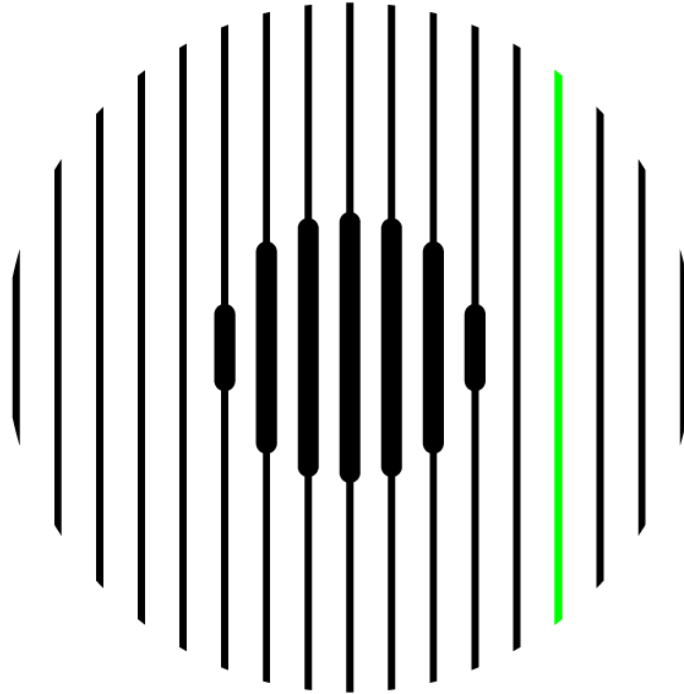


SentispecTM



Data visionaries

Inventory Operation Manual

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1 Purpose and Scope

This document focuses on how to setup, operate and troubleshoot the Sentispec Inventory recording unit (the recording unit) that can be seen on Figure 1-1 - Recording unit.



FIGURE 1-1 - RECORDING UNIT

2 Recording Unit Preparation and Recording

2.1 Pre-conditions Before Commencing the Stock Take

2.1.1 Charging the Recording Unit

1. Insert the power cable into the power port on the recording unit. See Figure 2-1 - Powering the system
2. Charge the recording unit for up to 6 hours depending on the level of discharge.
3. Once the recording unit is fully charged the battery display will show full: A green bar to the far right. See Figure 2-2 - Charge indication.
4. Disconnect the power plug and ensure that the system is fully charged before commencing a stock taking operation.



Power cable



Recording unit power port

FIGURE 2-1 - POWERING THE SYSTEM

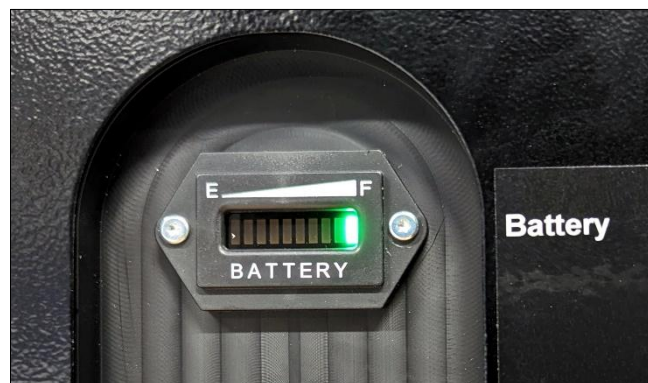


FIGURE 2-2 - CHARGE INDICATION

2.1.2 Safety Instructions

Sentispec ApS cannot be held liable for any incidents occurring during the use of the Inventory solution. Therefore, it is recommended for your safety to:

- Ensure that the area surrounding the recording unit is safe, prior to loading it onto the reach truck.
- Ensure that the pallet with the recording unit is placed at a point closest to the reach truck and farthest away from the tip of the forks, to avoid dropping the recording unit when recording.
- Ensure that the reach truck forks are level to avoid the recording unit from sliding off.
- Ensure that the pallet with the recording unit is safe to use in the Inventory Automated Stock Taking recording process.
- Ensure that the safety wire is attached around a solid piece of metal, once the recording unit has been loaded onto the reach truck, see Figure 2-3 - Safety wire.

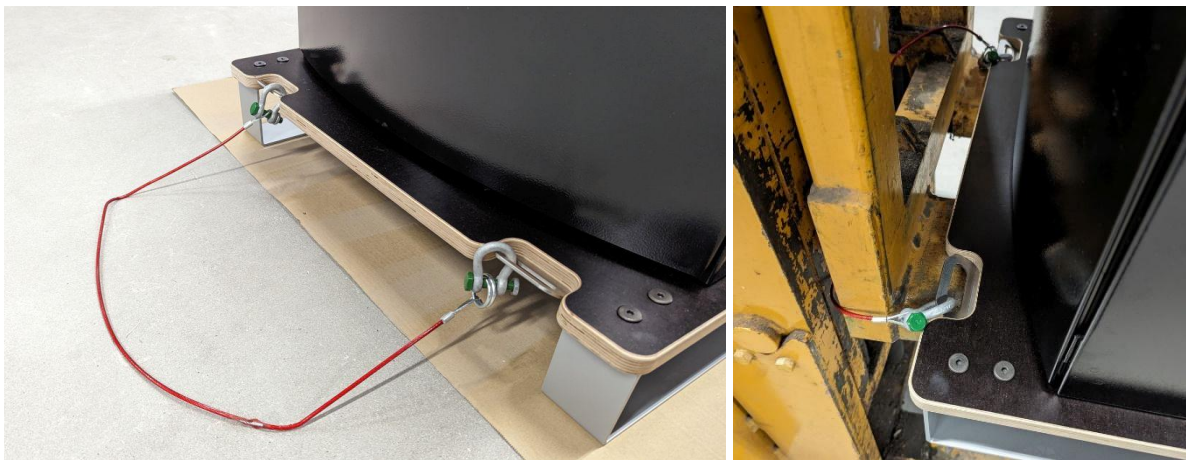


FIGURE 2-3 - SAFETY WIRE

- To ensure safety and risk mitigation while recording, it is advised that aisles which are being recorded are temporary blocked by the Quality Assurance (QA) / Inventory Management team during recording, if it is used during operational hours. This precautionary measure aims to prevent potential hazards while recordings are in progress. Aisle blocking refers to intentional obstruction of walkways, pathways, or aisles, safeguarding the well-being of your employees, visitors, and valuable goods.

Note: It is recommended to document the Inventory Operating Procedure for the usage of the recording unit for inventory management and stock taking.

I/O port and switches - rear		
	Battery	Battery charge status
	Light & Laser	Turns ON/OFF guide lasers and camera light
	Ethernet	Ethernet Network port
	USB	USB 3.0 port for barcode scanner or other peripherals
	Mini DisplayPort	Port to connect an external monitor
	ON/OFF	Turns on and shuts down the recording unit
	AC IN	Power inlet – connect power cable to charge the recording unit. See Product Label below for power specification.
I/O port and switches - top		



FIGURE 2-4 - I/O PORT AND SWITCHES

2.2 Planning the Recordings

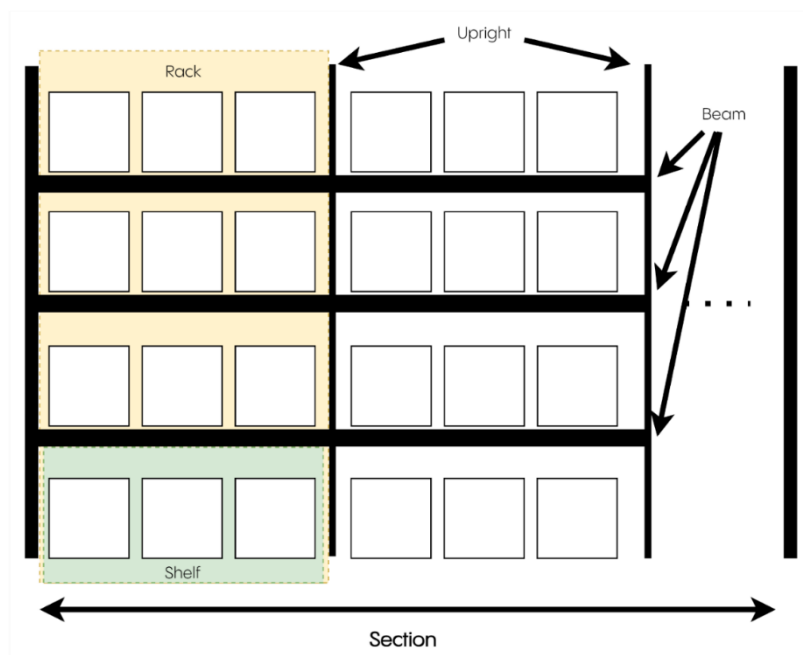


FIGURE 2-5 - RACKING SYSTEM LAYOUT

When planning a set of recordings there are several factors to take into consideration. If thru/arches are aligned with the beams on the shelves next to the thru/arch, then the entire section can be recorded in one recording otherwise it has to be broken up into one recording per section, see Figure 2-5 - Racking system layout and Figure 2-6 - Recording aisle with misaligned shelves on thru/arch.



