ZYRO Ground Control User Manual

V1.0 | Windows x64 and Android ARM64 | Illustrated English Edition

Use this manual to connect one or more aircraft to ZYRO Ground Control, plan missions, and monitor telemetry. The zyrolink 3516 example walks through wiring an AP/STA link, configuring the application, and tracing communication faults.

Start with Chapter 1 for installation, Chapter 3 for 3516 radio setup, and Chapter 12 for troubleshooting. Arrows show menu paths. Button and field names match the English interface where available.

The screenshots show the English interface on Windows V1.0. The manual also covers Android, where the layout may differ. IP addresses and aircraft IDs shown are examples.

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1 Installation and First Launch

1.1 Choose an Installer

Platform	Installer	Requirements
Windows	ZYROGroundControl-V1.0.exe	Windows 10 or later, x64
Android	ZYROGroundControl-V1.0.apk	Android 9 or later, ARM64 device

Obtain the installer from a ZYRO distribution channel. Chapter 13 lists SHA-256 values for verifying the download. Before upgrading, back up mission plans, logs, recordings, and any other files you need. Record the connection settings currently in use.

1.2 Install or Upgrade on Windows

1. Save your current mission, exit ZYRO Ground Control, and open the EXE installer.
2. Confirm the destination folder in the setup wizard. A first-time installation defaults to %LOCALAPPDATA%\Programs\ZYROGroundControl for the current user. If setup detects a previous version, it preselects that version's folder. Edit the path or select “Browse” to choose a different folder.
3. Launch the app from the Start menu when installation finishes. If you changed the installation folder, check that the shortcut points to the new location. After an upgrade, verify where the program is installed and where the app stores your data.
4. If Windows reports “DeleteFile failed, code 5” while replacing avcodec-63.dll, exit the old version, confirm in Task Manager that it has closed, and select “Retry.” If the error persists, cancel setup and check which process has the file open and whether your account can write to the destination folder. Then run setup again.

If Windows shows a warning about the installer source, verify the distribution channel and file hash before proceeding. On managed devices, follow your organization's approval process.

1.3 Install or Upgrade on Android

1. Copy the APK to the tablet or phone and open it from the file manager. If prompted, allow that app to install the APK. You can revoke the permission in Android settings after installation.
2. To upgrade, open the new APK with the same signing certificate and select “Update.” If Android reports a signing conflict, back up missions and logs, then verify where both packages came from. Uninstalling clears local app data. Check that you can open the backup first.
3. After first launch, check the storage location. Grant the permissions needed for device location, video recording, or export when prompted. For a wired connection, check Android's Ethernet settings for the assigned IPv4 address.

1.4 Interface Language and App Data

Select “English” under “Settings → General → Language” or “zyrolink Connections → Interface,” then restart the application. Use the labels you see in your build. Technical abbreviations such as MAVLink, UDP, RTK, and SITL are shared across languages.

Under “Settings → General,” check “Application Load/Save Path.” Keep each project's .plan files, mission readbacks, flight logs, recordings, and fleet operation reports together. If you use external storage, confirm that it is mounted and writable. Stop recording and let writes finish before unplugging it.

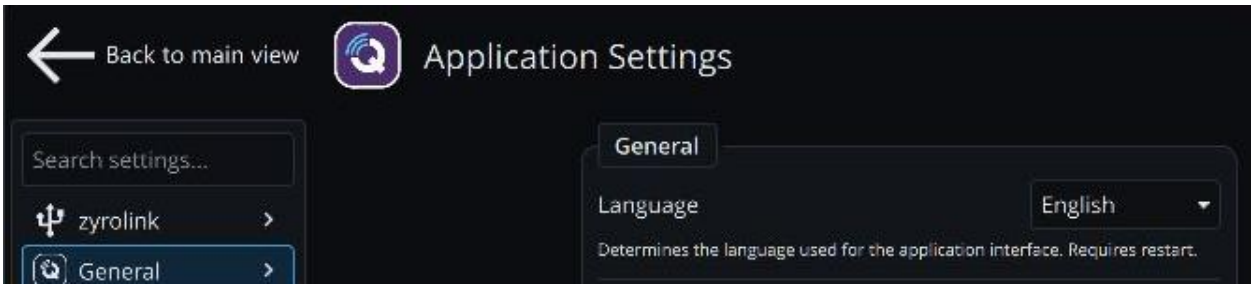


Figure 1 Windows General settings. Select “English” under “Language” on the right. “Back to main view” is at the upper left.

1.5 First Use Checklist

1. Install the app and choose where to save its data. Start with a bench test using simulated heartbeats or Windows SITL.
2. When using a 3516 radio, choose a ground station IP that the STA can actually reach. Configure the STA to send to UDP port 60000 on the ground station. Once the expected MAVLink system ID appears, check telemetry, parameter synchronization, and the return path.
3. Practice planning, uploading, reading back, and recovering a single aircraft first. Validate each aircraft individually before running fleet missions.

The example IP addresses, ports, and serial settings show how the components fit together. Use values appropriate for your radio, flight controller, and network. Available commands, modes, and sensor states depend on the hardware and flight controller firmware.

2 Main Views and Everyday Operation

2.1 Main Menu

Open the app menu at the upper left to switch views. To leave Settings, select “Back to main view” at the upper left or select “Flight” from the menu.

Entry	What it does
Flight	Shows position, mode, attitude, battery, GPS, alerts, and video. Use it to verify the active aircraft.

Entry	What it does
Missions	Create, edit, save, upload, and read back missions. Manage fences and rally points supported by the firmware.
Fleet missions	Select participating aircraft, manage independent routes, preview translated routes, and export operation reports.
zyrolink Connections	Configure automatic discovery, check UDP status, manage aircraft links, and access radio settings.
Aircraft Setup	After parameter synchronization, inspect sensors and settings supported by the flight controller. Verify the target aircraft before editing.
Settings and App Log Viewer	Adjust app options and search diagnostic logs. Match log timestamps to connection or state changes.
SITL simulation	Launch simulated aircraft on Windows to practice mission workflows and recovering from a lost link.



Figure 2 Windows main menu with Fleet missions, zyrolink Connections, Missions, SITL simulation, and App Log Viewer.

