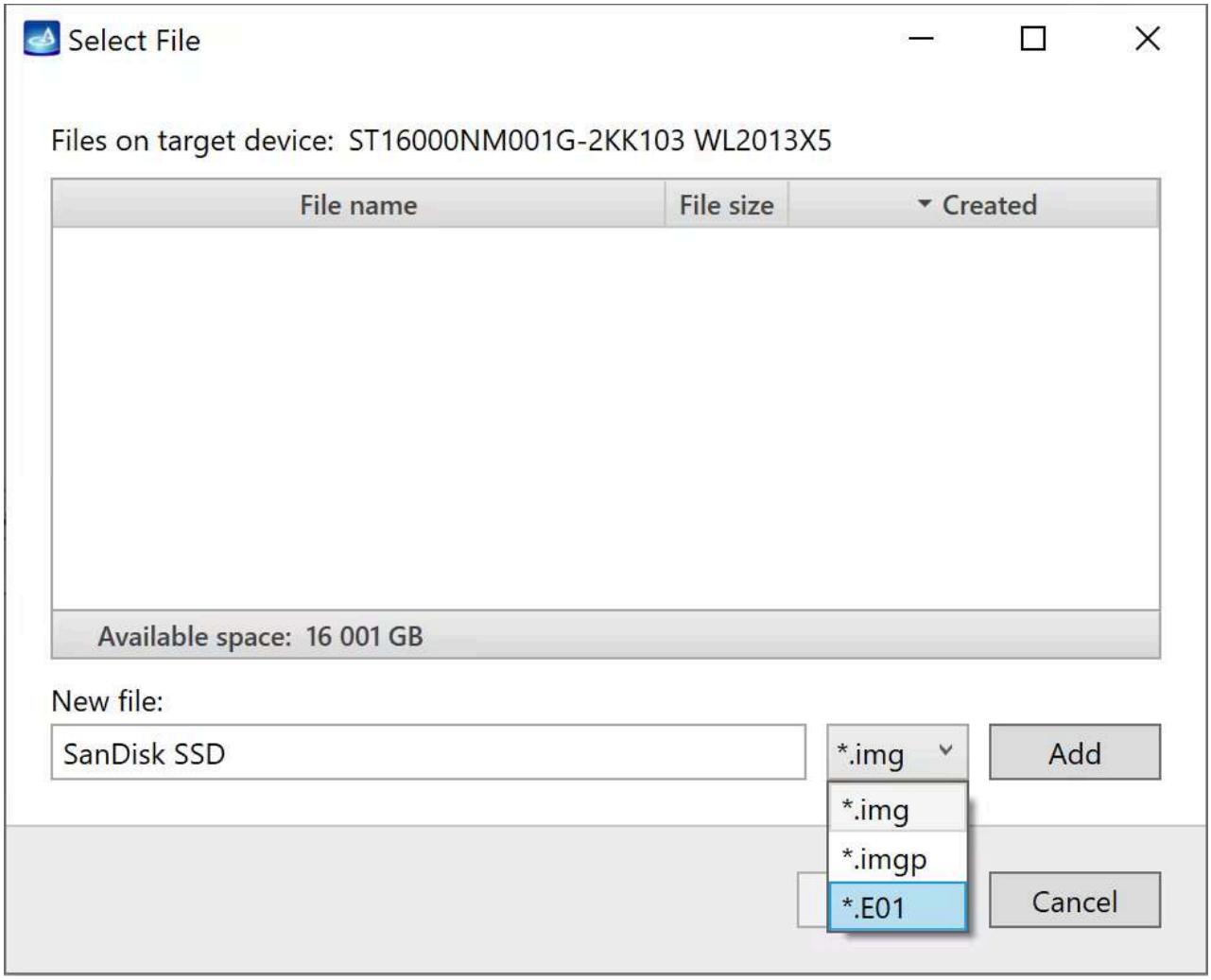
5. In the **Create file** dialog, select **Format device to exFAT** and then click **Next**.



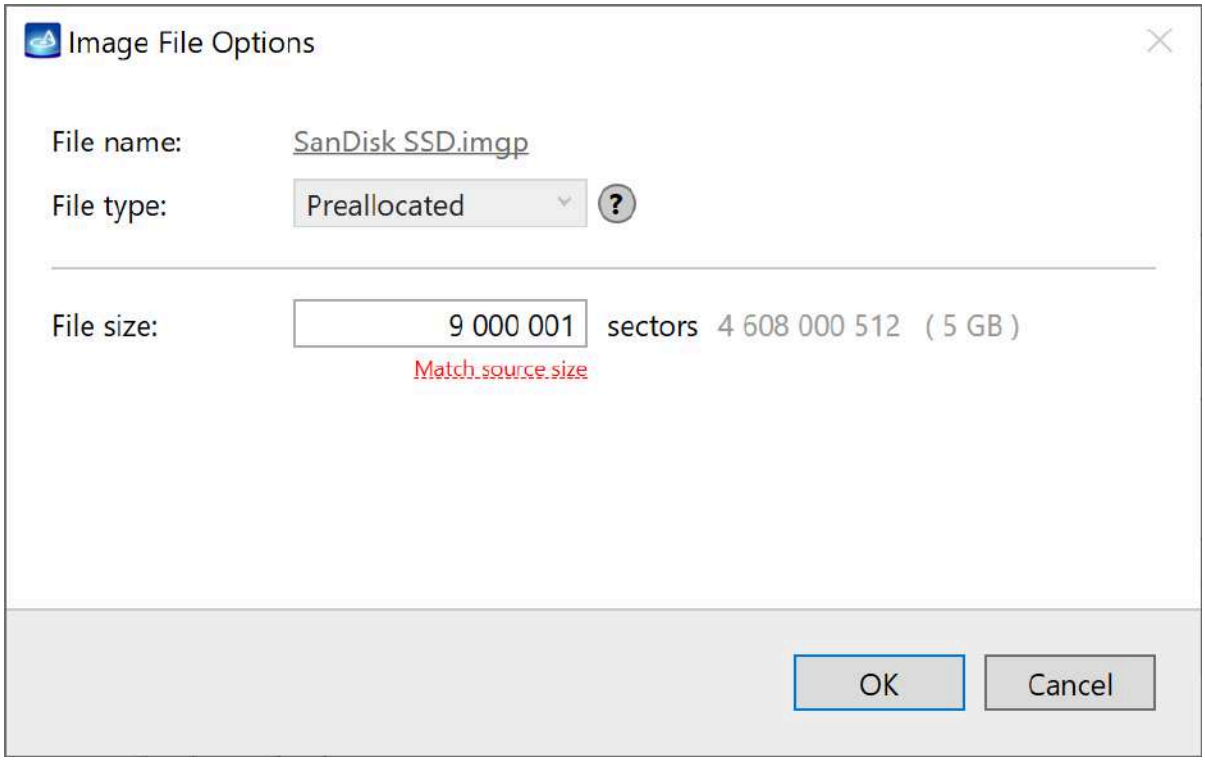
6. To confirm formatting of the target device, enter `YES` and then click **Format**. On the target device, Atola Insight Forensic creates a regular exFAT partition with 32 MB cluster size.



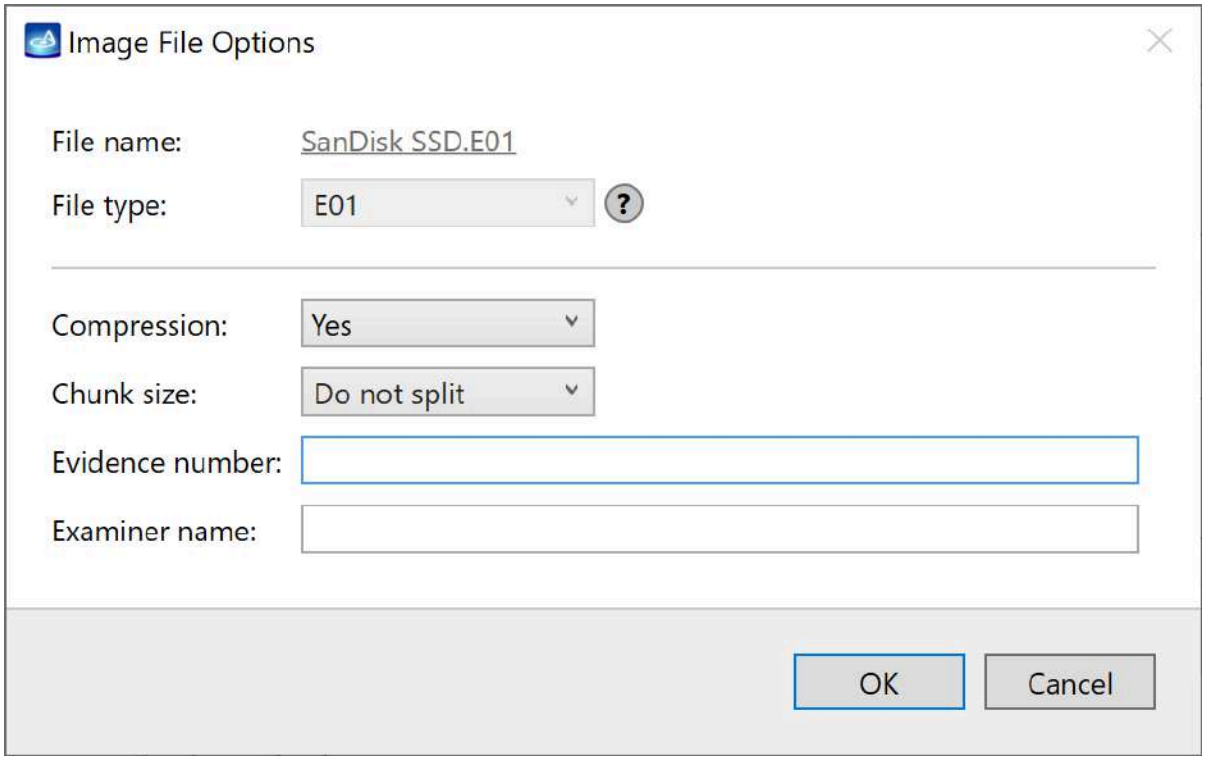
7. In the **Select File** dialog, enter filename in the **New file** field, select file extension and then click **Add**.



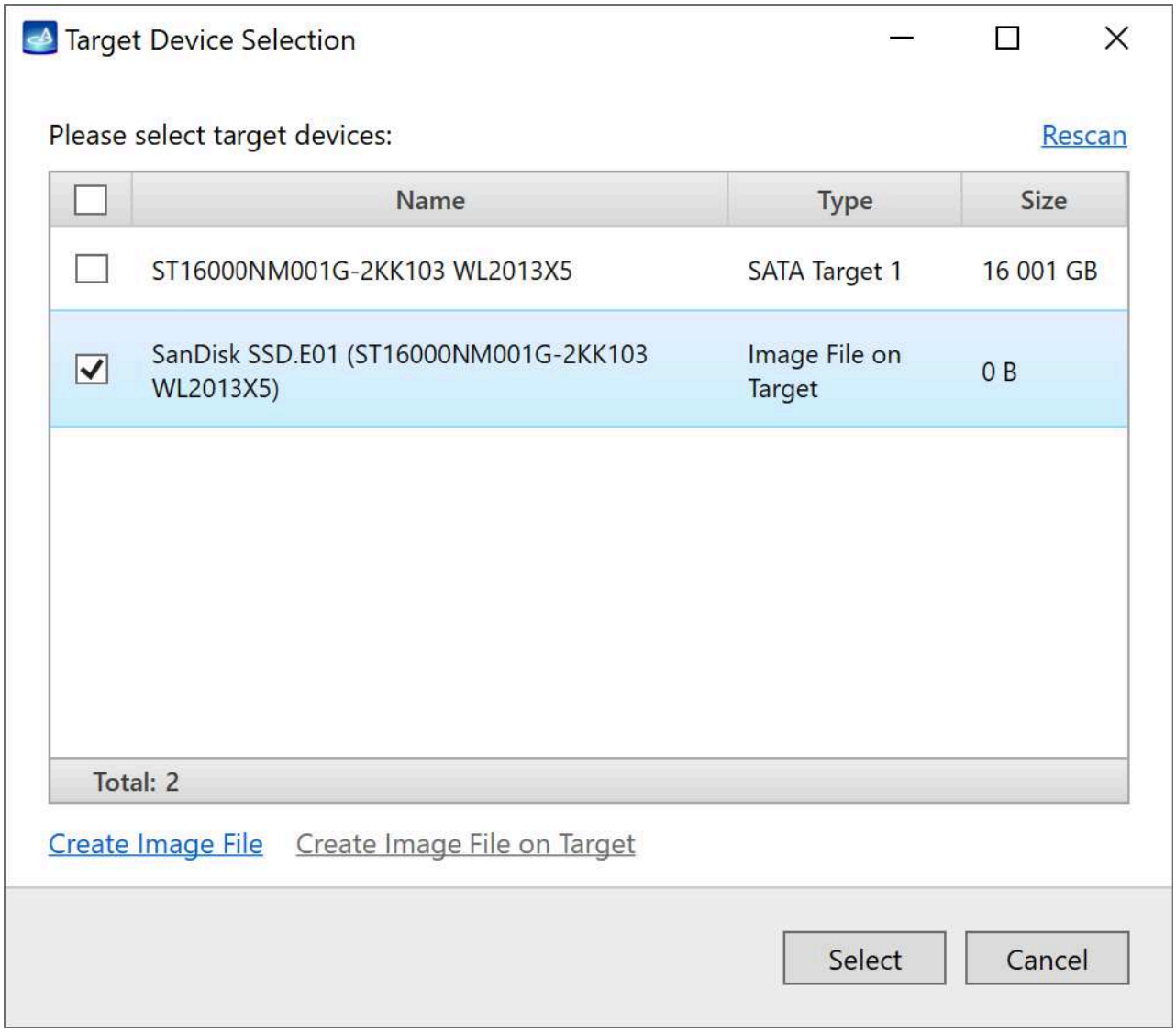
- For **Preallocated raw image file** (*.imgp) you can configure file size to match source device size.



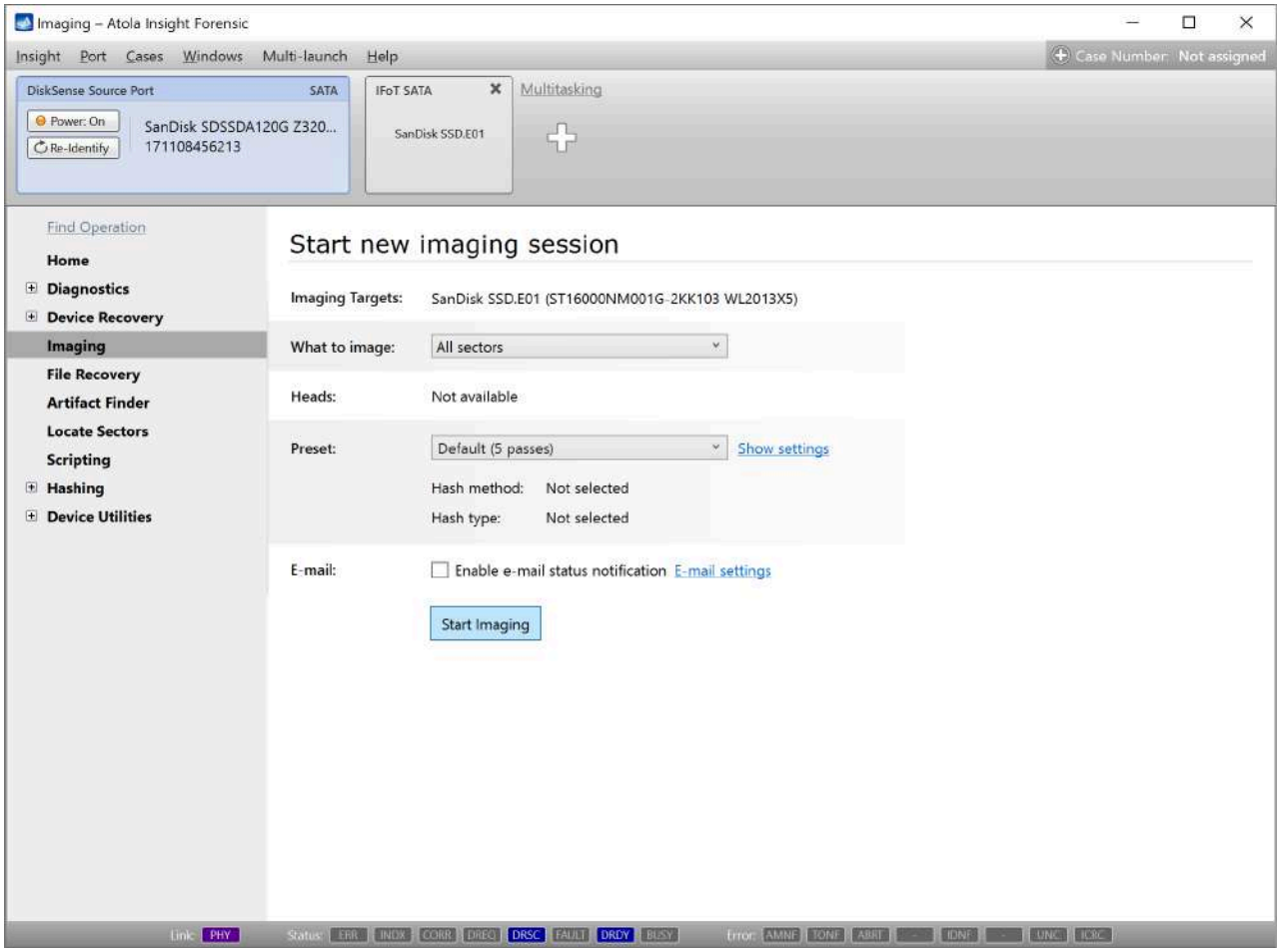
- For **E01 file** you can configure compression and chunk size, enter evidence number and examiner name.



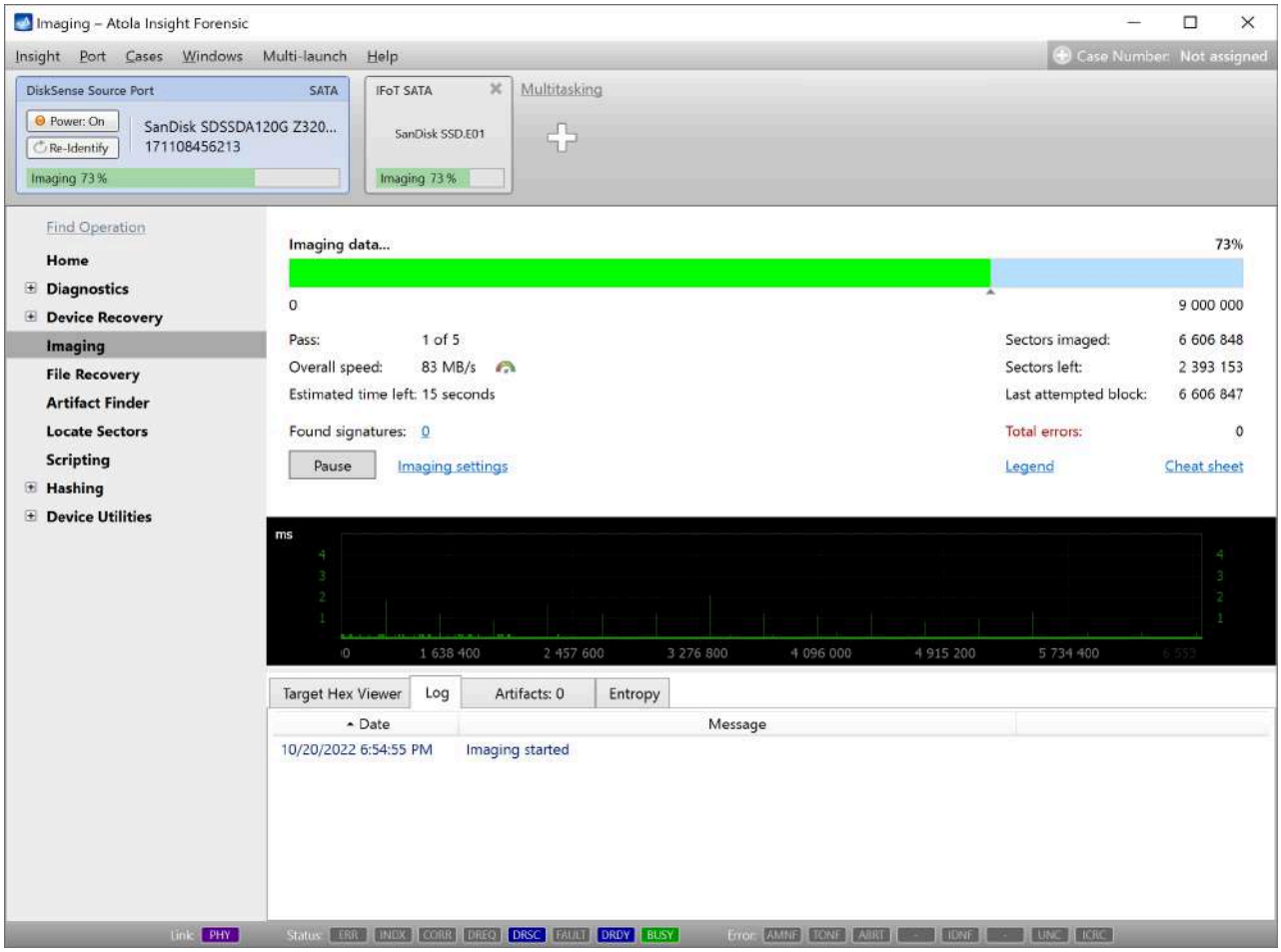
8. In the **Target Device Selection** dialog, choose your image file and then click **Select**.



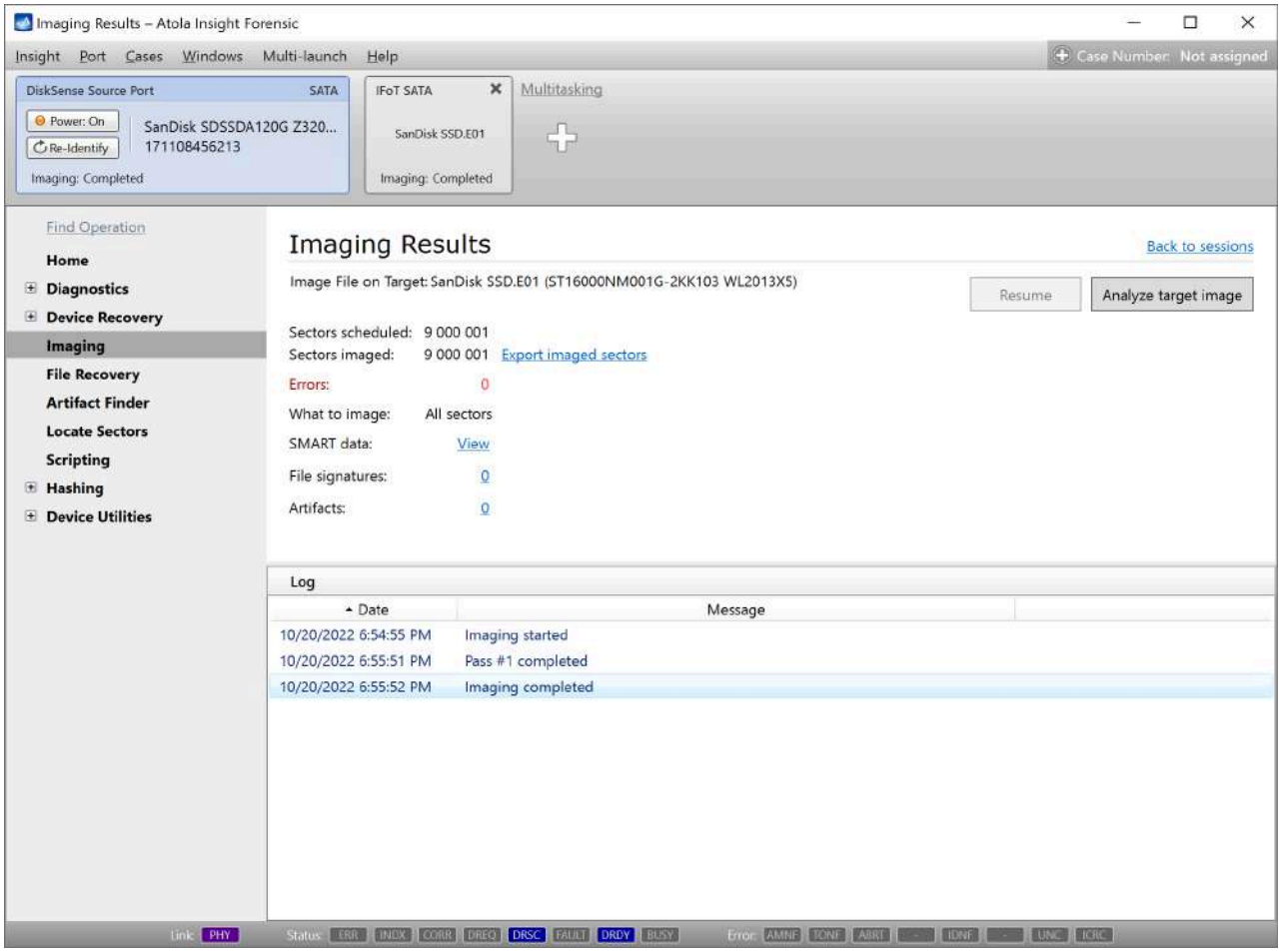
9. Specify the settings for this imaging session and then click **Start Imaging**.



Atola Insight Forensic begins imaging data into the file on the selected target device.



After the imaging is completed, check the **Imaging Results**.



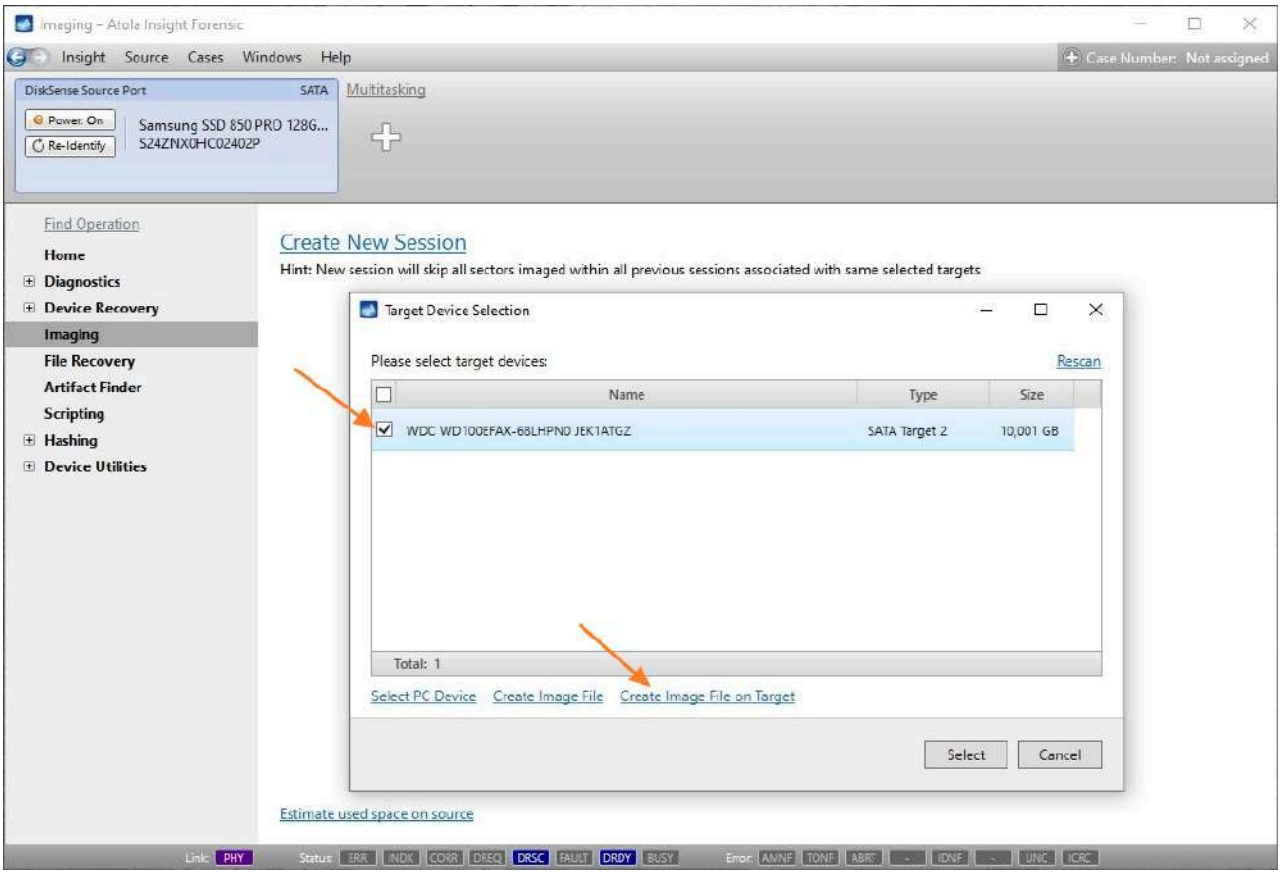
Imaging into a file on an encrypted target

Atola Insight Forensic supports imaging into a file on an encrypted target drive, using VeraCrypt for data encryption.

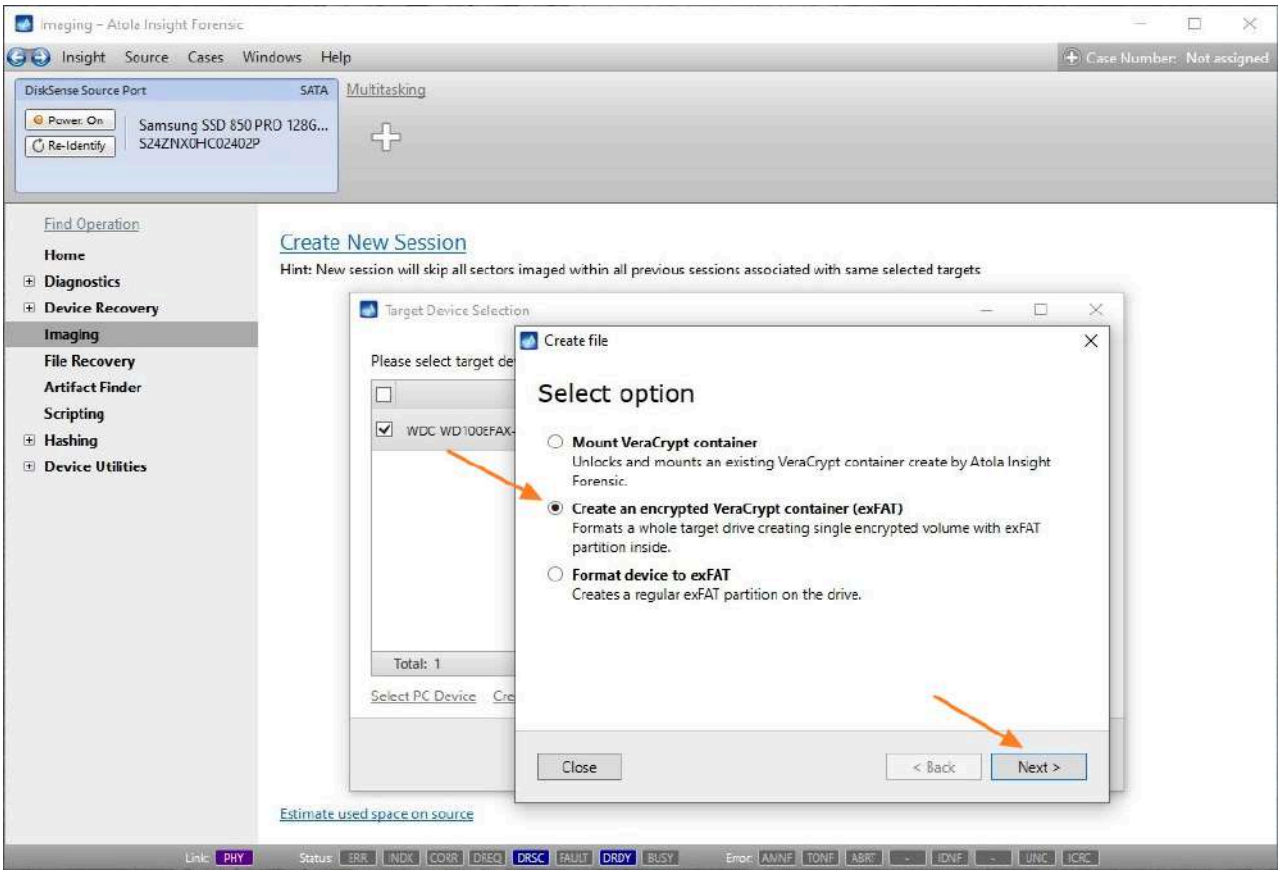
Create an encrypted target volume

After your source drive is identified by the system perform these steps:

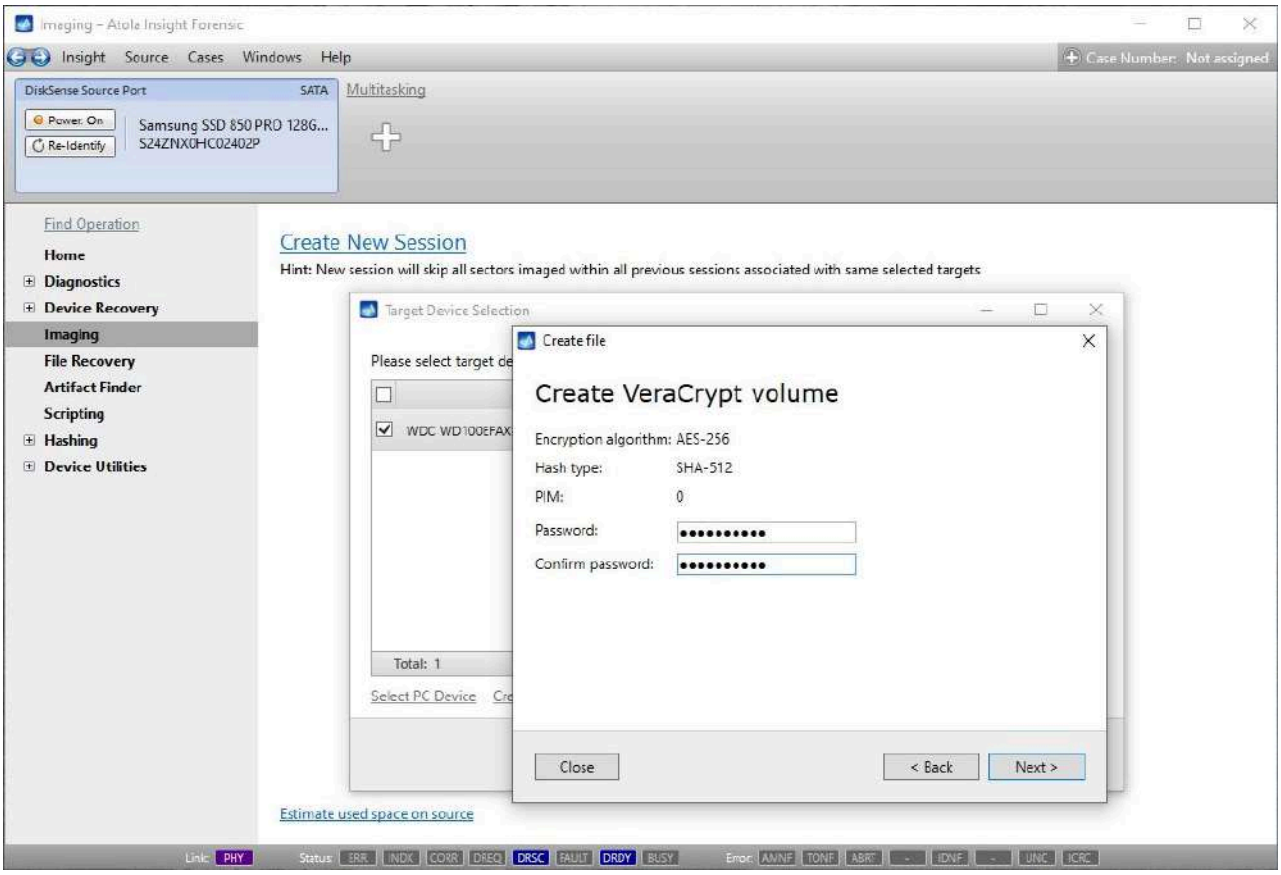
1. In the sidebar, go to **Imaging**.
2. Click **Create New Session**.
3. In the **Target Device Selection** dialog, select target device and then click **Create Image File on Target** link.



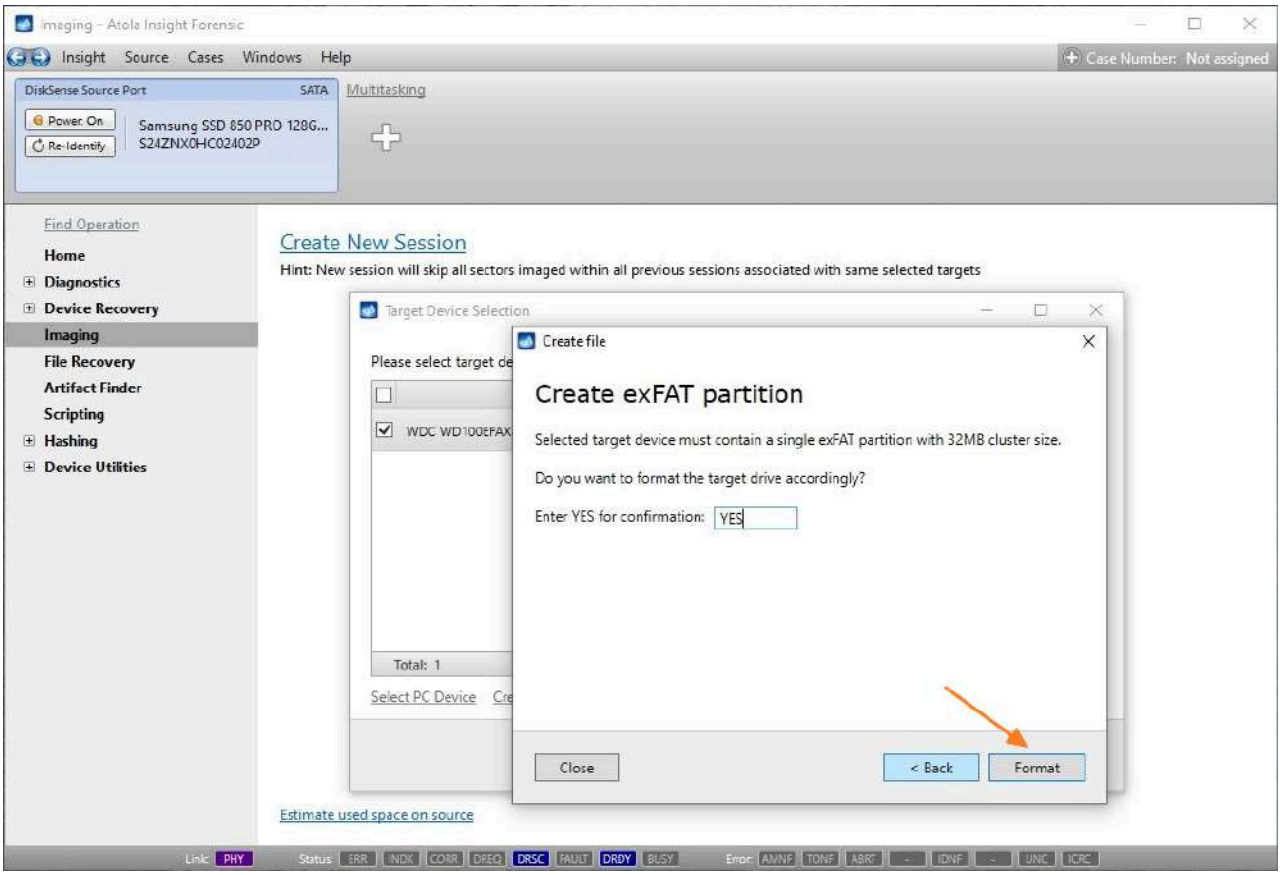
4. In the **Create file** dialog, select **Create an encrypted VeraCrypt container (exFAT)** and click **Next**.



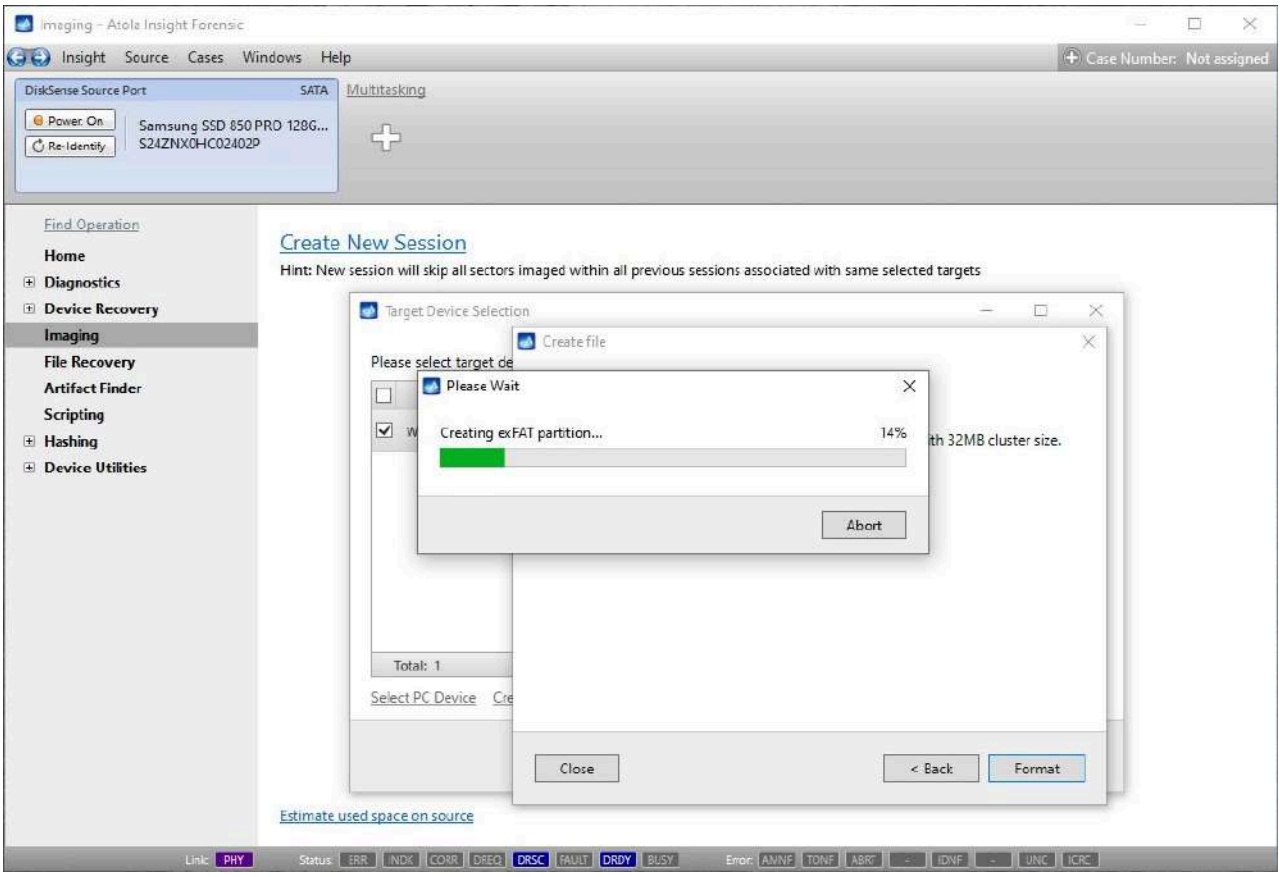
5. To complete the creation of a VeraCrypt volume, enter the password and click **Next**.



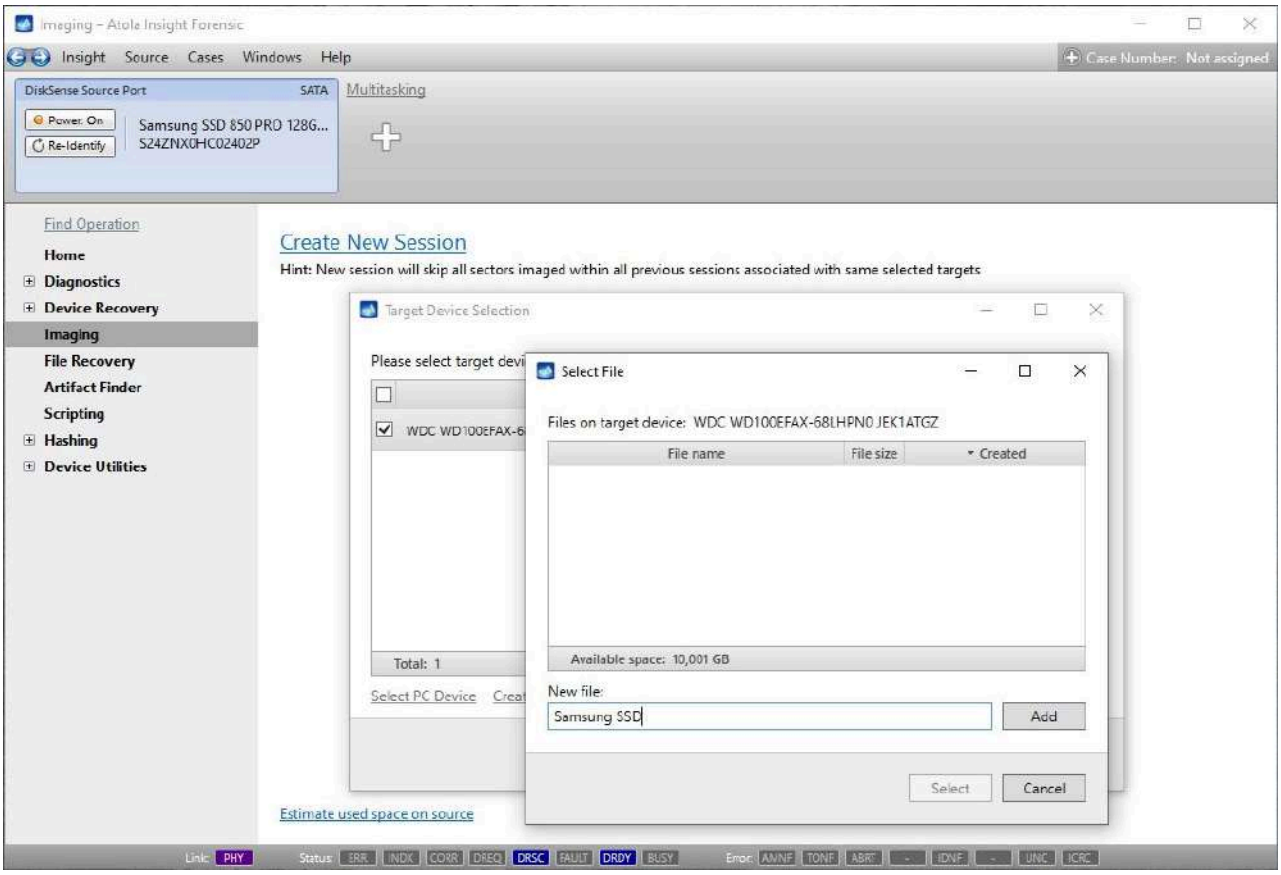
6. To confirm formatting the drive to create the encrypted partition, enter *YES* and then click **Format**.



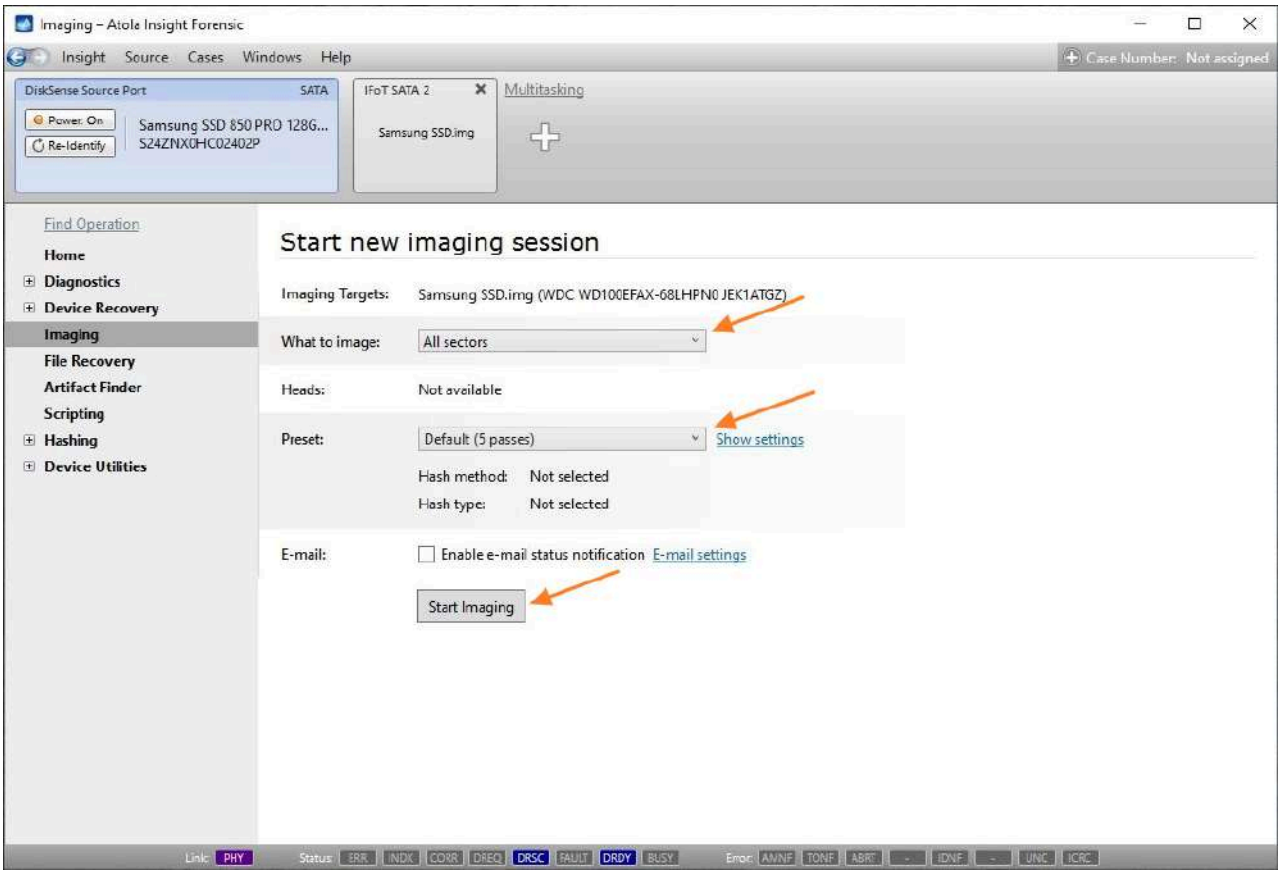
Formatting takes a few seconds.



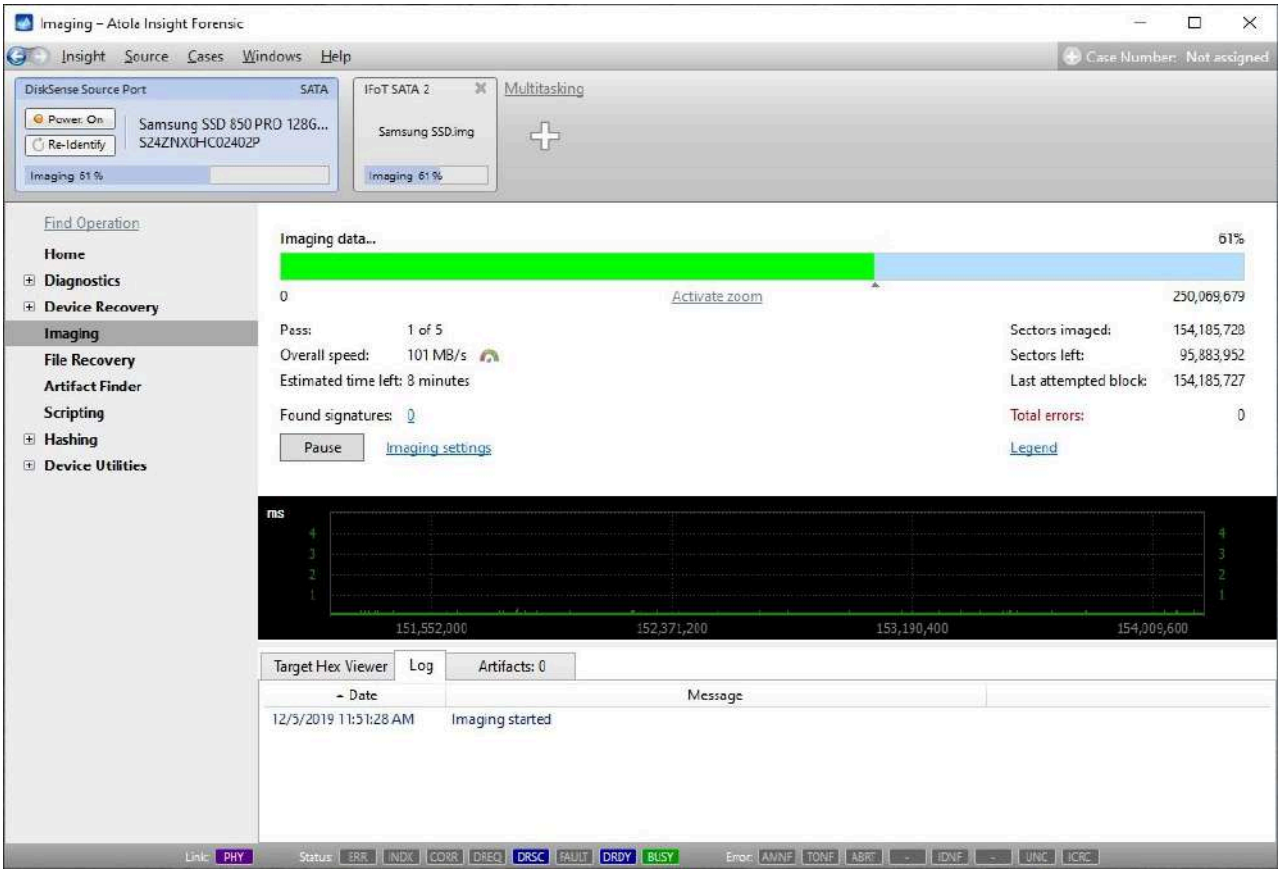
7. Enter a name for a new image file, click **Add** and then click **Select**.



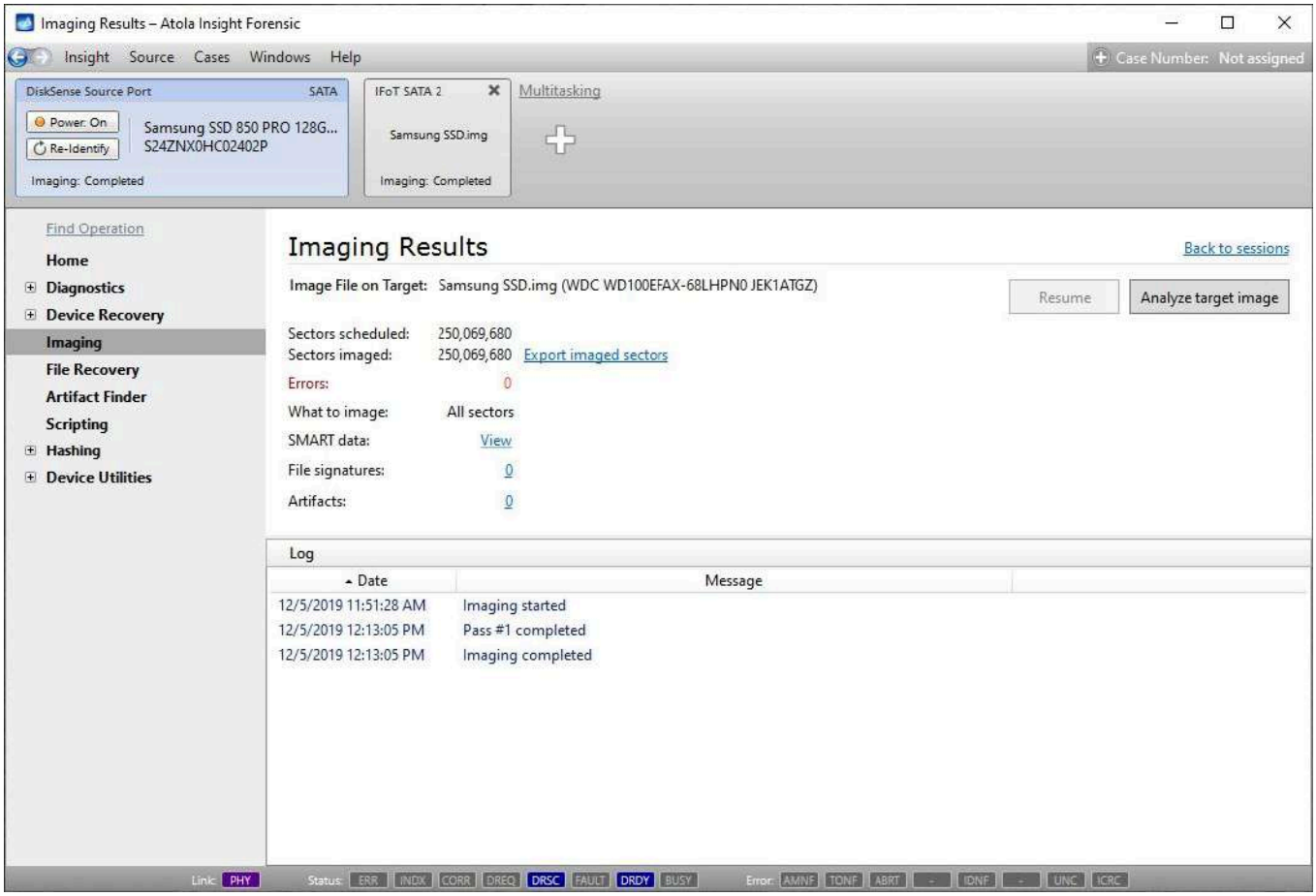
8. Specify the settings for this imaging session and click the **Start Imaging** button.



After you click the **Start Imaging** button, Insight begins imaging data into the file on your encrypted target.

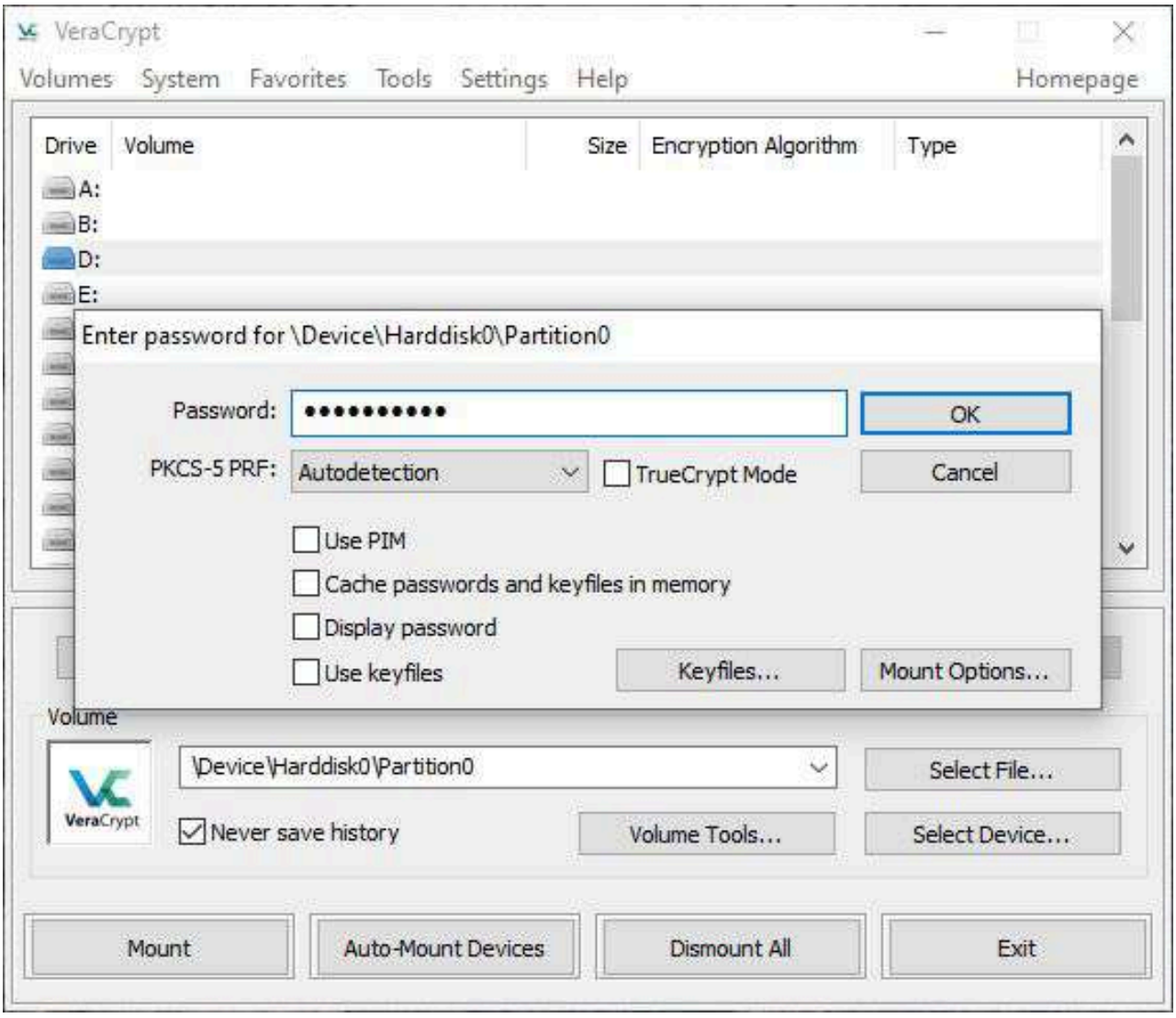


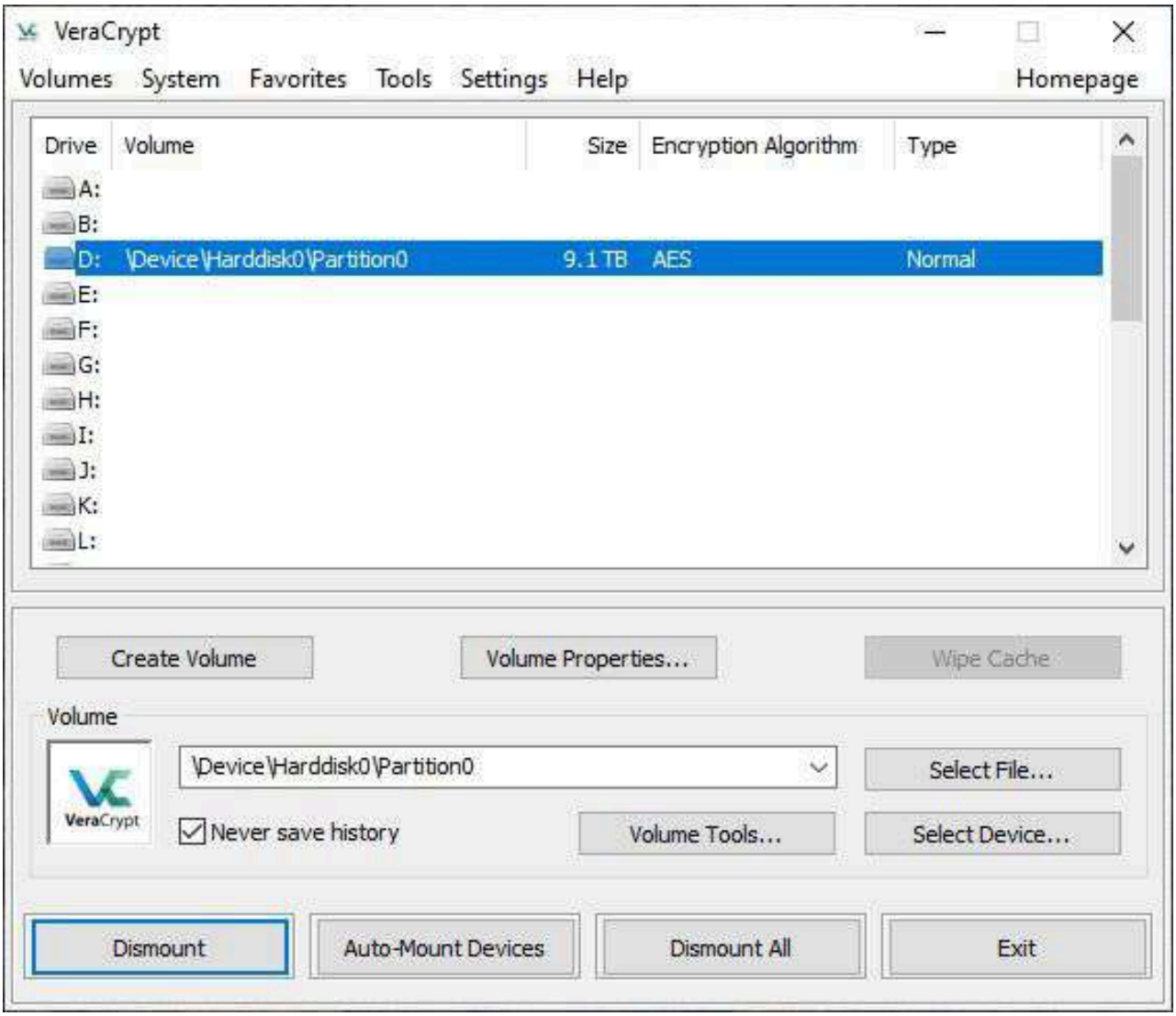
Upon completion of the imaging session, check the **Imaging results** screen.



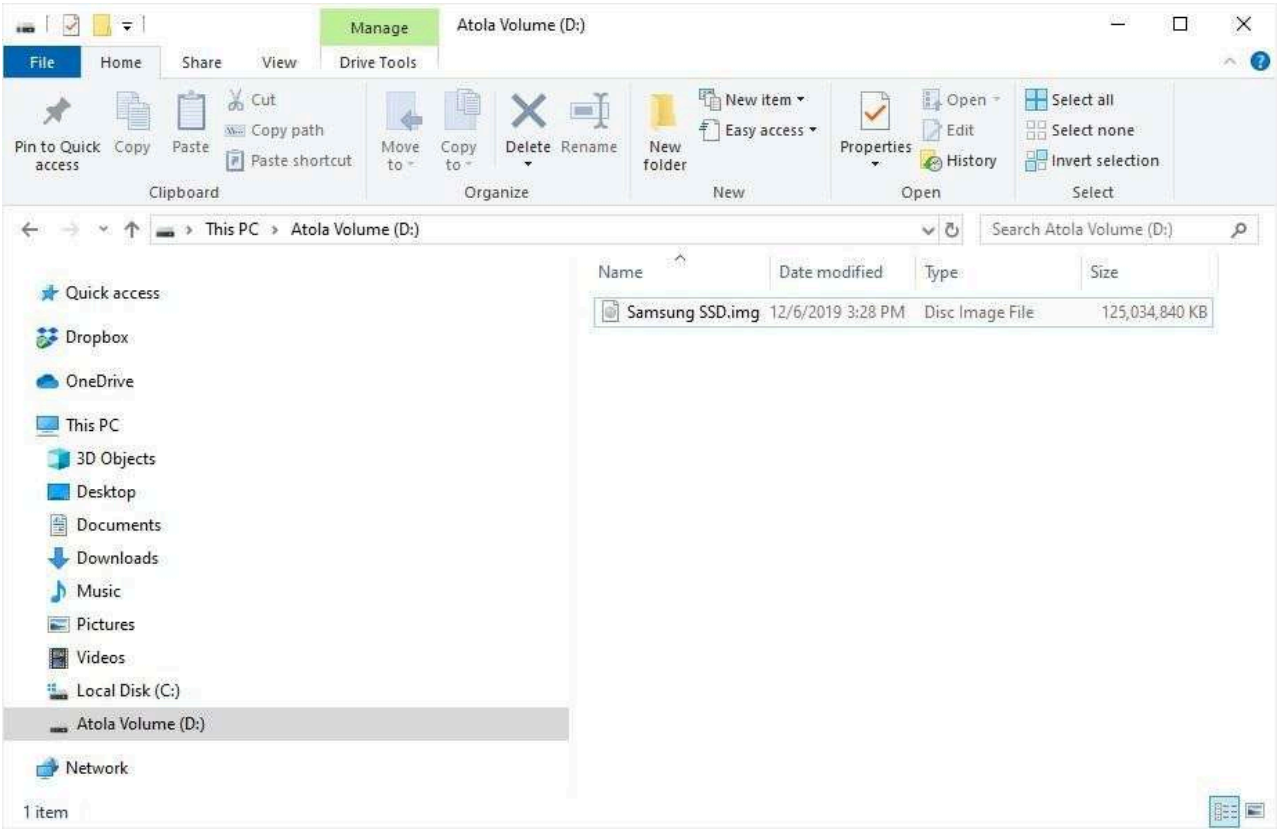
Extract data from your encrypted VeraCrypt volume

1. To find the VeraCrypt volume and the imaged file, plug the target drive into your computer.
2. Use VeraCrypt software to safely access encrypted data from your drive.
3. Select the drive label (A, B, C, etc.) on which you want the volume to be mounted.
4. Click the **Select device** button.
5. In the pop-up window, select your encrypted volume.
6. Click the **Mount** button. Now you can view the partition name, size and encryption algorithm.
7. To get access to the encrypted volume, use the password set prior to the imaging session.


VeraCrypt
Volumes System Favorites Tools Settings Help Homepage
Drive Volume Size Encryption Algorithm Type
A:
B:
D:
E:
Enter password for \Device\Harddisk0\Partition0
Password:
OK
PKCS-5 PRF: Autodetection
TrueCrypt Mode
Cancel
Use PIM
Cache passwords and keyfiles in memory
Display password
Use keyfiles
Keyfiles...
Mount Options...
Volume
\Device\Harddisk0\Partition0
Select File...
Never save history
Volume Tools...
Select Device...
Mount
Auto-Mount Devices
Dismount All
Exit



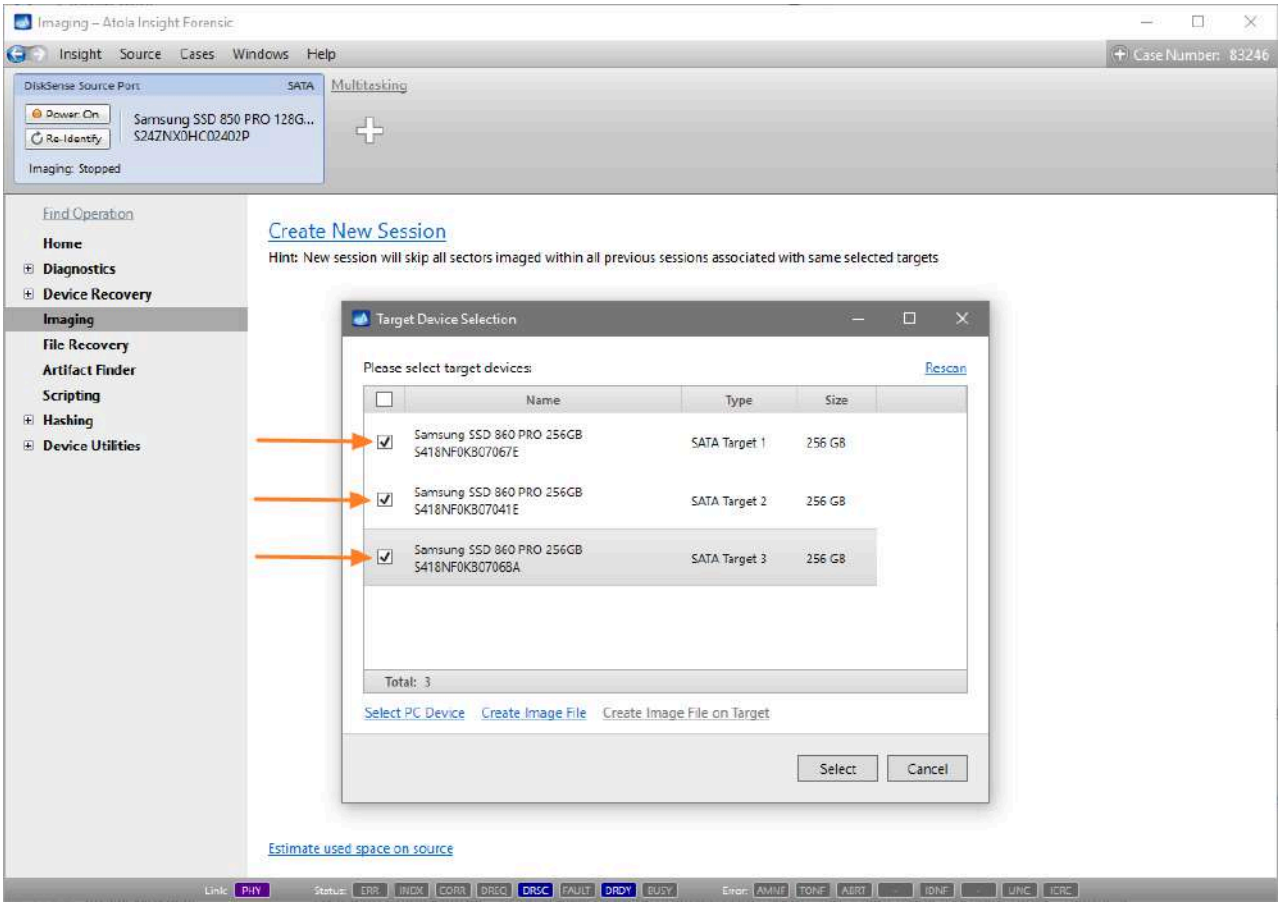
8. Once you have entered the password, the volume will be mounted and you can access it from Windows Explorer and use the image for subsequent operations.



Imaging an evidence drive to 3 targets

If you need to create multiple images of a drive for different purposes, with Insight you can image to three targets simultaneously. The targets can be of different types: another drive, an E01/AFF4/RAW file located on a server/workstation.

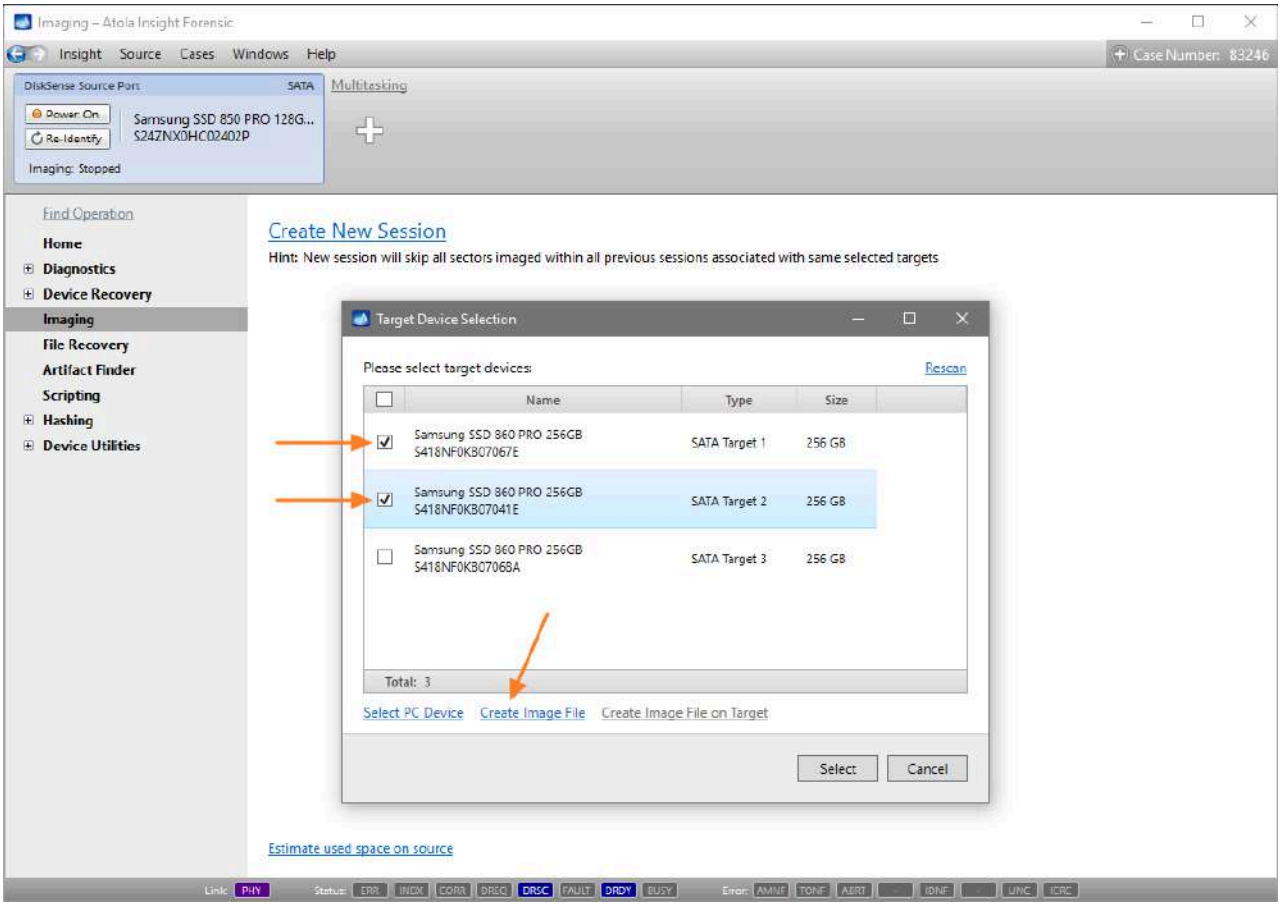
1. In the sidebar, click **Imaging**.
2. Click **Create New Session**.
3. In the **Target Device Selection** dialog, select the target drives you want to image to and click the **Select** button.



Selecting target drives.

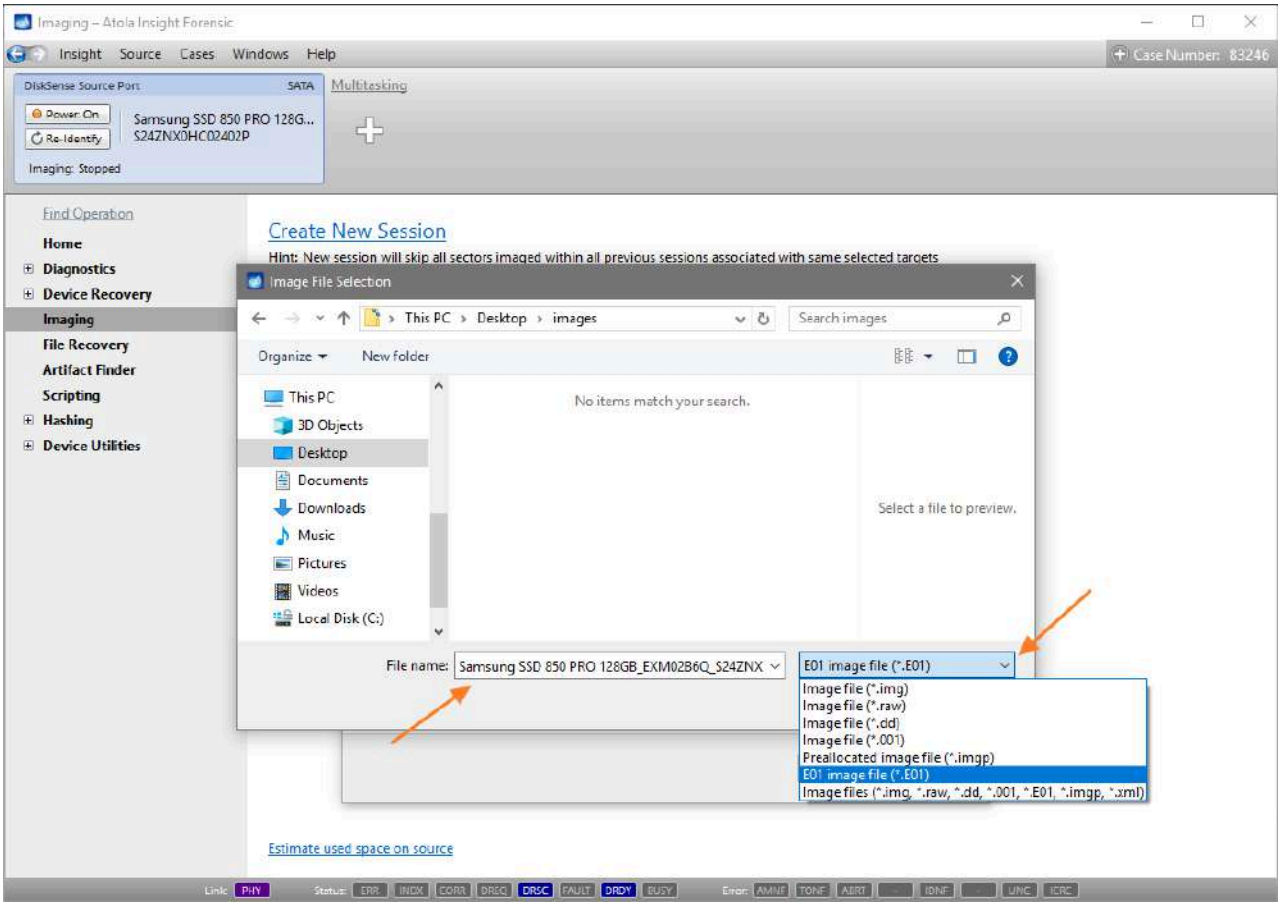
If one of the targets has to be a file, follow these steps:

1. In the **Target Device Selection** dialog, click the **Create Image File** link.



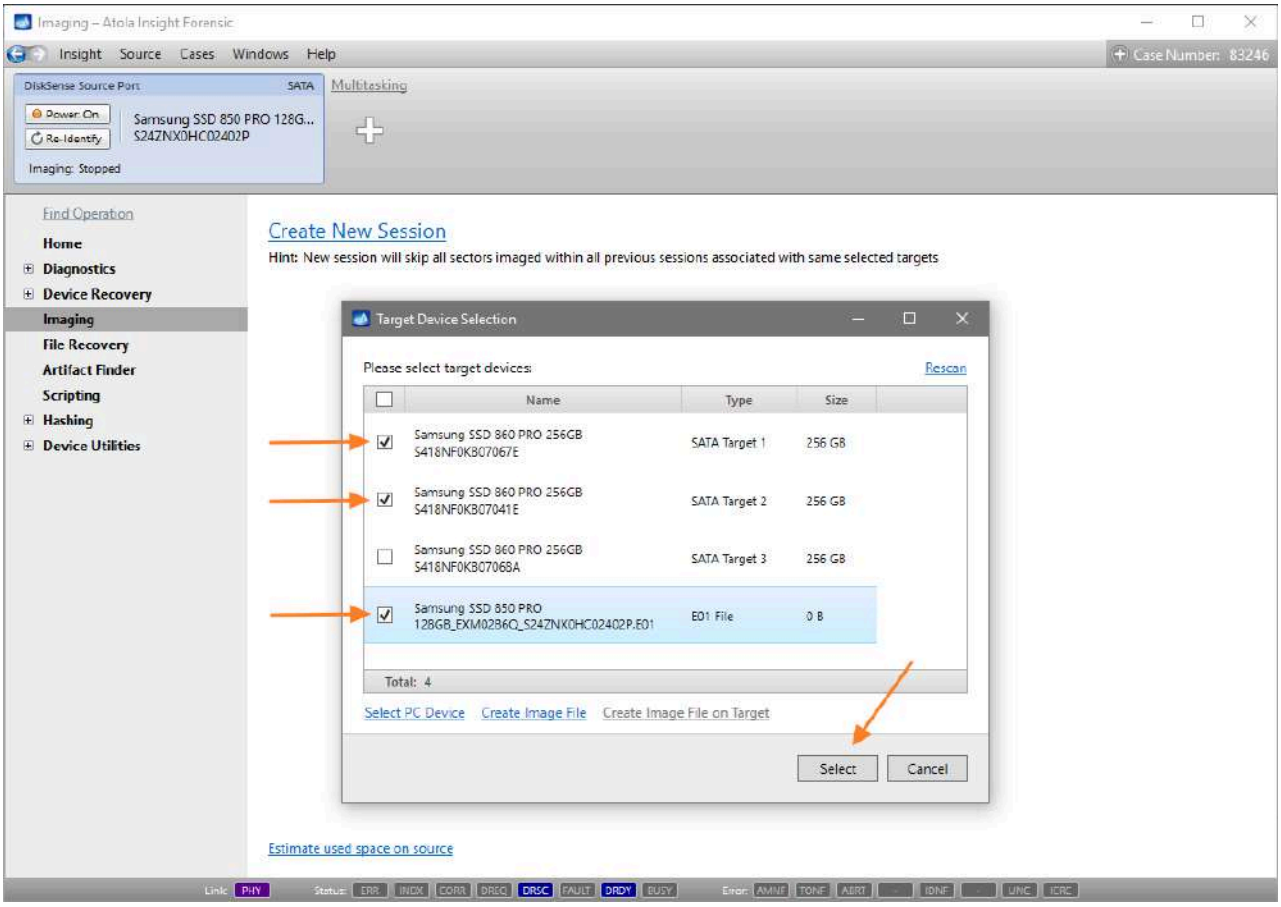
The Create Image File link in the Target Device Selection dialog.

2. Select file location, name and format, then click **Open**.



Selecting target file.

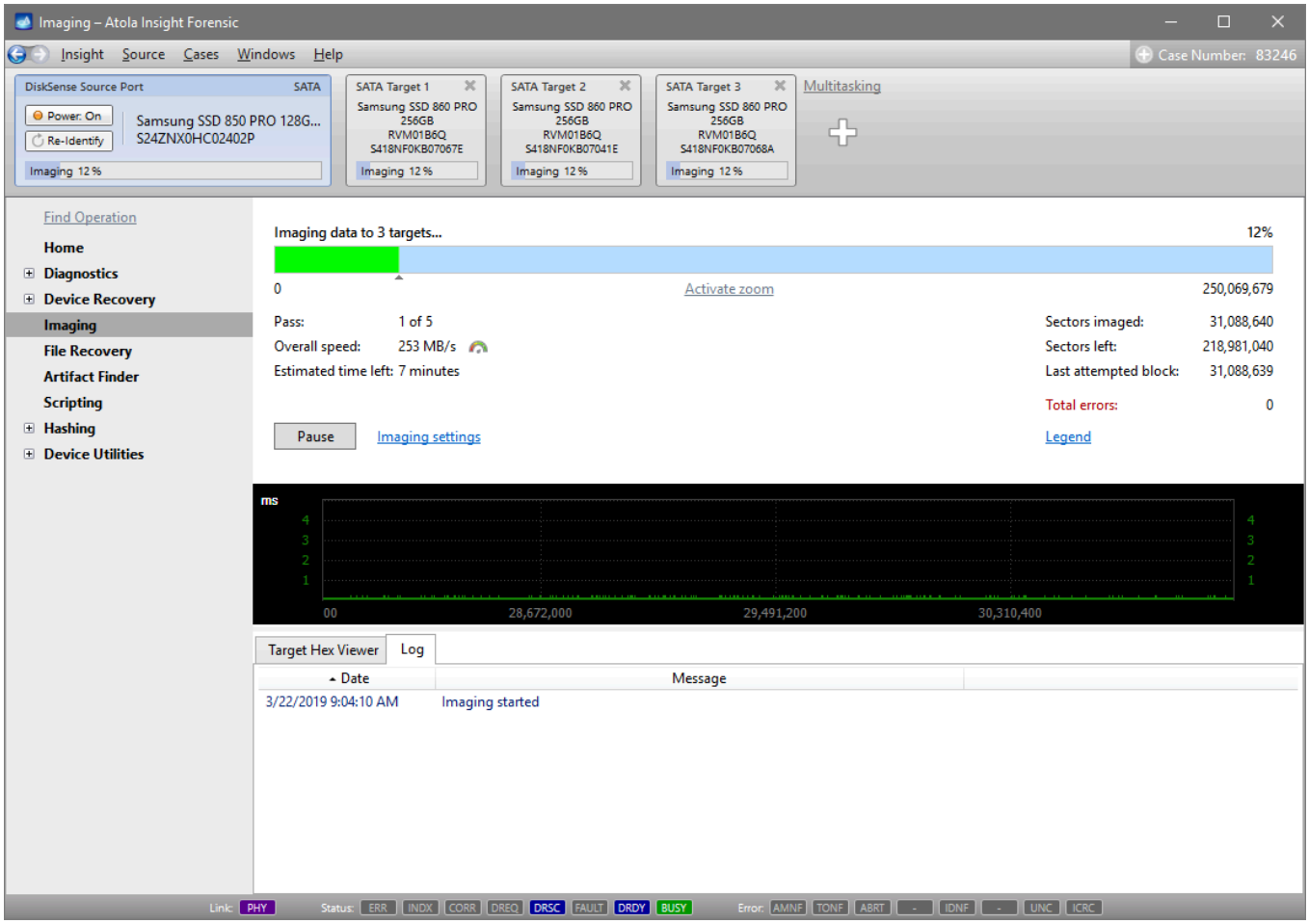
3. Once you have selected all targets, click the **Select** button.



Selecting multiple files as imaging targets.

4. Double-check the imaging settings and click the **Start Imaging** button.

The speed of this imaging session will depend on the slowest of the devices involved in it: either on the read speed of the source drive or the write speed of the targets you have selected.



Imaging data to 3 target files.

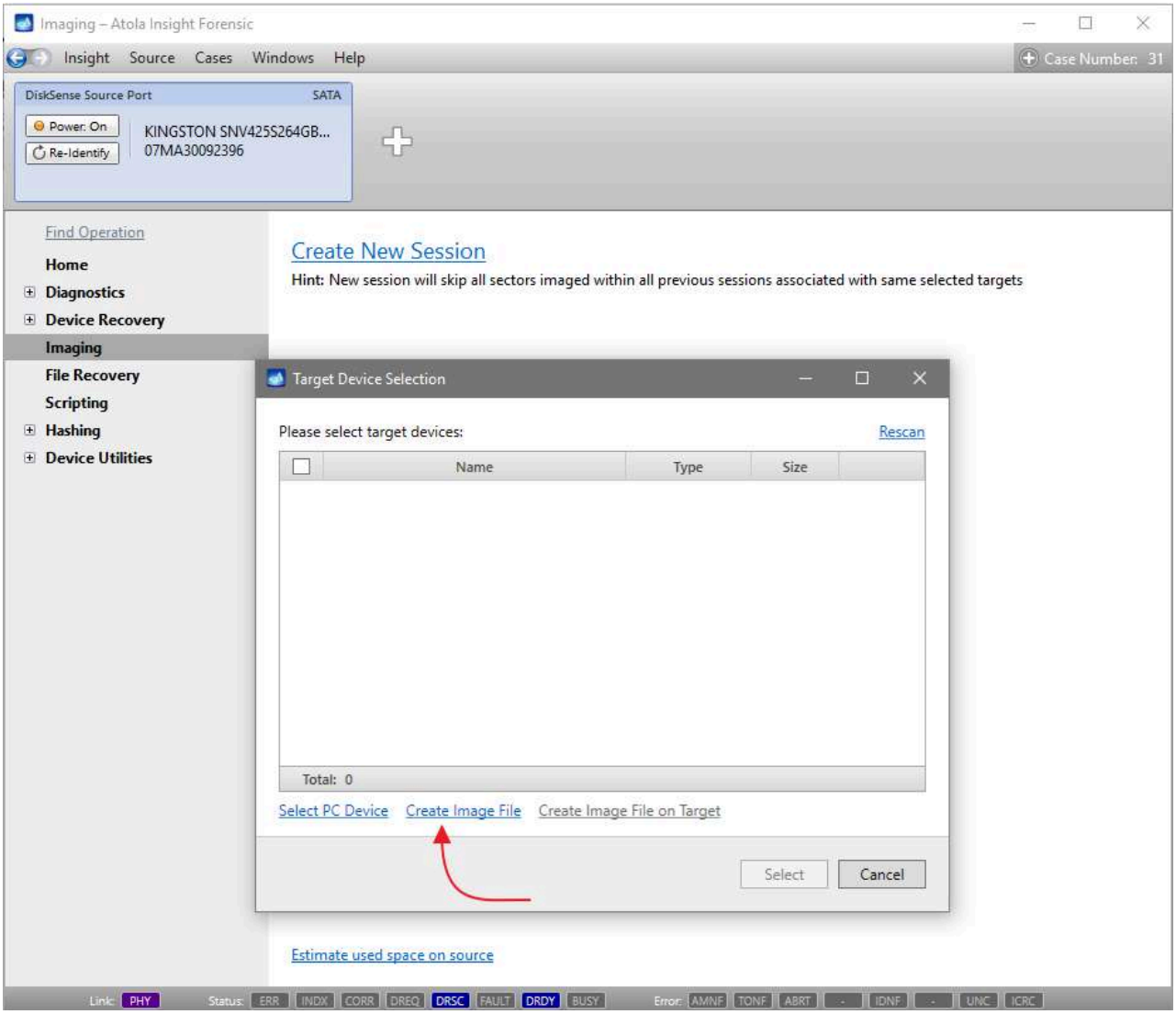
Imaging to an E01 File with MD5 and SHA-1 Hashes

In recent years, E01 file format has become the de facto standard format for forensic purposes due to its ability to store not only a physical or logical copy of a source drive, but also case and evidence details. E01 file can also contain both MD5 and SHA-1 hashes. And it is considered a good practice among forensic specialists to calculate both hashes while imaging the evidence so that they are included in the E01 file.

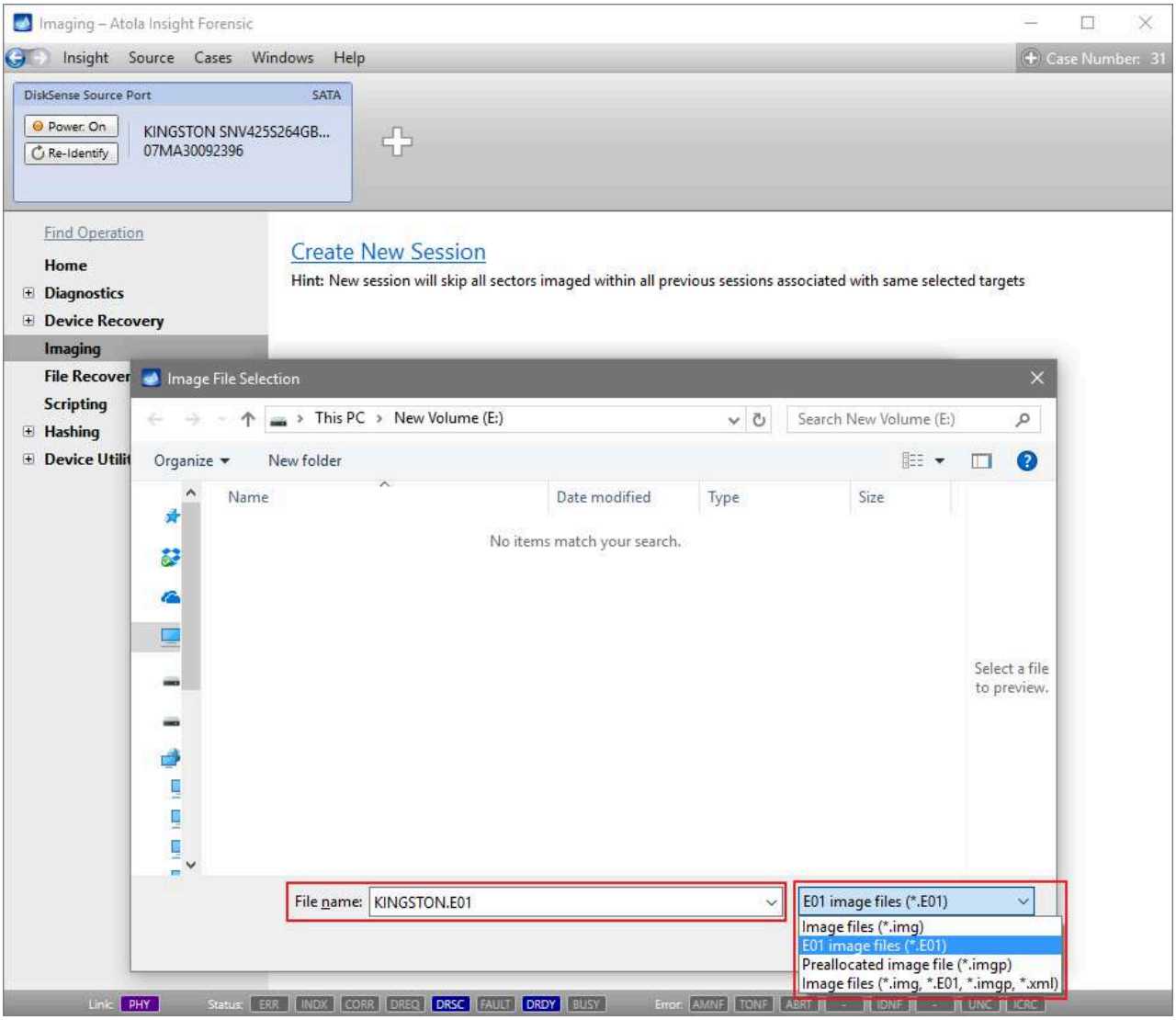
To image a source evidence drive to an E01 file, you have to add a new target file.

Select a new E01 file

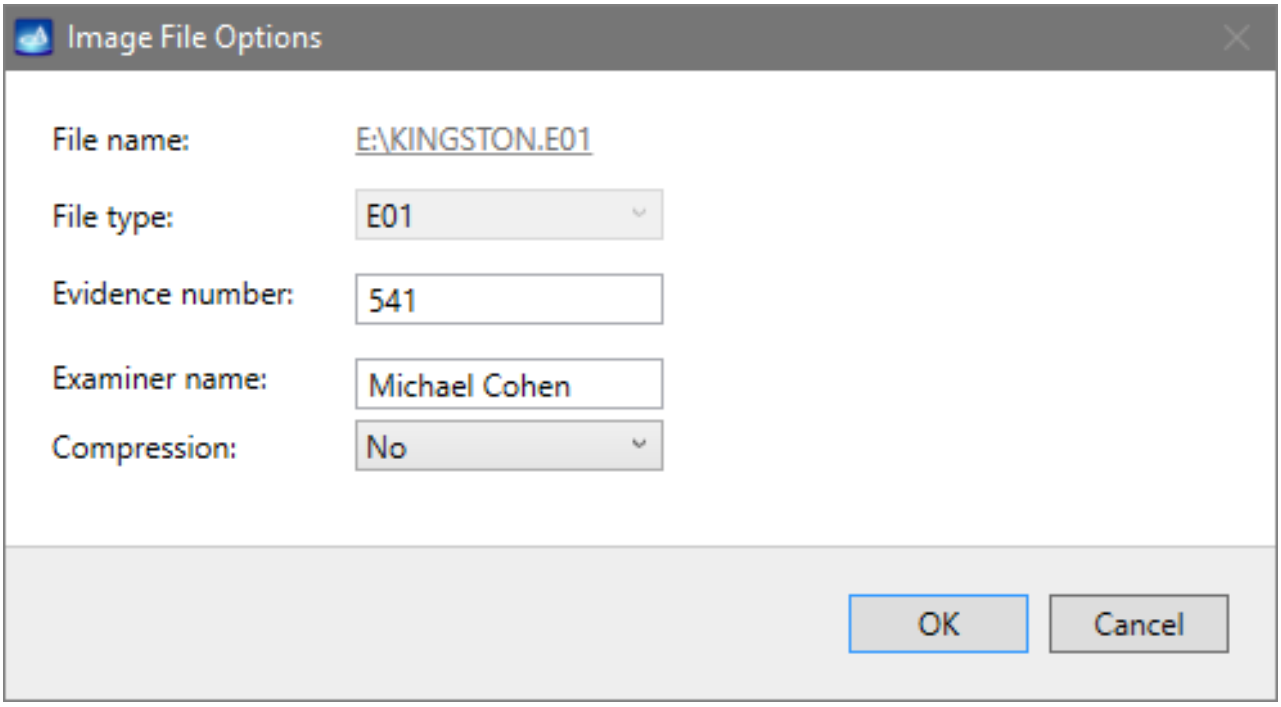
1. In the sidebar, click **Imaging**.
2. Click **Create New Session**.
3. In the **Target Device Selection** dialog, click the **Create Image File** link.



4. In the **Image File Selection** dialog, select E01 file extension in the drop-down menu to create an image file with this extension and enter the name you prefer in the **File Name** field.



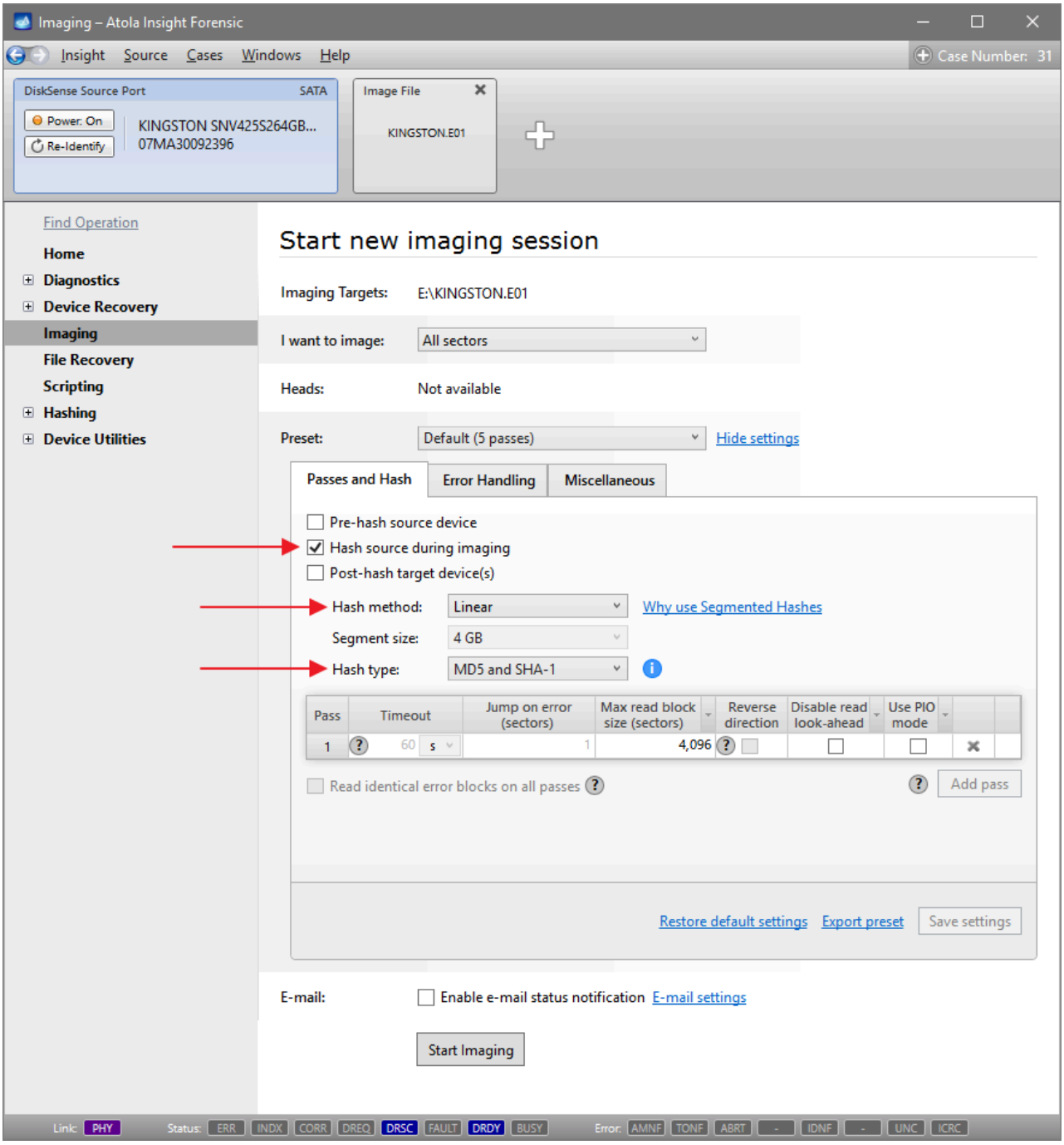
5. In the **Image File Options** dialog, fill out all the relevant fields. You can also do it later on the **Home** page of the file when it is created.



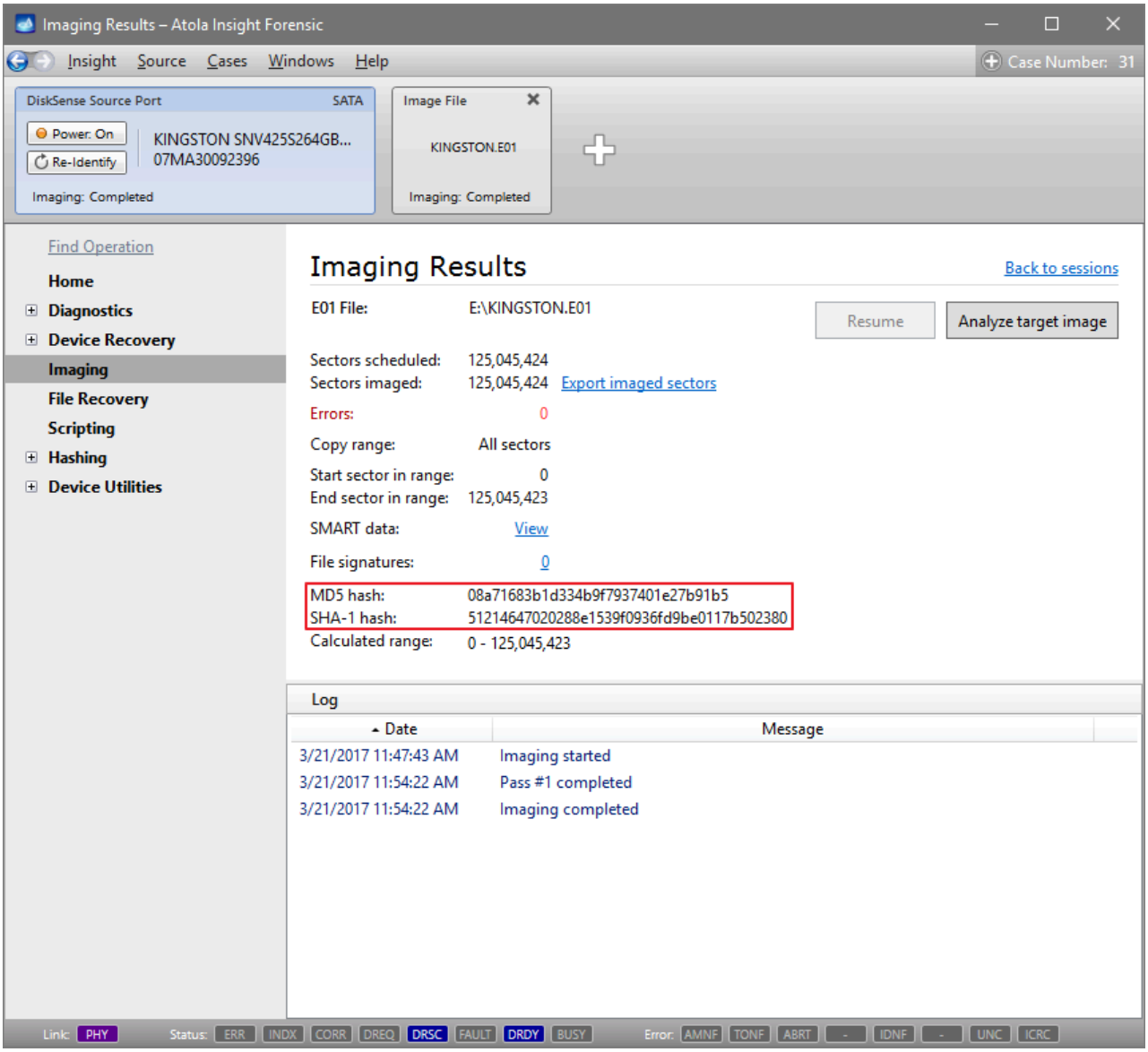
6. In the **Target Device Selection** window, click the **Select** button.
7. Insight creates an E01 file with current 0 bytes capacity. Its final capacity will be defined by the amount of imaged data it contains plus the metadata.

Calculate the hashes during imaging

1. In the sidebar, click **Imaging**.
2. Click **Create New Session**.
3. In **Preset** line, click the **Show settings** link.
4. On the **Passes and Hash** tab, select the **Hash source during imaging** option.
5. In the **Hash method** list, select **Linear**.
6. In the **Hash type** list, select **MD5 and SHA-1**.
7. Click **Start imaging**.



8. Upon completion of imaging, on the **Imaging Results** page, Insight features both MD5 and SHA-1 hashes.



Calculated MD5 and SHA1 hashes

Logical imaging

The logical imaging module in Atola Insight Forensic creates an L01 file with a forensically sound logical copy of folders and files you've selected manually or using built-in include and exclude filters.

The resulting L01 file also includes unaltered metadata, such as file attributes and creation dates, as well as hashes calculated during the imaging process. An L01 file can be compressed to save storage space.

Once the logical imaging process is complete, Insight also generates a comprehensive report with details about the source, target, number of imaged files and bytes and more.

Key features of logical imaging

- Smart include and exclude filters
- L01 format for target image file
- Compression of L01 image file
- Up to 3 parallel logical imaging sessions
- Pause and resume option for each imaging session
- Supported source drive types: SATA, USB, IDE, NVMe, SAS, MacBook
- Supported image file located on a source drive: RAW, E01, AFF4
- Supported file systems: NTFS, APFS, XFS, ext4/3/2, exFAT, Btrfs, HFS/HFS+, FAT32, FAT16

Logical imaging workflow

To create a logical image of your source device, follow these steps:

1. Select your source device and go to Logical imaging.
2. Select partitions, folders or files to image.
3. Apply smart filters, if needed.
4. Create a target file.
5. Optional: Pause and resume the imaging process.
6. View the logical imaging report.

Select source device

As a source for logical imaging, you can use:

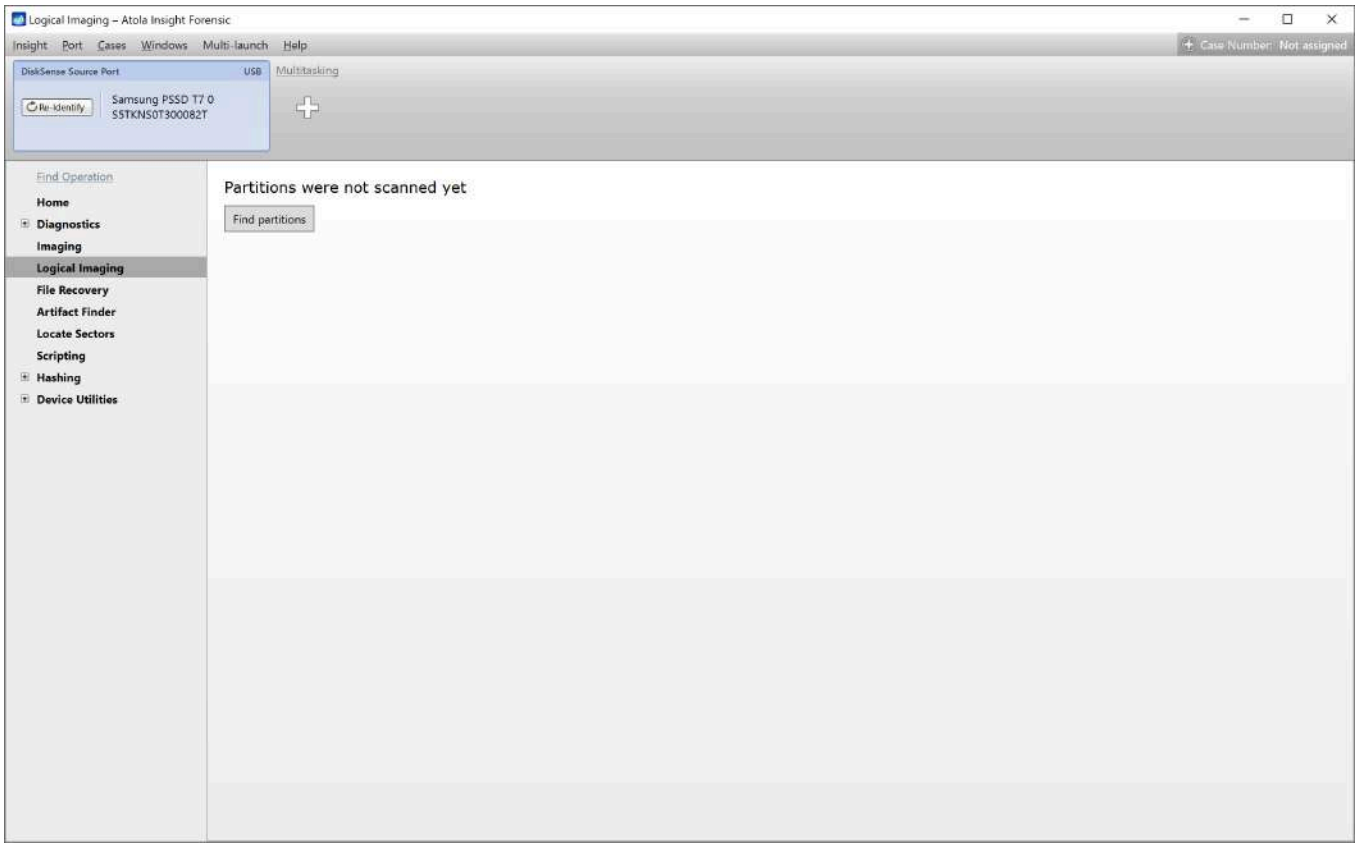
- **Physical drives**, connected directly or via extension modules
  - SATA
  - USB
  - IDE
  - NVMe via M.2 extension module
  - SAS via SAS extension module
  - MacBook drives via Apple PCIe SSD or Thunderbolt extension modules
- **Image files** from a Source drive
  - RAW
  - E01
  - AFF4

To launch the Logical imaging module:

1. On the Devices panel, select the source drive or file.

2. On the Sidebar, click **Logical imaging**.

3. Click the **Find partitions** button.

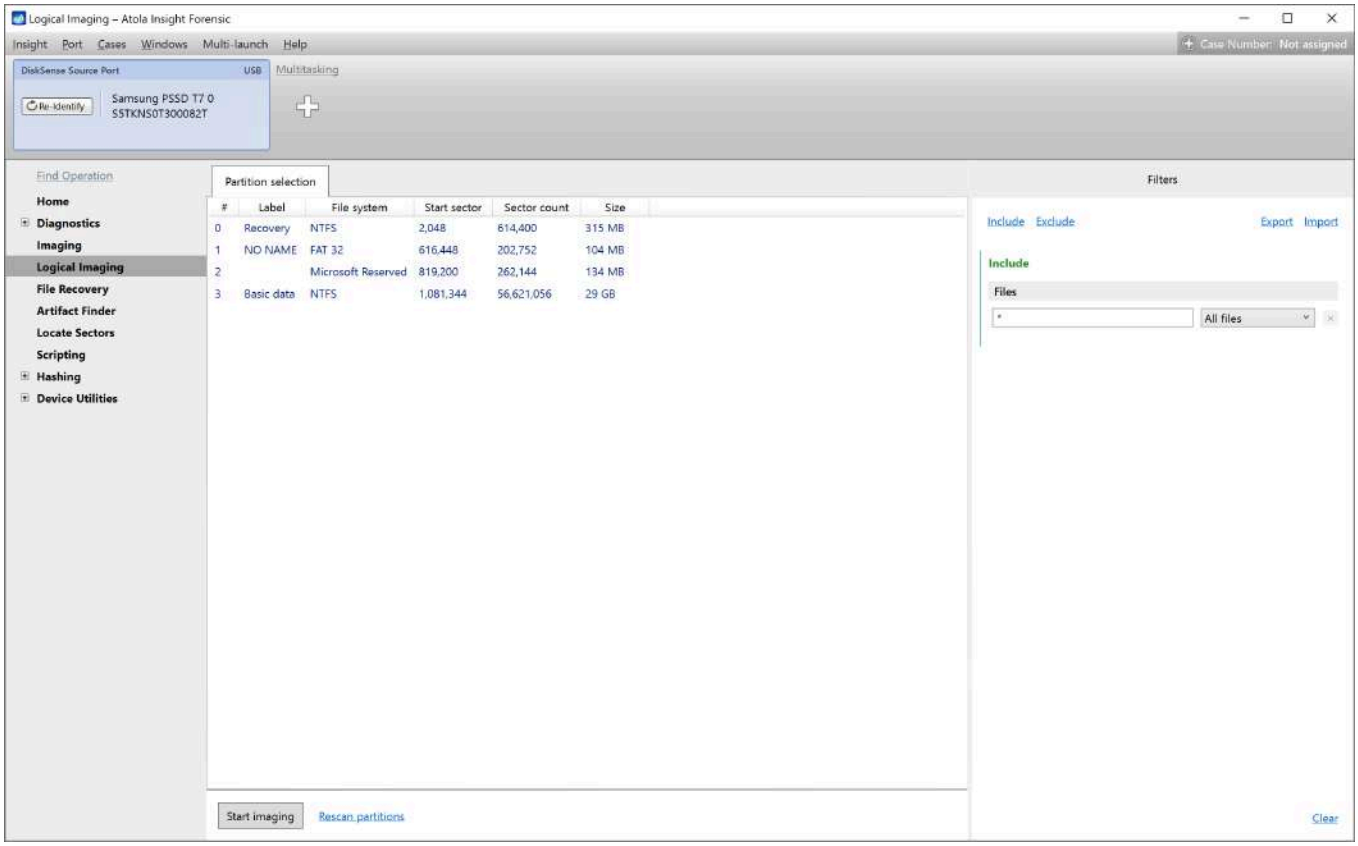


The 'Find partitions' button in the Logical imaging section.

Select partitions, folders or files to image

After scanning partitions on the source device, Insight displays their list on the **Partition selection** tab.

