STUDICA ROBOTICS & UAS

MAINTENANCE MANUAL

WS5100 AGRICULTURAL UAS



Six-Rotor Agricultural Spraying Drone — 10L Tank Configuration

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Applies to: WS5100 UAS and standard accessory kit
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This manual supersedes all previous editions of the WS5100 Maintenance Manual.

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1 Introduction

1.1 About This Manual

Performing regular maintenance on the WS5100 UAS helps ensure proper and safe operation, extends the service life of the aircraft, and reduces the risk of accidents or in-flight incidents. Always refer to the manufacturer's maintenance manual for specific instructions on maintenance and repair. This document focuses on the compliance requirements for maintaining the UAS so that it continues to perform to its designed characteristics.

This manual includes the procedures, checklists, and details of maintenance that should be carried out periodically. Reviewing this document in full will give operators and maintenance personnel a clear understanding of the maintenance methodology adopted to ensure the continued airworthiness of the WS5100 UAS.

1.2 Purpose

The purpose of this manual is to provide a detailed description of the system and operational aspects of the WS5100 UAS. It describes the various subsystems and the step-by-step procedures required to operate and maintain the aircraft safely. All operators must read and understand this manual before commencing flight operations.

1.3 Printed Version of the Maintenance Manual

With the environment in mind, the printed version of this manual contains only the most important information regarding UAS operation and maintenance, along with select technical parameters. The complete, most current edition is maintained electronically by Studica.

2 Safety Summary

2.1 General Safety

WARNING

Keep the UAS away from live circuits. Operating personnel must always observe all safety regulations. Do not replace components or adjust internal wiring while the equipment is powered.

2.2 Warnings, Cautions & Notes

Warnings and cautions precede the text and follow the paragraph heading to which they apply. Notes may precede or follow the applicable text depending on the material being highlighted. When a warning, caution, or note consists of two or more paragraphs, the heading is repeated above each paragraph. These statements are used to emphasize important or critical data and, unless obvious, state the danger, the result, and the reason.

Term	Definition
WARNING	The UAS is subject to an operation or maintenance procedure, practice, or condition which, if not strictly observed, may result in injury to personnel or collateral damage.
CAUTION	The UAS is subject to an operation or maintenance procedure, practice, or condition which, if not strictly observed, may result in damage to or destruction of equipment.
NOTE	Appears before or after an operating or maintenance instruction to emphasize or clarify that instruction.

3 Maintenance Procedure

Follow this general procedure before each scheduled maintenance session on the WS5100 UAS:

1. Ensure the UAS is powered off, and the battery is disconnected before commencing maintenance.
2. Conduct a thorough inspection of the UAS for physical damage or signs of wear on the body, propellers, motors, and other components.
3. Check the battery for swelling, leakage, or other damage, and follow the manufacturer's guidelines for charging, discharging, and storage.
4. Examine the propellers for damage or deformities and replace them if necessary.
5. Inspect sensors and cameras for dust and debris, cleaning gently with a soft cloth.
6. Verify the spray system is clean and free from obstructions or blockages and inspect the spray nozzles for wear.
7. Check the motors for damage or malfunction, and clean and lubricate them as required.
8. Ensure communication systems, including the remote control and receiver, are functioning properly.
9. Calibrate the UAS compass and GPS for accurate navigation.
10. Verify and update the UAS firmware and software versions as needed.
11. Maintain a detailed record of all maintenance activities, including inspections and any repairs or replacements.
12. Conduct a test flight; if unsuccessful, contact the service partner.

4 Maintenance Checks

4.1 UAS Airframe

- Confirm that all screws are properly tightened.
- Inspect the UAS for visible breaks or damage that could impact flight safety.
- Check the arm tubes for any signs of damage.
- Confirm the landing gear is in perfect condition.
- Verify the camera and flashlights are pointed in the proper direction (if installed).
- Ensure there are no obstructions around the GPS module (if installed) or antennas on the landing gear that could interfere with signals; remove obstacles such as tape containing conductive material.
- Verify that the right and left landing gear rest at the same tilt angle.

4.2 Battery

- Inspect the battery for signs of damage or deformity. If any damage is detected, cease using the battery immediately, discharge it to 10% capacity or lower before disposal, and never dismantle it.
- Inspect battery connectors for residue; clean thoroughly with an eraser to ensure a reliable connection. Examine connectors for damage and replace if necessary.
- Check for serious erosion in the battery connectors or bends in the connector body; replace before the next operation.