FIGURE 2-6 - RECORDING AISLE WITH MISALIGNED SHELVES ON THRU/ARCH

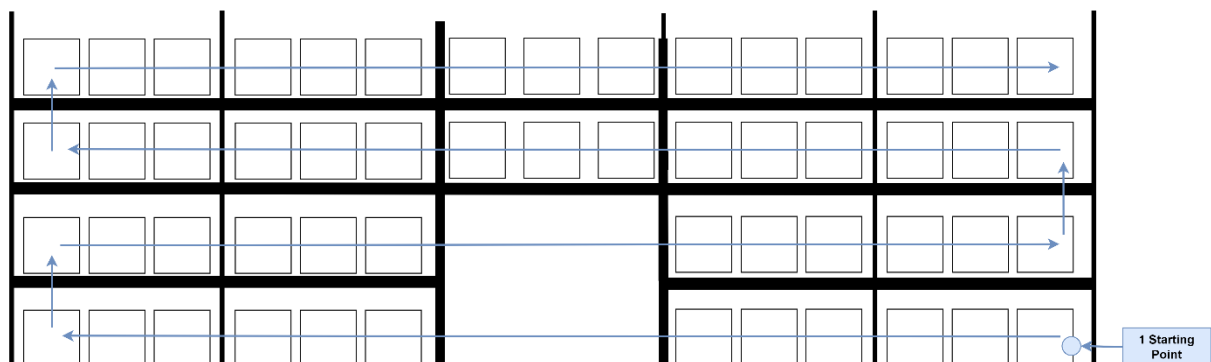


FIGURE 2-7 - RECORDING AISLE WITH ALIGNED SHELVES ON THRU/ARCH

2.3 Powering-up the System and Moving to the Starting Point

1. Load the recording unit on the reach truck.

Drive to the section that needs to be recorded and position the recording unit at the starting point see Figure 2-7 - Recording aisle with aligned shelves on thru/arch. The blue arrows indicate the movement of the reach truck. The circle indicates the starting location and the starting location code.

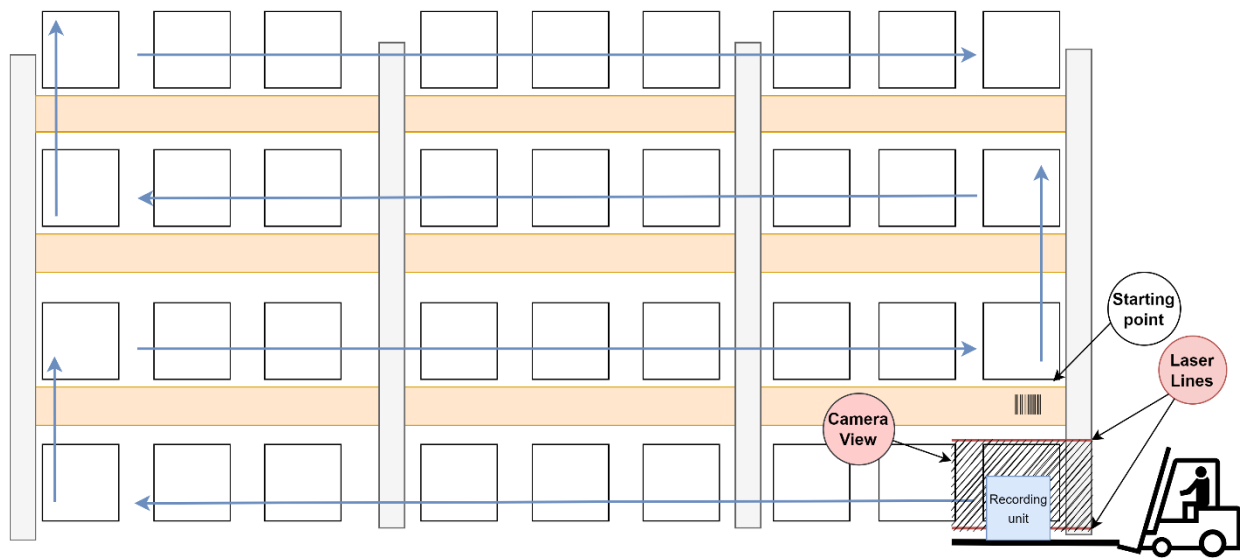


FIGURE 2-8 - SECTION LAYOUT AND RECORDING PROCESS

2. Power up the recording unit by switching to ON position on the ON/OFF Switch, see Figure 2-4 - I/O port and switches.
3. Wait until the display shows the login screen, see Figure 2-9 - Login screen

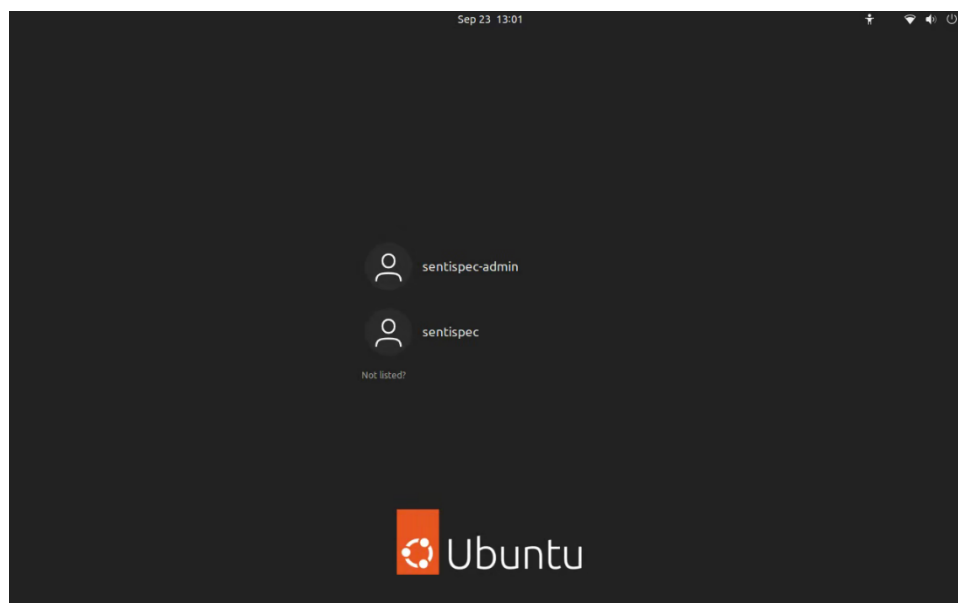


FIGURE 2-9 - LOGIN SCREEN

4. Press the "sentispec" user to log in and enter the password. The default password is 123456, see Figure 2-10 - Insert password

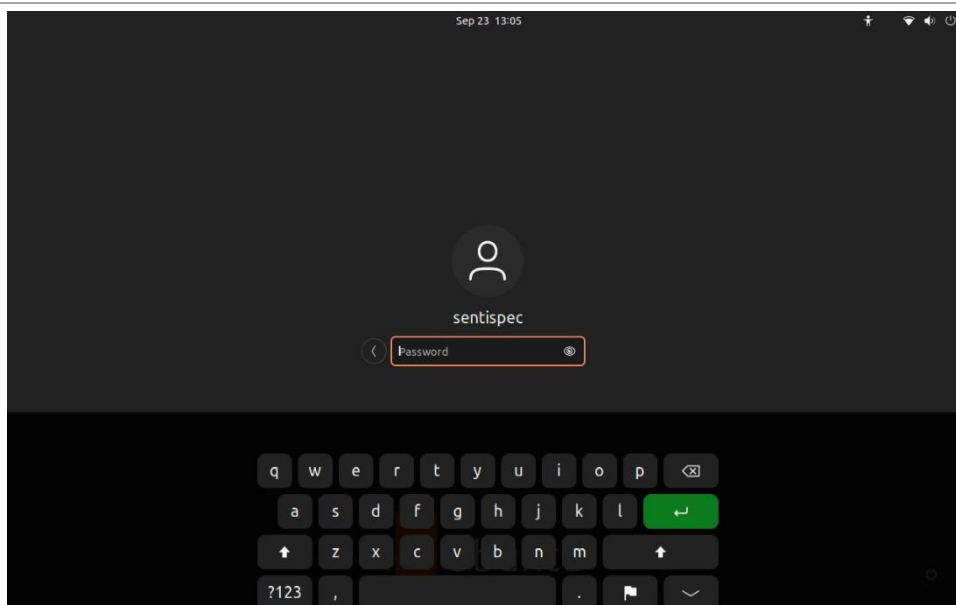


FIGURE 2-10 - INSERT PASSWORD

5. Wait until the system screen has been loaded and displays the "Ready" state, see Figure 2-11 - User interface in ready state.
6. If the recording unit is used in multiple warehouses, select the appropriate configuration:
 - Click on the **Warehouse** drop-down menu (see Figure 2-11 - User interface in ready state).
 - Choose the correct warehouse configuration from the list.

