



INSTALLATION INSTRUCTIONS

X-LINE BIG BRAKE KITS

Quick Start

Brakes are safety critical items, to ensure your own safety and to get the best service from your new Powerbrake kit, please follow the detailed instructions carefully. For a quick guide to getting started, please note the following important points:

1. Some items are marked “Left” or “Right”. For best performance and brake life ensure they are fitted to the correct side of your vehicle.
2. Do not clean the black coating off the new rotor rings. Fit as is.
3. The vehicle’s hubs should be cleaned thoroughly before fitting the new rotors to ensure no run-out issues occur. This is a crucial step – do not ignore!
4. Follow torque specs carefully (see assembly diagram included, and all torque specs below).
5. Check brake hose routing carefully after installation. Brake hoses should not snag any suspension component, nor be pulled tight at full steering lock.
6. Service bleed both calipers after the first 50-100km (30-60miles) to remove the last remaining air in the system. This will result in the best possible pedal feel.

Torque settings

Caliper mounting bracket to upright (using OEM bolts)	See included assembly drawing
Caliper to mounting bracket (using M12 cap screws supplied)	105Nm (77 lb-ft)
Banjo bolt for caliper fluid inlet (M10 x 1.0mm)	20Nm (15 lb-ft)
Caliper bleed nipples (M10x1.0mm)	20-25Nm (15-18.5 lb-ft)

Before starting:

If you have not already done so, ensure your wheels will clear the calipers in your big brake kit. If you are not sure if they will clear, please contact our sales office to request a copy of the “wheel fitment template” for your vehicle in order to check clearance.

Your kit should include the following:

- 2 x X-Line 6-piston billet calipers
- 1 x set high-performance brake pads
- 2 x aircraft grade aluminium mounting brackets
- 2 x directional cooling vane rotor assemblies, marked “Left” and “Right”
- 2 x stainless braided hoses including:
 - 2 x M10 banjo bolts
 - 4 x ductile washers
- 4 x high tensile caliper mounting bolts & washers
- 1 x 11mm brake bleeder tool
- 2 x rubber end caps

Removal of OEM brake components

- After securing the vehicle carefully on jack stands – remove the front wheels.
- Leave the cap tightly on the master cylinder reservoir. Loosening the cap will cause more brake fluid to drip/leak when removing the standard brake components.
- Place a drip tray directly below the area where the original rubber brake hose and steel ‘hard’ brake line from the chassis meet.



WARNING:

Brake fluid will damage any painted surface. We recommend keeping some warm, soapy water on hand during the entire installation process. Use this water to immediately clean spilled brake fluid from any painted surface.

- You will find two additional rubber end caps supplied in your Big Brake Kit. These are to be placed over the end of the steel ‘hard’ brake lines, once the rubber brake hoses have been removed, in order to stop the brake fluid from dripping/running out during the installation process.
- Loosen the rubber brake hose at the chassis end (not at the caliper).
- Immediately place one of the supplied rubber end caps over the end of the steel brake line to limit brake fluid loss from the reservoir.
- Remove the stock caliper mounting bolts that fasten the caliper to the upright.
- Keep the stock caliper mounting bolts, which will be re-used to attach the Powerbrake caliper mounting bracket to the upright.

- Remove the stock caliper with the rubber brake hose still attached. Be aware that some fluid may leak from the open end of the rubber brake hose.
- Remove any retaining screws or bolts holding the stock brake rotor to the hub.
- Remove the stock brake rotor from the hub.

Fitting Powerbrake Big Brake Kit components

Powerbrake big brake kit components are labeled “Left” and “Right”. In all instances, it refers to the left or right of your vehicle when seated in the vehicle.

Mounting brackets:

- Remove or trim the splash plate mounted behind the rotor using metal shears. File all sharp edges after cutting.
- Clean the caliper mounting lugs on the knuckle using brake cleaner or solvent.
- Ensure that the stock caliper mounting bolts are clean and in good condition. Use brake cleaner or a solvent to clean the threads if necessary. Apply a small amount of thread-locker to the threads of the stock caliper mounting bolts.
- Use the stock caliper mounting bolts to attach the Powerbrake caliper mounting bracket to the upright (See included Assembly Diagram for mounting bracket orientation and torque specs).
- Torque the caliper bracket mounting bolts as indicated on the Assembly Diagram.