4.3 Motors

- Inspect the rotors to confirm they are securely fastened and correctly positioned.
- Remove the propellers and run the motors to detect unusual noise or excessive vibration. If issues arise, notify the service partner for further inspection.
- Check for deformities by verifying even spacing between the motor and its base. Contact Support to arrange replacement motors if irregularities are found.
- Confirm the motor base screws are adequately tightened and assess the condition of surrounding plastic components. Tighten screws as needed and contact us for repair if plastics are damaged.

4.4 Propellers

- Inspect the propellers for bending, breakage, or cracking. Do not use any propeller exhibiting such damage.
- Fit the propeller, power on the UAS on the ground, stand 1 metre away, and observe the rotating propeller. If two distinct outlines appear when viewed from the side during rotation, this indicates damage — do not use the propeller.

4.5 Flight Controller Unit

- Access the ground control application to assess IMU status and run an advanced calibration if necessary.
- Position the UAS on a cool, level, sturdy surface. If the landing gear is damaged, use four objects of uniform height to support the aircraft.
- Avoid any contact with the UAS throughout the calibration process.

4.6 Transmitter & Receiver

- Verify the stability of the antennas on the landing gear and inspect for bending or damage.
- Assess the condition of the antennas on the remote controller for any damage.
- Confirm antennas are securely fastened; if loose, tighten by rotating clockwise per the flight manual.
- Examine the neck strap for wear or damage and replace if needed.

5 Storage Instructions

When storing the WS5100 UAS during periods of non-use, observe the following guidelines:

- Ensure the storage location is waterproof, protected from sunlight, insect-proof, and fire-resistant.
- Secure the UAS during storage to prevent it from being damaged by other objects.
- Ensure the storage area is free from hazardous materials such as chemicals or corrosive substances that could damage UAS components.
- Monitor temperature and humidity levels in the storage area to prevent excessive moisture buildup, which can lead to corrosion or electronic damage.
- Conduct periodic inspections of the stored UAS for signs of damage, corrosion, or deterioration, and perform maintenance as needed.
- Store the battery and remote controller separately in a designated box, protected from fire, moisture, and sunlight. Maintain the battery at storage voltage and charge it every other month during extended storage.

6 Preventative Maintenance and Monitoring

Care of the WS5100 UAS involves systematically tracking and analyzing various operational aspects to ensure optimal performance throughout its usage:

Stage	Description
Pre-Flight Inspection	Before takeoff, the operator conducts a thorough check of the drone's components, including the battery, sensors, and spraying mechanism.
Flight Planning	The operator plans a safe flight path, ensuring compliance with regulations and proper configuration of onboard systems such as the camera and GPS.
Real-Time Monitoring	During flight, the operator monitors the drone's position, altitude, speed, and other parameters in real time using ground station software.
Payload Oversight	Monitoring of the spraying system involves tracking pesticide dispersion, spray pattern, and coverage rate.
Environmental Monitoring	The operator observes environmental conditions such as wind speed, temperature, and humidity, adjusting spraying parameters accordingly.
Post-Flight Analysis	After each flight, collected data — including flight logs and sensor data — is analyzed to identify issues and optimize future operations.

6.1 Inspection Frequency

- Every 2 days for a continuously operated UAS.
- Weekly for UAS with sporadic operation.
- Regular cleaning after each day of operation.

7 Maintenance Recommendations & Logbook

Effective maintenance of the UAS offers the following benefits:

- Minimizes unexpected UAS failures.
- Ensures consistent operational efficiency.
- Lowers maintenance and material expenses.
- Decreases time wastage.
- Improves the rate of productivity.

7.1 Flight Logbook

Maintaining an updated logbook is essential, with flight details recorded for each take-off and landing. These records serve as valuable references during maintenance, especially when diagnosing different scenarios.

The logbook should include the date and location of operation, the times of take-off and landing, the duration of flight, pilot information, and the licensed operator's signature for confirmation.

