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# Caterham CSR260 Build Manual

*Key Words: Build, Build Manual*

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Date: 22/06/06	Date: 22/06/06	22/06/06

## Caterham CSR260 Build Manual

### Build manual updates

**Note: All latest changes to the build manual are highlighted grey**

Update Number	Description	Section	Page	Date
CAUD1341	Removal of fuel rail insulators	Fuel rail fitting	26	22/06/06

Quality concerns reporting can be made via:

**\\crl\_cluster1\CRLDbases\P.E.G\New PEG Database Switchboard.mdb**

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## Tooling List

### General Tools

Ratchet	3/8" Drive
Ratchet	1/2" Drive
Breaker Bar	1/2" Drive (750mm + long)
3/8" Drive Sockets	8mm(deep), 10mm, 11mm(12pt), 13mm
1/2" Drive Sockets	19mm, 21mm
Combination Spanners	17mm, 21mm, 24mm
Torx Female Sockets	E12
Torx Male Sockets	T55
Allen Key Sockets	6mm (Long Reach)
Step Down Socket	1/2" to 3/8" Drive
Step Up Socket	3/8" to 1/2" Drive
Hammer	Soft
Hammer	Light Weight Steel
Pliers	Normal
Pliers	Long
Pliers	Snip
Pliers	Circlip
Torque Wrench	0-12Nm
Torque Wrench	0-35Nm
Torque Wrench	0-120Nm
Feeler Gauges	Metric
Spark Plug Socket	5/8" Plug 3/8" Drive
Steel Rule	6" and 12"
Magnet Telescopic	
Oil Filter Strap	
Piston Ring Pliers	
Nylatron Drifts	
Angle Gauge	
Water Hose Clip Pliers	

### Special Tools

Gudgeon Pin Circlip Tool Handle	YZ0765
Gudgeon Pin Circlip Tool Pin	YZ0766
Piston Fitting Sleeve	YZ8893
Crankshaft Timing Pin	PR6823
Cam Timing Tool (260HP)	PR6850
Crank Position Sensor Tool	YZ0774
Oil Pump Gear Holding Tool	
Rear Seal Fitting Tool	

## YD Block Finishing

1. Set up 'short' block on engine stand
2. Remove pistons and rod assemblies.
3. When building 250hp engines the Ford piston and rod assemblies should be booked back into the stores under the following numbers.

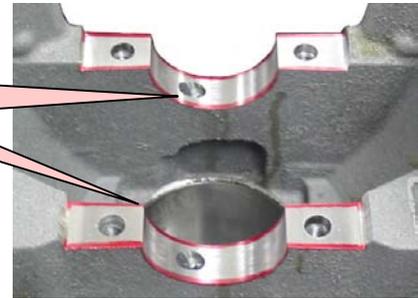
Piston grade	Part number
Grade1	FP3208
Grade 2	FP3209
Grade 3	FP3210

4. Remove crankshaft and mains bearings, keep mains bearing shells in correct order for re-fitment.
5. Check bores are rust free.

**NOTE:** - This is not a full block de-burr, but pays attention to specific problematic areas.

1. Remove the pistons and crankshaft from the block.
2. Using a medium round file de-burr the main bearing journal edges shown below in red apart from the middle journal with the crank thrust faces.

**De-burr edges marked in red**



**De-burr edges marked in red**

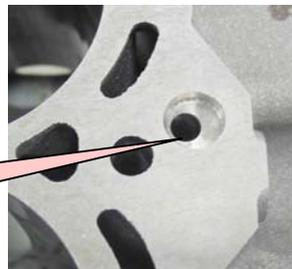
3. De-burr the middle main bearing journal edges shown below in red with a medium round file.

4. De-burr the edge shown in red at the rear of the block where the engine number is stamped using a medium round file.

**De-burr edge marked in red**



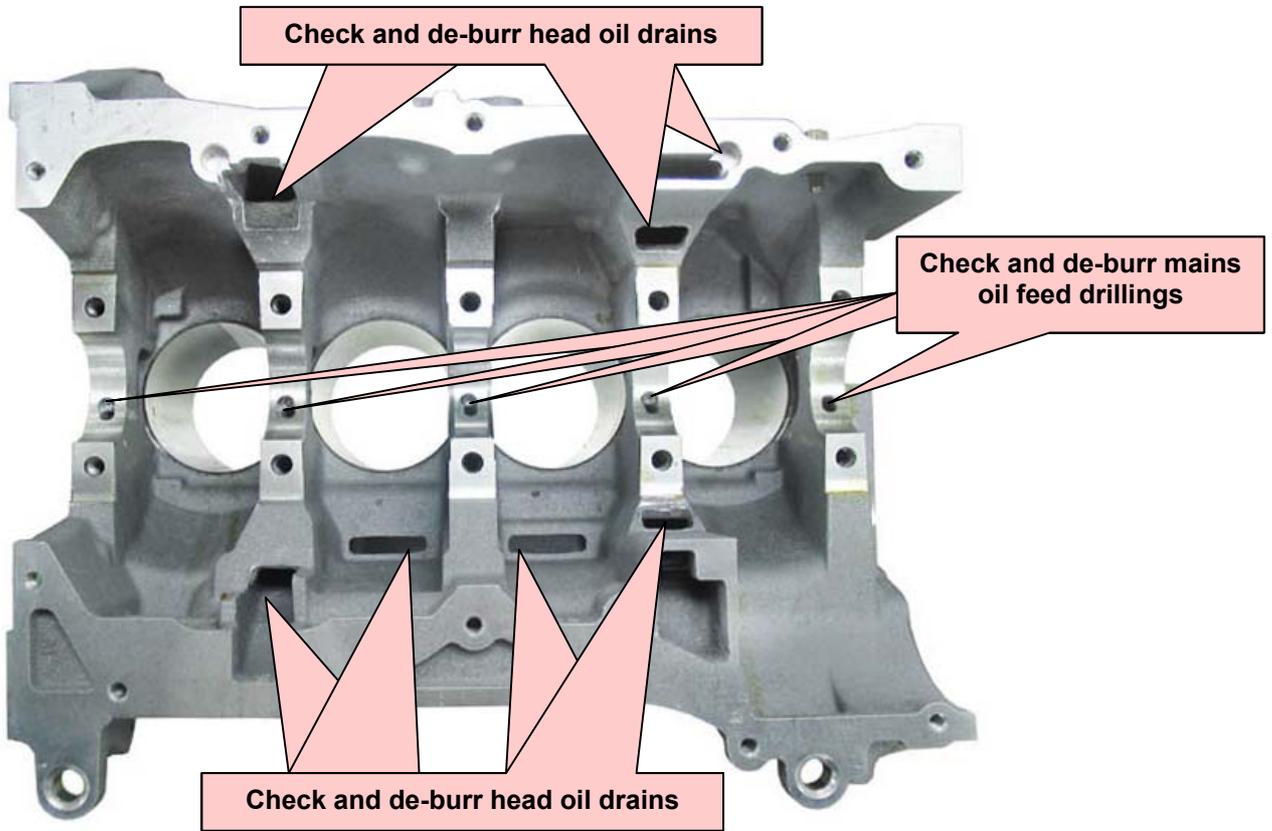
**Inspect head feed oil drilling for burrs**



5. Inspect head oil feed drilling and de-burr as necessary.

## YD Block Finishing (cont.)

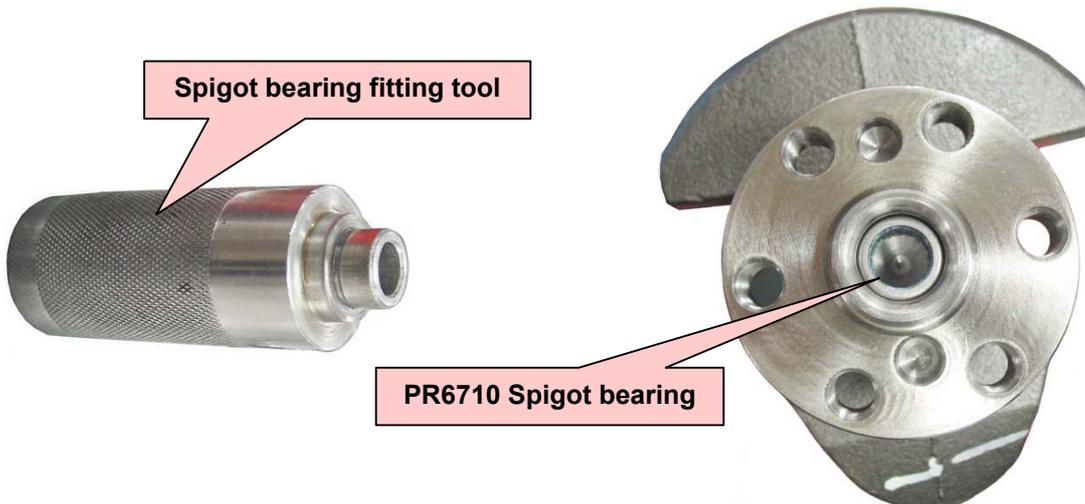
6. Inspect all mains oil feed drillings and head oil drains and de-burr as necessary.



7. The block should then be thoroughly cleaned using the Parawash and water tanks, but should **not** be cleaned in the ICI vapour tank. After washing, the bores should have build oil applied to them to stop them corroding.

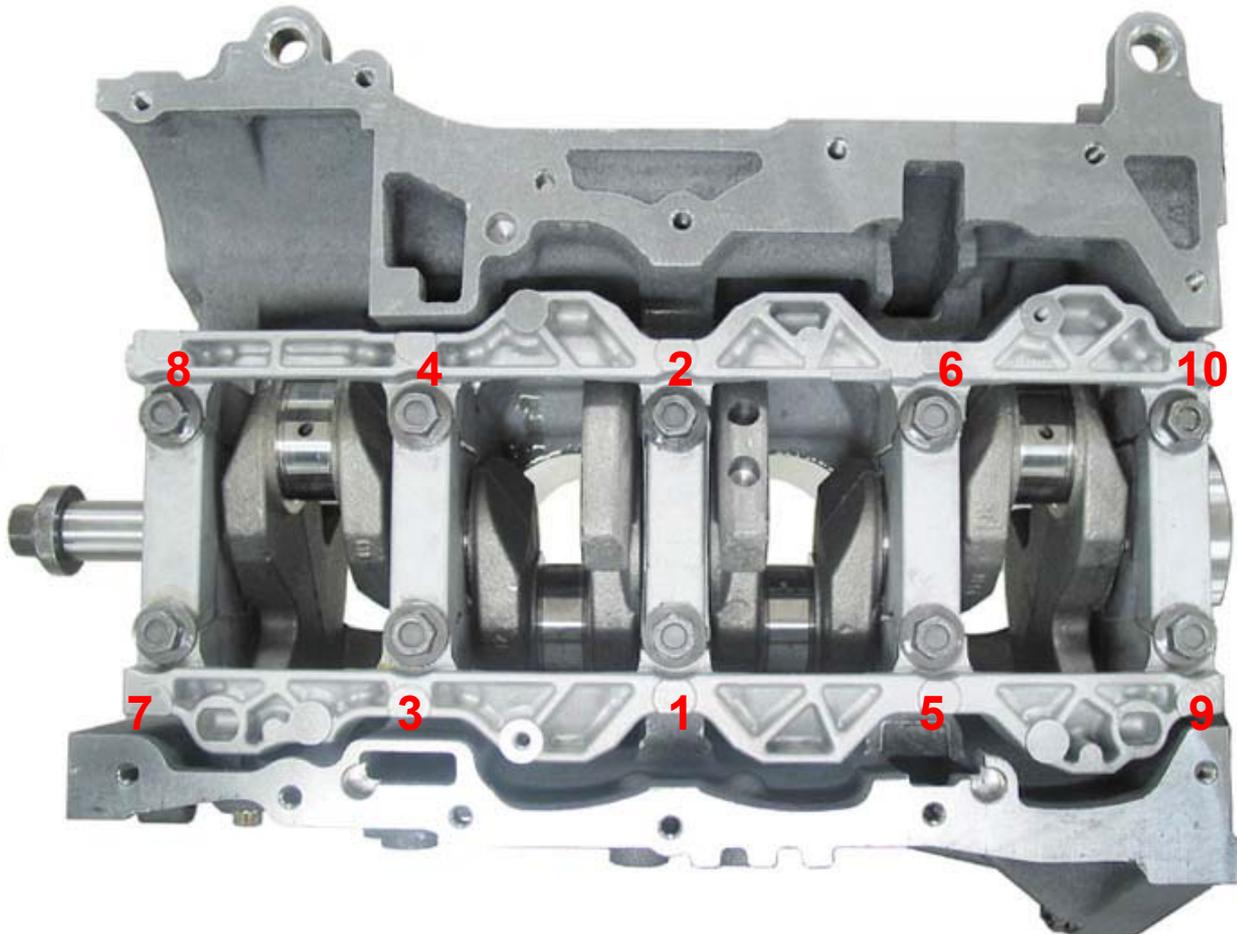
## Crankshaft

1. The crank should be thoroughly cleaned in the Parawash but should just be blown off, **not** dipped in the water tank or ICI vapour cleaner.
2. Before refitting the PR6710 crankshaft spigot bearing should be fitted using the tool shown below.



## Crankshaft Fitting

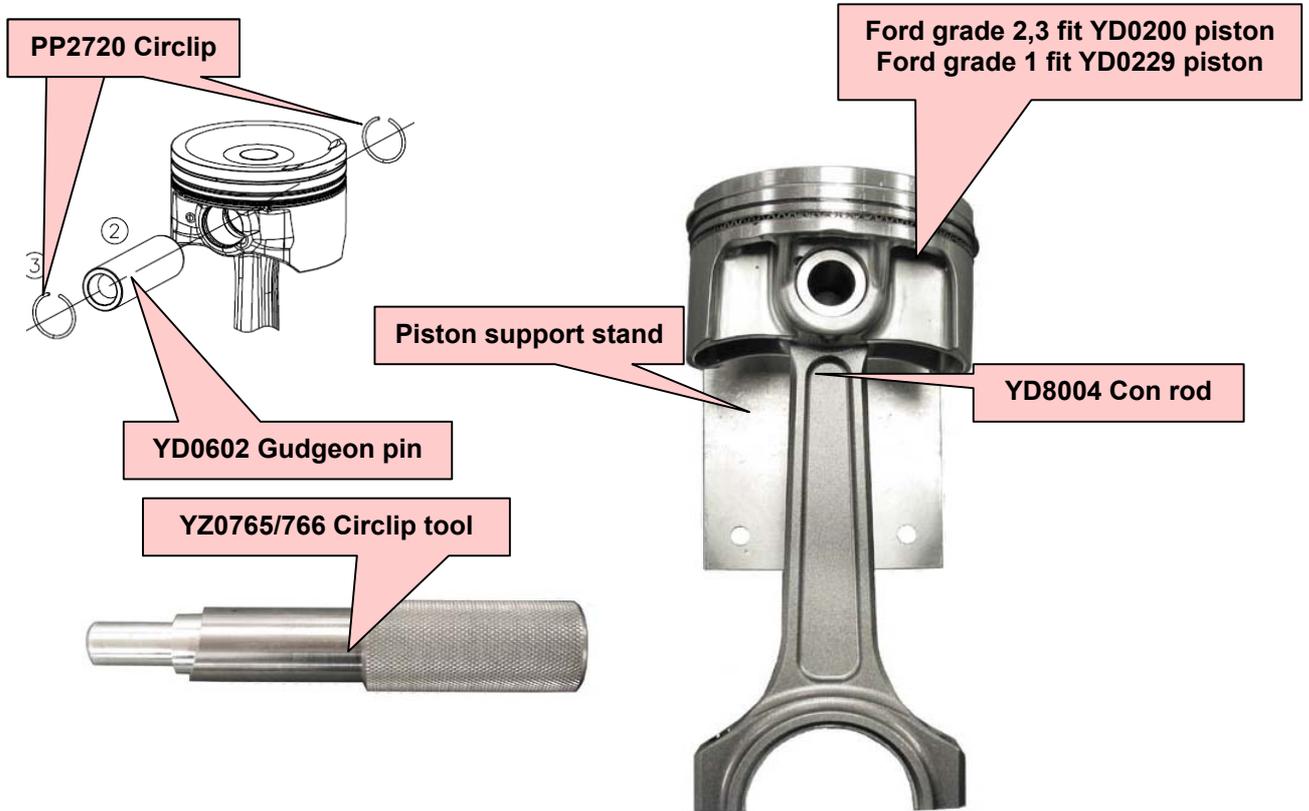
1. Refit all main bearing shells in their correct positions.
2. Refit crankshaft and bearing ladder.
3. Fit bearing ladder bolts as they came out of the engine, do not degrease the bolts and do not apply any oil to them.
4. Tighten bolts in the sequence shown below.



5. Torque in sequence to 5Nm.
6. Torque in sequence to 25Nm.
7. Torque in sequence to 40Nm.
8. Loosen all bolts.
9. Torque in sequence to 5Nm.
10. Torque in sequence to 20Nm.
11. Torque in sequence to an angle of 90°.

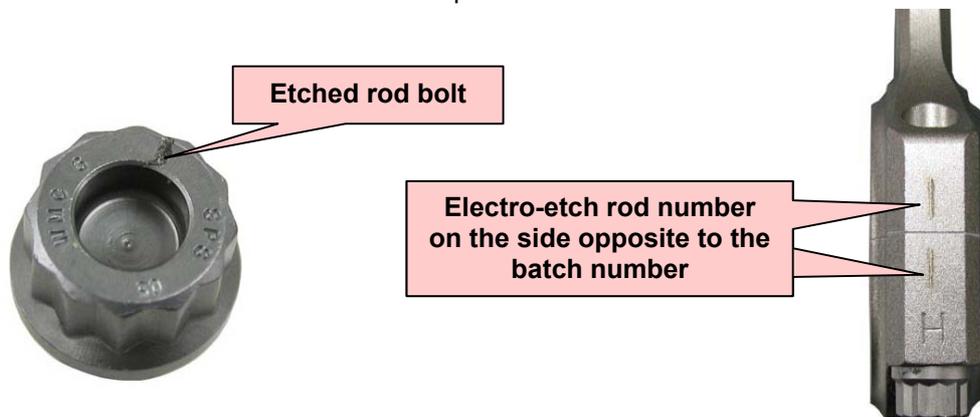
## Piston and Rod Assembly

1. Assemble YD8004 con rods into YD0200 pistons, with the batch number of the rod to the inlet side of the piston.
2. Lubricate YD0602 gudgeon pins with build oil and insert into the piston/rods.
3. Using YZ0765 /YZ0766 circlip tool fit 8 off PP2720 circlips.



4. Electro-etch each rod from 1 to 4 as shown on the opposite side to the batch number.
5. The big end bolt should be etched with a line every time it gets assembled in a rod to full torque.
6. Once it has been torqued 3 times (3 etched lines on the bolt head), it should be replaced with a new bolt when it comes apart again.
7. The big bolt part number is PR7159. This is a special bolt that should only be used with forged con rods.

**Note:** In engines that have suffered a catastrophic failure leading to piston, crankshaft or con rod damage, replace all the big end bolts regardless of the number of etched lines. Bolts that have no line etched on them should also be replaced when the con rod is taken apart as it is unknown how often these have been torqued.