Rotors:



IMPORTANT:

There may be considerable rust/corrosion buildup that has formed on the mounting surface of the hubs. It is essential that you thoroughly clean the mounting surface of the hubs with a wire brush, Scotch-bright or emery paper, followed by a brake cleaner or solvent. The mounting surface must be perfectly clean. Failure to do this can lead to excessive run-out on your new rotors and result in the onset of brake judder.

Do not ignore this important step!

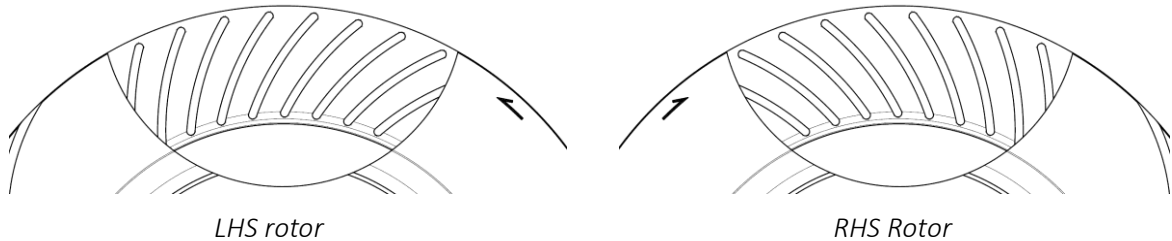
- Once clean – check the hub surface for any burs or imperfections. Minor burs may be removed using a fine-tooth file. Work carefully.
- If possible, measure the runout of the newly cleaned hubs using a dial gauge. The runout on each hub should be in the 0.01mm – 0.02mm (0.0004 – 0.0008in) range. Do not fit your rotors to a hub with excessive runout, as this will result in brake vibration and damage to the new rotors.
- Wheel bearings must be in good condition and correctly torqued.
- In some cases the stock splash plate will need to be removed* or modified (cut) in order to fit the new Powerbrake brake rotor. Test fit the new rotor by hand to ensure that the rotor sits flat against the hub face with a minimum of 3mm (0.1in) clearance between the rotor and dust/splash shield.

** Do not remove if the splash shield is mounted behind the hub/bearing – in this case it should rather be trimmed with metal shears or a grinder.*



WARNING:

Your new Powerbrake rotors features curved directional cooling vanes. Be sure to fit the correct rotor to each side of the car. Reversing the rotor direction will substantially reduce their cooling efficiency. The packet in which each rotor is sealed is clearly marked “Left” or “Right” side. The internal cooling vanes should “lean” to the rear of the car at the 12 o’clock position of the rotor (see cutaway images below).



- Fit the rotor to the hub and use the wheel nuts (and spacers/washers if necessary) to hold it in place without the wheel. Tighten using moderate torque. If possible, measure the runout on the rotor friction surface, approximately 2cm (1in) from the edge of the rotor, using a dial gauge. The maximum runout should be no more than 0.07mm (0.0027in) and must not exceed 0.08mm (0.003in).
- If runout exceeds 0.08mm (0.003in), remove the rotor and rotate it by one bolt hole and re-check. This can be repeated until the optimum (lowest) runout is achieved. The rotor and hub can then be marked for future indexing.

