1. Revision History

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<td>J. Leighton</td>
<td>Sections 5, 9 and 17 added. Section 15 updated.</td>
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<td>Sections 7, 8, 9, 11 and 18 updated.</td>
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<td>20 July 2016</td>
<td>M. O'Driscoll</td>
<td>Section 14 updated (Major service interval extended).</td>
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<td>Sections 8, 9, 10, 14, 15, 16, 17 and 18 updated.</td>
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<td>09 Feb 2017</td>
<td>M. O'Driscoll</td>
<td>Section 8 added. Section 11 (hydraulic installation) updated.</td>
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3. Important Information

This manual applies to the fourth generation Sealed Integrated Braking System (SIBS® 4) for the Toyota LandCruiser. The manual details how to install the SIBS® 4 system correctly to ensure optimum safety and performance. All information contained in this manual is based on the latest SIBS® product information available at the time of publication.

This manual should be read in conjunction with the appropriate Toyota vehicle manual for further information on removal and installation of any standard Toyota components.

While every effort has been made to address all aspects of installation and servicing, please advise Advanced Braking of any omissions or suggestions on how this manual may be improved.

Advanced Braking Pty Ltd reserves the right to change the manual at any time without prior notice.

The most up to date version of the manual can be obtained by contacting the ABT Customer Service Manager.

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4. Terminology

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7. **Wiring Diagram**

[Diagram of wiring connections with labels and colors indicated]

- **Proxy Switch**
- **Proxy Extension**
- **Proxy Double Adapter**
- **Cabin Harness**
- **OEM Door Switch**
- **Door Switch**
- **Landcruiser Breakout**
- **To Oem Dash Harness Breakout Plugs**
- **Hawk Sbs Iv Module**

[Legend of color codes and connections]
8. Pump Hardware Parts List
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9. **Installation – Rear Brakes**

1. Ensure all OEM Toyota rear brake equipment has been removed from the vehicle:
   a. Remove both rear brake assemblies.
   b. Remove the two hydraulic brake lines across the rear axle.
   c. Remove the handbrake lever and handbrake cable.

2. Clean the axle flange and spindle to remove any grease, dirt and gasket remains. If the flange is damaged or corroded it must be cleaned thoroughly with abrasive paper.

   ![Figure 1: Clean axle flange and prepare gasket face.](image1)

3. Check the condition of the wheel bearing seal running surface. If the surface shows signs of degradation (e.g. corrosion or wear) repair using a speed-sleeve.

4. Apply Loctite® 515™ directly to the axle flange face.

   ![Figure 2: Apply Loctite® 515™ to axle flange.](image2)

5. Using a suitable lifting hoist, remove the SIBS® 4 wheel-end assembly from its packaging.
6. Each brake unit is stamped with its corresponding position on the vehicle and must be installed accordingly:
   a. LH = Left Hand
   b. RH = Right Hand

7. Remove the 4x brake mounting nuts and washers.

8. Remove the outer hub bearing.

9. Fit the SIBS® 4 brake unit over the stub axle. Align the mounting holes and locate the housing evenly and firmly against the axle flange.

10. Fit the 4x brake mounting nuts that were previously removed.

11. Torque the brake mounting nuts to 80 Nm in a diagonal pattern. Repeat this procedure 3x over a 5 minute period.

12. Half fill the hub cavity with high temperature bearing grease (Castrol LMX recommended).

13. Fit the outer wheel bearing and retaining collar and adjust to Toyota specifications.
14. Fill the cavity behind the V-lip seal with a high temperature bearing grease (Castrol LMX recommended) via the grease nipple located on the hub face. Do not over-grease the V-lip cavity.

15. Install the axle half shafts in accordance to Toyota manual specifications and top up the differential oil as required.

16. Remove the 4x retractor bolts from the spring cover.

17. Fit the pad wear indicator to the lowest piston:
   a. Screw the pad wear indicator plunger into the lowest piston thread and torque to 15 Nm.
   b. Apply Loctite 222 to the gland fitting on the thread that attaches to the spring cover only.
   c. Fit the gland fitting over the piston and screw this into the spring cover. Torque to 15Nm.
   d. Fit the stainless steel protective cap and fibre washer to the gland fitting.
   e. Fit 3x supplied tapered plugs to seal the remaining holes in the spring cover. Use an anti-seize or a low strength thread locker on the threads to prevent the plugs seizing in the spring cover. The hex sockets may be filled with silicone or similar, to aid future removal.

---

Figure 5: Fit V-lip seal over hub.

Figure 6: Pad wear indicator install in spring cover.
18. Remove the SIBS® cooling fluid fill plug.

19. Fill the SIBS® 4 brake unit with new SIBS® cooling fluid and refit the fill plug with a new copper washer. Approximately 1 litre of SIBS® cooling fluid is required per brake unit.

20. Repeat for the opposing brake unit.

21. Fit the rear expansion chambers:
   a. There is one expansion chamber per brake unit.
   b. Mount the expansion chambers as high as possible in a protected location on the vehicle. ABT recommends mounting to the chassis cross-member above the rear axle.
   c. Fit the expansion chambers with the 90° fittings at the top and the straight fittings at the bottom. The 90° fittings should be facing towards the right-hand side of the vehicle.
   d. Secure using the supplied mounting plate and fasteners.
22. Run lengths of breather hose between the brake units and the furthermost expansion chambers.
   a. Route the breather hose from the brake units, along the axle to the diff centre, up to the expansion chambers.
   b. Route the hose away from the exhaust and any moving components. Allow extra length for axle articulation. Cut hose to desired length.
   c. Protect areas of the hose that may abrade using spiral guard.
   d. Ensure SIBS® fluid can easily drain back into the brake units.
   e. Secure the hose using supplied P-clips.

   f. Attach the remaining lengths of breather hose to the top of the expansion chambers.
   g. Route the hoses to the right-hand chassis rail.
   h. Follow the chassis rail to the back of the cab.
   i. Secure the hose along the chassis rail.
   j. Route the hose up behind the cab and cut to desired length.
   k. Attach the breather cap and barbed fitting to the end of each hose.
   l. Secure to the front of the tray/well body with p-clips.
23. Fit the ABS sensors (if equipped):
   a. Remove the ABS harness from the OEM bracket on the rear differential.
   b. Remove the OEM ABS sensor connector by cutting the cable as close to the connection as possible, this will ensure there is enough cable length to install the new sensor in the SiBS® brake.
   c. Slide 40mm of heat shrink over the ABS cable and fit the supplied Deutsch connector. Ensure the Deutsch pins are fitted to the Deutsch plug correctly:
      i. White cable goes to pin 1
      ii. Black cable goes to pin 2.

d. Use a heat gun to heat the shrink wrap so it closes over the end of the Deutsch connector.
e. Insert ABS sensor assembly into the SIBS® brake housing and secure with the original mounting bolt removed from the OEM brakes, torque to 10 Nm.

f. Ensure each sensor is installed in the correct wheel end or the ABS will not function:
   i. Sensor with a white stripe on the cable should be installed in the left-hand brake housing.
   ii. Sensor with a yellow stripe on the cable should be installed in the right-hand brake housing.

