

AST/MAST Brakes

Pacing Guide

Sequence	Lesson Title	Objectives	AST Task Sheets	MAST Task Sheets
1	AST/MAST: Brakes Pre-Test	1. To establish a baseline for current knowledge as well as identify areas of improvement.	N/A	N/A
2	Brake System Fundamentals (AST/MAST)	1. Identify brake system components and configurations.	5A2	5A2
3	Brake Diagnosis Procedures (AST/MAST)	1. Describe procedure for performing a road test to check brake system operation, including an antilock brake system (ABS). 2. Identify and interpret brake system concerns; determine needed action. 3. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pulsation concerns; determine needed action.	5A4 5A6 5D11	5A4 5A6 5D11
4	Introduction to Hydraulic System (AST/MAST)	1. Diagnose pressure concerns in the brake system using hydraulic principles (Pascal's Law).	5B1	5B1

Sequence	Lesson Title	Objectives	AST Task Sheets	MAST Task Sheets
5	Servicing the Hydraulic System (AST/MAST)	<ol style="list-style-type: none"> 1. Measure brake pedal height, travel, and freeplay (as applicable); determine needed action. 2. Check master cylinder for internal/external leaks and proper operation; determine needed action. 3. Check master cylinder for internal/external leaks and proper operation; determine needed action. 4. Select, handle, store, and fill brake fluids to proper level; use proper fluid type per manufacturer specification. 5. Identify components of hydraulic brake warning light system. 6. Inspect, test, and/or replace components of brake warning light system. 7. Bleed and/or flush brake system. 8. Test brake fluid for contamination. 9. Remove, bench bleed, and reinstall master cylinder. 10. Diagnose poor stopping, pulling, or dragging concerns caused by malfunctions in the hydraulic system; determine needed action. 11. Replace brake lines, hoses, fittings, and supports. 12. Fabricate brake lines using proper material and flaring procedures (double flare and ISO types). 13. Bleed the electronic brake control system hydraulic circuits. 	<p>5B2</p> <p>5B3</p> <p>5B4</p> <p>5B5</p> <p>5B6</p> <p>5B7</p> <p>5B8</p> <p>5B9</p> <p>5B10</p> <p>5B11</p> <p>5B12</p> <p>5B13</p> <p>5G3</p>	<p>5B2</p> <p>5B3</p> <p>5B4</p> <p>5B5</p> <p>5B6</p> <p>5B7</p> <p>5B8</p> <p>5B9</p> <p>5B10</p> <p>5B11</p> <p>5B12</p> <p>5B13</p> <p>5G3</p>
6	Introduction to Drum Brakes (AST/MAST)	<ol style="list-style-type: none"> 1. Remove, clean, and inspect brake drum; measure brake drum diameter; determine serviceability. 	5C1	5C1

Sequence	Lesson Title	Objectives	AST Task Sheets	MAST Task Sheets
7	Servicing Drum Brakes (AST/MAST)	<ol style="list-style-type: none"> 1. Refinish brake drum and measure final drum diameter; compare with specifications. 2. Remove, clean, inspect, and/or replace brake shoes, springs, pins, clips, levers, adjusters/self-adjusters, other related brake hardware, and backing support plates; lubricate and reassemble. 3. Inspect wheel cylinders for leaks and proper operation; remove and replace as needed. 4. Pre-adjust brake shoes and parking brake; install brake drums or drum/hub assemblies and wheel bearings; perform final checks and adjustments. 5. Diagnose poor stopping, noise, vibration, pulling, grabbing, dragging, or pedal pulsation concerns; determine needed action. 	<p>5C2 5C3 5C4 5C5 5C6</p>	<p>5C2 5C3 5C4 5C5 5C6</p>
8	Introduction to Servicing Calipers (AST/MAST)	<ol style="list-style-type: none"> 1. Remove and clean caliper assembly; inspect for leaks, damage, and wear; determine needed action. 2. Inspect caliper mounting and slides/pins for proper operation, wear, and damage; determine needed action. 3. Remove, inspect, and/or replace brake pads and retaining hardware; determine needed action. 4. Lubricate and reinstall caliper, brake pads, and related hardware; seat brake pads and inspect for leaks. 5. Remove and reinstall/replace rotor. 	<p>5D1 5D2 5D3 5D4 5D6</p>	<p>5D1 5D2 5D3 5D4 5D6</p>
9	Rotors (AST/MAST)	<ol style="list-style-type: none"> 1. Clean and inspect rotor and mounting surface; measure rotor thickness, thickness variation, and lateral runout; determine needed action. 	<p>5D5 5D7 5D8 5D10</p>	<p>5D5 5D7 5D8 5D10</p>