Calipers and brake lines

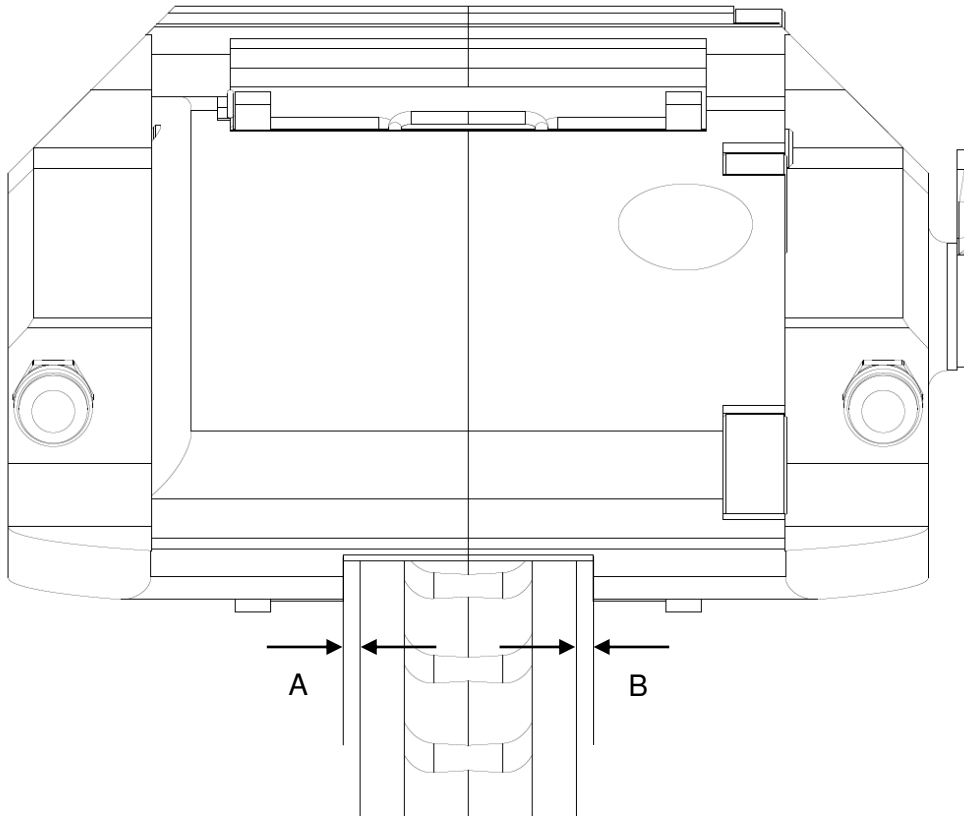
- Fit the supplied high-performance pads to your calipers before installation. Refer to the inside back page of this installation manual for pad fitment instructions.
- Powerbrake uses stainless steel Heli-coil™ inserts for the radial mountings in the caliper brackets. Do not use any thread locker / Loctite on caliper radial mounting bolts. Use a small amount of thread lubricant (such as *ARP Fastener Assembly Lubricant*) on the bolt threads.
- Fit the new Powerbrake caliper to the bracket installed earlier, using the M12 cap screws and washers supplied. The washers must be fitted underneath the bolt heads, not underneath the caliper. Torque the radial mounting bolts to 105Nm (77 lb-ft). Refer to included Assembly Diagram.



IMPORTANT:

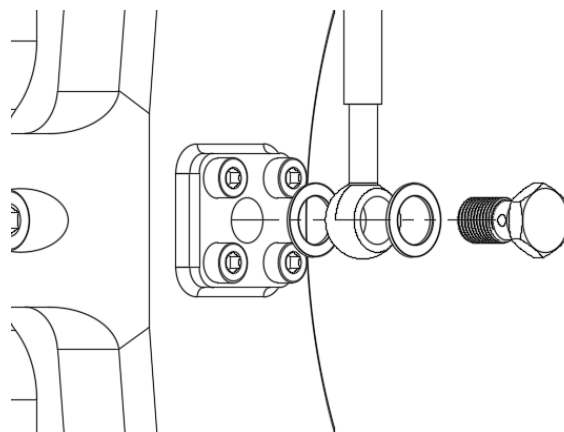
Ensure that the caliper is perfectly centered over the rotor and that no part of the caliper is fouling the rotor at all.

With the caliper mounted to the bracket, measure rotor face to caliper clearance on either side (A and B on the next page). The difference between the two dimensions must not exceed 1.0mm (0.04in) either at the top or bottom of the caliper (see image).



NOTE: For vehicles with splash plates mounted behind the hub: If you have completely removed your vehicle's splash plates, it will affect the caliper centering since the hub has now moved inboard. It would be preferable to cut the center of the splash plate out and reinsert it behind the hub to get the centering correct.

Install the Powerbrake stainless steel braided brake hose with the banjo fitting at the caliper end and the female fitting at the steel hard-line at the chassis. After removing the red plastic tab from the caliper fluid inlet, install the banjo bolt into the caliper with a ductile washer on each side of the banjo fitting as per the image below.



 **WARNING:**

Failure to use a ductile washer on either side of the banjo fitting can result in a leak and loss of brake system pressure under braking.

