



CURRICULUM GUIDE

Abex



ANCO

BECKARNLEY



FELPRO

FERODO



MOOG

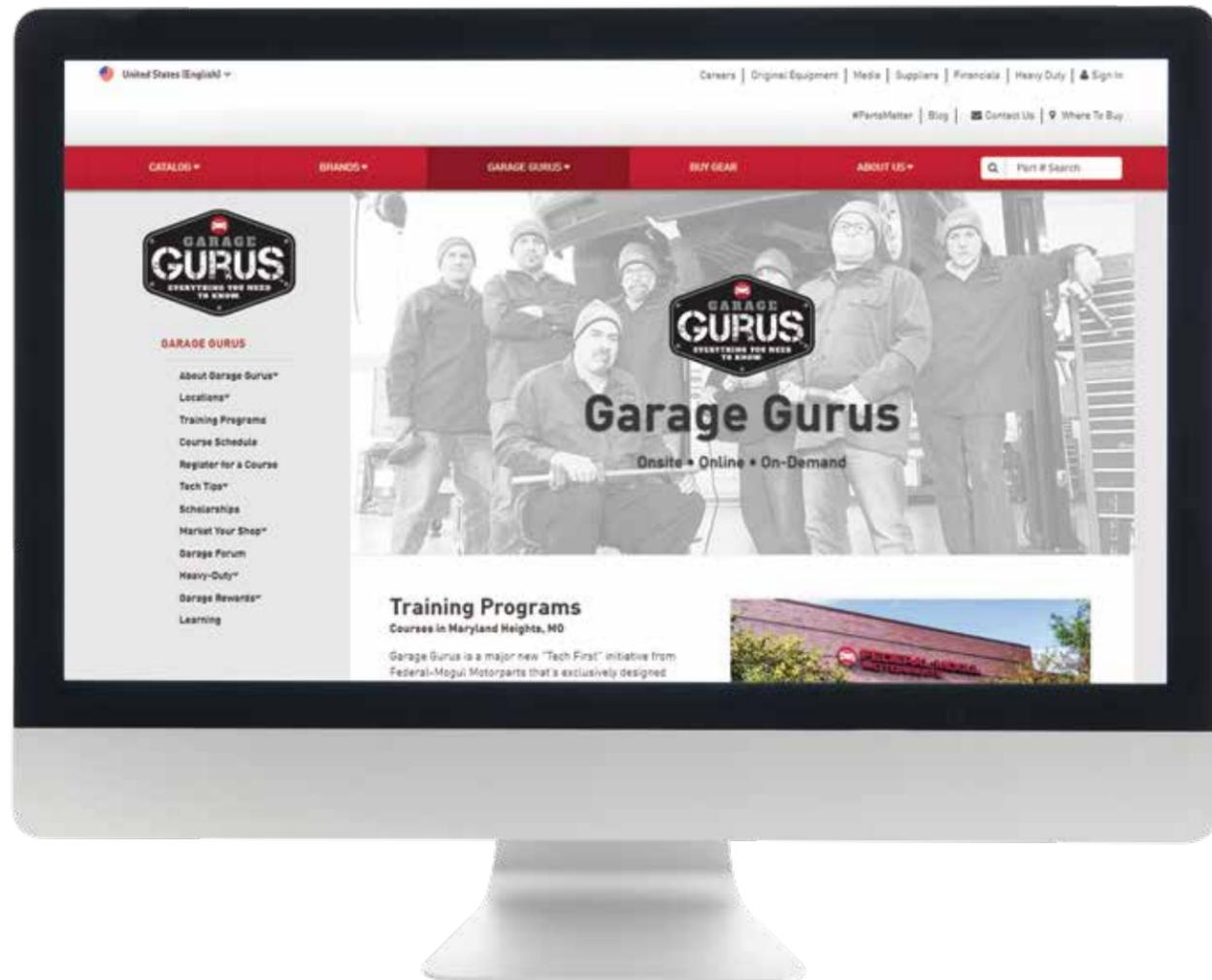
National
Oil Seals & Bearings



WAGNER



YOUR ONLINE INFORMATION RESOURCE



TRAINING PROGRAMS

Get info on...

- The Garage Gurus program
- Download Workshop Guide and Course Catalog
- Meet the Garage Gurus

COURSE SCHEDULE

Review the complete course schedule by location!

LOCATIONS

Location, directions and course calendar for each Technical Support Center!

TECH TIPS

View the latest Tech Tips that keep you a step ahead!

SCHOLARSHIPS

Find out how to earn a \$2,500 scholarship!

MAILING LIST

Get the latest newsletters and announcements from Federal-Mogul Motorparts!

GARAGE GURUS

Onsite. Online. On-Demand.

Garage Gurus™ is your portal to the most comprehensive training and technical support available in the automotive aftermarket. It is designed to offer you the tools you need to succeed, delivered in the way that best suits your needs.

TABLE OF CONTENTS

ASE TEST PREP COURSES	2
ASE Test Prep courses are designed for the working technician looking to gain accreditation with ASE. Getting your ASE certification is an important step in advancing your career as an automotive technician. Garage Gurus ASE Test Prep training can assist you with passing your test the first time. These Test Prep courses offer a convenient and effective venue for helping you become comfortable in learning the necessary test taking tips needed to become ASE certified.	
DAYTIME COURSES	6
One of our best venues for complete and thorough technical training. Our daytime training courses provide plenty of time to dive deep into the details of the topic at hand. We provide lunch and adequate time for proper classroom explanation, leaving plenty of time for the most desired format of technical training in the industry - 'hands-on'. We spend a good portion of time in our state-of-the-art technical facilities applying installation practices and test procedures discussed in the classroom.	
EVENING COURSES	16
This convenient option for technical training is our most popular. Throughout this venue, we are able to provide comprehensive automotive training when it is most practical for busy shop owners and technicians looking to improve their technical skill sets. This condensed training offering meets the time slot demands for those distracted with the hectic day to day operations of a demanding shop environment. The favorable four-hour offering provides an adequate balance of time in the classroom and in our state-of-the-art training bays.	
ONSITE FIELD CLINICS	24
The high levels of quality found in Garage Gurus training is also found beyond the walls of our nationwide Garage Gurus Technical Support Centers. Our field clinics are held throughout the country all year long. Field clinics are local, three-hour presentations given by one of Garage Gurus ASE Certified Master Trainers on selected topics. These clinics are designed for the professional technician and are usually presented during the evening hours to maximize attendance and minimize time away from the shop.	
ONLINE COURSES	29
Online training is a convenient addition to the Garage Gurus portfolio of world-class training. Online programs conveniently bring the world-class technical support center right to the student's computer or tablet. Garage Gurus online training meets the need for up-to-date, relevant training by offering online classes covering industry-specific topics for automotive technicians.	
TECHNICAL LUNCH AND LEARN PRESENTATIONS	38
The Lunch and Learn training presentation brings an ASE Certified Guru-on-the-Go right to the technician's location. These presentations range in duration from 30-90 minutes, during which, the Guru-on-the-Go delivers the latest in specific vehicle systems and diagnostics in a shop environment. The use of hands-on demonstrations (where applicable) makes this a fully interactive training experience for all technicians.	
HEAVY DUTY OFFERING	40
The in-class workshop experience allows students to work hand-in-hand with a Garage Gurus HD Master Trainer at one of our conveniently located Technical Support Centers (TSCs).	