Note: The recording unit must be connected to the internet whenever changing the configuration. For network connection instructions, refer to **Section 2.5 – Connecting to Wi-Fi**.

7. It is important to always keep the recording unit inside the racking system and align with the last pallet location before moving up one level, see Figure 2-8 - Section layout and recording process.

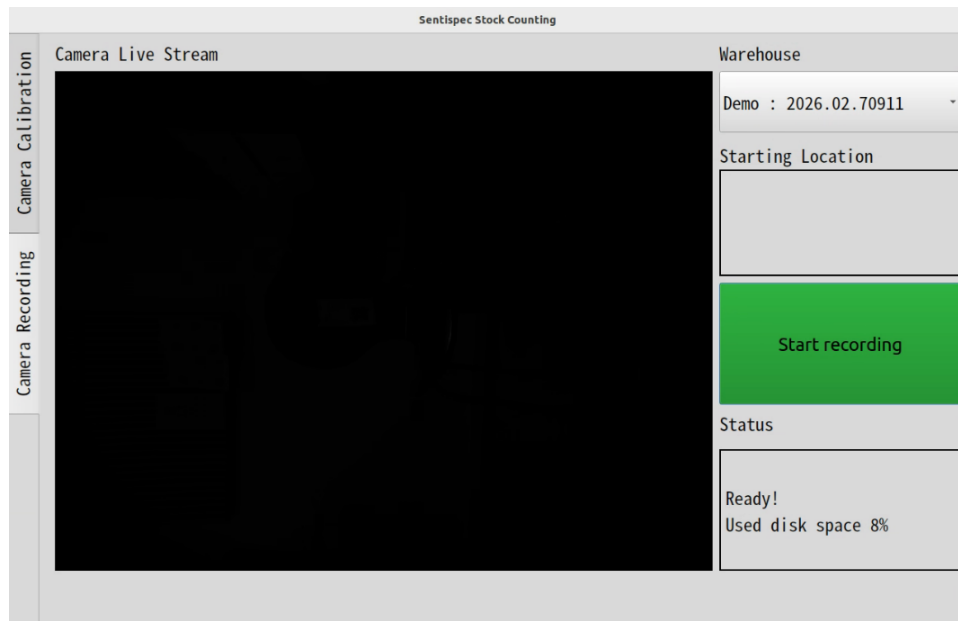


FIGURE 2-11 - USER INTERFACE IN READY STATE

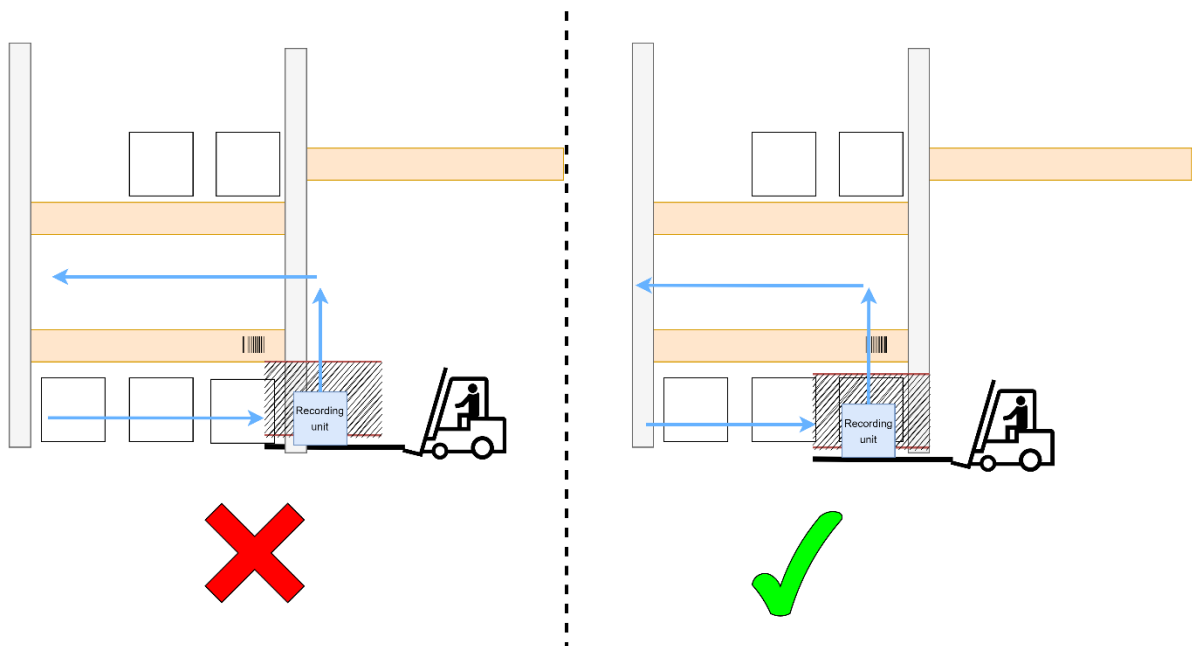


FIGURE 2-12 - VERTICAL SHIFT ALIGNMENT

2.4 Connecting to Wi-Fi

The recording unit needs an internet connected Wi-Fi connection to work optimally, and at minimum a locally available Wi-Fi where the IP of the recording unit can be accessed from networks where discrepancy analysis is made.

To connect to a Wi-Fi network

1. Push the icon in the top right corner of the screen, see Figure 2-13 - Connect to Wi-Fi, then press "Select Network"

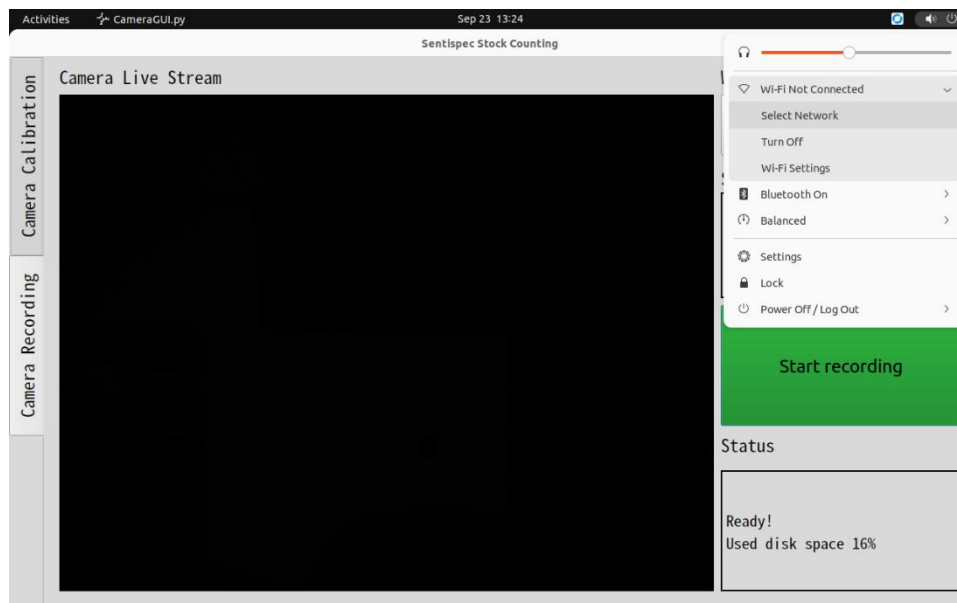


FIGURE 2-13 - CONNECT TO WI-FI

2. Select the Wi-Fi network you would like to connect to by clicking the name in the shown list and press connect.
3. Enter the Wi-Fi password in the dialog that opens.

2.5 Recording a Standard Section

1. Adjust the position of the camera.
 - a. Ensure distance of 1.5 m between the camera and the pallet on the shelf.
 - b. Turn on the laser and recording light using the switch located on the control panel see Figure 2-4 - I/O port and switches.
 - c. Two laser lines will be projected onto the shelf.
 - d. Ensure License Plate Number (LPN) is inside the field of view (FoV) indicated by the projected laser lines see Figure 2-14 - Field of view & positioning.

