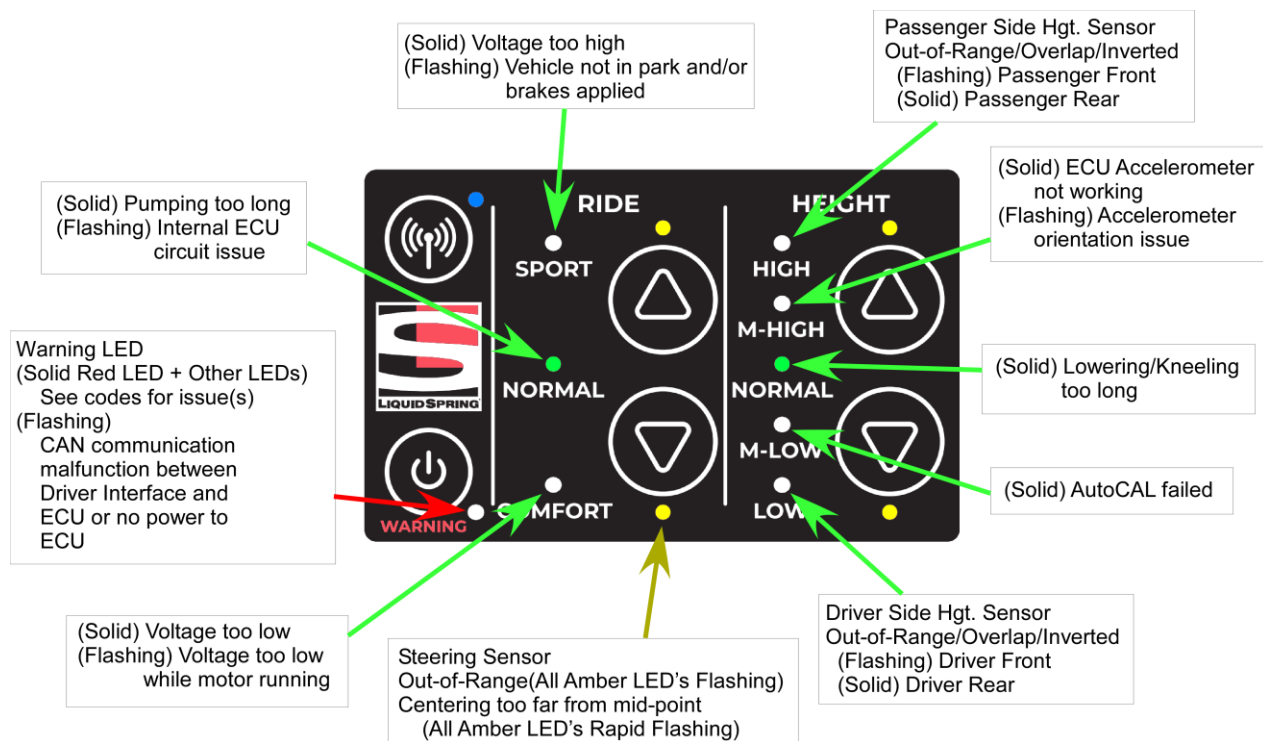




Troubleshooting Guide

This document provides a troubleshooting guide for the LiquidSpring® **Smart Suspension** System. The suspension includes on-board diagnostics to assist in pin-pointing potential issues. When a fault in the system occurs, the red warning light on the Driver's Interface will light along with one or more of the other lights on the interface.



NOTE: Driver interface graphic may vary from what is shown above, but functions the same.