Sequence	Lesson Title	Objectives	AST Task Sheets	MAST Task Sheets
10	Power Assist Systems Overview and Diagnosis (AST/MAST)	<ol style="list-style-type: none"> 1. Check brake pedal travel with and without engine running to verify proper power booster operation. 2. Identify components of the brake power assist system (vacuum/hydraulic/electric). 3. Inspect vacuum-type power booster unit for leaks; inspect the check-valve for proper operation; check vacuum supply (manifold or auxiliary pump) to vacuum-type power booster; determine needed action. 4. Inspect and test hydraulically-assisted power brake system for leaks and proper operation; determine needed action. 5. Inspect electric power booster unit; determine needed action. 	<p style="text-align: center;">5E1 5E2 5E3 5E4</p>	<p style="text-align: center;">5E1 5E2 5E3 5E4 5E5</p>
11	Wheel Bearings (AST/MAST)	<ol style="list-style-type: none"> 1. Remove, clean, inspect, repack/replace and install wheel bearings; remove and install bearing races; replace seals; install hub and adjust bearings. 2. Inspect and replace wheel studs. 3. Remove, reinstall and/or replace sealed wheel bearing assembly. 4. Diagnose wheel bearing noises, wheel shimmy and vibration concerns; determine needed action. 	<p style="text-align: center;">5F1 5F5 5F6 5F7</p>	<p style="text-align: center;">5F1 5F5 5F6 5F7</p>
12	Parking Brakes and Brake Light Systems (AST/MAST)	<ol style="list-style-type: none"> 1. Retract and re-adjust caliper piston on an integrated parking brake system. 2. To check parking brake system components for wear, binding, and corrosion; clean, lubricate, adjust and/or replace as needed. 3. To check parking brake operation (including electric parking brakes); check parking brake indicator light system operation; determine needed action. 4. To check operation of brake stop light system. 	<p style="text-align: center;">5D9 5F2 5F3 5F4</p>	<p style="text-align: center;">5D9 5F2 5F3 5F4</p>

Sequence	Lesson Title	Objectives	AST Task Sheets	MAST Task Sheets
13	Systems and Components (AST/MAST)	<ol style="list-style-type: none"> 1. Identify and inspect electronic brake control system components (ABS, TCS, ESC); determine needed action. 2. Describe the operation of a regenerative braking system. 3. Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine needed action. 4. Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine needed action. 5. Depressurize high-pressure components of an electronic brake control system. 6. Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data). 7. Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.). 	5G1 5G2	5G1 5G2 5G4 5G5 5G6 5G7 5G8

Sequence	Lesson Title	Objectives	AST Task Sheets	MAST Task Sheets
14	Anti-Lock Brake System Diagnosis and Service (AST/MAST)	<ol style="list-style-type: none"> 1. Identify and inspect electronic brake control system components (ABS, TCS, ESC); determine needed action. 2. Describe the operation of a regenerative braking system. 3. Diagnose poor stopping, wheel lock-up, abnormal pedal feel, unwanted application, and noise concerns associated with the electronic brake control system; determine needed action. 4. Diagnose electronic brake control system electronic control(s) and components by retrieving diagnostic trouble codes, and/or using recommended test equipment; determine needed action. 5. Depressurize high-pressure components of an electronic brake control system. 6. Test, diagnose, and service electronic brake control system speed sensors (digital and analog), toothed ring (tone wheel), and circuits using a graphing multimeter (GMM)/digital storage oscilloscope (DSO) (includes output signal, resistance, shorts to voltage/ground, and frequency data). 7. Diagnose electronic brake control system braking concerns caused by vehicle modifications (tire size, curb height, final drive ratio, etc.). 	N/A	N/A
15	AST/MAST: Brakes Final Exam	1. To measure knowledge and skill growth.	N/A	N/A

