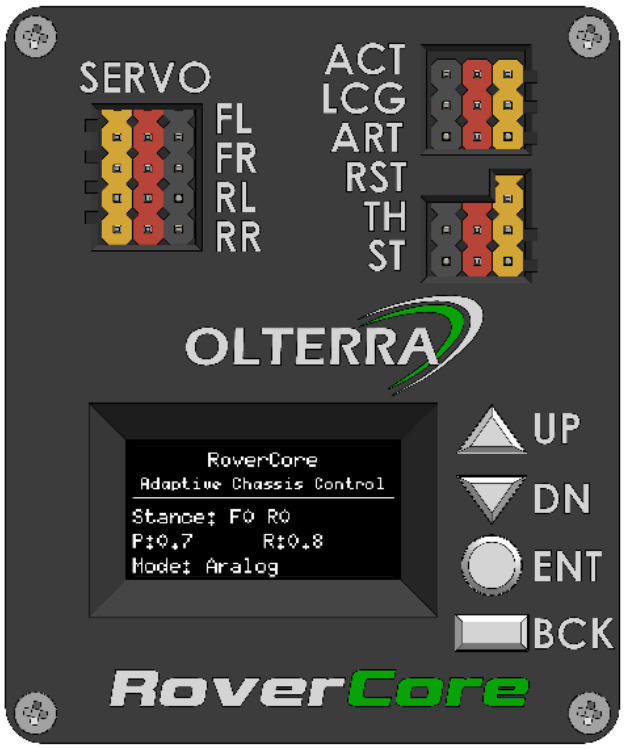
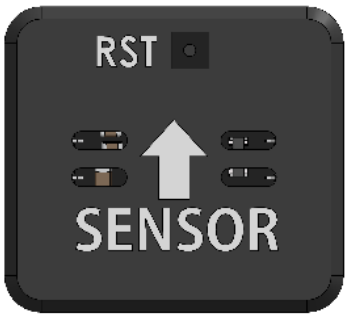
OLTERRA ROVERCORE™

Adaptive Chassis Control System

Professional Product, Installation, Operation & Service Manual





Olterra Solutions

Release Date: 11 July 2026 | Document Revision: 1.0

This manual supersedes the separate Product Overview and OLED Menu Tree documents.

Document Control

Item	Details
Product	RoverCore™ Adaptive Chassis Control System
Manufacturer / Brand	Olterra Solutions
Document Type	Installation, Operation & Service Manual
Document Revision	1.0
Release Date	11 July 2026
Audience	Operators, installers, integrators, trained service personnel and advanced RC / UGV users
Scope	Hardware installation, commissioning, OLED menu operation, Web Dashboard, Direct Control, OTA updates, tuning, troubleshooting and maintenance

IMPORTANT
This edition consolidates the previous product overview and OLED menu guide and adds the July 2026 Web Dashboard, Web Control, Direct Control touch joystick, light/dark theme, unique device SSIDs, revised auto-learning sequence, and improved OTA portal behavior.

Safety Conventions

Symbol / Term	Meaning
WARNING	Risk of injury, uncontrolled chassis movement, electrical damage, or loss of control.
CAUTION	Risk of component damage, incorrect calibration, overheating, or unstable behavior.
NOTE	Important operating information, recommended practice, or clarification.

Contents

1. Product Overview and Feature Summary

1.1 Product Description

RoverCore™ by Olterra Solutions is a real-time adaptive chassis control platform for advanced unmanned ground vehicles and precision RC crawlers. It combines a dual-core OlterraCore controller, an external BNO085 inertial sensor, four independent suspension-servo outputs, RC receiver inputs, an OLED operator interface, and a wireless Web Dashboard.

The system converts a conventional servo-actuated suspension into a software-defined chassis architecture. Depending on the selected mode, RoverCore™ can stabilize chassis attitude, simulate digital spring and damping behavior, apply driver-intent weight transfer, command low-center-of-gravity stance, execute kinetic recovery motion, or provide direct touch control from a phone or computer.

1.2 System Architecture

Subsystem	Function
Main Control Module	Real-time control, RC input decoding, servo output generation, OLED menu, Web Dashboard and OTA update management.
External IMU / Sensor Module	Measures chassis attitude and motion. Mounts on the sprung chassis near the vehicle center.
Four Suspension Servos	Independent FL, FR, RL and RR actuation.
RC Receiver Inputs	ACT, LCG, ART, RST/Aux, throttle (TH) and steering (ST) intent inputs.
Web Dashboard	Wireless configuration, mode override, Direct Control joystick, tuning, calibration and learning actions.

1.3 Technical Specifications

Category	Specification
Processor	OlterraCore dual-core MCU
Sensing	BNO085 external 9-DOF inertial sensor module
Nominal Control Loop	200 Hz real-time chassis control loop
Servo Output Refresh	Configurable 50–400 Hz, matched to servo capability
Operating Voltage	4.8–8.4 V DC system / servo supply as designed for the installation
Servo Outputs	4 independent PWM channels: FL, FR, RL, RR
Receiver Inputs	PWM: ACT, LCG, ART, RST/Aux, TH, ST
Onboard UI	128×64 OLED telemetry and settings interface
Wireless UI	2.4 GHz local Web Dashboard; no internet required for normal dashboard operation
Firmware Service	Wi-Fi OTA update workflow with local configuration portal

1.4 Feature Summary

- Dedicated Web Dashboard with collapsible navigation and touch-optimized controls.
- Separate WEB CONTROL section: Web UI command authority is no longer treated only as a radio override.
- DIRECT CONTROL mode with touch joystick, independent Invert X and Invert Y controls, center return and servo-safety enforcement.
- Direct Control automatically returns ACT / LCG / ART selections to Normal and prevents conflicting Web mode commands while active.
- Display Theme selector for Dark or Light mode.
- Unique dashboard SSID: RoverCore_DashBoard_<ID>, where <ID> is the last three hexadecimal characters of the physical device MAC address.
- Unique OTA portal SSID: RoverCore_OTA_<ID> using the same device suffix.
- Dashboard is temporarily paused during OTA Wi-Fi provisioning to prevent 192.168.4.1 portal conflicts, then restored after cancel/failure/no-update when previously enabled.
- Revised learning sequence: Auto Learn Servo Orientation is performed before Auto Learn PID to prevent PID learning with incorrect servo direction.
- Updated OLED System menu guidance for Web Dash, Web Ctrl and Web Time.

