

TUNE-UP AND SERVICE

DIY The BMW 3-Series

BY RAY EBERLEIN

IF ever a car could be said to have ushered in a new era in servicing, especially as far as the DIY motorist is concerned, then the BMW 3-Series is it. Admittedly its bigger brothers in the 7-Series have many of the same maintenance features, but then the man who owns one of those is less likely to be a DIY man.

The car tells its owner when it needs servicing through a Service Interval Indicator (SII) which takes account of engine speeds and temperatures, distance covered, time elapsed and the number of times the engine is started to assess when the car needs servicing or an oil change. BMW claims that this will usually be a lot later than the standard service interval based on average driving conditions which is used in other cars.

Just when you service one of these cars is up to you. CAR, however, still feels that in the interest of safety, it's best to service the car and carry out the safety checks at the prescribed intervals.

The 3-Series uses fuel injection versions of the 1 796 cm³ four-cylinder engine and the 2- and 2.3-litre six-cylinder engines in a common body shell, with a five-speed manual or three-speed automatic transmission driving the rear

Before changing the oil (left), warm-up the engine, then jack-up and support the car using the reinforced points. The engine drain plug needs

wheels. A disc-drum braking system is used on the 318 and discs allround on the others. Power steering is optional on the 318 and standard on 320 and 323.

Weekly check

Although not strictly necessary, an eyeball inspection of the vital signs is comforting, in this age of electronics. Check fluid levels in radiator, engine, hydraulic system and automatic transmission, then look under the car for leaks, loose or perished hoses and so on.

Check the tyre pressures (no computer assistance here!) with the tyres cold, and include the spare in the check. The electronic system will tell you if a vital light is not working, but the kids might consider it fun to run around the car and check them out too!

5 000 km/3 months

Somewhere around 5 000 km the oil in the engine needs to be changed, even if the SII hasn't already told you so. You might consider changing the oil filter at the same time.

Park the car on a level surface and unless the engine is already hot, run it up to operating temperature. Jack-up the

car and support it on stands to enable you to crawl underneath, remembering that you still need to get at the filter which is more accessible from under the bonnet than under the car.

There are reinforced points for jacking and supporting the car without damaging the frame, so use them. As usual these are arches. Be careful when positioning a jack near the left rear wheel arch, the fuel pump is here. It is well protected by its position, but it doesn't pay to tempt fate.

The sump drain plug takes a 17 mm spanner and a throw-away filter is fitted. Position a can to collect spillage, then unscrew the sump plug and allow the oil to drain. While it's draining, use a strap tool to loosen and unscrew the filter.

Punching a screwdriver through the filter body is an acceptable if messy alternative to buying a strap tool. Have a plastic bag handy in which to drop the used filter. Allow the oil to drain, then smear a little clean oil on the rubber seal at the base of the new filter and screw it up *hand-tight only*.

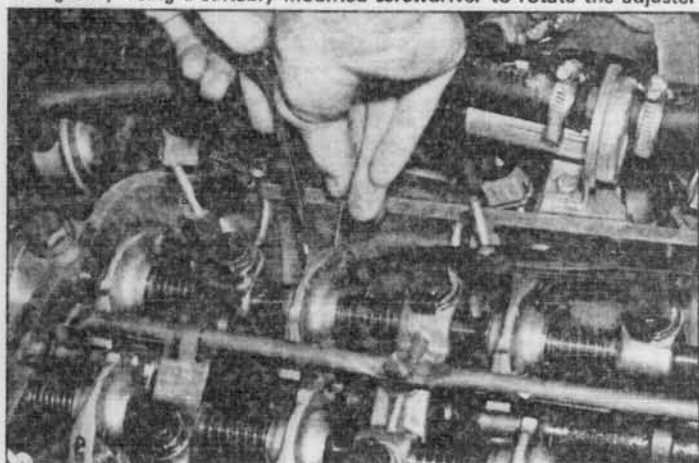
Replace the sump plug firmly using a new washer and fill the engine with clean oil through the filler cap on the rocker cover. Start up and check for leaks. If all is well, switch off, wait a few minutes for the oil to drain back into the sump, then recheck the level.

