MAIN INTRODUCTION

GROUP INDEX

- For correct reinstallation of EGR system hoses attach a tag describing the correct positions Fig. 4.
- Make sure only the branded lubricants, coolant, corrosion protection coatings and sealants are used.

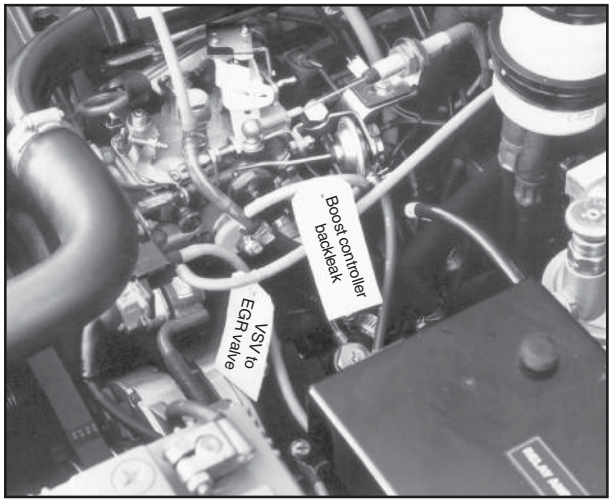


Fig. 4

- Check all the lines for leaks related to the systems like fuel, oil, coolant, vacuum, exhaust and brakes after servicing Fig. 5.
- Do not disconnect the fuel line between the injector and the fuel pump without releasing the fuel pressure or fuel can be sprayed out under pressure.

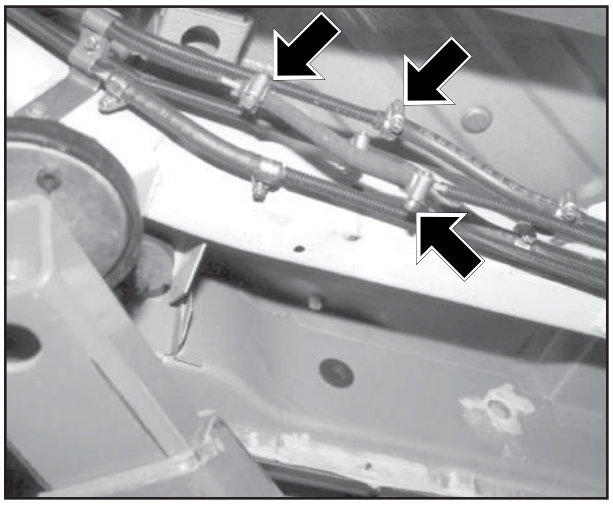


Fig. 5

Precaution for Catalytic Converter Fig. 6.

Caution : If large amount of unburnt fuel goes into the converter, it may overheat and creat a fire hazard. To prevent this, observe the following precautions.

- Use only Low sulphur (<0.25%) Diesel.
- Engine compression checks should be carried out within the shortest possible time.
- Do not run the engine when the fuel tank is nearly empty to avoid engine misfire and damage to catalytic converter.

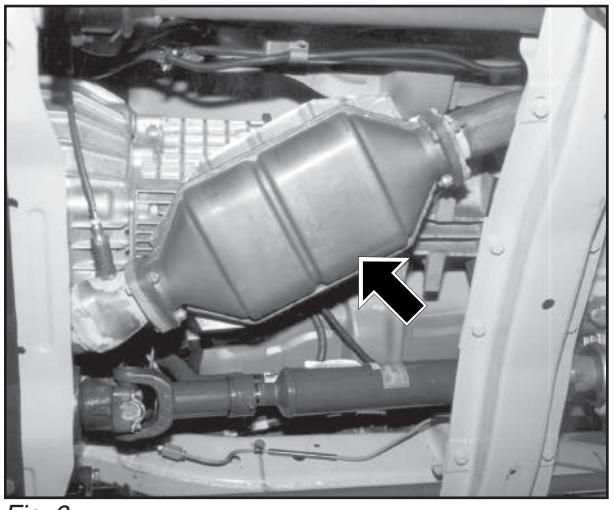
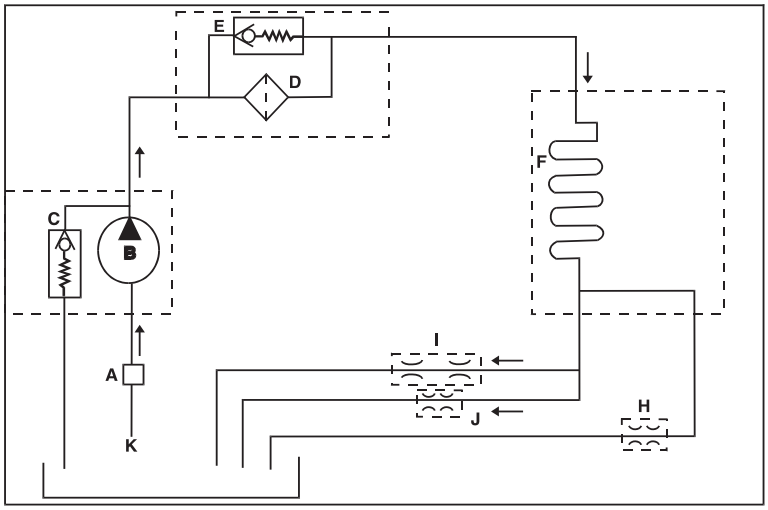


Fig. 6

SCHEMATIC CIRCUITS OF VARIOUS SYSTEMS ON 4 DLTC ENGINE

2a. Lubrication System



A. Strainer in sump
B. Oil pump
C. Oil pump relief valve
D. Full flow oil filter (paper type)
E. Filter bypass valve
F. Oil cooler
H. Turbocharger
I. Crankshaft Journals etc.
J. Piston cooling nozzles
K. Oil sump

