



ANDHRA PRADESH STATE ROAD TRANSPORT CORPORATION
Mechanical Engineering Department, Office of the VC & MD,
Bus Bhavan, Mushirabad, Hyderabad - 500 624

Lr.No.OP4/462(1)/2012-MED,

CIRCULAR No: 10/2012-MED, Dt.03.04.2012

Sub: **MAINTENANCE** - Proper maintenance of TATA Engines at depots to improve life and reduce cost of overhaul - Certain instructions issued - Reg.

It is a matter of serious concern that the frequency of Engine changes has increased abnormally at the Depots in the recent months owing to several reasons.

The following data is self explanatory of Engine replacements in Tata area.

Area	Tata Fleet Held	Volume of operation in lakh kms upto Dec'11	Engines sent to workshops upto Dec'11	Engines supplied to Depots (Excl.scrap) upto Dec'11	Frequency of Engine change in lakh kms
VZM	2139	2223.00	642	466	4.77
VJA	2228	2267.00	677	430	5.27
KDP	2066	2204.00	936	558	3.95
TPT	1305	1364.00	468	356	3.83
Total	7738	8058.00	2723	1810	4.45

For about 7,738 Tata fleet, the volume of operations for 3 quarters of 2011-12 is 8058 lakh kms. Taking 12.50 lakh kms as average scrapped vehicle life and 7.66 lakh kms as OE engine mileage and 3.08 lakh kms as CO engine mileage, the total demand for engines during these 3 quarters should have been 1055 engines only. Whereas the actual supply of Tata engines during this period was as high as 1,810. Thus the Depots have consumed more than 755 engines than the estimated demand during the period of 9 months. Taking Rs.50,000/- as the average cost of each CO engine, the additional expenditure incurred because of excess consumption is about Rs.3.78 crores. This awful situation might have arisen either due to improper engine care at depots or poor quality of overhaul at workshops or combination of both.

It is a healthy practice that the engine replacement be taken place as per a precise pre-planned programme based on the wear & tear of components like Cylinder liners, Piston rings and bearings on completion of stipulated mileage so that the engine overhaul of highest quality at lesser expenditure can be achieved without any retrieval.

But in majority of the cases, the engines replacement is taking place abruptly because of serious failures like seizure of Pistons/rings, seizure of Crankshaft bearings, breakage of Connecting rods/bolts, Crankshaft, Cam shafts, Cylinder block and cracks in Cylinder bores etc thus resulting in irreparable damage to the expensive components.

The Corporation is forced to procure new engine blocks, Crankshafts, Cylinder Heads and Connecting rods to meet the demand of engines by spending huge amounts. The quantum of such procurement has increased drastically in the recent past because of maintenance abuses. Unless we aim at achieving an average ultimate life of 13 to 14 lakh kms for an engine block and crankshaft, it is difficult to curtail the expenditure on procurement of new Cylinder blocks and crankshafts.

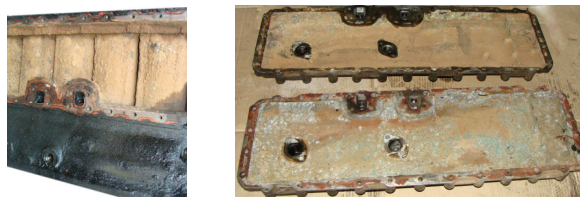
Apart from direct financial losses, there are several other repercussions like cancellation of kms, loss of earnings, under-utilization of fleet, disruption in scheduled maintenance, inconvenience to commuters etc because of such unforeseen and unplanned engine replacements at depots.

Indulging in frequent engine changes not only affects the manpower utilization at depots as the manpower has to be diverted to attend the relief of vehicle breakdowns and attend unplanned replacement of engines but also result in backlog of Preventive maintenance schedules.

A thorough study of stripped engines at various workshops has revealed that majority of the abrupt engine failures could have been averted had the depots taken proper care in engine maintenance.

The stripping analysis of Engines at Workshops reveals that on an average

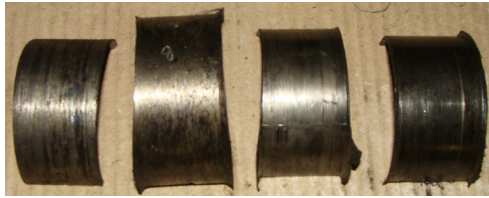
- 40% of engines are subjected to overheating due to improper cooling system,
- 27% of engines are subjected to poor lubrication and
- 20% to improper Air intake system.



Engine block & Cooler plates with Heavy scale formation
(Coolant additive not used in recommended ratio)



Severe scoring on Cylinder Liner & Pistons
(Subjected to severe overheating due to defective Cooling system)



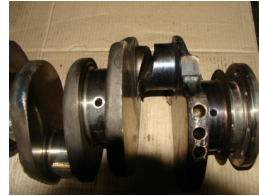
Badly worn Bearings
(Starvation of engine oil)



Broken Con-rod bolts



Broken Engine Block



Broken Crankshaft

There is every scope for improving the life of engines by taking proper care on maintenance of engines.

There are ample guidelines through MED circulars on better maintenance of vital systems like Air intake, Cooling, Lubrication, Fuel and Engine suspension which greatly influence the performance and life engines. But it is felt that some laxity is prevailing at depots in implementing these guidelines. The following are the common lapses observed in Engine maintenance at Depots.

- Badly diluted coolant mixture
- Missing/Loose Radiator caps & usage of non-genuine Pressure caps (pressure setting not matching with the OE recommendation)
- Loose mounting of Radiator Assembly
- Blocked Intercooler/ Radiator fins
- Missing Radiator shrouds
- Low coolant level. Coolant leakage from Radiator, rubber hoses, Cooler plate etc.
- Overfilling of coolant (without allowing space for air in De-aeration tank)
- Blocked de-aeration holes
- Non functioning of Coolant temperature gauges
- Defective/ missing thermostats
- Non-functioning of Viscous fan, broken fan blades, loose fan belts
- Defective water pump
- Defective fuel injectors, incorrect FIP timing, choked exhaust system
- Choked Air filters
- Low engine oil level
- Non functioning of Oil pressure gauges/ low pressure indicators
- Improper grade of engine oil and delayed engine oil/filter changes
- Leakage of engine oil from seals, gaskets and pipes etc
- Loose engine mounting bolts & damaged mounting pads.
- Worn out Turbocharger seals
- Crankcase dilution
- Defective air intake system. Dust entry into Air intake system due to loose/missing hose clamps, damaged rubber hoses/metallic pipes.
- Missing/loose Air compressor suction hose.
- Incorrect valve clearance

Since each of the above systems play equivalent role in achieving optimum engine life, it is felt essential to pay special focus on these systems at all depots as a drive.

The following **8 point programme** is evolved in this regard for strict implementation at all Depots of Tata area with a view to improve the life of engines and reduce the expenditure.

1. Constitute **exclusive teams consisting of a Mechanical Supervisor, one Mechanic and one Shramik** and take **accurate census** on the condition of various items of the engines (furnished in the annexure) on **100% vehicles of the Depot**. More than one team may be engaged if the fleet strength of the depot is high.
2. **Consolidate the data** obtained through physical census.
3. **Rectify the minor deficiencies within 3 days** after conducting census by engaging the above team during the course of Sch-I/II maintenance.
4. Prepare the list of various items required for total rectification of deficiencies. Place **special indents on Zonal Stores for supply** and collect the materials within one week.
5. Prepare a **time bound programme for rectification of defects which necessitate detention of vehicles** for attention duly keeping the required spare parts readily available.
6. **Complete the task on 100% vehicles within 2 weeks** and submit detailed **compliance report to the respective Dy.CMEs**.

The Coolant Temperature gauge and Engine Oil Pressure gauge/ Low oil pressure indicators shall always be kept in proper working condition in all vehicles under any circumstance after this Drive.

7. **Sensitize the Drivers on identifying the engine defects by way of Coolant Temperature gauge and Engine Oil Pressure gauge/ Low oil pressure indicators** with the help of Safety Instructors covering 100% drivers of the Depot.

The Drivers must be suitably educated to stop the engines if the engine oil pressure falls below **0.50 bar (for 697)** and **0.69 bar (for Cummins) at idling speed** and **2.50 bar (for 697)** and **2.07 bar (for Cummins) at rated speed**.

Similarly, the engine **shall not be operated if the coolant temperature exceeds 100°C (falls in Red band)**

The Drivers shall be instructed to indicate the defects in the vehicle logsheets which they have observed through dashboard.

The observations made by the Drivers and as reported through logsheet remarks shall not be neglected by the Maintenance staff. The reasons for high coolant temperature and low engine oil pressure shall be thoroughly investigated and the vehicle shall not be booked for service until the defects are totally rectified.

8. Implement the following standing instructions on Engine maintenance with true spirit
- Identify the vehicles for Top-overhaul in a systematic manner by 1st day of every month based on engine blow-by condition. The guidelines issued vide circular No.40/92-MED., Dt. 04 08 1992 and circular No. 3/2000-MED, Dated 29.2.2000 shall be followed in this regard.
 - Never resort to replace the damaged liners, Pistons and con-rod bearings at depot level. Send the engines to Workshops for complete overhaul in such cases.
 - Carry out diagnostic analysis of engines failed at low mileage and take appropriate action to avoid recurrence of such failures.
 - Implement the instructions on maintenance of engine Cooling system issued vide circular No. 18/2007-MED, Dt.06/09/2007 religiously
 - Keep adequate stocks of different types of Engine oils for various types of engines and never deviate the instructions in filling the recommended grades. Strictly adhere to recommended schedule of changing engine oil and filters and do not allow delayed oil changes under any circumstance.