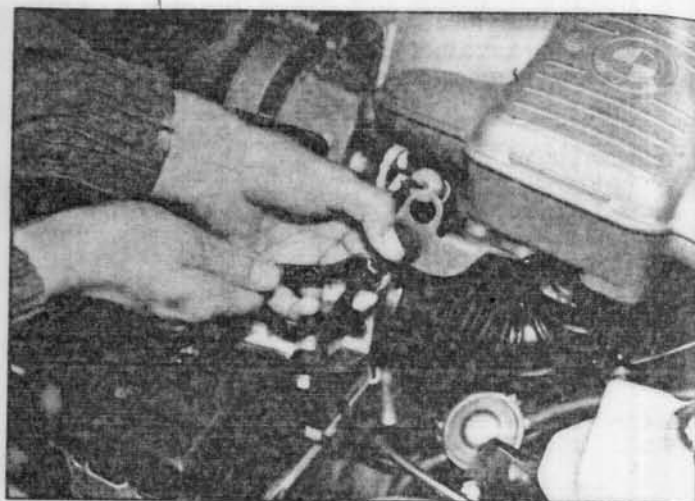
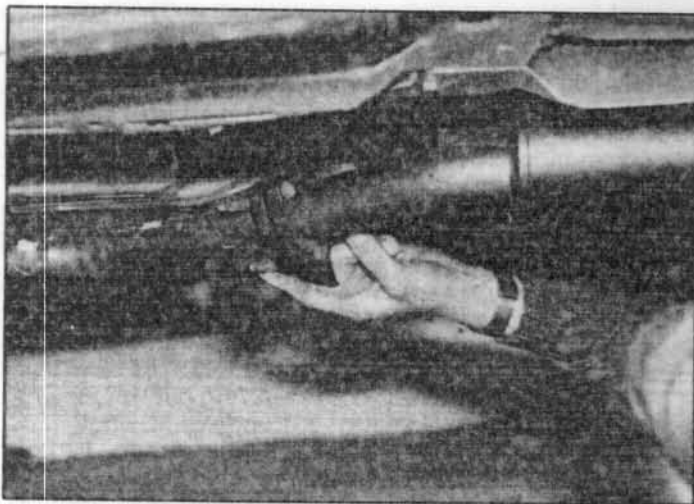
Lower the car to the ground, and drive on until 10 000 km or until you're informed that the next service is needed.

Every 10 000 km/6 months

The sequence of operations for this service, which includes an oil change, is largely dependent upon the fact that the valve clearances need to be adjusted with the engine "cold", or at a temperature no higher than 35°C. It is best to start with the jobs which can be done with the engine cold and the wheels on the ground (to make it easier to reach into the engine compartment). Then start the engine, warm it up and jack-up the car to do the jobs which are best done while the car's wheels are off the ground.

Remove the air cleaner top by loosening the two 10 mm retaining nuts and a 17 mm key. Valve adjustment (right) calls for a special tool but you can get by using a suitably modified screwdriver to rotate the adjuster.





One of the undercarriage inspection jobs (left) is to examine the exhaust pipe along its length for corrosion, loose rubber hangers and clamps. The

only advisable adjustment to the fuel injection system (right) is to check the accelerator cable for slack and if necessary, use the adjuster shown.

the four over-centre spring clips. Lift it carefully and extract the filter element. Air filters are important in normally aspirated engines and vital in fuel-injected engines.

No cleaning is normally recommended, so if the filter, when held so that a lead light can be shone through it and it shows large amounts of dust or even damage, discard it. Using an air hose to clean off excess dust is acceptable, if all the loose dust is removed in this way. If in any doubt, replace the filter element.

As the cars are fitted with electronic ignition, no fiddling or setting is necessary or encouraged. Leave well alone! Remove the spark plugs and examine them as described in a recent feature in CAR. If they are to be returned to service, set the gap to 0,6 to 0,7 mm and lay them aside.

Valve clearances

A special tool is needed in order to set the valve clearances. You can substitute a thin screwdriver — about 2,5 mm thick with the last 20 mm bent at an angle of about 75°, used in conjunction with a 10 mm spanner. Turning the engine is made easier if you have the special tool which fits on the cam gear, but you can make do by pulling on the fan belt.

Start the job by removing any hoses and lines attached to the rocker cover. Use a 10 mm spanner to remove the nuts and washers holding the cover, remembering that the earth return lead and a harness clip are held in place by two of the nuts.

Rotate the engine (in the direction of normal rotation) so that No 1 cylinder is at TDC on its compression stroke. On four-cylinder engines, the valves on No 4 cylinder would be "rocking" (No 6 on the six-cylinder engines) and the rockers on No 1 cylinder would show a little free play when rocked by hand.

The valve clearance must be measured with a feeler gauge inserted between the valve and the rocker. The clearances are 0,20 mm (inlet and ex-

haust) on the 318 engine and 0,25 mm on the 323 and 320 engines.