![Figure 13: ABS harness installed in LH SIBS® brake.](image)

Figure 13: ABS harness installed in LH SIBS® brake.

g. Mount the Deutsch connector bracket using the original ABS connector mounting point.

h. Secure the connection using Denso tape.

i. Repeat for the opposite wheel-end.
10. Installation – Front Brakes

1. Ensure all OEM Toyota front brake equipment has been removed from the vehicle:
   a. Remove both front brake assemblies.
   b. Remove the two flexible hydraulic hoses from the front brakes to the OEM hard brake lines.

2. Each brake unit is stamped with its corresponding position on the vehicle and must be installed accordingly.
   a. LH = Left Hand
   b. RH = Right Hand

3. Remove the 12x M10 bolts from around the circumference of the outer housing.

4. Flip the brake unit over so it is balancing on the hub studs.

5. Remove the long bolt securing the packing spacers. Remove the outer bearing at the same time.

6. Remove the inner housing from the assembly and note the position of the brake pads.

7. Undo the 8x nuts to remove the transport packer from the inner housing. Retain the screws for later use. The nuts can be discarded.

8. Clean the axle stubs and shafts to remove any traces of grease and dirt.
9. Smear both sides of a new gasket with Loctite® 515™.

10. Install the gasket with the cork filler fitted into the drain slot.

![Gasket](image)

**Figure 15**

11. Apply Loctite® 515™ flange sealant to the underside of the 8x M10 brake mounting screw heads.

12. Bolt the inner housing onto the stub axle flange with the 8x M10 brake mounting screws. 2x guide pins may assist with fitment.

13. Torque the 8x brake mounting screws in a star pattern to 60 Nm. Repeat this process 3x times over a 5 minute period.

14. Bend over the lock tabs to secure the 8x brake mounting screws.

![Lock tabs](image)

**Figure 16**
15. Install the inner brake pads in the inner housing ensuring correct orientation. A location pin on the brake pads will assist.

![Figure 17](image17.jpg)

16. Lubricate the hub inner lip seal with silicone grease (Parker Super O Lube recommended) and carefully fit the outer housing, hub and rotor assembly to the inner housing on the vehicle. 2x guide pins may assist with fitment.

![Figure 18](image18.jpg)
17. Fit the 12x M10 bolts and torque to 50 Nm in sequence. Ensure each bolt is torqued twice.

![Figure 19: Housing bolt torque sequence.](image)

18. Fill the wheel bearing cavity in the hub with a high temperature bearing grease (Castrol LMX recommended).

19. Fit the wheel bearing and locking hub as described in the Toyota manual.

20. Fill the cavity behind the V-lip seal with a high temperature bearing grease (Castrol LMX recommended) via the grease nipple located on the hub face. Do not over-grease the V-lip cavity.

21. Fit the ABS sensors (if equipped) and secure using the OEM bolt, torque to 10 Nm.

![Figure 20](image)

22. Remove the SIBS® cooling fluid fill plug.

23. Fill the SIBS® 4 brake unit with new SIBS® cooling fluid and refit the fill plug with a new copper washer. Approximately 800 ml of SIBS® cooling fluid is required per front brake unit.
24. Connect the hydraulic hoses to the original mounting points on the chassis and to the SIBS® front brake using the new banjo bolts and sealing washers provided.

![Image](Figure 21)

![Image](Figure 22)

25. Repeat for the opposing wheel-end.

26. Mount the expansion chambers above the wheel-ends at suitable locations within the engine bay.

27. Run a length of breather hose from the bottom of the expansion chambers down to the barb fitting on each brake unit. Ensure there are no bends or kinks. Ensure the wheel is able to turn from lock to lock without any interference.
11. Installation – Hydraulic System

1. Mount the SIBS® 4 pump enclosure in a suitable location on the vehicle.
   
a. On single-cabs mount the pump behind the driver’s seat using the supplied bracket.

![Figure 23: SIBS® 4 pump enclosure single cab (shown behind drivers seat RHD vehicle).](image)

b. On dual-cabs mount the pump under the tray behind the rear right wheel using the supplied bracket.

![Figure 24: SIBS® 4 pump enclosure dual cab.](image)
c. On troop carriers mount the pump inside the vehicle using the supplied free-standing bracket (the straight bulkhead union at the rear of the pump enclosure must be replaced with the supplied right angle bulkhead union).

![Figure 25: SIBS® 4 pump enclosure troop carrier (mounted to floor behind front seats).](image)

- Use 90° Bulkhead fitting at back of pump enclosure
- Use spacers if required

Figure 25: SIBS® 4 pump enclosure troop carrier (mounted to floor behind front seats).


d. Drill the vehicle body as required and mount the SIBS® pump using provided mounting hardware.

2. Mount the park/emergency brake tee-union.
   a. On vehicles with a single brake line to the rear axle. Mount the tee-union on the rear axle using the same fasteners as the service brake tee-union.

![Figure 26: Park/emergency brake tee-union beside service brake tee-union.](image)

   - Service brake tee-union
   - Emergency brake tee-union

Figure 26: Park/emergency brake tee-union beside service brake tee-union.

b. On vehicles with two brake lines to the rear axle (vehicles equipped with electronic stability control). Mount the tee-union on the front of the bracket that holds the brake lines.
3. Connect one end of the park/emergency brake hydraulic hose to the bulkhead fitting at the rear of the pump enclosure.

4. Route the other end of the hydraulic hose down to the centre of the tee-union on the rear axle and connect. Secure the hose along the chassis using supplied P-clips and brackets.