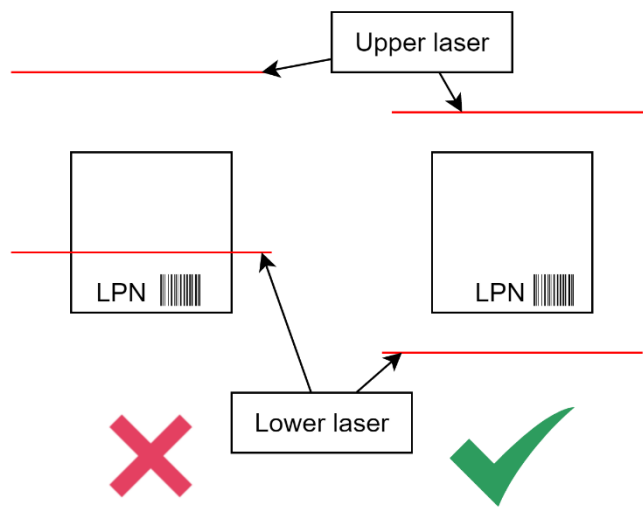


FIGURE 2-14 - FIELD OF VIEW & POSITIONING

2. Locate starting point label see Figure 2-7 - Recording aisle with aligned shelves on thru/arch and type the location code under the "Starting Location" field on the display see Figure 2-15 - Starting location field.
3. Once the camera has been properly positioned at the starting point, the recording can start.
4. Click the button "Start Recording".

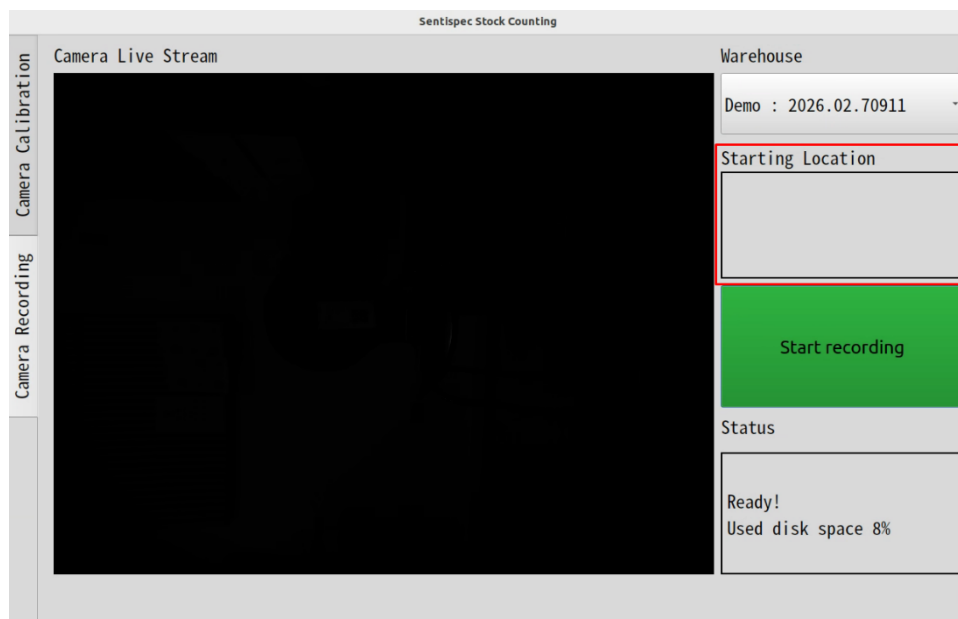


FIGURE 2-15 - STARTING LOCATION FIELD

5. Start driving the reach truck alongside the section whilst maintaining a distance of 1.5 m between the camera and the pallets, at a speed of less than 1.2 m/s.
6. When the end of the section has been reached and the pallet with the recording unit is aligned with the last pallet:
 - a. Stop the reach truck and raise the recording unit one level up.
 - b. When raising the forks, make sure the vertical divider is in the Field of View (FoV) and the recording unit is opposite the divider.
 - c. This means that the recording unit stays within the target rack at all times to ensure accurate navigation.
7. Adjust the height of the recording unit, to ensure the License Plate Numbers on the new level are covered by the FoV for the camera, shown by the lasers, see Figure 2-14 - Field of view & positioning.
8. Move and adjust the recording unit until the starting point has been reached for that level.
9. Scan the new level and repeat the process. See Figure 2-7 - Recording aisle with aligned shelves on thru/arch. The blue arrows indicate the movement of the reach truck.
10. When the recording of a new section has been completed, lower the forks and press "Stop Recording" button on the touch screen. This will finalize the recording and bring the system to "Processing" state and finalize once the "Ready" state as shown in Figure 2-11 - User interface in ready state.

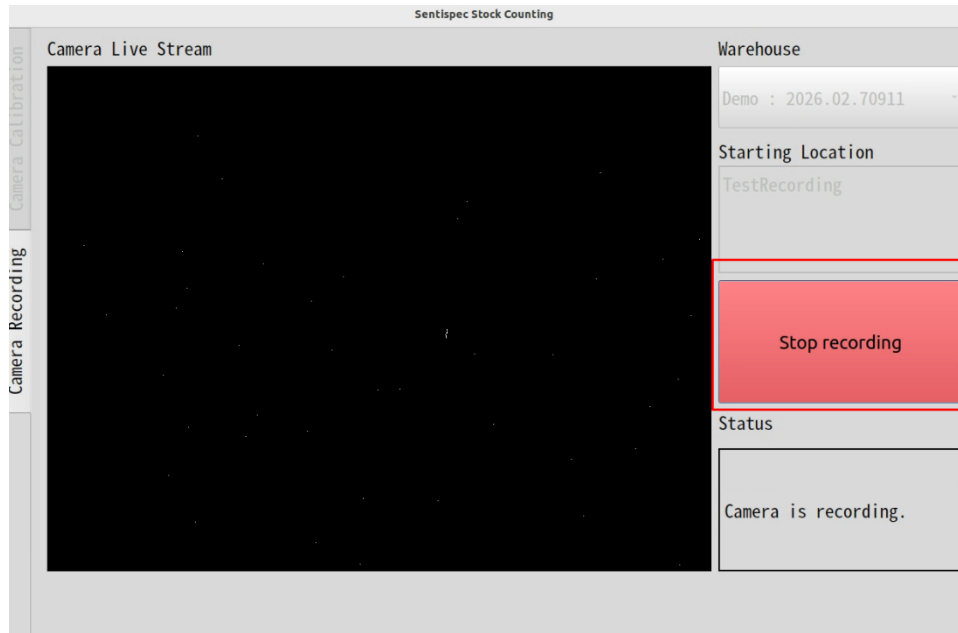


FIGURE 2-16 - STOP RECORDING

2.6 Recording an Arch/Thru Section

Arches/thrus that are misaligned with the racking system must be recorded as separate sections following the same process as shown in the standard section 2.5.

1. Drive to the starting point of the arch as seen in Figure 2-17 - Archway recording.
2. Follow all the steps in section 2.5 "Recording a Standard Section". It is important that the camera field of view is inside the archway until it reaches the first level of pallets, to avoid reading the barcodes from the closest section when moving the camera up, see Figure 2-12 - Vertical shift alignment.