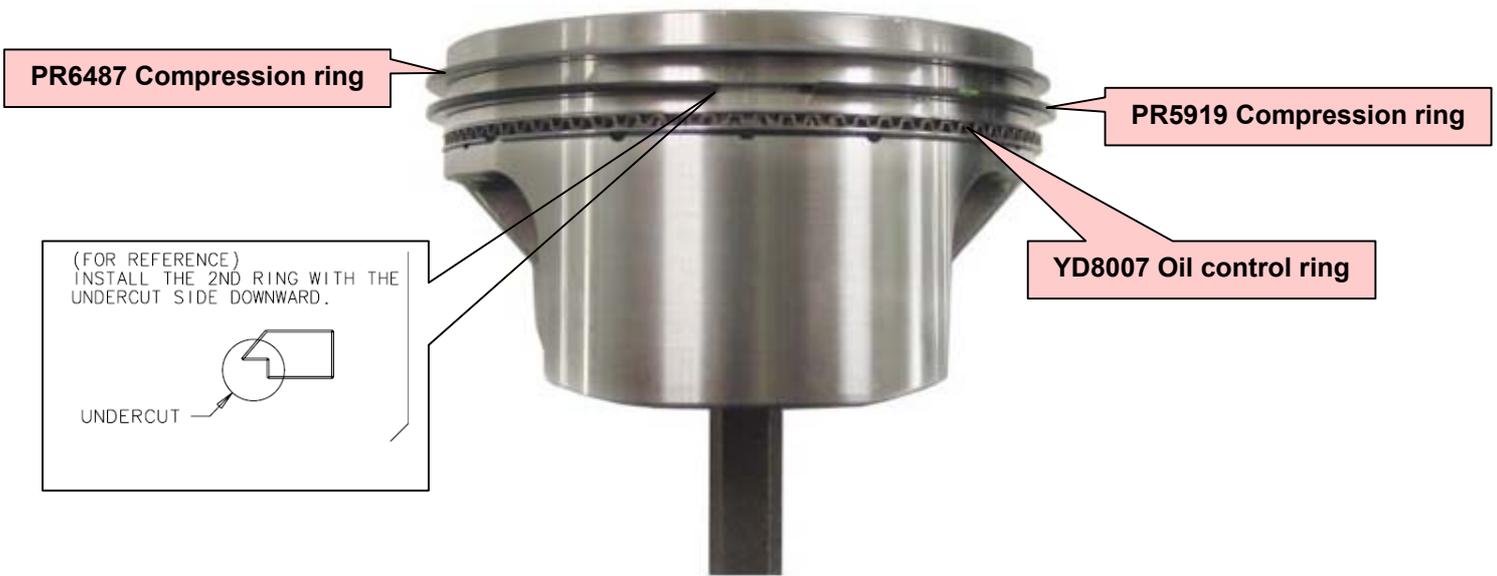


## Piston Rings

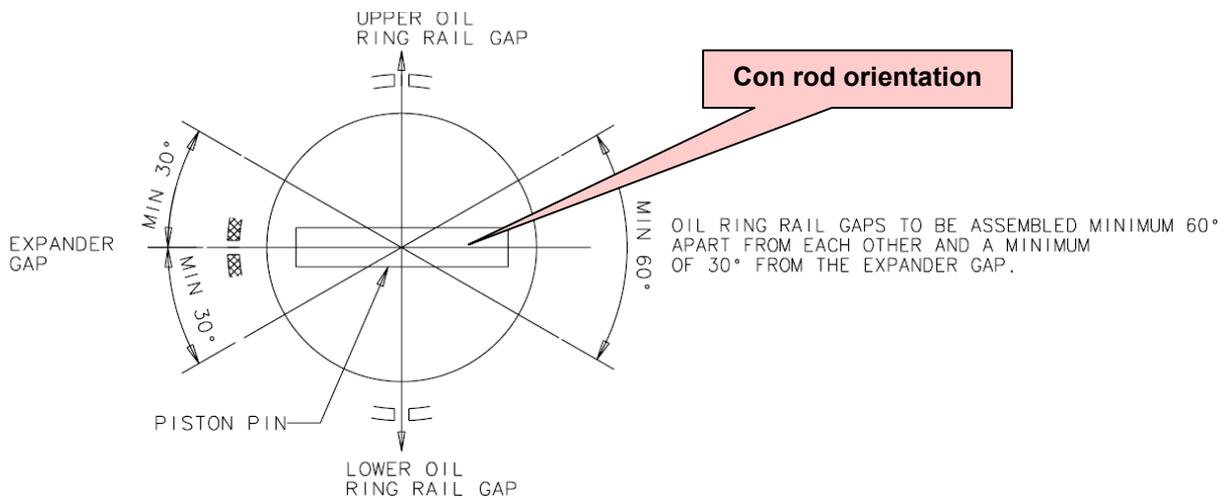
1. New rings do not need the gaps checking but for reference gaps are shown below.

Ring	Gap (mm)
Top compression ring	0.254-0.508
2 <sup>nd</sup> compression ring	0.500-0.600
Oil control ring rails	0.150-0.400

2. Fit YD8007 oil control rings to pistons.
3. Fit PR5919 lower compression rings to the pistons with the undercut side downwards.
4. Fit PR6487 top compression rings to the pistons

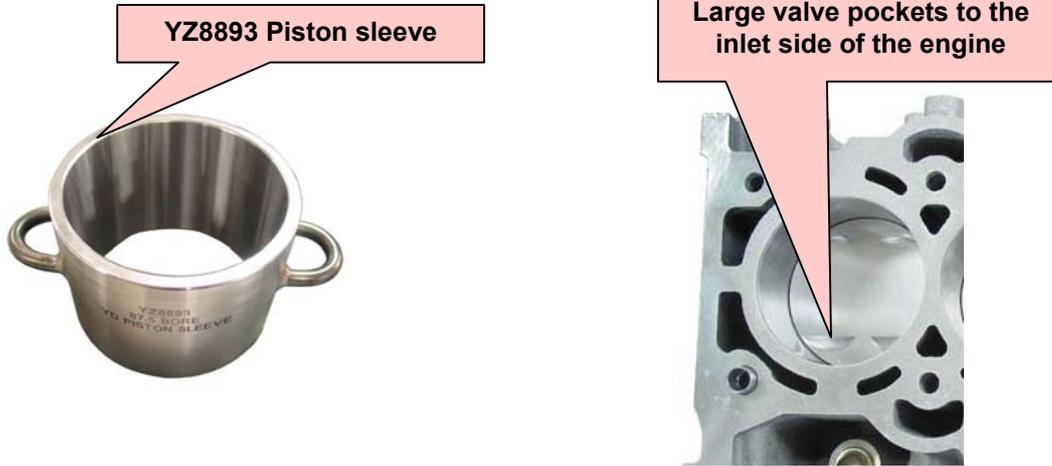


5. See figure below for gap radial alignment.



## Piston and Rod Installation

1. Lubricate cylinder bores with build oil.
2. Apply build oil to the pistons and using YZ8893 sleeve fit each piston into it's appropriate cylinder with the large valve pockets in the piston to the inlet side of the engine



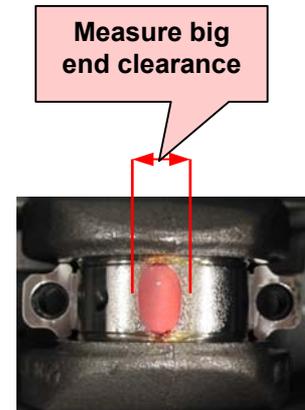
## Big End Bearing Shells

1. Remove the big end bearing shells from the original Ford con rods and refit into the corresponding new con rods (**NOTE:** - the bearings from the old number 1 rod must go into the new number 1 rod etc.)
2. Trim suitable lengths of PL-A Plastiguage and fit onto each big end journal of the crank.
3. Fit each con rod cap.
4. Apply Loctite Heavy Duty Anti-Seize paste (as supplied with each set of Carillo rods) to the under head and the threads of each of the con rod bolts. Then fit the bolts to the rods.
5. Initially tighten the bolts on number the 1 rod to 20Nm.
6. Final torque the bolts on the number 1 rod to 58Nm.
7. Remove each con rod cap and measure the big end clearances, using the measuring card supplied with the Plastiguage.

**Big End Clearance Tolerance: - 0.026mm to 0.052mm**

8. For reference listed below are the part numbers for new big end bearing shells, (If the clearances are out of limits inform engineering).

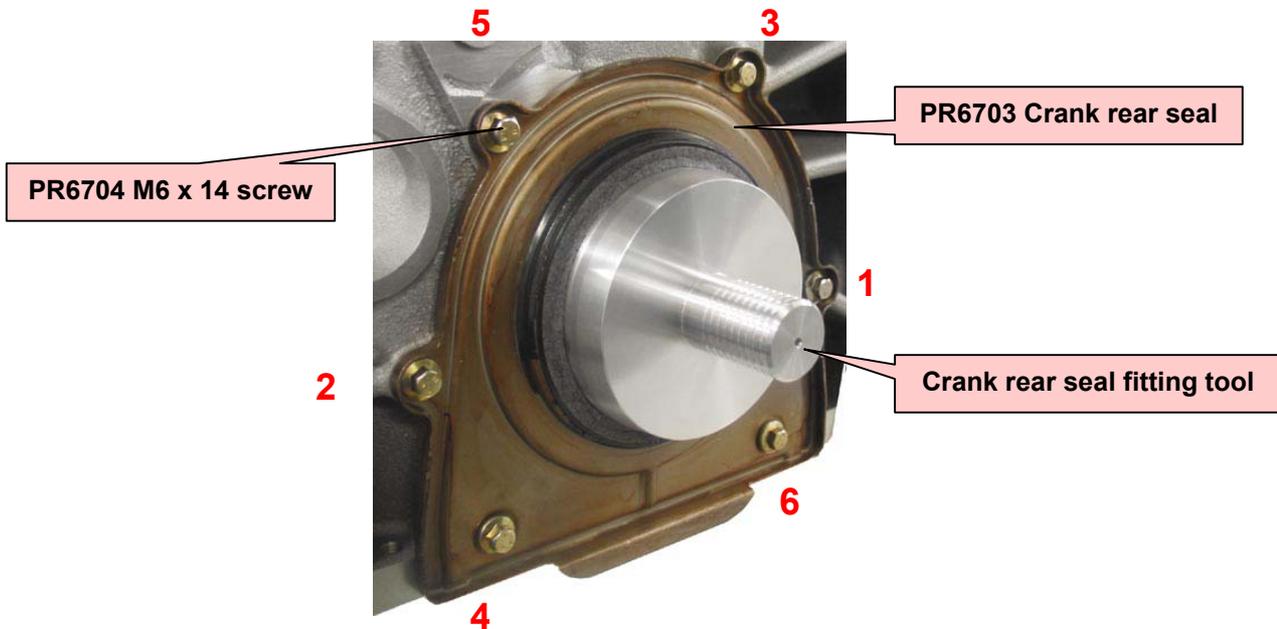
Part No.	Bearing grade	Size (wall thickness)
PR6707	Green	1.496 – 1.502
PR6708	Blue	1.505 – 1.511
PR6710	Red	1.514 – 1.520



9. Clean off Plastiguage and lubricate the bearing shells with build oil, fit con rod caps.
10. Torque the con rod cap bolts using the same tightening procedure as above.

## Fitting the Rear Crank Seal

1. Using the tool shown carefully fit the PR6703 rear crank seal over the crankshaft.  
**NOTE:** After fitment check that the lip of the seal has not folded back on itself.
2. Secure the seal with 6 off PR6704 M6 x 14 screws.
3. In the order shown the torque the screws to 10Nm.



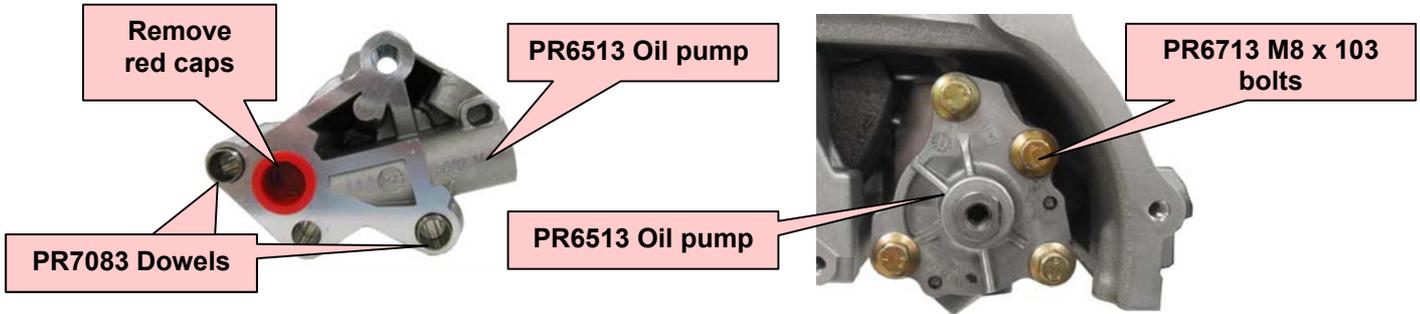
## Crankcase ventilation cover

1. Fit YD8071 crankcase ventilation cover, and secure with 8 off PR6706 M6 x 20 screws.  
Torque screws to 10Nm.



## Oil Pump Fitting

1. Before fitting PR6513 check that all red caps have been removed.
2. Ensure PR7083 dowels are fitted to both positions shown below.
3. Fit PR6513 oil pump to the block and secure with 4 off PR6713 M8 X 103 bolts.



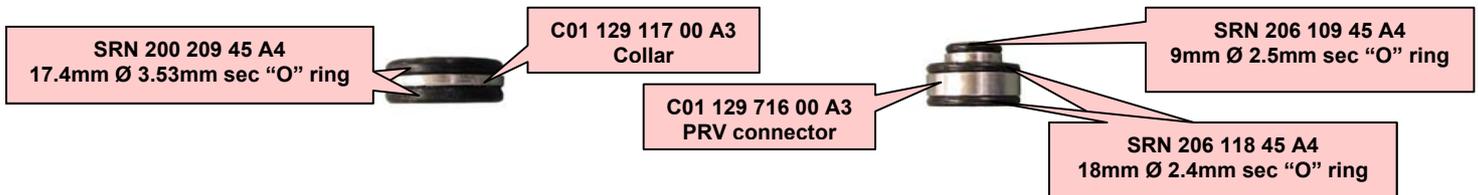
4. Initially tighten the bolts to 10 Nm then finally torque to 20Nm.

## Titan Sump (PR6819) Fitting

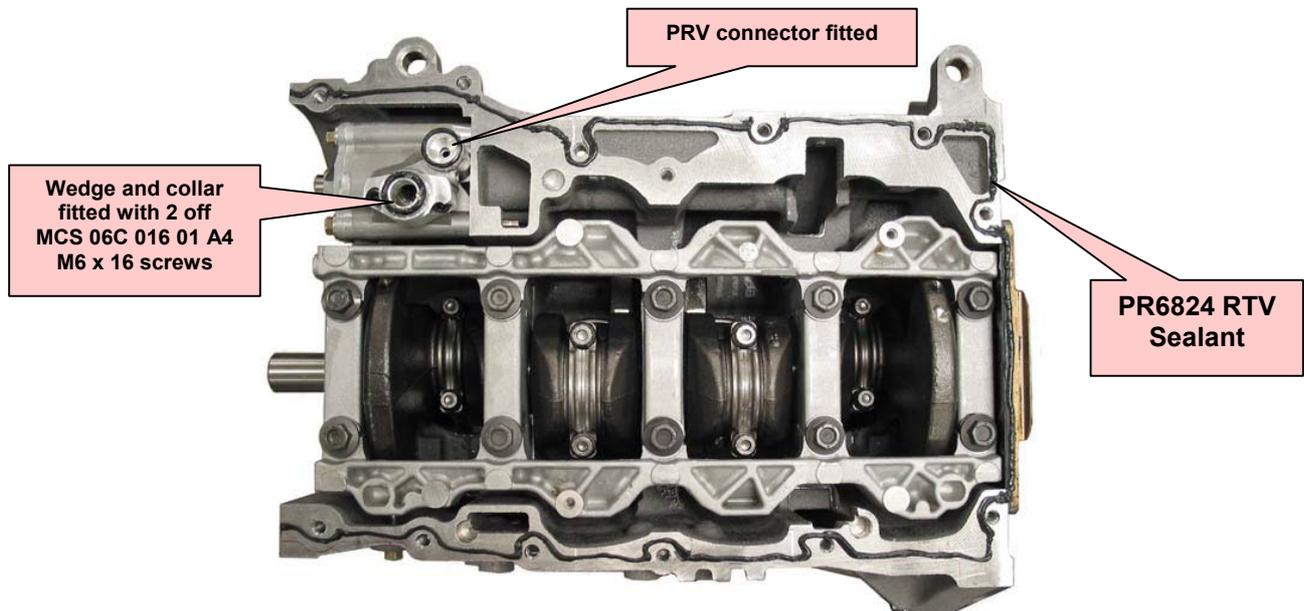
1. Fit SRN 204 020 45 A4 20mm Ø 2mm sec. "O" ring to C01 129 715 00 A2 wedge.



2. Fit wedge to oil pump and secure with 2 off MCS 06C 016 01 A4 M6 x 16 screws. Torque to 10Nm with Loctite 243.
3. Fit C01 129 117 00 A3 collar with 2 off SRN 200 209 45 A4 17.4mm Ø 3.53mm sec. "O" rings.
4. Assemble 2 off SRN 206 118 45 A4 18mm Ø 2.4mm sec. and 1 off SRN 206 109 45 A4 9mm Ø 2.5mm sec "O" rings to the C01 129 716 00 A3 PRV connector.

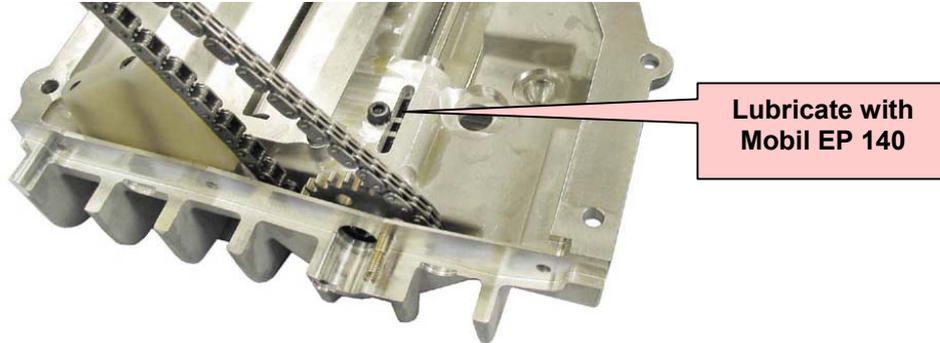


5. Fit the oil pump return adapter to the oil pump.
6. Apply PR6824 RTV sealant as shown below.



## Titan Sump (PR6819) Fitting (cont.)

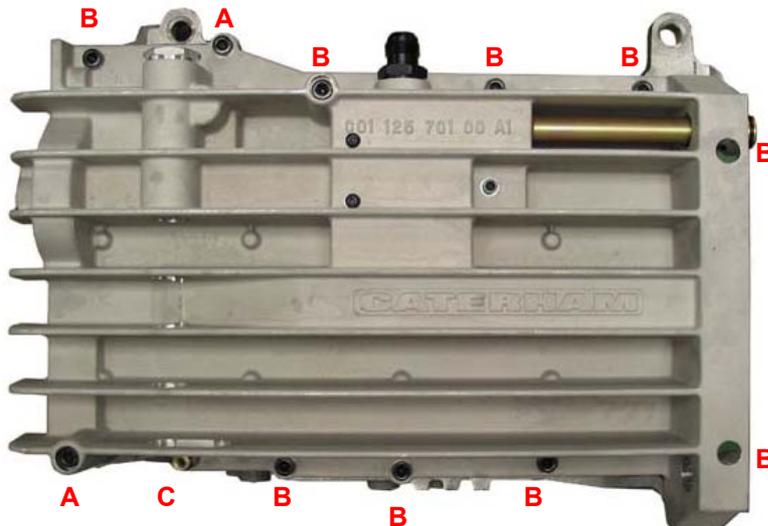
7. Before fitting the sump to the engine, apply some Mobil EP140 thick gear oil into the slot in the sump shown. Turn the shaft with the sump pointing downwards to ensure that the oil runs to the front of the shaft.



8. Fit sump plate ensuring that the front edge is flush with the crankcase, the “O” rings on the pick up and oil return remain in place and that a gap is evident behind the chain guide. **Note:** When lowering sump onto the engine, ensure the chain is passed over the nose of the crank as this cannot be done with the sump in position.



9. Secure the sump plate with the fasteners shown below.

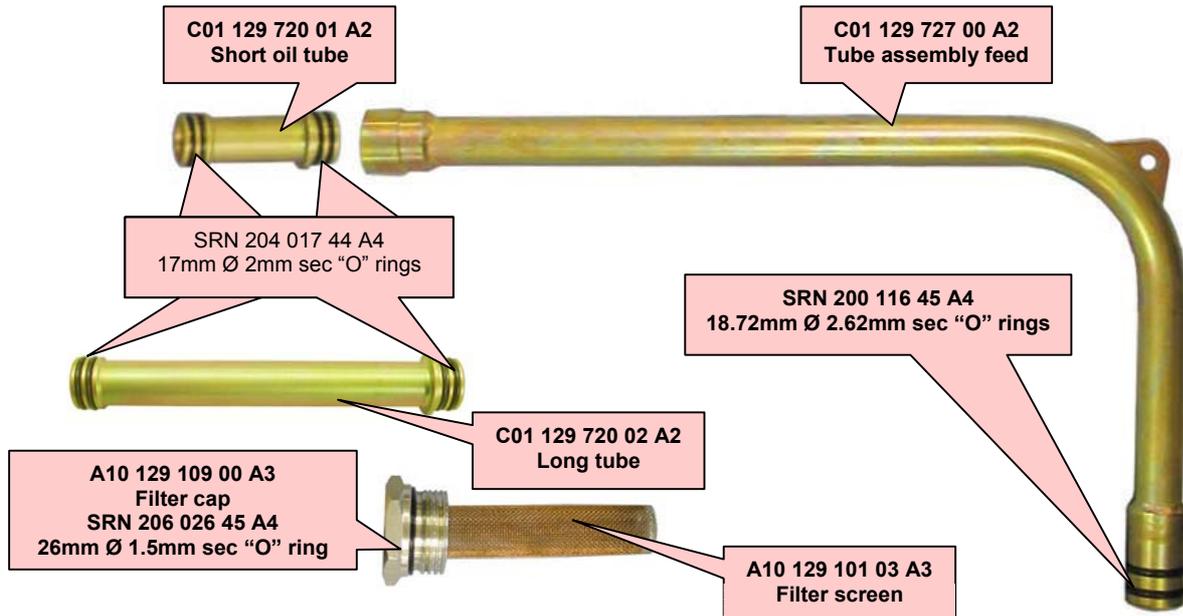


<b>A</b>	M8 x 80 Bolt	MCS 08C 080 01 A4
<b>B</b>	M8 x 25 Bolt	MCS 08C 025 01 A4
<b>C</b>	M8 x 55 Pillar	A10 917 103 01 A3

10. Torque all M8 fasteners to 25Nm. Starting from the middle working outwards.

## Titan Sump (PR6819) Fitting (cont.)

11. Fit "O" rings onto oil inlet pipe, and oil inlet pipe extension as shown below.



12. Fit "O" ring to sump filter screen cap as shown below.

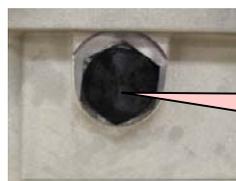
13. Fit the pipes as shown below, and fasten pipe with MBS 06C 012 01 A4 M6 x12 button head screw. Torque to 12Nm. Fit PR1770 (EP14) yellow caps to blank pipes.