5. Fit the RH service brake tubes.
   a. On vehicles with a single brake line to the rear axle. Connect one end of the RH service brake tube to the rear axle tee-union and the other end to the inlet on the RH brake unit.
   b. On vehicles with two brake lines to the rear axle (vehicles equipped with electronic stability control). Connect one end of the RH service brake tube to the RH service brake line and the other end to the inlet on the RH brake unit.
   c. Secure the brake line using the OEM P-clip.

6. Fit the RH park/emergency brake hydraulic hose.
   a. Connect one end of the RH park/emergency brake hydraulic hose to the tee-union on the rear axle.
   b. Connect the other end to the inlet on the RH brake unit.
Figure 29: Brake and EMMA lines routed on to brake units (facing rear of vehicle equipped with ESC).

Figure 30: Brake lines routed on to RH brake unit (facing front of vehicle).

Figure 31: Brake lines routed on to RH brake unit (facing front of vehicle equipped with ESC).
7. Fit the LH service brake line.
   a. Connect one end of the LH service brake line to the rear axle tee-union and the other end to the inlet on the LH brake unit.
   b. On vehicles with two brake lines to the rear axle (vehicles equipped with electronic stability control). Connect one end of the LH service brake tube to the LH service brake line and the other end to the inlet on the LH brake unit.
   c. Secure the brake line using the OEM P-clips.

8. Fit the LH park/emergency brake hydraulic hose.
   a. Connect one end of the LH park/emergency brake hydraulic hose to the tee-union on the rear axle.
   b. Route the hydraulic hose across the rear axle and connect to the inlet on the LH brake unit.
   c. Use the supplied bracket to route the hose around the damper.
   d. Secure the hydraulic hose along the rear axle using P-clips. Ensure the hose will not contact any moving suspension components.
12. Installation – Electrical System

1. Isolate the vehicle battery.

2. **Do not test the control system functions until the system is fully installed as this may confuse the control unit while learning** – details on control unit setup can be found in section 13.

3. Mount the control unit to the dash:
   a. Remove the vehicle radio.
   b. Mount the SIBS® control unit on the dash using the provided bracket. Position so that bracket is central on the dash and aligned with the vehicle axis. 4x holes will need to be drilled.
   c. For LH drive vehicles the control unit bracket can be reversed so that it is always facing the vehicle operator.

![Figure 34: SIBS® 4 control unit mounted on dash.](image)

4. Fit the SIBS® cabin harness:
   a. Remove the glove box, seats and vinyl floor mats.
   b. Connect cabin harness branch to the rear of the control unit by passing up through the dash. A hole will need to be drilled in the dash to achieve this.
   c. Route the harness down behind the dash to the passenger side of the transmission tunnel.
   d. Route the cabin harness along the transmission tunnel and connect to the pump enclosure. Some vehicles may require an extension harness to reach the pump enclosure, this should be provided with the kit.
   e. Secure the harness where necessary using P-clips.
5. Fit the vehicle interface harness:
   a. Remove the trim around the instrument cluster.
   b. Remove the vehicle instrument cluster by removing 4x retaining screws and disconnecting 2x multi-plugs at the rear.

   ![Figure 35: Instrument cluster retaining screws.](image)

   ![Figure 36: Instrument cluster multi-plugs.](image)

   c. Connect the Deutsch end of the vehicle interface harness to the 6 pin connector on the SIBS® cabin harness located behind the radio.
   d. Route the harness toward the cavity at the rear of the instrument cluster.
e. Connect the vehicle interface harness between the white 28-pin connector and the connector and the rear of the instrument cluster.

![Image: Vehicle interface harness connection](image_url)

Figure 37: Connect the vehicle interface harness between the instrument cluster and 28-pin white OEM plug.

6. Fit the OEM door harness (optional):
   a. The OEM door harness is part of the vehicle interface harness – simply connect the additional 3-pin Deutsch connector to the SIBS® cabin harness behind the radio.

7. Fit the engine bay harness:
   a. Connect the engine bay harness to the 2x 2 pin connectors on the cabin harness located beside the passenger foot well.
   b. Route the engine bay harness through the grommet in the passenger foot well and into the engine bay.
   c. Route the engine bay harness through the engine bay and connect the red wires to the positive battery terminal via the eyelet.
   d. Connect the black wire to a vehicle earth point via the eyelet.
   e. Secure the relay using the vehicle battery bracket.
   f. Secure the harness where necessary using P-clips.
8. Fit the door proximity harness (optional):
   a. Connect the door proxy harness to the 3 pin connector on the cabin harness (the OEM door connector may need to be unplugged first).
   b. Dependent on how many doors have been specified will affect the number of proximity switches included in the harness.
   c. Drill Ø12mm holes in the door pillars to mount the proximity switches. Suggested location is on the raised circular pad in the A-pillar for front doors.

Figure 38: Proximity switch mounting location on A-pillar.

Figure 39: Drill A-pillar to mount proximity switch.
d. Secure the proximity switch to the door pillar such that there is a 1.0 mm gap between the tip of the proximity switch and door frame when the door is closed.

![Figure 40: Secure proximity switch with locknuts and route harness.](image)

e. Run the extensions and connect to the proximity switches.

f. For every proximity switch to be added, an additional Y-split harness must be installed.

9. Replace the instrument cluster, radio, glove box, seats, mats and all vehicle trim.
13. **Pre-Service Inspection**

1. Top up all reservoirs with the specified fluids.
   
   a. Use DOT 3 brake fluid for the brake master cylinder (service system).
   
   b. Use ATF Dexron III for the SIBS® pump reservoir (park/emergency system).

   ![Figure 41: SIBS® 4 pump enclosure with lid removed.](Image)

2. Ensure the battery is in good condition – this is critical to ensure correct programming of the control unit.

3. Reconnect the vehicle battery to power the vehicle and SIBS® system.
4. **Bleed the service brake system:**
   a. Connect a clear vinyl tube onto the service brake bleed nipple and the other into a clean container of brake fluid.
   b. Slowly pump the brake pedal several times.
   c. While an assistant presses on the brake pedal, loosen the bleed nipple until fluid runs out then close the nipple.
   d. Repeat this process until there are no more air bubbles in the fluid. Ensure the master cylinder reservoir is kept topped up during the procedure.
   e. The service brake system should be bled in the following sequence:
      i. LPSV (this is the highest point apart from the master cylinder in the system).
      ii. 2x bleed nipples on rear left hand brake (wheel end with the longest hydraulic line).
      iii. 2x bleed nipples on rear right hand brake.
      iv. 1x bleed nipple on front left hand brake.
      v. 1x bleed nipple on front right hand brake.