VISIT FMGARAGEGURUS.COM TO LEARN MORE!

ASE TEST PREP COURSES



TABLE OF CONTENTS

STEERING AND SUSPENSION

ASE A4 Test Prep for Steering and Suspension 3

BRAKE

ASE A5 Test Prep for Brakes 3

ELECTRICAL

ASE A6 Test Prep for Electrical and Electronic Systems..... 4

HVAC

ASE A7 Test Prep for Heating and Air Conditioning..... 4

DRIVABILITY

ASE A8 Test Prep for Engine Performance 5

ENGINE

ASE A1 Test Prep Engine Repair 5

STEERING AND SUSPENSION

ASE.A4.1.WS | ASE A4 Test Prep for Steering and Suspension

Course Length: 4 hours Tuition: \$99.00 U.S.

This workshop reviews the needs for passing the A4 Steering and Suspension ASE Test. A Garage Guru overviews general test taking procedures and guidelines. The workshop includes reviewing several ASE sample questions and the logic behind the way they were written. We provide a summary of the description and operation for the following items taken from the task list for the ASE A4 test:

- Steering Systems Diagnosis and Repair
 - Steering Columns
 - Steering Units
 - Steering Linkage
 - Electric Assist
- Suspension Systems Diagnosis and Repair
 - Front Suspensions
 - Rear Suspensions
- Related Suspension and Steering Service
- Wheel Alignment Diagnosis, Adjustment, and Repair
- Wheel and Tire Diagnosis and Service

BRAKE

ASE.A5.1.WS | ASE A5 Test Prep for Brakes

Course Length: 4 hours Tuition: \$99.00 U.S.

This workshop reviews the needs for passing the A5 Brakes ASE Test. A Garage Guru overviews general test taking procedures and guidelines. The workshop includes reviewing several ASE sample questions and the logic behind the way they were written. We provide a summary of the description and operation for the following items taken from the task list for the ASE A5 test:

- Hydraulic System Diagnosis and Repair
 - Master Cylinder
 - Lines and Hoses
 - Valves and Switches
 - Bleeding, Flushing and Leak Testing
- Drum Brake Diagnosis and Repair
- Disc Brake Diagnosis and Repair
 - Power Assist Units Diagnosis and Repair
 - Miscellaneous Systems Diagnosis
 - Electronic Brake Control Systems
- Diagnosis and Repair

EVERYTHING YOU NEED TO KNOW.



ELECTRICAL

ASE.A6.1.WS | ASE A6 Test Prep for Electrical and Electronic Systems

Course Length: 4 hours Tuition: \$99.00 U.S.

This workshop reviews the needs for the A6 Electrical and Electronic Systems ASE Test. A Garage Guru overviews general test taking procedures and guidelines. This workshop includes reviewing several ASE sample questions and the logic behind the way they were written. We provide a summary of the description and operation for the following items taken from the task list for the ASE A6 test:

- General Electrical /Electronic System overview
- Battery and Starting System Diagnosis and Repair
- Charging System Diagnosis and Repair
- Lighting Systems Diagnosis and Repair
- Instrument Cluster and Driver Information Systems Diagnosis and Repair
- Body Electrical Systems Diagnosis and Repair

HVAC

ASE.A7.1.WS | ASE A7 Test Prep for Heating and Air Conditioning

Course Length: 4 hours Tuition: \$99.00 U.S.

This workshop reviews the needs for the A7 Heating and Air Conditioning ASE Test. A Garage Guru overviews general test taking procedures and guidelines. This workshop includes reviewing several ASE sample questions and the logic behind the way they were written. We provide a summary of the description and operation for the following items taken from the task list for the ASE A7 test:

- A/C System Service, Diagnosis and Repair
- Refrigeration System Component Diagnosis and Repair
- Compressor and Clutch
- Evaporator, Condenser and Related Components
- Heating and Engine Cooling Systems Diagnosis and Repair
- Operating Systems and Related Controls Diagnosis and Repair
- Electrical
- Vacuum/Mechanical
- Automatic and Semi-Automatic Heating, Ventilating and A/C Systems

DRIVABILITY

ASE.A8.1.WS | ASE A8 Test Prep for Engine Performance

Course Length: 4 hours Tuition: \$99.00 U.S.

This workshop reviews the needs for the A8 Engine Performance ASE Test. A Garage Guru overviews general test taking procedures and guidelines. This workshop includes reviewing several ASE sample questions and the logic behind the way they were written. We provide a summary of the description and operation for the following items taken from the task list for the ASE A8 test:

- General Engine Diagnosis
- Ignition System Diagnosis and Repair
- Fuel, Air Induction and Exhaust System Diagnosis and Repair
- Emission Control Systems Diagnosis and Repair
- Computerized Engine Control Diagnosis

ENGINE

ASE.A1.1.WS | ASE A1 Test Prep Engine Repair

Course Length: 4 hours Tuition: \$99.00 U.S.

This workshop reviews the needs for passing the A1 Engine Repair ASE test. A Garage Guru overviews general test taking procedures and guidelines. This workshop includes reviewing several ASE sample questions and the logic behind the way they were written. We provide a summary of the description and operation for the following items taken from the task list for the ASE A1 test.