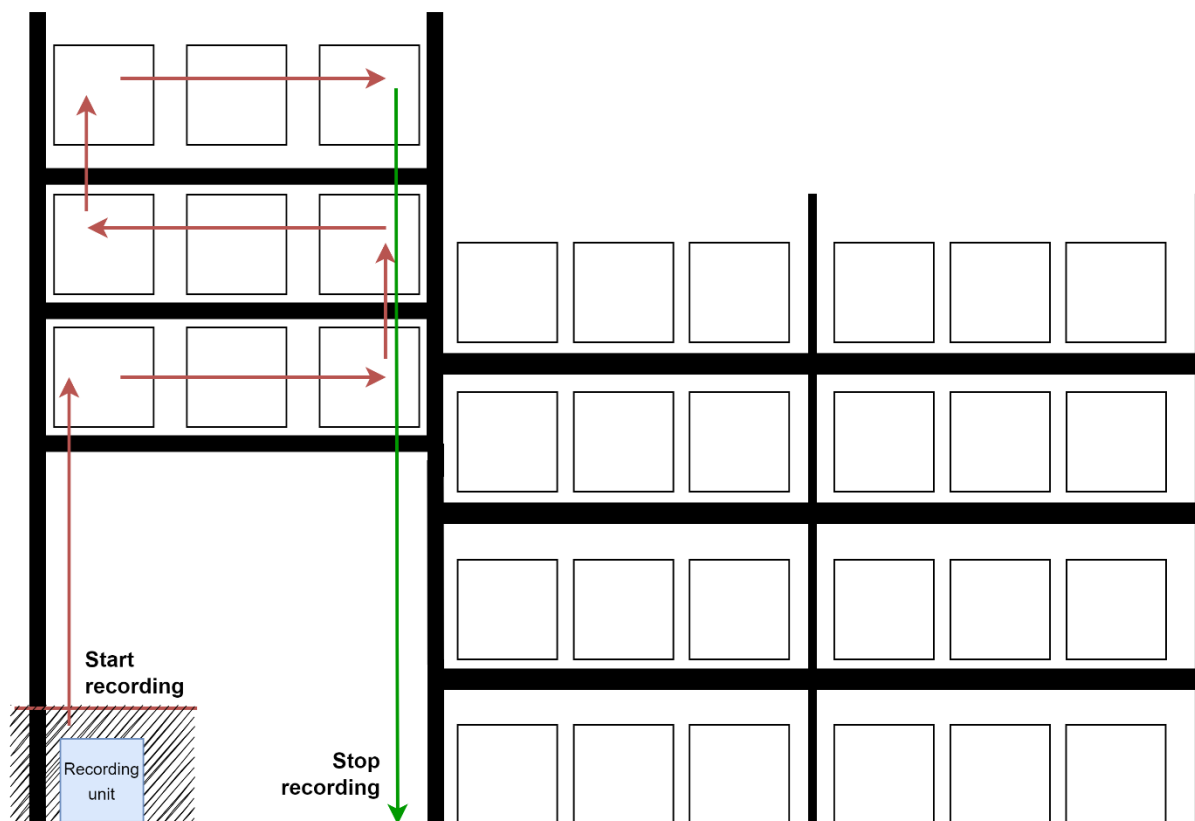


FIGURE 2-17 - ARCHWAY RECORDING

2.7 Example - Recording an Entire Aisle

2.7.1 Recording Aisles with Misaligned Beams on Arches/Thrus

An aisle with one misaligned arch should be recorded in as separate sections, see Figure 2-18 - Aisle with two standard sections and with a misaligned arch/thru:

1. Record the standard section until the first arch – see section 2.5 Recording a Standard Section
2. Record an arch section – see section 2.6 Recording an Arch/Thru Section.
3. Record a standard section – see section 2.5 Recording a Standard Section

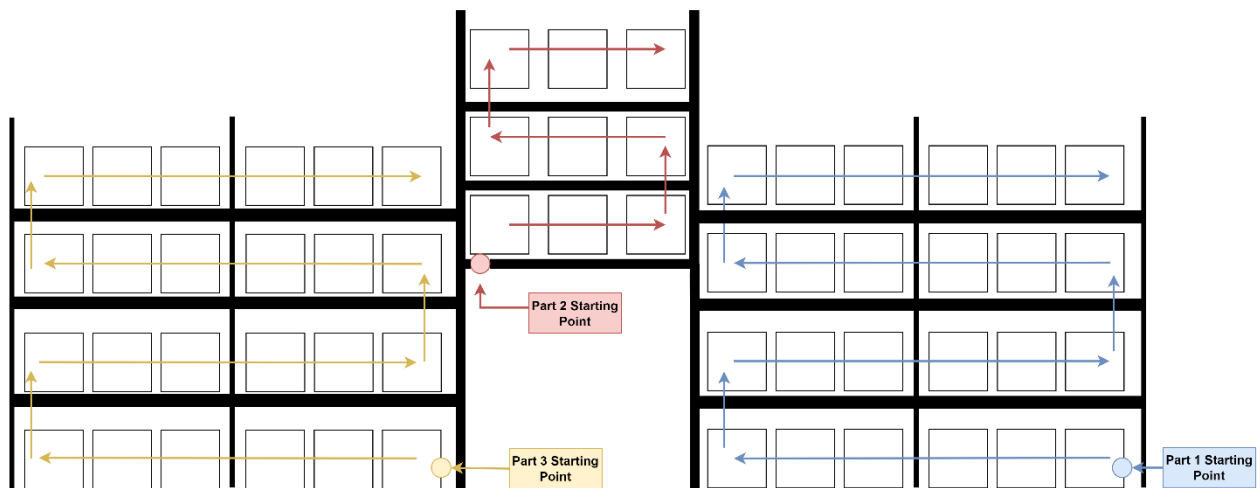


FIGURE 2-18 - AISLE WITH TWO STANDARD SECTIONS AND WITH A MISALIGNED ARCH/THRU

2.7.2 Recording Aisles with Aligned Beams on Arches/Thrus

An aisle with beams that are aligned between the regular shelving system and arches/thrus as shown in Figure 2-19 - Aisle with two standard sections and with an aligned arch/thru should be recorded as in section 2.5

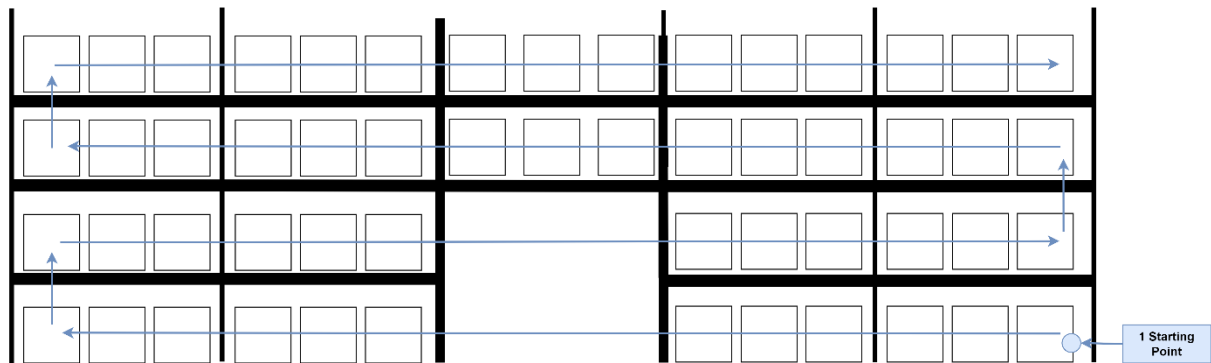


FIGURE 2-19 - AISLE WITH TWO STANDARD SECTIONS AND WITH AN ALIGNED ARCH/THRU

2.8 Recording Preprocessing

Once a recording has been stopped, the recording unit will finalise the recording and notify on screen when the video is ready to be processed.

Typical time for pre-processing is 5-minutes for a 10-minute stock counting recording.

2.9 Analyzing Results and Processing Status

1. Ensure the recording unit is connected to local Wi-Fi
2. Videos will automatically process once the preprocessing stage has been completed. Progress can be seen in the Admin UI, which was provided during deployment. (Figure 2-20 - Sentispec Automated Stock Taking Admin UI)

