airelectronics

ARTIFICIAL VISION

Remote Module User Manual

V 1.0

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Table of Contents

1 Artificial Vision – Remote Module

1.1 Product Description

The Remote Module is a new product developed as part of the Artificial Vision product portfolio. Its purpose is to provide a fully autonomous image acquisition solution without the need for continuous power supply, fixed installations, or permanent internet connectivity.

Unlike traditional Artificial Vision systems, where a high-performance computer processes real-time data from up to eight 4K cameras and requires a 220 V power supply and a 3G/4G internet connection, the Remote Module has been designed for mobile, off-grid operation without 3G/4G signal.

The system is specifically intended for temporary deployments, multi-location surveys, and vehicle-mounted operation.

Figure 1: General Product View

1.2 Intended Audience

This manual is intended for:

- System operators
- Site technicians
- Maintenance personnel with basic technical background

The reader is expected to be familiar with basic computer operation and standard industrial equipment handling, but no prior knowledge of computer vision algorithms is required.

1.3 System Concept and Operating Principle

The Remote Module consists of eight 4K cameras arranged in four stereoscopic pairs. Each pair operates independently, capturing synchronized image data for later post-processing.

Instead of processing the data in real time, the system locally stores all captured images using two onboard computers and a total storage capacity of 4 TB. This allows the system to record image data continuously for several days without requiring any network connection.

The system is powered by its own 48 V battery and does not require access to a 220 V power supply during acquisition. All components are compactly integrated and designed to be conveniently mounted on the roof rack of a vehicle.

Once the vehicle returns to a substation, hangar, or base location with available Wi-Fi connectivity, the system automatically synchronizes the stored detections and images with a remote processing computer. This remote computer performs the post-processing and presents the results through a web interface identical to the standard Artificial Vision reporting module.

This architecture enables operation across multiple locations, whose coordinates are recorded automatically using an integrated GPS antenna.

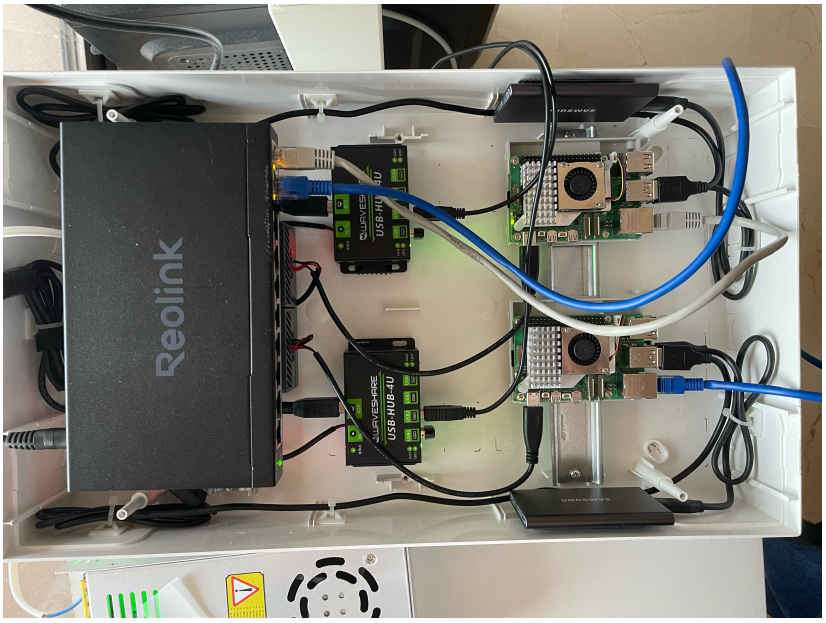


Figure 2: System Overview

1.4 Local Wi-Fi Interface and System Monitoring

The Remote Module generates its own local Wi-Fi networks, allowing operators to verify correct system operation at any time.

Each onboard computer creates a dedicated Wi-Fi network:

- **SSID:** raspberry01
- **SSID:** raspberry02
- **Password:** 12345678

Once connected, the system status interface can be accessed via a web browser at:

`http://192.168.4.1:8000`

1.5 Information Available in the Local Web Interface

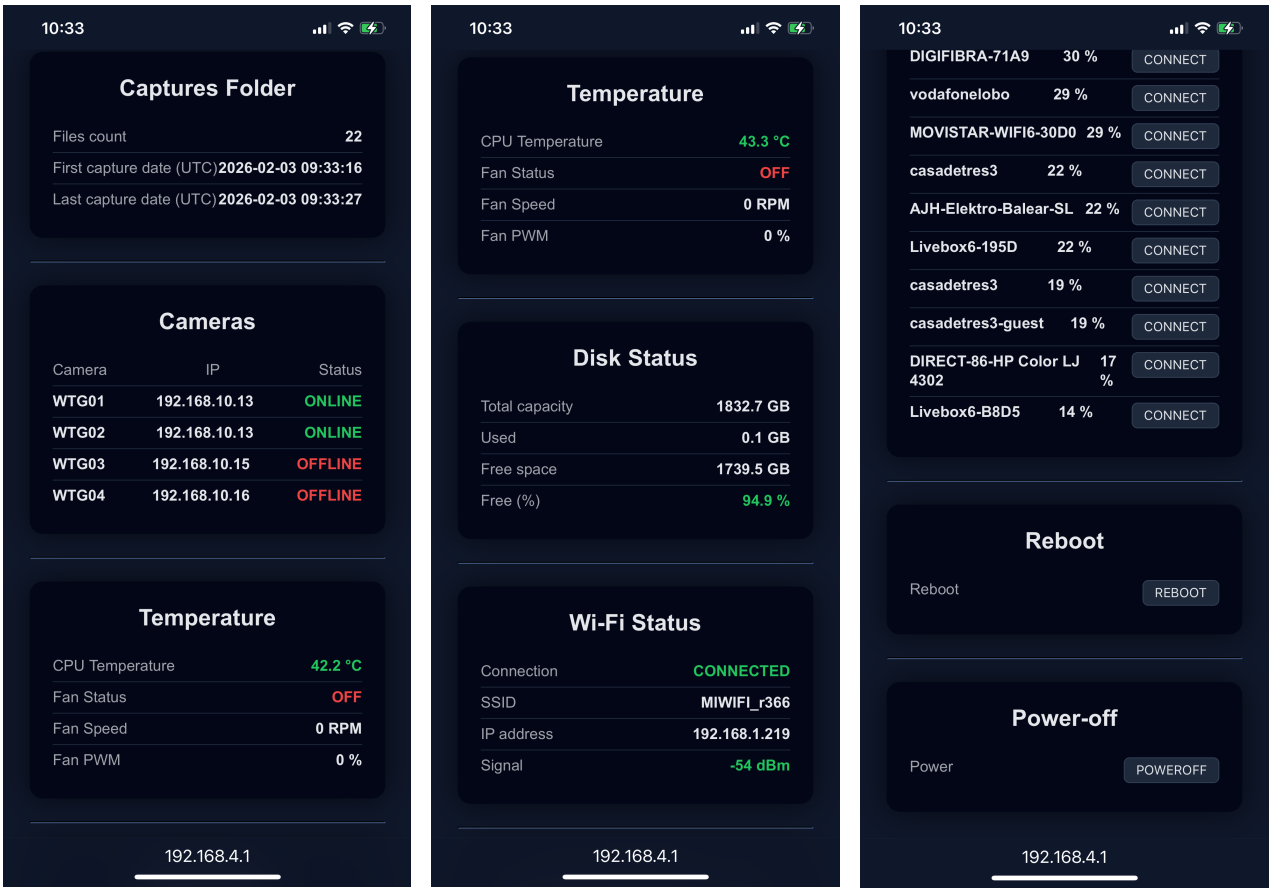
The local web interface provides real-time system monitoring information, including:

- Device name
- System uptime
- GPS status
- Camera status
    - Green: camera online
    - Red: camera offline
- Internal temperature and fan status
- Number of images stored in the capture folder
    - If fewer than 1000 images are stored, the interface also displays:
        - Date of the oldest capture
        - Date of the most recent capture
    - This date information is hidden automatically when more than 1000 files are present
- Hard disk status and percentage of disk usage
- GPS information:
    - Latitude and longitude
    - UTC time
    - Number of visible satellites
- Available Wi-Fi networks in the surrounding environment
- System control buttons:
    - Reboot
    - Power off

This interface is intended exclusively for monitoring and basic control. No configuration changes are required during normal operation.

1.6 Web Interface Examples

The following examples illustrate the appearance and typical information displayed by the local web interface during normal system operation. These views allow the operator to quickly verify system status, including device uptime, camera connectivity, GPS availability, storage usage, and data acquisition activity. The interface is designed to provide a clear and concise overview of all critical system parameters, enabling rapid validation of correct operation both during image capture and data synchronization phases.