“zyrolink Connections → Interface → Advanced settings” exposes diagnostics and tools such as Mesh topology, All attitudes, Video, GNSS installation, RTK correction sources, Device interfaces, DroneCAN modules, 4G / MQTT telemetry, and Photo positions. Which entries appear depends on the platform and configuration.

2.2 Identify the Active Aircraft

In Flight, check the active aircraft ID at the top and the aircraft list on the right. The active aircraft supplies the displayed state and receives single-aircraft actions. The checkboxes in Fleet missions define the targets for fleet actions. Before proceeding, match each ID to the airframe label and the mission file.

Each flight controller reports a MAVLink system ID, or SysID. Assign a distinct ID to each controller on the same operating network. If two aircraft alternate under one displayed ID, connect them individually and check the SysID and radio assignment for each one.

“Follow active aircraft” pans the map with the selected aircraft. To see the entire site, turn off follow and zoom until the aircraft and work area are in view. If position or attitude is missing, check the most recent telemetry and alerts for that aircraft.

2.3 Connection and Readiness Indicators

Status	What to check next
UDP is listening	The ground station has opened the local port. Check whether any data has arrived.
An aircraft ID appears	The app received a valid heartbeat. Check telemetry and parameter synchronization next.
Not Ready	The flight controller reports that the aircraft is not ready. Review status details, the preflight checklist, and messages.
Comms Lost	The aircraft heartbeat timed out. Record when it happened. After recovery, recheck position, mode, battery, and mission state.
Request accepted	The flight controller acknowledged the request. Check later telemetry to determine whether it reached the requested state.

3 Set Up and Test the 3516 AP and STA Link

3.1 Wiring and IP Addresses

The telemetry path is flight controller serial port ↔ STA UART2 ↔ wireless AP bridge ↔ ground station UDP. Use either a computer or a tablet as the ground station for a given test. On the bench, a USB-to-serial adapter can replace the flight controller as the source of simulated MAVLink heartbeats.

Role	Example	Use
Ground station tablet	192.168.10.37:60000	Enter this as the STA's “Ground station IPv4:port” when using the tablet.
Ground station computer	192.168.10.100:60000	Set this as the STA's destination when using the computer.
AP	192.168.10.20	Use this management address to check the bridge and STA association.
STA	192.168.10.28:60001	STA data IP and local UDP port. The ground station sends data here.

1. Connect the ground station to the AP Ethernet port or the same test switch. The STA associates with the AP wirelessly. Its Ethernet port can remain unplugged in this setup. Verify the ground station's IPv4 address, subnet mask, and network adapter. The example uses a /24 subnet. With multiple adapters, check the interface that actually carries the packets.
2. Confirm STA association on the AP wireless status page. From the ground station network, open the STA's management page and check its data IP on the “Serial” page.
3. Connect flight controller TX to STA UART2 RX, flight controller RX to STA UART2 TX, and GND to GND. Check pinout, signal levels, and power requirements against both devices' documentation before wiring. Use a compatible level converter if necessary. The bench example uses a CH340 USB-to-serial adapter on COM15.
4. On the STA “Serial” page, select or verify “UDP — Ground Station.” For the tablet, enter 192.168.10.37:60000. The STA local UDP port is 60001. Match the serial settings on both sides. The bench used 115200 baud, 8N1, and no flow control. Select “Save and Apply” and wait for the settings to take effect.

3.2 Automatic UDP Discovery

1. Go to “zyrolink Connections → Automatic Aircraft Discovery,” turn on “Automatically discover aircraft over UDP,” and set the listening port to 60000. Restart the application as prompted.
2. If you have a manual UDP link, make sure it is not also listening on port 60000. Wait for the flight controller or bench source to send heartbeats.
3. Open “UDP connection status.” Verify the local port and aircraft SysID, then check that the last heartbeat continues to update. Confirm the same ID in Flight.
4. When switching ground stations, update the fixed destination on the STA to the new device's actual IP. Record the device, IP address, and port you tested.

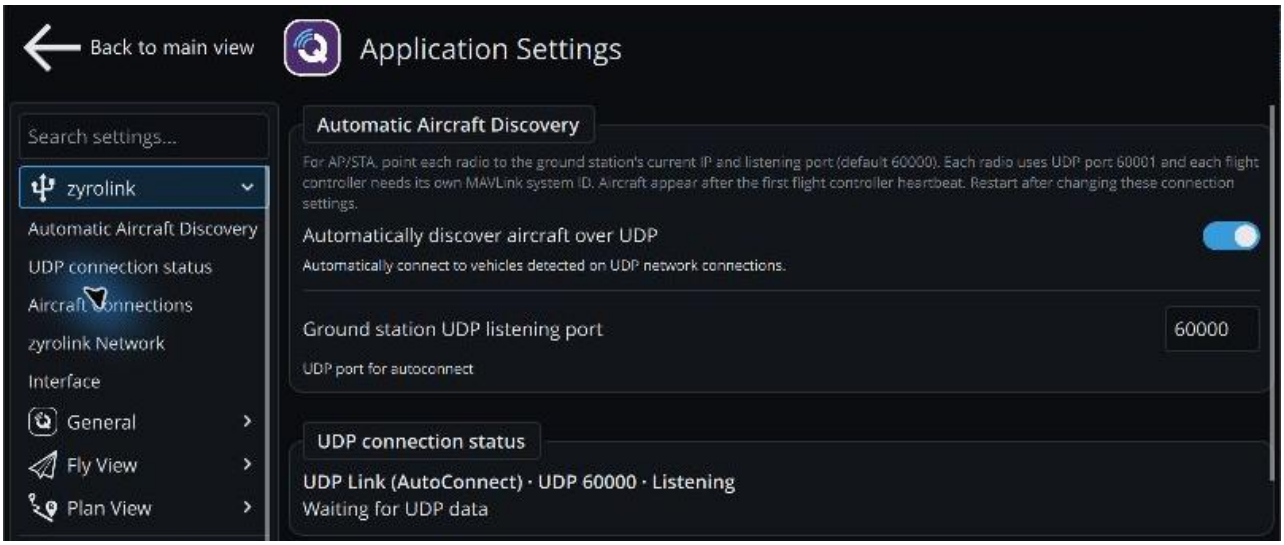


Figure 3 Windows Automatic Aircraft Discovery. Enable the switch at the upper right and set the local port to 60000. “Waiting for UDP data” means the listener is active and awaiting packets.