Engine Model	Recommendge Oil grade	Capacity	Change Kms
TATA 1510 - 697	SAE 30	16.5	18000
Tata 1512 -TC (Old)	SAE15w40 CF4 MB 228.1	16.5	18000
TATA 1510 - CMVR	SAE 15w40 CH4+ MB 228.1	16.5	36000
TATA 1510/1613 - BS2	SAE 15w40 CH4+ MB 228.2	16.5	36000
TATA 1512- BS3 FE Mofussil	SAE 15w40 CI4+ (with LF9028 filter)	16.5	18000
TATA 1618 - BS3 FE City	SAE 15w40 CI4+ (with LF9028 filter)	16.5	9000

- Pay adequate attention to timely replacement of damaged engine mounting beds and periodically inspect the tightness of engine mounting bolts. Defective engine suspension like loose engine mounting bolts and damaged mounting pads will result in heavy engine vibrations which in turn may lead to leakage of engine oil from gaskets due to loosening of fasteners.
- Always ensure proper connections to the Air filter Service Indicator. Choked Air filters if ignored may not only affect the engine performance but also lead to internal seepage of engine oil through Turbocharger seals.

All the Depot Managers & Maintenance Incharges of Depots holding Tata Fleet shall bestow special attention to implement the above instructions on Engine maintenance.

The Dy.CMEs are advised to monitor the situation at the depots under their Jurisdiction and submit a compliance report to respective EDs (Zones) and ED(E&IT) in this regard.

The COS' of Tata area are advised to ensure adequate supply of the spares required for effective engine maintenance at all Depots.

The WMs of Tata area are advised to ensure proper quality of Engine overhaul and avoid premature failures.



VICE CHAIRMAN & MANAGING DIRECTOR

To

All Depot Managers of Tata Area for necessary action.

Copy to: Dir (V&S), ED (E&IT), ED (O&MIS), ED (A&AM), FA, CAO, ED (HRD&Med) for infn.

Copy to: all EDs (Zones) for necessary action.

Copy to: All RMs for necessary action.

Copy to: CME (O), CCOS, CA, CFM, CME(C&B), CE (IT), CPM, CM (HRD) for information

Copy to: DyCME (O), DyCME (P), DyCME(C&B), DyCME (IED), DyCAO (SP&A), CSTO, COS(C) I & II for information.

Copy to: All DyCMEs, COSs & DyCAOs of Tata area for necessary action.

Copy to: WMs of Tata Area Workshops for necessary action.

Copy to: All AOs for information & n/action.

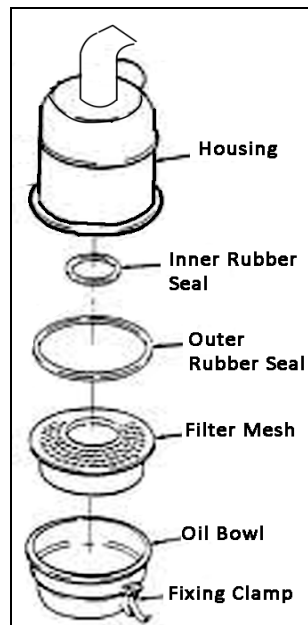
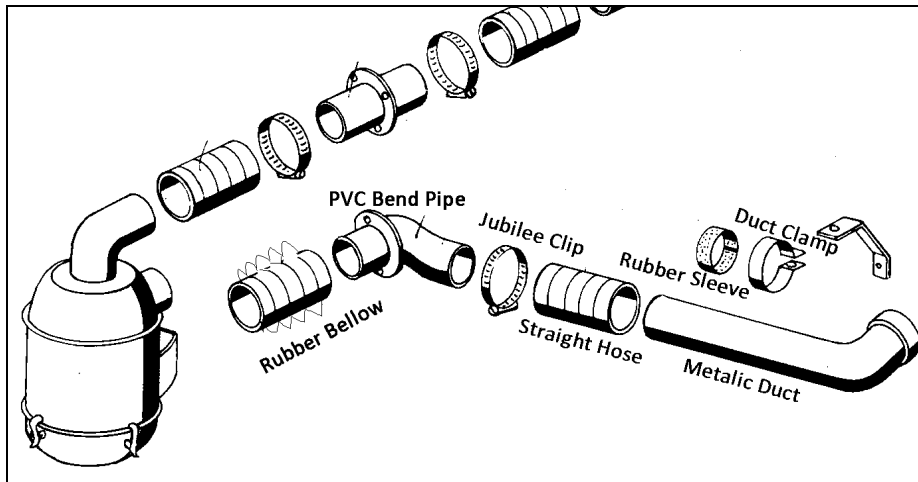
Copy to: All Principals of ZSTCs, BTC, HPT & TA/HPT for information.

Copy to: All Maintenance In-charges of Tata area depots for necessary action.

Copy to: RAO, AG Audit, Bus Bhavan, Hyderabad for information.

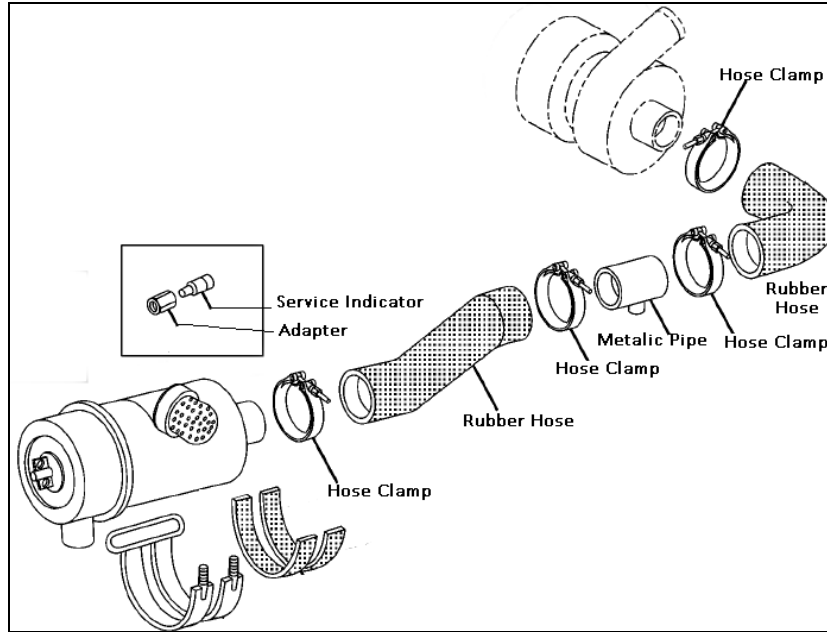
Copy to: Manuals section for record.

OIL BATH TYPE AIR CLEANER - 697 NA ENGINES

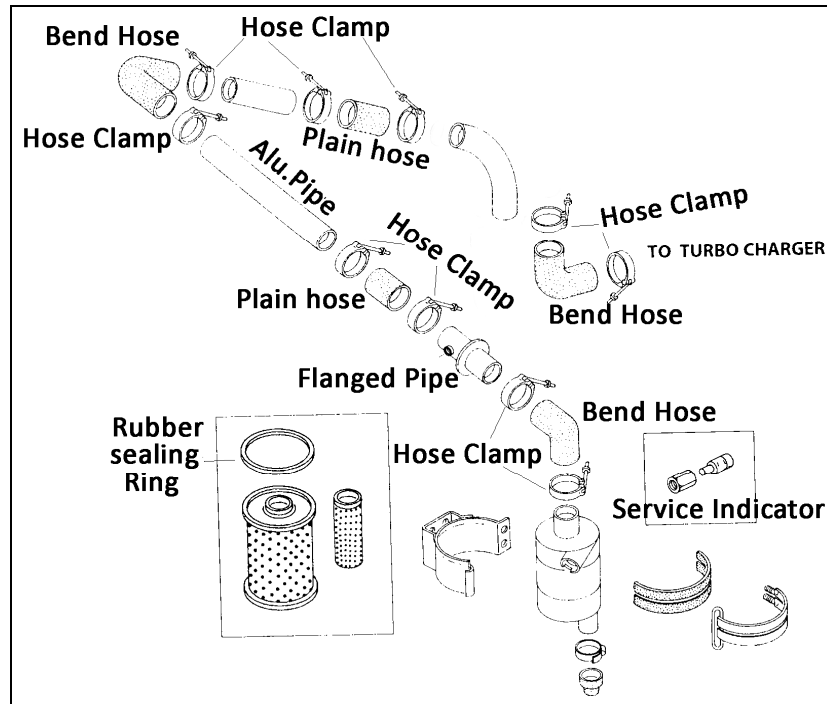


VEHICLE No:		ENGINE TYPE:	Dt.of Check:	
	Items to be checked	Condition	Remarks	
Air Filter (Oil Bath)				
1	Rubber Seal (Small)			
2	Rubber Seal (Big)			
3	Air cleaner oil level			
4	Air cleaner bottom fixing clamps			
5	Filter mesh			
6	A/C Outlet Rubber Bellow			
7	A/C Outlet PVC bend pipe			
8	A/C outlet Rubber Hose			
9	Pipe Clamps (Jubilee Clips)			
10	Metalic pipe Rubber Sleeve			
11	Metalic pipe clamp & bracket			
12	Air Comp. Suction hose			