- General Engine Diagnosis
- Cylinder Head and Valve Train Diagnosis and Repair
- Engine Block Diagnosis and Repair
- Lubrication and Cooling Systems Diagnosis and Repair
- Fuel, Electrical, Ignition and Exhaust Systems Diagnosis and Repair

DAYTIME COURSES



TABLE OF CONTENTS

BRAKE

Brake Diagnostics and Service 7

ABS/Stability Control and Traction Control Diagnostics 7

DRIVABILITY

Engine Performance and Drivability 8

Diagnosing Variable Valve Timing Systems on Today's Engines 8

Electronic Engine Diagnostics 9

ELECTRICAL

Automotive Electronics 10

ENGINE AND SEALING

Block Reconditioning and Sealing (St. Louis, MO only) 10

Cylinder Head Reconditioning and Sealing (St. Louis, MO only) 11

Diagnosing Modern Engine Sealing Challenges 12

IGNITION

Ignition Failure Diagnostics..... 12

Ignition Systems Diagnostics..... 13

STEERING AND SUSPENSION

Steering and Suspension Service 13

Advanced Steering and Suspension Diagnostics 14

Advanced Alignment Diagnostics..... 14

SERVICE WRITER TRAINING

Service Writer – Brakes..... 15

Service Writer – Steering and Suspension..... 15

BRAKE

BRK.201.1.WS | Brake Diagnostics and Service

Workshop Length: 2 days (16 hours) *\$349.00 U.S. 1.6 CEUs awarded

This workshop is designed with a combination of classroom and hands-on education to enhance the technician's ability to properly diagnose and service automotive and light truck braking systems. We define the function of brake system components, discussing friction, hydraulic theory operation and bleeding. We overview diagnostic procedures used to diagnose brake pull, brake performance and brake noise complaints.

After completing this workshop, the student will have the knowledge to:

- Interpret the proper friction material per vehicle application
- Apply hydraulic theory and use recommended brake service procedures to reduce diagnostic time and eliminate costly misdiagnosis
- Perform measurements of runout and parallelism of brake rotors
- Discuss hydraulic and friction failures on passenger cars and light trucks
- Discuss components and operation of electronic parking brake systems

BRK.203.1.WS | ABS/Stability Control and Traction Control Diagnostics

Workshop Length: 1 day (8 hours) *\$199.00 U.S. 0.8 CEUs awarded

This workshop is designed with a combination of classroom and hands-on education to enhance the technician's ability to properly diagnose automotive ABS, stability control and traction control systems. We will discuss the operation of the most current ABS/stability control systems utilized by Domestic, Asian and European vehicle manufacturers. Teves, Bosch, Delphi, Kelsey Hayes/TRW and Advic systems will be discussed.

After completing this workshop, the student will have the knowledge to:

- Discuss the function and components of ABS/stability control systems
- Evaluate scan tool data and fault codes
- Recognize the correct test procedures using scan tool data, oscilloscope, DVOM and graphing to view and diagnose yaw/lateral force and steering wheel position (SWP) sensors
- Identify base brake system issues that relate to unwanted ABS application and misdiagnosis

EVERYTHING YOU NEED TO KNOW.

**Tuition includes meal and classroom materials*



DRIVABILITY

DRV.601.1.WS | Engine Performance and Drivability

Workshop Length: 2 days (16 hours) *\$349.00 U.S. 1.6 CEUs awarded

This workshop uses a combination of classroom and hands-on education to keep technicians current on changing engine management systems and diagnostic tools for Asian and Domestic vehicles. The most frequently seen emission-based DTC diagnostic routines are reviewed in the classroom and applied in the service bays. The workshop helps technicians become more proficient in interpreting the information the scan tool provides for engine diagnostics. We establish a foundation utilizing strategy-based diagnostics to reduce diagnostic time and prevent Check Engine light comebacks. Learn to interpret scan tool information to gain diagnostic direction to repair today's most seen engine performance concerns.

After completing this workshop, the student will have the knowledge to:

- Evaluate scan tool information on emissions/performance related parameter identification data (PIDs) by using the graphing function of the tool to trend important PID relationships
- Diagnose emission related Check Engine light problems on vehicles using generic and enhanced scan data analysis
- Interpret important engine performance sensor information and vehicle operating system strategies
- Recognize fuel system monitoring strategies, operation and diagnostic routines
- Test for causes of the popular fuel system lean (P0171/P0174) and fuel system rich (P0172/P0175) DTCs on all makes, models and fuel injection types

DRV.604.1.WS | Diagnosing Variable Valve Timing Systems on Today's Engines

Workshop Length: 1 day (8 hours) *\$199.00 U.S. 0.8 CEUs awarded

This workshop will focus on the different types of variable valve timing (VVT) systems used by vehicle manufacturers today. After multi-valve technology became standard in engine design, VVT became the next step to enhance engine output, increasing engine power and torque output along with reducing emissions. Without VVT technology, engineers previously had to choose the best compromise in valve/cam timing and ended up sacrificing one thing to gain in another area. VVT allows the best of both worlds – increased performance and economy and lower emissions. There are a multitude of DTCs that can set related to VVT faults stemming from oil contamination to inoperative cam actuators and oil control solenoids. We explain the variations of VVT systems used by manufacturers today and look at diagnostic tests that can be performed on this system using the scan tool and other diagnostic equipment to confidently diagnose these systems before the costly and labor-intensive engine teardown for service.

After completing this workshop, the student will have the knowledge to:

- Identify the VVT system types used by manufacturers
- Relate to the scan tool parameters used by various manufacturers to validate camshaft control and operation
- Understand the VVT DTC stored in the Powertrain Control Module (PCM)
- Realize the importance of testing the crankshaft position and camshaft position sensors via a lab scope to validate camshaft to crankshaft correlation
- Perform mechanical engine testing and diagnosis using electronic pressure transducers
- Diagnose engine breathing related faults (both intake and exhaust) using fuel trim and volumetric efficiency testing information via the scan tool
- Utilize new scan tool information and techniques to reduce diagnostic time in the service bay for VVT related faults or symptoms

DRV.605.1.WS | Electronic Engine Diagnostics

Workshop Length: 1 day (8 hours) *\$199.00 U.S. 0.8 CEUs awarded

This workshop will focus on the different types of electronic engine diagnostic procedures used to diagnose today's engines. Both in-cylinder pressure transducers and manifold vacuum transducers used with a digital storage oscilloscope (DSO) can reduce valuable diagnostic and teardown time on today's VVT equipped multi-cam engines.