3.3 Connect to a Specific STA

1. Turn off UDP automatic discovery and restart as prompted to free the automatic link on port 60000.
2. If “Connect a STA radio” is available, enter the STA data IPv4 address, such as 192.168.10.28. Verify the local port 60000 and remote port 60001, then connect.
3. To configure the link manually, go to “zyrolink Connections → Aircraft Connections” and select “Add” in the Links list. Enter a name such as STA28. Set the type to UDP and “Port” to 60000. Under “Server Addresses,” enter 192.168.10.28:60001, select “Add Server,” and then select “Save.”
4. In the list, select “Connect” for the new link. When the button changes to “Disconnect,” check “UDP connection status” and the aircraft SysID. Remove temporary packet-capture destinations after testing.

Keep the STA's ground station destination aligned with the device in use. The quick connection uses a preset local port. To use a different port, create a manual connection and change the ground station destination port on the STA to match.



Figure 4 Windows manual UDP form. “Port” is the local listener at 60000. “Server Addresses” contains the STA endpoint at 192.168.10.28:60001. Disable automatic discovery on the same port before connecting.

3.4 Verify Both Directions with Counters

Note the STA counters before sending a test, then refresh the page and compare the increases. The counters are cumulative. A UDP packet count and a MAVLink frame count can differ.

Direction or check	STA counter behavior	What to verify at the other end
Serial to ground station	UART RX, Network TX, and UDP packets sent increase.	Ground Control shows the test SysID and the heartbeat keeps updating.
Ground station to serial	UDP packets received, Network RX, and UART TX increase.	The serial receiver captures bytes or complete MAVLink frames sent by the ground station.
UDP source check	Rejected UDP source typically stays unchanged.	If it increases, check the actual source IPv4, source port, and ground station permitted by the STA.

Use a send-and-receive mode in any serial test script that verifies both directions. Send-only mode tests the aircraft-to-ground path. Capture received data to verify the reverse path. To check the ground station heartbeat, open “Settings → Telemetry → Ground Station” when advanced settings are available and verify “Emit heartbeat.” Use the intended link and receiver for the test.

“Remote service unconfirmed” can appear with raw UDP. Verify transfer using counter increases, receipt at the target, and MAVLink heartbeats. Parameter and mission requests may time out when the source sends only simulated heartbeats. To test heartbeat recovery on the bench, stop the source, observe the timeout, then resume it and verify that the timeout clears.

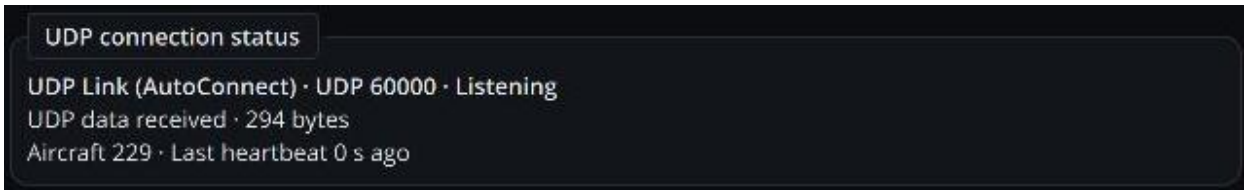


Figure 5 Windows “UDP connection status” with a local simulated heartbeat. The panel shows the listening port, bytes received, aircraft ID 229, and the age of its last heartbeat.

3.5 Add More STA Radios

Verify one STA before adding more radios. Assign a distinct data IP to each STA and a distinct SysID to each aircraft. To use one ground station port, configure each STA to send to the same ground station IPv4 address and UDP port 60000. When using manual UDP, manage the intended destinations through a single listening link for that port.

Record each airframe label, SysID, radio data IP, UART settings, and test time. Check the displayed SysID as you add each aircraft, then verify that they remain online together. Base fleet capacity on radio conditions, telemetry rates, video traffic, and actual test results.

4 Other Connection Methods and Mesh

4.1 Connect Aircraft over TCP

Enable advanced settings and open “zyrolink Connections → TCP Aircraft Connections.” Confirm that the radios or flight controllers are listening for TCP connections. Enter the first IPv4 address, device count, and remote TCP port. Review the range, then add the connections. Connect one at a time to confirm aircraft identity. Use the port configured on the device. Port 60001 in Chapter 3 is the UDP example.

4.2 Create Batch UDP Listeners

Use “Batch UDP listeners” when aircraft need distinct ground station ports. Enter a starting port and quantity, preview the range, and create up to 16 consecutive listeners at a time. For example, two STAs can send to 192.168.10.100 on ports 60010 and 60011, respectively. Check existing listeners and choose whether to start the new ones now or auto-connect at launch. For each port, verify that it is listening and that the expected SysID is sending heartbeats.

4.3 Mesh Topology

Configure the mesh on the radios before opening “Mesh topology” in Ground Control. Enter the node data URL provided by the equipment. Select the ground node for the deployment and bind aircraft nodes to distinct MAVLink system IDs. The ground node does not require an aircraft binding. Where the interface offers ID 0, it indicates an unspecified or cleared binding.

The topology view shows neighbors and radio link quality. Read signal-to-noise ratio (SNR) separately for each direction. A dashed gray link indicates unknown or unconfirmed data. A mesh aircraft needs valid position telemetry to appear in its mapped location. If a radio node appears without an aircraft, check the UDP data path and heartbeat as described in Chapter 3. If the aircraft appears without topology data, verify the node data URL, data freshness, and node bindings.

5 Maps and Mission Planning

5.1 Create and Save a Mission

1. Open “Missions.” If connected, verify the current SysID, firmware, and vehicle type. For offline planning, select the firmware and vehicle type that will receive the mission so the relevant commands appear.
2. Find the work area on the map and verify its latitude and longitude. On a desktop, drag the left edge of the right-hand editor to resize it. Double-click the divider to restore the default width.
3. Select “No Template” for a waypoint mission, or choose the appropriate template. Set the planned Home, default altitude, and altitude reference. The offline Home is used for planning calculations. After connecting, compare it with the Home reported by the flight controller to verify the actual return location.