![Service brake bleed screws](image)

*Figure 42: Service brake bleed screws.*
5. **Bleed the park/emergency brake system:**
   a. Twist and release the red E-stop button on the control unit.
   b. If the control system detects air in the system on first release, it will enter bleed mode – this is indicated by the brake status light flashing green – system pressure will be limited to 100 psi.
   c. With the E-stop released, thoroughly bleed the brake system by opening and closing the park/emergency system bleed nipples until the fluid runs through clearly with no air bubbles. Ensure the pump reservoir is topped up regularly during the procedure.
   d. Once the system is bled, apply and then release the park/emergency brake again – if the system has been sufficiently bled then the brake status light should be solid green with the brake is released.

![Park/emergency brake bleed screws]

Figure 43: Park/emergency brake bleed screws.

6. **Affix the SIBS® caution label to the inside top corner of the windshield on the driver’s side.**

7. **Complete a vehicle pre-start check.**

8. **If the vehicle is to be used on public roads it will require approval for road use.**
   a. New and unregistered vehicles can be fitted with a second stage manufacturer plate.
   b. Used and already registered vehicles can be fitted with an aftermarket modification plate.
   c. Please contact ABT customer service for details regarding SIBS® equipped vehicles requiring approval.
14. Control System Setup

1. Ensure the battery is fully charged and in good working condition before connecting the SIBS® controller.

2. With the vehicle engine running, twist and release the red E-stop button to release the brakes - the system will automatically detect the correct brake release pressure during its first release.

3. Activate all connected interlocks and check function:
   a. To activate the door interlock – open and close a vehicle door.
   b. To activate the seat belt interlock – connect and disconnect the driver’s seatbelt.
   c. To activate the stall interlock – switch the ignition off, wait for 5 seconds, then start the engine, run for 10 seconds and then switch the engine off again.
   d. The corresponding warning light on the control unit should display when each interlock is activated (note: interlock warning lights are only displayed when ignition is on).

4. Set the HSI speed threshold:
   a. After releasing the brake for the first time the green HSI light will begin flashing – this indicates the HSI speed threshold needs to be set.
   b. The HSI system overrides the door, stall and seatbelt interlocks when the vehicle is travelling at speeds above the HSI threshold – this is designed to prevent unintended brake application at high speeds.
   c. Start the engine, release the brakes and accelerate the vehicle up to the desired HSI threshold speed (ABT recommends 40 km/h).
   d. While maintaining this speed, press and hold the grey button on the control unit for 3 seconds – the control unit will beep twice to confirm the speed has been accepted.
   e. If HSI is not required, simply complete the above procedure with the vehicle is stationary.

![Figure 44: SIBS® control unit warning lights](image-url)
15. Service Schedule

The following table shows the recommended service intervals for SIBS® 4 brake systems fitted to vehicles being operated in a harsh mining environment. ABT recommends each site undertake a review of the service intervals and adjust to suit their specific conditions.

<table>
<thead>
<tr>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Start Check: Daily</td>
</tr>
<tr>
<td>Minor Service: Monthly or every 5,000 km or every 100 hours (whichever occurs first)</td>
</tr>
<tr>
<td>Major Service: Rear When rear brake pad wear reaches minimum (as indicated by the pad wear indicator)</td>
</tr>
</tbody>
</table>

The pre-start check involves a quick check of the fluid levels and confirms proper brake system operation.

The minor service involves a general system inspection and replacement of the SIBS® cooling fluid in the wheel-ends.

The major service involves a system inspection and replacement of any worn components to ensure continued reliable operation of the SIBS® braking system.
16. **Pre-Start Check**

1. Check brake master cylinder reservoir level. If low, top up with DOT3 brake fluid and check system for leaks.

2. Check SIBS® pump reservoir level. If low, top up with ATF Dexron III and check system for leaks.

3. With the doors closed, engine running and driver’s seat belt connected, press the E-Stop button:
   a. The brake status light on the SIBS® control unit should be solid red.
   b. The park brake should be applied.

4. Twist and release the E-Stop button:
   a. The brake status light should flash red momentarily and then change to solid green.
   b. The park brake should now be released.

5. Check the park/emergency brake applies when (Note: optional interlock connections c, d and e if connected):
   a. The E-Stop is pressed.
   b. The ignition is switched to the ‘ACC’ position.
   c. The door is opened (door ajar warning light should display on control unit).
   d. The driver seatbelt is released (seatbelt warning light should display on control unit).
   e. The engine is stalled (low oil pressure warning light should display on control unit).

6. Check the service brake (foot brake) firmly applies the brake.

7. Carry out park brake performance test:
   a. Ensure the test is carried out on a level surface, with no obstructions in front of the vehicle.
   b. With engine running at normal operating temperature
      - Apply SIBS park/emergency brake
      - Depress clutch
      - Engage third gear low range
      - Do not press footbrake
      - Do not rev engine (engine should be idling as normal)
      - Slowly release clutch
      - Allow the engine rpm to slowly reduce until either the engine stalls or the vehicle rolls forward
      - Vehicle must stall without the vehicle driving through the brake

8. If the vehicle drives through the brake a Major Service must be performed.

   Note: The Pre-Start check does not replace visual inspection of the pad wear indicators.
17. Minor Service (100hrs)

1. Check the brake fluid level in the master cylinder. Top up if necessary.
2. Check service brake units for leaks:
   a. Engine running
   b. Press the brake pedal firmly for 30 seconds
   c. The pedal should not drop
3. Check the fluid level in the SIBS® EMMA™ pump reservoir. Top up if necessary.
4. Check SIBS® pump for leaks:
   a. Engine running
   b. Twist and release the E-stop button to release the park/emergency brake
   c. Release the brake for 30 seconds
   d. The alarm should remain silent and the pump should not recharge
5. Check hydraulic lines for cracks or damage.
6. Check the breather hose for cracks or damage.
7. Check the expansion chamber filler breather caps are clear.
8. Check all electrical connectors and wiring for damage or corrosion.
9. Ensure the vehicle battery is in good working order.
10. Check rear brake pad wear:
    a. Apply the park brake.
    b. Remove the protective cap on the pad wear indicator (found on the spring cover).
    c. The plunger should project out from the gland fitting.
    d. The distance the plunger projects shows the remaining brake pad wear available. (New pads = 2mm approx.).
    e. Refit the protective cap and fibre washer.