14. Lubricate the "O" ring on the A10 129 109 00 A3 filter cap and fit cap. Torque to 51Nm.



## Air Outlet Bung

1. Fit SRN 206 020 45 20mm Ø 1.5mm sec "O" ring to PR6939 plug.
2. Lubricate "O" ring with build oil and fit union to the sump. Torque to 25Nm.

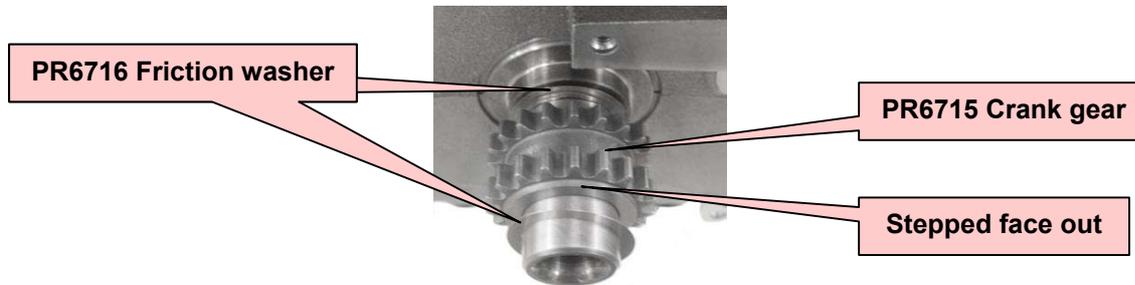


Fit PR6939 plug with  
SRN 206 020 45  
20mm Ø 1.5mm sec "O" ring

## Crank Gear

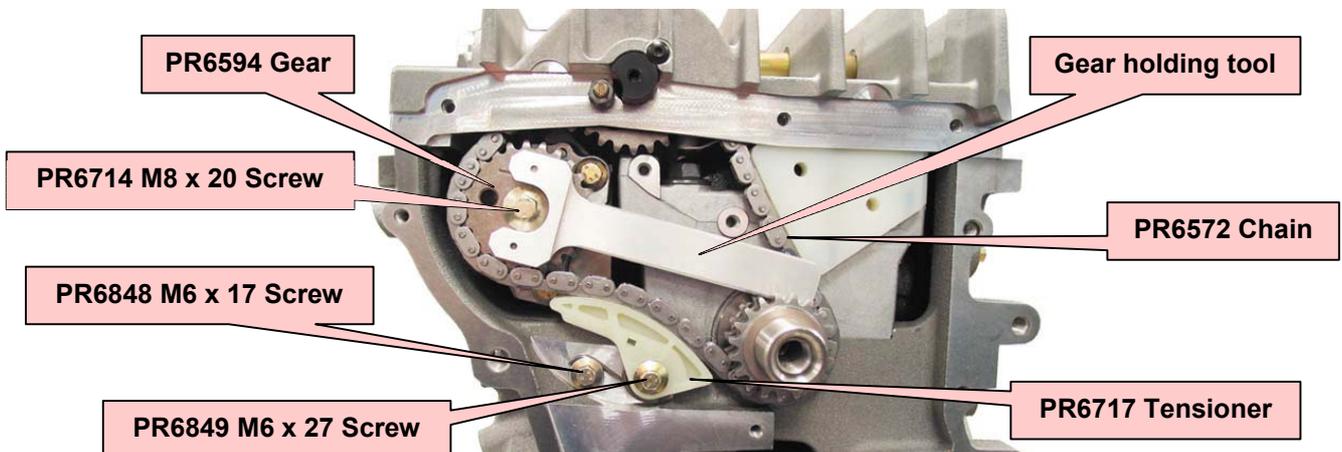
1. Fit a PR6716 friction washer to the front of the crankshaft.
2. Fit PR6715 crank gear to the front of the crankshaft with the stepped facing outwards
3. Fit a PR6716 friction washer to front side of the gear.

**Note:- Ensure only one washer is used at the front and one at the rear of the gear, and the washers are fitted dry with no oil.  
Do not use a bent washer.  
Do not fit a used washer.**



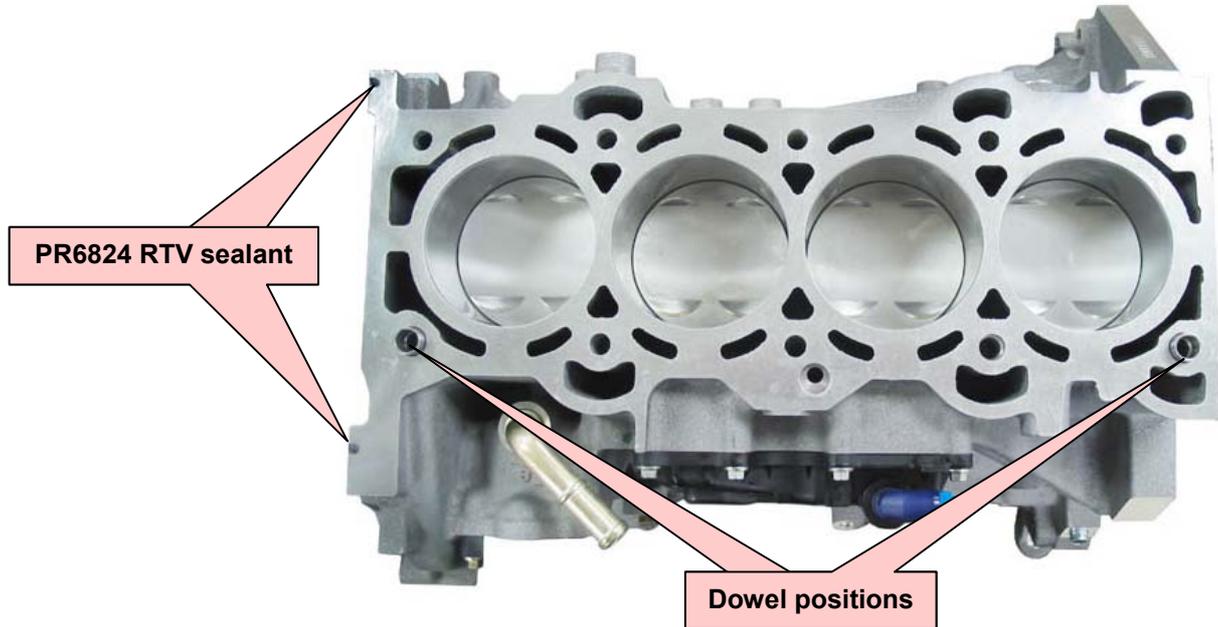
## Oil Pump Drive Chain

1. Fit PR6572 chain oil pump drive chain around PR6594 oil pump drive gear, and secure the gear to the oil pump using PR6714 M8 x 20 screw.
2. Fit PR6848 M6 x 17 screw into the block and torque to 10Nm.
3. Attach the hook end of the spring on PR6717 tensioner to PR6848 M6 x 17 screw, offer the tensioner onto the chain and fit PR6849 M6 x 27 screw. Torque to 10Nm.
4. Using the gear holding tool as shown torque PR6714 M8 x 20 screw to 25 Nm.

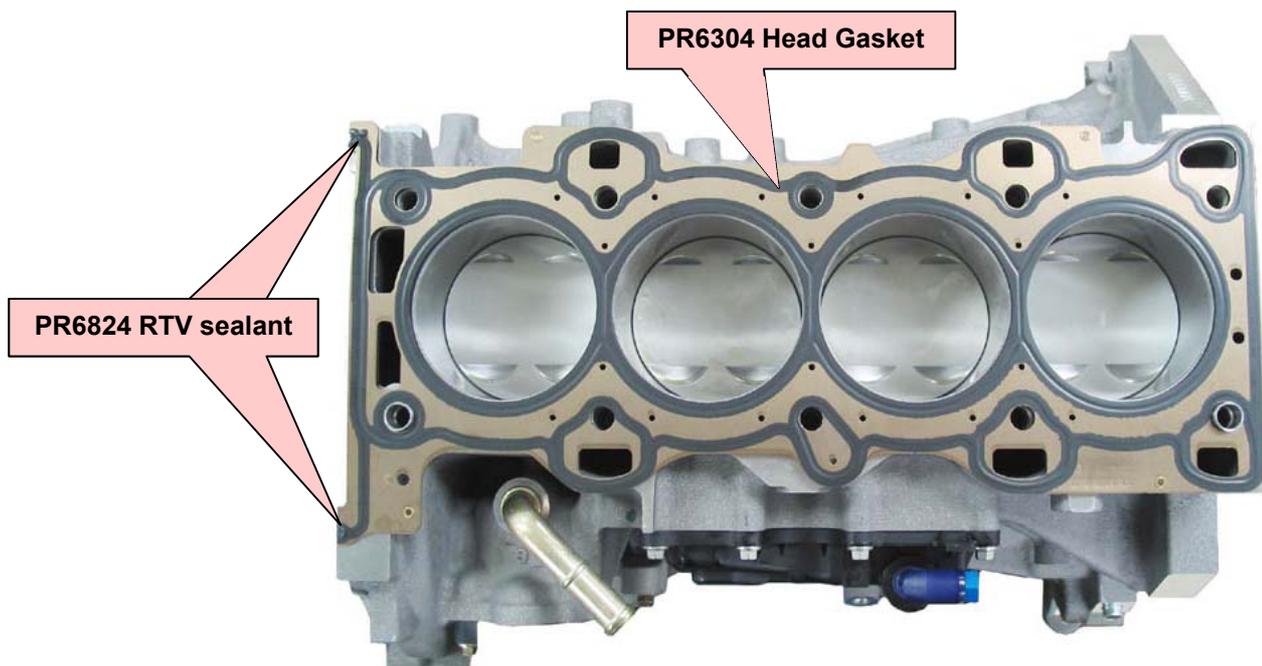


## Cylinder Head Fitting

1. Ensure both head location dowels are fitted to the block.
2. Apply PR6824 Super RTV silicone sealant to the areas shown below.

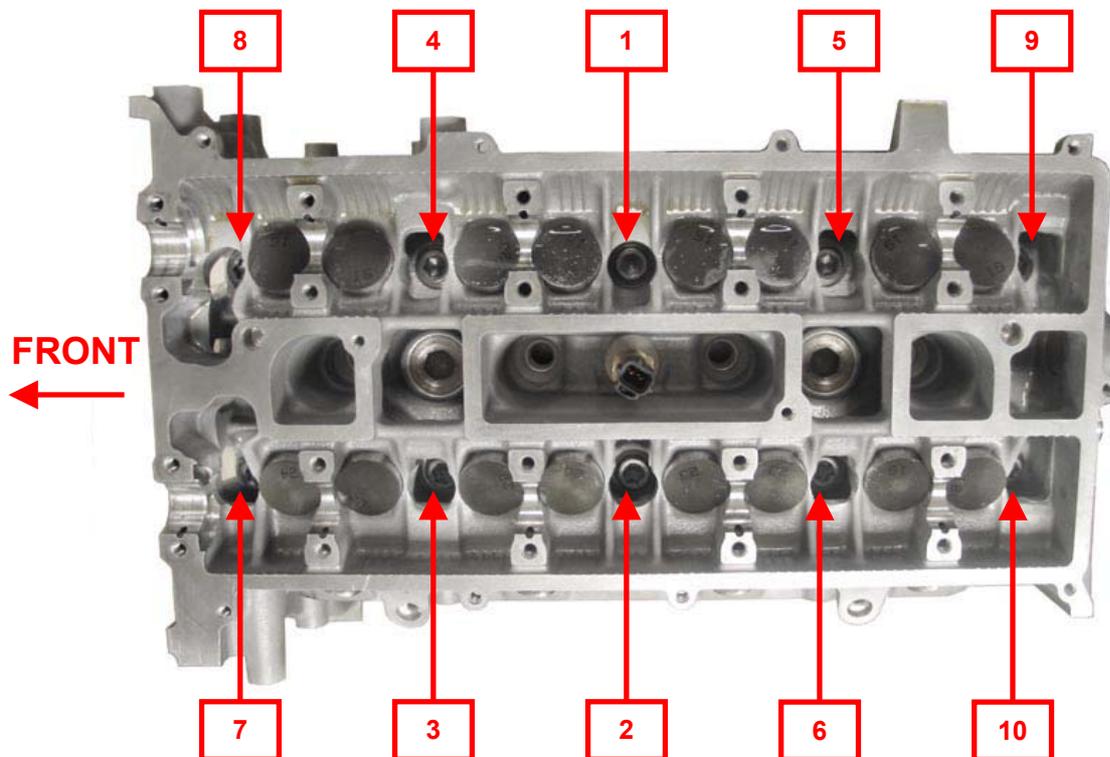


3. Fit PR6304 head gasket.
4. Apply PR6824 Super RTV silicone sealant to the areas shown below on the top face of the head gasket.



## Cylinder Head Fitting (cont.)

1. Fit cylinder head to the block.
2. Fit 10 off PR6065 head bolts as supplied, do not apply any oil to the threads or underheads. (**NOTE: - Do not remove the rust inhibitor from the head bolts**)
3. Tighten the head bolts in the sequence shown below.
4. Tighten the cylinder head bolts to 7Nm.
5. Tighten the cylinder head bolts to 15Nm.
6. Tighten the cylinder head bolts to 45Nm.
7. Turn the cylinder head bolts through 90°.
8. Turn the cylinder head bolts through 90°.



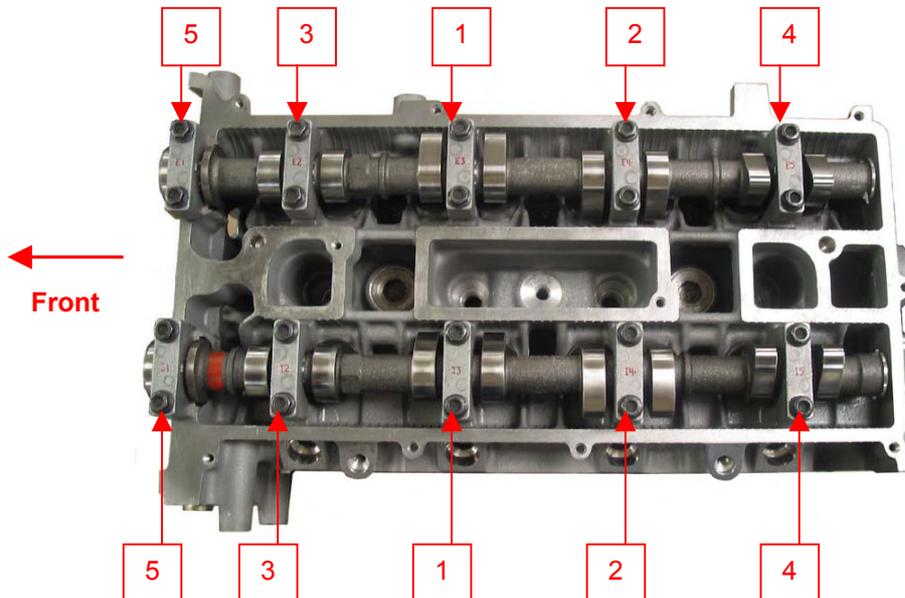
## Camshaft Fitting

1. Rotate engine crankshaft so that all the pistons are half way down the bores.
2. Apply build oil to the cam journals in the head and the tops of the tappet buckets.
3. Assemble the inlet and exhaust cams into the cylinder head in the cylinder number 4 TDC firing position.
4. Apply EP140 gear oil to camshaft journals.
5. Fit the cam caps and tighten so that the camshaft seats evenly into the cylinder head.  
(Note: - Ensure each cap is in its correct position. The cam caps are fitted with the etched position (e.g. E1) to the outside of the head.)

Cam caps should be fitted with etched position to the outside of the head



6. Torque each cap in the order shown below, initially to 7Nm then a final torque of 16Nm.
7. Rotate each camshaft in turn and check the valve clearances. Adjust as necessary.



Exhaust clearance  
0.27 – 0.30mm  
(0.0105" - 0.012")

Inlet clearance  
0.22 – 0.28mm  
(0.0085" - 0.011")

## Camshaft Timing

1. Remove timing pin hole bung from the side of the block.

Timing pin hole bung



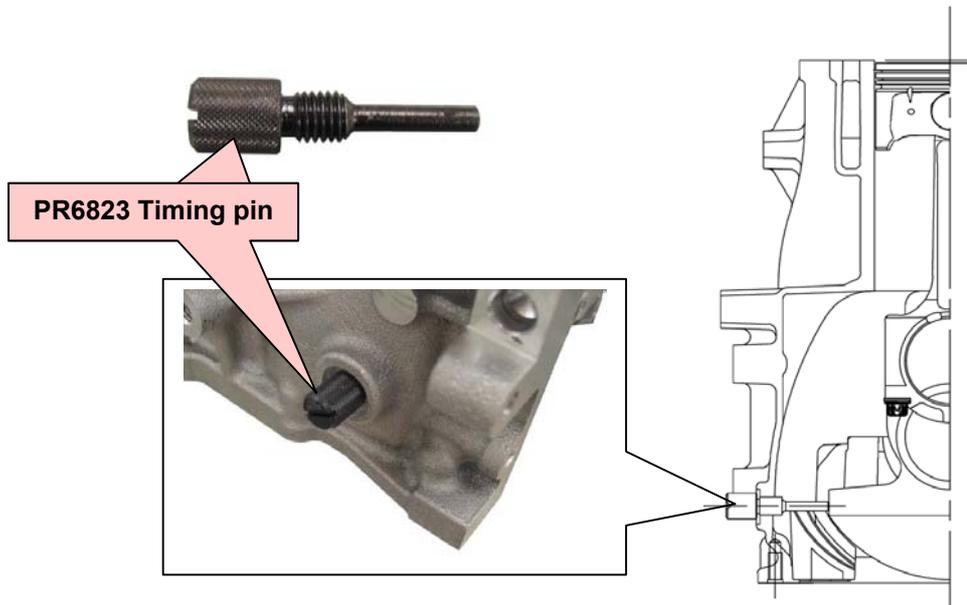
**Camshaft Timing (cont.)**

- Align camshafts into their timed positioned by using the appropriate tool from the table below.

Engine Type	Power	Tool	Camshaft Part No.
Caterham	250hp	Ford parallel tool PR6850	YD0223 – Inlet YD0182 – Exhaust



- Fit PR6823 timing pin and rotate the crank to TDC on cylinder number 1.

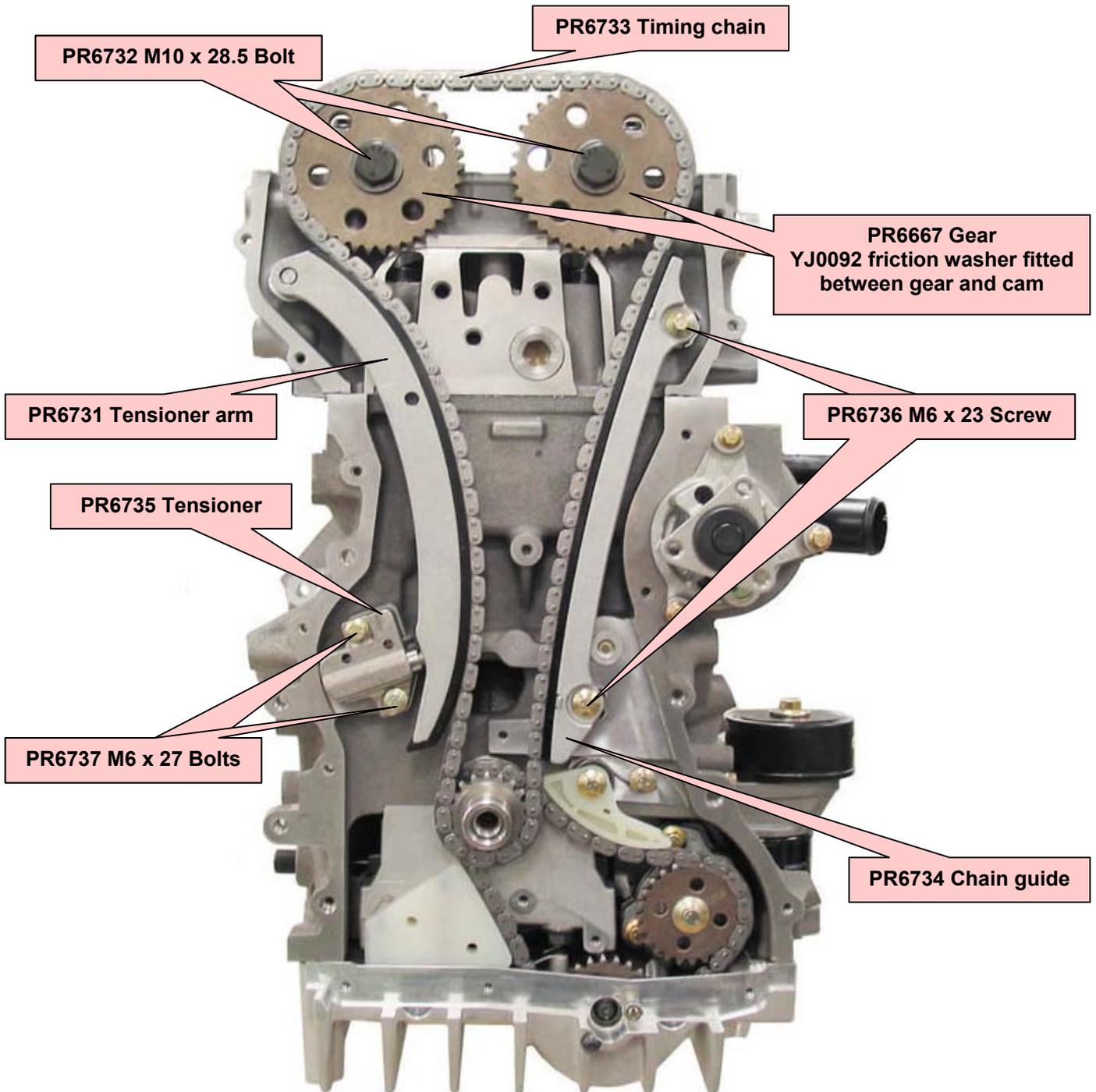


- Fit a YJ0092 friction washer to each of the PR6667 camshaft gears.
- Assemble the gears onto the camshafts (**NOTE:** - Ensure the friction washer is in between the gear and camshaft, not under the bolt head and is free from oil). Secure with PR6732 M10 x 28.5 bolts, do not tighten the bolts (ensure the gears are free to turn on the camshafts).