4. Add waypoints on the map. Check their order, coordinates, altitude reference, altitude, and actions. When a mission includes takeoff, return, or landing, review those points and how the flight controller handles them.
5. Save the mission as a .plan file. Include the site, date, aircraft ID, and revision in the filename. Save a separate reviewed copy after edits so you can compare or revert revisions.

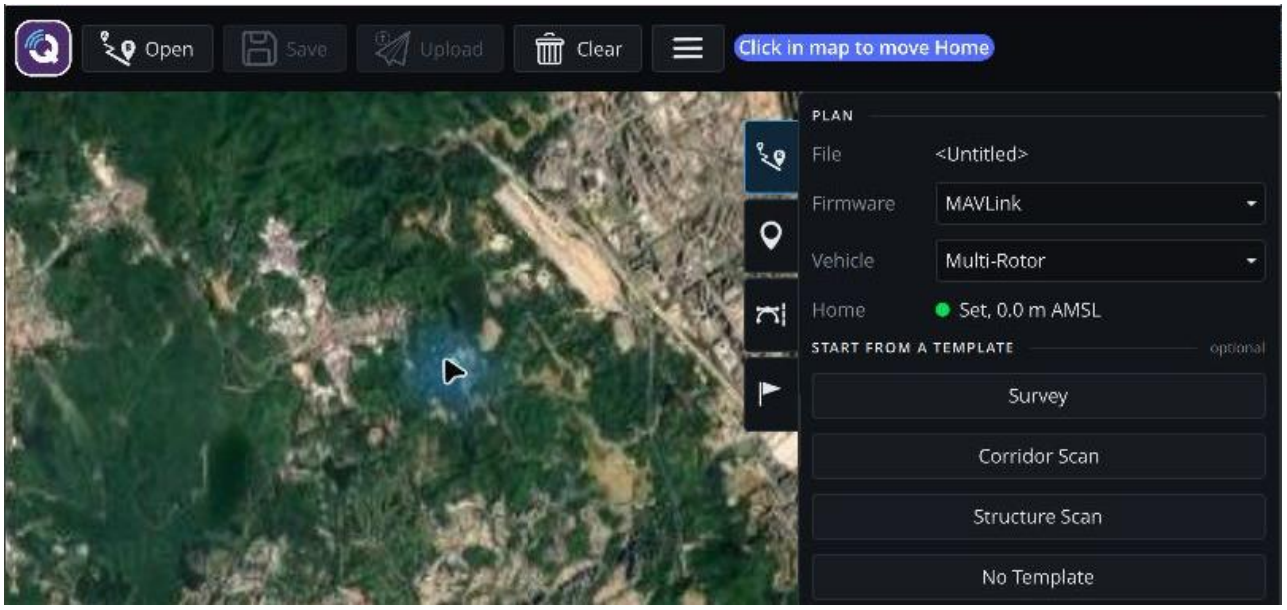


Figure 6 Windows offline "Missions" view. Open, Save, and Upload are at the top. The widened right panel shows firmware, vehicle type, planned Home, and the available templates.

5.2 Choose a Mission Template

Template	Use	Review before uploading
No Template	Place waypoints and actions manually.	Waypoint order, heading, turns, takeoff, landing, and return.
Survey	Generate flight lines over an area.	Coverage boundary, line direction and spacing, turnaround extension, camera trigger, and image overlap.
Corridor Scan	Generate a route along a narrow feature such as a road or pipeline.	Centerline, scan width, turns at both ends, terrain, and obstacles along the route.
Structure Scan	Generate scan passes around a three-dimensional structure.	Outline, altitude of each layer, clearance, corners, approach and exit routes, and camera direction.

Expand the important mission segments and inspect the generated waypoints. Recheck the result after changing scan direction, width, or camera settings. If the item supports KML import, import the appropriate outline and check coordinates, point order, and boundaries. Use the reviewed waypoints and the flight controller readback to verify the mission.

5.3 Altitude References and Map Checks

Reference	What to verify
Relative to Home	Check the altitude relative to the return point. Account for varying ground elevation in hilly terrain, valleys, and missions that take off and land in different places.
AMSL	Altitude above mean sea level. Check the position data, site reference, and how the flight controller interprets it.
Terrain reference	Assess clearance using terrain data coverage and accuracy, firmware support, and mission settings.

Recheck the altitude of each waypoint after changing the reference. Terrain elevation and map imagery can be out of date or inaccurate. During planning and site checks, account for trees, wires, structures, changes to takeoff or landing points, and failsafe paths. If you cache maps for offline use, disconnect from the public network and verify the area at the zoom levels you need.

5.4 Geofences and Rally Points

In the mission sidebar, select “Fence” or “Rally.” Configure circular or polygonal inclusion and exclusion areas and rally points where the flight controller supports them. Check the mission against the fence through approach, turns, exit, return, and landing. The flight controller configuration determines the response to a fence breach and how rally points are used. Confirm that the firmware can accept and read back the relevant commands and fences.

5.5 Upload and Read Back a Mission

1. Keep the aircraft on the ground with a stable link. Verify the target SysID, firmware version, and controller state. To retain the existing mission, download it and save a separate copy first.
2. Select the reviewed .plan file, upload it, and monitor progress and the reported result.
3. Read the mission back from the same flight controller. Compare waypoint count, key coordinates, altitudes, actions, fences, and rally points. Some values may be rounded by the protocol. Verify the intended behavior and apply your project's tolerances.
4. Record the mission revision and readback result for each aircraft. If the upload times out or you find a mismatch, recheck the link and SysID and read the mission currently stored on the controller before deciding whether to upload again.

6 Flight View and Status Monitoring

6.1 Preflight Checks

Practice with a bench setup or SITL first. For live operations, follow your team's procedures and site requirements. Have a qualified operator monitor the aircraft and be ready to take over. Match each airframe

to its SysID. Check flight mode, positioning, battery, Home, return altitude, fences, link-loss actions, and the available ways to take control. After a heartbeat appears, confirm that the aircraft meets the release criteria for the mission.

Under “Settings → Fly View → General,” select “Use Preflight Checklist.” Compare each check against the aircraft's current state. If the aircraft reports Not Ready, refuses to arm, has an unsettled position estimate, or reports a battery issue, read the reported reason, resolve it, and check again.