Red Warning LED + LED Listed	Solid / Flashing	Fault
Warning (Red)	Solid	Overall Error notification. Accompanied by other LED's.
Warning (Red)	Flashing	CAN communication malfunction between ECU and Driver Interface/No Power to ECU
Arrow (Amber)	Flashing	Steering Sensor Center further than expected mid-point
Arrow (Amber)	Fast Flashing	Steering Sensor out of range/disconnected/malfunctioned
Sport Ride Mode (Green)	Solid	PM Battery Voltage greater than 16 VDC
Sport Ride Mode (Green)	Flashing	Vehicle not in Park and/or Brakes applied during Auto Calibration
Normal Ride Mode (Green)	Solid	Pump/Motor runs longer than 3 minutes
Comfort Ride Mode (Green)	Solid	PM Battery Voltage less than 9 VDC
Comfort Ride Mode (Green)	Flashing	PM Battery Voltage less than 9 VDC while PM motor is running
High Ride Height (Green)	Solid	Passenger Side Rear Height Sensor out of range/disconnected/malfunctioned
High Ride Height (Green)	Solid	Passenger Side Rear Height Sensor HIGH/NORMAL/LOW values too similar/Inverted
High Ride Height (Green)	Flashing	Passenger Side Front Height Sensor out of range/disconnected/malfunctioned
High Ride Height (Green)	Flashing	Passenger Side Front Height Sensor HIGH/NORMAL/LOW values too similar/Inverted
M-High Ride Height (Green)	Solid	ECU Accelerometer non-functional
M-High Ride Height (Green)	Flashing	ECU Accel. Orientation—Too small movement to detect during Auto Calibration
Normal Ride Height (Green)	Solid	Lowering/Kneeling longer than 3 minutes
M-Low Ride Height (Green)	Solid	Auto Calibration failed. See additional lights for error code.
Low Ride Height (Green)	Solid	Driver Side Rear Height Sensor out of range/disconnected/malfunctioned
Low Ride Height (Green)	Solid	Driver Side Rear Height Sensor HIGH/NORMAL/LOW values too similar/Inverted
Low Ride Height (Green)	Flashing	Driver Side Front Height Sensor out of range/disconnected/malfunctioned
Low Ride Height (Green)	Flashing	Driver Side Front Height Sensor HIGH/NORMAL/LOW values too similar/Inverted
Normal Ride Mode (Green)	Flashing	Internal ECU circuit issue. Resets after 30 seconds. After 3 rd issue, ECU shut down

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Issues with Steering Sensor

Condition	Cause	Correction
Steering Sensor centering further than expected	Mis-installed steering sensor and/or linkage	Check steering sensor installation and linkage. Correct as necessary.
Steering Sensor out of range	Steering sensor arm travels too far	Check steering sensor installation and linkage. Correct as necessary.
No steering signal (reduced roll control when cornering)	Steering sensor wiring broke or incorrect.	Inspect wiring to steering sensor and correct as necessary.
	Steering sensor malfunction	Replace sensor.
	Steering sensor not installed correctly	Inspect installation and correct as necessary
Yellow lights on driver display not lit when steered straight ahead.	Zero point of steering sensor incorrect.	Recalibrate the steering sensor.
	Steering sensor malfunction	Replace sensor.
	Loose connector / wiring issue	Check connector and wiring. Correct as necessary
Intermittent steering sensor signal	Loose connector / wire / sensor	Check sensor and check wiring between Steering sensor and Power module for loose connection.

Issues with Height Sensors

Condition	Cause	Correction
Height Sensor out of range	Sensor wiring not connected	Inspect electrical connector and correct.
	Linkage not connected	Inspect installation of height sensor and linkage. Correct as necessary.
	Height sensor arm to travel too far	Inspect installation of height sensor and linkage. Correct as necessary.
	Height sensor malfunction	Replace sensor.
Height Sensor HIGH/NORMAL/LOW values too similar	Vehicle didn't raise enough during calibration	Inspect power module and fluid level. Re-run calibration after correcting.
	Vehicle didn't lower enough during calibration	Inspect for obstructions and inspect power module. Re-run calibration after correcting.
	Height sensor malfunction	Replace sensor.
Height Sensor output inverted	Height sensor/linkage/wiring mis-installed	Inspect and correct installation of sensor/linkage/wiring. Re-run calibration after correcting.
	Incorrect ECU	Check ECU part number and correct as necessary.
Vehicle or corner stops leveling at incorrect height	Damaged height sensor and/or linkage	Inspect height sensor components. Replace as necessary.
	Incorrect calibration	Recalibrate vehicle – see System Operation section.
	Incorrect height sensor installation	Inspect height sensor components and correct.
Corner height where leveling stops is inconsistent	Sensor or Linkage loose	Inspect installation of height sensor and linkages and tighten if necessary
	Loose connector / wire / sensor	Inspect height sensor and inspect wiring between sensor and power module for loose connection
Vehicle will not level - no height sensor signal	Height Sensor wiring shorted, broken, or disconnected	Inspect wiring between sensor and power module.
	Malfunction in Sensor	Replace sensor.
No Height Sensor Signal change while driving	Linkage broken/disconnected	Inspect installation of height sensor and linkages. Correct and/or replace.
	Malfunction in Sensor	Replace sensor.
	Loose connector / wire / sensor	Inspect height sensor and inspect wiring between sensor and power module for loose connection