DRY TYPE AIR FILTER FOR CUMMINS



DRY TYPE AIR FILTER FOR 697 CMVR & BS-II MODELS



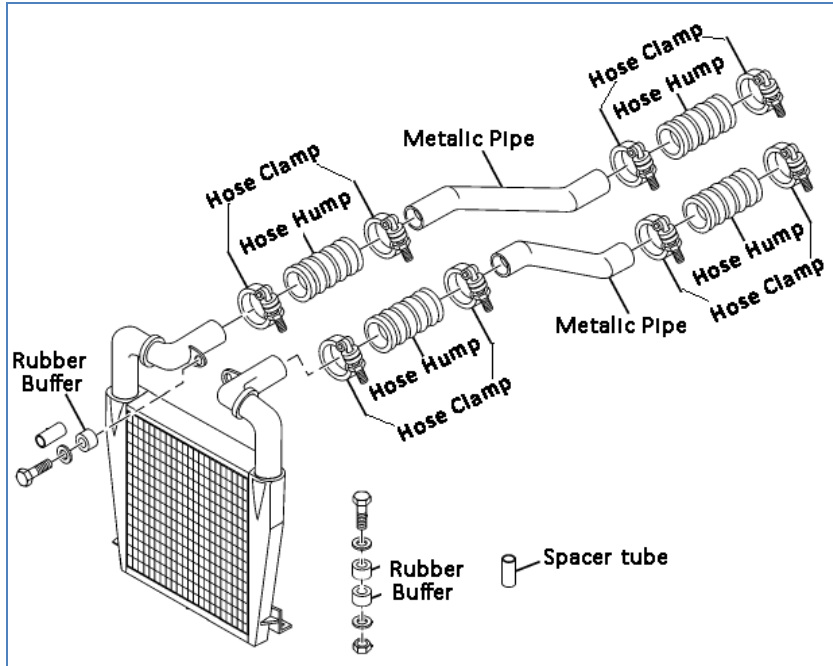
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ENGINE TYPE:

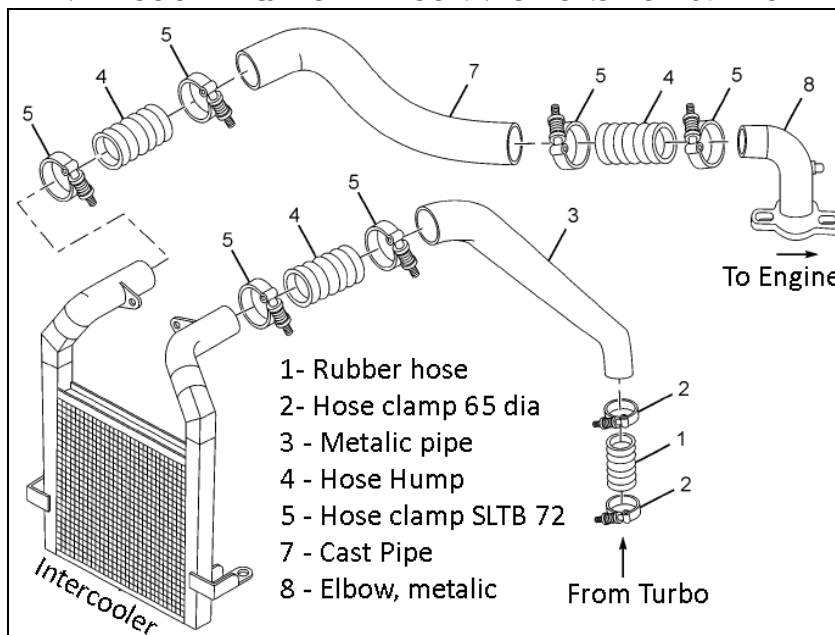
Dt. of Check:

	Items to be checked	Condition	Remarks
Air Filter (Dry type)			
1	Rubber seal for End Cover		
2	Rubberized metallic washer for wing nut		
3	Service Indicator Pipe connections		
4	Service Indicator		
5	Rubber Hoses (Bend & Straight)		
6	Hose Clamps (Jubilee Clips)		
7	Air Comp. Suction hose & clamps		

INTERCOOLER & ITS PIPE CONNECTIONS FOR CUMMINS BS-III



INTERCOOLER & ITS PIPE CONNECTIONS FOR 697 BS-II



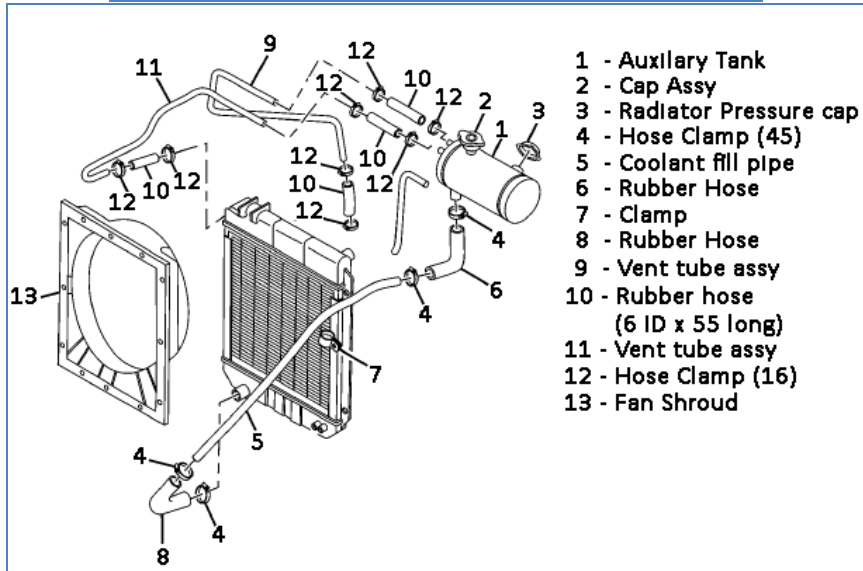
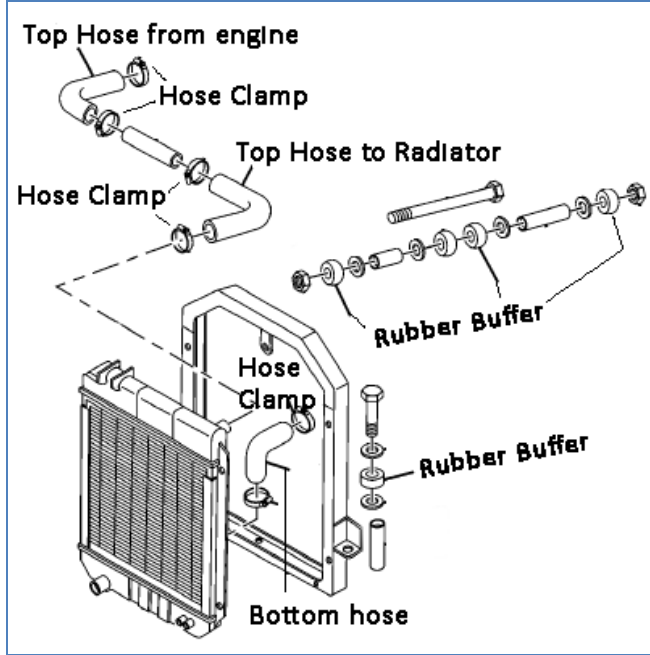
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ENGINE TYPE:

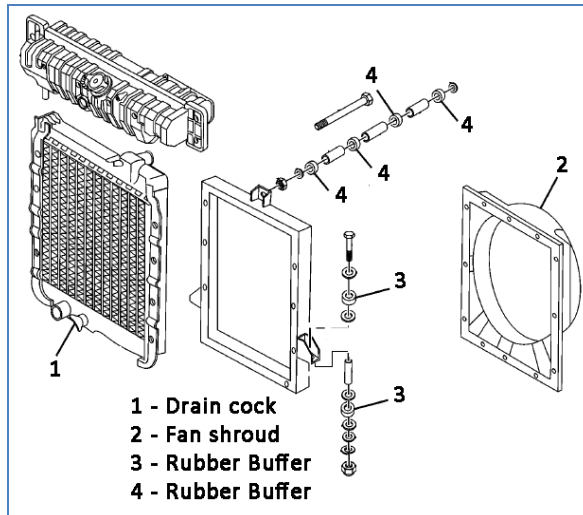
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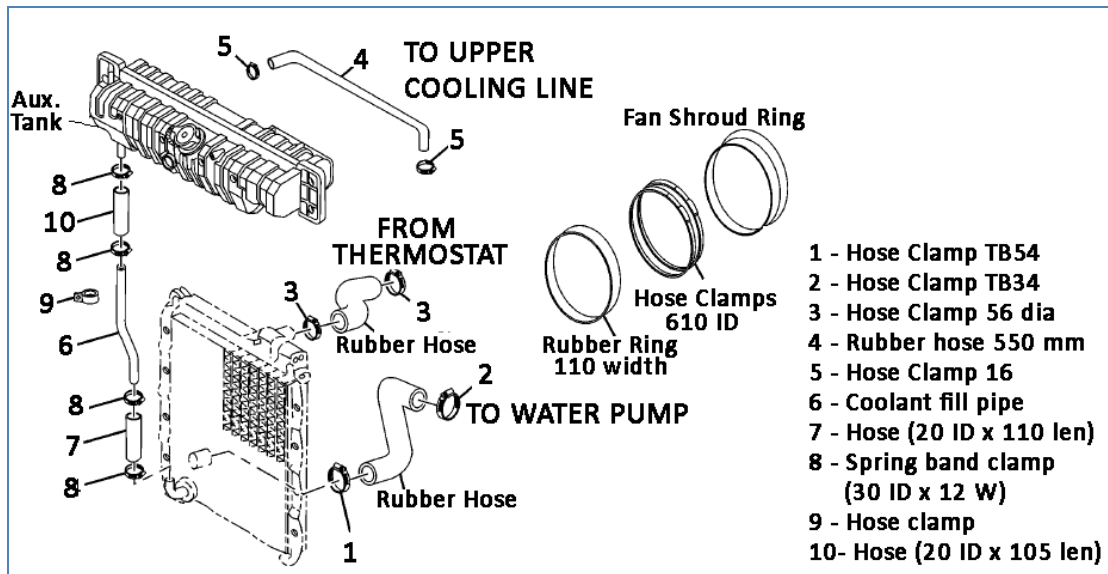
Items to be checked	Condition	Remarks
Intercooler		
1 Intercooler mounting bolts (4 nos)		
2 Intercooler mounting Rubber buffers (6 nos)		
3 Intercooler Hoses (4 nos)		
4 Hose clamps (Jubilee clips 8 nos)		
5 Intercooler fins condition		
6 Cleanliness between Intercooler & Radiator		
7 Front Grill (free flow of air)		