8 Battery & Charger Maintenance

8.1 Do's

- ✓ Always use balance-charging mode when charging batteries.
- ✓ Prioritize connecting the balance port to the battery first, then the charging port.
- ✓ Store batteries in storage mode if they will not be used within 24 hours.
- ✓ Never leave batteries unattended during charging.
- ✓ Perform a check on stored batteries every 14 days.
- ✓ Report any system repairs falling outside operator instructions to the OEM / service partner.
- ✓ Submit damaged equipment requiring secondary analysis along with flight logs, videos, and battery logs.
- ✓ Hold batteries by the main body when changing them.
- ✓ Keep chargers away from dust, humidity, rain, high temperatures, direct sunlight, and excessive vibration.
- ✓ Use a blower to remove dust from connector ends.
- ✓ Use a dry fire extinguisher (never water) to extinguish a battery fire.
- ✓ Dispose of damaged batteries properly, avoiding exposure to fire or heat.

8.2 Don'ts

- ✗ Avoid using batteries that are damaged or swollen for flight operations.
- ✗ Do not disconnect the battery until the charger indicates it is done, to maintain cell balancing.
- ✗ Do not touch battery connector ends with metal objects — this can cause a short circuit and battery damage.
- ✗ Do not place batteries near open high-power devices; keep charging stations away from flammable items or liquids.
- ✗ Do not charge batteries inside a moving vehicle.
- ✗ Do not store damaged or swollen batteries with serviceable ones.
- ✗ Do not allow batteries to get wet or immerse them in water.
- ✗ Do not disassemble or modify batteries and avoid charging in locations with frequent high-voltage fluctuations.

9 Safety Precautions for Lithium Batteries

The system operates using rechargeable Lithium Polymer (LiPo) batteries, which are dry and safe for both operation and storage provided the following precautions are observed.

9.1 Checks & Recommendations

- Regularly inspect batteries for changes in physical appearance such as swelling or leakage between flights and charges. If any signs are evident, cease usage immediately and do not charge or connect the battery to the UAS or charger.
- Store batteries in a storage-charge state if they will not be used for more than 24 hours. Storing discharged batteries damages the cells, while storing fully charged batteries may cause corrosion or swelling.
- Double-check the LiPo charger settings before connecting the battery to the charger communication box.
- Charge batteries on heat-resistant surfaces to avoid fire hazards, and away from flammable items or liquids.
- Use a dry fire extinguisher (Class ABC recommended) to extinguish a battery fire — do not attempt to fight the fire yourself. Contact the fire department immediately.
- Avoid charging batteries inside a moving vehicle.
- Store damaged or swollen batteries separately from serviceable ones, and never in an automobile.
- Do not store batteries in areas with high temperatures or direct sunlight exposure; keep them away from heat sources such as generators or fires.

9.2 General Battery Handling

- Avoid storing battery packs in pockets, bags, or drawers where they may contact other items and short-circuit. Be cautious of battery wires being pinched together, which can also cause a short circuit.
- Keep sharp metallic objects — knives, scissors, screws, pins, coins, key chains — away from the battery housing or end caps to prevent puncturing the casing. Such contact can cause a short circuit or damage that poses a safety risk.

9.3 Battery Handling After a Crash or Accident

- Remove the battery immediately.
- Keep it away from people and objects — a minimum of 20 feet (6 metres).
- Fireproof containers may be used for isolation.
- If the battery pack appears normal after 2 hours, with no visible signs of puffing or swelling, check the voltage for normal range.
- Charge/discharge the pack using storage mode.
- Let the pack rest for 30 minutes after reaching storage charge, then charge normally.

NOTE

If the battery charges normally, exhibits proper charged voltage, and shows no external physical damage, it may be used for flight.

9.4 Warnings — Battery Handling

⚠ Misuse of the battery can lead to overheating, explosion, or fire hazard.

⚠ Avoid disposing of the battery in fire or heat sources.

⚠ Keep the battery away from water or moisture to prevent damage.

⚠ Do not puncture, strike, disassemble, or modify the battery.

⚠ Avoid placing the battery near high-temperature sources such as fires or stoves.

⚠ Never leave the battery unattended during charging.

⚠ Charge the UAS battery only once its temperature has returned to normal ambient levels after flight.

⚠ If the UAS battery temperature remains elevated after flight, do not store or pack it until it returns to ambient temperature.