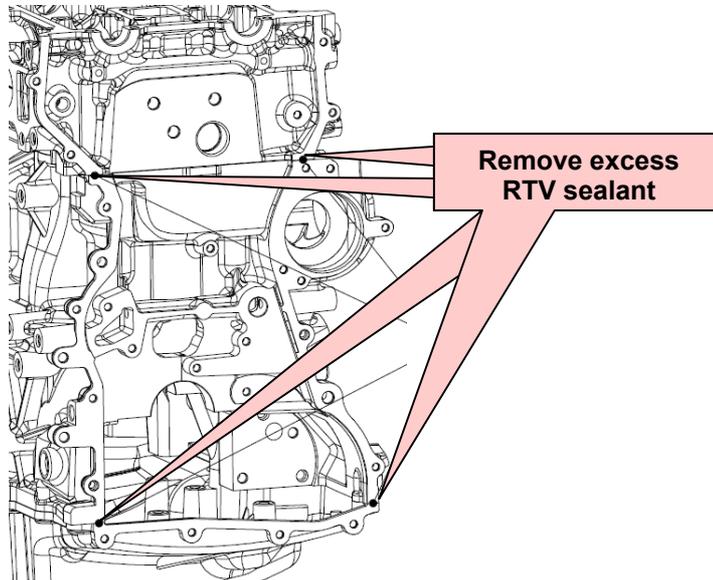
## Camshaft Timing (cont.)

6. Fit PR6733 timing chain around the crank and both camshaft gears.
7. Assemble the PR6734 timing chain guide onto the engine and secure with 2 off PR6736 M6 x 23 screws. Torque to 10Nm.
8. Assemble the PR6731 timing chain tensioning arm onto the PR6622 dowel pin.
9. Fit PR6735 timing chain tensioner and secure with 2 off PR6737 M6 x 27 bolts to 10Nm.
10. Pull the pin on the timing chain tensioner.
11. Ensure that the crankshaft is still in its timed position.
12. Torque each camshaft gear bolt to 72Nm using a 24mm spanner to hold the camshaft against rotation, this will avoid damaging the camshaft timing bar.



## Front Cover Pre Fit

1. Before fitting the front cover ensure that all the excess RTV sealant is removed from the areas shown below.

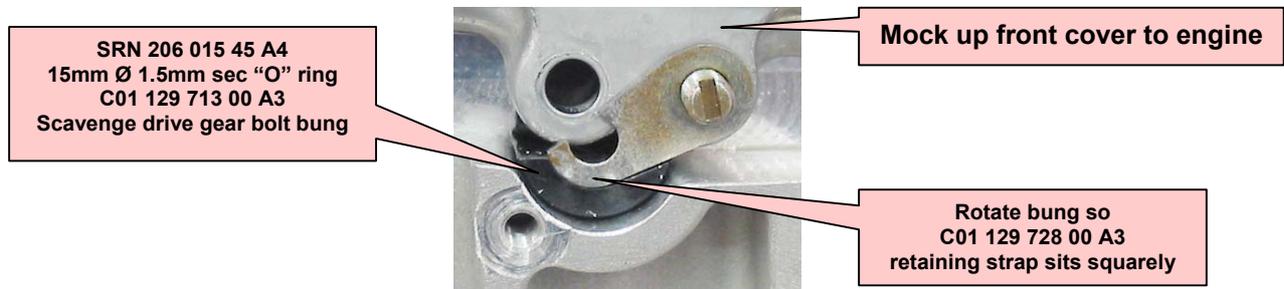


## Titan Front Sump Bung

1. Apply Dow Corning 732 sealant to the SRN 206 015 45 A4 15mm Ø 1.5mm sec "O" ring on the C01 129 713 00 A3 Sump plug.



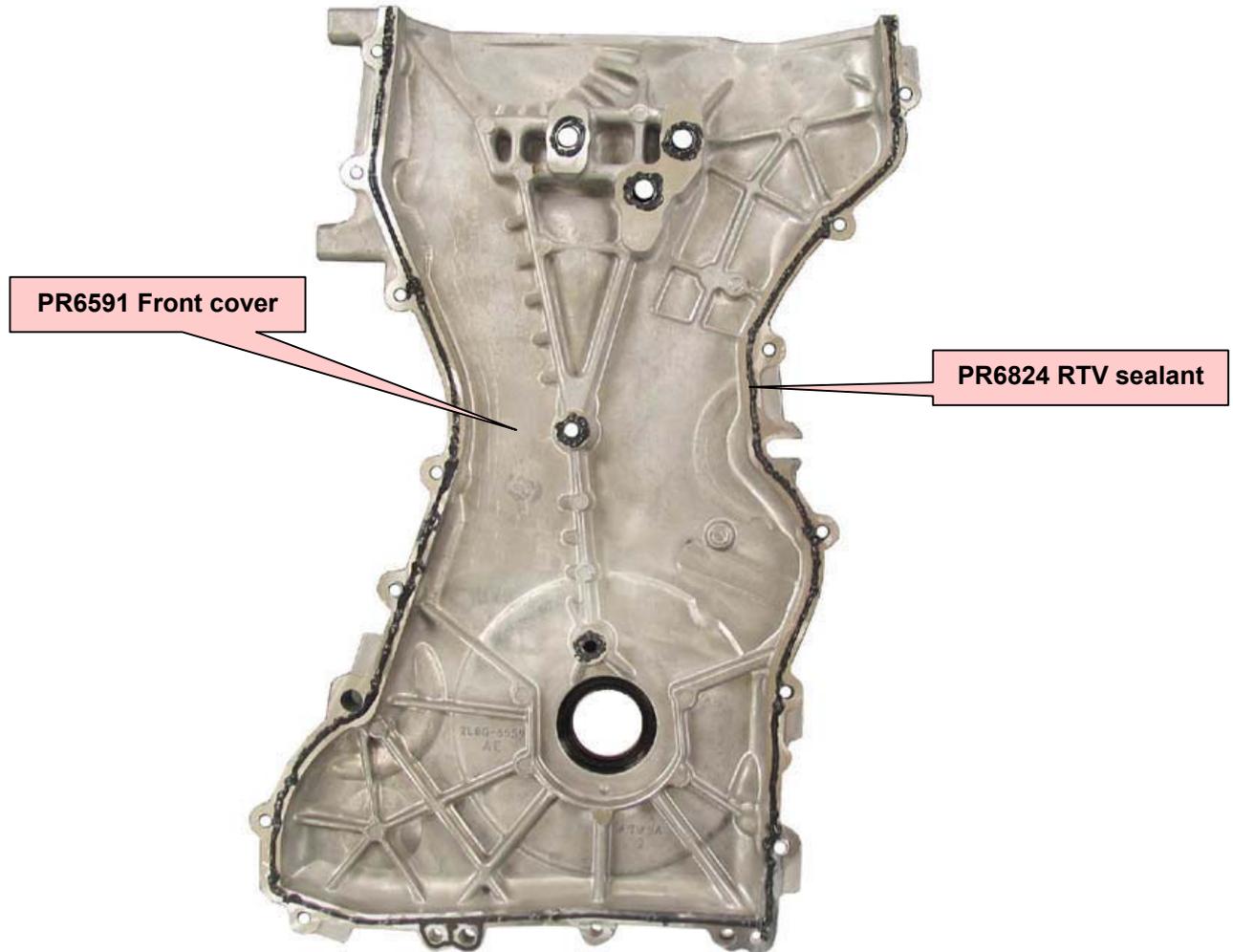
2. Mock up front cover onto the engine.
3. Check that the plug is free to rotate (if it is fouling on the front cover then it will not rotate.)
4. Rotate the plug so that C01 129 728 00 A3 retaining tab will sit squarely in the recess.



5. Apply PR6824 RTV sealant to the areas shown below on the PR6591 front cover.

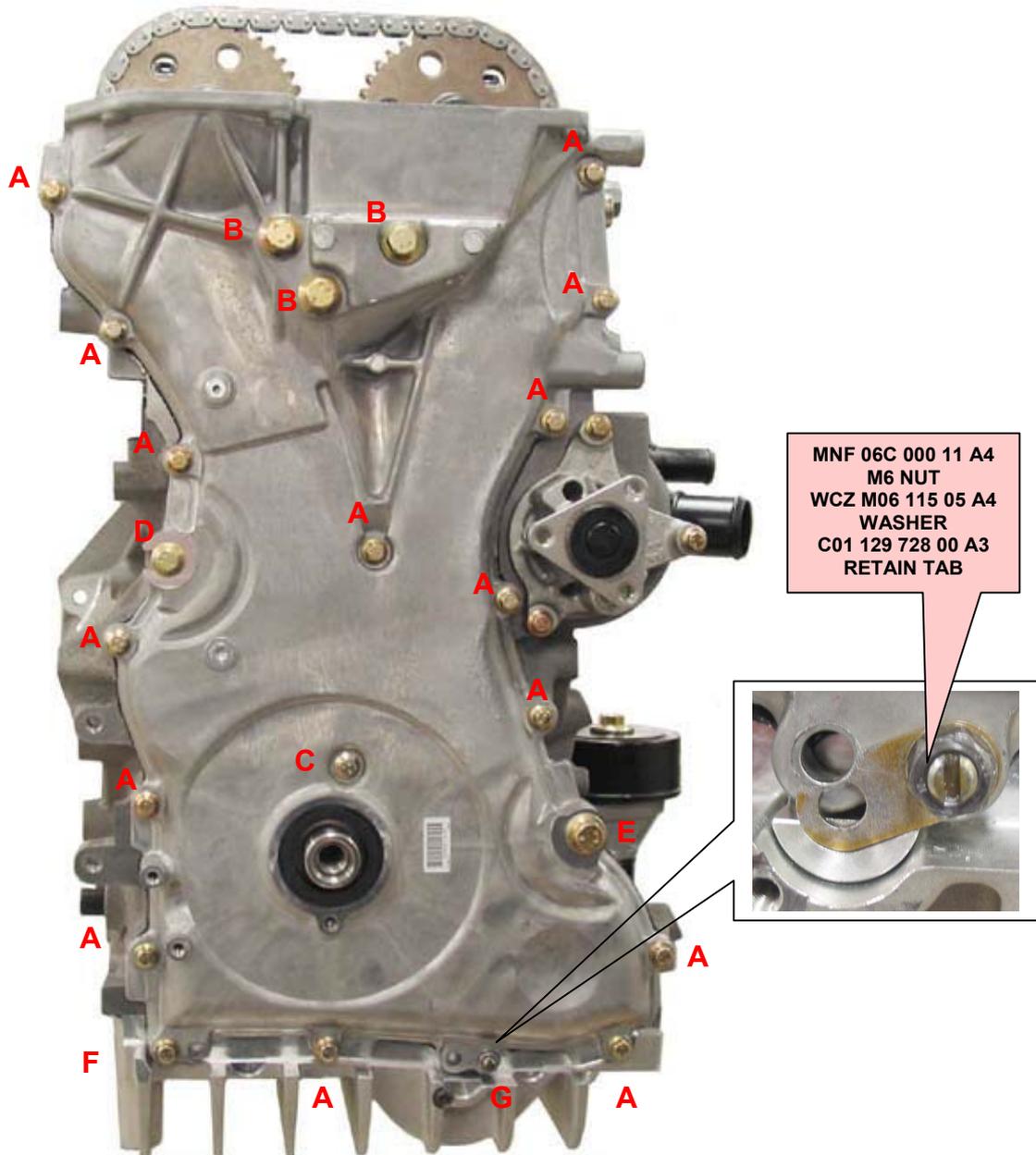
## Front Cover Pre Fit (cont.)

6. After front cover fitment wipe away excess sealant.



## Front Cover Fitting

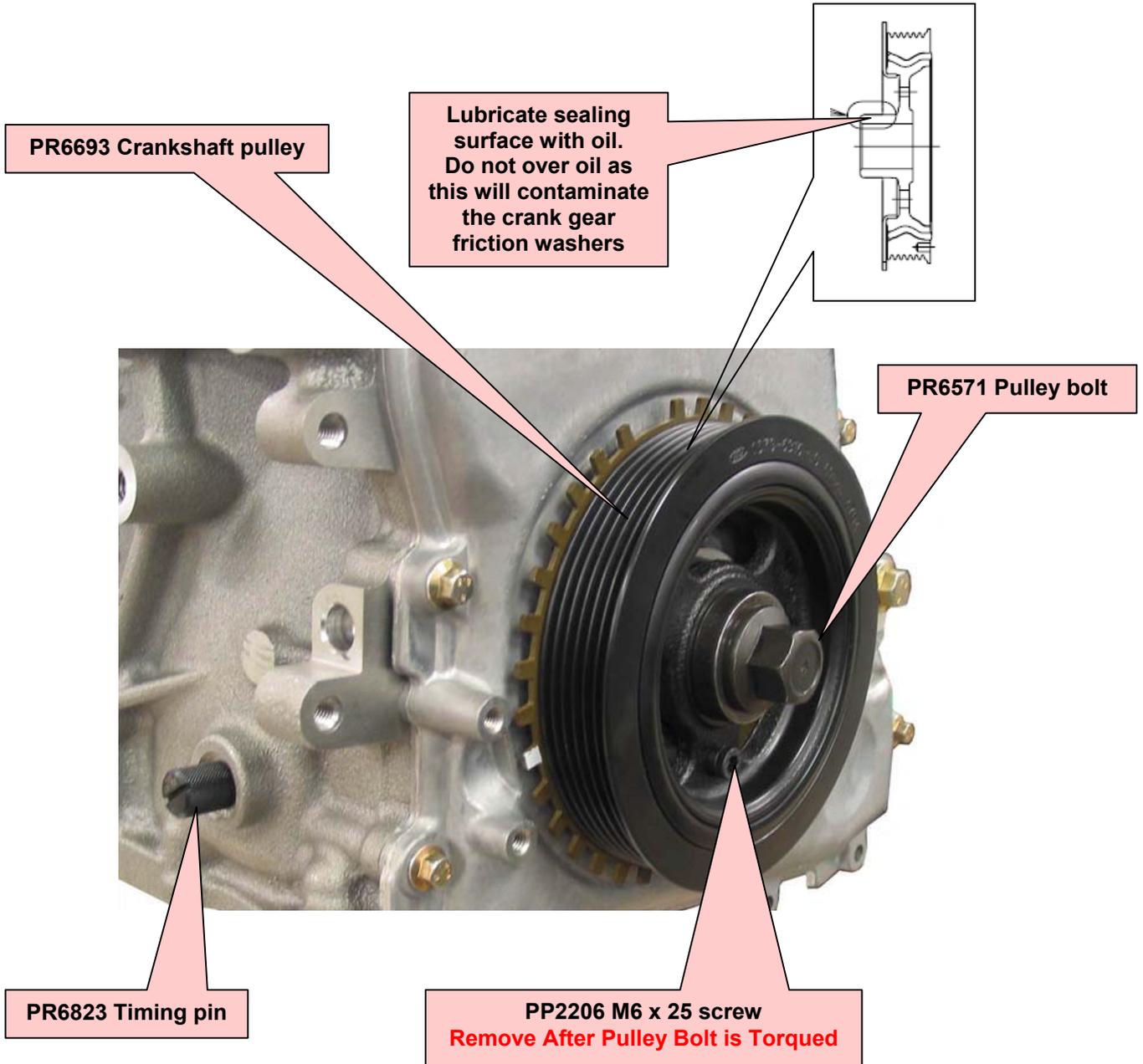
1. Fit PR6591 front cover to the engine and secure with the fasteners shown below.



	Part no.	Description	Torque (Nm)
A	PR6741	M6 X 25 SCREW	10
B	PR6727	M10 X 80 SCREW	48
C	PR6728	M6 X 30 SCREW	10
D	PR6729	M8 X 40 SCREW	25
E	PR6730	M10 X 40 SCREW	48
F	YD0288	<b>M6 x 25 DRILLED SCREW</b>	10
G	MNF 06C 000 11 A4 WCZ M06 115 05 A4 C01 129 728 00 A3	M6 NUT (Titan Supply) WASHER (Titan Supply) RET. TAB (Titan Supply)	10

## Crank Pulley Fitting

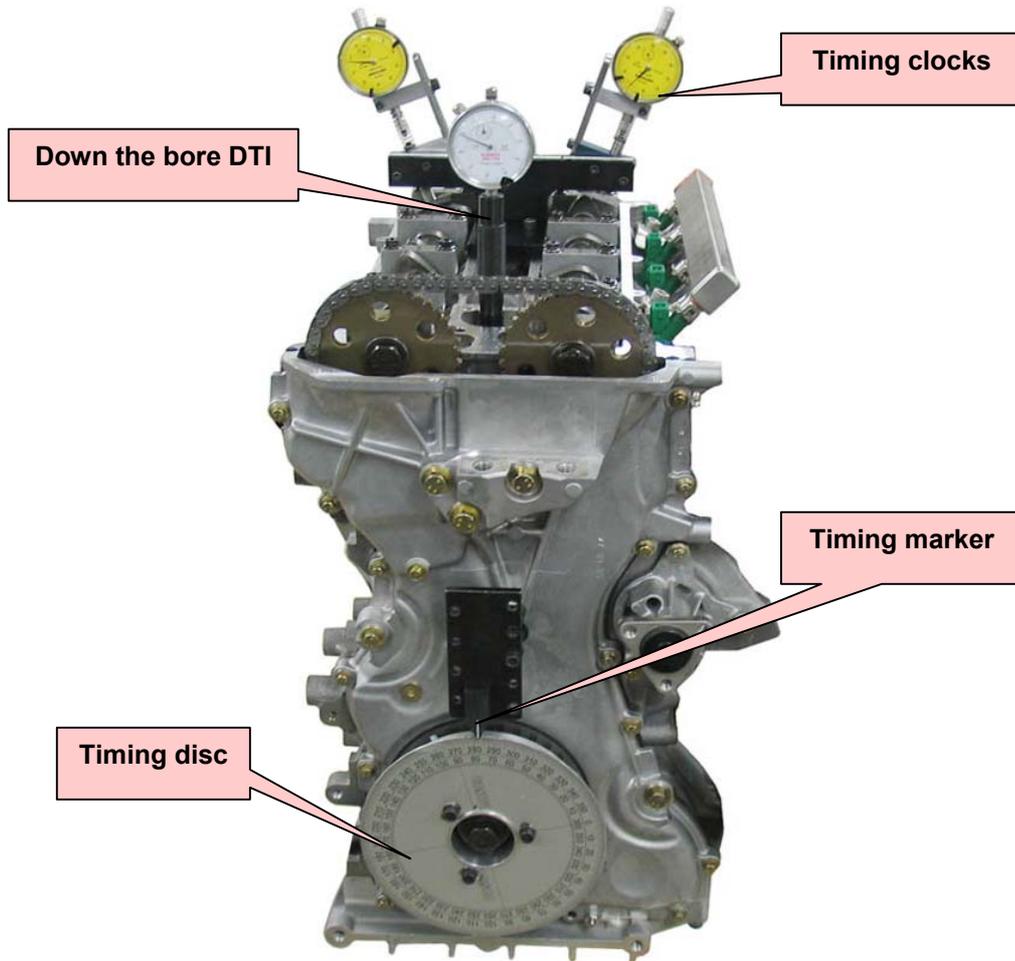
1. Ensure PR6823 crankshaft timing pin and then camshaft timing tool (as described in camshaft timing) are still fitted.
2. Lightly oil the sealing surface of the PR6693 crankshaft pulley. **Note:** Over oiling of this area can result in oil contamination of the crank gear friction washers.
3. Fit the crankshaft pulley and rotate to align with the timing hole in the front cover.
4. Insert PP2206 M6 x 25 screw to locate the pulley in the timed position. Ensure that the crank is still at TDC (against the timing pin).
5. Clamp the crankshaft pulley with PR6571 pulley bolt.
6. Initially torque bolt to 100Nm, then turn through a further 90°.



## Camshaft Timing Check

**NOTE:** - For the purpose of timing the engine, the Direction Of Rotation of the engine (**DOR**), is the clockwise direction when looking at the engine from the front and anticlockwise from the rear. The opposite direction is the Counter Direction Of Rotation (**CDOR**).