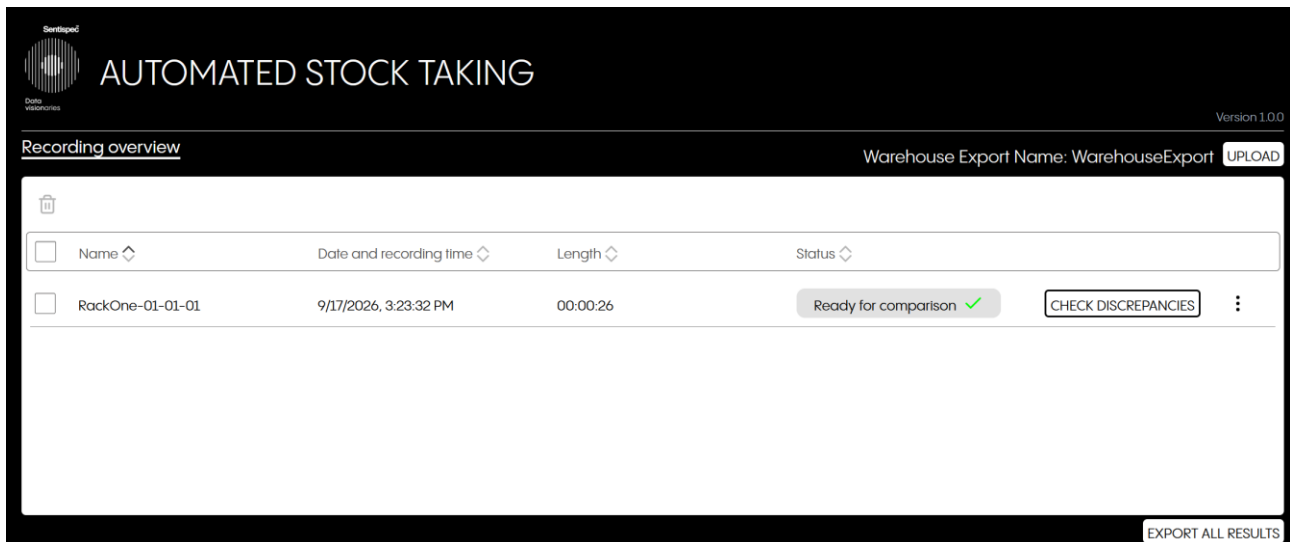


FIGURE 2-20 - SENTISPEC AUTOMATED STOCK TAKING ADMIN UI

3. Ensure that the recording unit has successfully finalised the last video.

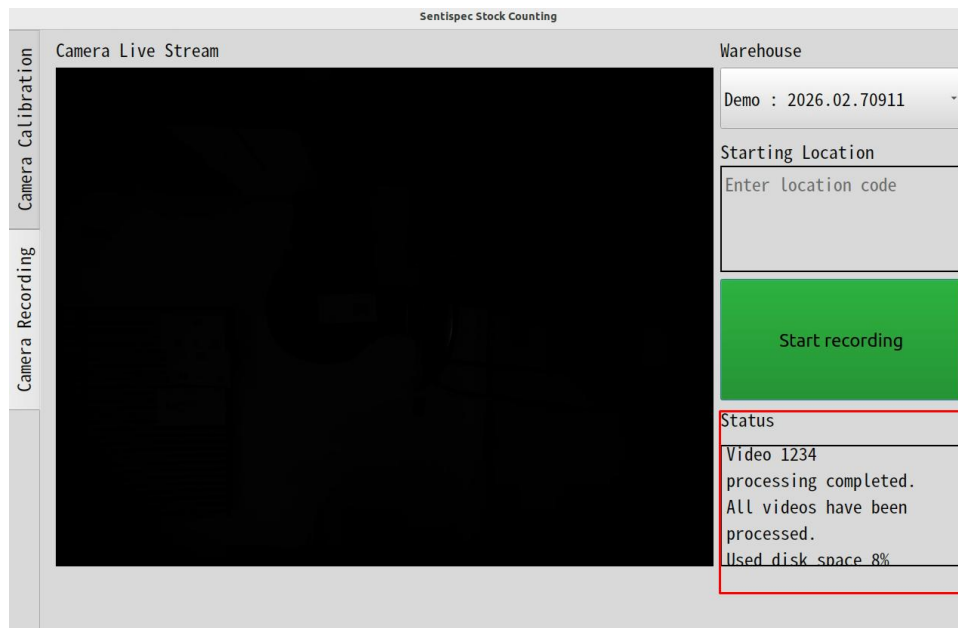


FIGURE 2-21 - RECORDING UNIT READY FOR OFFLOADING, ALL VIDEOS HAVE BEEN PROCESSED

3 Processing Output

When the processing of a video is completed, the output will be two files.

1. A statistics file that will show where a specific License Plate Number (LPN) has been found in a section of racks and shelves.
2. An annotated video file, that will show the end user what the recording unit saw and how it was interpreted.

The statistics output is a comma-delimited CSV file with the following columns:

Column Name	Description
AnchorId	The first location, typed in when recording
ShelfX	The horizontal shelf number in the recorded section. The number is zero based, so the first shelf will always have the value 0. When moving from left to right in the recording, the ShelfX number will increase every time the camera moves past an upright. When moving right to left past an upright, the number decreases.

	For a section with 10 shelves, the values will be the following, when starting: Left to right: 0...9. Right to left: 0...(-9)
ShelfY	The vertical level for the shelf. This is a zero-based number, so the ground level will be 0 and the shelf above this will be 1. For a rack with four shelf levels the values will be 0...3.
ShelfSlotNumber	The pallet slot on the specific shelf. The value is zero based and always outlines locations from left to right, so in a shelf with four slots the locations left to right are 0..3
SlotId	The actual location name. If the software is configured with a warehouse layout configuration.
LPN	The translated License Plate Number/barcode that was read
RelativeDateTime	The relative time in the video where the specific shelf recording ended, and the recording crosses the upright for moving into the next shelf.

4 Sentispec Automated Stock Taking Admin UI

Sentispec Automated Stock Taking Admin UI has been developed to monitor the processing of new recordings from the recording unit. Additionally, it allows for discrepancy management.

The following prerequisites are necessary to facilitate connection to the Sentispec Automated Stock Taking Admin UI:

- The recording unit needs to be powered on.
- The recording unit needs to be connected to Wi-Fi and within range.
- The laptop used for discrepancy management also needs to be connected to the same Wi-Fi or another network that is routed to the Wi-Fi used by the recording unit.

To use the Admin UI:

1. Select and open "Sentispec Automated Stock Taking UI" provided by Sentispec.
2. The application starts and we can see information regarding the recordings:

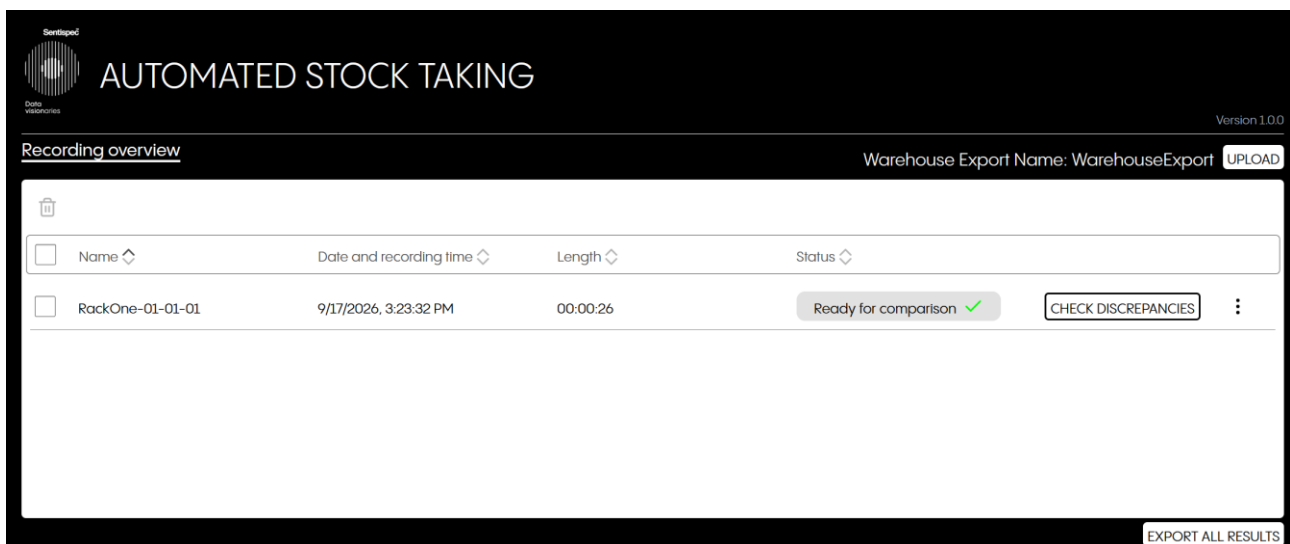


FIGURE 4-1 - ADMIN UI DISPLAY

The following table elaborates on the sections to be mindful of when working in the Admin UI.

Denomination	Description
Name	The name of the video is the starting location of the recording according to input prior to recording.
Date and Recording Time	The date and time of recording.
Length	The length of the video material offloaded to the Admin UI.
Status	Status field can be one of the following: Processing: Recordings have finalised and are being processed at this stage. Ready for Comparison: The processing of the videos has been successfully completed, and the statistics output is ready to be compared with the WMS export.
Check Discrepancies	Check discrepancies button gives the option to the user to open the processed video output and compare discrepancies between the WMS and Inventory recording.