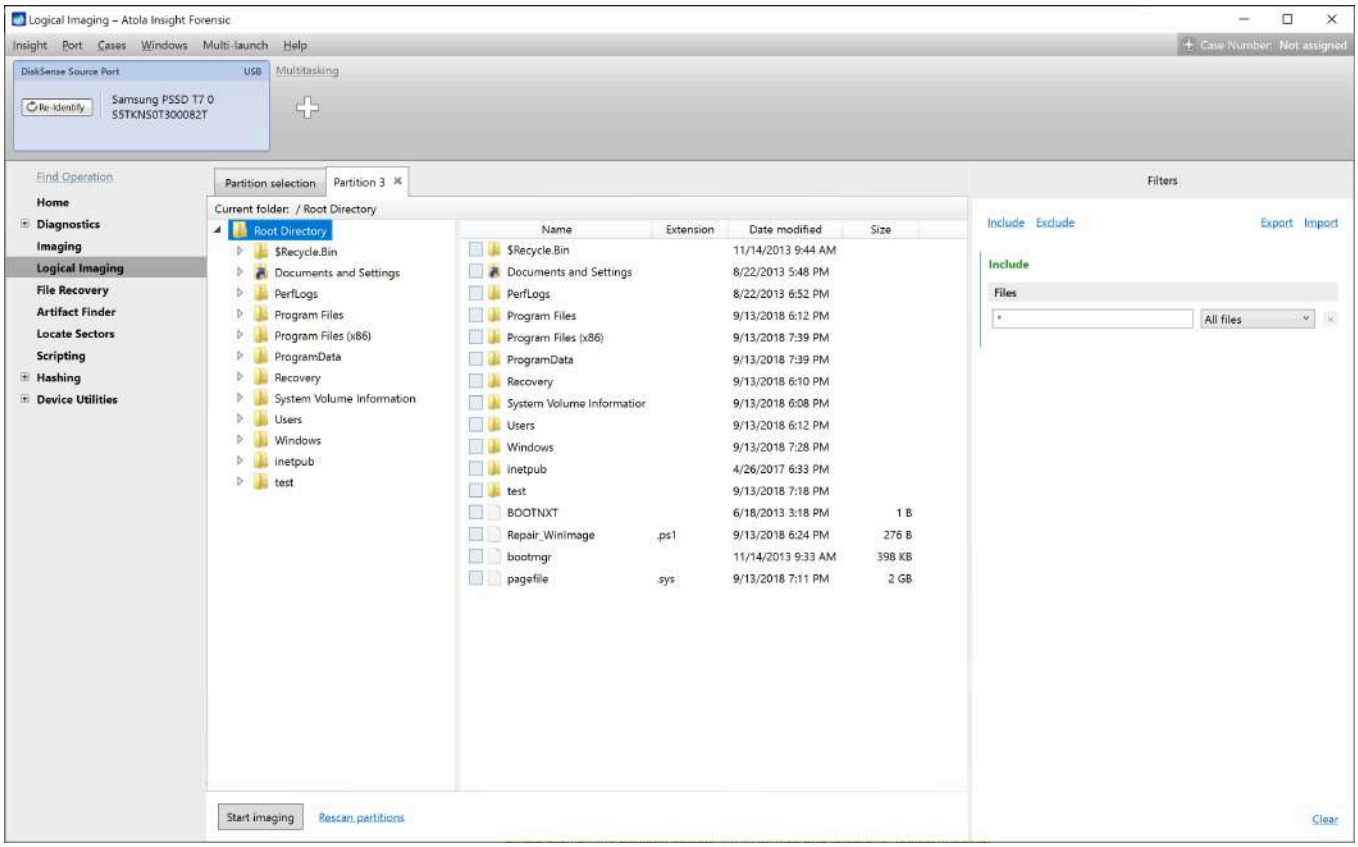
By default, Insight images all files from all partitions.



The list of the available partitions.

Preview, select or deselect partition

To preview the partition contents, double-click its name on the **Partition selection** tab. The separate **Partition** tab opens, displaying the partition folder structure and file list.

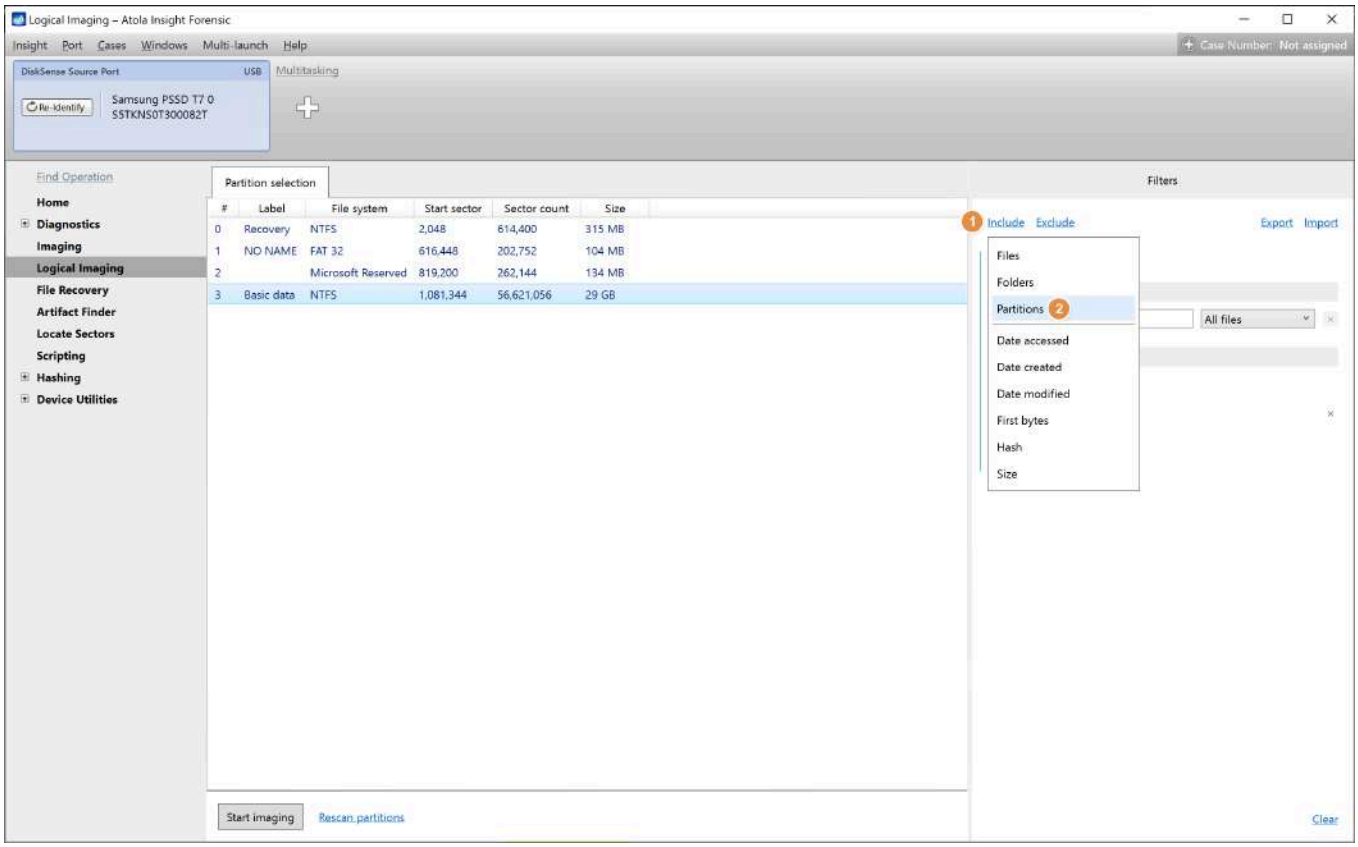


The partition preview, displaying the folder structure and file list.

Important: By default, all files from all partitions are selected for logical imaging.

To exclude a partition:

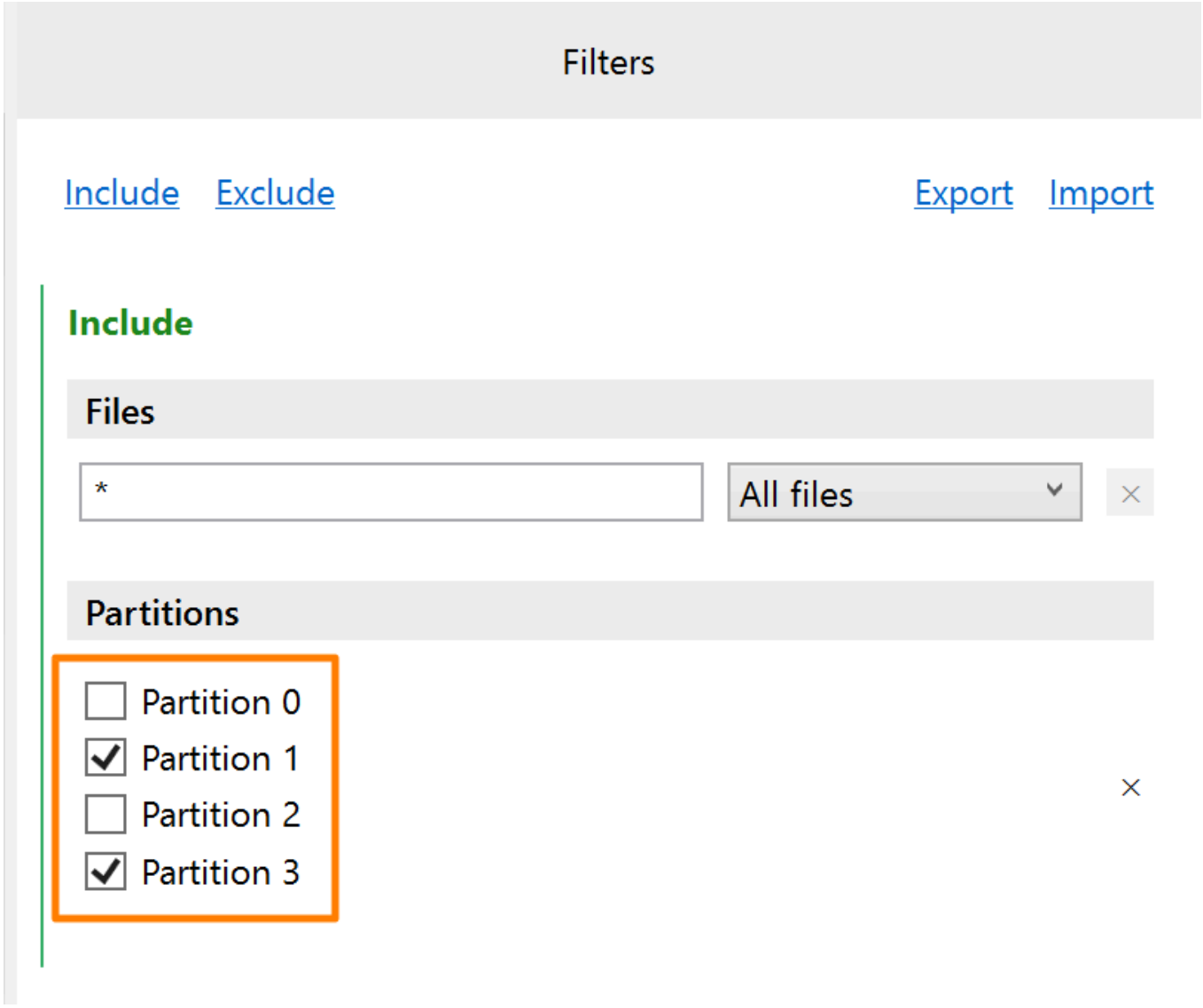
1. On the **Filters** panel, click the **Include** link at the top.
2. Select **Partitions** from the list.
3. Clear the checkboxes next to the partitions you want to exclude.



The partitions filter.

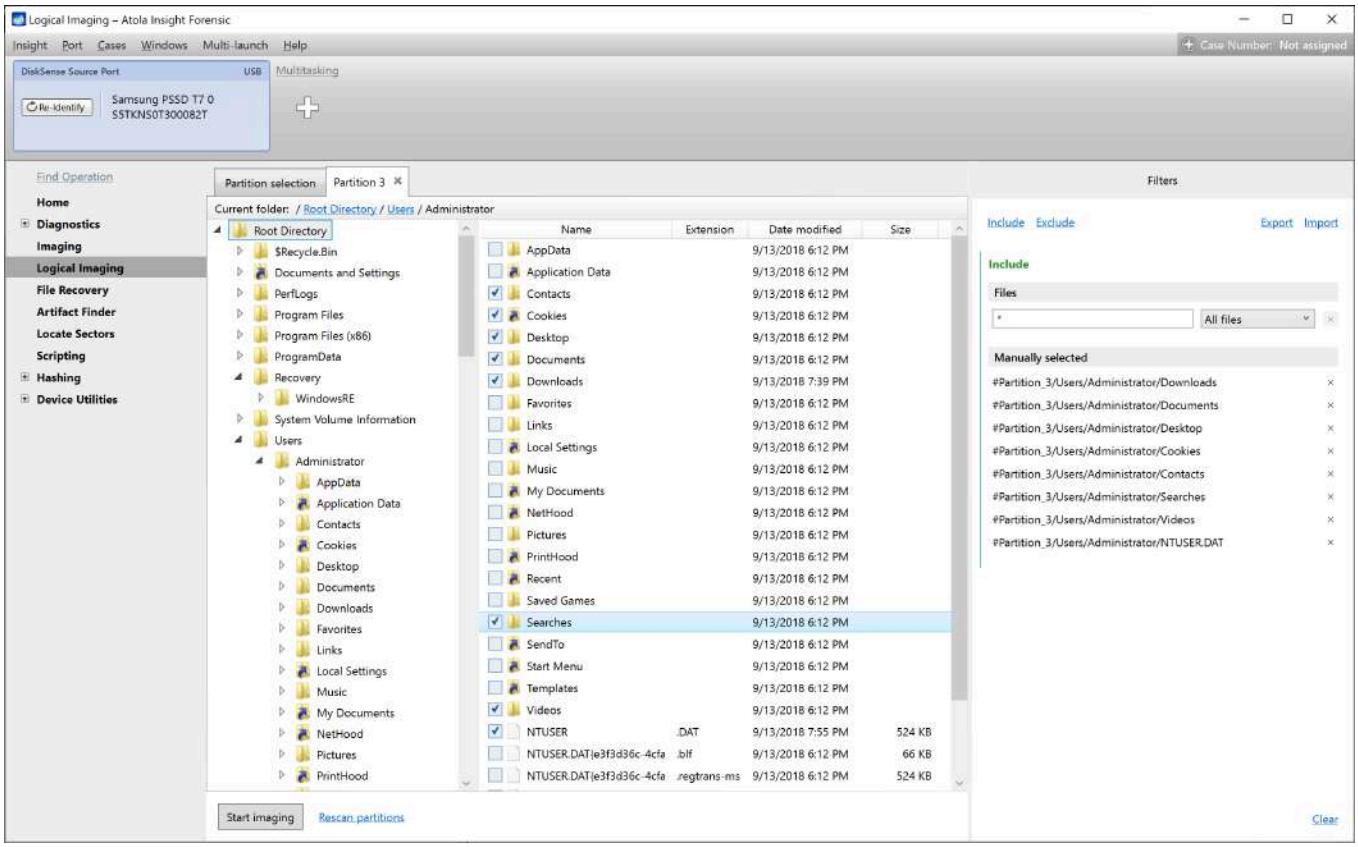
To include a partition again, select the checkbox.

Your selection is saved automatically.



Preview folder, manually include or exclude folders and files

The **Partition** tab displays the partition folder structure and the file list.



Manually selecting folders and files for logical imaging.

- **To preview** a folder's contents, click the folder name in the folder tree.
- To manually **include** a folder or file for imaging, click the checkbox next to its name. The folder or file appears on the **Filters** panel on the right as manually selected.
- To manually **exclude** a folder or file from the selection, clear its checkbox or use the **x** icon on the **Filters** panel on the right. The folder or file disappears from the panel.
- To **deselect** all the selected folders and files, click the **Clear** link at the bottom of the **Filters** panel.

Use smart filters and presets for selecting folders or files

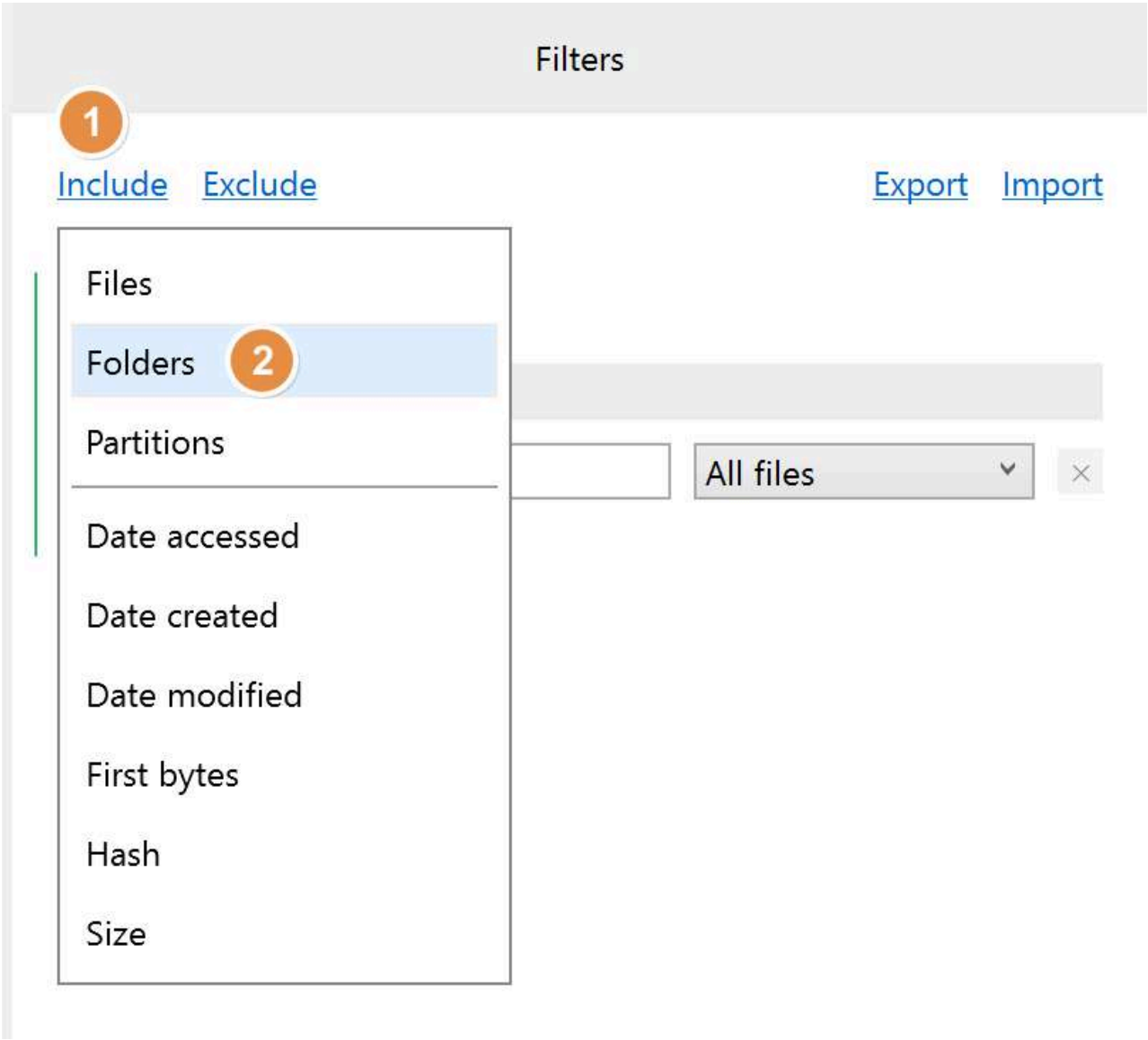
By default, Insight images all files from all partitions.

On the **Filters** panel, you can automatically include or exclude folders and files for imaging by applying the built-in smart filters or custom filtering presets.

Filtering folders and files

To automatically include or exclude specific files or folders:

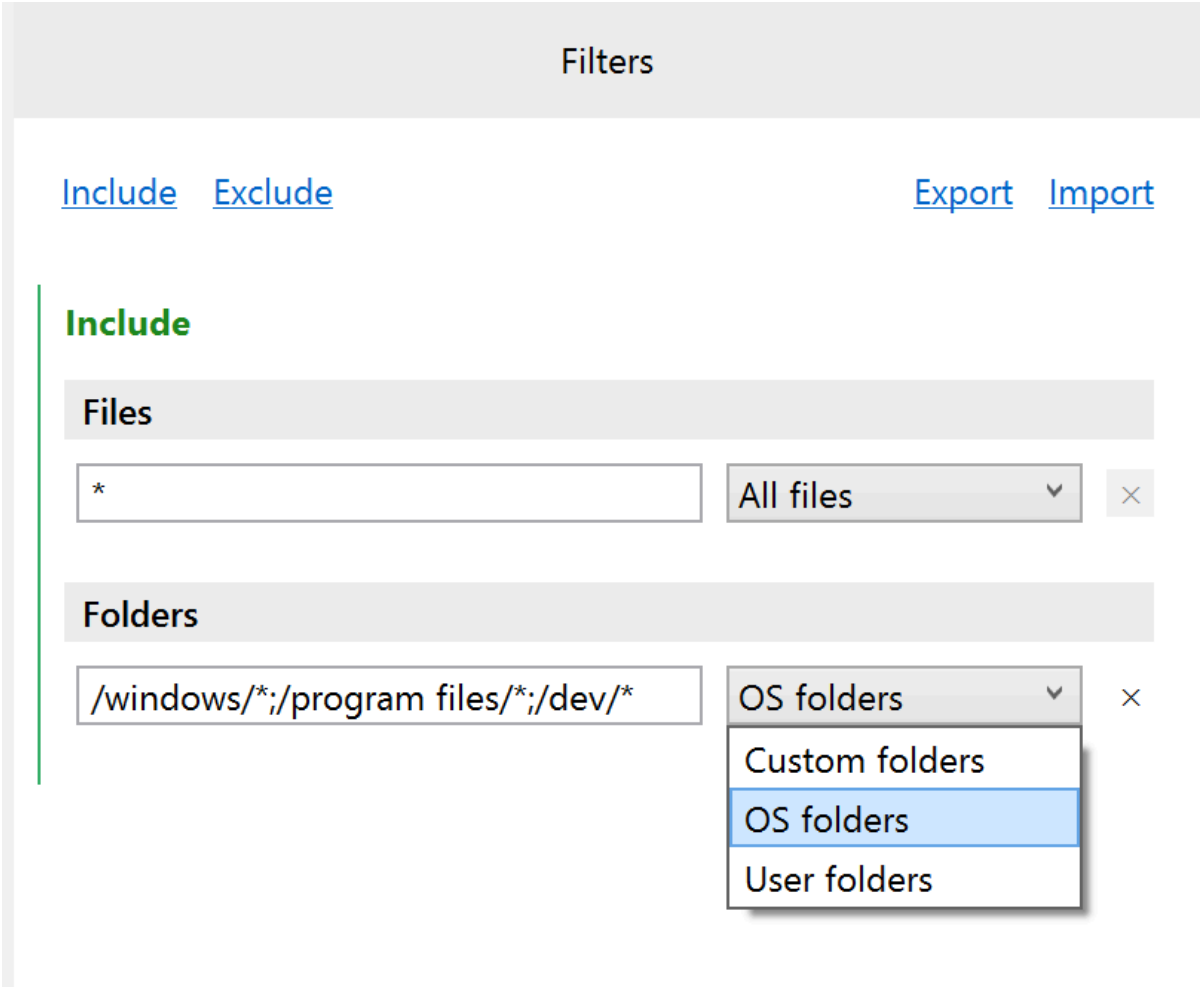
1. On the **Filters** panel, click the **Include** or **Exclude** link at the top.
2. Select **Folders** or **Files** from the list that appears.



3. The respective section on the **Filters** panel appears. In that section, select one of the predefined options from the list:

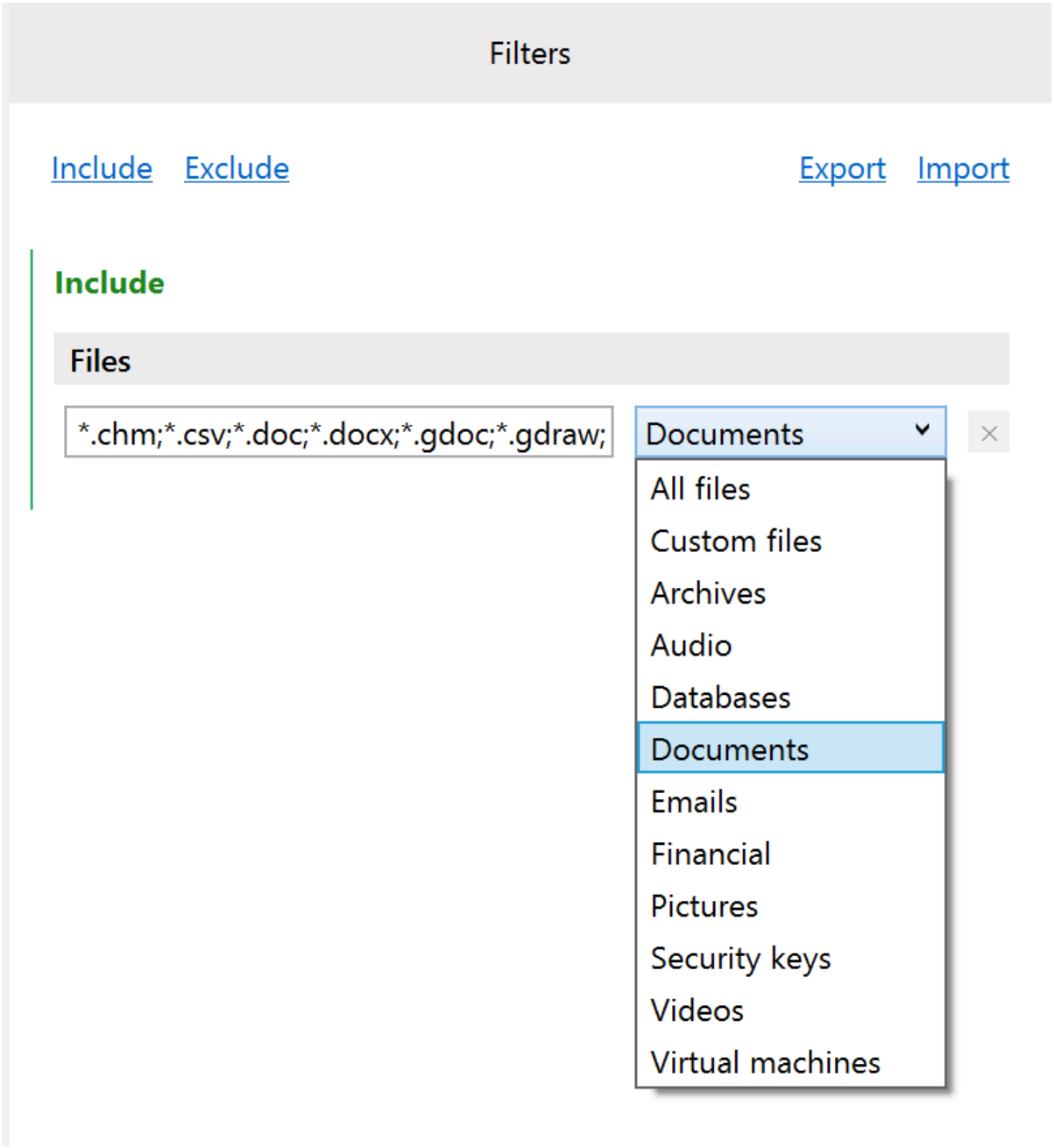
    a. For folders:

    - OS folders
    - User folders
    - Custom folders – Filter folders using user-defined patterns with wildcard support. Use wildcards to match multiple folders at once (for example, `*/temp` for all temp subdirectories, or `backup_202?_*` for dated backup folders).



b. For files:

- Archives
- Audio
- Databases
- Documents
- Emails
- Financial
- Pictures
- Security keys
- Videos
- Virtual machines
- Custom files – Filter files using user-defined patterns with wildcard support. Use wildcards to match multiple files at once (for example, `*.log` for all log files, `report_*.pdf` for numbered reports, or `data_202?_*.csv` for yearly data files).



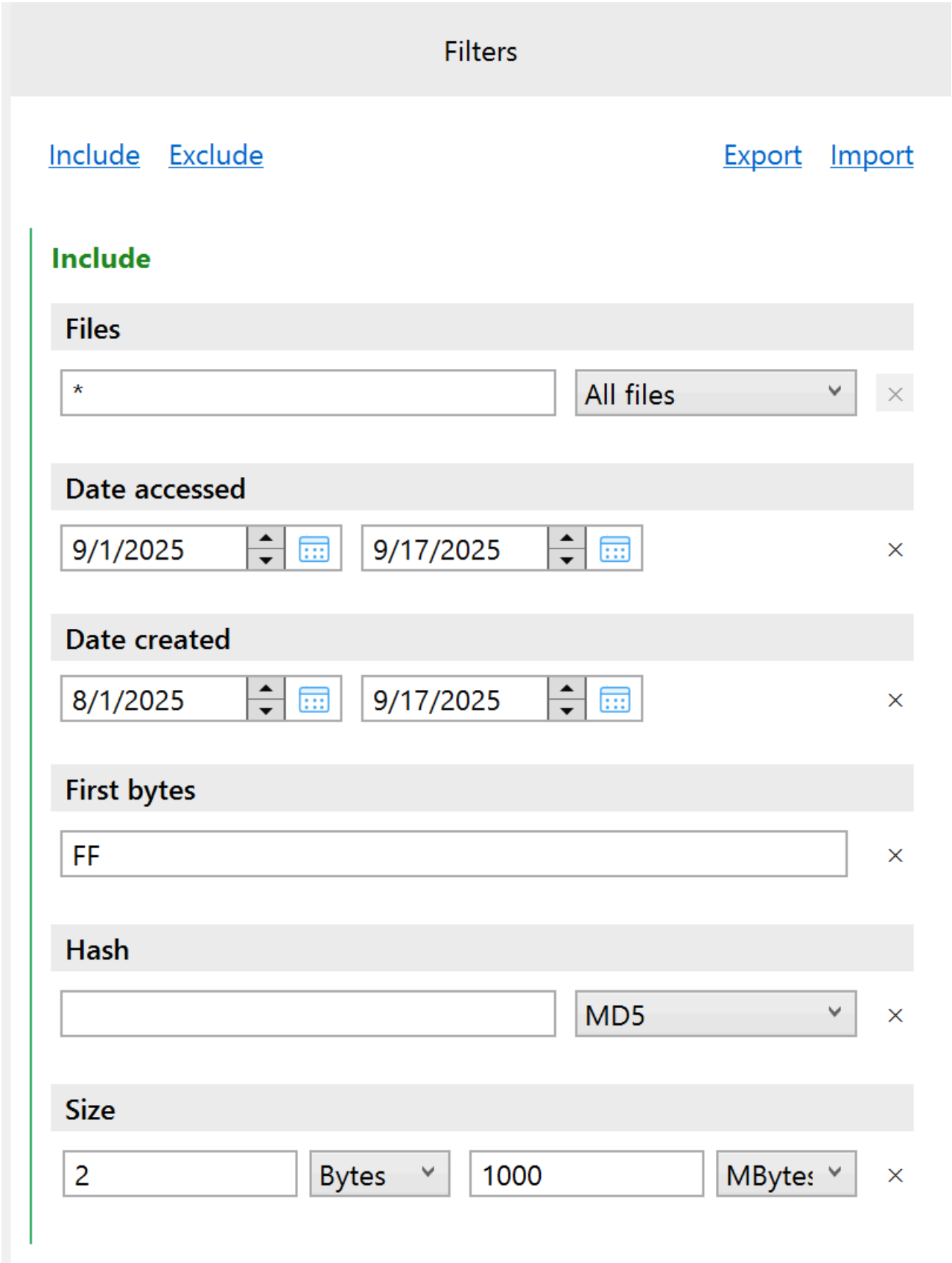
Additional filtering parameters

You can also include or exclude specific files or folders meeting one or more of the following parameters:

- Date accessed
- Date created
- Date modified
- First bytes
- Hash
- Size

To apply additional filtering parameters, do the following:

1. On the **Filters** panel, click the **Include** or **Exclude** link at the top.
2. Select an additional filtering parameter from the list that appears.
3. The respective section on the **Filters** panel appears. In that section, enter a value for a filtering parameter.

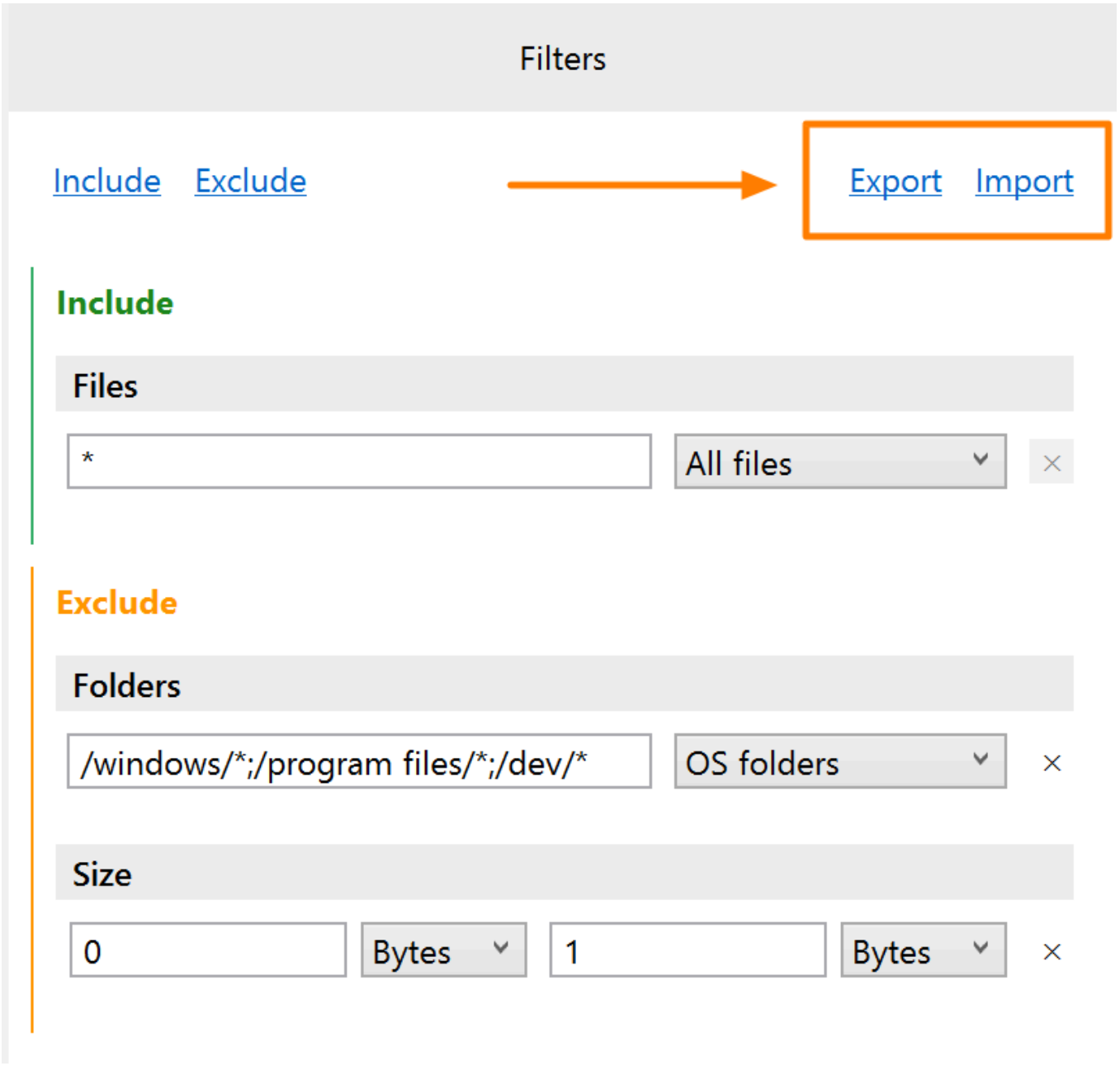


Save filtering settings as a preset

To reuse your filtering settings later or share them with your colleague, save them as a logical imaging preset in JSON format:

1. On the **Filters** panel, click the **Export** link at the top.
2. Enter the name for your preset and click **Save**.

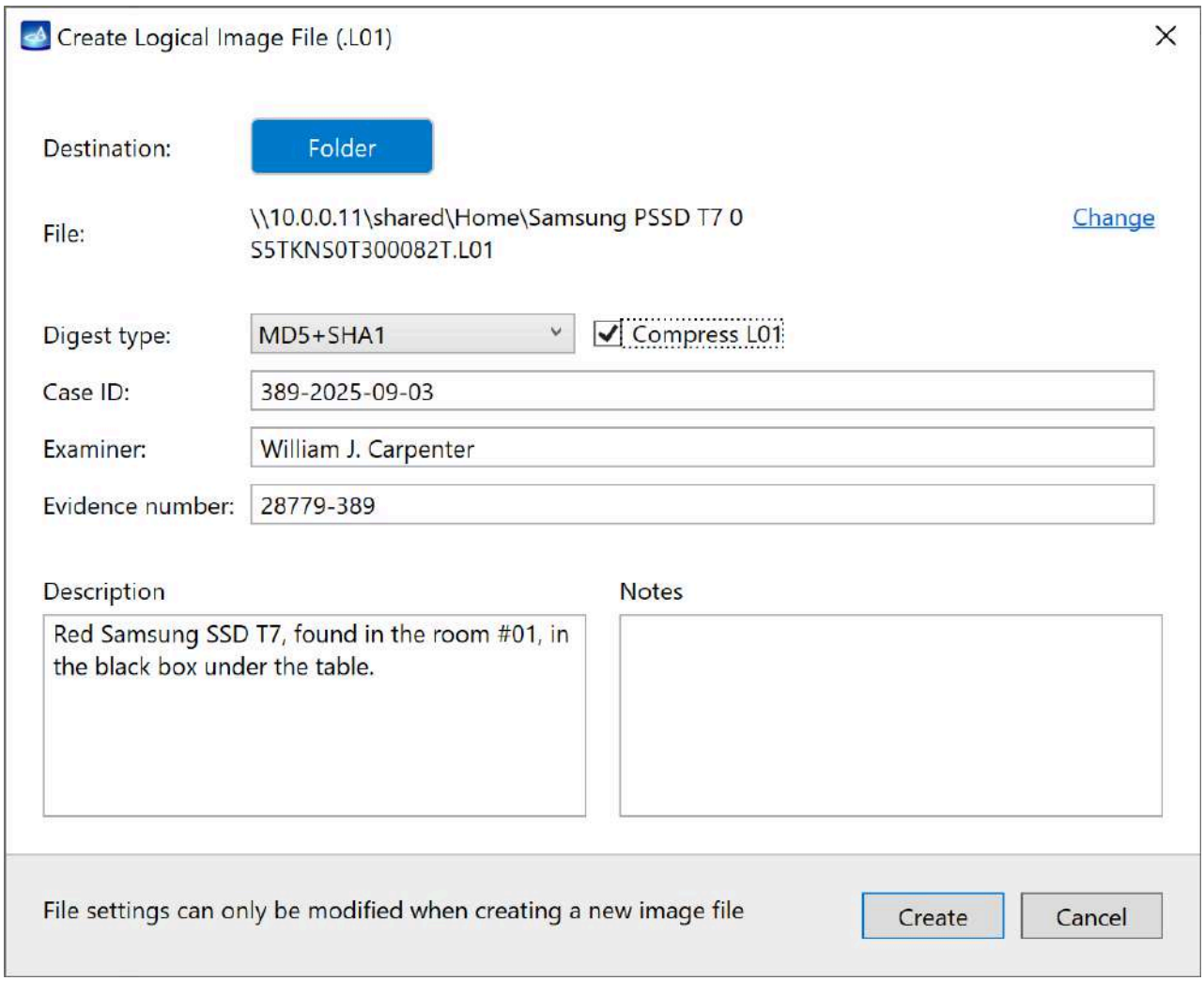
To apply an existing filter preset, use the **Import** link at the top of the **Filters** panel.



Create a target file

1. Once you have adjusted the logical imaging parameters, click the **Start imaging** button at the bottom.

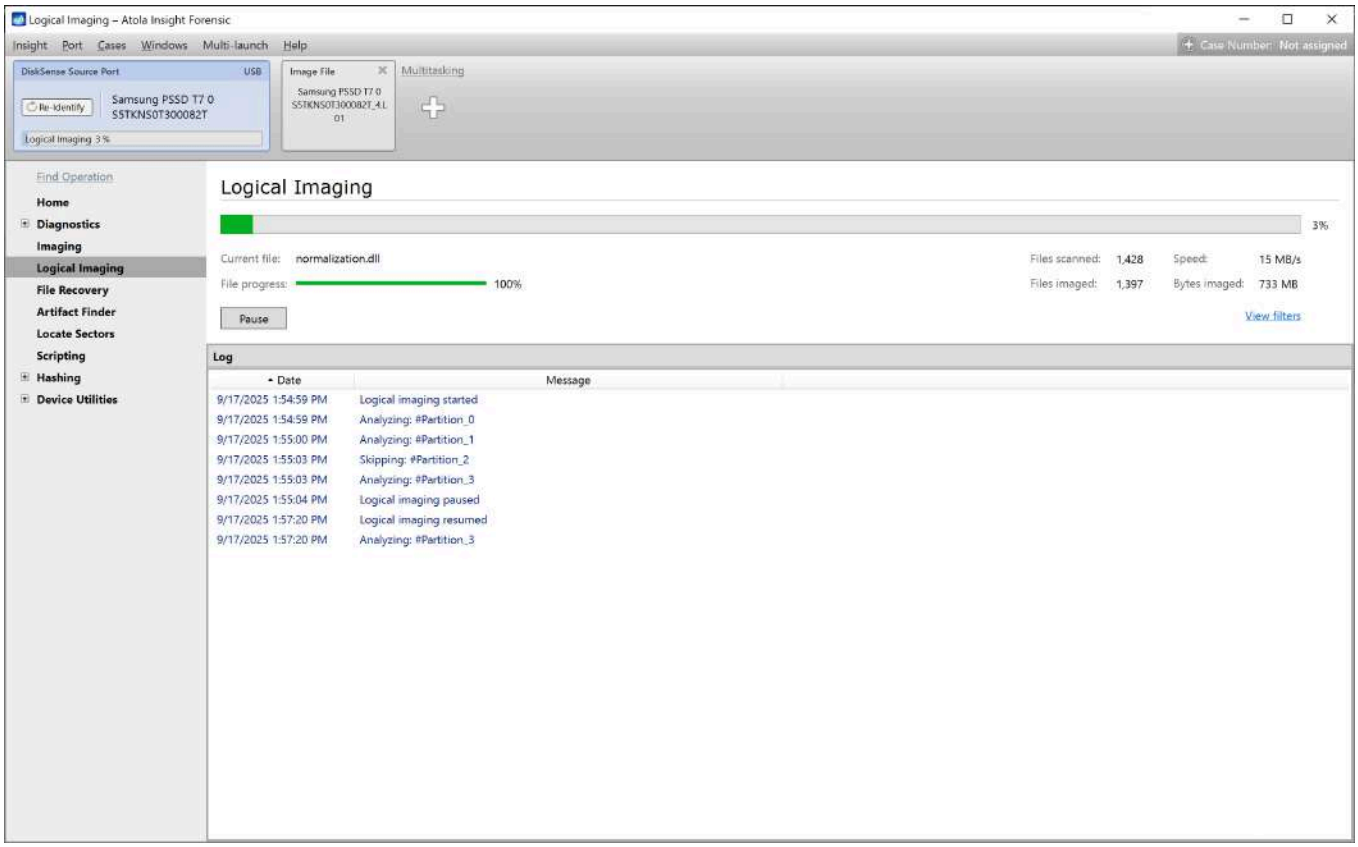
2. The **Create Logical Image File** dialog opens.



3. Select the **Destination** folder for the target L01 file on the local PC or remote network drive.
4. Change the file name if necessary.
5. Select the hashing method (Digest type): MD5, SHA1 or MD5+SHA1.
6. Enable or disable compression for the L01.
7. Fill in other details: Case ID, Examiner name, Evidence number, Description and Notes.
8. Click **Create**.

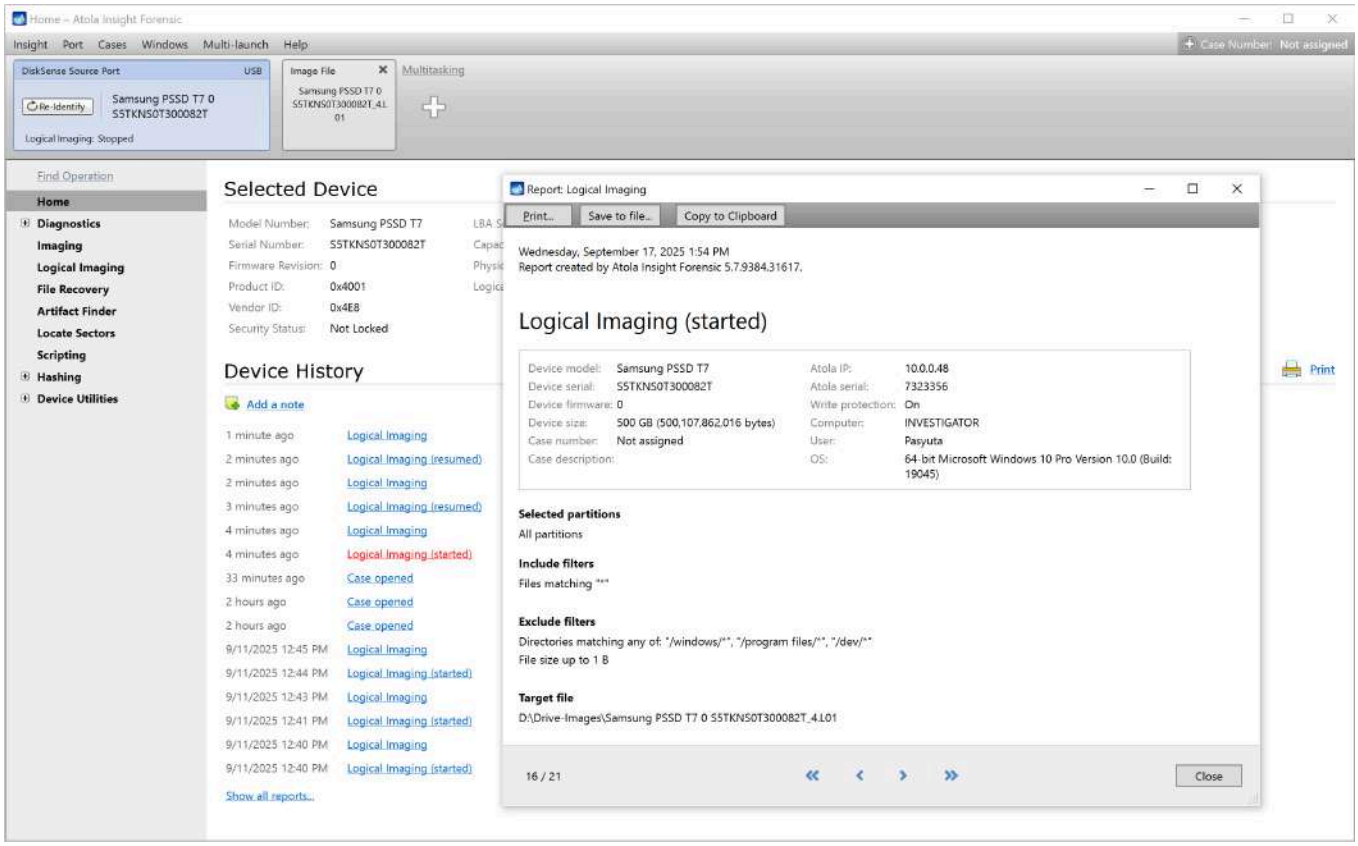
Logical imaging process. Pause and resume

The logical imaging process starts immediately when you click **Create** in the **Create Logical Image File** dialog.



The Logical imaging progress screen.

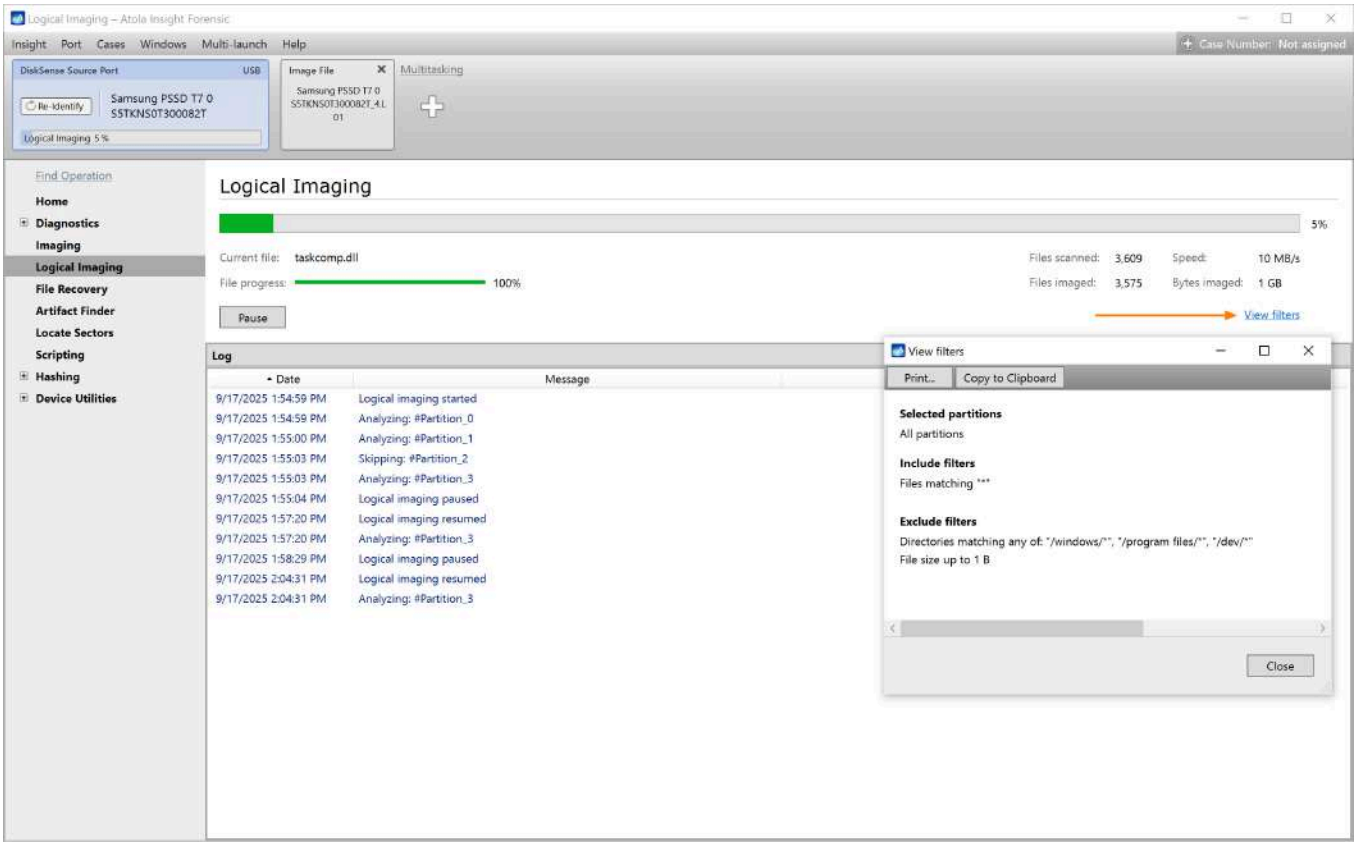
Once imaging is launched, Insight creates a **Logical imaging (started)** report. It contains all details about the imaging source and target(s), as well as information about the include or exclude filters. You can find this report on the device **Home** screen, in the **Device history** section.



The 'Logical Imaging (started)' report.

During the imaging process, you can track the progress of individual files.

To check the filtering parameters of the running session, click the **View filters** link on the right.



The 'View filters' option.

Pause and Resume

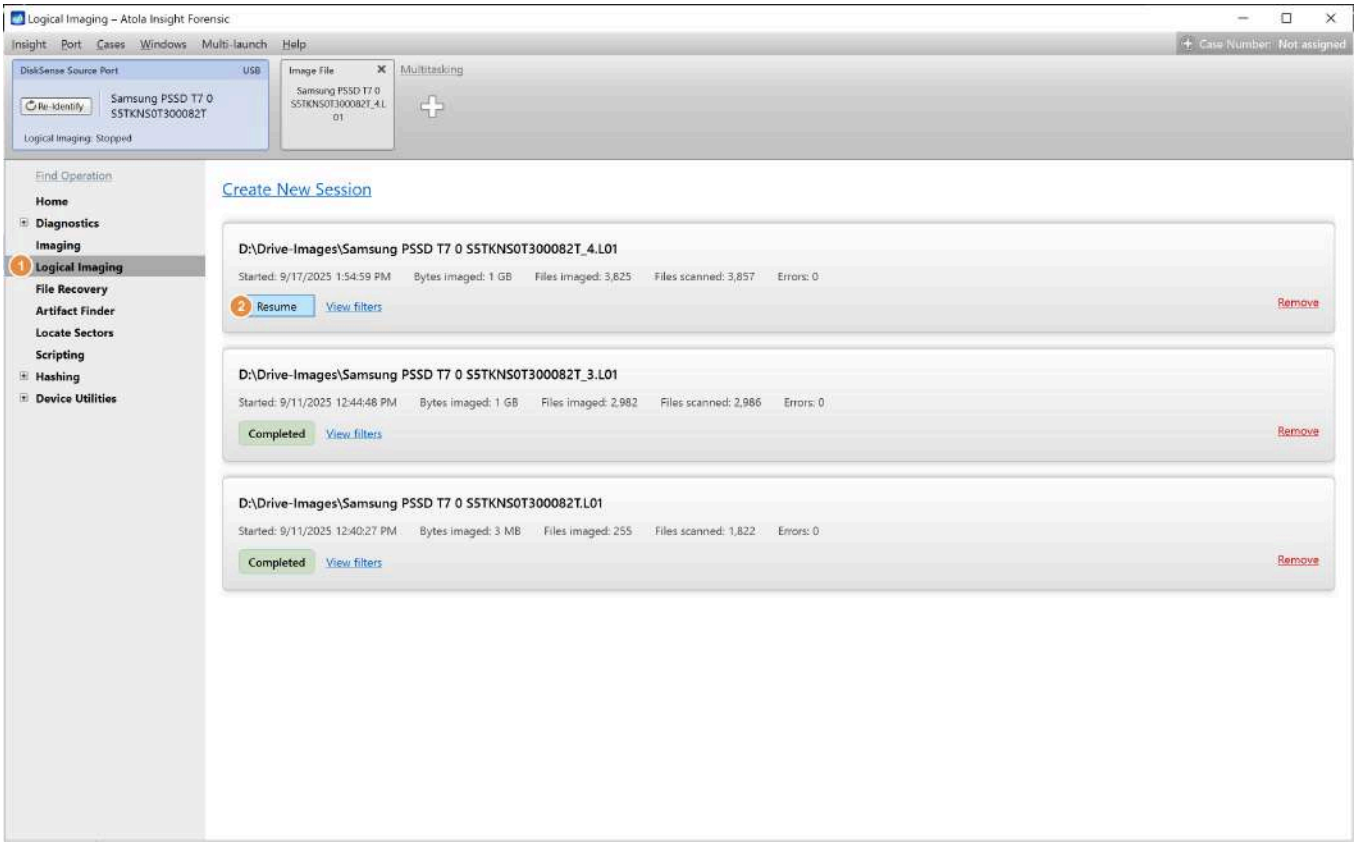
Insight lets you pause any logical imaging session and resume it later.

This feature could be helpful when you need to:

- Turn off your equipment and leave the lab for a night, or
- Continue a logical imaging process at a different location

Pause: While the logical imaging process is running, click the **Pause** button on the left.

Resume: In the Sidebar, click **Logical**, find your paused session and click the **Resume** button.



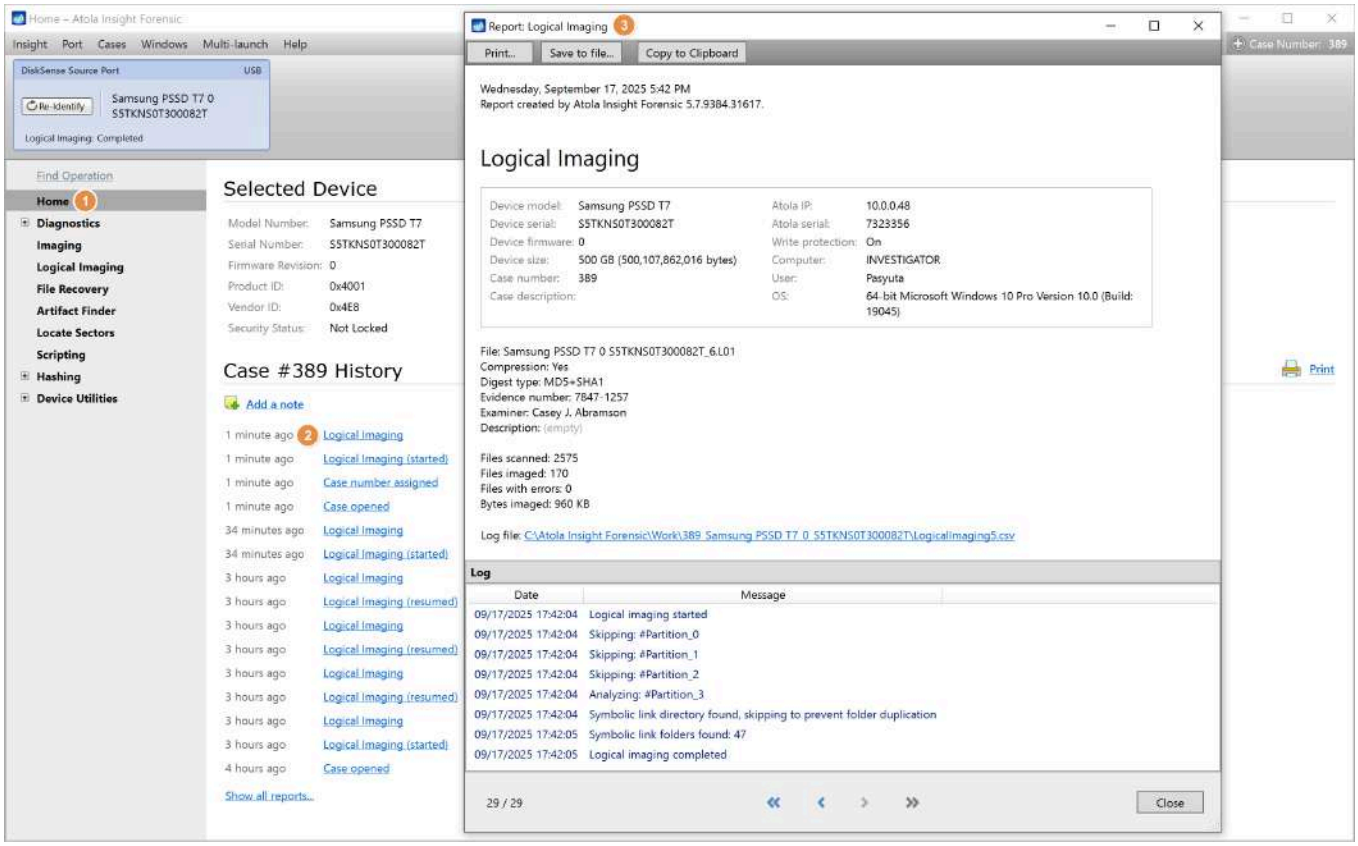
Resuming the paused logical imaging session.

Logical imaging report

After the logical imaging process is completed, Insight generates a comprehensive report with all the details of the imaged data:

- The number of scanned and imaged files
- The volume of imaged data
- Timestamps
- and more

You can find the **Logical imaging** report on the device **Home** screen, in the **Device history** section.



The Logical imaging report.

Clip target drive to source evidence device size

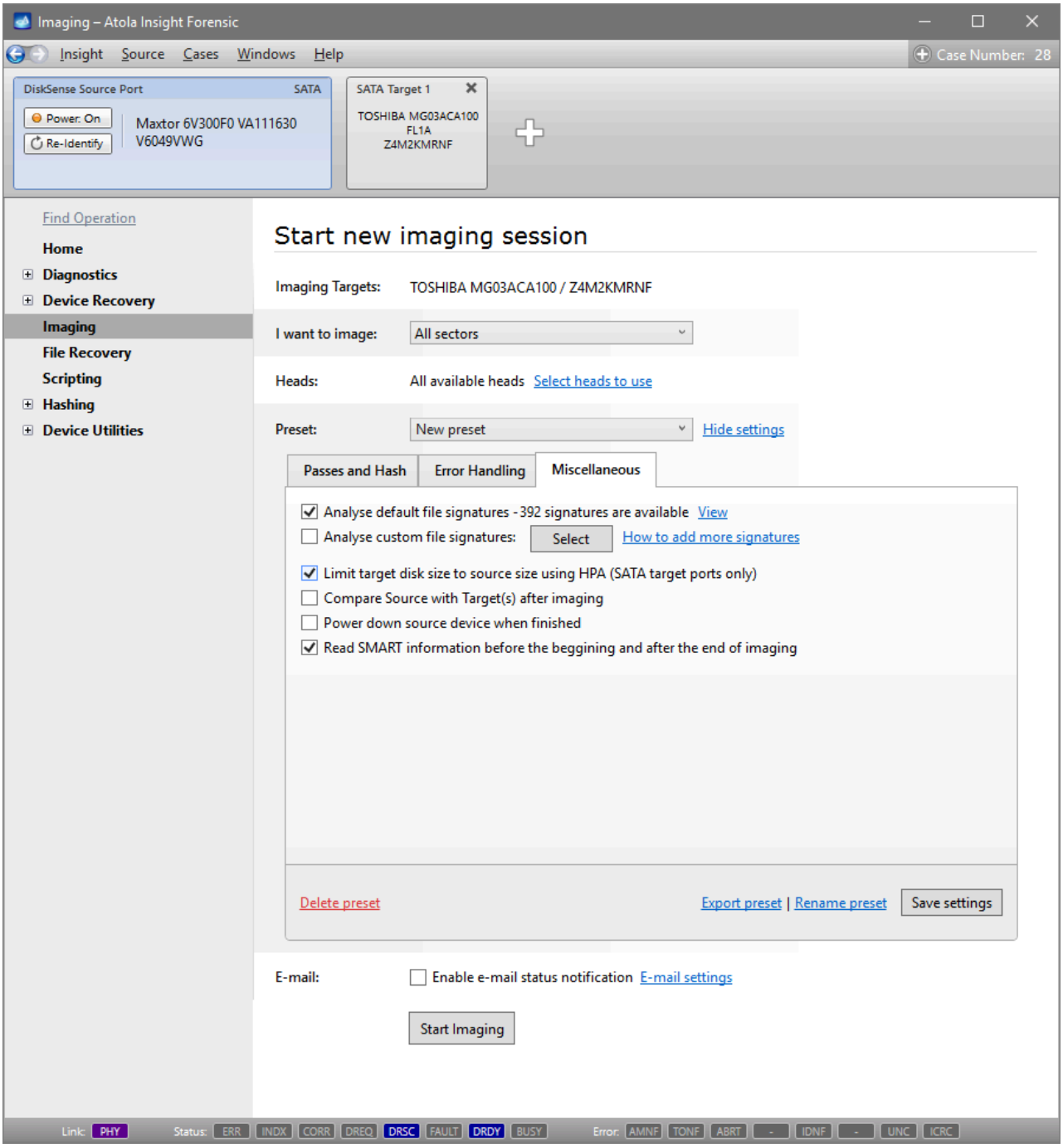
When you image data from a drive involved in an investigation case, and the target drive will be holding a 1:1 clone of evidence data, in many cases it is critical that the target drive's capacity is identical to that of the source drive. Should there be a difference in size between the source and the target devices, their hashes will be different too.

However, if your SATA target drive has a larger capacity, you can limit its size to that of the source drive using Host Protected Area (HPA). It will make the sectors beyond this limit inaccessible to the hashing tools as well as the end user.

> Enabling HPA is an option available only for SATA target drives.

To clip target drive to source evidence device size, do the following:

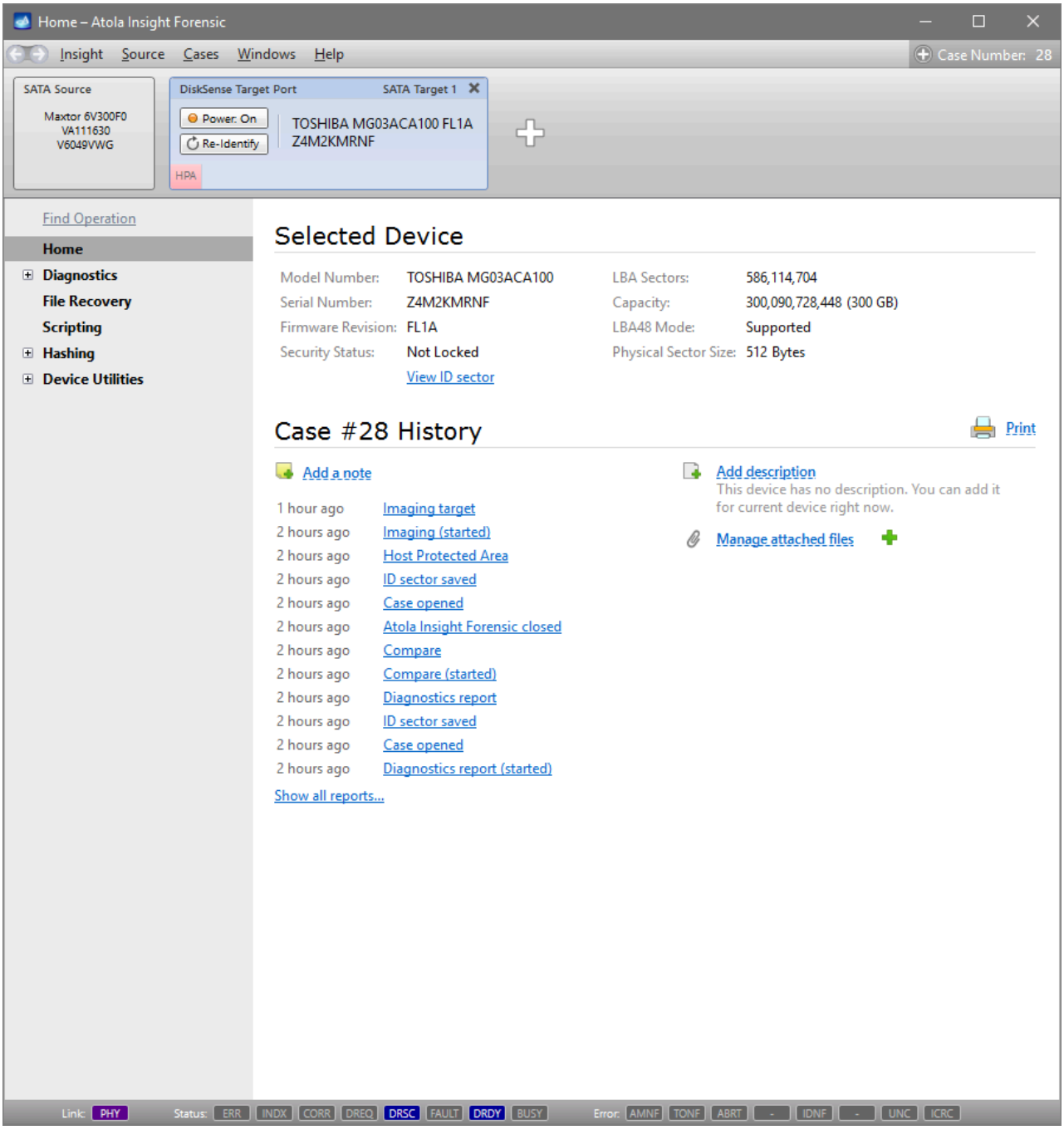
1. In the sidebar, click **Imaging**.
2. Click **Create New Session**.
3. In the **Preset** line, click the **Show settings** link.
4. On the **Miscellaneous** tab, select the **Limit target disk size to source size using HPA (SATA target ports only)** option.



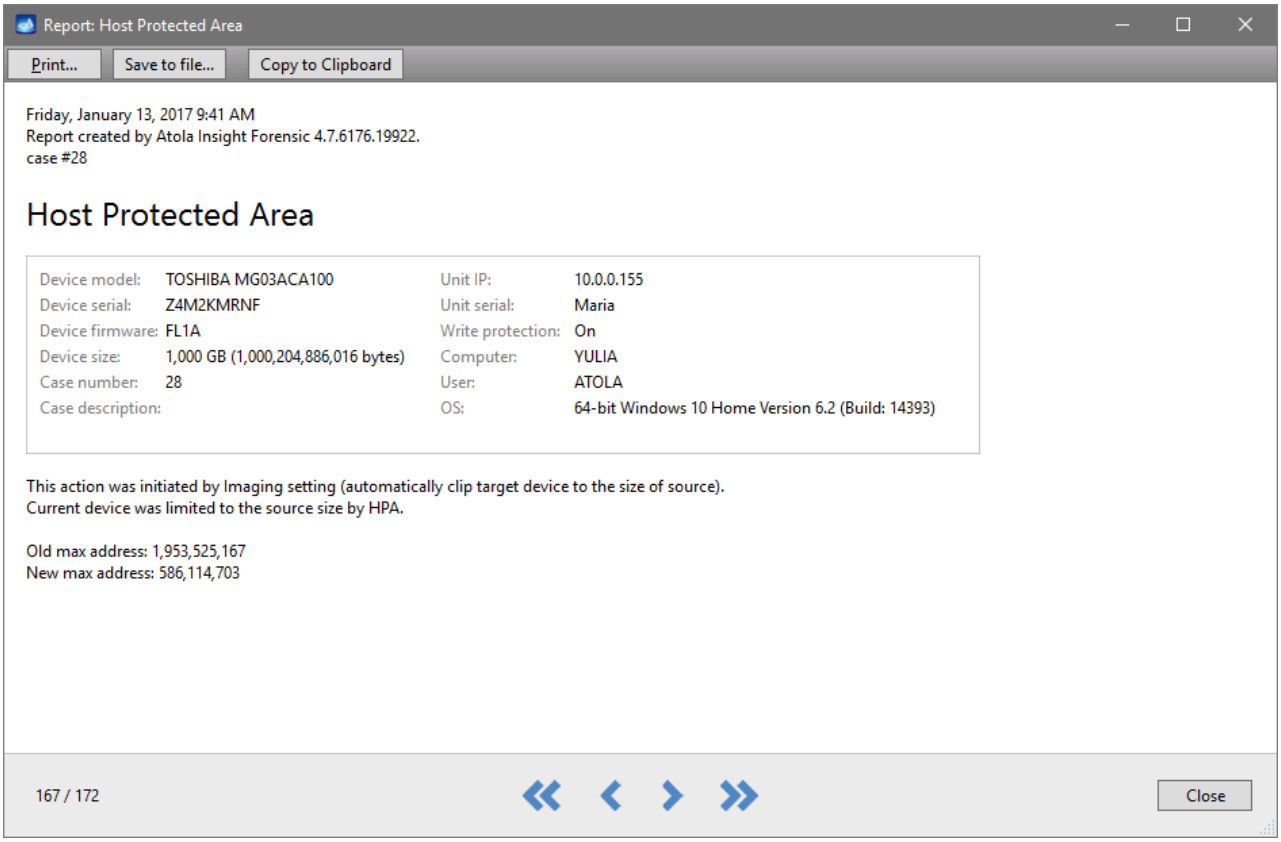
Enabling HPA restriction for target

5. Click the **Start Imaging** button.

6. To indicate that HPA has been enabled on the target drive, Insight displays an **HPA** tag on the target drive port.



7. In the **Case History**, Insight creates a report with the information about the time when HPA was enabled, a detailed device description and how this action was initiated. The report also indicates the initial max address as well as the current one.



To make sure that source and target are identical after enabling HPA, calculate hashes on both drives.

Artifacts search

Imaging is a time-consuming part of the evidence acquisition process, especially when dealing with damaged drives.

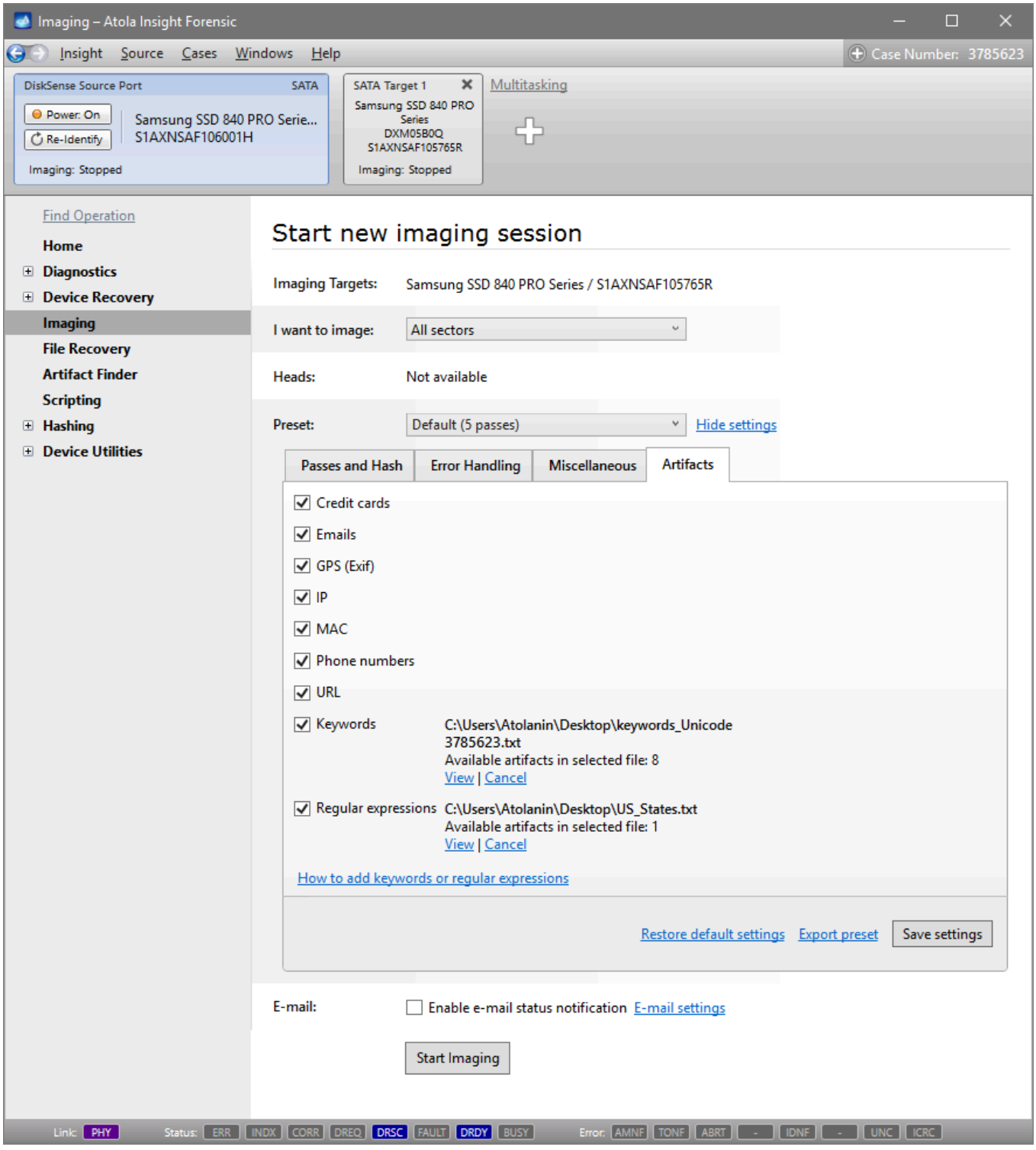
Even though Atola Insight Forensic is the fastest forensic imaging tool in the world (there is literally no penalty on a drive speed when you image it with Insight!), we want to help expedite forensic process even further. The **artifact search** feature allows analysis of data from an evidence device in the course of imaging.

Unlike most forensic analysis tools that parse the file structure, Insight does sector-level parsing, which allows getting data even from the spaces of the drive that are not associated with any file (e.g. remnants of previously deleted documents), thus providing you with clues that are omitted by most analysis tools. Artifact finder uses Intel Hyperscan engine, which makes it the fastest possible tool for primary data analysis.

Artifacts settings

1. On the sidebar, click **Imaging**.
2. Click **Create New Session**.
3. In the **Target Device Selection** dialog, select target device.

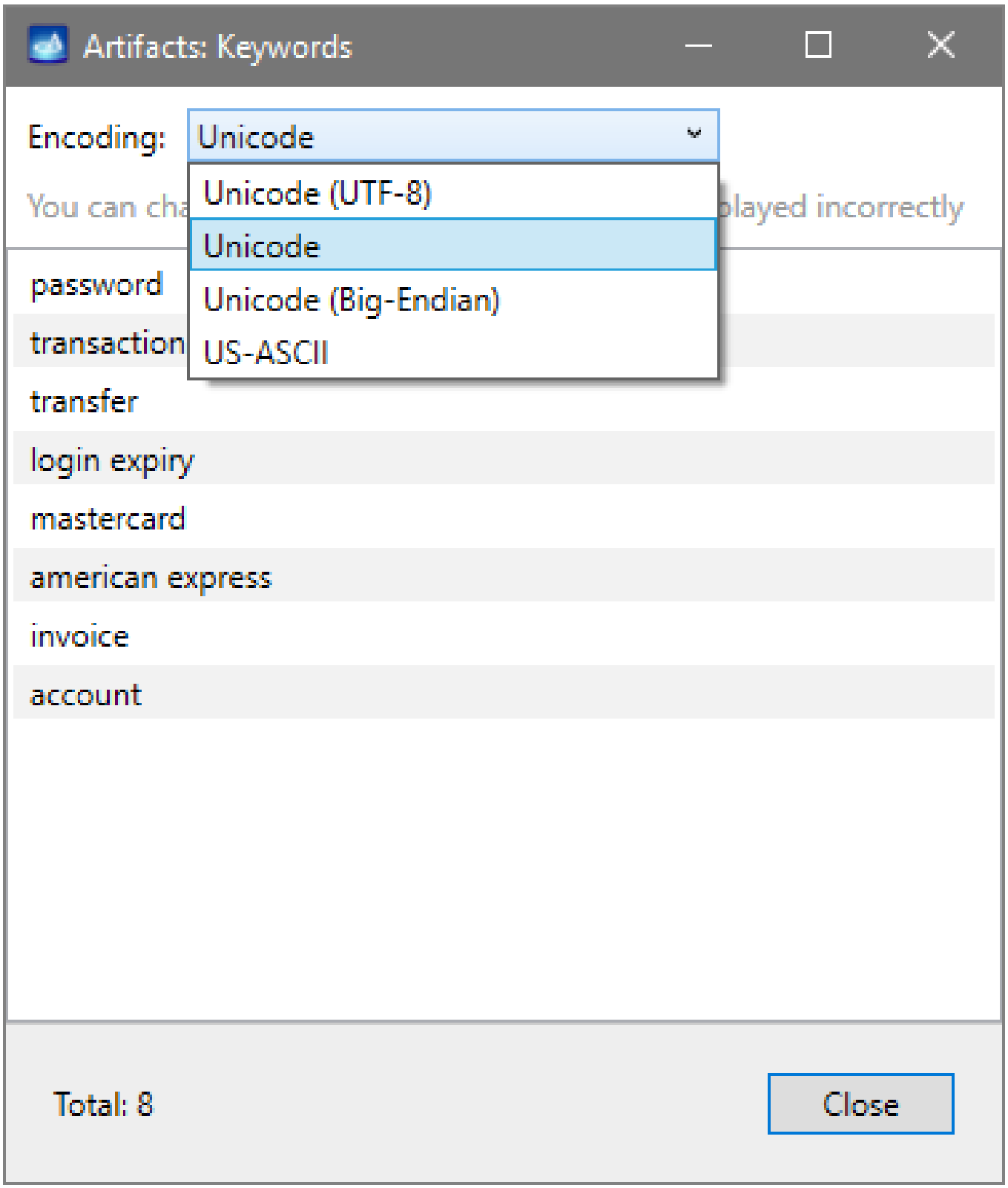
4. Open the **Artifacts** tab.



In this tab it is possible to view, select or deselect the artifacts you want to be searched in the course of imaging.

For each of these artifacts we have not only applied well-known algorithms including the Luhn formula used to validate credit card numbers, but also applied our own smart filters to eliminate false results (for example, if there are two slashes near the number that has preliminarily been identified as a credit card number, that will eliminate it from the search results, as it is likely to be a part of a URL).

Keywords and regular expressions can be added to the search parameters in a txt file with one artifact per line. Next to the **Keywords** category on the **Artifacts** tab, click the **View** link before imaging and make sure the keywords are displayed correctly. Keyword encoding can be adjusted to **Unicode, Unicode (UTF-8), Unicode (Big-Endian)** or **US-ASCII**.



A few of the artifacts are selected by default, namely: *GPS, MAC, Phone numbers, URL*. You can adjust these default settings and click the **Save settings** button. This will affect all future imaging sessions (including those on new source drives) unless you re-adjust the settings or restore the default settings by clicking the corresponding link. The paths to the files with keywords and regular expressions will also remain saved, although should any changes by made to the txt files in the saved directory, the changes will be uploaded at the start of each imaging session.

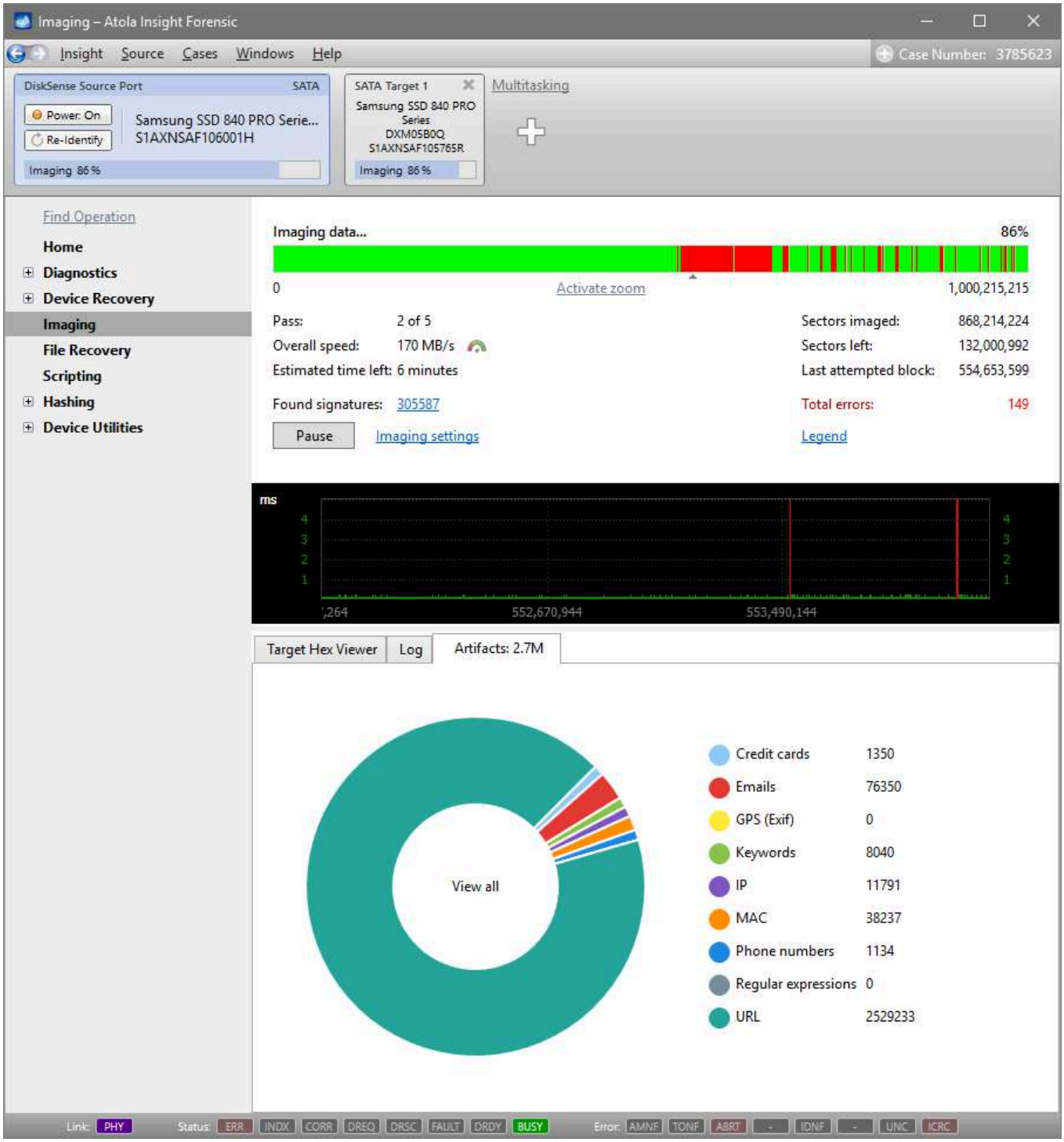
> It is advisable that no more than 4 artifacts are selected at a time, otherwise imaging will slow down considerably. Also, keywords consisting of less than 4 symbols or regular expressions consisting of less than 6 symbols; large number of keywords (more than 2000) or regular expressions (more than 10) may also slow down imaging process. This is due to the large number of results such search parameters are capable of producing.

Once you have ticked the boxes next to the artifacts you would like to be searched for, click the **Start Imaging** button.

Browse through the artifacts in the course of imaging

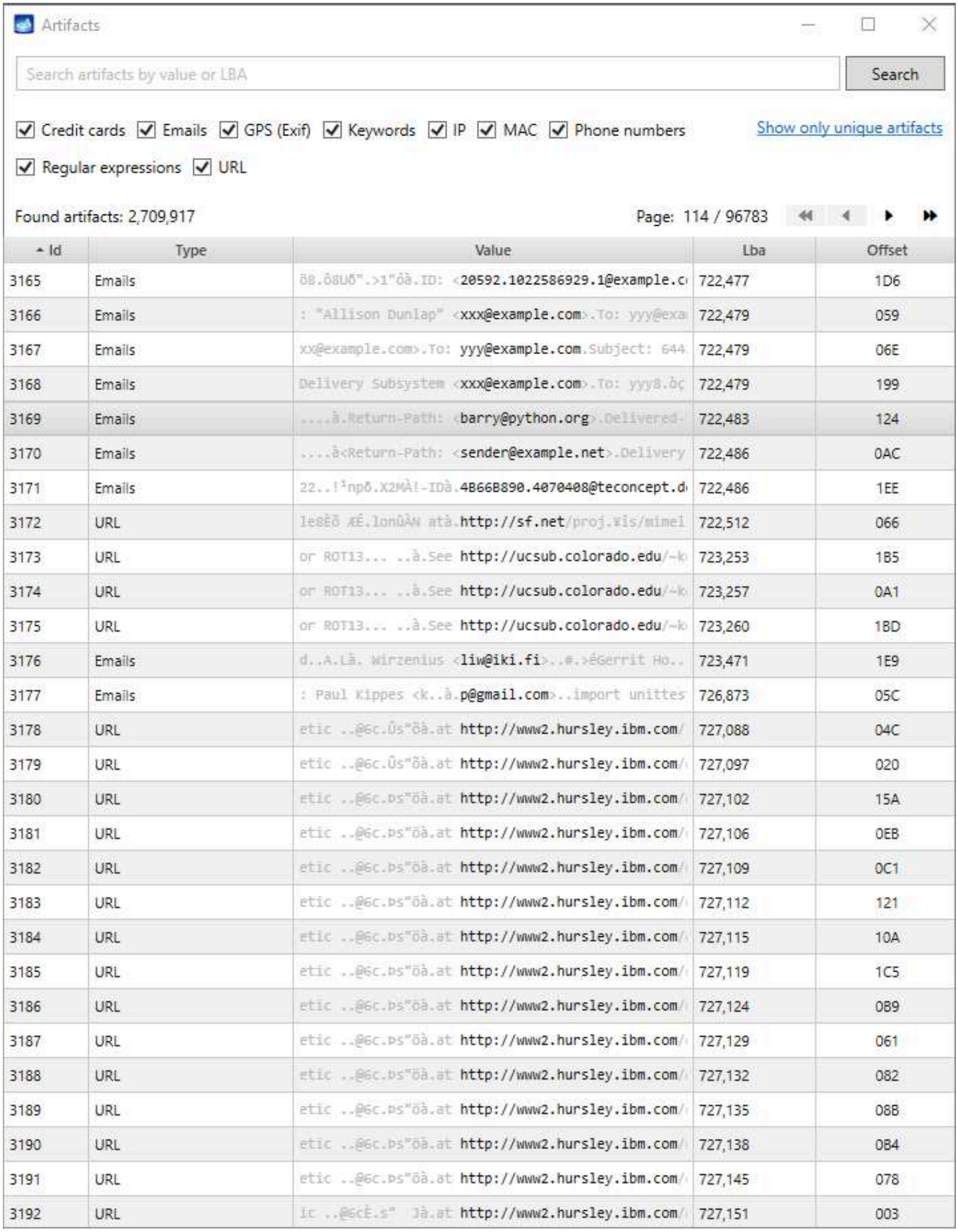
Once imaging has begun, go to the **Artifacts** tab in the bottom part of Insight window and watch the selected artifacts being found: the numbers of artifacts and the corresponding diagram change on the go.

To see the artifacts in a list, press on any of the categories or the diagram.



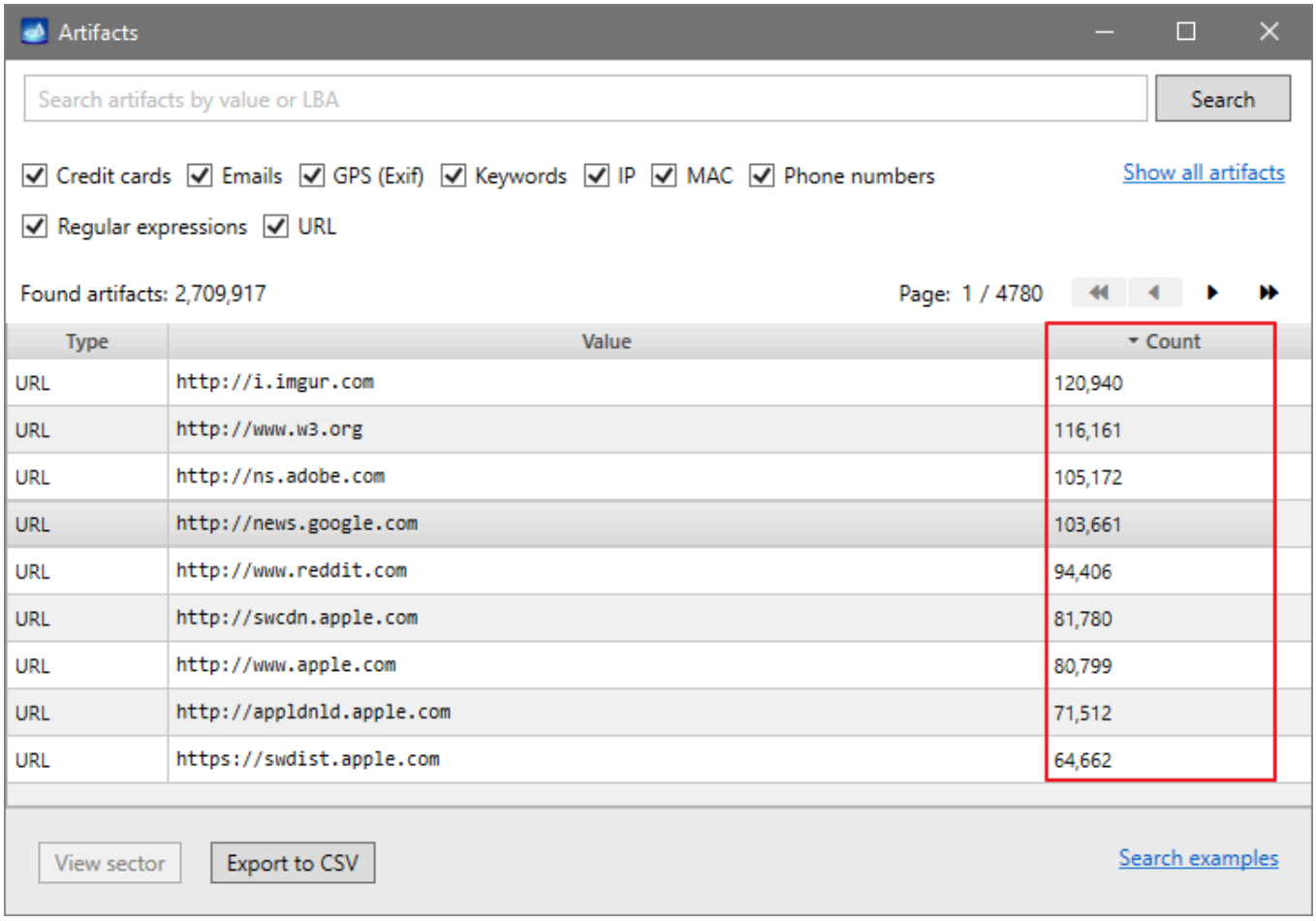
In the table, each artifact is assigned an **Id** number, each found **Value** is shown in the context (including 20 bytes before and 20 bytes after the artifact in grey color), the **LBA** and the **Offset** are also displayed in the table to help locate the artifact.

There are many options to help find, sort, filter and view the artifacts: it is possible to view one or a few categories of artifacts in one list, use the **Search** bar to find a specific value (search examples are provided in the bottom right corner of the window), filter results for unique values by clicking the **Show unique artifacts** link.

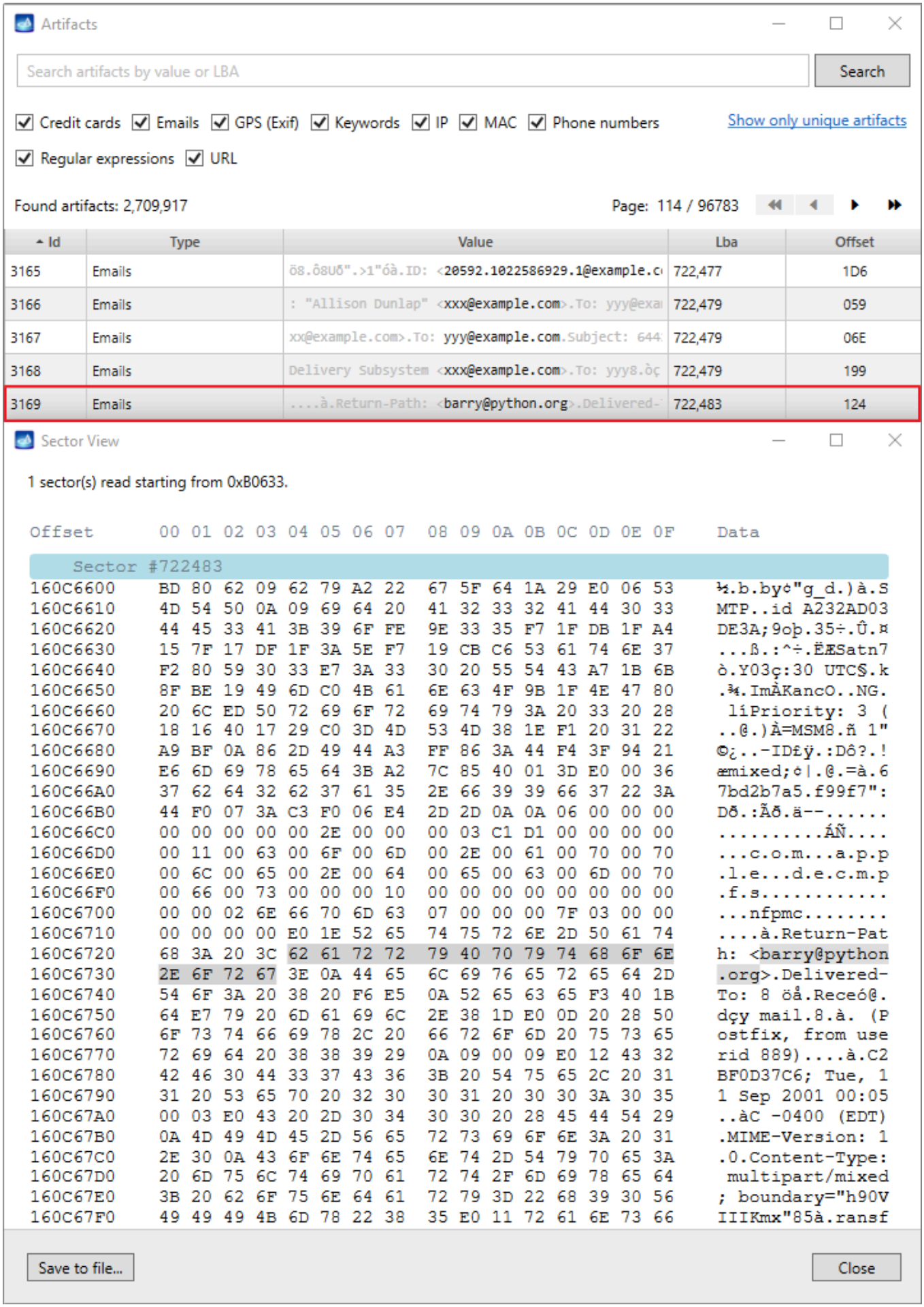


Id	Type	Value	Lba	Offset
3165	Emails	ö8.ô8Uõ".>1"ôà.ID: <20592.1022586929.1@example.c	722,477	1D6
3166	Emails	: "Allison Dunlap" <xxx@example.com>.To: yyy@exa	722,479	059
3167	Emails	xx@example.com>.To: yyy@example.com.Subject: 644	722,479	06E
3168	Emails	Delivery Subsystem <xxx@example.com>.To: yyy8.òç	722,479	199
3169	Emails	....à.Return-Path: <barry@python.org>.Delivered-	722,483	124
3170	Emails	....à<Return-Path: <sender@example.net>.Delivery	722,486	0AC
3171	Emails	22..!¹npδ.X2MÀ!-IDà.4B66B890.4070408@teconcept.d	722,486	1EE
3172	URL	le8ÈÖ ÆÉ.1onÛÀN atà.http://sf.net/proj.¥is/mimel	722,512	066
3173	URL	or ROT13... ..à.See http://ucsub.colorado.edu/~k	723,253	1B5
3174	URL	or ROT13... ..à.See http://ucsub.colorado.edu/~k	723,257	0A1
3175	URL	or ROT13... ..à.See http://ucsub.colorado.edu/~k	723,260	1BD
3176	Emails	d..A.Là. Wirzenius <liw@iki.fi>..#.>ÉGerrit Ho..	723,471	1E9
3177	Emails	: Paul Kippes <k..à.p@gmail.com>..import unittes	726,873	05C
3178	URL	etic ..@6c.Ûs"ôà.at http://www2.hursley.ibm.com/	727,088	04C
3179	URL	etic ..@6c.Ûs"ôà.at http://www2.hursley.ibm.com/	727,097	020
3180	URL	etic ..@6c.Þs"ôà.at http://www2.hursley.ibm.com/	727,102	15A
3181	URL	etic ..@6c.Þs"ôà.at http://www2.hursley.ibm.com/	727,106	0EB
3182	URL	etic ..@6c.Þs"ôà.at http://www2.hursley.ibm.com/	727,109	0C1
3183	URL	etic ..@6c.Þs"ôà.at http://www2.hursley.ibm.com/	727,112	121
3184	URL	etic ..@6c.Þs"ôà.at http://www2.hursley.ibm.com/	727,115	10A
3185	URL	etic ..@6c.Þs"ôà.at http://www2.hursley.ibm.com/	727,119	1C5
3186	URL	etic ..@6c.Þs"ôà.at http://www2.hursley.ibm.com/	727,124	0B9
3187	URL	etic ..@6c.Þs"ôà.at http://www2.hursley.ibm.com/	727,129	061
3188	URL	etic ..@6c.Þs"ôà.at http://www2.hursley.ibm.com/	727,132	082
3189	URL	etic ..@6c.Þs"ôà.at http://www2.hursley.ibm.com/	727,135	08B
3190	URL	etic ..@6c.Þs"ôà.at http://www2.hursley.ibm.com/	727,138	0B4
3191	URL	etic ..@6c.Þs"ôà.at http://www2.hursley.ibm.com/	727,145	078
3192	URL	ic ..@6cÈ.s" Jà.at http://www2.hursley.ibm.com/	727,151	003

The latter option is quite valuable as it helps identify the values most frequently occurring on the drive: to sort the results click **Count** in the table header.



To promptly find the sector where an artifact is located, you can double click the artifact you would like to examine more thoroughly.

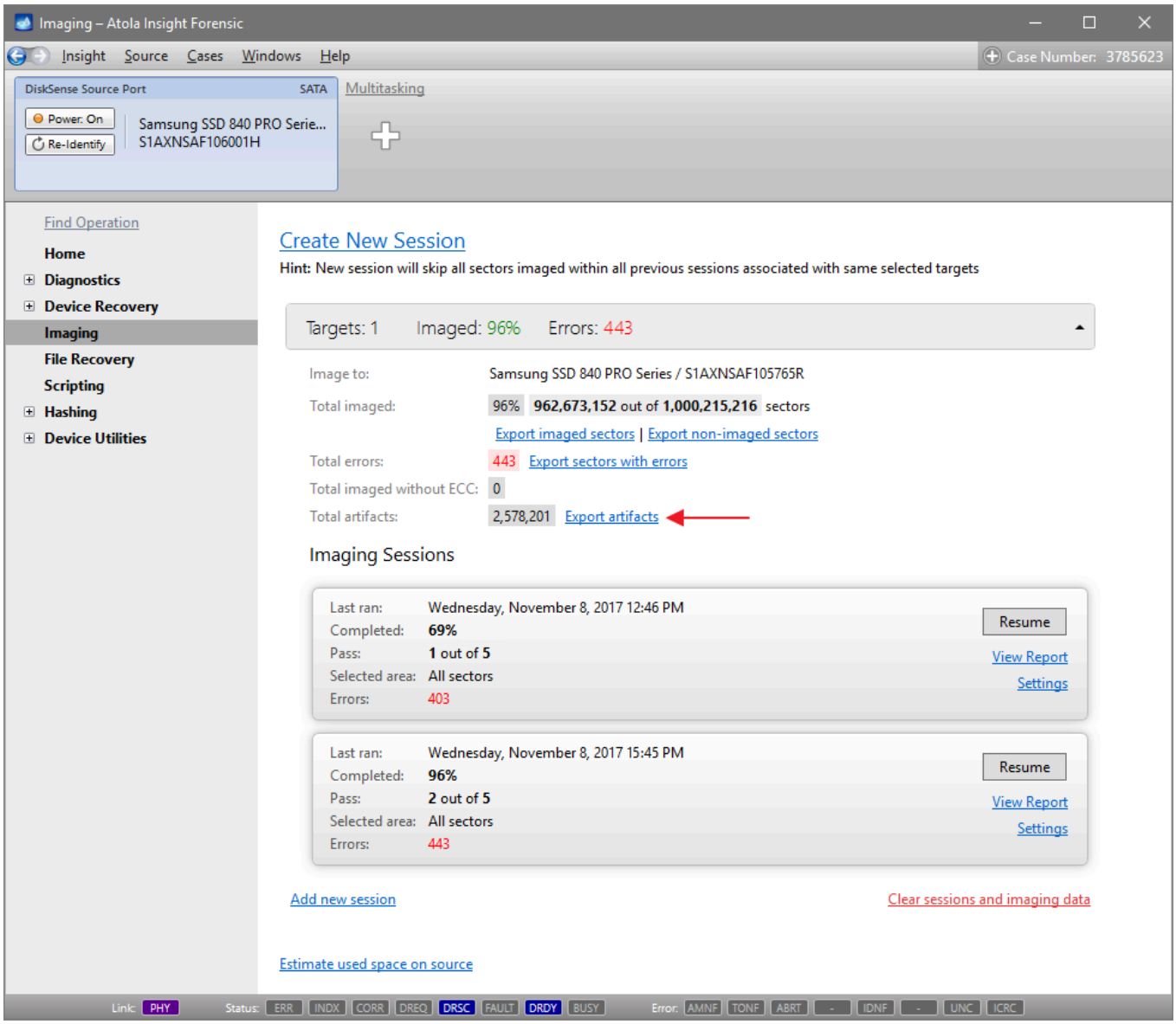

Artifacts
Search artifacts by value or LBA
Search
Credit cards
Emails
GPS (Exif)
Keywords
IP
MAC
Phone numbers
Show only unique artifacts
Regular expressions
URL
Found artifacts: 2,709,917
Page: 114 / 96783
Id
Type
Value
Lba
Offset
3165 Emails ö8.ô8Uð".>1"óà.ID: <20592.1022586929.1@example.c 722,477 1D6
3166 Emails : "Allison Dunlap" <xxx@example.com>.To: yyy@exa 722,479 059
3167 Emails xx@example.com>.To: yyy@example.com.Subject: 644 722,479 06E
3168 Emails Delivery Subsystem <xxx@example.com>.To: yyy8.òç 722,479 199
3169 Emails ....à.Return-Path: <barry@python.org>.Delivered- 722,483 124
Sector View
1 sector(s) read starting from 0xB0633.
Offset 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F Data
Sector #722483
160C6600 BD 80 62 09 62 79 A2 22 67 5F 64 1A 29 E0 06 53 ½.b.by¢"g_d.)à.S
160C6610 4D 54 50 0A 09 69 64 20 41 32 33 32 41 44 30 33 MTP..id A232AD03
160C6620 44 45 33 41 3B 39 6F FE 9E 33 35 F7 1F DB 1F A4 DE3A;9oþ.35÷.Û.¤
160C6630 15 7F 17 DF 1F 3A 5E F7 19 CB C6 53 61 74 6E 37 ...ß.:^÷.ËÆSatn7
160C6640 F2 80 59 30 33 E7 3A 33 30 20 55 54 43 A7 1B 6B ò.Y03ç:30 UTC§.k
160C6650 8F BE 19 49 6D C0 4B 61 6E 63 4F 9B 1F 4E 47 80 .¾.ImÀKancO..NG.
160C6660 20 6C ED 50 72 69 6F 72 69 74 79 3A 20 33 20 28 líPriority: 3 (
160C6670 18 16 40 17 29 C0 3D 4D 53 4D 38 1E F1 20 31 22 ..@.)À=MSM8.ñ 1"
160C6680 A9 BF 0A 86 2D 49 44 A3 FF 86 3A 44 F4 3F 94 21 ©¿..-IDf.:Dô?.!
160C6690 E6 6D 69 78 65 64 3B A2 7C 85 40 01 3D E0 00 36 æmixed;¢|.@.=à.6
160C66A0 37 62 64 32 62 37 61 35 2E 66 39 39 66 37 22 3A 7bd2b7a5.f99f7":
160C66B0 44 F0 07 3A C3 F0 06 E4 2D 2D 0A 0A 06 00 00 00 Dð.:Ãð.ä--.....
160C66C0 00 00 00 00 00 2E 00 00 00 03 C1 D1 00 00 00 00 .....ÁÑ....
160C66D0 00 11 00 63 00 6F 00 6D 00 2E 00 61 00 70 00 70 ...c.o.m...a.p.p
160C66E0 00 6C 00 65 00 2E 00 64 00 65 00 63 00 6D 00 70 .l.e...d.e.c.m.p
160C66F0 00 66 00 73 00 00 00 10 00 00 00 00 00 00 00 00 .f.s.....
160C6700 00 00 02 6E 66 70 6D 63 07 00 00 00 7F 03 00 00 ...nfpmc.....
160C6710 00 00 00 00 E0 1E 52 65 74 75 72 6E 2D 50 61 74 ....à.Return-Pat
160C6720 68 3A 20 3C 62 61 72 72 79 40 70 79 74 68 6F 6E h: <barry@python
160C6730 2E 6F 72 67 3E 0A 44 65 6C 69 76 65 72 65 64 2D .org>.Delivered-
160C6740 54 6F 3A 20 38 20 F6 E5 0A 52 65 63 65 F3 40 1B To: 8 öå.Receó@.
160C6750 64 E7 79 20 6D 61 69 6C 2E 38 1D E0 0D 20 28 50 dçy mail.8.à. (P
160C6760 6F 73 74 66 69 78 2C 20 66 72 6F 6D 20 75 73 65 ostfix, from use
160C6770 72 69 64 20 38 38 39 29 0A 09 00 09 E0 12 43 32 rid 889)....à.C2
160C6780 42 46 30 44 33 37 43 36 3B 20 54 75 65 2C 20 31 BF0D37C6; Tue, 1
160C6790 31 20 53 65 70 20 32 30 30 31 20 30 30 3A 30 35 1 Sep 2001 00:05
160C67A0 00 03 E0 43 20 2D 30 34 30 30 20 28 45 44 54 29 ..àC -0400 (EDT)
160C67B0 0A 4D 49 4D 45 2D 56 65 72 73 69 6F 6E 3A 20 31 .MIME-Version: 1
160C67C0 2E 30 0A 43 6F 6E 74 65 6E 74 2D 54 79 70 65 3A .0.Content-Type:
160C67D0 20 6D 75 6C 74 69 70 61 72 74 2F 6D 69 78 65 64 multipart/mixed
160C67E0 3B 20 62 6F 75 6E 64 61 72 79 3D 22 68 39 30 56 ; boundary="h90V
160C67F0 49 49 49 4B 6D 78 22 38 35 E0 11 72 61 6E 73 66 IIIKmx"85à.ransf
Save to file...
Close

Export artifacts

The **Export to CSV** button is disabled during imaging. You can wait until imaging is completed or pause it, make an export and restart imaging, should it be necessary to start analyzing the current artifact search output with an external tool:

1. **Pause** imaging.
2. On the **Imaging results** screen, click the **Artifacts** link.
3. On the **Artifacts** screen, select the artifacts you would like to be exported (for example, one or multiple artifact categories, unique artifacts or only those fitting certain search criteria).
4. Click the **Export to CSV file** button.
5. Select the path for the file and click **Export**.
6. Once the export is completed (which normally takes no longer than a few seconds), restart imaging.

Now, in the **Imaging** category on the **Sidebar**, there is the **Export artifact** link. If the source drive was imaged in multiple sessions, and artifact lists were created during different imaging sessions, by clicking this link you can download a merged list of artifacts from multiple imaging sessions.



Split an imaging session to separate targets

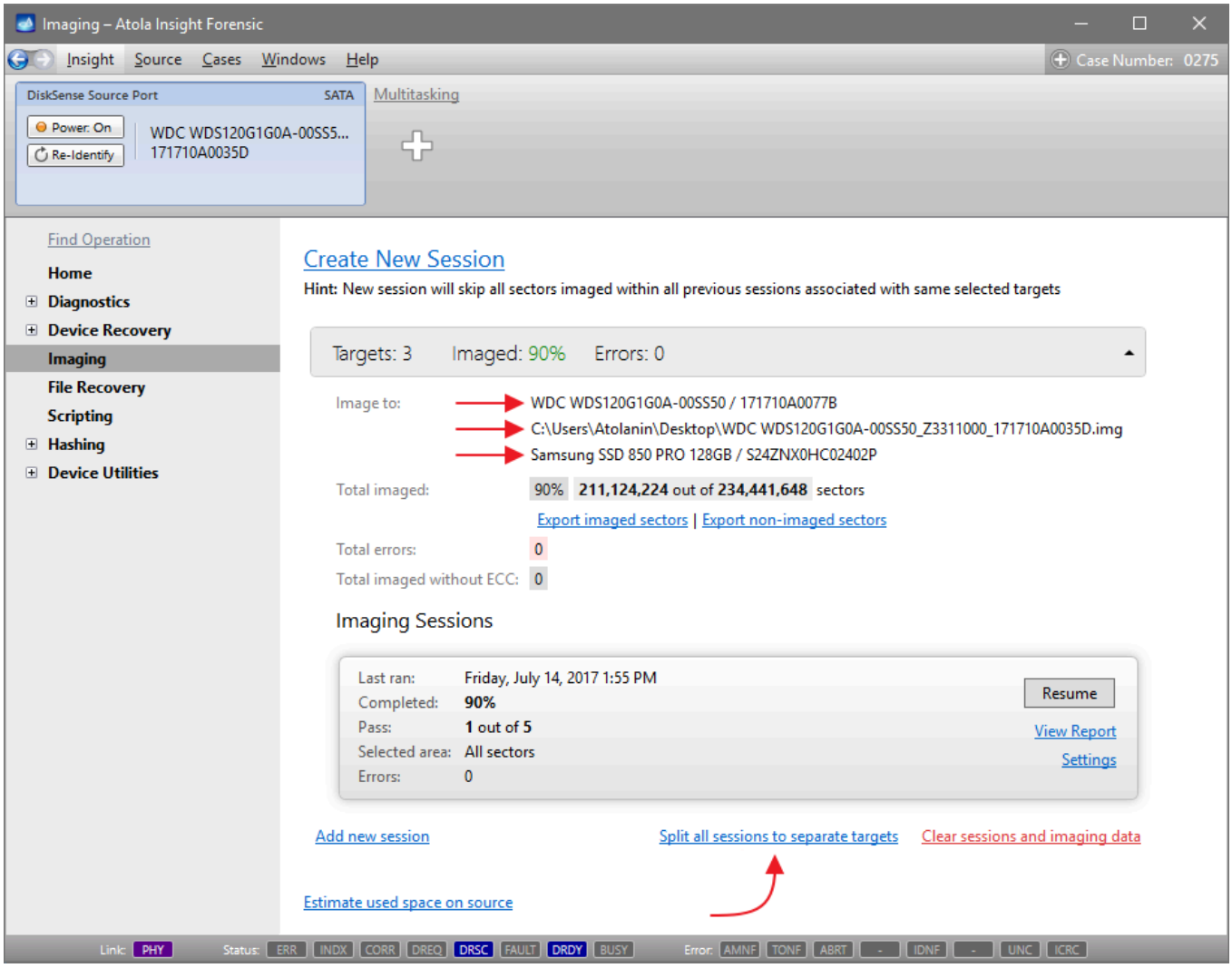
While a multi-target imaging is paused, one or more targets may become unavailable. The drive may be taken and used by another technician or broken, or the server with the image file may become unavailable.

To finish the imaging to the remaining target as fast as possible and start analyzing the evidence, you can split imaging sessions.

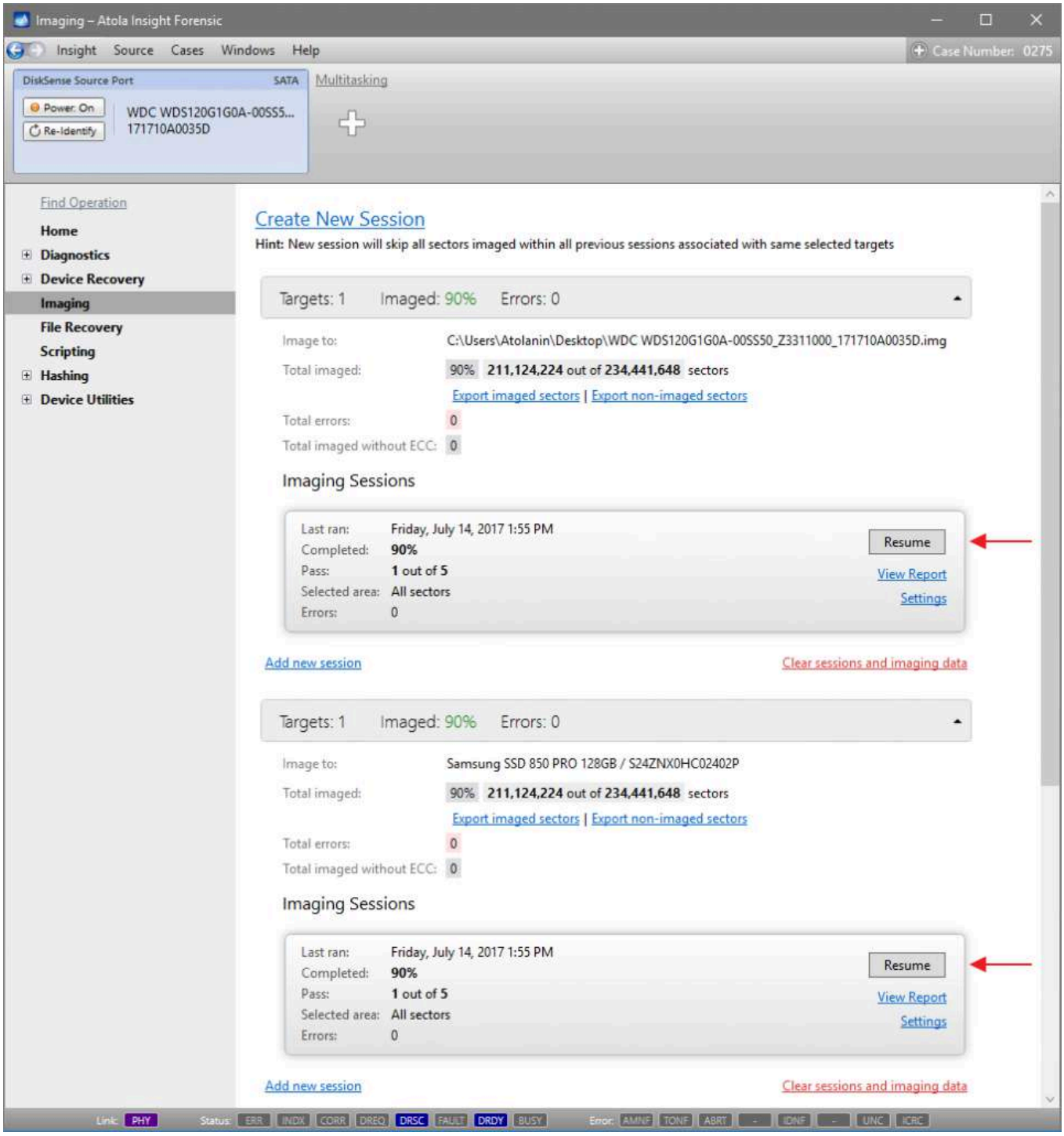
Split an interrupted multi-target imaging session

1. Connect the source device to the DiskSense unit.

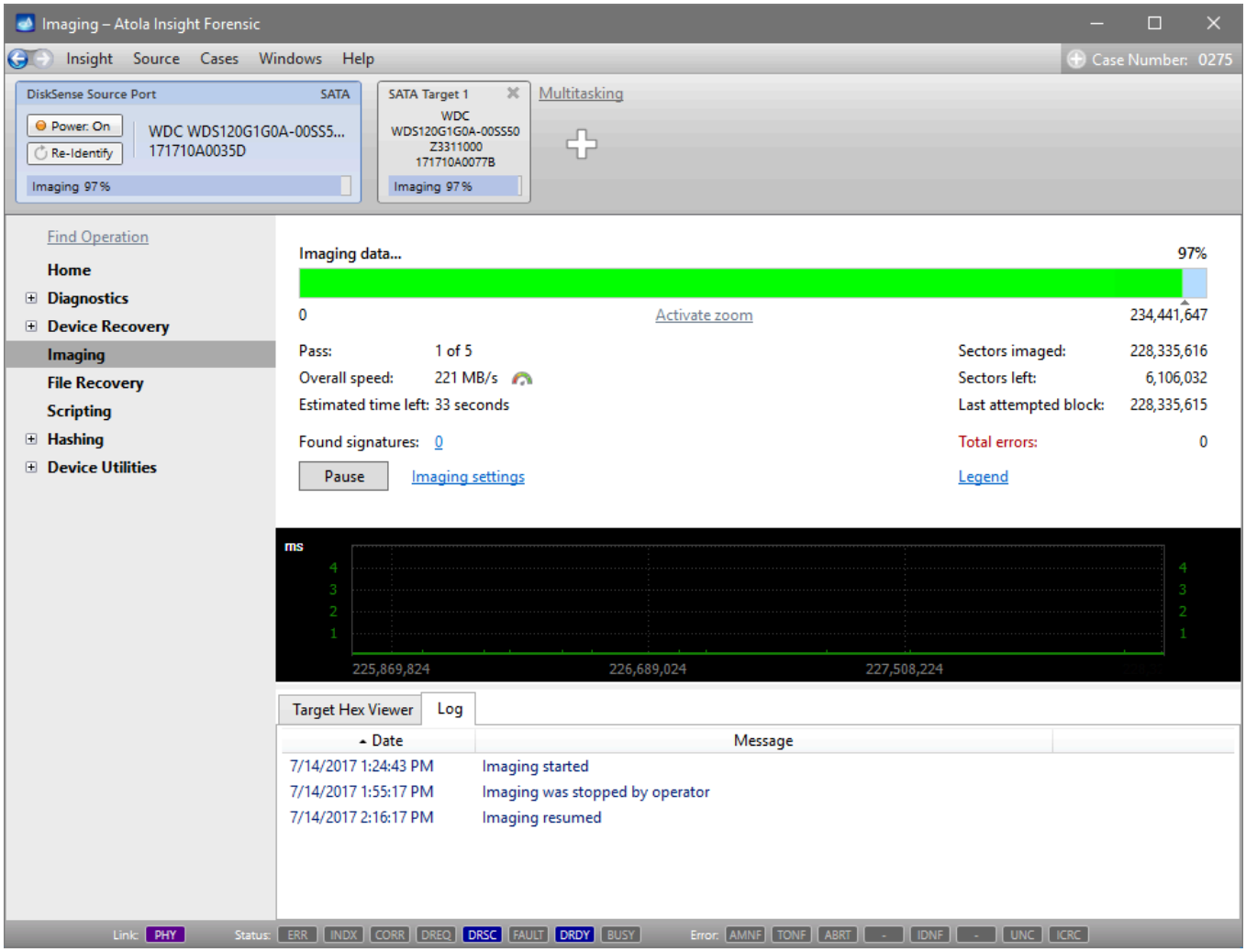
2. In the sidebar, click **Imaging** and find the interrupted imaging session to several targets. If not all target drives and image files are available, it is impossible to simply resume imaging.
3. To split the interrupted imaging session into separate ones, one per each target, click the **Split all sessions to separate targets** link. Insight splits the session.