1.7 Procedures

1.7.1 First-Time System Installation

For the initial installation of the system, the following steps must be followed carefully.

At this stage, **do not connect the cameras**.

First, power the system and verify that:

- The status LEDs of both Raspberry units turn on
- The blue LEDs of both hard disks are active
- The Ethernet switch LEDs are on
- The USB hub LEDs are on

Next, connect to both internal Wi-Fi networks (raspberry01 and raspberry02) using a mobile device or laptop. From each system, connect to the client's Wi-Fi network by selecting it in the Wi-Fi settings and entering the provided password. This Wi-Fi connection will be used later for nighttime data synchronization.

Once both systems have internet connectivity, shut them down.

Important:
The shutdown sequence must always be performed using the **Power Off** button in the web interface. Hot power disconnection is not recommended.

When the LEDs on both Raspberry units change from green to red, it is safe to disconnect the battery.

1.7.2 Image Acquisition Procedure

To perform an image acquisition session, follow the steps below.

Drive the vehicle to the target location.

Important:

Park the vehicle with its front facing north, ensuring that the cameras do not capture any vegetation and only have a clear view of the sky.

When the vehicle is parked with its front facing north, camera numbering starts with **Camera 1** at the **front-left** position and continues **clockwise** (following the direction of a clock's hands) around the vehicle until **Camera 8**.

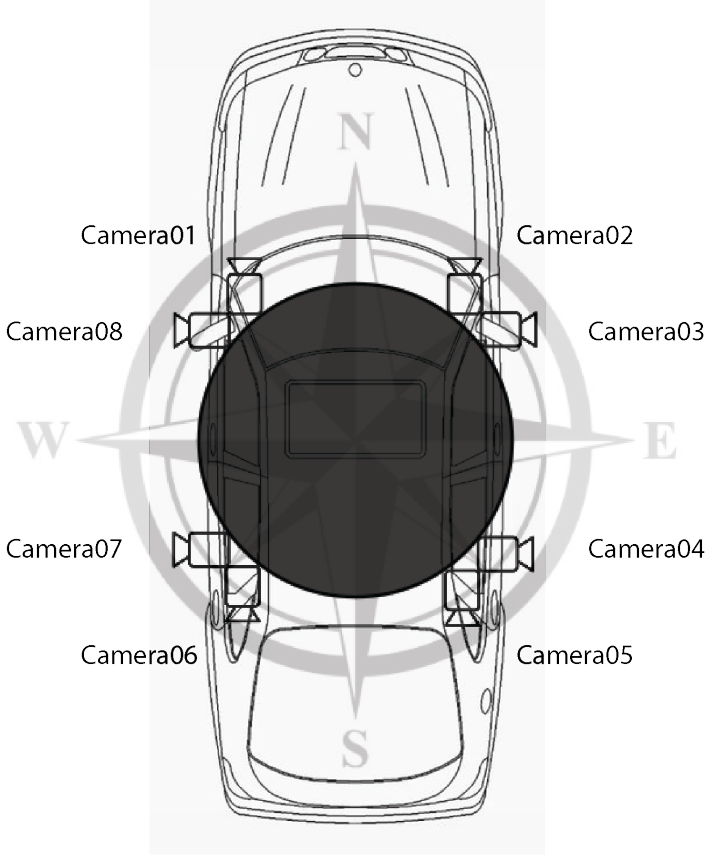


Figure 3: Cameras N with vehicle pointing to North

With the system powered off, connect the eight cameras using their PoE Ethernet cables.

Once all cameras are connected, connect the battery to power the system. Wait approximately one minute for the system to start.

Connect to both raspberry01 and raspberry02 Wi-Fi networks and access the local web interface. (http://192.168.4.1:8000) Verify that:

- All cameras appear with assigned IP addresses

- All camera indicators are shown in green
- The number of files in the capture folder increases at a rate of approximately 4-8 frames per second
- The GPS status indicator is green

Camera	IP
01	192.168.10.11
02	192.168.10.12
03	192.168.10.13
04	192.168.10.14
05	192.168.10.15
06	192.168.10.16
07	192.168.10.17
08	192.168.10.18

Once these conditions are confirmed, the system can be left operating unattended.

If any issue is detected during operation, the system can be restarted using the **Reboot** button in the web interface.

1.7.3 Shutdown After Image Acquisition

After completing image capture, connect to the system’s local Wi-Fi networks and use the **Power Off** button for both raspberry01 and raspberry02.

Wait until the LEDs on both units change from green to red. Once this occurs, disconnect the battery.