6.2 What to Monitor During Flight

Indicator	What to check
Mode and arming state	Do state changes match the most recent request and the current stage of the mission?
GPS, map track, and Home	Is position updating, and is the aircraft following the expected path?
Relative altitude, speed, and attitude	Compare these values with the planned altitude reference, flight stage, and conditions on site.
Battery and link	Monitor battery reserve, changes in heartbeat timing, alert times, and the freshness of data after reconnecting.
Mission progress and video	Match the selected aircraft ID to the mission position and video source.

Flight can show actions such as takeoff, pause, resume, and return when the flight controller supports them. Check the target aircraft, its current state, and the confirmation dialog. After sending a request, verify the result with telemetry, the map, and on-site observation.

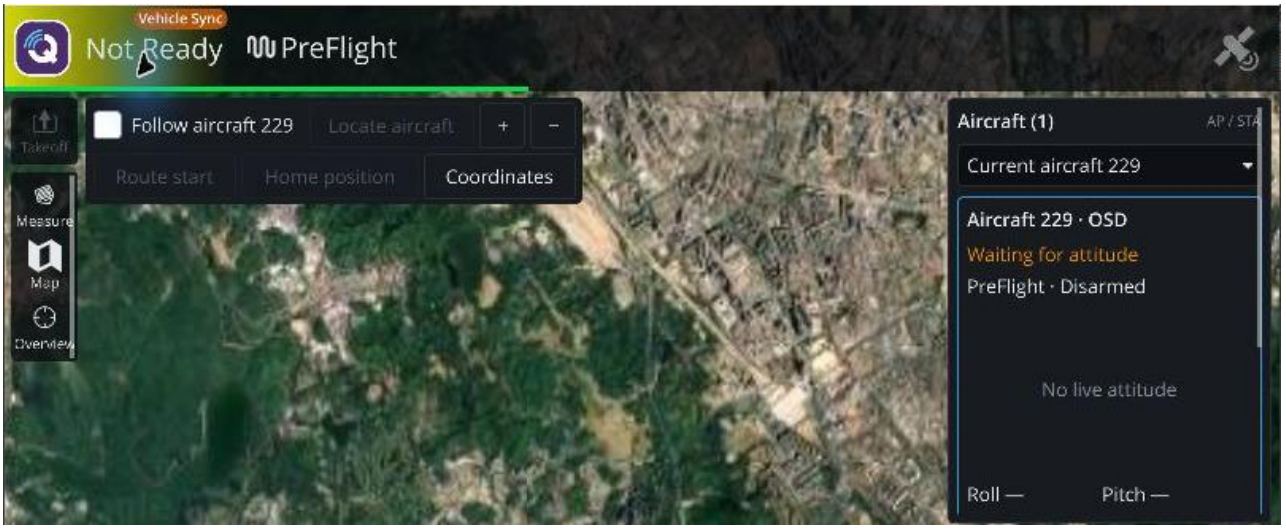


Figure 7 Windows Flight view with a simulated heartbeat. The upper left shows “Not Ready.” The panel on the right identifies aircraft 229 and shows its OSD.

6.3 Respond to a Lost Link

Record the last telemetry time, SysID, and last known position. Follow the flight controller's configured failsafe and the site's takeover procedure. Pause repeated requests from the ground station, monitor other connected aircraft, and notify the relevant staff according to site procedures. When the link returns, verify the latest mode, position, battery, mission progress, and alerts before deciding whether to continue. Treat the position left on the offline map as the last known position and check its timestamp. Chapter 13 links to the ArduPilot Copter and PX4 failsafe documentation.



Figure 8 Windows Flight view after the local test source stops sending heartbeats. The top bar shows “Comms Lost” and the aircraft panel shows “Link lost.”

7 Fleet Missions

7.1 Assign Roles and Select Aircraft

Open “Fleet missions” and work through “Connection → Planning → Upload / readback → Preflight → Execution → Recovery.” Record each aircraft's SysID, physical airframe, plan revision, takeoff and landing points, and assigned operator. Confirm each aircraft's telemetry and mission, then select the participating aircraft using the workspace checkboxes.

Assign who sends fleet actions, who watches each aircraft, and who handles on-site observation and takeover. Agree in advance how to handle failures, aborts, lost links, low battery, and an individual return. Make sure each target on screen maps to an identifiable airframe on site.

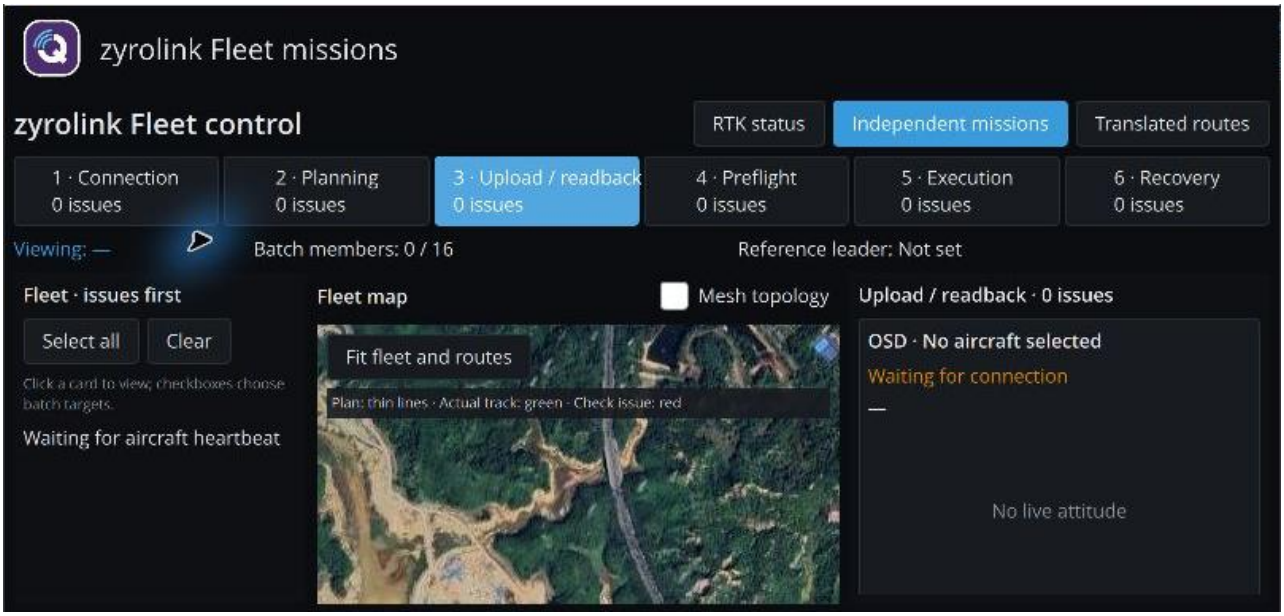


Figure 9 Windows Fleet missions workspace with “Upload / readback” selected. The fleet list is on the left and the aircraft status panel is on the right. No aircraft is selected in this example.