![Figure 45: Rear pad wear indicator schematic.](image)

11. If the brake pads have worn beyond the wear limit, then a major service must be completed.
12. Drain and discard the SIBS® cooling fluid from each wheel-end brake.
   a. At least 800 mL of SIBS® cooling fluid should be found in each rear wheel-end. Check for leaks if this amount is not found.
   b. The SIBS® oil should drain freely from the brake. If it comes out in a “glug, glug” fashion ensure there is no blockage in the SIBS® breather line.
   c. Dispose of used SIBS® cooling fluid responsibly in accordance with regulatory and environmental legislation.

13. Refit the drain plug with a new sealing washer.

14. Refill the wheel-end up to the level plug (fill to spill). 1 litre of SIBS® cooling fluid is required for each rear wheel-end.

15. Check front brake pad wear (if applicable):
   a. Apply the service brake.
   b. Remove the protective cap on the pad wear indicator.
   c. Push the plunger into the brake until it stops.
   d. The plunger should project out of the gland fitting.
   e. The distance the plunger projects shows the remaining brake pad wear available. (New pads = 4mm approx.).
   f. Refit the protective cap and fibre washer.

![](Figure 46: Front pad wear indicator schematic.)

16. If the brake pads have worn beyond the wear limit then a major service must be completed.

17. Drain and discard the SIBS® cooling fluid from each wheel-end brake.
   a. At least 600 mL of SIBS® cooling fluid should be found in each front wheel-end. Check for leaks if this amount is not found.
   b. The SIBS® oil should drain freely from the brake. If it comes out in a “glug, glug” fashion ensure there is no blockage in the SIBS® breather line.
   c. Dispose of used SIBS® cooling fluid responsibly in accordance with regulatory and environmental legislation.

18. Refit the drain plug with a new sealing washer.

19. Refill the wheel-end up to the level plug (fill to spill). 800 ml of SIBS® cooling fluid is required for each front wheel-end.

20. Conduct a “vehicle pre-start check”.

47
18. Major Service – Rear

1. Check service brake and park brake systems for leaks.
2. If leaks are present replace damaged seals where necessary during the major service.
3. Repair/replace damaged parts where necessary during the major service.
4. Remove the rear wheels.
5. Clamp the rear brake lines.
6. Drain and discard the SIBS® cooling fluid from each wheel-end brake.
   a. At least 800 mL of SIBS® cooling fluid should be found in each rear wheel-end. Check for leaks if this amount is not found.
   b. The SIBS® oil should drain freely from the brake. If it comes out in a “glug, glug” fashion ensure there is no blockage in the SIBS® breather line.
   c. Dispose of used SIBS® cooling fluid responsibly in accordance with regulatory and environmental legislation.
7. Remove the 3x tapered plugs and 1x pad wear indicator from the spring cover.
8. Fit 4x retractor bolts into the spring cover until they begin to retract the pistons.
9. Loosen the retractor bolts until there is approximately 2mm gap to the spring cover.
10. A short test is required to check the integrity of the springs in the EMMA brake. Assistance is required for this test.
11. While the EMMA brake is applying/releasing observe the movement of the retractor bolts.
12. The 4 x retractor bolts should move in and out simultaneously.
13. If the retractor bolts move simultaneously then the spring integrity check is complete. Skip to step 16.
14. If the retractor bolts appear to be moving unevenly then check the following:
   a. While the brake is releasing (the pump is running) one or more bolts moves quickly out at the beginning of the pump cycle and is then followed by the remaining retractor bolts moving slowly as the pump cycle continues and then finishes
   b. While the brake is applying (fluid dumping back to reservoir) the slow-moving bolt/bolts from the previous test move back into the spring cover first and are then followed by the remaining bolt/bolts
15. If the retractor bolts behave as explained in step 14 then the spring covers must be removed to visually check the springs.
16. With the brake released retighten the retractor bolts. Then apply the brake.
17. Remove the axle shaft.
18. Remove the hub nut. The hub can now either be removed or left in place and removed with the rest of the brake.
19. Remove and discard 2x housing bolts on opposite sides of the brake housing.
20. Attach 2x guide pins.
21. Remove and discard the remaining 10x housing bolts.
22. Carefully separate the inner and outer housings. 2x guide pins may assist with disassembly. The outer housing, hub, rotor and outer pads should remain as one assembly.
23. Stand the brake assembly on a clean bench.
24. Sit the outer housing, rotor and hub assembly face down on the hub studs.
25. Remove the rotor from the outer assembly, clean and inspect.
   a. Inspect the rotor and hub splines for wear. Check for movement between the rotor and hub. If there is movement between the splines of the mating components the rotor should be replaced.
   b. Inspect the rotor friction surface. If there are signs of scouring covering more than 50% of the surface the rotor should be replaced.
   c. Measure the thickness of the friction surface using a micrometer at four evenly spaced position around the rotor. If thickness is below 14.0 mm the rotor should be replaced.

26. Remove and discard the inner and outer brake pads.

27. Remove the hub from the outer housing and clean.

28. Remove all seals from the hub and discard.

29. Remove 2x bearings from the hub, clean and inspect.
   a. If bearings show any sign of wear they should be replaced.
   b. Grease the bearings with a high temperature bearing grease (Castrol LMX recommended).
c. Install the inner bearing into the hub. Set the outer bearing aside for installation onto the vehicle.

30. Inspect all hub studs, dowel pins and grease nipple. Replace if showing any signs of thread damage or corrosion.

31. Pack the hub with a high temperature bearing grease (Castrol LMX recommended).

32. Fit new hub seal and v-seals to hub.

33. Remove the cassette seal from the outer housing and discard.

34. Clean the outer housing and inspect for damage or wear.

35. Install a new cassette seal into the outer housing.

36. Push the outer housing onto the hub.

37. Install the outer brake pads in the outer housing ensuring correct orientation.

38. Install the rotor onto the hub spline ensuring correct orientation.

39. Remove the housing O-ring from the inner housing and discard.

40. If the piston seals need to be replaced (ref. step 1 and 2), remove the pistons now.
   a. Remove the piston o-ring seals.
   b. Clean the pistons with parts cleaner.
   c. Apply a light smear of silicone grease to the piston o-ring seals.
   d. Attach the piston seals to the pistons. Ensure o-rings are installed in the correct position.

Figure 49: Rear service piston with seals installed.