10 Troubleshooting Guide

10.1 General

If the UAS encounters any of the following issues, follow these troubleshooting steps. Section 12 provides an expanded set of common-issue charts organized by subsystem, with likelihood ratings and detailed step-by-step resolutions.

Issue	Recommended Action
UAS fails to power on	Verify the battery is fully charged and the power switch is in the ON position. Ensure a secure connection between the battery and the UAS.
UAS does not connect to the remote controller	Confirm both the UAS and remote controller are powered on and within range. Inspect the antenna and cable, ensuring antennas on both the UAS and controller are correctly positioned and cables are secure. Reset the connection between the UAS and remote controller.
Poor GPS lock / inaccurate navigation	Allow time to acquire GPS signal and perform an accurate compass calibration. Assess wind conditions and adjust the flight path accordingly.
UAS does not respond to commands	Ensure the remote controller battery is fully charged and check the connection between the controller and the UAS. Try re-binding the two.
Spraying system malfunction	Verify the pesticide tank is filled with the correct pesticide and inspect the spraying nozzle for clogs. Adjust spraying system pressure as needed.
UAS camera malfunction	Clean the camera lens of dirt or debris and verify camera settings are configured correctly. Reset the camera and restart the UAS.
UAS crashes during flight	Ensure the flight path is clear of obstacles and check the functionality of UAS sensors. Confirm battery level is adequate for the flight duration.

11 Troubleshooting Charts

The following pages consolidate the WS5100 UAS troubleshooting references into quick-lookup charts. Each section is a probability rated by how frequently it is typically encountered in normal operation, together with the likely cause and a numbered resolution procedure.

High	Medium	Low
Frequently reported in the field — check first.	*Occurs occasionally — check after ruling out High items.*	*Uncommon — usually points to a specific fault.*

These charts cover the issues most frequently encountered in field operation of the WS5100 UAS, grouped by subsystem. Probability reflects how often each issue is typically the cause of the stated symptom, based on common agricultural-UAS field experience — always verify with the actual GCS message or physical inspection before replacing a component. If a step involves opening the airframe, disconnecting the battery first is mandatory (Section 3).

11.1 Power & Battery

Symptom	Probability	Likely Cause	Step-by-Step Resolution
UAS fails to power on	High	Battery disconnected/undercharged	1. Confirm the flight battery is charged (check cell voltages with a balance checker). 2. Verify the XT90/battery connector is fully seated and locked at the distribution board.
Battery will not hold a charge / short flight time	Medium	Cell aging, one weak/imbalanced cell, or the battery was stored outside its recommended voltage range for an extended period.	1. Fully charge the battery using balance mode and record the total charge time and capacity. 2. Compare individual cell voltages after charging — a spread greater than 0.05V between cells indicates imbalance. 3. Run one short hover flight and log the voltage sag under load. 4. If capacity has dropped more than ~20% from rated capacity, retire the battery from service.

Symptom	Probability	Likely Cause	Step-by-Step Resolution
Battery swells, feels hot, or smells unusual after flight	**Low**	Internal cell damage, over-discharge, physical impact, or an over-current event during spraying operations.	**1.** Stop use immediately. Do not charge, puncture, or attempt to flatten the pack. **2.** Move the battery outdoors, at least 6 metres (20 ft) from people and structures, onto a non-flammable surface. **3.** Place it in a fireproof LiPo bag/container and monitor for at least 2 hours. **4.** If swelling increases or smoke/odour develops, treat as a fire risk — use a Class ABC dry extinguisher only. **5.** Once stable, dispose of the battery per local hazardous-waste regulations; do not return it to general storage.
Charger stops or beeps mid-cycle	**Medium**	Cell-voltage mismatch beyond charger tolerance, a damaged balance lead, or incorrect charger cell-count/current setting.	**1.** Stop charging and disconnect the battery from the charger. **2.** Confirm the charger's cell-count (S) setting matches the battery label before reconnecting. **3.** Inspect the balance connector pins for corrosion or bent pins; clean with an eraser if needed. **4.** Let the pack cool for 10–15 minutes, then restart charging in balance mode at a lower current. **5.** If the fault repeats on the same battery, remove it from service and contact support.