Engine performance and emissions can be severely impacted by cam timing concerns caused from lack of oil, failed timing chain tensioners and/or stretched timing chains or belts. Volumetric efficiency reductions caused by lack of air flow concerns from restrictions in the intake or exhaust systems can cause Low Power concerns. Air leaks in the induction system cause Check Engine lights and can be difficult to validate and pinpoint. Engine compression issues can be significant in size or very small, almost undetectable at times, leading to misfire DTCs. Relative compression testing can reduce the time it takes to validate a compression issue on an engine. These types of problems can skew the diagnostic information in the scan tool and can make it unreliable or unclear. In this class you learn the benefits of modern diagnostic equipment and learn when and how to use these testing techniques on the vehicle.

After completing this workshop, the student will have the knowledge to:

- Identify what tests to apply to accurately pinpoint the cause of engine performance concerns such as lack of power, run roughs, vacuum leaks and engine misfire
- Perform relative compression tests using both scan tools and lab scopes with a high amp current probe
- Perform mechanical engine testing and diagnosis using electronic pressure transducers
- Perform cranking vacuum tests on the engine using both the scan tool and a lab scope with vacuum transducer to validate air leaks
- Validate engine camshaft to crankshaft correlation accurately using lab scope tests
- Utilize new scan tool information and techniques to reduce diagnostic time in the service bay for VVT related faults or symptoms

**Tuition includes meal and classroom materials*

ELECTRICAL

ELC.501.1.WS | Automotive Electronics

Workshop Length: 2 days (16 hours) Tuition: *\$349.00 U.S. 1.6 CEUs awarded

This workshop is designed for technicians desiring educational instruction on one of today's hottest subjects. It includes hands-on lab exercises diagnosing electrical circuit faults, voltage drop and current testing. This workshop familiarizes the technician with electricity, electronics and fundamental circuits to become proficient with the diagnostic tools needed to service electrical systems. Students learn skills necessary to develop diagnostic strategies and avoid lengthy troubleshooting. Exercises include the use of diagnostic tools and demonstrations of various types of automotive electrical repairs. Students learn how to quickly identify electrical failures and recommend the proper repair.

After completing this workshop, the student will have the knowledge to:

- Accurately define electrical and electronic components
- Employ the diagnostic tools needed for electrical diagnosis
- Utilize skills to develop diagnostic strategies and avoid lengthy diagnostic times while increasing profitability
- Comprehend electrical schematics and apply knowledge to assist point of failure diagnostics
- Test automotive electronic circuits
- Identify electrical failures and recommend appropriate repair

ENGINE AND SEALING

ENG.401.1.WS | Block Reconditioning and Sealing (St. Louis, MO only)

Workshop Length: 4 days (32 hours) Tuition: *\$599.00 U.S. 3.2 CEUs awarded

The workshop is designed with a combination of classroom and hands-on education for automotive repair technicians and machinists involved in engine rebuilding. Disassembly, cleaning, critical measurements and selection of the proper sequence in reconditioning is thoroughly covered. Cylinder boring and honing, surface milling and connecting rod reconditioning are all demonstrated using proven techniques and tools. Assembly preparation is also discussed for engine components.

The technician will leave with the knowledge to make a determination of what machine shop services are required along with selecting the proper replacement parts for performance and service life. Knowledge is gained on OE design changes for proper assembly and sealing of aluminum and cast iron engines.

After completing this workshop, the student will have the knowledge to:

- Apply disassembly and cleaning techniques for efficient service and to prevent costly damage
- Identify the needs for machining, repair or replacement of lower block components through inspection and measurement of all components
- Calculate and determine lower block machining in the areas of line honing, surface mill, cylinder bore/hone and connecting rod reconditioning
- Recognize critical factors for gasket selection and installation
- Analyze failed seals and gaskets to identify required steps and procedures to ensure a quality repair and prevent comebacks
- Identify procedures and materials used in dry and fluid applications

ENG.402.1.WS | Cylinder Head Reconditioning & Sealing (St. Louis, MO only)

Workshop Length: 4 days (32 hours) Tuition: *\$599.00 U.S. 3.2 CEUs awarded

The workshop is designed with a combination of classroom and hands-on education for automotive technicians and machinists involved with cylinder head service and repair. Expand your knowledge of cylinder head reconditioning and sealing characteristics of head gaskets. Analyze components to identify required service and machining procedures. This class includes servicing aluminum and cast iron cylinder heads. Analyze different cleaning methods, milling, pressure testing, straightening, crack detection and repair. Repair techniques such as welding, oven straightening and stitching pins is discussed with hands-on demonstrations and shop activities. Hands-on experience is provided for aluminum and cast iron cylinder head reconditioning with quality parts, tools and equipment.

After completing this workshop, the student will have the knowledge to:

- Identify the correct cleaning procedure for cast iron and aluminum cylinder heads and their components to minimize time and prevent damage utilizing the following cleaning techniques: hot and cold wet cleaning, airless shot blasting, pyrolytic oven, glass beading and ultrasonic cleaning
- Perform critical measurements using various instruments — micrometers (inside diameter [I.D.] and outside diameter [O.D.]), vernier calipers and dial bore gauges
- Identify integrity of cylinder head components through specification measurements
- Perform failure analysis of cylinder head components (head gaskets and surface finish, valves, rocker arms, springs, retainers, guides and seats)
- Categorize cylinder head service steps in preparation for milling, pressure testing, straightening, crack detection and crack repair
- Differentiate techniques to repair cylinder heads in the areas of welding, oven and heat straightening, stitching pins and milling
- Employ various operations using equipment related to cylinder head reconditioning:
 - Surface/Milling machine
 - Crack detection and repair using stitching techniques
 - Guide and seat machine
 - Valve grinders
 - Tig welding
- Apply experience to efficiently assemble cylinder heads