RADIATOR MOUNTING & HOSES - CUMMINS BS-III



RADIATOR MOUNTING & HOSES - 697 CMVR & BS-II





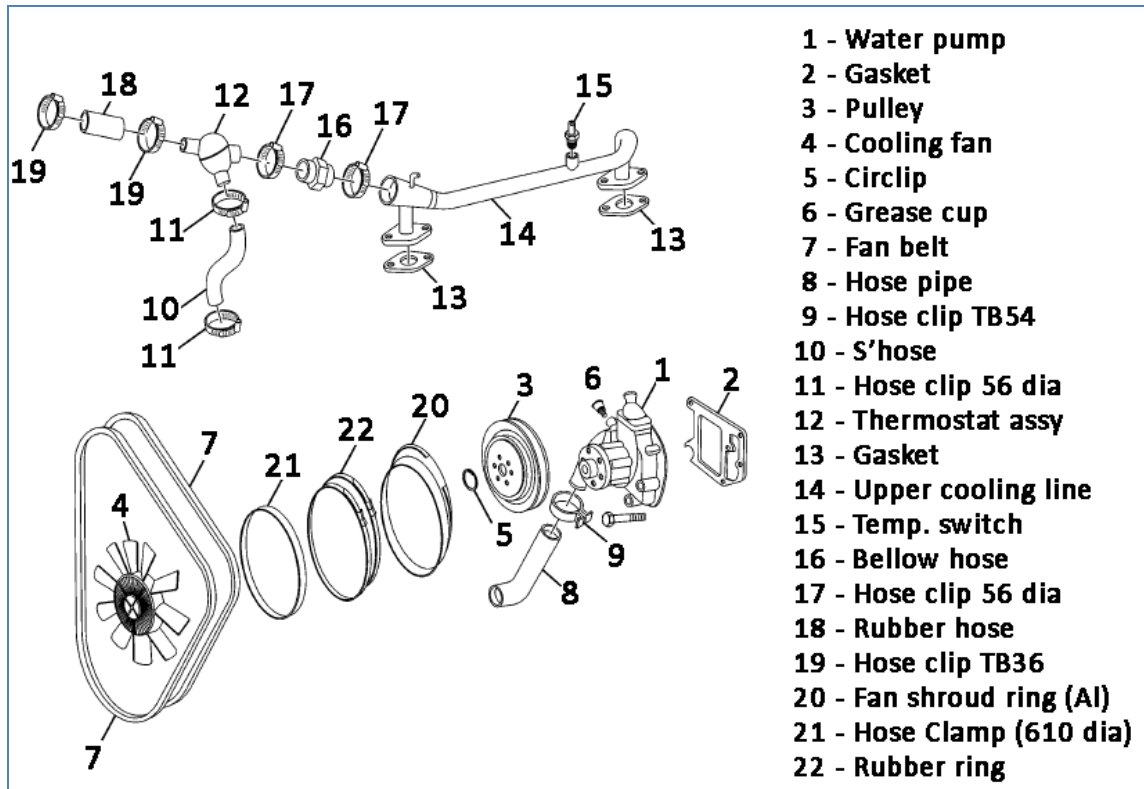
VEHICLE No:

ENGINE TYPE:

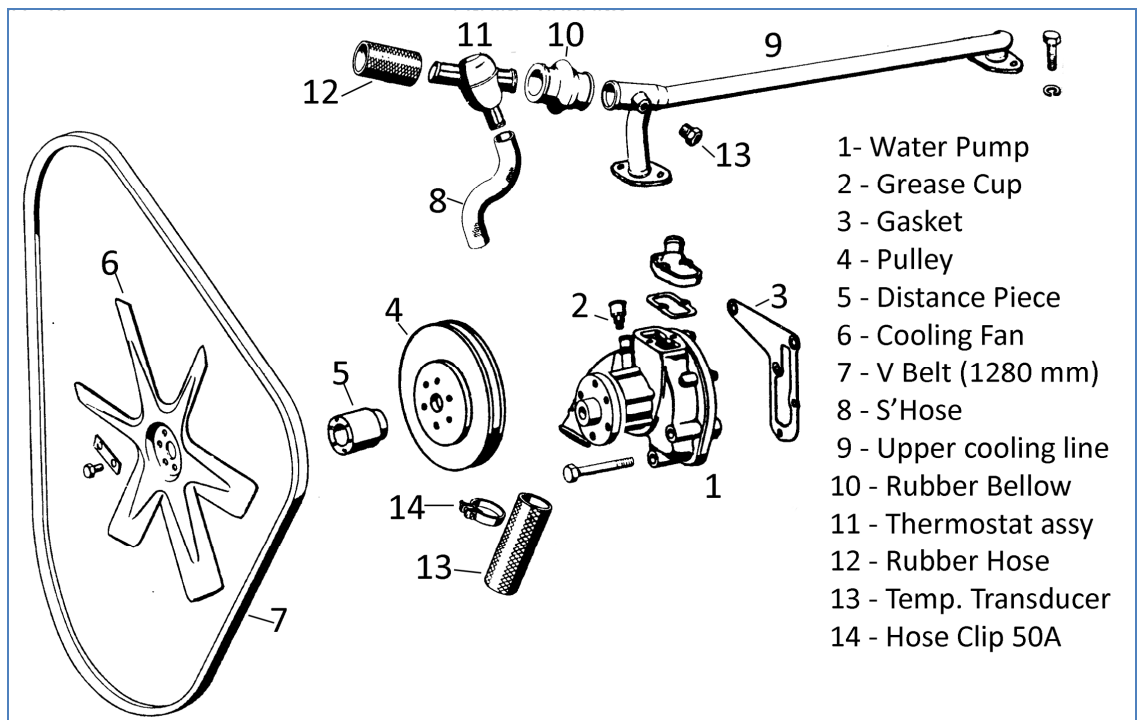
Dt. of Check:

	Items to be checked	Condition	Remarks
Radiator			
1	Radiator Mounting bolts		
2	Radiator Stay bolts		
3	Radiator mounting rubber buffers		
4	Radiator fins		
5	Radiator core		
6	Radiator Shroud		
7	Coolant concentration		
8	Coolant level		
9	Coolant Visibility in translucent tank		
10	Radiator Pressure Cap with chain		
11	De-areation holes in auxiliary tank & upper tank		
12	De-areation hoses & clamps		
13	Radiator Bottom hose & clamps		
14	Radiator Top hose & Clamps		
15	Pipe connection between Aux tank & Radiator Bottom tank		
16	Temp. difference between Top & Bottom tanks (not < 15° C)		

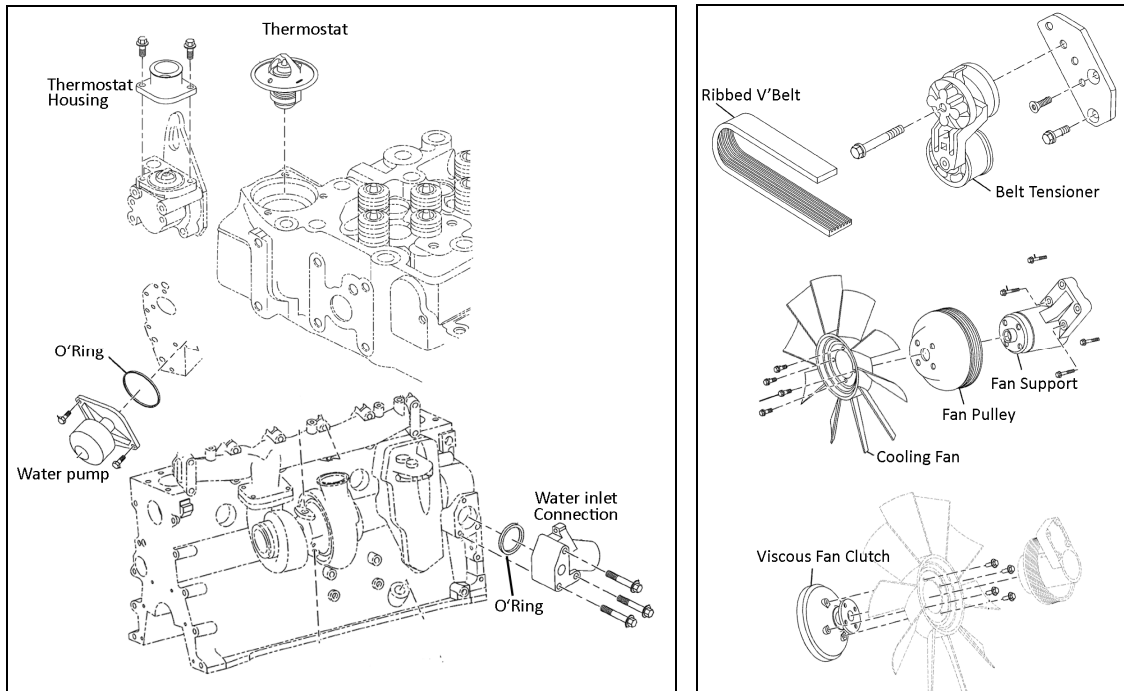
WATER PUMP, COOLING FAN & UPPER COOLING LINES-697 BS-II