11.2 RC Link, Telemetry & GCS Connectivity

Symptom	Probability	Likely Cause	Step-by-Step Resolution
UAS will not bind/connect to the remote controller	**High**	Controller or aircraft not powered before binding, aircraft out of range, or antennas not correctly seated.	**1.** Power on the remote controller first, then the UAS, keeping both within 5 metres. **2.** Check that both antennas on the landing gear and both on the controller are undamaged and connected. **3.** Enter binding mode per the flight manual and wait for the controller's connection tone/LED. **4.** If binding still fails, power-cycle both devices and repeat. **5.** Check for stable power being supplied to the receiver.
Intermittent signal loss / RC failsafe triggers mid-flight	**Medium**	Operating beyond effective range, antenna obstruction/damage, or RF interference from nearby transmitters or power lines.	**1.** Land as soon as failsafe is triggered and inspect logs for the range/RSSI at the time of loss. **2.** Inspect both aircraft antennas for bends, cracks, or loose connectors. **3.** Move flight operations away from high-voltage lines, cell towers, or other 2.4/5.8 GHz transmitters. **4.** If the issue persists at short range— the receiver module may need replacement.
GCS mobile application will not connect or is unresponsive	**High**	App/controller communication fault, low controller battery, or an app requiring an update.	**1.** Restart the GCS controller and relaunch the mobile application. **2.** Confirm the controller battery is adequately charged. **3.** Check for and install any pending application or firmware updates. **4.** Reseat the USB/data cable (if used) between the controller and mobile device. **5.** If the app still fails to connect, reinstall it and re-pair with the controller.
Telemetry data drops out during flight	**Low**	Weak telemetry-radio signal, antenna damage, or firmware mismatch between air and ground telemetry units.	**1.** Check both telemetry antennas for physical damage and secure attachment. **2.** Confirm telemetry radios on both ends are set to the same frequency and baud rate. **3.** Reduce operating distance and re-test to isolate a range-related cause. **4.** Update telemetry radio firmware to the latest matched version if drop-outs continue.

11.3 GPS, Compass & Navigation

Symptom	Probability	Likely Cause	Step-by-Step Resolution
Poor GPS lock / long time to acquire signal	High	Operating under tree cover, near tall structures, or before the GNSS receiver has had time to acquire enough satellites.	1. Move to open sky, away from buildings, trees, and metal structures. 2. Allow 60–120 seconds after power-on for the GPS to acquire a stable fix. 3. Confirm the GPS module and antenna wiring are undamaged and firmly seated. 4. Check the GCS satellite count and HDOP value before attempting take-off — do not launch below the manufacturer's minimum satellite count.
Compass calibration fails or heading is erratic	Medium	Magnetic interference during calibration, nearby ferrous material, or a compass that has drifted out of calibration.	1. Move at least 5 metres away from vehicles, rebar, metal tables, or large batteries before calibrating. 2. Remove metallic objects (tools, phones, keys) from pockets during calibration. 3. Re-run the advanced compass calibration from the GCS app, rotating the aircraft slowly through all axes as instructed. 4. If calibration continues to fail, inspect the GPS/compass module cable for damage or a poor connector seat.
Aircraft drifts or 'toilet-bowls' in position-hold/loiter	Medium	Compass/GPS interference, uncalibrated compass, or a degraded GPS fix quality.	1. Land immediately in a controlled manner using manual/stabilize mode. 2. Re-calibrate the compass away from magnetic interference sources per the steps above. 3. Verify satellite count and HDOP are within the recommended range before resuming autonomous modes. 4. Check for nearby high-power CAN bus or motor wiring routed too close to the GPS/compass mast.
Magnetic-field interference warning displayed	Medium	High ambient magnetic field from rebar, power lines, or large batteries near the take-off point.	1. Relocate the take-off point away from the interference source. 2. Re-check compass calibration once relocated. 3. If the warning persists in open terrain, inspect wiring near the GPS mast for proximity to power cables.