**Tuition includes meal and classroom materials*

ENG.403.1.WS | Diagnosing Modern Engine Sealing Challenges**Workshop Length: 1 day (8 hours) Tuition: *\$199.00 U.S. 0.8 CEUs awarded**

This workshop enhances the skills of the professional under hood technician in the areas of interpreting gasket failure as it relates to modern emission control technologies used today by all manufacturers. A 'sealed' engine is a 'clean' engine today as viewed by the Environmental Protection Agency (EPA). Leaking engine gaskets not only leave spots on the ground, but they can cause a vehicle to have excessive emission levels. Induction leaks, coolant leaks, positive crankcase ventilation (PCV) system problems, crankcase leaks and cylinder head gasket failures are all discussed in this class with the focus placed on the impact these problems have on the On-Board Diagnostics, OBD-II system. Lean DTCs (P0171/0174), Misfire DTCs (P0300), and catalytic converter efficiency DTCs (P0420/P0430) can all be the result of gasket failure concerns. We discuss how to diagnose the symptoms that are the result of these failures using the everyday 'modern' diagnostic equipment in the repair shop.

After completing this workshop, the student will have the knowledge to:

- Distinguish the impact on the OBD-II system of failed engine gaskets versus a problematic sensor input (cause and effect)
- Diagnose oil consumption related problems due to failed engine gaskets, seals and piston rings
- Apply proper testing techniques that can be used to validate induction system leaks using scan tool data, smoke machines and pressure transducer diagnostic tools
- Employ test methods for diagnosing cylinder leakage due to head gasket failure and lower engine failure
- Identify cooling system concerns leading to gasket failures and vice versa

IGNITION**IGN.301.1.WS | Ignition Failure Diagnostics****Workshop Length: 2 days (16 hours) Tuition: *\$349.00 U.S. 1.6 CEUs awarded**

This workshop is designed for technicians servicing drivability, emission and tune-up repair on today's vehicles using a combination of classroom and hands-on education. Coil on Plug (COP) ignitions of all types are discussed. Enhanced scan tool data used to diagnose P0300 misfire diagnostic trouble codes (DTCs) is covered. Primary and secondary ignition waveform diagnostics are performed hands-on in the service bays using a variety of lab scope test equipment to aid in diagnosis of 'No Code' misfires. Emphasis is placed on techniques to help the technician become more proficient at diagnosing problems such as hard start, no start and intermittent misfire related DTCs using aftermarket scan tools and test equipment for quick and accurate analysis. New industry tools for misfire diagnostics are used in the service bays.

After completing this workshop, the student will have the knowledge to:

- Distinguish different operational strategies used on today's ignition systems ranging from Input triggering to misfire detection
- Diagnose misfire concerns on gasoline engines using enhanced scan tool data interpretation techniques
- Define differences between mechanical, fuel related and ignition misfires using advanced testing techniques
- Apply accurate testing practices for diagnosing Type A and B misfires utilizing scan tools, lab scopes, and current probes
- Identify faults in primary/secondary ignition waveforms

IGN.302.1.WS | Ignition Systems Diagnostics**Workshop Length: 1 day (8 hours) Tuition: *\$199.00 U.S. 0.8 CEUs awarded**

This workshop is designed with a combination of classroom and hands-on education to enhance the professional level technician's knowledge of modern ignition system diagnostics. P0300 misfire DTC diagnostic strategies are covered using modern scan tools and ignition system testing equipment. Technicians use digital storage oscilloscopes (DSOs), current probes, inductive wands and voltage leads to test modern ignition system components ranging from crankshaft and camshaft position sensors to today's COP (Coil on Plug) assemblies. Today's vehicle operational strategies are reviewed pertaining to OBD II Misfire Monitoring.

After completing this workshop, the student will have the knowledge to:

- Accurately test crankshaft position and camshaft position sensors
- Distinguish the difference between testing procedures for conventional ignition coils and 'smart coil' assemblies
- Interpret ignition component waveforms captured from a DSO (Digital Storage Oscilloscope)
- Recognize different manufacturers' operational strategy during misfire conditions
- Understand fuel trim corrections during ignition misfire conditions

STEERING AND SUSPENSION**SS.101.1.WS | Steering and Suspension Service****Workshop Length: 2 days (16 hours) *\$349.00 U.S. 1.6 CEUs awarded**

This workshop combines classroom and hands-on activities to enhance the diagnostic and service skills of the professional undercar technician in the areas of suspension diagnosis, steering system diagnosis and wheel alignment. Special emphasis is given to the effects of worn suspension system components on handling, ride quality, tire life and the symptoms to expect if a part has failed. The relationships between component integrity, alignment geometry, vehicle handling and tire wear is stressed. Customer communication skills are presented to help the student explain the value of the suggested repair to the vehicle owner.

After completing this workshop, the student will have the knowledge to:

- Perform accurate vehicle inspections on suspension and steering systems
- Identify the components and operating characteristics of suspension and steering systems on current passenger cars and light trucks
- Apply time-tested service techniques, tool usage and problem-solving parts to ensure accurate steering and suspension repairs in the minimum amount of time
- Utilize the latest alignment equipment to adjust chassis components for optimum handling, ride quality and tire life

**Tuition includes meal and classroom materials*

SS.102.2.WS | Advanced Steering and Suspension Diagnostics**Workshop Length: 1 day (8 hours) *\$199.00 U.S. 0.8 CEUs awarded**

This workshop enhances the skills of the professional undercar technician in the area of steering systems on both hydraulic and electronic assist units. Steering systems have evolved from hydraulic pump assisted steering gears to modern EPS (electric power steering) designs that can provide various level of assist. Each system's component operation is discussed and the strategies of operation are outlined. Information on steering angle sensor recalibration and sensor testing on both hydraulic and electrical assist steering units are reviewed. We also discuss electronic and mechanical suspension ranging from variable valve ride control systems to modern Magna Ride systems. Operation and diagnostic tips for air, nitrogen and hydraulic suspension systems are included in this workshop. Numerous diagnostic strategies are reviewed related to owner concerns of inadequate ride quality, handling issues and accelerated tire wear that may be caused by a suspension component failure.