AST/MAST Task Sheets

AST Task Sheets

A. General

- AST 5A1: Vehicle Service Information and History
- AST 5A2: Identify Brake System Components
- AST 5A3: Obtain and Interpret Diagnostic Trouble Codes and Scan Tool Data
- AST 5A4: Road Test Brake System Operation
- AST 5A5: Installation of Tire and Wheel Assembly
- AST 5A6: Identify and Interpret Brake System Concern

B. Hydraulic System

- AST 5B1: Diagnose Brake System Pressure Concerns Using Hydraulic Principles
- AST 5B2: Inspect, Measure and Adjust the Brake Pedal
- AST 5B3: Inspect the Master Cylinder for Leaks
- AST 5B4: Inspect Brake Lines and Hoses
- AST 5B5: Check and Adjust the Master Cylinder Fluid Level
- AST 5B6 & 5B13: Test and Repair the Hydraulic Brake Warning Light System
- AST 5B7: Bleed and/or Flush the Brake System
- AST 5B8: Check Brake Fluid for Contamination
- AST 5B9: Remove, Bench Bleed and Reinstall the Master Cylinder
- AST 5B10: Diagnose Brake Hydraulic System Concerns
- AST 5B11: Replace Brake Lines and Hoses
- AST 5B12: Fabricate Replacement Brake Lines

C. Drum Brakes

- AST 5C1: Remove and Inspect Brake Drum
- AST 5C2: Refinish Brake Drums
- AST 5C3: Disassemble and Inspect Drum Brake Components
- AST 5C4: Service Wheel Cylinders
- AST 5C5: Install and Adjust Drum Brake Components
- AST 5C6: Diagnose Drum Brake System Concerns

D. Disc Brakes

- AST 5D1: Remove, Clean and Inspect Caliper Assembly
- AST 5D2: Clean and Inspect Caliper Mounting
- AST 5D3: Remove, Inspect and Replace Pads
- AST 5D4: Install Disc Brake Calipers
- AST 5D5: Measure Rotor Thickness, Parallelism and Runout
- AST 5D6: Remove and Install Brake Rotors
- AST 5D7: Refinish Disc Brake Rotors on the Vehicle

AST/MAST Task Sheets

AST 5D8: Refinish Disc Brake Rotors off the Vehicle

AST 5D9: Retract and Adjust Caliper Piston on an Integrated Parking Brake System

AST 5D10: Brake Pad Break-in

AST 5D11: Diagnose Disc Brake System Concerns

E. Power-Assist Units

AST 5E1: Check Brake Pedal Travel to Verify Brake Booster Operation

AST 5E2: Identify Components of the Power Brake System and Test Vacuum Supply to Booster