- Align the neck of the banjo fitting in the direction of the brake hose locating bracket on the shock strut.
- Torque the banjo bolt to 20Nm (15 lb-ft).
- If applicable, slide the rubber grommet on the brake hose into the locating bracket on the strut, or fasten the brake hose center mount(s) as necessary.
- Secure the female fitting of the new hose to the locating bracket on the chassis using the stock spring or clip, or use the clip if provided with the new brake hose. If this is not possible then use a cable tie to secure the female fitting to the chassis locating bracket.
- Remove the rubber end cap from the end of the steel (hard) brake line and immediately screw the tube nut on the hard-line into the female fitting on the new brake hose. Ensure that the fittings are tight but do not over-tighten them.
- The process described above is the same for both sides of the car. Complete the installation of the Powerbrake components on both sides of the car before bleeding the brakes.



IMPORTANT:

Once hoses are fitted, turn the wheels full-lock to full-lock, while carefully checking that neither the caliper mounting bracket or the brake hose are binding or fouling in any way. If necessary, make adjustments by re-clocking the banjo fitting in order to re-direct the brake hose. Re-tighten the banjo bolt to 20Nm (15 lb-ft) once done.

IF YOU HAVE RAISED YOUR VEHICLE, PLEASE CONTACT US FOR BRAKE HOSES WITH THE REQUIRED EXTRA LENGTH. DO NOT FIT THE HOSES IN THIS KIT AS THEY MAY BE TOO SHORT!

Bleeding the brakes

- The X6M and X6L calipers feature recessed bleed nipples for extra protection against rocks and debris. It therefore requires a special 11mm tube wrench for bleeding (see below). This wrench is supplied with your kit. Keep it with your big brake kit for future service bleeds. Should it be lost, a new wrench can be ordered from FACOM (part # 76.11) or King Tony (part # 1080-11), or contact our Sales Office.



Pass the bleeder pipe through the back of the tool and onto the bleed nipple

- The new brake hoses and calipers will have to fill with fluid during the bleeding process. This will quickly drain the master cylinder reservoir. Do not allow the master cylinder reservoir to run dry and draw air into the system. Doing so may require the brake system to be serviced by a certified brake technician or the OEM franchised dealer. You will need to top up the master cylinder reservoir regularly with new brake fluid while bleeding.
- Use a clear bleed tube and bleed bottle when bleeding. The clear tube should fit tightly onto the heads of the bleed screws in order to avoid brake fluid spilling onto the calipers and brake pads. It is very important to avoid contaminating the brake pads with brake fluid as this will reduce brake efficiency.
- Use a brake fluid that is compatible with the seals in your brake system. Powerbrake recommends Glycol based brake fluids that meet DOT 4 specifications or higher. Do not use Silicone based brake fluids with Powerbrake calipers. For recommendations on specialised high-temperature or competition brake fluids, please contact Powerbrake.
- The sequence for bleeding the brakes should be:
 1. Caliper furthest from master cylinder - outboard bleed screw.
 2. Caliper furthest from master cylinder - inboard bleed screw
 3. Caliper closest to master cylinder - outboard bleed screw.
 4. Caliper closest to master cylinder - inboard bleed screw.
- With the ignition and engine OFF, start by opening a bleed nipple slightly (quarter to half a turn is usually enough) and have a second person pump the brake pedal slowly a number of times to expel air from the system and start filling the new brake lines and calipers with fluid. The person pumping the brake pedal should not depress it to its furthest extent, preferably only half way – this is particularly important on vehicles with higher mileage and more wear in the master cylinder. Pump the brake pedal until clean fluid runs into the bleed bottle. Close the bleed nipple only while the brake pedal is depressed. **NB: DO NOT LET THE RESERVOIR RUN DRY DURING THIS STAGE. FILL IT REGULARLY.** Repeat this process on both calipers, and both bleed nipples.
- Next, return to the first bleed nipple and attach the bleed bottle again. Get the second person to pump the brake pedal five times in rapid succession with the bleed nipple closed. Open the bleed nipple very slightly while they keep pressure on the pedal to release any trapped air. Continue until no more escaping air bubbles are visible. **NB: DO NOT LET THE RESERVOIR RUN DRY DURING THIS STAGE. FILL IT REGULARLY.** Repeat this process on both calipers, and both bleed nipples.
- **NOTE:** For **TOYOTA** models with a brake booster fitted with an electric accumulator pump please note the following. The above process should be completed but with the ignition turned ON (no need to run the engine). Start by connecting the bleed bottle, then turning the ignition ON. Wait for the pump to stop running (a whirring noise is audible when the accumulator pump runs). Keep the ignition turned ON while pumping the brake pedal (a whirring noise is heard when depressing the brake pedal – this is normal). Now follow the two steps outlined above.
- When finished, tighten all bleed screws to a max torque of 25Nm (18.5 lb-ft).
- Once the bleeding is complete, we recommend you soak up excess brake fluid remaining in the bleed screw. Roll a piece of tissue paper into a thin strip and insert into the bleed screw to soak up the fluid. Repeat this procedure for each of the four bleed screws until the tissue remains dry and is soaking up no more brake fluid.
- Place the rubber bleed screw caps provided onto each bleed screw.
- Get a helper to apply a constant pressure to the brake pedal while you check all connections, including bleed screws and both ends of each brake hose for leaks. Tighten if necessary.
- **MAINTENANCE:** Powerbrake recommends flushing the brake system with new fluid every 24 months.