41. Clean the inside of the inner housing with parts cleaner.

42. Ensure the piston seals avoid contamination during cleaning process in cases where the pistons have not been removed.

43. Wipe the piston bores dry and install any pistons that were previously removed.

44. If the EMMA springs passed the integrity test as per steps 10 to 13 and do not require a visual inspection, skip to step 73.

45. Disconnect the service brake line, the park/emergency brake hydraulic line, the breather line and ABS sensor (if connected) from the brake.

46. Remove the 4 nuts that hold the brake onto the axle.
47. Lift the inner brake assembly clear from the axle. The inner housing may need to be tapped with a copper mallet to free it from the axle.

48. Inspect the mounting studs. Replace if showing signs of damage or corrosion. If replacing studs:
   a. Ensure the mating parts of the housing and seal carrier are clean and free of debris.
   b. Apply a light smear of Loctite® 515 on the mating surface of the seal carrier and under the head of each stud as it is pushed into place. Note that the heads of the studs are ‘D’ shaped and need to be orientated correctly.
   c. Using spacers, attach 4x mounting nuts and tighten to 15 Nm.

49. Inspect all fittings for damage or corrosion and replace if necessary.

50. Inspect the inner seal carrier. Buff the seal surface with a fine wet & dry (600 – 1000 grit) if it shows signs of wear or replace if necessary.

51. Remove the 10x spring cover bolts and discard.

52. Loosen the 4x retractor bolts progressively and in sequence no more than 3x full turns at a time until completely removed. Retain the retractor bolts for later use.

53. Remove the spring cover.

54. Remove and discard spring cover gasket.

55. Remove the disc springs and inspect each one for signs of excessive wear or cracking. If there are any cracked springs, then all 24x springs must be replaced.

56. If there are no cracked springs clean all thoroughly and set aside.

57. If the piston seals need to be replaced (ref. step 1 and 2), remove the pistons now.
   a. Remove the piston o-ring seals.
   b. Clean the pistons with parts cleaner.
   c. Apply a light smear of silicone grease to the piston o-ring seals.
   d. Attach the piston seals to the pistons. Ensure o-rings and back-up washers are installed in the correct position.

58. Clean the exposed areas of the park/emergency pistons in cases where the pistons have not been removed.

59. Ensure the piston seals avoid contamination during cleaning process.
60. Clean the inner housing and spring cover.

61. Wipe the piston bores dry and install any pistons that were previously removed.

62. Lubricate all disc springs with a high-pressure grease (Castrol LMM recommended) and reinstall on the park/emergency pistons. There is 6x springs per piston all stacked in series.

63. Install a new spring cover gasket and refit spring cover.

64. Install 10x spring cover bolts and washers finger-tight.

65. Reinstall the retractor bolts and torque to 80 Nm.

66. Install and torque all spring cover bolts progressively and in sequence (one full turn at a time) to ensure that the spring cover does not distort or crack, torque to 60 Nm. Ensure each bolt is torqued twice.

67. Clean the axle flange and spindle to remove any grease, dirt and gasket remains. If the flange is damaged or corroded it must be cleaned thoroughly with abrasive paper.

68. Apply Loctite® 515™ directly to the axle flange face.
69. Each brake unit is stamped with its corresponding position on the vehicle and must be installed accordingly:
   a. LH = Left Hand
   b. RH = Right Hand

70. Fit the SIBS® inner brake assembly unit over the stub axle. Align the mounting holes and locate the housing evenly and firmly against the axle flange.

71. Fit 4x new brake mounting nuts. Washers/spacers may be required with some kits.

72. Torque the brake mounting nuts to 80 Nm in a diagonal pattern. Repeat this procedure 3x over a 5-minute period.

73. Check the condition of the wheel bearing seal running surface. If the surface shows signs of degradation (e.g. corrosion or wear) repair using a speed-sleeve (part no: 99242 to suit Ø62mm max.).

74. Fit a new housing O-ring into the groove around the circumference of the inner housing.

75. Install the inner brake pads in the inner housing ensuring correct orientation.

76. Carefully fit the outer housing, hub and rotor assembly to the inner housing. 2x guide pins may assist with fitment.

77. Fit the 12x M10 bolts and torque to 50 Nm in sequence. Ensure each bolt is torqued twice.

![Figure 53: Housing bolt torque sequence.](image)

78. Fit the outer wheel bearing and retaining collar and adjust to Toyota specifications.

79. Fill the cavity behind the V-lip seal with a high temperature bearing grease (Castrol LMX recommended) via the grease nipple located on the hub face. Do not over-grease the V-lip cavity.

80. Install the axle half shafts in accordance to Toyota manual specifications and top up the differential oil as required.

81. Remove the 4x retractor bolts from the spring cover.

82. Fit the pad wear indicator to the lowest piston:
   a. Screw the pad wear indicator plunger into the lowest piston thread and torque to 15 Nm.
   b. Apply Loctite 222 to the gland fitting on the thread that attaches to the spring cover only.
   c. Fit the gland fitting over the piston and screw this into the spring cover. Torque to 15Nm.
   d. Fit the stainless steel protective cap and fibre washer to the gland fitting.
e. Fit 3x supplied tapered plugs to seal the remaining holes in the spring cover. Use an anti-seize or a low strength thread locker on the threads to prevent the plugs seizing in the spring cover. The hex sockets may be filled with silicone or similar, to aid future removal.

83. Remove the SIBS® cooling fluid fill plug.

84. Fill the SIBS® brake unit with new SIBS® cooling fluid and refit the fill plug with a new copper washer. Approximately 1 litre of SIBS® cooling fluid is required per rear brake unit.

85. Repeat for the opposing brake unit.

86. Inspect all the park/emergency brake hydraulic hoses and replace as required.

87. Replace all rear breather hoses.

88. Flush the pump reservoir with new ATF Dexron III and then fill to level window.

89. Prime the SIBS® pump by running intermittently (no more than 10 seconds at a time) until full hydraulic pressure is reached and the motor stops running automatically.
   a. To run the pump and release the EMMA™ brake, twist the red pushbutton on the control unit clockwise.
   b. To release hydraulic pressure and engage the EMMA™ brake, press the red operator pushbutton.
   c. While performing this priming process, ensure the EMMA™ reservoir is constantly topped up to prevent the pump from running dry.