TERMINOLOGY

The Web Dashboard uses the label “Normal.” This corresponds to the neutral / analog mode used elsewhere in the OLED and RC mode descriptions. “Direct Control” is the current professional user-facing name for the Web touch-joystick mode.

2. Safety, Power and Installation Requirements

2.1 General Safety

WARNING

Four high-torque suspension servos can move the chassis suddenly and with high force. Keep hands, tools, cables and clothing clear of suspension links, servo arms, axles and pinch points whenever power is applied.

- Support the chassis securely before running Servo Orientation learning, PID learning, Direct Control tests, or any action that can move multiple corners.
- Do not perform calibration or learning with people or fragile equipment beneath the vehicle.
- Do not power the four suspension servos from a receiver rail unless the receiver and power system are specifically rated for the total current.
- Do not remove power during firmware flashing.
- After changing servo limits, verify mechanical clearance at all four corners before driving.

2.2 Power Requirements

RoverCore™ controls four independent suspension servos. The power system must be sized for simultaneous stall and transient loads, not only average current.

Application	Recommended Power Provision
1/10 scale, 25–35 kg·cm class servos	Dedicated external UBEC; approximately 20 A minimum system capability is recommended.
Heavy-duty / 1/8 scale, 50 kg·cm and larger servos	Dedicated external UBEC; approximately 30 A or higher system capability is recommended.
Any installation	Common electrical ground between RoverCore™, receiver, servo power system and required signal references.

CAUTION
Actual current requirement depends on servo model, linkage ratio, supply voltage, mechanical binding and vehicle mass. A brownout or undersized UBEC can cause resets, erratic motion and loss of control.

2.3 Pre-Installation Checklist

☐ All four suspension servos are mechanically installed and move freely through the intended range.
☐ External UBEC / power distribution is correctly rated and fused where appropriate.
☐ Receiver signal ground and RoverCore™ ground are common.
☐ Sensor module is mounted on the sprung chassis, not on a moving axle.
☐ Throttle and steering parallel/Y connections do not interrupt normal ESC or steering-servo control.
☐ Servo arms and links cannot collide with chassis components at programmed limits.

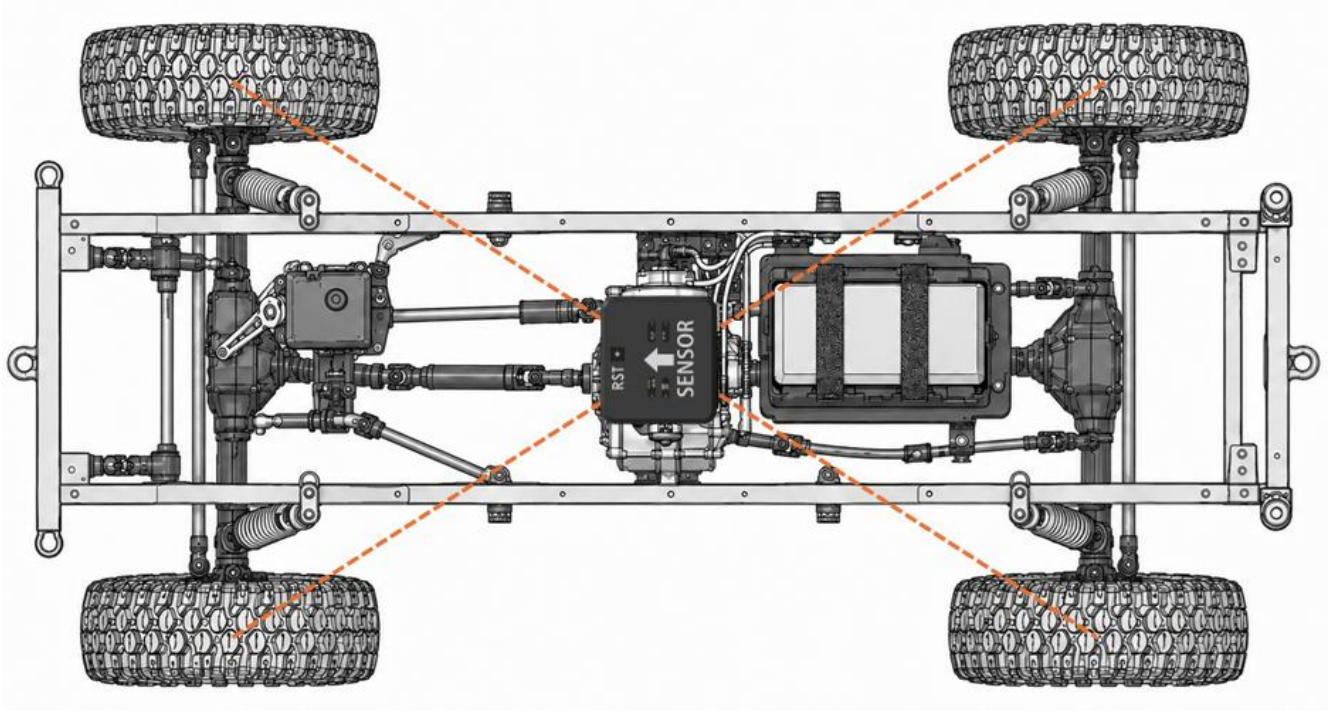
3. Hardware Installation and Wiring

3.1 Main Control Module Connections

Label	Connection / Purpose
FL	Front Left suspension servo
FR	Front Right suspension servo
RL	Rear Left suspension servo
RR	Rear Right suspension servo
ACT	Architecture / Suspension mode input
LCG	Stance & Recovery input
ART	Articulation input
RST	Reset / auxiliary input
TH	Throttle intent input
ST	Steering intent input

3.2 Sensor Module Mounting

Mount the external IMU module rigidly on the sprung chassis near the geometric center of the vehicle. The preferred position is near the intersection of the four wheel centers, with the sensor arrow pointing forward. Avoid flexible panels, moving axles and locations exposed to direct drivetrain vibration.