7.2 Independent Missions

1. Open “Independent missions” and prepare a separate .plan file for each aircraft. Allow enough space and time for each mission, return, and any holding period.
2. Switch to each target aircraft, upload its route, and read it back. Check alerts, fences, Home, and altitude references individually.
3. Select the participating aircraft in the workspace. Compare the selected targets with the verified mission records. Follow the interface prompts for aircraft on the ground and in flight.
4. Before selecting “Resume individual missions in flight,” “Pause selected aircraft,” or “Return selected aircraft,” verify the affected aircraft. Check each response and the state that follows. If an aircraft drops out of the workflow, use the on-site takeover procedure to confirm its actual state.
5. When work finishes, select “Export operation report.” Keep the report with the individual mission plans, readbacks, telemetry logs, and field records.

7.3 Translate a Lead Route by Fixed Offsets

Use “Translated routes” at the upper right of the Fleet missions workspace to make fixed-offset copies of a lead route. Select the lead aircraft and members, then generate the translated preview. Check each route's start and end, horizontal offsets, absolute and relative altitude, ground clearance, and return path. Upload only for supported vehicle, firmware, and mission types. This workflow applies to supported ArduPilot multicopter configurations.

Regenerate and review the preview after changing the lead route or Home, or after a member's link changes. Read back each uploaded mission. Translation preserves the planned offsets. Actual spacing also depends

on start timing, wind, tracking error, speed, lost-link actions, and flight controller behavior. Plan separation and collision avoidance for the site independently.



Figure 10 The top of the Windows Fleet missions workspace. Select “Translated routes” at the upper right, then open the “Planning” stage.

7.4 Fleet Takeoff Workspace

Use simulation to learn what “Preflight checks,” “Take off and run missions,” and “Stop further takeoffs” do. Confirm that every selected aircraft passes the software checks for current link data, ground state, positioning, Home, battery, and mission readback. Then verify personnel and environmental conditions against the mission's operating requirements.

After starting the sequence, confirm each aircraft's response. “Stop further takeoffs” stops pending steps that the ground station has yet to send. For aircraft that have already received a request or left the ground, confirm mode and position and handle each aircraft according to the site procedure.

7.5 Read the Operation Report

Report status	What to verify
Accepted and awaiting state confirmation	The flight controller acknowledged the request. Continue monitoring its telemetry.
Target state confirmed	The app observed the target state in telemetry. Confirm the result with on-site observation.
Timed out, unknown, or not sent	Check the link, aircraft identity, and current mode. Respond to the aircraft's actual state.
Skipped or remaining actions stopped	Identify which aircraft did not receive a request and check the state of aircraft already handled.

Record the result for each aircraft, including failures or results that could not be confirmed. Include the time, route revision, and actions taken on site.

8 Video and Logs

8.1 Connect a Video Stream

1. Open “Settings → Video” and choose RTSP, UDP, or another available source that matches the device output.
2. For RTSP, enter the full stream URL provided by the camera or encoder. For UDP, enter the receiving port and select the encoding used by the transmitter. Check the device IP, port, codec, and network path.
3. Return to Flight and open the video view. Verify that the image comes from the intended camera and aircraft. Check that it keeps updating and that latency is suitable for the task.
4. If recording is available, check the destination folder and free space. Make a short test recording, stop it, and confirm that the file plays. Back up recordings you need before enabling automatic cleanup.

Test video and telemetry separately. For a blank video pane, start with the source stream, codec, and firewall. For a telemetry outage, start with the heartbeat checks in Chapter 3.

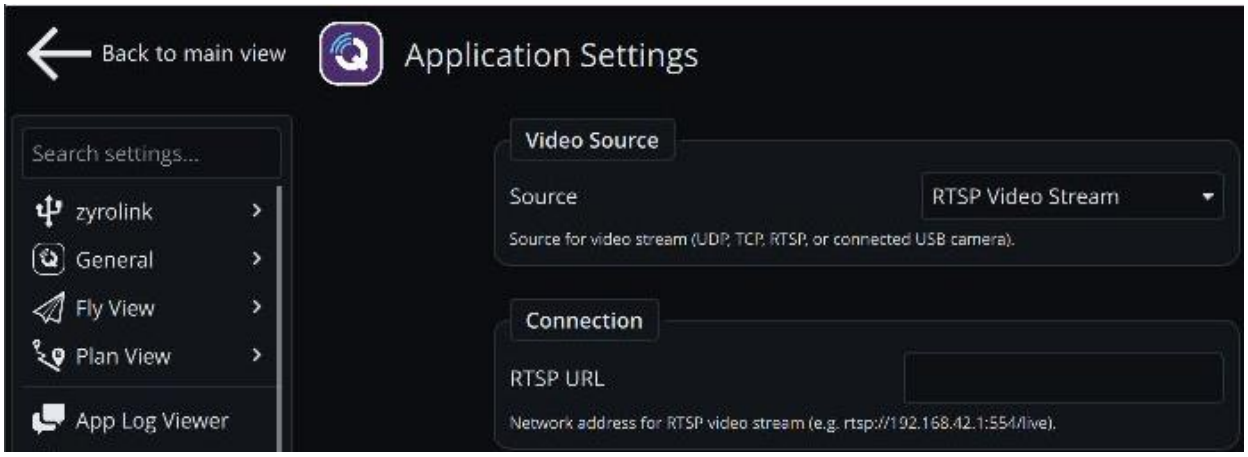


Figure 11 Windows Video settings. Select “RTSP Video Stream” as the source, then enter the address supplied by the device in the connection settings.

8.2 Save and Review Records

Record or tool	Use
Telemetry log (.tlog)	Stores telemetry received by the ground station for playback and checking events by timestamp.
Onboard flight controller log	Retrieves the firmware's onboard data, such as ArduPilot .bin or PX4 .ulg. Use the download method for that controller.
Video recording	Stores the video stream. Match its timestamp and aircraft ID to the operation record.