Fig. 1

2b. Cooling System

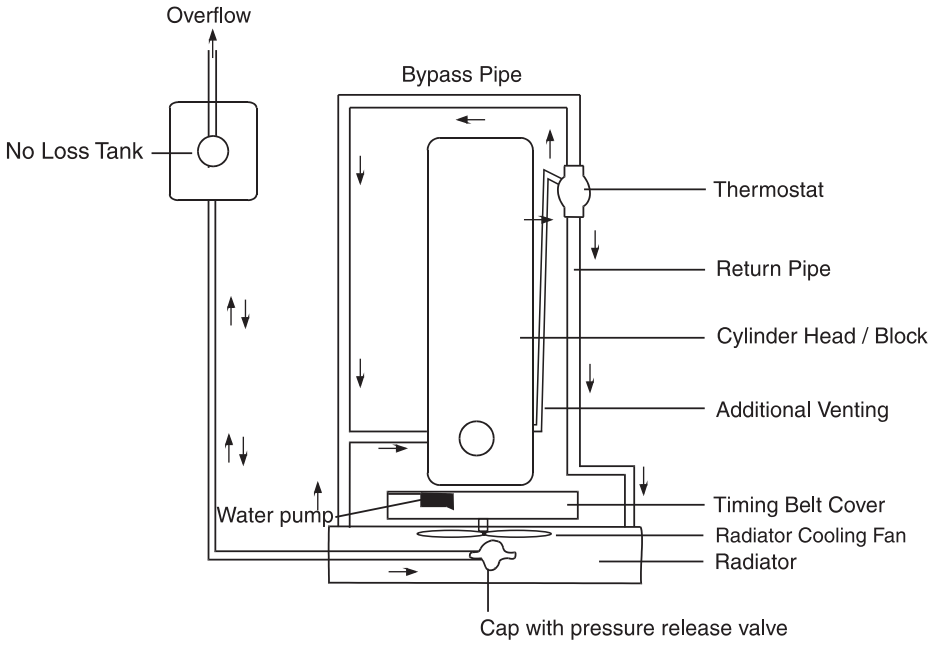


Fig. 2

VALVE GUIDES

In case of valve stem sticking in valve guide bore or excessive clearance between them, remove valve guide from cylinder head using drift 2654 5890 05 04. - Refer Figure 78

Remove valve guide seal. Check condition.

Check valve guide bore diameter in cylinder head. If necessary, ream valve guide bore to next over size.

Install matching size valve guide in cylinder head using drift, 2654 5890 05 04 and spacer, 2654 5890 05 05. Refer Figure 79.

It is desirable to ream (machine) ID of valve guides in installed condition (on cylinder head) to attain concentricity with tappet bore & to maintain their perpendicularity with cylinder head bottom face. Refer Figure 80.

Fit valve guide oil seals.