After completing this workshop, the student will have the knowledge to:

- Define the operation of various electronically assisted steering systems (column drive, rack motor drive, belt drive)
- Overview variable ratio system operation from various manufacturers
- Diagnose hydraulic steering assist concerns and causes of noise and intermittent assist
- Utilize scan tools and other methods to service the system and recalibrate sensors after repairs and wheel alignment
- Identify the components and operation of late model ride control systems and related service procedures
- Utilize scan tools for diagnosis and bi-directional testing on both electronic steering and suspension controls

SS.104.1.WS | Advanced Alignment Diagnostics**Workshop Length: 1 day (8 hours) *\$199.00 U.S. 0.8 CEUs awarded**

This workshop enhances the skills of the professional undercar technician in the area of advanced and standard wheel alignment. It covers suspension and steering diagnosis due to bent parts from accidents and road hazards, vehicle modifications, tire/wheel resizing and height issues. A thorough understanding of camber, caster, toe, steering axis inclination (SAI), included angle, scrub radius and toe out on turns will assist the alignment technician in utilizing the aligner as a diagnostic tool. Related electronic systems are also covered in this course. Vehicle component inspection and customer communication skills are necessary traits for any successful alignment tech and the importance of these skills are stressed in this class.

After completing this workshop, the student will have the knowledge to:

- Utilize the alignment machine as a diagnostic tool for the alignment and repair of vehicles involved in road hazard incidents and vehicle collisions
- Identify root causes for uneven or erratic tire wear and handling problems. Effectively communicate the results to the vehicle owner.
- Identify how vehicle modifications and tire/wheel changes affect alignment and dynamic operation
- Analyze related electronic systems that interact with the chassis system in need of recalibration or adjustment after the alignment procedure

SERVICE WRITER TRAINING**SW.701.1.WS | Service Writer – Steering and Suspension****Workshop Length: 4 hours *\$129.00 U.S. 0.4 CEUs awarded**

This workshop enhances the skills of the service professional working as the interface between the customer and the business. Effective customer communication and selling skills are highlighted throughout this workshop. Emphasis is placed on practicing the 4C model (concern, cause, correction and consequence). Attendees are trained on how to professionally interact with their customers. Several role play exercises take place throughout the workshop so attendees can practice and hone their skills. This workshop focuses on a light technical overview of a vehicle's steering and suspension system. Proper vehicle inspections are demonstrated and documented following the most recent MAP (Motorist Assurance Program) guidelines.

After completing this workshop, the student will have the knowledge to:

- Professionally communicate the corrective action necessary for servicing a vehicle's steering and suspension system
- Interact professionally with the customer
- Properly inspect and document repair needs for a vehicle's steering and suspension system following MAP guidelines
- Communicate the benefits of replacing steering and suspension components with premium parts to the customer

SW.701.2.WS | Service Writer – Brakes**Workshop Length: 4 hours *\$129.00 U.S. 0.4 CEUs awarded**

This workshop enhances the skills of the service professional working as the interface between the customer and the business. Effective customer communication and selling skills are highlighted throughout this workshop. Emphasis is placed on practicing the 4C model (concern, cause, correction and consequence). Attendees are trained on how to professionally interact with their customers. Several role play exercises take place throughout the workshop so attendees can practice and hone their skills. This workshop focuses on a light technical overview of a vehicle's brake system's components. Proper vehicle inspections are demonstrated and documented following the most recent MAP (Motorist Assurance Program) guidelines.

After completing this workshop, the student will have the knowledge to:

- Professionally communicate the corrective action necessary for servicing a vehicle's braking system
- Interact professionally with the customer
- Properly inspect and document repair needs for a vehicle's braking system following MAP guidelines
- Communicate the benefits of a premium brake service to the customer

**Tuition includes meal and classroom materials*

EVENING COURSES



TABLE OF CONTENTS

BRAKE

Advanced Brake System Service Tips and Techniques..... 17

ABS Wheel Speed Sensor Testing 17

Electronic Brake Control (EBC) on Hybrid & Non-Hybrid Vehicles..... 18

DRIVABILITY

Engine Performance Diagnostics Strategies..... 18

Gasoline Direct Injection 19

Understanding CAN Networks 19

Air:Fuel System Management & Volumetric Efficiency Testing 20

O2 and Wide Range Air:Fuel Sensor Diagnostics 20

ELECTRICAL

Hands-On Electrical Diagnostics 21

ENGINE AND SEALING

Engine Misfire Analysis..... 21

IGNITION

Analyzing Today's Ignition Systems..... 22

Understanding Fuel Trims..... 22

How to Use Your Lab Scope..... 22

STEERING AND SUSPENSION

Diagnosing Modern Chassis Systems..... 23

Calibrating Steering Angle Sensors..... 23

Electronic Suspension Diagnostics..... 23

BRAKE

BRK.206.1.WS | Advanced Brake System Service Tips and Techniques

Workshop Length: 4 hours Tuition: *\$129.00 U.S. 0.4 CEUs awarded

The workshop is designed with a combination of classroom and hands-on education to enhance the technician's ability to properly diagnose automotive and light truck braking systems. In this class we discuss how to pinpoint the causes of brake pulls, brake vibrations and brake noise complaints. Proper service procedures are reviewed and installation tips are covered to prevent comebacks. The causes of uneven brake pad wear are also identified. We use live vehicles in the shop to help illustrate some of these points.

After completing this workshop, the student will have the knowledge to:

- Pinpoint noise problems
- Diagnose brake pull concerns
- Properly service automotive brake systems
- Understand 'uneven' brake pad wear
- Locate the source of brake vibration concerns

BRK.207.1.WS | ABS Wheel Speed Sensor Testing

Workshop Length: 4 hours Tuition: *\$129.00 U.S. 0.4 CEUs awarded

This workshop enhances the technician's ability to diagnose common ABS/Stability Control system faults that can illuminate a variety of warning lamps in the dash. Wheel speed sensor DTCs are one of the most frequently retrieved trouble codes from the ABS module. We define a variety of tests used to diagnose both Analog and Digital wheel speed sensors. These methods are demonstrated 'hands-on' in the shop.

After completing this workshop, the student will have the knowledge to:

- Connect a lab scope to various types of wheel speed sensors and validate powers and grounds
- Analyze faults found in wheel speed sensor waveforms
- Set up and use the scan tool capture function to chase 'intermittent' Wheel Speed sensor DTCs or false ABS activation concerns
- Differentiate circuit or component failures found when diagnosing wheel speed sensor DTCs

EVERYTHING YOU NEED TO KNOW.