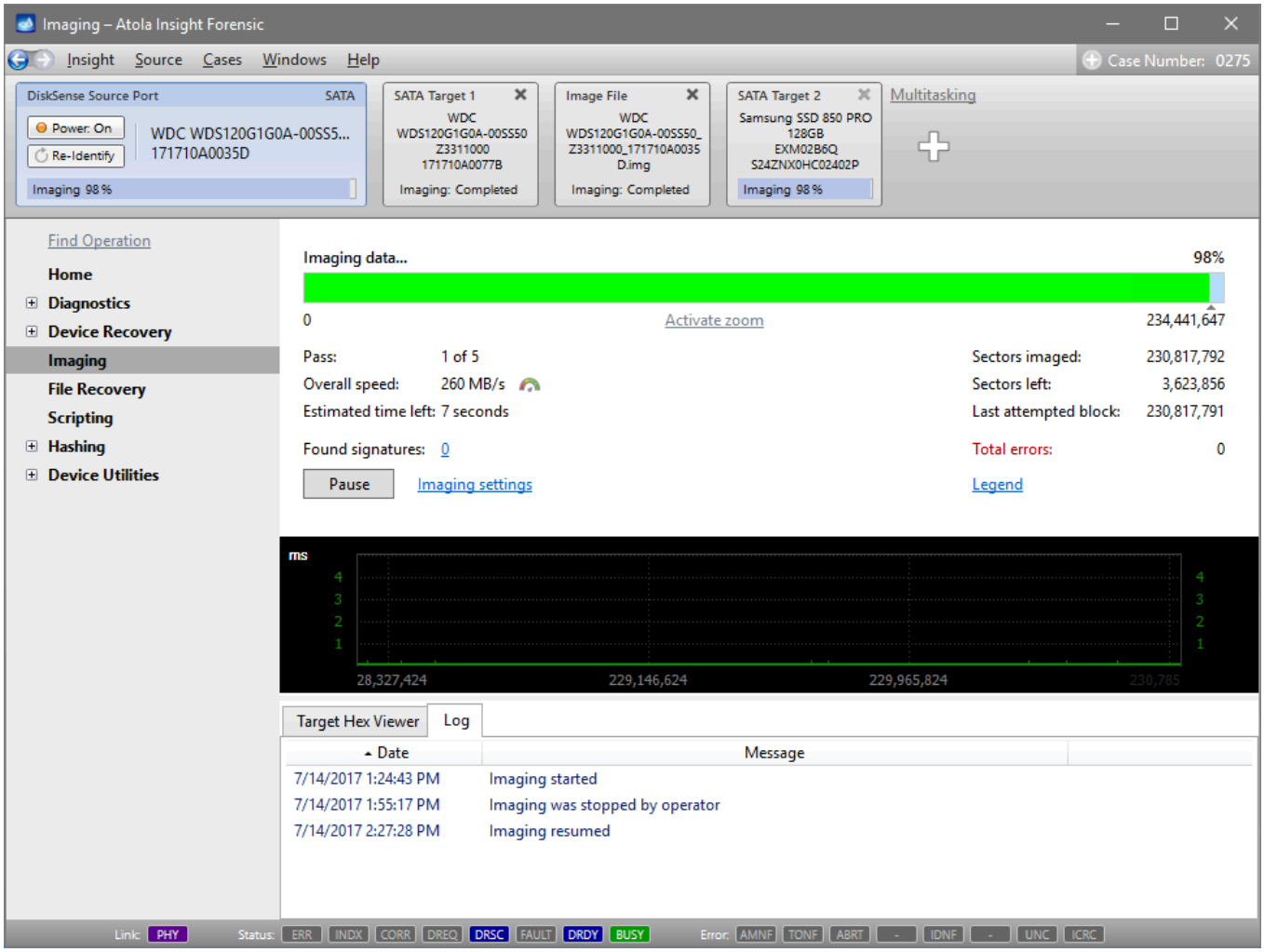
4. To resume imaging to each separate target, click **Resume** in each target's **Imaging Session**.



5. The resumed imaging session skips all the sectors imaged to the target during the previous session.



This way you can complete the imaging to all targets at different times, as they become available.



If a target becomes unavailable during imaging, the process automatically stops, and you can try to either resume the imaging to all targets, or split imaging sessions should it be necessary.

Imaging only selected sectors

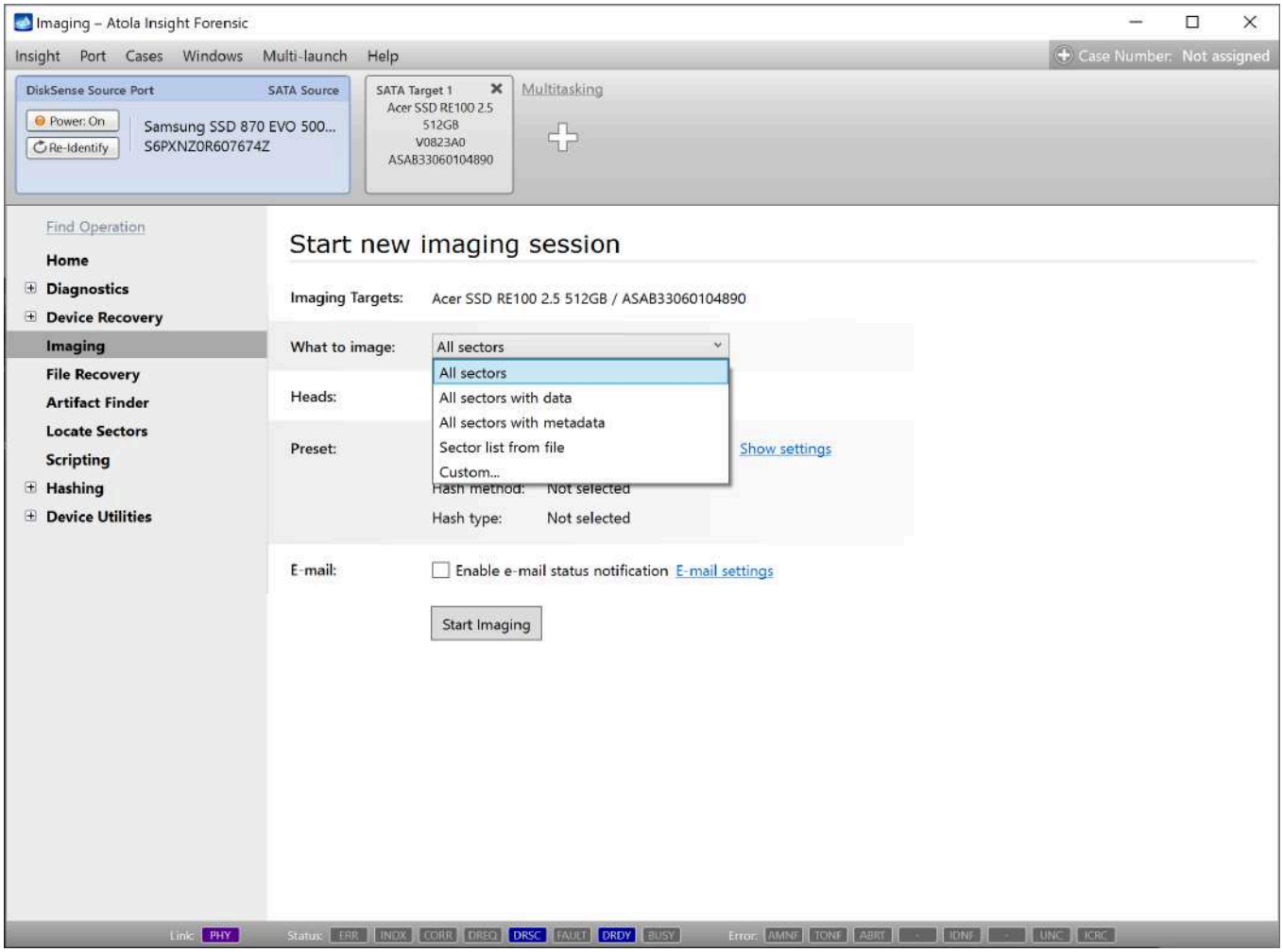
While physical imaging involves sector-for-sector copying of the whole evidence drive from the first LBA to the last one, selective acquisition implies bit-for-bit copying of the file structure.

The selective acquisition is handy when time is limited and you need to quickly start working with the file structure. At the same time, the image of only selected sectors does not include remaining fragments of previously deleted files, which makes this imaging method incomplete. On top of that, the hash values of the source and the target drives as a result of such imaging will not be identical. For these reasons, it may be preferable to use a physical image.

This guide will show how Atola Insight Forensic's flexible imaging functionality enables users to perform selective imaging. As for image verification, this guide will demonstrate how segmented hashing can help you verify such an image.

All sectors

By default, Insight Forensic is set to image **all sectors** of a drive. With this option selected in the **What to image** list on the imaging setting screen, the system will create a full physical copy of a source drive.

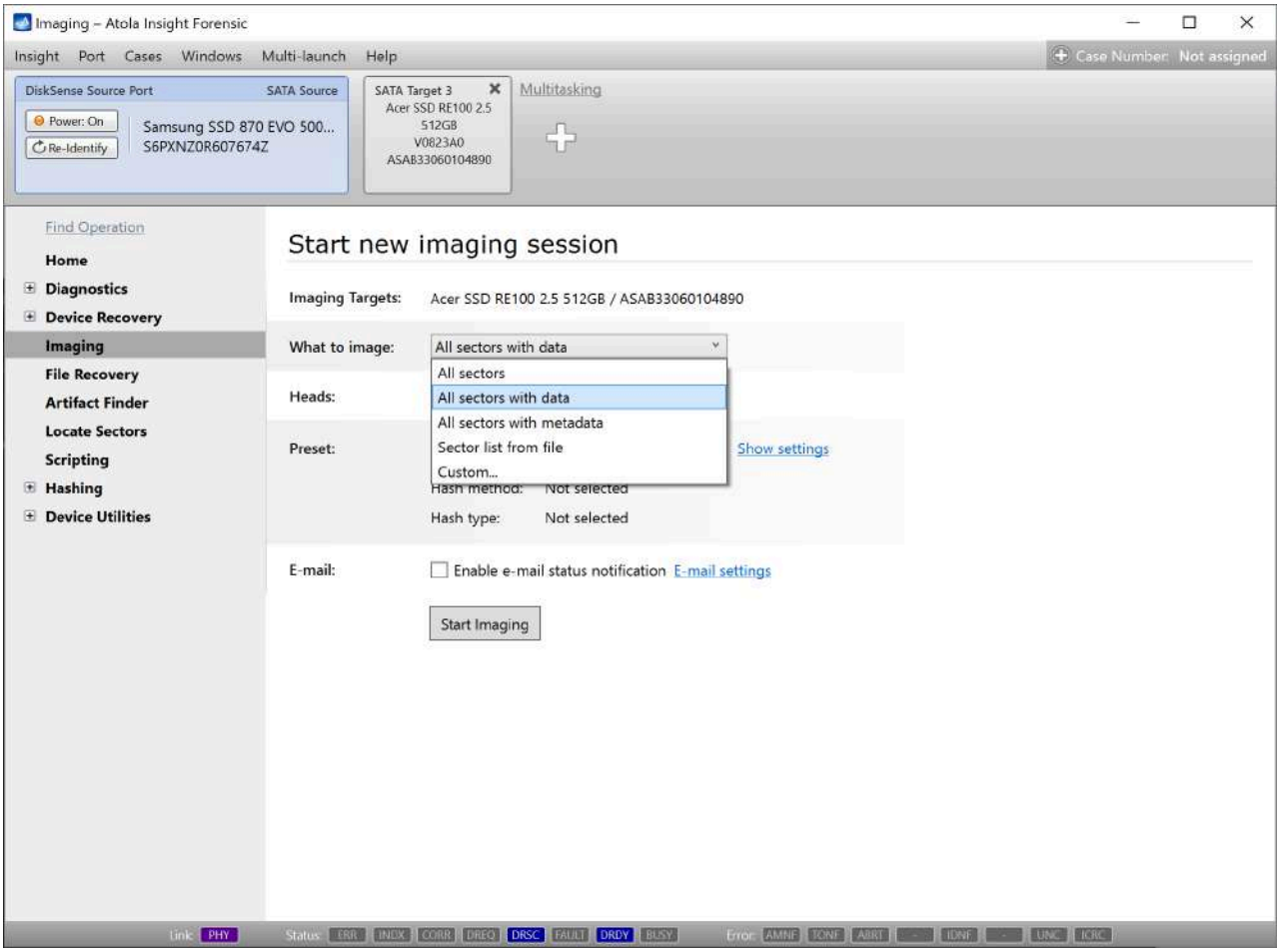


The All sectors option selected in the What to image list.

All sectors with data

To image the whole system structure of the drive including folders and files, while omitting the areas with no data or fragments of previously deleted files, do the following:

1. Go to **Imaging** > **Create New Session**.
2. In the **What to image** list, select **All sectors with data**.



The All sectors with data option selected in the What to image list.

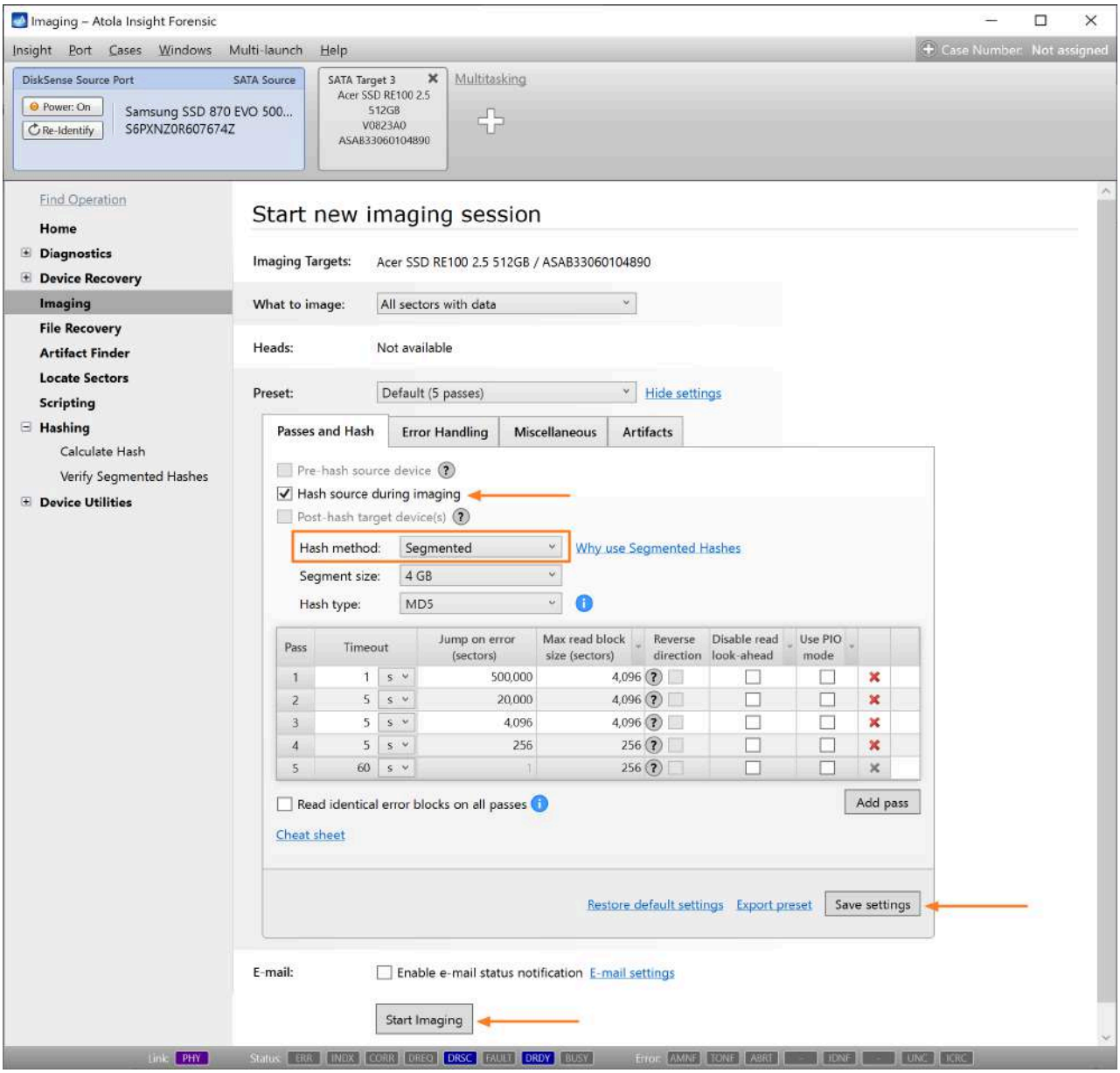
3. **Recommended:** Enable segmented hashing for an imaging session:

    a. In the **Preset** section, click the **Show settings** link.

    b. On the **Passes and Hash** tab, enable **Hash source during imaging**.

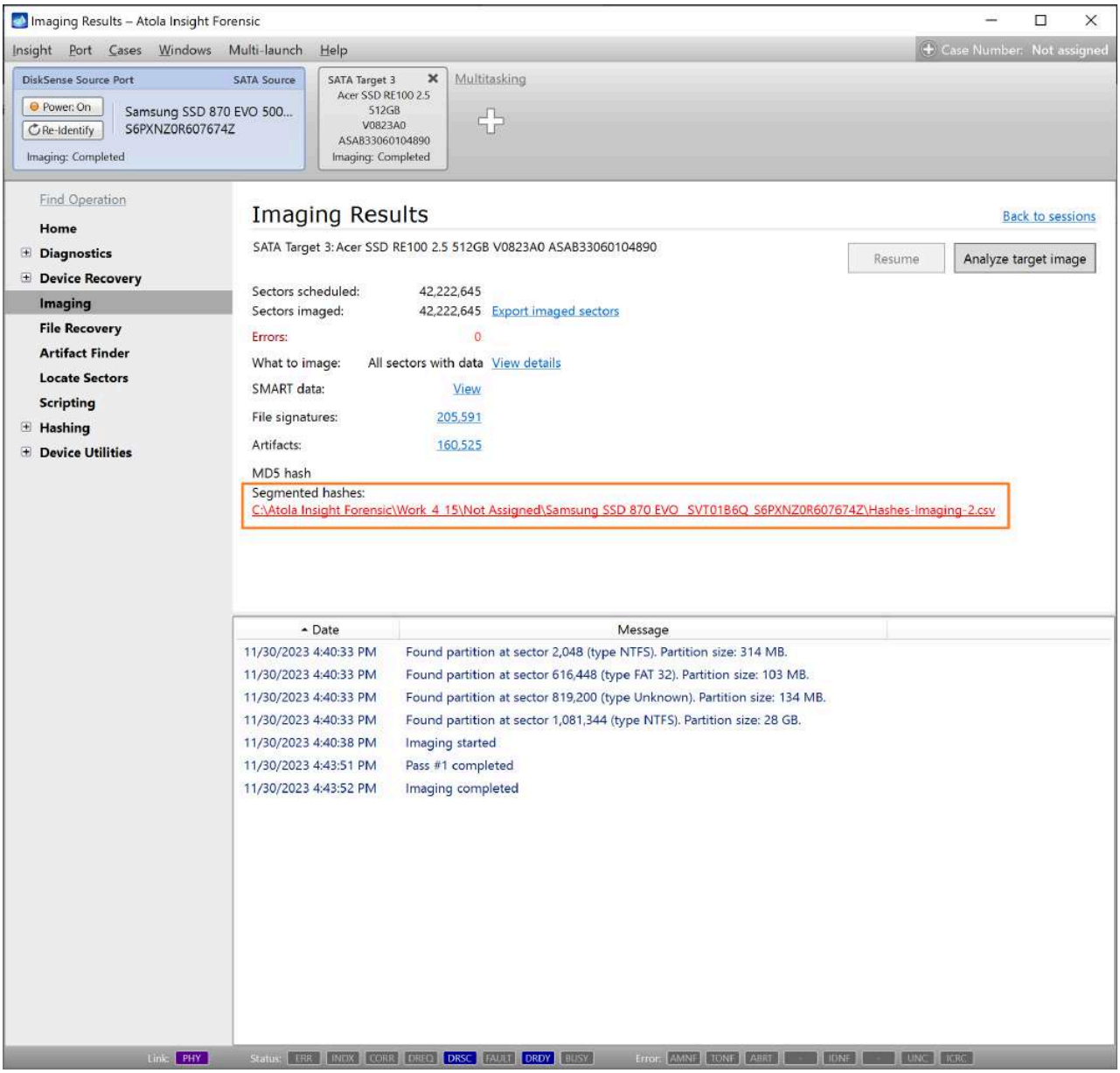
    c. Set the **Hash method** to **Segmented**.

    Otherwise, if you use the linear hashing method, the hash values of the source and the target drives, as a result of imaging only sectors with data, will not be identical.



Enabling segmented hashing in the imaging settings.

4. Adjust other imaging settings as needed and click **Start imaging**.
5. When you choose to image all sectors with data, the imaging log adds a message about the partitions Insight has been able to find. A link to the file with segmented hashes is included in the **Imaging Results** report.



The Imaging Results report with messages about partitions found during imaging all sectors with data.

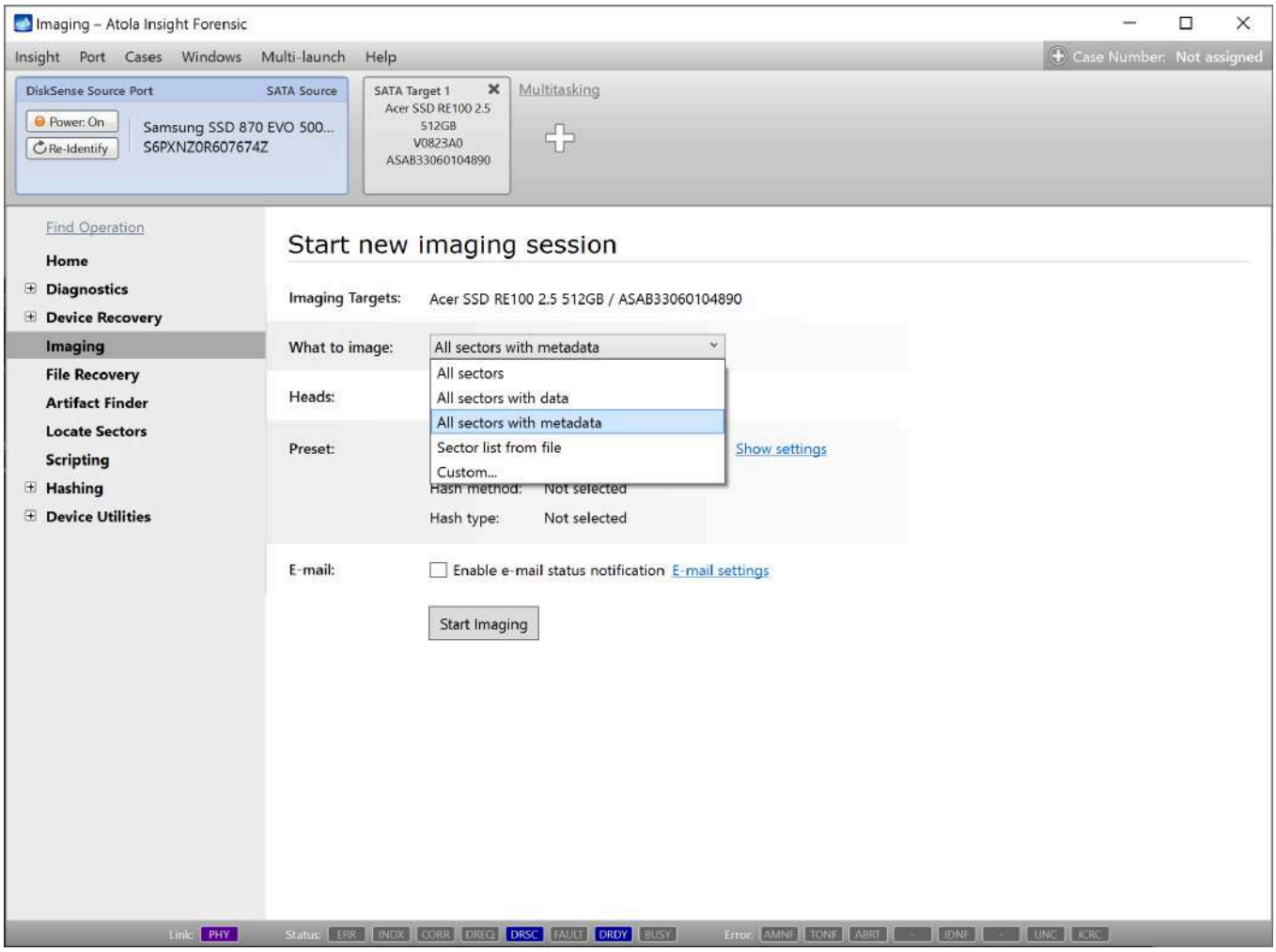
All sectors with metadata

To image only the system structure of a drive without data within its files (for example, MFT in NTFS), do the following:

1. Go to **Imaging** > **Create New Session**.
2. In the **What to image** list, select **All sectors with metadata**.
3. Adjust other imaging settings as needed and click **Start imaging**.

Imaged metadata can be used later to browse through files and select the ones to be imaged in full. For more details, watch this video guide: Benefits of imaging metadata.

When choosing to image all sectors with metadata, the imaging log adds a message about the partitions that Insight has been able to find.

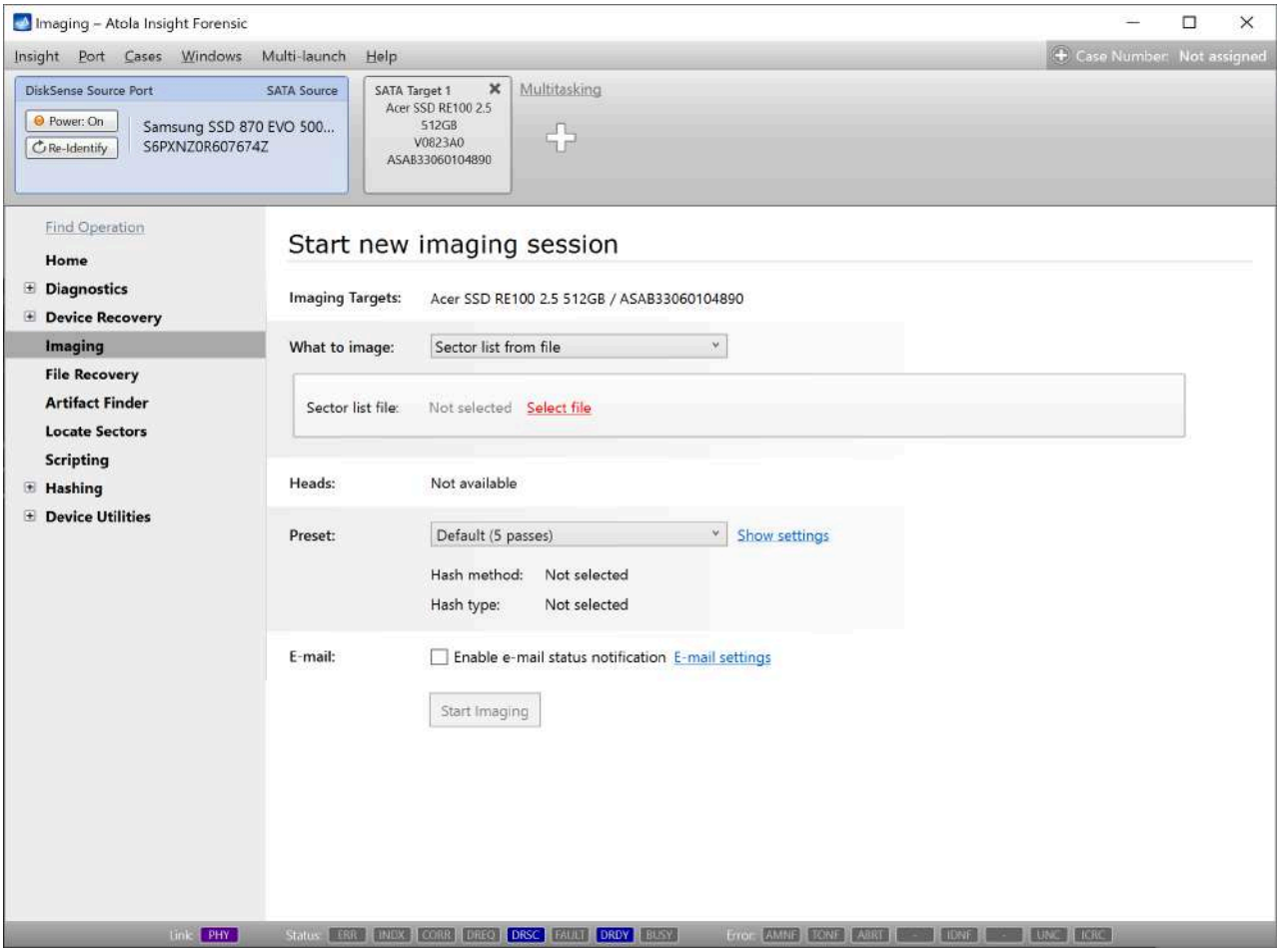


The All sectors with metadata option selected in the What to image list.

Sector list from file

If you have a text or a CSV file with a list of sectors you want to image, you can select the relevant option in the imaging settings, and Insight Forensic will image only the sectors specified in the file you provided:

1. Go to **Imaging** > **Create New Session**.
2. In the **What to image** list, select **Sector list from file**.
3. Click the **Select file** link and choose a file with a list of sectors.
4. Adjust other imaging settings as needed and click **Start imaging**.

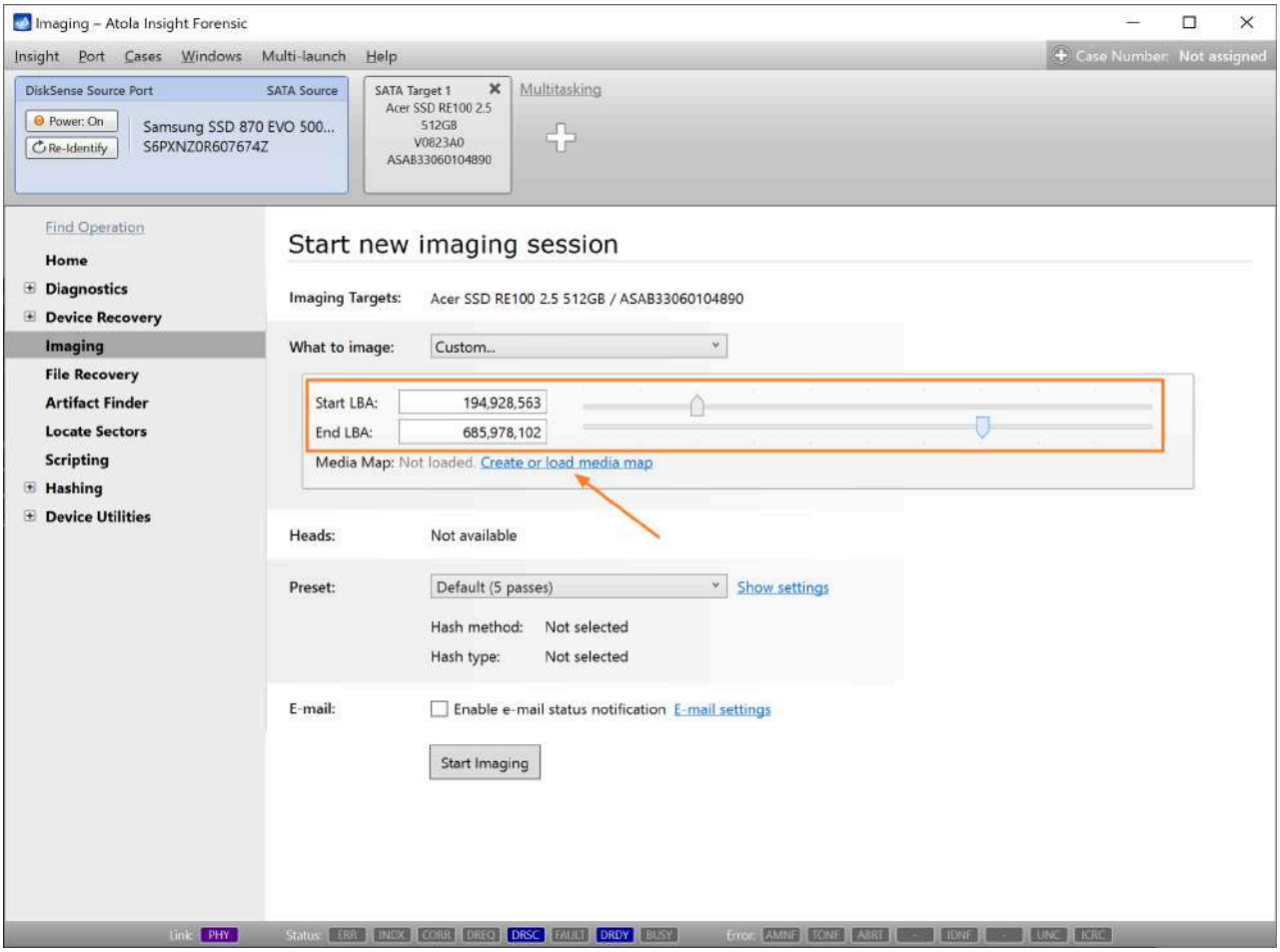


Selecting a file with a sector list to image in the imaging settings.

Custom sector selection

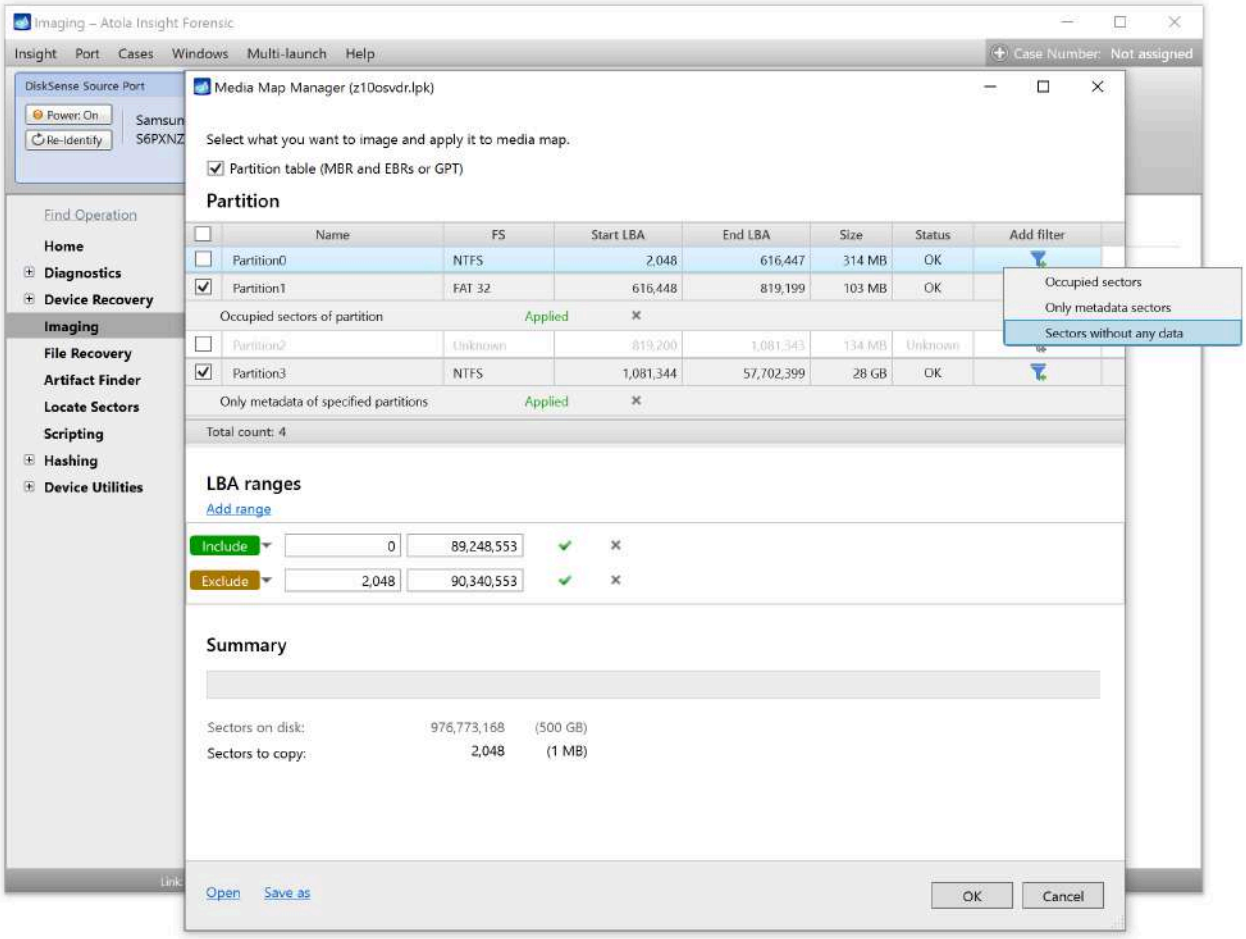
In Insight Forensic, you can fine-tune sector ranges you want to image, specifying start and end LBA, including or excluding certain partitions or sector ranges, or customizing imaging ranges for each partition. Here's how to do it:

1. Go to **Imaging > Create New Session**.
2. In the **What to image** list, select **Custom**.
3. **Optional:** To adjust Start and End LBA, enter values in the respective fields or use sliders.
4. Click the **Create or load media map** link.



The Create or load media map link on the imaging settings screen.

5. The **Media Map Manager** window opens. Here are various options to customize the sector ranges for imaging:
    - In the **Partition** section, you can select partitions to be imaged. Also, you can add a filter for each partition to specify which sectors to image:
        - occupied sectors,
        - only metadata sectors, or
        - sectors without any data.
    - In the **LBA ranges** section, you can add custom sector ranges you want to image, as well as exclude certain sector ranges from imaging. Click the **Add range** link, choose the **Include or Exclude** option from a list and enter the start and end LBA for a range.
    - As you adjust sector range settings, the **Summary** section immediately updates information about the number of sectors scheduled for copying and their total size.



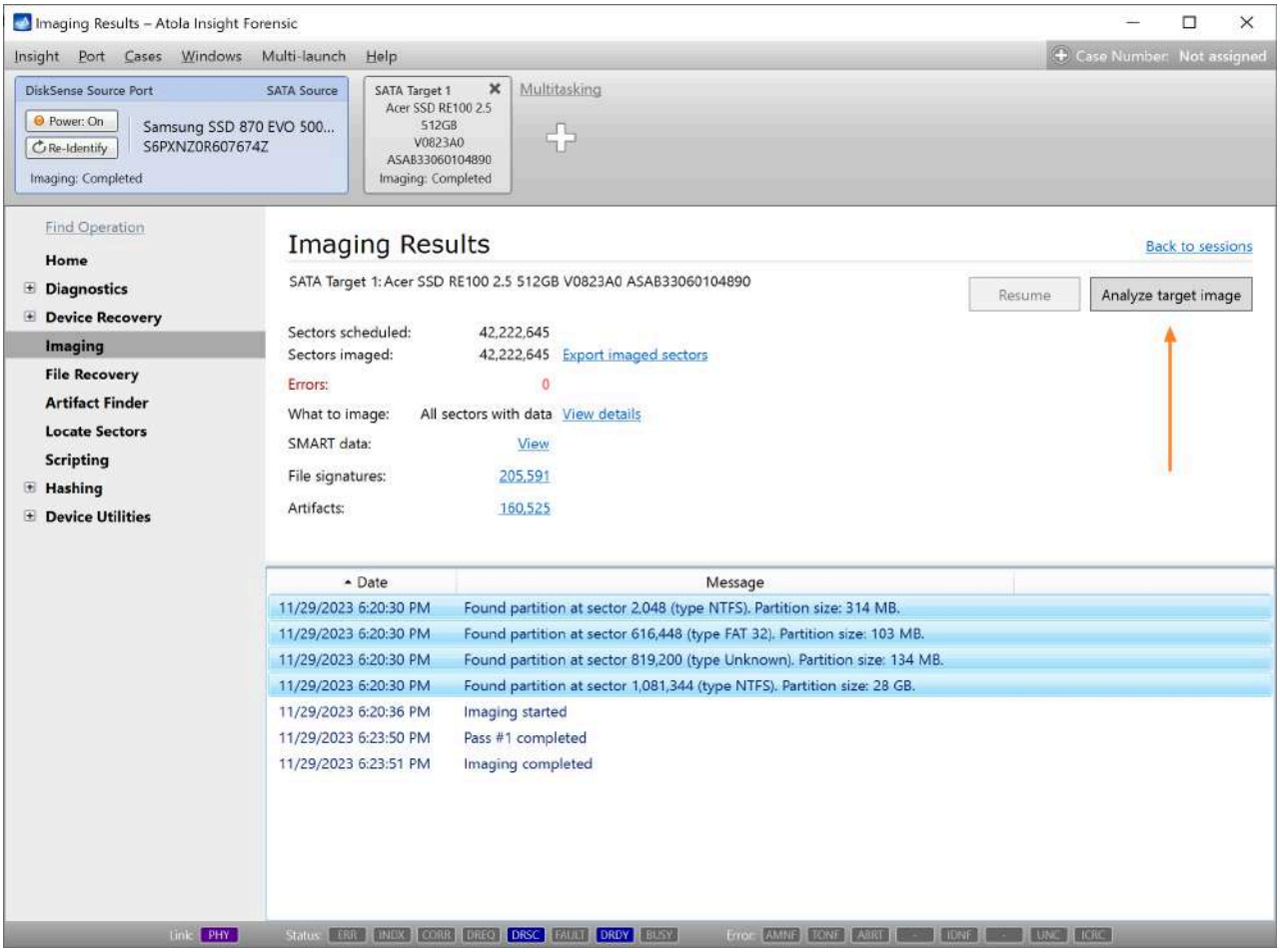
Adjusting sector ranges for imaging in the Media Map Manager window.

6. After adjusting sector ranges, click **OK**.
7. Back on the **Start new imaging session** screen, adjust other imaging settings as needed and click **Start imaging**.

Analyze data from the imaged sector ranges

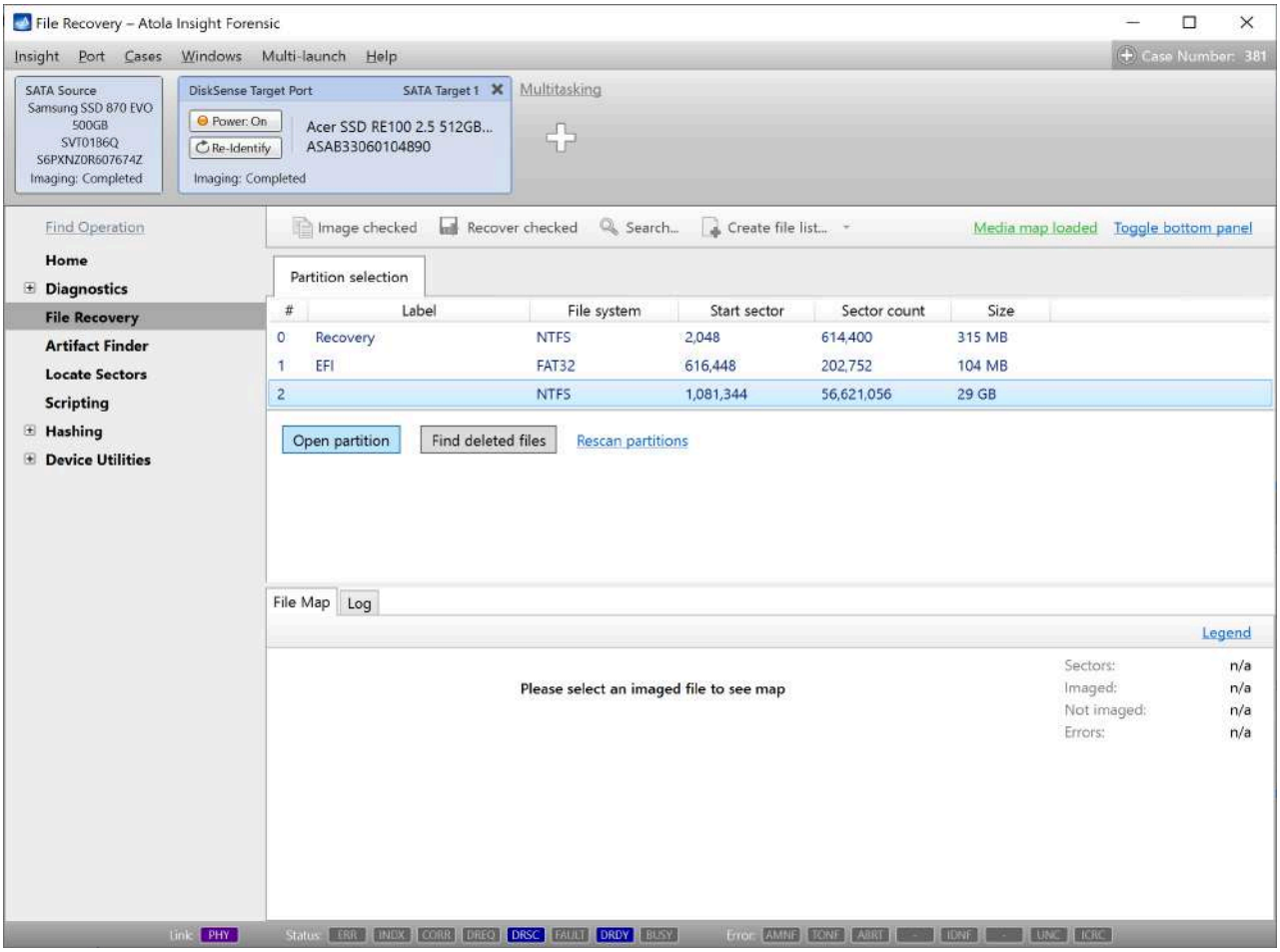
Once imaging of the selected sector ranges is complete, you can view the structure of the resulting image you have obtained:

1. On the Imaging results screen, click **Analyze target image**.

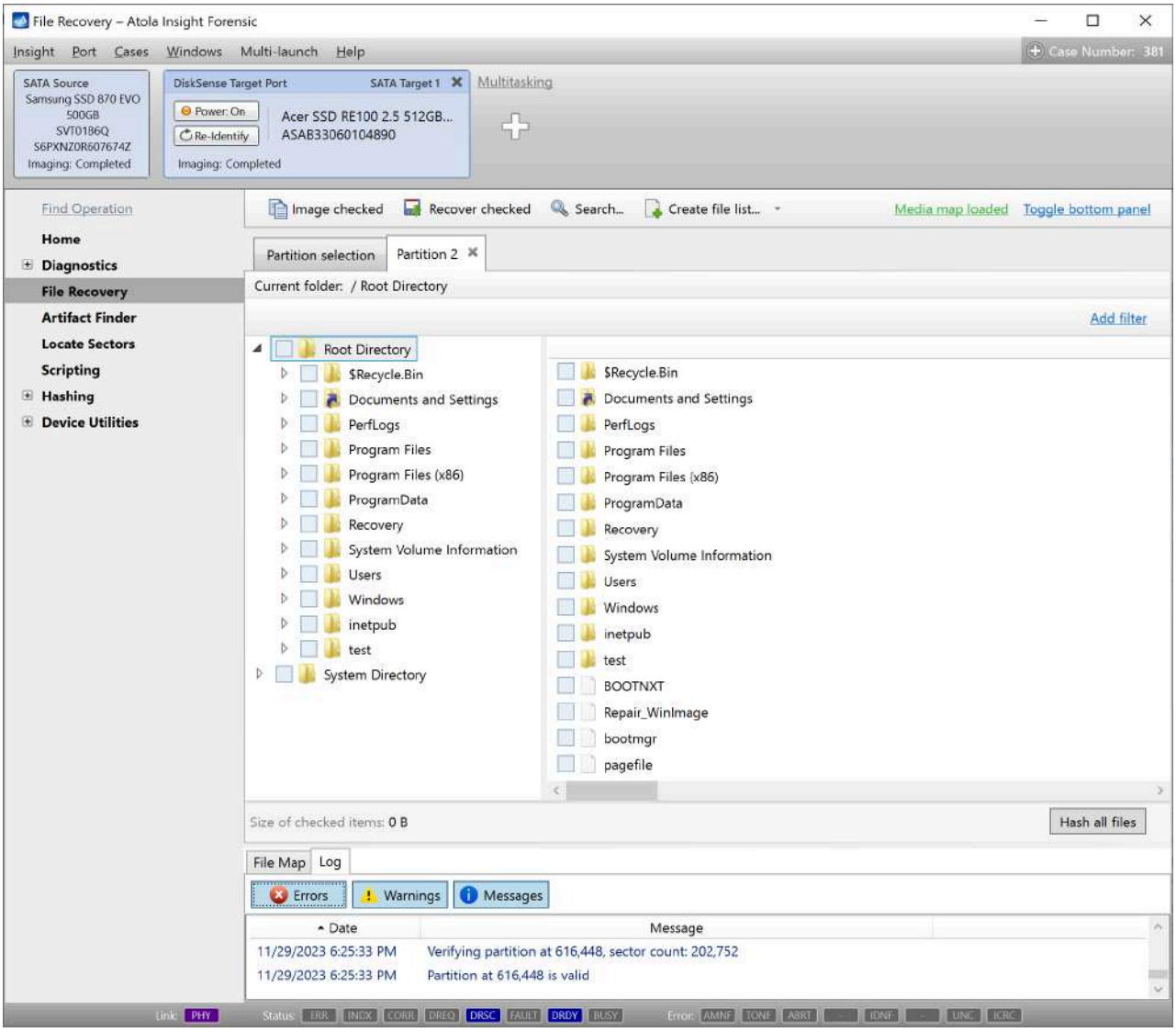


2. The Target port opens. Click the **Scan partitions** button.

3. Select any of the imaged partitions you want to preview and click the **Open partition** button.



4. Browse through the imaged folders and files.



NVMe drive imaging via NVMe-to-USB adapter

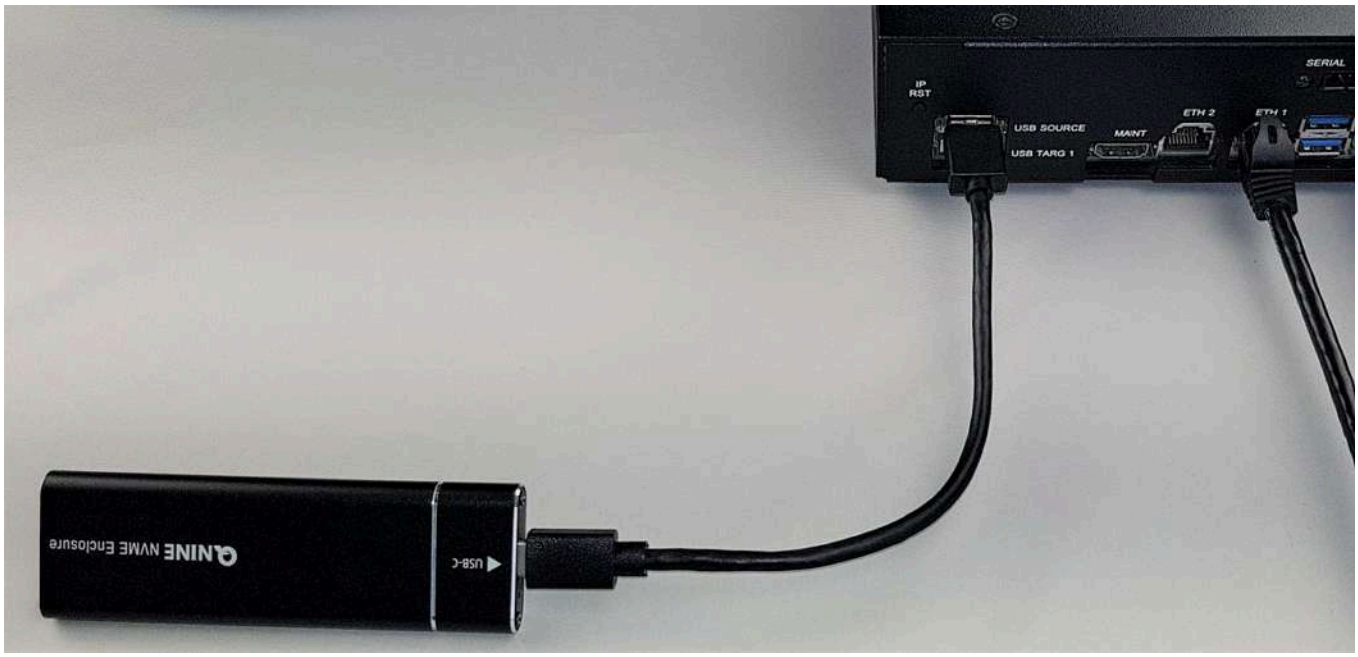
Atola Insight Forensic with the older DiskSense unit (2014) supports NVMe drive imaging via NVMe-to-USB adapter, based on the JMS583 chip.

Connect an NVMe drive

To start working with an NVMe drive:

1. Power on your DiskSense unit.
2. Plug an NVMe drive into the NVMe-to-USB adapter.
3. Connect the adapter to the USB source port.

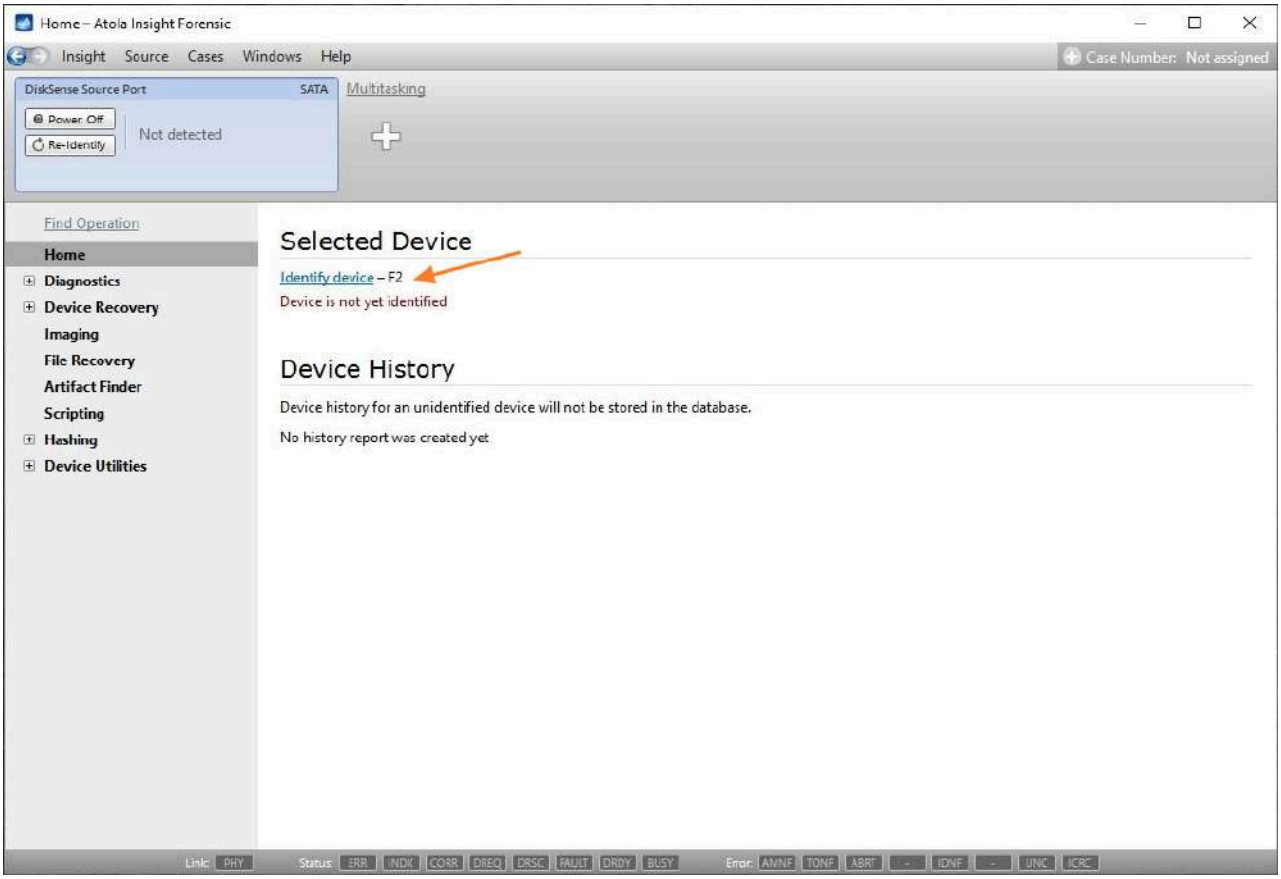
In case the unit is booted with a device plugged into its USB port, the booting will not be completed correctly.



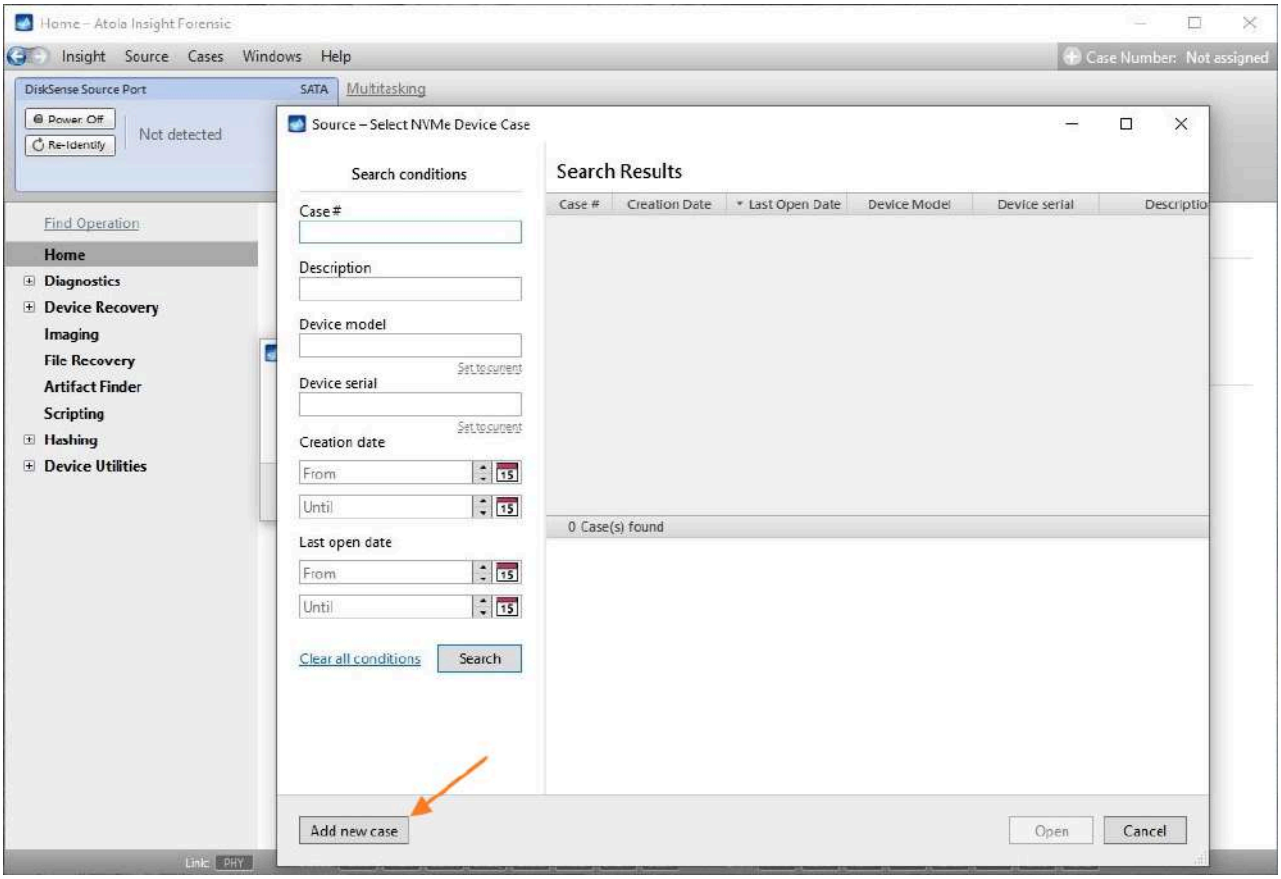
Identify the source drive

To identify the source drive:

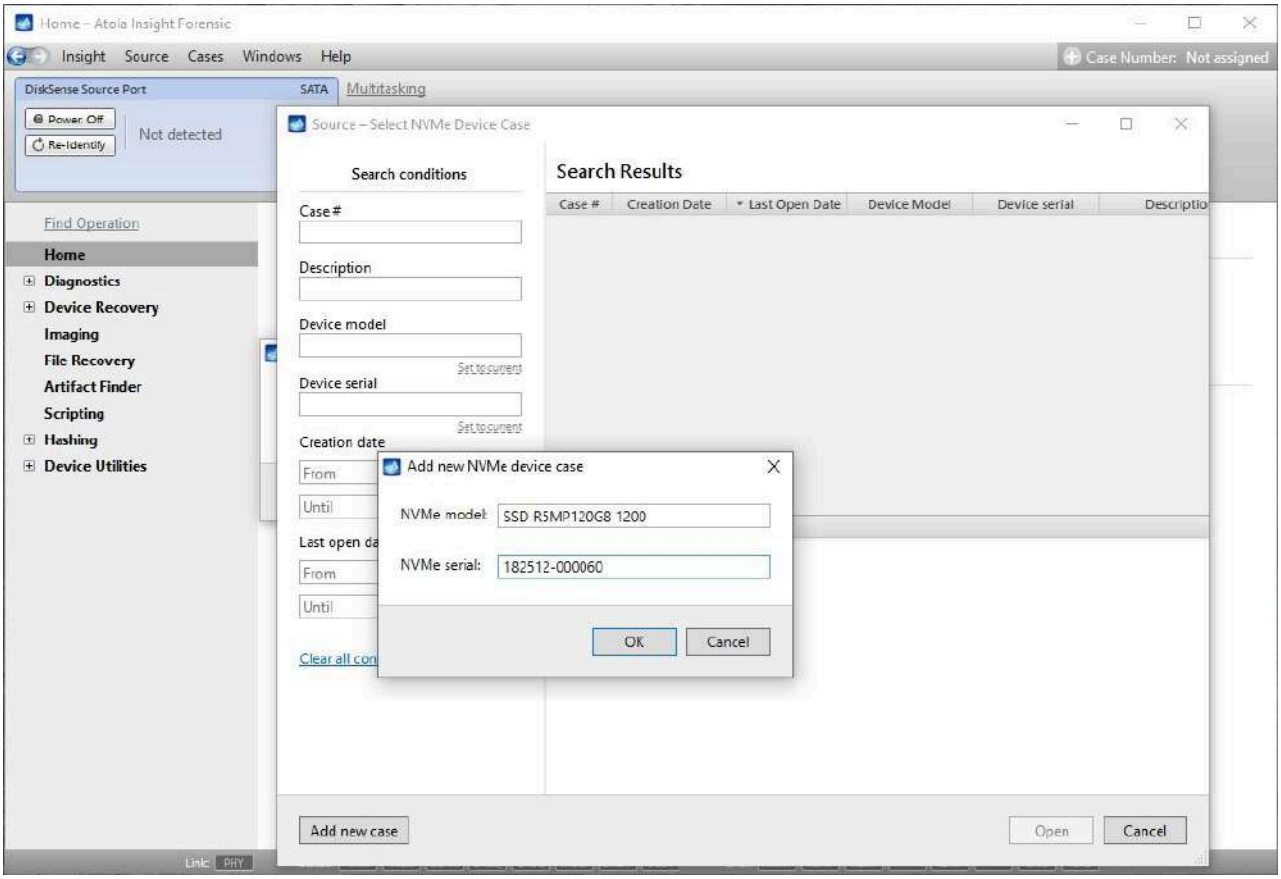
1. On the Home screen, click the **Identify device** link or press the **F2** button on your keyboard.
2. In the **Source Device Selection** dialog, select the NVMe device connected to the USB source port.



3. If the same drive had been connected and identified with your Insight before, select a previously created case or click the **Add new case** button.



4. To create a new NVMe device case, in the **Add new NVMe device case** dialog, enter the NVMe model and serial number.

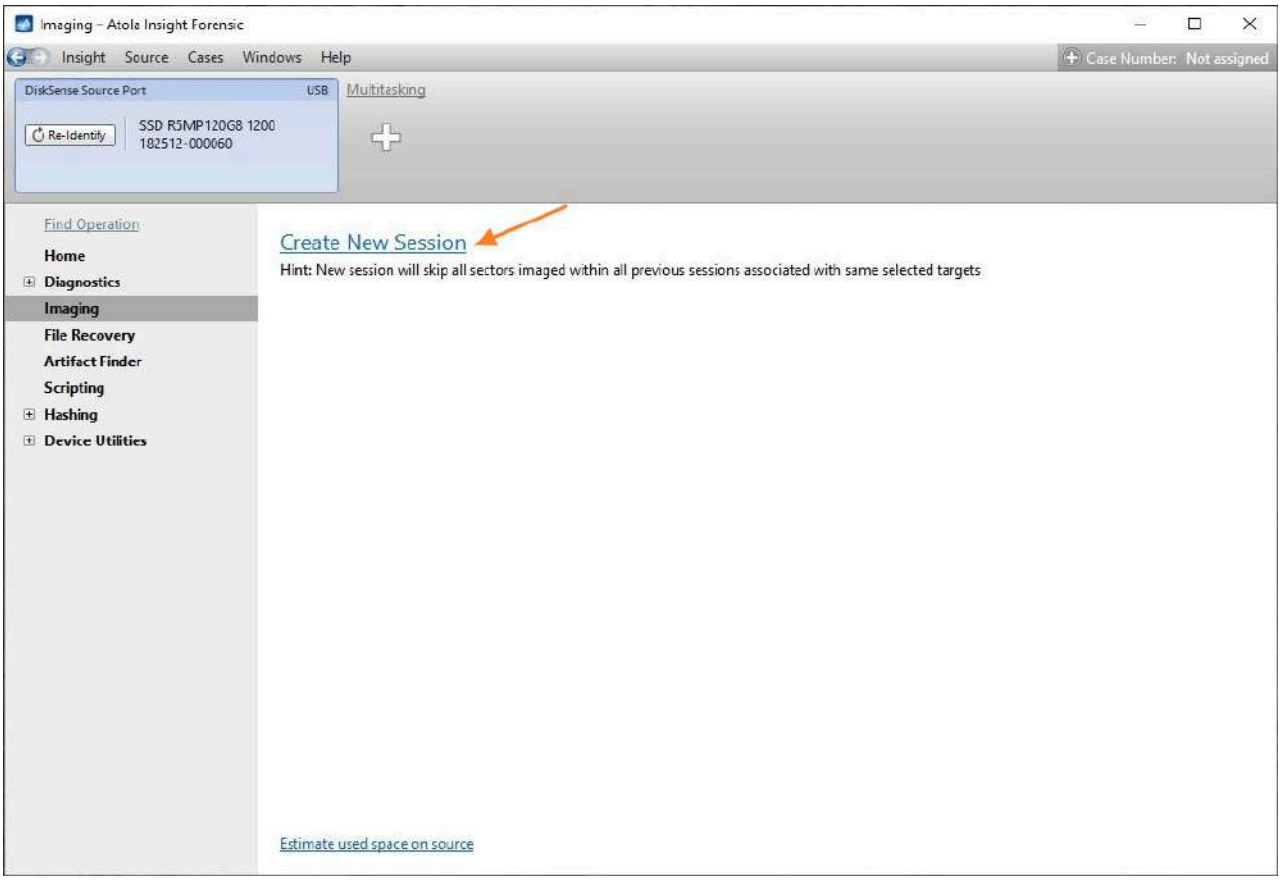


NVMe model and serial number can be found on the device's label:

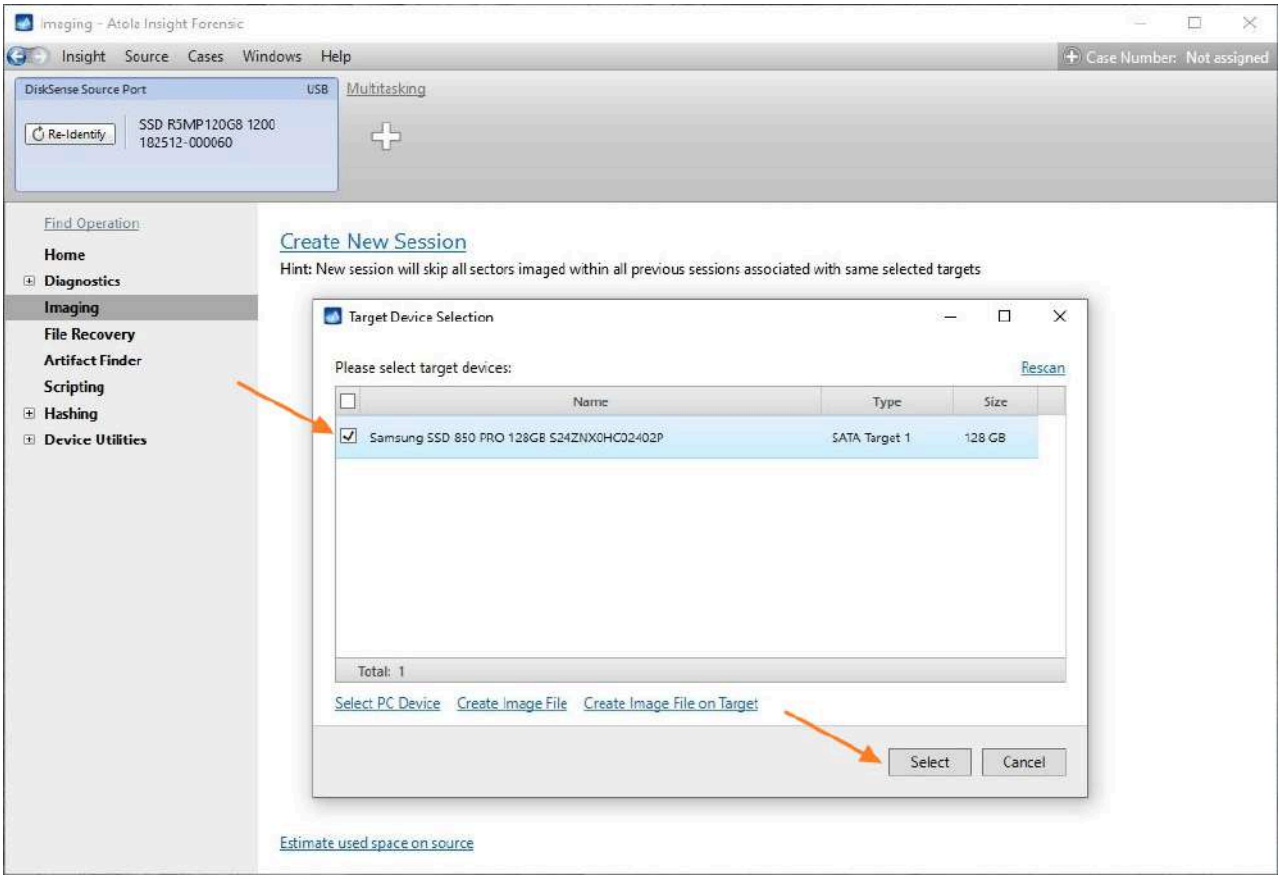
Image an NVMe drive

To launch an imaging session:

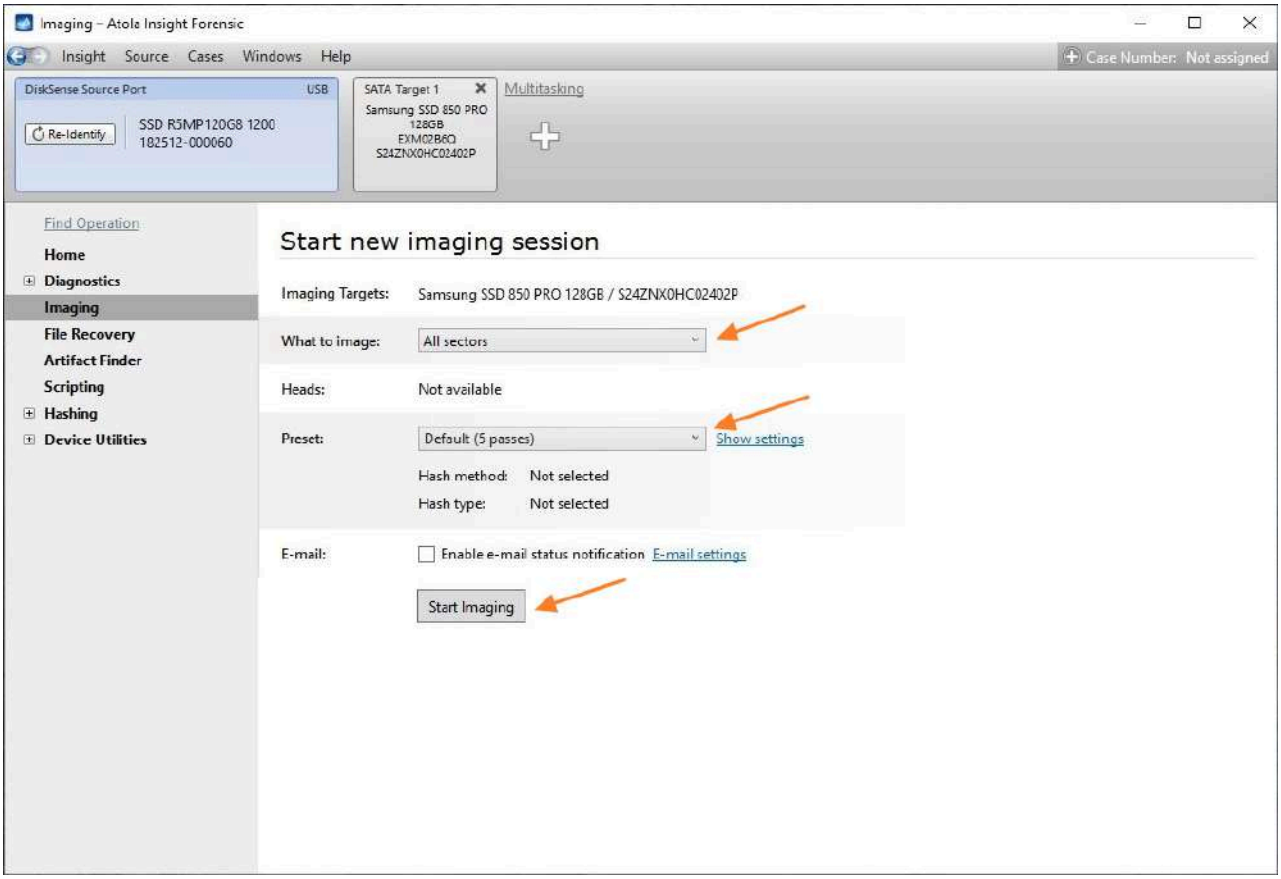
1. In the sidebar, click **Imaging**.
2. Click the **Create New Session** link.



3. Select the target device and confirm by clicking the **Select** button.



4. In **Imaging settings**, specify the parameters for the imaging session.
5. Click the **Start Imaging** button.



6. Insight starts imaging the NVMe drive.

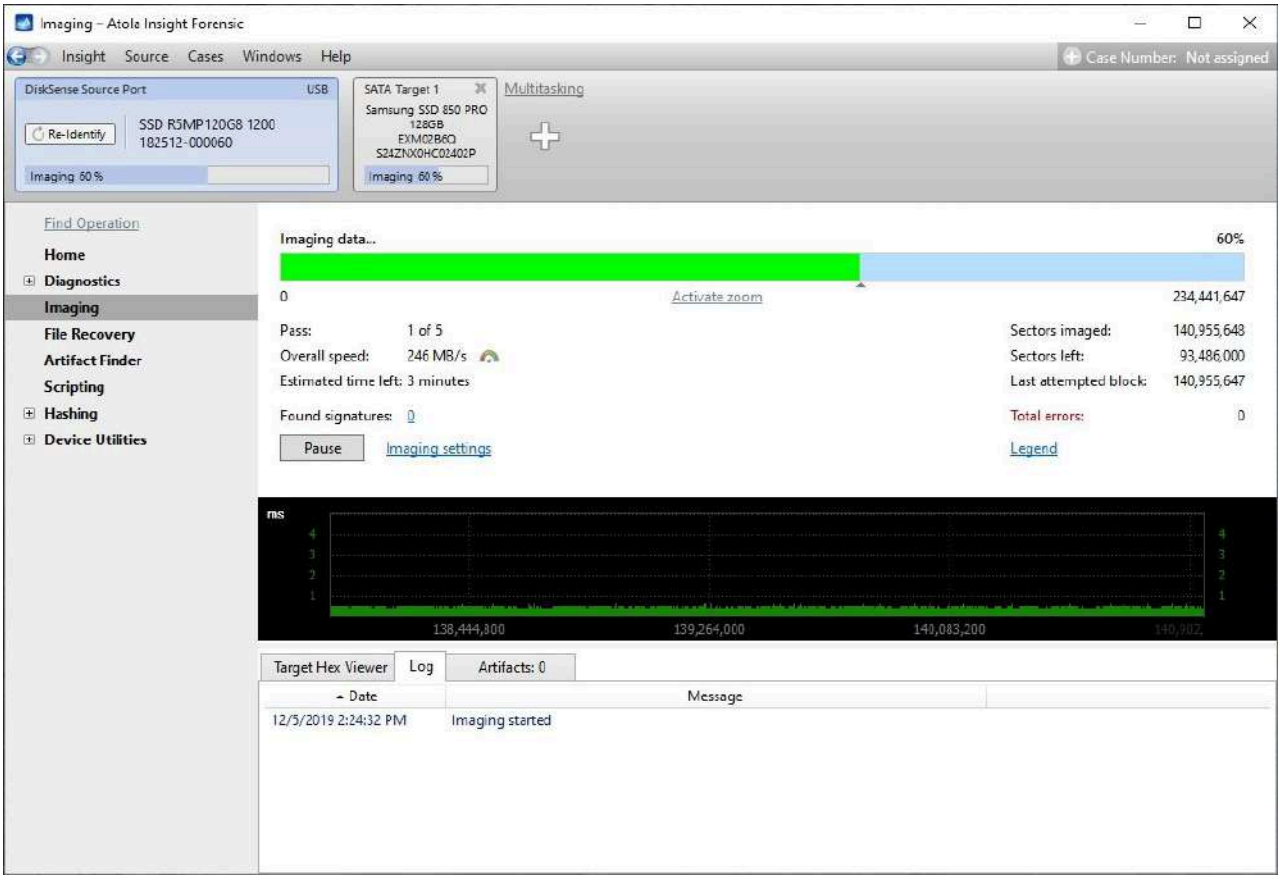


Image a remote drive using the iSCSI protocol

The iSCSI network protocol lets you access devices remotely. With its help, you can also image drives that can't be plugged into the DiskSense hardware unit. These could be drives soldered into a motherboard, servers that can't be turned off, or devices you have legal access to but not the right to seize.

Up to 3 remote network drives can be imaged in parallel via iSCSI.

To set up an iSCSI target correctly and expose a physical or logical drive via iSCSI on a network, you can utilize a Python script provided by Atola that automatically creates iSCSI targets for all drives except for a boot device.

Automatically create iSCSI targets

To expose a physical or logical drive via iSCSI on a network, first, you need to set up an iSCSI target correctly. To help you with that, Atola engineers created a Python script named iscsi-targets, that automatically creates iSCSI targets for all drives except for a boot device.

Download iscsi-targets from GitHub →

Features of the ‘iscsi-targets’ script

- Automatically creates iSCSI targets for all drives except for a boot device.
- Ensures that the iSCSI Qualified Name (IQN) of every iSCSI target includes the drive model and serial number. When you add such an iSCSI target in Atola imagers as a source drive, the imager’s software pulls the drive model and serial number from IQN into a case.
- Lets you specify a block device as a script argument to create an iSCSI target only for it.

What you need to run the ‘iscsi-targets’ script

The script runs on **Linux only**. It was tested on various flavors of Linux like Ubuntu, Fedora, CentOS, and RHEL, including DFIR boot images: Paladin, Caine, and Tsurugi.

1. **Python 3.6+** must be installed.
2. The script will also check for and install two dependencies the first time it is run:
    - *targetcli*
    - *python3-rtslib*

How to use the ‘iscsi-targets’ script

Here are some examples of using the ‘iscsi-targets’ script.

1. Create iSCSI targets for **all drives** except for a boot device:
   `*sudo python3 iscsi-targets.py*`
2. Create a **single iSCSI target** for the specified /dev/sdb1 partition:
   `*sudo python3 iscsi-targets.py /dev/sdb1*`

The example below shows the first run of iscsi-targets.py on Paladin. It has added 3 iSCSI targets for SATA and USB drives.

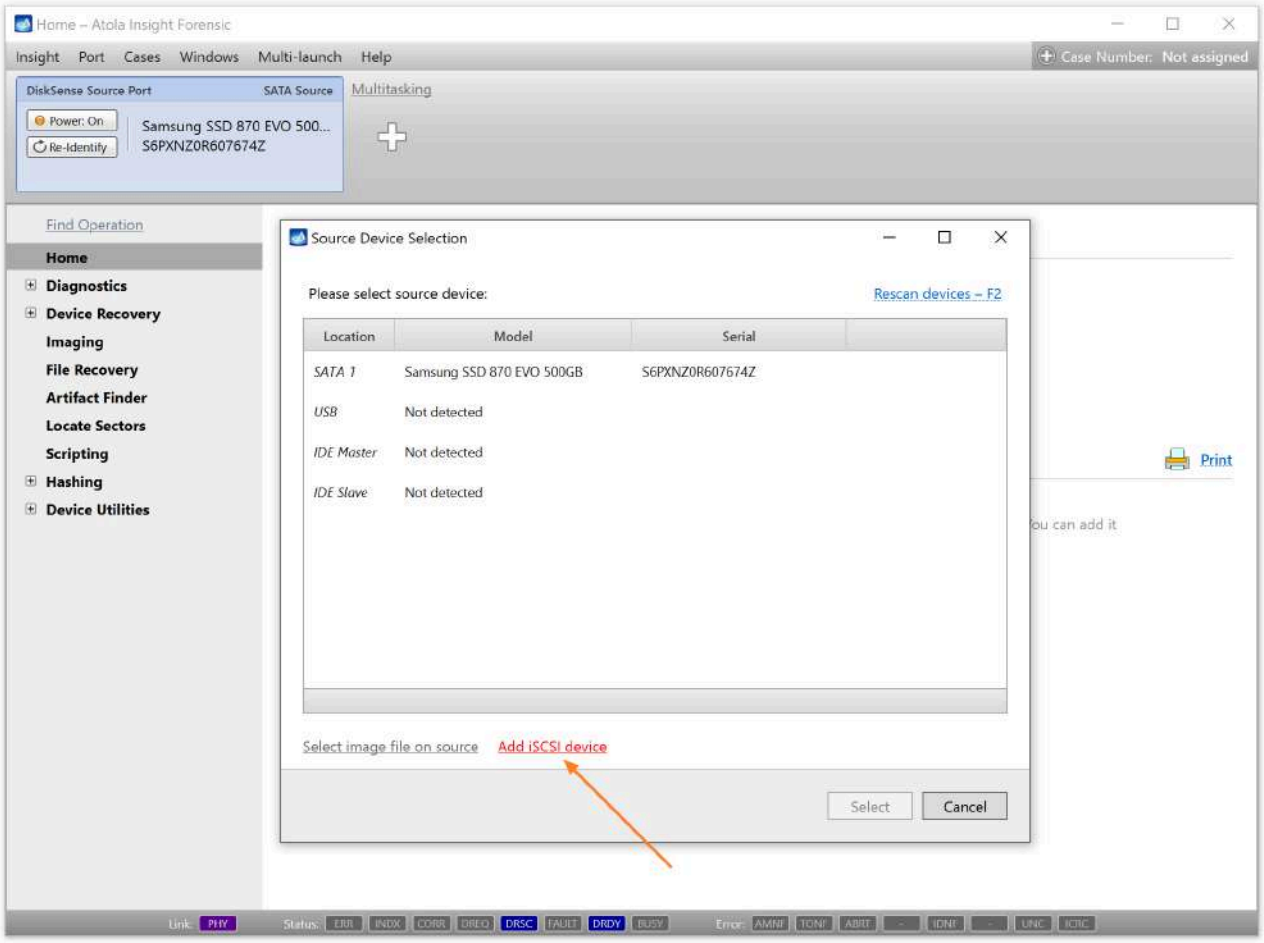
```
paladin@PALADIN:~/Downloads$ sudo python3 iscsi-targets.py
targetcli is not installed. Do you want to install it? (Y/N): y
Boot device: /dev/sdc
The following block devices will be unmounted and used for iSCSI target creation:
/dev/sda        256G-NVMe-T     0123456789AC
/dev/sdb        HyperX-Fury-3D-240G     50026B77840022F
/dev/sdd        Samsung-Portable-SSD-T  S3SWNV0M400263
Do you want to continue? (Y/N): y
iSCSI target created for /dev/sda with IQN: iqn.2024-05.com.atola:256g-nvme-t-0123456789ac
iSCSI target created for /dev/sdb with IQN: iqn.2024-05.com.atola:hyperx-fury-3d-240g-50026b77840022f
iSCSI target created for /dev/sdd with IQN: iqn.2024-05.com.atola:samsung-portable-ssd-t-s3swnv0m400263
paladin@PALADIN:~/Downloads$
```

Automated iSCSI target creation in Paladin.

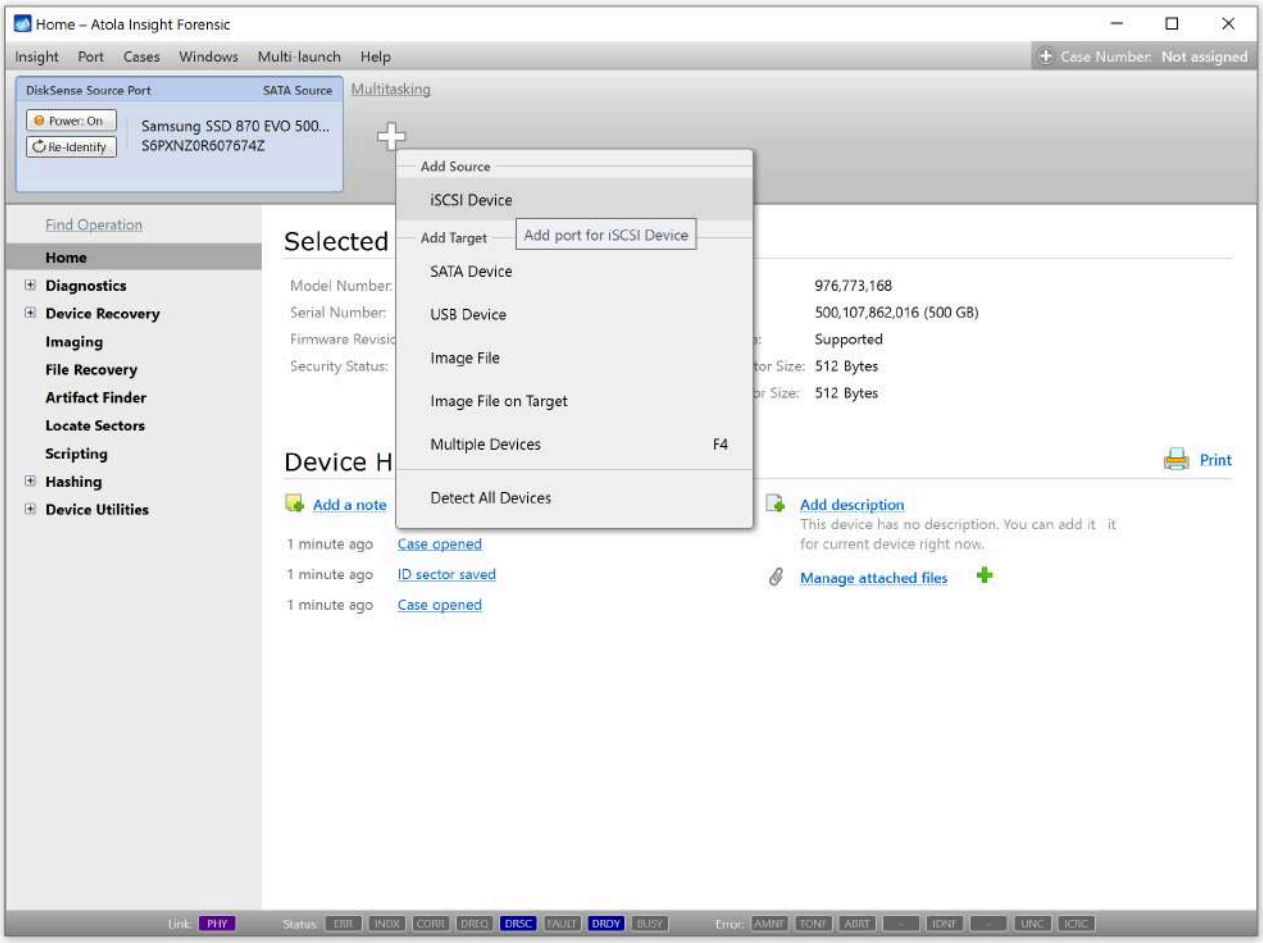
Image up to 3 remote drives in parallel using iSCSI

Here’s how to image a remote drive in Insight Forensic using the iSCSI protocol:

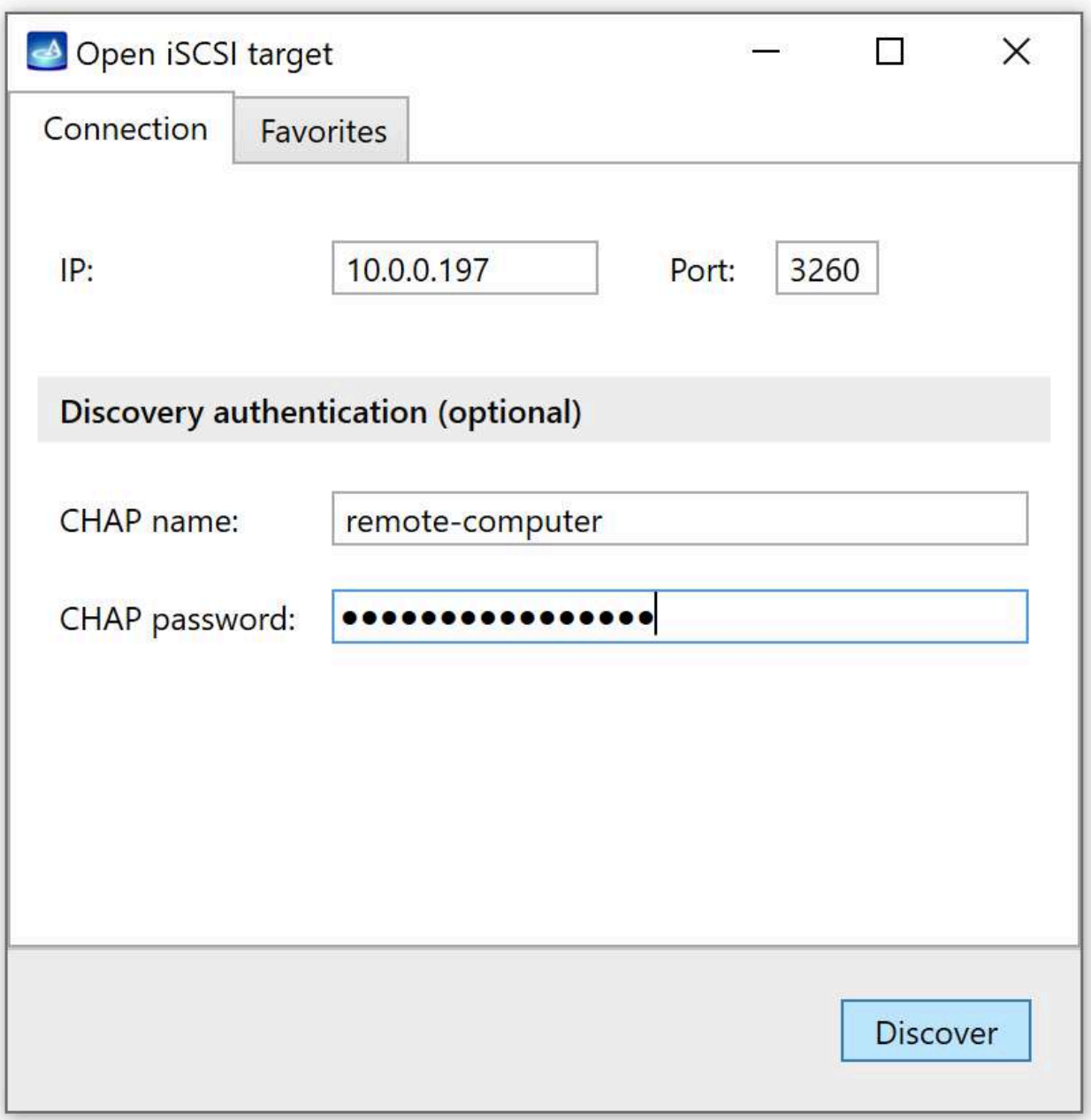
1. Expose a physical or logical drive via iSCSI on a network.
2. Go to **Port** > **Select Source** and then click the **Add iSCSI device** link.



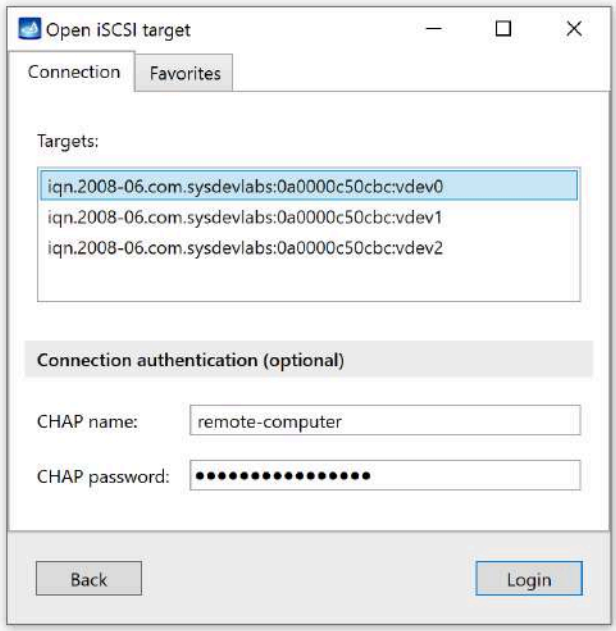
Alternatively, click the **Plus** icon at the top and in the **Add Source** menu select **iSCSI Device**.

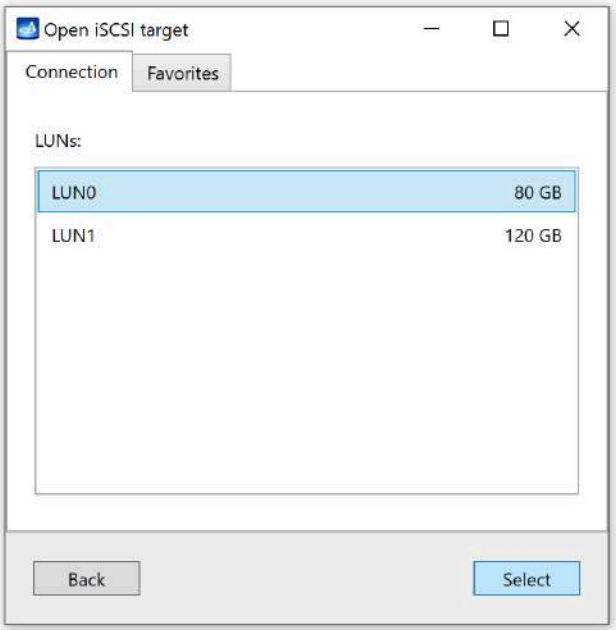


3. Enter the **IP address** and **Port** of a remote storage device. If needed, also enter a user name and password for remote authentication.

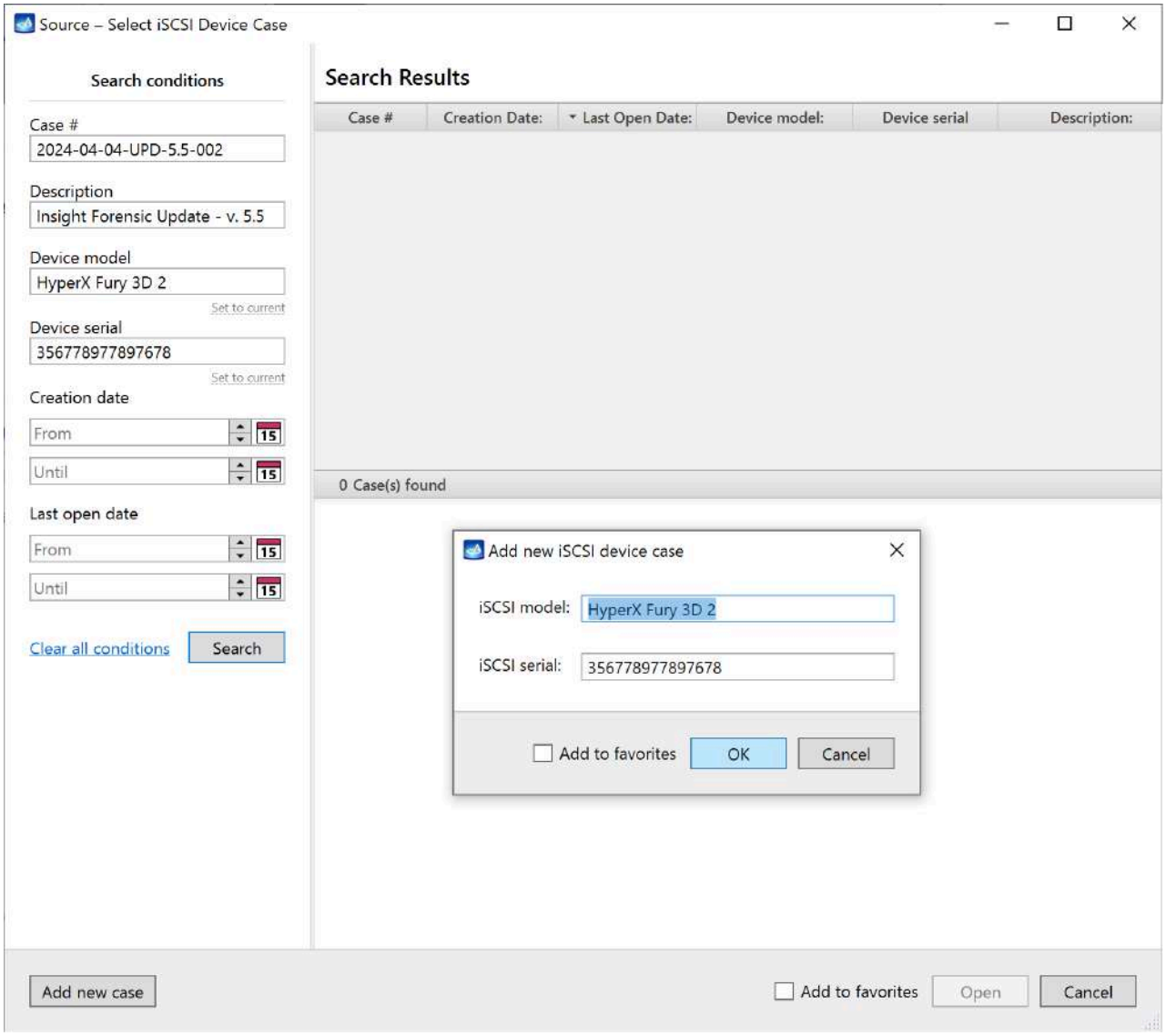


4. Click **Discover**.
5. Insight Forensic searches and shows all the iSCSI devices available at the IP and port address you provided. Select your device.

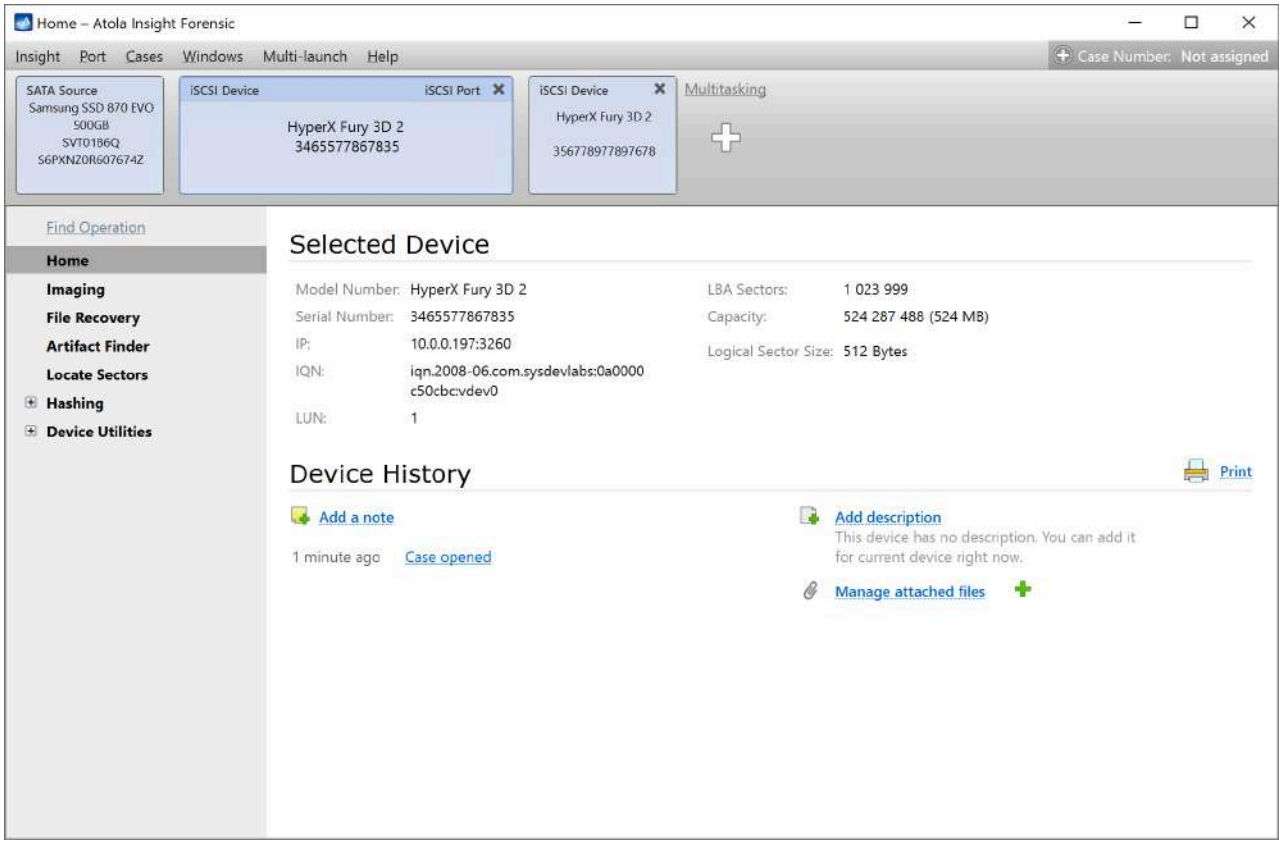




6. Create a new case for an iSCSI device or select an existing one.



7. Insight Forensic opens the selected iSCSI device as a separate port.



Now, you can image this device as usual or launch other operations, such as:

- File recovery
- Artifact finder
- Locate sectors
- Caclulate hash
- Disk editor (in read-only mode)

Multipass imaging of damaged hard drives

Physically damaged drives require a complex imaging approach to retrieve as much data as possible while approaching the bad areas in the most gentle way possible.

Atola Insight Forensic has a complex imaging functionality, which allows imaging of even physically damaged drives, avoiding their further deterioration.

Diagnose first

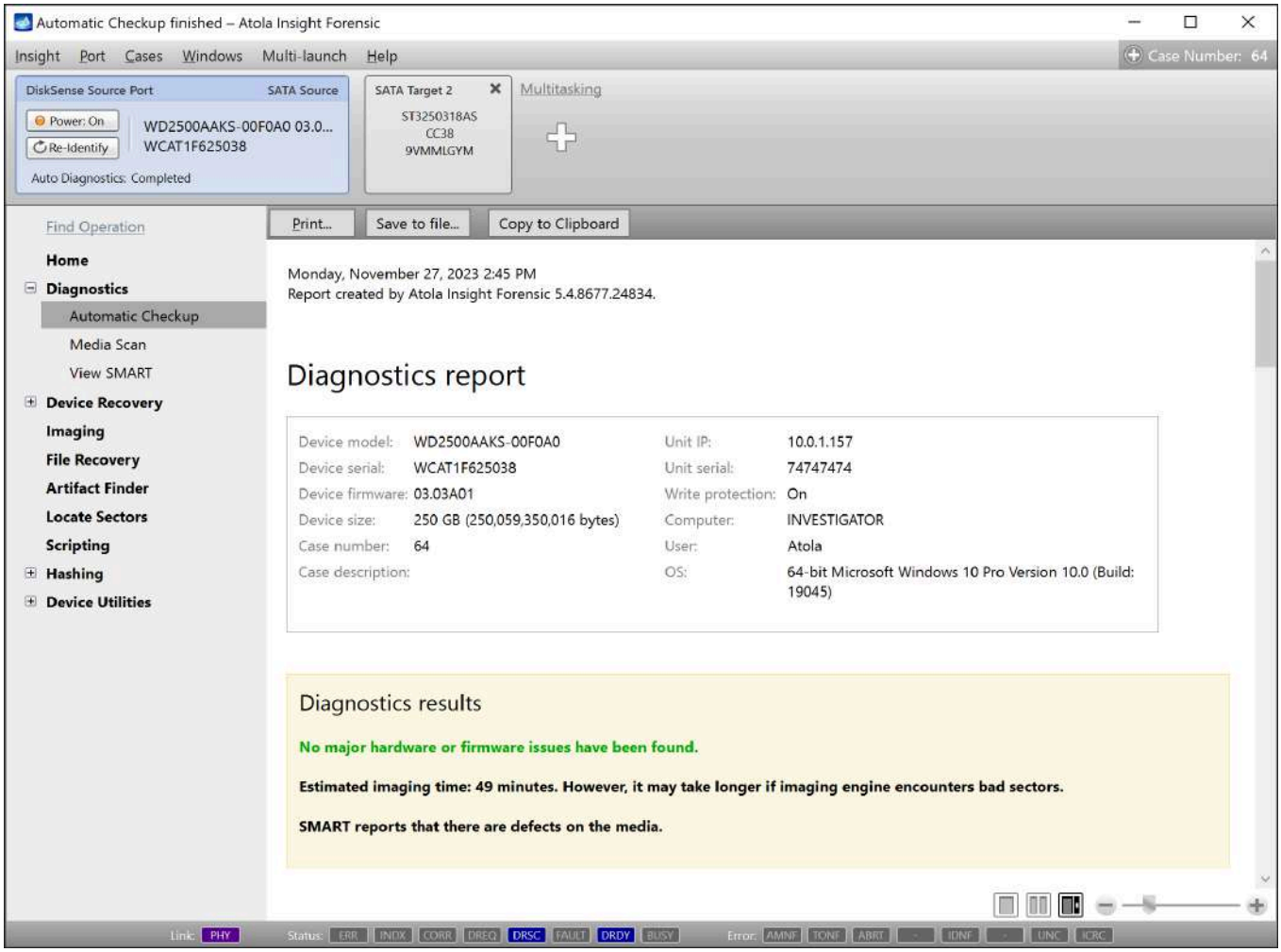
Whenever you start working on a drive, the very first thing we recommend to do is to find out if the drive is damaged in any way, and if so, what is the extent of the damage.

Insight Forensic comes with a fully automated diagnostics module. It diagnoses all drive components and data on it:

- printed circuit board (PCB),
- spindle motor,
- head stack,
- firmware,
- and file systems.

Diagnostics works properly even if the drive has burnt parts or damaged head stack—the routine makes use of the current monitor that is embedded into the DiskSense unit.

After diagnostics, Insight Forensic generates a detailed report, which lists the exact issue with the drive and suggests the best approach for data acquisition.



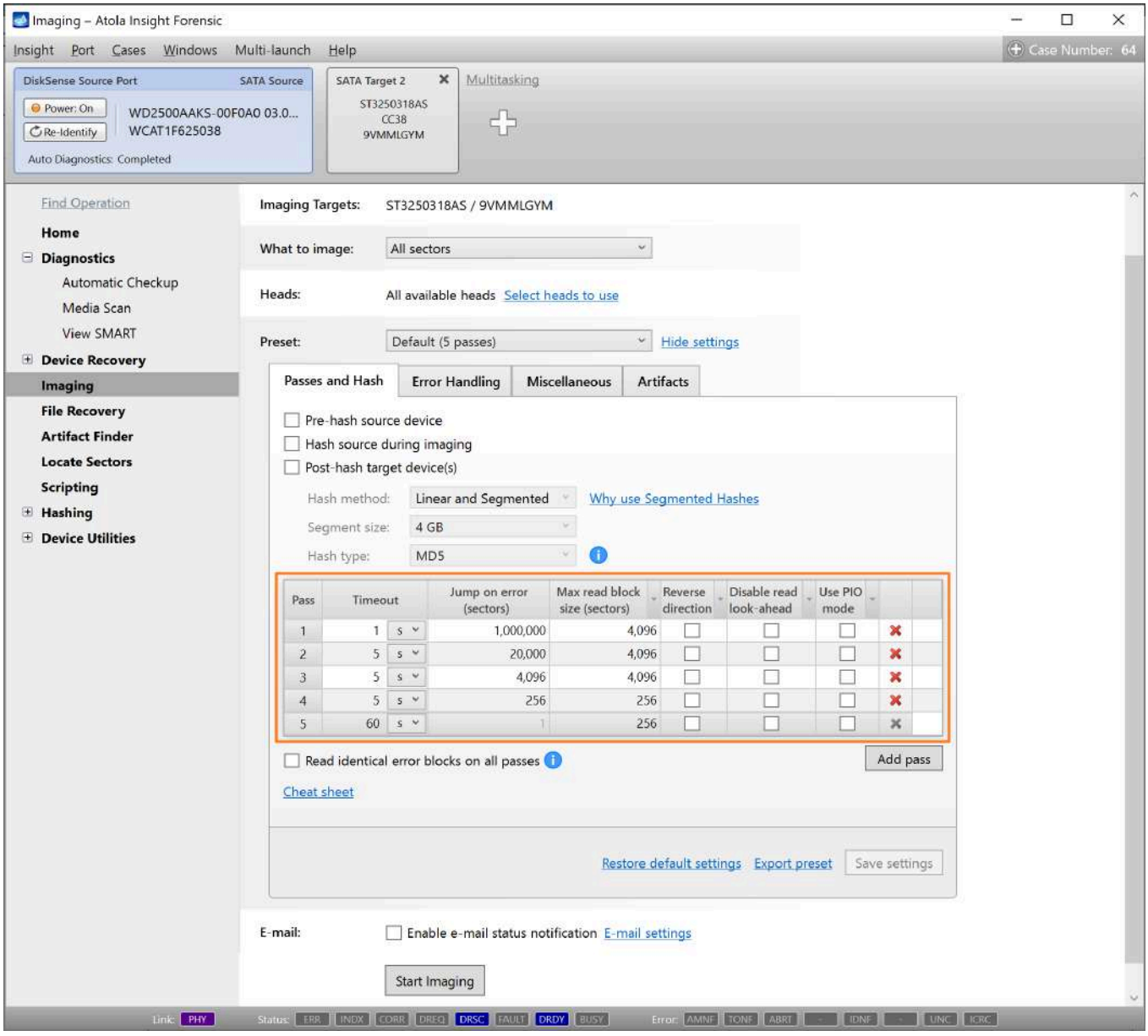
A diagnostics report of a damaged drive.

Default settings for imaging damaged drives

Most imagers have a linear imaging process. Whenever such an imager encounters a bad sector on a drive, the process slows down drastically. This often causes the drive to freeze.

Insight Forensic operates using a special multipass imaging algorithm that applies a non-linear approach and allows speeding up the imaging of damaged drives while maximizing the amount of successfully retrieved data.

The default settings of the passes are based on our decades-long experience in the data recovery market to fit the majority of problematic drives. Therefore, it is advisable to follow them, unless a particular drive requires specific settings.



Default imaging settings for damaged drives with 5 passes.

Let's clarify the terms used on the imaging settings screen:

- **Pass** is a single complete cycle of reading blocks from a source device and writing them to a target device, beginning from a start sector and finishing at an end sector (as specified in the **What to image** field).
- **Timeout** is the maximum time for a single read block attempt during this pass.
- **Jump on errors (sectors)** is the number of consecutive sectors that Insight Forensic will skip if it can't read a block from a source device.

- **Max read block size (sectors)** is the maximum number of sectors that Insight Forensic reads from a source device at a time.
- **Reverse direction:** when enabled for a particular pass, the imaging engine reads a source drive backward and reaches the damaged areas from the opposite direction. This way, the imaging module can retrieve more data from a drive before entering a damaged zone, which needs to be concentrated on during the following passes. However, the speed decreases due to the automatic disabling of the drive's cache.
- **Disable read look-ahead** turns off a read look-ahead functionality, which makes the drive read more blocks sequentially than requested by the software. In good drives, this functionality helps the drive operate faster by reading more data and caching it. With bad drives, the read look-ahead feature leads to bad areas being addressed more often. This slows down the process and may lead to a complete freeze of the drive. In such cases, we recommend disabling the read look-ahead option.
- **Use PIO mode** enables reading sectors using PIO commands (READ SECTORS EXT, READ SECTORS) instead of DMA commands. This can help in extremely rare cases of damaged drives.

Multipass algorithm for imaging damaged drives

To ensure thorough data extraction and avoid causing further damage to media, Insight Forensic applies the multipass imaging algorithm with deliberate timeout and block size control. Here’s how the algorithm works.

Timeouts and block size control

Using a small block size pays off when you need to retrieve the maximum data from an unstable drive. This approach also significantly slows down the imaging process. It may also increase the possibility of causing further damage to the media.

That's why Insight's multipass imaging engine uses **large blocks with short timeouts** on the first few passes. It schedules reads inside slow areas for later and then uses the **smallest block size on the last pass** when very few sectors are left to be read.

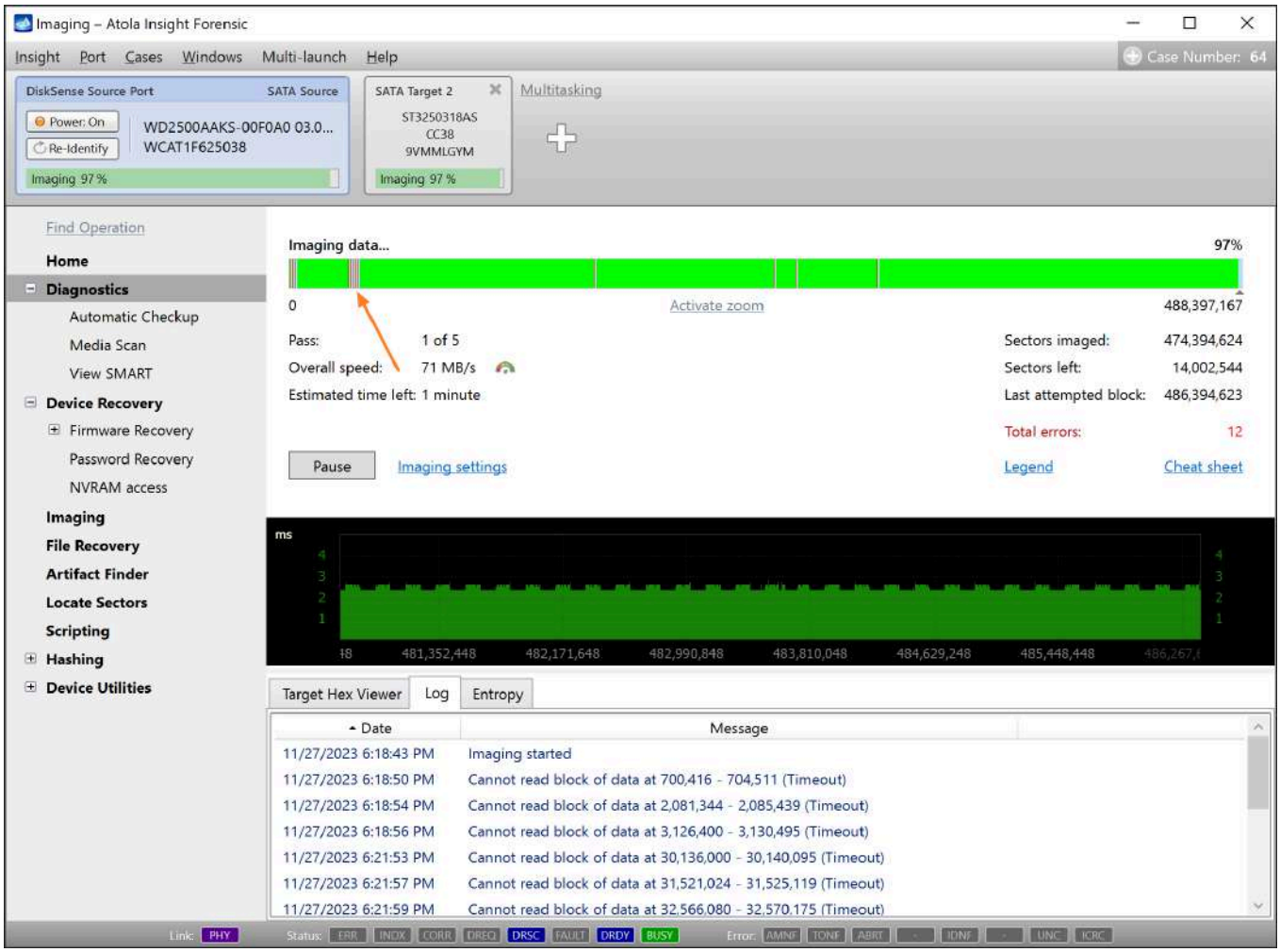
Insight Forensic handles block sizes automatically to provide the best possible results in the shortest amount of time.

