DIAGNOSTIC FLOWCHART 1990 RANGE ROVER CLASSIC Left Rear Brake Squeal — Light Pedal / Hot Only

Vehicle: 1990 Range Rover Classic
Symptom: LR Brake Squeal (hot/light)
Date: _____ Tech: _____ WO#: _____

⚠ Symptom Confirmation

☐ Noise isolated to **LEFT REAR** only

☐ Occurs **ONLY** under **LIGHT** brake pedal pressure

☐ Occurs **ONLY** when brakes are **HOT** (after sustained use)

☐ No noise under heavy braking or when cold

⚠ **ALL boxes must be checked before proceeding. If noise occurs under heavy braking or when cold, this flowchart does not apply — investigate other causes.**

Stage 1: Pad Fitment

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Condition

Action Steps

- Remove left rear wheel and caliper. Inspect pads.
- Check pad thickness against minimum spec: **2.0 mm (0.08 in)**.
- Check for anti-squeal shims — are they present, intact, and properly positioned?
- Check pad ears/tabs for wear, burrs, or damage preventing free slide in caliper bracket.
- Check for pad material contamination (brake fluid, axle oil, grease).
- Check pad-to-rotor contact pattern — uneven wear indicates fitment or caliper issue.

◆ Decision

Finding	Condition	Result
◆	Pads worn below spec, shims missing/damaged, contamination, or poor fitment?	—
YES	✔ **ACTION:** Replace pads (always in axle pairs). Install OE anti-squeal shims. Deburr bracket abutment surfaces. Clean with brake cleaner. Apply thin layer of brake-quiet compound to pad backing plates only. ▶ **RETEST** after bedding-in procedure (30 moderate stops from 30 mph).	**REPAIR**
NO	Pads OK.	▼

▼ Proceed to Stage 2 ▼

Stage 2: Rotor Surface

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Glazing

Action Steps

- Inspect rotor friction surface visually. Look for mirror-like glaze, blue/purple heat discoloration, or hard spots.
- Run fingernail across surface — a healthy rotor has a slight crosshatch texture. Glazed rotors feel glassy smooth.
- Measure rotor thickness with micrometer at 4 points:
    - **Minimum thickness:** 10.0 mm (0.394 in)
    - **New thickness:** 12.0 mm (0.472 in)
- Check for scoring deeper than **0.38 mm (0.015 in)**.

- Measure rotor runout with dial indicator on a cleaned hub face. **Maximum runout: 0.10 mm (0.004 in)**.

◆ Decision

Finding	Condition	Result
◆	Rotor glazed, scored beyond limit, below minimum thickness, or runout exceeded?	—
YES (surface)	✔ **ACTION:** Resurface rotor on-car or on bench lathe. Use non-directional finish (80–150 grit). Clean rotor with hot soapy water then brake cleaner. ▶ **RETEST.**	**REPAIR**
YES (below min / deep damage)	✔ **ACTION:** Replace rotor. Clean hub face of all corrosion before installation. Torque wheel to spec: **100 Nm (74 lb-ft)**. ▶ **RETEST.**	**REPLACE**
NO	Rotor OK.	▼

▼ Proceed to Stage 3 ▼

Stage 3: Parking Brake Shoe Interference

⚠ **CONTEXT:**

The 1990 Range Rover Classic uses a drum-in-disc parking brake on the rear axle. The parking brake shoes ride inside the rotor hat. Heat expansion can cause shoe-to-drum contact even when the parking brake is released.

Action Steps

- Remove rotor to expose parking brake drum shoes.
- Inspect shoe friction material for glazing, cracking, or contamination.

- Check shoe return springs — are they intact and pulling shoes fully off the drum surface?
- Measure shoe-to-drum clearance. **Minimum: 0.25 mm (0.010 in) per side**.
- Check parking brake cable adjustment — release the brake fully and check for residual tension at the cable.
- Manually spin the drum with shoes in place — listen for scraping or contact.

◆ Decision

Finding	Condition	Result
◆	Shoes glazed, springs weak, clearance tight, or cable dragging?	—
YES	✔ **ACTION:** Scuff shoe material with 80-grit to remove glaze. Replace weak return springs. Adjust star wheel adjuster to achieve proper clearance. Lubricate parking brake cable pivot points. If cable stretched or seized, replace cable. ▶ **RETEST.**	**REPAIR**
NO	Parking brake OK.	▼

▼ Proceed to Stage 4 ▼

Stage 4: Caliper Piston Behavior

⚠ **CONTEXT:**

The RRC rear uses Girling sliding calipers. Both the piston AND the caliper slide pins must move freely. A sticking piston or seized slide pin causes uneven clamping, which produces squeal at low clamping force. Heat exacerbates sticking due to seal swell and fluid expansion.

Action Steps

- With caliper removed, attempt to push piston back into bore using a C-clamp. It should retract smoothly with moderate force.
- Inspect piston dust boot for tears, swelling, or dislodgment.
- Remove and inspect caliper slide pins. They should slide freely and be coated with **silicone brake grease** (NOT petroleum-based grease).
- Check slide pin boots for tears or moisture ingress.
- Inspect left rear brake hose for external cracking, bulging, or swelling. Internally collapsed hoses act as one-way check valves — fluid pushes piston out but doesn't let it retract.
- Compare piston retraction effort to **RIGHT rear caliper** as a baseline.