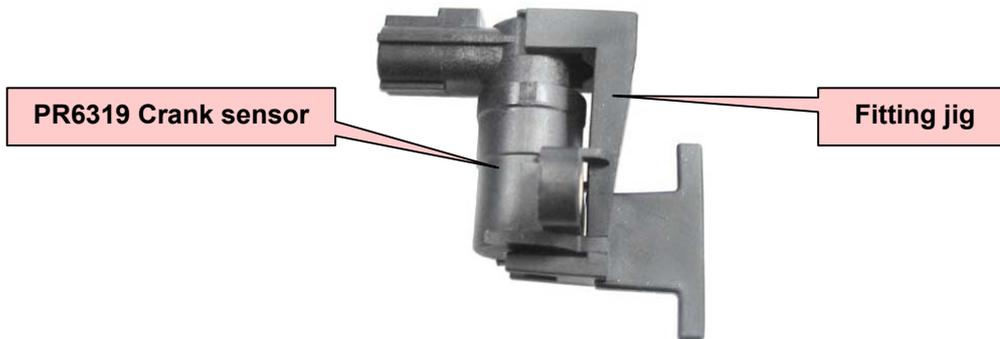
1. Fit a timing disc to the crank pulley, timing clocks, timing marker and a down the bore DTI clock to cylinder number 1.



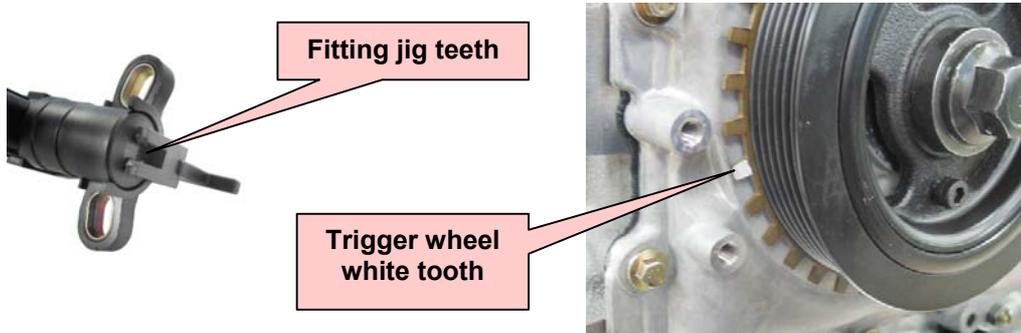
2. Bring the piston up to **TDC**. Set the clock to 0, set the timing disc approximately to 0°.
3. Rotate the engine in the **CDOR**, until the clock indicates 1.5mm then rotate **DOR** to the 1.0mm mark, take a reading from the timing disc (**A**).
4. Rotate the engine in the **DOR** back to **TDC**, **DO NOT RESET THE CLOCK TO 0**, carry on rotating until you reach the 1.0mm mark on the clock (i.e. same position on the other side) and take a reading (**B**).
5. Calculate **B-A=C**. **C** should equal 0. If it does not, then adjust the timing disc and recheck the set up as described above.
6. Bring the cam lobes of the rear cylinder to max. lift. Using the adjuster screw on the timing clock, set the big needle on 0.
7. Once the clock is set to zero, turn the engine in **CDOR** until the clock reads 2.0mm. Then rotate the engine in **DOR** until the timing clock reads 1.0mm. Note the angle on the timing disc. (Use the outer numbers for in the inlet cam and the inner numbers for the exhaust cam.)
8. Now turn the engine in the direction **DOR** past max lift until the clock reads 1.0mm. Again note the angle on the timing disc. Take the average of the two angles to get the cam timing. The timing should be Inlet 111° ATDC and Exhaust 103° BTDC.

## Crank Position Sensor (CPS) Fitting

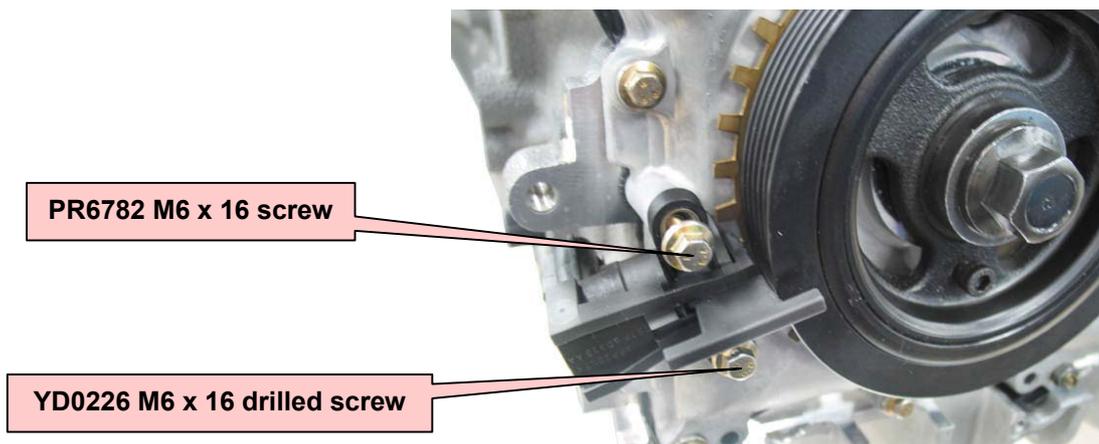
1. Ensure the crank is still in the timed TDC position as mentioned in the crank pulley fitting section.
2. Locate the fitting jig over the PR6319 crank sensor.



3. Fit PR6319 crank sensor with the fitting jig locating teeth over the white tooth of the trigger wheel.



4. Secure the sensor with the screws shown below but only hand tighten the screws whilst holding the sensor and jig assembly in position.



5. Final torque both screws to 7Nm, and remove fitting jig.
6. Remove M6 screw from pulley and timing pin from the engine.
7. Remove PR6823 timing pin and refit bung. Torque to 20Nm.
8. Remove camshaft timing bar.

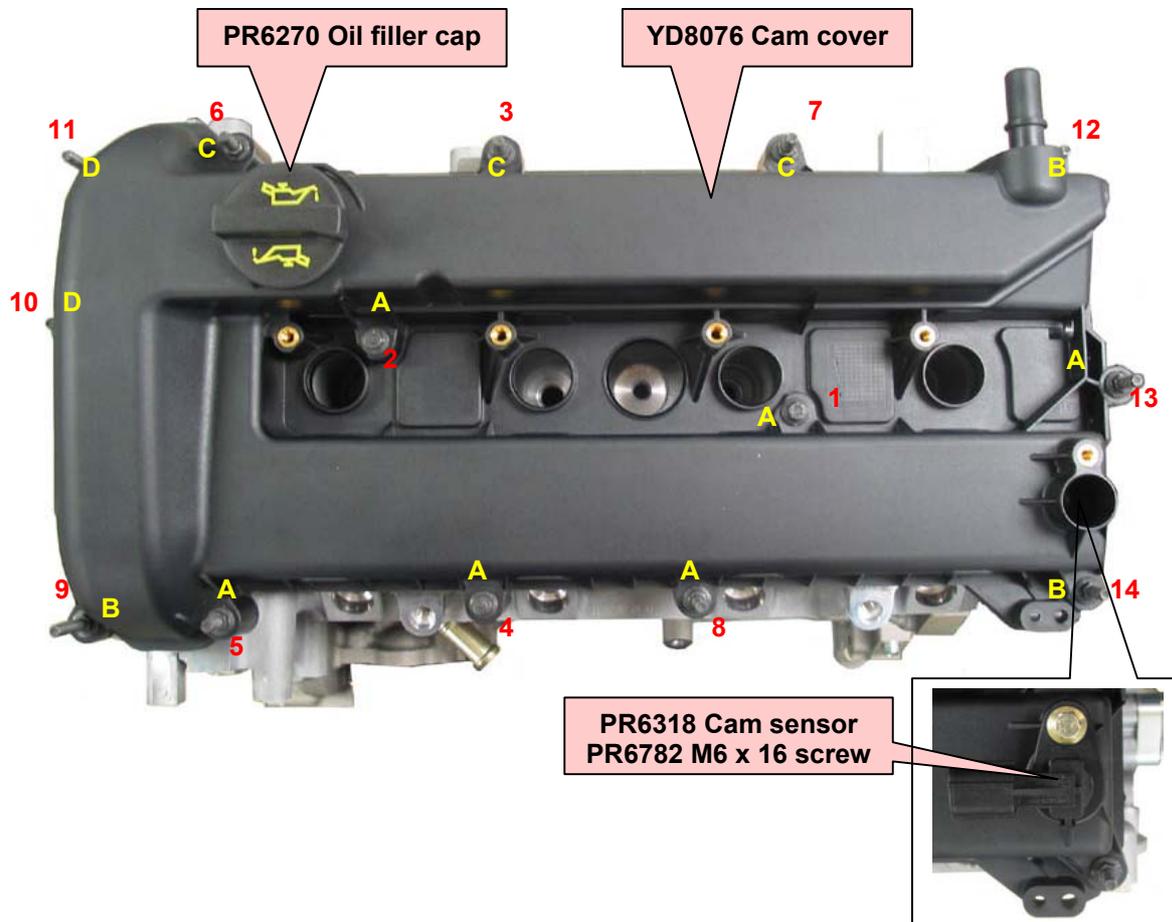
## Cam Cover Fitting

1. Apply PR1847 STP Oil Treatment for Gearboxes to all the cam lobes.
2. Apply PR6824 RTV sealant to the head to front cover joint face as shown below with ●



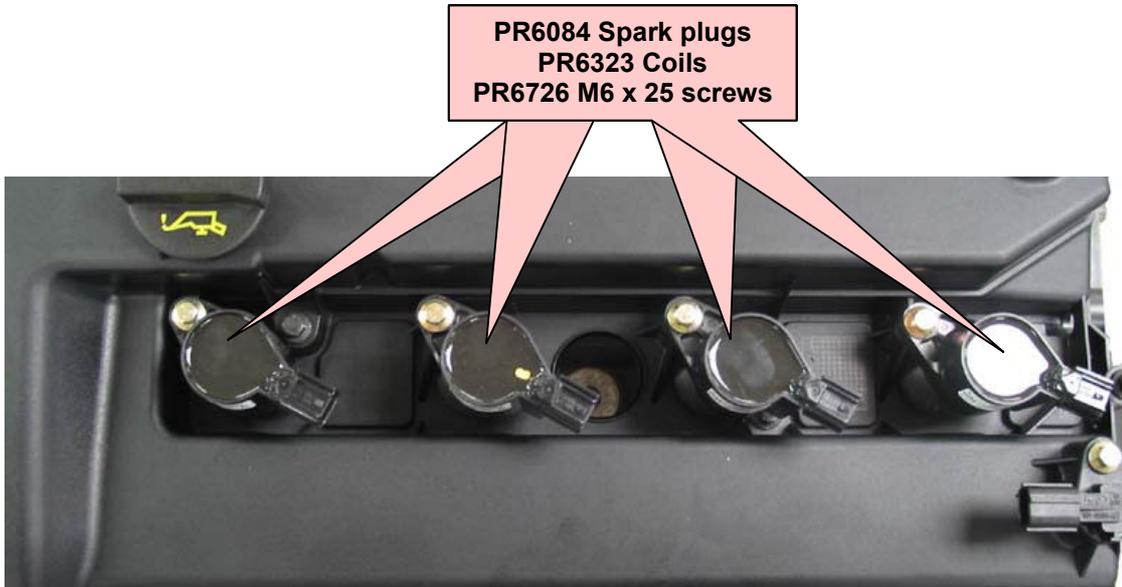
3. Fit YD8076 cam cover and torque fasteners in the order shown below to 10Nm.
4. Fit PR6318 cam sensor and secure with PR6782 M6 x 16 screw. Torque to 7Nm.
5. Fit PR6270 oil filler cap.

<b>A</b>	<b>Standard cam cover screw</b>
<b>B</b>	<b>PR6913 Short screw</b>
<b>C</b>	<b>PR6914 Long screw</b>
<b>D</b>	<b>YD0228 Drilled screw</b>



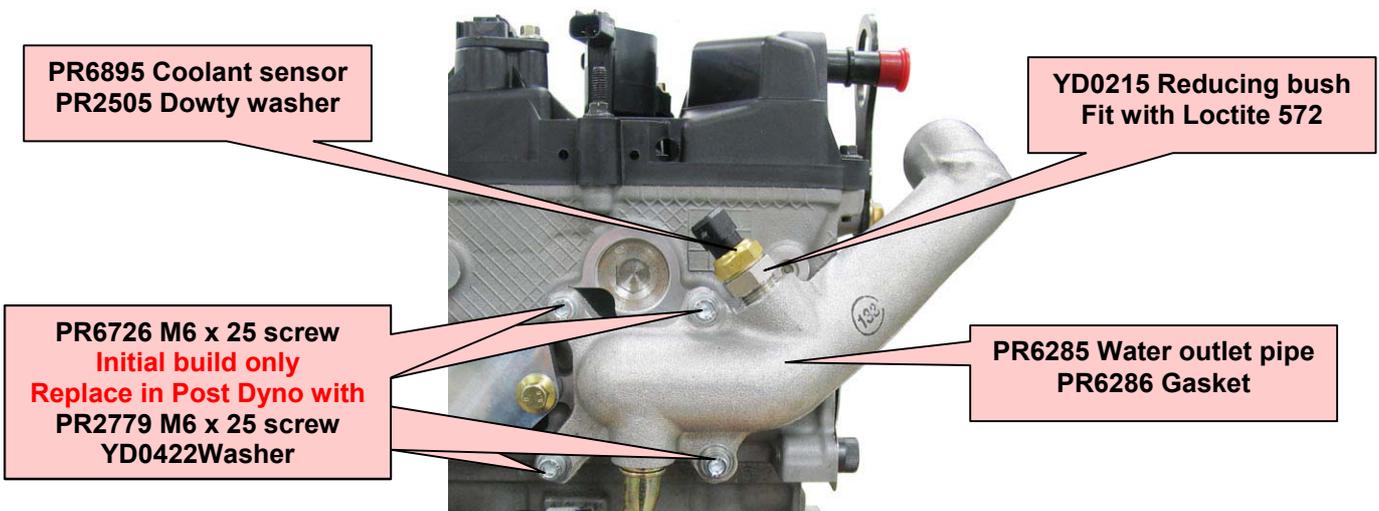
## Plugs and Coils

1. Fit 4 off PR6084 spark plugs, lubricate threads with build oil and torque to 12Nm
2. Fit 4 off PR6323 coils and secure with PR6726 M6 x 25 screws. Torque to 8 Nm.



## Water Outlet and Coolant Sensor

1. Before fitting water outlet check that 4 off PP4079 M6 x 1 x 2D helicoils have been fitted in the screw mounting holes
2. Fit PR6285 water outlet pipe to the cylinder head with a PR6286 gasket and secure at initial build with 4 off PR6726 M6 x 25 screws torqued to 11Nm.
3. At post dyno all the PR6726 fasteners water outlet fasteners should be replaced with 4 off PR2779 M6 x 25 screws and YD0422 washers. Torque to 18 Nm.
4. Apply PR6923 Loctite 572 sealant to the external threads of YD0215 reducing bush and fit to the water outlet pipe. Torque to 12Nm.
5. Fit PR2505 Dowty washer to PR6895 MBE coolant sensor and fit into the reducing bush. Torque to 12Nm



## Water bypass tube

1. Fit PR6789 coolant hose ensuring that the clamps are positioned as shown below.

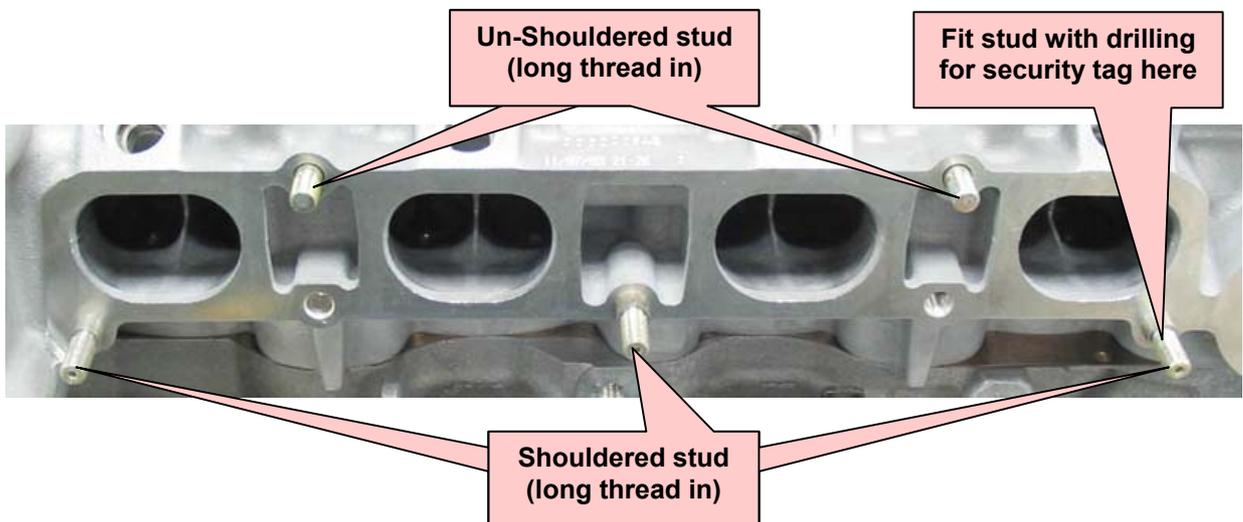


**PR6789 Hose / Clamp assembly**

## Fitting PR6818 Barrel Throttles

Note: Titan throttle fitting kit part number - PR7030

1. Fit 2 off un-shouldered studs and 3 off shouldered studs (supplied by Titan) in the positions shown below. The studs are fitted long thread end into the head. Torque with Loctite 270 to 8Nm.



2. Fit the four "O" rings supplied from Titan to the throttles.

**Fit throttle "O" rings**

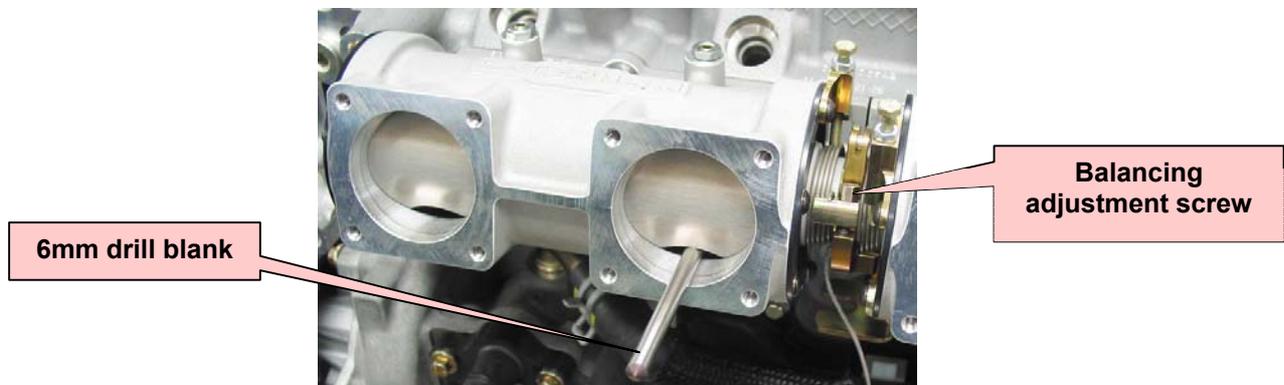


## Fitting Barrel Throttles (cont.)

3. Hold both sets of throttles in the wide-open position and push middle linkages together.  
**Note:** Keep the throttles held together until fitted the engine.
4. Fit the throttle assembly to the engine and secure with the nuts provided. The top nuts will have to be fitted first before the throttles are fully located. Torque to 18Nm when using the ground down extension spanner or 20Nm with a socket.
5. Attach the throttle cable tool to the linkage.
6. With the throttles in the closed position set idle gap on cylinders 3 and 4 with a 6mm drill blank. This can be adjusted using the screw shown below.
7. When set tighten the locking nut on the adjustment screw.



8. Using the 6mm drill blank now set the idle gap on cylinders 1 and 2 using the balancing adjustment screw.



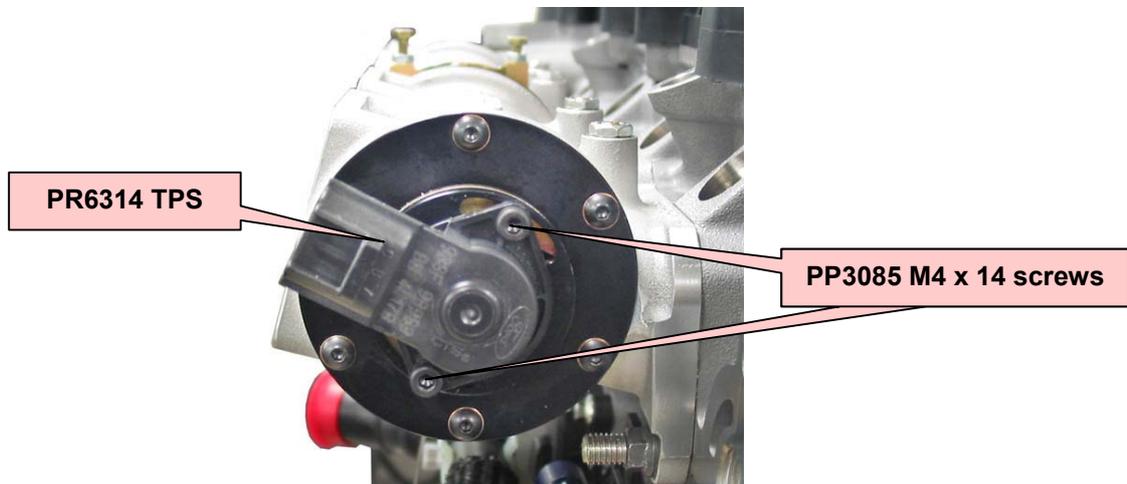
9. Open to the wide-open position and ensure all the barrels are at full throttle, i.e. there is no apparent step. If the barrels are out of alignment then set them with the throttle stop adjustment screw.