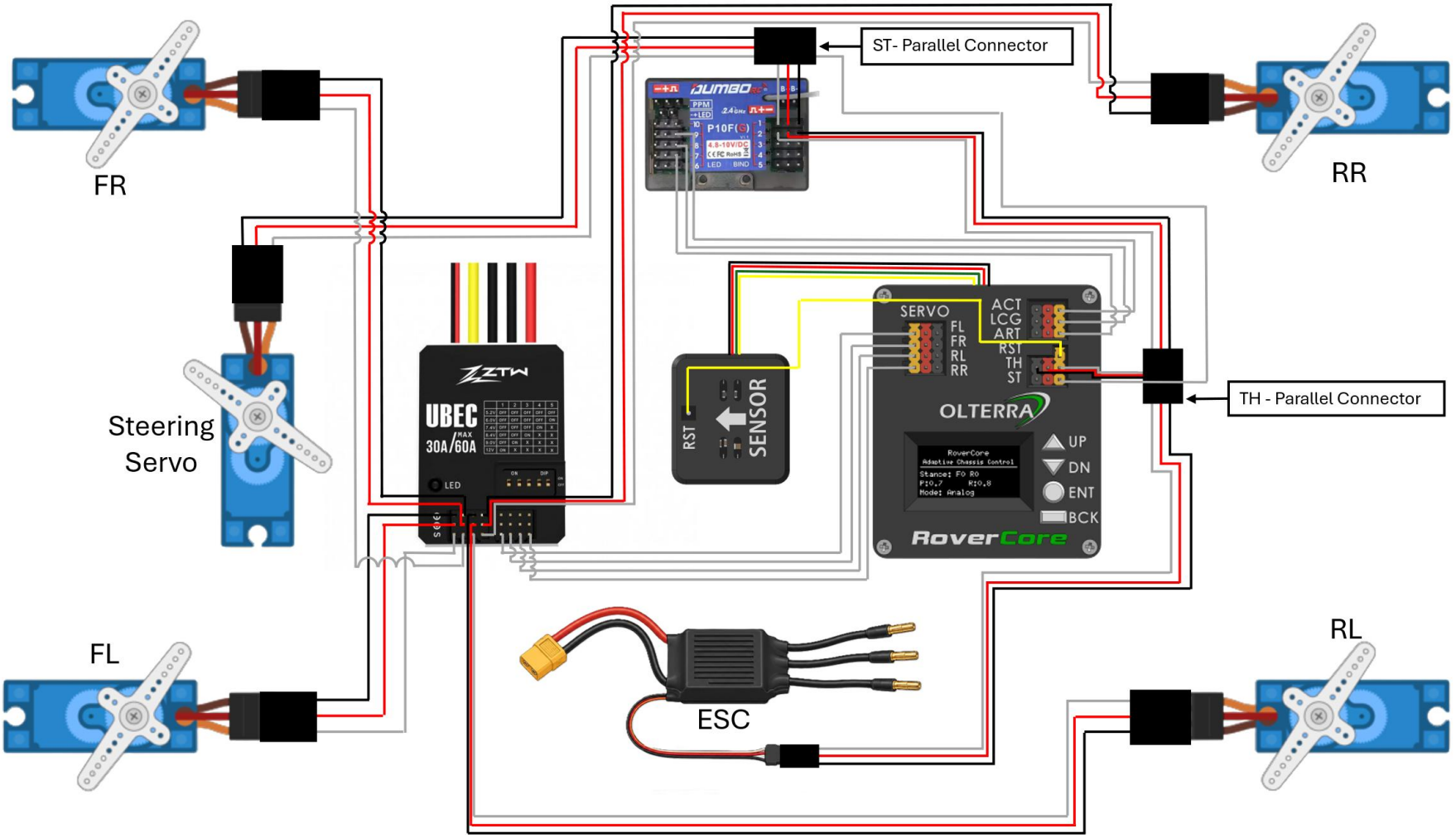
Recommended sensor location near the center of the sprung chassis. The arrow should point toward the vehicle front unless Sens Dir is configured for another orientation.

> **NOTE**
> If the sensor cannot be mounted perfectly level, use Calibrate Sensor / Reset IMU Zero after installation. If the sensor is rotated, configure Sens Dir to match the physical orientation before calibration and learning.

3.3 Wiring Procedure

1. Connect the main battery to the correctly rated UBEC / servo power distribution system.
2. Connect each suspension servo to the corresponding FL, FR, RL and RR output path. Verify signal, power and ground orientation.
3. Use a parallel/Y connection for steering: one branch remains connected to the steering servo and the other feeds RoverCore™ ST.
4. Use a parallel/Y connection for throttle: one branch remains connected to the ESC and the other feeds RoverCore™ TH.
5. Assign receiver auxiliary channels to ACT, LCG and ART. Use three-position switches where the full three-state mode set is required.
6. Connect the external sensor module to the dedicated sensor interface and secure the cable away from moving links.

3.4 Master Wiring Reference



Master wiring reference. Verify connector pin orientation and your specific receiver / UBEC documentation before applying power.