IMPORTANT:

On a dry bleed (first time bleed on a new caliper) some air may be trapped in the very tight tolerances between the caliper pistons and bores, resulting in a slightly spongy brake pedal. The vibration and suspension movement experienced under normal driving conditions will cause these small air pockets to rise to the top of the calipers near the bleed screws for easy bleeding. If you do not achieve a perfectly firm pedal after the initial bleeding, we suggest driving the car for ± 50 km (30 miles) before doing a final bleed. This will result in the best possible pedal feel. If you are a workshop, we suggest driving the car for a few kilometers and then re-bleeding or asking the customer to drive for a few days before returning for a final bleed. (This does not apply in cases where there is excessive pedal travel after initial bleeding, in which case the system should be checked for leaks etc, but only in cases where the driver feels that the pedal is not quite optimal).

Re-installing the wheels

It is essential to carefully check wheel / caliper clearance before re-installing the wheels. Of particular importance is wheel spoke clearance to the outboard caliper face! A minimum of 2.5mm (0.1") is required. Powerbrake cannot possibly check all aftermarket wheels for any specific vehicle. Wheel clearance is the vehicle owner's responsibility. Some wheels may require spacers in order to clear the calipers. If this is the case, please contact Powerbrake for recommendations.

Some wheels are balanced using adhesive backed lead weights stuck to the inside of the wheel rim. If the weights have been placed on the outboard edge (closest to the wheel spokes) they may interfere with the caliper as the wheel rotates. If this is the case, note the position and weight and place a new weight slightly further inboard on the wheel in order to clear the caliper. Alternatively, have your wheels re-balanced by a certified technician, once you have explained the situation to them clearly.

- Before reinstalling the wheels, ensure that sufficient length of wheel stud is available for proper thread engagement with the wheel nuts (a good rule of thumb is that available stud length should be $\pm 1.5 \times$ diameter of the stud). If not, longer wheel studs would be required.
- Re-install the wheels and torque the wheel nuts to the manufacturer's recommended specifications.
- Rotate the wheels while the car is still on the jack stands and check on last time to ensure that the wheels and wheel spokes clear the calipers by at least 2.5mm (0.1in).
- Before test driving the vehicle. Pump the brake pedal a few times to 'snug' the pads up to the rotors. Ensure that you have a firm brake pedal.
- Carefully test drive the vehicle at low speed in a safe area to ensure that all brake components are working correctly before continuing on to the bed-in procedures described next.

Bedding-in your new Powerbrake rotors/pads

- Drive normally for approximately 180 miles (300km's) to establish a proper wear pattern and maximum contact area between pads and rotors. Use medium brake pedal pressures during this time. Do not test the performance of your new brake setup during this time. Hard braking at this stage may ruin your new rotors and pads. Long open-road trips do not count as you are not using your brakes regularly enough. Only use brakes hard in an emergency. Never left foot brake or drag the brakes!
- Once you have completed 180 miles (300km's) you may use your brakes normally.

How to get the maximum wear life from your rotors and pads:

- Do not run your rotors at temperatures over 630 deg C (1166 F). Doing so will substantially reduce product life. All Powerbrake rotors feature a unique MTR (Maximum Temperature Recording) system. This consists of different levels of thermally sensitive paint that is applied to the outside edge of the rotor. Each of the paints will change color at a specific temperature, hereby providing a permanent record of the maximum temperature reached by the rotor. The paints will change only once, so it is recommended that you gradually build up your driving style after bedding in the rotors and monitor the MTR paints after each driving session. For maximum rotor life, temperatures should be kept under 630 deg C (1166 deg F).