## Throttle Position Sensor (TPS)

1. Fit the PR6314 TPS onto the throttles.
2. Before securing open to full throttle, if the whole TPS does not rotate then it has been fitted in the correct position.
3. Set the TPS in a midway position as shown below.
4. Secure the TPS with 2 off PP3085 M4 x 14 screws.
5. Use TPS Setting box - XF8178 No: 903002.
6. Before connecting to TPS switch on setting box, display should read -10.7. Refer to the Production Engines Dept engineering section if this value is not displayed.
7. Connect setting box to TPS.
8. Adjust TPS until setting box display reads 96.1 - 96.3.
9. Torque TPS screws with 243 Loctite on threads to 1Nm.
10. Re-check TPS position and remove TPS setting box.

**Note:** if the barrel throttles have to be removed from the engine, always remove the TPS first, otherwise it will result in the TPS being damaged.



## Fitting Airbox

1. Attach 3 off PR6873 retaining clips to PR6872 airbox backplate.
2. Fit PP5186 grommet to airbox.
3. Fit PR5063 Map sensor into the grommet with a PR7314 spacer washer under the screw hole.
4. Secure the map sensor with a PR6780 M5 x 16 screw and PP5444 nut. Torque to 5Nm.



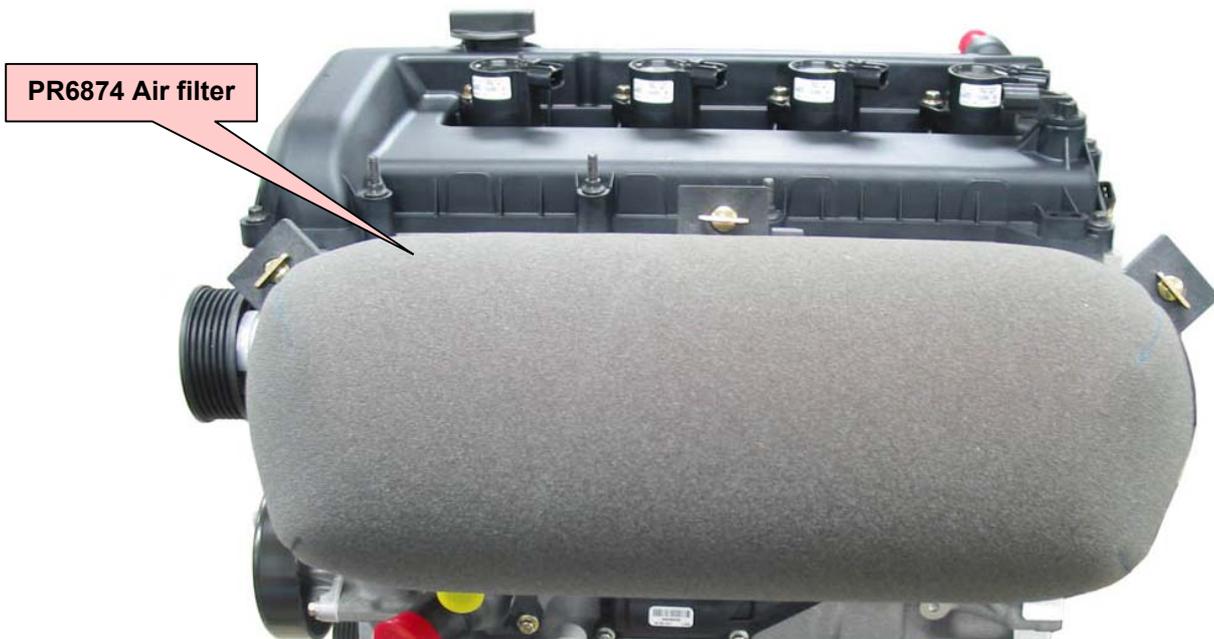
5. Fit the airbox to the throttles and secure with 8 off M5 x 10 screws (Titan supplied) and M5 crinkle washers (Titan supplied). Torque to 5Nm with Omnifit 230M.

### Fitting Airbox (cont.)

6. Fit the throttle trumpets to the airbox and secure with 8 off M5 x 12 screws and M5 crinkle washers (Titan supplied). Torque to 5Nm with Omnifit 230M.

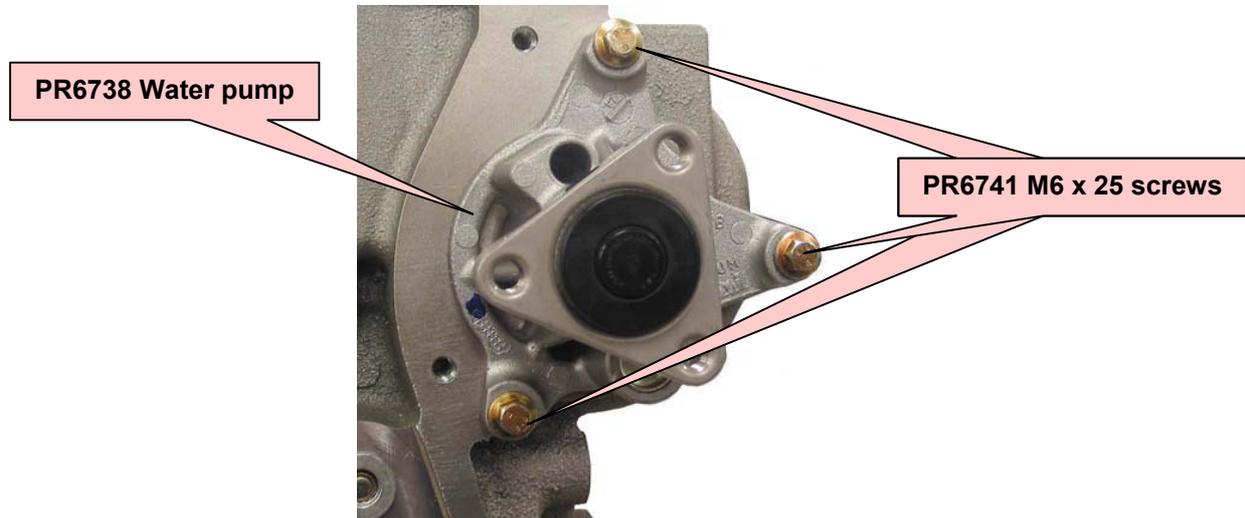


7. Fit PR6874 air filter and secure the 3 fasteners.



## Water Pump Fitting

1. Lubricate the "O" ring on PR6738 water pump, with Molykote 111 silicone grease.
2. Fit the water pump and secure with 3 off PR6741 M6 x 25 screws. Torque to 10Nm.



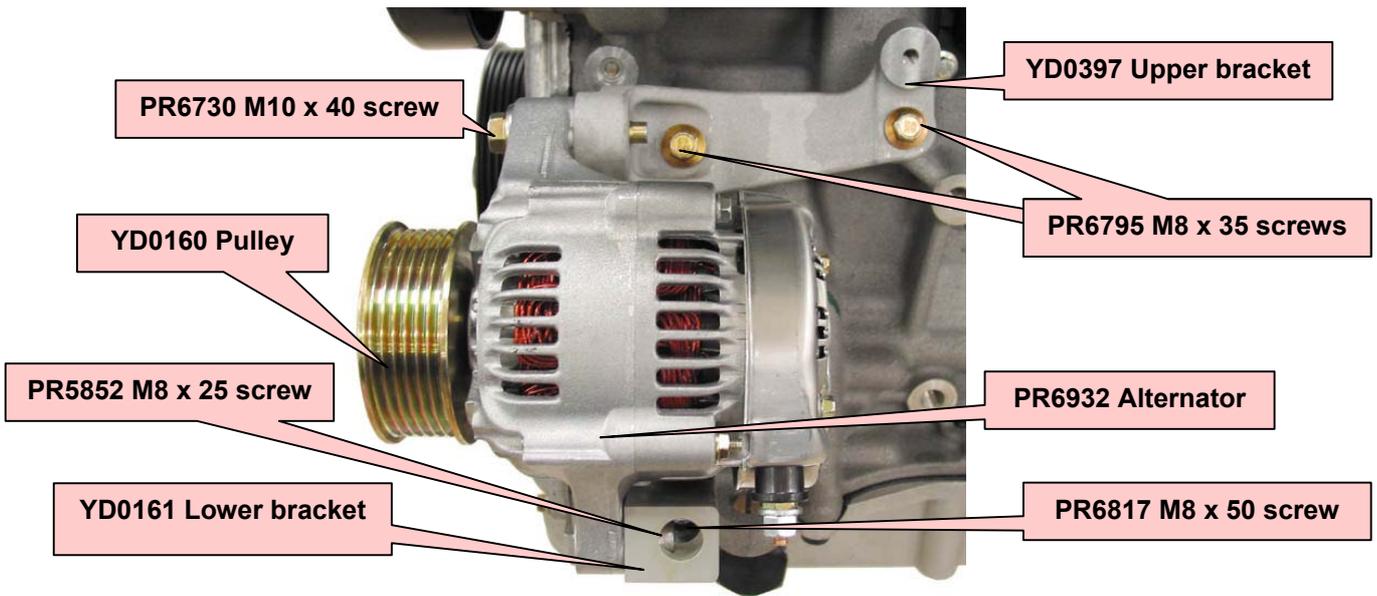
3. Fit water PR6739 water pump pulley and secure with 3 off PR6740 M8 x 12 screws. Torque to 20Nm.



**Note:** - Ensure the drive belt running surface is kept clean.

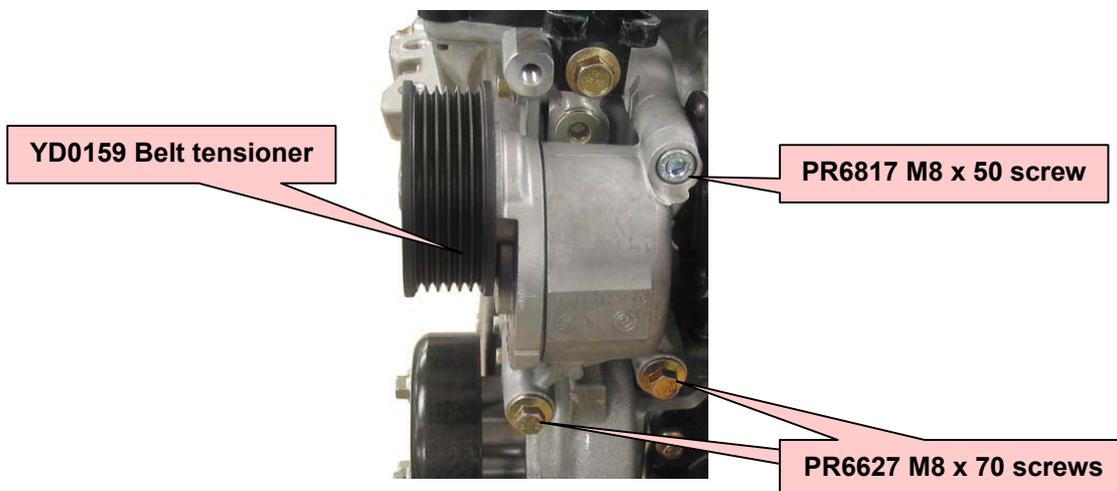
## Alternator Fitting

1. Fit YD0160 pulley to PR6932 alternator and secure with 22mm nut. Torque to 35Nm with Loctite 242. **Note:** After fitting manually spin the pulley to see if it has any visual run out, if in doubt consult team leader or engineering.
2. Fit YD0397 upper alternator bracket to the engine with 2 off PR6795 M8 x 35 screws. Torque to 20Nm.
3. Fit YD0161 lower alternator bracket to the engine with PR6817 M8 x 50 screw, but do not tighten at this point. Check visually for flatness/distortion, the machined face of the block mounting boss for YD0161 prior to fixing alternator.
4. Mount the alternator to the upper bracket using PR6730 M10 x 40 screw, and the lower bracket using PR5852 M8 x 25 screw. Torque to the upper bracket screw to 40Nm, and both the lower screws to 20Nm.



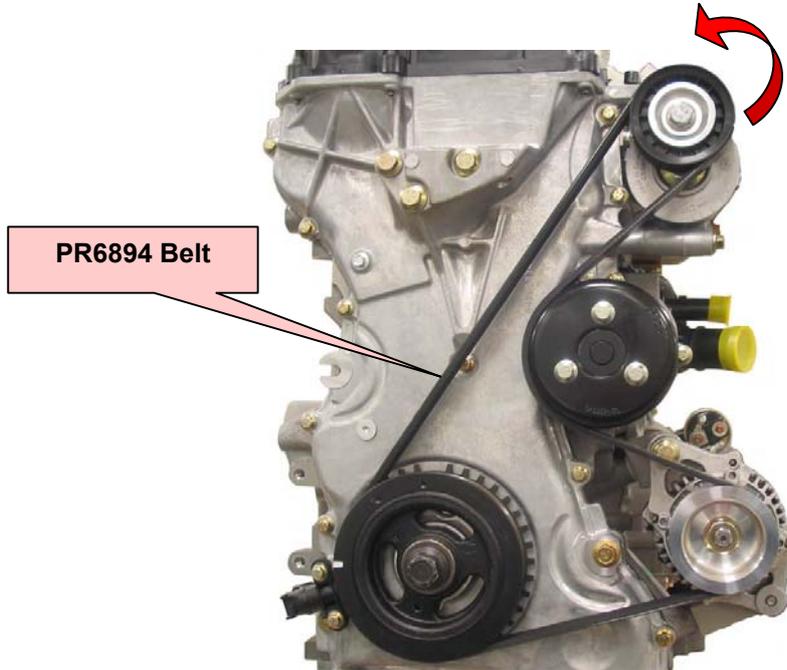
## Auxiliary Drive Belt Tensioner Fitting

1. Fit YD0159 auxiliary drive belt tensioner and secure with 1 off PR6817 M8 x 50, and 2 off PR6627 M8 x 70 bolts. Torque to 20Nm.



## Auxiliary Drive Belt Fitting

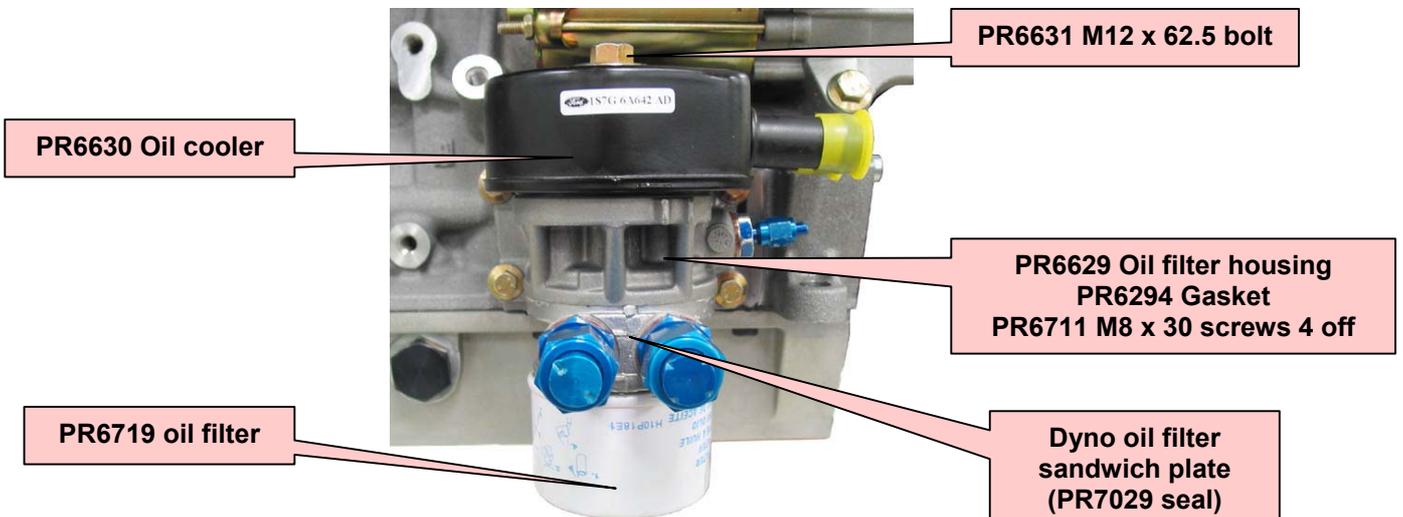
1. Fit PR6894 drive belt around tensioner, water pump pulley and alternator pulley.
2. Using a spanner (tensioner bolt heads vary in size), rotate the tensioner in an anti-clockwise rotation, to give enough slack on the belt to be fitted around the crank pulley.



3. Remove the 15mm spanner to tension the belt.

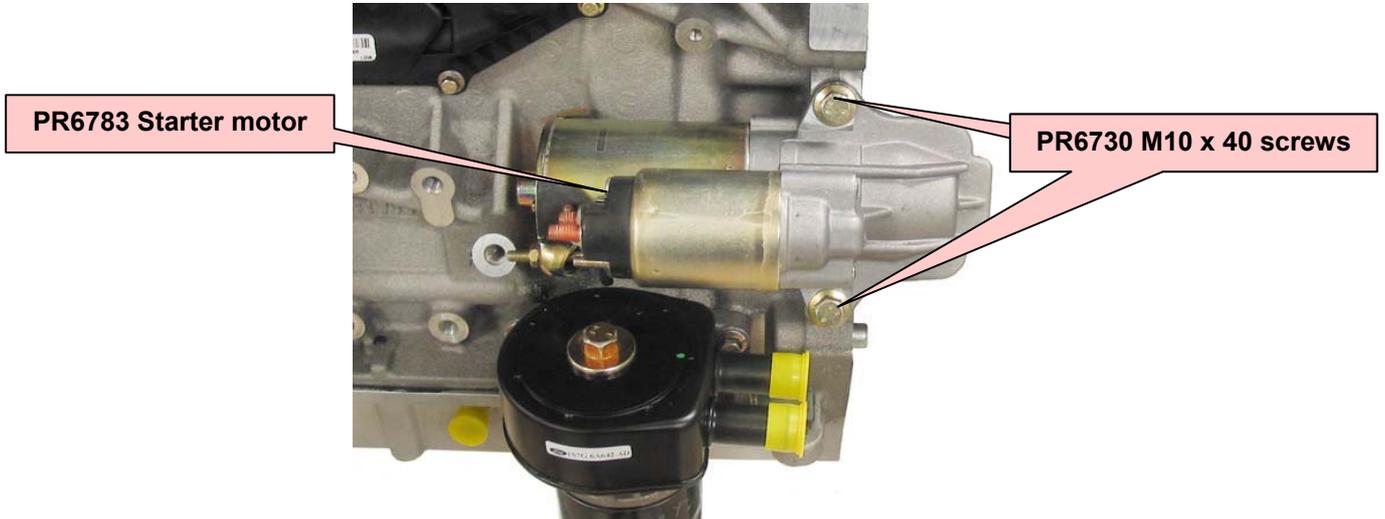
## Oil Filter and Cooler Fitting

1. Fit PR6629 oil filter housing with PR6294 gasket to the block and secure with 4 off PR6711 M8 x 30 screws. Torque to 25Nm.
2. Fit PR6630 oil cooler to the oil filter housing (with the pipes facing towards the rear of the engine as shown) and secure with **PR6631** M12 x 62.5 bolt. Torque to 37Nm.
3. Fit dyno oil filter sandwich plate and secure with oil filter sandwich plate bolt. (**Note:** Because this sandwich plate gets swapped between engines the seal will wear. If this is the case the PR7029 seal should be replaced.)
4. Lubricate the "O" ring on the PR6719 oil filter with build oil.
5. Fit the oil filter to the oil filter housing.