◆ Decision

Finding	Condition	Result
◆	Piston stiff/seized, boots damaged, slide pins corroded, or hose internally collapsed?	—
YES (piston / slides)	✔ **ACTION:** Rebuild caliper — hone bore lightly, replace piston seal and dust boot, replace slide pin boots and grease with silicone-based lubricant. If bore is pitted, replace caliper. ▶ **RETEST.**	**REBUILD**
YES (hose)	✔ **ACTION:** Replace brake hose (always replace in pairs, left + right). Bleed brake circuit. ▶ **RETEST.**	**REPLACE**
NO	Caliper OK.	▼

▼ Proceed to Stage 5 ▼

Stage 5: Wheel Bearing Play

⚠ **CONTEXT:**

The 1990 RRC rear axle is semi-floating with tapered roller bearings. Excessive bearing play allows the hub/rotor assembly to shift under braking, creating intermittent pad-to-rotor misalignment. Heat expansion worsens the play, explaining the hot-only symptom.

Action Steps

- Jack up the left rear. Grab tire at 12 o'clock and 6 o'clock, rock firmly. Check for clunking or movement.
- Grab at 3 o'clock and 9 o'clock, repeat.
- Spin wheel by hand — listen for roughness, grinding, or cyclic noise.
- **Maximum allowable bearing play: 0.05 mm (0.002 in)**.
- Compare to right rear for reference.

◆ Decision

Finding	Condition	Result
◆	Detectable play, roughness, or noise?	—
YES	✔ **ACTION:** Remove half-shaft, replace bearing and seal. Set bearing preload per workshop manual spec. Repack with high-temp wheel bearing grease. ▶ **RETEST.**	**REPLACE**
NO	Bearing OK.	▼

▼ Proceed to Stage 6 ▼

Stage 6: Heat-Dependent Vibration Causes

⚠ **CONTEXT:**

If all previous stages pass, the squeal is likely caused by a resonance condition that only manifests when components reach operating temperature. Heat changes the natural frequency of the rotor, pad, and caliper assembly. At light pedal pressure, clamping force is insufficient to dampen the vibration, allowing it to resonate.

Action Steps

- Measure Disc Thickness Variation (DTV) with outside micrometer at 8 equally-spaced points around the rotor. **Maximum DTV: 0.025 mm (0.001 in)**. DTV creates pulsation that excites squeal at resonant frequency.
- Check hub flange face for corrosion buildup, burrs, or debris. Even 0.05 mm of buildup causes runout.
- Check backing plate (splash shield) for contact with the rotor — heat expansion can close a marginal gap.
- Check for anti-rattle clips on caliper bracket — missing clips allow pad vibration.

◆ Decision

Finding	Condition	Result
◆	DTV exceeded, hub face contaminated, backing plate contacting, or clips missing?	—
YES	✔ **ACTION:** Address each finding — resurface or replace rotor for DTV, clean hub face with Scotch-Brite and verify with dial indicator, bend backing plate for clearance (**minimum 2 mm gap**), install anti-rattle clips. ▶ **RETEST.**	**REPAIR**
NO	⚠ **ALL MECHANICAL CAUSES RULED OUT.**	▼

▼ Proceed to Final Resolution ▼

✔ FINAL RESOLUTION — ALL 6 STAGES PASSED

If all six stages pass without identifying a root cause, implement the following measures:

✔	Action
✔	**Upgrade pad compound** — switch to a ceramic or semi-metallic formulation rated for high-temperature, low-noise performance (e.g., EBC Greenstuff or Ferodo DS2500 equivalent).
✔	**Apply vibration-dampening pad backing shims** — stainless steel + rubber laminate type.
✔	**Confirm rotor surface finish** is 60–80 RA (micro-inches) — too smooth = squeal.
✔	**RETEST** after full bedding-in procedure.

NOTE:

Some degree of light-braking squeal is inherent in the Girling rear caliper design on the Range Rover Classic and may not be fully eliminable without pad compound changes.

Quick Reference — Specifications Summary

Parameter	Specification
Minimum pad thickness	2.0 mm (0.08 in)
Rotor minimum thickness	10.0 mm (0.394 in)
Rotor new thickness	12.0 mm (0.472 in)
Maximum rotor scoring depth	0.38 mm (0.015 in)
Maximum rotor runout	0.10 mm (0.004 in)
Maximum disc thickness variation (DTV)	0.025 mm (0.001 in)
Parking brake shoe-to-drum clearance (min)	0.25 mm (0.010 in) per side
Maximum wheel bearing play	0.05 mm (0.002 in)
Wheel torque	100 Nm (74 lb-ft)
Backing plate to rotor clearance (min)	2 mm

Parameter	Specification
Target rotor surface finish	60–80 RA (micro-inches)
Caliper slide pin lubricant	Silicone brake grease only (no petroleum)
Bedding-in procedure	30 moderate stops from 30 mph

This flowchart is intended for use by qualified technicians. Always follow manufacturer service procedures and torque specifications.

Specs reference: Land Rover Workshop Manual — Range Rover Classic 1990 (LR Workshop Manual SRR660ENWM)

TECHNICIAN SIGN-OFF

Completed by: _____ Date: _____

Result: ☐ Fault Found & Repaired ☐ No Fault Found — Pad Compound Change ☐ Other: _____

Signature: _____