3.5 Recommended RC Transmitter Mapping

RoverCore Input	Recommended Switch / Source	Positions
ACT	3-position auxiliary switch	Active Leveling / Normal / Digital Suspension
LCG	3-position auxiliary switch	Kinetic / Normal / LCG, depending on transmitter mapping and configured direction
ART	2- or 3-position auxiliary switch	Normal / Articulation
TH	Parallel feed from throttle channel	Continuous PWM driver intent
ST	Parallel feed from steering channel	Continuous PWM driver intent

NOTE
Exact RC channel numbers are transmitter-dependent. Configure by function rather than assuming a fixed channel number.

4. Commissioning and First-Boot Procedure

The commissioning order is critical. Do not run PID learning before the system has correct sensor orientation and servo movement direction.

REQUIRED SEQUENCE
1) Mechanical inspection → 2) Sensor direction → 3) IMU zero → 4) Servo Orientation learning → 5) Servo limits and offsets → 6) Shock profile → 7) PID learning → 8) Functional mode test.

4.1 Step 1 - Mechanical and Power Inspection

☐ Vehicle is on a hard, level surface or securely supported for learning actions.

☐ Servo linkages move freely with no binding.

☐ Servo power supply is stable and correctly rated.

☐ All four output channels correspond to FL, FR, RL and RR.

4.2 Step 2 - Set Sensor Direction

Open System → Sens Dir and select the orientation matching the physical sensor installation. Use the sensor arrow and vehicle forward direction as the reference. Incorrect sensor mapping causes pitch and roll correction in the wrong axis.

4.3 Step 3 - Zero the IMU

1. Place the vehicle on a verified level surface and keep it completely still.

2. OLED method: System → Calibrate Sensor. Web method: Sensor → Reset IMU Zero.

3. Wait for the operation to complete before touching the chassis.

4.4 Step 4 - Auto Learn Servo Orientation

WARNING
The servos move during orientation learning. Lift or support the vehicle safely and keep hands clear.

1. OLED method: Servo Config → Auto-Learn Dir. Web method: Sensor → Auto Learning → Auto Learn Servo Orientation.

2. Start the operation and observe each corner movement.

3. Allow the sequence to finish without manually moving the chassis.

4. Verify that an “up” command raises the intended chassis corner and a “down” command lowers it.

IMPORTANT
Servo Orientation learning must be completed before Auto Learn PID. PID learning with incorrect servo direction can produce invalid results and unstable correction.

4.5 Step 5 - Set Stance, Offsets and Travel Limits

- Set Front Hgt and Rear Hgt / Web Front Base Angle and Rear Base Angle for the normal stance.
- Use individual FL/FR/RL/RR offsets only for mechanical asymmetry correction.
- Set Servo Min and Servo Max so no linkage binds and no servo is driven against a mechanical stop.
- Confirm full travel with the wheels unloaded before driving.

4.6 Step 6 - Select Shock Profile

In Active Leveling, set Shocks to Oil, Grease or Solid so the learning algorithm uses an appropriate damping expectation for the mechanical suspension.

4.7 Step 7 - Auto Learn PID

1. Confirm Servo Orientation learning is complete and correct.
2. Place the vehicle on the required stable test surface and keep clear of moving parts.
3. OLED method: Active Leveling → Auto-Learn PID. Web method: Sensor → Auto Learning → Auto Learn PID.
4. Do not touch the vehicle until the learning sequence completes.
5. Review the result and confidence / warning information shown by the firmware.

4.8 Step 8 - Functional Verification

☐ Normal mode returns the chassis to the configured base stance.
☐ Active Leveling corrects pitch and roll in the expected direction.
☐ Digital Suspension responds without oscillation or limit contact.
☐ LCG and Kinetic modes operate only when intentionally selected.
☐ Articulation moves within configured travel limits.
☐ Web Control OFF returns mode authority to the RC radio.
☐ Direct Control ON forces ACT / LCG / ART to Normal before joystick operation.

5. Operating Modes and Control Authority

5.1 Architecture / Suspension Domain (ACT)

Mode	Purpose
Active Leveling	IMU-based chassis attitude stabilization.
Normal	Neutral / analog behavior; no Active Leveling or Digital Suspension mode command.
Digital Suspension	Software-defined spring, damping, mass and dynamic/static response.

5.2 Stance & Recovery Domain (LCG)

Mode	Purpose
Kinetic	Rapid recovery oscillation intended to help break static friction when stuck.
Normal	Neutral stance / recovery command.
LCG	Low-center-of-gravity stance or configured directional stance action.

5.3 Actuation Domain (ART)

Mode	Purpose
Normal	No articulation cycle command.
Articulation ON	Cyclic / maximum-travel articulation behavior within configured limits.

5.4 Control Authority Hierarchy

State	Authority and Behavior
Web Dash OFF	No dashboard session. RC radio controls available chassis modes.
Web Dash ON + Web Ctrl OFF	Dashboard is available for viewing/tuning, but RC radio retains mode authority. Radio Overrides and Direct Control are disabled.
Web Ctrl ON	Web UI may command Radio Overrides and may enable Direct Control.
Direct Control ON	ACT / LCG / ART Web modes are forced to Normal; conflicting Web mode buttons are disabled; touch joystick becomes the active Web motion command.
Direct Control OFF	Joystick is inactive. Modes remain Normal until the operator selects another Web mode or returns authority to RC.

SAFETY
Turning Web Ctrl OFF cancels Direct Control and returns mode authority to the RC radio. Check the physical RC switch positions before handing control back to the transmitter.

6. OLED Home Screen and Complete Settings Menu

6.1 Home Screen

The OLED Home Screen is the normal operating display. It presents stance, live attitude and mode information. A secondary PWM monitor page shows receiver inputs used by the controller.