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Issues with ECU

Condition	Cause	Correction
CAN communication malfunction between ECU and Driver Interface	Loose/broken CAN wires	Inspect White and White/Black wire connection between dash harness and main harness. Correct as necessary.
	Pinched wires	Inspect White and White/Black wires. Correct as necessary.
	Loose ECU header connector/wires/pins	Inspect ECU header connector and correct as necessary.
	Failed ECU	Replace ECU.
No power to ECU	Loose battery power wire	Check Red wire on dash harness. Correct as necessary. Check Red wire on dash harness to main harness connection. Correct as necessary.
	Loose/missing ground connection	Check ground (Black) wire on dash harness. Correct as necessary.
	Blown 5A fuse	Check 5A fuse in dash harness for both ground and battery power. Correct as necessary.
Internal ECU circuitry issue	Loose battery power wire	Check Red wire on dash harness. Correct as necessary. Check Red wire on dash harness to main harness connection. Correct as necessary.
	Loose/Improper ground wire	Check ground (Black) wire on dash harness. Correct as necessary.
	Failed ECU	Replace ECU

Issues with Driver Interface

Condition	Cause	Correction
Warning light blinks, system appears to level.	CAN wires crossed or not connected.	Inspect wiring and repair/replace as necessary.
	Malfunctioning Driver Interface	Inspect and replace as necessary.
Warning light blinks, system does not appear to operate (level)	No power to ECU (5A 18ga Red Wire)	Inspect wiring and repair/replace as necessary.
	No ignition signal to ECU (Yellow Wire)	Inspect wiring and repair/replace as necessary.
	CAN wires crossed or not connected.	Inspect wiring and repair/replace as necessary.
DI will not turn on	Blown fuses	Inspect fuses and replace as necessary.
	Unplugged connector	Verify that the DI is plugged into the dash wiring harness.

Issues with Vehicle Raising/Pump

Condition	Cause	Correction
Vehicle Leveled, Pump continues to run	Pump motor shorted out.	Contact LiquidSpring for further instructions.
	Software issue	Turn off ignition, wait 30 seconds, restart vehicle.
	Excessive noise in height sensor	See <i>Issues with Height Sensors</i> .
Vehicle Not Leveled (or Raised), Pump runs	Reservoir fluid level low	Fill reservoir to specified level.
	Hydraulic leak in system	Check for fluid leaks and repair or replace.
	Vehicle overloaded	Check vehicle loading and correct.
	Air in pump	Check fluid level in reservoir and fill accordingly. Fully depressurize system and restart leveling.
	Internal leak in power module	Replace power module.
	Height sensor error	See <i>Issues with Height Sensors</i> .
	Pump failed	Contact LiquidSpring for further instructions.
Vehicle Not Leveled (or Raised), Pump does not run	System not turned on.	Turn system on.
	Blown fuse	Check system fuses.
	Loss of electrical power	Check wiring between power module and battery.
	Motor failed	Contact LiquidSpring for further instructions.
	ECU failed	Contact LiquidSpring for further instructions.
Pump runs for short time then stops	Motor controller over temperature	Contact LiquidSpring for further instructions.
Pump runs intermittently	Loose connector or wiring	Check wiring harness connections and battery connections. Repair as necessary.