WATER PUMP, COOLING FAN & UPPER COOLING LINES-697 NA

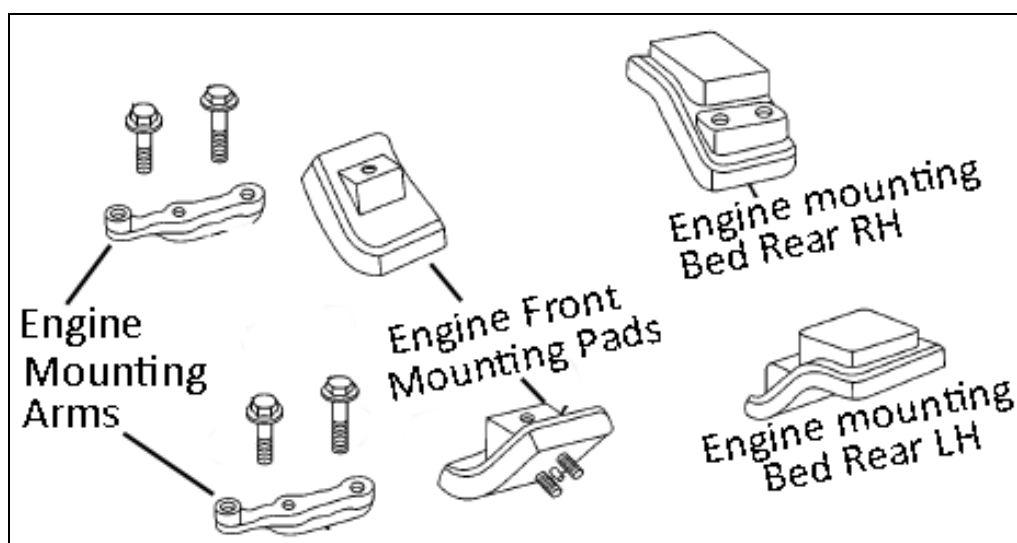


WATER PUMP, COOLING FAN & UPPER COOLING LINES-CUMMINS

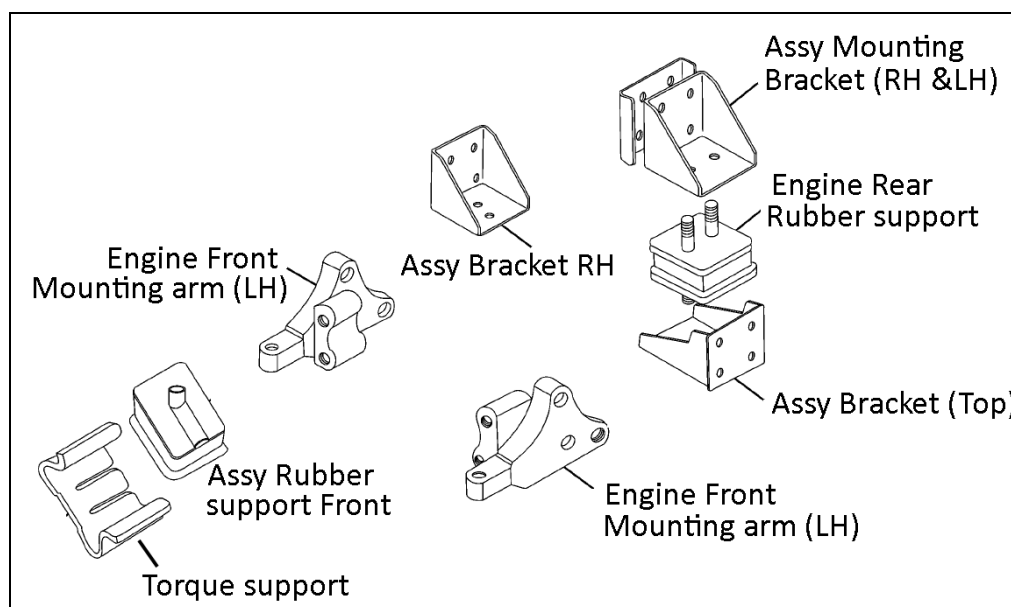


VEHICLE No:	ENGINE TYPE:	Dt. of Check:		
Items to be checked		Condition	Remarks	
Upper cooling System				
1	Thermostat (start opening at 83 ^o C; full opening at 94 ^o C)			
2	Temperature Transducer			
3	Working condition of Temp. gauge			
4	Upper cooling pipe Bellow Hose & clamps			
5	S' Hose (Thermostat to W.Pump) & Clamps			
6	De-aeration hole in Cylinder Head (Cummins)			
7	De-aeration hole in upper cooling line			
8	Air Compressor Water lines & clamps			
Water Pump & Cooling Fan				
1	Water pump grease cup			
2	Viscous fan working condition			
3	Fan blades condition			
4	Cleanliness of Bi-metallic coil/ Strip			
5	Fan Belt Tension			
6	Belt Tensioner (Cummins)			
7	Alternator bottom clamp (Cummins)			
8	Alternator foundation			
9	Alternator adjustment bracket			
10	Water pump gasket			

ENGINE SUSPENSION ALL 697 MODEL ENGINES



ENGINE SUSPENSION FOR CUMMINS ENGINE



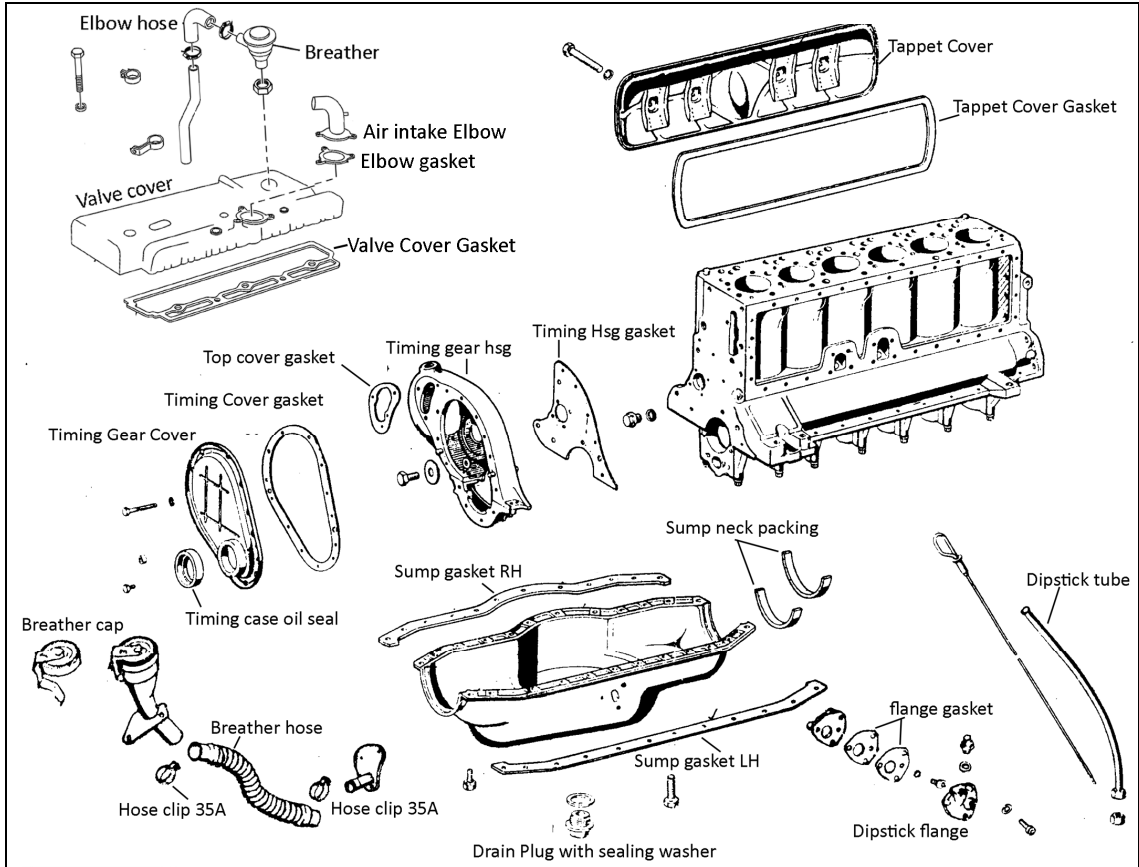
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ENGINE TYPE:

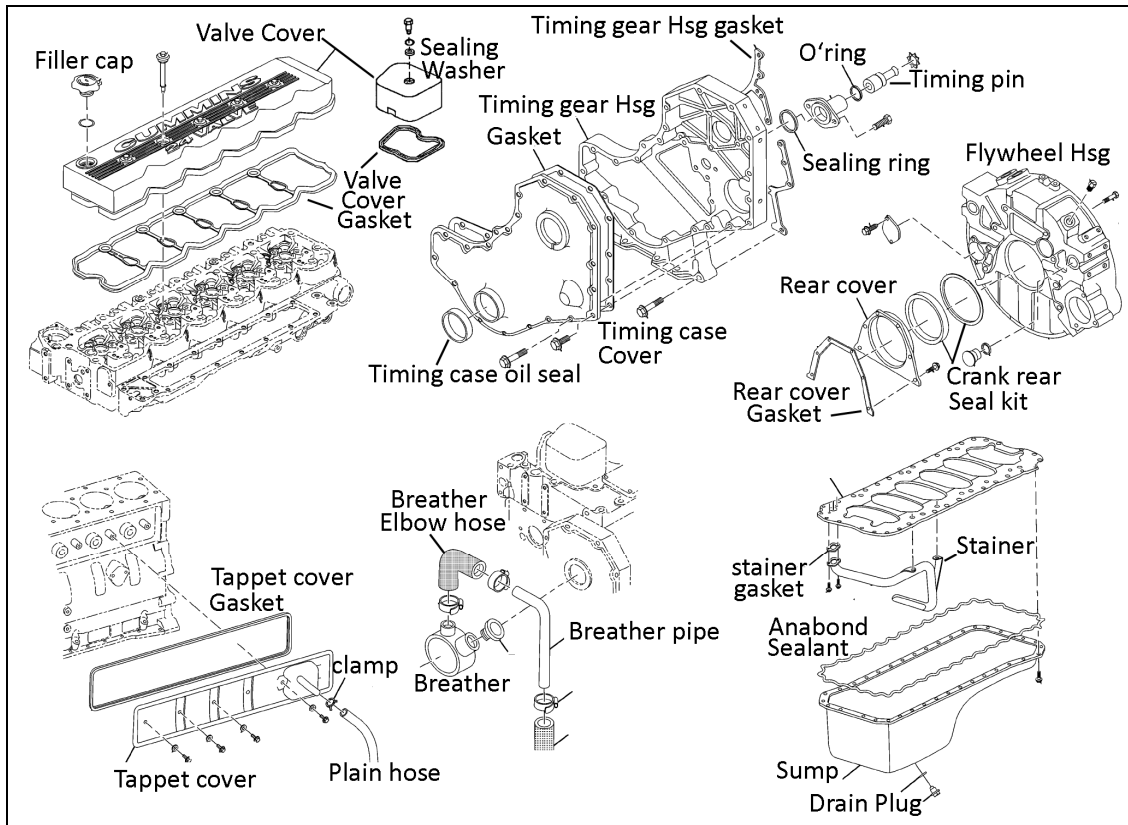
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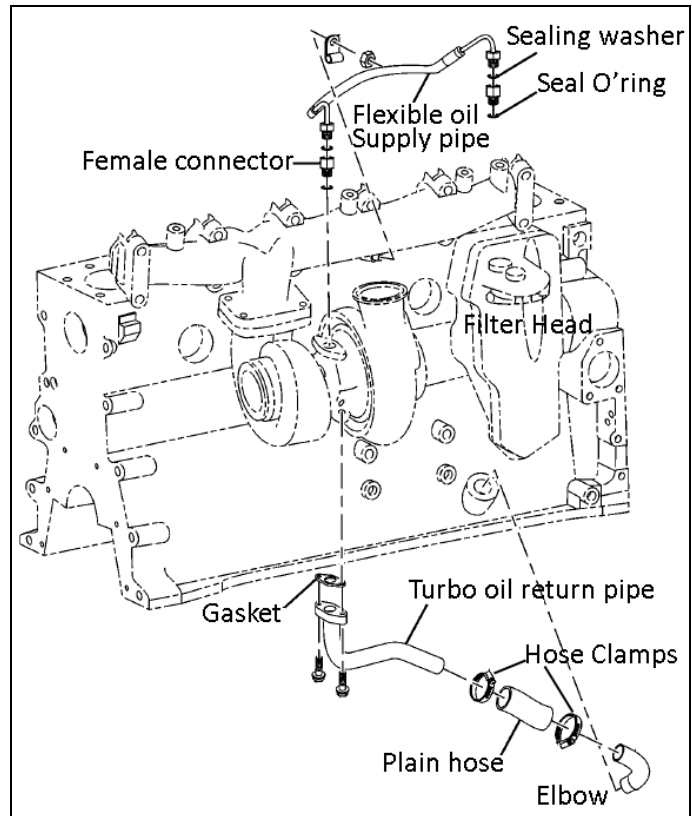
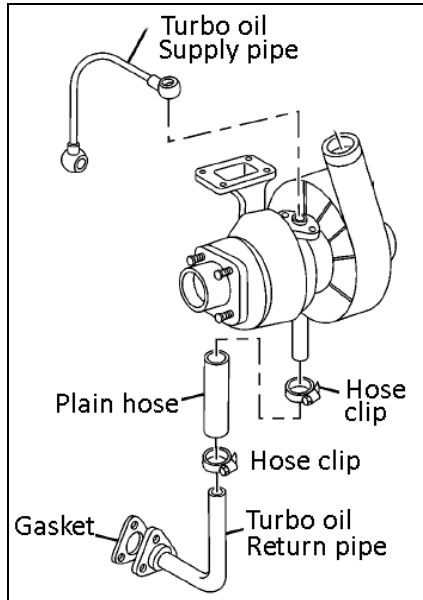
	Items to be checked	Condition	Remarks
Engine Suspension & Fuel			
1	Engine front mounting beds & bolts		
2	Engine rear mounting beds & bolts		
3	FIP timing		
4	Tappet clearance		
5	Exhaust brake Buttery fly valve		
6	Injector pressure		
7	Connection to KSB (Rotary FIP)		

GASKETS & SEALING RINGS FOR 697 LUBRICATION SYSTEM



GASKETS & SEALING RINGS FOR CUMMINS LUBRICATION SYSTEM





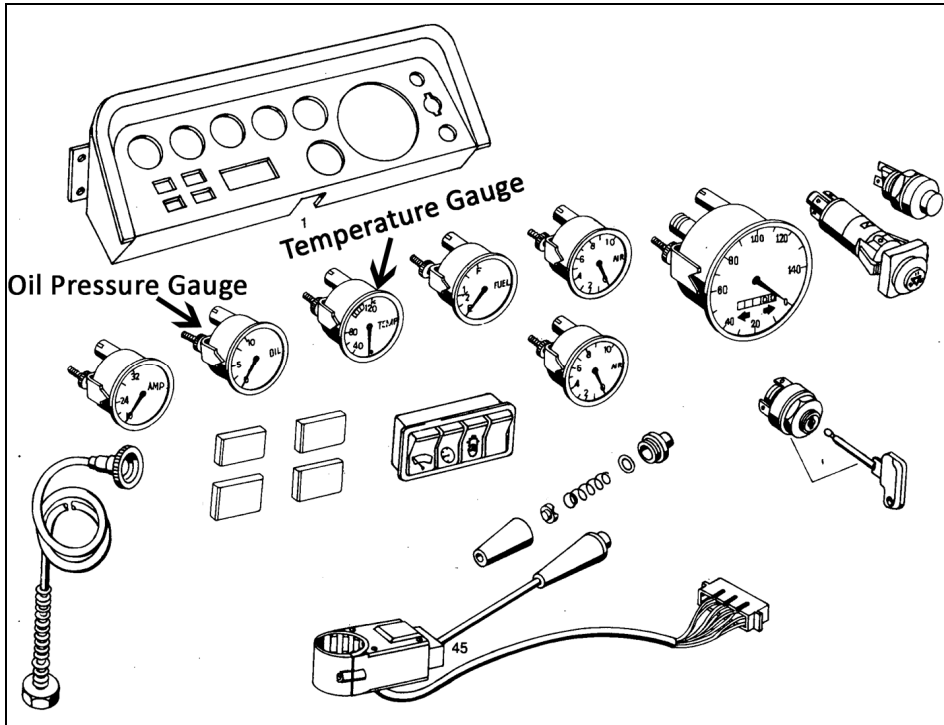
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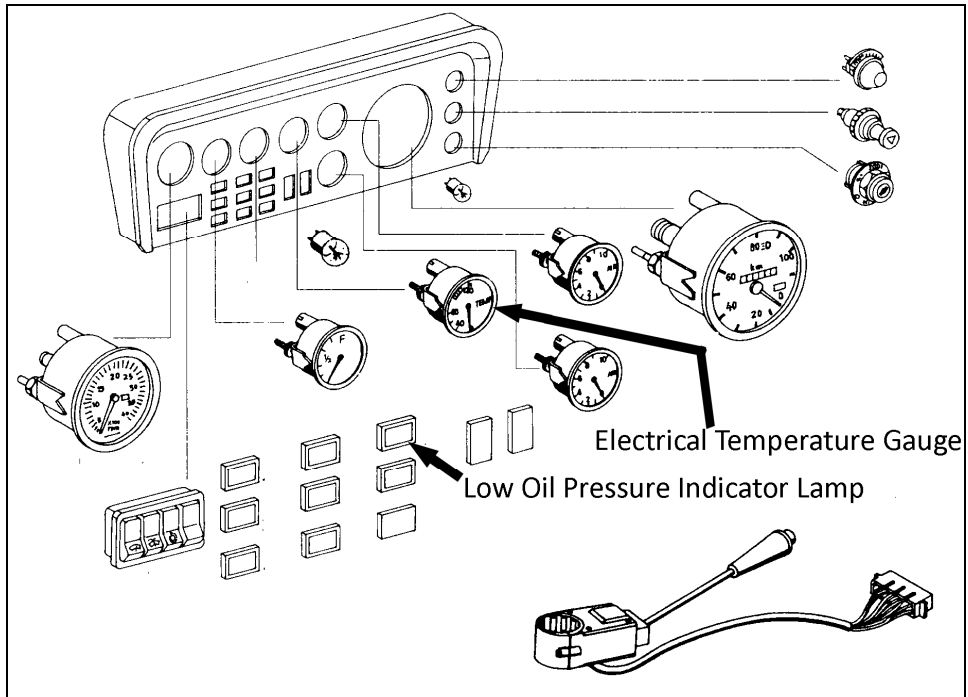
Dt.of Check:

	Items to be checked	Condition	Remarks
Engine Lubrication			
1	Correctness of Dipstick		
2	Engine oil Grade		
3	Engine oil level		
4	Engine oil Pressure transducer		
5	Engine oil pressure gauge connection		
6	Engine oil pressure gauge working condition		
7	Crankcase dilution		
8	Engine breather condition		
9	Sump gaskets		
10	Sump drain plug		
11	Timing Case Gasket		
12	Timing case oil seal		
13	Crank shaft rear oil seal		
14	Valve cover gasket		
15	Tappet cover (Side cover) gasket		
16	FIP mounting gasket		
17	Lube oil supply connection to FIP		
18	Lube oil supply connection to Air Compressor		
19	Lube oil supply connection to Turbocharger		
20	Turbocharger oil return line		
21	Turbocharger internal oil seepage		
22	Engine Oil filter head		
23	Air Compressor oil throw		
24	Engine oil Cooler gasket		

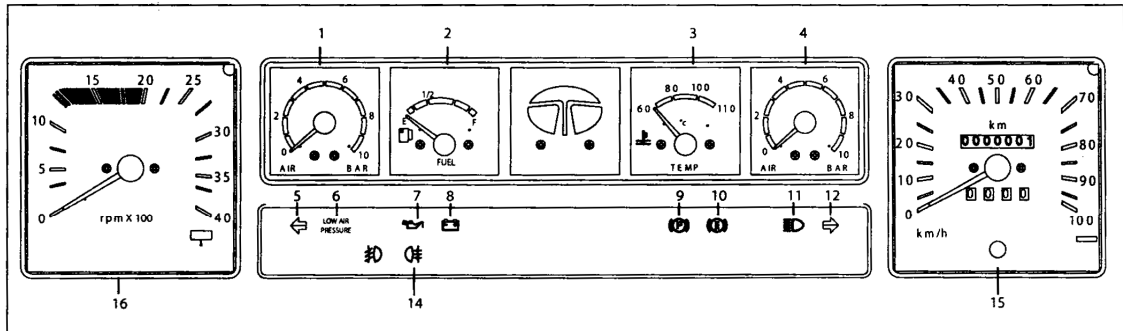
GAUGES FOR 697 OLD MODEL



GAUGES FOR CUMMINS OLD MODEL



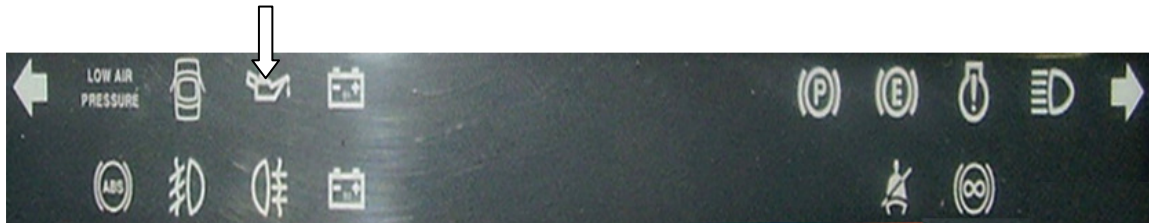
GAUGES FOR 697 BS-II & CUMMINS BS-III



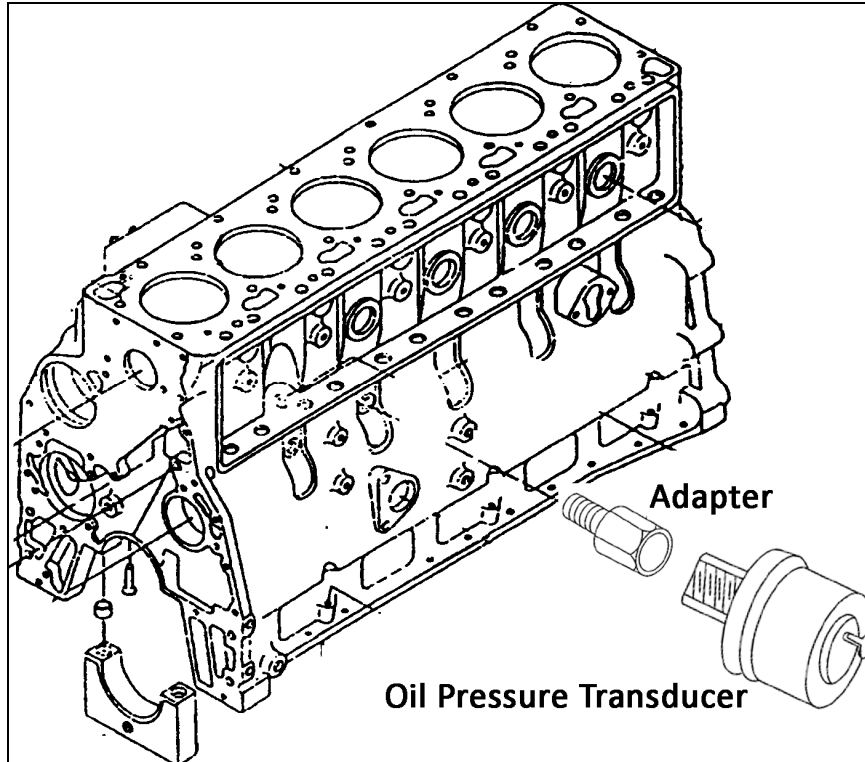
Instrument cluster : Gauges & indicators

- | | |
|---|--|
| 1. Air pressure gauge (I) | 10. Exhaust brake indicator |
| 2. Fuel gauge | 11. High beam indicator |
| 3. Coolant temperature gauge | 12. Right turn indicator |
| 4. Air pressure gauge (II) | 13. Front fog lamp indicator |
| 5. Left turn indicator | 14. Rear fog lamp indicator |
| 6. Low air pressure indicator | 15. Speedometer with
odometer & tripmeter |
| 7. Low engine oil pressure
indicator | 16. RPM meter |
| 8. Battery charging indicator | |
| 9. Parking brake indicator | |