Blue paint – turns Light Brown at 275 deg C (527 deg F).

Green paint – turns White at 460 deg C (860 deg F).

Orange Paint – turns Yellow at 550 deg C (1022 deg F).

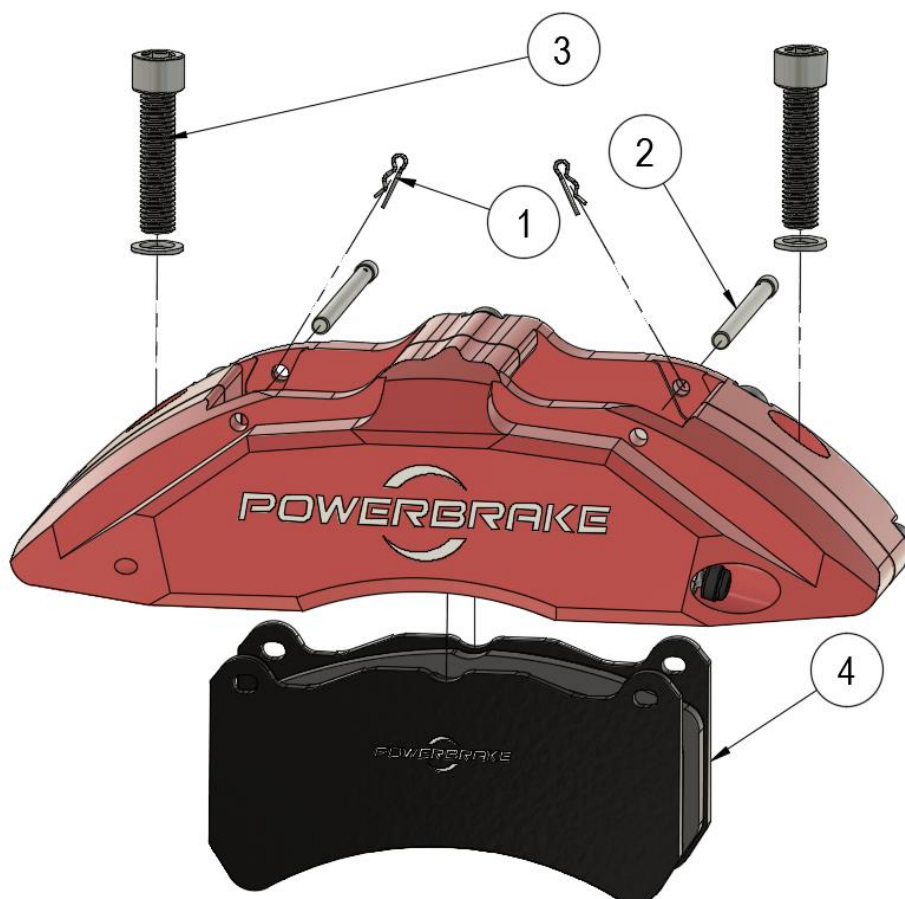
Red / Pink paint – turns White at 630 deg C (1166 deg F).

Wide Red paint strip – various shades from 104 – 1270 deg C (219 – 2318 deg F). *

* Contact Powerbrake for more info

- Ensure that you are running a brake pad compound that is designed to operate in the rotor temperature range that your driving style produces. If you run your brake pads above their recommended maximum operating temperature (MOT) they will start to deposit friction material unevenly on the face of the rotor, leading to the development of rotor thickness variation (DTV) and brake judder.
- Warm up your rotors prior to hard driving. It is best to get some heat into your rotors by driving moderately prior to spirited driving sessions – involving heavy, consecutive braking.
- It is important that you do not park your car with extremely hot rotors. After a spirited driving session you should slow down and use the brake as moderately as possible for about 2-3 miles (3-4 km's) prior to reaching your destination. This allows rotor temperatures to come down to acceptable level prior to parking the car.
- Nothing stresses brake rotors and pads like heavy, consecutive braking between traffic lights. If you are into 'street racing' it is recommended that you limit heavy braking to 3-4 consecutive intersections before driving on and allowing airflow to cool the rotors for a few minutes. Use the brakes only mildly during this cooling period and, if possible, do not bring the vehicle to a complete stop. It is important that you continue moving to allow airflow to cool the rotors.
- Never intentionally wet your rotors when they are hot. Be careful of using drive-through car washes when rotors are hot.
- All Powerbrake calipers feature temperature recording strips applied to the inboard surface of the calipers. The 'line' in the centre of the strip will turn dark indicating the maximum temperature reached by the caliper. For maximum seal life temperatures should be kept below 200 deg C (392 F). Caliper temperatures over 200 deg C (392 F) will lead to reduced seal life. If a caliper reaches 250 deg C (492 F) the seals should be replaced immediately. New seal kits can be ordered directly from Powerbrake.
- As the Powerbrake kit is a performance product, and due to the properties of materials used during construction, braking may be associated with elevated levels of noise, vibration and harshness. This is normal and will not impede brake performance or safety.
- **Be very careful when using aggressive wheel cleaners that contain strong acids as it will discolour the caliper and rotor hat finishes.**
- **It is not ideal to immerse your brakes into salt water (such as when launching a boat) as this could lead to galvanic corrosion of some brake components. If it has been in salt water, wash down with fresh water as soon as possible.**