If adjustment is necessary, use a 10 mm spanner to loosen the lock nut on the valve side of the rocker and insert the special tool (or bent screwdriver tip) into the hole in the eccentric cam of the adjuster. Rotate the adjuster slightly by raising or lowering the screwdriver handle a fraction, then check the gap by inserting the correct size of feeler gauge between the valve and rocker. Tighten the locking nut and check the clearance.

Repeat the process on the other valves in the following order:

Adjust No 3 with No 2 on overlap

Adjust No 4 with No 1 on overlap

Adjust No 2 with No 3 on overlap

On the six-cylinder engines the order is:

Adjust No 5 with No 2 on overlap

Adjust No 3 with No 4 on overlap

Adjust No 6 with No 1 on overlap

Adjust No 2 with No 5 on overlap

Adjust No 4 with No 3 on overlap

Note that "overlap" occurs when one valve is just closing and the other just opening — the valves are "rocking". When the valves have been checked the rocker cover can be replaced, preferably with a new gasket, the spark plugs inserted and the various pipes and wires reconnected.

On completion, the car can be parked on a hard level surface, the hubcaps removed (if fitted) and the wheelnuts slackened by a quarter-turn to make them easier to remove, once the car has been jacked-up. Jack up the car and support it on stands.

Under the car, remove the sump plug and allow the oil to drain. As described earlier, remove and replace the oil filter. While under the car, check the condition of the ball-joints which connect the steering arms to the track rods. Grasp the track rod firmly while you try to move the wheel. There should be no looseness at the joint and the rubber boot should be in perfect condition.

Examine the engine mountings for cracks in the rubber or signs of perish-

ing. Check the front suspension struts for leaks and signs of wear or damage. Examine the suspension mounting recesses at the front for cracks and clean out any dirt.

Examine the exhaust system along its entire length, checking the condition of the rubber hangers and clamps. Check-tighten the clamps. Look for cracks or leaks in pipes, silencers and joints. Check-tighten the heat shields mounted at strategic points above the silencers.

The fuel and brake lines run alongside the main frame members and are provided with ingenious metal shields at points where damage might be caused by contact with the road surface or by stones thrown up by the wheels. Examine all components for stone damage, cracks or corrosion.

Check-tighten all mounting bolts on engine, suspension and gearbox, as well as on the drive shafts. Examine the rubber boots on the drive shafts and tighten the securing nuts using an Allen key or a similar spanner.

To top-up the manual gearbox, remove the filler plug on its right side using a 17 mm Allen key and check the level inside with one finger. Top-up with SAE20/30/40. Use the same type of spanner but in the 13 mm size to remove the filler plug on the rear axle and check the oil level. Use SAE 90 Hypoid for topping-up.

If your car is fitted with automatic transmission, now is the time to check the fluid level. With engine idling, move the transmission lever through P to R, N and all the other positions before returning to P. The level must be checked with the lever at P and the transmission at normal operating temperature.

Withdraw the dipstick and wipe it clean. Insert it fully back in place and withdraw again immediately. With warm transmission, the reading should be on the maximum mark. Add ATF fluid if necessary.

Now check, and if necessary adjust, the tension of the vee-belts. You should be able to depress each belt by about 12 mm with one thumb midway on its

Continued overleaf CAR, January 1985



The fuel filter is a large metal canister mounted low and to the right of the engine (left, above). Replace only at extended intervals, noting direction of



flow. Keep an eye on the rubber boots of the driveshafts at the rear (right). Although relatively cheap, they can lead to expensive repairs if fractured.

longest run. There are two adjusting nuts on the alternator (using a 19 and a 17 mm spanner) and one on the power steering (17 mm). The air-conditioner belt usually also uses a 17 mm adjuster.

Talking about power steering is a reminder that the oil level for this system also needs checking. The dipstick is in the lid of the oil reservoir and the oil level should be between the two marks on the dipstick.

Fill the windscreen washer bottle, then use an oil can to lubricate the door and bonnet hinges and a stick lubricant for door, bonnet and boot catches. Have a look at the battery terminals and the electrolyte level, but it is rare for this component to need attention, as it is of the "low maintenance type".

Injection system

This sub-heading is necessary only to remind you that the car uses a fuel injection system and that no attention is either necessary or desirable. Another case of "leave well enough alone". . .

If you insist on fiddling though, you can check that the tension of the accelerator cable is correct. It has an adjuster to enable you to eliminate unnecessary slack.

Another job you can do — but at extended intervals only — is to replace the fuel filter. The filter is a large metal canister mounted low down on the right side of the engine compartment. It is mounted vertically with the inlet pipe underneath and the outlet (marked "OUT") on top.