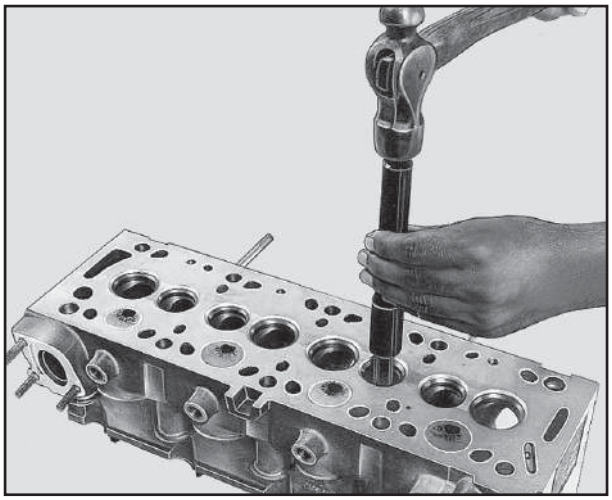


Fig. 78

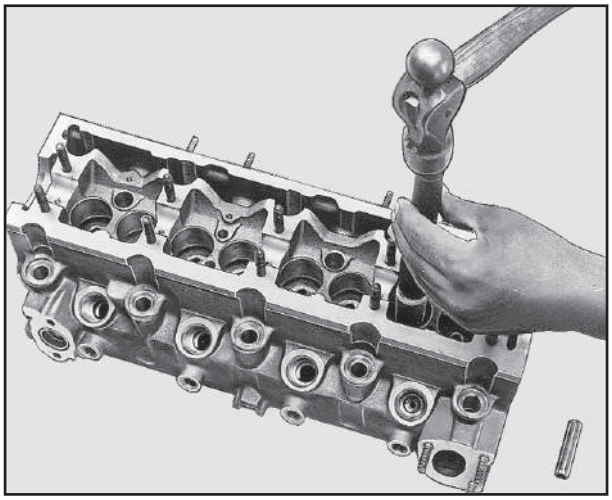


Fig. 79

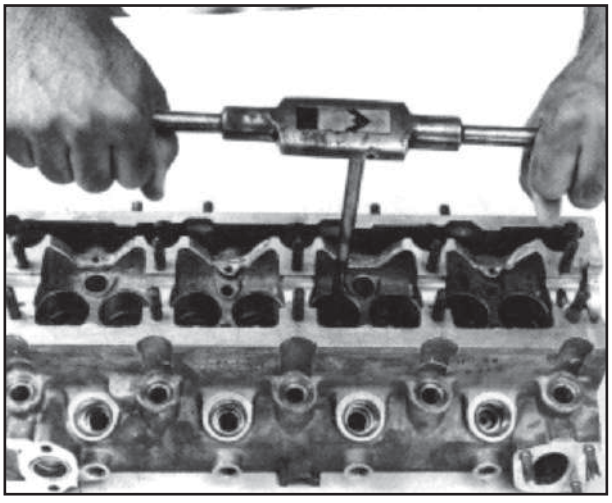


Fig. 80

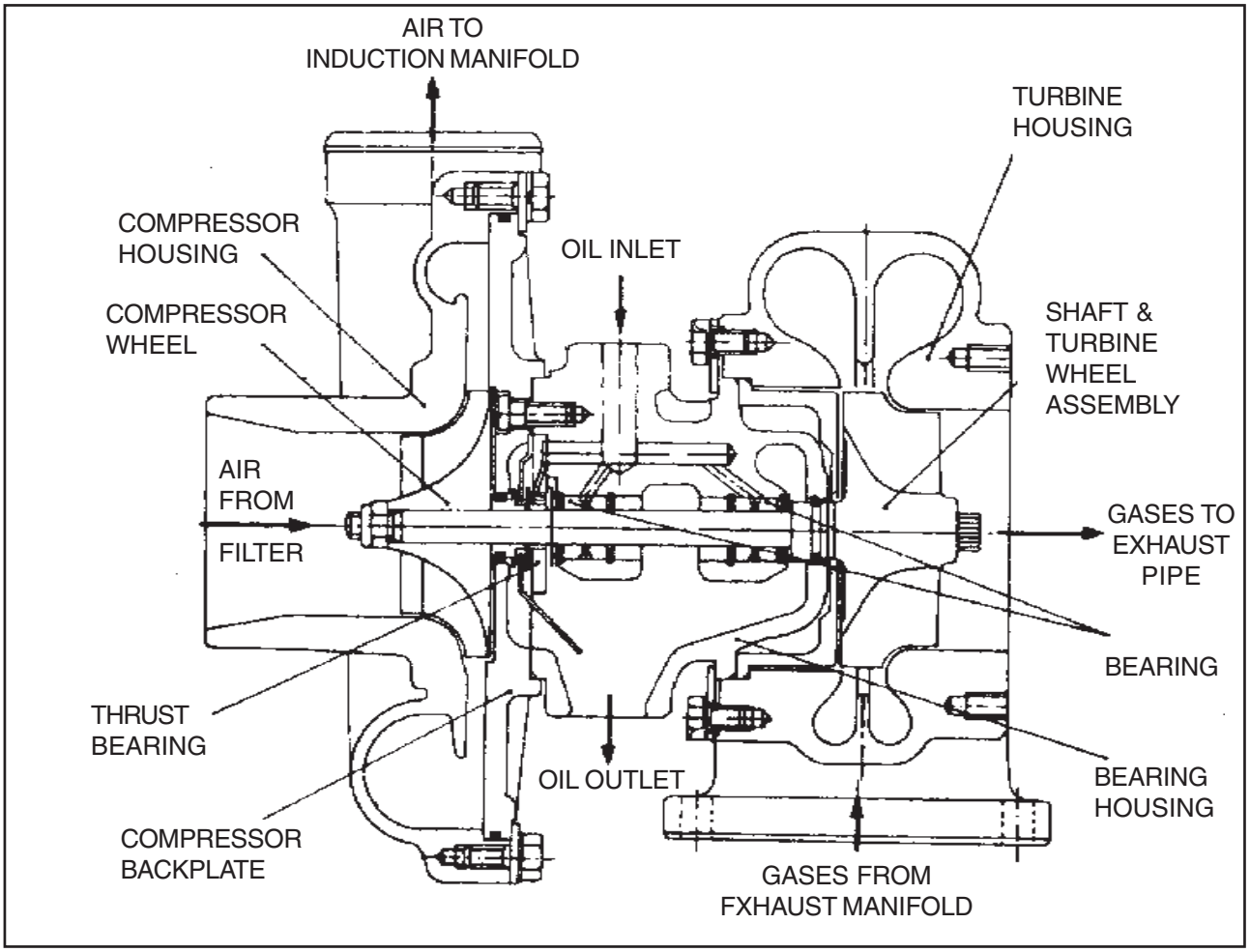


Fig. 170

TURBO CHARGER

Working Principle of Turbocharger

Power output from an internal combustion engine depends on mass of the air and fuel quantity that are available for combustion.

To increase engine horse power, more air for combustion and more fuel have to be delivered.

In case of a naturally aspirated engine, power increase is obtained by increasing swept volume or by raising speed.

Increasing swept volume, leads to larger and heavier engines that are expensive. Speed increase involves considerable technical problems and disadvantages like low mechanical efficiency, increased wear and tear and increase in noise etc.

Power increase with unchanged swept volume at same engine speed can be obtained by supercharging of engine.

Super charger delivers pre compressed air to engine cylinders i.e. engine intake pressure is higher than atmospheric. In naturally aspirated engines intake pressure is slightly below atmospheric.

Turbocharger is one of the super charging devices used in an engine. It makes use of thermal energy of engine exhaust gases to run a turbine which in turn drives a compressor to pressurise inlet air.

REMOVAL OF GEAR BOX FROM VEHICLE

Place chocks on wheels.

Disconnect battery terminals, electrical connections of starter motor and remove starter motor.

Remove rubber bellow from collar of base plate . Loosen lock nut or spacer (in case of Tatamobile) and remove gear shift lever knob . Take out rubber bellow.

Remove screws and take out clamping plate of the rubber bellow - bottom.

Disconnect exhaust pipe from manifold end and main muffler.

For 4x2 vehicles

Disconnect propeller shaft from gear box end and remove center bearing mounting bolts.

Slide the propeller shaft side ways and support it suitably.

Loosen nylock nuts and washer of extension arm support bracket and take it out.

For 4x4 vehicles

Disconnect extension arm support bracket from transfer case housing.

Disconnect electrical connector of electrical shift motor and speed sensor.

Disconnect electrical connector of vehicle speed sensor, In case of petrol engine.

Disconnect front and rear propeller shaft at transfer case end.

Slide the propeller shaft side ways and support it suitably.

Remove circlip from both ends of shift link and take it out along with teflon washers

Remove circlip and take out pin along with Teflon washer to disconnect extension arm from extension arm bracket . Remove extension arm assembly.

Disconnect and remove clutch slave cylinder from clutch housing.

Disconnect speedo cable and connector from reverse indicator switch.

Remove clutch housing front sheet metal cover.

Loosen and remove clutch housing mounting bolts.

Loosen and remove gear box adapter housing support - Rear mounting bolts. (4x2) / adapter housing (**4x4**)

Lift the gear box **(4x2)** / transfer case, gear box assembly **(4x4)** from rear and support the engine suitably.

Remove cross member supporting gear box, from the chassis.

Pull out gear box **(4x2)** / gear box along with transfer case **(4x4)** to disengage drive shaft from the clutch plate splines.

Lower the assembly carefully.

Loosen the adaptor housing bolts and separate gear box and transfer case. **(4x4)**

II) INSTALLATION OF HUB ON STUB AXLE (Fig. 8).

a. Slide assembled hub on stub axle.

b. Insert inner race with roller cage of outer bearing into stub axle after packing rollers with grease, using drift 2651 5890 33 08. Insert thrust washer and screw on the split nut.

c. **Wheel Bearing Adjustment:**

- Fit dial gauge on a magnetic stand. Fit magnetic stand on hub and adjust spindle of dial gauge in such a way that it rests against the face of stub axle. Dial gauge should have a pre-load of approx. 2 mm.
- Tighten split nut with suitable spanner fully. Loosen nut slightly, gently tap hub all around with a mallet.
- Check axial play of hub on the dial gauge by pulling and pushing hub by hand and go on tightening split nut until play is within 0.03 - 0.06 mm.
- Tighten cap screw on split nut.
- Check and ensure again axial play of hub, that it is within limit of 0.03 - 0.06 mm.
- Fit hub cover with gasket and tighten cap screws. Fill approx. 30 gms grease in cover before fitting.

d. Install caliper assy on disc and tighten screws connecting the caliper assy to stub axle to 6.8 - 8.3 mkg torque.

e. Connect one end of brake hose to caliper assy by banjo bolt.

f. Connect other end of brake hose to bundy pipe on bracket on chassis frame. Install the clip.

g. Fill brake fluid in brake fluid container and bleed the system.