First pass

On the first pass, Insight has a 1-second **Timeout** per block, and the **Max read block size** is set to 4096 sectors. The default settings of the first pass allow smooth sequential imaging of all modern drives in good condition.

But when you need to image a drive with bad sectors, these settings make Insight skip any areas that slow down the reading: it performs **Jump on error** by 1,000,000 sectors at a time.

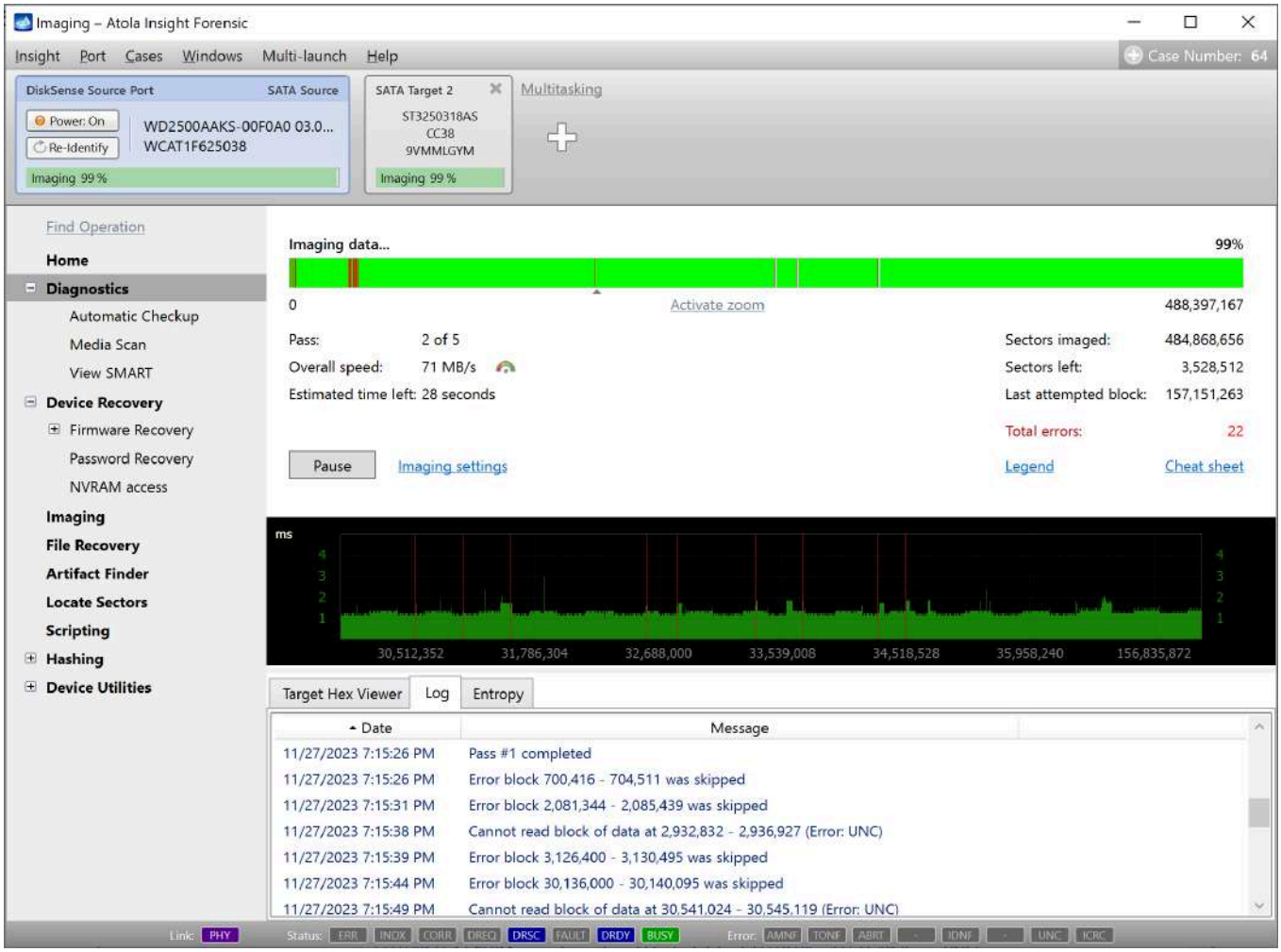
These settings ensure imaging data from the healthy areas of the drive at top speed while making Insight return to the problematic areas during the following passes. Atola Insight Forensic splits such areas into smaller pieces and allows more time for reading the data within them.



Insight performs Jump on error by 1,000,000 sectors on the first pass.

Second and third passes

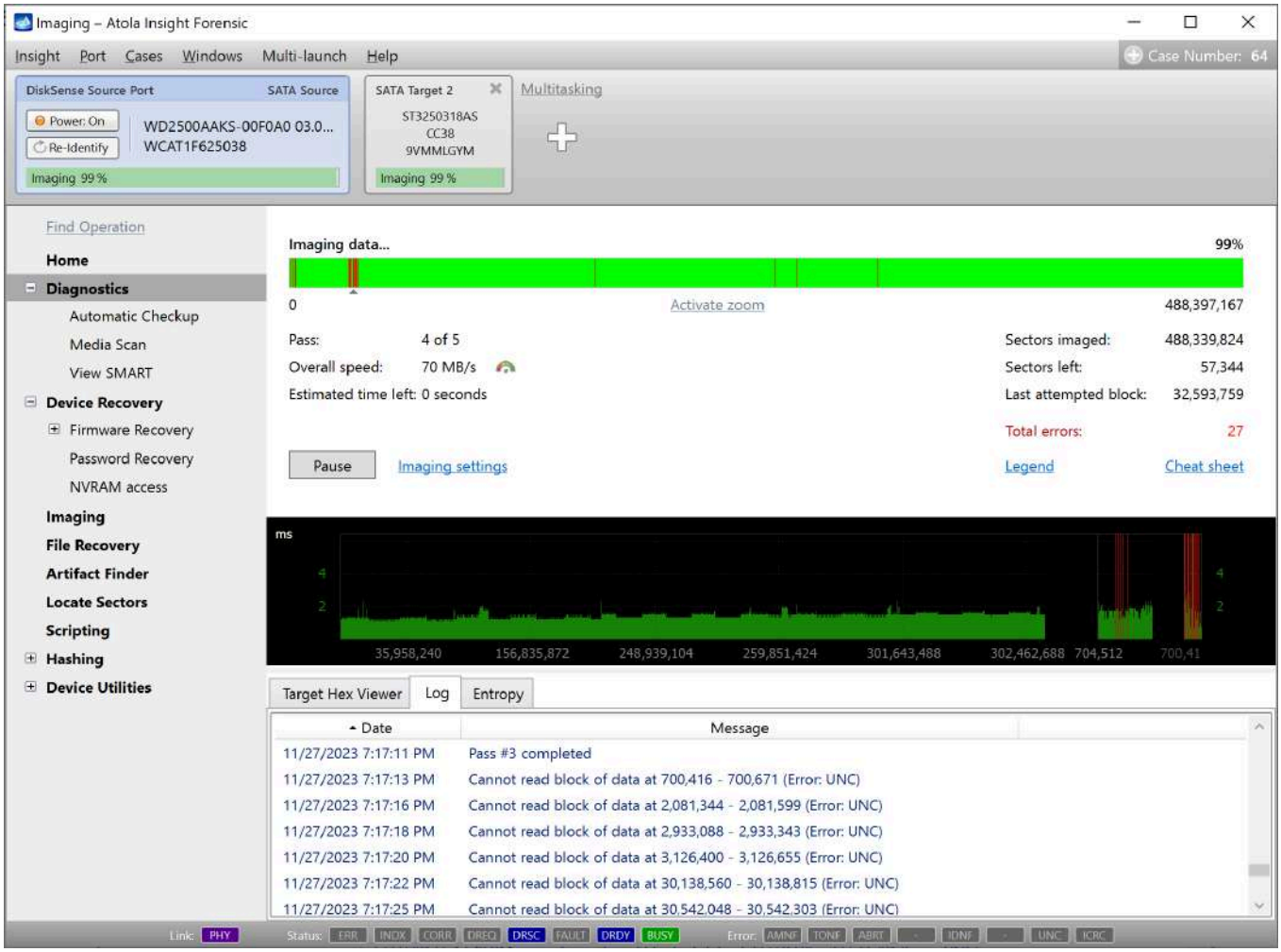
While the **Max read block size** remains the same during the second and the third passes, the **Jump on error** is set to 20,000 sectors and 4,096 sectors respectively. Insight allows slightly longer, 5-second **Timeouts** for attempted reading of the blocks. As the jumps become smaller, empty areas start filling up with data.



The secong imaging pass.

Fourth pass

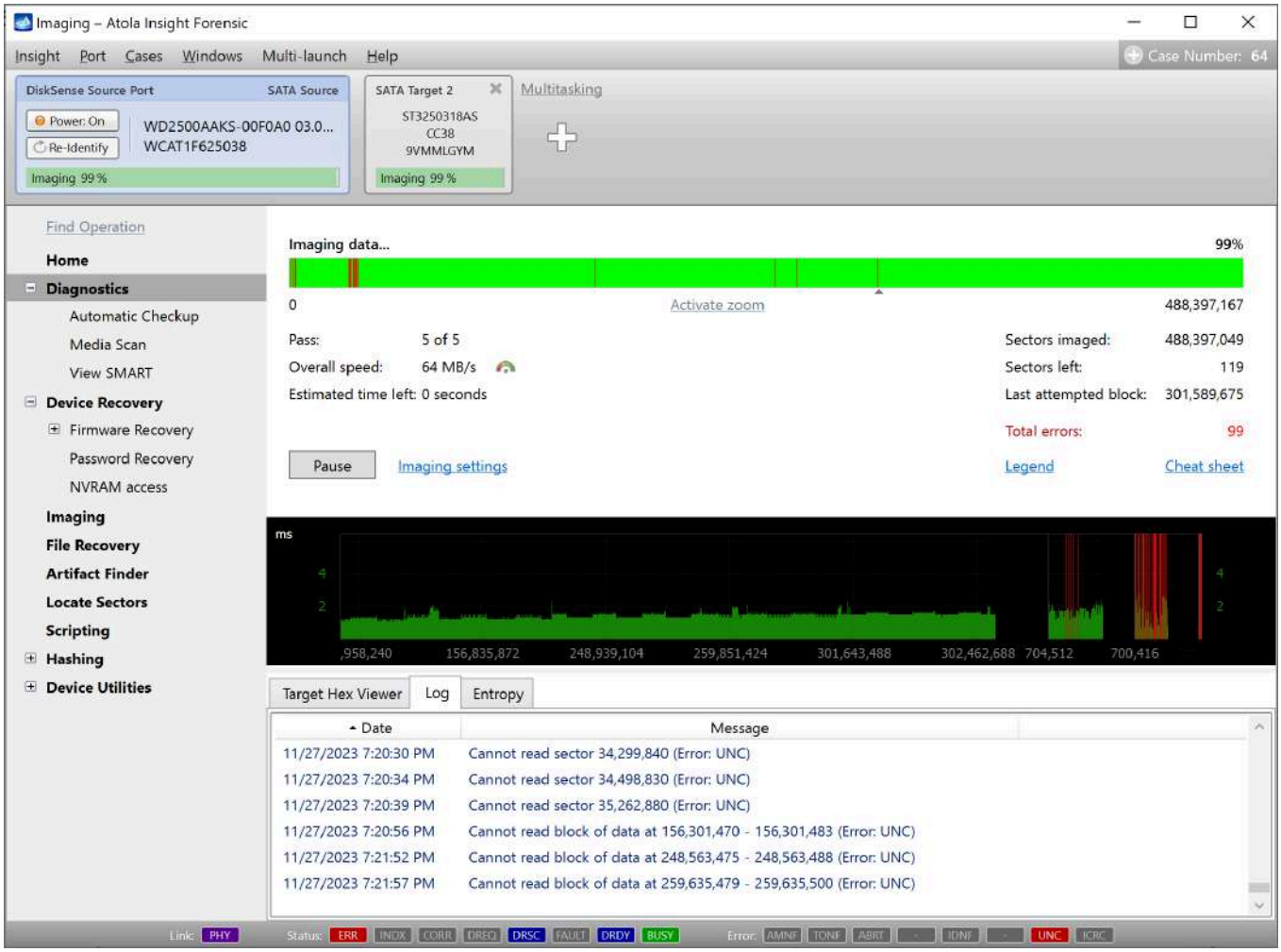
On the fourth pass, to try reading problematic zones in a more granular way, both **Jump on error** and **Max read block size** are yet again reduced, this time to 256 sectors.



The fourth imaging pass.

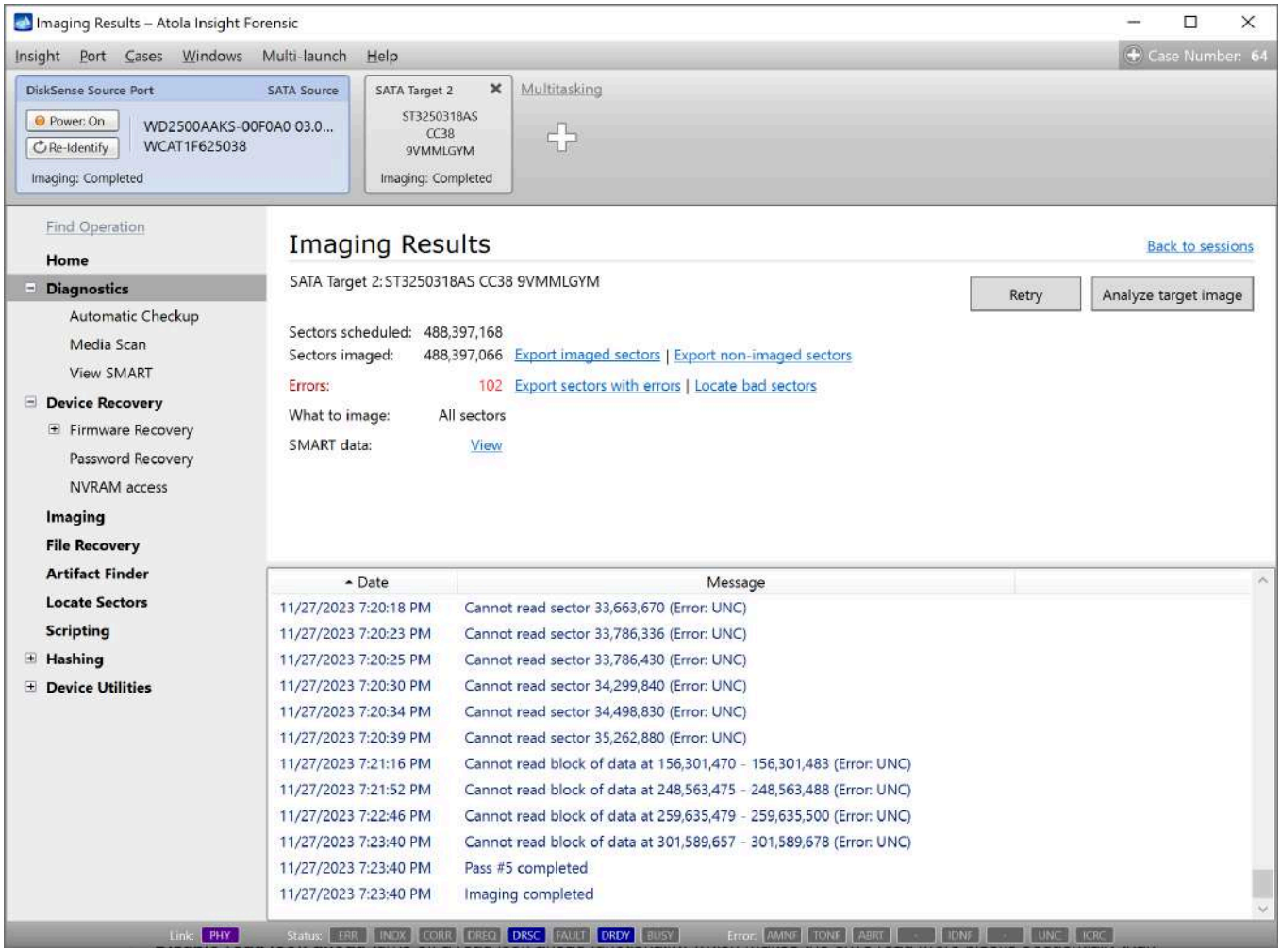
Fifth pass

On the fifth pass, Insight allocates 60-second **Timeouts** to read the **Maximum block size** of 256 with just 1-sector **Jump on error**. It is the last and the most scrupulous attempt to read the remaining problematic areas of the drive.



The fifth imaging pass.

After the final pass, the **Imaging Results** report will show the eventual number of errors on the drive and other detailed statistics.



The Imaging results report.

Customize imaging settings for each pass

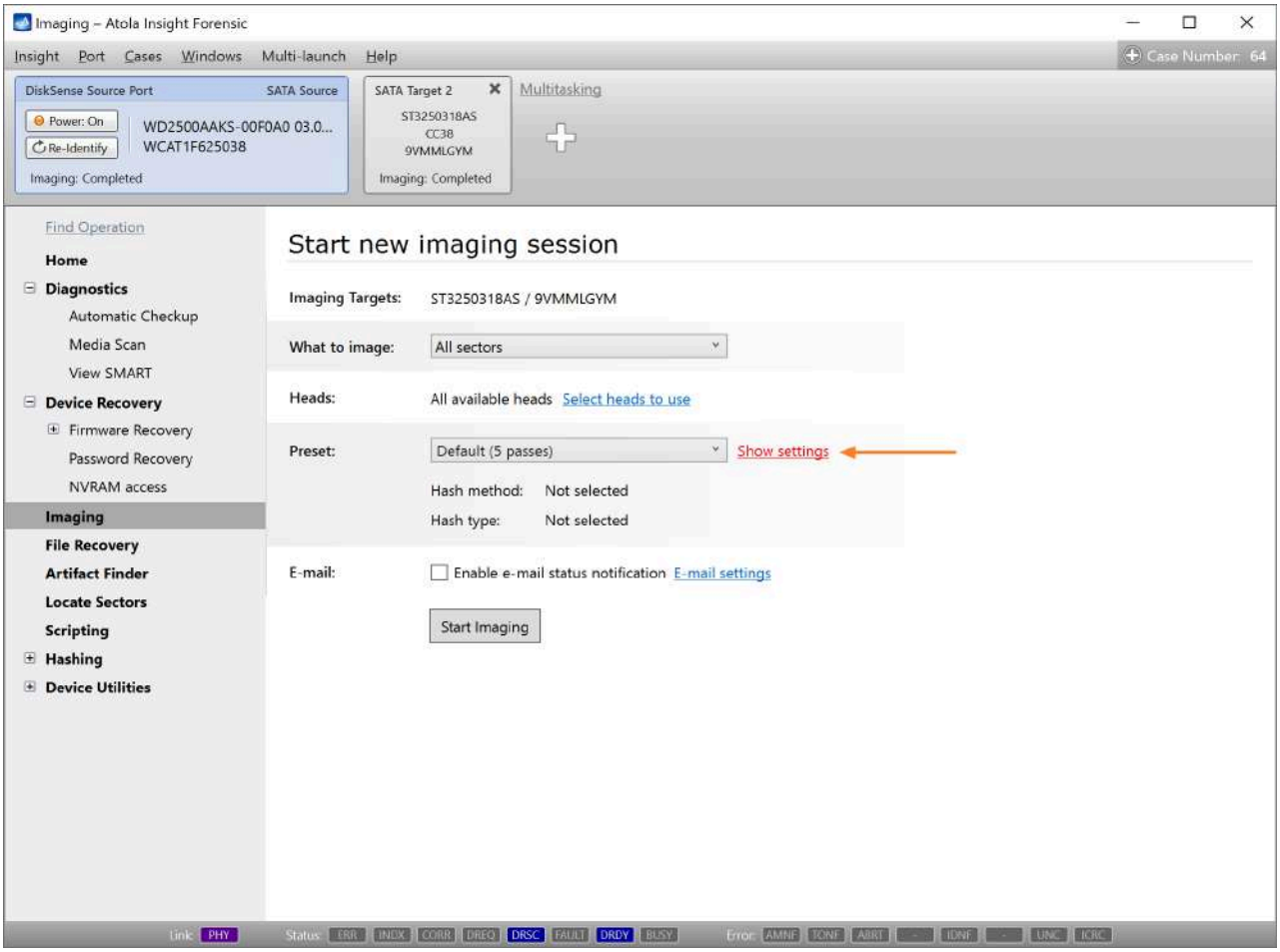
If a particular drive has some unusual damage and requires a specific imaging approach, you can customize the following settings for each pass:

- Timeout
- Jump on error
- Max read block address
- Start and end LBA
- Image in reverse direction
- Disable read look-ahead
- Use PIO mode

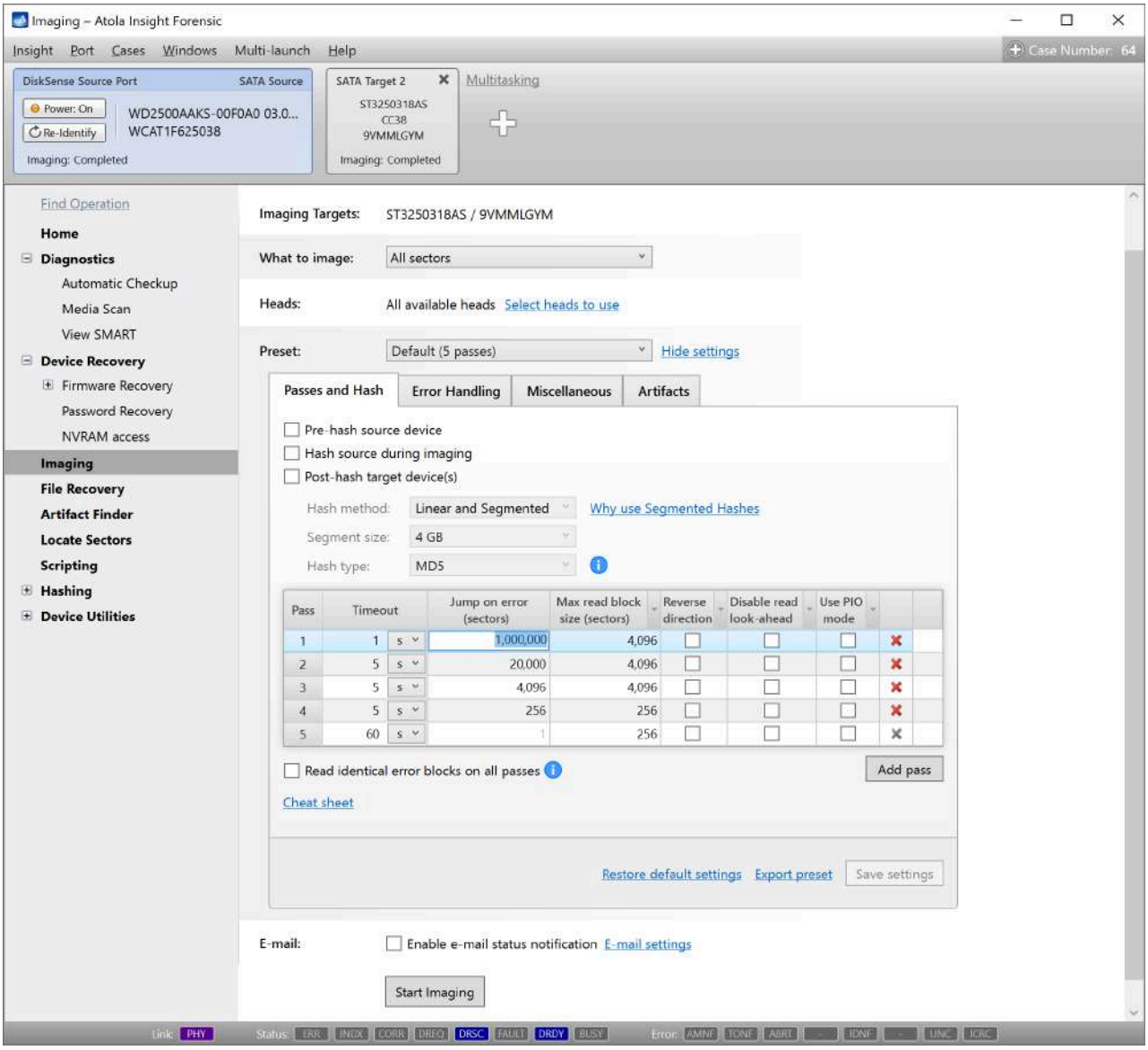
On top of that, you can add passes with customized imaging parameters or remove passes.

To change settings for a certain imaging pass, **add or remove** passes:

1. In the Insight sidebar, click **Imaging**, and then **Create New Session**.
2. On the **Start new imaging session** screen, in the **Preset** section, click the **Show settings** link.



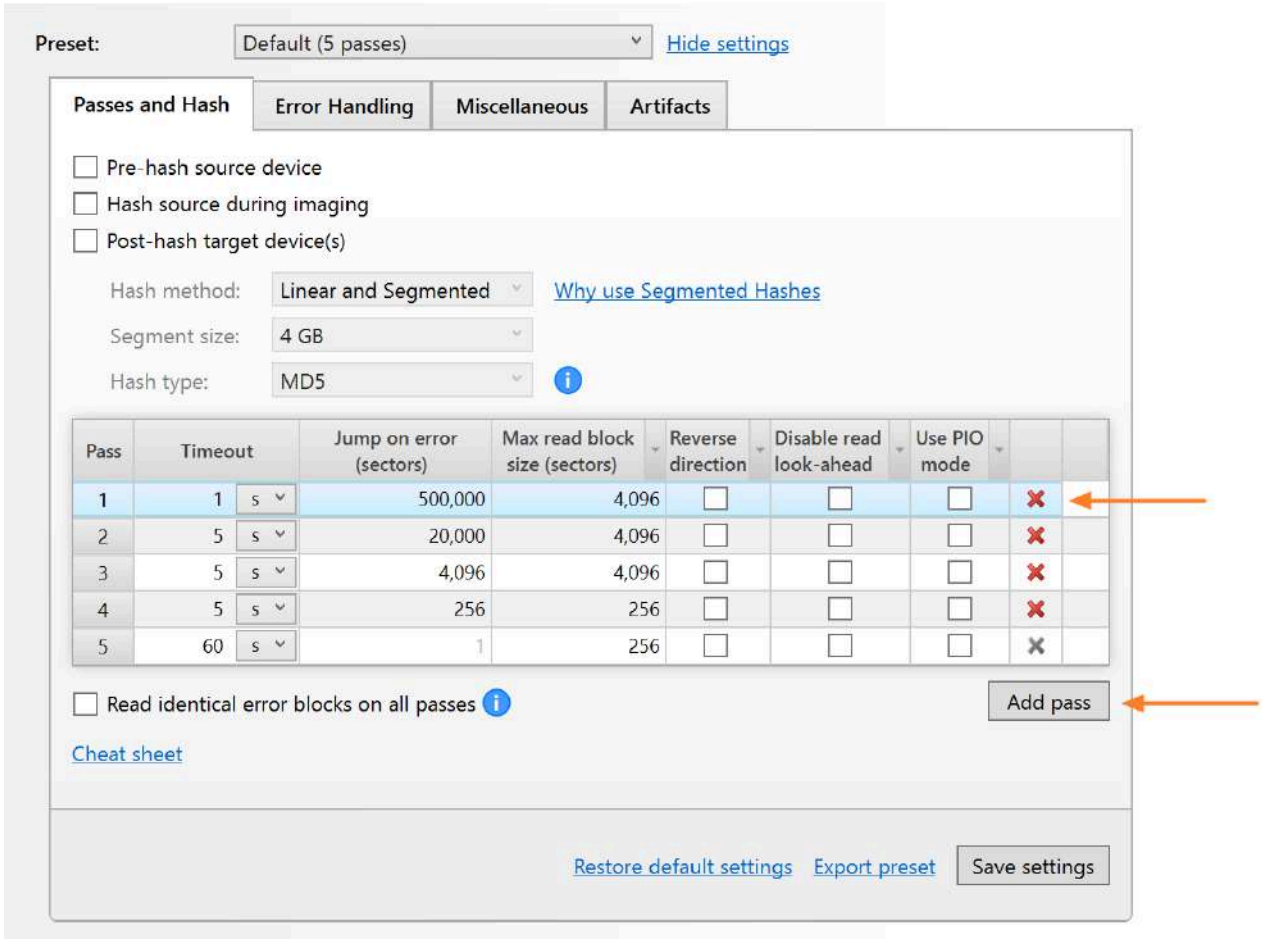
3. To adjust a particular parameter, click on a respective field and enter a new value.



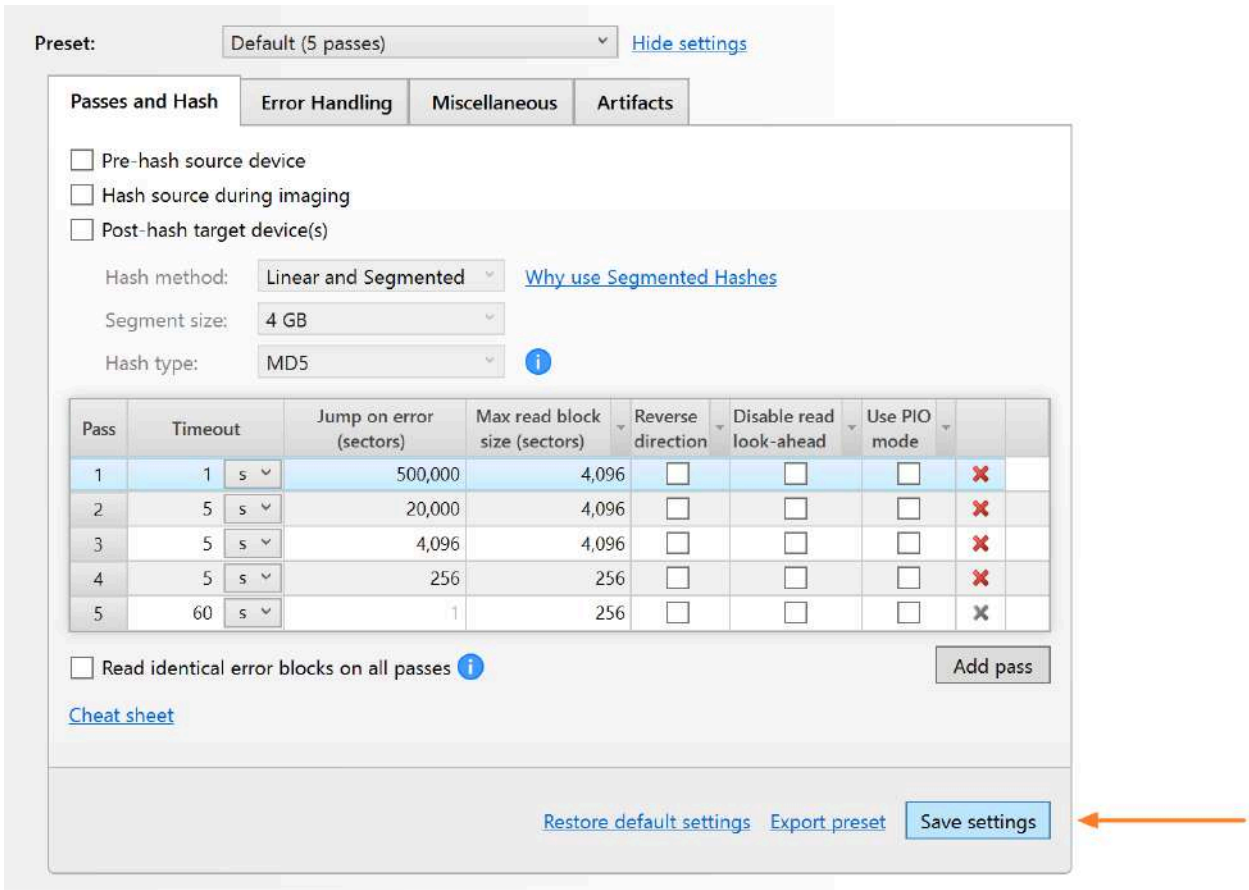
4. **Optional: Adding or removing passes.** After you expand the Imaging settings section:

    a. To **add** another pass, click the **Add pass** button.

    b. To **remove** a pass, click the **X icon** next to the respective pass.



5. Click **Save settings**.



Imaging drives with damaged heads

Hard drives with physical damage require a complex imaging approach. This guide will explain how to retrieve data with the minimal risk of data loss on a drive with a damaged head stack.

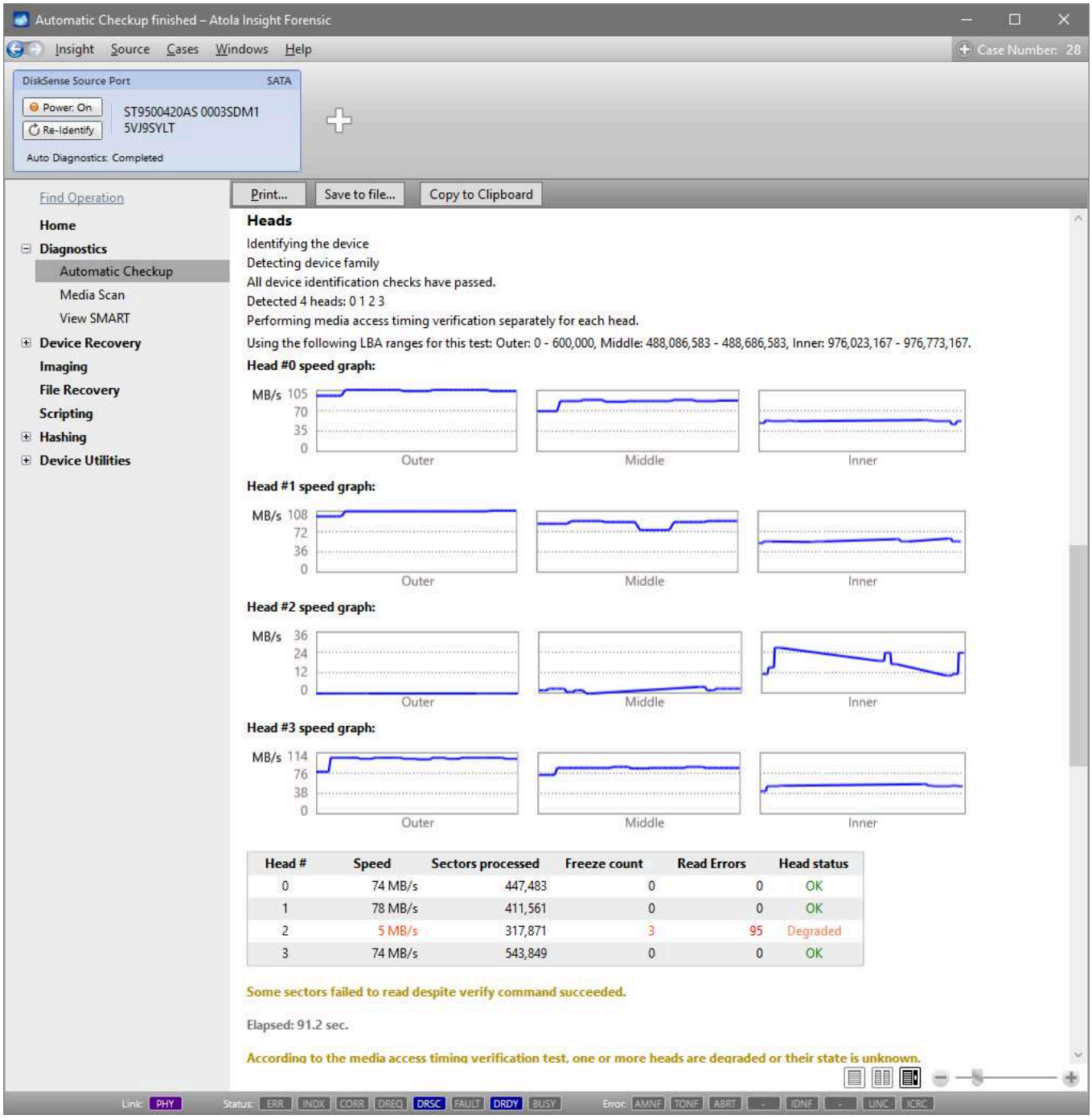
Diagnose first

The built-in Automatic Checkup module of Atola Insight Forensic automatically checks all major subsystems of the evidence drive: circuit board, heads, media surface, firmware and file system.

To run diagnostics, in the sidebar, go to **Diagnostics** > **Automatic Checkup** and click **Start**.

A diagnostics report provides detailed information about the heads. In addition, it offers recommendations for the optimal imaging strategy for your damaged hard drive.

If an **Automatic Checkup report** indicates that there is a problem with the heads, look at the status of each head.



Head problem found during Diagnostics.

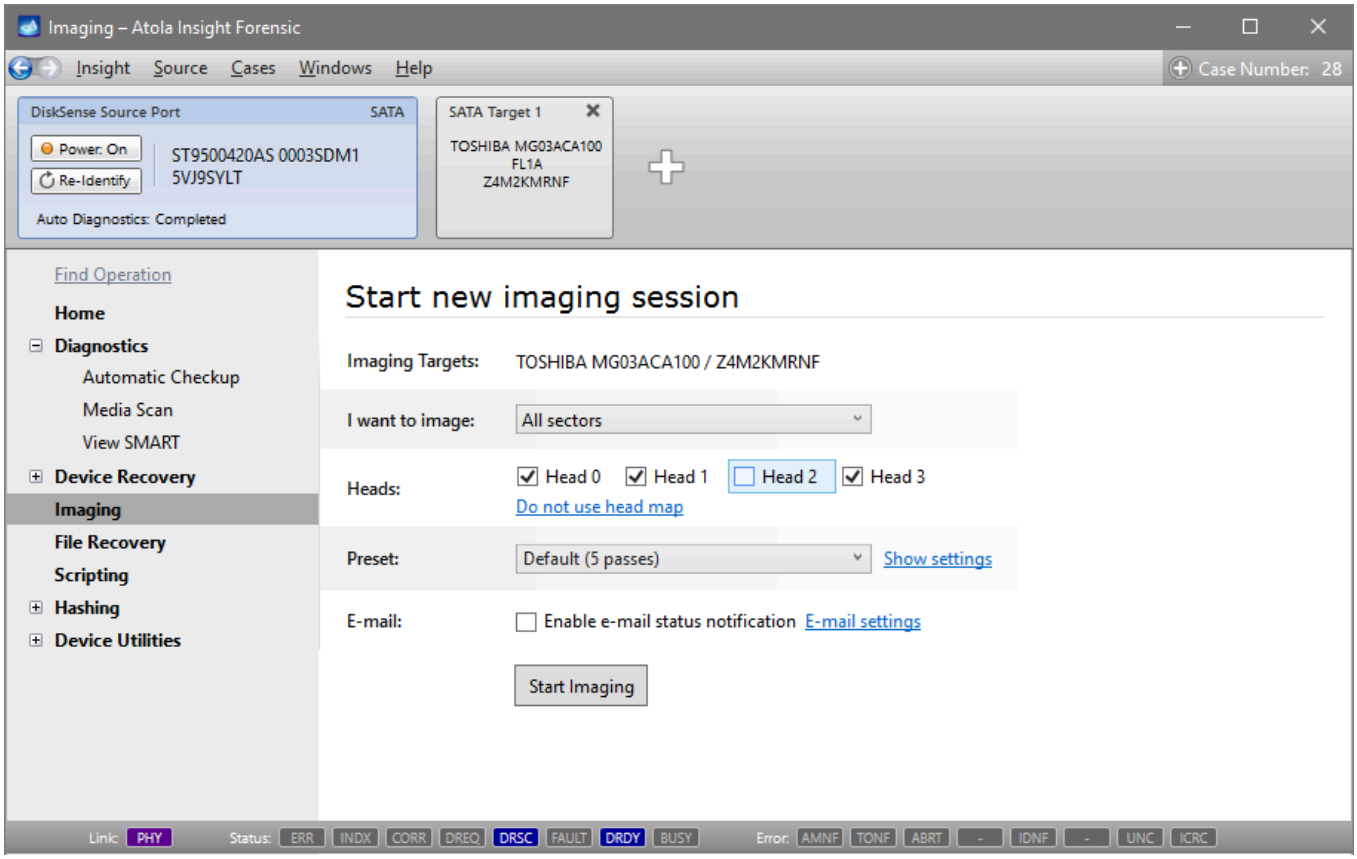
If the status of a head or multiple heads is *Degraded* or *Damaged*, the drive will not be able to read all the data. What's worse, even more sectors may soon become unavailable due to incorrect functioning of the drive's hardware.

Image good heads

We recommend that you start by imaging the heads, whose status is OK, as soon as possible. To do that:

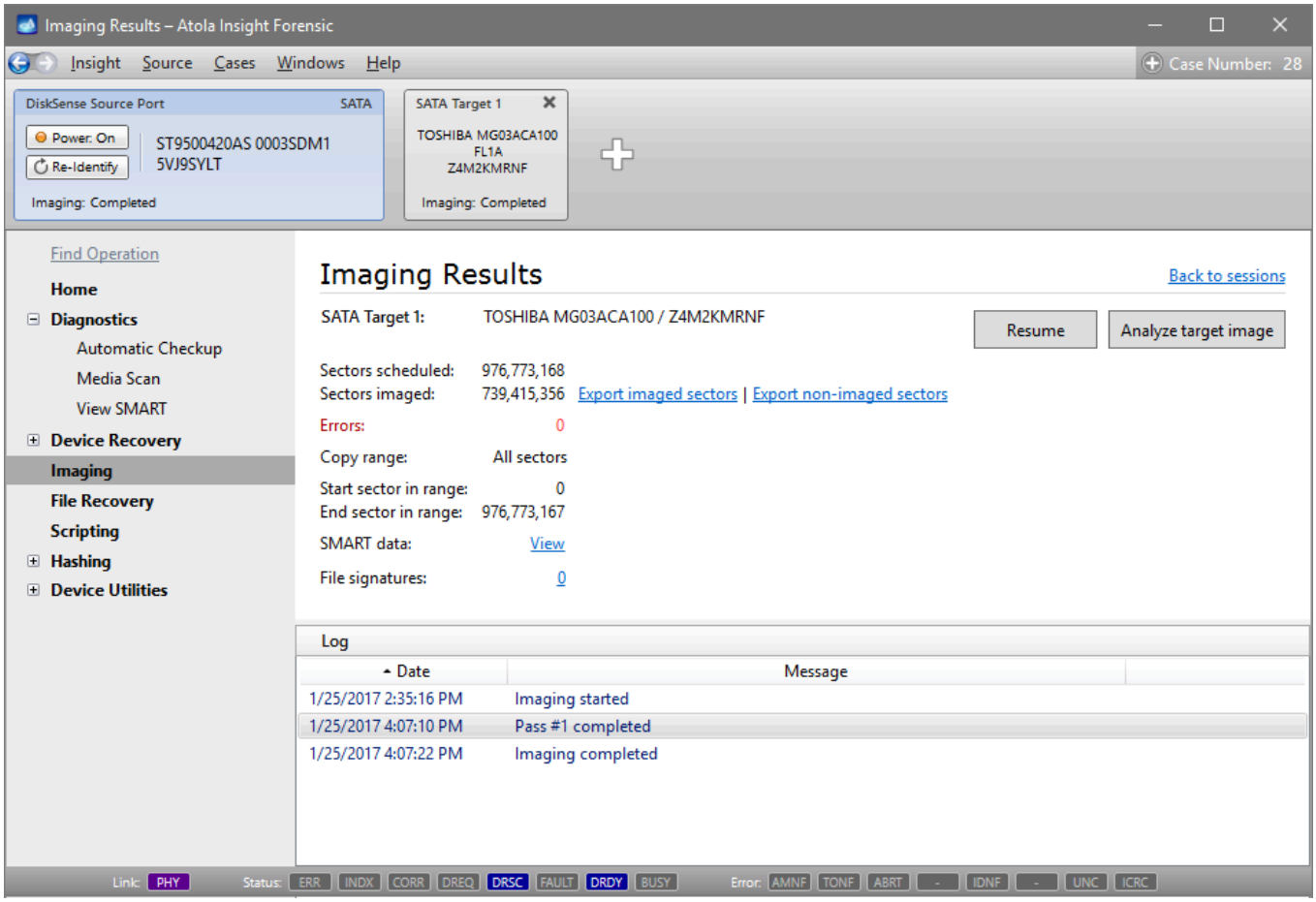
1. In the sidebar, go to **Imaging** and click the **Create New Session** link.
2. Choose the target device or file and click **Select**.

3. On the **Start new imaging session** screen, find the **Heads** section and unselect the damaged head.
4. Click **Start Imaging**.



Unselect degraded head.

As a result, you get as much data from the drive's viable heads as possible before even beginning to work with the damaged head. This way the risk of losing data on the working part of the head stack is minimized.



Imaging result with 3 good heads.

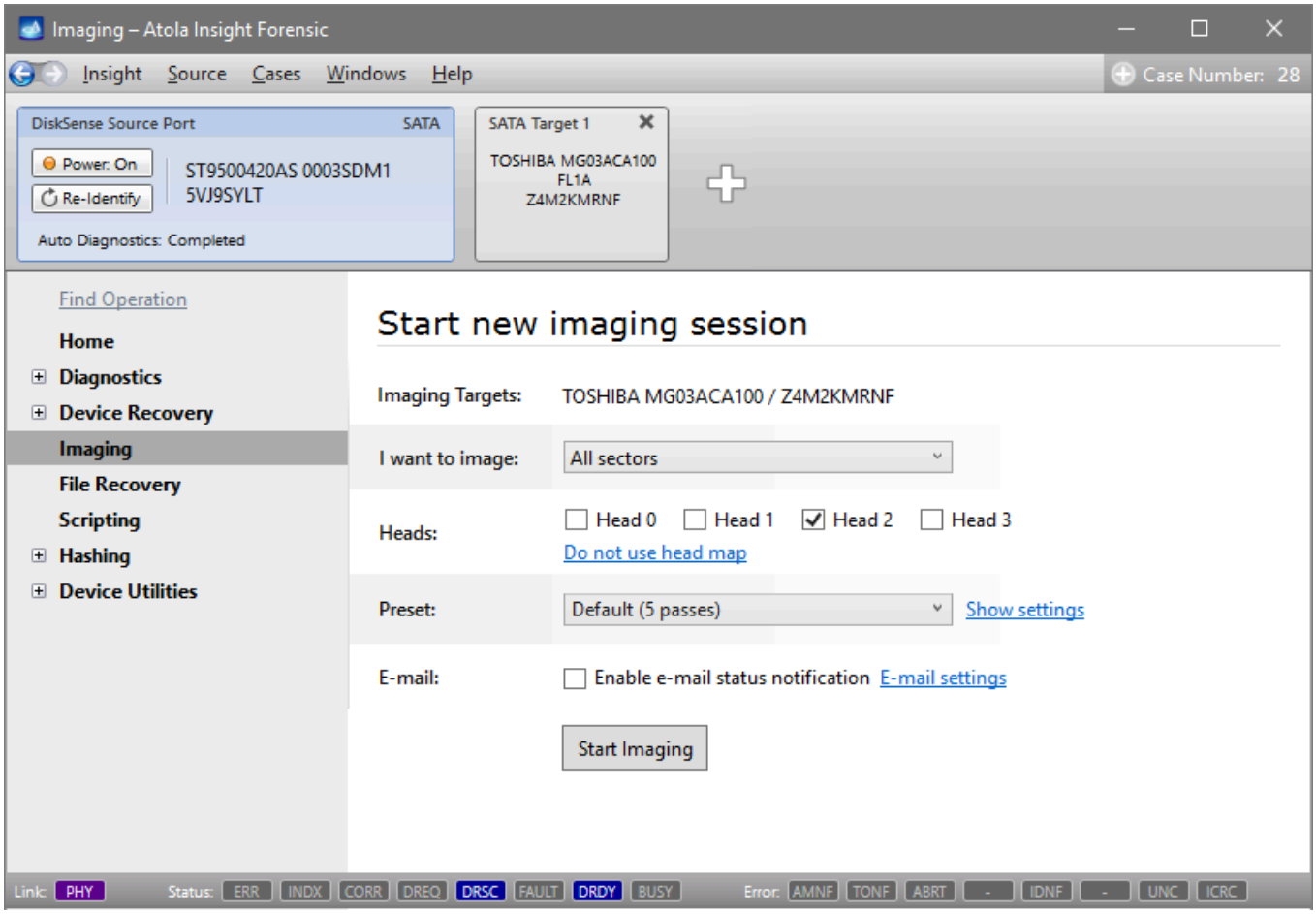
Now that this data has been successfully retrieved, you have two options:

- To have the head stack replaced before imaging the remaining data. However, there is a risk that as a result of head stack replacement, data on the drive can become unreadable.
- To attempt imaging data from the *Degraded* or *Damaged* head.

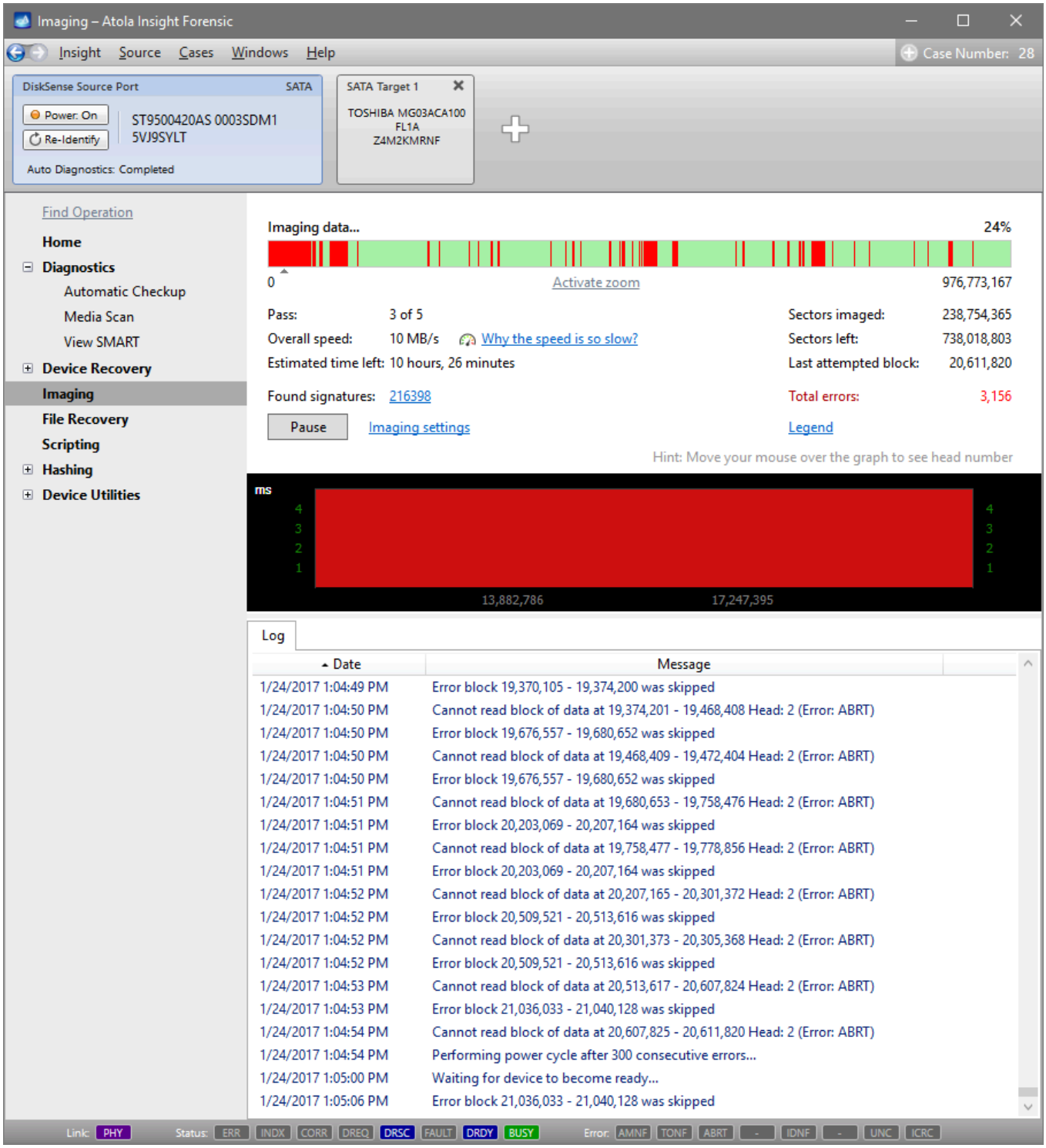
Image damaged or degraded heads

Insight's sophisticated functionality lets users retrieve maximum data even from severely damaged drives. To image damaged or degraded heads, do the following:

1. In the sidebar, go to **Imaging** and click the **Create New Session** link.
2. Choose the target device or file and click **Select**.
3. On the **Start new imaging session** screen, go to the **Heads** line, unselect all the working heads and leave only the Degraded/Damaged one(s).
4. Click **Start Imaging**.



Unselect 3 working heads.



Imaging degraded head.

Now that you have an image of the source evidence including the data copied from the damaged head, you can take the risk and get the head stack fixed. Afterward, you can start a new session to complete the initially created image with data from previously unreadable sectors.

Imaging freezing damaged drives

When Atola Insight Forensic performs imaging, it can succeed even with the drives that freeze.

Why do damaged drives freeze?

When a drive receives and runs a **Read sectors** command, and comes across a physically or logically damaged sector, the device is unable to read any data from that sector. So it goes into **Retry** mode, trying to get data from the damaged area again and again.

However, often the drive is unable to read data from the damaged sectors, and the **Retry** mode can last for a very long time before the drive decides to give up on a particular sector and return an error with a timeout.

How does Insight handle freezing drives?

If Insight simply waited for each Read sectors command to be completed:

- it would take ages to get an image of a drive with numerous errors;
- it could cause the drive to slip into complete freeze;
- in the worst-case scenario, further damage could be caused to the data on the drive.

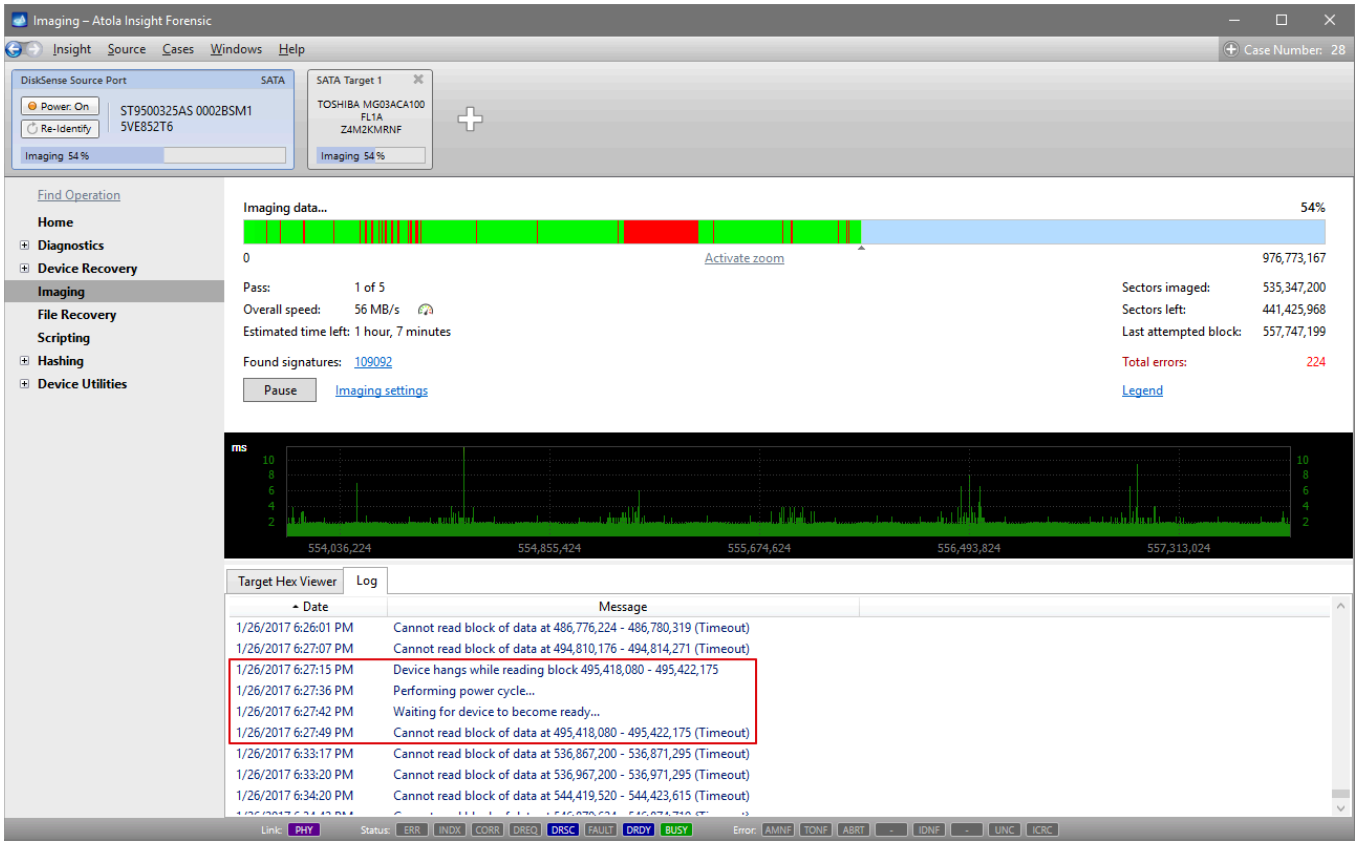
The Reset command

To avoid causing further damage to the data on the drive and long waiting periods, Insight issues the **Reset** command whenever a drive attempts to read a block of sectors for longer than allowed by the pre-configured timeout.

Reset is a device interface operation, using which Insight (the *host*) stops the previously sent **Read sectors** (or any other) command and then continues imaging from the next planned block on the drive.

If the device is still running the Read Sectors command, even after the first **Reset** attempt, Insight will wait 3 seconds and perform the second **Reset** command. At the moment of the second **Reset**, a new entry will appear in the imaging **Log** reading

```
Device hangs while reading block X – Y.
```



Power cycle due to the source device falling into freeze.

Performing a power cycle

If 20 seconds after the second **Reset**, the drive still tries to read the bad block, Insight performs a **Power cycle** by forcibly cutting power to the drive for 5 seconds.

At this point, Insight adds two entries to the imaging **Log**:

`Performing power cycle...` (when the power is cut off) and

`Waiting for the device to become ready…` (when the power is switched back on).

After a successful power cycle

If the first **Power cycle** command is successful, and the drive becomes ready to receive another command, there will be a final log entry for this problematic block of sectors saying:

`Cannot read block of data at X – Y (Timeout).`

And then Insight continues imaging from the next planned block.

After an unsuccessful power cycle

If the first **Power cycle** command is ineffective, and the drive is still in a **Busy** state and can't run another command, Insight makes one or more additional power cycles.

In Insight's default settings, the **Max consecutive Power Cycles** option is set to *five*. If all five Power cycles are unsuccessful, imaging is terminated. It can be resumed afterward, and Insight will continue to image all remaining sectors.

While users can change the default maximum numbers of Resets and Power cycles, this number is based on our decades-long experience and balances the need for data retrieving with the risk of further data loss.

Features with the 'until power cycle' option

If prior to imaging you apply the **Change Max Address temporarily (until power cycle)** option, the Power cycles performed in the course of imaging do not affect it. The Host Protected Area remains accessible throughout the imaging process. Insight temporarily removes the HPA max address restriction after each imaging-related Power cycle.

The same is true for the **Reset Password until power cycle** option. Insight keeps the password reset throughout the imaging process, without regard to the applied Power cycles.

Imaging a shorted hard drive

Every once in a while forensic examiners come across hard drives that get shorted. In most cases, a drive has become shorted after experiencing overvoltage either due to a power supply failure or as a result of a user error. Here is what happens to drive in these scenarios and how to fix this.

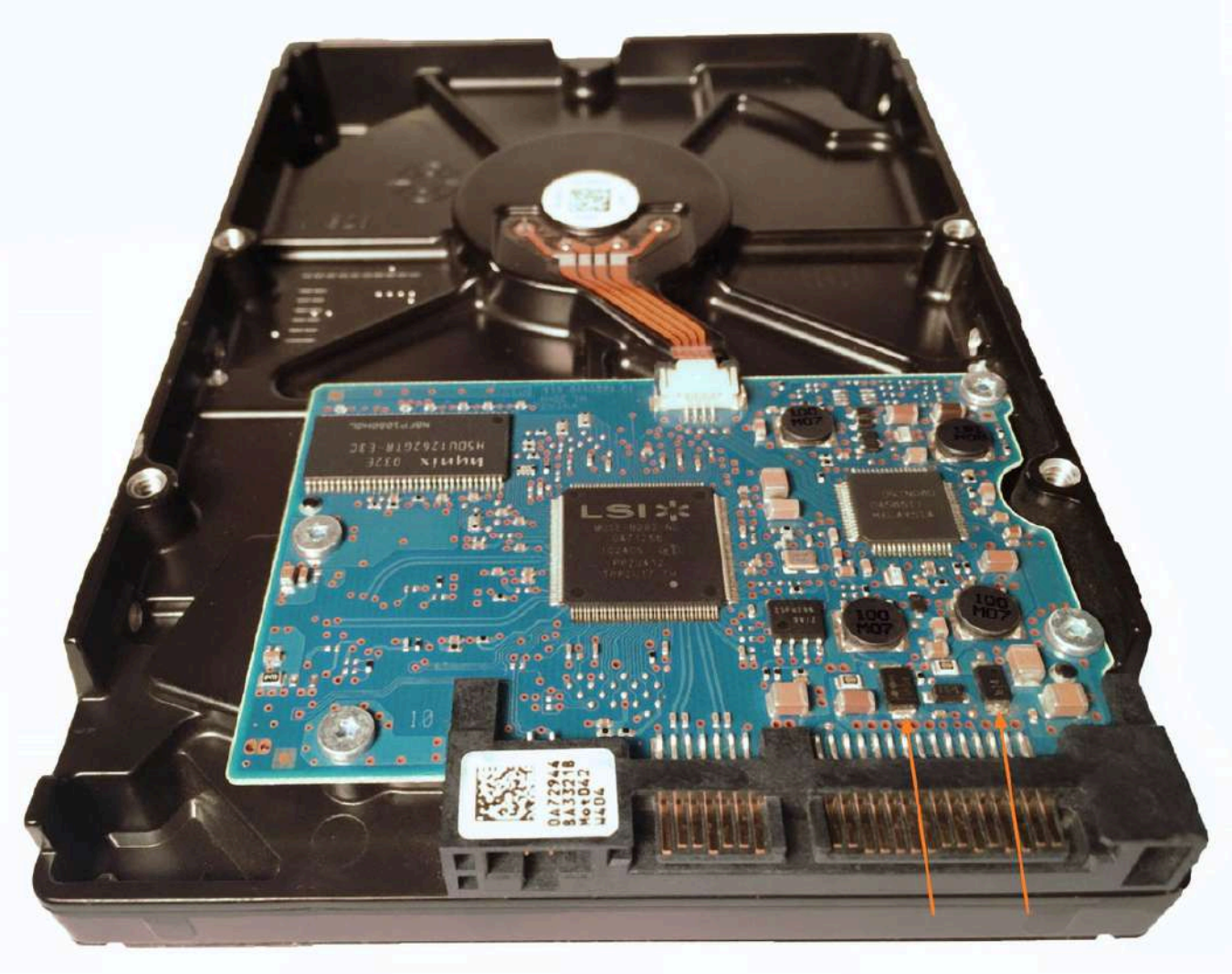
How drives become shorted

Most drives have two TVS diodes: one on the 5V rail and another one on the 12V rail.

If a drive experiences an overvoltage, its diodes convert the excess electrical power into heat energy and warm up, thus protecting the drive's circuit. Similarly, in the case of reverse polarity, the diode warms up as it conducts the current in the opposite direction.

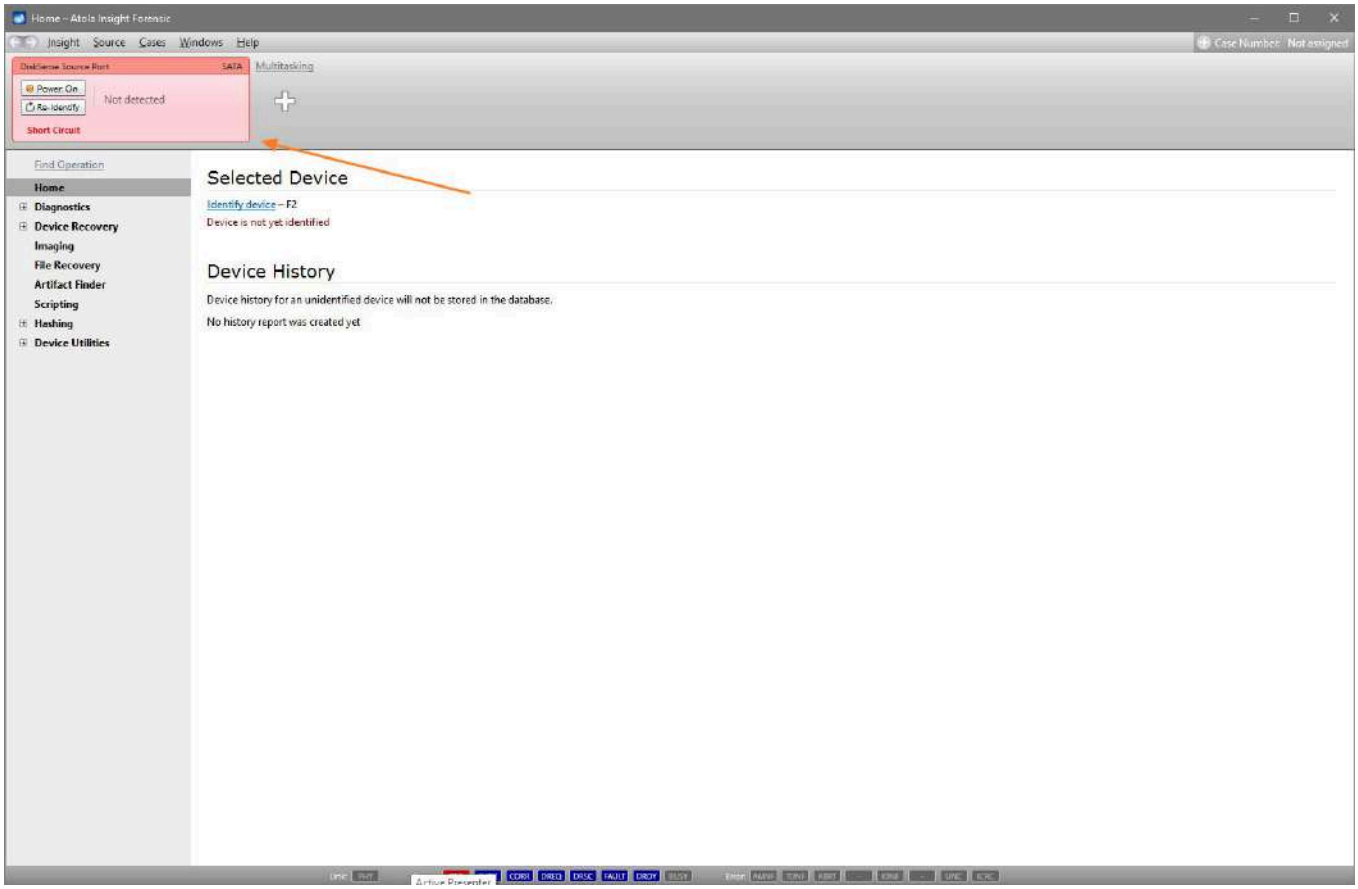
If the overvoltage or reverse polarity event is short and the dissipated energy is not too high, the diodes can recover and continue working. However, if the dissipated energy is too high, the diodes will "sacrifice" themselves and get shorted.

When the drive is subsequently powered, the shorted diodes create a low-resistance connection between two nodes, known as a short circuit. This is exactly what happens to a drive when its TVS diodes are shorted.



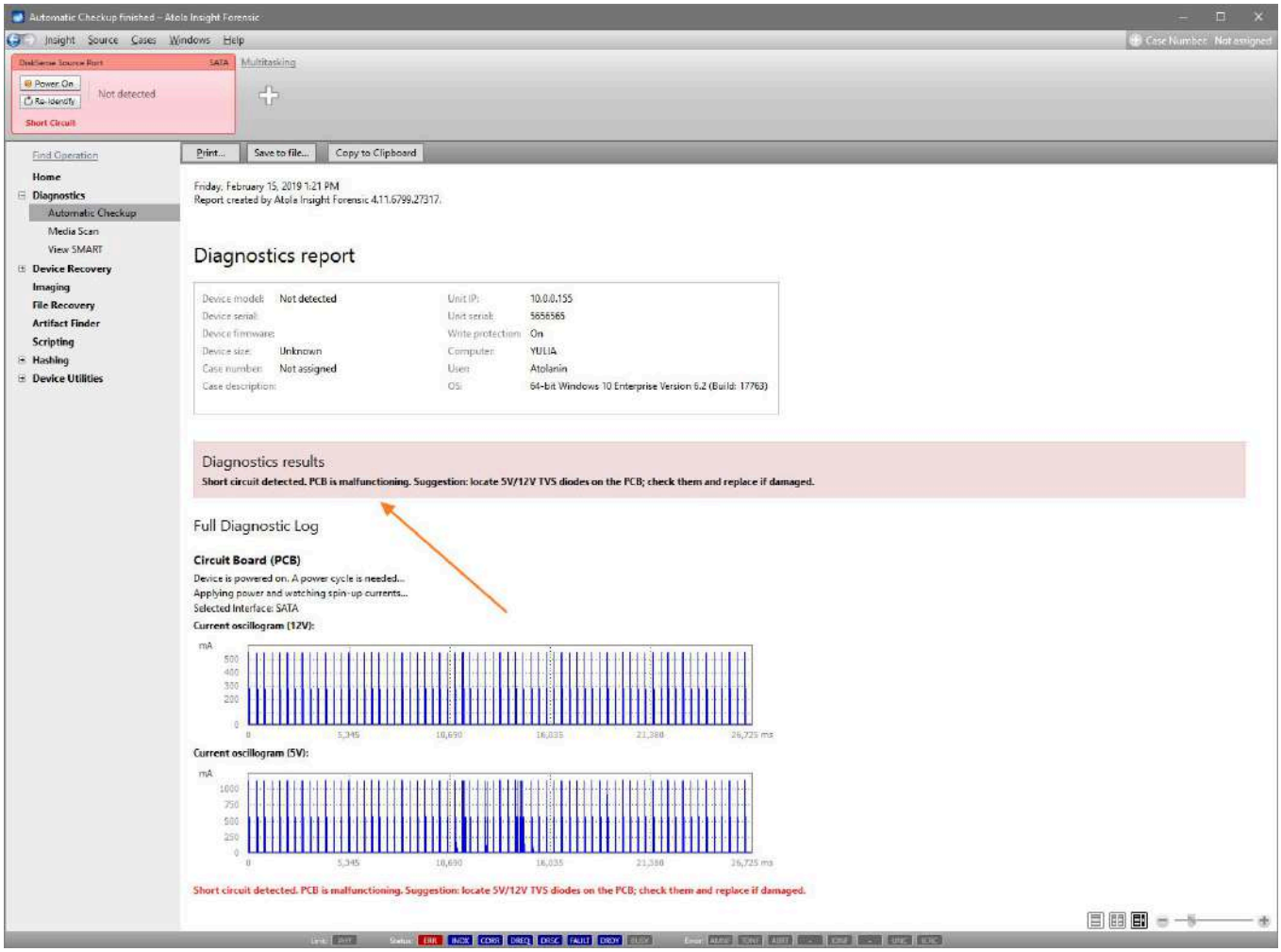
Detect a shorted drive

If you try to connect a shorted drive to Atola Insight Forensic, the Source window will have a short circuit alert to notify the operator about the detected issue.



Short circuit alert.

A drive with a shorted TVS diode cannot be identified or imaged. You can try to run diagnostics on the drive, although it cannot be properly diagnosed and the report will suggest that the TVS diodes should be replaced.



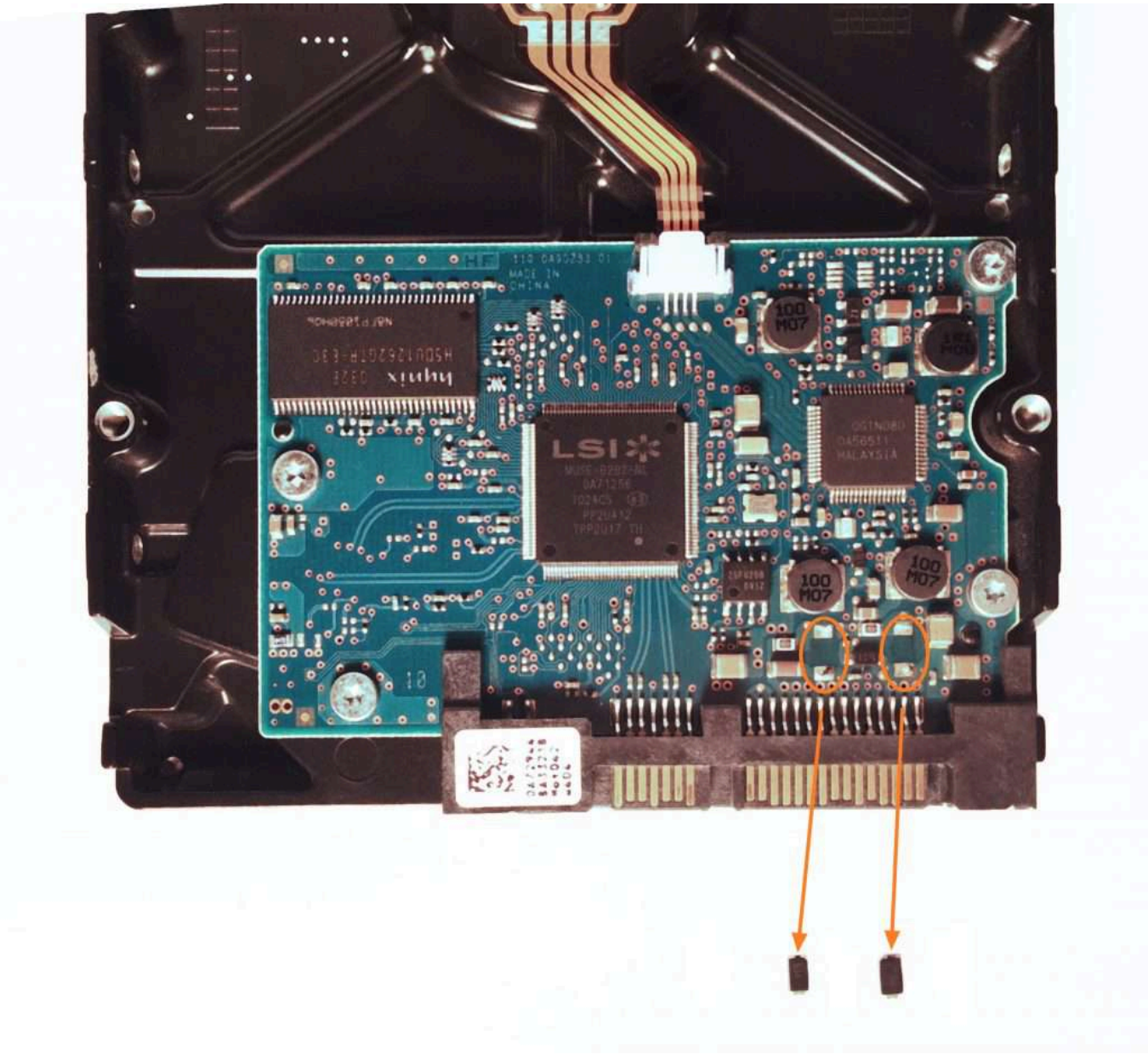
Diagnostics report of a shorted drive.

Image a shorted drive

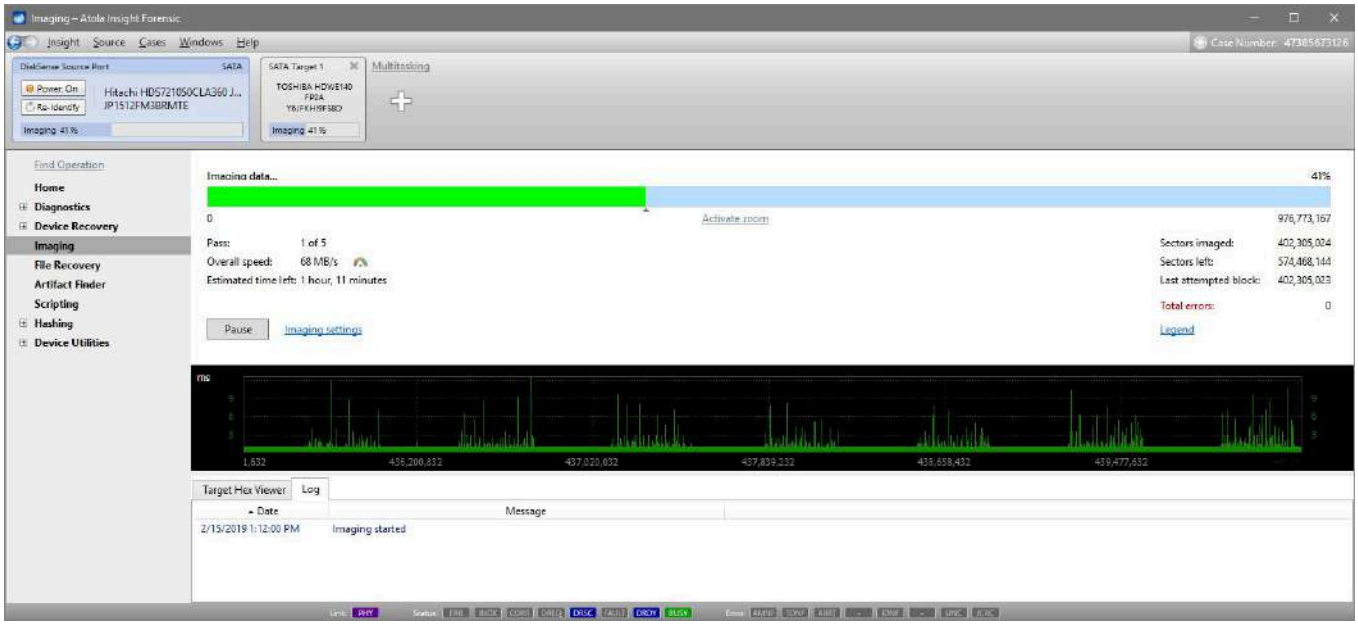
If you need to image a shorted drive but do not have new TVS diodes on hand to replace the shorted ones, you can image the drive using Insight after removing the diodes.

This process is safe because Insight has short circuit and overvoltage protection, which guards both the imager and the drives connected to it against circuit failures.

To remove the diodes, heat the area of the drive where they are located with a hot fan (such as in a hot air soldering station) and then gently remove them with tweezers.



Once the diodes have been detached, you can plug the drive into Insight and proceed with imaging data from its platters.



Imaging a drive with detached TVS diodes.

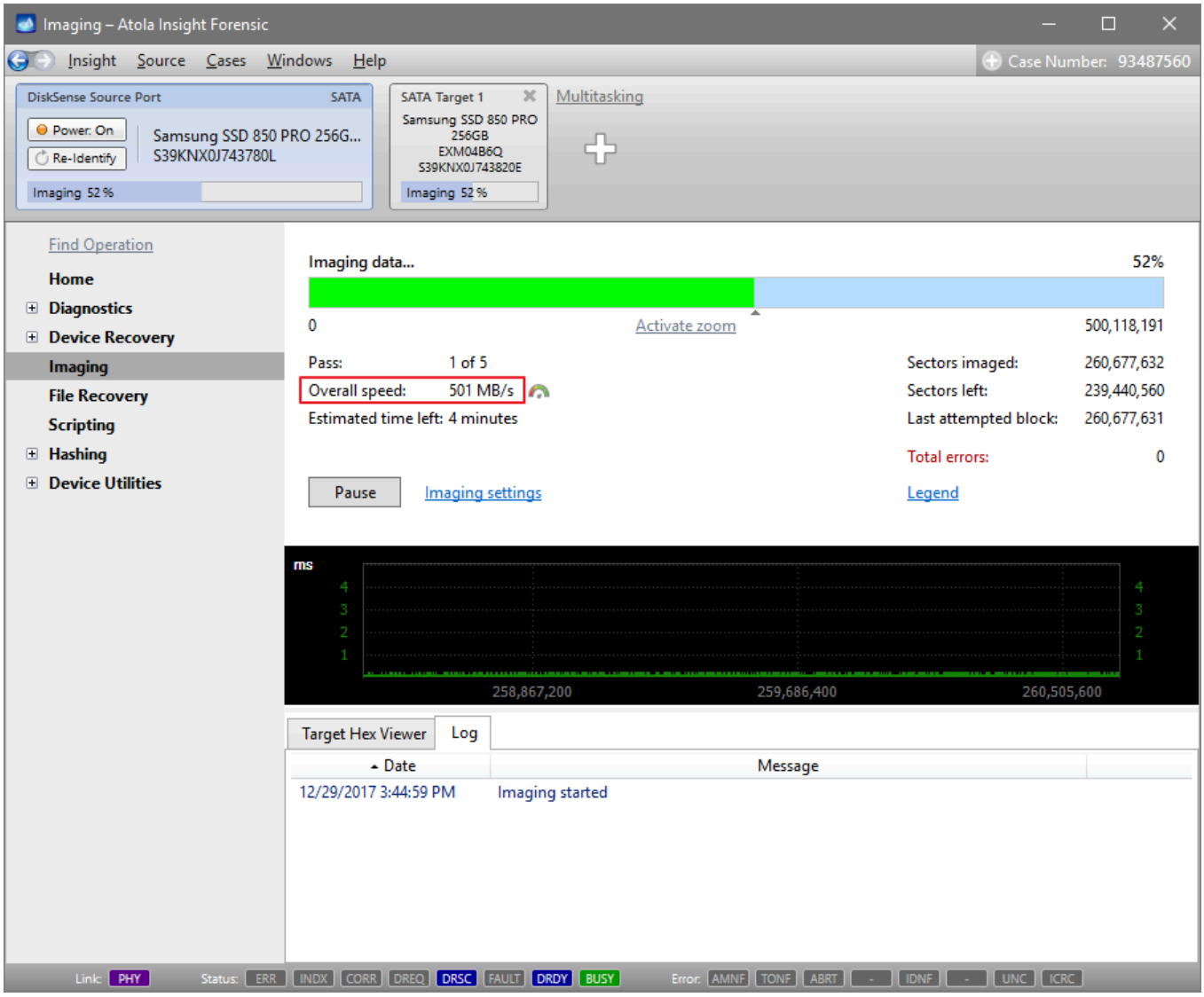
Imaging speed of Atola Insight Forensic

We test our units on a wide range of storage devices. To check the imaging speed on different HDDs, SSDs and USB flash drives we imaged a few of them and cross-checked the speed with userbenchmark.com, where you can find detailed info on the minimum, average and maximum read and write speed of almost every data storage device in the market.

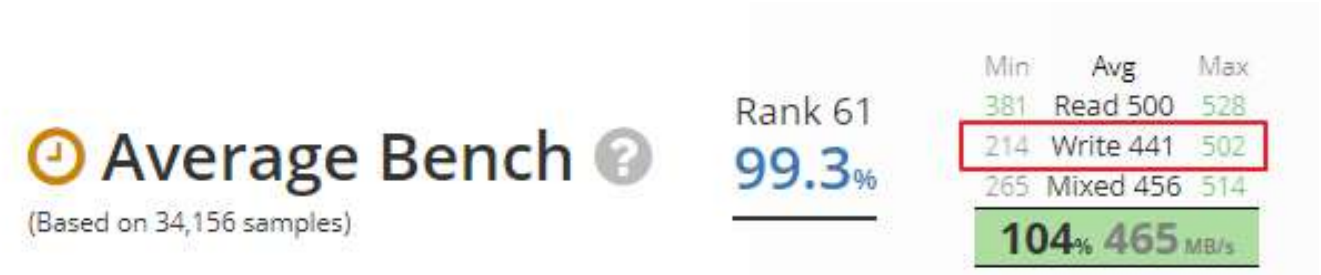
NB. Imaging speed is limited by the speed of the slowest of the devices participating in the imaging session. Therefore, the slowest of the two speeds (either the read speed of the source or the write speed of the target) will define the speed at which imaging process is running.

Samsung 850 Pro 256GB

We begin with the Samsung 850 Pro SSDs mentioned above. These two drives are not damaged but are rather worn out, as we have been demonstrating Insight's imaging speed on them at every exhibition for a few years now. Insight images from one such SSD to another at 501 MB/s (therefore it is the write speed of the target drive that defines the imaging speed in this case).

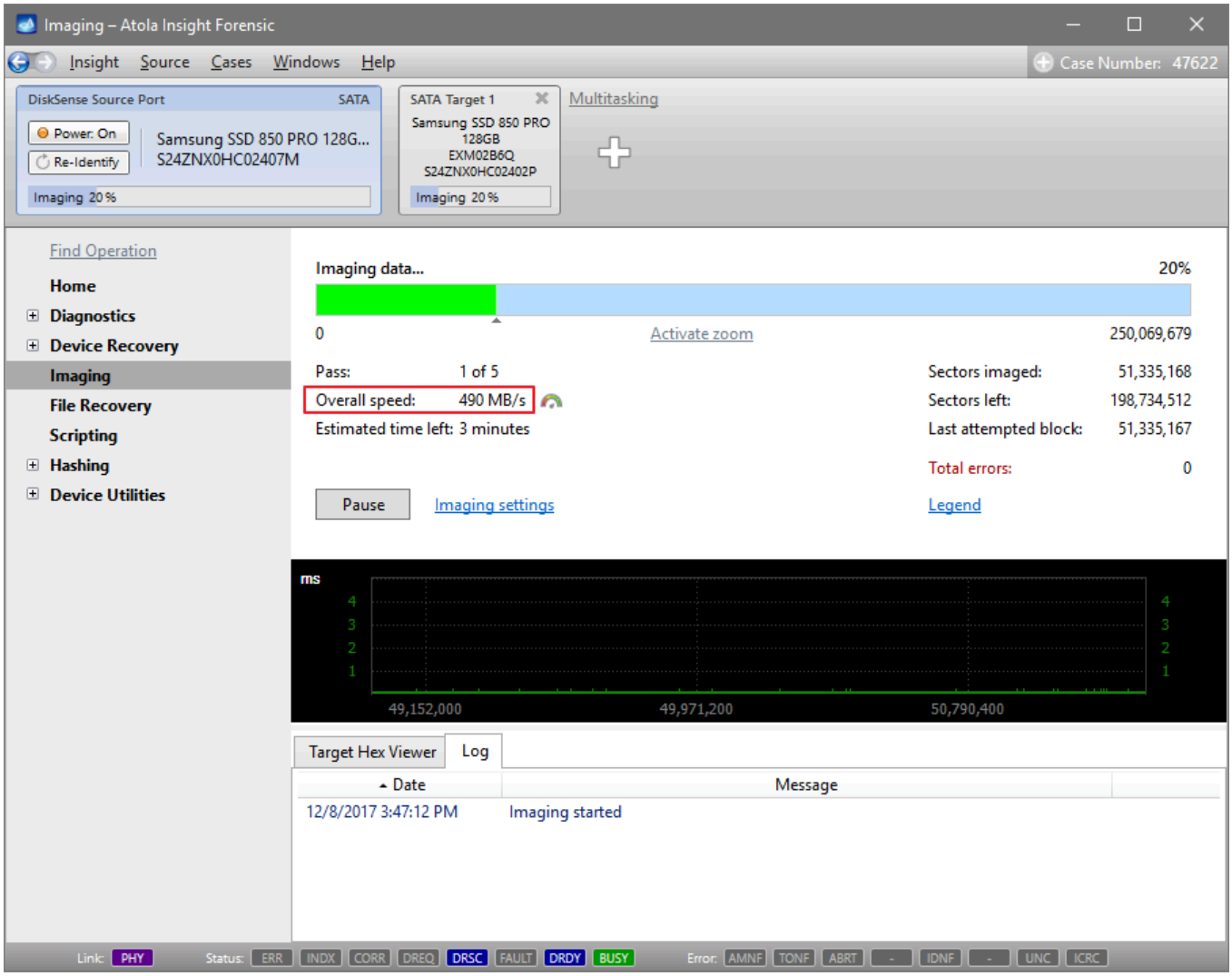


At userbenchmark.com this drive's maximum write speed in sequential mode (sectors read and written to in sequential order) is 502 MB/s.

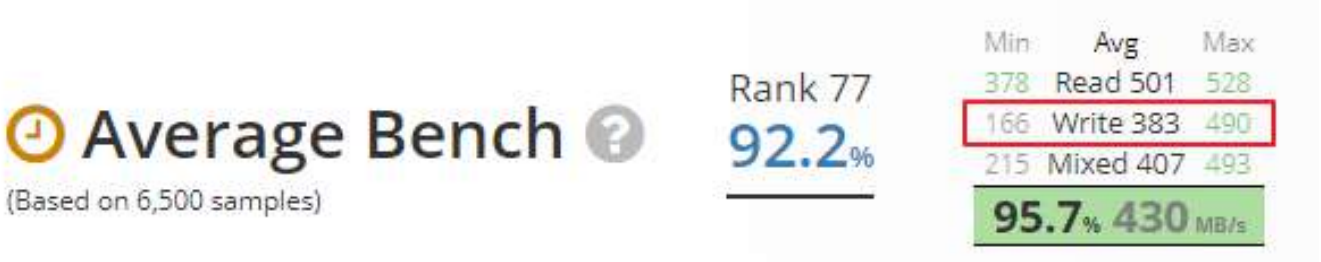


Samsung 850 Pro 128GB

Next, we take the 128 GB version of the same SSD drive, and Insight images it at 490 MB/s.

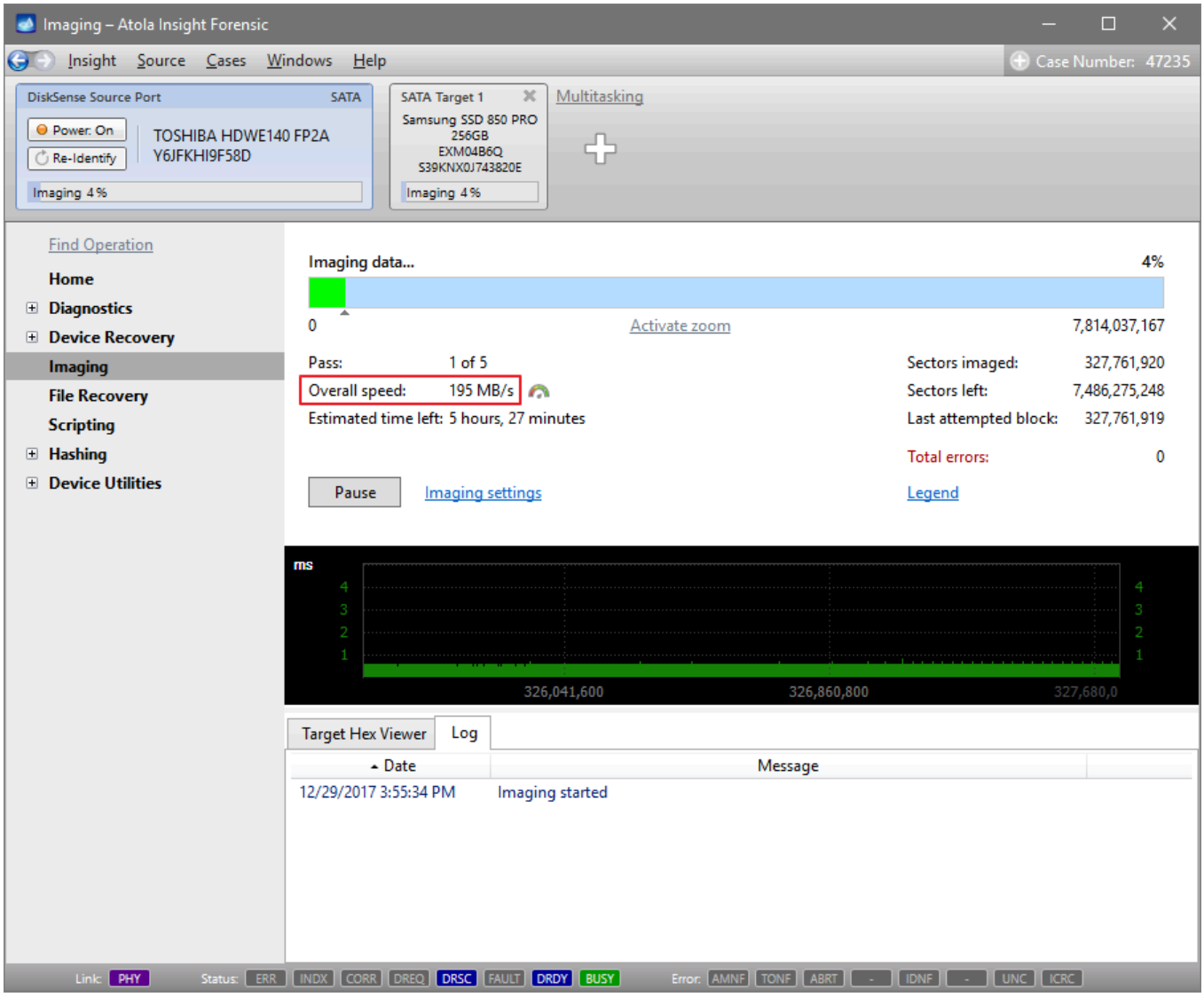


The maximum write rate (we image to an identical SSD) claimed at userbenchmark.com (based on over 6 thousand samples) is 490 MB/s, the same rate as that achieved by Atola disk imaging hardware.

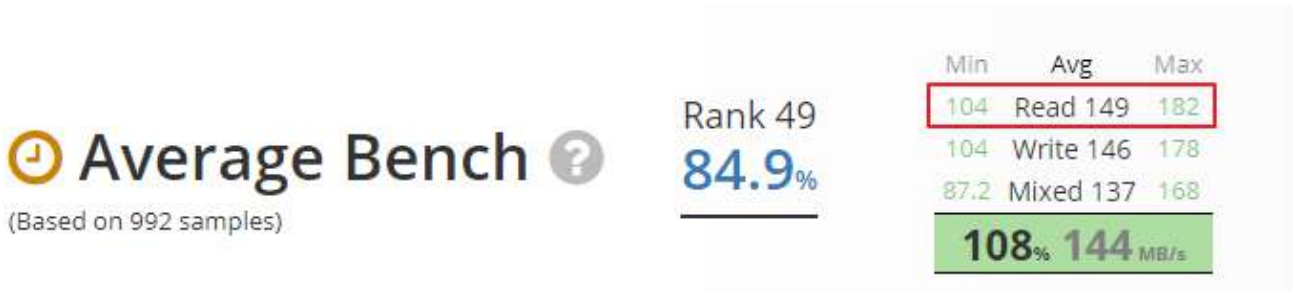


Toshiba X300 4TB

When Insight images a 4TB Toshiba X300 (an HDD with SATA interface), it achieves the speed of 195 MB/s.

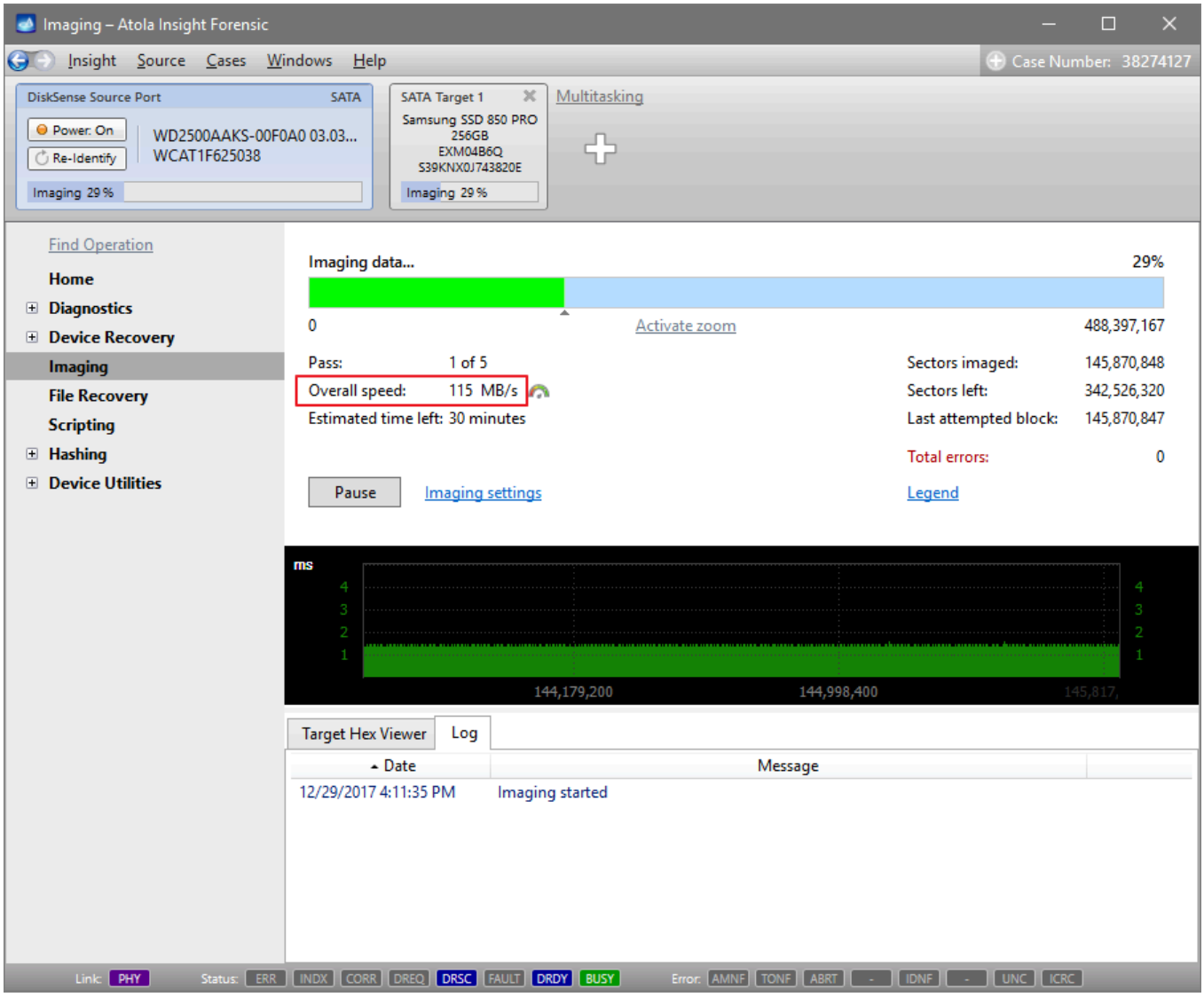


How does this speed compare to the one at userbenchmark.com? The website quotes 182 MB/s of max read speed. Insight's speed substantially exceeded the benchmark speed based on 992 samples!



Western Digital's Blue 250 GB (2008)

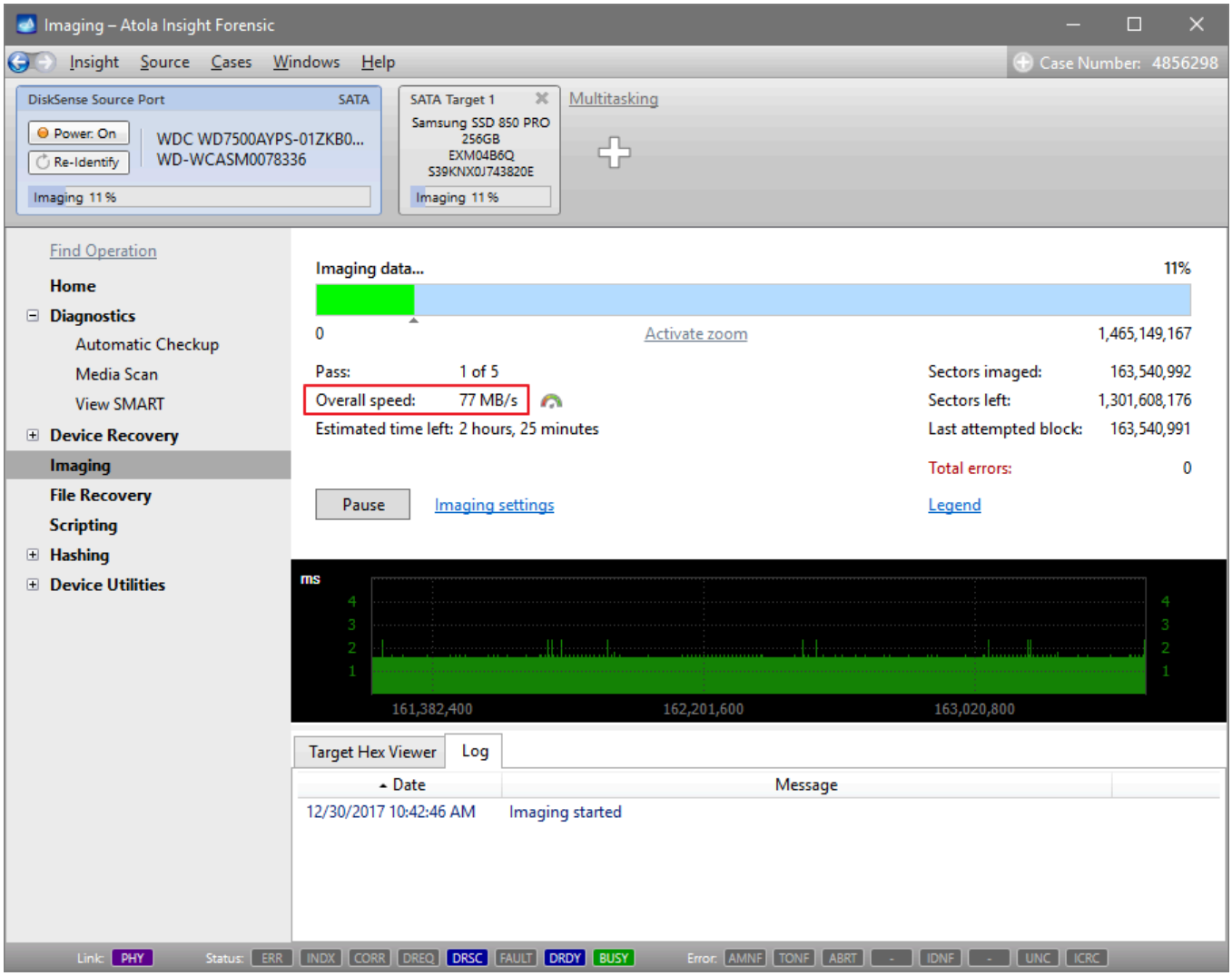
Insight's speed of imaging a Western Digital's Blue 250 GB constituted 115 MB/s.



At userbenchmark.com the same drive's max read speed is 115 MB/s. Again Insight achieved the top speed based on over 3000 samples.

Western Digital WD7500AYPS 750GB

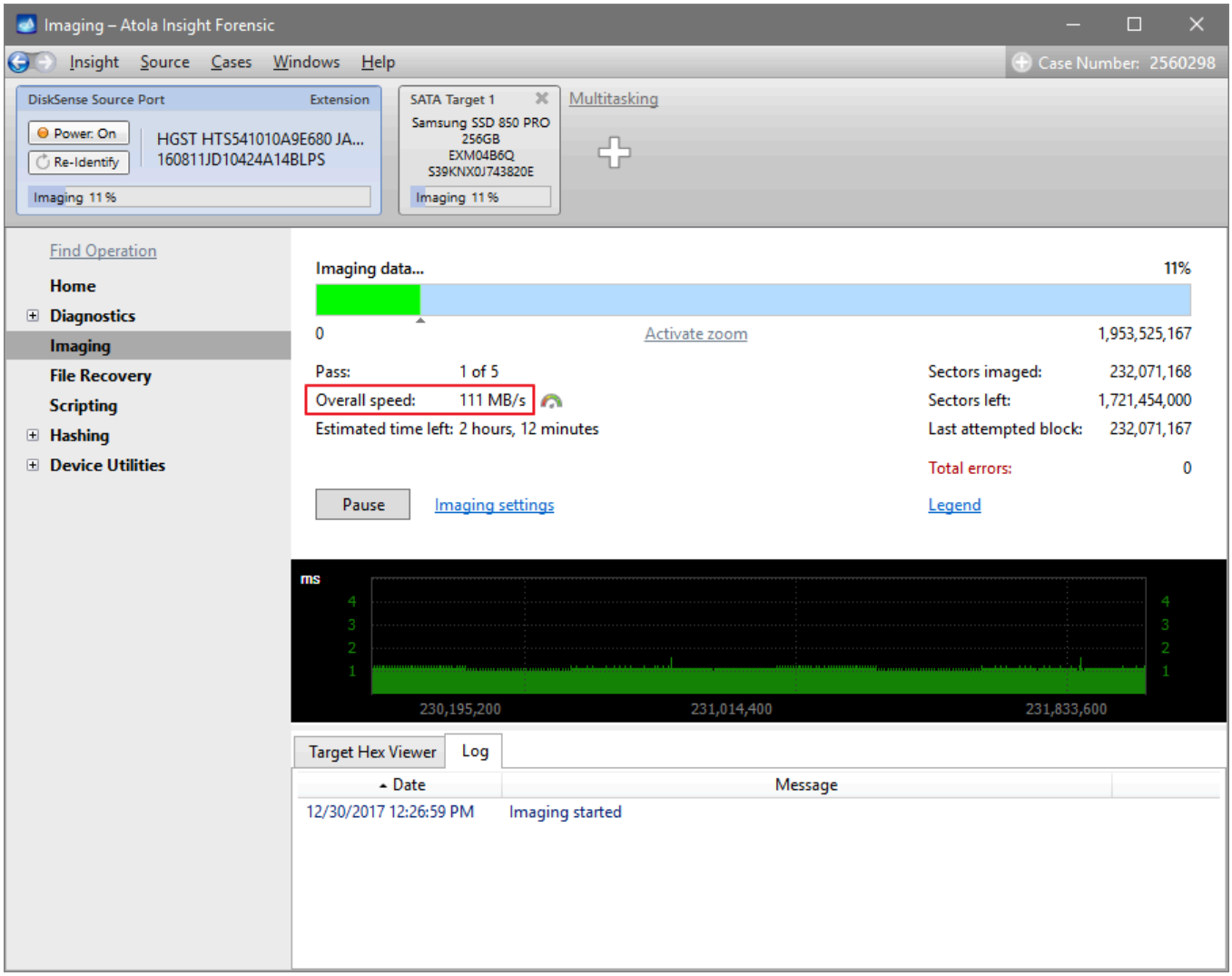
Insight was able to reach 77 Mb/s when reading WD7500AYPS 750GB drive.



The same drive at userbenchmark.com achieved the maximum read speed of 73.7 MB/s. Again Insight exceeds this index.

HGST HTS41010A9E680 1TB

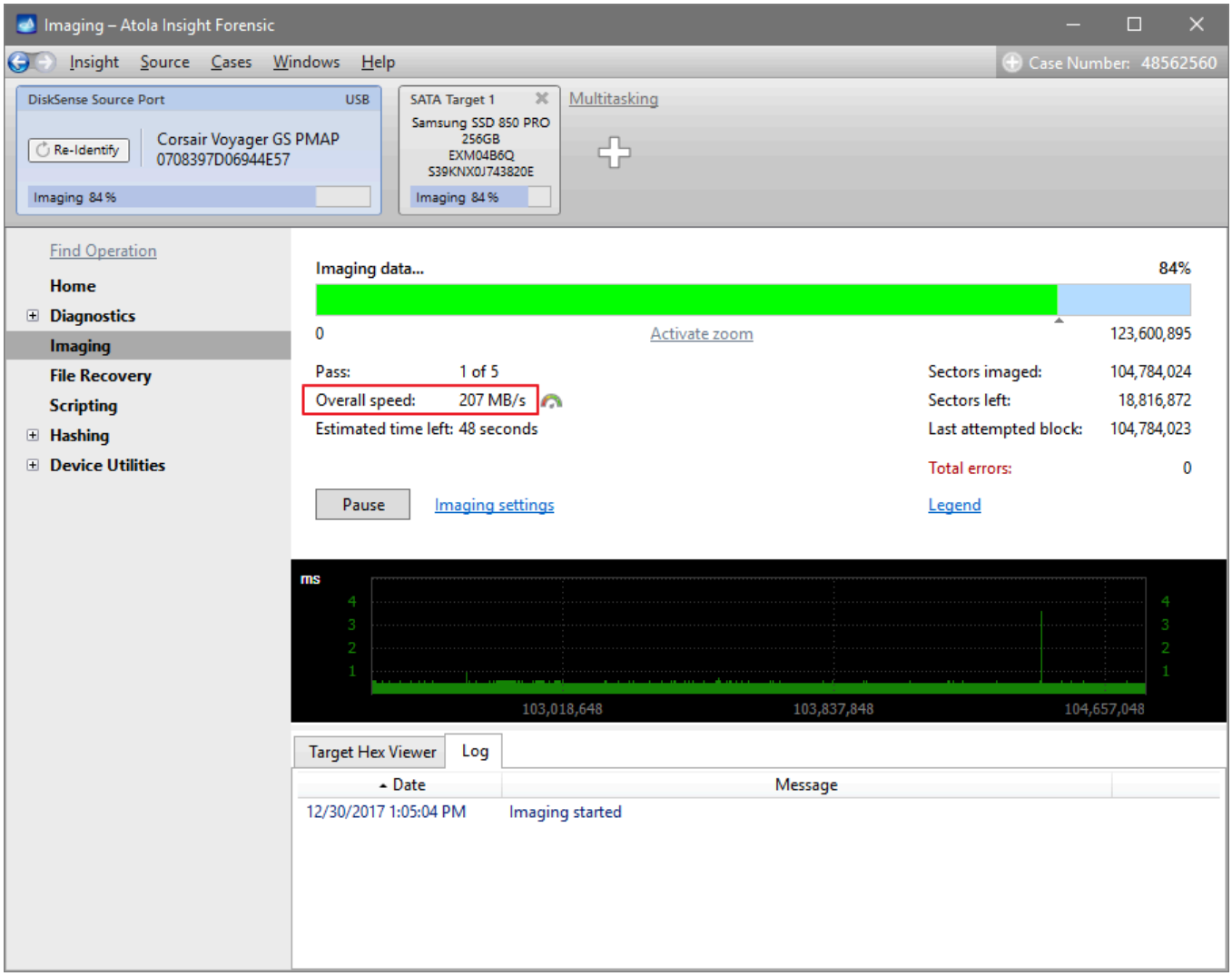
When imaging this HGST 1TB SAS hard drive, Insight was able to achieve 111 MB/s.



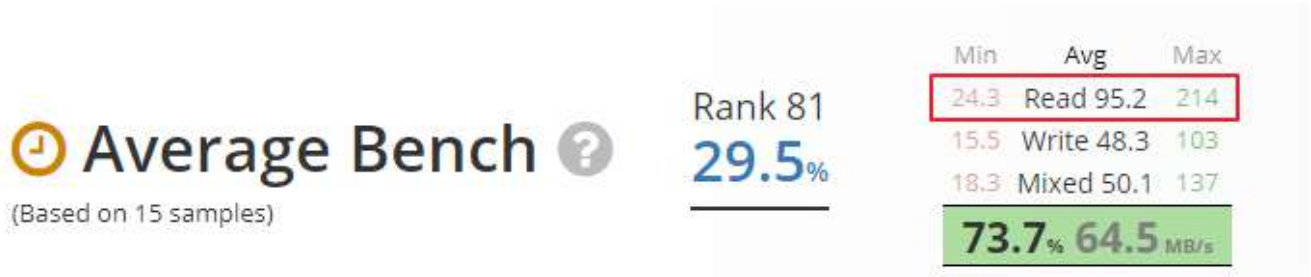
And it is a much higher speed than that of userbenchmark.com (99.5 MB/s max read speed).

Corsair Voyager 3.0 64GB

Next, we imaged Corsair Voyager 3.0 64GB USB, and Insight reached an overall speed of 207 MB/s.



The max read speed achieved by the contributors of userbenchmark.com constituted 215 MB/s. Insight did below the max speed but substantially above the average.



Please note that here we imaged devices that were in overall good health. Imaging may be considerably slower when dealing with a damaged drive, and the speed heavily depends on the type and degree of such damage.

Here are links to the userbenchmark.com pages with the devices mentioned above for your reference:

Samsung 850 Pro 256GB https://ssd.userbenchmark.com/Samsung-850-Pro-256GB/Rating/2385

Samsung 850 Pro 128GB https://ssd.userbenchmark.com/Samsung-850-Pro-128GB/Rating/3483

Toshiba X300 4TB https://hdd.userbenchmark.com/Toshiba-X300-4TB/Rating/3592

WD Blue WD2500AAKS 250GB https://hdd.userbenchmark.com/SpeedTest/2143/WDC-WD2500AAKS-00L6A0

WD WD7500AYPS-01ZKB0 750GB https://hdd.userbenchmark.com/SpeedTest/7309/WDC-WD7500AYPS-01ZKB0

HGST Travelstar 5K1000 2.5" 1TB https://hdd.userbenchmark.com/SpeedTest/72/HGST-HTS541010A9E680

Corsair Voyager GT 3.0 64GB https://usb.userbenchmark.com/SpeedTest/5886/Corsair-Voyager-GT-30

Launch a command-line interface app after imaging

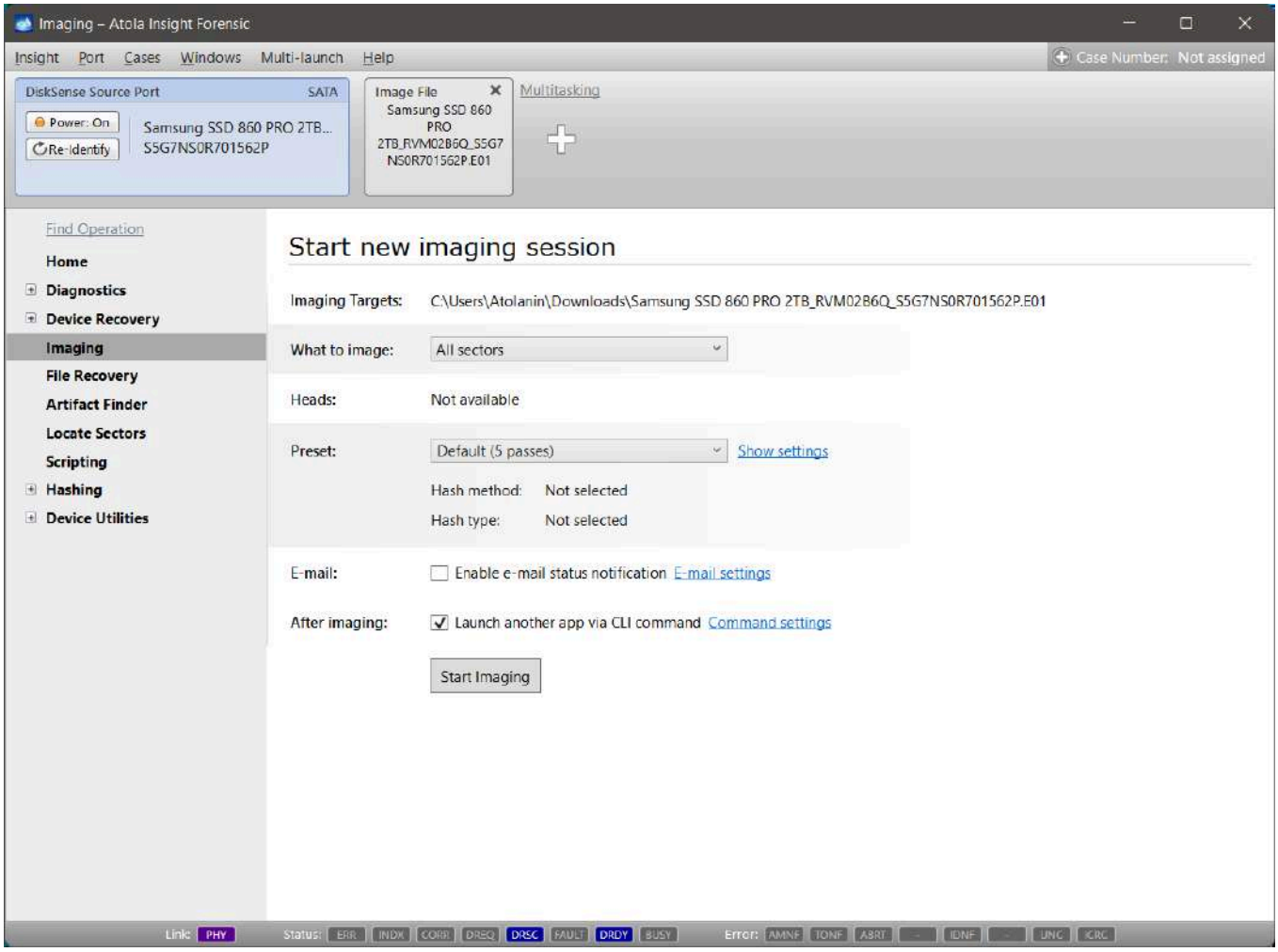
To include an imaging process in your automated workflow, you can tell Atola Insight Forensic to launch another application after imaging using command-line interface (CLI). It can be a single CLI command with custom arguments or even a chain of commands contained in a BAT file.

How to launch a CLI app after imaging

> If you want to launch not one, but a chain of custom CLI commands after imaging, you need to save them as the BAT file beforehand.

To launch a command-line interface app after imaging, do the following:

1. Connect your source and target devices to the DiskSense hardware unit.
2. Click on the port with your source device.
3. Go to **Imaging** > **Create new session**, and then select your target device.
4. On the **Start new imaging session** screen, find the **After imaging** section, and then select **Launch another app via CLI command**.



5. To specify that CLI app to launch, click **Command settings**.
6. In the **Application** field, enter the path to the executable file of your application or to your BAT file.
7. In the **Arguments** field, enter command-line arguments for your application.

   Atola Insight Forensics assists in specifying default arguments of Autopsy, X-Ways, Forensic Explorer, and OSFMount.