4.1 Discrepancy Analysis

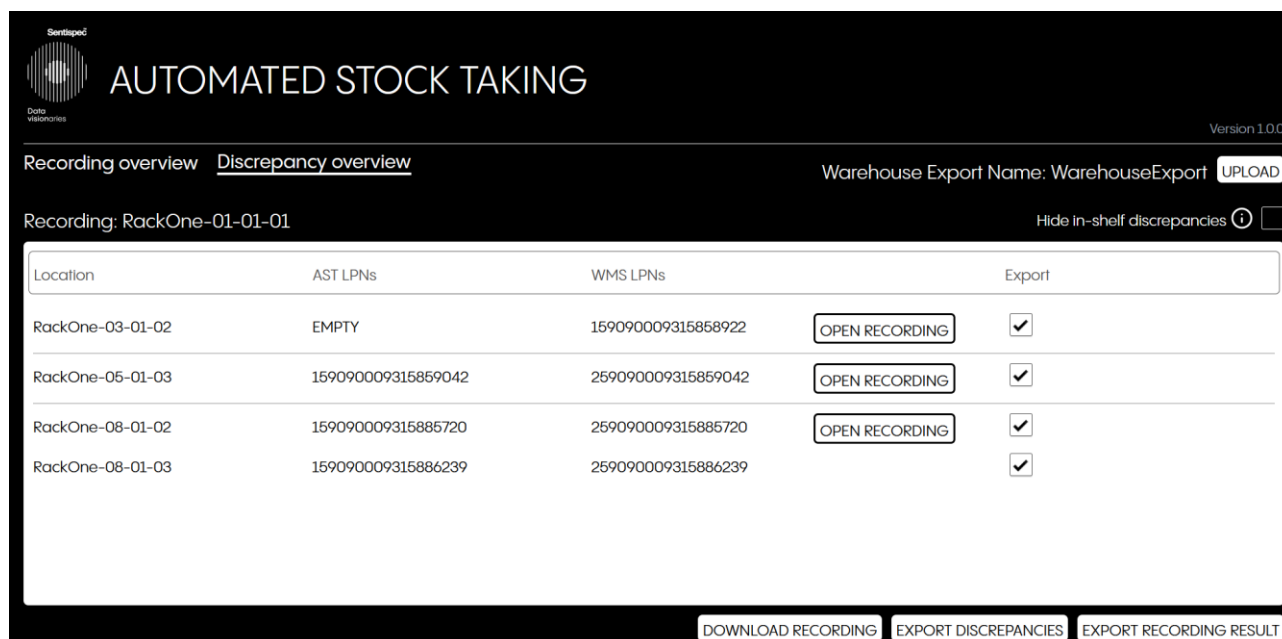


FIGURE 4-2 - DISCREPANCY OVERVIEW

Once the recordings have processed and the status field signals "Ready for Comparison" (see Figure 4-1 - Admin UI display), it is now possible to compare any discrepancies between the Inventory Automated Stock Taking recording and the WMS. By clicking the "Check Discrepancies" button on the Admin UI (see Figure 4-1 - Admin UI display), a new page will open which yields a side-by-side listing of discrepancies within a specific recording by the recording unit, see Figure 4-2 - Discrepancy overview.

Within the "Discrepancy Overview" tab, two different options for comparing/verifying results are available.

- By clicking the "Open Recording" button, the specific LPN recording in question is displayed through opening a video player dialogue. (see Figure 4-3 - Video player)
- By clicking the "Export Recording" button, an Excel file is downloaded for ease of searching within a document and for future auditing.

4.2 Video Player

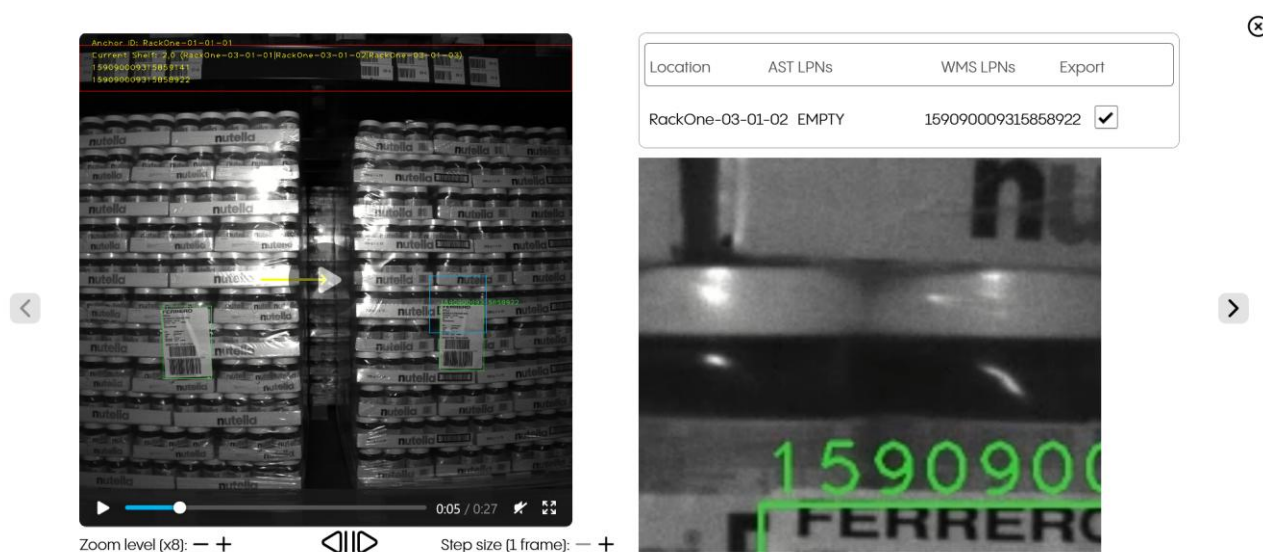


FIGURE 4-3 - VIDEO PLAYER

To ease the task of discrepancy management, the Sentispec Inventory UI is equipped with a video player, to be able to conduct discrepancy management remotely. The video player comes with a set of features, which is elaborated upon in the following section.

After clicking on “open recording” button, the video player dialogue will pop up. The player is paused at the discrepancy time. Under the recording there are two triangle buttons to see the recording frame by frame. Additionally, a table of the group within the rack is presented to see where the WMS and AST results differ. Lastly, by hovering the cursor on the video, the zoomed section will be displayed on the right side. On the video, the zoomed area is indicated by a small rectangle around the cursor.

5 Very Narrow Aisles

The Inventory solution is configured to be used in standard normal aisle widths of about 3-6 meters, with a distance between the recording unit and the pallets of 1.5 meters to ensure maximum functionality and effectiveness in your warehouse operations.

Support for very narrow aisles (VNA) requires a specific VNA configuration.

Depending on whether the warehouse has a uniform set of aisles or a combination of VNA and regular/wide aisles the options and configuration of the system may vary from optics to pure system configuration and should be agreed before installation of the system.

6 Troubleshooting

1. The recording unit is not turning on.
 - a. Check that the power button is in the correct position.
 - b. Check that the battery indication is on and is green. If not, or if the status led is flashing red, plug in the recording unit and wait until it is fully charged.
2. The user interface is not responding.
 - a. Restart the recording unit. Use the ON/OFF Switch, see Figure 2-4 - I/O port and switches to shut down the recording unit. When the recording unit has been powered off, use the same switch to turn it on.
3. The light is not working.
 - a. Check that the Light and Lasers switch is in the "I" position, see Figure 2-4 - I/O port and switches.

If the light is still not turning on, contact Sentispec Support.

7 Maintenance

7.1 Camera Focus Adjustment

Warning! The lens is fragile, so do not overtighten the screw that holds the lens in focus.

7.2 Focus Process

1. Place the front of the recording unit 1.5 m away from a wall.
2. Start the recording unit and select the tab "Camera Calibration" see Figure 7-1 - Camera calibration tab

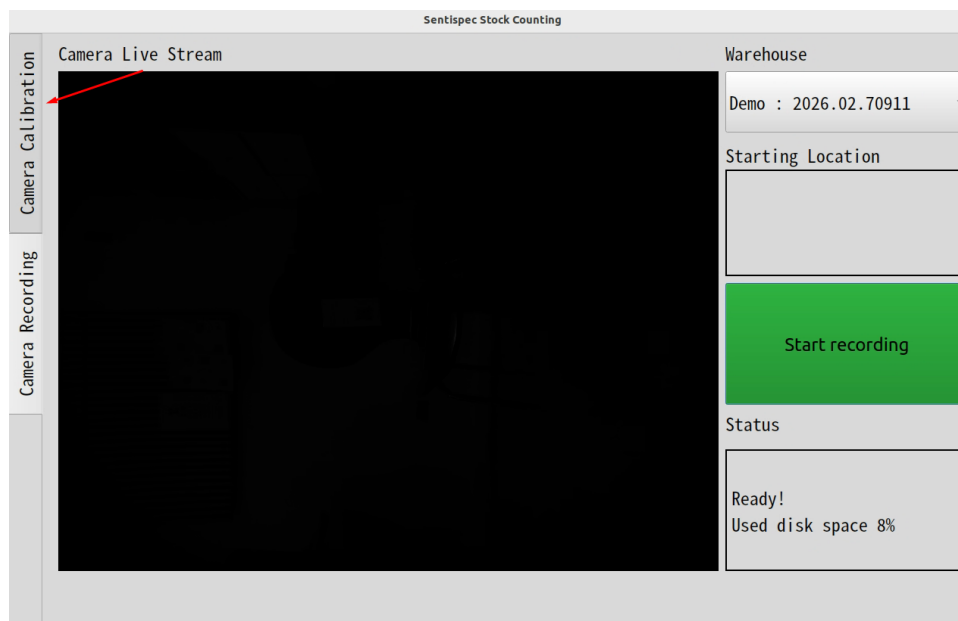


FIGURE 7-1 - CAMERA CALIBRATION TAB

3. Place a label with a barcode on the wall. The barcode must be visible from the user interface screen see Figure 7-2 - Zoomed camera preview with visible barcode