Clamp off the fuel pipes, unscrew the clamps holding the pipes and insert the new filter. It is of value allowing fuel to run through the filter after attaching the bottom pipe and before attaching the top one.

Clutch and brakes

The clutch is as much a disappointment to the DIY man as the fuel injection system — it's self-adjusting! Having passed that job by, you can at least get your teeth (partly) into the brakes. Only partly mind you, because if you rely

on the built-in sensors you won't have occasion to look at the brake pads until the minimum wear limit of 2 mm is reached on the front disc pads. Wear adjustment is automatic on all types and only the handbrake offers some action.

Girling single-piston, wrap-around caliper disc brakes are fitted in all cases. On the 323i the rear brake discs incorporate a small drum brake for the handbrake. Although adjustment is automatic, an adjuster is fitted in the rear drums of the 323i.

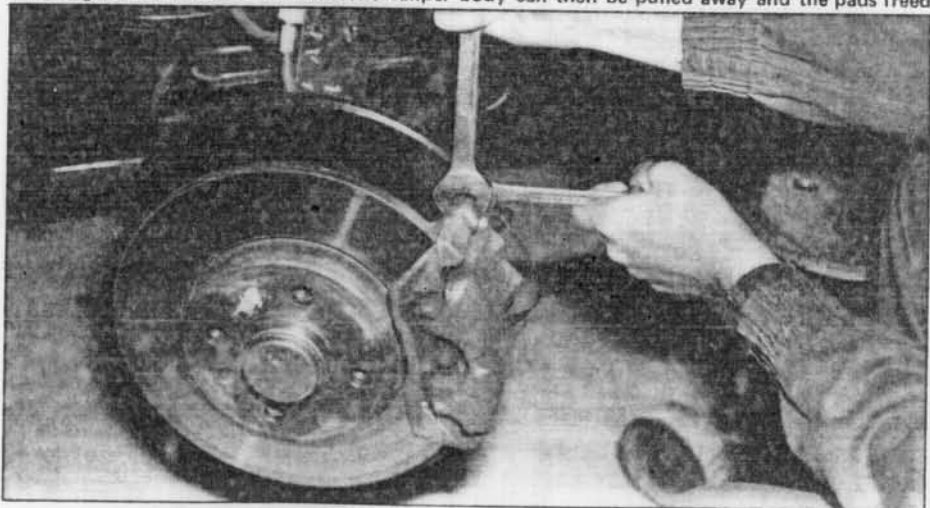
Before changing the pads, place a thick absorbent rag under the brake reservoir to absorb any fluid forced out. Remove the filler cap and cover the opening with a clean, lint-free cloth.

Locate the disc guides (bolts at the rear of the caliper) and use a 13 mm spanner to loosen them while holding the locking nut with a 17 mm spanner. Pull off the caliper body, collecting the dust boots as the guides come off. Remove the pads and retaining springs.

Clean the caliper using methylated spirits and press the piston fully home in the bore. Fit the new pads and retaining springs, then refit the caliper. Tighten the disc guide bolts evenly and lock them in place.

Pump the pedal several times to

To gain access to the pads, the disc guides must be unbolted with a 13 mm spanner while holding a locking nut with one of 17 mm. The caliper body can then be pulled away and the pads freed.



bring the piston back into contact with the pads. Finally, top-up the reservoir if necessary, and replace the cap.

Apply the handbrake about three clicks and try to rotate the rear wheels by hand. If they rotate, the chances are that the rear brake linings (on the drum brake models) need replacing. Remove the rear brake drums and examine the linings and drums.

It is advisable to replace the rear linings if the material has worn to the limit of 1,5 mm on bonded linings and 2,0 mm on riveted linings, measured at the thinnest point. Score marks on the braking surface of the drums less than 0,4 mm deep are of no consequence, but any deeper marks or obvious damage require that the drum be skimmed or replaced.

Once the drums have been replaced, apply the foot brake several times to bring the automatic adjuster into operation and to set the drum-to-lining clearance.

If the handbrake travel is still excessive, the handbrake cable needs adjusting. The adjuster is under the rubber dust cover of the handbrake lever (drum-braked models) and on the drum on disc-braked models.

Locate the adjuster under the hand-

Continued overleaf

brake lever and use a 10 mm spanner to loosen the locknut. Adjust as necessary until the wheels cannot be rotated with the handbrake on, but rotate freely with it released.