   Atola Insight Forensic saves the path to the resulting target image file as a variable and can pass this variable to your CLI app:

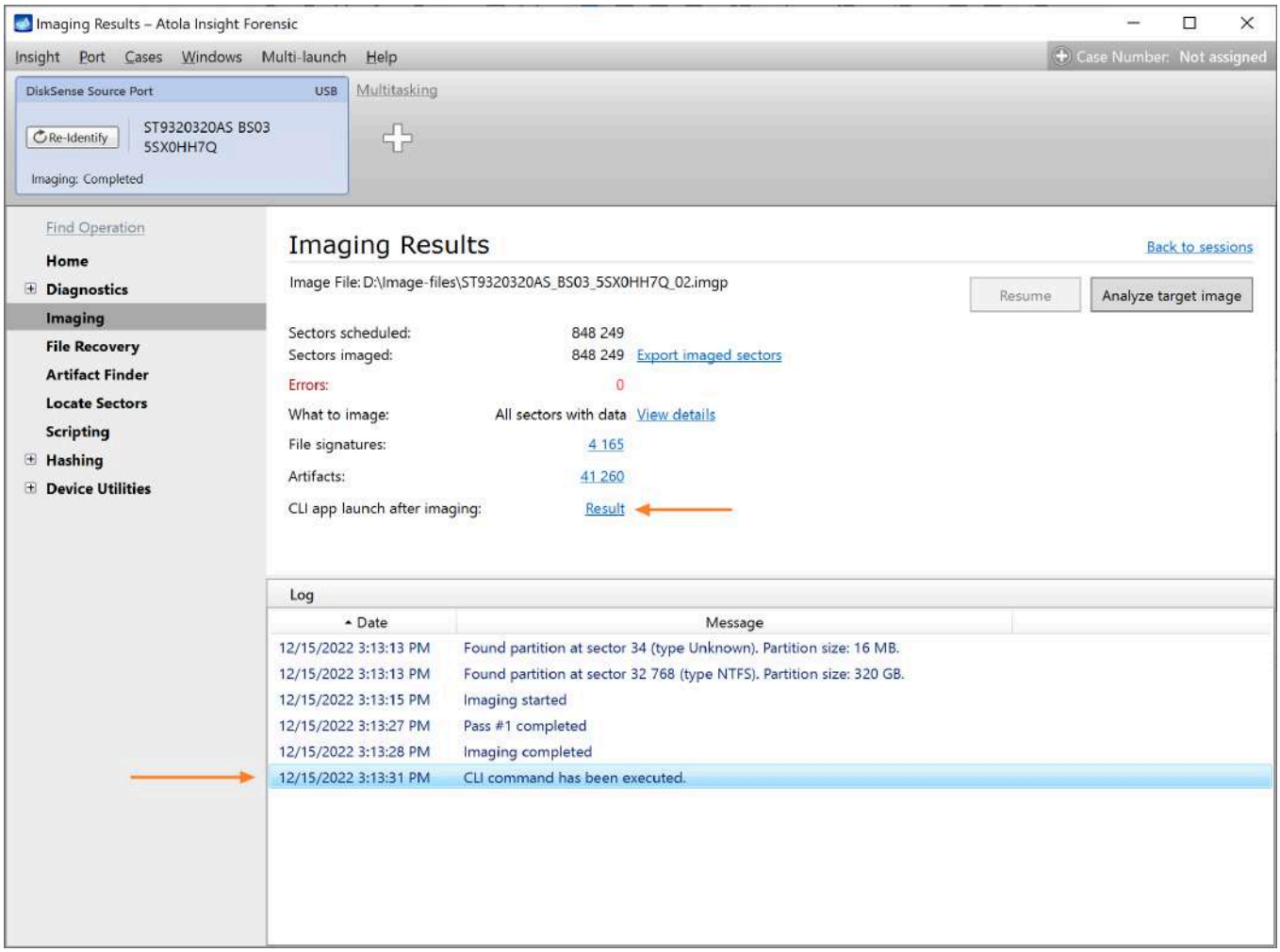
   - %1 - full path to the first target image file
   - %2 - full path to the second target image file
   - %3 - full path to the third target image file

   We recommend using %1 in double quotes due to possible spaces in the file path.

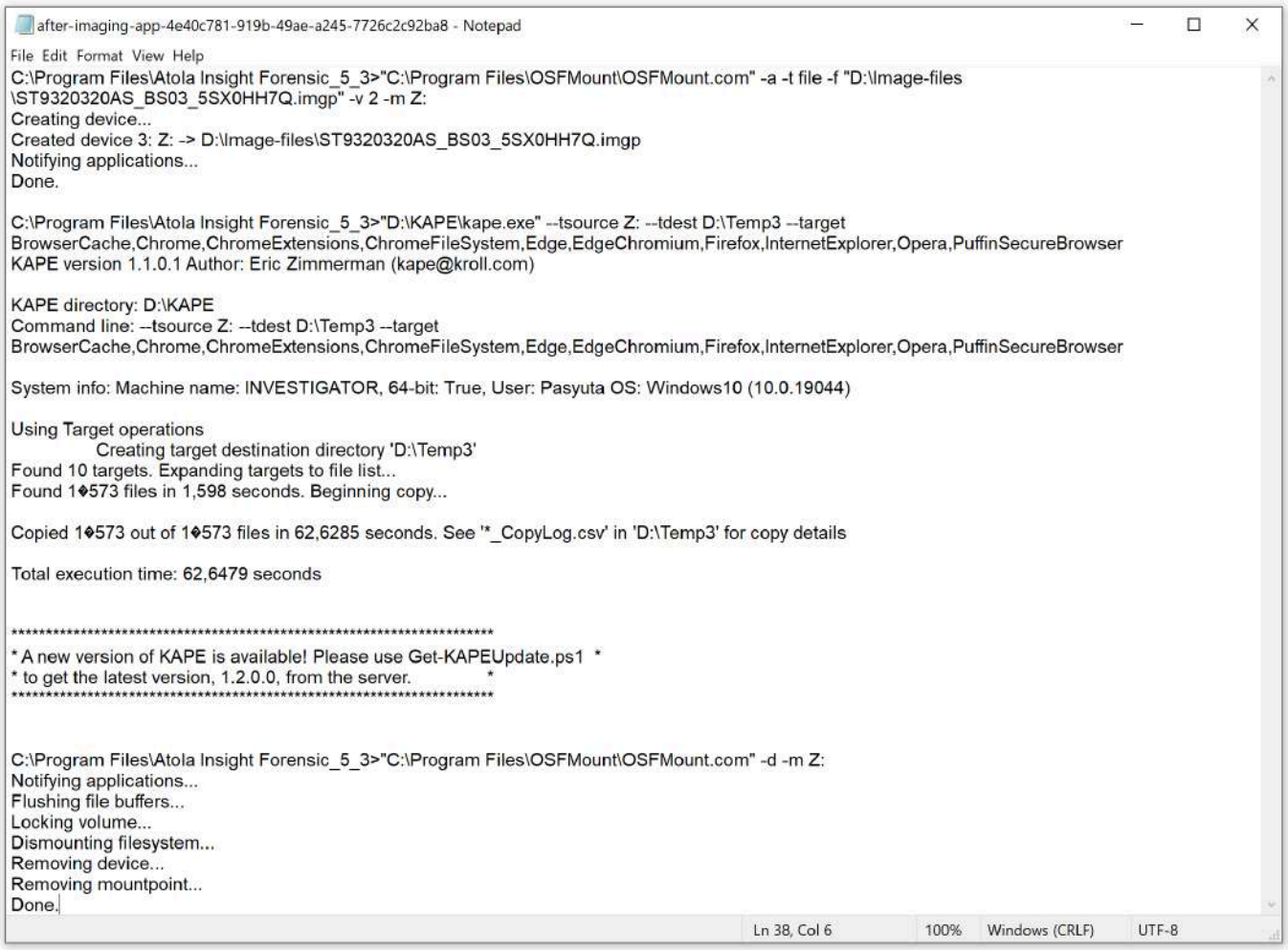
8. **Optional:** To see the possible result of running your application with specified arguments, click **Test command**.
9. After entering the application path and arguments, click **OK**.
10. Click **Start imaging**.

The imaging starts. When it is completed, Atola Insight Forensic launches the specified CLI app against the resulting image and records all the command-line interface commands it runs.

The message that a CLI app has been launched shows in the imaging log.



The report about the results of launching your custom CLI app appears on the **Imaging results** screen. To view the report and the text output from your CLI app, click on the **Result** link.



Imaging Cheat Sheet

When source drive is damaged

Use these imaging settings and follow the recommendations to cope with severely damaged drives.

Reverse direction

Imaging pass setting.
When enabled, the imaging engine reads a drive backwards.

Pros:

- disables Read Look-Ahead effect
- reaches damaged areas from the opposite direction

Cons:

- speed decreases due to auto disabling of drive's cache

Optimal target types for damaged source device

AFF4 image, RAW image, or target drive plugged into the unit Best to use segmented hashing with linear hashing disabled.

E01 is a linear format. It limits the use of Insight's advanced imaging features, e.g. reverse imaging or manual jumps.

USB drive read errors

Use high-quality short USB3 cables. Longer or lower-quality USB3 cables can produce read errors during imaging.

Disable read look-ahead

Imaging pass setting.
When enabled, a source device switches off its read-cache. Disabling read look-ahead decreases speed; but, it can be helpful against damaged drives.

Effective error handling rule

For particularly unstable drives, go to Error Handling tab and add a rule:

- Consecutive errors: 10
- Action: Change imaging direction

Segmented hashes

Imaging with linear hash: one MD5/SHA1 hash. Imaging with segmented hashes: many hashes of corresponding LBA ranges of the image

The sum of these LBA ranges represents the entire image, though not necessarily in sequential order. You can still prove that the entire image has not been modified by verifying all hashes in a set.

Damaged head

If Automatic Checkup detects a damaged or degraded head, disable the head in the imaging settings for the initial imaging session.

Read more here: Imaging Drives with Damaged Heads

Last imaging pass explained

The last pass has a unique feature which does not occur during previous passes: internal auto-reread procedure for error block sector-by-sector. It is defined by an unchangeable Jump size = 1 sector.

How imaging engine works on the last pass:

1. It reads block using Max Block Size pass setting (256 by default)
2. If reading is successful -> proceed to a next non-imaged block
3. If a read error occurs -> re-read the whole error block sector by sector.
4. If a read error occurs and ReadLong setting is enabled -> re-read using ReadLong command.

Faster imaging

If you want to speed up image acquistion, follow these hints.

Diagnose source before imaging

How it is useful:

1. Make sure the drive is in good condition or learn about the type of damage to make an informed decision about your following steps

2. Prioritize the drive. Diagnostics report tells you if there is any data at all.

3. Use imaging time estimation

Use faster targets

Good options:

- target SSD
- target NAS
- network server with RAID

When imaging to network, 10Gbit extension is highly recommended.

All sectors with metadata

All files contain file data and metadata. Partitions store metadata in specific structures, e.g MFT for NTFS. Metadata includes file name, access/modification datetimes, size, etc.

Imaging all sectors with metadata allows opening the full directory tree including files, without data within them.

Then you can open File Recovery and create an imaging session for specific files you need.
Example: pictures, videos, documents.

Disable Artifact Finder

If artifact search has been enabled and the output is too large, it may slow down imaging. Try this:

1. Pause imaging
2. Add a new imaging session
3. Disable some or all Artifacts
4. Resume the session

Change imaging pass timeout on-the-fly

Changing timeout is available only when you create a new session:

1. Pause the currently running imaging (‘Pause’ button)
2. Click 'Add New Session' link
3. Open imaging settings and change timeout of the last pass
4. Resume the imaging session

Important: The resumed imaging session will complement the data imaged prior to the pause with only the sectors that were not yet copied.

Use Media Map Manager

When imaging selected files, speed can be low due to a high fragmentation of sectors which belong to the files.

1. Select files and click 'Image checked'
2. Click 'Edit this map'
3. View the fragmented blocks in LBA ranges
4. Click 'Add range'

5. New LBA range will appear at the end of the list
6. Change Start and End LBA of the new range to include most of LBA ranges above

Segmented Hashing

Segmented hashing is no longer a new hashing concept. It was introduced by Atola Technology in November 2016 and has since been successfully utilized by thousands of investigators. Segmented hashing enables the hashing of damaged source drives and prevents losing a target image if part of the data gets corrupted. This hashing method can be used during multipass imaging of damaged drives.

How is segmented hashing different from regular hashing?

With regular hashing, you get a single hash for the entire image.

With segmented hashing, you end up with many hashes of corresponding LBA ranges of the image. The sum of these LBA ranges represents the entire image, though not necessarily in sequential order. You can still prove that the entire image has not been modified by verifying all hashes in a set.

Segmented hashes are saved in a CSV file in this format:

Hash,start LBA,end LBA

Example:

```
75c92419e86ce82734ef3bbb781e6602 ,0,8388608
e2c7fc5264bae820e46c50b0502236d3 ,8388609,16777216
42718e48b5adb59563c98727cbce0619 ,16777217,25165824
... And so on until the last LBA.
```

Segmented hashes for multipass imaging

Conventional hashing methods don't work when imaging an evidence device in a non-linear way, which means no proper hash calculation is possible when imaging damaged evidence drives.

Segmented hashing allows the use of multiple passes and more efficient handling of damaged drives while hashing all the good areas. Hashes are calculated only for the imaged areas, while all bad sectors are excluded from the calculation.

Better resiliency

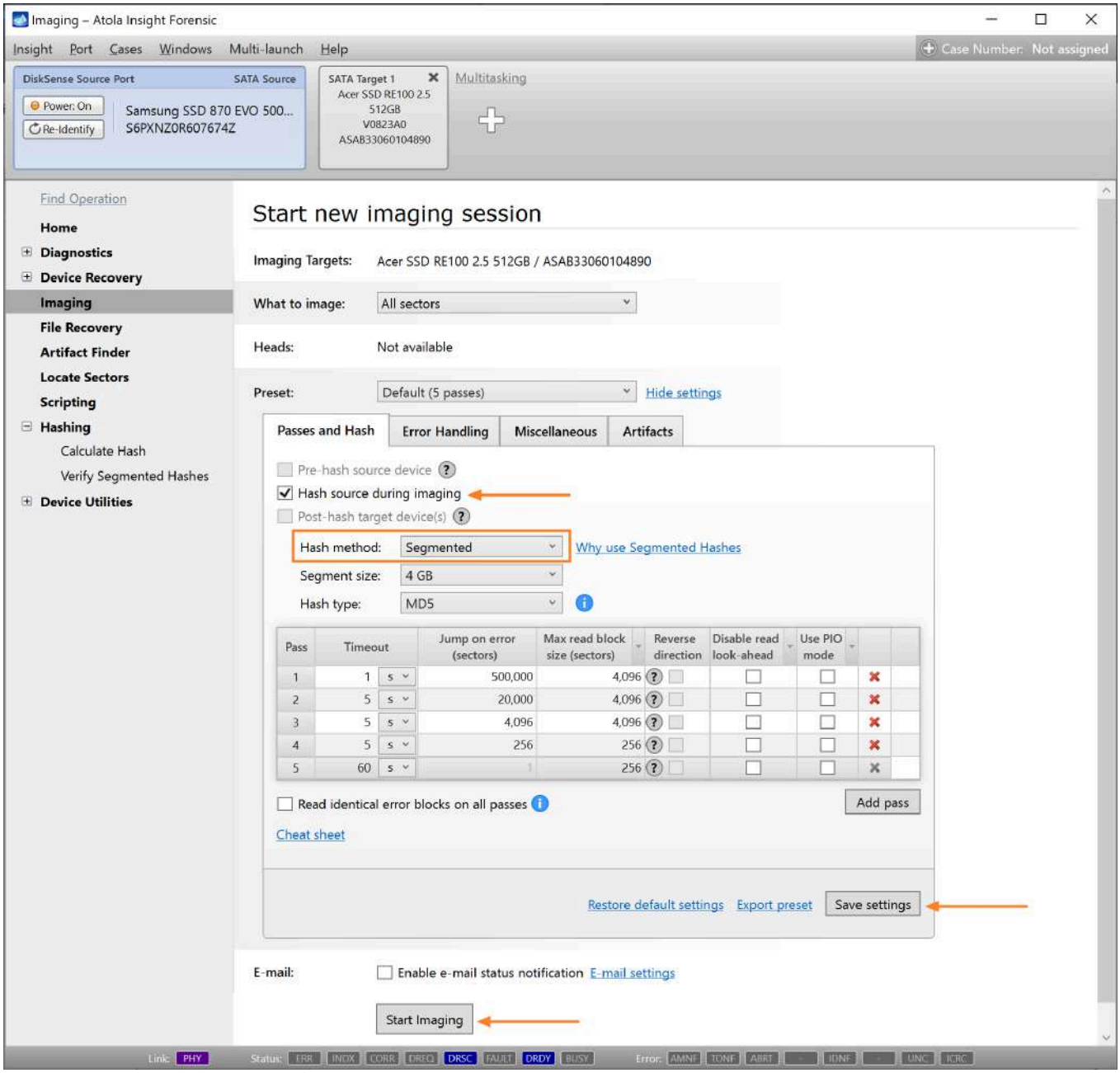
Another reason to use segmented hashes is to ensure better resiliency against data corruption in the image.

If your acquired evidence image gets damaged in the future, with a regular linear hash you will get a hash mismatch upon verification, and the entire image will become useless. With segmented hashes, only the hash for one segment in the set will become invalid.

Image with segmented hashing

To enable segmented hashing for an imaging session, do the following:

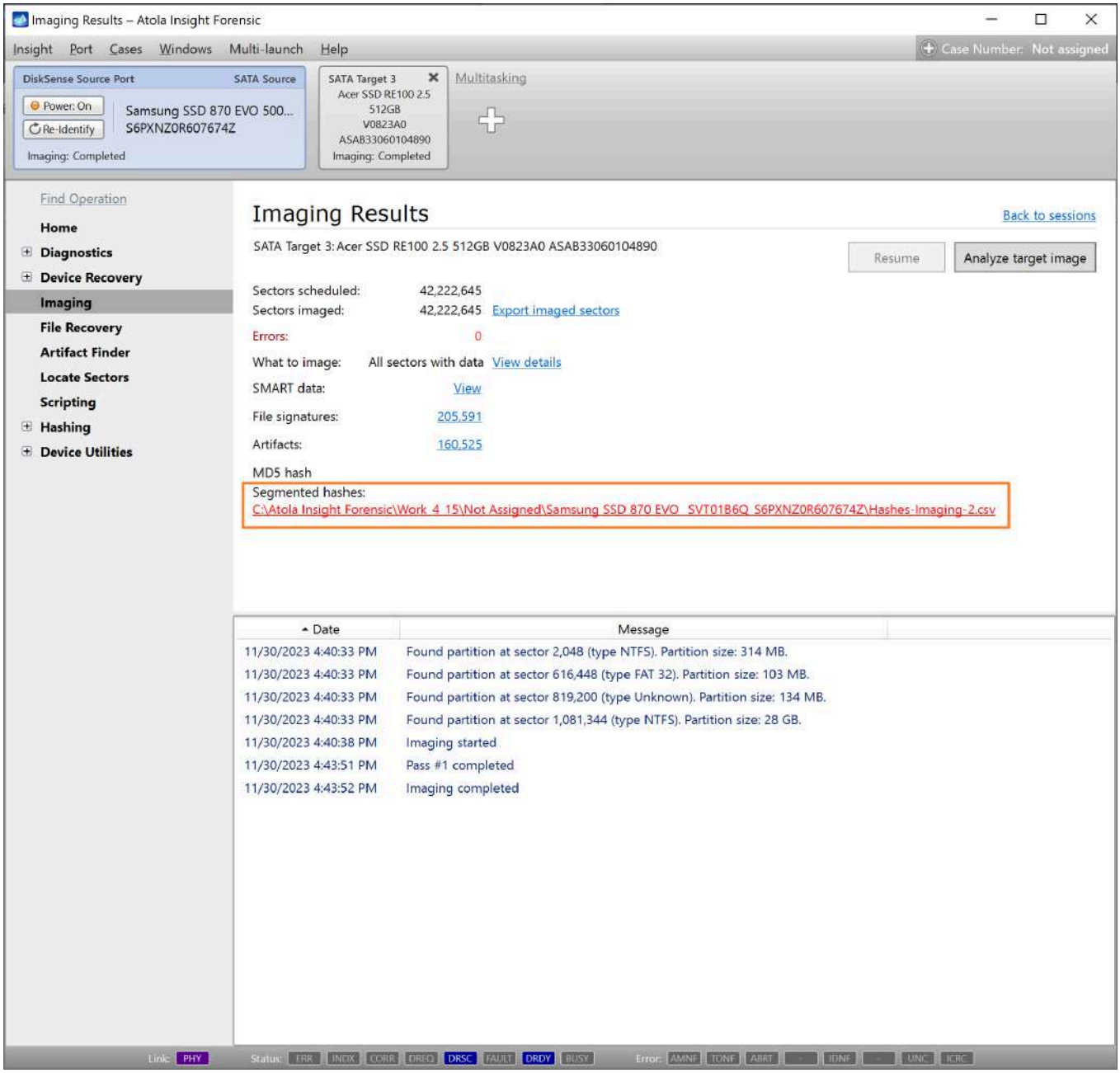
1. Go to **Imaging** > **Create New Session**.
2. In the **Preset** section, click the **Show settings** link.
3. On the **Passes and Hash** tab, enable **Hash source during imaging**.
4. Set the **Hash method** to **Segmented**.
5. Adjust other imaging parameters as needed and click **Save settings**.
6. Click **Start imaging**.



Segmented hashes are saved in a CSV file in "*Hash,start LBA,end LBA*" format:

	A	B	C
1	f7bf70a5334d2c89a446a8e19d51a1a0	0	8388607
2	6dee83f1113df428376a527e05aa1025	8388608	16777215
3	bd545f75d2105b70ebf8bf77e6646cbf	16777216	25165823
4	4b37dc251e944ffe07f55541c4bc2e87	25165824	33554431
5	cd8132c1a6519cf86581b87d1739468f	33554432	41943039
6	3ac718b7bf24a1e2e2c8e4f7e8f958fa	41943040	50331647
7	bd46b112052cbca1c11e11c0bc002bec	50331648	58720255
8	f5202708a3403fc12f0bcaacd94c2068	58720256	67108863
9	45a0fdd5d10a3bad3052b699dde12b48	67108864	75497471
10	8352fd4e1b91518746a25a9f1ea86040	75497472	83886079
11	757969d60ff8f2b98ed846dd2cc592fa	83886080	92274687
12	9ad7e94836a35b9b8bbc5fb53464cbdf	92274688	100663295
13	4c7241d3fc54e7b92c0e68b434c46d04	100663296	109051903
14	53ad24d1f14a680867b4c522c298124b	109051904	117440511
15	42bad2c897a8545c51a799944570c7b0	117440512	125829119
16	e71763cb053b96b0295fb8c482e86b32	125829120	134217727
17	144d2c8bd01f1faf80509bb33e04193e	134217728	142606335
18	c5193c7b808fcb7239c0ef2fcf5b672c	142606336	150994943
19	d068ad53d97ab03f6ad17d0c1412e70a	150994944	159383551
20	3dd6266ae3154dff290a3845495bccd7	159383552	167772159
21	004294e4fdab1a07b0bcbf78b8f4a67b	167772160	176160767
22	46b5d924925e8d150eaf6d3055e01dc1	176160768	184549375
23	3f0c00c4e931807eca7b5ad5eef2e1e5	184549376	192937983
24	d36b480b5cbd0c16fb53f1a23db4dc5f	192937984	201326591
25	045f7a61c38479f497c7e570572ebf19	201326592	209715199
26	95c625def63c33608e0dae9db3e59b8f	209715200	218103807
27	6d3c5057c90b5c0cf50cac80f77035be	218103808	226492415
28	98aaad3e787bd5d0bbee576825b33209	226492416	234441647
29			

A link to the file with segmented hashes is included in the **Imaging Results** report.



Verifying images of damaged drives with segmented hashing

Unlike the conventional linear hashing, segmented hashing produces not a single hash, but a list of hashes of corresponding LBA ranges of the image saved into a CSV file in this format:
Hash, start LBA, end LBA

By validating all hashes on the list, you can prove that the entire image has not been modified. For more information about this hashing method, see Segmented Hashing.

While this method of hashing has a number of benefits for forensic specialists, among its strongest advantages is its applicability to damaged drives.

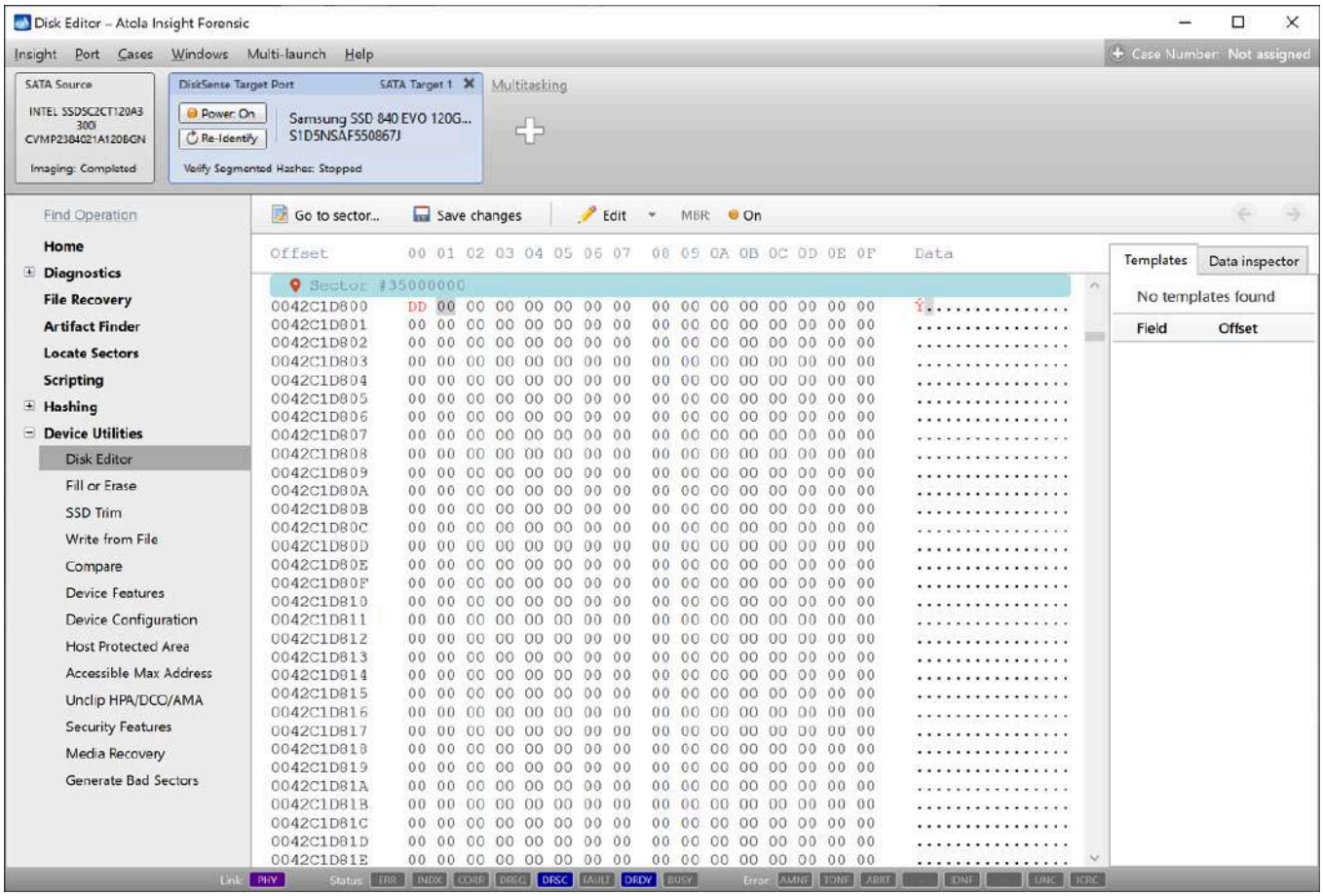
For one, this non-linear hashing method allows calculating hashes of the good areas of evidence media, while bad areas that are impossible to read and image, are left out of the calculation.

Secondly, if your acquired evidence image is damaged at some point in the future, with the regular linear hashes you will get a hash mismatch upon verification, and the entire image becomes useless, whereas with segmented hashes only the hash of the damaged segment will become invalid. For example, in the case of a 4TB hard drive, if the default 4GB segment size is applied, one invalid hash will account for only 0.1% of the drive, while the remaining 99.9% of hashes can still be verified.

Verifying segmented hashes

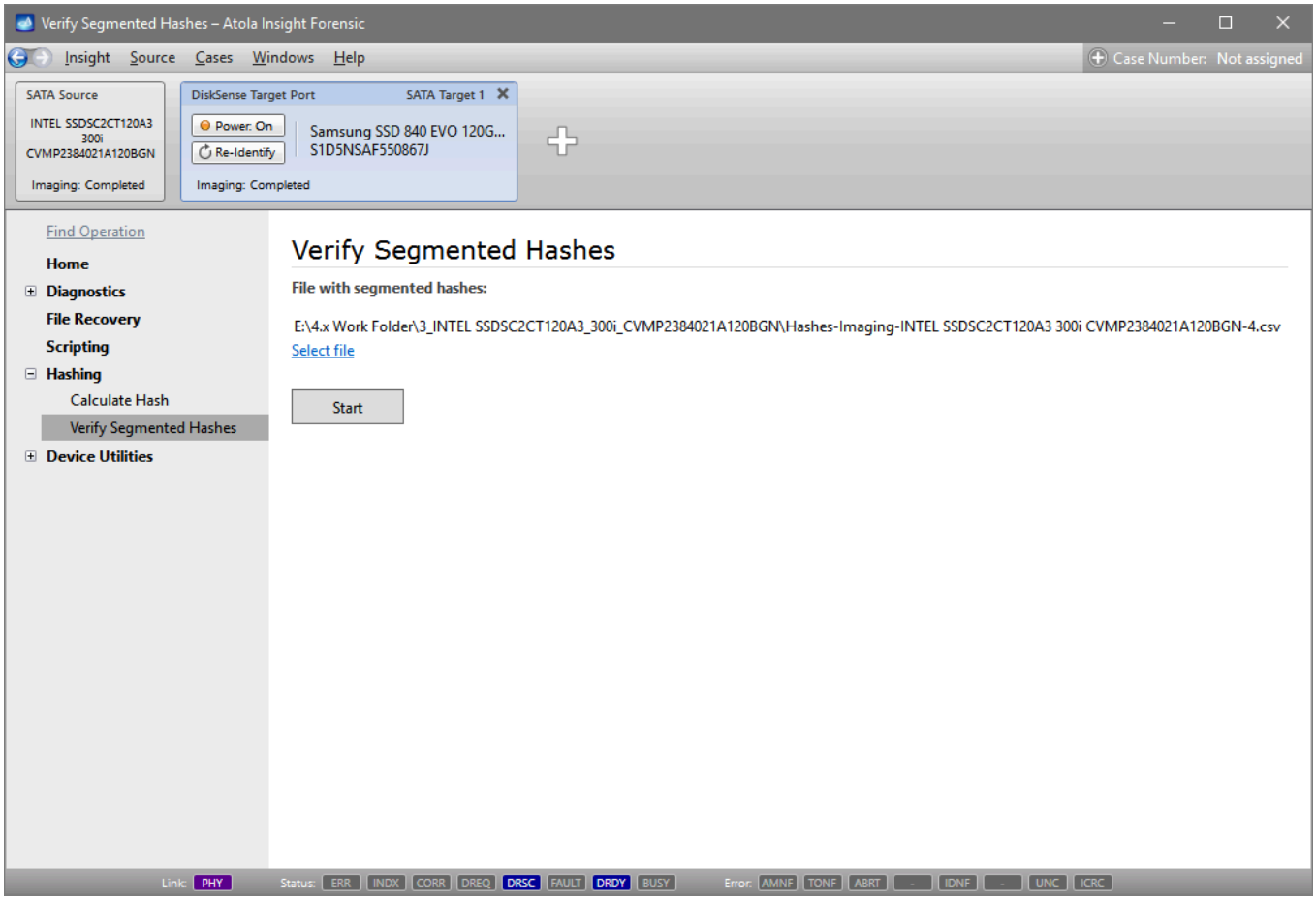
For instance, you have imaged a source drive and calculated its segmented hashes, the CSV file is stored on your computer. Now let's simulate a change of the evidence image to see how Segmented hashing helps us identify the areas, whose integrity has not been compromised.

Step 1. In the top **Device panel**, select the target image. In the sidebar, go to **Device Utilities** > **Disk Editor**. Click **Go to sector** and enter *35,000,000*. Change one byte in this sector and click **Save changes**.



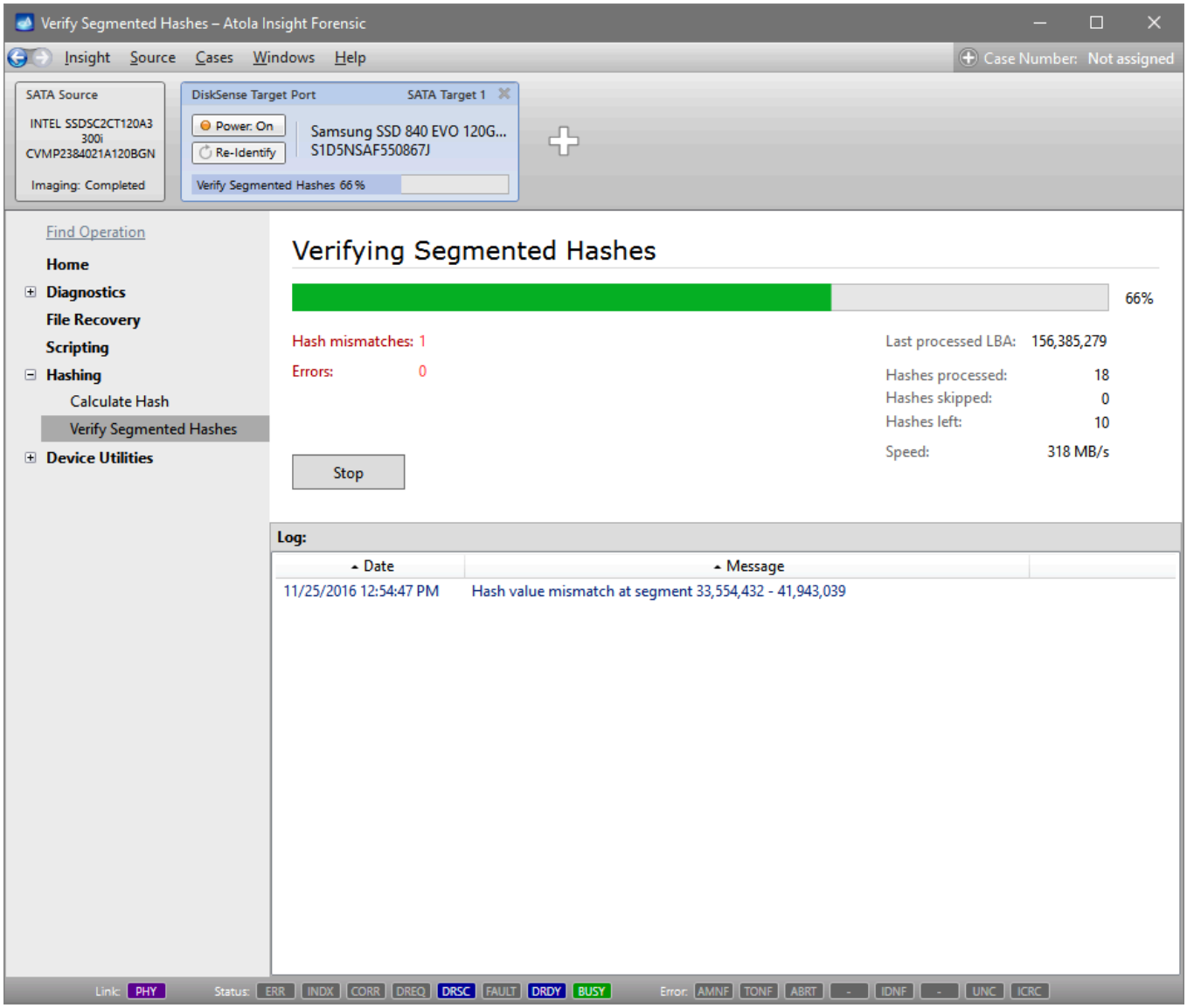
Changing one byte in Disk Editor

Step 2. In the sidebar, go to **Hashing** > **Verify Segmented Hashes**. This is an automated way to verify the segmented hashes in an existing CSV file against the target image. Select the file with segmented hashes calculated during imaging and click **Start**.



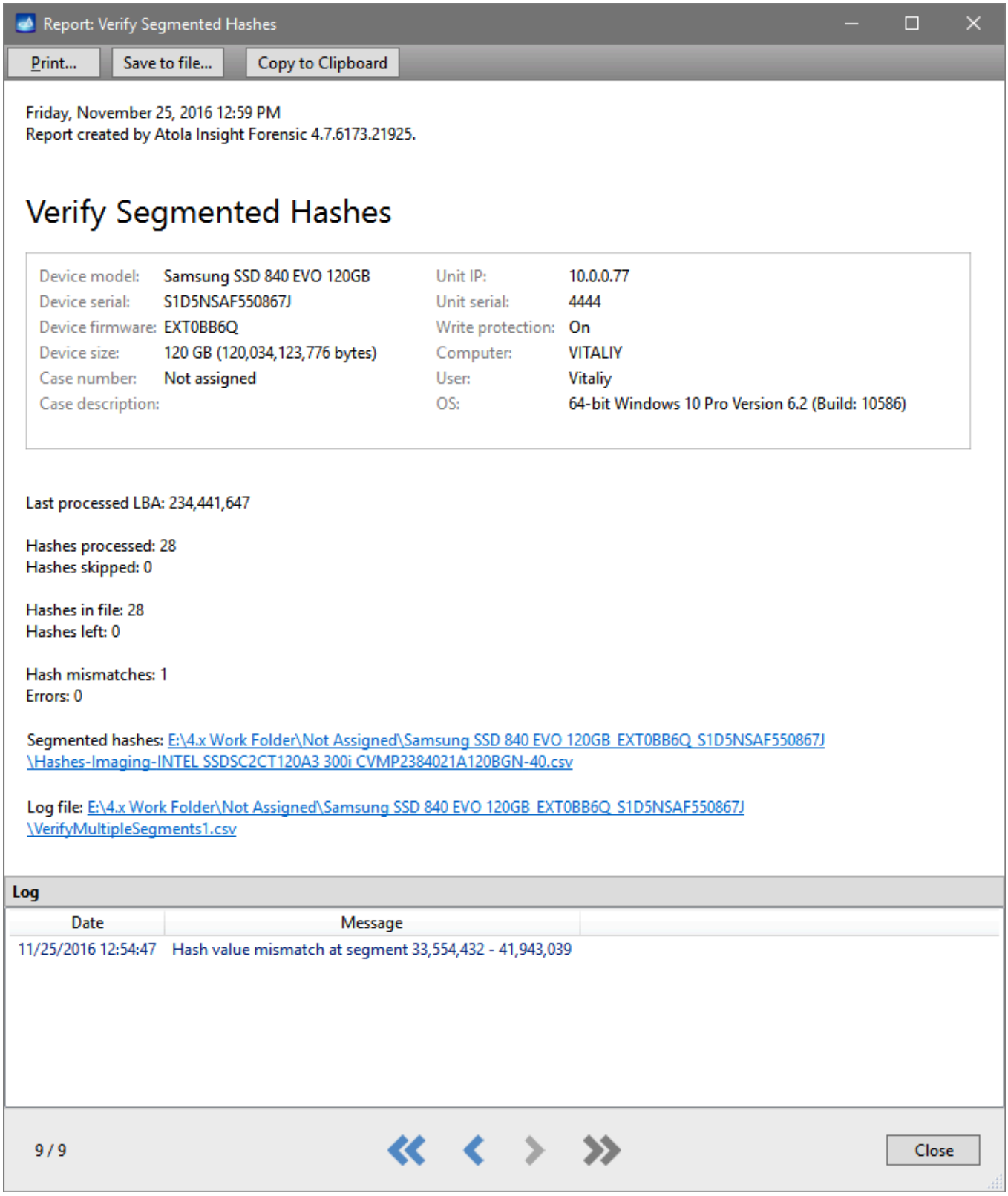
Hash verification

Step 3. Hash verification is in progress. Here we see 18 segmented hashes checked. Hash for the interval that includes sector 35,000,000 is invalid.



Segmented hash verification in progress

Step 4. Hash verification finishes with the proper case report automatically created, also in CSV format.



Segmented hash verification report

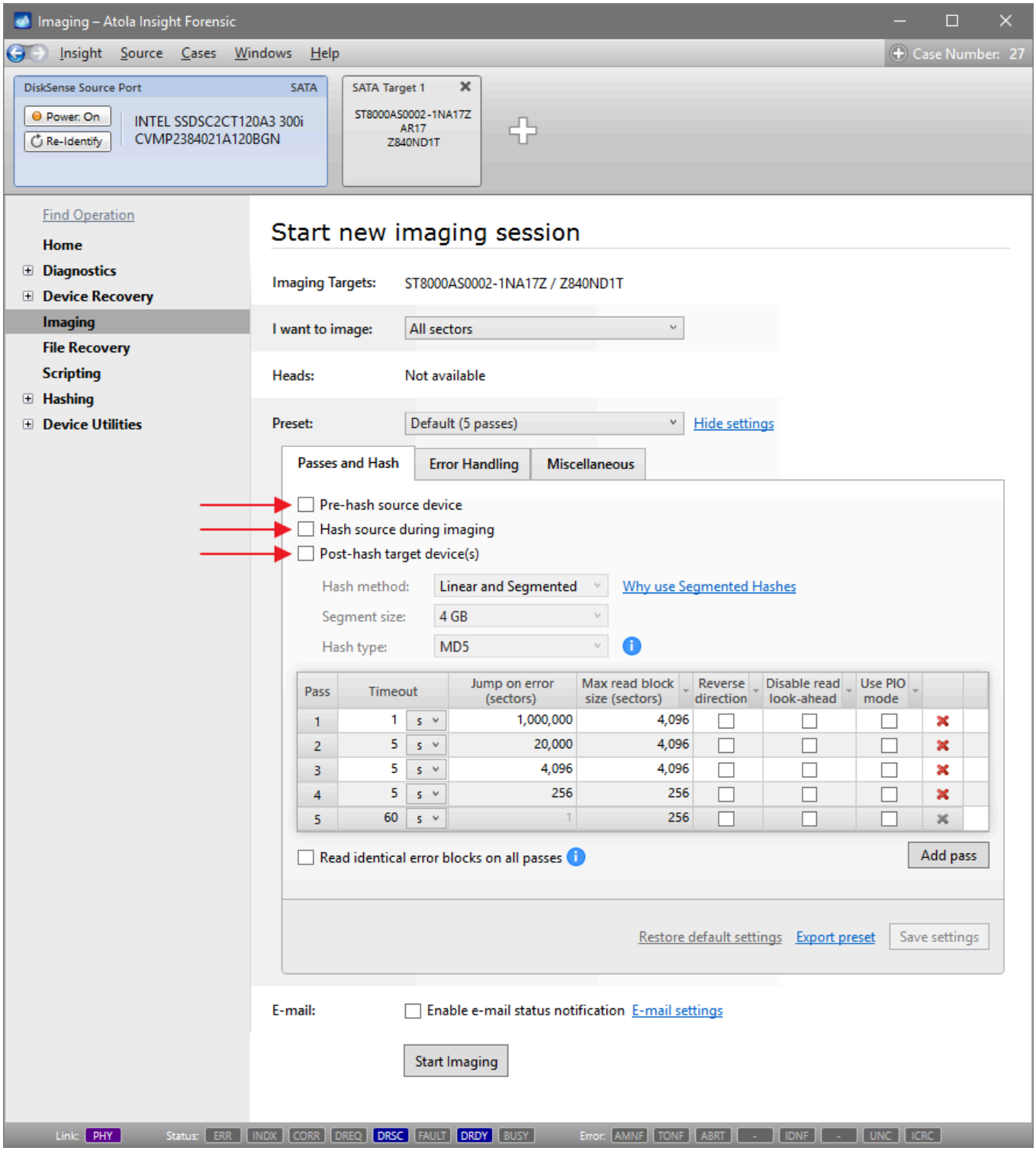
This is how segmented hashing helps you avoid the whole image being compromised when a small area of the evidence target is damaged.

Calculating hash during imaging

Atola Insight Forensic supports hash calculation of both source and target devices in conjunction with imaging. We have developed highly flexible functionality to help optimize evidence acquisition process to fit one's internal procedures as well as avoid causing further damage to fragile media.

To view the hashing options:

1. In the sidebar, click **Imaging**.
2. Click **Create New Session**.
3. Select the target device or file.
4. In **Preset** line, click the **Show settings** link.
5. In the upper part of the **Passes and Hash** tab there are three checkboxes:
    - Pre-hash source device.
    - Hash source during imaging.
    - Post-hash target device(s).



Imaging results with segmented hashes

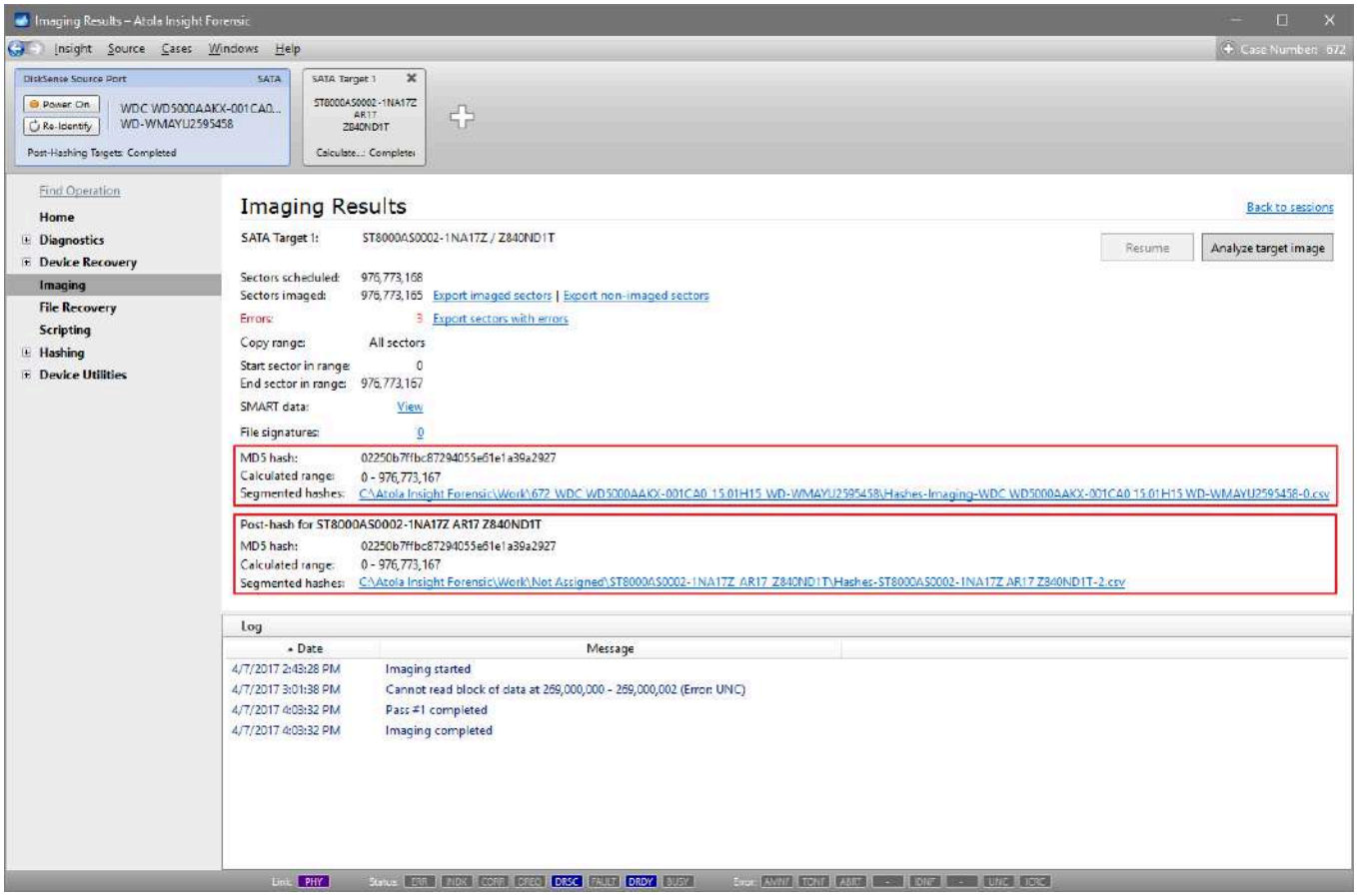
Multiselect is available, which allows an operator to use all three of these options.

However, **Pre-hash source drive** option must be used with caution: although pre-hashing can be required by an investigator's internal procedures, when dealing with drives that have been diagnosed with hardware failure, this operation may cause further damage to the drive before essential data is imaged.

On the contrary, **Hash source during imaging** is the most appropriate way to calculate the hash of a fragile source evidence drive. In this case, Insight only needs to read the data on the drive once to both image and calculate the hash, thus minimally using the drive's hardware.

> Linear hash can only be calculated by reading data in sectors consecutively in one pass. Therefore ticking **Hash source during imaging** checkbox and selecting **Linear** or combined **Linear and Segmented** option in the **Hashing method** list leads the number of passes to be limited to one. When dealing with a damaged drive, we strongly recommend using Segmented hashing, as this method supports multipass imaging and handling of bad sectors and provides better resiliency against data corruption. For more details, see Segmented hashing.

Post-hash target device(s) option allows to properly record the calculated hash in the case. Since this operation does not require reading the source drive, it is safe to use this option while imaging either good or damaged drives.

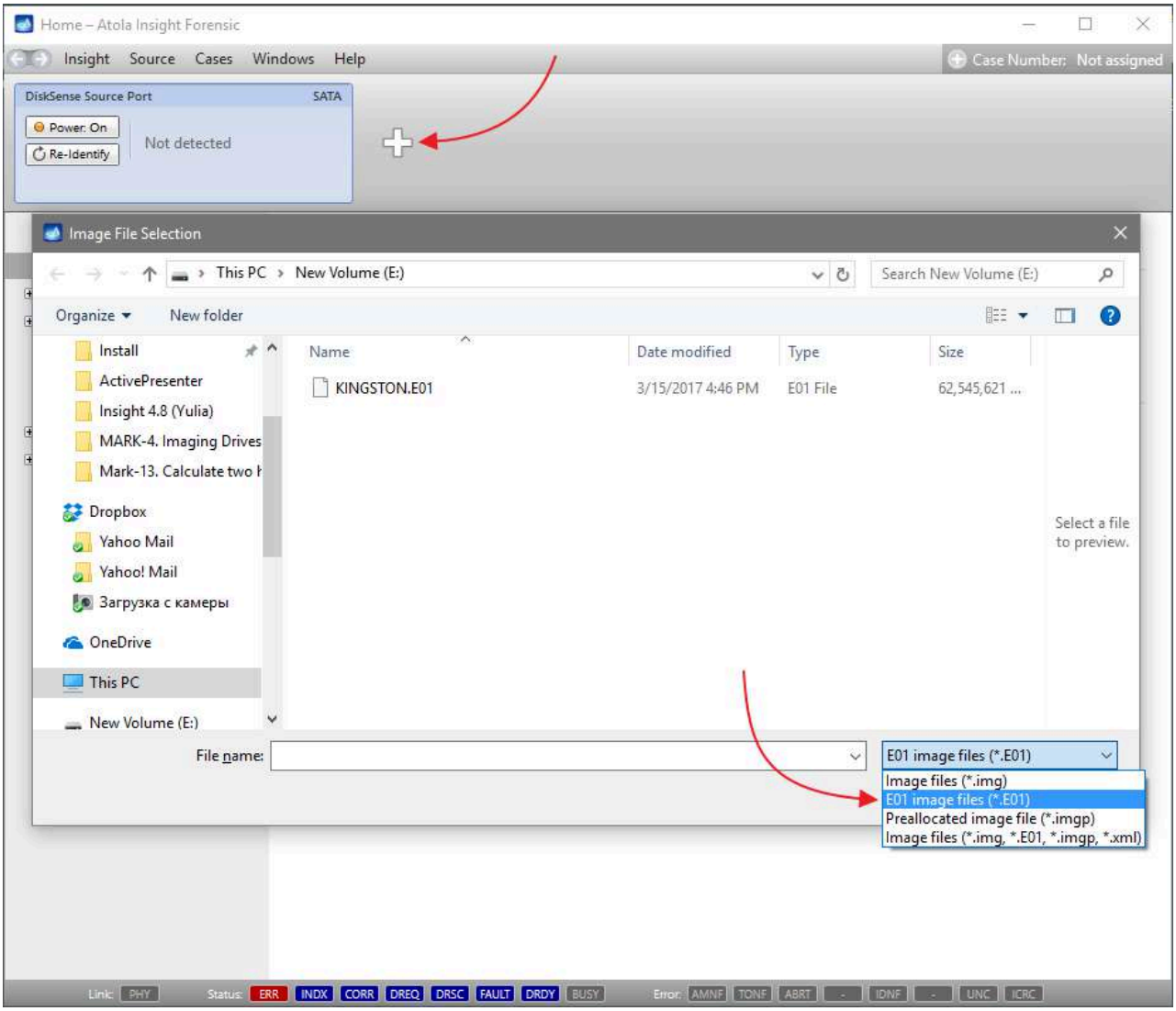


Calculating MD5 and SHA1 hashes of an existing E01 file

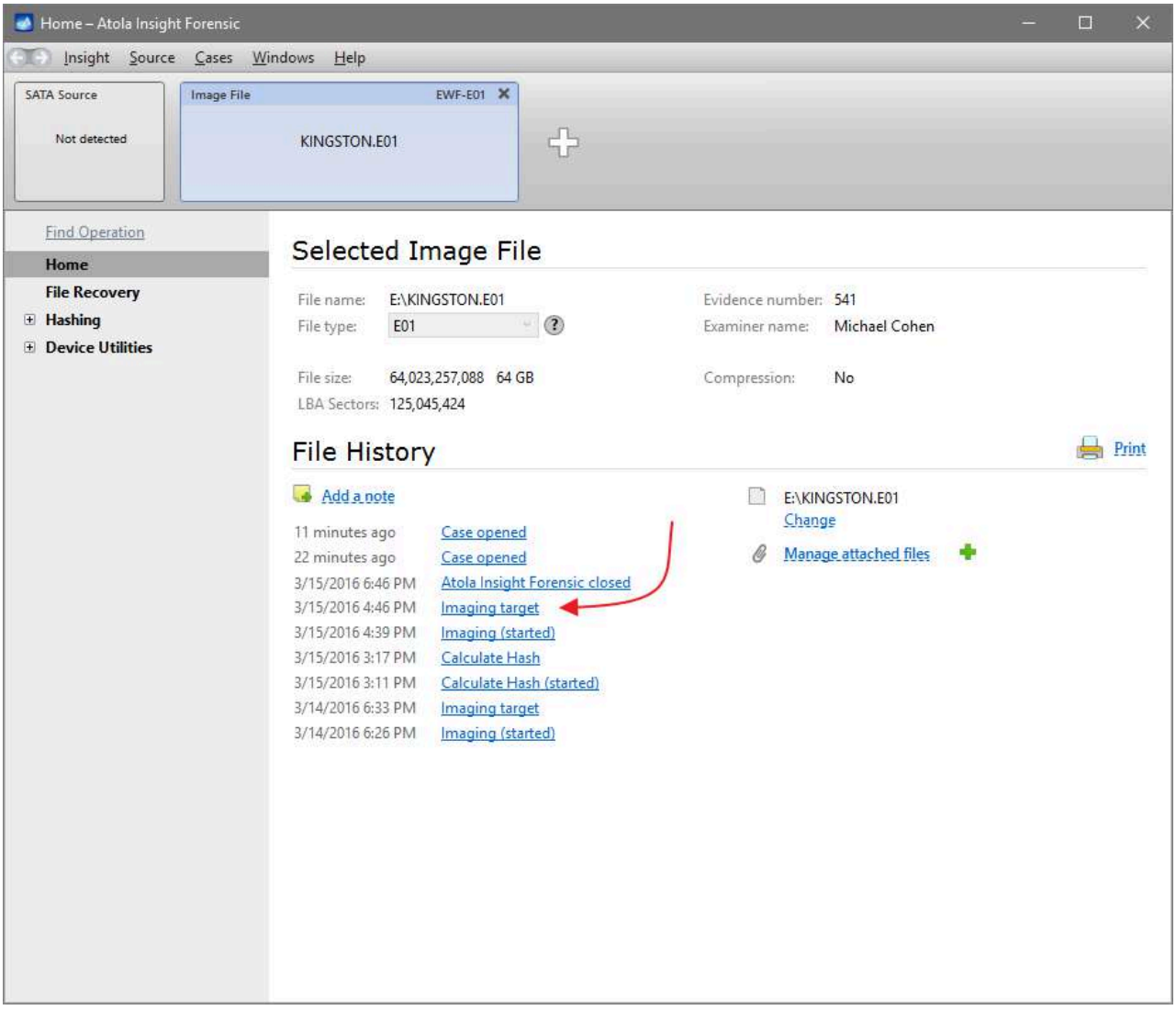
Over the years, E01 file format has become a popular format for forensic purposes due to its ability to store not only the physical or logical copy of the source drive, but also case and evidence details. E01 file can also contain both MD5 and SHA-1 hashes. And it is considered a good practice among forensic specialists to calculate both hashes while imaging the evidence so that they are included in the E01 file.

To view the hash calculated for an E01 file with Atola Insight Forensic, do the following:

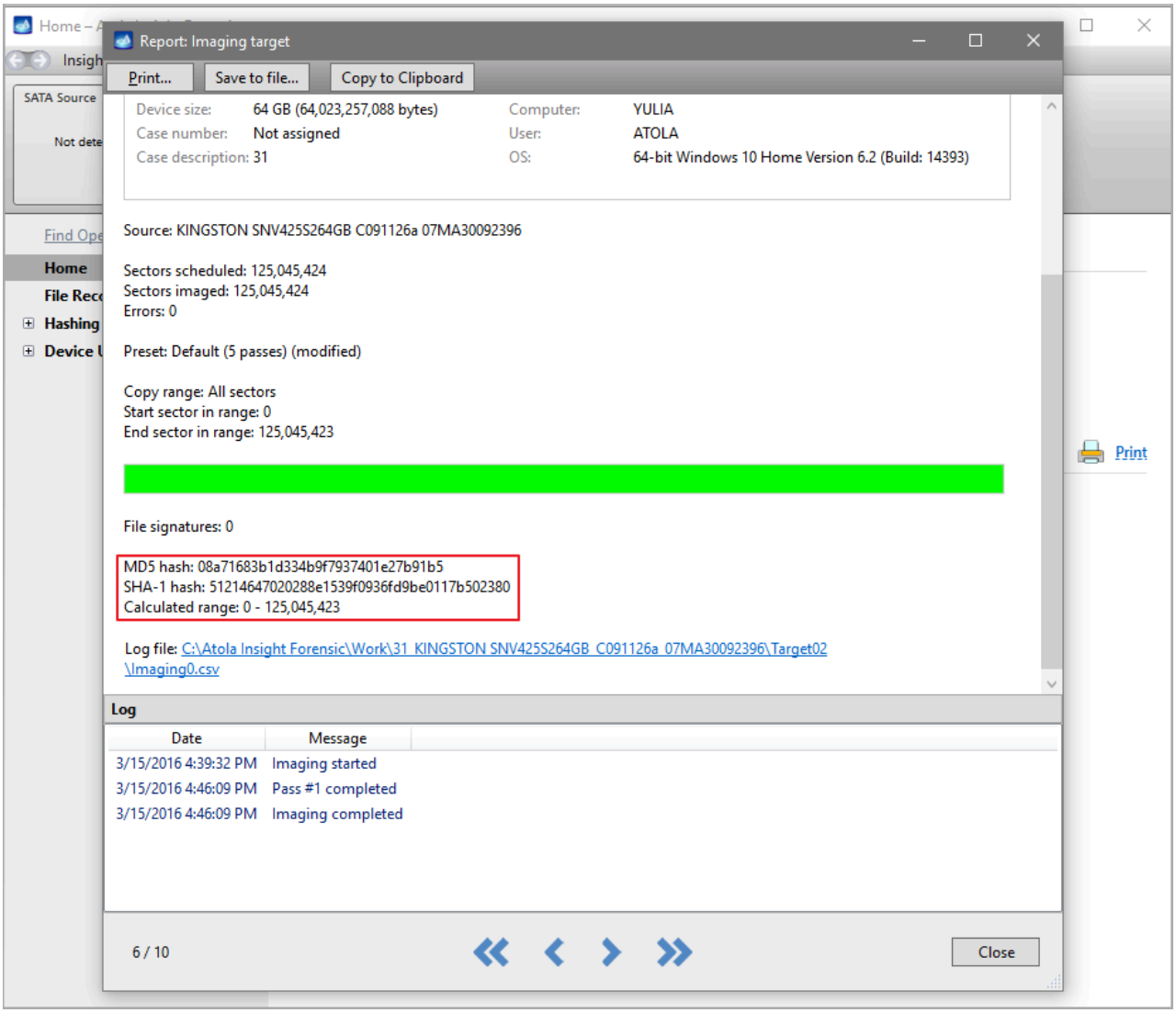
1. To open the file, press the **Plus** icon on the **Device panel** and then select the **E01 image files (*.E01)** file extension in the drop-down menu to view existing files with this extension.



2. On the **Home** screen, look through the **File History** and click on the **Imaging target** link.

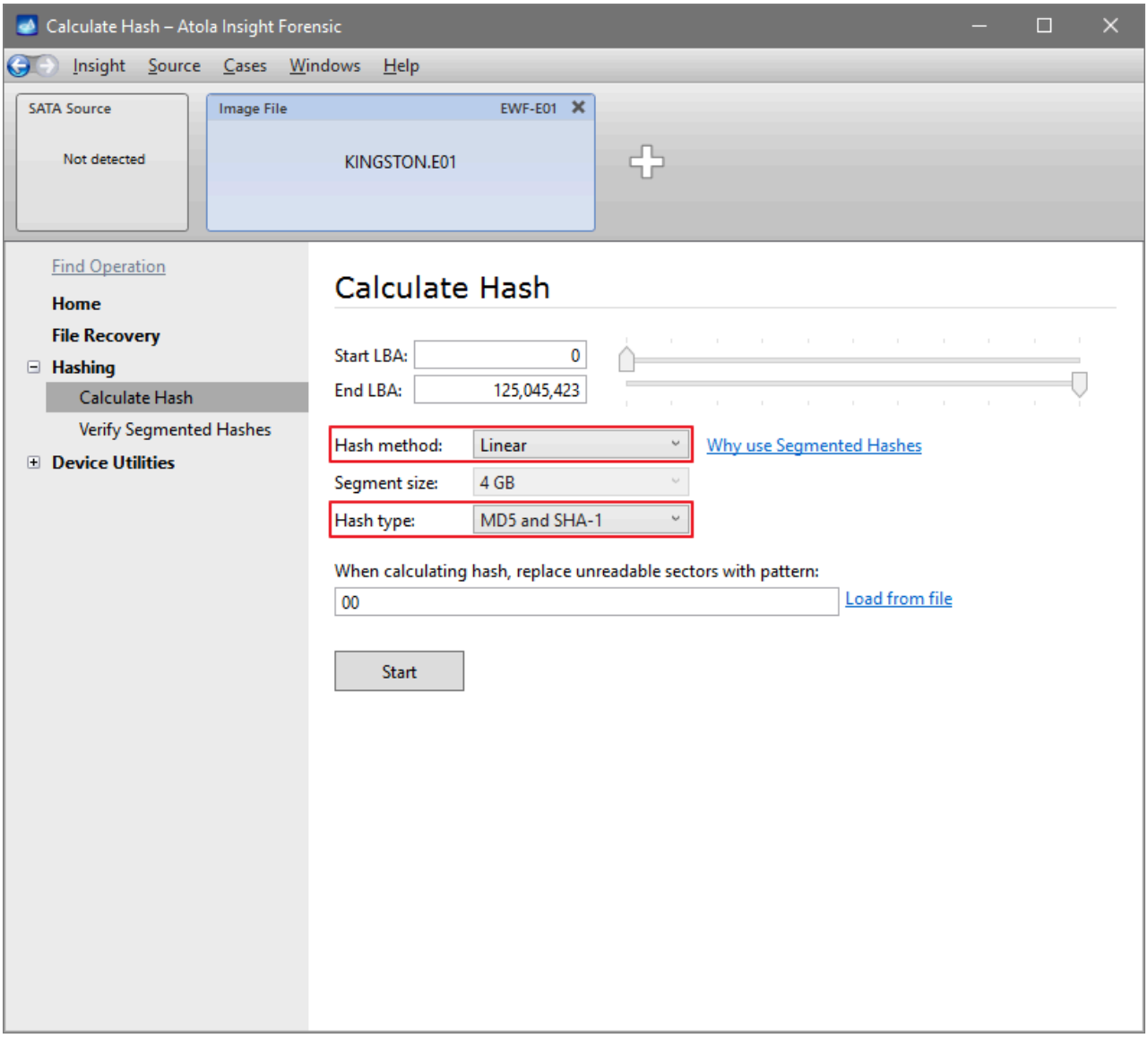


3. The **Imaging target** report opens. At the bottom the are both hashes calculated during the imaging session.

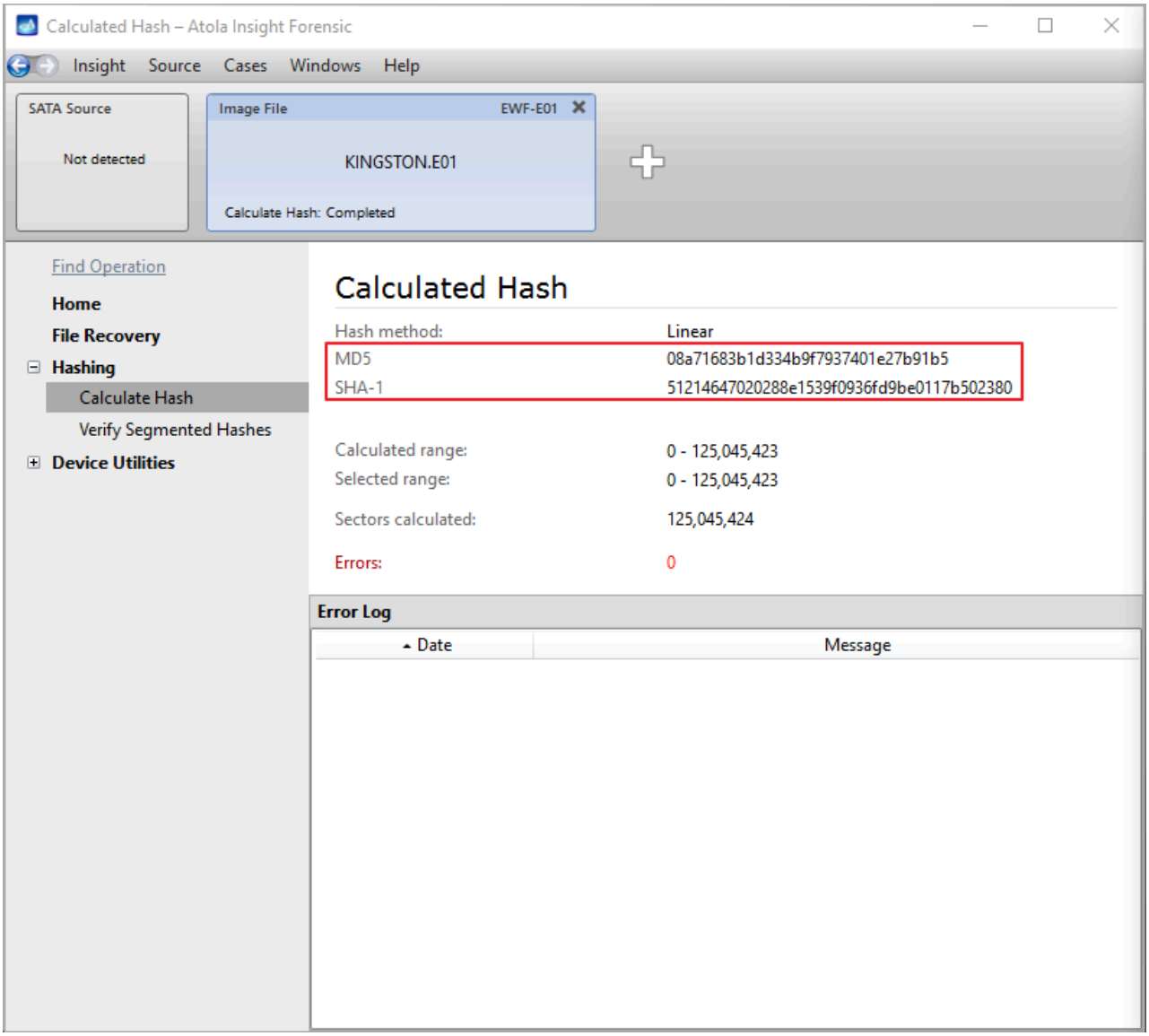


Leave this window open or save the report as a pdf file to compare the hash with the newly calculated one later.

4. In the sidebar, go to **Hashing** > **Calculate Hash**.
5. In the **Hash method** list, select **Linear**.
6. In the **Hash type** list, select **MD5 and SHA-1**.
7. Click **Start**.

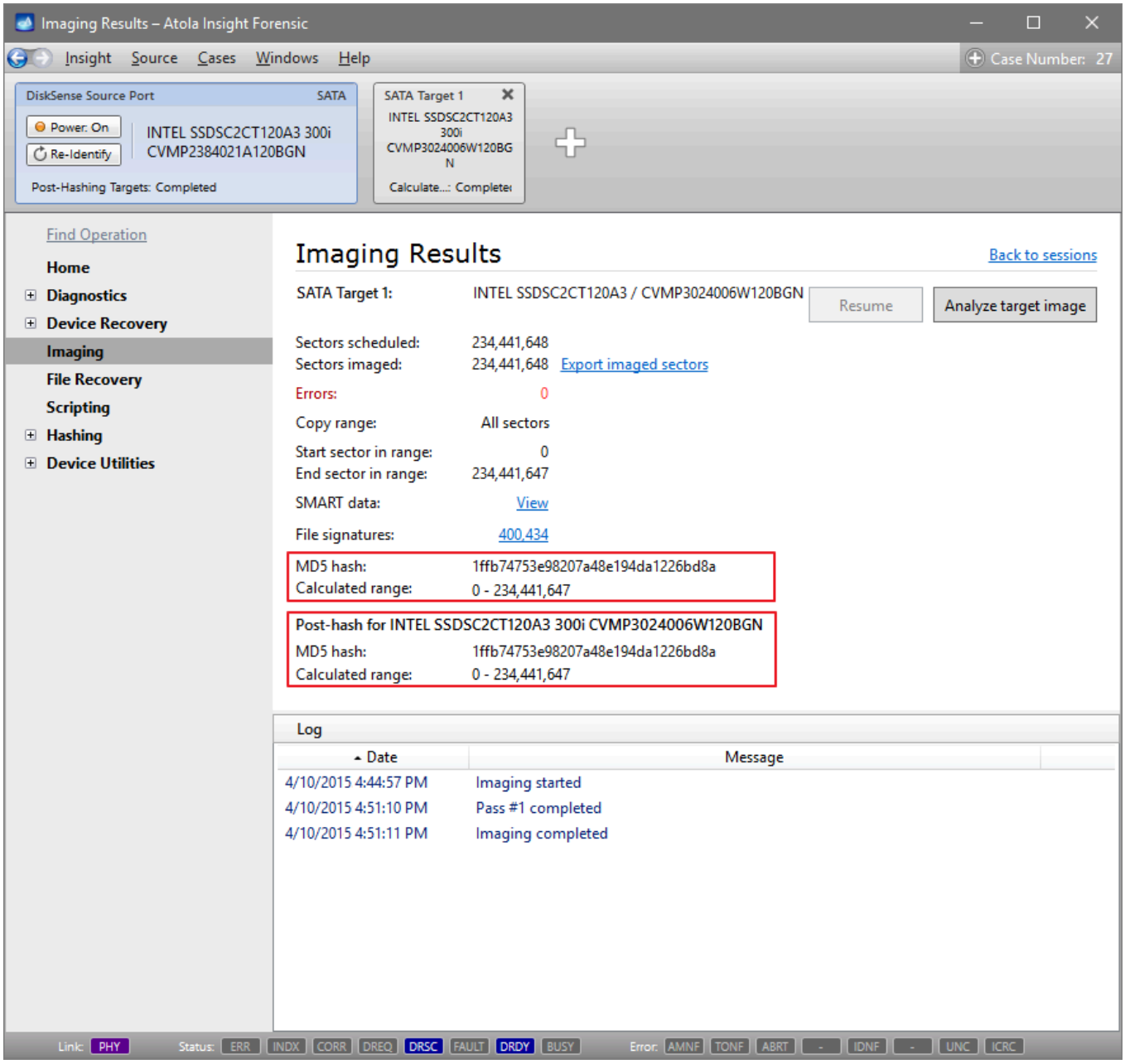


8. Once the hashes are calculated, you can make sure that the two sets of hashes are identical.

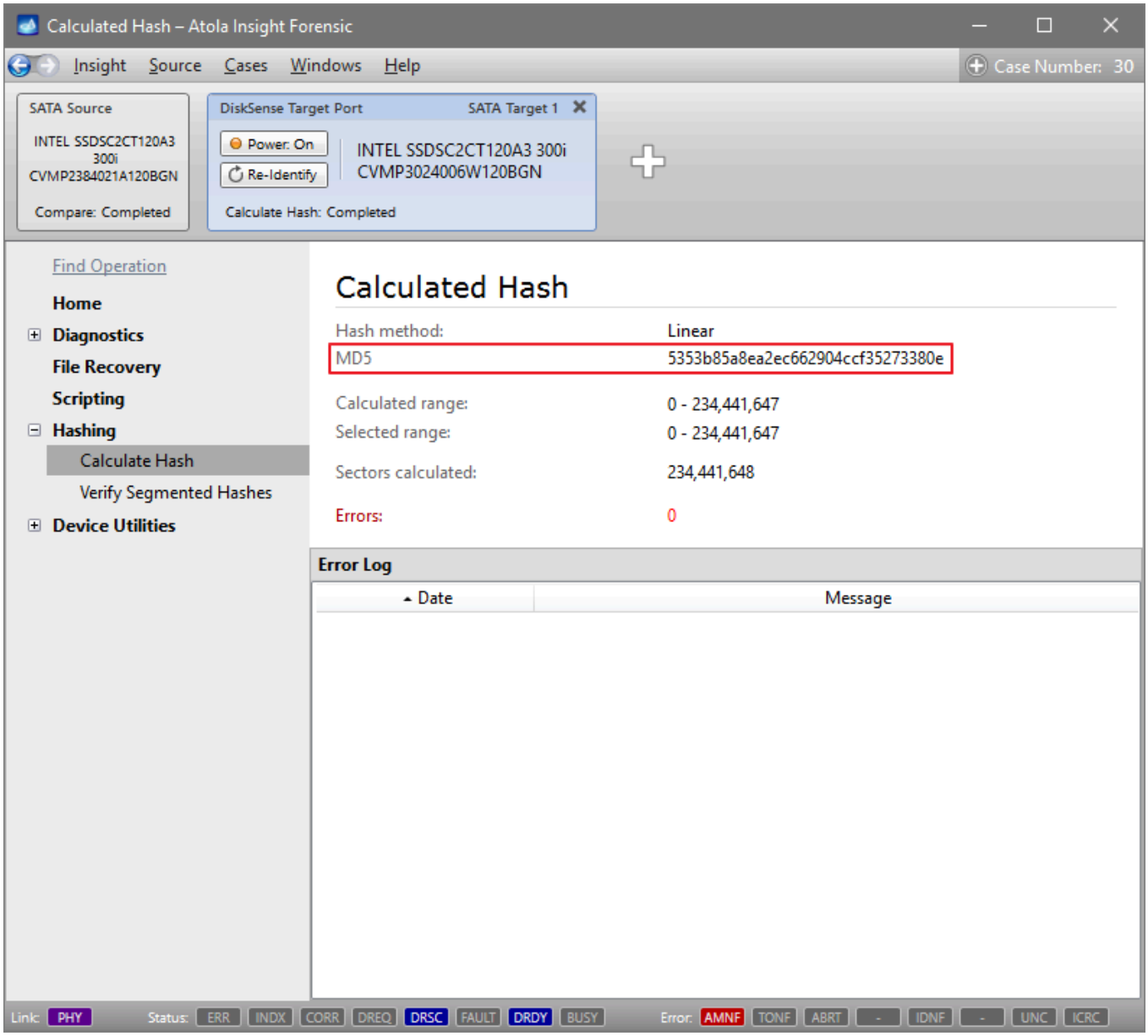


Compare source and target to find modified data

So you have a Source evidence drive and its image on a different device, and you have a record that their hash values were identical in the past.



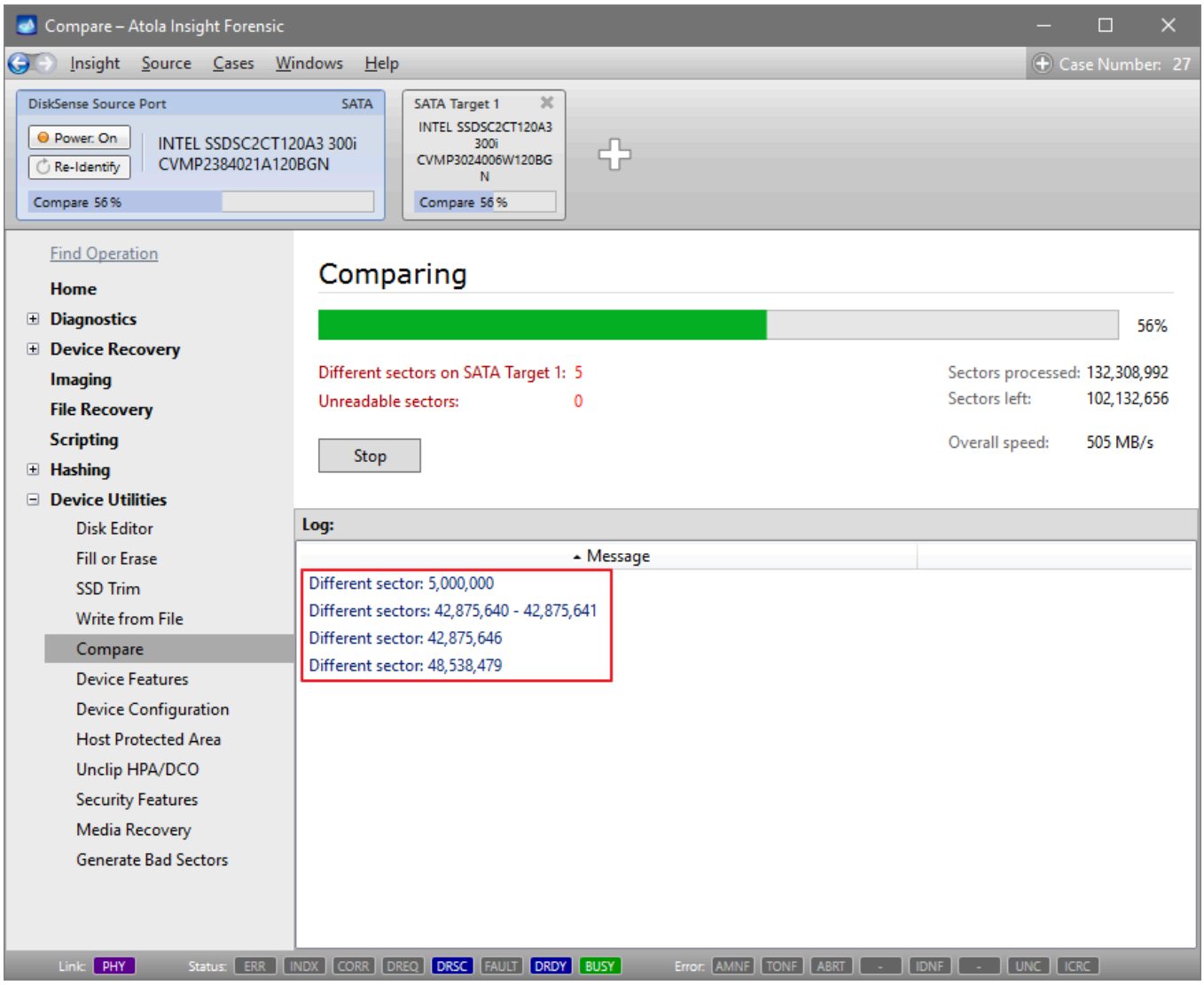
If you get a different hash value when you calculate the hash of the target now, it could be due to hardware failure, or because the device containing your image was used by a third party.



To understand how substantial these changes are, you may want to locate the sectors that have been modified.

1. In the sidebar, go to **Disk Utilities** > **Compare**.
2. Make sure that the whole range of sectors of the drive and radio button next to the **Device on DiskSense Target Port** option is selected.
3. Click **Compare**.

Insight's high-performance compare function compares the source and the target and helps you identify and locate the modified sectors:



Hash lists to filter good & bad files

To quickly detect and mark known "good" or "bad" files in Atola Insight Forensic, you can import lists of hashes of known white or black files:

- **White hash** belongs to a known good file created by known software.
- **Black hash** indicates a known bad file, which could be malware, a hacking script, a hidden illicit data file and more.

You can then use the imported hash lists in the **File Recovery** module to analyze each calculated file hash and filter files based on which hash list they belong to.

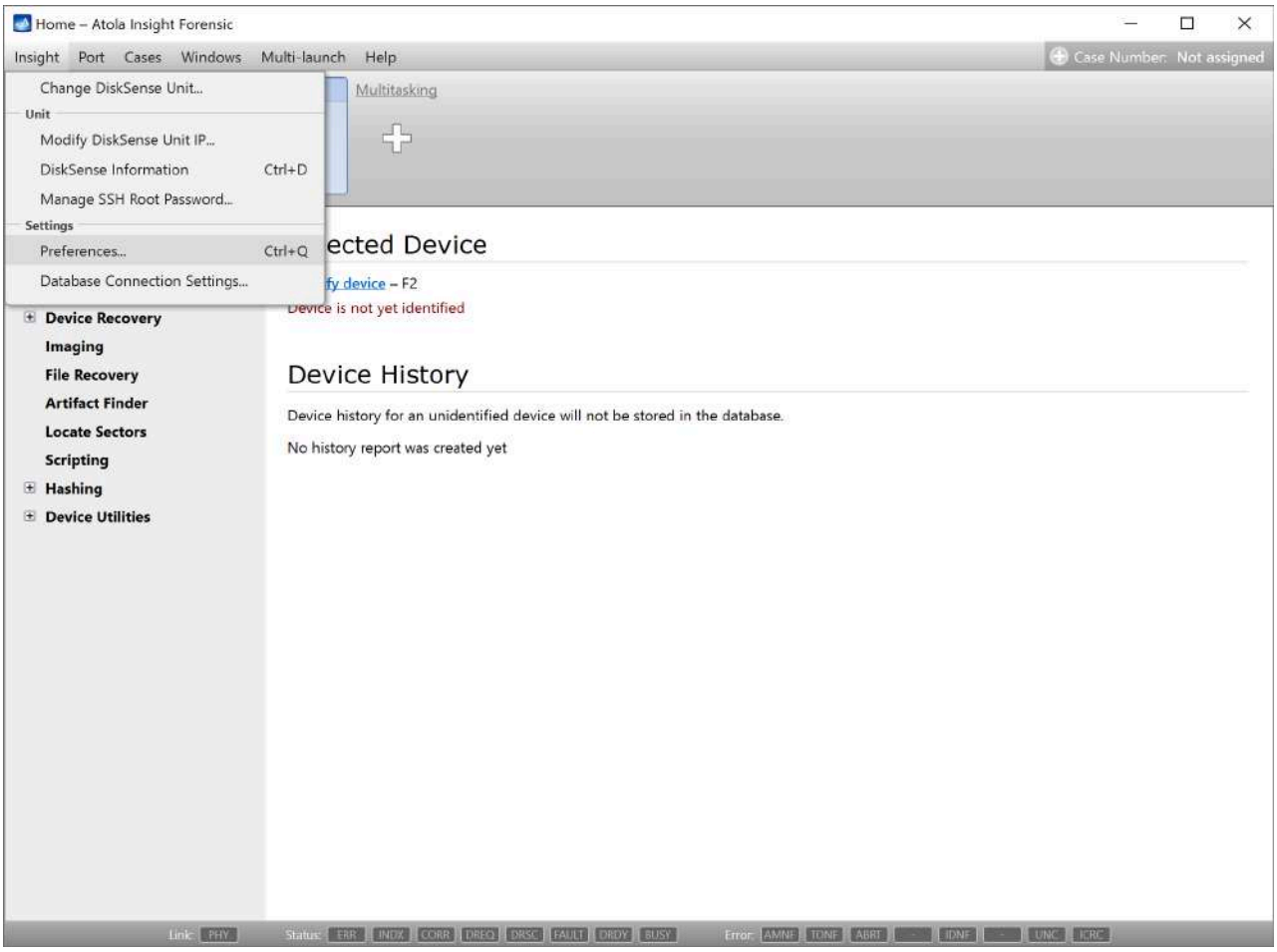
Add a hash list

To import a hash list from a file, do the following:

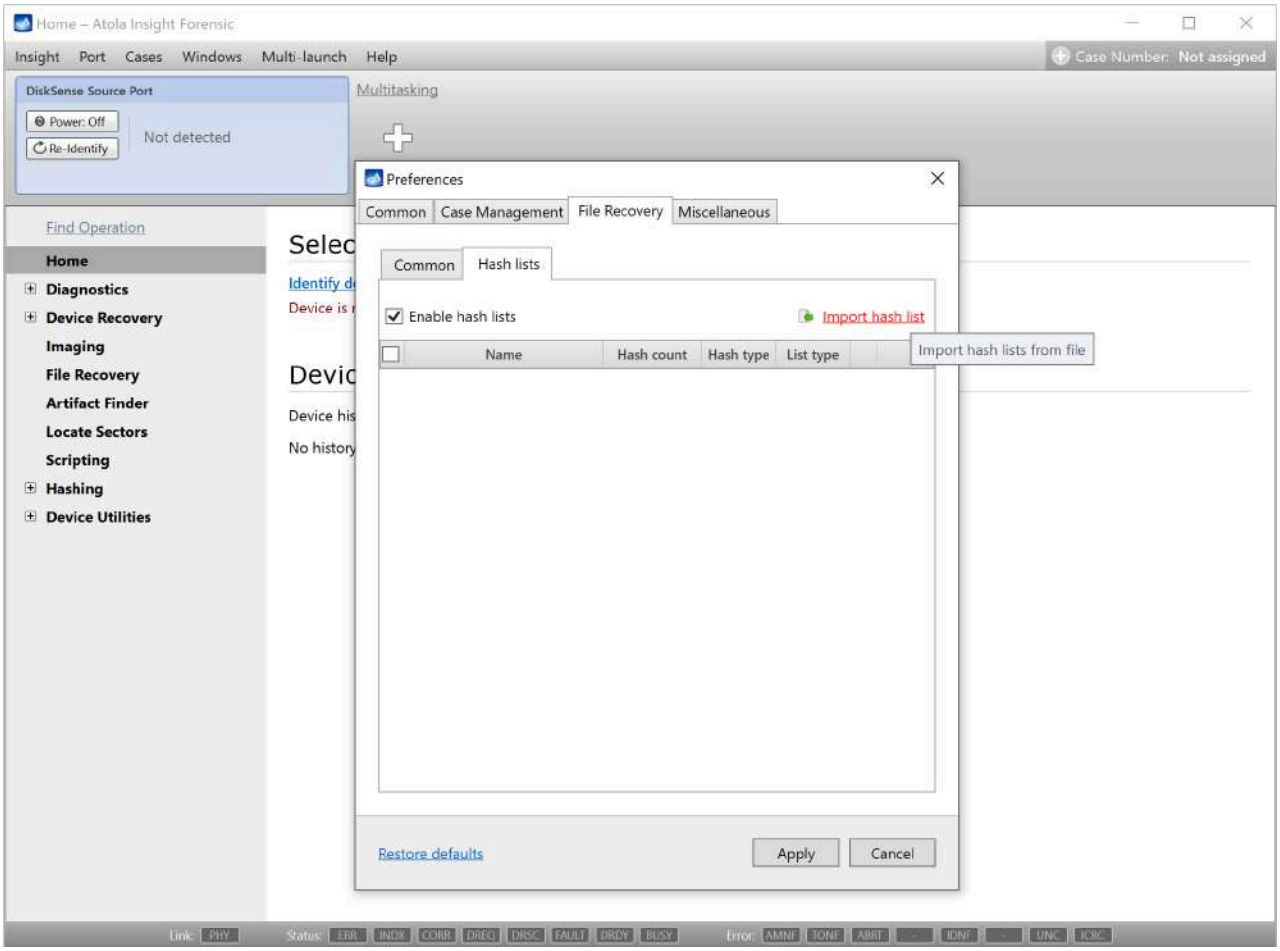
1. Prepare a CSV or text file with a hash list, with one hash per line. For example, a file with two MD5 hashes looks like this:

   1777f831255b7f6fa5869acddc2e2c93
   f6e0fcac265d3e139dd510be0eecb0b1

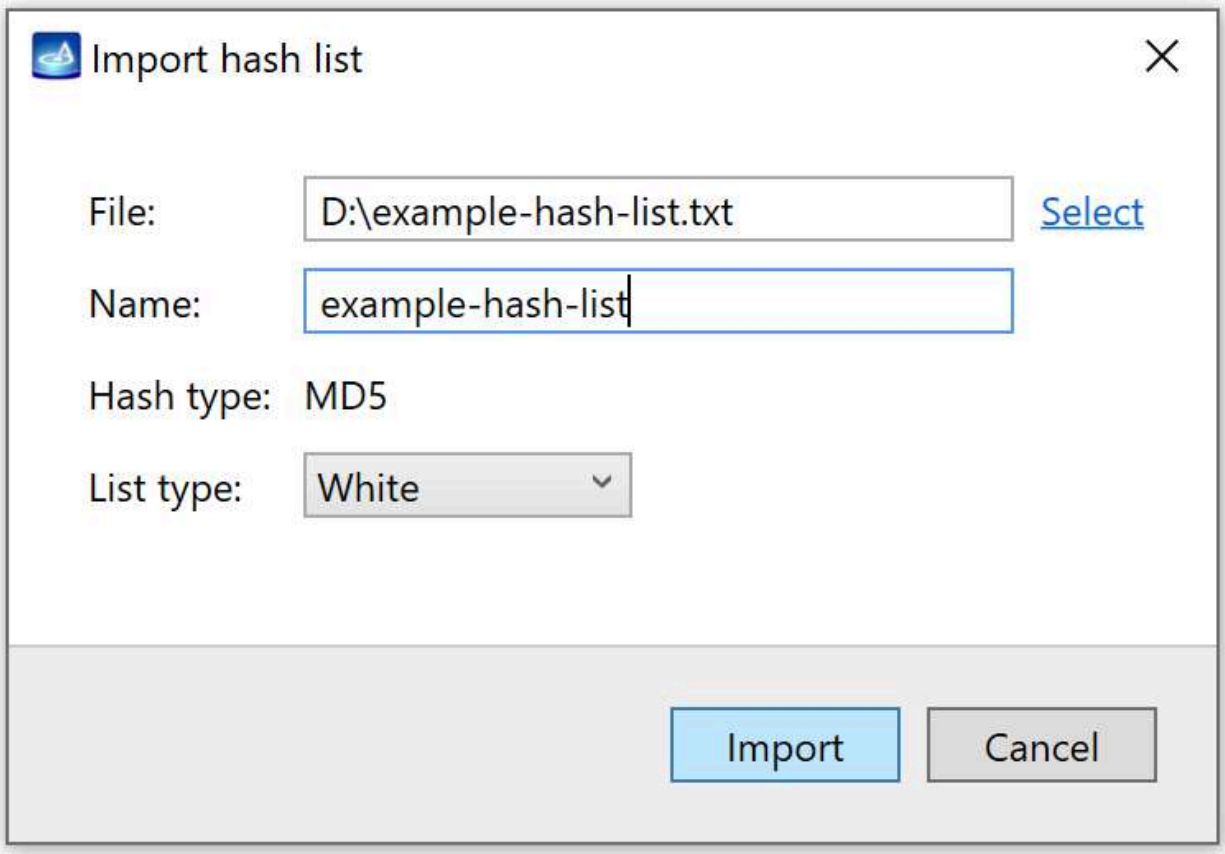
2. In the Insight Forensic menu bar, select **Insight** > **Preferences** or press **Ctrl** + **Q**.



3. In the **Preferences** window, go to the **File Recovery** tab.
4. On the **Hash lists** subtab, click the **Import hash list** link.



5. In the **Import hash list** dialog, select the file with hashes, enter the hash list name, and select hash list type:
    - **White** for hashes that belong to the known good files.
    - **Black** for hashes of the known bad files, such as malware, hacking scripts, hidden illicit data files and more.



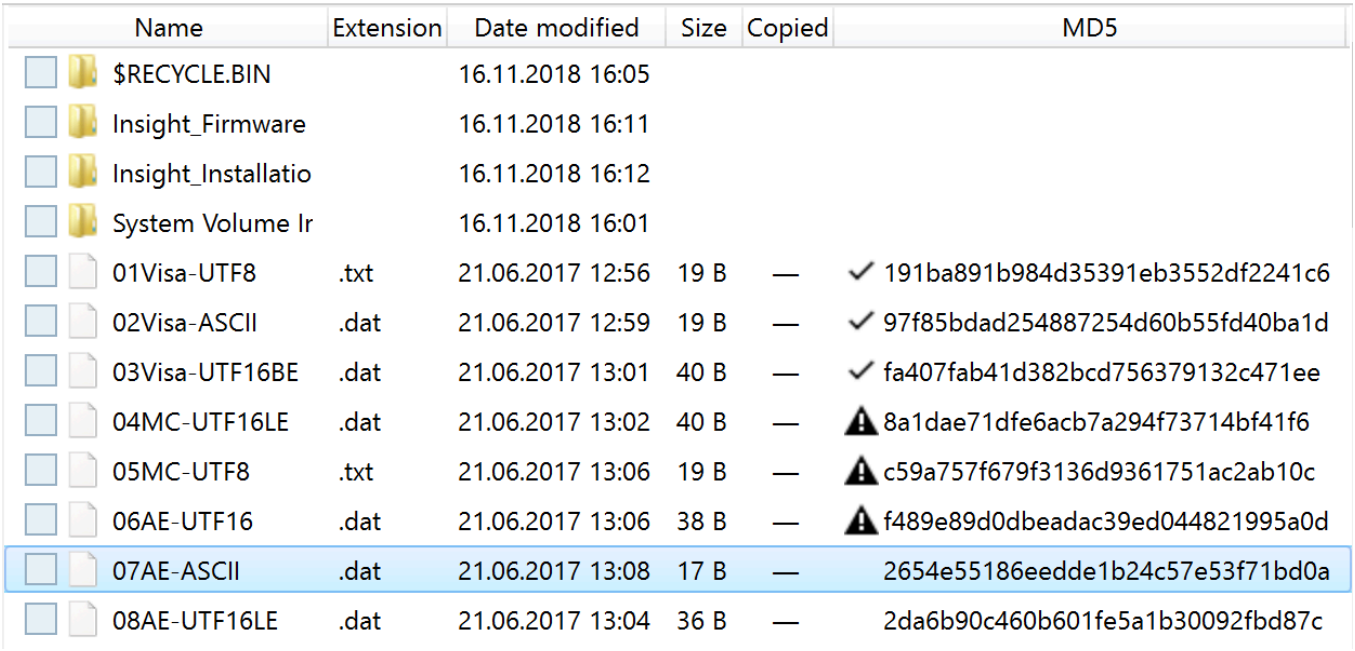
6. Click **Import**.
7. Click **Apply**.

Filter files using hash lists

Once imaging of an evidence drive is finished, you can open its copy in the **File Recovery** module for a quick analysis. If the file hash belongs to the previously imported white or black hash list, Insight Forensic displays special marks on the left of file hash values:

✓ Checkmarks for the files found in the white hash list.

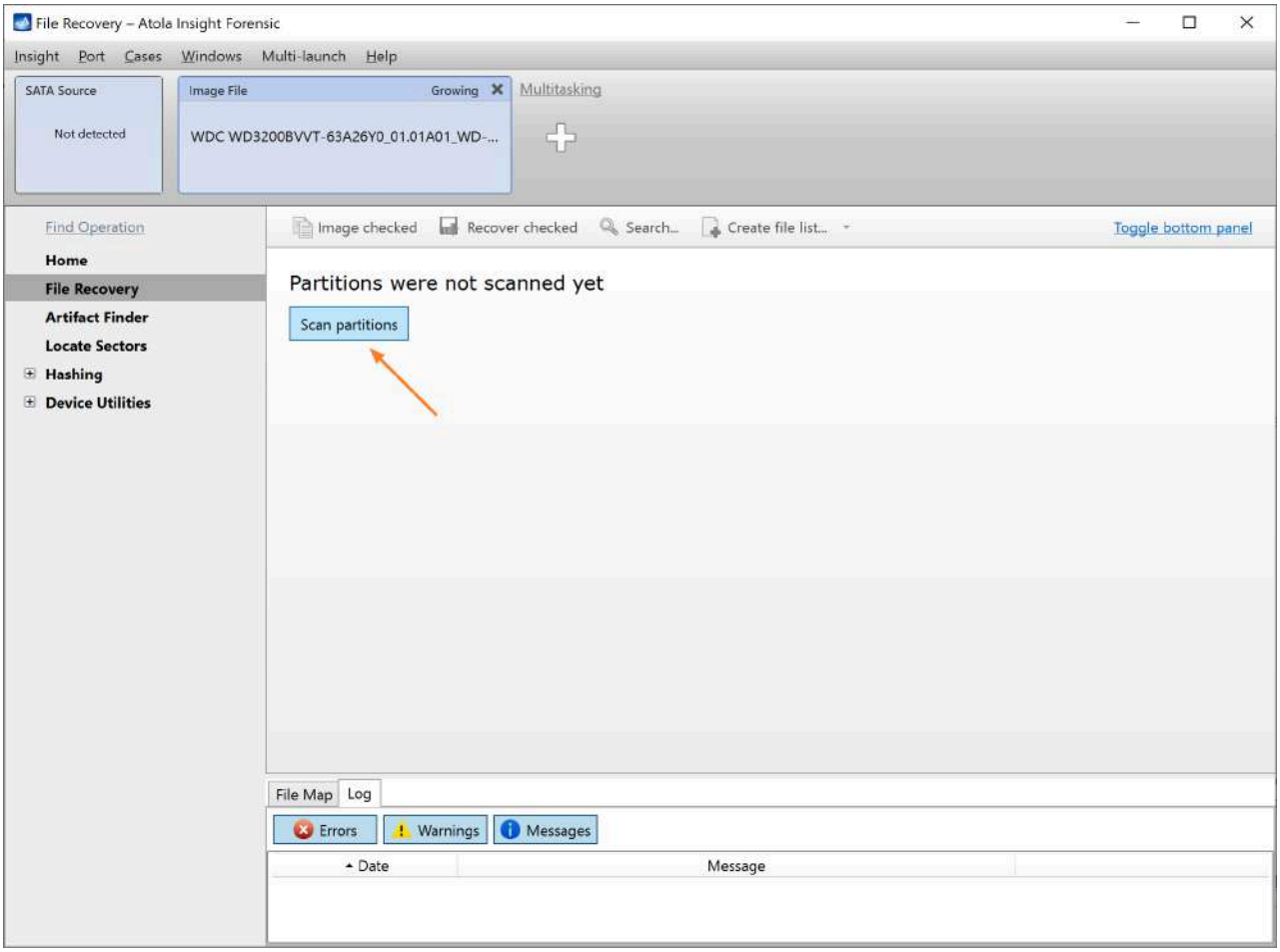
⚠ Warning triangles for the files found in the black hash list.



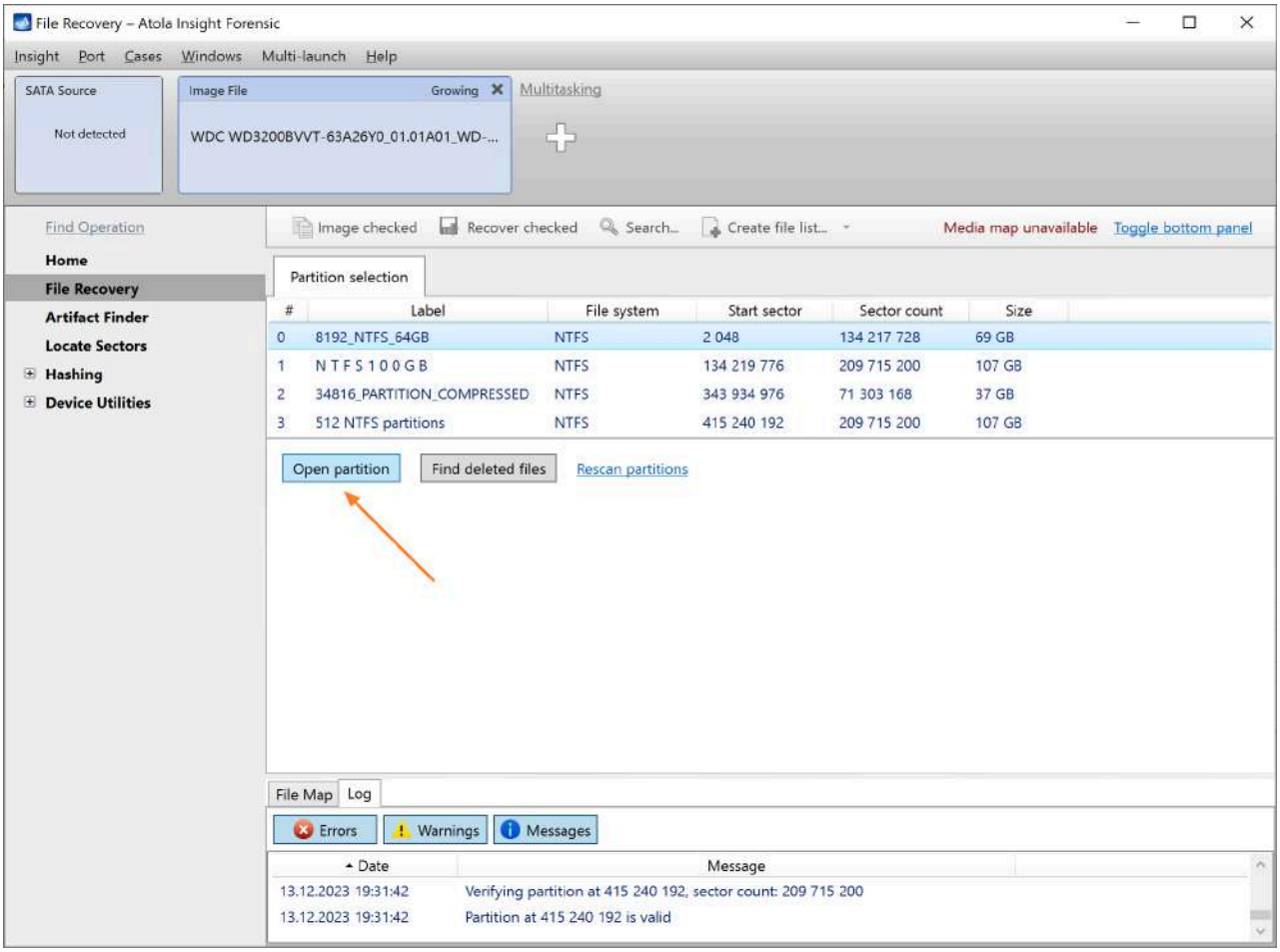
Name	Extension	Date modified	Size	Copied	MD5
$RECYCLE.BIN		16.11.2018 16:05			
Insight_Firmware		16.11.2018 16:11			
Insight_Installatio		16.11.2018 16:12			
System Volume Ir		16.11.2018 16:01			
01Visa-UTF8	.txt	21.06.2017 12:56	19 B	—	✓ 191ba891b984d35391eb3552df2241c6
02Visa-ASCII	.dat	21.06.2017 12:59	19 B	—	✓ 97f85bdad254887254d60b55fd40ba1d
03Visa-UTF16BE	.dat	21.06.2017 13:01	40 B	—	✓ fa407fab41d382bcd756379132c471ee
04MC-UTF16LE	.dat	21.06.2017 13:02	40 B	—	⚠ 8a1dae71dfe6acb7a294f73714bf41f6
05MC-UTF8	.txt	21.06.2017 13:06	19 B	—	⚠ c59a757f679f3136d9361751ac2ab10c
06AE-UTF16	.dat	21.06.2017 13:06	38 B	—	⚠ f489e89d0dbeadac39ed044821995a0d
07AE-ASCII	.dat	21.06.2017 13:08	17 B	—	2654e55186eedde1b24c57e53f71bd0a
08AE-UTF16LE	.dat	21.06.2017 13:04	36 B	—	2da6b90c460b601fe5a1b30092fbd87c

The File Recovery engine can filter files on a target device based on the imported white and black hash lists. To display only the files, which have either white or black hashes, do the following:

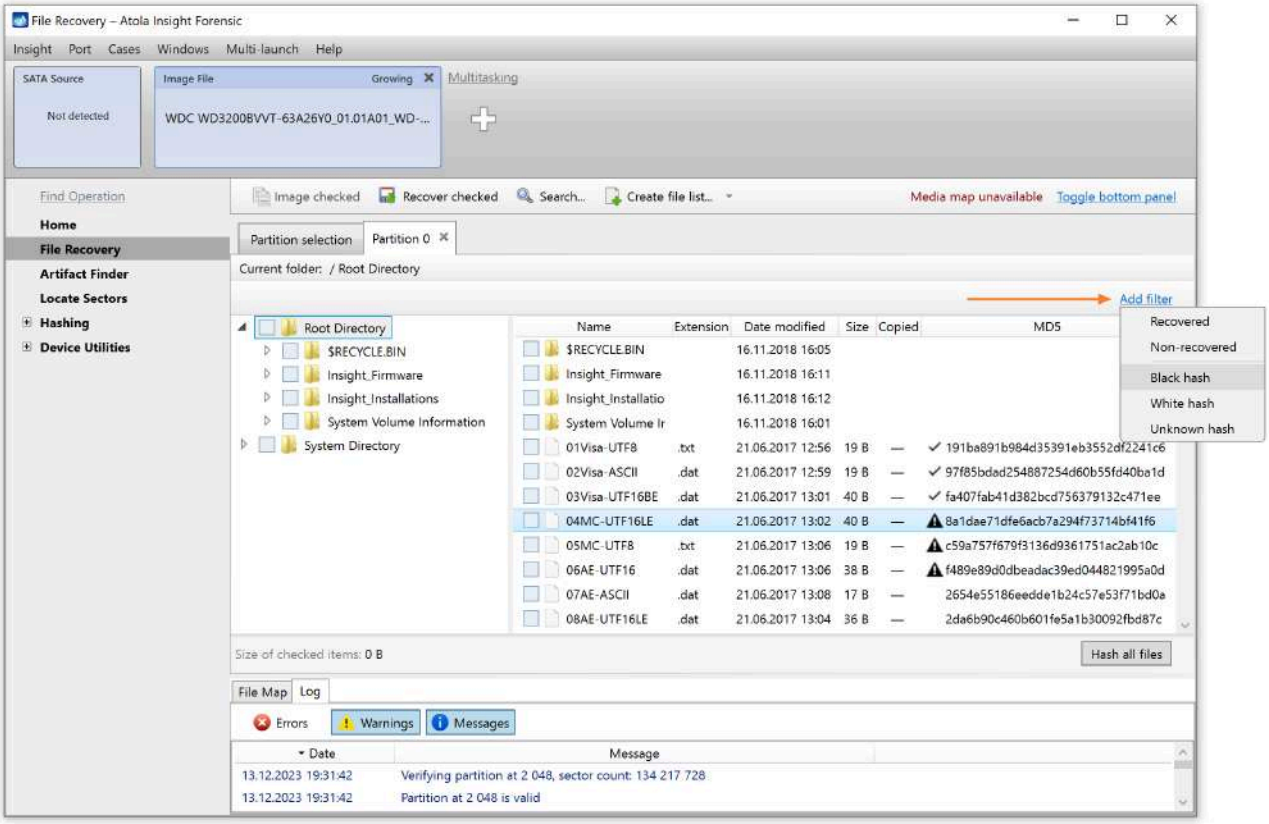
1. Select the **Target** port.
2. In the sidebar, click **File Recovery**.
3. Click the **Scan partitions** button.



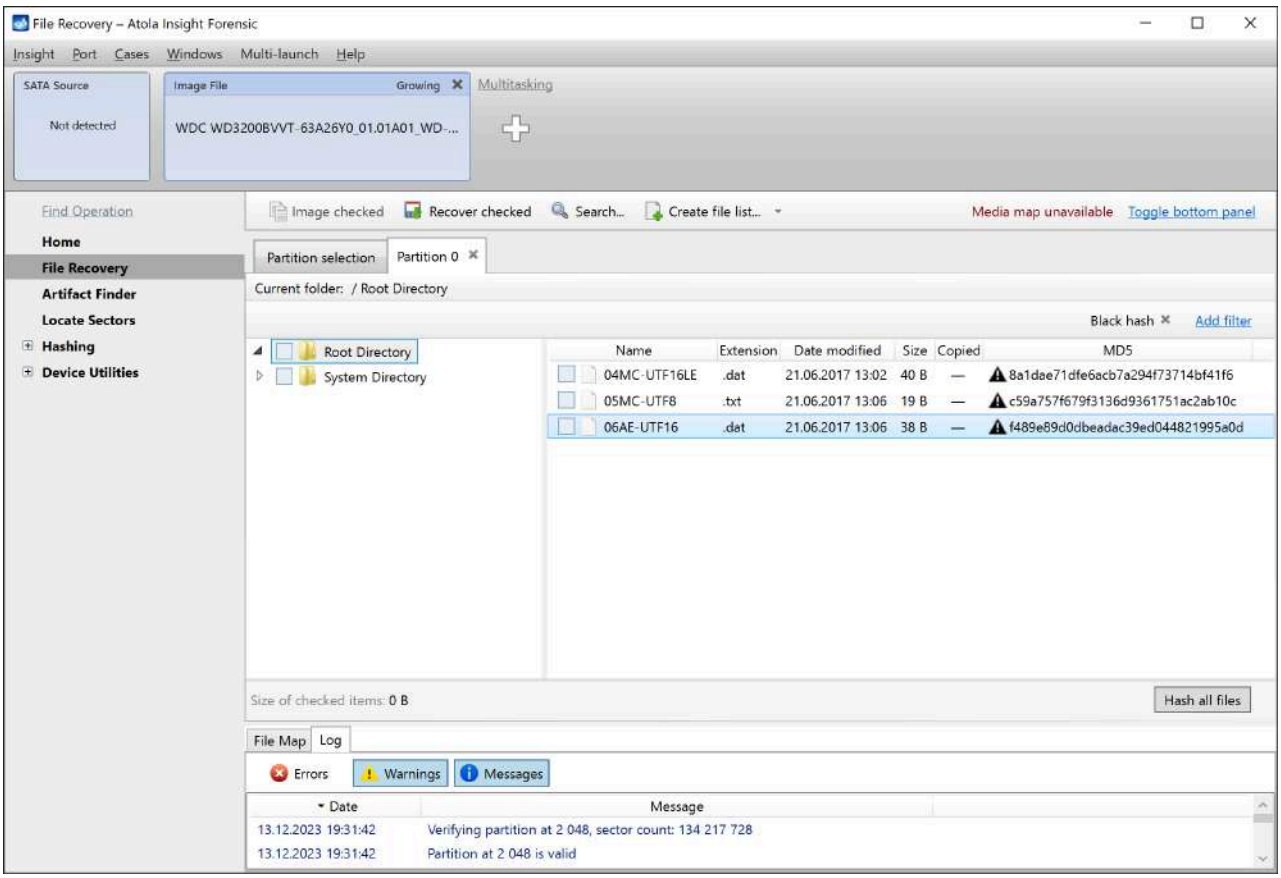
4. On the **Partition selection** tab, choose the partition you want to examine and click **Open partition**.



5. On the top right of the **Partition** tab, click the **Add filter** link.



6. Select either **Black hash** or **White hash**.
7. Insight Forensic compares every calculated file hash against the selected hash list and displays only the files whose hashes are found in this list.

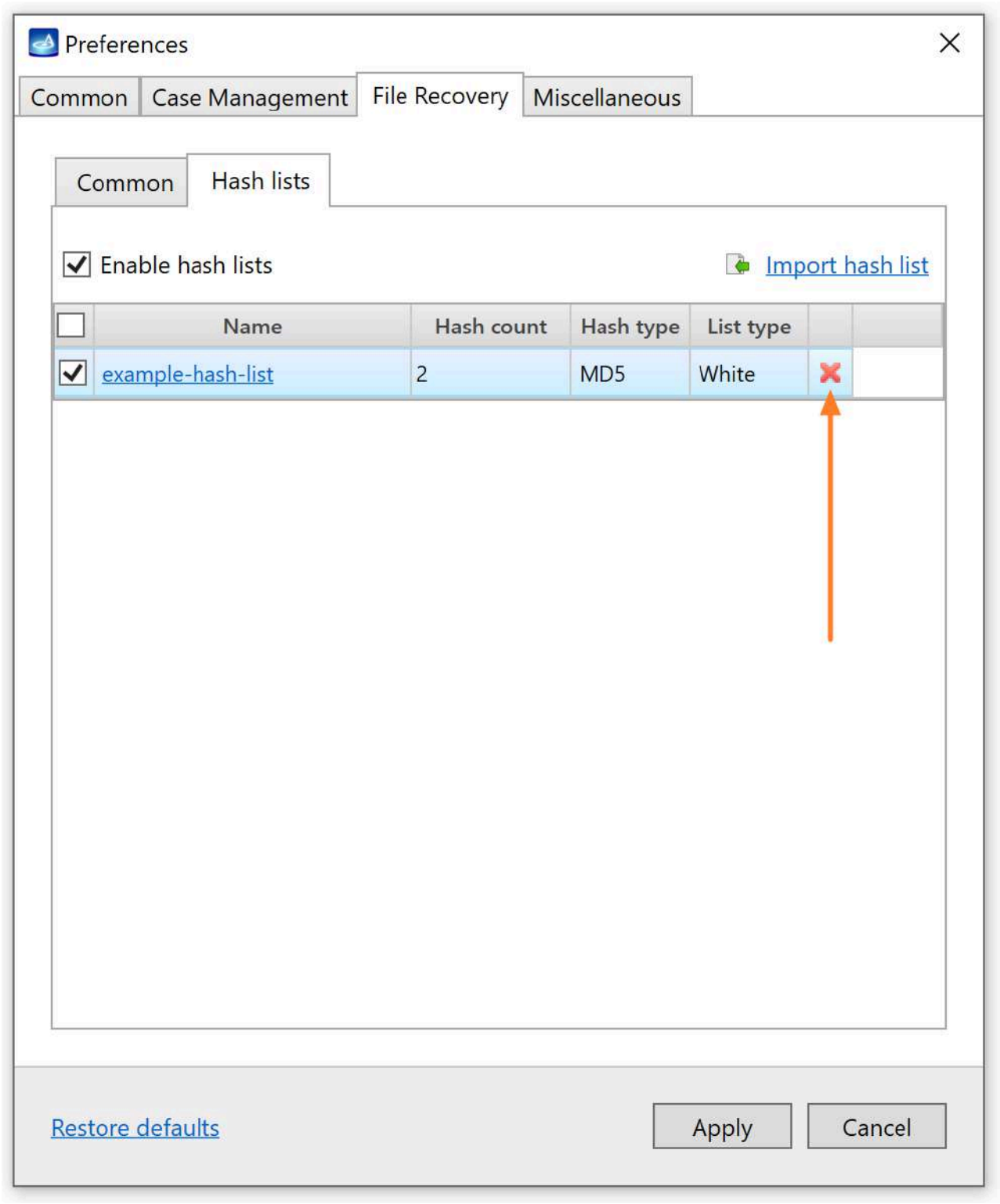


To learn more about file extraction capabilities for both good and damaged drives, see File Recovery.

Delete a hash list

To delete an existing hash list from Insight Forensic, do the following:

1. In the Insight Forensic menu, select **Insight** > **Preferences** or press **Ctrl** + **Q**.
2. In the **Preferences** window, go to the **File Recovery** tab, and then to the **Hash lists** subtab.
3. Select the hash list you want to delete, click the **Delete** icon and confirm your decision.



Extracting and resetting an unknown ATA password

Atola Insight Forensic can recover and/or remove unknown HDD passwords (also known as ATA passwords). For most hard drives the unlocking process is fully automated.

Automatic ATA password recovery is supported for many Seagate, WD, Toshiba, Hitachi, Samsung, Fujitsu, Maxtor SATA and IDE drives. For the full list of the hard drives supported by the feature, see Supported drives.

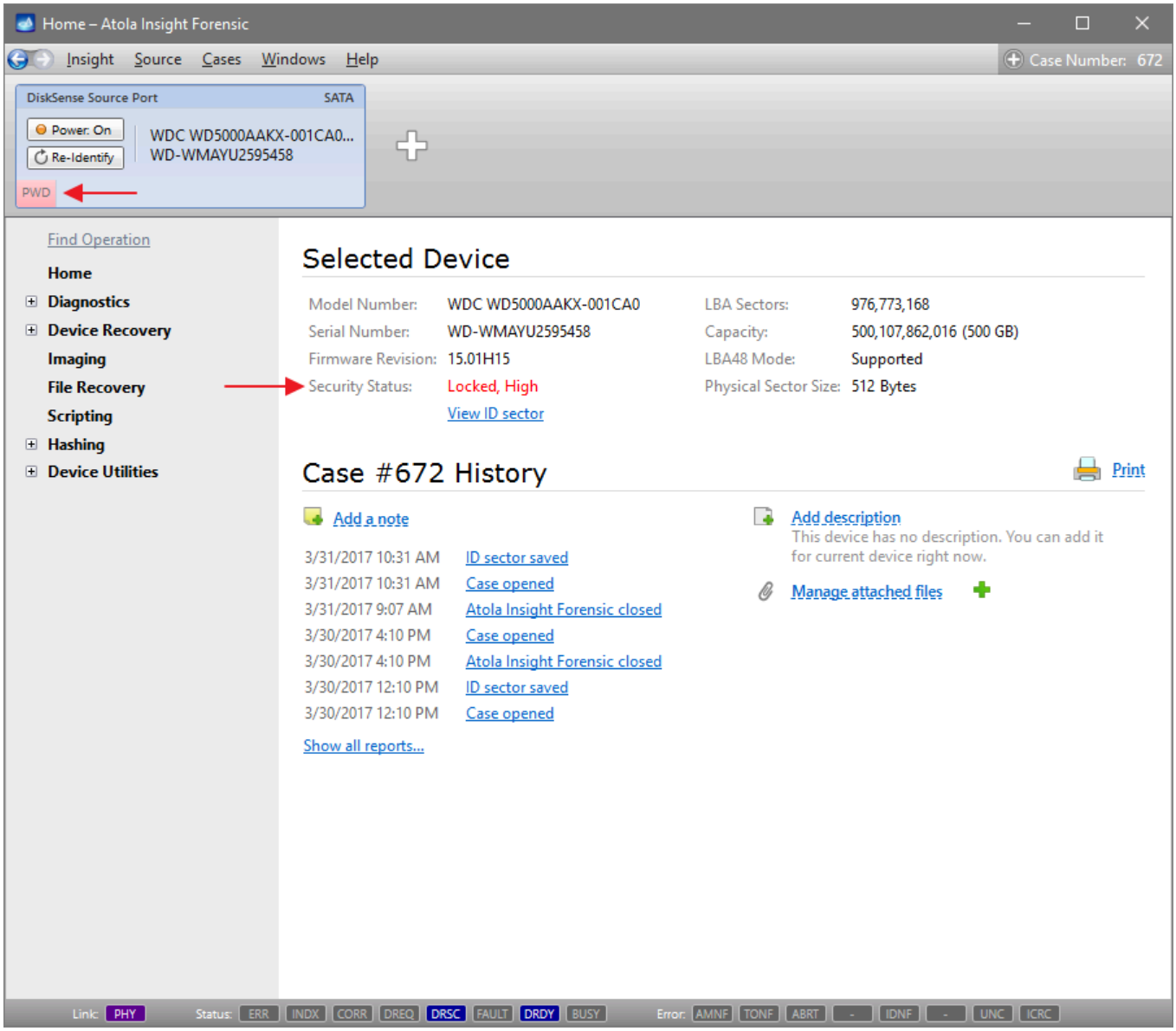
This guide is applicable to all supported Samsung, Toshiba and Western Digital hard drives.