Display Item	Meaning
F / R Stance	Front and rear chassis stance / height indication.
P	Pitch angle.
R	Roll angle.
Mode	Current chassis operating mode.
PWM Monitor: ART / LCG / ACT	Mode command input signals.
PWM Monitor: ST / TH	Steering and throttle intent signals.

6.2 Button Operation

Button	Function
UP	Move cursor up or increase selected value.
DN	Move cursor down or decrease selected value.
ENT	Open menu, select item, trigger action or save edit. Hold during numeric adjustment for faster scrolling where supported.
BCK	Return to previous menu, cancel edit, or exit toward the Home Screen.

6.3 Complete OLED Navigation Tree

Use this page as the primary OLED navigation reference. Start from the Home Screen, press ENT to open the Main Menu, use UP/DN to highlight an item, press ENT to enter or confirm, and press BCK to return one level.

WEB DASHBOARD ACCESS FROM THE OLED

System > Web Dash > ON - Starts the local dashboard access point.
Wi-Fi > RoverCore_DashBoard_<ID> - Connect the phone, tablet or computer.
Browser > 192.168.4.1 - Opens the Web Dashboard.
System > Web Ctrl > ON - Grants Web UI authority for Radio Overrides and Direct Control.
System > Web Time - Sets dashboard Wi-Fi auto-off time from 5 to 90 minutes.

Important: Web Dash makes the webpage available; Web Ctrl separately grants command authority.

Recommended learning order: Calibrate Sensor -> Auto-Learn Dir (Servo Orientation) -> set limits/stance -> select Shocks profile -> Auto-Learn PID.

MENU BRANCHES 1-3	MENU BRANCHES 4-7

1. SERVO CONFIG
- Front Hgt
- Rear Hgt
- Servo Spd
- **Servo Limits**
  - Servo Min
  - Servo Max
  - Servo Hz
- **Servo Dir**
  - Rev FL / Rev FR / Rev RL / Rev RR
- **Servo Offset**
  - FL Off / FR Off / RL Off / RR Off
- **Auto-Learn Dir**

2. ACTIVE LEVELING
- Auto-Learn PID
- Lvl Sens
- Deadzone
- Shocks: Oil / Grease / Solid
- G-Pitch
- G-Roll
- G-Bump
- **Front PID**
  - F-Kp / F-Kd / F-Ki
- **Rear PID**
  - R-Kp / R-Kd / R-Ki
- **Roll PID**
  - Rl-Kp / Rl-Kd / Rl-Ki

3. DIGITAL SUSPENSION
- D-Spring
- D-Damp
- D-Mass
- D-Speed
- D-DZone
- **D-Gains**
  - Dyn Pitch
  - Dyn Roll
  - Dyn Heave
  - Stat Pitch
  - Stat Roll

4. ACTUATION MODE
- Act. Rng
- Act. Spd

5. DRIVE ASSIST
- Kinetic Spd
- LCG Dir

6. SYSTEM
- Sens Dir
- Art. En
- Drv Asst. En
- Act. En
- Rev TX-TH
- Rev TX-ST
- Calibrate Sensor
- Rst Sensor Cal
- Factory Rst
- Update FW OTA
- **Web Dash**
- **Web Ctrl**
- **Web Time**

7. ABOUT
- Product / company information
- OlterraCore information
- IMU information
- Firmware version
- Device ID / MAC information

6.4 Main Menu Summary

Main Menu	Purpose
1. Servo Config	Height, speed, travel limits, direction, offsets and Servo Orientation learning.
2. Active Leveling	Sensitivity, deadzone, shock profile, G-force gains and PID tuning/learning.
3. Digital Suspension	Digital spring, damping, mass, speed, deadzone and gains.
4. Actuation Mode	Articulation range and speed.
5. Drive Assist	Kinetic speed and LCG direction.
6. System	Sensor orientation, RC input settings, transmitter reverse, calibration, reset, OTA, Web Dash, Web Ctrl and Web Time.
7. About	Product, OlterraCore, IMU, firmware and device information.

6.5 Servo Config

Menu Item	Function
Front Hgt	Front base stance / ride-height command.
Rear Hgt	Rear base stance / ride-height command.
Servo Spd	Maximum servo movement step / response speed.
Servo Limits → Servo Min / Servo Max	Absolute software travel boundaries.
Servo Limits → Servo Hz	Servo output refresh frequency.
Servo Dir → Rev FL/FR/RL/RR	Individual servo direction reversal.
Servo Offset → FL/FR/RL/RR Off	Individual corner trim.
Auto-Learn Dir	Automatically learns servo orientation. Run before PID learning.

6.6 Active Leveling

Menu Item	Function
Auto-Learn PID	Automatically profiles chassis response. Run only after correct Servo Orientation.
Lvl Sens	Leveling sensitivity / correction aggressiveness.
Deadzone	Ignores very small attitude changes.
Shocks	Oil / Grease / Solid mechanical damping profile.
G-Pitch	Front-to-rear G-force correction gain.
G-Roll	Side-to-side G-force correction gain.
G-Bump	Vertical bump / heave correction gain.
Front PID	F-Kp, F-Kd, F-Ki advanced tuning.
Rear PID	R-Kp, R-Kd, R-Ki advanced tuning.
Roll PID	Rl-Kp, Rl-Kd, Rl-Ki advanced tuning.

6.7 Digital Suspension

Menu Item	Function
D-Spring	Digital spring stiffness.
D-Damp	Digital damping / shock-oil effect.
D-Mass	Simulated chassis mass.
D-Speed	Digital suspension reaction speed.
D-DZone	Digital suspension deadzone.
D-Gains → Dyn Pitch	Dynamic pitch response from driver intent.
D-Gains → Dyn Roll	Dynamic roll response from steering intent.
D-Gains → Dyn Heave	Dynamic vertical response.
D-Gains → Stat Pitch	Static pitch sag / incline response.
D-Gains → Stat Roll	Static roll sag / side-hill response.