11.4 Motors, ESCs, Propellers & Frame

Symptom	Probability	Likely Cause	Step-by-Step Resolution
Unusual motor noise or excessive vibration on the bench	Medium	Bearing wear, foreign debris in the motor bell, or an unevenly seated motor base.	1. Remove the propeller and run the motor briefly to isolate whether the noise is motor- or propeller-related. 2. Check for even spacing between the motor bell and base — uneven spacing indicates a bent shaft or worn bearing. 3. Inspect for debris (dirt, spray residue) inside the motor bell and clean with dry compressed air. 4. Confirm the motor-base screws are torqued to specification. 5. If grinding or excessive play remains, replace the motor — contact support for a replacement unit.
One or more motors fail to spin, has no power, can be unresponsive or gives an error	Medium	Check power connection at distribution board, check for damaged CAN bus wiring/connector to the ESC, a faulty ESC, or a firmware mismatch between the flight controller and ESC.	1. Verify customer feedback or any errors from the GCS to identify which motor/ESC is flagged. 2. Inspect the CAN wiring (green/grey/yellow) between the CAN distribution block and the affected motor's connector. 3. Reseat all connectors and check for bent or corroded pins. 4. Swap the suspect motor's CAN lead with a known-good channel to isolate wiring vs. ESC fault.
Excessive vibration warning / IMU-related errors in flight	Medium	Propeller imbalance, a loose motor mount or frame fastener, or a cracked arm/frame component.	1. Land immediately and power down. 2. Inspect all propellers for chips, cracks, or bent tips and replace as needed. 3. Check every visible fastener on the arms, motor mounts, and frame for tightness. 4. Inspect arm tubes and swivels for hairline cracks, especially after any hard landing. 5. If vibration continues after these checks, run an IMU/vibration log review with the service partner.
Drone has unbalanced lift, shakes in flight, is unstable	High	Impact for propeller damage, loose mounting, wrong placement.	1. Do not fly with a damaged propeller — remove it immediately. 2. Replace with a manufacturer-approved propeller of the correct rotation (CW/CCW) for that position. 3. Tighten the propeller nut/bolt and re-check for smooth, quiet rotation before flight.

Symptom	Probability	Likely Cause	Step-by-Step Resolution
Aircraft tips, lurches, or drifts sideways on take-off	Medium	Uneven landing-gear tilt, a propeller installed on the wrong position/rotation, or an incomplete IMU calibration.	**1.** Power down and verify both landing gear legs rest at the same tilt angle. **2.** Confirm each propeller's CW/CCW marking matches its assigned motor position. **3.** Re-run IMU/level calibration on a flat, stable surface. **4.** Re-attempt take-off in a clear area at a safe distance from personnel.
Cracked arm tube, loose swivel, cracked or damaged landing gear, or missing frame fastener found during inspection	Low	Fatigue from repeated flight loads, a hard landing, or transport damage.	**1.** Do not fly the aircraft until the affected part is assessed. **2.** Photograph the damage and record it in the maintenance log. **3.** For cracked carbon tubing or swivels, use an approved replacement part — do not attempt field repair with adhesive alone. **4.** Re-tighten all surrounding fasteners once the part is replaced.

11.5 Spraying System

Symptom	Probability	Likely Cause	Step-by-Step Resolution
Pump does not prime / no spray output	High	Air lock in the pneumatic line, empty or low tank, or a disconnected pump power/signal cable.	**1.** Confirm the 10 L tank has sufficient liquid and the tank cap/vent is not blocked. **2.** Check the pump inlet/outlet orientation — the arrow on the pump housing must match flow direction. **3.** Inspect the pump's power (orange) and signal wiring back to the flight-control PWM output for a secure connection. **4.** Bleed the pneumatic line by briefly running the pump with the nozzle open to clear any air lock. **5.** If the pump still does not run, bench-test it directly on 12–14S power to isolate a pump-motor fault.
Uneven spray pattern or clogged nozzle	High	Debris or dried chemical residue in the nozzle, or a worn/damaged nozzle tip.	**1.** Shut off the pump and depressurize the line before servicing. **2.** Remove and inspect each nozzle tip for blockage; clear with a soft brush and clean water — never with a sharp object. **3.** Flush the entire spray line with clean water after every operating day, per Section 5. **4.** Replace any nozzle tip showing wear, an oval spray pattern, or dripping when off.