FIGURE 7-2 - ZOOMED CAMERA PREVIEW WITH VISIBLE BARCODE

1. Open the cabinet to access the camera lens.
2. Loosen lens screw see Figure 7-3 - Lens screws and focus ring
3. Rotate slowly focus ring, until barcode is in focus see Figure 7-3 - Lens screws and focus ring
4. Tighten the screw carefully, while holding the focus ring still, to ensure no change in focus, while tightening the screw.



FIGURE 7-3 - LENS SCREWS AND FOCUS RING

7.3 Battery Management Guideline

The recording unit contains a battery, that should be handled according to the below guidelines.

This documentation outlines the necessary steps for the safe handling, usage, and disposal of the included Maintenance-Free Lead Acid Batteries, a hazardous material used in our industrial product. To ensure compliance with CE and FCC standards and adhere to best practices for battery management, the following guidelines must be strictly followed:

7.3.1 Battery Type

The battery used in this product is a non-spillable, maintenance-free lead acid gel battery. The battery type is Absorbed Glass Mat or AGM batteries, which has been developed to increase the safety feature of the battery. Absorbed Glass Mat or AGM batteries have been developed to increase the safety feature of the battery.

7.3.2 Battery Safety Precautions

- Please handle the battery with care and avoid dropping or puncturing it.
- Ensure that the battery terminals are always clean and free from corrosion to maintain proper electrical connections.
- The battery is designed to be non-spillable, reducing the risk of leakage. However, avoid exposing it to extreme temperatures or direct sunlight for extended periods.
- Keep the battery away from flammable materials and sources of ignition.
- Never attempt to disassemble or modify the battery, which may result in safety hazards.

7.3.3 Operating Temperature

The battery is designed to work within the operating temperature range of the recording unit: -20°C to 40°C. Operating the product within this temperature range will maintain battery performance and prolong its lifespan.

7.3.4 Charging and Discharging Instructions

The recording unit is equipped with smart charging capabilities to avoid overcharging and ensure that the charging does not occur outside the perimeters of the battery.

Avoid overcharging the battery, as it may cause damage or reduce its lifespan. The built-in charger manages charging to avoid overcharge and can be continuously connected.

When discharging, avoid fully depleting the battery, as it may lead to the battery being damaged and/or become defective. The battery should be kept above 20% charge for longest product life span.

7.3.5 Battery Disposal and Recycling

At the end of the battery's service life, please dispose of it in accordance with local regulations and guidelines.

The lead acid gel battery is recyclable. Please do not dispose of it in household waste or incinerate it. Seek appropriate recycling facilities for lead acid batteries in compliance with environmental regulations.

7.3.6 Potential Hazards and Risks

The battery contains lead and acid, which are hazardous materials. In case of damage or leakage, avoid contact with skin, eyes, or clothing.

It's important to remember that lead-acid gel batteries of AGM type are considered non-spillable; however, handling a spill with proper precautions is still essential to minimize risks and environmental impact. In case of spill from a broken battery:

- **Safety First:**

Prioritize safety by wearing appropriate personal protective equipment (PPE), such as gloves and safety goggles.

- **Ventilate the Area:**

If the spill occurs indoors or in a confined space, ensure good ventilation to disperse any fumes that may be present.

- **Isolate the Area:**

Restrict access to the spill area to prevent accidental contact with the spilled gel.

- **Avoid Direct Contact:**

Do not touch the spilled gel with bare hands to avoid potential harm from hazardous materials.

- **Contain the Spill:**

Use suitable absorbent materials to contain and absorb the spilled gel. Place the absorbent material around the spill to prevent spreading.

- **Seek Professional Assistance (If Necessary):**

For significant spills or if unsure about handling safely, contact a professional hazardous materials cleanup service.

- **Clean Up and Disposal:**

Carefully collect the used absorbent materials and place them in a sealed container labelled as hazardous waste. Follow proper disposal regulations for hazardous materials, including lead-acid batteries and spilled gel.

- **Personal Hygiene:**

After handling the spill and cleanup, wash hands and any exposed skin thoroughly with soap and water. Launder any clothing that came into contact with the gel separately.

In the event of accidental ingestion, seek immediate medical attention and provide the medical professional with information about the battery type: Sealed Lead Acid Battery.

Following these guidelines will ensure safe and compliant use of the battery in our product.

For further information or clarification, please contact our customer support.

8 Remote Support

To enable remote support, the recording unit must be logged in and connected to a stable internet connection. Once these conditions are met, notify Sentispec personnel so they can initiate a remote connection.

If the primary remote connection method is unsuccessful, RustDesk is installed on the recording unit as a fallback solution.

To use RustDesk:

1. Drag the recording application window to the side of the screen.
2. Click the RustDesk icon on the desktop. (Figure 8-1 - RustDesk shortcut)
3. Provide Sentispec personnel with (Figure 8-2 - RustDesk app):
 - o ID
 - o One-Time Password

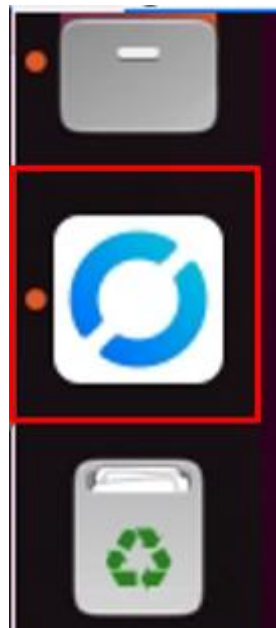


FIGURE 8-1 - RUSTDESK SHORTCUT

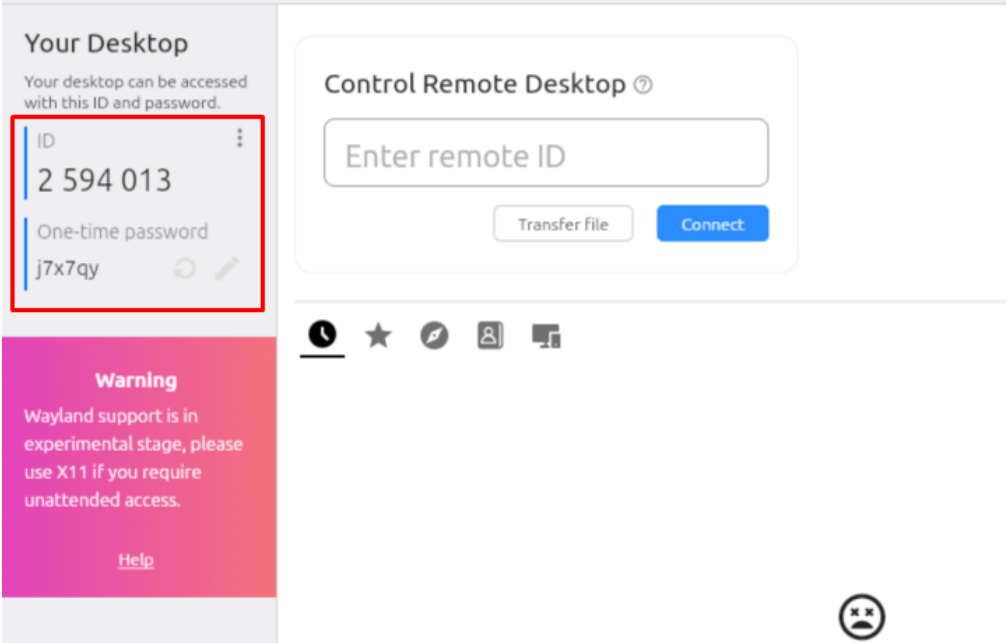


FIGURE 8-2 - RUSTDESK APP