90. Bleed the park/emergency brake system using the bleed screws on the rear brakes.

91. Remove any clamps on the rear service line.

92. Flush the master cylinder with DOT 3 brake fluid.

93. Bleed the rear service brake system of air.

94. Check that there are no leaks from the system.

95. Install wheels and torque all wheel nuts progressively and in sequence. Ensure each bolt is torqued twice.
   a. Steel rims: 210 Nm
   b. Alloy rims: 130 Nm

96. Conduct a “vehicle pre-start check”.
19. Major Service – Front

1. Check service brake system for leaks.
2. If leaks are present replace damaged seals where necessary during the major service.
3. Repair/replace damaged parts where necessary during the major service.
4. Remove the front wheels.
5. Clamp the front brake lines.
6. Drain and discard the SIBS® cooling fluid from each wheel-end brake.
   a. At least 600 mL of SIBS® cooling fluid should be found in each rear wheel-end. Check for leaks if this amount is not found.
   b. The SIBS® oil should drain freely from the brake. If it comes out in a “glug, glug” fashion ensure there is no blockage in the SIBS® breather line.
   c. Dispose of used SIBS® cooling fluid responsibly in accordance with regulatory and environmental legislation.
7. Remove the hub cap.
8. Remove the hub nut. The hub can now either be removed or left in place and removed with the rest of the brake.
9. Remove and discard 2x housing bolts on opposite sides of the brake housing.
10. Attach 2x guide pins.
11. Remove and discard the remaining 10x housing bolts.
12. Carefully separate the inner and outer housings. 2x guide pins may assist with disassembly. The outer housing, hub, rotor and outer pads should remain as one assembly.
13. Stand the brake assembly on a clean bench.
14. Sit the outer housing, rotor and hub assembly face down on the hub studs.

15. Remove the rotor from the outer assembly, clean and inspect.
   a. Inspect the rotor and hub splines for wear. Check for movement between the rotor and hub. If there is movement between the splines of the mating components the rotor should be replaced.

Figure 54: Outer housing, rotor and hub assembly.
b. Inspect the rotor friction surface. If there are signs of scouring covering more than 50% of the surface the rotor should be replaced.

c. Measure the thickness of the friction surface using a micrometer at four evenly spaced position around the rotor. If thickness is below 14.0 mm the rotor should be replaced.

![Rotor Image](image)

**Figure 55: Rotor.**

16. Remove and discard the inner and outer brake pads.

17. Remove the hub from the outer housing and clean.

18. Remove all seals from the hub and discard.

19. Remove 2x bearings from the hub, clean and inspect.
   a. If bearings show any sign of wear they should be replaced.
   b. Grease the bearings with a high temperature bearing grease (Castrol LMX recommended).
   c. Install the inner bearing into the hub. Set the outer bearing aside for installation onto the vehicle.

20. Inspect all hub studs, dowel pins and grease nipple. Replace if showing any signs of thread damage or corrosion.

21. Pack the hub with a high temperature bearing grease (Castrol LMX recommended).

22. Fit new hub seal and v-seals to hub.

23. Remove the cassette seal from the outer housing and discard.

24. Clean the outer housing and inspect for damage or wear.

25. Install a new cassette seal into the outer housing.

26. Push the outer housing onto the hub.

27. Install the outer brake pads in the outer housing ensuring correct orientation.

28. Install the rotor onto the hub spline ensuring correct orientation.

29. Remove the housing O-ring from the inner housing and discard.

30. If the piston seals need to be replaced (ref. step 1 and 2), remove the pistons now.
   a. Remove the piston o-ring seals.
   b. Clean the pistons with parts cleaner.
c. Apply a light smear of silicone grease to the piston o-ring seals.
d. Attach the piston seals to the pistons. Ensure o-rings and back-up washers are installed in the correct position.

Figure 56: Front service piston with seals installed.

31. Clean the inside of the inner housing with parts cleaner.
32. Ensure the piston seals avoid contamination during cleaning process in cases where the pistons have not been removed.
33. Wipe the piston bores dry and install any pistons that were previously removed.
34. Non-ABS models: Inspect the inner seal carrier and replace if there are any signs of wear or damage.
35. Check the condition of the wheel bearing seal running surface. If the surface shows signs of degradation (e.g. corrosion or wear) repair using a speed-sleeve (part no: 99242 to suit Ø62mm max.).
36. Fit a new housing O-ring into the groove around the circumference of the inner housing.
37. Install the inner brake pads in the inner housing ensuring correct orientation.
38. Carefully fit the outer housing, hub and rotor assembly to the inner housing. 2x guide pins may assist with fitment.
39. Fit the 12x M10 bolts and torque to 50 Nm in sequence. Ensure each bolt is torqued twice.

Figure 57: Housing bolt torque sequence.
40. Fit the outer wheel bearing and retaining collar and adjust to Toyota specifications.

41. Fill the cavity behind the V-lip seal with a high temperature bearing grease (Castrol LMX recommended) via the grease nipple located on the hub face. Do not over-grease the V-lip cavity.

42. Remove the SIBS® cooling fluid fill plug.

43. Fill the SIBS® brake unit with new SIBS® cooling fluid and refit the fill plug with a new copper washer. Approximately 800 ml of SIBS® cooling fluid is required per front brake unit.