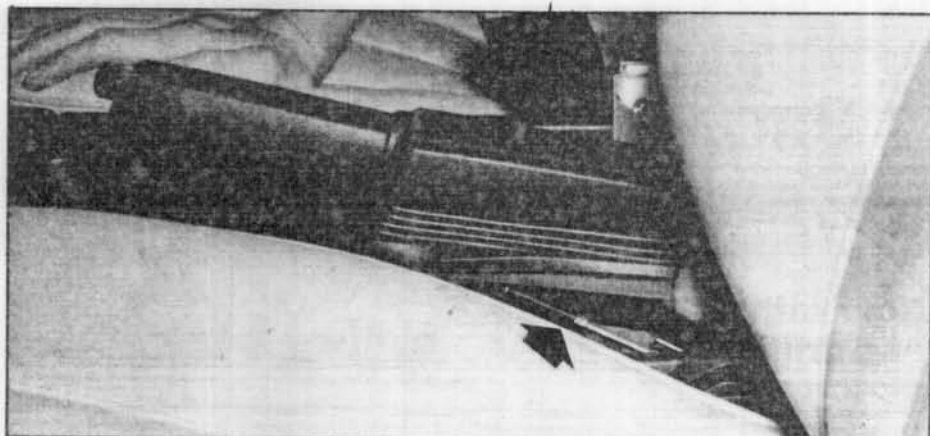
On the disc-braked models rotate the disc until the hole in the integral drum is at the top and slightly forward of vertical. Insert a screwdriver through this hole and rotate the toothed adjuster until the disc cannot be moved. Slacken the adjuster by four to six teeth and the job is done. Check by applying the brake and releasing it as for the drum-braked models.

Every 30 000 km/18 months

At this distance it is advisable to change the oil in the manual gearbox (the automatic transmission if fitted) and the final drive. On the manual gearbox and the final drive, the drain plugs are at the bottom and draining and re-filling are straightforward.

Remember to drive the car for a while beforehand so that the oil is hot. Draining is made easier if the filler plug is removed during the draining process.

On an automatic transmission, unscrew the drain plug and allow the oil to drain. Replace the plug and pour in considerably more than a litre of fluid (until some appears on the dipstick). Then, with the engine idling, continue to add fluid until the correct level is reached.



The handbrake cable adjuster (arrowed) is located under the rubber dust cover of the handbrake lever.

The wheel bearings need adjusting at this time, and as it is a process which has been described several times before in CAR, we won't repeat it here. At about 60 000 km the operation of the

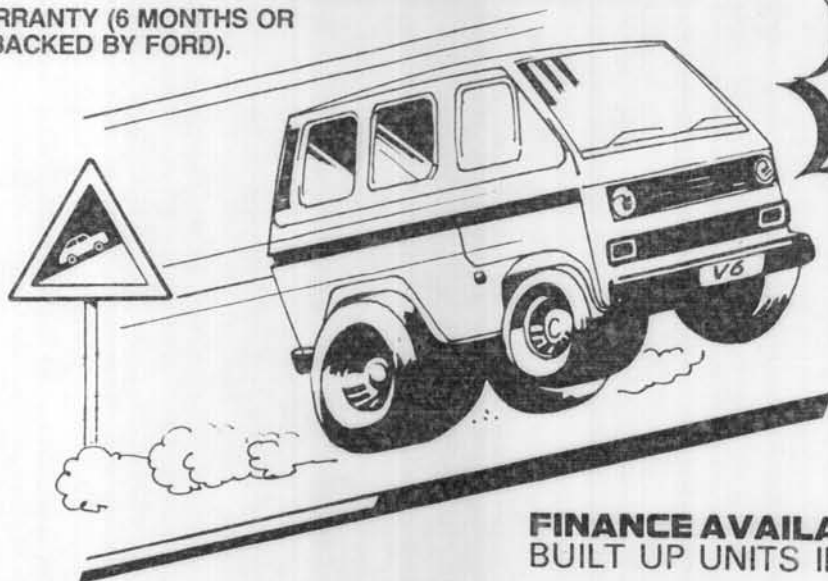
power steering needs to be checked and the filter in the system changed. Finally, heed the warning contained in each feature in this series: change the brake fluid every two years, at least!

Tune-up Specs

Tyre pressures (cold)	318i: Front 180 kPa Rear 200 kPa 320i, 323i: Front 200 kPa Rear 220 kPa
Spark plugs, gaps.	318i: Champion N9YC 320i, 323i: Bosch W8DC Gap: 0,6 ± 0,1 mm
Ignition.	Electronic
Valve clearances (cold)	318i: 0,20 mm Others: 0,25 mm

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