Finally, disconnect the cameras by unplugging their PoE Ethernet cables.

1.7.4 Data Transmission Procedure

For data transmission, the cameras must **not** be connected.

Park the vehicle near a location with available Wi-Fi connectivity, such as a substation or hangar. Power the system using the 220 V to 48 V converter instead of the battery.

At the same time, connect the battery to its charger to prepare it for the next operational day. (See next chapter)

Verify that all system LEDs indicate normal operation.

Connect to both raspberry01 and raspberry02 Wi-Fi networks and access the web interface. Confirm that the number of files in the capture folder decreases at a rate of approximately one file per second, indicating that data synchronization is in progress.

During this phase, GPS lock is not required.

Figure 4: 220V to 48V converter

1.7.5 Battery Recharge

Whenever the Remote Module is parked overnight within range of the customer's Wi-Fi network, this downtime should be used to recharge the 48 V battery so the system is ready for the next acquisition session. Connect the battery to the **Artificial Vision–supplied charger** (and power the Remote Module from mains using the 220 V to 48 V converter, as described in the Data Transmission Procedure), and allow the battery to charge uninterrupted throughout the night. Always use only the provided charger and follow standard electrical safety practices (dry environment, stable ventilation, and secure cable routing) to ensure safe and reliable charging.

Drive the vehicle to the target location. With the system powered off, connect the eight cameras using their PoE Ethernet cables.

Figure 5: Baterry Recharger

1.8 Operational Safety Guidelines

To ensure safe and reliable operation of the Remote Module, power must never be disconnected abruptly under any circumstances. The system shall always be shut down using the **Power Off** function available through the local web interface, allowing all processes to terminate correctly.

Cameras must never be connected or disconnected while the system is powered on. All camera connections shall be performed only when the system is fully powered off to avoid hardware damage and data corruption.

Adequate ventilation must be ensured at all times. The enclosure shall not be obstructed, and airflow openings must remain clear in order to prevent overheating during operation.

Figure 6: 48V Battery

2 Artificial Vision – Reports Module

Once the data has been successfully synchronized in accordance with the **Data Transmission Procedure**, the captured information is automatically transferred to the remote processing system. After a processing period of several hours, the resulting detections and analysis outputs become available in the reporting web interface without requiring any additional operator action.

An example of this reporting interface is shown below for reference. The reporting web platform provides access to processed results, visualizations, and historical data in the same format as other Artificial Vision systems.

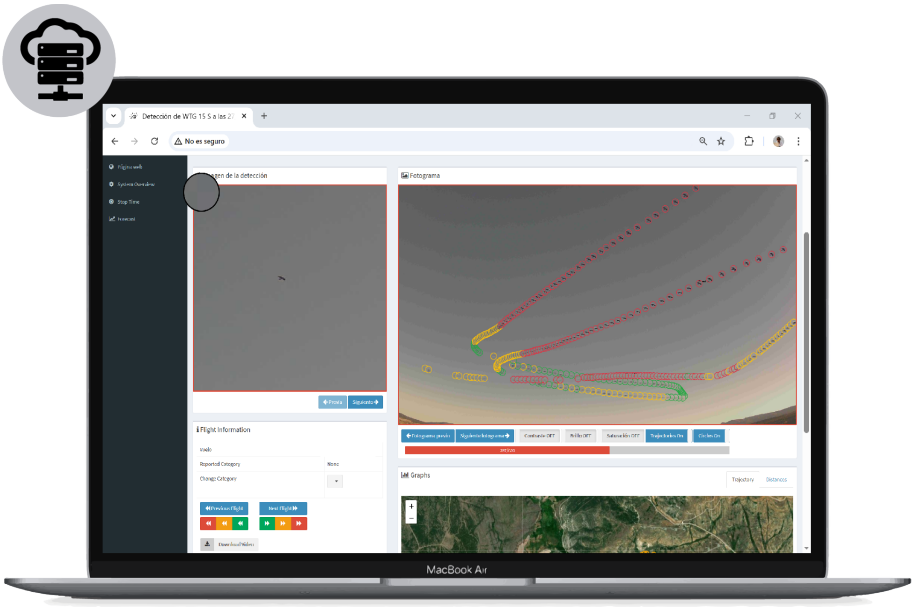


Figure 7: Reports Module Flight Example

The reporting web interface is documented in a dedicated user manual available on the Artificial Vision website at **www.artificialvision.es**. Operators are strongly encouraged to review this documentation in order to fully understand the available reporting features and data interpretation capabilities.