6.8 Actuation Mode and Drive Assist

Menu	Item	Function
Actuation Mode	Act. Rng	Articulation movement range.
Actuation Mode	Act. Spd	Articulation movement speed.
Drive Assist	Kinetic Spd	Kinetic recovery oscillation speed.
Drive Assist	LCG Dir	LCG direction behavior.

6.9 System Menu

Menu Item	Function / Service Note
Sens Dir	Rotates IMU software mapping to match physical sensor orientation.
Art. En	Enables/disables Articulation RC input behavior.
Drv Asst. En	Enables/disables Drive Assist RC input behavior.
Act. En	Enables/disables Architecture/Suspension RC input behavior.
Rev TX-TH	Reverses throttle intent interpretation without changing transmitter setup.
Rev TX-ST	Reverses steering intent interpretation.
Calibrate Sensor	Sets current stable level position as IMU zero.
Rst Sensor Cal	Clears saved sensor calibration.
Factory Rst	Restores system defaults. Recommission the vehicle afterward.
Update FW OTA	Starts wireless firmware update workflow.
Web Dash	Turns the local Web Dashboard access point ON or OFF.
Web Ctrl	Enables/disables Web UI command authority for Radio Overrides and Direct Control.
Web Time	Sets dashboard WiFi auto-off time.

IMPORTANT
Web Dash ON only makes the dashboard available. Web Ctrl ON grants Web UI command authority. These are different functions.

7. Web Dashboard: Connection, Navigation and Detailed Operation

7.1 Dashboard Overview

The RoverCore™ Web Dashboard is a local, touch-optimized interface served directly by the controller. Normal dashboard use does not require internet access. The dashboard can be opened from a phone, tablet or computer with a 2.4 GHz Wi-Fi connection.

- Responsive mobile layout with collapsible sections.
- Dark and Light display themes.
- Master Web Control authority switch.
- Radio mode overrides for ACT / LCG / ART.
- Direct Control touch joystick with independent X/Y inversion.
- Active Leveling and Digital Suspension tuning.
- Actuation / Kinetic tuning and servo-limit controls.
- Sensor zeroing and ordered auto-learning actions.

7.2 Enable and Connect to the Dashboard

1. On the OLED, open System → Web Dash and set it to ON.

2. Open Wi-Fi settings on the phone, tablet or computer.

3. Connect to RoverCore_DashBoard_<ID>. Example: RoverCore_DashBoard_7A3.

4. Enter the default dashboard password: 12345678.

5. Open a browser and navigate to 192.168.4.1.

DEVICE ID
The <ID> suffix is the last three hexadecimal characters of the controller's physical MAC address. The same suffix is used by the OTA portal, making multiple RoverCore™ units easier to distinguish.

CONNECTION LIMIT
The dashboard access point is configured for a single connected client. Disconnect a previous phone/computer before connecting another device.

7.3 Web Dashboard Navigation Map

Tap a section heading to expand or collapse it. Only the controls inside the expanded section are shown, which keeps the mobile interface compact.

Dashboard Section	Purpose	Primary Controls
Display Settings	Theme selection	Dark / Light
Web Control	Master Web UI command authority and WiFi timeout	Web UI Control, WiFi Auto-Off
Radio Overrides	Web selection of ACT / LCG / ART modes	Active Leveling, Normal, Digital Suspension; Kinetic, Normal, LCG; Articulation
Direct Control	Touch joystick command mode	Direct Control ON/OFF, Invert X, Invert Y, joystick
Active Leveling Tuning	Leveling and G-force response tuning	Sensitivity, deadzone, servo speed, terrain adaptation, G-force gains
Digital Suspension Tuning	Synthetic suspension physics	Spring, damping, mass, speed, deadzone, dynamic/static gains
Actuation / Kinetic Tuning	Articulation and recovery motion	Range, actuation speed, kinetic speed
Servo Limits	Base stance and travel protection	Front/rear base angle, max/min travel offset
Sensor	Calibration and learning actions	Reset IMU Zero, Servo Orientation learning, PID learning

7.4 Display Settings

Display Theme switches the interface between Dark and Light presentation. The selection is retained as a dashboard preference. Theme selection changes only the appearance; it does not alter chassis control behavior.

7.5 Web Control - Master Command Authority

WEB CONTROL is a separate top-level collapsible section because it authorizes more than radio mode overrides. It is the master permission for both Radio Overrides and Direct Control.

Web UI Control State	Behavior
OFF	RC radio controls chassis modes. Radio Overrides and Direct Control are disabled/greyed in the Web UI.
ON	Web UI may select ACT / LCG / ART modes and may enable Direct Control.

WiFi Auto-Off Time sets the dashboard inactivity timeout from 5 to 90 minutes in 5-minute steps. Use a shorter timeout for battery-powered field use and a longer timeout during service or tuning.

7.6 Radio Overrides

Radio Overrides are available only while Web Ctrl is ON and Direct Control is OFF. The buttons mirror the three chassis control domains.

Group	Web Buttons	Meaning
ACT - Architecture / Suspension	Active Lvl / Normal / Digital Susp	Selects the core suspension architecture.
LCG - Stance & Recovery	Kinetic / Normal / LCG	Selects stance and recovery behavior.
ART - Articulation	Normal / Articulation ON	Enables or disables articulation behavior.

NOTE
Normal is the neutral / analog selection. It is intentionally used in the Web Dashboard to make the state clear to operators.

7.7 Direct Control

Direct Control is the professional touch-joystick mode for manual chassis pitch and roll command from the Web Dashboard. It is intended for controlled positioning, demonstration, inspection and specialized maneuvers.

