

# JOB ROLE – AUTOMOTIVE SERVICE TECHNICIAN

Sector: Automotive  
(Qualification Pack Code : **ASC/Q01402**)



PSS Central Institute of Vocational Education  
Shyamla Hills, Bhopal – 462013, Madhya Pradesh, India

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# UNIT 3 : Transmission System

## Session 3: Servicing of differential unit and adjustments

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# Session Objectives

1. The student will be able to understand and explain the procedure for servicing and adjustment of differential unit.
2. Able to carry out adjustments in differential unit.
3. Able to find causes of faults in differential unit and suggest suitable remedies.

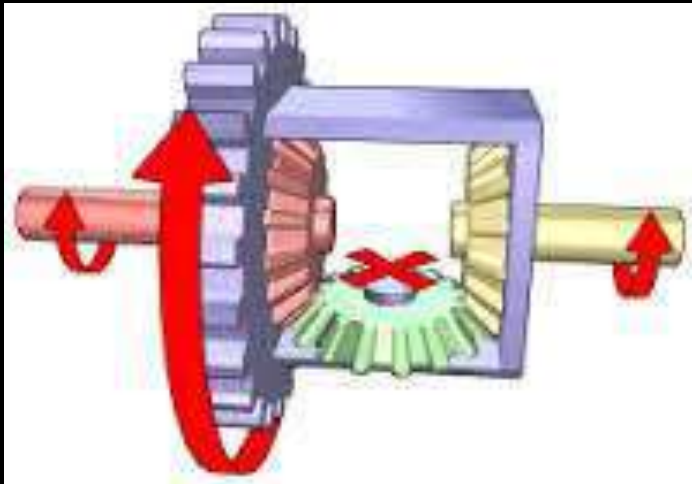
# Introduction

## **Differential unit**

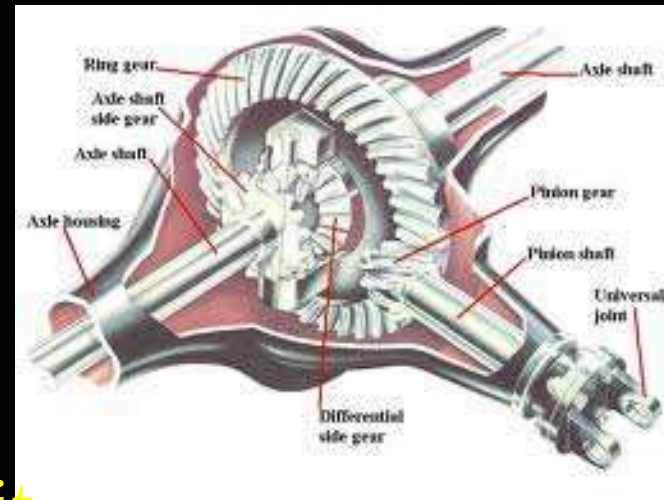
A differential is a device employing gears, capable of transmitting torque and rotation through three shafts. It transfers the power while in turning to the respective wheels. It consist crown gear, sun gear and star gear.

# Importance of Differential

A vehicle wheel rotates at different speeds, especially when turning. Each wheel travels a different distance through the turn, and that the inside wheels travel a shorter distance than the outside wheels. Since speed is equal to the distance travelled divided by the time it takes to go that distance, the wheels that travel a shorter distance travel at a lower speed. Also note that the front wheels travel a different distance than the rear wheels.



Differential unit

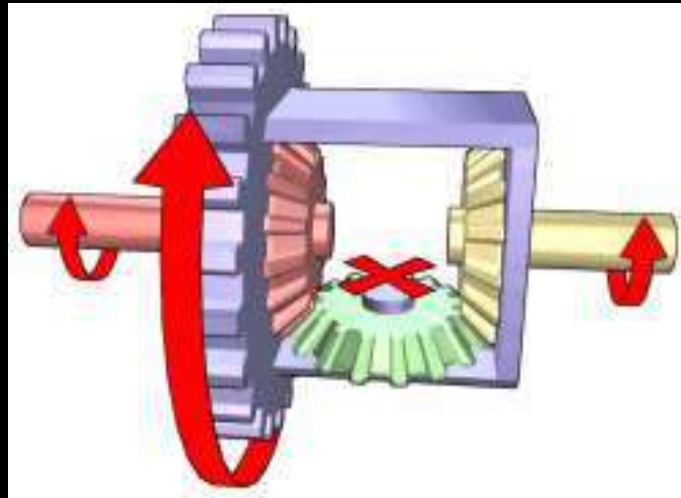


# Differential

1. The differential has three jobs:
2. To transfer the engine power through gearbox and propeller shaft to wheels.
3. To act as the final gear reduction in the vehicle, slowing the rotational speed of the transmission one final time before it hits the wheels
4. To transmit the power to the wheels while allowing them to rotate at different speeds while taking a turn.