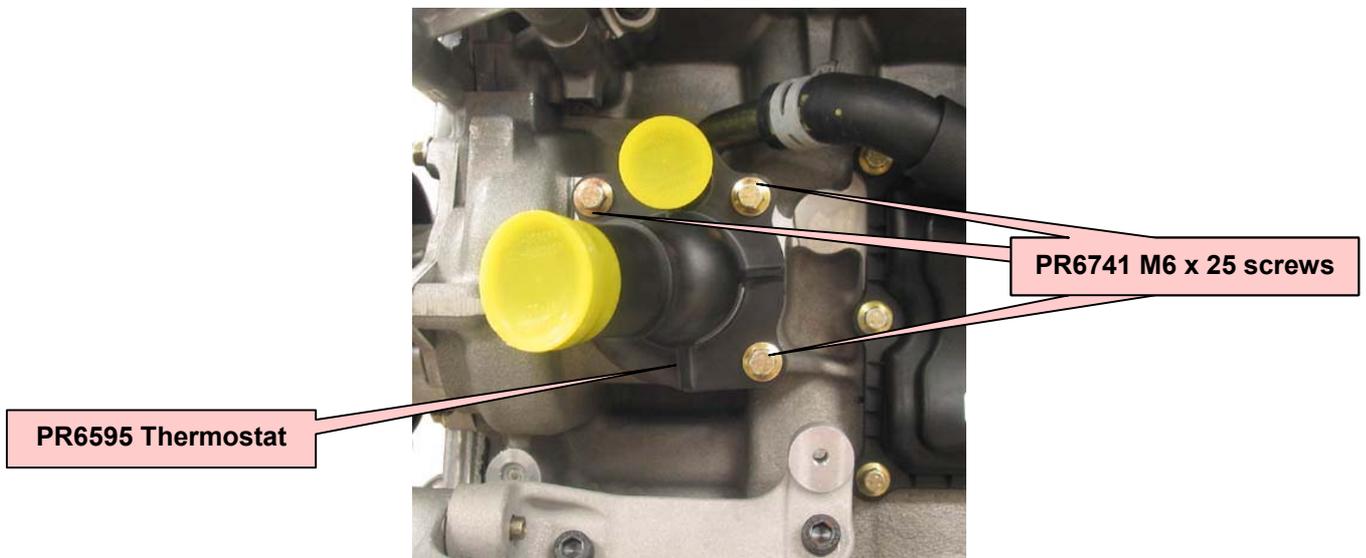
## Starter Motor Fitting

1. Fit PR6783 starter motor and secure with 2 off PR6730 M10 x 40 screws. Torque to 40Nm.



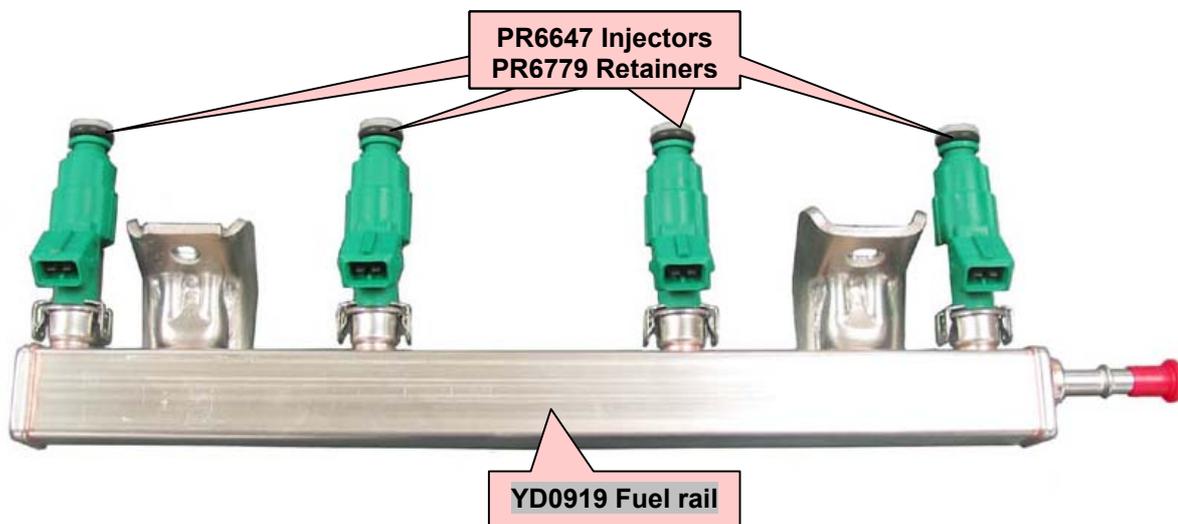
## Thermostat Housing Fitting

1. Fit PR6595 thermostat and secure with 3 off PR6741 M6 x 25 screws. Torque to 10Nm.



## Fuel Rail Fitting

1. Fit the PR6779 retainers to each PR6647 injector.
2. Lubricate the top "O" ring of the four PR6647 injectors with build oil and fit them into YD0919 fuel rail.



3. Lubricate the lower "O" rings of the injectors with build oil and assemble the fuel rail onto the cylinder head.
4. Secure the fuel rail with 2 off PR5852 M8 x 25 screws and PR6577 M8 washers. Torque to 23Nm.

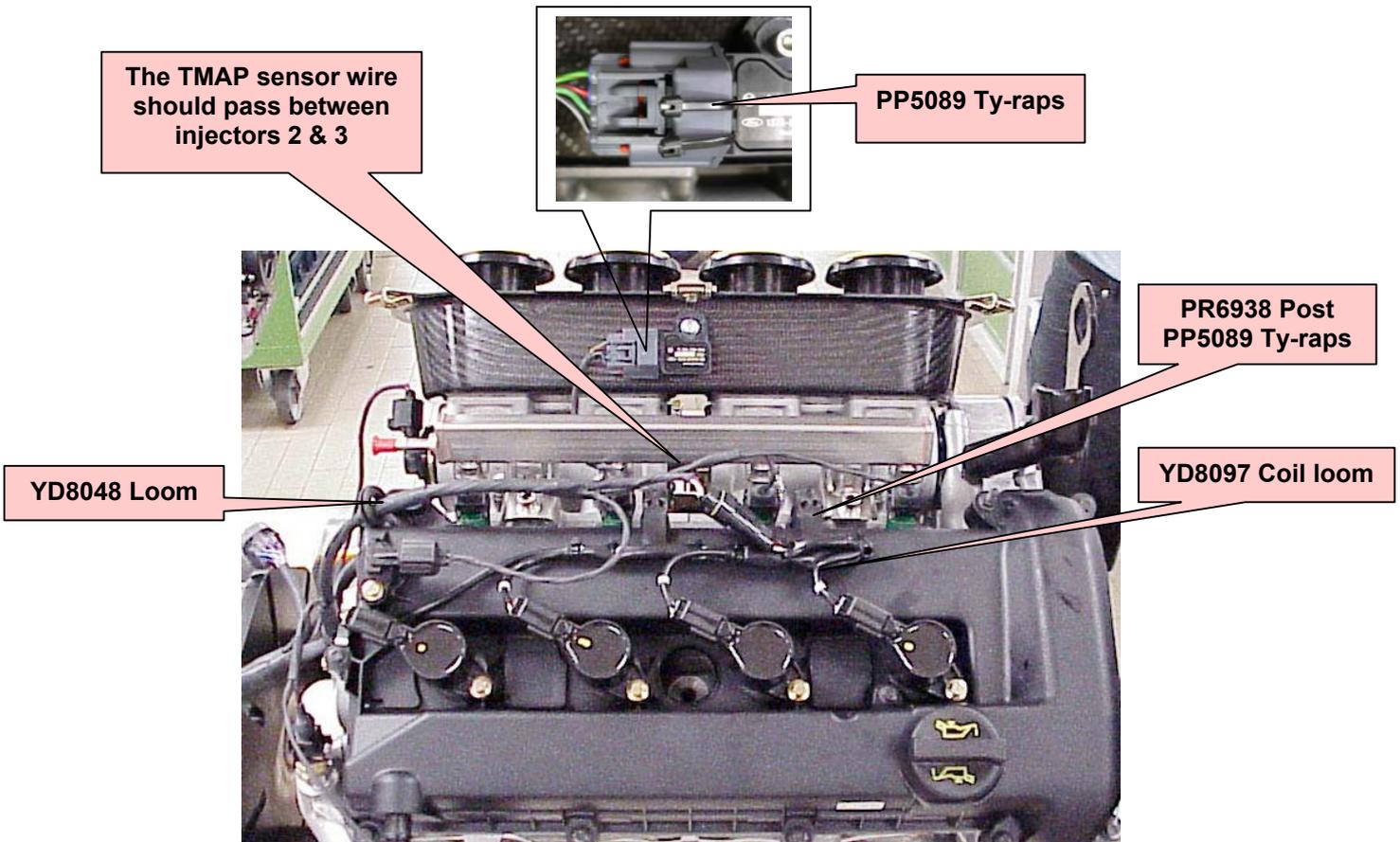


## Loom Fitting

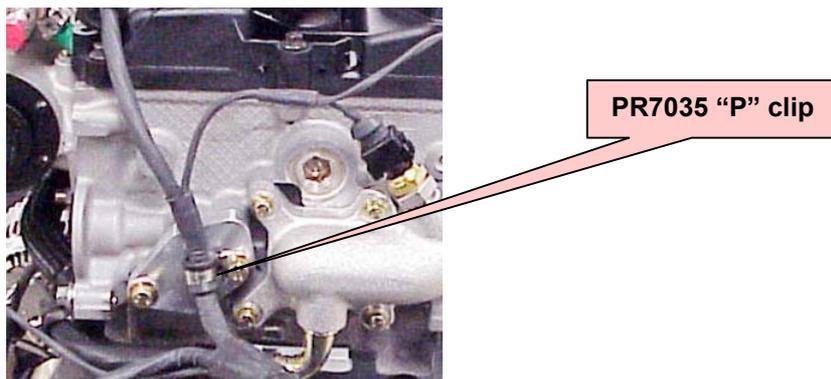
1. Fit PP5089 Ty-raps to each of the four coil connectors on YD8097 ignition coil loom.



2. Fit YD8097 ignition coil loom to the engine and secure to 1 off PR6938 post using 2 off PP5089 Ty-raps.
3. Fit YD8048 loom using KK3378 fitting kit as shown below.

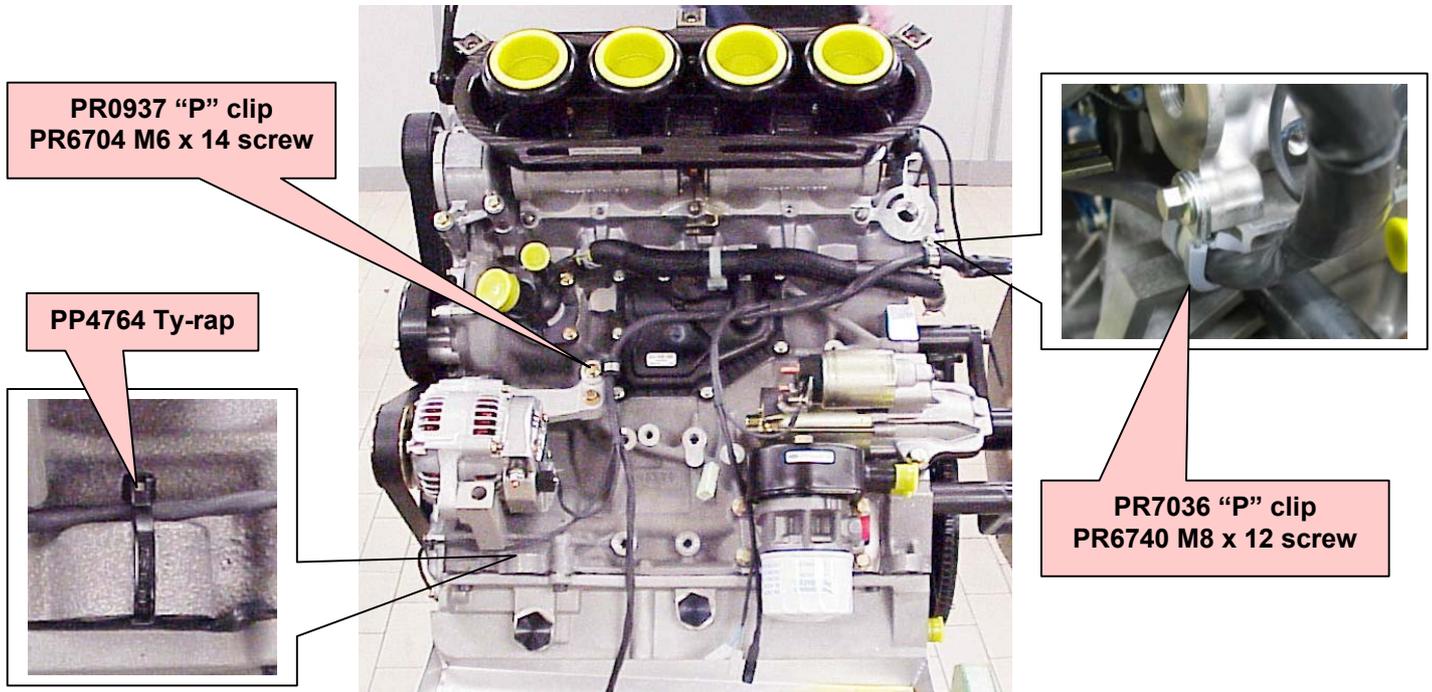


4. Secure the loom to the rear of the cylinder head using PR7035 "P" clip. This clip uses the existing EGR cover plate fixing screw. Re-torque screw to 20Nm.

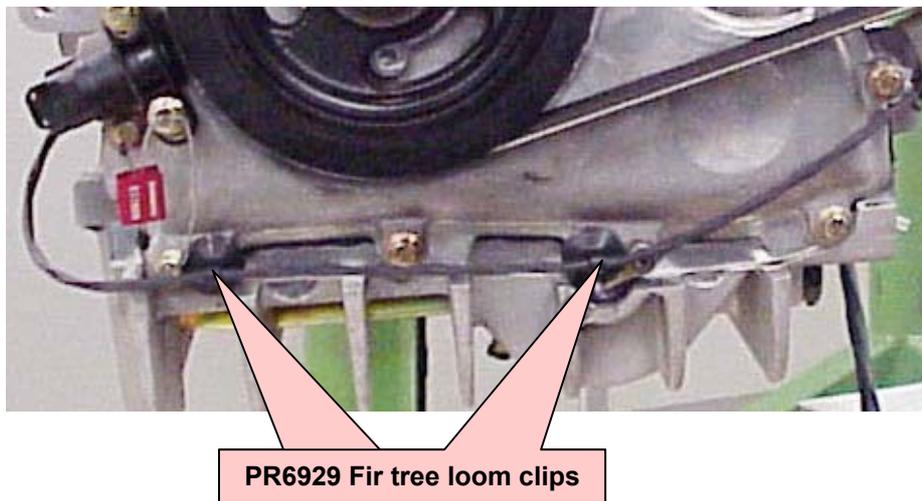


## Loom Fitting (cont.)

5. Fit loom to the rear of the engine using the clips and Ty-raps as shown below. Torque the PR6704 M6 x 14 screw to 10Nm, and the PR6740 M8 x 12 screw to 20Nm.

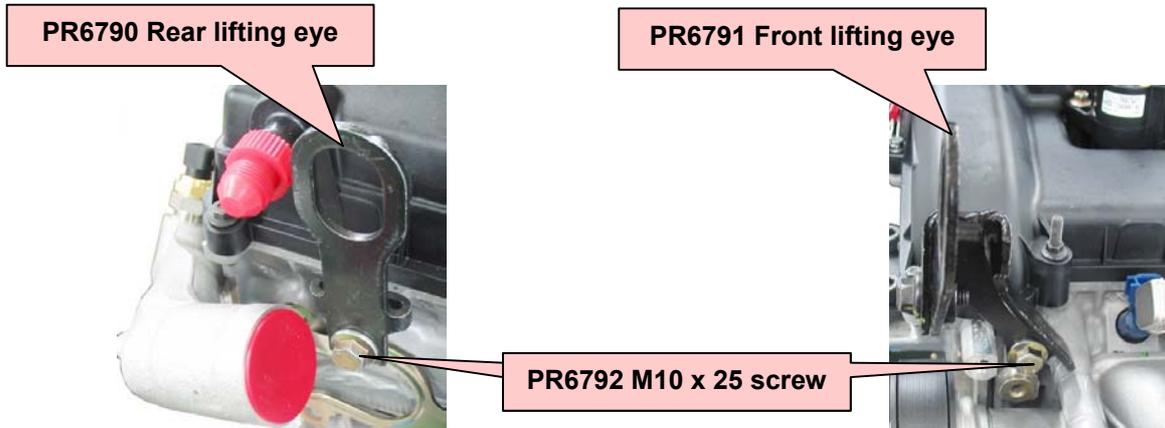


6. Attach the loom to front of the engine using 2 off PR6929 fir tree loom clips.



## Lifting Eyes Fitting

1. Fit PR6790 rear lifting eye and secure with a PR6792 M10 x 25 screw. Torque to 45Nm.
2. Fit PR6791 front lifting eye and secure with a PR6792 M10 x 25 screw. Torque to 45Nm.

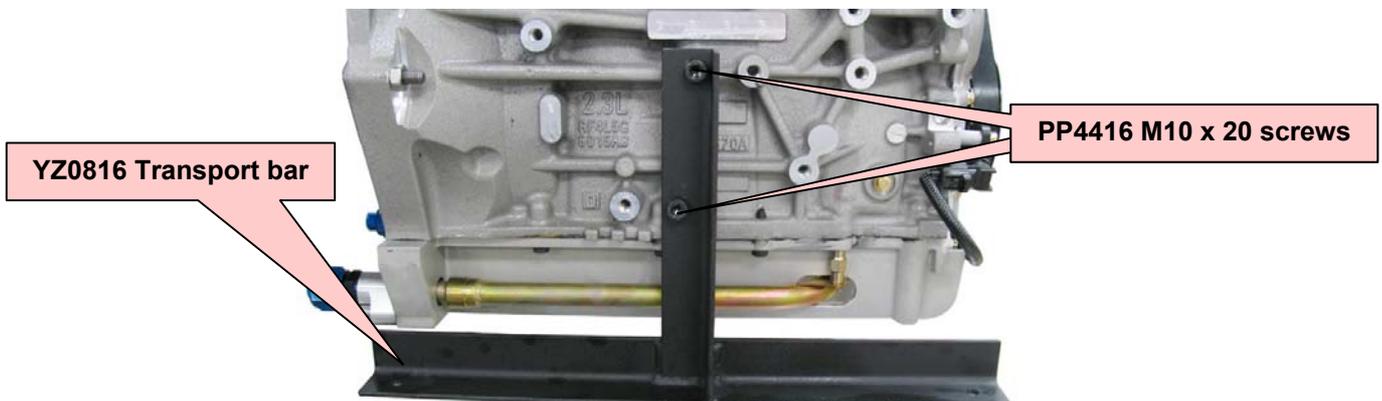


## Transport Bars

1. Before sending to the dyno, fit YZ0815 transport bar to the inlet side of the block with 2 off PR2852 M10 x 60 screws. Torque to 42Nm.

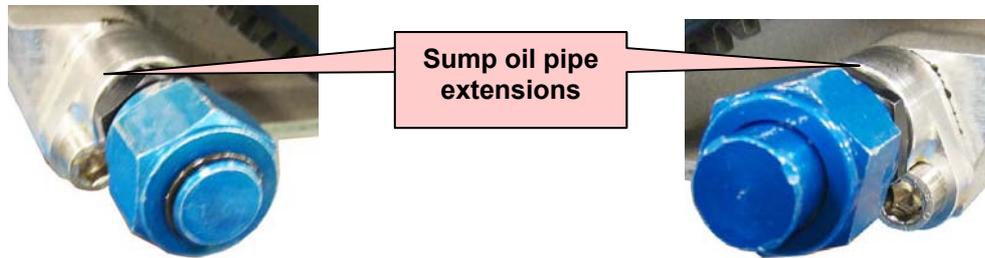


2. Fit YZ0816 transport bar to the exhaust side of the block with 2 off PP4416 M10 x 20 screws. Torque to 42Nm.



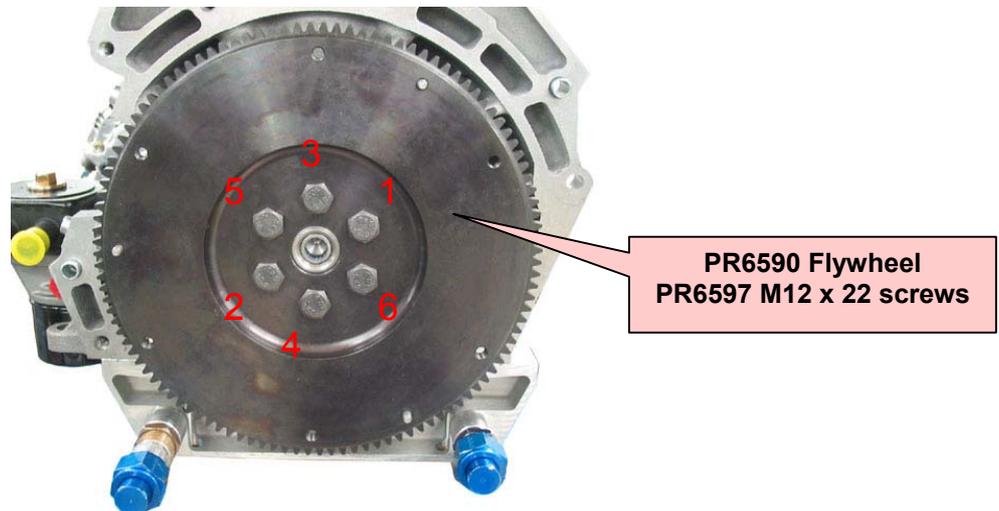
## Dyno Oil Pipe Extensions

1. Fit dyno oil pipe extensions to the sump rear oil pipes.



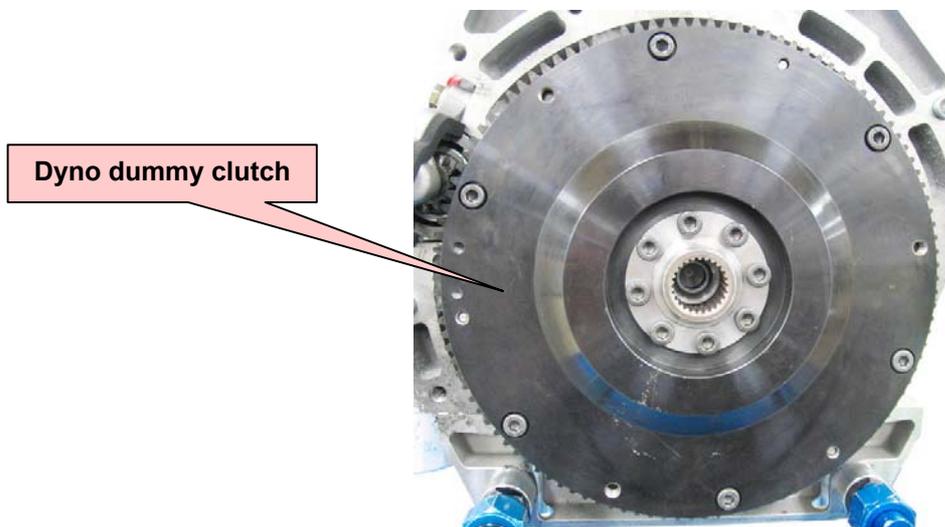
## Flywheel Fitting

1. Fit PR6590 flywheel to the crankshaft, and secure with 6 off PR6597 M12 x 22 screws.
2. Torque in the sequence shown to 50Nm.
3. Torque in the sequence shown to 80Nm.
4. Torque in the sequence shown to 112Nm.