**Tuition includes meal and classroom materials*



BRK.208.1.WS | Electronic Brake Control (EBC) Systems on Hybrid and Non-Hybrid Vehicles

Workshop Length: 4 hours Tuition: *\$129.00 U.S. 0.4 CEUs awarded

This workshop is designed for classroom education to enhance the technician's ability when performing base brake service on vehicles with Electronic Brake Control (EBC). These systems are found on many luxury and hybrid vehicles. We discuss the operation of the brake system components involved and how apply pressure is generated. In addition, ABS/stability control system operation found on EBC systems are reviewed.

After completing this workshop, the student will have the knowledge to:

- Discuss the function and components of EBC system
- Evaluate scan tool data and fault codes through Case Studies
- Identify procedures to prepare the vehicle for base brake service
- Discuss brake service issues that relate to base brake service and misdiagnosis

DRIVABILITY

DRV.606.1.WS | Engine Performance Diagnostic Strategies

Workshop Length: 4 hours Tuition: *\$129.00 U.S. 0.4 CEUs awarded

This workshop uses a combination of classroom and hands-on education to keep technicians current on changing Engine Management Systems and diagnostic tools for Asian and Domestic vehicles. The most frequently seen emission based DTC (Diagnostic Trouble Codes) diagnostic routines are reviewed in the classroom and applied in the service bays. The workshop helps technicians become more proficient in interpreting the information the scan tool provides for engine performance diagnostics. We establish a foundation utilizing "strategy based diagnostics" to reduce diagnostic time and prevent Check Engine Light comebacks. We discuss how to interpret Scan Tool information to gain diagnostic direction to repair today's most seen Engine Performance concerns.

After completing this workshop, the student will have the knowledge to:

- Review OBD II monitor strategy pertaining to the testing of emission related sensors
- Evaluate Scan Tool information on emissions/performance related PIDs (Parameter Identification Data) by using the Graphing function of the Scan Tool to 'trend' important PID relationships
- Diagnose emission related Check Engine light problems on vehicles using generic and enhanced Scan Data analysis
- Interpret important Engine Performance sensor information and vehicle operating system strategies
- Recognize Fuel System monitoring strategies, operation and diagnostic routines

DRV.607.1.WS | Gasoline Direct Injection

Workshop Length: 4 hours Tuition: *\$129.00 U.S. 0.4 CEUs awarded

The demand for more efficient, smarter and environmentally cleaner liquid-fueled spark ignition (SI) engines is a primary focus of today's vehicle manufacturers. GDI SI (Spark Ignited) engines have overcome many limitations and are now becoming commonplace. This workshop provides a comprehensive overview of GDI engines. Various engine operating modes (start-up injection, late injection, operating mode transition) are explored. An explanation of mixture preparation leading to the combustion process is outlined. An emphasis on operational strategies for both homogenous and stratified charge fuel control is reviewed. Issues related to the direct injection of gasoline into the combustion chamber are highlighted. Fuel injection system requirements for optimal spray characteristics are discussed. Emission of pollutants, fuel economy and effects of some key design and operating parameters are also covered.

After completing this workshop, the student will have the knowledge to:

- Describe the operating characteristics behind GDI engine operation
- Analyze the important criteria leading up to maximum performance in GDI engines such as proper operation of the Fuel Delivery system
- Explain injector spray and atomization requirements for successful GDI operation
- Utilize service tools and techniques to properly disassemble and reassemble GDI fuel systems
- Analyze important scan tool data parameters in verifying proper GDI engine performance
- Interpret scope waveforms captured from fuel injectors and other fuel system components
- Understand effects of key engine design and operating conditions on performance, combustion, and emission within GDI engines

DRV.608.1.WS | Understanding CAN Networks

Workshop Length: 4 hours Tuition: *\$129.00 U.S. 0.4 CEUs awarded

This workshop helps technicians understand, identify and diagnose CAN (Controller Area Network) communication networks. We review network fundamentals to help the technician understand the need, strategy and protocol of CAN. To aid in diagnostics, various types of network topology are explored and explained. To help pinpoint CAN failures, several electrical circuit integrity test methods are outlined to validate root cause of CAN communication failures. Application of the diagnostic strategies are demonstrated in our state-of-the-art service bays using modern diagnostic equipment.

After completing this workshop, the student will have the knowledge to:

- Identify Network type and topology
- Utilize the proper tools and test procedures when diagnosing network fault
- Diagnose 'U' code failures on CAN networks
- Test for 'No Communication' failures on CAN networks

**Tuition includes meal and classroom materials*

DRV.609.1.WS | Air:Fuel System Management & Volumetric Efficiency Testing**Workshop Length: 4 hours Tuition: *\$129.00 U.S. 0.4 CEUs awarded**

This workshop concentrates on the most common Drivability problems encountered on Asian and Domestic vehicles. Low power complaints and Engine Misfires are one of the highest causes of Check Engine Light illumination. Technicians explore how to test the function of various Engine Management Systems to validate root causes for many types of Engine Performance related problems. System diagnostics are performed in our state-of-the-art service bays. Explore the industry's newest aftermarket test equipment and procedures available for fast, efficient vehicle repair.

After completing this workshop, the student will have the knowledge to:

- Apply conclusive, in-bay tests to Speed Density and Mass Air Flow equipped vehicles to verify Fuel System control and to gain diagnostic direction for drivability complaints
- Examine causes of Misfire and Air:Fuel related DTC's using popular test equipment and scan tools
- Utilize NEW scan tool information and techniques to reduce diagnostic time in the service bay for Engine Performance concerns
- Diagnose engine breathing related faults (both Intake and Exhaust) using Fuel Trim and Volumetric Efficiency testing

DRV.610.1.WS | O2 and Wide Range Air:Fuel Sensor Diagnostics**Workshop Length: 4 hours Tuition: *\$129.00 U.S. 0.4 CEUs awarded**

This workshop concentrates on the most common drivability problems encountered on Asian and Domestic vehicles related to fuel control and Exhaust Sensor (O2 and A:F sensor) faults. Many manufacturers today have made the switch to using Wide Range Air:Fuel sensors over traditional O2 sensors to increase fuel economy and reduce vehicle emissions. The application of various diagnostic tests for both types of sensors are demonstrated in the service bays using both scan tools and lab scopes. Technicians observe how to test the function of the engine management system and Feedback Control Loop to validate root causes for many types of Engine Performance related problems. System diagnosis is performed in our state-of-the-art service bays. Explore the industry's newest aftermarket test equipment and procedures available for fast, efficient vehicle repair.