AST 5E3: Test the Vacuum Power Brake Booster

AST 5E4: Test the Hydraulically-Assisted Power Brake System

F. Related Systems

AST 5F1: Inspect, Replace, and Adjust Serviceable Wheel Bearings

AST 5F2: Inspect Parking Brake Cables and Components

AST 5F3: Test Parking Brake System

AST 5F4: Test the Brake Stop Light System

AST 5F5: Inspect and Replace Wheel Studs

AST 5F6: Replace Sealed Wheel Bearing Assembly

AST 5F7: Diagnose Wheel Bearing Noise, Wheel Shimmy and Vibrations

G. Electronic Brake Control Systems

AST 5G1: Electronic Brake Control Systems Components

AST 5G2: Regenerative Braking

AST 5G3: Bleed Electronic Brake Hydraulic System

AST/MAST Task Sheets

MAST Task Sheets

A. General

MAST 5A1: Vehicle Service Information and History

MAST 5A2: Identify Brake System Components

MAST 5A3: Obtain and Interpret Diagnostic Trouble Codes and Scan Tool Data

MAST 5A4: Road Test Brake System Operation

MAST 5A5: Installation of Tire and Wheel Assembly

MAST 5A6: Identify and Interpret Brake System Concern

B. Hydraulic System

MAST 5B1: Diagnose Brake System Pressure Concerns Using Hydraulic Principles

MAST 5B2: Inspect, Measure and Adjust the Brake Pedal

MAST 5B3: Inspect the Master Cylinder for Leaks

MAST 5B4: Inspect Brake Lines and Hoses

MAST 5B5: Check and Adjust the Master Cylinder Fluid Level

MAST 5B6 & 5B13: Test and Repair the Hydraulic Brake Warning Light System

MAST 5B7: Bleed and/or Flush the Brake System

MAST 5B8: Check Brake Fluid for Contamination

MAST 5B9: Remove, Bench Bleed and Reinstall the Master Cylinder

MAST 5B10: Diagnose Brake Hydraulic System Concerns

MAST 5B11: Replace Brake Lines and Hoses

MAST 5B12: Fabricate Replacement Brake Lines

C. Drum Brakes

MAST 5C1: Remove and Inspect Brake Drum

MAST 5C2: Refinish Brake Drums

MAST 5C3: Disassemble and Inspect Drum Brake Components

MAST 5C4: Service Wheel Cylinders

MAST 5C5: Install and Adjust Drum Brake Components

MAST 5C6: Diagnose Drum Brake System Components

D. Disc Brakes

MAST 5D1: Remove, Clean and Inspect Caliper Assembly

MAST 5D2: Clean and Inspect Caliper Mounting

MAST 5D3: Remove, Inspect and Replace Pads

MAST 5D4: Install Disc Brake Calipers

MAST 5D5: Measure Rotor Thickness, Parallelism and Runout

AST/MAST Task Sheets

- MAST 5D6: Remove and Install Brake Rotors
- MAST 5D7: Refinish Disc Brake Rotors on the Vehicle
- MAST 5D8: Refinish Disc Brake Rotors off the Vehicle
- MAST 5D9: Retract and Adjust Caliper Piston on an Integrated Parking Brake System
- MAST 5D10: Brake Pad Break-In
- MAST 5D11: Diagnose Disc Brake System Concerns

E. Power-Assist Units

- MAST 5E1: Check Brake Pedal Travel to Verify Brake Booster Operation
- MAST 5E2: Identify Components of the Power Brake System and Test Vacuum Supply to Booster
- MAST 5E3: Test the Vacuum Power Brake Booster
- MAST 5E4: Test the Hydraulically-Assisted Power Brake System
- MAST 5E5: Inspect Electric Power Booster

F. Related Systems

- MAST 5F1: Inspect, Replace, and Adjust Serviceable Wheel Bearings
- MAST 5F2: Inspect Parking Brake Cables and Components
- MAST 5F3: Test Parking Brake System
- MAST 5F4: Test the Brake Stop Light System
- MAST 5F5: Inspect and Replace Wheel Studs
- MAST 5F6: Replace Sealed Wheel Bearing Assembly
- MAST 5F7: Diagnose Wheel Bearing Noise, Wheel Shimmy and Vibrations

G. Electronic Brake Control Systems

- MAST 5G1: Electronic Brake Control Systems Components
- MAST 5G2: Regenerative Braking
- MAST 5G3: Bleed Electronic Brake Hydraulic System
- MAST 5G4 & 5G5: Diagnose Antilock Brake Electronic Controls
- MAST 5G6: Depressurize Electronic Brake System
- MAST 5G7: Diagnose Electronic Brake System Speed Sensors
- MAST 5G8: Diagnose Antilock Brake System Concerns Caused by Vehicle Modifications