Symptom	Probability	Likely Cause	Step-by-Step Resolution
Flow-meter reading is inaccurate or spray rate is off target	**Medium**	Air bubbles past the flow sensor, sensor wiring fault, or a partially clogged line reducing actual flow.	**1.** Confirm the flow-meter wiring is fully seated at the distribution board. **2.** Bleed air from the line and re-check the reading against a known volume dispensed over a timed interval. **3.** Inspect the line upstream of the flow meter for partial blockage. **4.** If the reading remains inconsistent with actual dispensed volume, replace the flow-meter unit.
Leaking tank, hose, or pneumatic fitting	**Medium**	A loosened push-fit connector, a hairline crack in the PVC tubing, or a worn O-ring/gasket at the tank outlet.	**1.** Depressurize and drain the system before inspecting for leaks. **2.** Check push-fit connectors are pushed fully home; reseat and verify by gently tugging the tube. **3.** Inspect PVC tubing along its length for cracking, especially near heat-formed joints. **4.** Replace any damaged tubing section — soften new PVC tube ends with a heat gun (~180 °C) before fitting, per the manufacturer's guidance, and allow to cool before use. **5.** Replace worn gaskets/O-rings at the tank outlet if seepage continues.
Spray system does not shut off on command	**Low**	A stuck pump relay/ESC, contaminated pump internals, or a signal-wiring fault holding the pump on.	**1.** Land immediately and disconnect the flight battery to stop the pump. **2.** Inspect the pump signal line for a short or pinched wire causing a stuck-on signal. **3.** Bench-test the pump control channel independently of the pump to confirm the fault location. **4.** Do not resume spraying operations until the fault is isolated and resolved by the OEM/service partner.

11.6 Software & Firmware

Symptom	Probability	Likely Cause	Step-by-Step Resolution
Firmware update fails or the flight controller becomes unresponsive	**Low**	Update interrupted by power loss or a disconnected USB/data link, or an incompatible firmware file.	**1.** Do not disconnect power during a firmware update. **2.** If an update fails, retry using the exact firmware file specified for the WS5100/flight-controller model..
GCS shows outdated or inconsistent parameters after an update	**Medium**	Cached parameters in the GCS app, or a partial parameter sync following a firmware update.	**1.** Force-close and relaunch the GCS application. **2.** Reconnect to the aircraft and allow a full parameter refresh/sync to complete. **3.** Re-verify calibration (compass, IMU, radio) after any firmware update, as some updates reset calibration data. **4.** If parameters remain inconsistent, reinstall the GCS application.
Flight logs are missing or corrupted	**Low**	SD card near end-of-life, a card removed before the log finished writing, or a card formatting issue.	**1.** Never remove the SD card while the flight controller is powered on. **2.** Reformat the SD card (FAT32) using a computer, not the flight controller, if logs repeatedly fail to save. **3.** Replace the SD card if corruption recurs after reformatting — use a manufacturer-recommended card class/speed. **4.** Back up flight logs regularly to a separate device for maintenance record-keeping.

12 Monitoring Procedure for Critical Components

Wear items and safety-critical components require closer, more frequent monitoring than the general maintenance checklist. Follow this simplified monitoring procedure for the components listed below:

Component	Monitoring Procedure
Propellers	After each flight, carefully examine for cracks or changes in shape. Replace immediately if any issue is noticed.
3M Tape (if used)	Replace monthly — adhesive strength diminishes over time, especially in extreme temperatures.
Pneumatic Tubing	Regularly inspect for bends or leaks to prevent blockages or liquid-flow issues.
Arm Swivel / Threaded Arm Swivel	Check joints and threads regularly for wear from continuous use. Apply recommended lubricants; contact the manufacturer if damage is observed.
Landing Gear	Take precautions during take-off and landing to prevent bending or damage. Contact the manufacturer for replacement after any crash.
LiPo Battery	Monitor for overheating, bulging, or unusual odour; replace promptly if any issue arises.
Arm Extension Pipe	Regularly inspect the surface for cracks or deformation; replace with a manufacturer-approved part if damage is detected.

Following these monitoring procedures helps ensure the proper functioning and longevity of the WS5100 UAS.

13 Appendix A — Electrical & Wiring Quick Reference

This appendix summarizes the WS5100 wiring architecture to support electrical troubleshooting (Section 13.1, 13.2 and 13.3).