- **To unlock a Seagate drive**, connect the device to the Serial port of the DiskSense unit and then follow the steps described in this guide.
- **Hitachi drives** require the use of the password extraction adapter. For more information, see Hitachi HDDs: Remove an unknown password.

Detect an ATA password

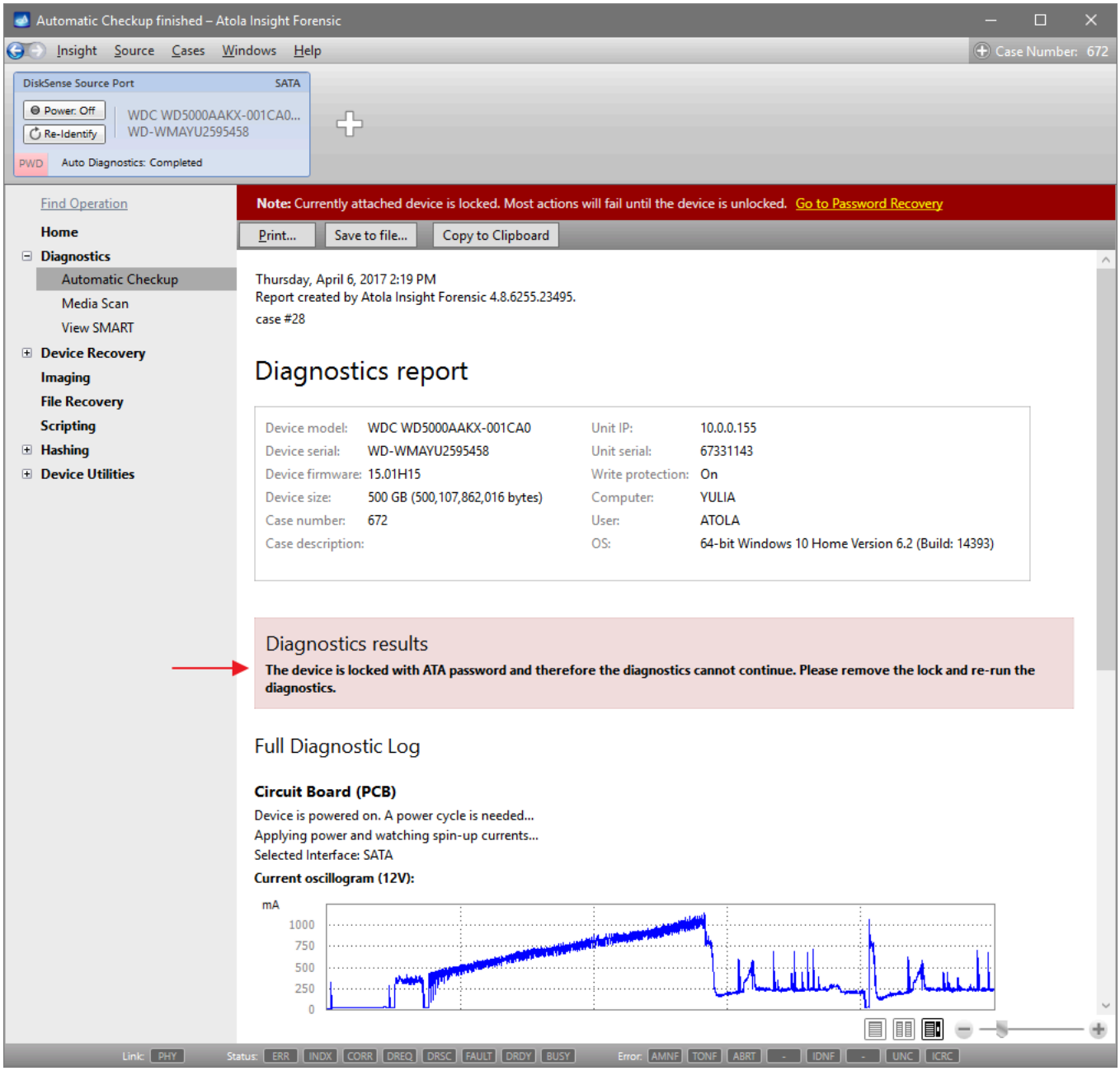
When a device is connected and identified as locked with an ATA password, there is a corresponding **PWD** indicator displayed in the port, and **Security Status** in the Home page says *Locked, High* or *Locked, Maximum*.

High and maximum are password protection levels that the operator who locked the device selected. Although information about it may be relevant to the investigator, both security levels are supported by Insight password recovery functionality, therefore this information is not important for the purpose of this guide.



Source device locked with ATA password

To perform a complete Diagnostics, Insight needs to have a hard drive unlocked. Therefore we suggest that when dealing with a locked device, password recovery is performed before running the **Automatic Checkup**.



Diagnostics showing password lock

Extract password, Reset password and Reset password until power cycle

There are 3 options of dealing with a locked hard drive:

- To extract and display password without unlocking the device.
- To reset password only until power cycle.
- To permanently unlock the device.

Extract and display password

This option does not require to switch off the write protection on the source port.

To display the password without unlocking the device, do these steps:

1. In the sidebar, go to **Device Recovery** > **Password Recovery**.
2. Click **Extract**.

Reset password only until power cycle

When you reset password only until power cycle, write protection stays enabled on the source port, and no changes can be made to the drive.

To work with the data on the drive without permanently resetting the password, do the following:

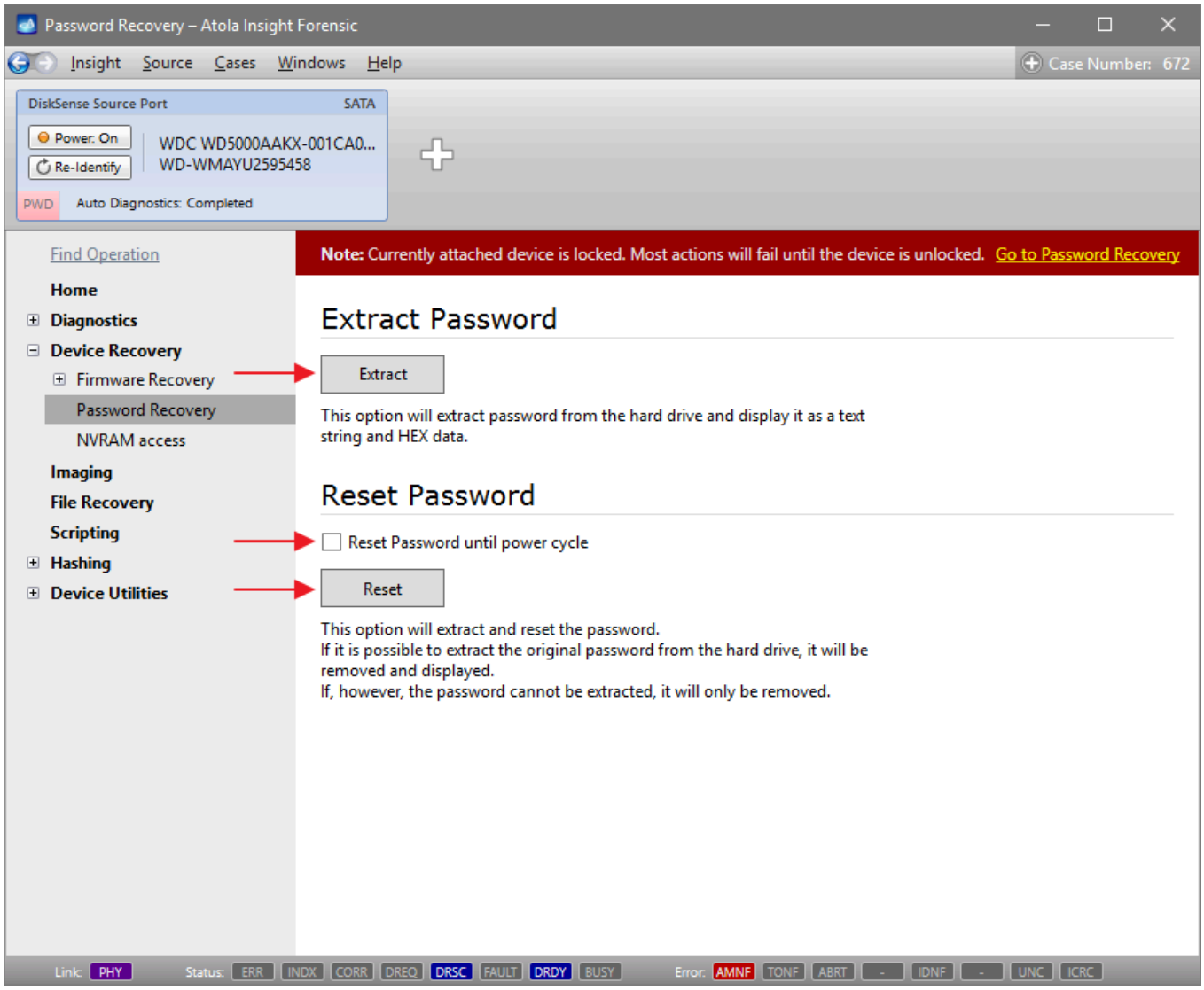
1. In the sidebar, go to **Device Recovery** > **Password Recovery**.
2. Select **Reset Password until power cycle**.
3. Click **Reset**.

If the **Reset Password until power cycle** option is selected, no power cycles that are executed in the course of automatic checkup, imaging, or other operations will affect the temporary unlocked status of the device. Only a deliberate power cycle, such as turning off and on the Power switch, will change the Security status of the drive back to Locked.

Permanently reset password

To permanently reset password and unlock the device, do next steps:

1. Turn off the **Write protection switch** on the front panel of the DiskSense hardware unit.
2. In the sidebar, go to **Device Recovery** > **Password Recovery**.
3. Click **Reset**.



Unknown password recovery

Unlocking Hitachi hard drives

DISCLAIMER: BY FOLLOWING THESE INSTRUCTIONS YOU ACKNOWLEDGE THAT NO ONE IS RESPONSIBLE FOR ANY DAMAGE THAT CAN BE DONE TO THE HARD DRIVE OR OTHER DEVICES OR EQUIPMENT DURING THIS PROCEDURE.

PLEASE MAKE SURE THAT YOUR PC AND ATOLA DISKSENSE UNIT ARE PLUGGED VIA A UPS (Uninterruptible Power Supply). PLEASE ALSO MAKE SURE YOU DO NOT HAVE ANY OTHER PROGRAMS RUNNING. INTERRUPTION OF THE UNLOCKING PROCESS MAY RENDER THE HARD DRIVE INOPERABLE.

BEFORE YOU PROCEED WITH UNLOCKING, PLEASE LOOK THROUGH FOLLOWING INFORMATION. IF YOU ARE NOT COMFORTABLE WITH THE PROVIDED INFORMATION, PLEASE DO NOT PROCEED.

Password extraction on Hitachi SATA drives

Hitachi drives require the use of the password extraction adapter which is included in the product package. The adapter plugs straight into the IDE port located on the front side of the DiskSense Forensic unit.

Atola Hitachi password extraction adapter

2.5-inch SATA hard drives (HGST models)

The following actions can only be performed if your SATA drive is attached to DiskSense unit via Hitachi password extraction adapter.

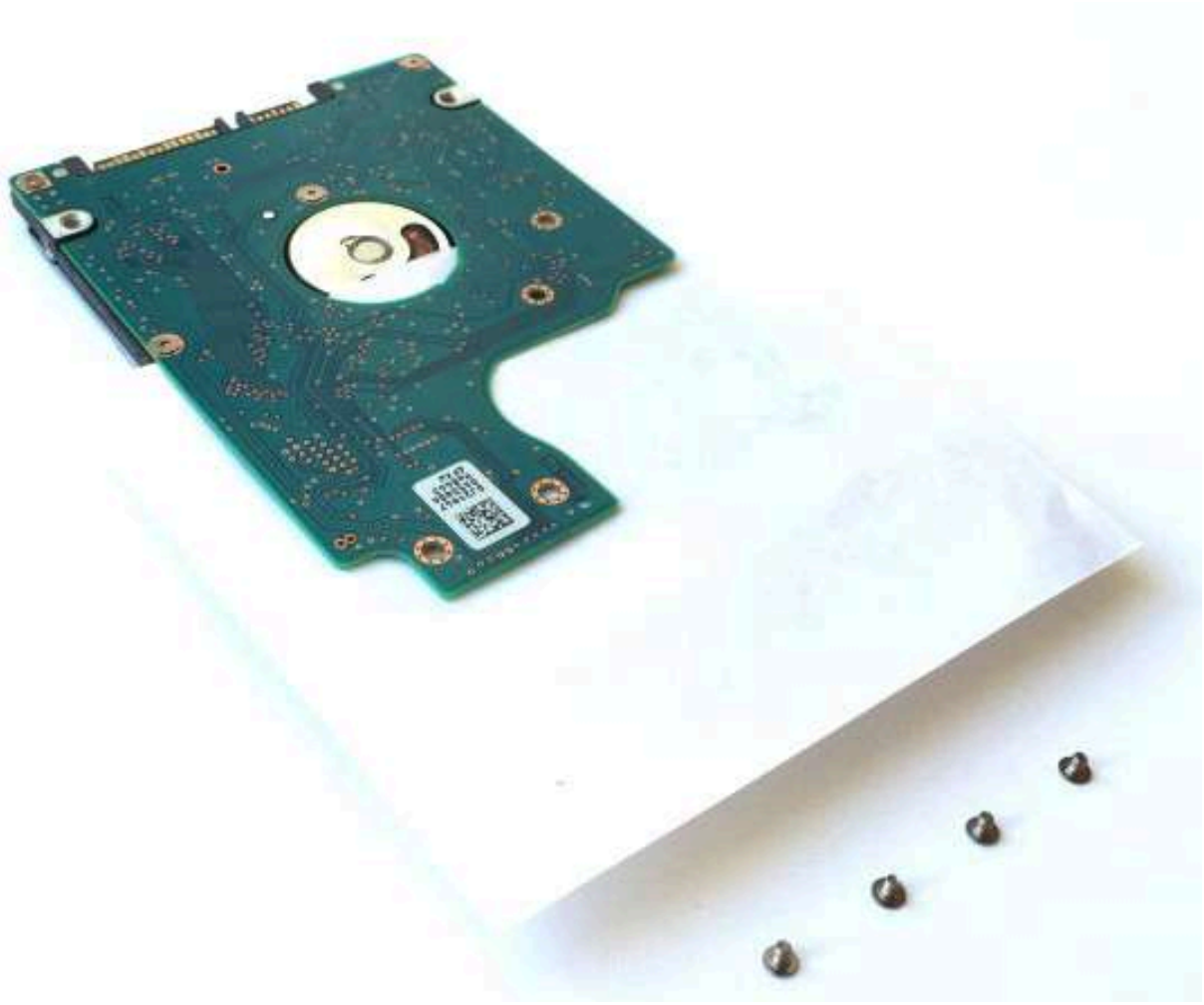
1. Connect Hitachi password extraction adapter to the IDE Source port of DiskSense unit.

2. Connect the source Hitachi HDD to Hitachi password extraction adapter.

3. Place the hard drive as shown on the picture (no need to disconnect any cables):

4. Use a T4 screwdriver to remove four screws as shown below:

5. Put a piece of paper between the circuit board and the hard drive assembly:



6. Do not remove paper; proceed with unlocking.

7. Remove the paper and then put all screws back:

8. Continue with the unlocking process.

2.5-inch SATA hard drives (old models)

The following actions can only be performed if your SATA drive is attached to DiskSense unit via Hitachi password extraction adapter.

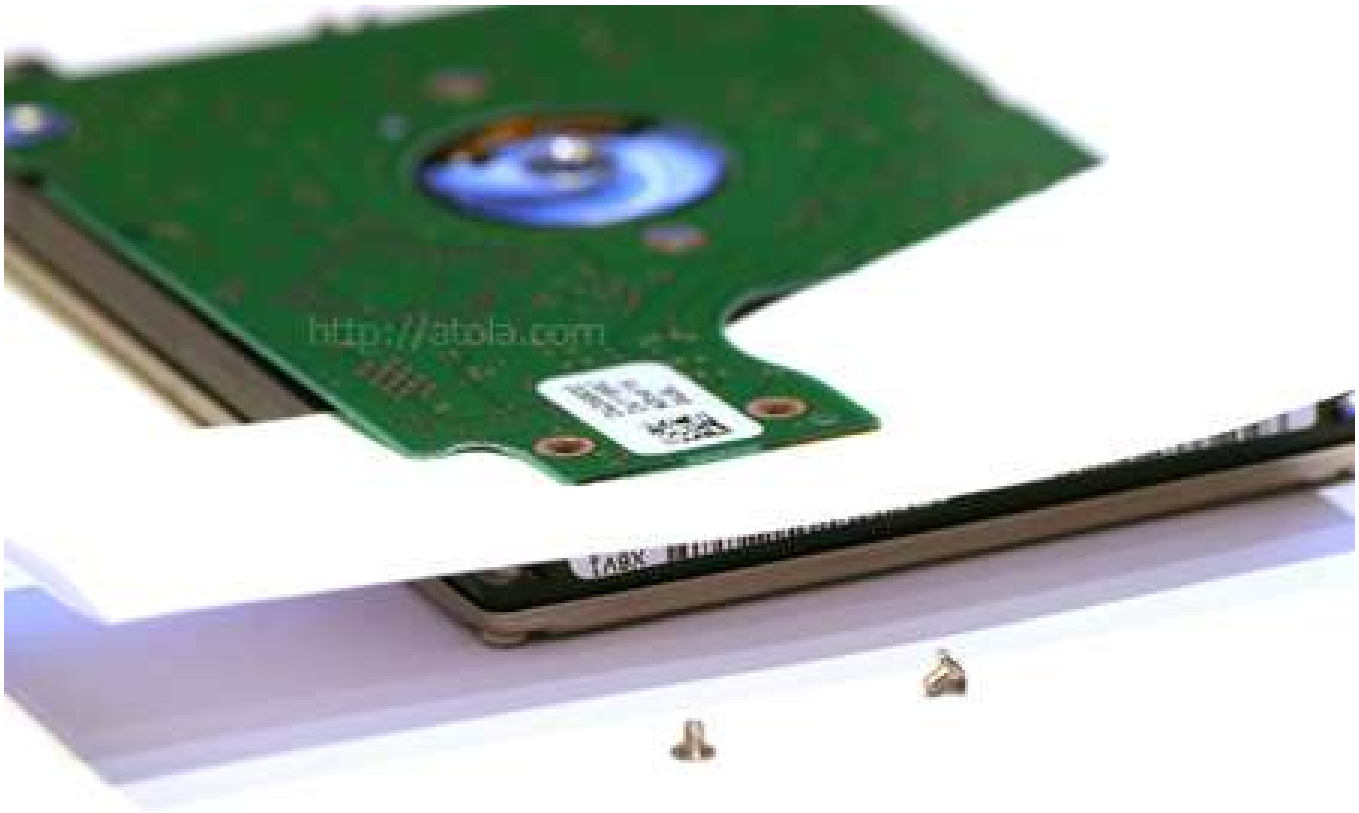
1. Connect Hitachi password extraction adapter to the IDE Source port of DiskSense unit.

2. Connect the source Hitachi HDD to Hitachi password extraction adapter.

3. Place the hard drive as shown on the picture (no need to disconnect any cables):

4. Use a T4 screwdriver to remove two screws as shown below:

5. Put a piece of paper between the circuit board and the hard drive assembly:



6. Do not remove paper; proceed with unlocking.

7. Remove the paper and then put all screws back:

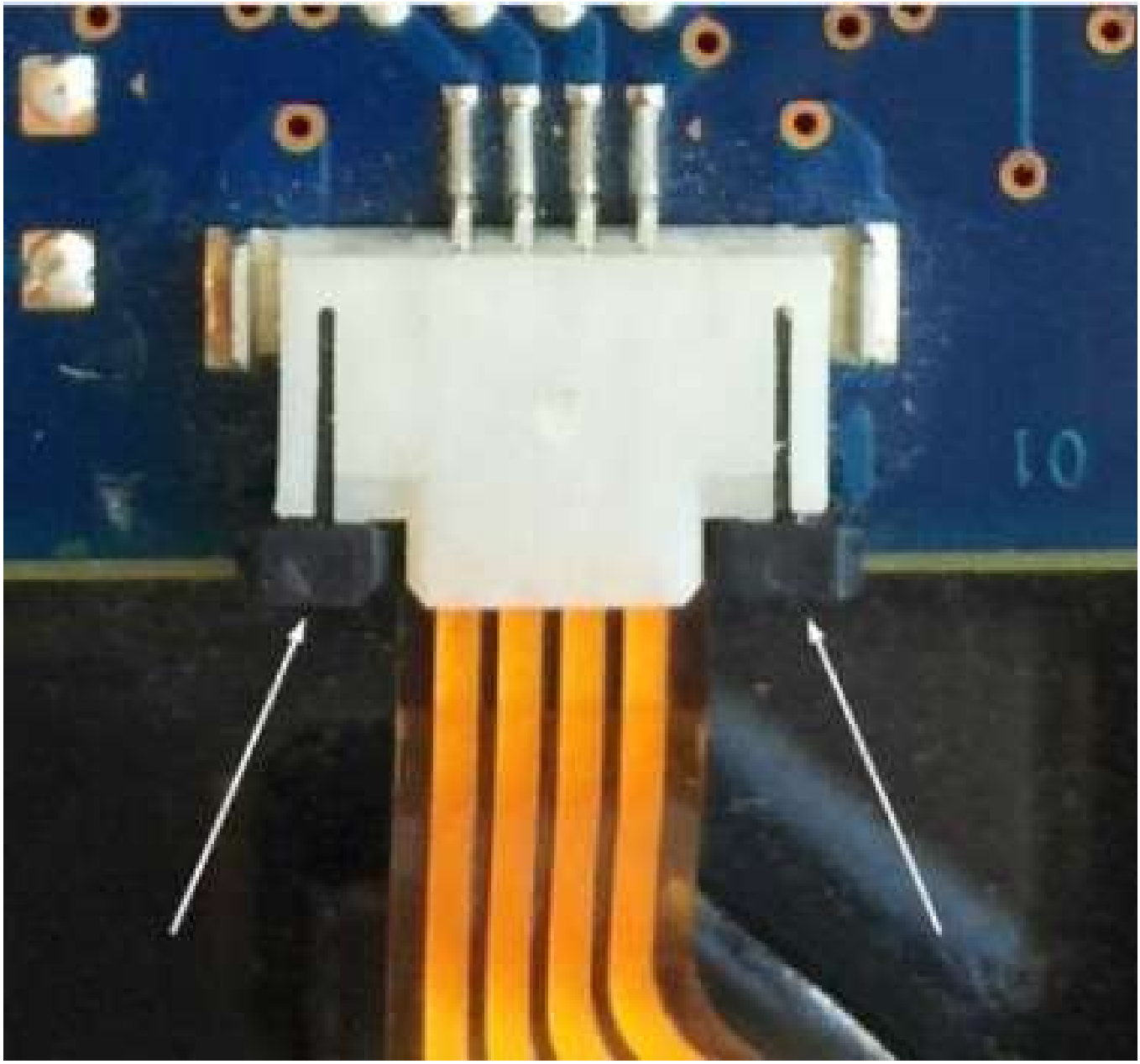
8. Continue with the unlocking process.

3.5-inch SATA hard drives

The following actions can only be performed if your SATA drive is attached to DiskSense unit via Hitachi password extraction adapter.

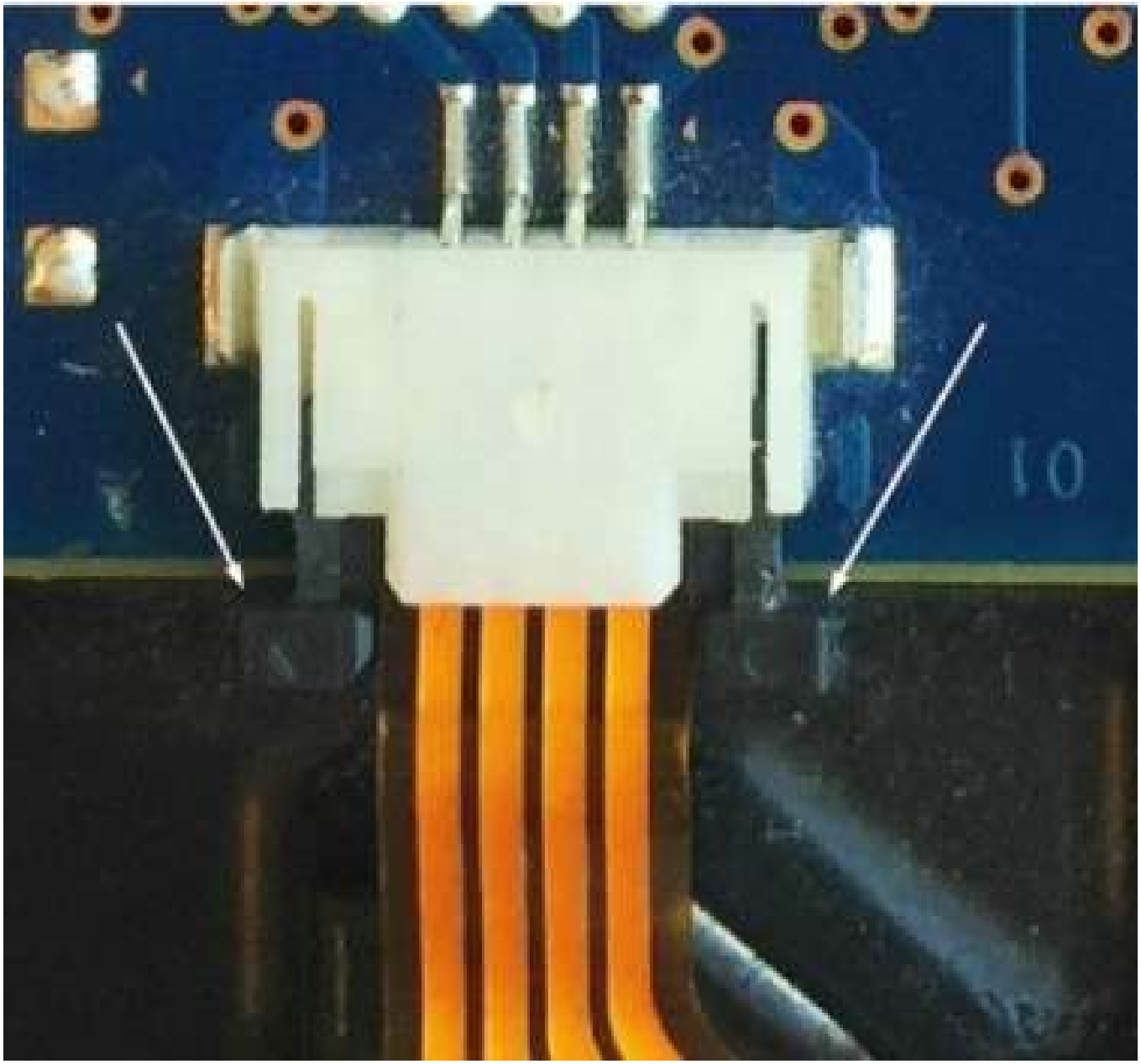
1. Place the hard drive as shown on the picture (no need to disconnect any cables):

You may see the orange cable connected to the PCB being fastened by the latch.

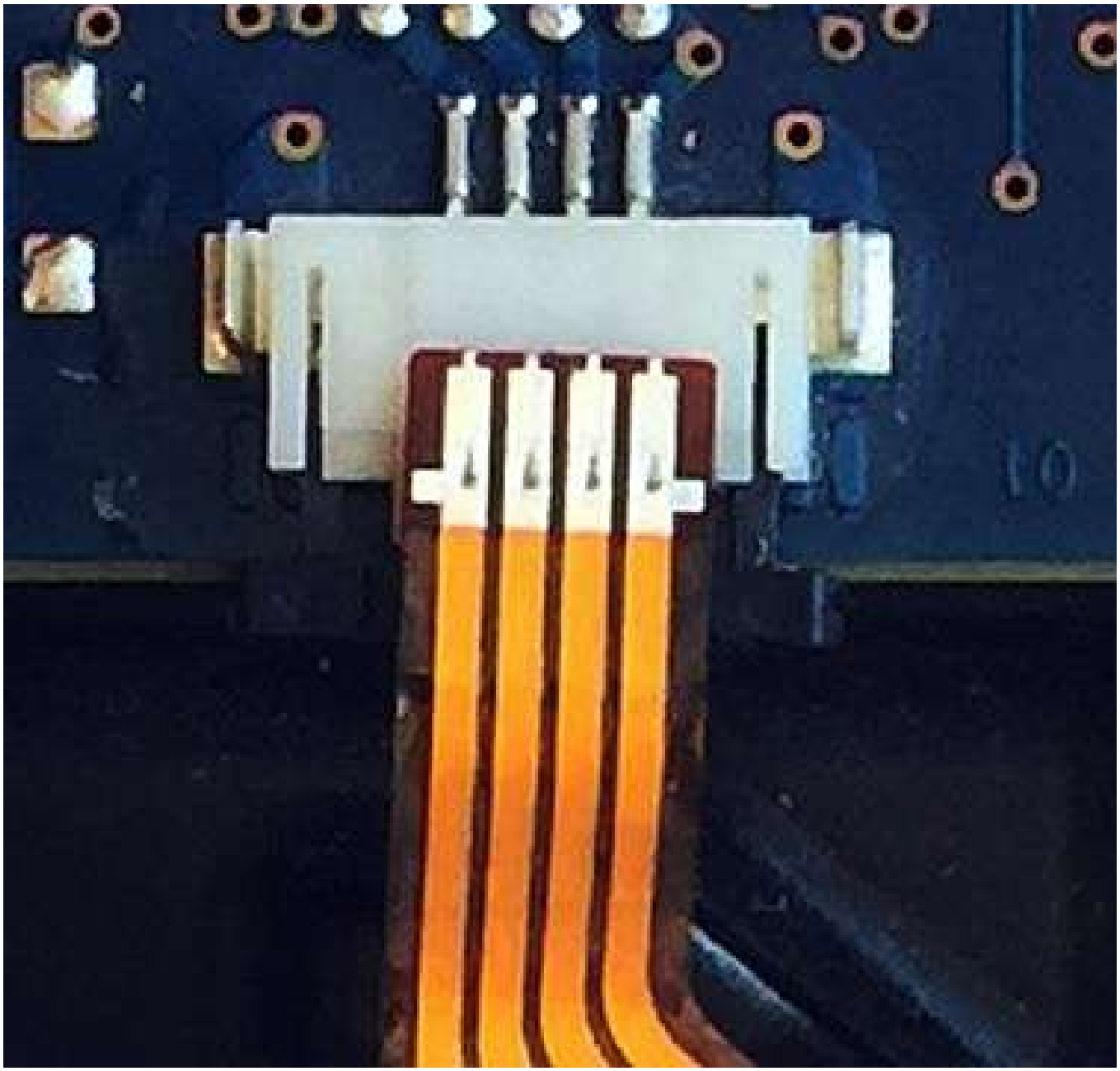


2. **Important**: Power off the drive.

3. Unlock the latch as it is shown below:



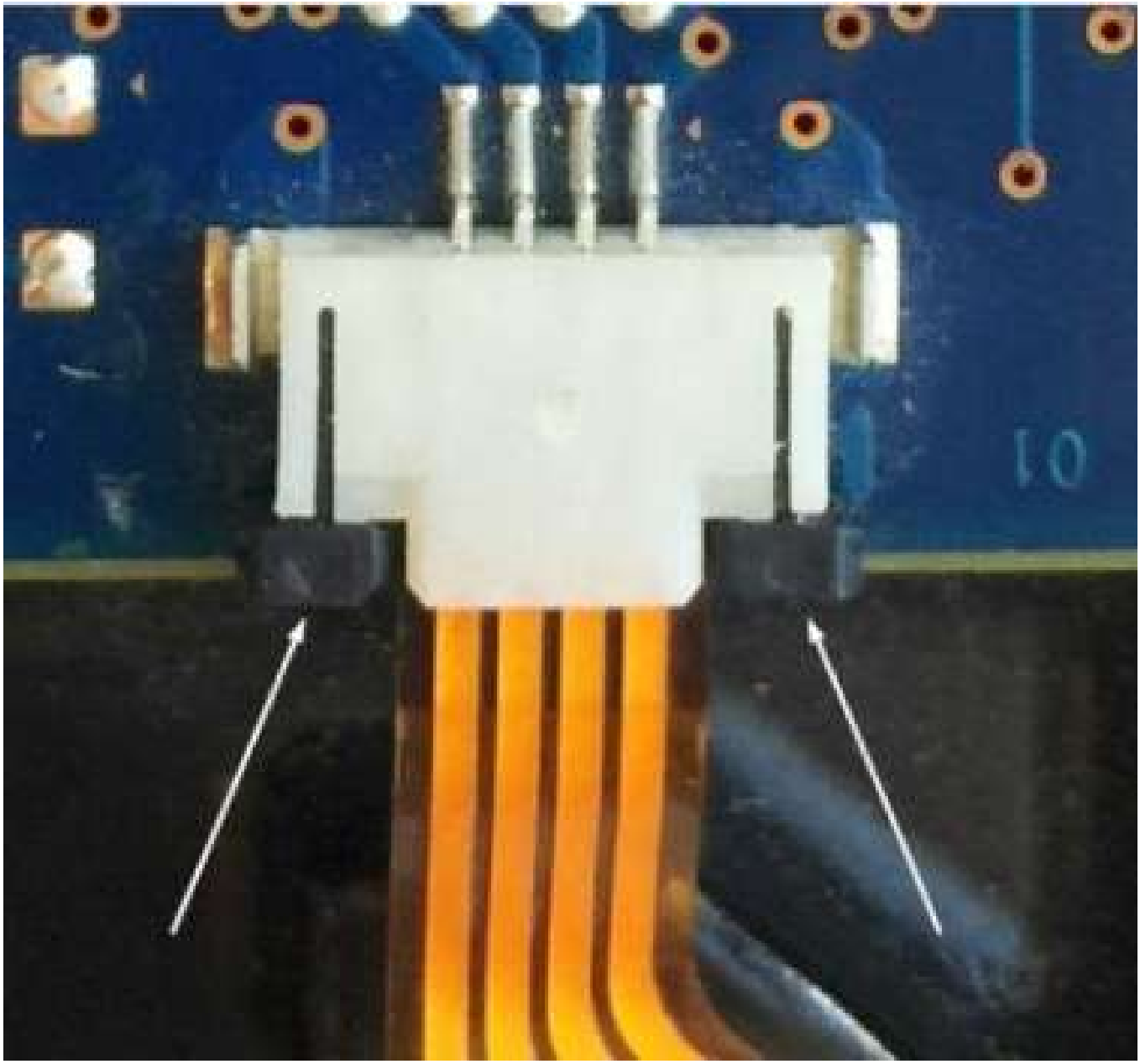
4. Disconnect the cable.



5. Proceed following Atola Insight instructions.

6. **Important**: Power off the drive.

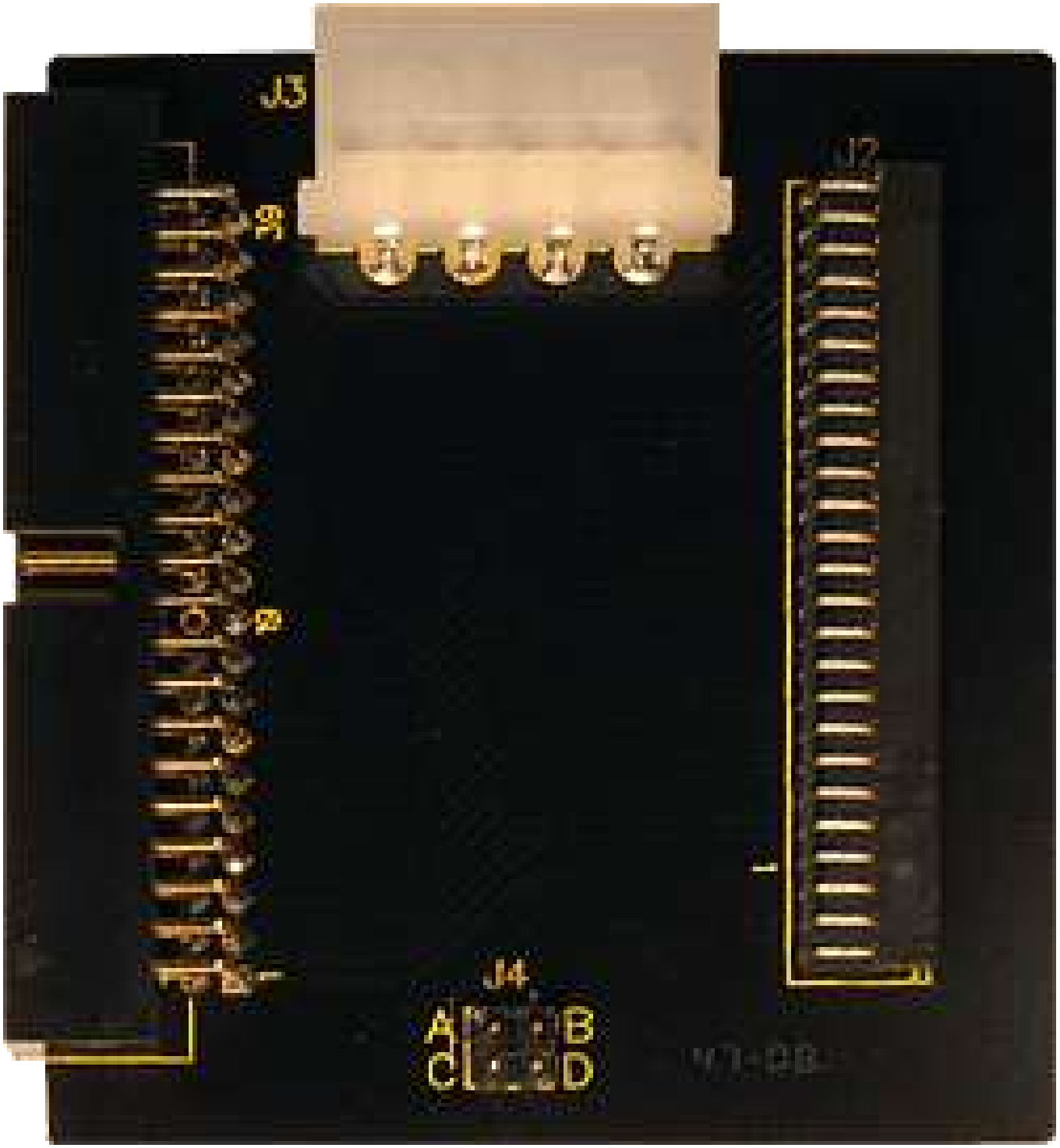
7. Plug the orange connector into the PCB socket and fasten it with the latch.



8. Follow Atola Insight instructions.

IDE hard drives

1. You will need Atola 2.5-inch to 3.5-inch adapter:



If you have such an adapter, please skip to step 4.

2. Disconnect the drive and place it as shown on the picture:

You do not need to perform this step if you have Atola 2.5-inch to 3.5-inch adapter (see step 1).

3. Locate a jumper that fits 2.5-inch HDD jumper pins:

And then install the jumper into position as shown below:

You do not need to perform this step if you have Atola 2.5-inch to 3.5-inch adapter (see step 1).

4. If you're using Atola 2.5-inch to 3.5-inch adapter, then install a jumper between pins A and C (on the adapter).

5. Attach the hard drive back to Atola DiskSense unit and proceed with unlocking.

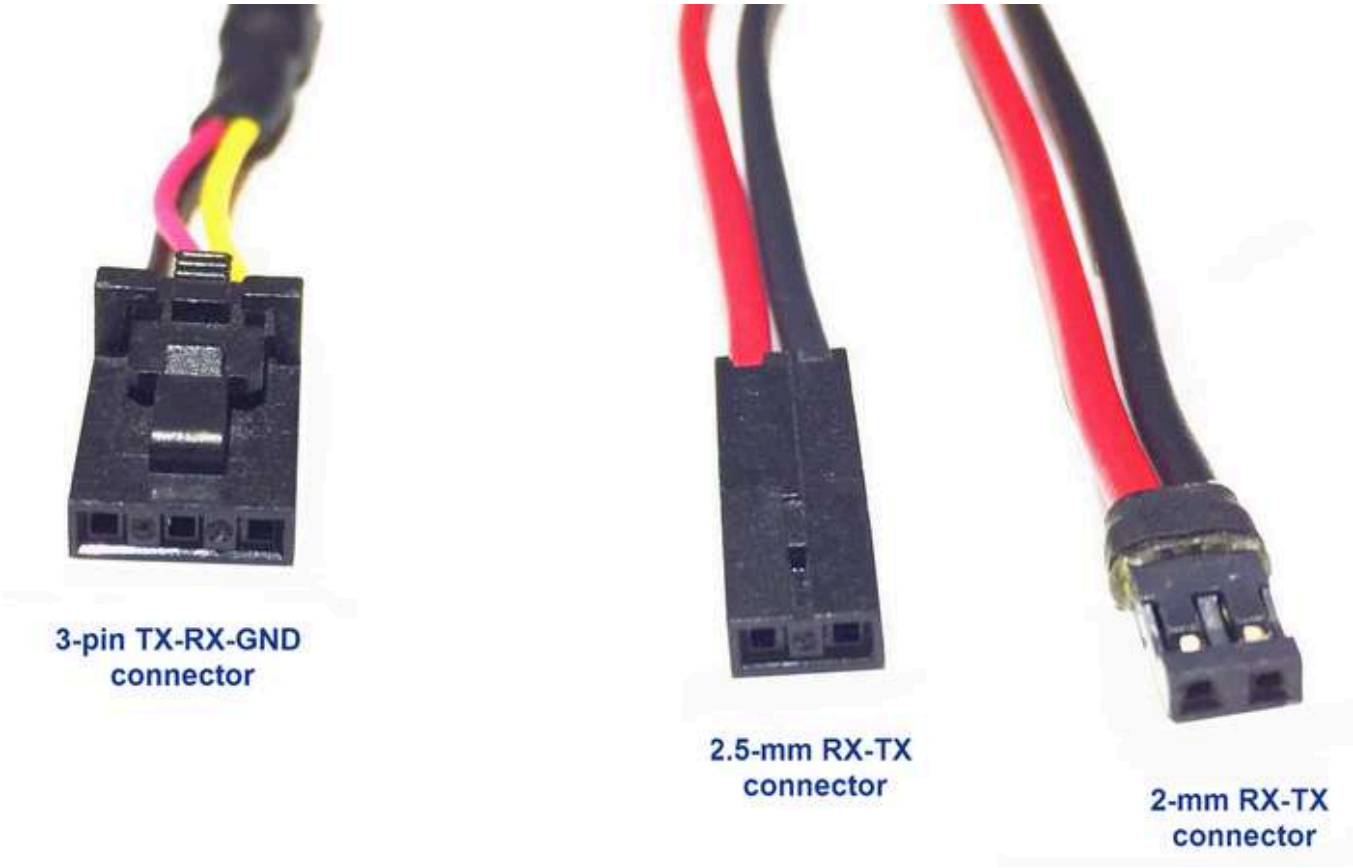
6. Remove the jumper:

7. Plug the hard drive back to Atola DiskSense unit and continue with unlocking.

Unlocking Seagate drives

If you need to extract or reset an unknown password or perform drive recovery on a Seagate hard drive, use a **Serial cable** to connect the drive to the DiskSense unit.

Take a minute to familiarize yourself with the Serial cable's three connectors. On one side of the cable, there are two connectors. Both are **2-pin RX-TX** (receive-transmit) connectors. The slightly larger one has **2.5-mm** pin pitch and is used for **IDE** drives. The smaller one has **2-mm** pin pitch and is used for **SATA** drives.



On the opposite side of the Serial cable, there is a **3-pin TX-RX-GND** (transmit-receive-grounding) connector. This connector is inserted in the **Serial port** on the back side of the DiskSense unit.

Connecting 3.5-inch and 2.5-inch Seagate SATA drives

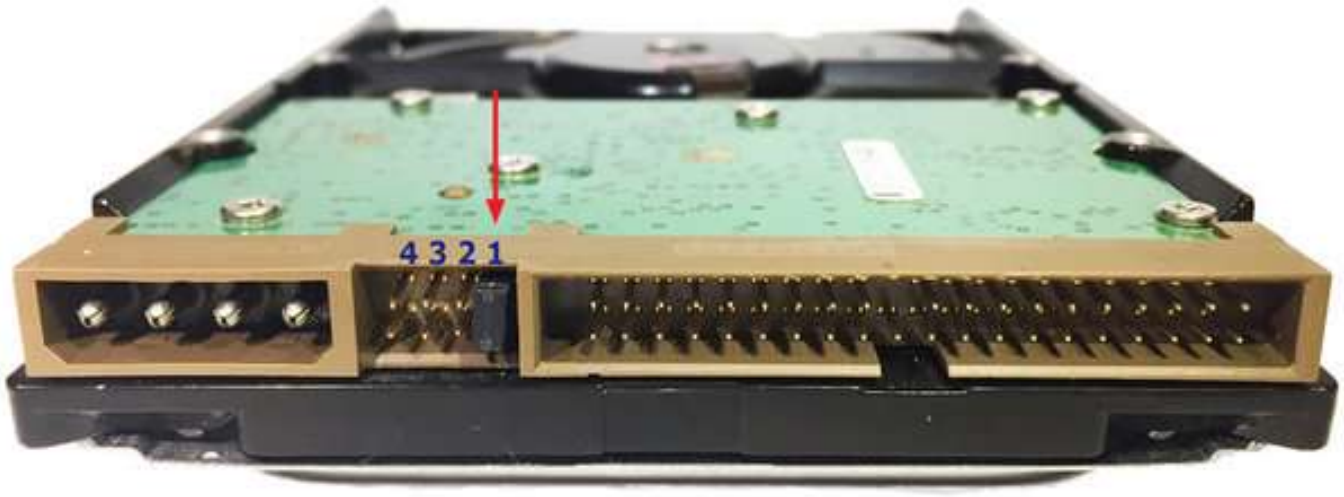
When you look at a Seagate SATA drive (either 3.5-inch or 2.5-inch), there is a **4-pin jumper block** right next to the SATA port.

Connect the **2-mm RX-TX** end of the serial cable to the two jumper pins located closest to the SATA port so that the red **RX** (receive) wire is connected to the pin closer to the SATA port.

Connecting 3.5-inch Seagate IDE drives

Desktop IDE drives have an **8-pin jumper block** between IDE port and Power port. For the purpose of this manual, we shall call the pair of pins located closest to the IDE port and used for Master/Slave settings the **first pair** of pins. The next, second pair of pins is usually used for Cable Select settings. The **third pair** of pins is the one we will connect the **Serial cable** to.

Please note that IDE hard drives must be set to **Master mode** for password extraction and reset or drive recovery. To use the drive in Master mode, place a jumper on the **first pair** of pins (closest to the IDE port), as shown in the picture below.



Attach the **2.5-mm RX-TX** connector to the **third pair** of jumper pins, as shown in the picture below. Make sure that red **RX** (receive) wire is facing down and the black **TX** (transmit) wire is facing up. The **second pair** and the **fourth pair** of pins must be left open.

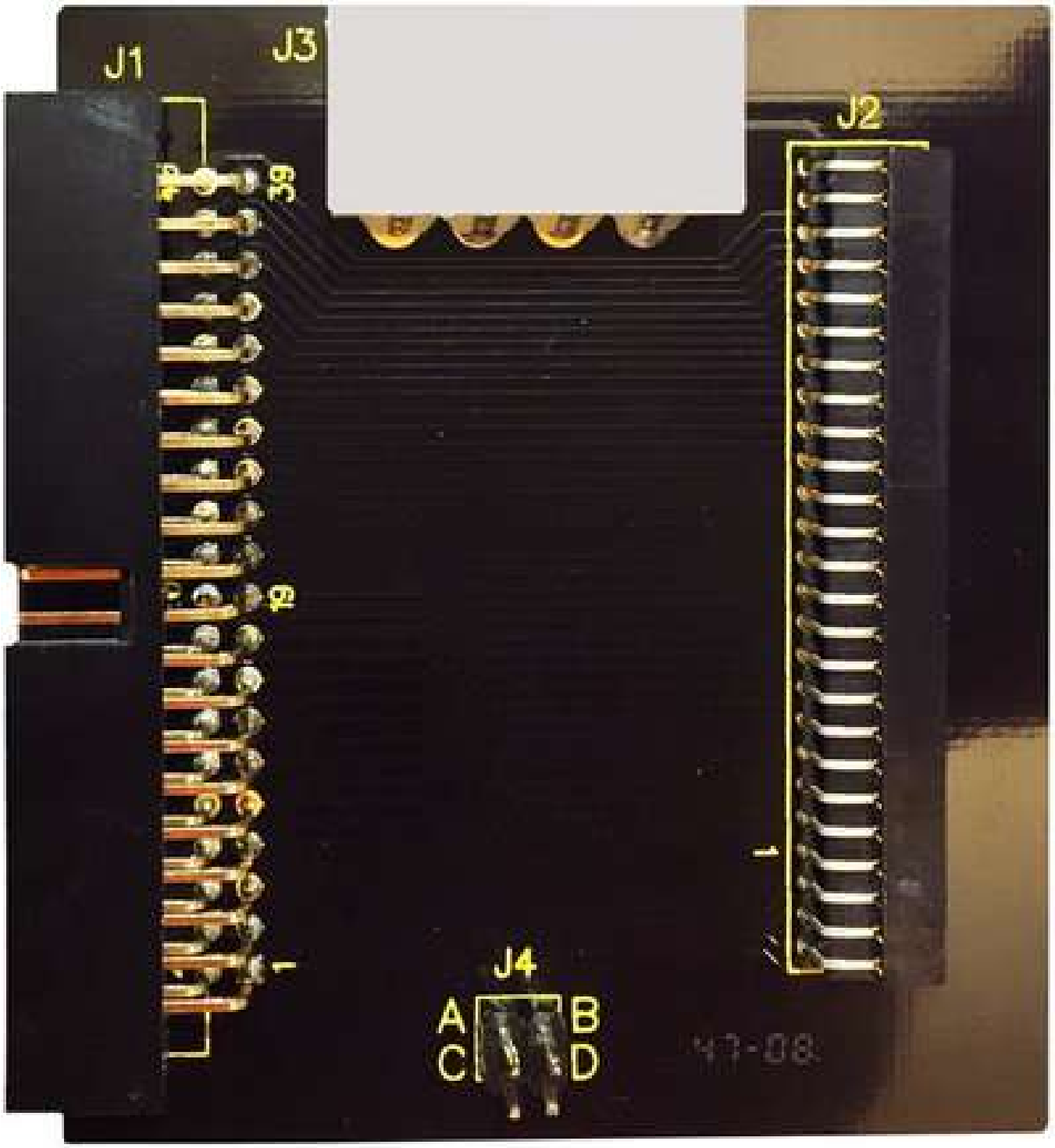
Connecting 2.5-inch Seagate IDE drives

Similar to desktop hard drives, laptop Seagate hard drives also must be set to Master mode to perform password extraction and reset or drive recovery. Master mode on a 2.5-inch device is set by removing all jumpers.

There is a **3.5"-to-2.5" IDE adapter** included in the package with the DiskSense unit. It consists of the following components:

- IDE port **J1** for IDE interface cable
- 2.5-inch IDE port **J2** to connect the drive to
- Power port **J3** for IDE power cable

- 4-pin block **J4**, where each pin is marked with letter **A**, **B**, **C**, and **D**.



Use the adapter to connect the drive to IDE interface cable and IDE power cable. Then attach the **2.5-mm RX-TX** connector to pins marked **A** and **C**, as shown in the picture below. Make sure that the black **TX** (transmit) wire is connected to the pin **A**, and red **RX** (receive) wire is connected to the pin **C**.

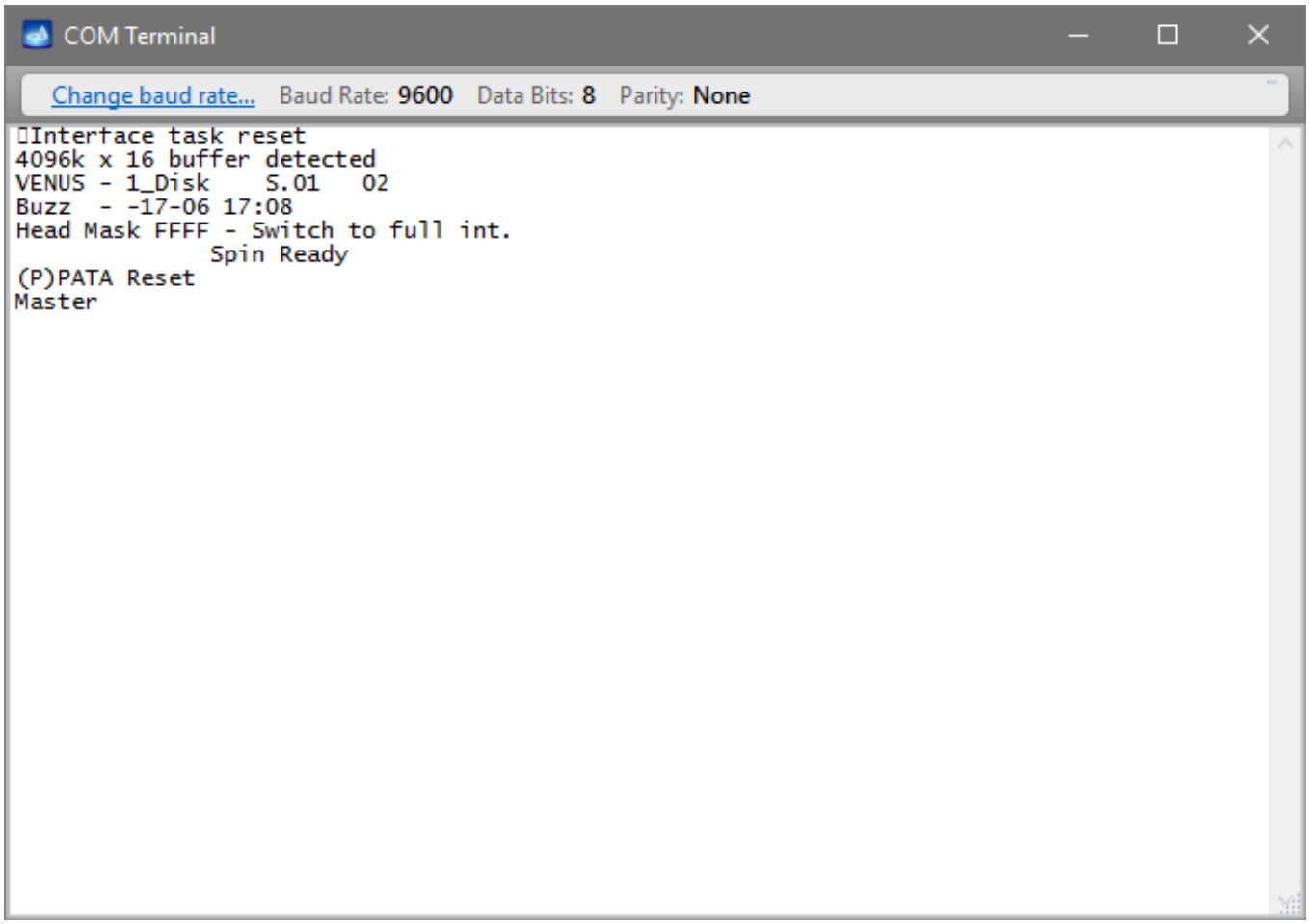
*Please note that to use the 2.5-inch Seagate IDE drive in **Slave mode**, the **2.5-mm RX-TX** connector must be detached from the adapter and instead a jumper must be placed on pins **A** and **B**.*

Configuring the Baud rate

Once the Seagate hard drive is connected to the unit, follow these instructions to configure the **Baud rate** of Seagate Terminal, which allows you to use an extensive set of commands on a Seagate drive:

1. If there is only one source drive connected to the DiskSense unit, it will automatically be identified and displayed in the **Source disk port**. However, if there are multiple hard drives connected to the DiskSense unit as Source drives, go to **Source** category of the top level menu, click on **Select Source** and choose the Seagate drive.

2. Power down the selected drive.
3. In the **Windows** category of the top level menu click on **Terminal** and in the **COM Port Settings** window select the **Baud rate** compatible with the drive. *Please note that for Seagate 7200.10 and older Baud rate will be 9600; for 7200.11 and newer Baud rate will be 38400 (Atola Insight Forensic will suggest the baud rate by setting a default value in the Terminal window for the drive connected to it)*.
4. Then click OK. But do not close the **Terminal** window just yet.
5. Power on the drive again. There must be a valid output in the **Terminal** window (see the picture below).



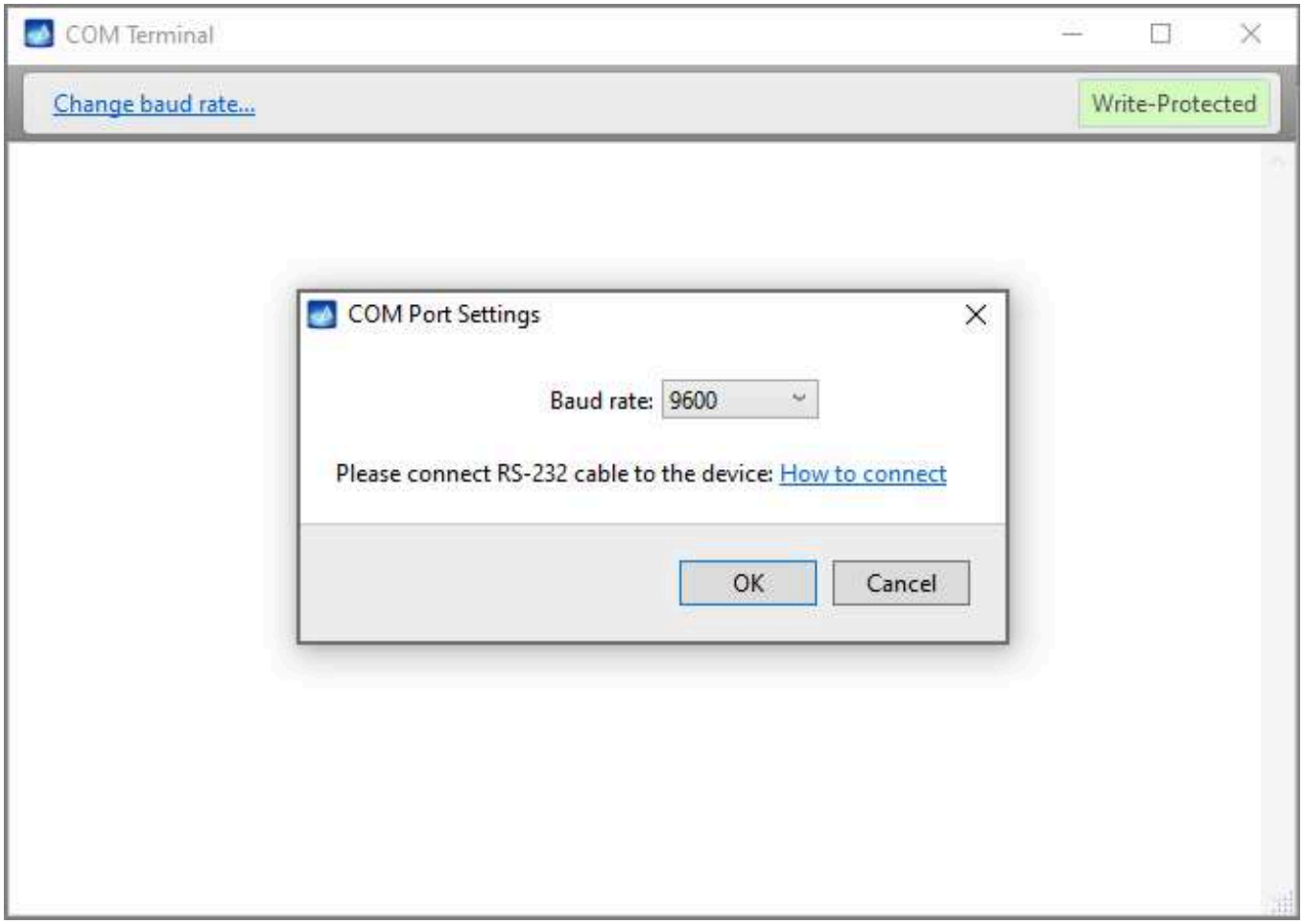
Should there be no output in the Terminal window or should it consist of random symbols, try to change the Baud rate until you get a good response.

Now proceed with password extraction or send Seagate Terminal commands to the drive.

Recovering Seagate 7200.11 hard drives

First of all, please connect the hard drive's serial port to DiskSense unit by following instructions on the Serial Port Connection page.

Open the Terminal window, select the DiskSense COM port (usually the one that is displayed by default is the correct one). 38400 is the proper speed for 7200.11 hard drives:



COM terminal connection

Once everything is set up, click OK. Make sure that you have attached everything correctly by applying power to the drive (you should see a meaningful output in the terminal window).

Note: if you make an mistake while entering commands, you will get the following message:

Invalid Diag Cmd Parameter

In this case simply re-enter the command and double-check that you are entering everything exactly as shown in this manual.

Once everything is ready and you have powered on the drive, you should see the following (or very similar) output in the terminal window:

```
Rst 0x20M
```

```
(P) SATA Reset
```

At this point press CTRL+Z. You should receive the command prompt:

```
F3 T>
```

Fixing zero capacity problem

1. Type the following: m0,2,2,0,0,0,0,22 and then press ENTER.

2. At this point the drive will stop responding for a while.

3. After some time (1-5 minutes) you will get several messages from the drive similar to these:

```
Max Wr Retries = 00, Max Rd Retries = 00, Max ECC T-Level = 00, Max Certify Rewrite Retries = 0000
```
User Partition Format Successful - Elapsed Time 0 mins 00 secs

4. Wait some more time until you see the command prompt again:

```
F3 T>
```

5. Type the following: /2 and then press ENTER. You will see the following output:

```
F3 T>/2
F3 2>
```

6. Type capital Z and press ENTER:

```
F3 2>Z
Spin Down Complete
Elapsed Time 10.543 secs
F3 2>
```

7. At this point you have to re-power the drive. The procedure is complete.

Fixing HDD always BUSY problem

This problem is also known as "LED:000000CC problem". This is because when you apply power, you will usually see the following output:

```
Rst 0x10M
LED:000000CC FAddr:0025BF67
```

To fix this issue, please follow these steps:

1. Power off the drive
2. Remove two screws as shown on the picture below (you will need a Torx T6 screwdriver):

3. Put a piece of paper as shown on the picture below (the goal is to separate spindle motor contacts from the pcb):

4. If you detached any cables from the drive, this is the right time to attach them back.

5. Apply power to the drive (with screws removed and paper inserted) and wait for the drive to become ready (usually no more than one minute)

6. You will see the following (or very similar) output in the terminal:

```
Rst 0x20M
```

7. Press CTRL+Z. You will get the command prompt:

```
F3 T>
```

8. Type the following: /2 and then press ENTER. You will see the following output:

```
F3 T>/2
F3 2>
```

9. Type capital Z and press ENTER:

```
 F3 2>Z
Spin Down Complete
Elapsed Time 0.132 msecs
F3 2>
```

10. Now remove the paper, put all screws back and tighten them (do not power off the drive!):

11. Type capital U and press ENTER:

```
 F3 2>U
Spin Up Complete
Elapsed Time 6.604 secs
F3 2>
```

12. Type the following: /1 and then press ENTER. You will see the following output:

```
 F3 2>/1
F3 1>
```

13. Type the following: N1 (capital N and one) and then press ENTER. You will see the following output:

```
F3 1>N1
F3 1>
```

14. Re-power the drive (press Power Off button on the DiskSense unit; wait 10-15 seconds; press Power On button) and wait until it initializes:

```
Rst 0x20M
(P) SATA Reset
```

15. Press CTRL+Z. You will get the command prompt:

```
F3 T>
```

16. Type the following: i4,1,22 and then press ENTER. You will see the following output:

```
F3 T>i4,1,22
F3 T>
```

17. At this point do not re-power the drive, scroll to the top of this page and go through **Fixing zero capacity problem** starting from step 1.

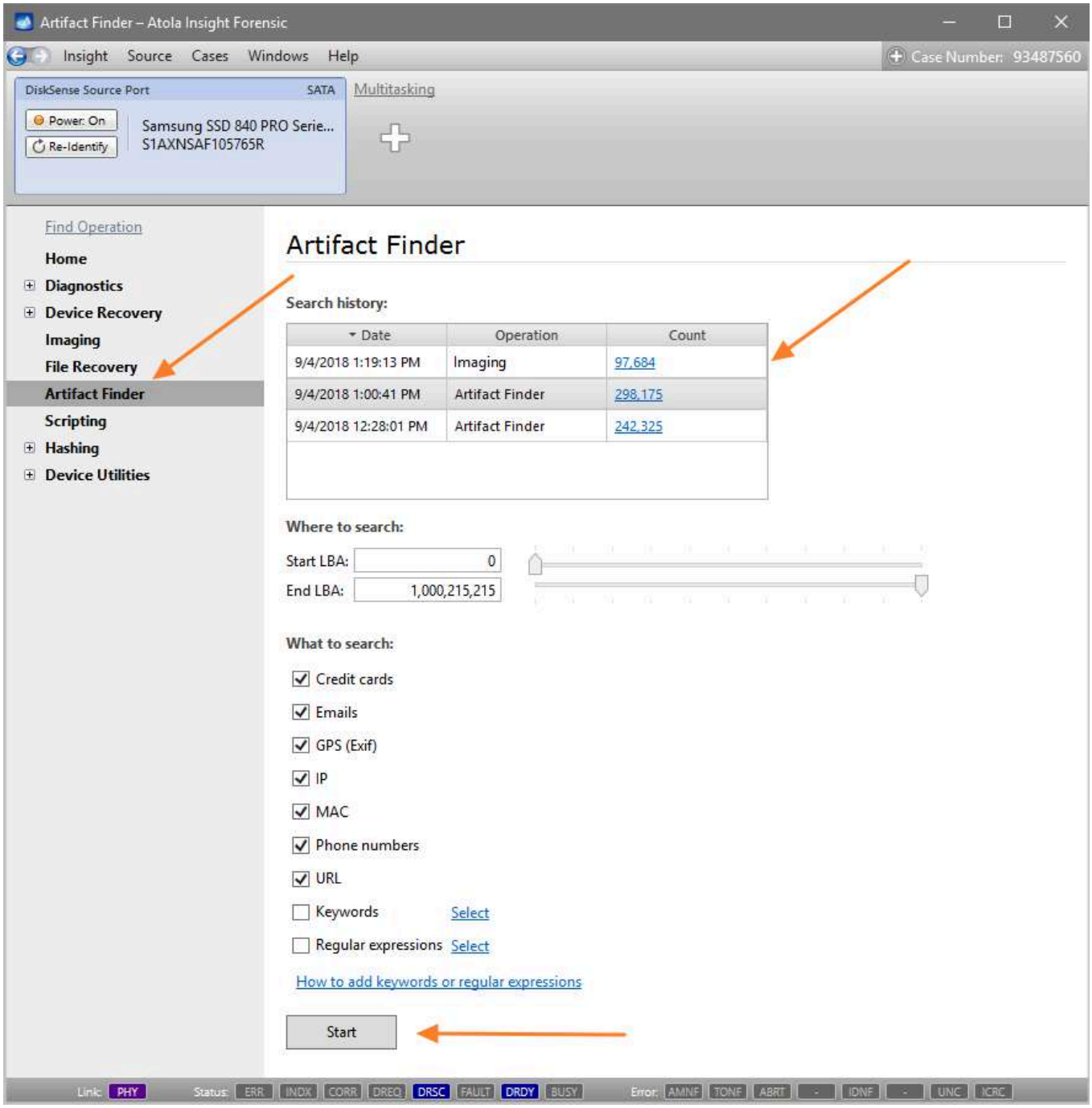
Artifacts Finder

Insight's Artifact Finder feature allows early analysis of data by reading and parcing it on an evidence drive or its images. Unlike most forensic analysis tools that parse the file structure, Insight does sector-level parsing, which allows getting data even from the spaces of the drive that are not associated with any file (e.g. remnants of previously deleted documents), thus providing you with clues that are omitted by most analysis tools. Artifact finder uses Intel Hyperscan engine, which makes it the fastest possible tool for primary data analysis.

Insight supports multiple simultaneous artifact searches on both source and target drives.

Search for artifacts

On the Sidebar, go to Artifacts Finder. In the upper part of the window there is a table with previous artifact searches performed on the current drive including those carried out during imaging. If you want to perform another search, select the artifacts that need to be found.

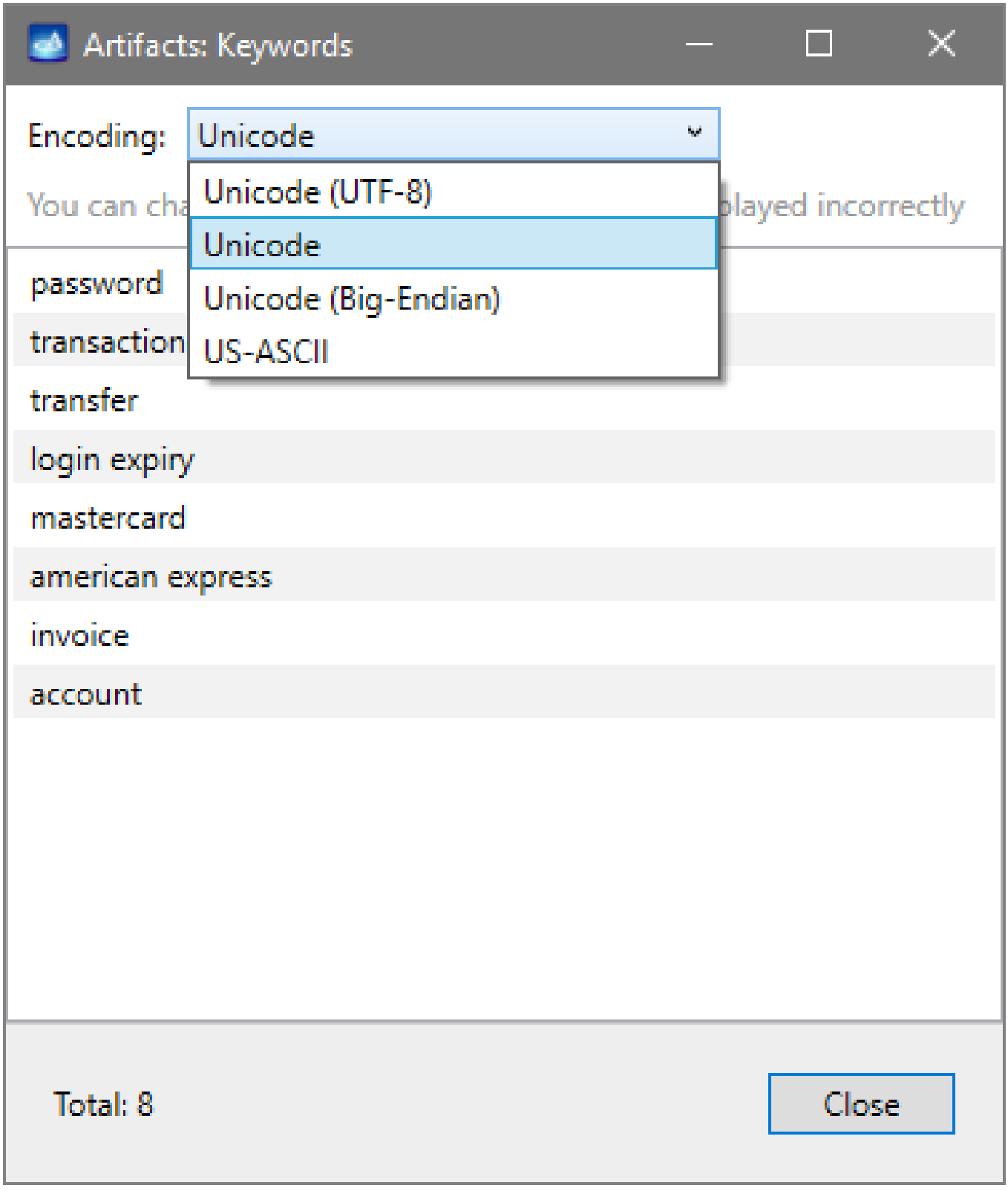


The artifacts include:

1. Credit cards
2. Emails
3. GPS coordinates
4. IP
5. MAC
6. Phone numbers
7. URL
8. Keywords
9. Regular expressions

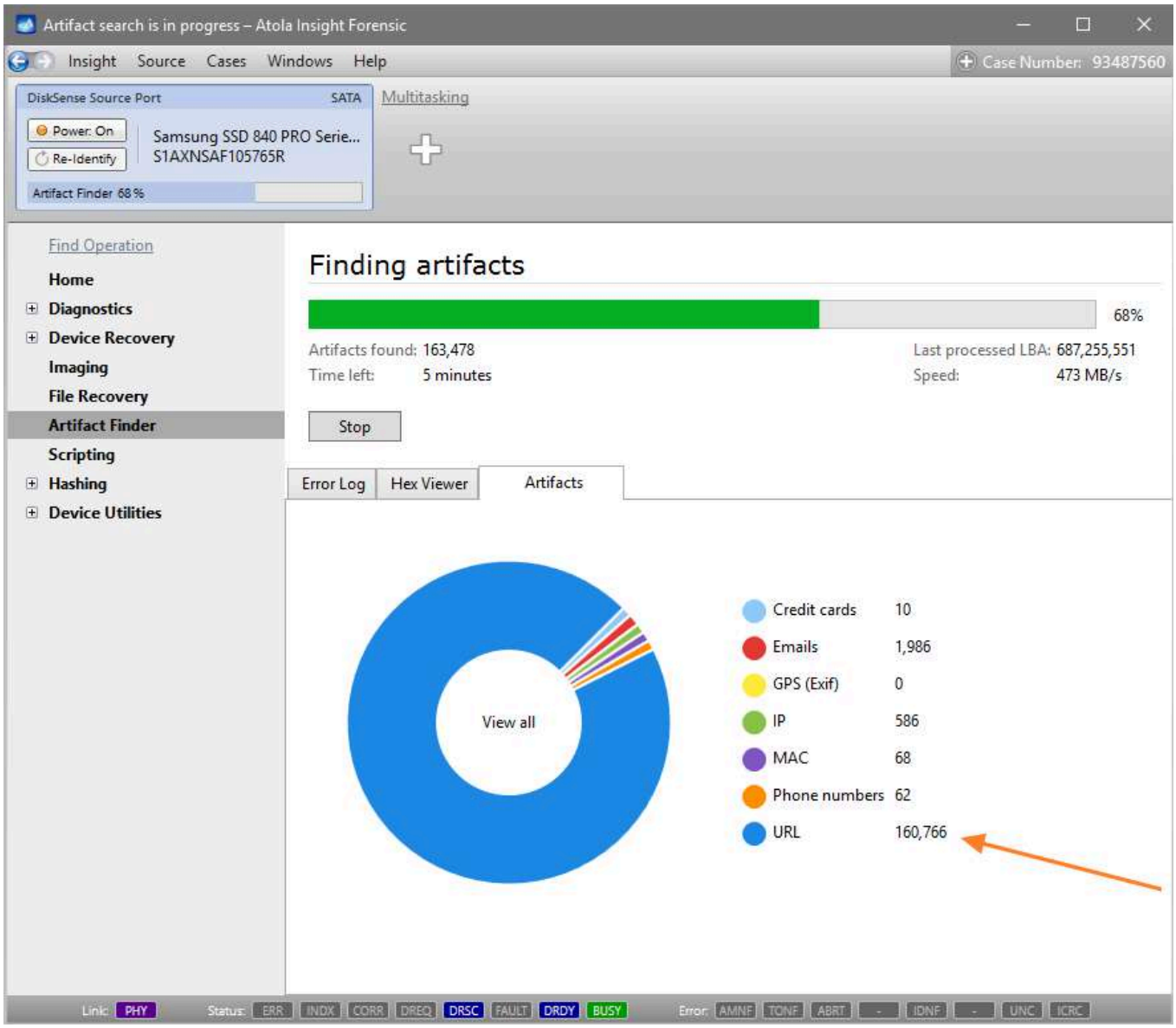
For each of the artifacts, not only widely known filter algorithms were applied for proper result filtering (such as the Luhn formula used to validate credit card numbers), but there have also been custom smart filters applied to eliminate false results (e.g. two slashes next a number that has preliminarily been identified as a credit card number, will eliminate it from the search results, as it is likely to be a part of a URL).

Keywords and regular expressions can be added to the search parameters in a txt file with one artifact per line. Keyword encoding can be adjusted to *Unicode, Unicode (UTF-8), Unicode (Big-Endian)* or *US-ASCII*.

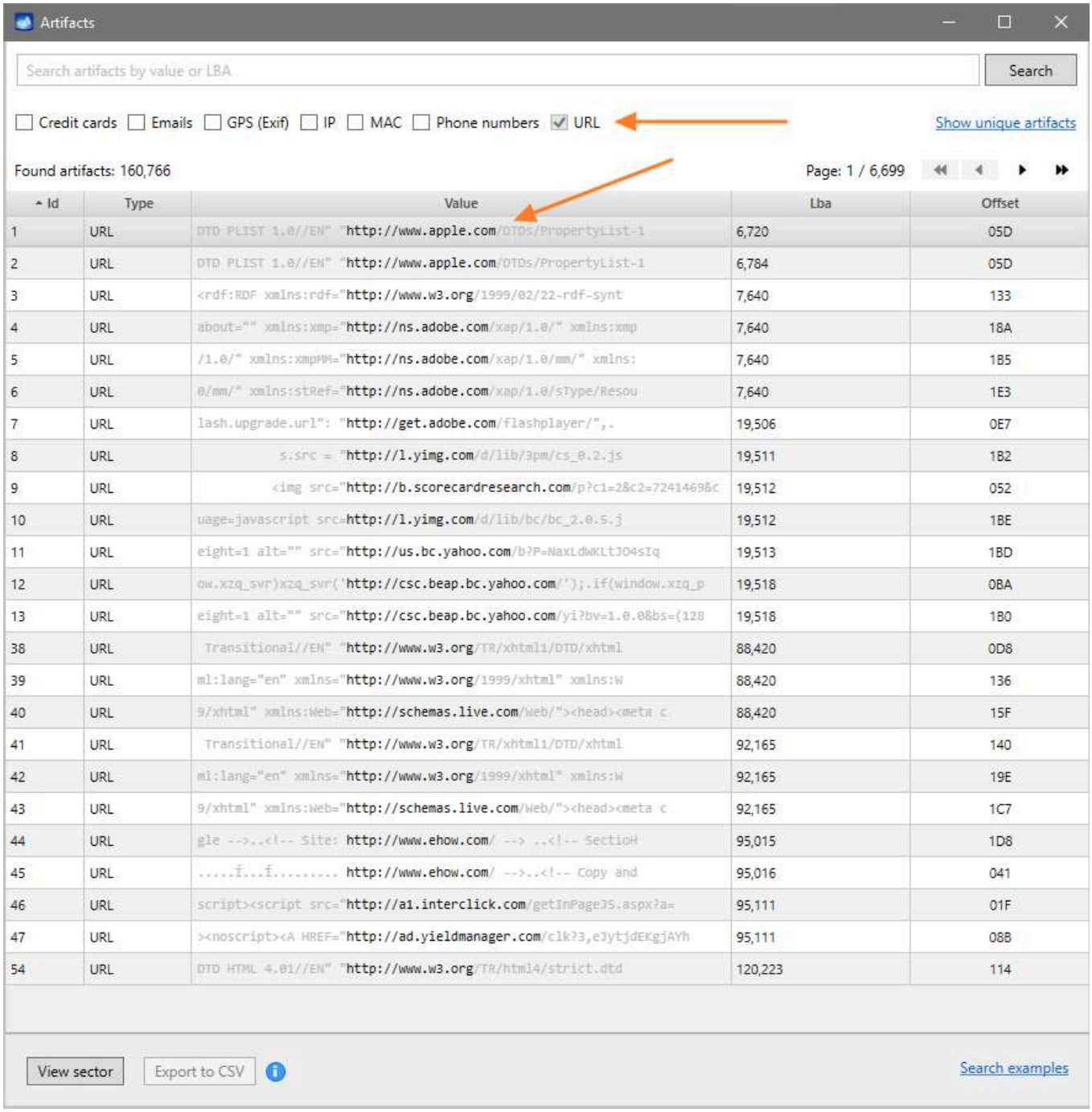


Browse through the found artifacts

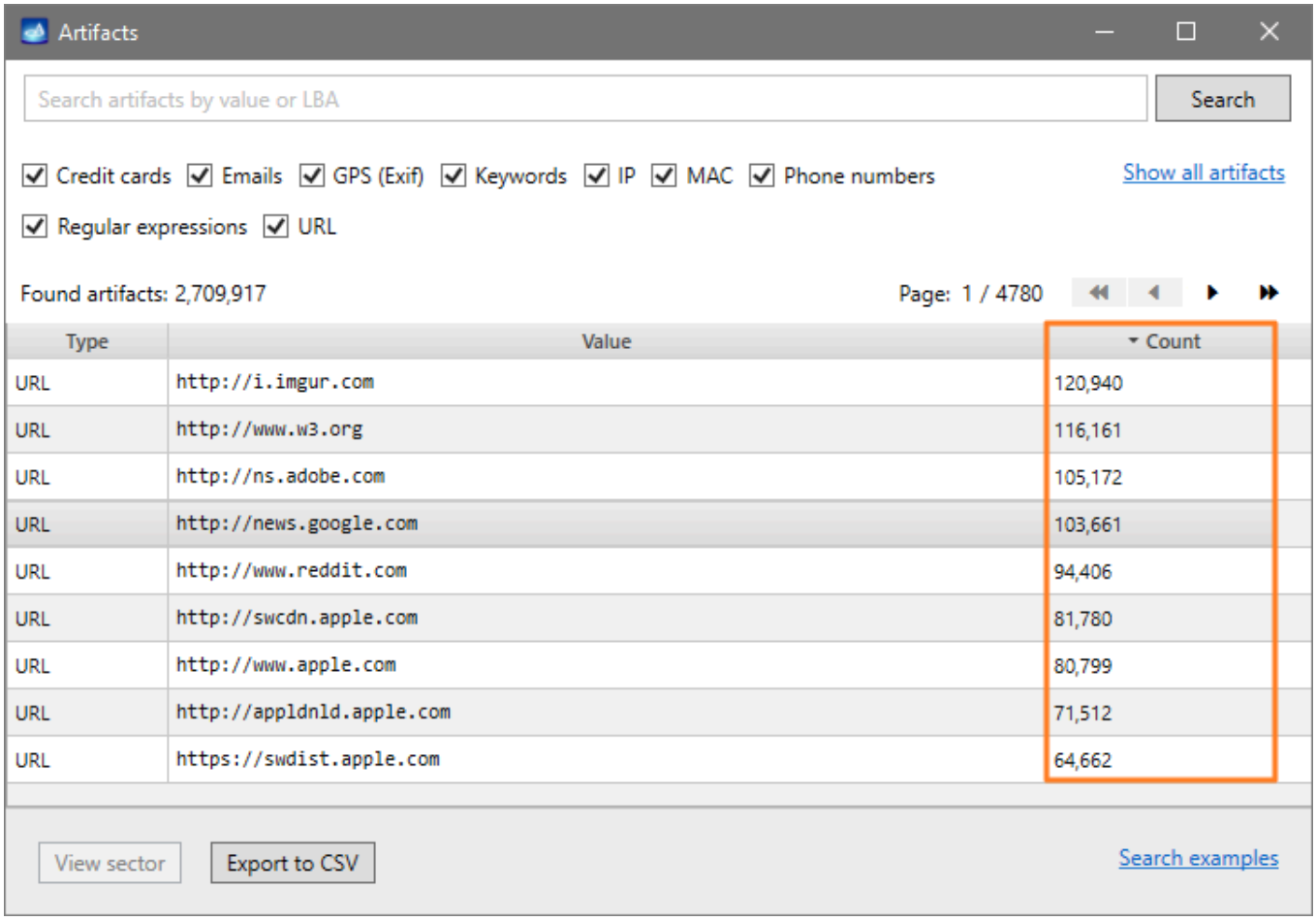
As the Artifact Finder is still running, you can look at the progress in the Artifacts tab below the progress bar and click the diagram to see the list of found artifacts. If you only want to look at a certain category, click it in the list or in the diagram.



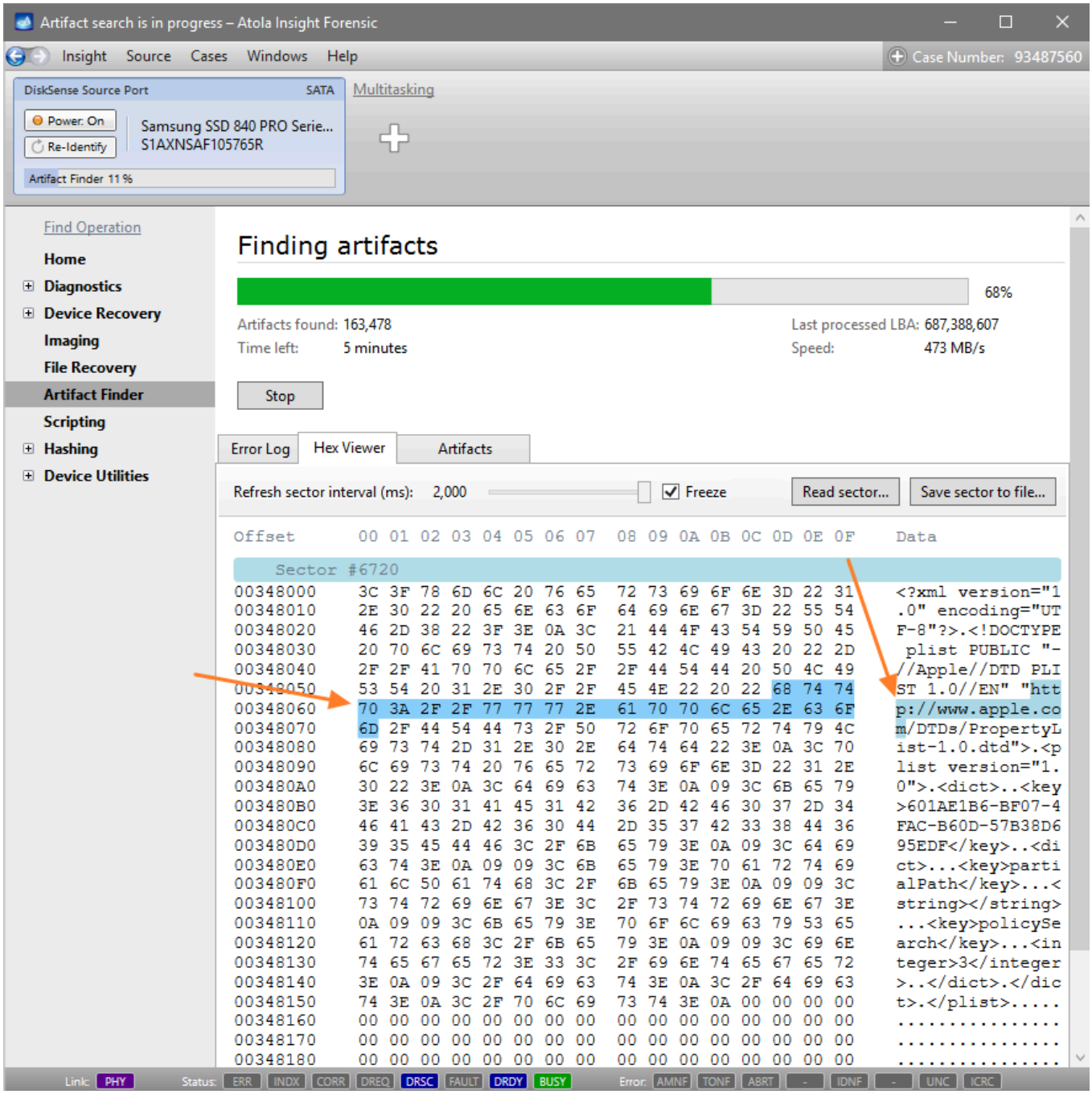
In the table, each artifact is given an **Id** number, each found **Value** is shown in the context (including 20 bytes before and 20 bytes after the artifact in grey color), the **LBA** and the **offset** are also displayed in the table to help locate the artifact.



There are many options to help find, sort, filter and view the artifacts. It is possible to view one or a few categories of artifacts in one list, use the **Search** bar to find a specific value (search examples are provided in the bottom right corner of the window), filter results for unique values by clicking the **Show unique artifacts** link. It helps identify the values most frequently occurring on the drive: to sort the results click **Count** in the table header.



Click an artifact in the list to see the sector where it is located. It allows you to see the context, in which this artifact is placed.



Export the list of found artifacts

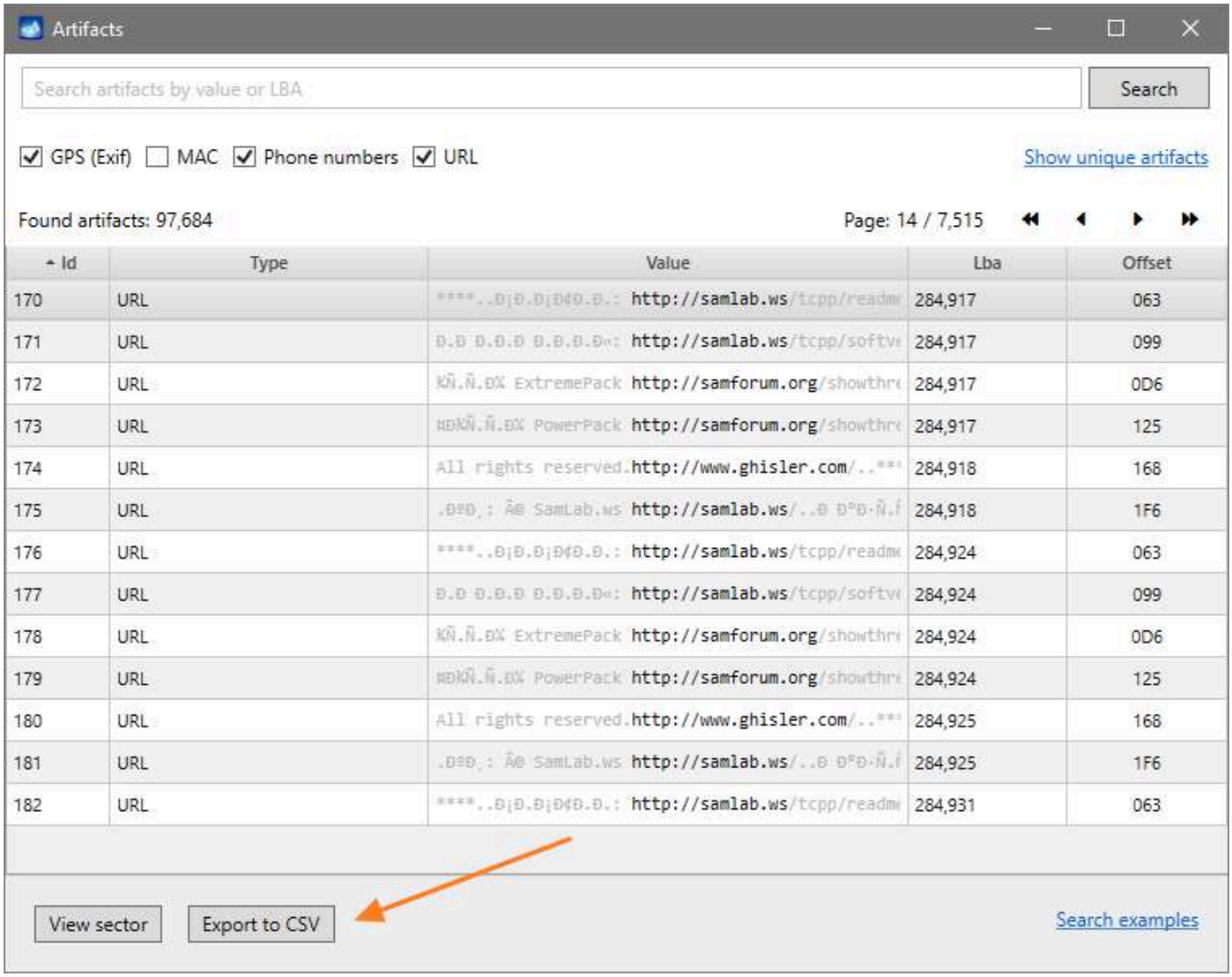
During the search, the **Export to CSV** button is disabled. You can wait until the process is completed or, should it be necessary to start analyzing the current search output with an external tool, stop it, make an export and restart the search from scratch or from the last LBA analyzed during the previous session.

To make an export:

1. Click the link with the number of artifacts found during this search.
2. On the **Artifacts** screen, select the artifacts to be exported (e.g. one or multiple artifact categories, unique artifacts or

only those fitting certain search criteria), and then click the **Export to CSV file** button.

3. Select the path for the file and click **Export**.



Analyze device data on the byte level

Atola Insight Forensic lets you delve deeper than the device partitions, folders, or files and analyze the drive contents on the level of individual bytes.

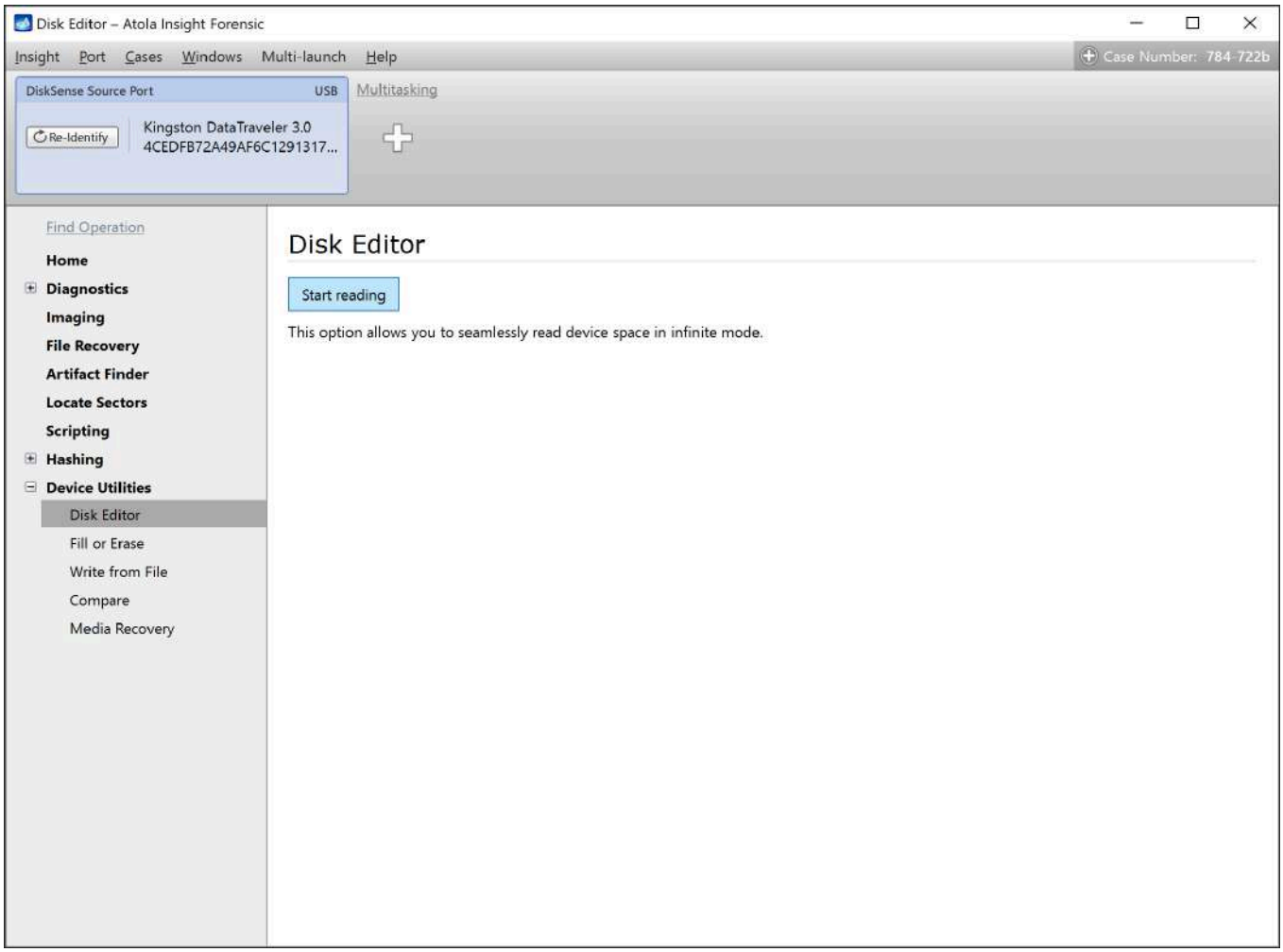
The specialized Disk Editor module makes it possible to find, read, or edit individual bytes, identify the exact location of specific sectors, automatically detect file system structures using built-in templates, search for hex strings, and convert hex values to decimal or binary format on the fly.

Launch Disk Editor

To launch the Disk Editor module:

1. In the sidebar, go to **Device Utilities** > **Disk Editor**.
2. Click **Start reading**.

To prevent possible damage to an unstable media, Disk Editor won't start reading device contents without your command.



Launching the Disk Editor module.

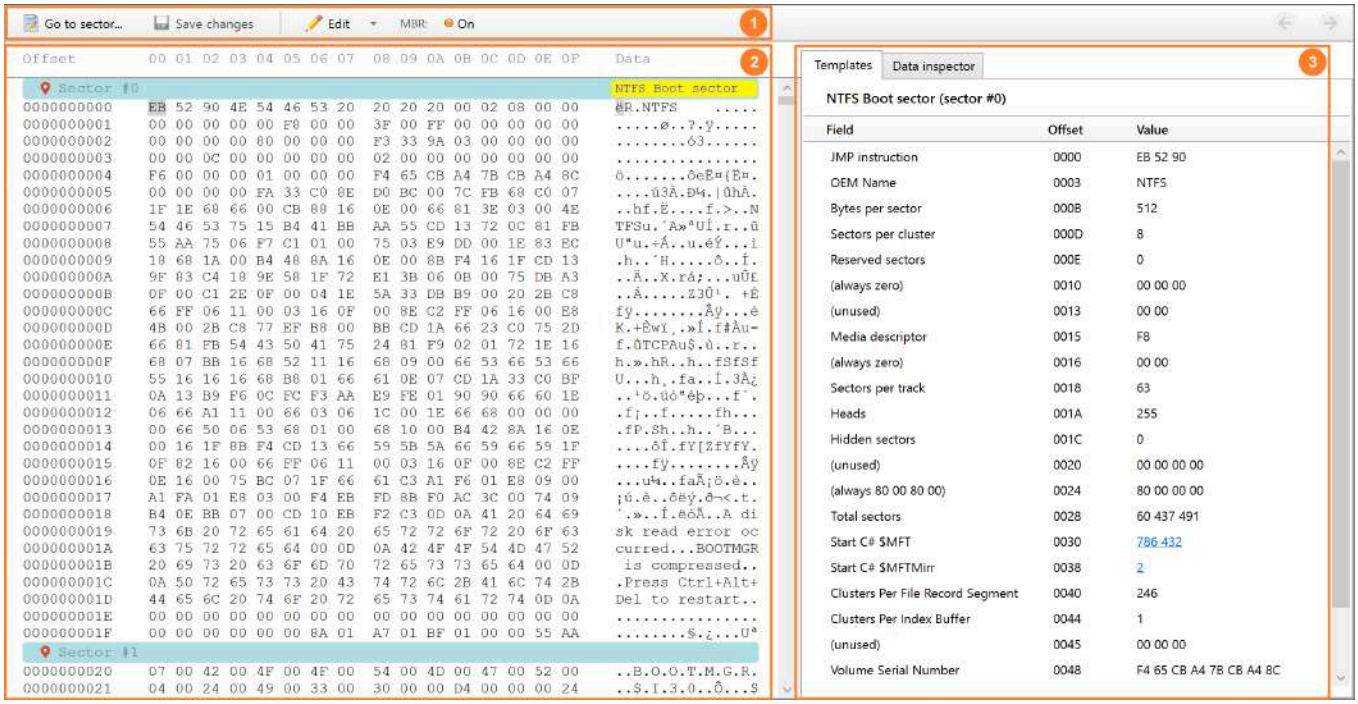
Disk Editor screen explained

The Disk Editor screen consists of three main areas:

1. **Toolbar** provides quick access to frequently used commands, like **Go to sector** or **Save changes**.
2. **Hex viewer** shows byte-level contents of a device in the hexadecimal format:

- Left column contains hexadecimal offset values, meaning how far the byte array is from the starting sector of the drive.
- Central column presents individual bytes in the hexadecimal format.
- Right column shows corresponding values in the ASCII format.

3. **Templates** and **Data inspector** tabs are used to display sector metadata in a human-readable form, search for hex strings, and convert hex values to alternative formats.



Three main areas of the Disk Editor screen: 1 - Toolbar, 2 - Hex viewer, 3 - Templates and Data inspector tabs.

Read sectors using Hex viewer

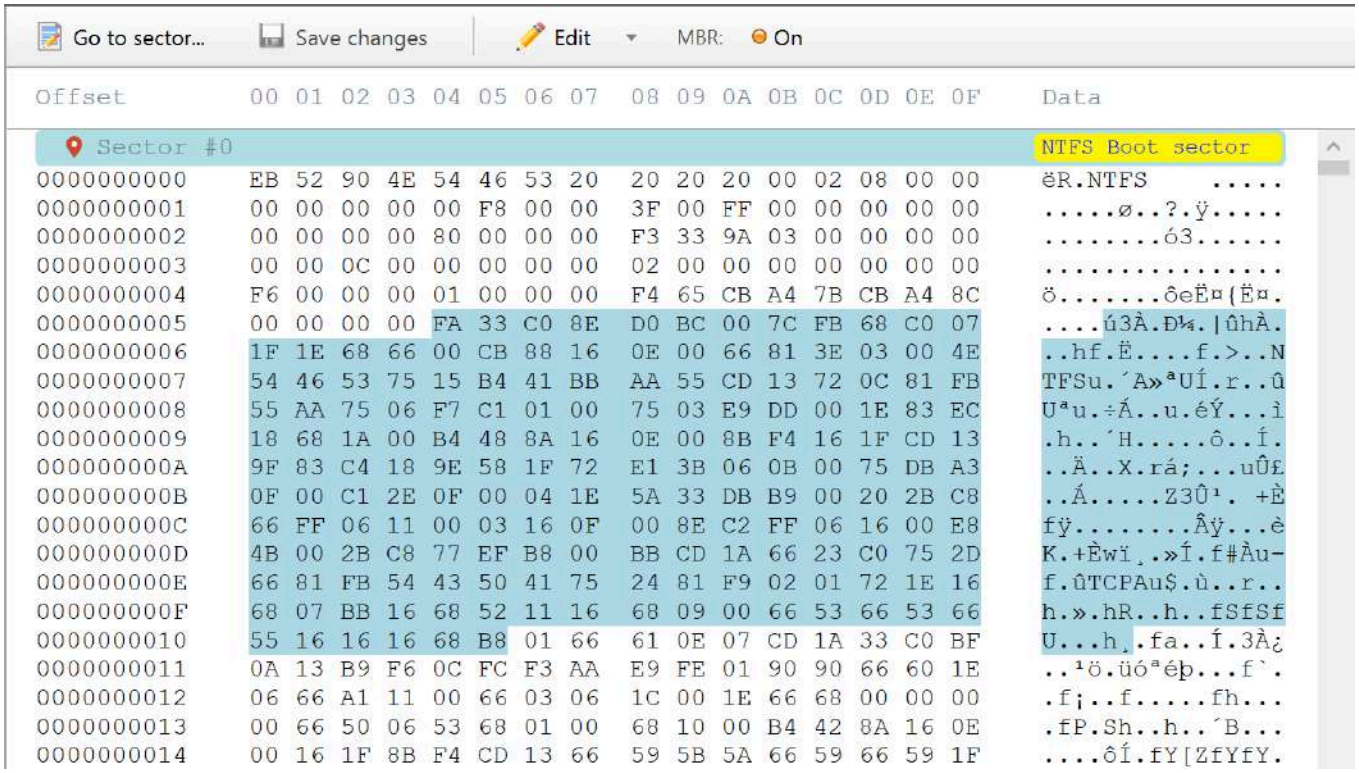
Insight Forensic seamlessly reads device space in infinite mode: bytes are loaded automatically as you scroll the hex viewer up or down.

To quickly jump to a certain position, click the **Go to sector** button on the toolbar or press *Ctrl+G*. Two more convenient shortcuts:

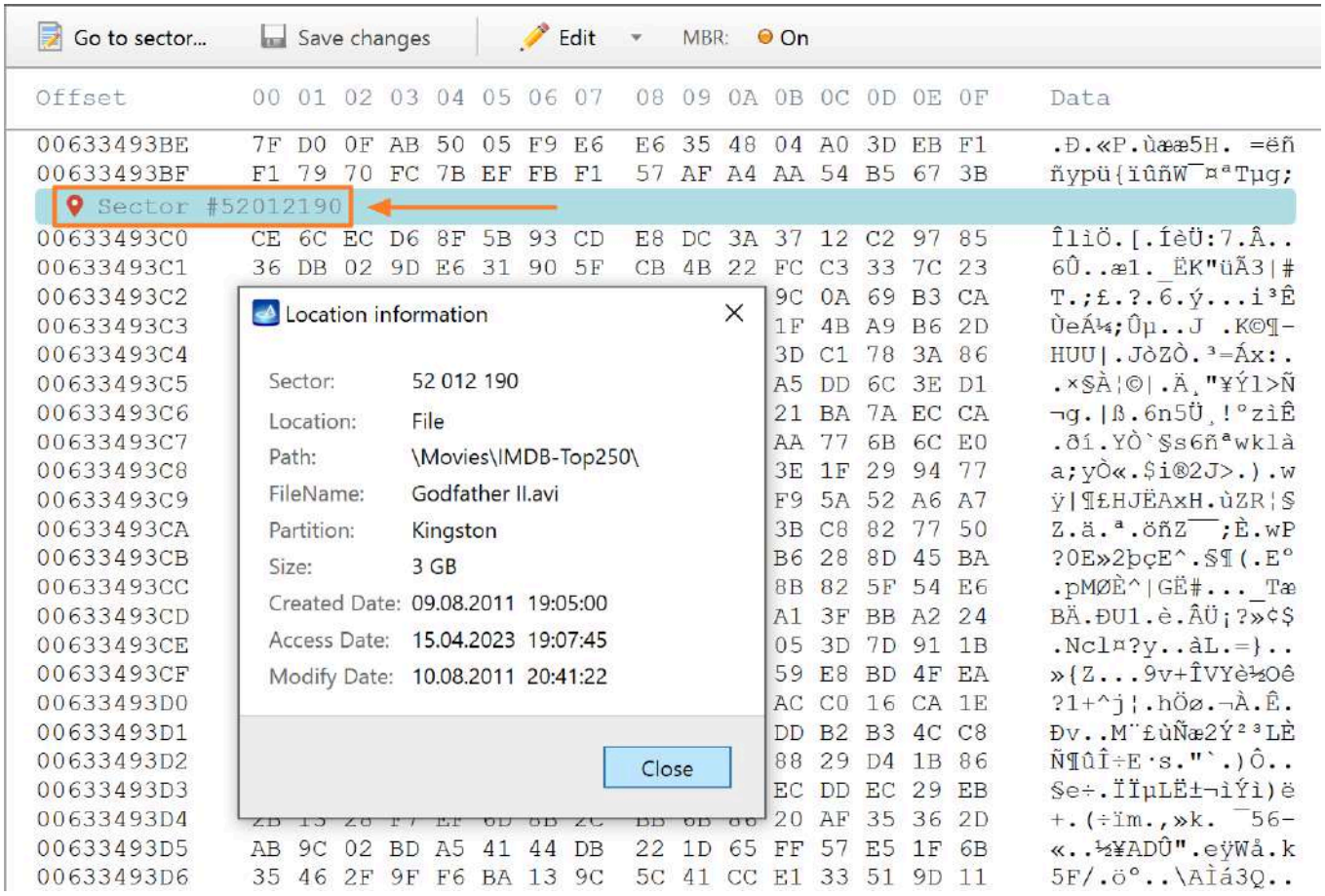
- *Ctrl+Home* immediately brings you to the first sector of a drive,
- *Ctrl+End* gets you to the last sector.

To select a single byte, click it in the central column of the Hex viewer. To select multiple bytes, click the first byte of the sequence and drag a cursor to the last byte. Insight also highlights the corresponding ASCII values in the right column.

To save selection to a file, in the toolbar, go to **Edit** > **Save selection to file** or press *Ctrl+Shift+S*.



Locate sector: To find the exact location of a specific sector, click on the sector number with a red pin. Insight detects which files and partitions the sector belongs to and shows the detailed information about the location.

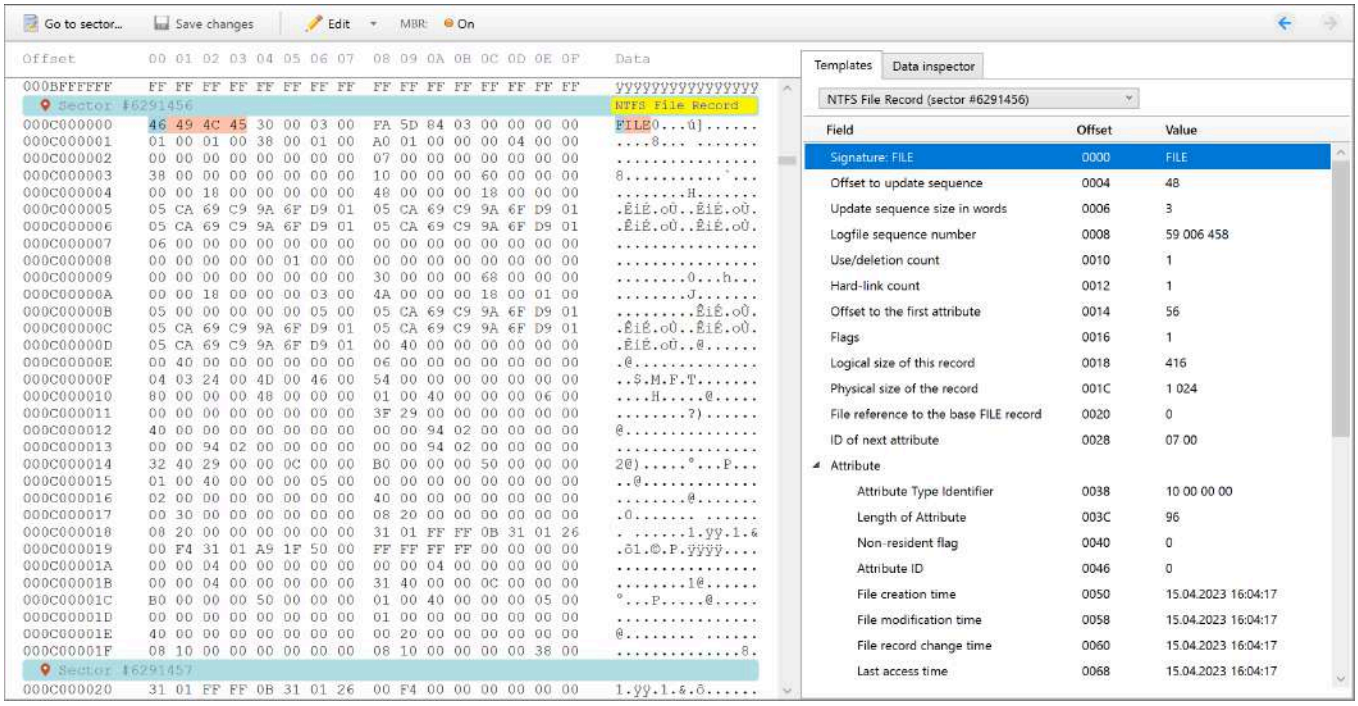


Examine file system structures

After you launch Disk Editor, it detects file system structures automatically and shows known metadata in a human-readable form on the **Templates** tab.

When you click a field in the **Templates** tab, Insight highlights the corresponding byte sequence in the **Hex viewer**.

Navigate through file system structures using a drop-down list at the top of the Templates tab or Back and Forward arrow buttons in the top right corner of the Disk Editor screen.



The Templates tab contains file system metadata in a human-readable form.

Supported metadata structures:

Edit sector contents

As its name suggests, Disk Editor lets you modify any sector contents. You can edit individual bytes directly in the Hex viewer or paste the previously saved byte sequence from a file.

To edit a byte directly, select it in the Hex viewer and enter a new value. You can use standard **Copy** (*Ctrl+C*) and **Paste** (*Ctrl+V*) commands as well.

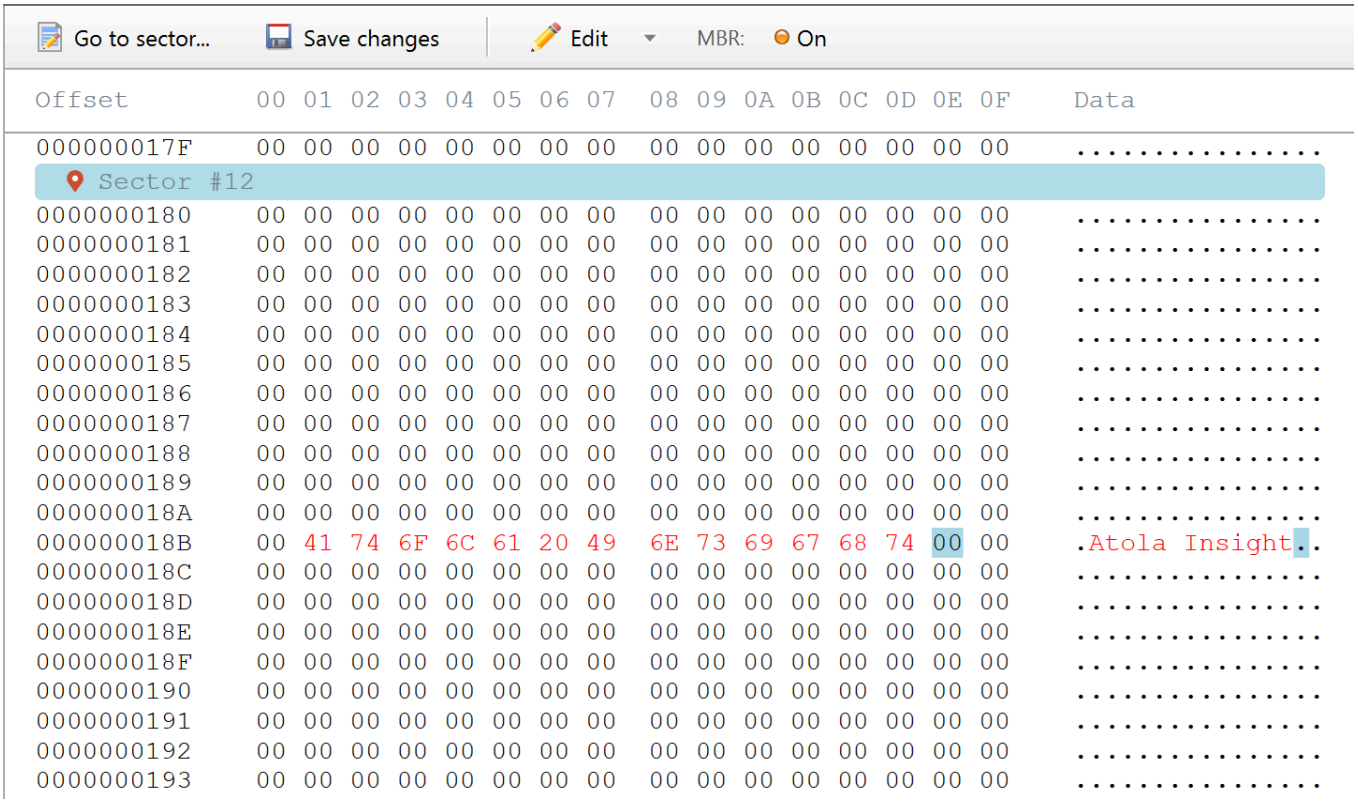
To paste the previously saved byte sequence from a file, in the toolbar, select **Edit** > **Paste from file** or press *Ctrl+Shift+V*.

Modified bytes are colored red.

To revert the last changes, use standard **Undo** (*Ctrl+Z*) and **Redo** (*Ctrl+V*) commands in the **Edit** menu.

To write modified data, click **Save changes** on the toolbar or press *Ctrl+S*.

MBR On/Off button on the toolbar is used in data recovery cases. It swaps the last two bytes of MBR sector #0 to disable partition scanning by Windows.



