BAKER COLLEGE
STUDENT LEARNING OUTCOMES

AST2250A Manual Drivetrain

2 Semester Hours

Student Learning Outcomes and Enabling Objectives

1. Apply drive train diagnosis techniques
    a. Identify and interpret drive train concerns; determine needed action. (P-1)
    b. Research vehicle service information including fluid type, vehicle service history, service precautions, and technical service bulletins. (P-1)
    c. Check fluid condition; check for leaks; determine needed action. (P-1)
    d. Drain and refill manual transmission/transaxle and final drive unit; use proper fluid type per manufacturer specification. (P-1)
2. Demonstrate clutch diagnosis and repair techniques.
    a. Diagnose clutch noise, binding, slippage, pulsation, and chatter; determine needed action. (P-1)
    b. Inspect clutch pedal linkage, cables, automatic adjuster mechanisms, brackets, bushings, pivots, and springs; perform needed action. (P-1)
    c. Inspect and/or replace clutch pressure plate assembly, clutch disc, release (throw-out) bearing, linkage, and pilot bearing/bushing (as applicable). (P-1)
    d. Bleed clutch hydraulic system. (P-1)
    e. Check and adjust clutch master cylinder fluid level; check for leaks; use proper fluid type per manufacturer specification. (P-1)
    f. Inspect flywheel and ring gear for wear, cracks, and discoloration; determine needed action. (P-1)
    g. Measure flywheel runout and crankshaft end play; determine needed action. (P-2)
    h. Describe the operation and service of a system that uses a dual mass flywheel. (P-3)
3. Demonstrate transmission/transaxle diagnosis and repair techniques.
    a. Inspect, adjust, lubricate, and/or replace shift linkages, brackets, bushings, cables, pivots, and levers. (P-2)
    b. Describe the operational characteristics of an electronically-controlled manual transmission/transaxle. (P-2)

c. Diagnose noise concerns through the application of transmission/transaxle powerflow principles. (P-2)
d. Diagnose hard shifting and jumping out of gear concerns; determine needed action. (P-2)
e. Diagnose transaxle final drive assembly noise and vibration concerns; determine needed action. (P-3)
f. Disassemble, inspect clean, and reassemble internal transmission/transaxle components. (P-2)

4. Demonstrate drive shaft and half shaft, universal and constant-velocity (CV) joint diagnosis and repair techniques.
    a. Diagnose constant-velocity (CV) joint noise and vibration concerns; determine needed action. (P-1)
    b. Diagnose universal joint noise and vibration concerns; perform needed action. (P-2)
    c. Inspect, remove, and/or replace bearings, hubs, and seals. (P-1)
    d. Inspect, service, and/or replace shafts, yokes, boots, and universal/CV joints. (P-1)
    e. Check shaft balance and phasing; measure shaft runout; measure and adjust driveline angles. (P-2)
5. Demonstrate drive axle diagnosis and repair and ring and pinion gears and differential case assembly techniques.
    a. Clean and inspect differential case; check for leaks; inspect housing vent. (P-1)
    b. Check and adjust differential case fluid level; use proper fluid type per manufacturer specification. (P-1)
    c. Drain and refill differential case; use proper fluid type per manufacturer specification. (P-1)
    d. Diagnose noise and vibration concerns; determine needed action. (P-2)
    e. Inspect and replace companion flange and/or pinion seal; measure companion flange runout. (P-2)
    f. Inspect ring gear and measure runout; determine needed action. (P-3)
    g. g. Remove, inspect, reinstall and/or drive pinion and ring gear, spacers, sleeves, and bearings. (P-3)
    h. Measure and adjust drive pinion depth. (P-3)
    i. Measure and adjust drive pinion bearing preload. (P-3)
    j. j. Measure and adjust side bearing preload and ring and pinion gear total backlash and backlash variation on a differential carrier assembly (threaded cup or shim types). (P-3)
    k. k. Check ring and pinion tooth contact patterns; perform needed action. (P-3)
    l. l. Disassemble, inspect, measure, adjust, and/or replace differential pinion gears (spiders), shaft, side gears, side bearings, thrust washers, and case. (P-3)
    m. Reassemble and reinstall differential case assembly; measure runout; determine needed action. (P-3)

6. Demonstrate limited slip differential diagnosis and repair techniques.
    a. Diagnose noise, slippage, and chatter concerns; determine needed action. (P-3)
    b. Measure rotating torque; determine needed action. (P-3)
7. Demonstrate drive axel inspection and replacement techniques.
    a. Inspect and replace drive axle wheel studs. (P-1)
    b. Remove and replace drive axle shafts. (P-1)
    c. Inspect and replace drive axle shaft seals, bearings, and retainers. (P-2)
    d. Measure drive axle flange runout and shaft end play; determine needed action. (P-2)
    e. Diagnose drive axle shafts, bearings, and seals for noise, vibration, and fluid leakage concerns; determine needed action. (P-2)

Comply with personal and environmental safety practices associated with clothing; eye protection; hand tools; power equipment; proper ventilation; and the handling, storage, and disposal of chemicals/materials in accordance with local, state, and federal safety and environmental regulations.

Big Ideas

Drive train issues
Clutch diagnosis and repair
Drive shaft and CV joint diagnosis and repair
Drive axel, ring and pinion gear, differential case diagnosis, repair, and assembly
Slip differential
Drive axel replacement
Four-wheel drive/All-wheel drive diagnosis and repair

Essential Questions

1. How do you perform manual drivetrain diagnosis?
2. How do you perform clutch diagnosis and repair?
3. How do you perform drive shaft and CV joint diagnosis and repair?
4. How do you perform drive axel, ring and pinion gear, and differential case diagnosis, repair and assembly?
5. How do you perform diagnosis and repair on the slip differential?
6. How do you perform a drive axel replacement?
7. How do you perform a four-wheel drive/all-wheel drive diagnosis and repair?