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Issues with Vehicle Lowering/Dump Valve

Condition	Cause	Correction
Vehicle does not lower (kneel).	System not turned on	Turn system on
	Blown fuse	Check system fuses and replace as necessary.
	Obstacle under vehicle frame	Remove obstacle.
	Wiring harness disconnected	Check wiring harness connections and reconnect.
	Loss of electrical power	Check wiring between power module and battery.
	Power module filters plugged	Contact LiquidSpring for further instructions.
	Internal power module blockage	Contact LiquidSpring for further instructions.
	Faulty door switch	See <i>Issues with Door Switch</i> section.
	Door switch not wired correctly	See <i>Issues with Door Switch</i> section.
	Faulty speed signal	See <i>Issues with Vehicle Speed Signal</i> section.
Vehicle slow lowering (kneeling)	Partial internal power module blockage	Contact LiquidSpring for further instructions

Issues with One Corner Not Leveling Properly

Condition	Cause	Correction
One side will not raise or lower	Internal power module blockage	Contact LiquidSpring for further instructions
	Low voltage	Check battery voltage.
	Wiring harness disconnected	Check wiring harness connections and reconnect
	Obstacle under vehicle frame	Remove obstacle
	Power module filters plugged	Contact LiquidSpring for further instructions
	Height sensor error	See <i>Issues with Height Sensors</i>
	Leakage at Strut or Strut failure	See <i>Issues with Strut Assembly</i>
One corner raises and lowers slower than other corners	Internal power module blockage	Contact LiquidSpring for further instructions
	Filter partially clogged	Contact LiquidSpring for further instructions

Issues with Ride/Handling

Condition	Cause	Correction
Vehicle rolls side to side excessively	System inactive (Drivers interface dark)	Turn system on (press On/Off button)
	No electrical power to system	Inspect and replace as necessary
	Strut bushings worn	Inspect and replace as necessary
	Control arm bushings worn	Inspect and replace as necessary
	Sway bar bushings worn	Inspect and replace as necessary
	Strut mounting loose	Inspect and replace as necessary
	Rate Valve wiring shorted, broken, or disconnected	Inspect wiring and correct/replace as necessary.
	Voltage to Rate Valve solenoid too low	Check battery voltage.
	Rate Valve Poppet Jammed open	Contact LiquidSpring for further instructions
	No vehicle speed signal	See <i>Issues with Vehicle Speed Signal</i> section.
	No steering signal	See <i>Issues with Steering Sensor</i> section.
Excessive stiffness when on flat, straight road	Short to Rate Valve	Check wiring between rate valve (on secondary volume) and power module for signs of shorts. Replace as necessary.
	Wiring to Rate Valve incorrect	Inspect wiring and correct as necessary.
	Steering not zeroed correctly	See <i>Issues with Steering Sensor</i> section.

Issues with Vehicle Speed Signal

Condition	Cause	Correction
System leveling excessively while driving.	Speed Sensor wiring shorted, broken, or disconnected	Inspect wiring and repair/replace as necessary.
	Speed signal malfunction	Replace OEM speed sensor. See OEM service manual.
	Malfunctioning Height Sensor	Inspect Height Sensor, connector, and wiring. Repair / replace as necessary. Also see <i>Issues with Height Sensors</i> .
Intermittent speed sensor signal	Loose connector / wire	Check wiring between Speed sensor and Power module for loose connection.

Troubleshooting Guide

Issues with Door Switch

Condition	Cause	Correction
Vehicle will not kneel when rear door opened	Short or break in wiring between door switch and power module.	Inspect wiring and repair/replace as necessary.
	Door switch malfunction	Inspect door switch and repair/replace as necessary
Vehicle kneels whenever speed below 10mph	Short or break in wiring between door switch and power module.	Inspect wiring and repair/replace as necessary.
	Door Switch out of adjustment	Check installation of door switch and adjust as necessary
	Door switch malfunction	Inspect and replace per body builder instructions.
Intermittent door switch signal	Loose connector / wire	Inspect wiring and repair/replace as necessary.

Issues with Vehicle Ignition Signal

Condition	Cause	Correction
System does not turn on (no leveling or stiffness control)	No ignition signal to controller or driver interface	Inspect wiring and repair/replace as necessary.
	Ignition "sensor" malfunction	Inspect and replace per OEM service manual.
System does not turn off once ignition switched off	Signal side short to battery	Inspect wiring and repair/replace as necessary.
	Ignition "sensor" malfunction	Inspect and replace per OEM service manual.
	No ignition signal	Connect the IGN wire in the LS dash harness to vehicle Ignition.
System intermittently works	Loose connector / wire	Inspect wiring and repair/replace as necessary.

Issues with Vehicle Brake Signal

Condition	Cause	Correction
Vehicle will not level	Brake signal wire not correctly tapped.	Inspect wiring and repair/replace as necessary.
	Brake switch malfunction	Replace OEM speed sensor. See OEM service manual.
Intermittent leveling	Loose connector / wire	Inspect wiring and repair/replace as necessary.