D. INSTALLATION OF THE FRONT WHEELS

a. Install front wheels on hub assy and tighten wheel nuts by hand.

b. Remove supports, supporting chassis long member.

c. Tighten wheel nuts to a torque of 12-15 mkg.

NOTE :

Front hubs manufactured by Tata Motors & Dana Spicer are used in selection in 4x2 version.

Procedure given in this section is applicable only for Tata Motors front hubs.

Repair procedure for Dana Spicer front hub & Dana Spicer rear hub are same. Please refer relevant portion of Spicer rear axle for repair of Spicer front hubs.

Spicer hubs only are used for front wheels in 4x4 version. Dismantling, inspection, repairs & assembly procedure for spicer front hubs used in 4x4 version & special tools required are same as that of spicer rear hubs.

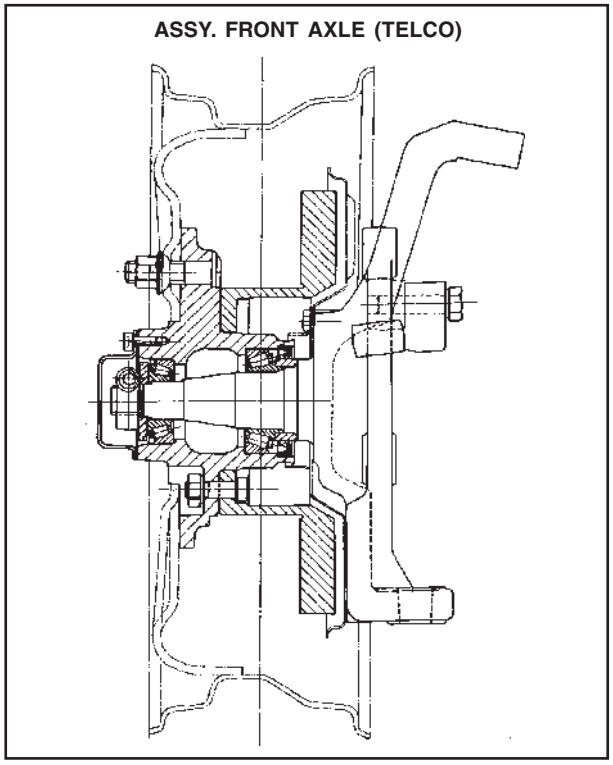


Fig. 8

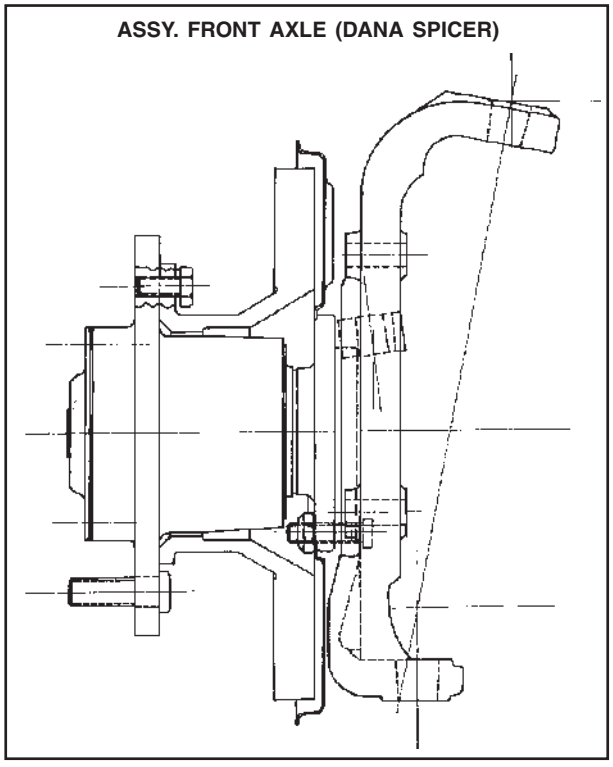


Fig. 9

Automatic Locking Hub (Model : 1704-000-002) of Divgi Warner Limited

Introduction

Automatic Hub Locks Model : 1704-000-002 of Divgi Warner Limited is presently used on Telcoline 4x4 vehicles.

When 4-wheel drive is selected, automatic hub, locks axle shaft to wheel hub. This occurs when vehicle is driven in either forward or reverse direction. Hub unlocks when 2-wheel drive is selected, and vehicle is driven in opposite direction for a few feet.