13.1 System Wiring Overview

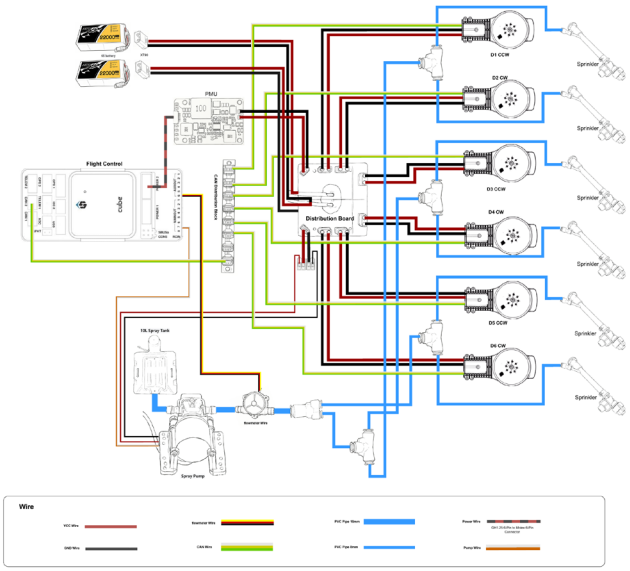


Figure A-1. WS5100 six-rotor power, CAN-bus, and spray-system wiring overview.

13.2 Wire Colour Legend

Wire / Harness	Colour	Function
VCC	Red	Power supply positive
GND	Black	Ground / power return
CAN Wire	Green / Grey / Yellow	CAN-bus data (CANL / CANH / GND) to CAN-enabled motors/ESCs
Flowmeter Wire	Red / Black / Yellow	Flow-sensor signal to distribution board
Power Wire (GH1.25 6-Pin to Molex 5-Pin)	Red / Black pair	Motor power connector
Pump Wire	Orange	Spray-pump power/signal
PVC Pipe 10 mm / 8 mm	Blue (tube colour)	Pneumatic spray lines

13.3 Flight Controller Connector Pinouts

Reference pinouts for the flight-control unit's TELEM, GPS, USB, CAN, and POWER ports — useful when diagnosing GPS, telemetry, or CAN-bus faults.

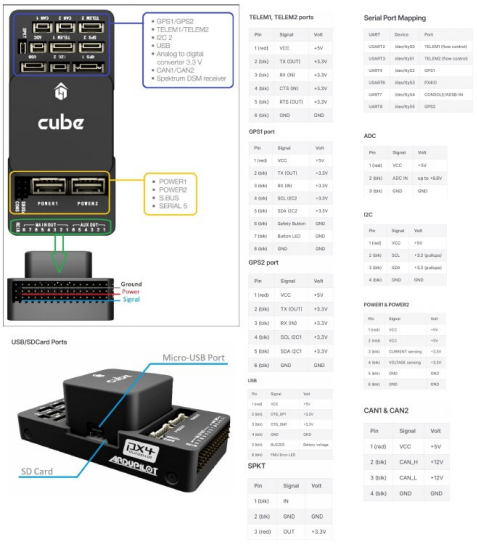


Figure A-2. Flight-controller port pinouts and serial-port mapping.

14 Product Warranty Note

The WS5100 UAS is covered by the warranty terms provided at the time of purchase. Warranty coverage and claims are subject to the terms and conditions issued by Studica and/or the OEM at delivery.

14.1 Warranty Claim Process — Important Notes

- Warranty claims must be accompanied by the aircraft's unique identification/serial number and a description of the fault.
- Damaged equipment submitted for secondary analysis should include flight logs, videos of the incident (if available), and battery logs.
- Flights completed beyond the manufacturer-specified flight-count threshold may no longer be covered under warranty.
- Damage resulting from misuse, unauthorized modification, or failure to follow this manual's maintenance procedures is excluded from warranty coverage.

NOTE

For complete, current warranty terms specific to your unit, contact Studica. This manual does not itself constitute the warranty agreement.

15 UAS & Owner Details

15.1 Owner

Owner Name:

Address:

Invoice Number:

15.2 Unique Identification

Manufacturer Serial Number:

Model Number:

Flight Control Serial Number:

RPS Serial Number:

15.3 Dealer

Dealer Name:

Address:

16 Contact & Support

For assistance beyond the scope of this manual, or if a troubleshooting chart directs you to contact the OEM/service partner, use the details below.

General Enquiries
Info_ca@studica.com
+1 905 564 7272

Service Enquiries
support_ca@studica.com

Sales Enquiries
sale_ca@studica.com
+1 905 564 7272
www.studica.ca