Record or tool	Use
App Log Viewer	Shows app warnings, connections, and diagnostics. Filter UDP entries, look for file errors, and export logs for support.
Fleet operation report	Records the targets selected, actions requested, and results for review after a mission.

Disconnect live aircraft links before playback or offline diagnostics as appropriate. Preserve original files along with the event time, software version, SysID, network topology, and steps to reproduce the issue. Remove credentials before sharing and handle coordinates and video according to your organization's rules.

8.3 Export Photo Positions

Enable advanced settings and open “Photo positions.” Select an ArduPilot DataFlash .bin log containing CAM records. Check the preview and export CSV. Coordinates are generally expressed as latitude and longitude. Use the original log to verify the altitude reference. GPS time, UTC, and elapsed time since boot have distinct meanings. Match log records to photos using timestamps or event numbers. Correct clock offsets where necessary. Leave missing fields empty and record the reason.

9 GNSS and RTK Device Settings

9.1 GNSS Receivers and RTK Corrections

“GNSS Receiver” is for the ground station's receiver. Check onboard GPS in Flight or Aircraft Setup. For RTK, confirm compatibility between the flight controller, onboard receiver, and correction source, then open “RTK correction sources.”

1. Select a local receiver, NTRIP, or a supported RTCM input. For a local receiver, verify the system serial port and receiver configuration.
2. For NTRIP, enter the host, port, mountpoint, and credentials, and configure TLS as required by the service. For UDP RTCM, verify the correction sender and the receiving port.
3. After connecting, inspect correction bytes, last update time, or status. Check the fix type, correction age, and positioning changes reported by each receiver. Once a correction stream appears at the ground station, verify the onboard receiver's fix separately.

9.2 GNSS Installation and DroneCAN

On the ground, isolate propulsion according to your maintenance procedure. Select the correct aircraft, wait for parameters to synchronize, and back them up. For GNSS antenna offsets, check the airframe axes, units, direction, and reference point against the flight controller documentation. Some fields write to the controller when you press Enter or leave the field. Read any prompt and read back the final values.

“Device interfaces” offers presets for compatible hardware. Check the device model, CAN port, protocol, and parameter preview first. Apply a preset only to supported firmware. Check each write and readback,

and record the values that took effect if the update was partial. After restarting as directed by the flight controller, verify device detection and health. Use “DroneCAN modules” to inspect nodes and configure features provided by that page.

10 4G and MQTT Telemetry

4G and MQTT offer another way to transport MAVLink. Before deploying, prepare an onboard MQTT gateway, a broker, credentials, and dedicated topics for both directions for each aircraft.

1. In the advanced menu, open “4G / MQTT telemetry” and select “Add connection.” Enter the broker host, port, authentication, and TLS settings. With TLS, use a hostname that matches the certificate and provide a PEM CA certificate if required.
2. Enter the full topic names for aircraft-to-ground and ground-to-aircraft traffic. Topics are case-sensitive. Use explicit names and assign each direction and each aircraft according to the gateway configuration.
3. To use “Import device configuration,” choose JSON, CSV, text, or a QR code image as prompted. Review the broker, topic directions, and authentication settings in the preview before applying and connecting. Re-enter credentials if required.
4. Check the broker connection, subscription, ground station link, and MAVLink heartbeat in that order. Verify traffic in both directions on the bench, then assess latency, congestion, and network switching at the site.

The MQTT link carries raw MAVLink. Broker and subscription status confirm parts of the transport path. Use MAVLink responses and telemetry to confirm the flight controller's actions. After reconnecting, verify the latest state before taking further action.

11 Windows SITL Simulation

11.1 Start and Stop a Simulation

1. On Windows, disconnect live aircraft links and open “SITL simulation.” On first use, follow the prompts to prepare the simulation engine.
2. Select a supported model, such as a quadrotor, and check the starting latitude, longitude, AMSL altitude, and heading. For multiple instances, check each SysID, port, and initial position.
3. Select “Start simulation.” When the simulated aircraft appears in Flight, check that its type, location, and telemetry match the configuration.
4. Select “Stop simulation” when finished. Confirm that the process exits and the simulated aircraft disappears. Open the simulation records folder if you need to preserve logs from the session.

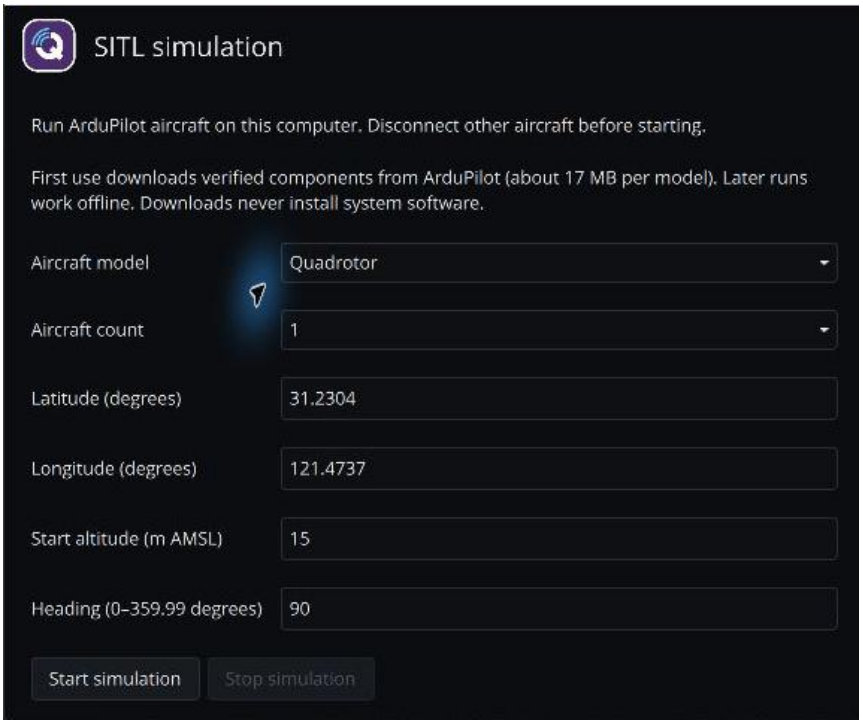


Figure 12 Windows SITL configuration before launch. Choose the model and aircraft count, then enter the starting coordinates, altitude, and heading.