WARNING
Direct Control can move multiple suspension corners at the same time. Keep the vehicle supported during setup and keep people clear of moving linkages.

1. Enable Web Ctrl in the WEB CONTROL section.
2. Expand DIRECT CONTROL.
3. Set Direct Control Mode to ON.
4. Confirm that ACT, LCG and ART return to Normal. Their override controls are disabled while Direct Control is active.
5. Touch and drag the joystick. X commands roll; Y commands front/rear pitch.
6. Release the joystick to return the command to center. Direct Control remains ON until switched OFF.

7.7.1 Joystick Direction and Axis Inversion

Control	Behavior
X axis	Left / right roll command.
Y axis	Front / rear pitch command.
Invert X	Reverses only the left/right command. Y behavior is unchanged.
Invert Y	Reverses only the up/down command. X behavior is unchanged.
Diagonal movement	Combines X and Y commands. If only one axis is inverted, only that component of the diagonal command is reversed.

7.7.2 Direct Control Safety Behavior

- Direct Control does not bypass servo Min/Max limits.
- Front and rear base angles and individual corner offsets remain part of the command calculation.
- Servo Reverse settings remain active at the normal output stage.
- Servo Speed limits are retained for controlled motion.
- Full joystick travel means a full requested Direct Control command, subject to available safe servo travel. The controller scales combined commands when necessary to avoid exceeding limits.
- Loss of valid joystick updates is handled by the firmware safety timeout; command values are neutralized and Direct Control is cancelled according to the implemented safety logic.

7.8 Active Leveling Tuning

Dashboard Control	Range	Purpose
Level Sens	0.2–5.0	Overall leveling sensitivity.
Core Deadzone	0.2–5.0	Ignores small attitude changes.
Servo Speed	1.0–6.0	Limits response step / movement speed.
Terrain Adapt	0.005–0.100	Terrain adaptation rate.
Pitch G-Gain	0–6	Front/rear dynamic correction.
Roll G-Gain	0–6	Side-to-side dynamic correction.
Bump / Heave Gain	0–6	Vertical impact / heave response.

7.9 Digital Suspension Tuning

Dashboard Control	Range	Purpose
Spring Rate	1–100	Digital spring stiffness.
Damping / Oil	0–20	Digital damping effect.
Chassis Mass	0–20	Simulated mass response.
Reaction Speed	1–50	Digital response speed.
Digital Deadzone	0–10	Filters small model response.
Dyn Pitch Gain	0–300	Dynamic pitch response.
Dyn Roll Gain	0–300	Dynamic roll response.
Dyn Heave Gain	0–100	Dynamic vertical response.
Stat Pitch Gain	0–100	Static pitch response.
Stat Roll Gain	0–100	Static roll response.

7.10 Actuation / Kinetic Tuning

Dashboard Control	Displayed Range	Purpose
Actuation Range	10–60	Maximum articulation command range.
Actuation Speed	5–100	Articulation cycle speed.
Kinetic Speed	5–100	Kinetic recovery oscillation speed.

7.11 Servo Limits

Dashboard Control	Range	Purpose
Front Base Angle	20–160	Front normal stance reference.
Rear Base Angle	20–160	Rear normal stance reference.
Max Travel Offset	20–70	Positive travel boundary relative to center logic.
Min Travel Offset	-70 to -20	Negative travel boundary relative to center logic.

CAUTION
After changing base angles or travel offsets, verify all four corners through the full intended range before driving.

7.12 Sensor and Auto Learning

The SENSOR section contains calibration and automated learning actions. The order is intentionally arranged to prevent PID learning before servo direction is correct.

1. Reset IMU Zero - use only while the vehicle is flat and still.
2. Auto Learn Servo Orientation - run first. The servos move during the sequence.
3. Auto Learn PID - run second, after orientation is verified.

REQUIRED ORDER
Auto Learn Servo Orientation → Auto Learn PID. Do not reverse this sequence.

7.13 Saving Settings and Power-Off Practice

Dashboard tuning changes are committed through the controller settings system after a short idle delay. After the final adjustment, allow a few seconds before removing power so the latest value can be stored. Live joystick X/Y commands and the active Direct Control state are temporary and are not intended to be stored as persistent settings.

8. Wireless Firmware Update (OTA)

8.1 Overview

RoverCore™ can check for and install firmware over Wi-Fi. During OTA provisioning, the normal dashboard access point is temporarily stopped to prevent the dashboard and Wi-Fi setup portal from competing for the same 192.168.4.1 address.

WARNING
The suspension servos are detached during the OTA process. The chassis may drop. Support the vehicle before starting Update FW OTA.

8.2 Start OTA Update

1. Open OLED System → Update FW OTA and press ENT.
2. RoverCore™ remembers whether the Web Dashboard was enabled/running, then temporarily pauses the dashboard AP and Web control state.
3. The OLED displays “Starting Wifi...” and the suspension servos are detached for safety and power reduction.

8.3 Connect the OTA Portal

1. If saved Wi-Fi credentials are valid, RoverCore™ may connect automatically to the configured 2.4 GHz network.
2. If provisioning is required, open Wi-Fi settings and connect to RoverCore_OTA_<ID>. Example: RoverCore_OTA_7A3.
3. A captive portal may open automatically. If it does not, open a browser and go to 192.168.4.1.
4. Choose Configure WiFi, select the target 2.4 GHz network and enter its password.

NOTE
The dashboard SSID may disappear during OTA. This is intentional. The OTA portal uses a different SSID and the same device suffix.

8.4 Version Check and Confirmation

1. The OLED displays “Checking Update...” while the controller reads the online version information.
2. If current, the OLED displays “FW up to date!”.
3. If a new version is found, the OLED displays the version and prompts [ENT] Update [BK] Cancel.
4. Press ENT to continue or BCK to cancel.