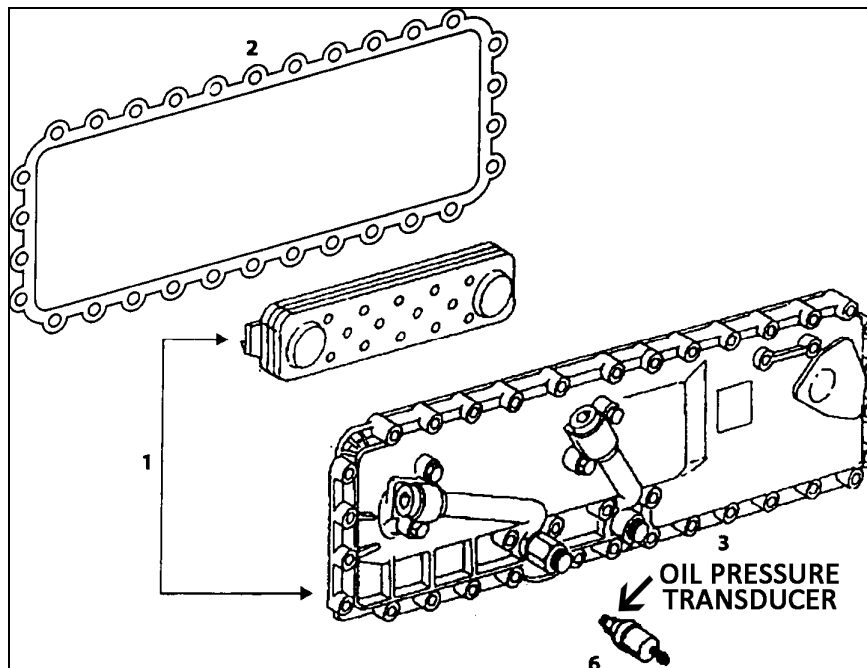
LOW ENGINE OIL PRESSURE INDICATOR



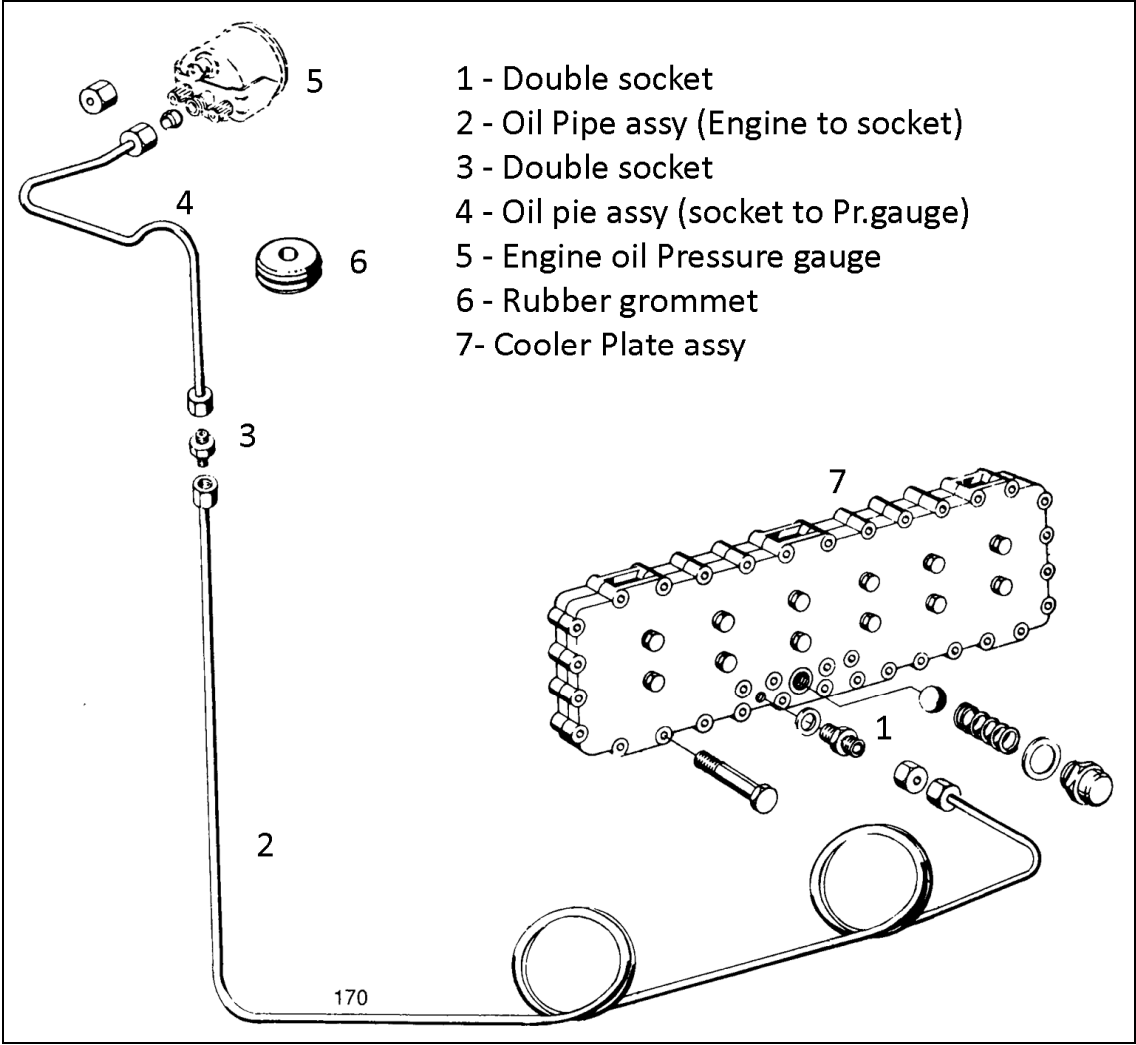
ENGINE OIL PRESSURE TRANSDUCER FOR CUMMINS



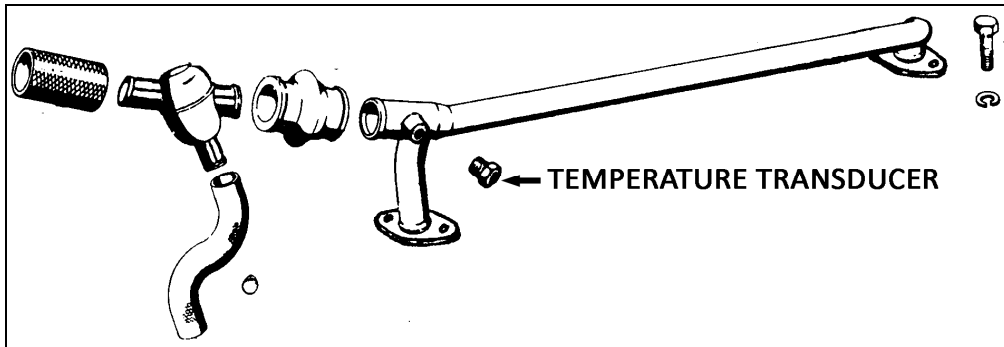
ENGINE OIL PRESSURE TRANSDUCER FOR 697 BS-II



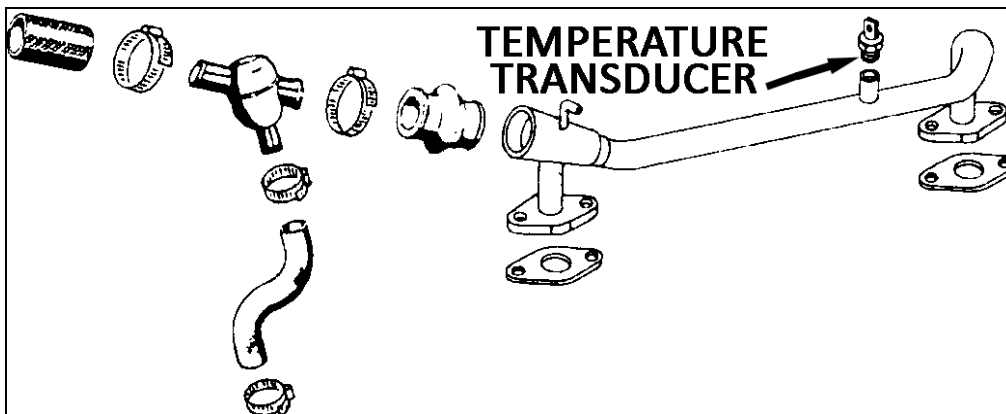
ENGINE OIL PRESSURE GAUGE CONNECTIONS FOR 697 NA & CMVR



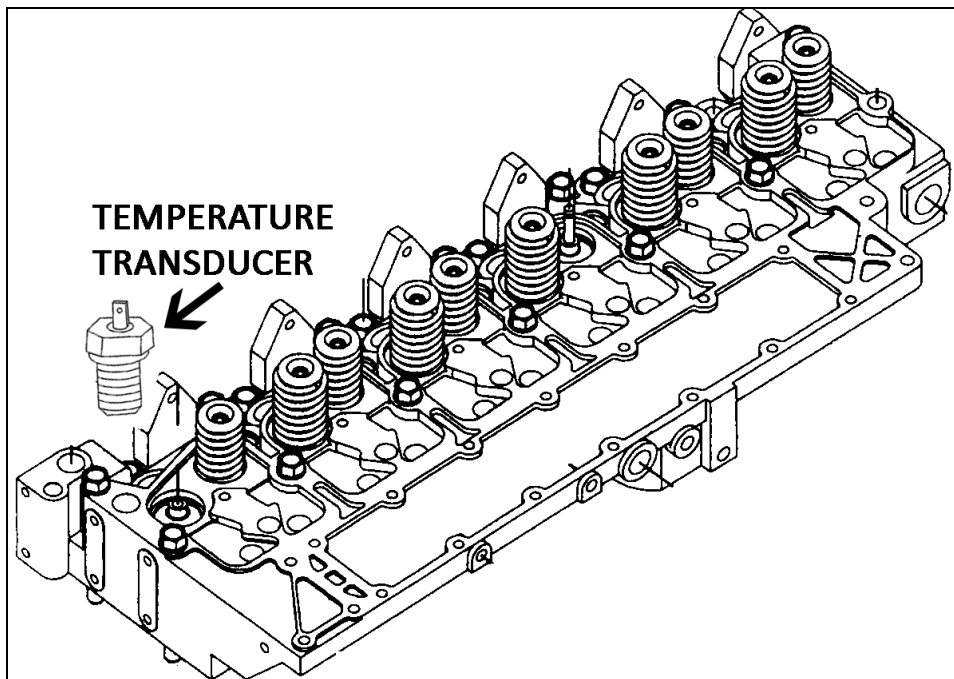
TEMPERATURE TRANSDUCER FOR 697 NA



TEMPERATURE TRANSDUCER FOR 697 CMVR & BS-II



TEMPERATURE TRANSDUCER FOR CUMMINS



DETAILS OF PARTS REQUIRED FOR FITMENT OF OIL PRESSURE GAUGES & TEMPERATURE GAUGES

S. NO	Description	697 NA	CUMMINS OLD	697 CMVR	697 BS-II	CUMMINS BS-3
1	ENGINE OIL PRESSURE GAUGE	2573 5420 99 32/ 2575 5420 99 02/ 2574 5420 99 16	--	2576 5420 99 32/ 2574 5420 9916	--	--
2	TEMPERATURE GAUGE	2573 5420 99 19/ 2575 5420 9903/ 2574 5420 99 14	2763 5420 99 21		2618 5420 99 25	2618 5420 99 27/ 2157 5420 99 07
3	TEMPERATURE GAUGE WITH BUZZER	--	--	--	--	2782 5420 99 11
4	LOW OIL PRESSURE INDICATOR LAMP	--	2770 5444 01 05		--	--
5	ASSY.PIPE (OIL PRESSURE GAUGE) FROM ENGINE TO SOCKET	2575 5420 01 09	--	2573 5420 01 52	--	--
6	ASSY.PIPE (OIL PRESSURE GAUGE) FROM SOCKET TO D/SOCKET	2575 5420 01 10	--	2573 5420 01 53	--	--
7	DOUBLE SOCKET	000 990 00 66J	--	--	--	--
8	DOUBLE SOCKET (NEAR COOLER)	1644 0500 602	--	1642 0800 600	--	--
9	SEALING WASHER A10X14	1622 0610 148	--	--	--	--
10	HOSE ASSY. (OIL LINE) FOR PRESSURE GAUGE	--	--	2574 4291 01 65	--	--
11	OIL PRESSURE SWITCH/ TRANSDUCER	--	2654 5450 01 39	2651 5450 99 21	2654 5490 99 13	2576 5420 99 30
12	ADAPTER FOR OIL PRESSURE SWITCH	--	2786 1817 99 01	--	--	2069 1817 99 01
13	SEALING WASHER FOR ADAPTER A14X20St	--	1622 0610 22 9	--	--	--
14	TEMPERATURE TRANSDUCER	2574 5420 99 15/ 2101 5420 29 11/ 2575 5420 99 11	2754 5430 99 02	2574 5420 99 15/ 2101 5420 29 11	2632 5420 99 03	2754 5430 9901