44. Repeat for the opposing brake unit.

45. Inspect all the brake hydraulic hoses and replace as required.

46. Replace all rear breather hoses.

47. Remove any clamps on the front service line.

48. Flush the master cylinder with DOT 3 brake fluid.

49. Bleed the rear service brake system of air.

50. Check that there are no leaks from the system.

51. Install wheels and torque all wheel nuts progressively and in sequence. Ensure each bolt is torqued twice.
   
   a. Steel rims: 210 Nm
   b. Alloy rims: 130 Nm

52. Conduct a “vehicle pre-start check”.
20. Troubleshooting

1. Problem
   a. Possible cause
      i. Solution

1. Fault light on control unit flashing.
   a. 2x flashes then rest – low battery fault (below 11V)
      i. Charge vehicle battery
      ii. Fault will self-clear when battery voltage is above 11V
   b. 3x flashes then rest – control unit PCB too hot
      i. Remove any sources of heat that could be causing the control unit to overheat
      ii. Fault will self-clear when the PCB temperature drops below a certain level.
   c. 4x flashes then rest - park/emergency brake took too long to release – operation aborted.
      i. Check pump reservoir level is not too low. If low check system for leaks.
      ii. Possible air in system causing slow release. Bleed park/emergency brake system.
      iii. Pump motor has is too hot and has lost effectiveness – allow to cool to ambient.
      iv. Cycle ignition to clear the fault from the control unit.
   d. 5x flashes then rest – pump relay fault
      i. Ensure wiring is not causing a short or open circuit to pump relay.
      ii. Check pump relay for correct function – replace if required.
      iii. Cycle ignition to clear the fault from the control unit.
   e. 6x flashes then rest – dump valve fault
      i. Ensure wiring is not causing a short or open circuit to dump valve.
      ii. Check dump valve for correct function – replace if required.
      iii. Cycle ignition to clear the fault from the control unit.
   f. 7x flashes then rest – diff lock solenoid fault
      i. Diff lock not fitted for LandCruiser – check for interference with 6 pin connector behind radio.
      ii. Cycle ignition to clear the fault from the control unit.
   g. 8x flashes then rest – pressure sensor fault
      i. Ensure wiring is not causing a short or open circuit to pressure sensor.
      ii. Check pressure sensor for correct function – replace if required.
      iii. Cycle ignition to clear the fault from the control unit.
2. ATF warning light on control unit on.
   a. Vehicle parked on steep incline causing sensor to read incorrect fluid level.
      i. Park vehicle on flat surface and check ATF warning light if off.
   b. Low fluid level in SIBS® pump reservoir.
      i. Top up reservoir with ATF Dexron III and check system for leaks.

3. Brake status LED is solid green and control unit is not responding.
   a. Control unit is in ‘SIBS® 3’ mode.
      i. Conduct a master reset of the control unit by holding the manual release button and cycling the E-stop button 3 times within 5 seconds. All lights on the control unit will flash once to confirm reset was successful and all settings have been cleared.

4. Brake pedal soft/spongy
   a. Air in the service brake system
      i. Bleed the brakes
   b. Brake rotors binding on splines
      i. Crimp off brake hoses to isolate offending brake.
      ii. Strip wheel end & inspect.

   a. Pads and rotor surface glazed.
      i. Change SIBS® cooling fluid and perform dry deglaze procedure if required.
   b. SIBS® oil contaminated with brake fluid, ATF or grease.
      i. Remedy any leaks then change SIBS® cooling fluid and perform dry deglaze procedure if required.
   c. Vacuum system leak.
      i. Inspect vacuum hoses, connections and booster for leaks.

6. Pedal goes slowly to floor with light application.
   a. Master cylinder bypassing internally.
      i. Strip and inspect. Replace cylinder or install overhaul kit.
   b. Leak in brake lines/hoses or fittings.
      i. Inspect brake lines and hoses for leaks.
      ii. Ensure stainless fittings and bleed nipples are seated correctly. Tighten or replace as required.
   c. Brake seals bypassing internally.
      i. Strip brake and inspect service piston seals. Replace with new piston seal kit.
7. Brakes drag/brakes not fully releasing after operation.
   a. Booster/master cylinder out of adjustment.
      i. Adjust booster output pushrod.
   b. EMMA™ piston seals bypassing or service piston seals contaminated & swollen preventing them from retracting.
      i. Locate which wheel end is affected (which wheel is dragging) or inspect rear brakes for ATF leakage around rear of spring cover.
      ii. Strip brake, inspect components. Replace seals as required.
   c. Insufficient hydraulic pressure to release EMMA™ brake.
      i. Place vehicle on hoist and release EMMA™ brake. Check to see if one or both wheels are dragging.
      ii. If both sides: Carryout pressure check in EMMA™ circuit, should be 850psi, if pressure is insufficient change pressure switch. If pressure still low, EMMA™ pump may be at fault.
      iii. If only on one side: strip wheel-end & inspect.

8. Vehicle pulls to one side during braking.
   a. Generally due to reduced effectiveness in one brake (brake steer). Vehicle will pull to the side with the more effective front brake. Usually caused by front brake issue.
      i. If running OEM front brakes refer to Toyota manual.
      ii. If running SIBS® front brakes check seized or sticking service pistons.
      iii. Strip wheel ends and inspect service pistons & seals.
      iv. Note: service brake seals can deteriorate (swell) if outer Viton seal fails allowing SIBS® cooling fluid to come in contact with brake seal. Replace seals.
   b. SIBS® oil contaminated with brake fluid, ATF or grease.
      i. Remedy any leaks then change SIBS® cooling fluid and perform dry deglaze procedure if required.

9. Brakes shudder as vehicle slows to a stop.
   a. Old/overused SIBS® oil.
      i. Change SIBS® cooling fluid.
   b. Brakes are cold.
      i. Complete 3x medium/hard stops to warm brake.
      ii. If shudder persists after more than first three brake applications, change SIBS® cooling fluid and perform dry deglaze procedure if required.

10. SIBS® park/emergency brake applies unexpectedly.
    a. Faulty wiring causing intermittent loss of continuity.
       i. Inspect/test 12 volt ignition switched & 12 volt constant supply. Ensure all connections are clean, secure and free of corrosion.
       ii. Check door switches.
       iii. Check seatbelt switches.
       iv. Check oil-pressure switches.
11. SIBS® park/emergency brake is poor. Brake not holding on inclines.
   a. Brake pads and/or rotor worn.
      i. Check pad wear indicators. If pads below wear limit conduct a major service.

12. SIBS® park/emergency brake slow to apply
   a. Brake pads worn.
      i. Check pad wear indicators. If pads below wear limit conduct a major service.
   b. SIBS® relief valve set too high.
      i. Adjust to desired application speed by loosening locknut and turning adjusting screw out. Adjust ½ turn at a time & test.

13. SIBS® pump runs intermittently during service (brake status light flashes red and beeps occasionally).
   a. Minor leak in park/emergency brake system
      i. Check all hydraulic hoses and connections for signs of leaking ATF.
      ii. Strip brake and check emergency/park brake piston seals and bores. Replace as required.

14. Pump does not run (SIBS® park/emergency brake does not release).
   a. Check interlocks are not preventing brake release
      i. Close all doors, fasten driver’s seatbelt, start vehicle engine.
   b. Loss of power to SIBS® control unit (indicated by lack of brake status LED).
      i. Check all fuses. If blown identify cause and repair.
   c. Loss of power to SIBS® pump.
      i. Check all fuses. If blown identify cause and repair.
      ii. Check function of relay mounted at vehicle battery. Replace if required.
      iii. Check for continuity of wiring from battery to pump motor and relay to control unit.
   d. Faulty pump motor.
      i. Replace pump motor.