8.5 Download, Flash and Recovery Behavior

- During download, the OLED shows the target version and a progress bar when file size information is available.
- Firmware initialization is checked before writing the update partition.
- Unknown file size is handled without invalid percentage calculation.
- HTTP download failure, update initialization failure and flash finalization failure are handled as error paths.
- On successful update, the controller displays “Update success!” and reboots.
- On cancel, no-update or recoverable failure, servos are reinitialized and the Web Dashboard is restored if it was previously enabled/running.

WARNING
Do not disconnect battery power while firmware data is being written. An interrupted update can require service recovery.

9. Troubleshooting and Recovery

Symptom	Likely Cause / Corrective Action
Dashboard SSID not visible	Confirm System → Web Dash is ON. Wait several seconds after enabling. Verify the device is not currently in OTA mode.
Connected to dashboard but page does not open	Open 192.168.4.1 manually. Disconnect VPN/mobile “smart network switch” features if they prevent local access.
Cannot connect a second phone	Dashboard AP is configured for one client. Disconnect the first client.
Radio Overrides are greyed out	Web Ctrl is OFF, or Direct Control is ON. Enable Web Ctrl; turn Direct Control OFF to use mode buttons.
Direct Control cannot be enabled	Enable Web Ctrl first.
Direct Control joystick moves the wrong direction	Use Invert X and/or Invert Y. Do not change Servo Reverse merely to fix joystick preference.
Diagonal joystick motion seems reversed on one component	Only the selected inverted axis is reversed. Check independent X/Y inversion states.
Servo corner moves opposite to chassis command	Run Auto Learn Servo Orientation, then verify individual Servo Dir settings.
Active Leveling reacts in wrong axis	Check Sens Dir and repeat IMU zero calibration.
PID learning gives warning / low confidence	Check binding, shock stiffness, servo limits, available travel and power stability. Confirm orientation learning was completed first.
OLED shows Wifi failed / Server Error	Check 2.4 GHz Wi-Fi credentials, internet access and update server availability.
OTA portal 192.168.4.1 unavailable	Confirm you are connected to RoverCore_OTA_<ID>, not RoverCore_DashBoard_<ID>. The dashboard is intentionally paused during OTA.
Dashboard disappears after inactivity	WiFi Auto-Off / Web Time has expired. Re-enable Web Dash from OLED.
Random resets under movement	Suspect UBEC/current shortage, voltage drop, poor ground or mechanical binding.

9.1 Safe Recovery Sequence

1. Stop the vehicle and remove load from the suspension if movement is abnormal.
2. Set Web Ctrl OFF or power-cycle only when safe to do so.
3. Verify servo power and common ground.
4. Check sensor direction and calibration.
5. Check servo orientation before changing PID values.
6. Restore conservative travel limits and test one mode at a time.

10. Preventive Maintenance and Service

10.1 Recommended Inspection

Interval	Inspection / Action
Before each operating session	Check loose servo horns, linkage interference, damaged wiring, sensor mounting and abnormal servo noise.
After heavy impact / rollover	Inspect sensor module attachment, recalibrate IMU zero if mounting shifted, and verify corner offsets.
Periodic service	Inspect UBEC connectors, receiver splitters, servo leads, grounds, fasteners and moisture ingress.
After servo replacement	Recheck Servo Hz, limits, offsets, Servo Orientation learning and PID behavior.
After major chassis geometry change	Repeat commissioning sequence, including Servo Orientation before PID learning.
Before firmware update	Support chassis, verify battery condition and ensure reliable Wi-Fi.

10.2 Service Data to Record

☐ Firmware version shown in About.
☐ Device ID / MAC suffix.
☐ Servo model and configured Servo Hz.
☐ Servo Min / Max and corner offsets.
☐ Shock profile and key PID / Digital Suspension values.
☐ Date of last IMU zero, Servo Orientation learning and PID learning.

11. Technical Reference and Abbreviations

11.1 Abbreviation Guide

Term	Meaning
ACT	Architecture / Suspension
LCG	Low Center of Gravity / Stance & Recovery
ART	Articulation
PID	Proportional, Integral, Derivative control tuning
TH	Throttle intent input
ST	Steering intent input
FL / FR	Front Left / Front Right
RL / RR	Rear Left / Rear Right
Dyn	Dynamic response
Stat	Static response
IMU	Inertial Measurement Unit
OTA	Over-The-Air firmware update
UBEC	Universal Battery Eliminator Circuit / external regulated power supply

11.2 Dashboard and OTA Network Naming

Purpose	SSID Format	Example
Web Dashboard	RoverCore_DashBoard_<ID>	RoverCore_DashBoard_7A3
OTA Provisioning	RoverCore_OTA_<ID>	RoverCore_OTA_7A3

<ID> is the last three hexadecimal characters derived from the physical device MAC address. This identifier helps distinguish multiple RoverCore™ units in the same area.

11.3 Quick Reference: Correct Learning Order

Order	Action	Why
1	Set Sens Dir	Maps IMU axes to vehicle orientation.
2	Calibrate Sensor / Reset IMU Zero	Defines the level reference.
3	Auto Learn Servo Orientation	Confirms each corner moves in the correct direction.
4	Set limits, stance and offsets	Protects mechanics and establishes neutral geometry.
5	Select Shocks profile	Provides damping context for learning.
6	Auto Learn PID	Profiles chassis only after motion directions are correct.

11.4 Release Notes

Document Revision 1.0, release date 12 July 2026. This unified manual incorporates the former Product Overview & Technical Specifications and OLED Home & Settings Menu Tree documents, with additional coverage for the current Web Dashboard, Web Control, Direct Control, revised auto-learning order, unique SSID naming and OTA portal handover behavior.

END OF MANUAL

For service work, record the firmware version and device ID before changing settings. Recommission the system after factory reset, servo replacement, sensor relocation or major suspension geometry changes.