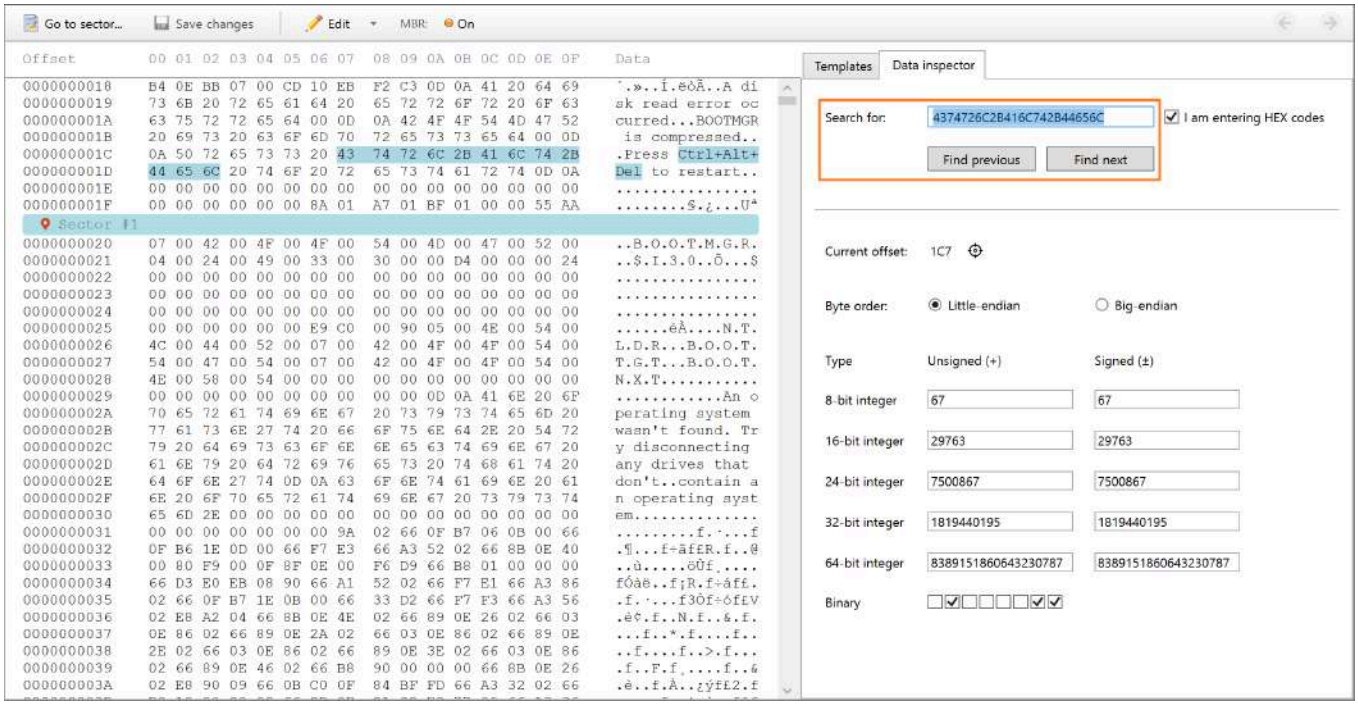
Search for a string or byte sequence

To quickly find a certain byte sequence, go to the **Data inspector** tab or press *Ctrl+F* shortcut and enter a string you are searching for.

If you search the data in the hexadecimal format, select the **I am entering HEX code** option.

Insight highlights the found string in the Hex viewer.

Use **Find previous** and **Find next** buttons to cycle through found byte sequences.



Searching for a hex string in the Disk Editor module.

Interpret bytes with Data inspector

Understand bytes quicker thanks to the Data inspector feature. It converts hex value to decimal (8-, 16-, 24-, 32-bit integer) or binary format on the fly.

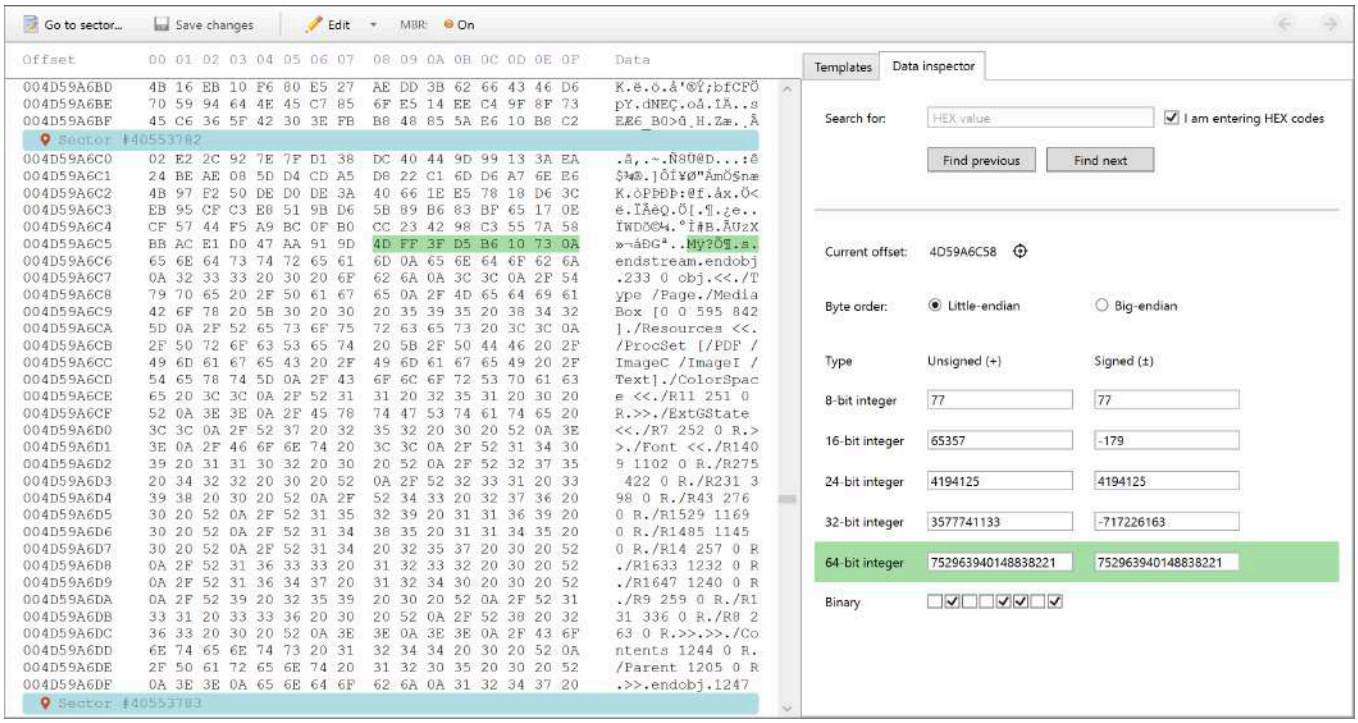
Change bytes by entering new values in the respective fields or by selecting or deselecting bits in the Binary format.

Current offset: shows the selected byte position relative to the first sector of the device.

Byte order: switches byte order between Little-endian and Big-endian modes.

8-, 16-, 24-, 32-bit integer: shows selected byte(s) in the respective decimal format.

Binary: shows the first selected byte in the binary format.



Data inspector feature in the Disk Editor module.

Disk Editor keyboard shortcuts

Navigation and search

Go to sector	Ctrl+G
Scroll one screen up	Page Up
Scroll one screen down	Page Down
Jump to the first sector	Ctrl+Home
Jump to the last sector	Ctrl+End
Find a string	Ctrl+F

Editing

Undo	Ctrl+Z
Redo	Ctrl+Y
Copy	Ctrl+C
Paste	Ctrl+V
Save selection to file	Ctrl+Shift+S
Paste from file	Ctrl+Shift+V
Save changes	Ctrl+S

Locate sectors

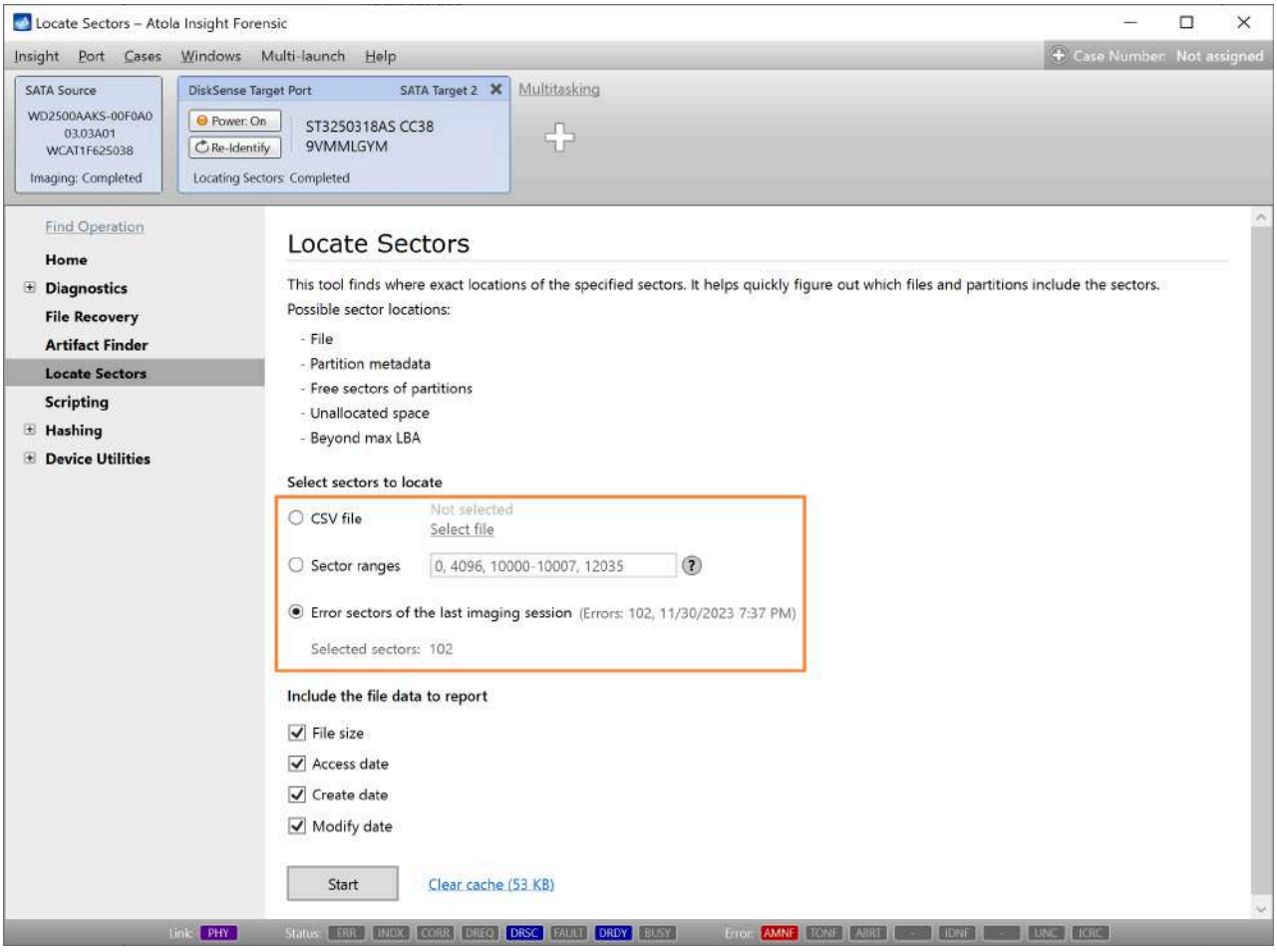
The Locate Sectors functionality helps find the exact location of specific sectors to detect which files and partitions they belong to.

You can launch the **Locate sectors** operation from the **Sidebar**. Alternatively, select it as an option to identify bad sectors belonging to the file system when you get the **Imaging Results** report which contains errors.

How to quickly locate sectors

To run **Locate sectors** as a separate operation, follow these steps:

1. In the Sidebar, click **Locate Sectors**.
2. Select sectors to locate, using one of the following options:
    - **CSV file:** select a CSV file, which contains comma-separated sector ranges.
    - **Sector ranges:** enter comma-separated individual sector numbers (for example: *501, 607*) or sector ranges (for example: *1000-2000*).
    - **Error sectors of the last imaging session:** this option is available if you are locating sectors on a target that contain an image of a drive that had bad sectors.

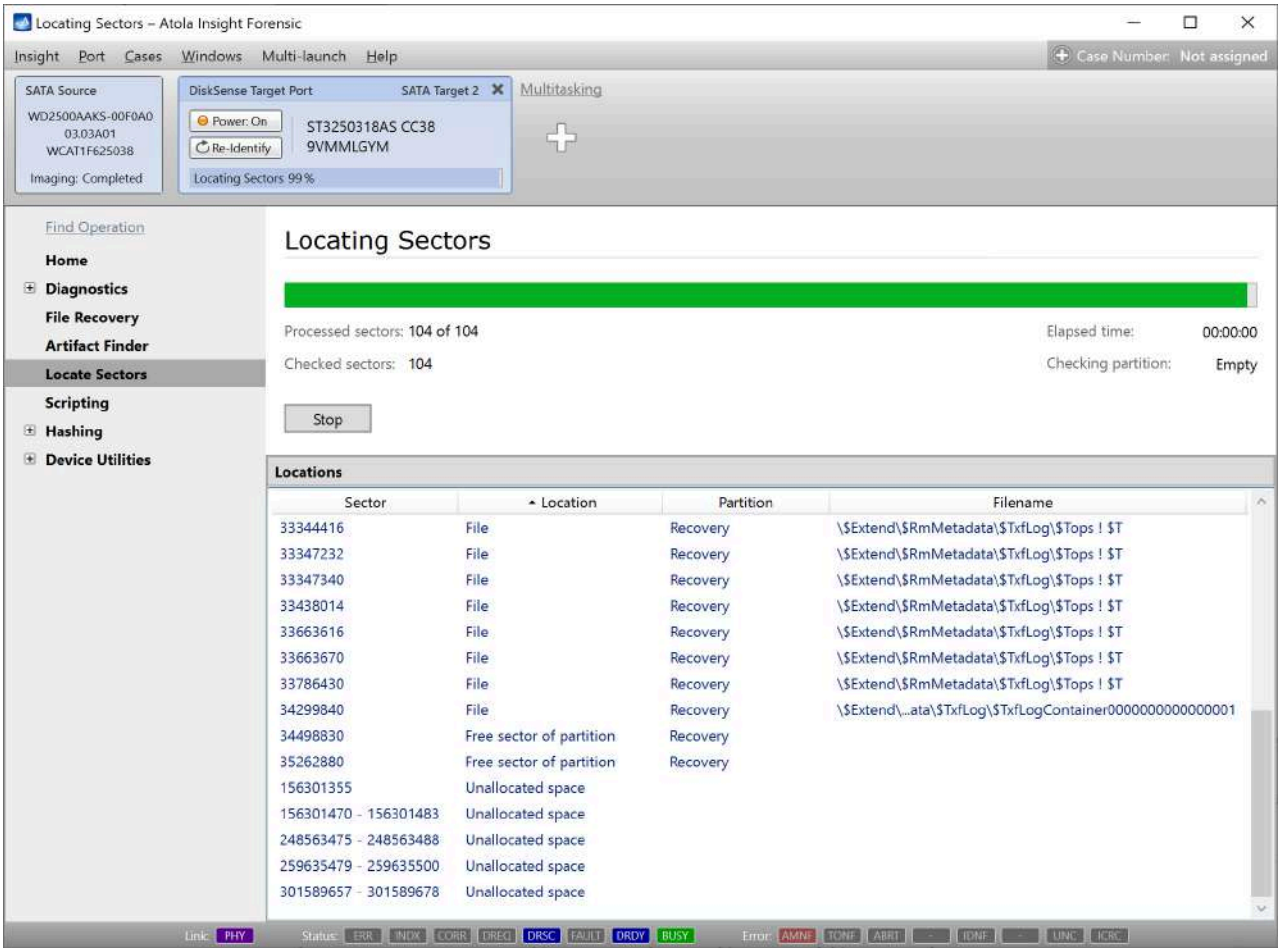


3. Select the file data you'd like to see in the report:

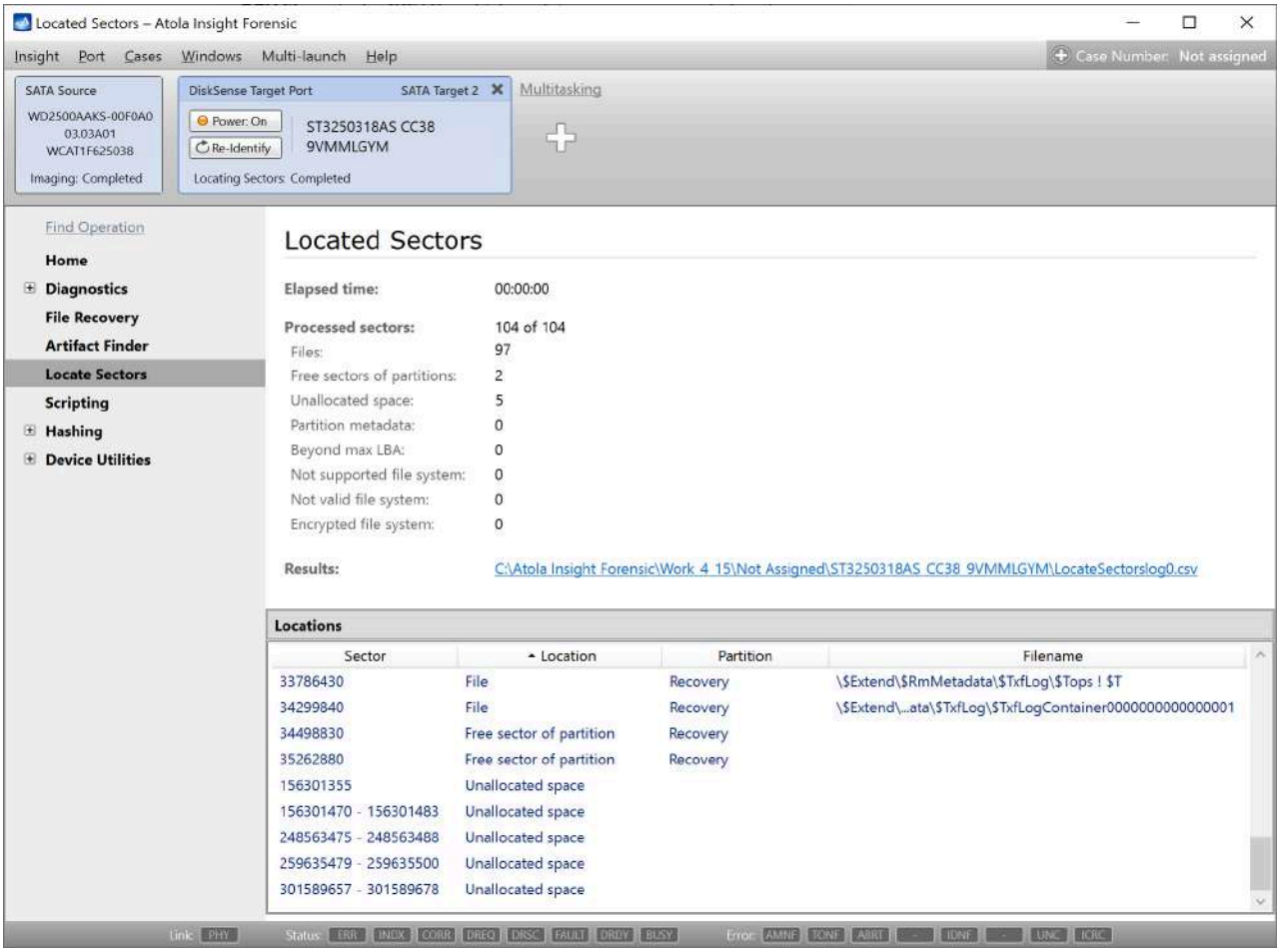
- File size
- Access date
- Create date
- Modify date

4. **Optional:** Insight caches files to speed up the analysis of the sector location. If the cache takes too much space in your Insight work folder, click the **Clear cache** link at the bottom.

5. Click the **Start** button. Insight immediately begins locating the sectors.



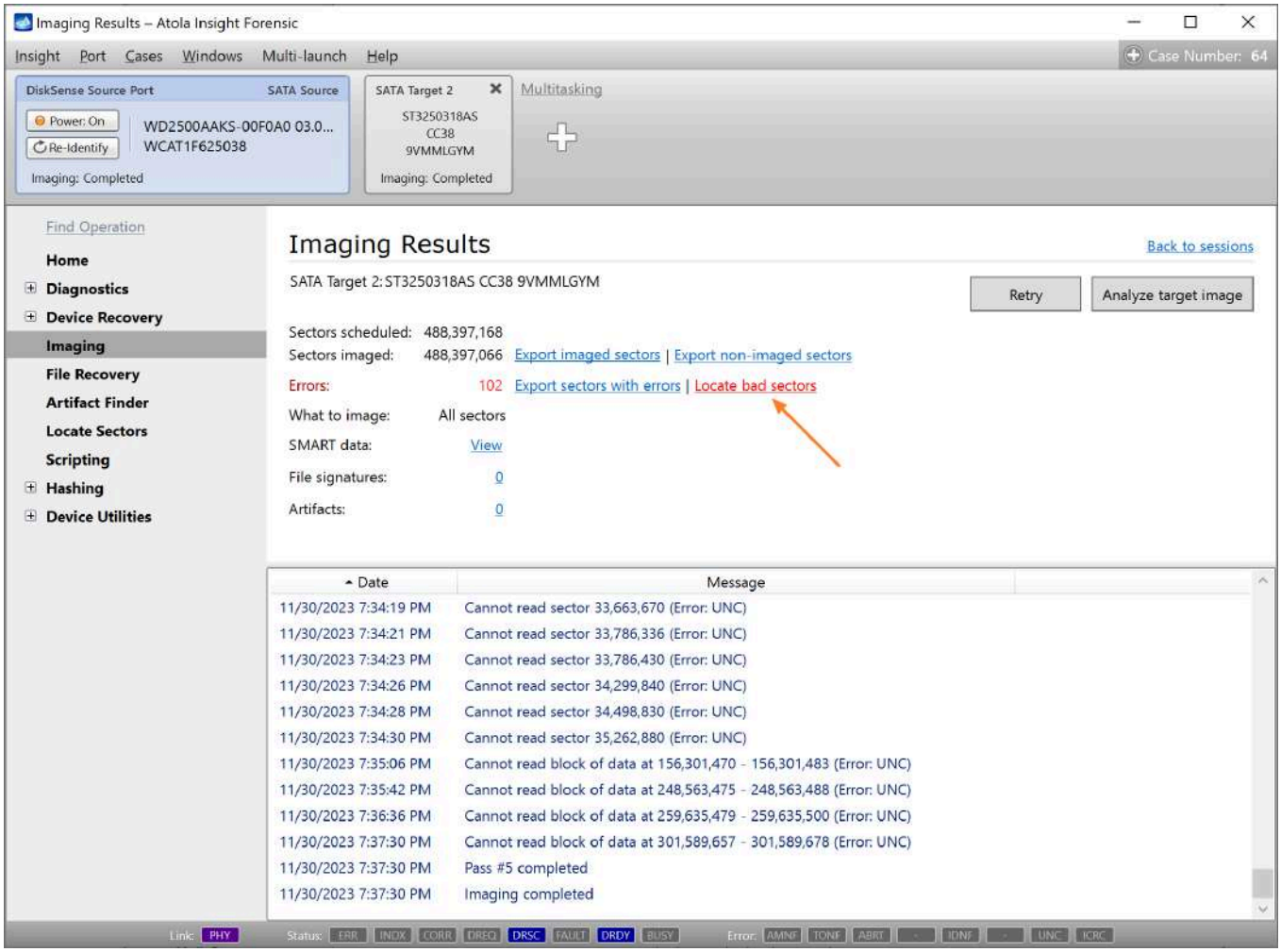
6. After processing all the scheduled sectors, Insight generates a report listing where the sectors have landed in relation to individual files and the file system as a whole.



Locate bad sectors in the Imaging Results report

After an imaging session is completed, Insight generates the **Imaging Results** report. If Insight runs across bad sectors, it reflects them in the report and the operator is offered a few options for working with bad sectors.

To detect which files and partitions these bad sectors belong to, launch the Locate sectors operation by clicking the **Locate bad sectors** link.

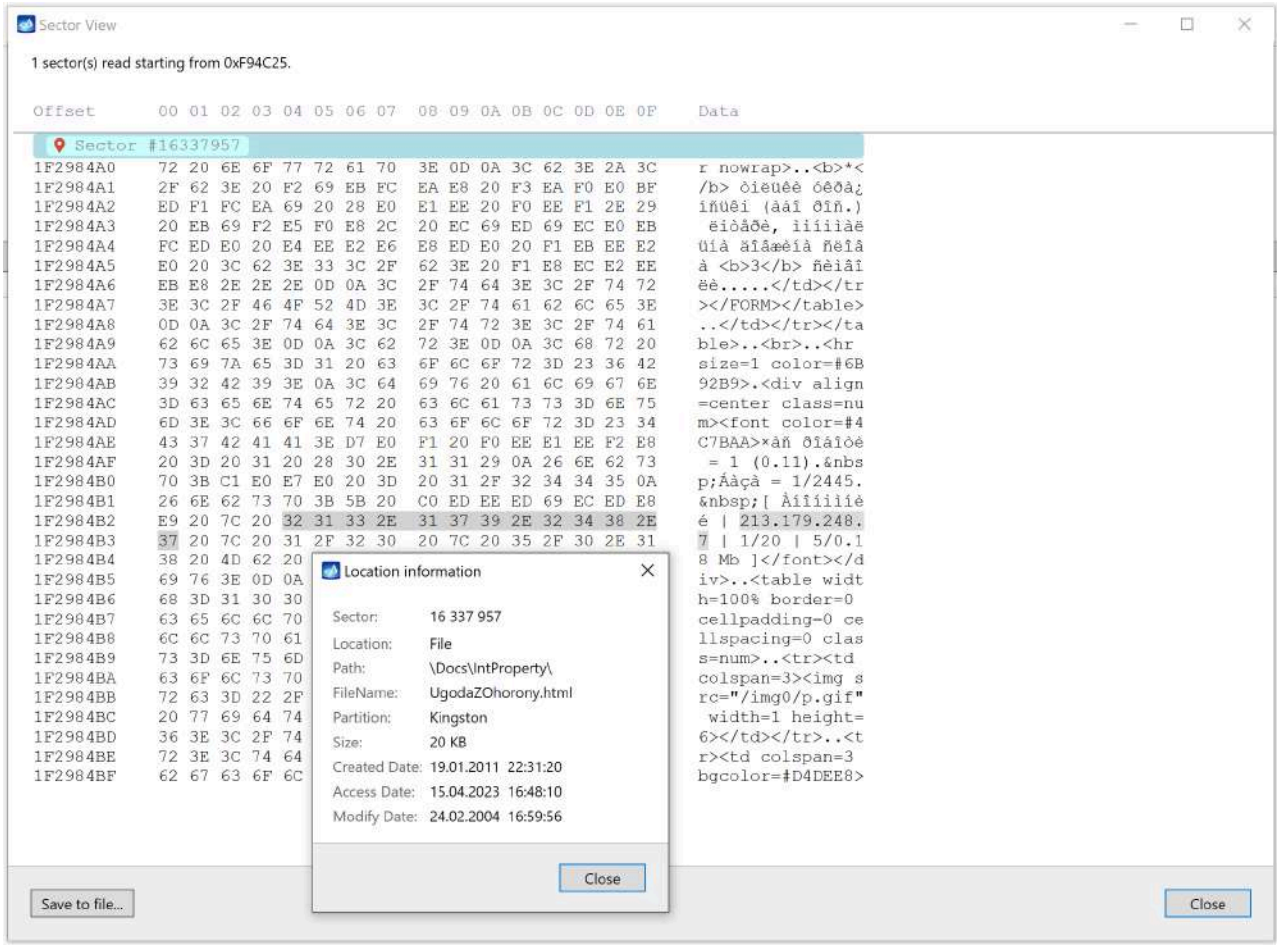


Locate sectors in the HEX viewer

The **HEX viewer** is integrated into a few modules of Insight: Artifact Finder, Disk Editor and File Signatures.

To use the HEX viewer for analyzing to which file on the drive a found artifact belongs, do the following:

1. In the Sidebar, click **Artifact Finder**.
2. Set the parameters of your search and start the process. For guidance, see Search for artifacts.
3. Whether the search is ongoing or finished, you can start examining the output of the found artifacts in the table: filter, sort, and search for individual artifacts.
4. By double-clicking on an artifact, you open the **Hex viewer** window/tab, which shows the artifact within the sector where it was found.
5. To find the file to which this sector belongs, click the red pin icon next to the sector number.



Similarly, you can look up how a signature encountered during imaging relates to the file system.

If the imaging has been completed: look up the signature list in the imaging report and then on an individual signature, this will open the HEX viewer window. By clicking the red pin icon in the sector view, you will see which file the found signature belongs to.

If the artifact does not belong to a file, it may be remnants of the data of a file deleted by the user.

Unclip or change HPA, DCO, or AMA restrictions

HPA (host protected area), DCO (device configuration overlay), and AMA (accessible max address) features were created by hard drive manufacturers as hidden areas reserved for storing vendor utilities or simply to make a drive appear to have a certain number of sectors (smaller than the actual drive capacity). Sometimes they use it for refurbished drives.

But it was many years ago that end users learned to modify and write to these areas of hard drives with the help of open-source and freely available tools.

For digital forensics specialists, it means that without the ability to identify such hidden areas of a drive and image the full physical image including data in these areas, the evidence they get may be incomplete and lead to inaccurate investigative conclusions.

Atola Insight Forensic can detect, unclip, or change HPA, DCO, and AMA limitations.

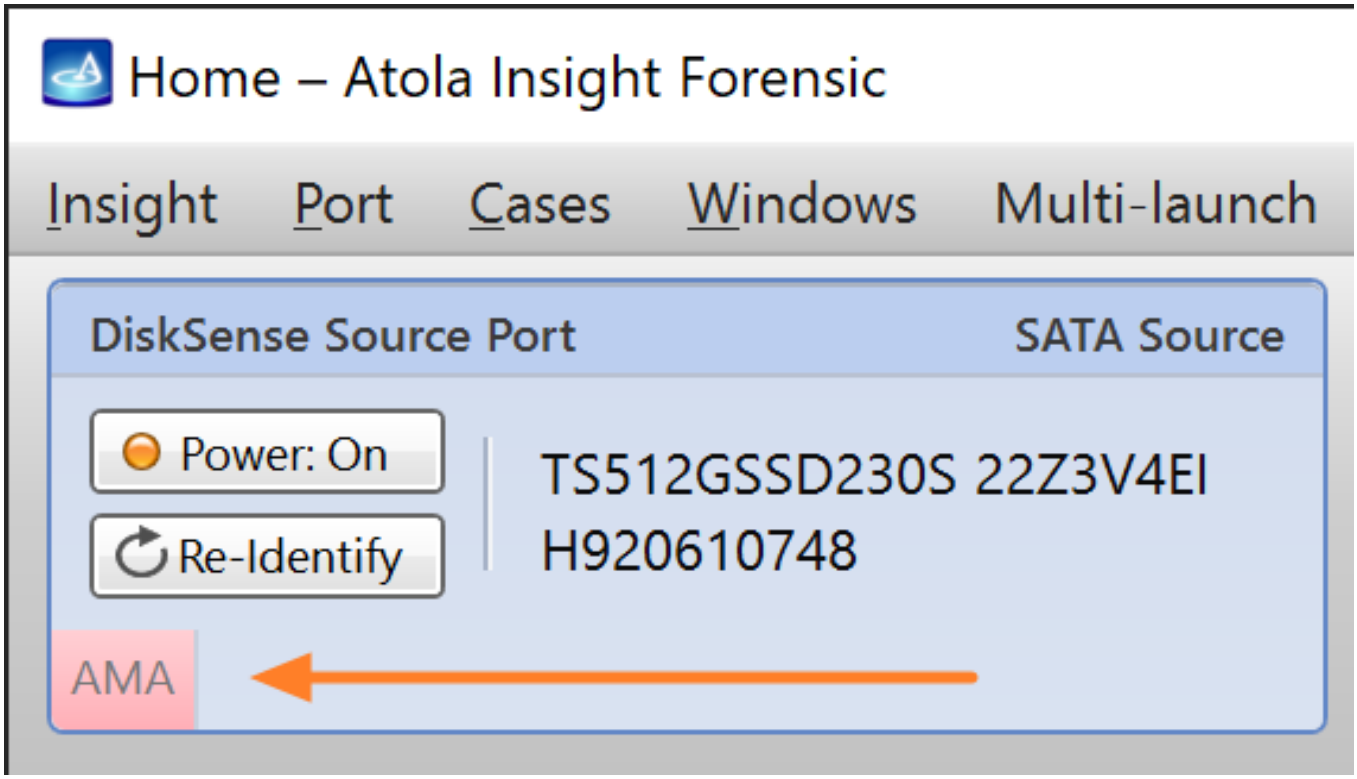
The DCO and HPA can co-exist on the same drive: max address limited via HPA should be less than DCO.

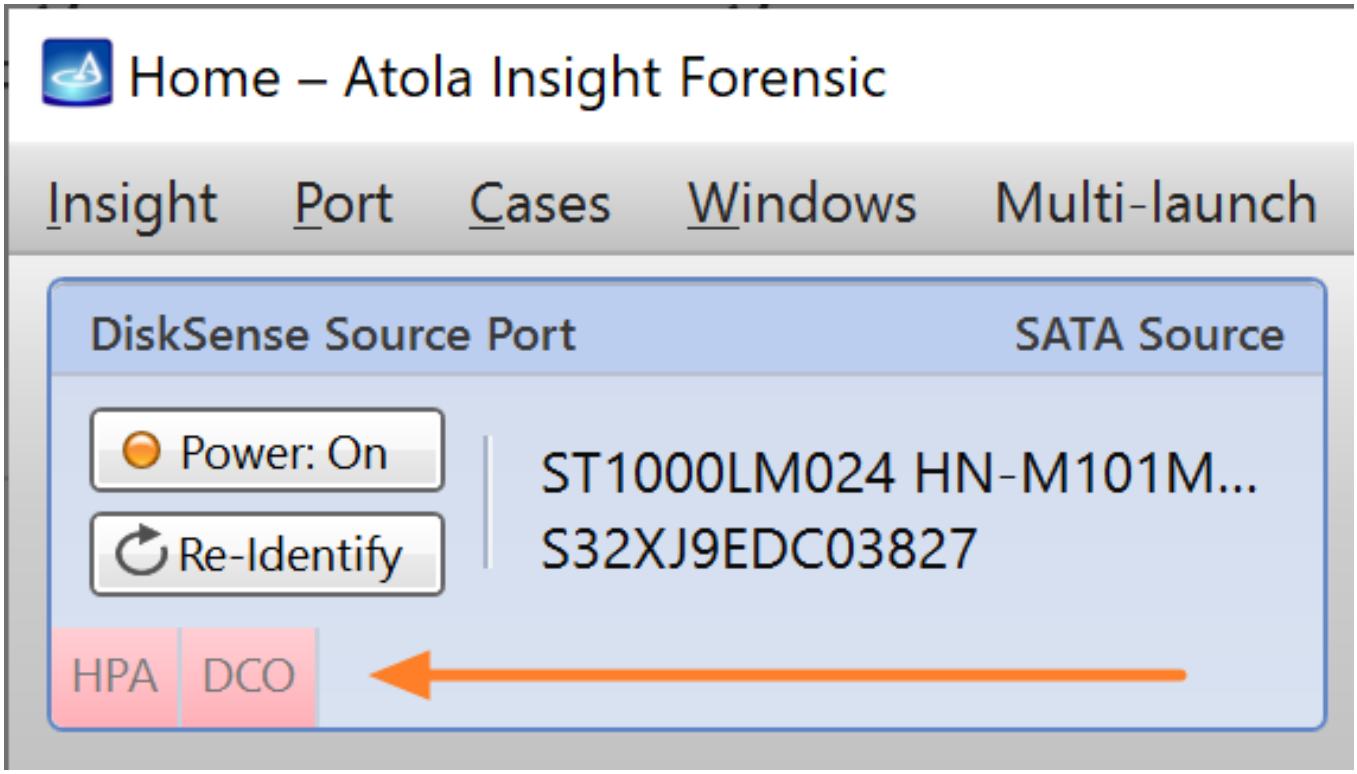
AMA is supported by new drives and can't exist if DCO or HPA is supported, and vice versa.

Detect HPA, DCO, or AMA restrictions

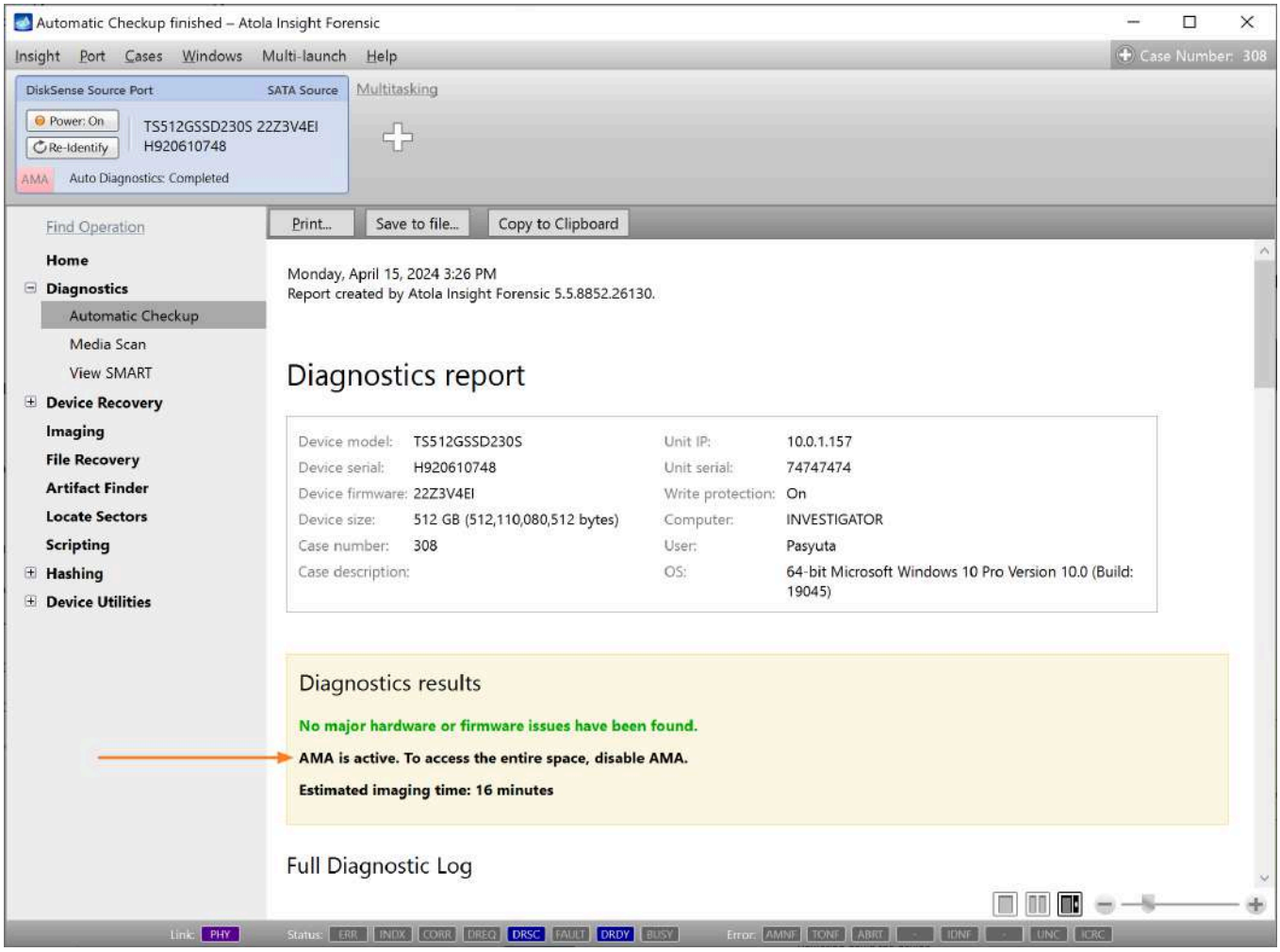
When you connect a hard drive to the DiskSense unit, in addition to the standard **Identify device** command, Atola Insight Forensic automatically sends commands to look up the drive size as set in the drive's firmware.

If drive size is limited by HPA, DCO, or AMA, Insight draws attention to these changes by adding corresponding red indicators to the DiskSense Source Port.





To get more details about the modifications that have been made to the drive's firmware, run **Automatic Checkup**.

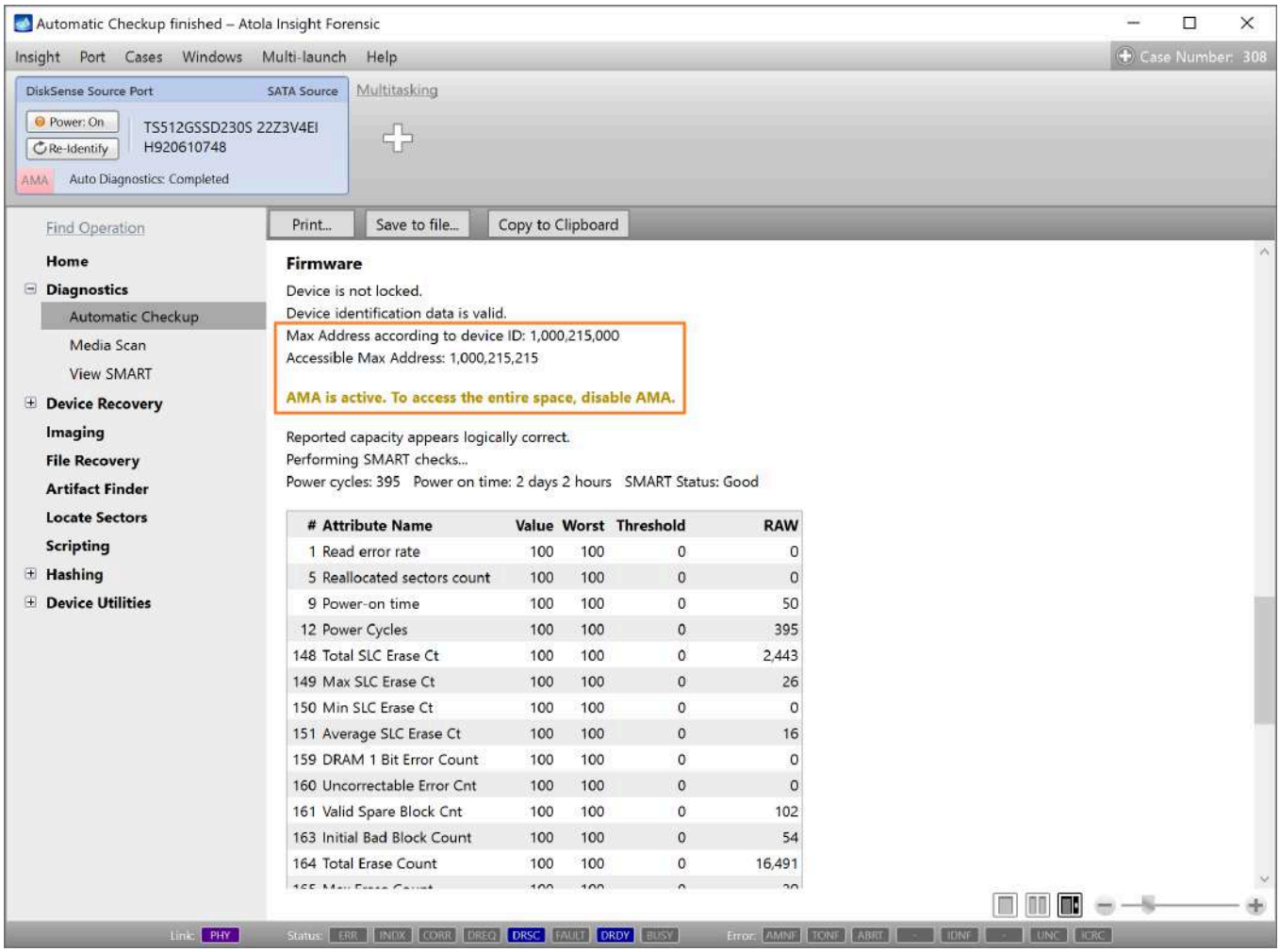


AMA limitation is indicated in the Diagnostics results.

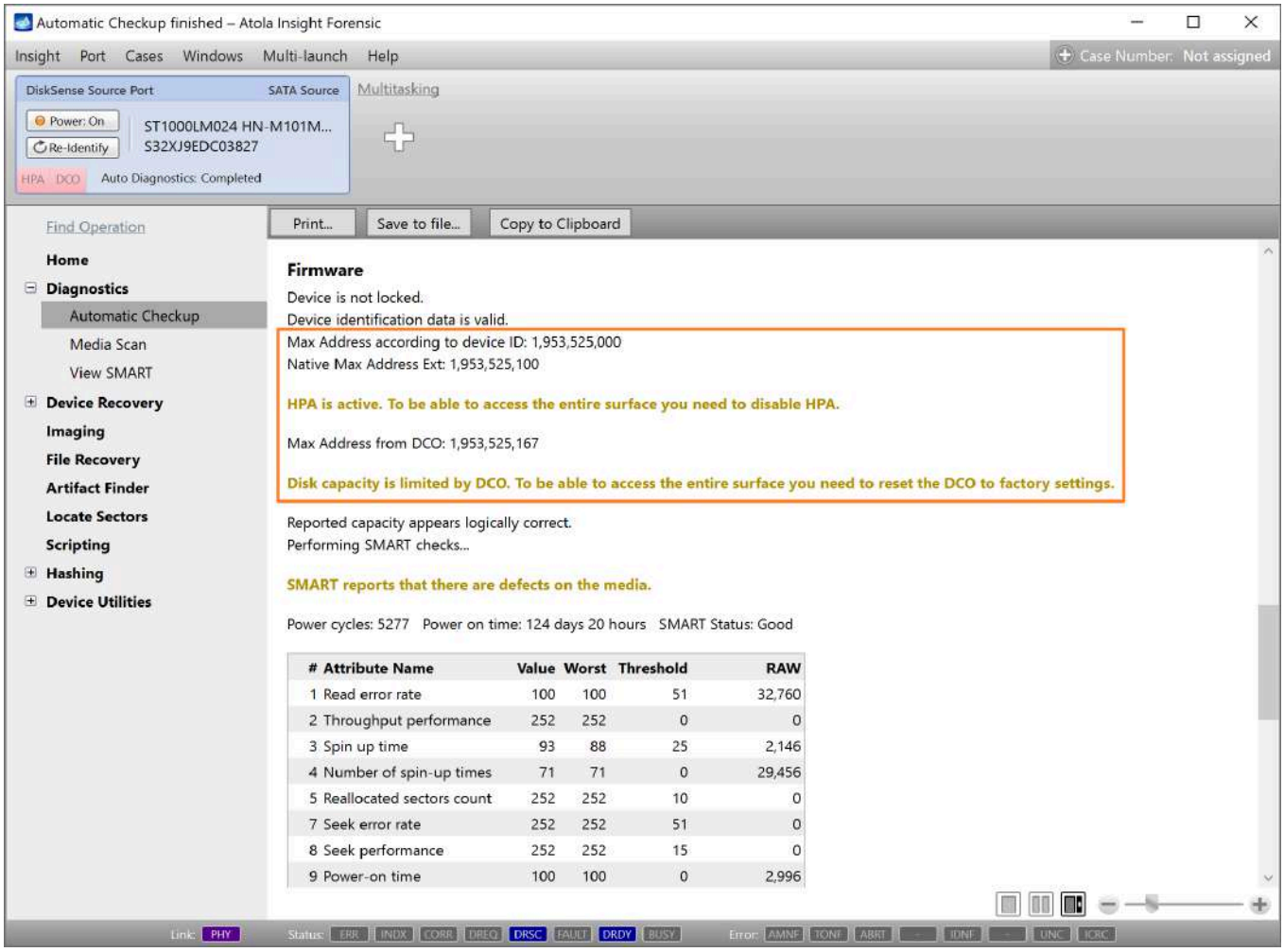
In the **Firmware** section of the **Diagnostics report**, there are two (for AMA) or three (for HPA and DCO) of the following lines, indicating the drive's Max Address according to different records in the drive's firmware:

- The **Max Address according to device ID** line shows the max address from the ID sector, affected by DCO and HPA/AMA restrictions if those are applied.
- **Accessible Max Address** indicates max address ignoring AMA limitation that may have been enabled.
- **Native Max Address** indicates max address ignoring HPA limitation that may have been enabled, yet affected by DCO restriction.
- **Max Address from DCO** is the line that gives you the actual drive size.

A **Diagnostics report** of a drive that does not have HPA, DCO, or AMA activated will have the same value in all these lines.



AMA restriction details in the Firmware section of the Diagnostics report.

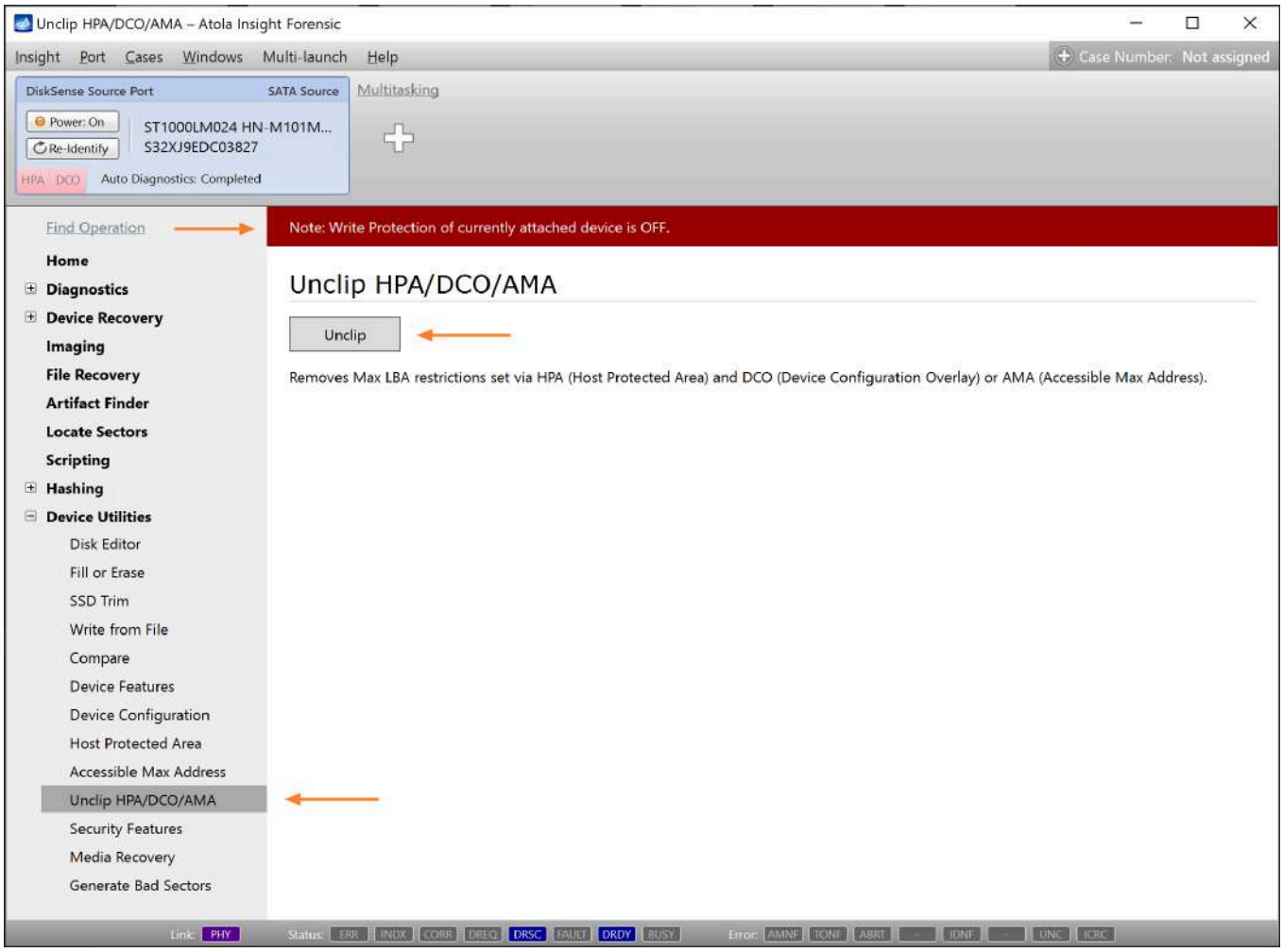


HPA and DCO restriction details in the Firmware section of the Diagnostics report.

Unclip HPA/DCO/AMA restrictions

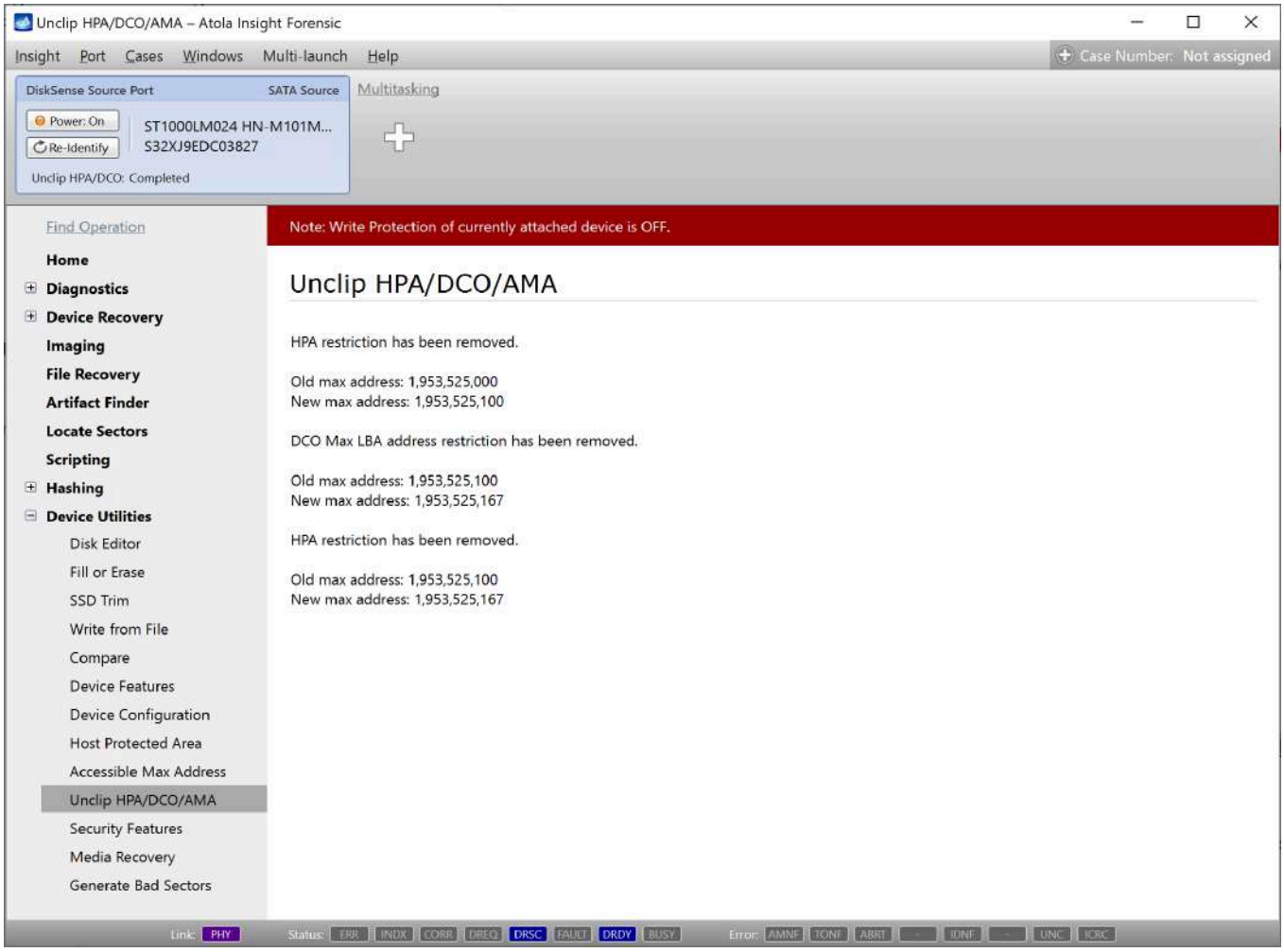
To lift any restrictions that have been applied to the drive's firmware:

- Disable **Write protection** using the physical switch situated on the front panel of the DiskSense unit. The respective LED indicator turns off. Unclipping HPA/DCO/AMA implies making changes to the drive's firmware, and Write protection won't let perform such changes.
- Go to **Device Utilities** > **Unclip HPA/DCO/AMA**.
- Click the **Unclip** button.



Unclipping HPA/DCO/AMA.

Insight Forensic lifts HPA, DCO, or AMA restrictions in a matter of seconds and enables access to all data on the drive.



HPA and DCO restrictions have been removed.

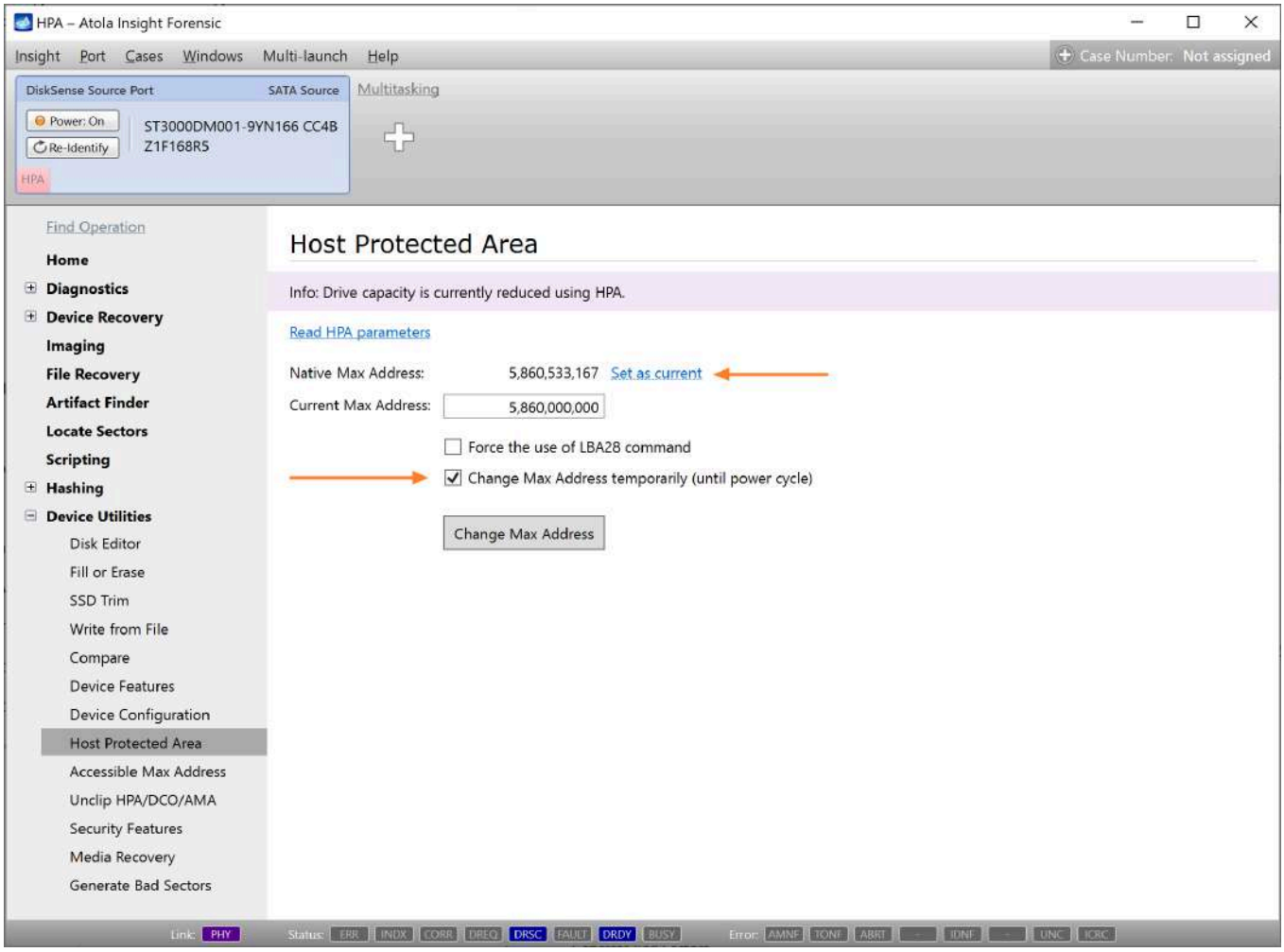
Change HPA max address temporarily (until power cycle)

To ensure a forensically sound process, it can be necessary to avoid making any changes to the drive. Therefore it is prohibited to disable HPA and DCO restrictions and access data in the hidden areas.

With Insight Forensic it is possible to lift HPA restriction until the next power cycle. This helps avoid permanent changes to the drive.

To unclip HPA on the source drive until the next power cycle before imaging:

1. In the sidebar, go to **Device Utilities** > **Host Protected Area**.
2. Click the **Read HPA parameters** link.
3. Click **Set as current** to automatically change the **Current Max Address** value to that of the **Native Max Address**.
4. Select the **Change Max Address temporarily (until power cycle)** option.
5. Click the **Change Max Address** button.



Changing HPA max address until power cycle.

This will allow access to the data in the area previously protected by HPA, yet as soon as you power off or detach the drive, the HPA will be in place again.

> If the drive contains damaged areas and Insight needs to perform power cycles during imaging, such power cycles will not affect the temporarily disabled HPA: Insight will temporarily remove the HPA max address restriction after each imaging-related power cycle, and HPA will remain accessible throughout the imaging process.

For more information about imaging of freezing drives, see Imaging freezing damaged drives.

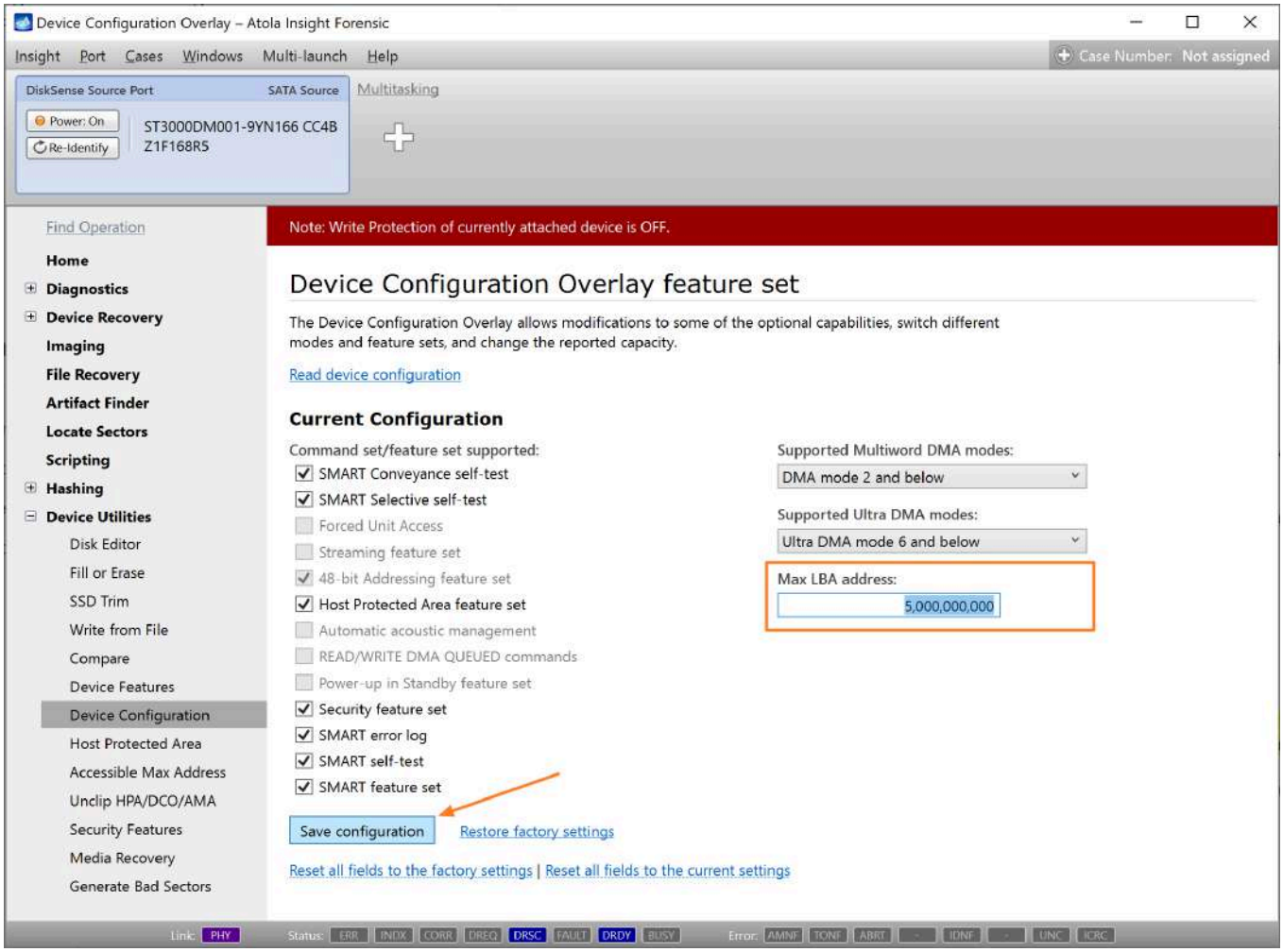
Set or change HPA, DCO, and AMA restrictions

Not all drives support hidden areas. The DCO and HPA can co-exist on the same drive: max address limited via HPA should be less than DCO. AMA is supported by new drives and can't exist if DCO or HPA is supported, and vice versa.

If your target device is larger than your source device, but you need hash values for the source and for the target devices to be identical, see Clip target drive to source evidence size.

To set or change DCO restriction:

1. Disable **Write protection** using the physical switch situated on the front panel of the DiskSense unit. The respective LED indicator turns off.
2. Go to **Device Utilities** > **Device Configuration**.
3. Click the **Read device configuration** link.
4. Enter a new **Max LBA address**.
5. Click **Save configuration**.

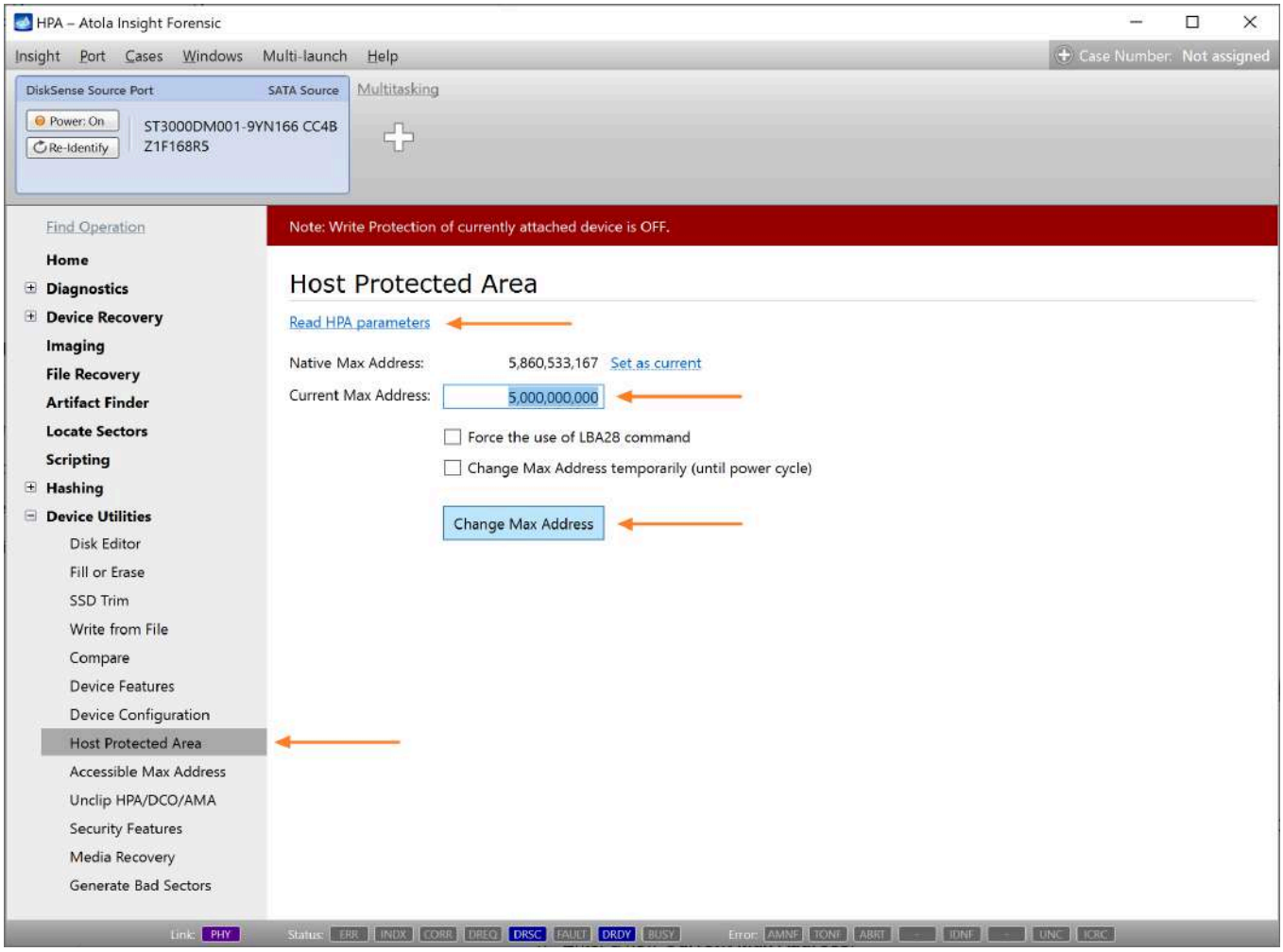


Setting a new Max LBA address using DCO.

To set or change HPA restriction:

1. Disable **Write protection** using the physical switch situated on the front panel of the DiskSense unit. The respective LED indicator turns off.
2. Go to **Device Utilities** > **Host Protected Area**.
3. Click the **Read HPA parameters** link.

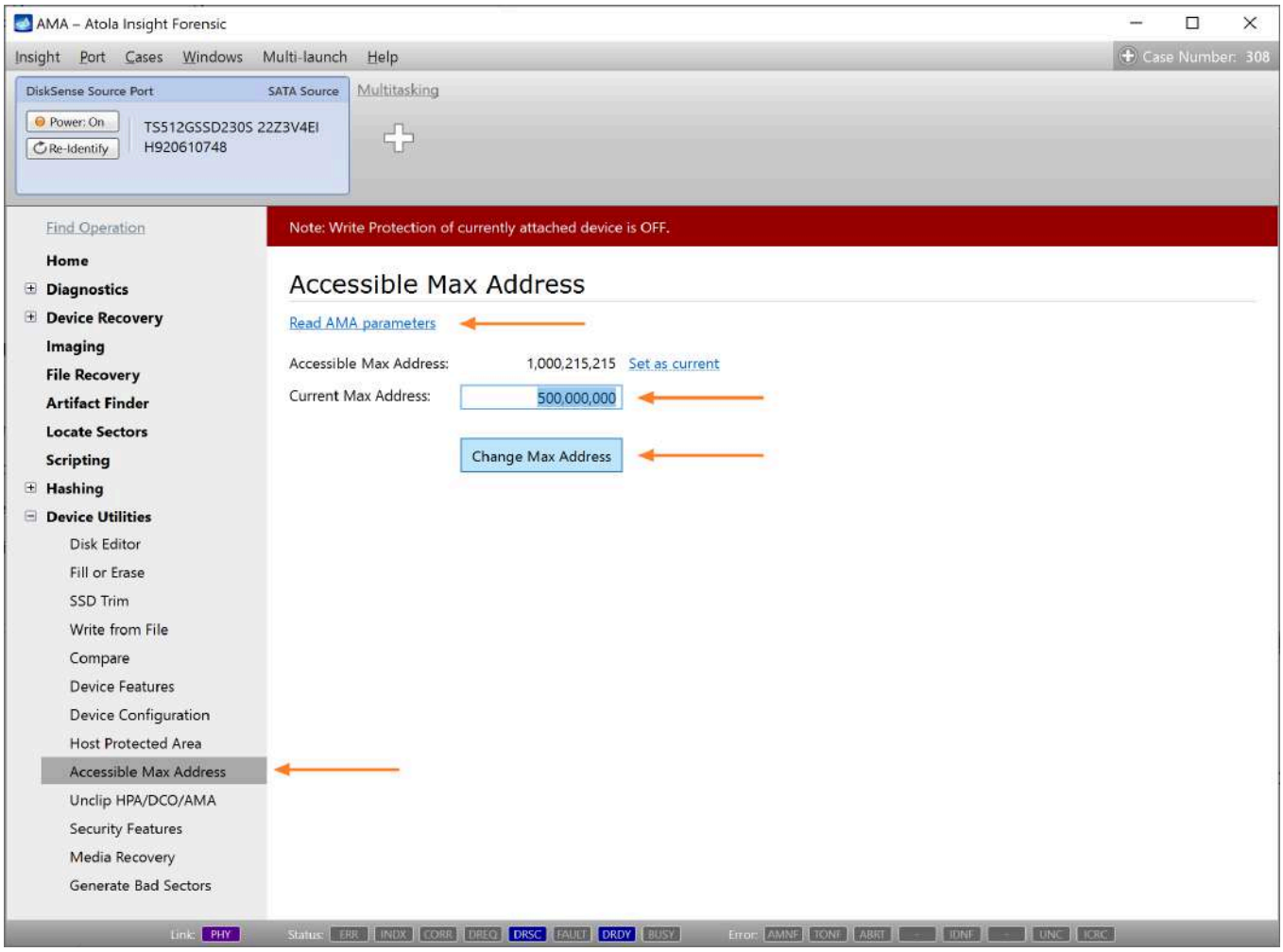
4. Enter a new **Current Max Address**. The max address limited via HPA should be less than the Max LBA address set using DCO.
5. **Optional:** Check the **Change Max Address temporarily (until power cycle)** option if needed.
6. Click the **Change Max Address** button.



Setting a new HPA restriction.

To set or change AMA restriction:

1. Disable **Write protection** using the physical switch situated on the front panel of the DiskSense unit. The respective LED indicator turns off.
2. Go to **Device Utilities** > **Accessible Max Address**.
3. Click the **Read AMA parameters** link.
4. Enter a new **Current Max Address**.
5. Click the **Change Max Address** button.



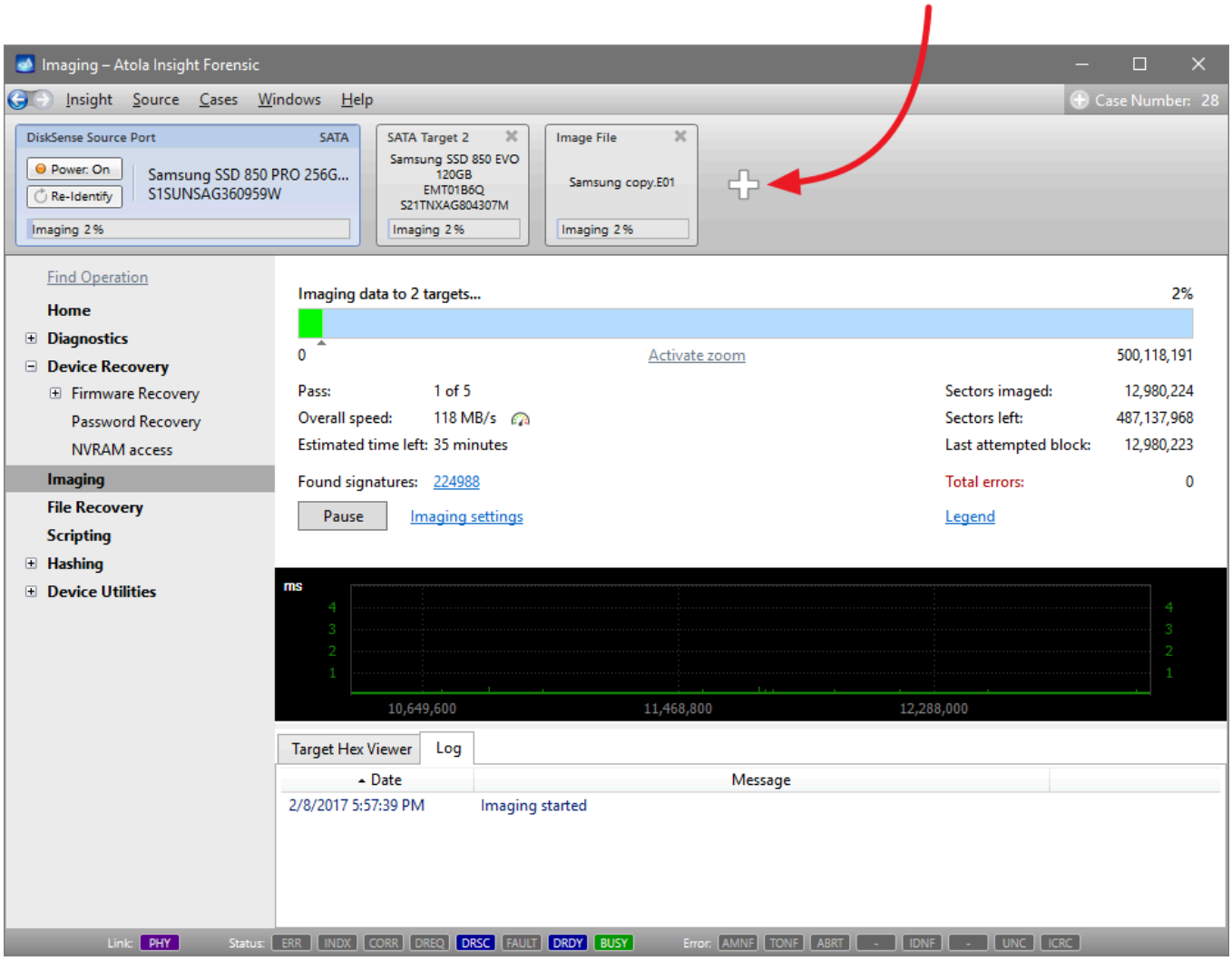
Setting a new AMA restriction.

Run up to 15 concurrent tasks in Atola Insight Forensic

With each passing year, speed becomes a yet bigger issue for forensic specialists: while the capacity of hard drives grows exponentially, their speed does not keep up. A common 4TB drive's speed constitutes up to 200 MB/s or 12 GB/min, which translates to more than 5 hours of imaging. And it may take prohibitive amounts of time to image a drive with damaged zones. Therefore, the ability to simultaneously run different operations on several devices is more vital than ever.

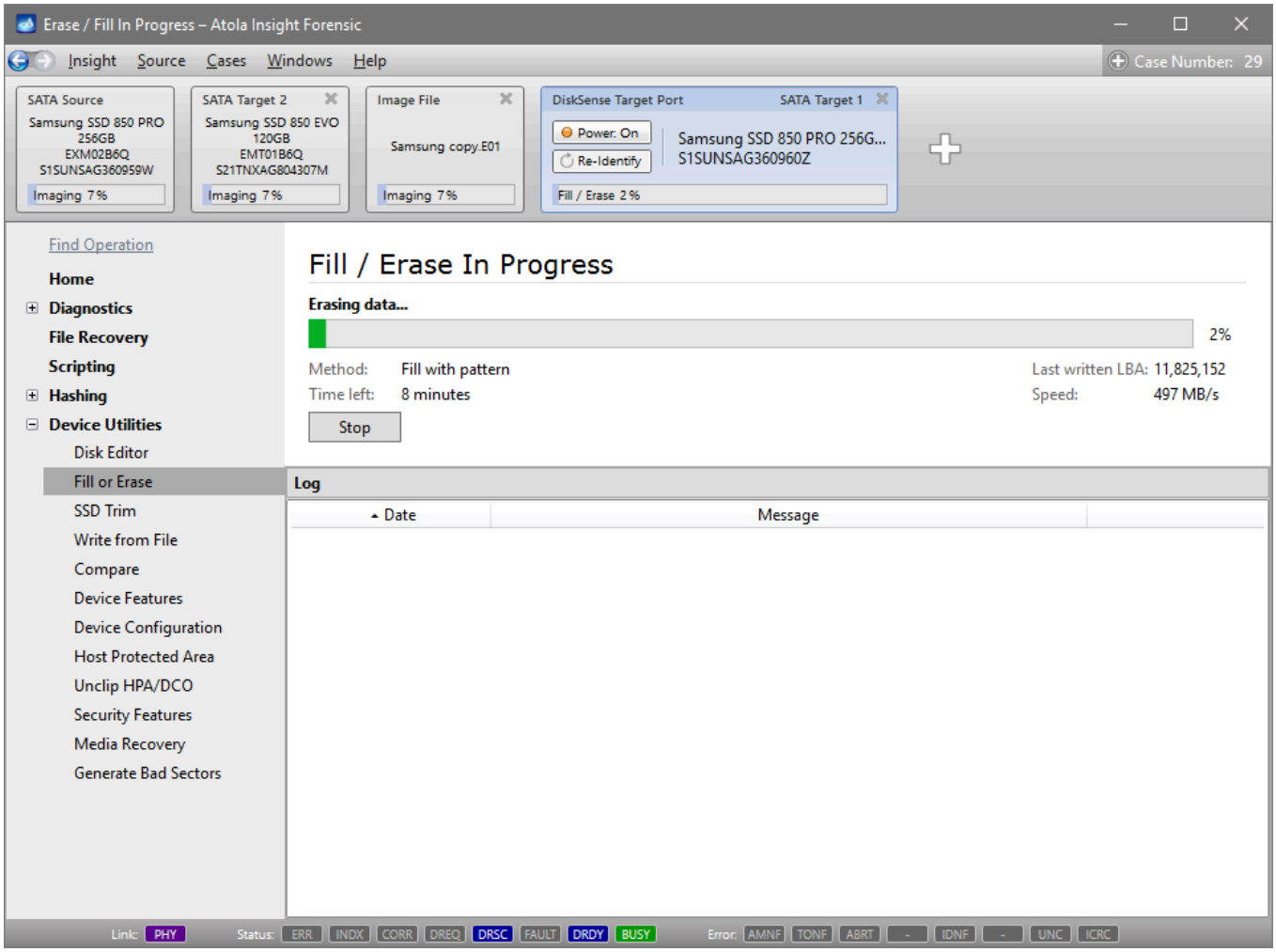
To provide users with greater productivity, Atola Insight Forensic's high-capacity multi-core CPU supports **up to 15 concurrent tasks**, that can be assigned to different drives or image files.

You can start Imaging process from a Source drive to one or multiple Target drives and/or image files. Then you can click on the **Plus** icon and open another target drive to start another operation.



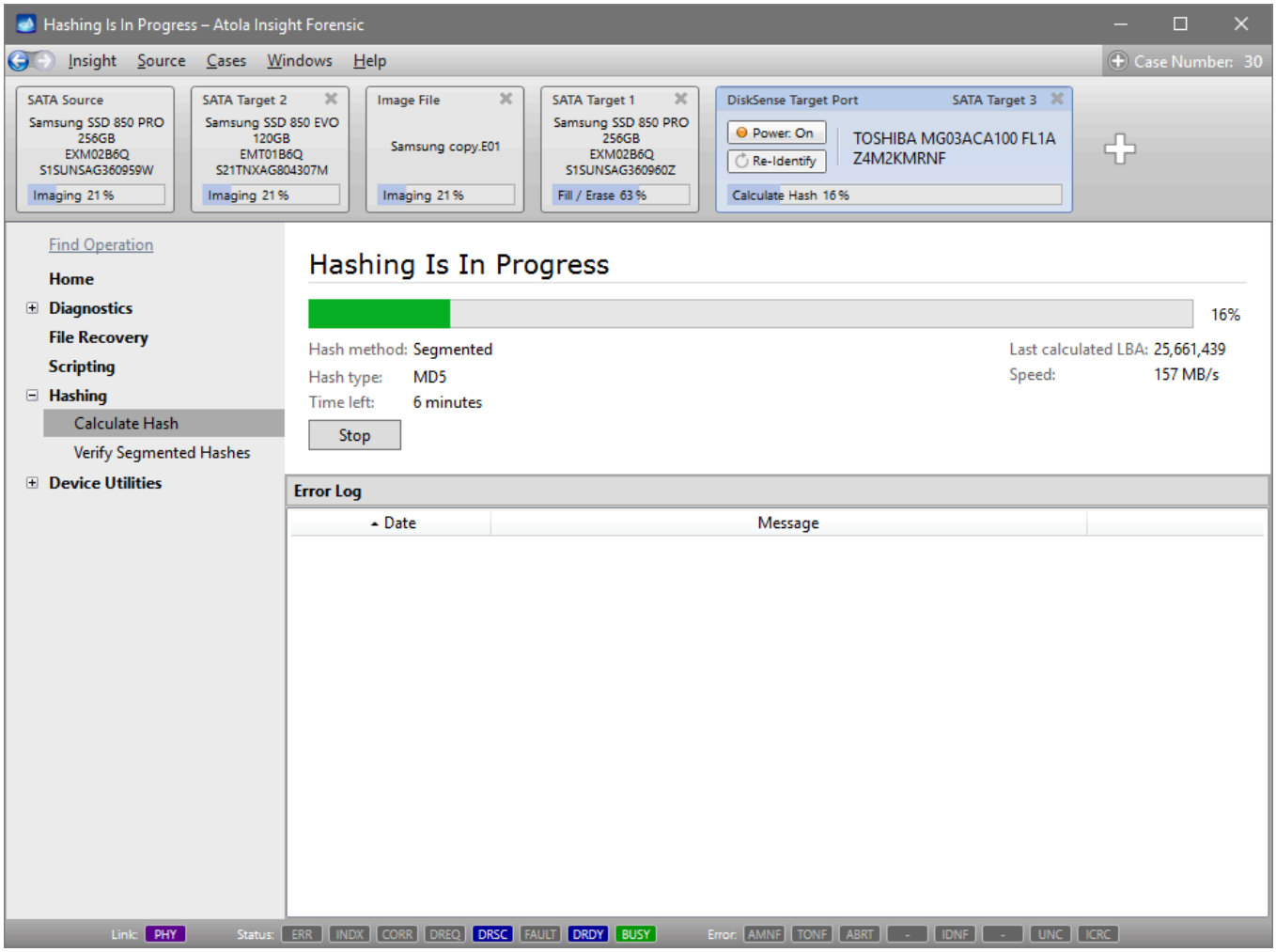
How to add more device operations

For example, you can launch Fill/Erase on this Target drive to get it ready for the next imaging session:



Additional wiping task being executed in parallel

It is also possible to Calculate Hash on yet another Target drive:



Hash calculation being executed in parallel

Other long-running operations you can perform simultaneously include:

- Automatic Checkup
- Artifact Finder
- Locate Sectors
- Verifying Segmented Hashes
- Scripting (e.g. search files, files types, words, phrases or patterns, specific information type like email address, telephone, address, GPS coordinates etc.).
- Comparing data on drive with a pattern
- Media Scan

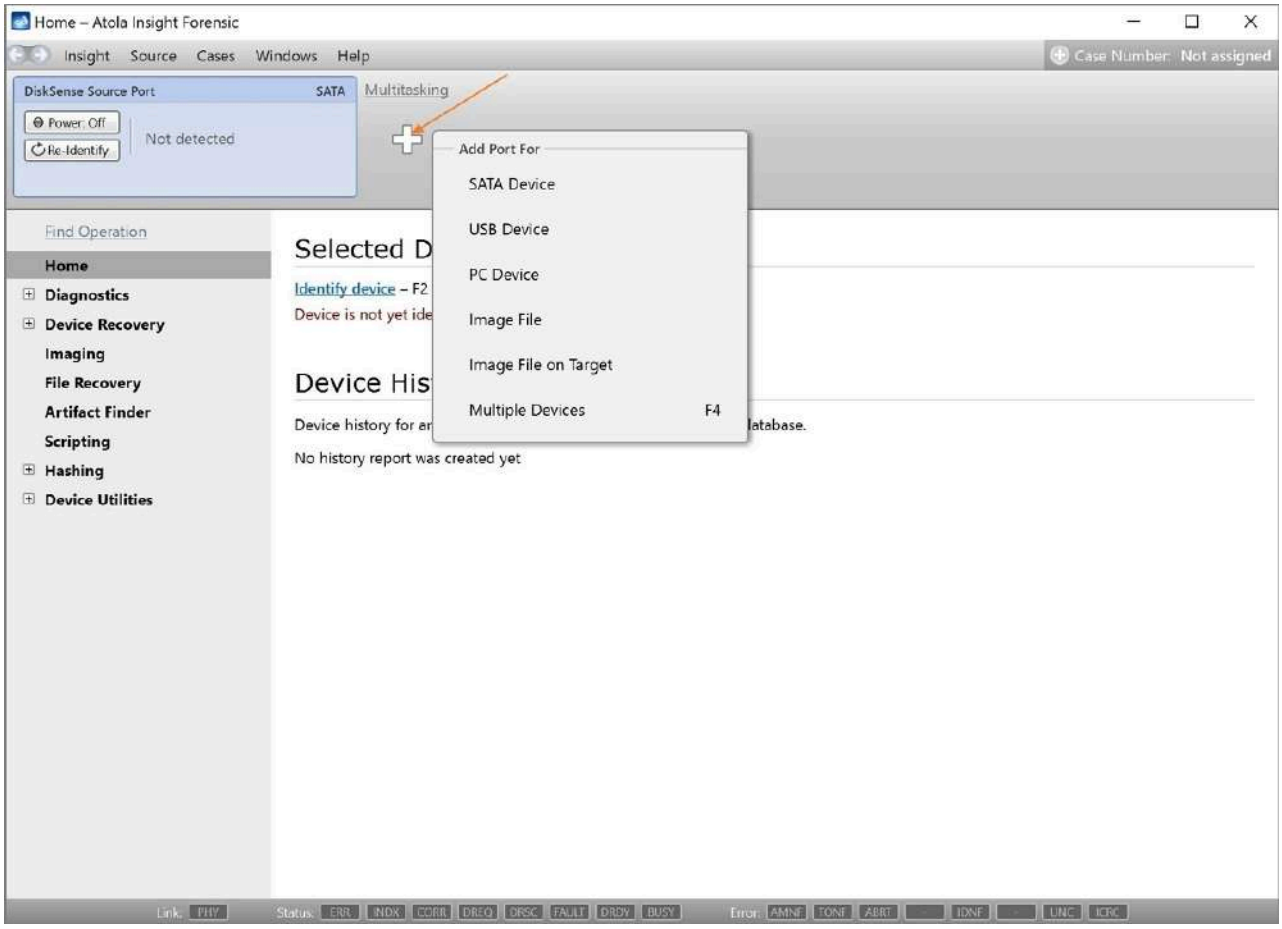
Restore image file to device

Writing from image file to device allows to promptly copy data from the chosen container to the target device.

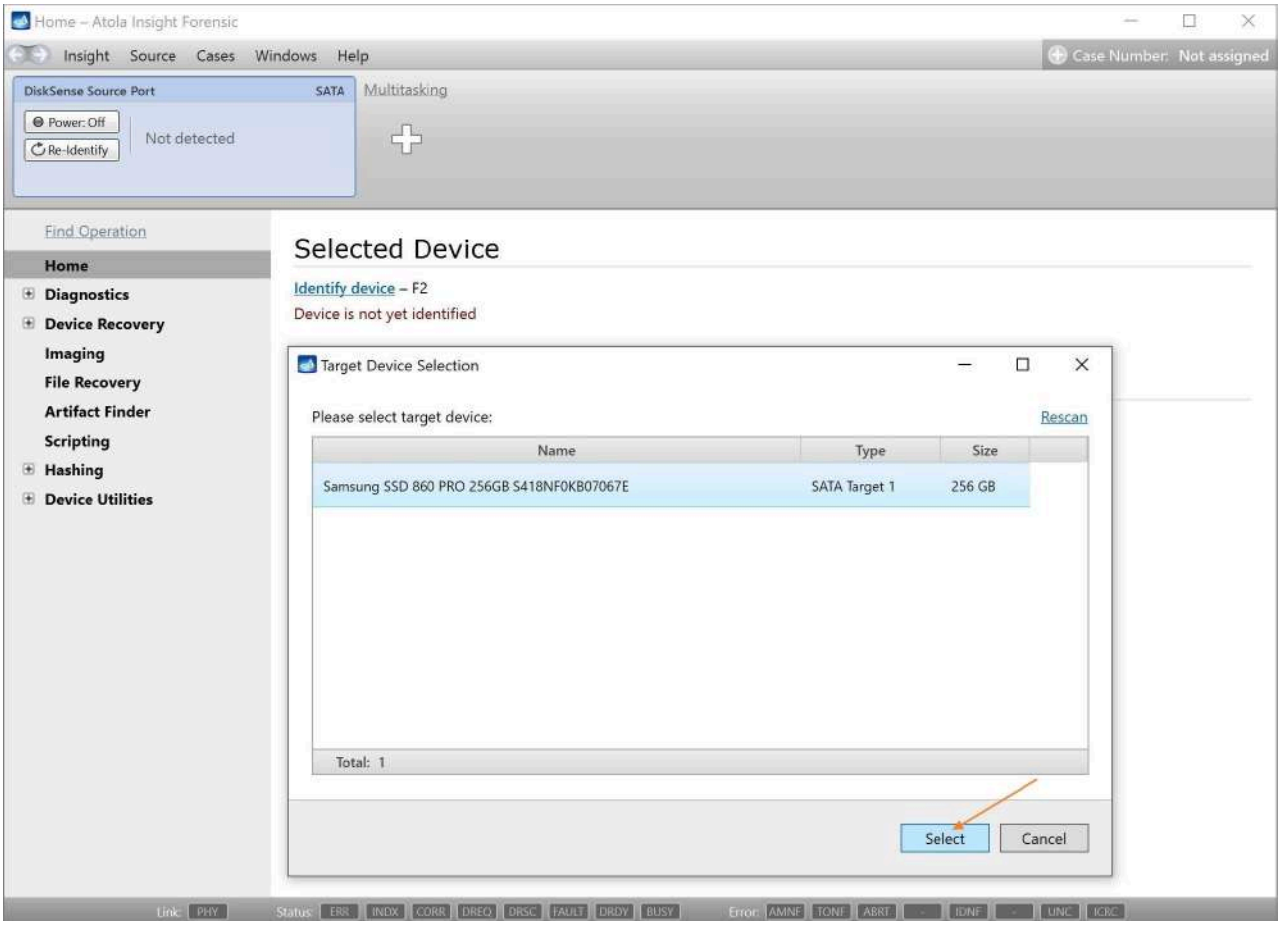
Getting devices ready

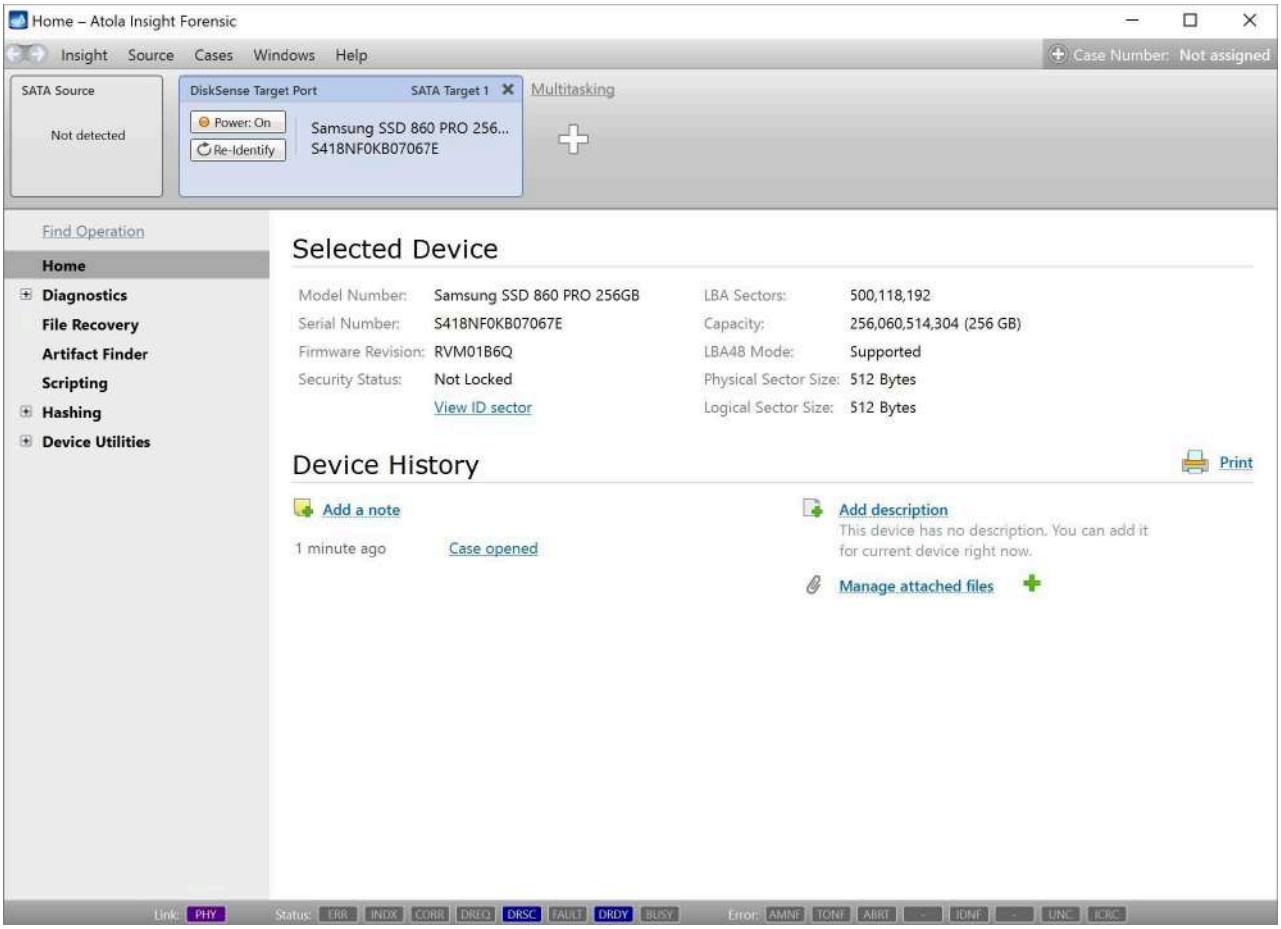
To start extracting data from the file, follow these steps:

1. On the **Device panel**, click the **Plus** button and select port for the target you intend to use:

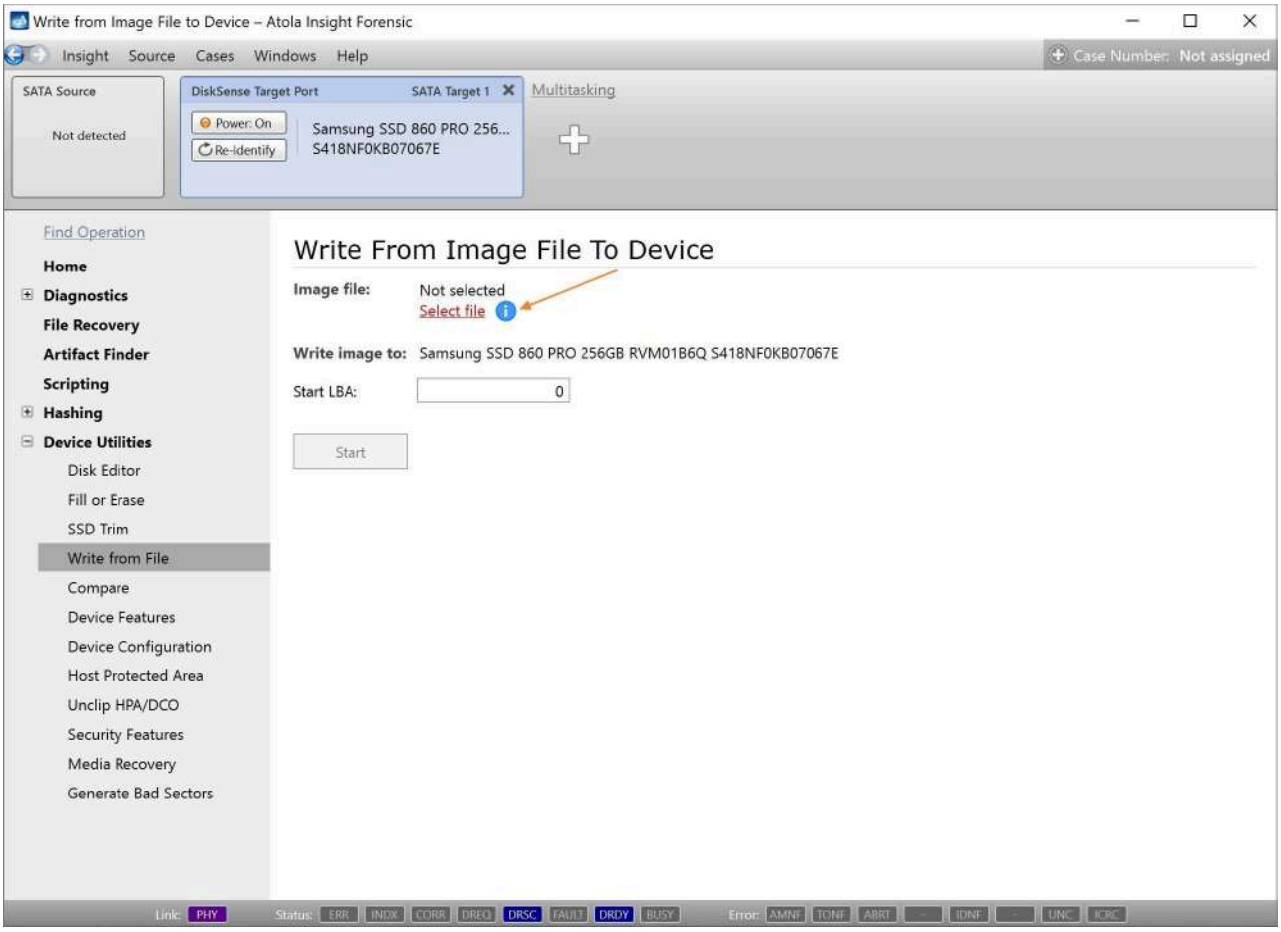


2. Choose your target device and click **Select**:

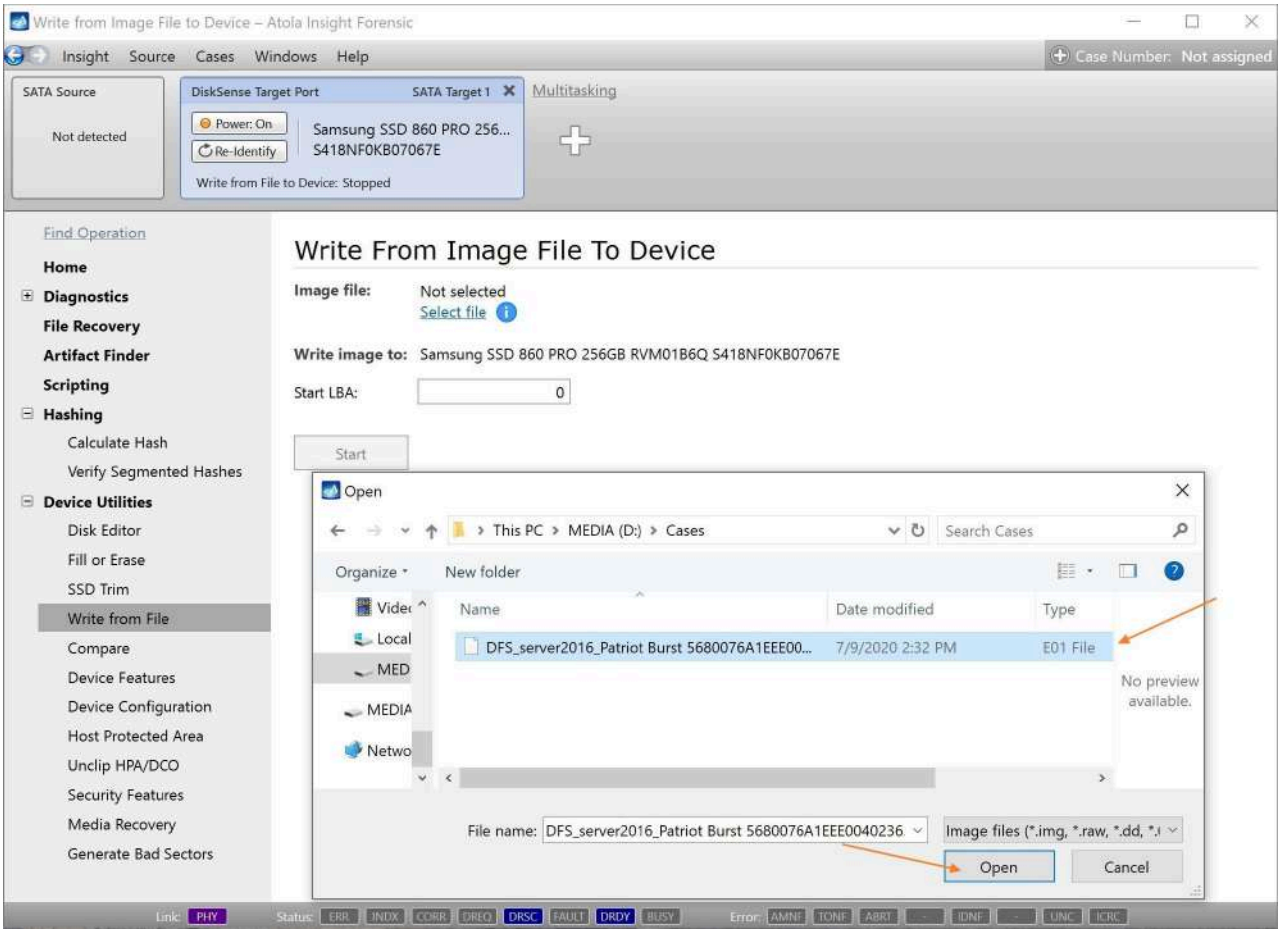

Home – Atola Insight Forensic
Insight
Source
Cases
Windows
Help
Case Number: Not assigned
DiskSense Source Port
SATA
Multitasking
Power: Off
Re-Identify
Not detected
Find Operation
Home
Diagnostics
Device Recovery
Imaging
File Recovery
Artifact Finder
Scripting
Hashing
Device Utilities
Selected Device
Identify device – F2
Device is not yet identified
Target Device Selection
Please select target device:
Rescan
Name
Type
Size
Samsung SSD 860 PRO 256GB S418NF0KB07067E
SATA Target 1
256 GB
Total: 1
Select
Cancel
Link: PHY
Status: ERR INDX CORR DREQ DRSC FAULT DRDY BUSY
Error: AMNF TONF ABRT IDNF UNC ICRC



3. In the sidebar, go to **Device Utilities** > **Write from file**.
4. To locate the file you're planning to image, click the **Select file** link. You can work with E01/AFF4/Raw image files, split image files and more.

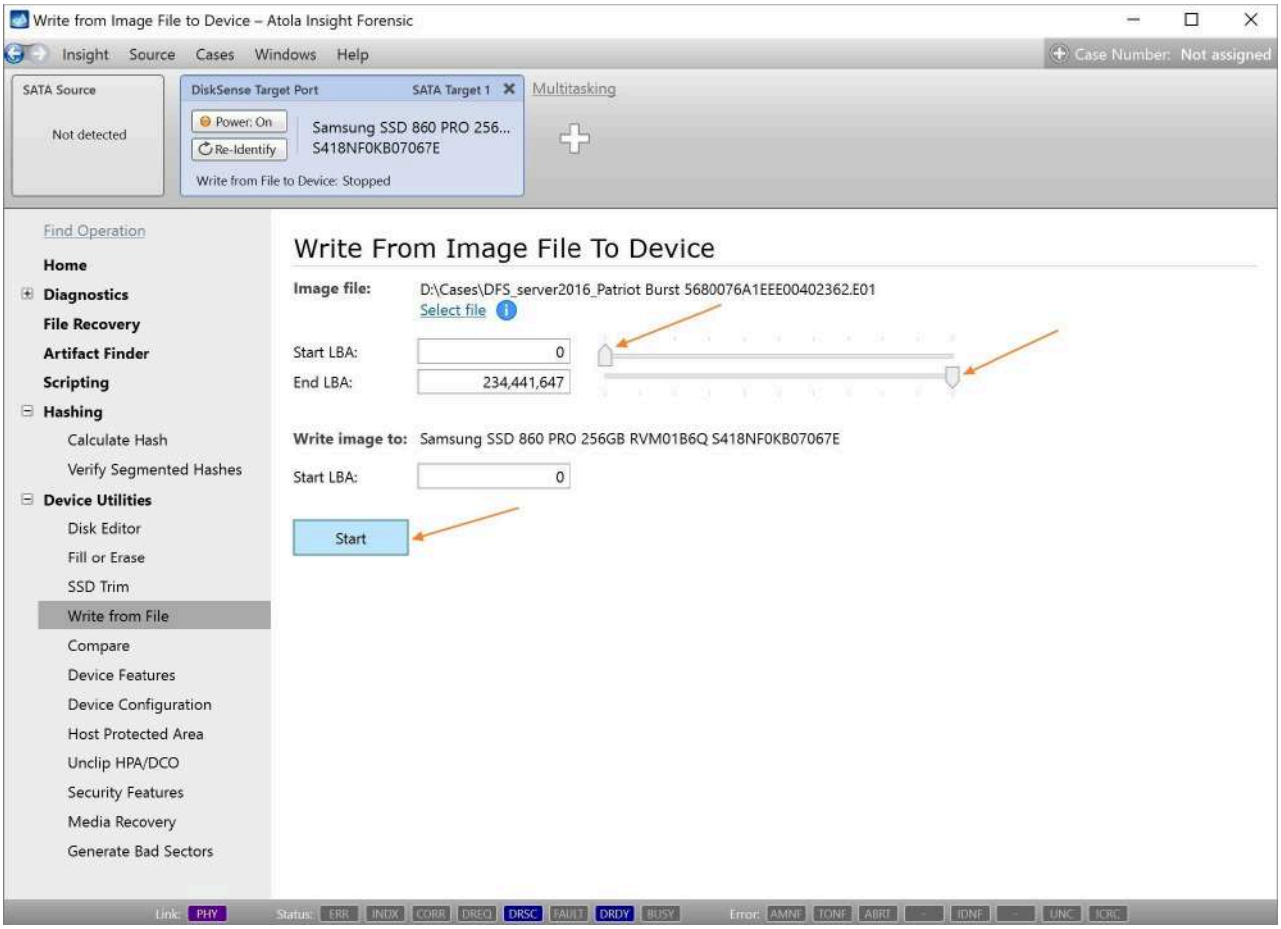


5. Having selected your image file, click the **Open** button:



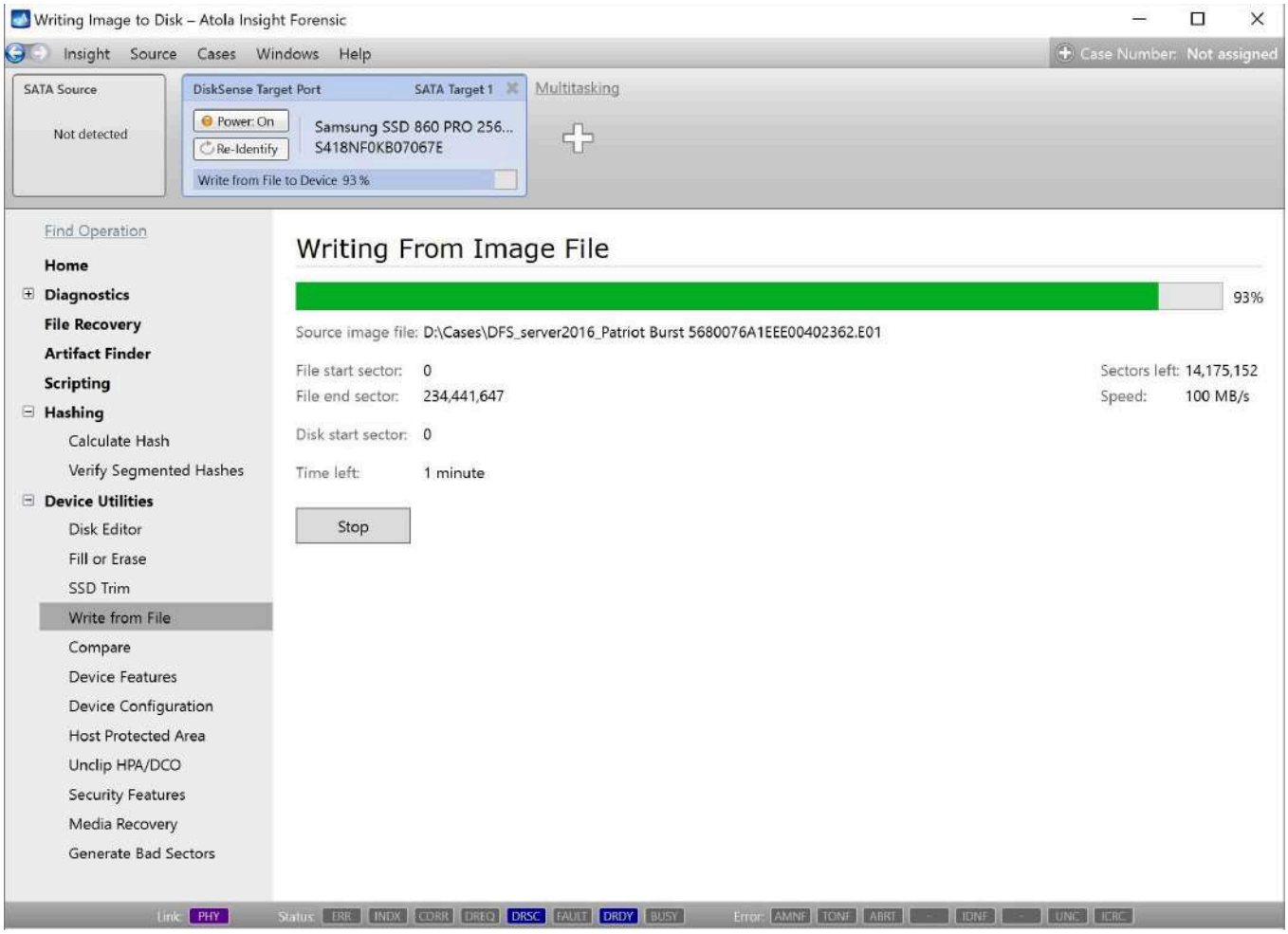
6. **Optional:** If you want to copy a certain range of data from the file, adjust start and end LBA.

7. To launch your imaging session, click the **Start** button.

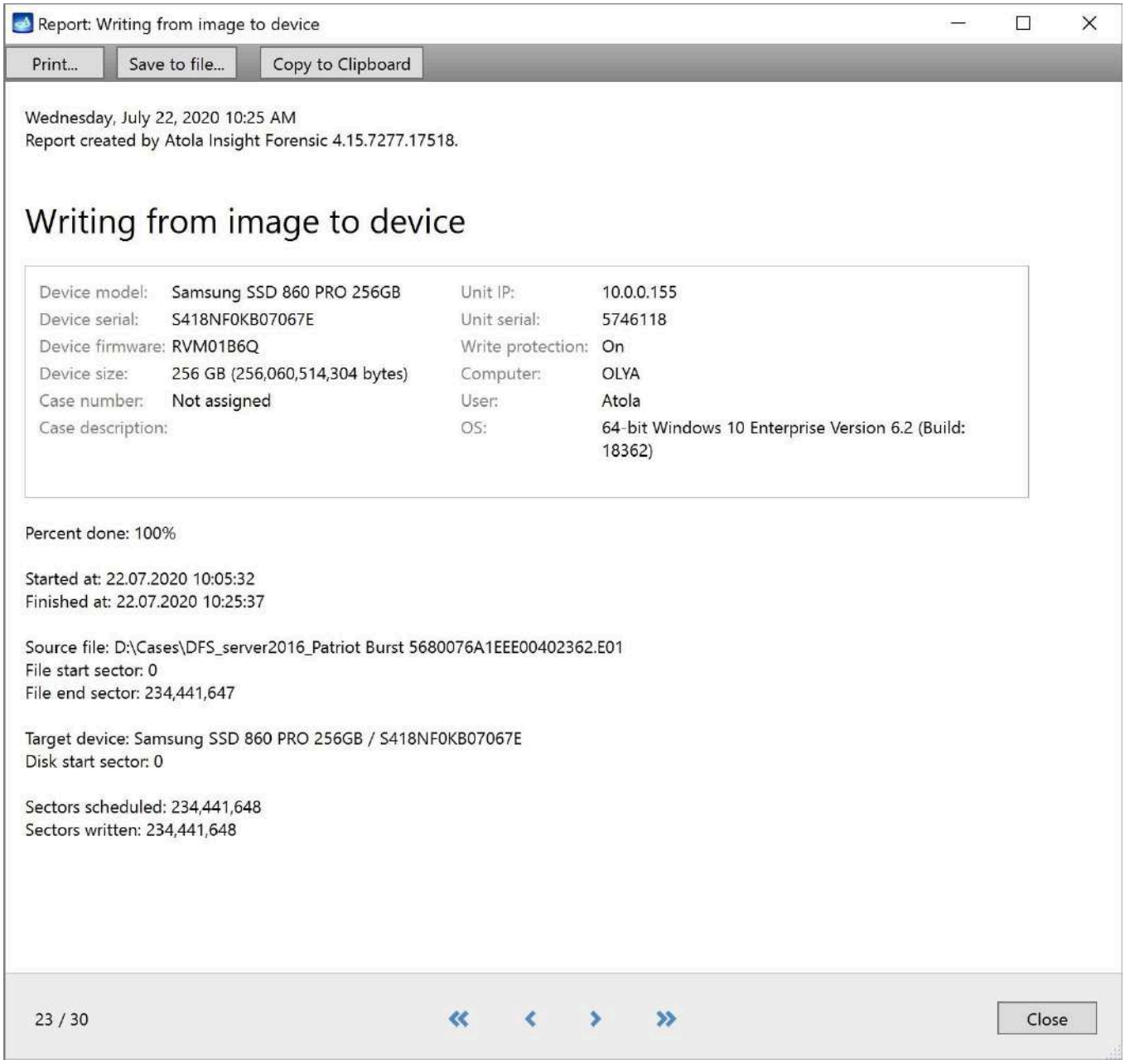


Insight Forensic provides you with all the essential details on the target you are going to use. The system notifies you if your target contains data. To confirm the intention to overwrite the data, enter *YES* in the pop-up window.

Depending on your bandwidth, writing from file to target device may require more time than drive-to-drive imaging. Insight will help you track the progress of your session and indicate the estimated time left.