# Working of Differential

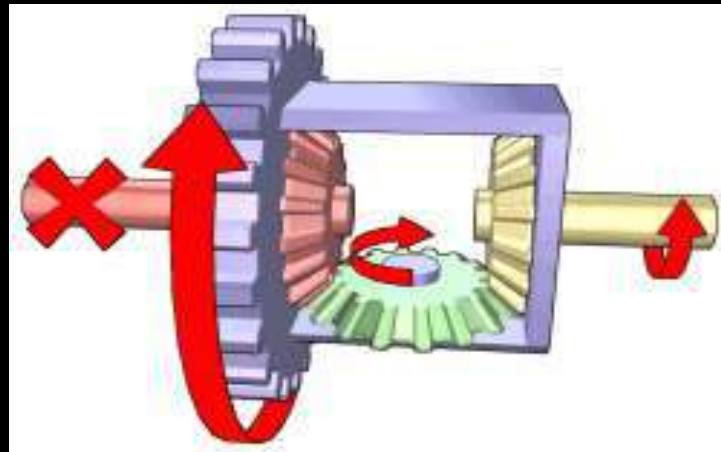
Input torque is applied to the ring gear, which turns the entire carrier, providing torque to both side gears, which in turn may drive the left and right wheels. If the resistance at both wheels is equal, the planet gear does not rotate, and both wheels turn at the same rate.



- If the left side gear encounters resistance, the planet gear rotates about the left side gear, in turn applying extra rotation to the right side gear.



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Differential at left not working

# **Servicing of Differential**

Servicing of differential means regular interval of oil has to be changed with proper grade as per service manual. Replace the broken gear and brass washer or damaged portion if required .

## **Adjustment of differential**

Adjustment of differential can be done by various thickness of shim. Adjusting bolt is provided at outer side of cage assembly to adjust crown gear.

# Procedure

1. Drain off the oil from differential unit & open the Cover.
2. Disconnect the propeller shaft from the companion flange of pinion drive.
3. Disconnect the half axle shaft from the differential housing.
4. Open the complete cage assembly
5. Open both side of side caps and remove the crown star gear and sun gears.
6. Mark the position of all parts carefully for their easy reassembly in their original position.
7. Check crown wheel, sun gears, star gears teeth if it is broken replace the gears. Change all the brass washers.

# Procedure

8. Keep the caps and shims carefully as the control clearance between two moving parts.
9. Pull out the companion flange from pinion drive.
10. Now slowly tap the pinion shaft from outside the casing, the pinion will come out with spacer and two bearing.

# Inspection

1. Inspect the bearing, if they are badly worn out /do not run freely, replace them.
2. Inspect the condition of all the gears teeth's for roughness, chipping, cracking.
3. Put the new oil seals/gaskets, brass washer
4. To check the tooth contact
5. To check the tooth contacts apply the precision blue or red oxide paste.
6. Apply the above mentions pastes to the crown wheel teeth's.
7. Apply the grease on both the side of the teeth equally.
8. And then rotate the pinion check the tooth contact.
9. If the tooth contact is improper the do the following adjustments.

## Adjustments in Differential unit

1. If there is heavy face contact then remove the shims from the bevel Pinion and move the pinion towards crown wheel.
2. If there is heavy flank, contact add the shims in the pinion and pullout the pinion away from the crown wheel.
3. If there is heavy toe contact then remove the shims from right hand side and add shims towards left hand side of the crown wheel.
4. If there is heavy heel contact, add the shims towards right hand side of crown wheel.
5. In some cases outer adjustments bolt with chuck nut also provided to support crown and final drive.

## Check the backlash in final drive

- Now without turning the pinion shaft, move the crown wheel backlash will be noted on the dial gauge
- The Backlash of pinion & crown wheel should not exceed 0.15 to 1.18mm.
- To adjust the backlash, tighten the side check nuts in 4:1 ratio
- Backlash between sun gear and star pinion
- Place the dial gauge telescopic end on sun gear tooth
- Rotate the sun gear without turning star pinion and take down the reading from dial gauge
- Place the telescopic end of dial gauge on the crown wheel teeth, set dial gauge to zero

## Important points

1. The backlash of sun gears & planetary gears should not exceed 0.10 to 0.20mm.
2. If there is more backlash, change the thrust pad with more thickness
3. If there is less backlash, change the thrust pad with less thickness
4. Also check the radial run out of crown wheel , it should not exceed more than 0.0025mm.
5. Check the internal spline of sun gear and external spline of half axle shaft for stripping
6. Check the gears at the other end of the half axle shaft



# Summary

In this session you have learnt about, the

## **Differential unit**

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