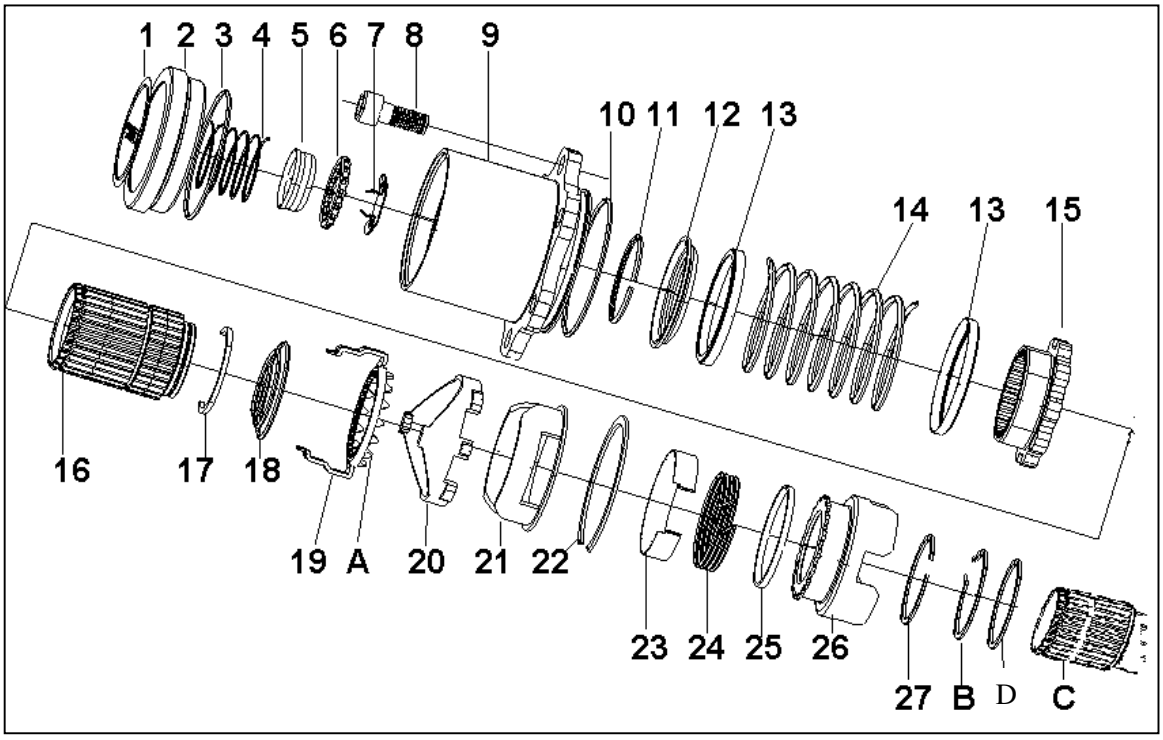


Fig. 75 Construction & operation

Construction

The 4 Tanged washer is held in place on the Wheel Spindle. The cut-outs on the drag sleeve(26) fit over the tangs on the washer, preventing the drag sleeve from rotating. The brake band (24) fits over the serrated portion of the drag sleeve. The tangs of the brake band are fitted through the window in the steel inner cage (21). The plastic outer cage (20) fits over the inner cage. Each tang of the brake band fits through each cutout in the outer cage. The cam follower (19) is attached to the clutch gear (15). The follower profile on the cam follower (A) ride against the cam faces or ramps of the steel inner cage. The clutch gear slides on the splines on the out side the hub sleeve (16). The axle shaft(C) is splined to the inside of the hub sleeve. The large teeth on the outside of the clutch gear can engage the teeth inside the outer clutch housing (9).The outer clutch housing is bolted to the wheel hub. An End Cap (2) fits over the hub lock assembly. The end cap contains a bearing assembly (6) that supports the other end of the hub sleeve. The End Cap is fitted with an Aluminium Decorative Plate(1) for better aesthetics.

CONSTRUCTION :

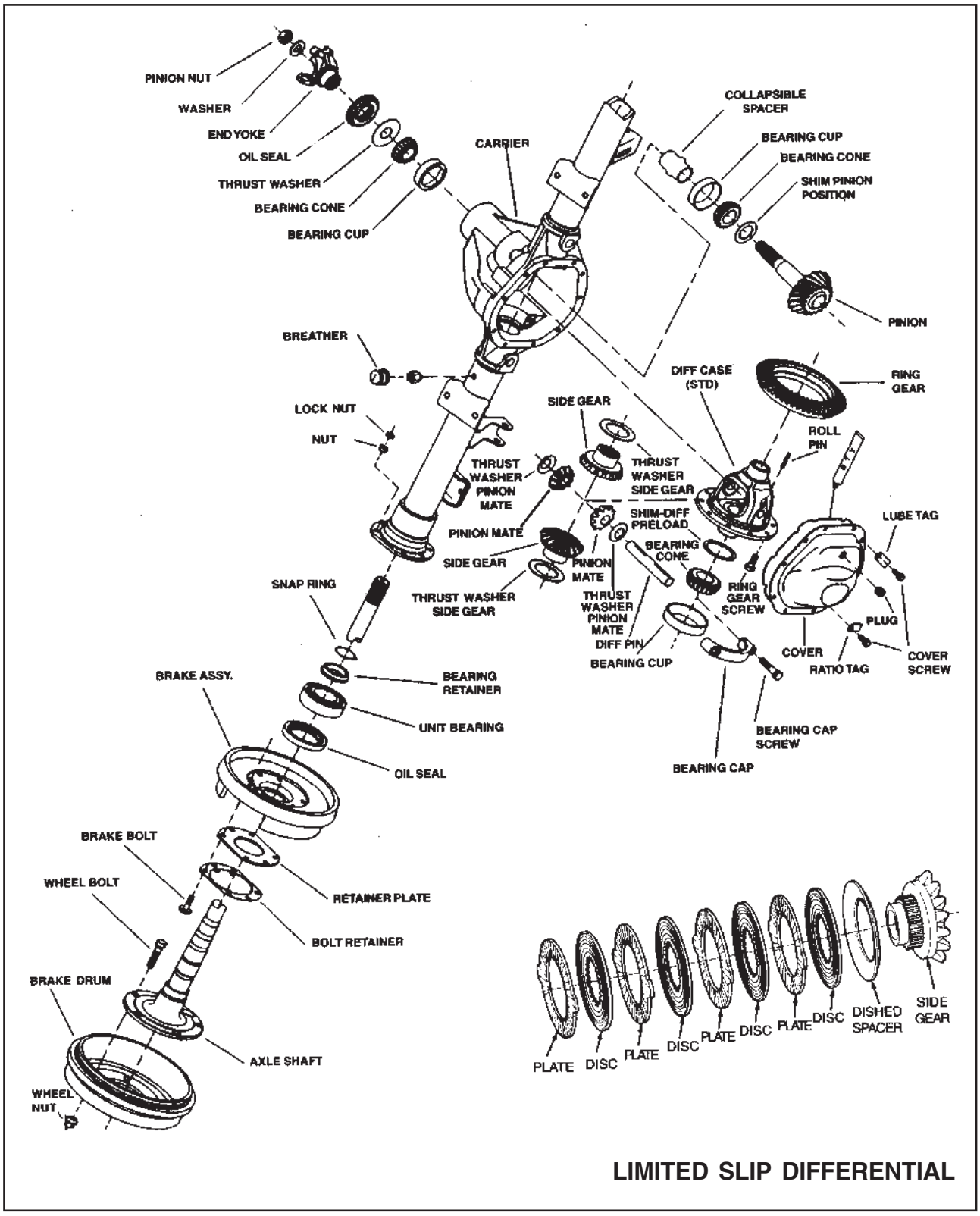


Fig. 1

Paint right gear teeth with a marking compound on both drive and coast side.

Rotate ring one complete revolution in both directions while applying load with a large screwdriver between carrier casting and differential case flange.

