Insight Light Rover: Quick Start Guide

System: Tethered Fiber Optic Inspection Rover
Controller: Lenovo Legion Go

1. Hardware Deployment

1. **Connect Tether:** Securely connect the fiber optic tether to the **Insight Light Rover** and the **Ground Network Unit (GNU)**.
    - *Check:* Ensure the LC fiber connectors are clean and fully seated ("Click" sound).
2. **Power Ground Unit:** Turn on the GNU. Wait for 30 sec for warm up.
3. **Power Rover:** Turn on the Rover.
    - ⚠️ **Wait 15 Seconds:** Allow the SIYI A8 Gimbal to perform self-calibration. **Do not touch** the camera head during this process.
    - *Note: Recording starts when vehicle arms.*

Startup Procedure

1. **Power Off Rover:** Turn off the rover **FIRST** (Safe file closure).
2. **Power Off Ground Unit.**
3. **Shut Down Legion Go.**

2. Controller Setup (Legion Go)

1. **Power On:** Press the power button.
2. **Auto-Launch:** The **Insight Dashboard** will open automatically.

3. Operations & Controls

Component	Input	Action
Movement	**Left Joystick**	Forward / Reverse / Turn Rover
Gimbal	**Right Joystick**	Pitch (Up/Down) & Yaw (Left/Right)

4. Video Retrieval (SD Card)

1. **Stop Recording:** Toggle the **"Record"** switch on the Dashboard to **STOP**.
    - ⚠️ *Crucial: Wait 3 seconds after stopping to ensure the file saves completely.*

2. **Power Off Rover:** Switch the Rover main power to **OFF**.
    - *Note: It is safer to remove the card when the gimbal motors are powered down.*

3. **Locate SD Slot:** Find the MicroSD card slot on the **rear of the SIYI A8 camera head**.
4. **Eject Card:** Gently press the card in until it clicks and pops out.
5. **Transfer Data:** Insert the card into a card reader/laptop to offload the **.MP4** files.
6. **Re-insert Card:** Place the card back into the camera immediately to be ready for the next run.

5. Shutdown Procedure

4. **Power Off Rover:** Turn off the rover **FIRST** (Safe file closure).
5. **Power Off Ground Unit.**
6. **Shut Down Legion Go.**

Troubleshooting

- **Video Feed Lost?**
    1. Check if the Fiber Optic cable is bent too tightly (Bend Radius).
    2. Verify the connectors at the Rover and GNU are secure.

Insight Light: Beta 1 Test Plan (Hardware Validation)

Objective: Validate mechanical durability, tether integrity, and software workflow stability before final design freeze.

Test Environment: Controlled simulated confined space (e.g., test pipe network, workshop obstacle course).

Phase 1: Bench & System Integration

Goal: Ensure all subsystems talk to each other correctly on boot.

Test ID	Test Case	Procedure	Pass Criteria	Notes
B1-01	Cold Boot Sequence	Power on GNU 9 (wait 30 sec) → Rover → Legion Go.	Dashboard auto-launches; Video feed appears < 45 seconds.	
B1-02	Legion Go Boots to Dashboard	Ensure Legion Go boots to Dashboard without intervention	Controller connects to Dashboard without manual intervention.	
B1-03	SIYI A8 Auto-Record	Power on Rover. Wait 2 mins. Power off. Check SD card or Web Interface.	Video file exists.	
B1-04	Latency Check	Wave hand in front of camera. Observe Legion Go screen.	Latency < 200ms (perceptible but not hindering).	

Phase 2: Gimbal & Optical Validation

Goal: Verify the SIYI A8 mechanics, range of motion, and image quality.

Test ID	Test Case	Procedure	Pass Criteria	Notes
G2-01	Range of Motion (Pitch)	Use Right Joystick: Full Up (+90°) to Full Down (-90°).	Camera reaches physical limits smoothly without stalling or shaking.	
G2-02	Range of Motion (Yaw)	Use Right Joystick: Full Left to Full Right (approx ±135°).	Camera rotates fully without snagging internal cables.	Check for cable tension.
G2-03	Active Stabilization	Pick up the Rover (motors off). Tilt chassis ±30° Roll/Pitch.	Horizon stays level on the screen. Video does not jitter.	
G2-04	Zoom Mechanics	Test Zoom In/Out (via Dashboard or Button).	Focus readjusts automatically; Image is sharp at Max Zoom (6x).	
G2-05	Gimbal Drift	Leave Rover stationary on flat ground for 5 mins.	Camera remains centered; Does not slowly drift left/right on its own.	
G2-06	Low Light Performance	Dim the room lights.	Camera switches to high-ISO/night mode (if auto); Noise is acceptable.	

Phase 3: Drive Mechanics & Thermal

Goal: Verify chassis movement and thermal stability.

Test ID	Test Case	Procedure	Pass Criteria
M3-01	Bend Radius Limit	Coil tether to manufacturer minimum radius while operating.	No signal loss; Video feed remains stable.
M3-02	Obstacle Traversal	Drive over 2-inch obstacles.	Rover clears obstacle; Gimbal absorbs the shock (video remains watchable).
M3-03	Thermal Run-in	Leave Rover ON, LEDs 100%, Recording ON for 30 mins.	SIYI A8 does not overheat/shutdown; Chassis safe to touch.

Phase 4: Operational Workflow (User Experience)

Goal ; Validate the Legion Go control scheme.

Test ID	Test Case	Procedure	Pass Criteria
UX4-01	Joystick Deadzone	Gently nudge Legion Go joysticks.	Rover/Gimbal ignores slight drift; moves smoothly on intentional input.
UX4-02	Simultaneous Input	Drive Forward + Yaw Gimbal / Pitch simultaneously.	System handles all inputs without lag or command drop.
UX4-03	Video Retrieval (Web)	Stop motors. Open Browser 192.168.144.25.	Download completes; File plays back with audio/video synced.
UX4-04	Wi-Fi Range (GNU)	Walk Legion Go away from Ground Network Unit.	Connection stable at target distance (10m-20m).

Phase 6: High Risk / Stress Testing (Perform Last)

Goal ; Destructive testing.

Test ID	Test Case	Procedure	Pass Criteria	Risk Level
HR6-01	Tether Drag Stress	Drive rover to max tether length. Pull cable taut.	Video feed does not flicker. Strain relief holds jacket.	HIGH
HR6-02	Emergency Power Cut	Pull battery while recording.	File corruption limited to last 5 seconds.	Medium