Installing or changing pads – X6M / X6L V3 Caliper



The international standard width for the pads used in the X6M / X6L caliper is 164.50mm. If the replacement pads you are fitting is wider than 164.50mm the edges need to be filed to fit.

To remove and replace pads on the X6M or X6L caliper, follow the steps below:

- 1) Remove the two R-clips (#1) from the pad retaining pins. Use a thin screw driver or hook-and-pick set to prise the R-clips upwards. Be careful not to lose them.
- 2) Push the pad retaining pins (#2) out towards the back (inboard side) of the caliper.
- 3) Remove the caliper by undoing the two radial mounting bolts (#3) using a 10mm hex driver (Allen key), and hang the caliper onto the strut with a zip-tie. Do not disconnect the brake hose and do not let the caliper hang on the brake hose as it may cause damage to the hose.
- 4) Slide the pads (#4) out at the bottom of the caliper.
- 5) Clean around piston walls with brake cleaner before pushing them back into the caliper body. A caliper spreader tool will make this easier.
- 6) Refit your new pads by sliding them up into the caliper.
- 7) Re-fit the pad retaining pins (#2).
- 8) Fit the caliper back onto the bracket and torque radial mount bolts to 105Nm (77 lb-ft). Ensure the washers below the radial mount bolts are still present.
- 9) Refit R-clips (#1). Make sure they clip over the pad retaining pin.



WARNING – do not drive without R-clips fitted.



Powerbrake has been the chosen brake supplier for the factory Toyota Gazoo Racing Hilux since 2012 with a proud racing heritage:

- South African National Cross-Country Championship: 2016, 2017, 2018, 2019, 2020 and 2021 National Champions.
- FIA Cross Country World Cup Championship: 2016, 2017 and 2021 World Champions.
- 2012 - 2018 Dakar Rally: 2012 - 3rd Overall, 2013 - 2nd Overall, 2015 - 2nd Overall, 2016 - 3rd Overall, 2018 - 2nd & 3rd Overall.
- 2019 Dakar Rally: Overall victory.
- 2020 Dakar Rally: 2nd place overall with 5 of the top-10 and 9 of the top-20 cars running Powerbrake R-Line off road race calipers.
- 2021 Dakar Rally: 2nd place overall with 25% of the entire car field running Powerbrake R-Line off road race brake systems.
- 2022 Dakar Rally: Overall victory with 3 of the top 5 finishers running Powerbrake R-Line off road race brake systems.

Warranty

POWERBRAKE (PTY) LTD will guarantee any product manufactured by the company that is found to be faulty in workmanship or materials with 12 months or 12,500 miles (20,000km) use, whichever occurs first.

The warranty does not extend to faults or failure caused by ordinary wear and tear, misuse/abuse, use of the product for any form of motor sport or track-day use, incorrect fitting, use of incorrect or defective associated component parts (e.g. pads), or any cause not relating to a defect in design or manufacturing.

IMPORTANT: All Powerbrake rotors and calipers feature our MTR (Maximum Temperature Recording) tabs that are applied to the outside diameter of each rotor and the inboard side of each caliper. The above warranty is VOID if any Powerbrake rotor is run to maximum temperatures in excess of 630 degrees C (1166 F) or any Powerbrake caliper to run to maximum temperatures in excess of 200 degrees C (392 F).

Powerbrake (PTY) Ltd South Africa

www.powerbrake.co.za / www.powerbrakeglobal.com