Refer Fig. 71

A. Normal or desirable pattern. Drive pattern should be centered on the tooth. Coast pattern should also be centered on the tooth, but may be slightly towards the toe. There should be some clearance between the pattern and top of the tooth.

B. Backlash correct. Thinner pinion position shim required.

C. Backlash correct. Thicker pinion position shim required.

D. Pinion position shim correct. Decrease backlash.

E. Pinion position shim correct. Increase backlash.

Pattern movements summary

- Decreasing backlash moves the ring gear closer to pinion.

  Drive pattern (convex side of gear) moves slightly lower and toward the toe.

  Coast pattern (concave side of gear) moves lower and toward the toe.

- Increasing backlash moves ring gear away from pinion.

  Drive pattern moves slightly higher and toward the heel.

  Coast pattern moves higher and toward the heel.

- Thicker pinion position shim with backlash constant moves pinion closer to ring gear.

  Drive pattern moves deeper on the tooth and slightly toward the toe.

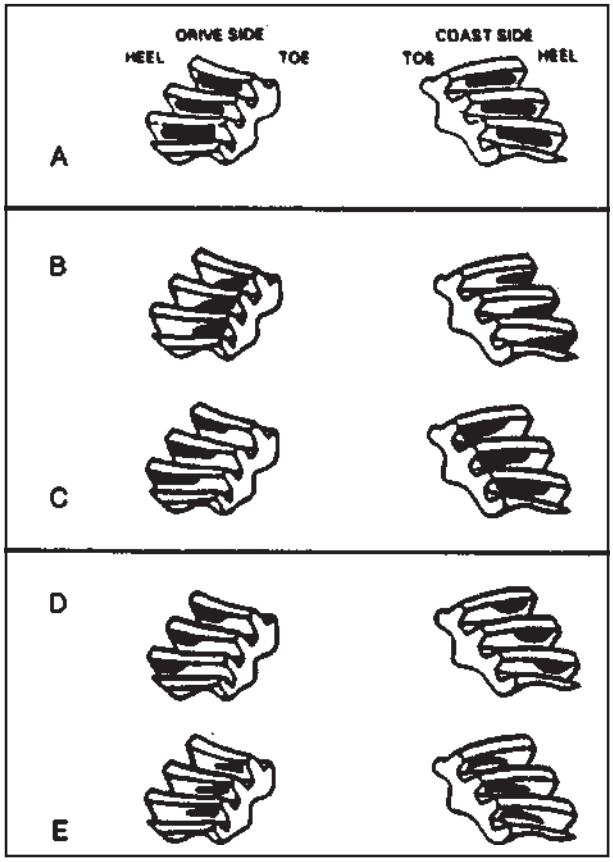


Fig. 71

  Coast pattern moves deeper on the tooth and slightly toward the heel.

- Thinner pinion position shim with the backlash constant moves pinion farther from ring gear.

  Drive pattern moves toward top of the tooth (face contact) and toward heel.

  Coast pattern moves toward top of the tooth and slightly toward toe.

WHEELS AND TYRES

TYRES :

Vehicle is equipped with 205/80 R16 radial tubeless tyre. Tyre is designed to operate satisfactorily with loads upto full rated load capacity when inflated to recommended inflation pressures. It is important to maintain correct tyre pressures. Heavy cornering, excessively rapid acceleration, and unnecessary sharp braking increases tyre wear.

WHEELS :

Wheel rim size : 5.5 J x 16 Steel.

Advantange of tubeless tyres :

1] Air leakage after puncture is very slow.

2] Better fuel efficiency.

3] Less chance of run-flat damages.

4] No tube related problems.

5] Less balance weight required.

6] Easy repairing.

Special care for tubeless tyre :

1) Do not stand over tyre when inflating. Bead may break when bead snaps over rim's safety hump and cause serious personal injury.

2) Do not exceed specified pressure when inflating. If specified pressure will not seat beads, deflate, re-lubricate and reinflate.

3) While removing tyre from wheel rim and mounting it back on wheel rim, take precautions not to damage tyre bead. Use tyre removal and assembly machines. Damage or cut on tyre bead may cause gradual loss of air and deflation of tyre.

4) Do not scratch inside of tubeless tyre with metallic or sharp object. Tubeless tyres are coated with impermeable layer of rubber from inside which hold the air inside tyre. Removal of this layer due to scratching may cause gradual loss of air and deflation.

5) If wheel rims get damaged in service, get the wheel rims repaired/replaced immdiately. Running the vehicle with damaged rim my cause deflation of tyre and subsequent disloging of tyre from rim.

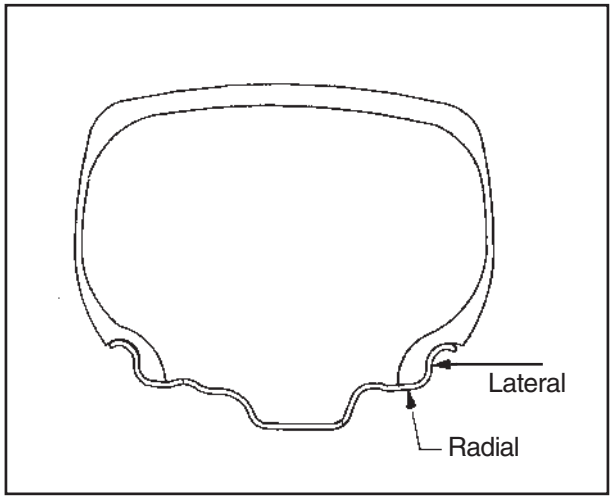


Fig. 2

6) Maintain recommended inflation pressures in tyre. Over in flation, in particular, may cause puncture or bursting of tyre.

Condition of clamping strap for any damage specially at crimping portion.

Free and smooth rotation of bearing unit in centre bearing assembly.

The bearing should have negligible radial play.

Condition of dust seals in centre bearing assembly.

If any of the above defects are noticed in the centre bearing assembly, complete centre bearing assembly should be replaced.

Condition of dust caps on propeller shaft and coupling flange. These are tack welded to respective components.

Check both spacer rings for wear score marks. If found defective replace with NEW one.

Replace defective parts.

LUBRICATION

PRELUBE OR LUBE FOR LIFE DESIGNS

Universal joint crosses and bearings are prelube or lube for life designs and have no lube fittings. Special seals are used to contain the lubricant in the cross bearings in this design. *Fig.18*

Replacement of the cross and bearing kit is recommended rather than relubrication.