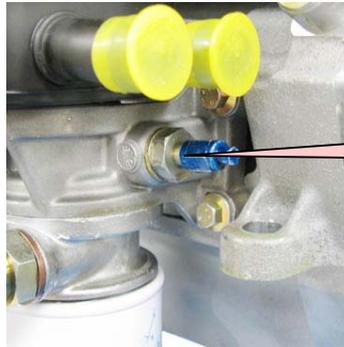
## Dyno Clutch

1. Fit dyno dummy clutch.
2. Evenly tighten the mounting bolts. Torque to 25Nm.



## Dyno Oil Pressure Sensor Adapter

1. Fit dyno oil pressure sensor adapter.



**Oil pressure sensor adapter**

## Post Dyno

1. Check for Dyno faults on database.
2. Check for any water, fuel and oil leaks plus any abnormalities.
3. Replace all the PR6726 fasteners water outlet fasteners with 4 off PR2779 M6 x 25 screws and YD0422 washers. Torque to 18 Nm.

**PR2779 M6 x 25 screws  
YD0422 Washers**



4. Remove oil filter sandwich plate and refit oil filter.
5. Clean engine.
6. Check all red/yellow caps are fitted as shown below.
7. Fit PR1757 EC-10 red cap to cam cover breather.
8. Fit PR6970 EC-28 red cap to water outlet.

**PR1757 EC-10 Red cap**



**PR6970 EC-28 Red cap**



9. Fit PR1752 EC-M8 red cap to the fuel rail.

**PR1752 EC-M8 Red cap**



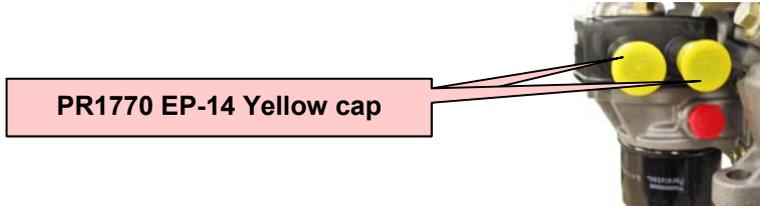
10. Fit 2 off PR1770 EP-14 yellow caps to the sump oil pipes.



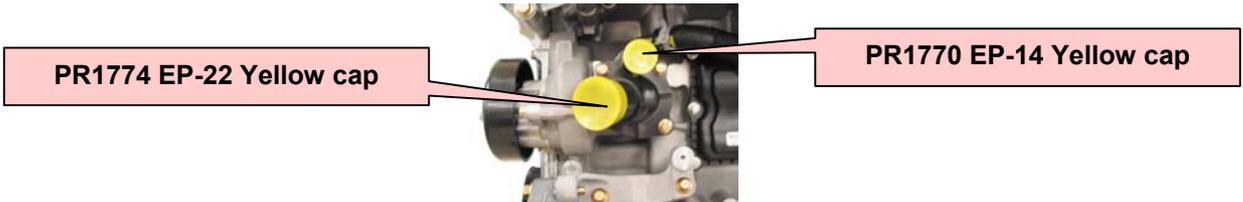
**PR1770 EP-14 Yellow cap**

## Post Dyno (cont.)

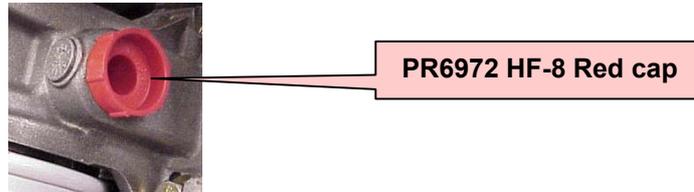
11. Fit 2 off PR1770 EP-14 yellow caps to the oil cooler pipes.



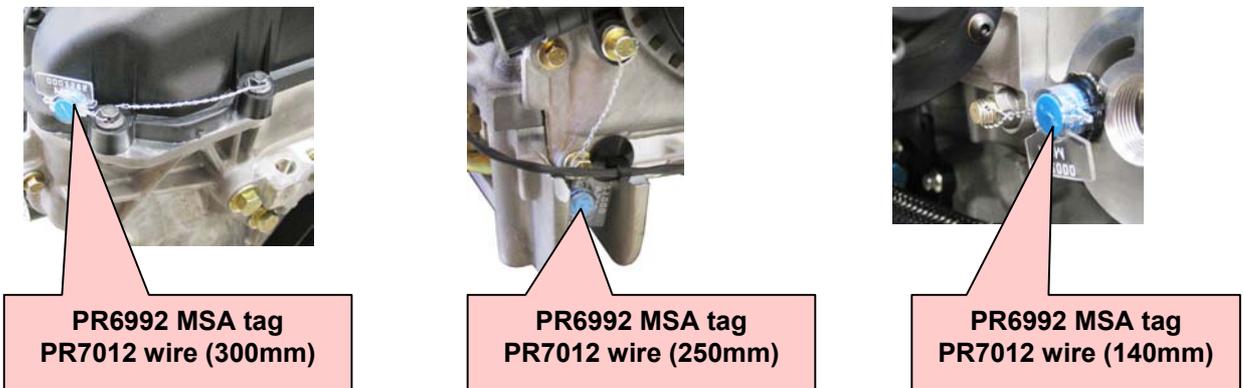
12. Fit 1 off PR1774 EP-22 and 1 off PR1770 EP-14 yellow caps to the thermostat housing.



13. Fit PR6972 HF-8 red cap to oil pressure transducer hole.



14. Fit 3 off PR6992 MSA security tags with PR7012 locking wire to the cam cover, crank sensor, rear lower throttle barrel stud and record serial numbers.



15. Fit the drive plate of PR6886 clutch to flywheel and support with clutch alignment tool.

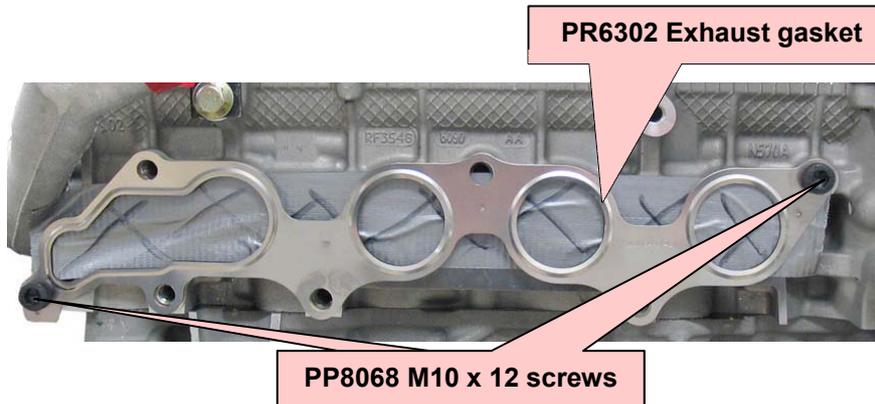


## Post Dyno (cont.)

16. Fit the pressure plate of PR6886 clutch and secure using 6 off PR6926 M8 x 16 Durlok bolts. With clutch aligning tool still fitted, torque clutch bolts evenly to 25Nm.



17. Tape up exhaust ports and fit PR6302 exhaust gasket with 2 off PP8068 M10 x 12 screws.



18. Remove and bag air filter. Fit 4 off PR6835 yellow caps to inlet trumpets.



19. Check engine with YD update sheet  
20. Ensure all paperwork has been correctly completed.  
21. Box engine and cover with GG0036 bag.  
22. Ensure YD8095 Handbook is signed by the engine builder and tester.  
23. Place YD8095 Handbook into a plastic sealable bag and supply with engine.  
24. Check the ECU is the correct spec (YD8083) and record the serial number.  
25. Place ECU in Jiffy bag and attach to engine.

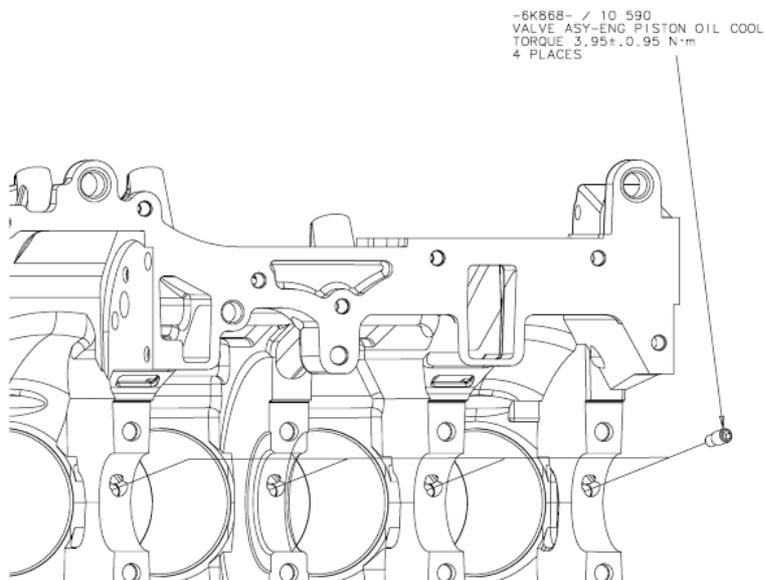
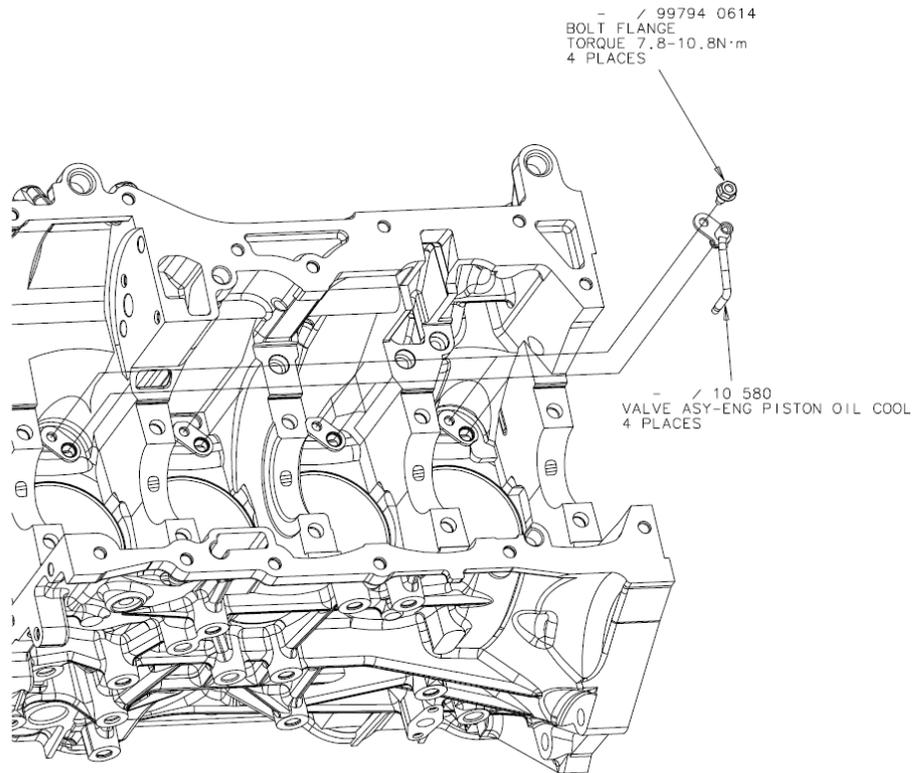
## Appendix 'A'

### Short Block Assembly (as supplied)

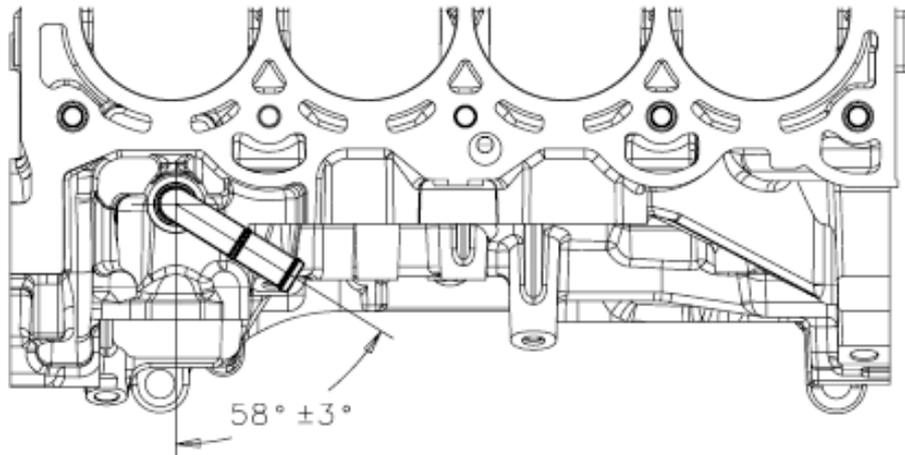
#### Preparation Work to be checked (do not disassemble):

Confirm the following Pipework, Jets and Galleries are fitted correctly:

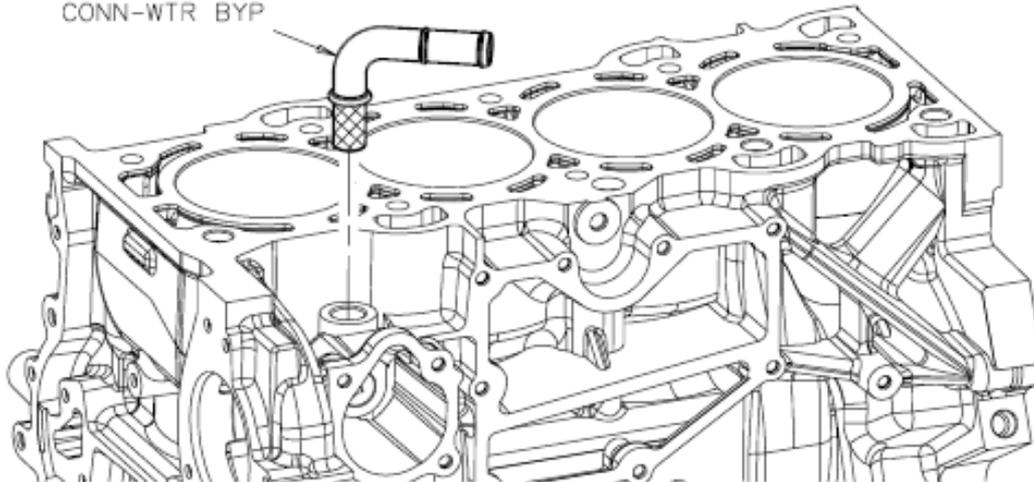
- Insert squirt jets as shown
- Insert oil control valve



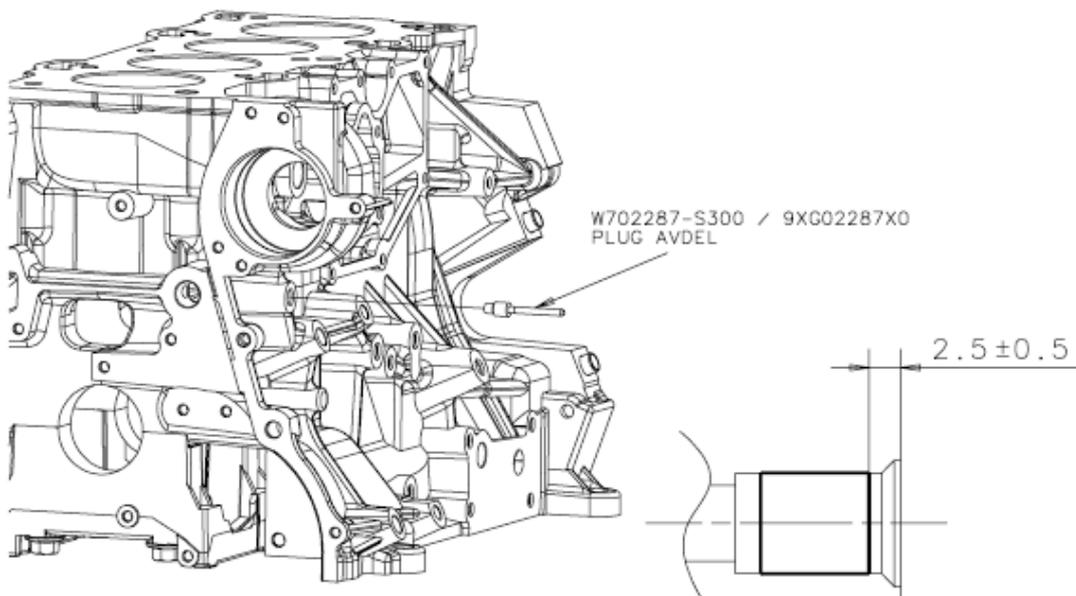
- Press pipe into block using collar not the pipe itself.  
Seal using Loctite 243



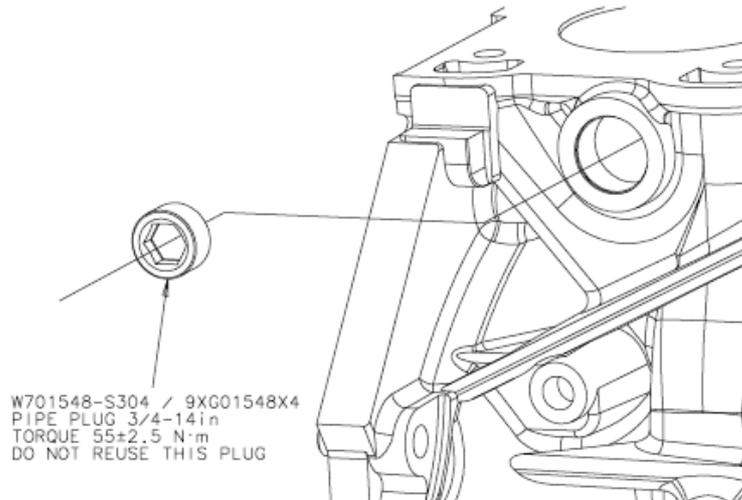
-8597-/15271  
CONN-WTR BYP



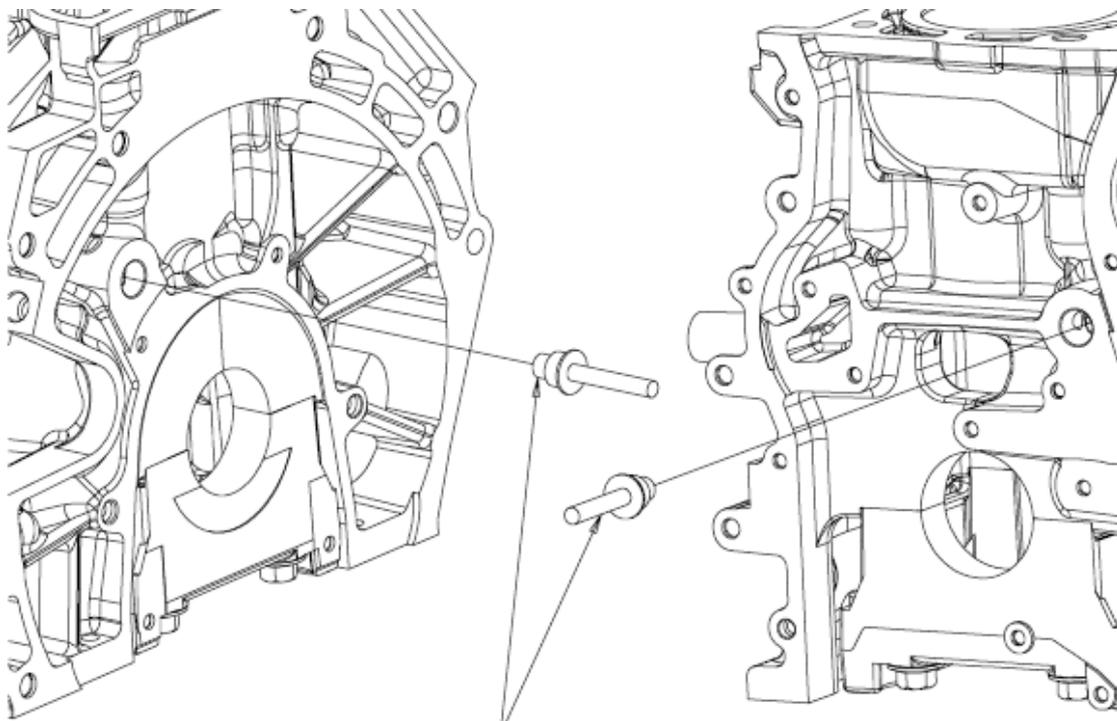
- Plug Gallery



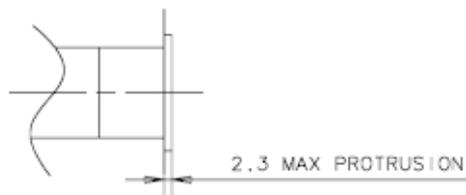
- Insert Bung



- Plug Oil Ways



W704456-S1300 / 9XG04456X0  
PLUG AVDEL  
2 PLACES



## Issue Change History

<b>Issue Number</b>	<b>Date</b>	<b>Change</b>
2	22/06/06	Removal of fuel rail insulators