11.2 Simulation Exercises

Exercise	Pass criteria
Single-aircraft mission	The saved, uploaded, and read-back missions match. You can identify the flight mode, current waypoint, and mission end.
Two independent missions	Two aircraft use different SysIDs and routes. Readback and target switching work for each aircraft.
Link loss and recovery	You can identify heartbeat timeout, target unavailability, restoration, and the updated state after reconnecting.
Missing fleet target	With one aircraft offline, you can identify the missing target and check the remaining aircraft and the operation report.
Review a session	You can correlate app logs, telemetry, mission files, and operation reports by timestamp.

Use simulation to verify how Ground Control interacts with the flight controller, handles target selection, and reports state. Validate radio coverage, positioning, battery reserve, site restrictions, and hardware compatibility in the actual deployment.

12 Troubleshooting and Field Checklists

12.1 Troubleshoot by Symptom

Symptom	Check first
Cannot open the AP or STA management page	Check cables, network adapters, Ethernet IPv4 address and mask, wireless association, and the interface in use.
UDP port bind fails	Check whether discovery, a manual link, a test probe, or another process already uses the local port.
STA UART RX does not increase	Confirm that the source transmits. Check TX/RX, common ground, signal levels, and serial settings such as 115200 baud. On the bench, test USB-to-serial loopback first.
UART RX increases while Network TX stays flat	Check the STA's active destination, service status, queue, and send errors.
STA sends UDP but no aircraft appears	Check the ground station IP, the listener on port 60000, and firewall rules. Verify that the payload contains a valid MAVLink heartbeat.
An aircraft appears, but STA Network RX and UART TX are both zero	Check that the manual link targets the STA on port 60001 and uses the intended local port. Check “Rejected UDP source.” If necessary, capture packets on the active ground station interface to see the source address.
STA UART TX increases, but the serial receiver sees no data	Check the path from STA TX to receiver RX, common ground, and how the receiver opens and reads the serial port.
Heartbeat is present, but parameter or mission requests time out	Check whether the source sends only simulated heartbeats, whether traffic works both ways, and whether the selected SysID matches the flight controller's replies.
Comms Lost keeps returning	Compare the heartbeat time, STA counters, and app logs. Check routing, wireless stability, the serial link, and the heartbeat source. Check data freshness after recovery.
Upload and readback differ	Verify aircraft identity, firmware compatibility, altitude reference, and upload result. Read the mission back from the flight controller again.
Recording fails to start or the file will not play	Verify the source, folder permissions, and disk space. After stopping recording, check the saved file and app logs.
Windows setup reports access denied	Exit the old application, check directory permissions and DLLs in use, then retry.

12.2 Prepare a Support Report

Open “App Log Viewer.” If needed, enable Comms.UDPLink or Comms.* in “Categories.” Reproduce the issue once and export the relevant time range. A successful bind typically produces “Attempting to bind”

followed by “UDP connected to 60000.” Record the actual SysID and STA counters. If the log shows parameter or mission timeouts, check whether the peer implements the relevant flight controller services.



Figure 13 Windows App Log Viewer toolbar. Open “Categories” on the left, use the category selector and search in the middle, and select “Save” on the right to export the log.

Include the platform, version, hardware, firmware, event time, source and destination IP and port, baud rate, STA counter values before and after, and steps to reproduce. Attach the app log and screenshots that show the relevant state.

12.3 Field Checklist

Stage	Checks
Before leaving for the site	Install and launch the intended version. Check offline maps, back up .plan files, prepare power and network equipment, and record aircraft and radio assignments.
After connecting	Verify local and remote IPs, ports, SysIDs, and link stability. Confirm both directions for each aircraft.
Before flight	Check mission readback, controller readiness, positioning, Home, battery, fences, weather, site conditions, and who will take control if needed.
During flight	Monitor each aircraft's mode, position, battery, link, and mission state. Follow procedures to confirm faults and recovery.
After recovery	Confirm that each aircraft is on the ground. Stop recording and save logs, reports, and missions. Record faults and items to test before the next operation.

13 Glossary and Reference Information

13.1 Common Terms

Term	Meaning in this manual
AP / STA	The access point provides wireless access and bridges the network. The station is the aircraft-side radio.
MAVLink / SysID	MAVLink is the messaging protocol between Ground Control and the flight controller. SysID is the aircraft's MAVLink system ID.
UDP / TCP	A UDP listener receives datagrams. A TCP client opens a connection to a listener at a specified address and port.

Term	Meaning in this manual
Home / AMSL	Home is the flight controller's return location. AMSL means altitude above mean sea level.
SITL	Software-in-the-loop simulation. It tests interactions between Ground Control and a simulated flight controller.
GNSS / RTK / RTCM	Global navigation satellite systems, real-time kinematic positioning, and a common correction data format.
MQTT / Broker	MQTT is a publish-subscribe messaging protocol. The broker receives messages and distributes them to subscribers by topic.

13.2 Verify the Installer

Open Windows PowerShell in the installer folder and run the command below. To verify the APK, replace .exe with .apk.

```
Get-FileHash -Algorithm SHA256 -LiteralPath .\ZYROGroundControl-V1.0.exe
```

These values identify the V1.0 download files used for this manual. If the installers are repackaged, use the checksums from the relevant distribution batch.

```
EXE  34325e875b9cdda96beca57bae295d3c007f5be75497bfdd8a9cecf359184958
APK  8c720f4c23e8d8668d191f5940d7c5615f5b400f3d612361609bfb857d5f11cc
```

13.3 References and Verification Scope

The menu paths, default ports, and installation steps describe the V1.0 distribution. The 3516 example comes from an AP/STA bench test using UART2 and a ground station. The Android tablet displayed the simulated SysID, heartbeat timeout, and recovery. Validate live missions against the actual flight controller, firmware, equipment, and site conditions.

For more on the common interface, mission editing, and flight controller failsafes, consult the official documentation for the firmware version you use.

QGroundControl Interface Overview

QGroundControl Mission Planning

ArduPilot Copter Ground Station Failsafe

ArduPilot SITL Simulation

PX4 Safety and Failsafes