LUBRICATION FOR SLIP SPLINES

Apply grease gun pressure to the tube fitting until lubricant appears at the pressure relief hole in the plug at the slip yoke end of the spline. *Fig.19*

Now cover the pressure relief hole with your finger and continue to apply pressure until grease appears at the slip yoke seal. *Fig.20*

Caution : In cold temperatures be sure to drive the vehicle immediately after lubricating. This activates the slip spline and removes the excessive lubricant. Failure to do so could cause the excess lubricant to stiffen in the cold weather and force the plug out. The end of the spline would then be open to collect contaminants and cause the spline to wear and/or seize.

LUBE FOR LIFE CENTRE BEARING :

Centre bearing is packed with grease for life. No filling of bearing with grease is recommended.

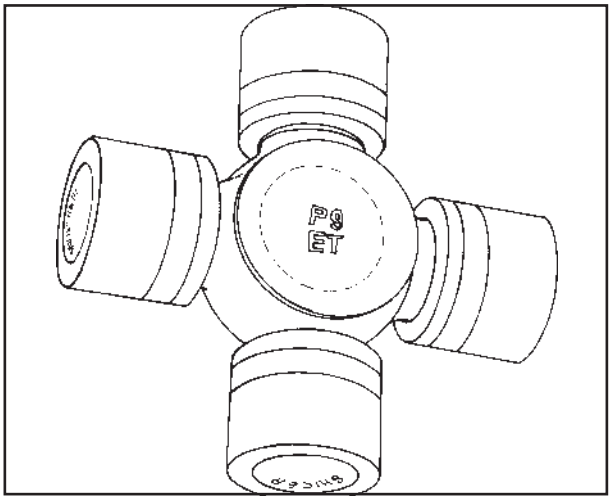


Fig. 18

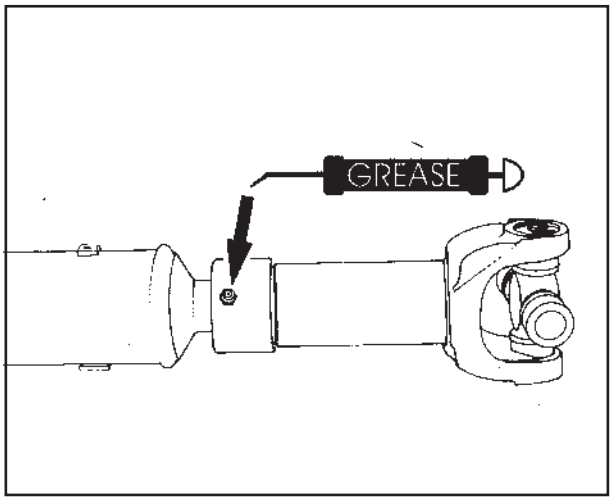


Fig. 19

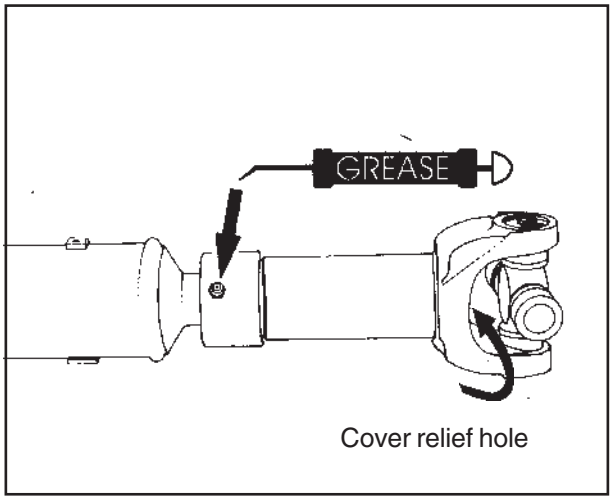
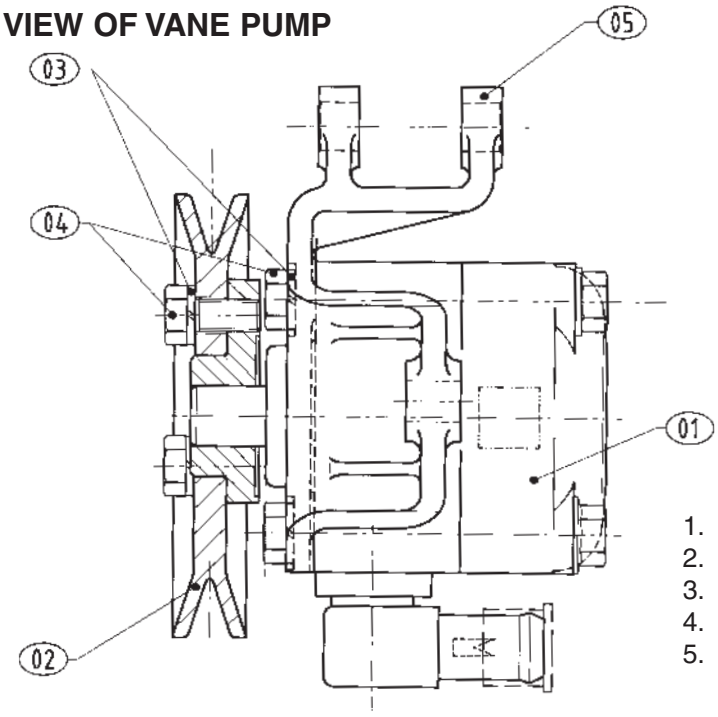