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Issues with Power Module

Condition	Cause	Correction
Battery Voltage greater than 16VDC	Incorrect supply voltage	Connect to 12VDC supply.
Battery Voltage less than 9VDC (without motor running)	Incorrect supply voltage source	Connect to 12VDC supply.
	Improper/loose battery connection	Inspect and correct.
	Blown 80A fuse	Inspect and correct.
	Wiring issue (missing, broken, pinched, corrosion)	Inspect and correct.
	Inadequate ground connection	Inspect and correct.
Battery Voltage less than 9VDC (with motor running)	Inadequate supply current	Connect to 12VDC supply with at least 100A available.
	80A fuse blows during motor running	Inspect and correct.
	Inadequate ground connection	Inspect and correct.
	Motor connections loose or damaged	Inspect and correct.
Pump exhibits high pitch whine immediately after pump stops or when vehicle lowering	Pump pressure relief valve worn or dirty	Replace pressure relief valve.
Pump running under heavy load and leveling slow	Pump filter clogged	Clean or replace filter.
	Improper / loose battery connection	Inspect and correct
	Inadequate ground connection	Inspect and correct
	Weak motor	Replace motor or power module.
Pump running under heavy load and no leveling	The Check valve is stuck closed	Replace power module.
	Pump pressure relief valve stuck open	Replace pressure relief valve.
	Vehicle overloaded	Correct vehicle loading.
Hydraulic fluid leaking from Power Module	O-ring failure	Replace O-ring.
	Manifold cracked	Replace power module.
	Fitting loose	Tighten fittings.
	Valve loose	Tighten valves to correct torque.
	Hydraulic line loose	Tighten hydraulic line correctly.
	Bolts between reservoir and manifold loose/broken	Replace and/or tighten bolts to required torque.
	Broken / cracked reservoir	Replace reservoir.
Audible "chirp" when motor turns off	Worn Pressure Relief Valve	Replace pressure relief valve.

Troubleshooting Guide

Issues with Strut Assembly

Condition	Cause	Correction
Hydraulic Leak	Weld failure between cylinder and end	Replace strut.
	Cylinder fracture	Replace strut.
	Threads stripped between cylinder and gland	Replace strut.
	Seals worn out	Replace strut.
	Rod severely scratched or dented	Replace strut.
	Fitting loose	Tighten or replace fittings.
	Hose failure	Replace failed hose.
	Hose cut	Replace failed hose.
Rod broken at bushing housing	Weld failure	Replace strut.
Rod doesn't move freely in/out cylinder	Piston jammed in cylinder	Replace strut.
Rod moves very easily in/out cylinder	Piston broken therefore no damping	Replace strut.
Reduced damping level	Damping components broken/worn out	Replace strut.
Strut upper mount not securely attached to frame or Strut	Bolts attaching bracket to frame broken / came out	Replace bolts and tighten to required torque.
	Bolt attaching strut to bracket broke / came out	Replace bolts and tighten to required torque.
	Weld Failure	Replace strut upper mount.
	Structural failure	Replace strut upper mount.
Strut lower mount not securely attached to axle or strut	Bolts attaching bracket to axle broken / came out	Replace bolts and tighten to required torque.
	Bolt attaching strut to bracket broke / came out	Replace bolts and tighten to required torque.
	Weld Failure	Replace strut lower mount.
	Structural failure	Replace strut lower mount.

Issues with Secondary Volume Assembly

Condition	Cause	Correction
Hydraulic Leak	Weld failure between tube and end	Replace secondary volume welded assembly
	Weld failure between tube and manifold	Replace secondary volume welded assembly
	Cylinder fracture	Replace secondary volume welded assembly
	Bleed screw loose	Tighten bleed screws to appropriate torque
	Fitting loose	Tighten all fittings
	Hose failure	Replace failed hose
	Hose cut	Replace failed hose
Loose or no longer attached	Bolts attaching bracket to frame broken / came out	Replace bolts and tighten to required torque
	Bolt attaching volumes to bracket broke / came out	Replace bolts and tighten to required torque
	Weld Failure	Replace brackets
	Structural failure	Replace brackets

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