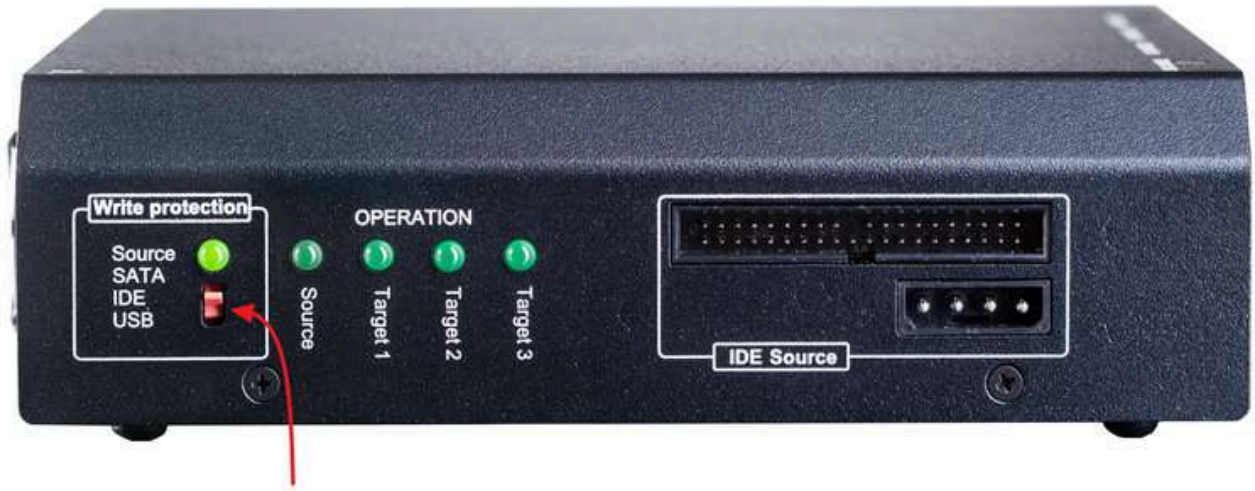
Insight Forensic automatically creates reports for every session. You can find reports in the Case management system.



Wiping multiple drives simultaneously

Erasing data on destination drives guarantees accuracy of the imaged data and helps verify that the drive has no errors. In the course, all sectors are overwritten with the help of selected pattern or method.

When you need to prepare multiple hard drives for imaging, Insight's multitasking capabilities enable you to do so much faster by launching Erase/Fill on multiple drives simultaneously, including those connected to the source port.



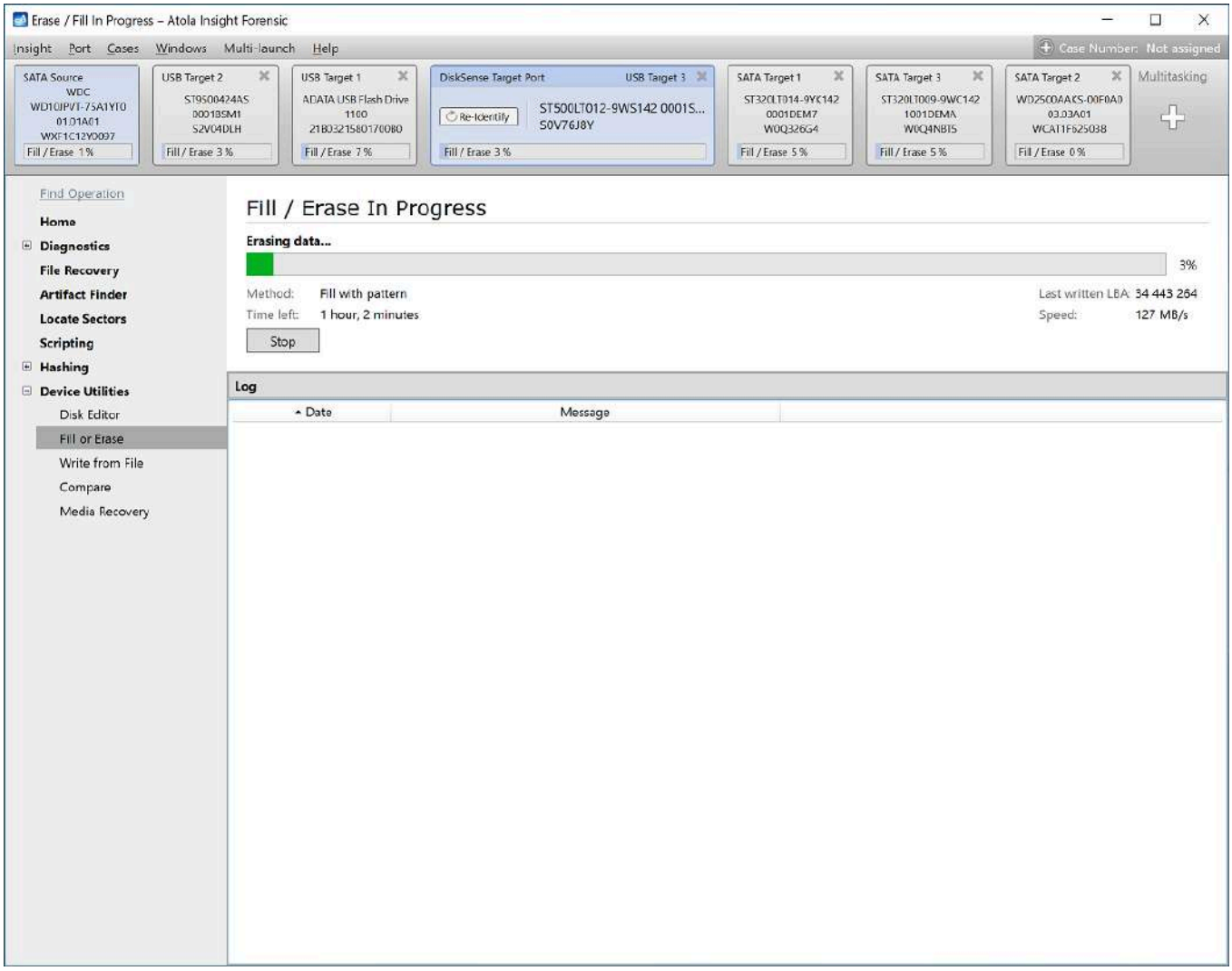
Write protection switch

To wipe the drive connected to the source port, remember to switch off write protection on the port so that the indicator above the switch is off and there is a notification right below the port bar saying *Note: Write protection of currently attached device is OFF*.

Then follow these steps:

1. In the Menu bar, go to **Multi-launch** > **Fill or Erase**.
2. Select all devices you want to fill or erase and then click **Continue**.
3. Select Fill method among the wide range of options and then click **Start Fill / Erase** button.
4. In the **Confirmation** dialog, type `YES` to confirm that you want to erase data on the selected devices and then click **OK**.

By following these steps, you can wipe data from one source drive and up to six target drives, all at the same time, as shown in the picture below.



This ability to perform Fill/Erase on multiple drives makes Insight exceptionally useful for forensic units dealing with multiple cases, where evidence acquisition is an ongoing activity.

Case Management system

Insight's Case Management system records every step of data acquisition process: every operation is automatically added to the case from the moment a device is identified including date, time, media map and hash values. When a hard drive is imaged, its media map is recorded detailing all the sectors that have been skipped. Case notes can be added at any time to log information such as the case technician or owner of the hard drive.

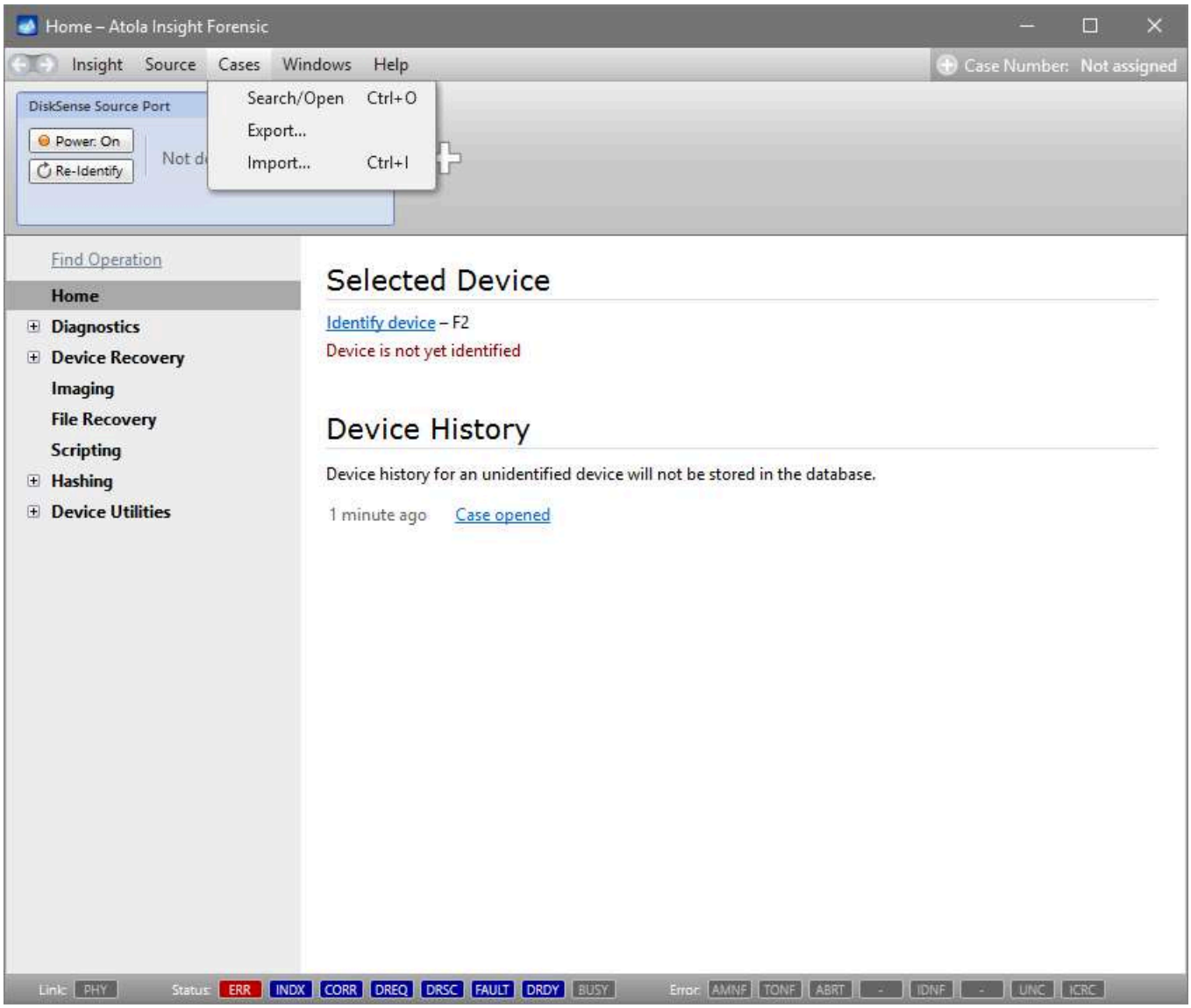
Whenever an operator connects a hard drive to DiskSense unit, Atola Insight Forensic makes an automatic database lookup and retrieves all past records associated with that particular hard drive. New entries will be added seamlessly to the database. You do not need to enable Case Management or take any additional actions for it to start functioning; it is fully embedded into Atola Insight Forensic and works at all times.

Case number can be assigned and changed at any time. The system also allows browsing through all cases and records within the cases, without corresponding devices being connected to the unit.

Finding and opening a case

Insight's Case Management system records every step of data acquisition process saving them into reports grouped by cases.

To view the whole list of cases and their devices, go to **Cases** > **Search/Open** in the Menu bar or press **Ctrl** + **O**.



Search/Open case

In the **Search and Open Case** window you will see the list of all the devices that have ever been connected and identified by your Insight.

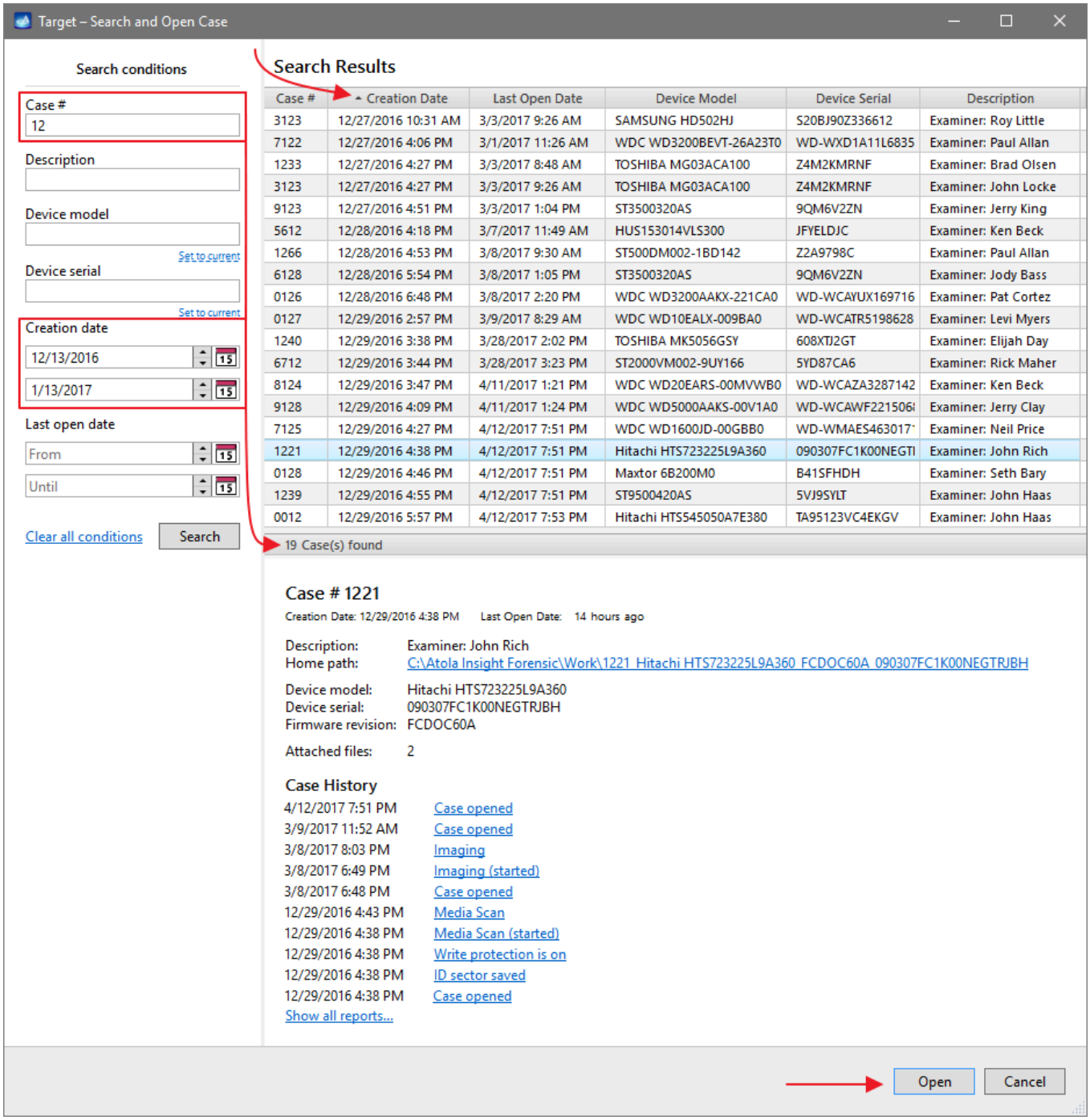
It is possible to search for cases using multiple criteria and sort the results ascending or descending in any of the columns.

You can store multiple devices under the same case number to keep track of all devices related to a certain case.

Once a device is selected, you get a preview of the case including device details:

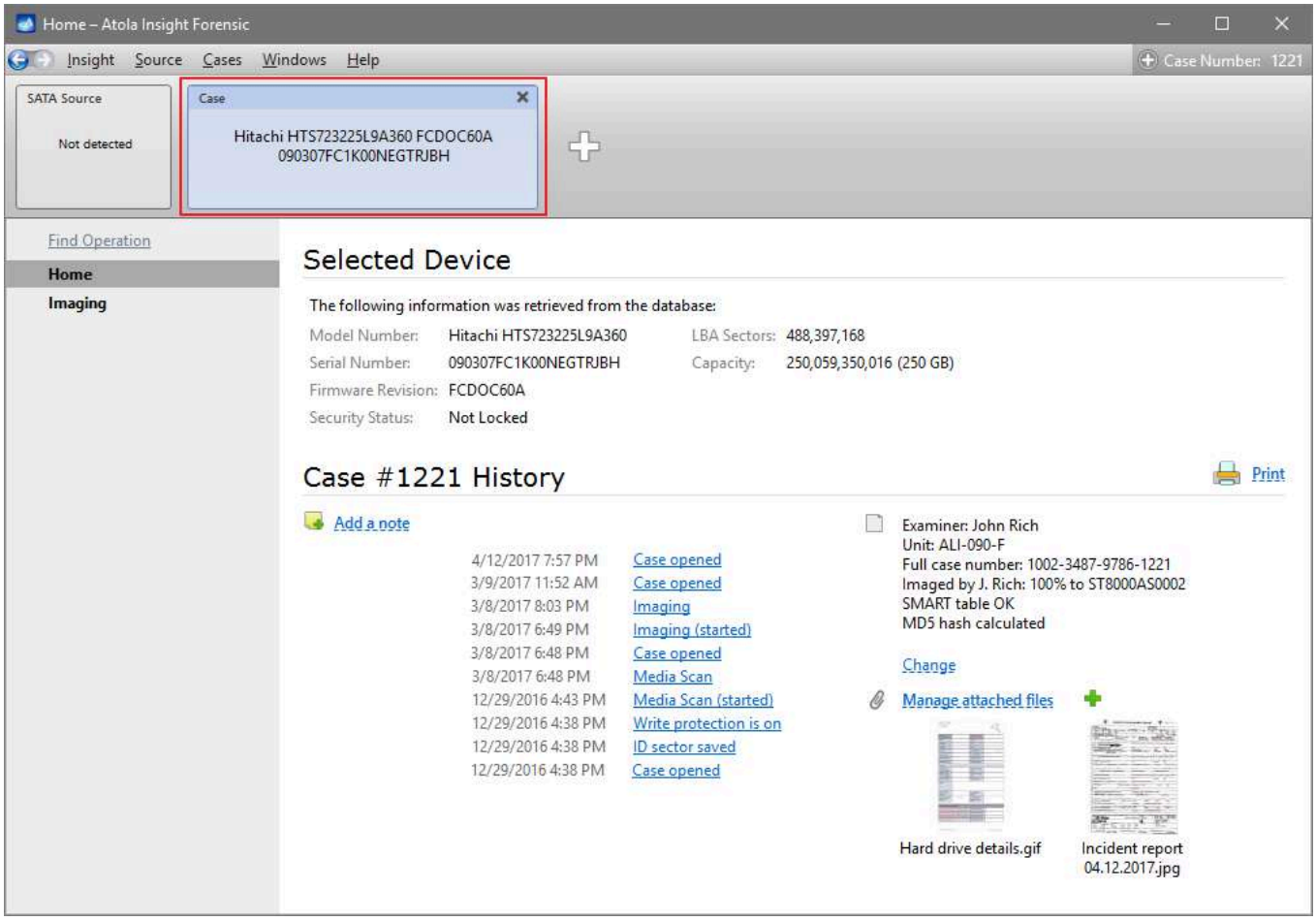
- when the case was created (i.e. the device was connected to the unit and identified by Insight for the first time),

- last time it was opened,
- the device model,
- serial number and
- description.



Case search filters

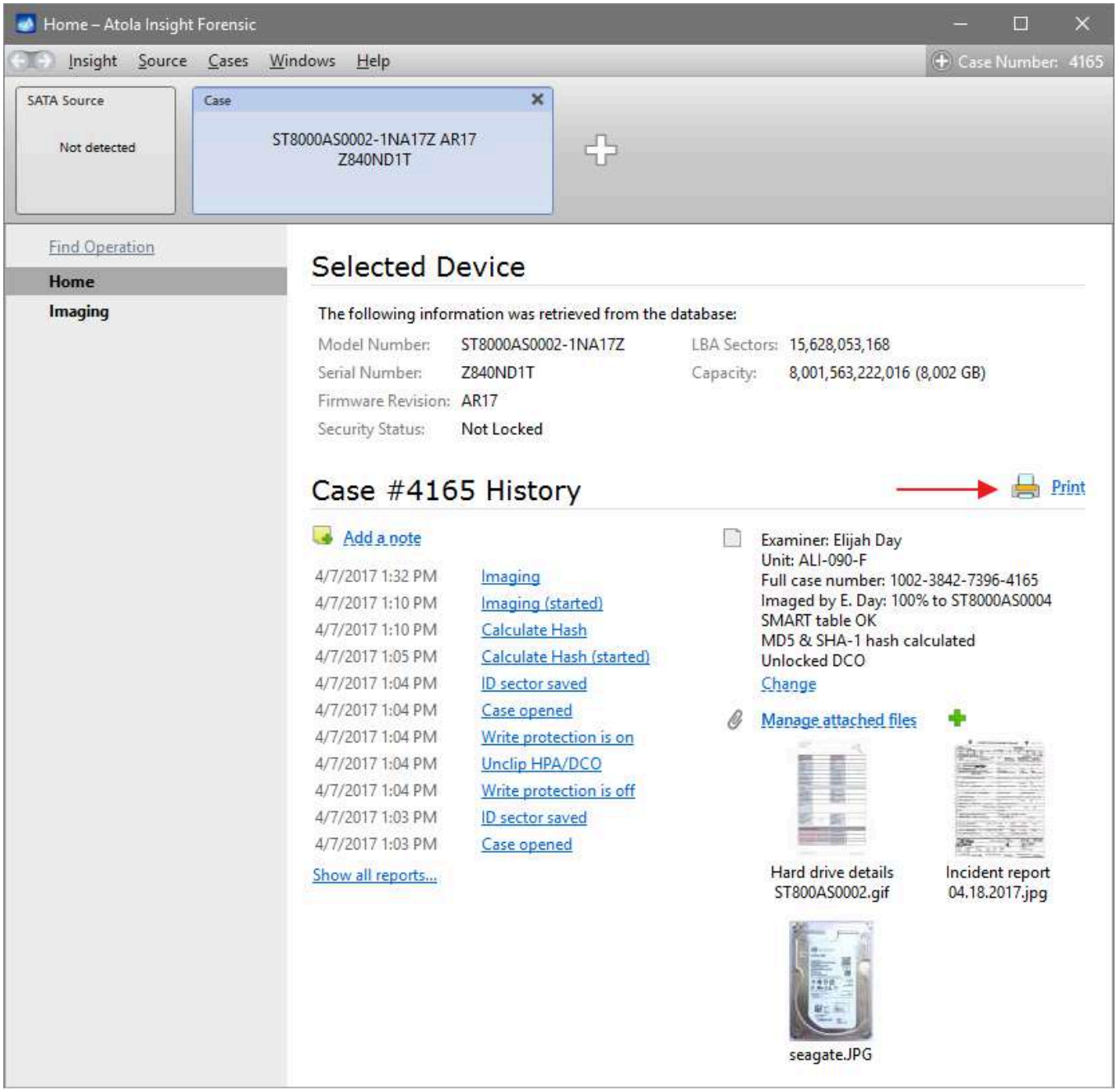
The case opens as a separate port on the **Device panel** of the Insight window.



Print reports from a case

Insight's Case Management system includes flexible printing functionality.

To print a report, click the **Print** link on the case's Home screen.



Print link

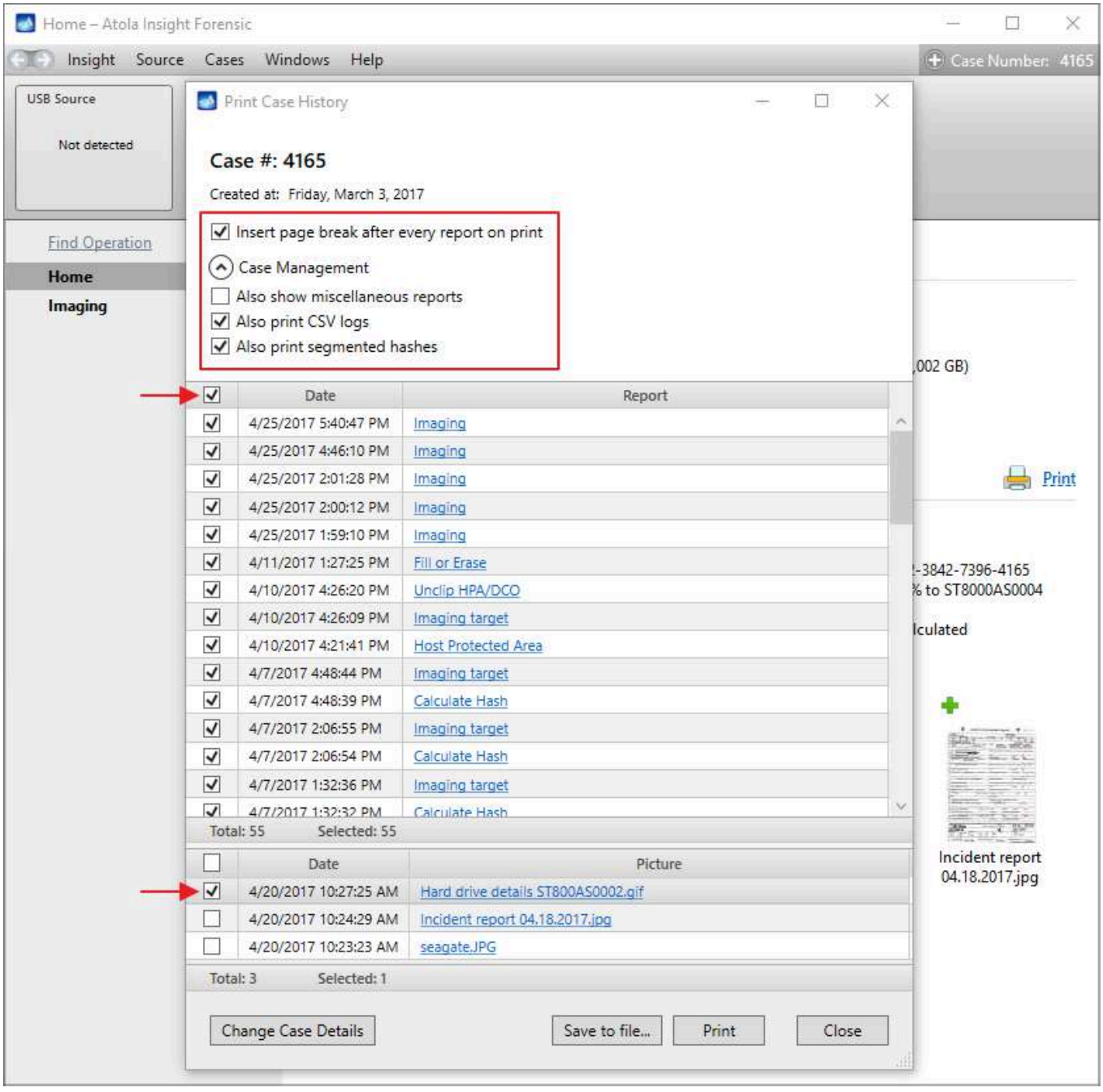
In the **Print Case History** window you get all the reports listed, sortable by date or by reported operation. It is possible to select just some of the reports or select all reports in the case by ticking the check box in the header of the list. Below there are all pictures attached to the case, which you can also select to be printed.

At the top of the **Print Case History** window there are four check boxes with report listing and printing settings (click on the **Case Management arrow** to view all check boxes):

- **Insert page break after every report on print**.
- **Also show miscellaneous reports** hides/displays all reports of seemingly minor importance, yet essential to some forensic specialists in accordance with their internal procedures.

- **Also print CSV logs** allows the printed version of the reports to include operation logs saved in CSV format.
- **Also print segmented hashes** also enables segmented hash saved in CSV files to be included in the printed version of the reports.

It is possible to print or save the selected reports and pictures in a PDF, HTML or RTF file by clicking **Save to file** or **Print** buttons.



Print options

If you have selected the two later options, this is how the log and the segmented hashes will be displayed in the report:

Friday, April 7, 2017 4:48 PM
Report created by Atola Insight Forensic 4.8.6255.23495.
case #4165

Imaging target

Device model:	ST8000AS0002-1NA17Z	Unit IP:	10.0.0.155
Device serial:	Z840ND1T	Unit serial:	67331143
Device firmware:	AR17	Write protection:	On
Device size:	8,002 GB (8,001,563,222,016 bytes)	Computer:	YULIA
Case number:	Not assigned	User:	ATOLA
Case description:		OS:	64-bit Windows 10 Home Version 6.2 (Build: 14393)

Source: WDC WD5000AAKX-001CA0 15.01H15 WD-WMAYU2595458

Sectors scheduled: 976,773,168
Sectors imaged: 976,773,165
Errors: 3

Preset: Default (5 passes) (modified)

Copy range: All sectors
Start sector in range: 0
End sector in range: 976,773,167

File signatures: 0

MD5 hash: 02250b7ffbc87294055e61e1a39a2927
Calculated range: 0 - 976,773,167
Segmented hashes: C:\Atola Insight Forensic\Work\672_WDC WD5000AAKX-001CA0_15.01H15_WD-WMAYU2595458\Hashes-Imaging-WDC WD5000AAKX-001CA0 15.01H15 WD-WMAYU2595458-0.csv

Post-hash for ST8000AS0002-1NA17Z AR17 Z840ND1T
MD5 hash: 02250b7ffbc87294055e61e1a39a2927
Calculated range: 0 - 976,773,167
Segmented hashes: C:\Atola Insight Forensic\Work\4165_ST8000AS0002-1NA17Z_AR17_Z840ND1T\Hashes-ST8000AS0002-1NA17Z AR17 Z840ND1T-2.csv

Log file: C:\Atola Insight Forensic\Work\0037_WDC WD5000AAKX-001CA0_15.01H15_WD-WMAYU2595458\Target02\Imaging0.csv

Date	Message
4/7/2017 2:43:28 PM	Imaging started
4/7/2017 3:01:38 PM	Cannot read block of data at 269,000,000 - 269,000,002 (Error: UNC)
4/7/2017 4:03:32 PM	Pass #1 completed
4/7/2017 4:03:32 PM	Imaging completed

Segmented hashes: C:\Atola Insight Forensic\Work\0037_WDC WD5000AAKX-001CA0_15.01H15_WD-WMAYU2595458\Hashes-Imaging-WDC WD5000AAKX-001CA0 15.01H15 WD-WMAYU2595458-0.csv

6d4bc0dcb6d4173561d02acae8022309,0,8388607
a98c409f5229faaffe3646e731ad5c94,8388608,16777215
c9a5a6878d97b48cc965c1e41859f034,16777216,25165823
c9a5a6878d97b48cc965c1e41859f034,25165824,33554431
c9a5a6878d97b48cc965c1e41859f034,33554432,41943039
c9a5a6878d97b48cc965c1e41859f034,41943040,50331647
c9a5a6878d97b48cc965c1e41859f034,50331648,58720255

Printing report having logs and segmented hashes included

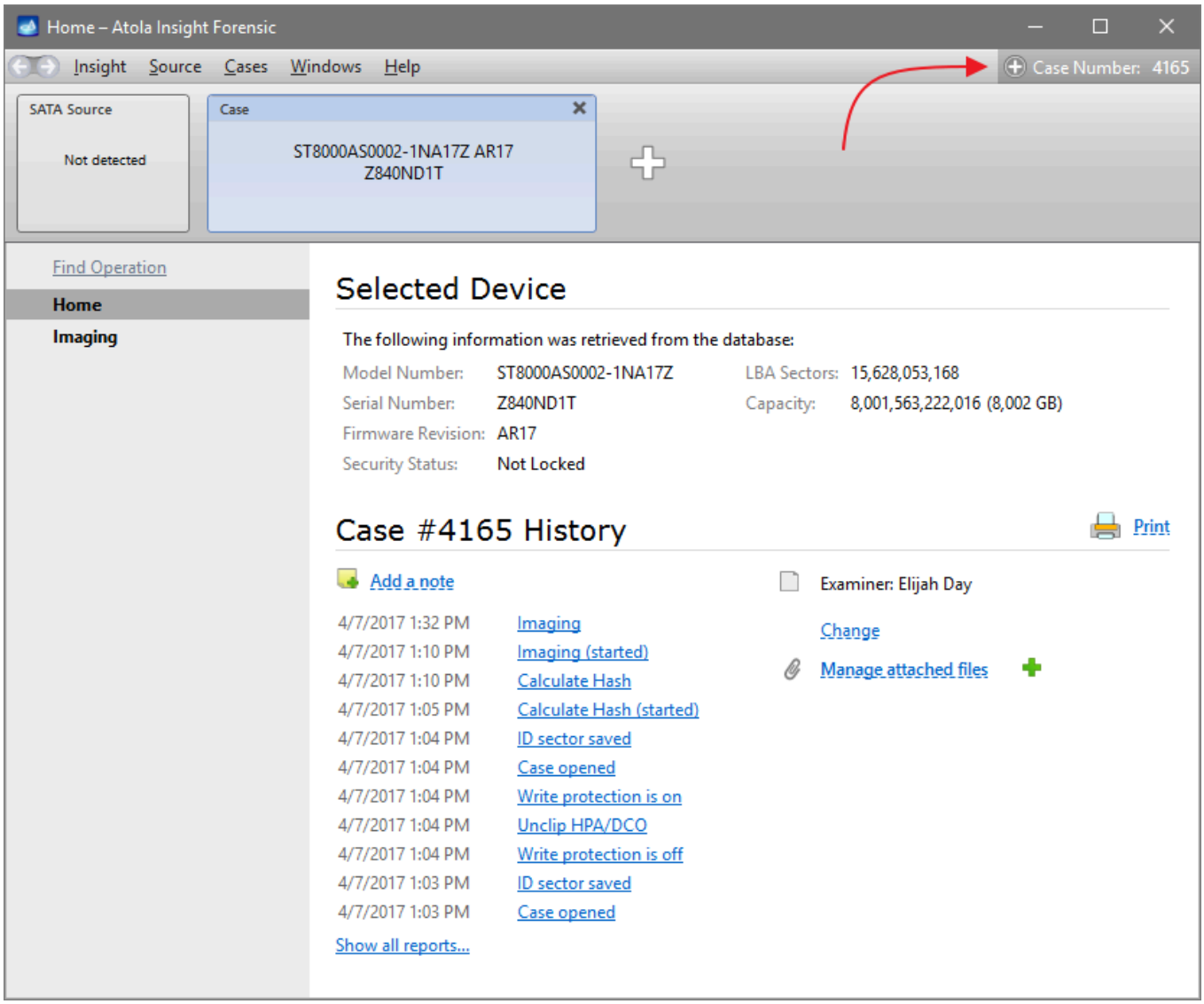
Changing details in a case

Insight's case management system helps users efficiently keep track of drive-related information.

Even if a drive has already been used for a while, its imaging and hashing have already been performed, it is still possible to open its case and make adjustments to the case details.

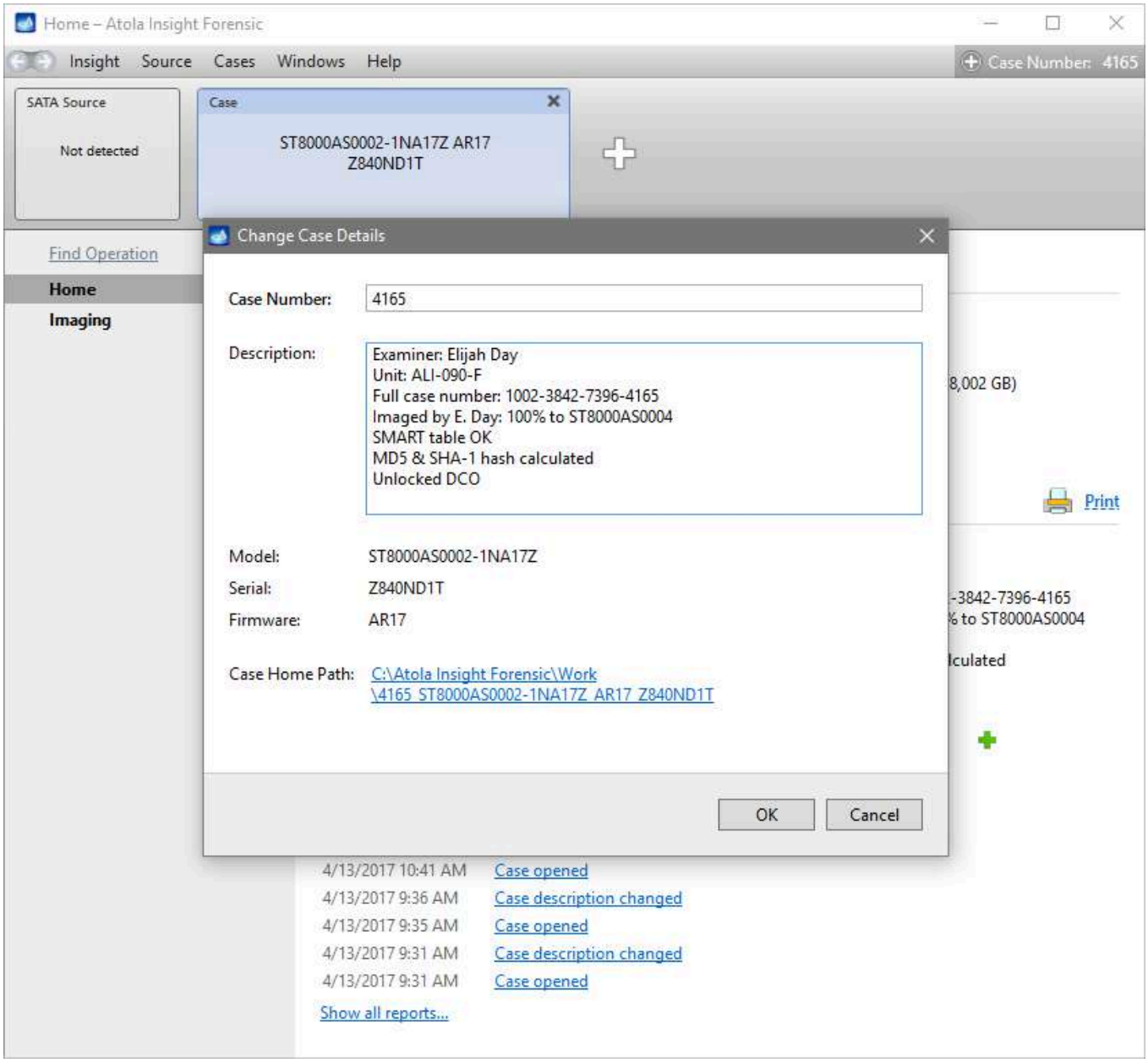
Add or change the case number and description

1. In the top right, click the **Plus** icon next to the **Case Number**.



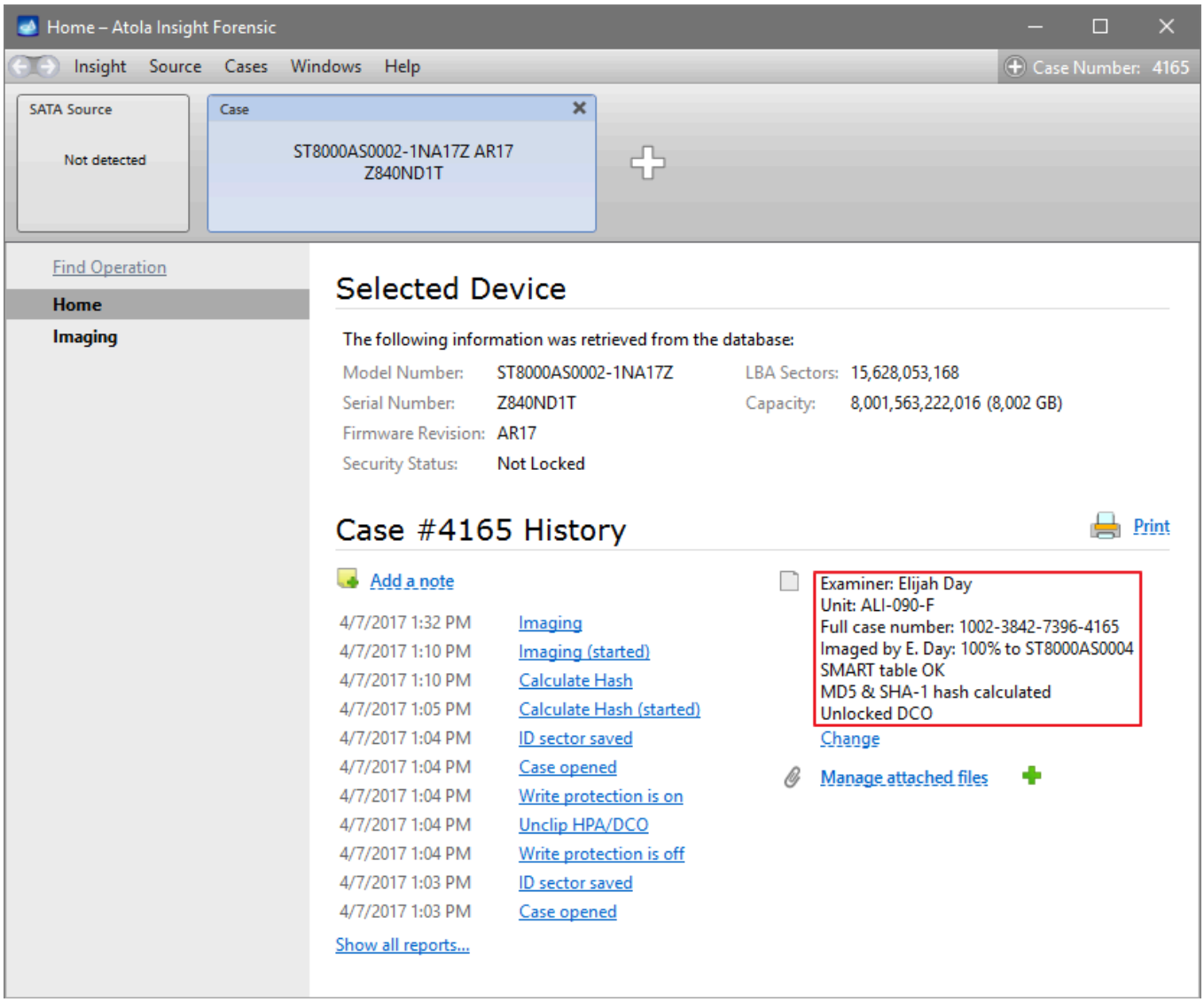
The Plus icon next to the Case Number.

2. Enter or change the **Case Number** and **Description**.



Changing case details.

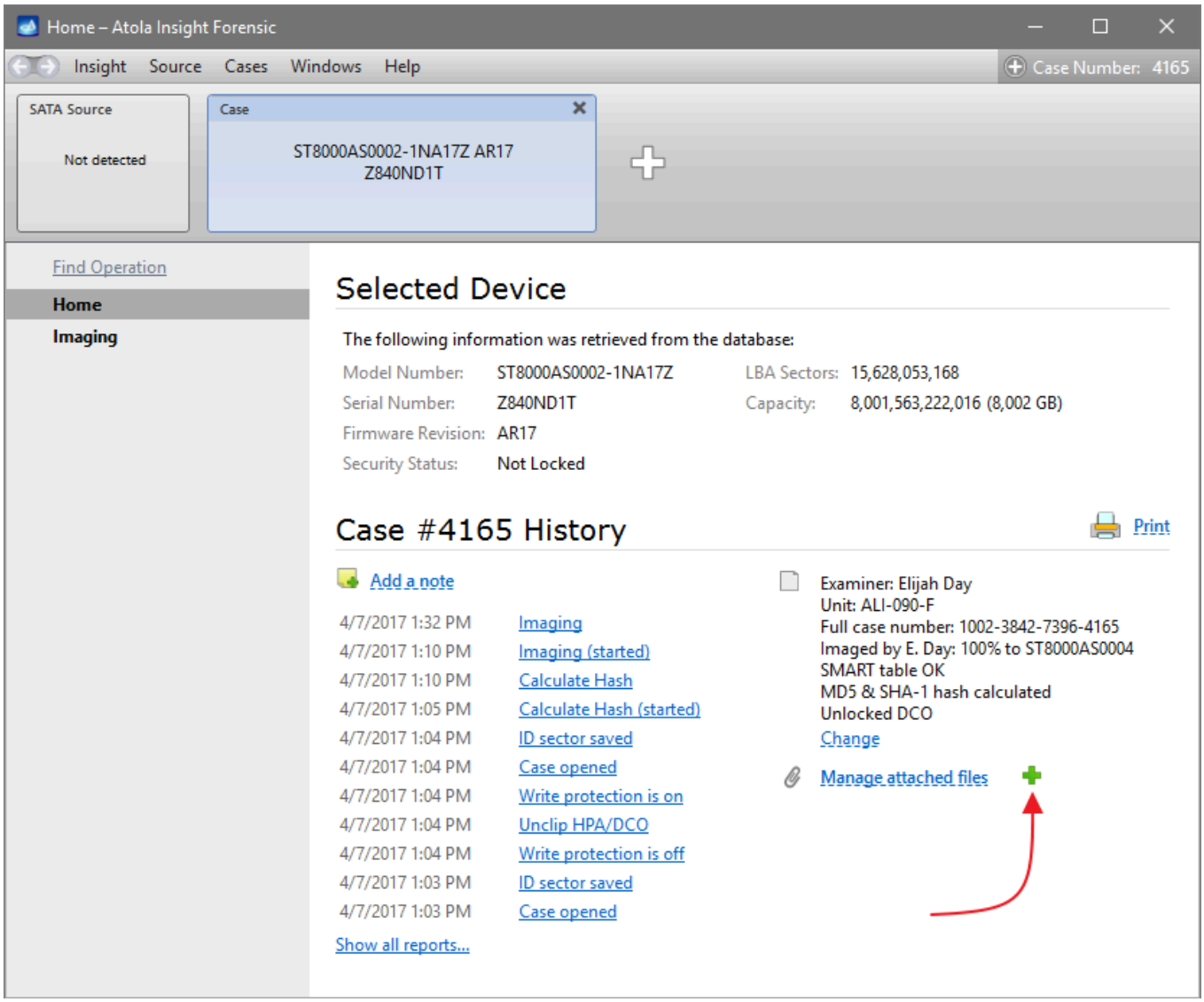
1. Click **OK**. The description appears next to the **Case History**.
   For quick changes, you can also click the **Change** link right below the description.



Case description added

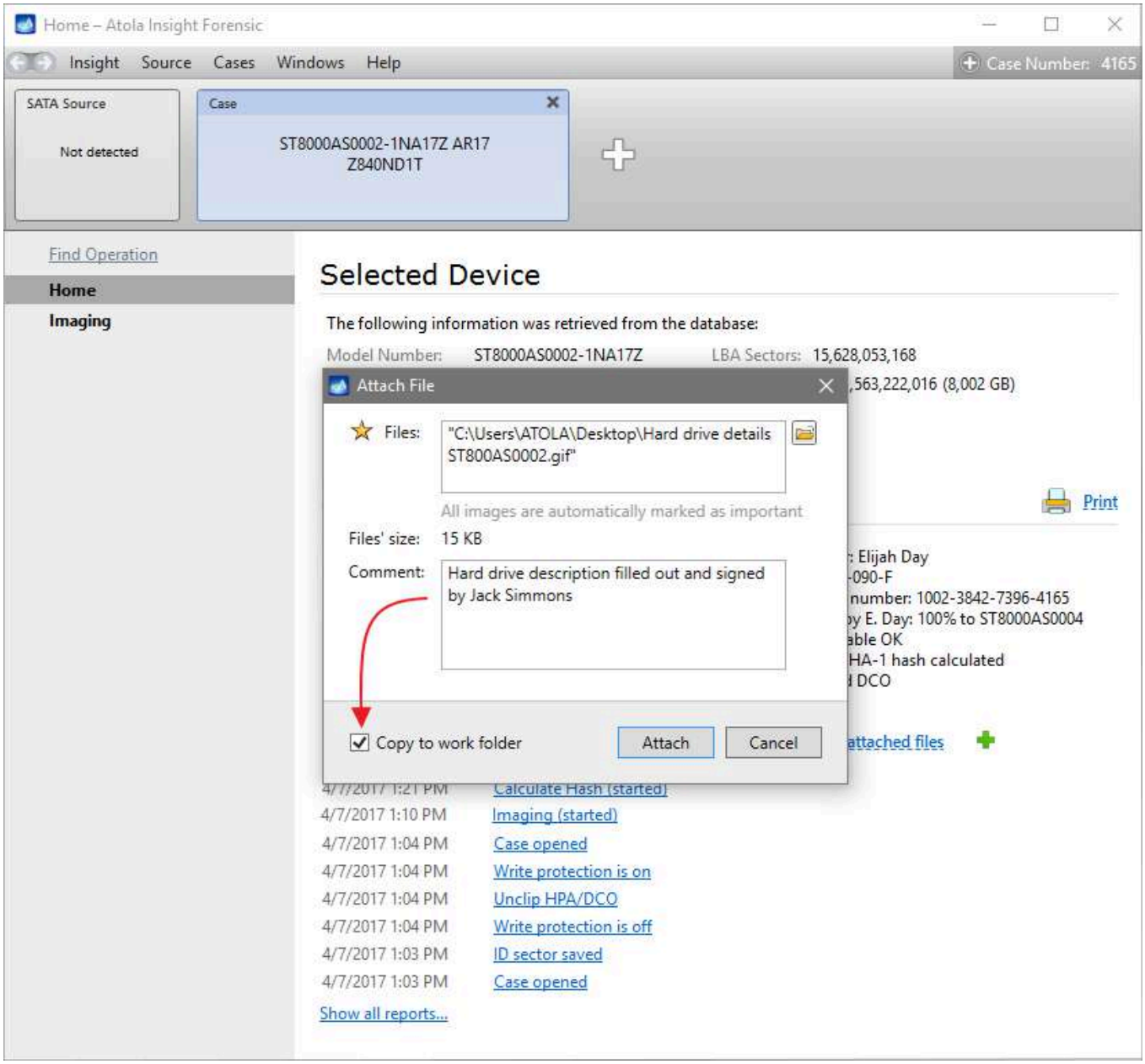
Add a document or an image to the case

1. On the case **Home** screen, in the **Case history** section, click the green **Plus** icon.



Adding a file to the case.

2. In the **Attach File** dialog, enter the path to a file and leave a comment in the corresponding field.
3. **Optional:** Select **Copy to work folder** to copy the file to the same folder where any other related files are located, for example, tables with segmented hashes, logs, imaging maps, file signature lists and more.

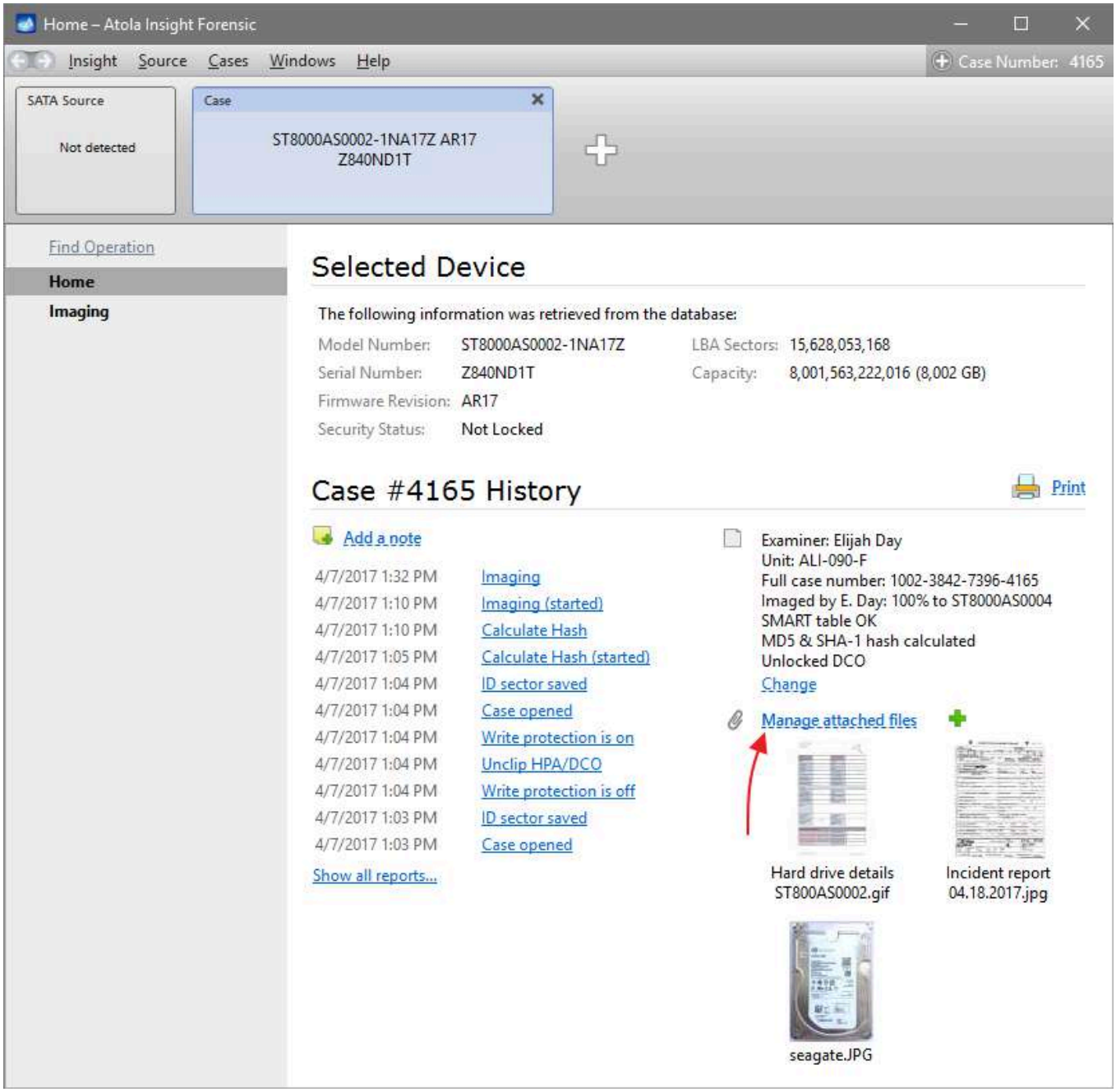


The Attach file dialog.

4. Click **Attach**. All the uploaded files appear on the case **Home** screen below the description.

View or remove the attached files

To view all the attached files, change their details, or remove them from the case, click the **Manage attached files** link.

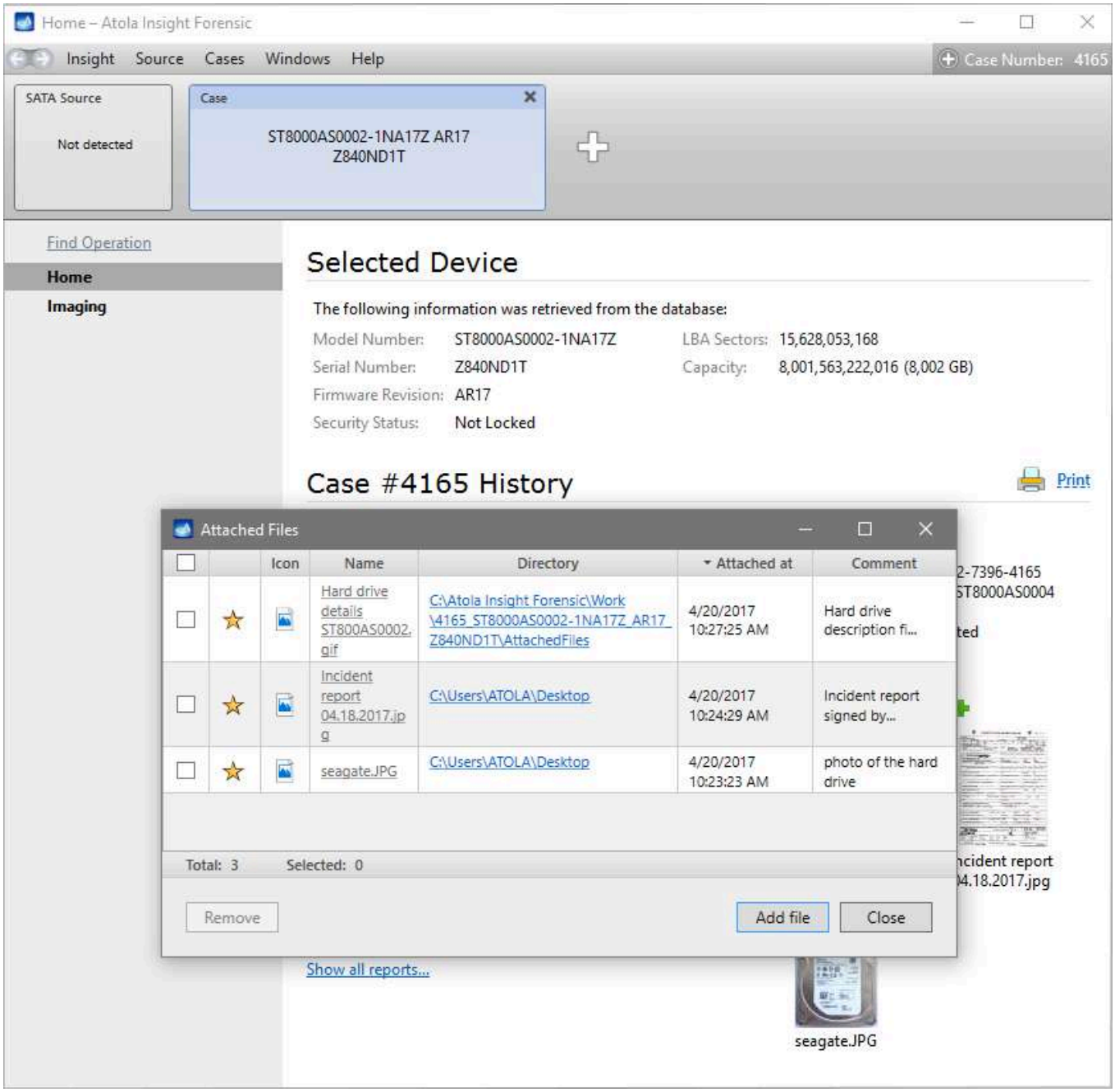


The **Attached files** window contains the list of files including

- an icon representing the file type,
- the name,
- the folder where the file is located,
- the date when the file was attached to the case and
- the comment added by the user.

To edit the **Comment** or copy the file to the case folder, right-click a file and select **Edit**.

To remove the file from the case, select the file and click **Remove**.



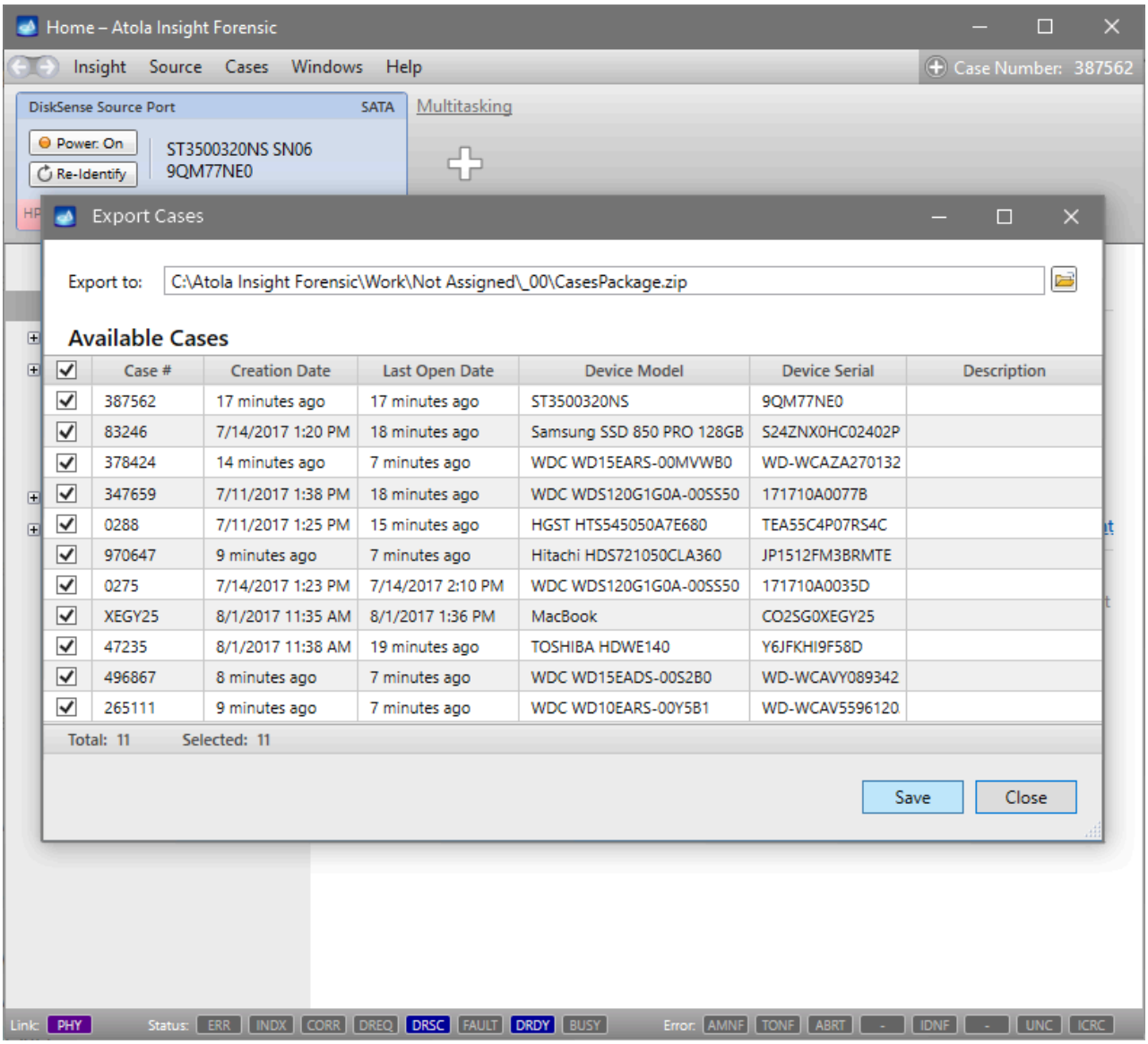
Exporting and importing cases from one computer to another

It is possible to transfer all or some of the cases stored in one Insight's case management system to another one. The only requirement is that both computers have the same version of Insight installed.

Export cases

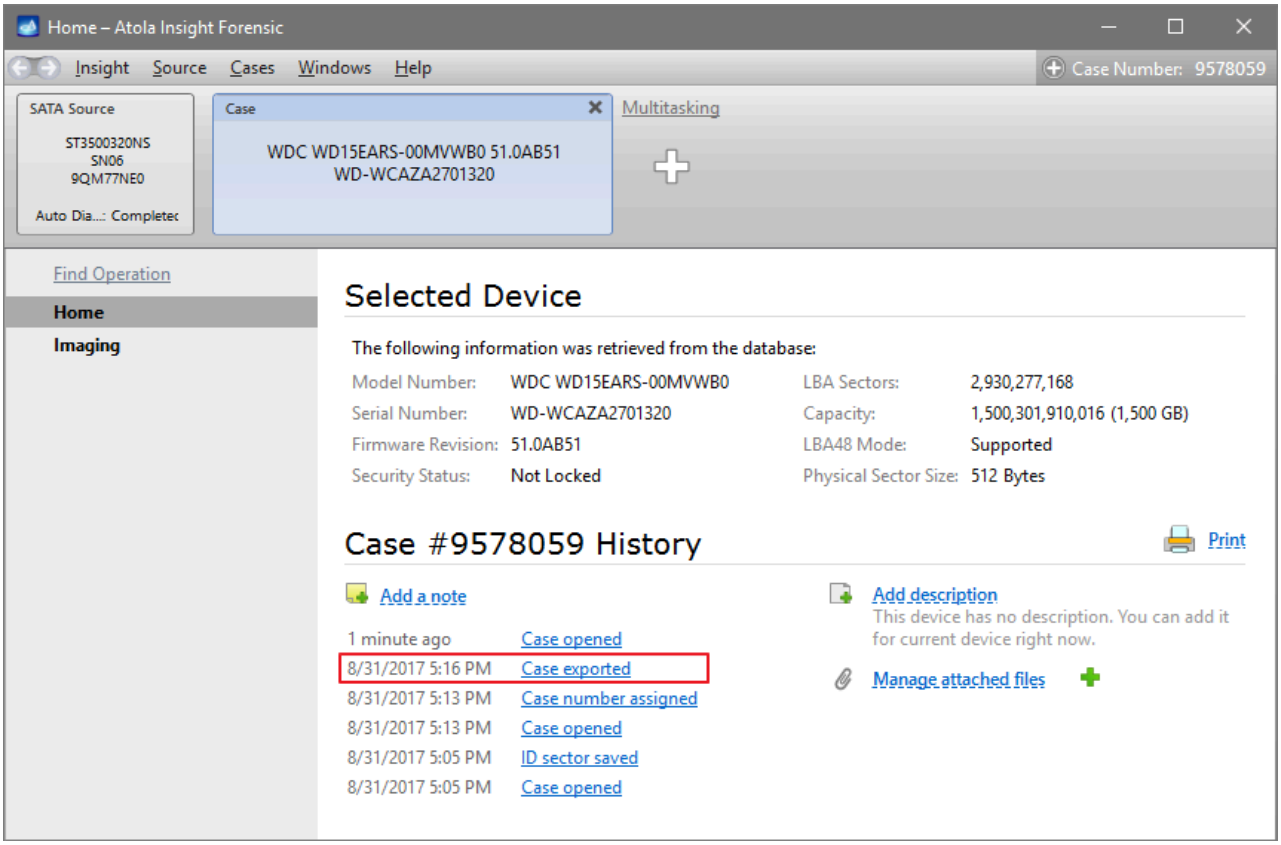
Whenever cases need to be transferred from one computer to another one, start by exporting the cases.

1. In the Menu bar, go to **Cases** > **Export**.
2. In the **Export Cases** window, select the folder where the cases should be stored.
3. Select the cases you want to export and click the **Save** button.



Export selected cases

4. Insight saves cases as a package in a zip file with the default name *Cases.Package.zip*. Later you can copy this file to a different computer.
5. Once a case is exported, Insight adds a record about it to the case's history.

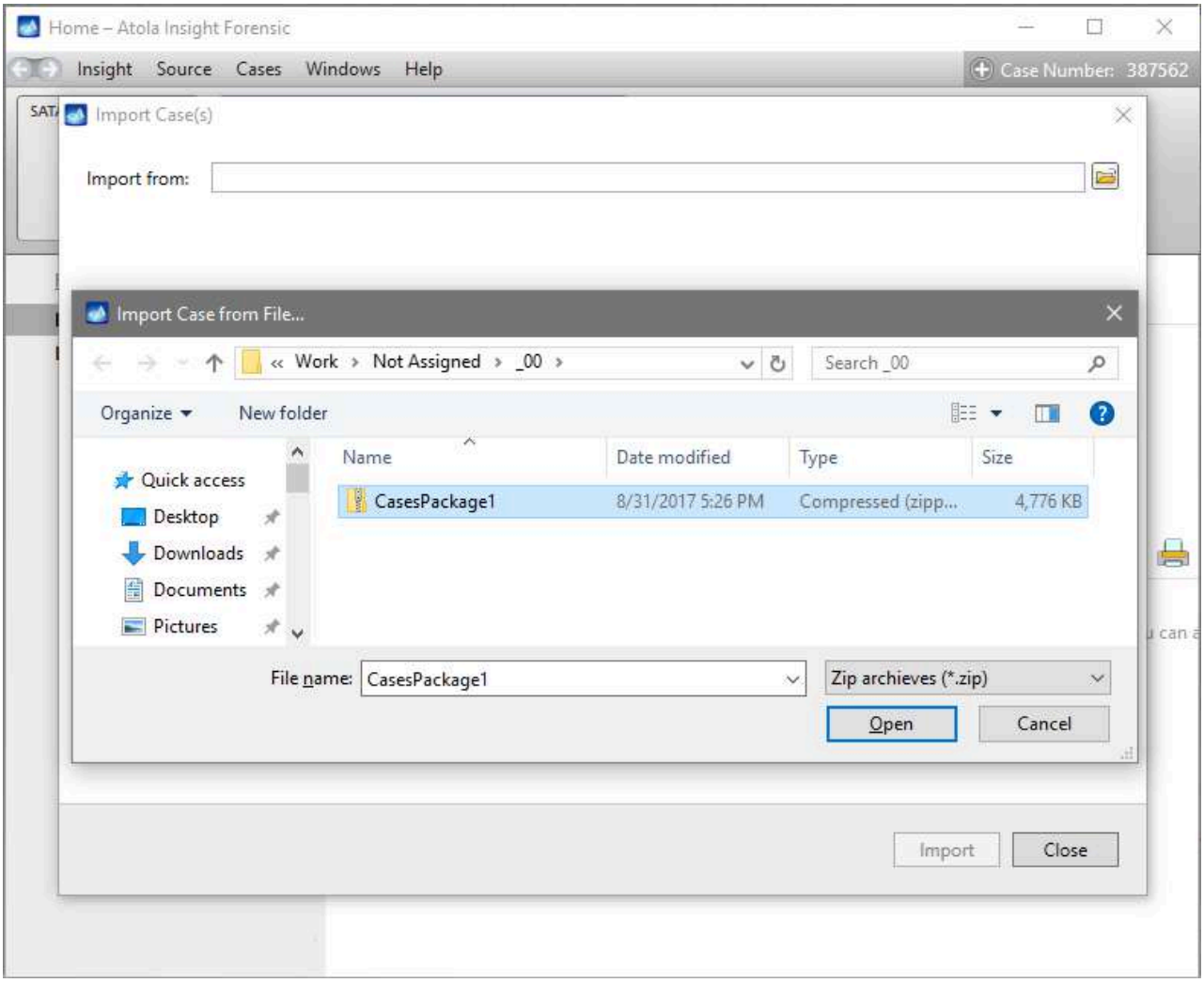


Case export report

Import cases

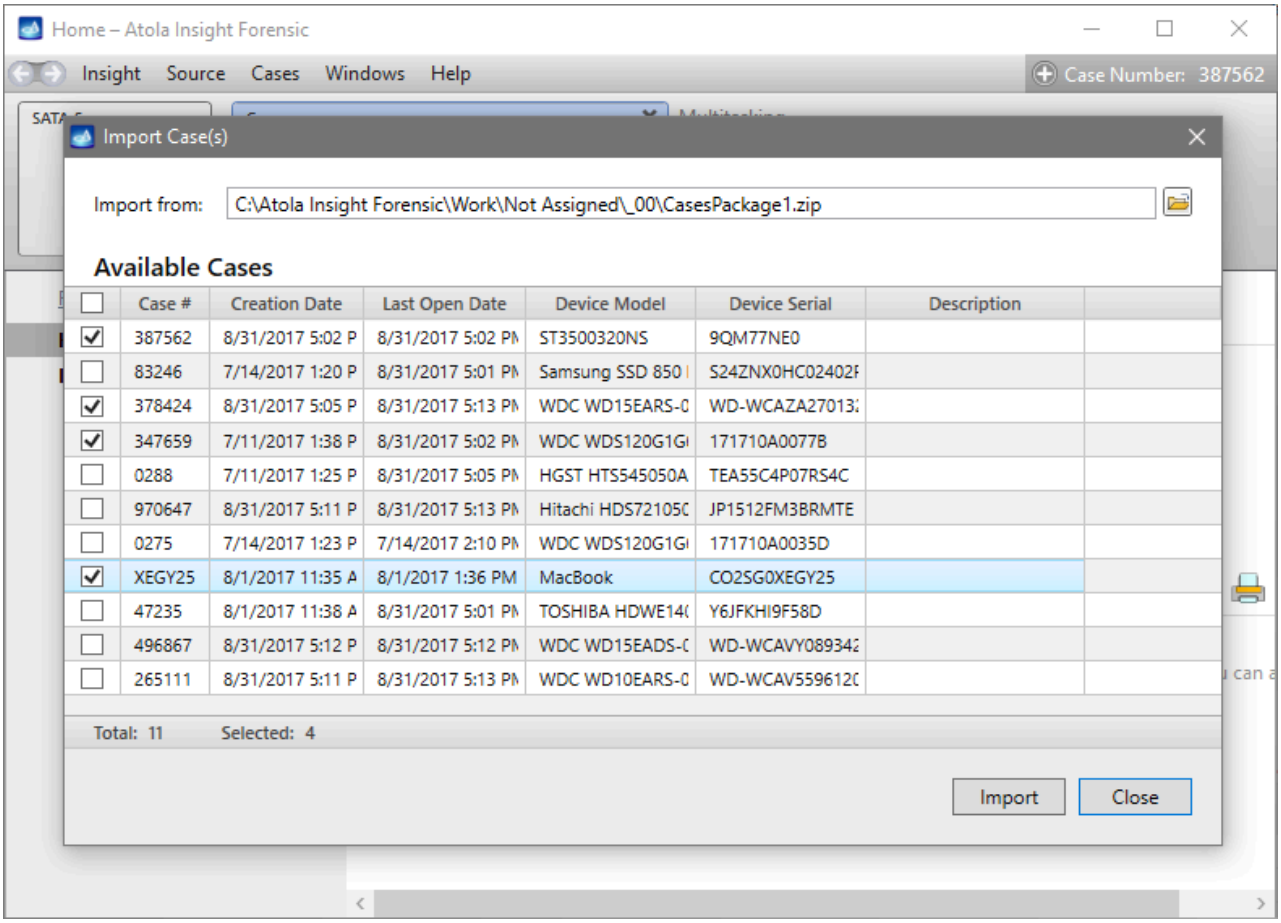
To import cases from a zip file into Insight on a different computer, do the following:

1. In the Menu bar, go to **Cases** > **Import** or press **Ctrl** + **I**.
2. Click the **Browse** icon and open the zip file with saves cases.



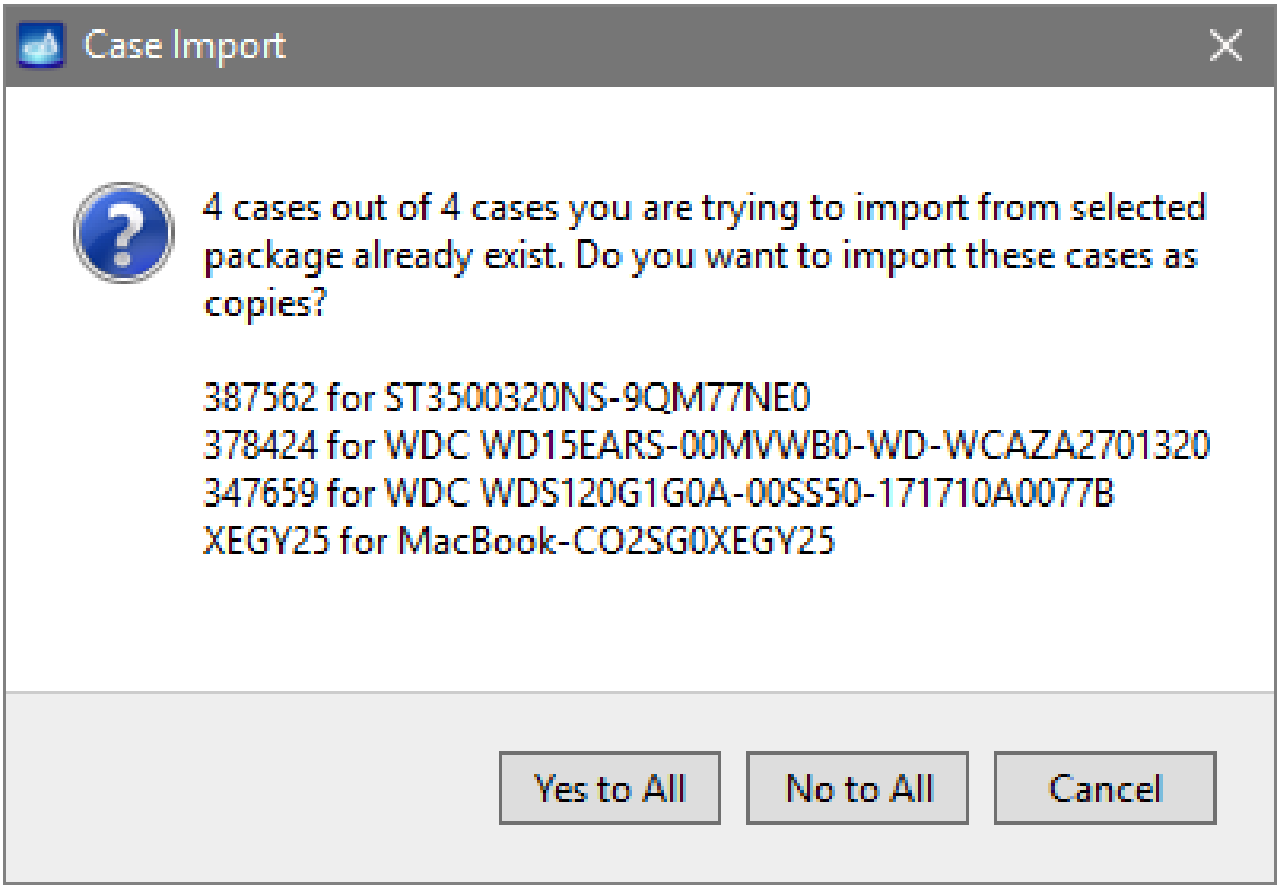
Importing cases

3. Select some or all of the cases in the table and click the **Import** button.



Importing cases selectively

If there is a match between existing case numbers and the imported ones, Insight will prompt you to either cancel the import or save the case that causes the conflict as a copy.



Ways to resolve import conflicts

FAQ and Troubleshooting

- General
- Hardware unit and installation
- Connectivity
- Drive ports
- Imaging
- Performance
- Damaged media & File recovery
- Diagnostics
- Hashing
- Fill/Erase

- Case Management
- Device Recovery

General

What is the advantage of using Atola Insight Forensic compared to other forensic imagers?

We produce the only solution that is specifically designed to support damaged media. Here is how it stands out:

Our users usually start with **automatic diagnostics** of an evidence drive. It takes a couple of minutes but saves a lot of time and energy. It detects drive issues such as PCB instability, problems with the motor, a short circuit, firmware errors, degraded or even non-working heads, and physical media surface damage. Based on the results, you can decide on the next steps for handling the evidence drive.

Even if you work with a severely damaged source device, the imaging engine enables you to:

- disable damaged heads
- automatically overcome much more serious problems than the so-called 'software bad sectors'
- track drive state before, during and after imaging
- have every imaging event logged in a forensically sound manner

Atola Insight has file recovery integrated with imaging. By browsing the target image directory tree, you can always see which source file sectors are bad sectors or even were read with the ReadLong ATA command (without ECC).

Last but not least, Atola Insight Forensic can clear any unknown ATA password from the hard disk drive in just a minute.

What are the PC requirements for Atola Insight Forensic?

Atola Insight Forensic software requires a Windows PC. More details are available in the Atola Insight Forensic Manual.

Does Insight utilize BIOS and/or operating system functions in the hardware unit to image data?

Insight's hardware runs a Linux OS with a highly-customized and fine-tuned kernel that allows the blocking of all BIOS and standard Linux I/O operations to enable the lowest-level control of SATA, USB and IDE ports.

Does Insight image mobile phones, tablets, IoT devices, etc.?

Atola products are designed to handle HDDs, SSDs and other detachable media. We have never developed our systems to support mobile devices like phones or tablets. This approach allows us to be the best at handling the media we focus on and progress quickly in developing high-performance imaging and innovative features for our customers.

Does Insight repair damaged drives?

Insight can handle damaged drives with varying degrees of success depending on the severity and type of damage, including:

- Degraded or damaged heads
- Drive freezing after a read attempt
- Scratches on the media surface

What are the advantages of Atola Insight Forensic compared to software data recovery tools?

There are several advantages. Let's take *ddrescue*, for example. Here are some of the functions that Atola Insight Forensic provides but *ddrescue* lacks:

1. For Insight, we have developed a functionality that specifically helps image freezing damaged drives.
2. Insight's diagnostics function identifies damaged heads, while advanced imaging settings allow head selection to perform imaging in a fast and, most importantly, careful manner to avoid causing further damage to the evidence drive.
3. Insight can image to multiple targets at the same time, including both hard drives and files.
4. Forensic procedures require hash calculation to be a part of the acquisition process. Insight has a very flexible hash calculation functionality: it can simultaneously calculate MD5 and SHA hashes of the source before, during or after imaging, and the target drive's hash can be calculated in conjunction with imaging or as a separate action. Additionally, Insight has the segmented hashing feature, which can verify an image of a damaged drive—something that is impossible with a standard linear hashing.
5. Built-in write protection.
6. Insight's in-depth diagnostics help identify the drive status and, based on that, the right way to handle the drive for successful data acquisition.
7. Insight's overcurrent protection detects when a hard drive draws an abnormal current and stops the hard drive to prevent any further damage to the system and the drive.
8. Insight's automatic password removal function can extract an unknown ATA password and unlock the drive in less than two minutes with just a few mouse clicks.
9. Locate Sectors finds the exact location of specific sectors and detects which files and partitions they belong to. On top of that, it gives you a list of files that were impacted by bad sectors.

- Firmware issues
- Magnetic layer wear
- Bad sectors (ECC errors)

Insight is equipped with various functionality for damaged media:

- Automatic checkup to identify the damage
- Complex multipass imaging algorithms
- Disabling damaged heads for faster and safer imaging
- Control of read look-ahead and other device features
- Calculation of segmented hashes for image verification
- Reset and power cycle commands for imaging freezing drives
- Overcurrent and short-circuit protection
- Bad sector recovery for sectors with damaged ECC fields

However, the system does not perform drive repair. We advise that a drive's hardware-related problems be referred to data recovery labs.

Is Atola planning to discontinue the support for DiskSense units (manufactured between 2014 and 2021)?

Both Atola TaskForce and Atola Insight Forensic are in high demand and have strong user bases. We are not planning to discontinue either of these imaging systems. We have several years' worth of exciting new features planned for both systems.

DiskSense hardware units (the first generation of hardware for Atola Insight Forensic imager) will continue to be supported in the foreseeable future and will include the same features as the new, higher-capacity DiskSense 2 hardware units.

We at Atola stand by our products. Remember that your system is covered by a lifetime warranty for as long as you keep your subscription active. The subscription's other benefits include software updates and fast and effective support from our team of engineers who develop the software and know all the ins and outs of the product.

These are just some of the key features that Insight offers. For more details, see the full product overview.

Hardware unit and installation

Why does my DiskSense hardware unit not boot?

It is very likely that there is a USB device plugged into the unit, which is preventing it from booting properly. Try detaching all USB cables and restarting the hardware unit. If that has not worked, follow these steps to fully reset:

1. Power the hardware unit off.
2. Detach any cables and devices (including PSU cable, Extension module, all SATA cables and any USB devices or cables).
3. Leave it powered off for 3-5 minutes to reset fully. A few internal circuits need up to a minute to fully reset, but waiting a bit longer may help.
4. Plug in only the power cable (do not connect network, USB, or SATA cables yet).
5. Power the system on and check the **Unit Status** LED on the back side of the unit after 15 seconds.

Why does Windows 10 (32-bit) show a hardlock.sys error during installation?

It looks like a HASP dongle run-time installation issue. You can install the newest run-time by following an alternative procedure:

1. Download the new HASP run-time version from this page.
2. Unzip it.
3. Temporarily disable firewall and antivirus.
4. Run Command Prompt as Administrator and change the folder to the one containing the downloaded file (from step 1).
5. Execute the following commands:
   ```
   haspdinst.exe -r -fr -kp -fss -purge
   haspdinst.exe -i -fi -kp -fss
   ```
6. Launch Atola Insight Forensic.

The previous boot attempt was interrupted and now the unit does not boot. What should I do?

Connect a monitor directly to the unit's HDMI or VGA port. If you see a BIOS message saying *Would you like to restore Fastboot on the next boot? (Y/N)*, it is likely that the previous boot was interrupted at a specific stage.

The most straightforward solution here is to plug a USB keyboard into one of the USB ports and press the *N* key. After the unit has booted successfully, please restart it again to make sure the next boot cycle is smooth.

Windows crashes with a blue screen when launching Atola Insight Forensic. How can I fix this?

Microsoft updated Windows 10 (October 2020), and it broke the support of the HASP run-time v6.60.

The issue was fixed in Atola Insight Forensic version 4.17. For software versions 4.16 and older, please download and install the newest run-time following these steps:

1. Download the newest HASP run-time version.
2. Unzip it.
3. Run and install *HASPUserSetup.exe*.
4. Launch Atola Insight Forensic.

Insight software is stuck in the 'Searching for the DiskSense unit' window. How can I solve this issue?

It appears that your unit's HASP is not detected. Please check if you can still ping the DiskSense unit's IP address from Windows PC. Then try the following steps:

1. Open http://localhost:1947 in a web browser.
2. Click **Configuration** in the left menu.
3. Click **Access to Remote License Managers**.
4. Enable the following two options:
    - **Broadcast Search for Remote Licenses**
    - **Aggressive Search for Remote Licenses**
5. Wait a minute.

The **Remote License Search Parameters** field must be either empty or contain the DiskSense unit's IP address (the latter is preferable).

How to fix an error "To run this application you must install .NET" (Insight 5.1–5.3 versions only)?

Atola Insight Forensic versions 5.1–5.3 are based on .NET 5. To resolve this issue, install the latest version of .NET 5 64-bit Desktop Runtime:

Download .NET Desktop 5.0.17

Connectivity

How do I reset the IP address of the hardware unit?

You can reset the DiskSense unit's IP address by holding the small **IP RST** button on the back. You should keep holding the button until the **UNIT STATUS** LED stops blinking. Then the unit's IP address will be reset to *192.168.0.188* and *10.0.0.188*.

How to change the hardware unit's IP address?

The system has been designed to work in the most commonly used networks and has the IP addresses *10.0.0.188*, *172.16.0.188*, *192.168.0.188*, *169.254.0.188*.

If your network uses one of these subnets (*10.0.0.**, *172.16.0.**, *192.168.0.**, *169.254.0.**), and the IP address ending in *188* is free, you can simply connect the unit to

I am able to ping the Insight's hardware unit but cannot connect to it. Why?

Here are the possible reasons:

- The unit has two Ethernet ports, but only the **ETH1** port can be used to interact with the Insight software. Make sure the Ethernet cable is connected to the DiskSense unit's **ETH1** port.
- Firewall or anti-malware software may be blocking communication (while ping might work, other ports could be filtered). Try disabling the firewall or anti-malware software and restart the Insight software.
- IP address conflict. Please double-check the IP address of your PC's Ethernet card. The fourth digit in it must be different from that of the DiskSense unit. For example, if the DiskSense unit's IP address is *192.168.0.188*, then the PC's IP

the network. Then run the Insight software, select the default unit IP ending in *188*, and click **Insight** > **Modify DiskSense Unit IP**.

If your network has a different subnet address, follow these steps:

1. Connect your PC to the DiskSense unit with an Ethernet cable.
2. Go to **Settings** > **Network & Internet** > **Change adapter options**.
3. Find the Ethernet connection with the unit, right-click it and click **Properties**.
4. Find **Internet Protocol Version 4 (TCP/IPv4)** in the list, select it and click the **Properties** button.
5. Select the **Use the following IP address** option, enter *192.168.0.5* and click **OK**.
6. Disable other Ethernet and Wi-Fi connections to avoid IP conflicts.
7. Change the IP address to the one you need.
8. If your PC and the unit belong to different subnets, the connection will be lost. Re-enable the connection in **Network and Internet**.
9. Connect the DiskSense unit to your network with an Ethernet cable and run Atola Insight Forensic.

I connected the DiskSense unit directly to my PC's second Ethernet card, but I cannot ping it or connect to it. What should I do?

First and foremost, check whether you can ping the unit when it is connected directly via your second Ethernet adapter.

1. If ping attempts are unsuccessful, double-check the IP address of the Ethernet adapter. It should be in the same subnetwork as the unit. The default unit IP addresses (if unchanged) are: *192.168.0.188*, *10.0.0.188*.
2. Check if you have another network connection and its IP address.
3. If another connection exists, assign a static IP address from a different subnet to the Ethernet adapter. address should be different—such as *192.168.0.100*.

- The HASP drivers have not been installed correctly. To verify this, visit the localhost:1947 page. (It may take up to 5 minutes for the HASP keys to appear after powering on the unit.) There is a HASP dongle inside the unit that the Atola Insight software connects to. If you do not see any HASP keys in the list, this indicates the problem. Rerun the installation and make sure to click OK in all pop-up windows as one of them should be the HASP installation. This step will only succeed if a HASP key appears in the web browser.
- The router or switch your unit is connected to may not be configured correctly, especially if it is a Wi-Fi router. Try connecting the unit directly to your PC using an Ethernet connection. You can use the USB-to-Ethernet adapter included in the package.

If these steps prove ineffective, try updating your PC's Windows installation.

How can I prevent connection losses when I use a USB-to-Ethernet adapter (NIC)?

Certain platforms may experience issues with these adapters, especially after large amounts of data have been transferred.

This may be a USB-related issue, for example, a memory leak in the USB driver that builds up after several days of high-speed transfers.

Try replacing the adapter with a similar one:

- ASIX AX88179 chipset
- aRTL8153 chipset

Examples:

- Other network card's IP address on your PC: *192.168.0.5* — set the IP address to *10.0.0.200*.
- Other network card's IP address on your PC: *10.0.0.5* — set the IP address to *192.168.0.5*.

4. Connect to the DiskSense unit by specifying its address in Atola Insight Forensic:
   - *10.0.0.188* — if you set *10.0.0.200* as the second Ethernet adapter's IP address
   - *192.168.0.188* — if you set *192.168.0.5* as the second Ethernet adapter's IP address

Drive ports

The USB flash drive or USB port is not working. What could be the issue?

It's very unlikely that your DiskSense system is faulty. Also, keep in mind that all USB ports are native to the motherboard, with no adapters in between. Nevertheless, let's run diagnostics to determine what is working and what is not:

1. Remove all USB flash drives.
2. Power-cycle the DiskSense system to reset USB ports to their initial state.
3. Take a new USB flash stick which is good and working.
4. Plug it into the **USB Target 1** port.
5. Press **F4** and wait until target device scanning is complete.
6. Plug the same USB flash drive into the **USB Target 2** port.
7. Press **F4** and wait until target device scanning is complete.
8. Plug the same USB flash drive into the **USB Target 3** port.

9. Press **F4** and wait until target device scanning is complete.
10. Plug the same USB flash drive into the **USB Source** port.
11. Press F3 and wait until source device scanning is complete.

This is a reliable test for checking USB ports. It would be great if you can run the scenario several times using different USB flash drives. Note that the second step (power-cycling the DiskSense system) is essential for accurate test results.

Imaging

Does write protection work only for SATA source drives?

Write protection works for all source ports: SATA, IDE, USB and extensions.

How do I image an NVMe drive?

The Insight hardware unit does not have an NVMe port. However, an adapter with the JMS583 bridge chip by JMicron has been tested on various NVMe drives and approved for use by our QA team. This NVMe-to-USB adapter allows imaging NVMe drives via any USB port.

However, the adapter does not support detection of the NVMe drive's model and serial number. You can enter these details manually when creating a new case or starting an operation:

1. To create a new case, in the menu bar, go to **Cases** > **Search/Open**.
2. In the **Source - Select NVMe Device Case** window, click the **Add new case** button and enter the device details. All reports for subsequent actions will be stored in this case.

Insight automatically opens the **Source - Select NVMe Device Case** window when you select a source or target USB port with the adapter plugged in to start a session

When should I use *All sectors with data* and *All sectors with metadata* imaging options?

These options define the scope of imaging.

All sectors with data is used to image only the sectors belonging to files of all detected partitions. The exception is partitions that Insight cannot parse (rare types, e.g. UFS, ReiserFS), which will be imaged in their entirety.

All sectors with metadata results in a complete directory tree with files without the file data. Partitions store metadata in specific structures (e.g. $MFT for NTFS). Metadata includes file name, access/modification timestamps, attributes and the exact sector numbers of the corresponding file data.

This screencast explains how to make use of metadata imaging.

How do I create or format an NTFS partition on a target drive?

Insight supports creating exFAT partitions (including encrypted ones) on target drives for subsequent imaging to files stored on them. However, creation or formatting of NTFS partitions is not supported.

(imaging, hashing, wiping, etc.), except diagnostics. The automatic checkup works at a low level: it identifies the adapter and runs NVMe drive checks through it.

How do I image a drive soldered into a laptop?

You can add up to 3 remote network drives simultaneously and image them in parallel using the iSCSI protocol.

To image a remote device via the iSCSI protocol, follow these steps:

1. Expose a physical or logical drive via iSCSI on a network. For that task, you can use our Python script that automatically creates iSCSI targets for all drives except the boot device.
2. In Insight, go to **Source** > **Select Source**.
3. In the Source Device Selection window, click the **Add iSCSI device link** and follow the instructions.

Insight also supports imaging of specific models of MacBooks Pro and Air released in 2016-2017. Here is a manual article on how to image them using a Thunderbolt extension.

Why could the mapped network drive be unavailable during Image File selection?

The shared folder mapped as a network drive on the local PC is unavailable. This issue occurs in Windows 10 and is caused by Microsoft's native components we use to select files.

Microsoft explains this with UAC being enabled and suggests editing the Windows registry as a workaround.

Note that the mapped network drive is just a shortcut for the longer network path. Always select the **Network** part of the tree view and choose the same network folder. Insight will remember the last selected path and open it when you select another image file.

How do I ensure that *Target HEX Viewer* does not save any data to persistent storage?

Here is how **Target HEX Viewer** works internally. It has two modes:

1. **Automatic refresh** is performed when **Freeze** checkbox is inactive. Every time a block of data is imaged, one sector from this block is sent to the Windows software via Ethernet. Insight's software receives the sector and displays it in the **Target HEX Viewer** wiping the previous one. Thus, it performs an automatic refresh on-the-fly and does not save any data to persistent storage (e.g., a hard drive).

2. **Manual Read Sectors** can only be run by clicking on the **Read Sector...** button. This initiates the reading of a specified sector from one of the target devices. The read sector resides only in RAM temporarily while it is displayed in the **Target HEX Viewer**. Similarly to the **Automatic refresh**, no data is saved to any persistent storage during manual read sectors.

Will an E01 file created by Insight open in Encase?

E01 files may fail to open in Encase typically due to a file handle held by Insight. It can manifest itself in CRC errors during Encase verification. To resolve this, close the E01 file's port in the Insight's top panel before opening the file in Encase.

Note that Encase caches unsuccessful verification results for the E01 file (or E01 file with the same metadata). Therefore, you may need to clear the cache or start a new case in the EnCase application.

How to solve an issue with the max path length / folder length?

Make sure that the path length does not exceed the limit set in Windows API.

Atola Insight supports file paths up to 32,767 characters in length.

How do I image into split (segmented) raw files?

Segmented imaging into RAW files is supported. You can split the image into segments (chunks) on the home page of the target image port. Follow these step-by-step instructions:

1. In the sidebar, click **Imaging**.
2. Click **Create New Session**.
3. In the **Target device selection** window, click **Create image file**.
4. Click the **Select** button.
5. On the top port panel, select the **Image file** port.
6. Click **Edit file options**.
7. Change **Chunk size** to a preferred value in the combo box.
8. On the top port panel, select the **Source** port.
9. Click the **Start Imaging** button.

What is the difference between a standard IMG and a preallocated IMGP image file?

An IMGP file's contents are identical to those of an IMG file: it is the same raw bit-for-bit source copy. The only difference is that Insight preallocates space within an IMGP file, filling it with zeros until the last LBA, so that the IMGP file is the same size as the source even before imaging begins.

An IMGP file is used to preallocate space on the target media. Our customers use it when storing image files on a remote server for the entire organization. This ensures that, as the image file grows to its final size, there will be no risk of running out of space.

To mount it to any other forensic software, one can just change IMGP target file image extension to .img, .dd, .raw or any other file extensions they want.

To continue working with an IMGP file in Insight after changing its extension, change the image file extension back to .imgp.

If you are unable to move the files using Windows Explorer, you can use the `subst` command to shorten the file path. Follow these steps to resolve the issue:

1. Substitute the folder that has a long file path with a drive letter to shorten the overall character count for the files contained in the folder.
2. Copy or move the files to a different folder with a shorter path that does not exceed the Windows path length limit.
3. Delete the mapped folder.

Why does the artifact finder not find artifacts in files (.pdf, .pst, .docx, etc.)?

Artifact finder performs a low-level, sector-by-sector search without parsing file structure or interpreting specific file formats (.pdf, .pst, .docx).

Instead, Insight's search engine detects keywords, IP addresses, URLs, and other artifacts in raw drive space. This way, it complements the traditional analysis via Magnet AXIOM, X-Ways Forensics, etc.

Another benefit of Insight's artifact search is that it scans the entire drive, including unallocated space. It helps find evidence at the sector level, where other tools could miss it.

Why does a USB drive imaging produce read errors?

To rule out cable issues, consider using short, high-quality USB 3.0 cables. Longer or lower-quality USB 3.0 cables may cause read errors during acquisition.

Performance

How do I achieve the best performance when imaging to the network?

To avoid potential bottlenecks, make sure of the following:

- You are using a 10Gbit Ethernet adapter.
- All the network cables are 5e category or higher.
- The network switch supports 10Gbit Ethernet and is configured correctly (if Insight is not connected directly to a PC).
- For maximum performance, connect Insight directly to the PC's Ethernet adapter without intermediate network switches.

Other factors that could affect transfer speeds are network adapter drivers, motherboard drivers, antivirus software and so on. However, following the guidelines above is sufficient for most cases.

Does Insight always image at the max speeds listed on this website?

The max speeds have been lab-tested for accuracy on modern storage devices.

However, actual imaging speed depends on the native performance of the devices involved. During the drive-to-drive imaging, the slower device will determine the actual data transfer rate because one drive can only receive data as fast as the other can send it, and vice versa. When imaging to or from the network, another potential bottleneck is the bandwidth.

How much does data transfer speed vary during imaging?

Insight can reach speeds of up to 500 MB/sec, but speeds may drop to as low as 50 MB/sec (3 GB per minute) when working with older or slower HDD models.

How do I verify the data transfer rate from Insight to the network?

Follow these steps:

1. Launch Atola Insight Forensic software.
2. Connect a fast SSD (e.g. Samsung 860 PRO/EVO or any other that can image at 500+ MB/sec) to the SATA Source port of the DiskSense unit.
3. Go to **Imaging** and select the **Imaging to File** option.
4. In the file selection dialog, enter ***null*** file name. This special file name will make Insight read the source at the highest possible speed and skip writing, so that target write speed does not affect the measurement, while data is still transferred through Ethernet.
5. Start imaging.

If everything is working properly, the speeds will be between 50 MB/s and 500 MB/sec, depending on the native speed of the source drive.

Damaged media & File recovery

You claim that Atola Insight Forensic is capable of imaging even bad drives. What does a bad drive mean?

By bad drives, we imply various types of drive issues, namely:

- Scratches on the media surface
- Magnetic layer wear-out
- Degraded or even non-working head
- Drive freeze after reading attempt
- Firmware issues
- Bad sectors
- Short circuit on PCB

How exactly does the Atola Insight imaging process handle damaged drives?

We have two goals here when dealing with severely damaged source drives:

1. Get as much data as possible.
2. Decrease the number of failed read attempts to finish imaging with a still-alive evidence drive.

Atola Insight Forensic uses a fast imaging map, thereby enabling us to run the whole process in multiple passes. The tool uses large blocks with short time-outs on the first few passes and then smaller blocks with longer time-outs on the last pass to image the tough areas. This provides the best possible results in the shortest amount of time.

Atola Insight's ability to disable damaged heads can save your evidence! Other imagers may cause further damage to the media during such imaging.

Imagine having seven out of eight good heads. You can image data with all of them except the damaged one. Afterward, you can begin analysis of 87% of the acquired data and at the same time try to replace the damaged head. A physical head swap is always a risky endeavor.

How do I identify which of the imaged files contains bad sectors?

1. Select the target device or image file. Alternatively, on the **Imaging results** screen, click the **Analyze target image** button.
2. Go to **File Recovery** and open the partition.
3. Click **Create file list** and select **All files**.
4. Select **Files that were partially imaged** and click **Create** for the list to be saved in a .CSV file.

NB *If the imaging session was interrupted or the range of sectors scheduled for the session did not cover the whole partition (and therefore some of the files), the list of partially imaged files may contain both files with bad sectors and those not covered by the imaging session.*

How do I find where the bad sectors are located within a file?

When imaging, Insight automatically creates a **Media Map** that reflects the status of all sectors imaged during a given session, namely:

- imaged sectors
- unimaged sectors (with errors or those beyond the imaged range)
- sectors imaged without ECC

To look up the Media Map:

1. In the **Imaging results** screen, click the **Analyze target image** button. Or select the target device or file.
2. Go to **File Recovery** and open the partition.
3. By clicking the individual files, look up an individual **File Map** and see which of the sectors have or have not been successfully imaged.

The imaging engine contains multiple automatic rules. For example, it resets or power-cycles the device when a source drive freezes. It can apply a reverse imaging direction in particular cases. A helpful feature when working with damaged evidence is that two imaging reports are generated: one before and one after the process. Both include not only the imaging information but also SMART tables, thus enabling you to see what happened to the source drive during the process.

Learn more in these articles:

- Multipass imaging of damaged drives
- Imaging drives with damaged heads
- Imaging freezing damaged drives
- Imaging a shorted drive

Does Insight support damaged SSD drives?

Atola Insight Forensic does support damaged SSDs. It can automatically diagnose SSDs and generate a detailed, well-structured report. Insight's imaging process can retrieve all readable data from solid-state drives using multipass and read error recovery subsystems. It's fair to say you receive pretty much the same functionality as with standard HDDs. The only exception: unknown password removal and firmware recovery are not supported for SSDs.

In addition to that, Insight Forensic supports custom PCIe SSDs from Apple MacBooks. It works fast via a proprietary Atola extension.

Can Atola imagers acquire evidence from damaged SSDs?

As is true with any type of media, the degree of damage will inform how we can help with data recovery from a specific device. SSD failures fall into three major categories: logical errors, hardware issues, and firmware failure.

Atola imagers may be able to image data from an SSD with logical errors or hardware issues (e.g. NAND flash wear-out) using our multipass imaging system. A good

When encountering bad sectors on the source drive during imaging, how does Insight handle the corresponding sectors on the target drive?

Such sectors can be either left alone (skipped) or filled with a pattern. The default pattern used to fill unreadable sectors is *00*. However, you can enter any other pattern or load a pattern (of any length) from a file. To use this option:

1. Go to **Imaging** > **Create New Session**.
2. Select your target device.
3. On the imaging settings screen, in the **Preset** section, click the **Show settings** link.
4. On the **Error handling** tab, select the **Fill unreadable sectors with the following pattern (HEX)** option.
5. Leave the default pattern as it is or enter/upload a new one.
6. To make this new pattern the default one, click the **Save settings** button. Otherwise, simply click the **Start imaging** button.

How do I compare the files on a source and a target using their hashes?

To compare the files on the two devices:

1. Select the **Source** device.
2. In the sidebar, go to **File Recovery**.
3. Click **Hash all files**.
4. If the hash column is missing, enable it in **Preferences** > **File Recovery**.
5. Select all files.
6. Click **Create file list** and select **All files**.
7. Select the **Show file hash** option.
8. Repeat steps 1-5 for the target drive.

predictor of success can be the Media Scan stage of the diagnostics process.

What is the success rate of File recovery?

You can recover up to 100% of files imaged with Insight only if the internal file system structure has been successfully imaged. Follow these steps:

1. Select an acquired image on the **Target** port.
2. Go to **File Recovery**.
3. Try to open all the imaged partitions.
4. If partitions do not open, use dedicated DR software to recover the files (e.g. R-Studio).
5. If the partitions do open, you have two options:
    - Select and recover all files. Then use the **Create file list** button to generate a list of partially imaged files.
    - Alternatively, manually select all files with *100%* values in the **Copied** column. Some hints for you:
        - By sorting the files in the **Copied** column you can group 100% of imaged files from a specific directory.
        - Selection of multiple objects is available.

Can you recover data from a deleted file?

Even if a user deletes a file from a computer or even the Recycle Bin, it does not mean that all file data has been erased from the drive. While the record of the file in the filesystem has been removed, the data from the file remain in the sectors to which it had been recorded.

However, over time, the old data may be overwritten with new files and their data. Therefore the more the drive is being used, the lower the likelihood that data from a deleted file remains intact.

Here is how Insight can help retrieve this data

In the end, you get two complete file lists and can compare them using third-party software, for example Compare++.

How do I use black and white hash lists to filter data?

Watch this screencast about using hash lists in Insight.

For the full step-by-step guidance, see Hash lists to filter good & bad files.

Also, you can find two use cases in White/Black hash lists section in our blog.

When should I use the reverse imaging option, and is there a downside to it?

Normally, reverse imaging is beneficial when there is a spot/scratch resulting in a number of bad sectors on the surface area. Reverse imaging (from the inner to the outer tracks) on one of the imaging passes helps you narrow down the bad area faster. It also allows you to get more data from the good areas of the drive before entering the damaged zone and digging into it to retrieve data.

As for the downsides, reverse imaging leads to a speed decrease because HDD's heads have to make additional moves to perform it, and caching is impossible.

How do I change timeout in the imaging settings on-the-fly?

Changing timeout is only possible when you are creating a new session. Here is how to work around it:

1. Pause the current imaging session by clicking the **Pause** button.
2. Click the **Add New Session** link.
3. Open imaging settings and change timeout of the following pass(es).

***NB** The new imaging session will complement the previous one and will only attempt to retrieve data from the sectors that have not yet been copied.*

If you know any details from the file contents, search for keywords or other artifacts in Insight's Artifact Finder. Unlike most other forensic analysis tools, Insight's Artifact Finder parses data not on the file system level but on the sector level. This gives you the advantage of finding data from deleted files.

The File Recovery module can recover deleted files in these file systems: NTFS (all versions), FAT16, FAT32, HFS, HFS+, HFSX.

Modern SSDs wipe the sectors belonging to the deleted files at the command of an operating system (Windows, Linux, macOS) shortly after the files have been deleted:

1. The operating system sends the Trim command to the sectors belonging to the deleted files.
2. The SSD controller decides when to wipe them.
3. The trimmed sectors are replaced by new ones from the over-provisioning zone.
4. Trimmed sectors are then shortly used for new data.

This means that SSDs provide a much lower chance of recovering such data from deleted files.

Does Insight support mounting of a damaged APFS partition?

Partition search in Insight is quite advanced; it is more than just looking into MBR/GPT records and involves our unique heuristic algorithm.

It means that Insight should be able to find a partition, and the partition should not be damaged. For cases of damaged partitions, our customers use forensic software that performs file carving or DR software (e.g. R-Studio).

The only File Recovery functionality that works when there is missing data is the ability to find deleted files in several partition types including NTFS, HFS, FAT.

Some imaging pass settings can be adjusted on the fly—for example, enabling reverse imaging for the next pass.

How do I look up a drive's G-List with Insight?

Firmware recovery has not been our focus for many years now; therefore, Insight has limited firmware recovery functionality. While some models may provide information about the G-List (see 3. Full firmware access), the G-List is not a kind of information you automatically see on the screen. You would need to manually find the G-List among firmware modules, which requires a certain level of data recovery knowledge.

Can I turn off bad sector reallocation (or clear the G-List) for a Seagate drive?

Unfortunately, Insight does not handle bad sector reallocation automatically. You may find more info on data recovery forums by searching for:

- your Seagate drive model
- G-List cleaning
- bad sector reallocation

Here is the information about terminal commands for modern Seagate drives.

What should I do if Insight can't identify a Seagate drive and shows an inaccurate device capacity?

Zero-capacity typically implies firmware issues, which may be corrected via the serial port in the case of Seagate drives. Atola Insight Forensic enables you to take advantage of a serial connection.

We do not have many guides about fixing specific Seagate issues, which would require extensive knowledge of the Seagate terminal command system. But here is another article in the manual that may be helpful.

Diagnostics

How does diagnostics work, and how accurate is it?

The automatic diagnostic function applies a sophisticated system that analyzes electrical currents as they enter and leave the hard drive, examines the hard drive's responsiveness to low-level commands and incorporates firmware information (if it is accessible). Our studies have shown that this approach is accurate in pinpointing malfunctions in at least 95% of cases.

How do I analyze electrical currents from the oscilloscope if I received no training?

Some data from the oscilloscope is straightforward to understand (for example, when HDD power fails, the lines go flat). Users can learn to understand more complex oscilloscope information by seeking advice from other data recovery technicians, seeking professional training, or simply by gaining experience in the field.

While current monitoring technology plays an important role in Insight's operation, no specific skills are required because the system performs current analysis automatically.

How does Insight detect the capacity of hybrid drives?

There are two types of hybrid drives.

1. *Dual-drive hybrid systems*. In this case, Insight shows the total capacity, which is the sum of the volumes of both drives. All sectors are addressable and readable.
2. *Solid-state hybrid drive (SSHD)*. For such drives, Insight detects and displays only the capacity of the HDD because the internal SSD is designed to be inaccessible without a chip-off procedure. Hybrid drives of this type use NAND memory (small SSD) for cache. The cached data resides in both the HDD and the NAND chip. What is cached

Can RAID arrays be diagnosed as a single HDD?

Insight can diagnose only the drives that are directly connected to the hardware unit. Hard drives from RAID arrays must be diagnosed and recovered individually.

Atola TaskForce is capable of automatically assembling RAID drives into a single virtual device even when the RAID configuration is unknown.

Why is there a difference in the quantity of errors and performance between Media Scan and Imaging?

The short explanation: Imaging uses different commands and a different level of reading thoroughness than Media Scan.

Imaging reads data and sends it over a data cable (SATA, PATA, USB). At the same time, Media Scan utilizes a low-level Verify command that checks a block of sectors for an error with no data transfer involved.

The two operations are not equally thorough. Media Scan verifies the drive surface block by block (2048 sectors per block). It does not dig in searching for specific bad sectors in a 2048-sector error block.

As opposed to that, the imaging engine has a goal to image as much data as possible. The multipass system is used during imaging.

However, if linear hashing is enabled, imaging switches to one pass with a 4096-sector block size by default using this algorithm:

1. Read 4096 sectors.
2. If a read error occurs, re-read the sector range using a 256-sector block.
3. Read the first 256 of 4096 sectors.
4. If there is a read error, re-read the 256-sector range sector by sector.
5. Read the first sector of the 256 (within the original 4096).

and how it is cached depends on the drive model and firmware algorithms.

Hashing

How do I calculate a hash during imaging, and do I need to use both linear and segmented hashing

Hashing is disabled in the default settings. Select the **Hash source during imaging** option in the **Default (5 passes)** preset.

Here are the guides on calculating linear hash during imaging and segmented hashing.

Segmented hashing is the only tried-and-tested way to verify an image of a damaged source drive. A segmented hash can be calculated during multipass imaging, which lets you retrieve more data while covering all imaged intervals with a set of hashes,—an ability that has proven crucial for our customers in court.

Besides, with segmented hashing, the image remains usable even if some of the data gets corrupted over time (due to human error, buggy software, hardware issues or power loss): it allows you to identify the segment of data that was corrupted and continue using the good parts of the image

Do courts of law accept segmented hashing as a valid way of verifying data?

Yes, segmented hashing has been a principle that forensic examiners successfully follow in their work. This principle is well laid out in academic works and is also widely used in cryptography and secure data modification. Meanwhile, in digital forensics, several vendors who support AFF4 image files have adopted the same principle. Among them are X-Ways, Magnet Axiom, GetData Forensic Explorer, Encase Forensic, etc.

Most importantly, with the forensic examiner's proper understanding of the concept and ability to demonstrate it to the court, segmented hashing is as good a

How does hashing work in parallel with imaging?

When Insight images and calculates hash in parallel, here is how our imaging engine works:

1. Read *block A* from the source to RAM.
2. Hash *block A* + Write *block A* to the target + Read *block B* from the source - all these three actions execute in parallel.
3. Hash *block B* + Write *block B* to the target + Read *block C* from the source...
4. and so on

Two important rules:

- If *read* block fails with an error/timeout, the block is replaced by an unreadable pattern (it can be set by the user).
- If *write* block fails, Insight stops imaging and reverts the *hash* state one block backwards.

verification method as any.

Fill/Erase

Why do I need to wipe/erase the target before imaging data onto it?

Certain forensic evidence acquisition or data recovery scenarios require the target hard drive to be wiped/erased prior to imaging. It ensures that the software being used to recover files won't extract old data that was previously on the destination HDD.

How does *write verification* work in Fill/Erase?

Here is how the algorithm works during the wiping process in Insight:

1. 100 individual sectors selected evenly across the range are filled with the verification pattern *Atola Insight*.
2. The whole drive or a selected range of sectors on it are wiped applying the method selected by the user (*Erase with pattern* by default).
3. The 100 sectors filled with *Atola Insight* during the first step are read to ensure that none of them contains the pattern.

How does SSD Trim work and does it wipe a drive completely?

SSD Trim doesn't instantly wipe sectors (NAND memory cells) of a drive. It instructs the SSD's firmware which sectors can be wiped by marking them as '*dirty*'.

Time of erasure of '*dirty*' sectors depends on the SSD manufacturer and firmware. For instance, recent Samsung SSDs have what is called foreground garbage collection. It wipes any erased file almost immediately thanks to a TRIM command proactively executed by the operating system. In older SSDs, trimmed sectors can remain intact for minutes or even hours.

The most secure way to erase an SSD entirely is running *Secure Erase*, which is available in Insight as a method of Fill/Erase. The drive's internal *Secure Erase* implementation is vendor-specific. In most drives, it ensures the full erasure of an SSD, including non-addressable areas.

Case Management

How do I change the path to the Work Folder?

To change the path to the **Work Folder**, go to **Insight** > **Preferences** > **Work folder path**, change the directory and click the **Apply** button.

How do I add notes to the case history after a case was closed?

The quickest and easiest way is to open case history **Cases** > **Search/Open** and click **Add note**.

How do I free up storage space in the Work folder?

Depending on the features and settings you use, Insight saves different kinds of data in its **Work Folder**.

- Make sure to disable an on-the-fly artifact search in the imaging settings. Storage space is consumed most aggressively when artifact search is enabled. When artifact search is enabled in the imaging settings, you may be gathering and storing substantial amounts of data.
- The same goes for File Signatures. Disabling this setting results in much less data being stored, yet it may accumulate and become considerable over time. This setting can be disabled in the Miscellaneous tab of the imaging settings.
- Last but not least, if you no longer need the results of a previously performed artifact search, you can delete all *ArtifactFinder* subfolders to free up space. *ArtifactFinder* subfolders are located at paths similar to this: *C:\Atola Insight Forensic\Work\02_ST1500DM003\ArtifactFinder*, where:
    - *C:\Atola Insight Forensic\Work* - work folder path
    - *\02_ST1500DM003* - device case subfolder

After I changed the Work folder, how do I move files from the previously created cases to the new folder?

This can be done manually:

1. In the top right corner, click the **Case Number** button.
2. The **Change Case Details** window opens. The **Case Home Path** in it indicates the directory where case files will be moved.
3. Click **OK**. The **Case Home Path** has now been changed in the database and all case files have been moved to the new case folder.

How do I copy Insight database to another PC?

Yes, it is possible: go to **Cases** > **Export** and select **All cases**. A single file will be generated, which can later be imported via **Cases** > **Import**.

Why are some cases missing in the Search window after database setup?

Most likely, you selected either an incorrect Work Folder or SQL Server.

Insight's database consists of SQL Server data and Work folder files. Large files like imaging maps, file signatures, artifacts and report logs are saved in the Work folder, while the case information, including report data, is stored on the SQL Server.

Two Insight settings refer to that:

- Work folder
- Database connection settings

\\networkpath\Atola is the work folder we need. First of all, it must be specified in **Insight** > **Preferences** > **Work folder path setting**.

1. Open **Insight** > **Database Connection Settings**.
2. Select server type: **Remote** (in some cases, it can be **Local**).
3. Enter the **Computer name** from the work folder's network path.
4. Click the **Search** link next to the **SQL server name** field.
5. Select one of the found SQL servers.
6. Click the **Search** link next to the **Database name** field.
7. Select one of the found databases.
8. Click **OK**.
9. Restart Atola Insight Forensic software.
10. Check **Cases** > **Search/Open** for your cases.

How can I tell who worked with the drive if I am working on a previously created case?

You can open any operation performed with a hard drive by clicking on the corresponding link in the case history. In the report header, you can see which computer was used, and thus deduce which user worked on this phase of the case.

Can two hard drives share the same case number if they are related?

Yes, it is possible to assign the same case number to multiple hard drives. It helps keep track of hard drives related to the same investigation.

If cases do not appear, try different combinations of the database name, the SQL server name, and the computer name.

Device Recovery

I don't seem to be able to unlock an SSD or a USB drive with Insight. What could be the issue?

Insight supports unlocking passwords of a limited range of drives. While we would like to provide you with maximum support, it is impossible due to the firmware of different drive families being very vendor-specific. Please check the list of supported drives.

We have primarily developed this functionality for hard drives, but extending this functionality to SSDs or USBs would require a prohibitive amount of work to support the huge range of firmware types and controllers. Unfortunately, this functionality has not been the focus of our attention.

How do I decrypt a BitLocker volume in Insight?

For the time being, Insight supports only the decryption of APFS partitions with a known password or recovery key.

I'm having trouble unlocking the Seagate drive connected to the Serial COM port (RS-232). What could help?

First and foremost, we recommend double-checking that the serial cable connection and selected baud rate are correct. Here is the easiest way:

1. Power off the Seagate drive.
2. Connect cables.
3. In Insight, open **Windows** > **Terminal**.
4. Select baud rate: 38400 (most likely for modern drives)
5. Power on the Seagate drive.

As for BitLocker partitions, Insight detects BitLocker volumes and displays their GUID and type during imaging and diagnostics. While imaging, Insight immediately adds a log record with the start LBA of a BitLocker volume when encountering it.

Password removal: How do hard drives become locked with ATA passwords?

ATA password can be set through the computer's BIOS. In addition, specialized utilities—both commercial and freeware—can set or modify ATA passwords. Examples include commercial tools like Insight, as well as free utilities such as hdparm (Linux) and Victoria HDD (Windows). These tools communicate directly with the drive's firmware, allowing users to set, change, or remove ATA passwords outside of the BIOS environment.

Password removal: For which hard drives is password removal supported?

Automatic password removal is supported for at least 50% of hard drives available on the market. For details about specific models, see Supported drives.

Can Atola imagers retrieve data from water-damaged hard drives?

Depending on many factors, the impact on the drive can vary considerably. The kind of contact (which can range from sprinkles to complete submergence), the duration of such impact and even the composition of the water (if there is residue in the form of salts) all matter. Additionally, the disk might have been damaged before the drowning, so water may not be the only problem.

Therefore, we recommend that you bring such drives to a cleanroom. At the cleanroom, engineers will perform drying, the initial damage assessment, repair, and cleaning. When drying, it's better to keep the temperature at a reasonable level, such as 100-200 degrees Celsius. Do not heat the PCB to the point where the solder or plastic starts to melt.

Firmware recovery: Which hard drive models does the Insight support firmware recovery for?

There are two ways in which Insight provides firmware recovery: by automatically repairing firmware and by providing direct access to firmware files for manual repair.

Different sets of hard drive models are supported for each of these approaches due to differences in the firmware design by the hard drive manufacturers. For a complete and up-to-date list of supported hard drive models for firmware recovery, see Supported drives.

Firmware recovery: How common is firmware corruption in modern hard drives?

Less than 10% of data recovery cases with modern hard drives involve firmware corruption. Occasionally, a manufacturer will release a hard drive with flawed firmware, and data recovery labs will see a spike in firmware recovery jobs for a period of time.

Firmware recovery: What is the difference between firmware files stored on the HDD platter and those stored in ROM/EEPROM/NVRAM?

This depends on the HDD manufacturer and hard drive model. Each hard drive has its own specifications for where firmware data is stored.