Fig. 20

XIII. SECTIONAL VIEW OF VANE PUMP



1. Vane Pump
2. Pulley
3. Spring Washer
4. Hex Bolt
5. Bracket

Fig. 17

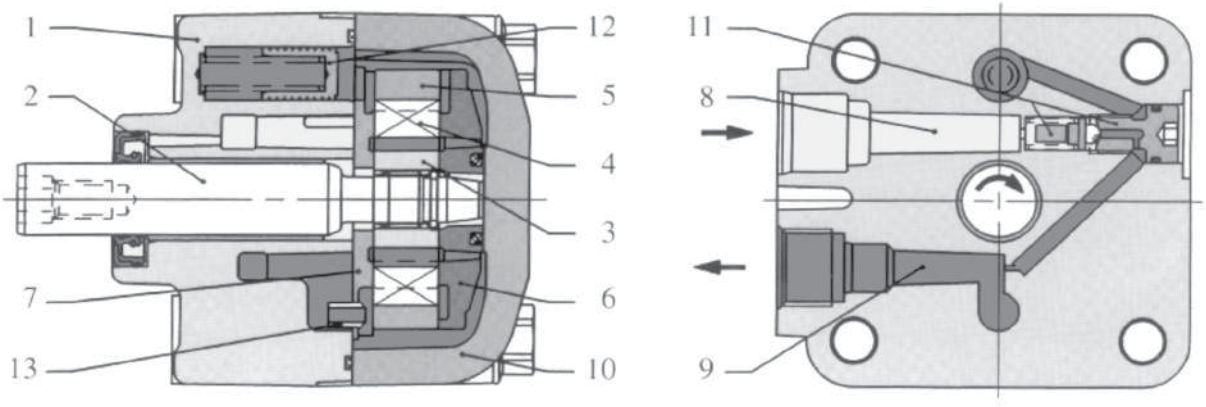


Fig.14b Functional Representation of ZF Vane CP1

1. Housing
2. Shaft
3. Rotor
4. Vanes
5. Cam ring
6. Rear control
7. Front control
8. Suction duct
9. Pressure duct
10. Cover
11. Pressure relief valve
12. Flow control valve
13. Throttle insert

Fig. 18

TECHNICAL DATA

ALTERNATOR

1.	Type	3SA23
2.	Rating	Continuous
3.	Battery Voltage	12 V
4.	Nominal Output	65 A
5.	Weight	6.6 Kg. Approx. (Including Pump & Pulley)
6.	Rated Maximum Output Speed	6000 R.P.M
7.	Speed	1000 to 10,000 R.P.M.
8.	No. Of Poles	12
9.	Over Speed with Maximum Output	11000 RPM for 1.0 Minute
10.	Polarity	Negative Earth
11.	Regulating System	Bult-In Regulator
12.	Reg. Set Voltage	14.0 ± 0.2 V
13.	Direction of Rotation	Clockwise (Viewed from Pulley end)

VACUUM PUMP

1.	Type of Vacuum Pump	Vane Type	
2.	Capacity of the Pump	30 CC/REV.	
3.	**Operating Condition**		
(a)	Speed	1000 to 11,500 RPM	
(b)	Ambient Temperature	- 30^{O}C to + 80^{O}C	
(c)	Oil Feeding Pressure	1.0 to 3.0 kgf/cm^2	
(d)	Lubricating Oil	SAE 30	
(e)	Rotation	Clockwise (Viewed from Drive end)	
(f)	Oil Temperature	75^{O} ± 5^{O}C	
4.	**Exhaust Characteristics**		
	Test Specifications		
(a)	Speed	1000 RPM	5000 RPM
(b)	Time	35 SEC MAX.	10 SEC MAX
(c)	Vacuum	500 mm Hg.	500 mm Hg. 700mm Hg. at 5000 RPM Under oil Feeding
5.	Maximum Attainable degree of vacuum	Presssure of 1Kgf.cm^2 and oil temperatue of 75^{O} ± 5^{O} C Conditions.	
6.	Vacuum Drop (After stoppage of pump at 400 mm Hg.)	Vacuum drop 20mm Hg. max. in 15 secs.	

F) GAUGES & INDICATORS - FUNCTIONAL DETAILS :

1. **Fuel gauge :**
   Indicates the approximate level of fuel in tank. Fill up tank with recommended diesel fuel before needle touches 'Red' mark on gauge.

2. **Water temperature gauge**
   When needle touches red band it indicates engine overheating.

3 & 6. **Turn signal indicators** (Green)

   Turn signal lamps can be operated only when ignition is 'ON' and by using turn indicator switch on the combi switch.

   Direction indicator arrow ⇦ (LHS) & ⇨ (RHS) on the instrument cluster flashes alongwith external indicator lights as selected.

4. **Speedometer**
   Indicates vehicle speed in km/hr or miles/hr.

5. **Odometer** registers total distance covered by the vehicle in km or miles.

7. **Engine RPM meter.**

   It shows engine speed in revolutions per minute (RPM).

8. **Battery charging indicator light.** (Red)

   This light should come ON when ignition is 'ON' and should go off after the engine starts. If it remains 'ON' when engine is running, it indicates battery is not getting charged.

   In such a case, avoid using electrical loads and get the problem attended at an authorised workshop.

9. **High beam indicator** (Blue)

   It comes on when head lamp is operated in high beam position.

10. **Spare for Indicator**

11. **Rear fog lamp indicator**

    Indicator comes 'ON' when fog lamp is switched on. Fog lamp operation is coupled with head lamps.

12. **Trip counter setting knob**

    To reset it push the knob. Trip counter will show zero.

13. **Trip Counter km. or miles**

    It indicates number of km or miles driven since last reset.

14. **Spare for Indicator**

15. **Glow plug indicator light** (Amber)

    It glows when the ignition key is turned to position 'ON' and after a few seconds depending on ambient temperature the indicator light goes off indicating that the engine can be started.

    If the glow plug indicator light does not go off automatically, get the electrical system of your vehicle checked.

16. **4WDH & 4WDL indicator** (Green)
    (For 4x4 vehicle)

    4WDH & 4WDL indicator lights glow up when ignition key is turned to position 'ON' and go off after a few seconds. Either 4WDH or 4WDL indicator light glows continuously when four wheel drive mode high or low respectively is selected.

17. **Hand Brake + Brake fluid level indicator** (Red)

    It comes on when the brake fluid level in the container is too low or when hand brake is on.

    In case fluid level in container is low, get your vehicle checked at authorised agency for leakages.

18. **Oil pressure indicator light** (Red)

    It lights up when ignition key is turned to position 'ON' and goes off as soon as the required oil pressure has developed after the engine has started. If the light continues to glow when the engine is running, it indicates low oil level in engine oil sump, or a fault in the lubrication system.

    Continued running of the engine when the oil pressure indicator light is on, may damage the engine.

19. **Immobilizer - Anti theft security system** (Red) (Optional)

    This system disables starter motor circuit, ignition supply & fuel cutoff solenoid supply. The vehicle can be started only if key fitted with corresponding transponder is inserted in ignition switch.

20. **Low Fuel Indicator** (Amber/Orange)

    It comes on when fuel level reaches 10 litres (approx.) in tank altering the user to fill fuel.