After completing this online course, the student will have the knowledge to:

- Review OBD II monitor strategy pertaining to the testing of Air:Fuel and emission related sensors
- Verify Air:Fuel (Lambda) sensor operation on car and test using proper techniques
- Validate O2 sensor performance
- Test O2 and A:F Sensor heater circuit related DTCs
- Efficiently diagnose O2 Sensor Performance, Lack of Switching, Slow Response, Circuit High and Circuit LOW DTCs in a timely manner
- Examine causes of Misfire and Fuel related DTCs using popular test equipment and O2 sensor scan data

ELECTRICAL**ELC.503.1.WS | Hands-On Electrical Diagnostics****Workshop Length: 4 hours Tuition: *\$129.00 U.S. 0.4 CEUs awarded**

This workshop is designed for technicians who have a basic understanding of electrical theory and are ready to put it to use. A large portion of this class is spent in our state-of-the-art shop working on vehicles with common, everyday automotive electrical test equipment. Technicians walk through a quick procedure to check battery, starting and charging systems, utilizing a DVOM to assist in accurate diagnosis. Common sensor inputs and outputs are explored with emphasis on diagnostic procedures and on-car testing. Input testing includes diagnosing three wire analog sensors, variable reluctance sensors and digital sensors. Output testing includes, pulse width modulated solenoids and DC motors.

After completing this workshop, the student will have the knowledge to:

- Diagnose common battery, starting, and charging issues using DVOM
- Understand and diagnose common 3 wire analog and digital sensors
- Measure and test Duty Cycle outputs for diagnostics
- Use amperage draw to diagnose DC Motor failures

ENGINE**ENG.404.1.WS | Engine Misfire Analysis****Workshop Length: 4 hours Tuition: *\$129.00 U.S. 0.4 CEUs awarded**

This workshop is designed for the drivability technician. Emphasis is placed on streamlining the process during the diagnostic of an engine misfire. We review scan tool data captured from various types of engine misfire complaints and connect-the-dots to locating the root cause. Several diagnostic tips and strategies are highlighted to help improve anyone's diagnostic methods. The infamous P0300 DTC (random cylinder misfire code) will no longer elude you after completing this workshop.

After completing this workshop, the student will have the knowledge to:

- Understand and apply tests using in-cylinder pressure transducers, vacuum transducers, and current probes for Misfire diagnosis
- Interpret valuable scan tool PIDs to aid in diagnosing a Misfire concern
- Differentiate between Fuel, Ignition, and Mechanical Misfires using the scan tool and a lab scope

**Tuition includes meal and classroom materials*

IGNITION

IGN.303.1.WS | Analyzing Today's Ignition Systems

Workshop Length: 4 hours Tuition: *\$129.00 U.S. 0.4 CEUs awarded

This workshop discusses diagnostic shortcuts and test methods that streamline the time spent pinpointing failures within the Ignition system. Modern COP Ignition system operation is reviewed in the classroom and tested in the service bays. Primary and Secondary Ignition waveforms are captured and reviewed in the service bays using the latest automotive diagnostic equipment.

After completing this workshop, the student will have the knowledge to:

- Interpret enhanced scan tool data helpful in the diagnosing a P0300 (random cylinder misfire) DTC
- Diagnose 'hard start' and 'no start' conditions
- Pinpoint causes of 'intermittent' Misfire
- Analyze Ignition waveforms captured with a lab scope

IGN.304.1.WS | Understanding Fuel Trims

Workshop Length: 4 hours Tuition: *\$129.00 U.S. 0.4 CEUs awarded

This workshop is designed to enhance the technician's ability to diagnose engine performance related problems through using Fuel Trim correction information provided from the scan tool data stream. It is often said that Total Fuel Trim correction learned by the vehicle PCM (Powertrain Control Module) is the technician's window into the vehicle's fuel injection system. Several cause and effect relationships are defined with emphasis placed on faulty sensor inputs, engine breathing problems (intake and exhaust restriction), Misfire and cylinder sealing (compression) issues. This workshop includes several in-bay demonstrations in our state-of-the-art service bays.

After completing this workshop, the student will have the knowledge to:

- Diagnose the common Fuel Trim diagnostic trouble codes (DTC's, P0171, P0174, P0172, P0175)
- Use Fuel Trim scan tool data to diagnose a variety of engine performance concerns
- Identify faulty sensor inputs that can affect fuel control through using fuel trim information
- Define LEAN and RICH engine running conditions and their causes

IGN.305.1.WS | How to Use Your Lab Scope

Workshop Length: 4 hours Tuition: *\$129.00 U.S. 0.4 CEUs awarded

In this workshop we present how to set up and operate a lab scope for the purpose of testing automotive sensors and components of various types. We cover set up procedures, voltage and time base settings, and waveform capturing techniques. Waveform analysis is discussed on many different captures to differentiate 'good' and 'bad.' Several on-car demonstrations take place in our state-of-the-art service bays during this workshop.

After completing this workshop, the student will have the knowledge to:

- Set up and capture automotive waveforms using a lab scope
- Configure lab scope settings for optimized viewing of waveforms
- Properly connect a lab scope to various solenoids, actuators, speed and position sensors, and DC motors found under hood and undercar

STEERING AND SUSPENSION

SS.105.1.WS | Diagnosing Modern Chassis Systems

Workshop Length: 4 hours Tuition: *\$129.00 U.S. 0.4 CEUs awarded

This workshop is designed to focus on the high volume repair opportunities found in the undercar sector of the automotive industry. The important relationships between component integrity, alignment geometry, vehicle handling and tire wear are defined. We discuss proper inspection procedures for all suspension and steering system types. Hands-on shop demonstrations in our state-of-the-art service bays are performed during this workshop.

After completing this workshop, the student will have the knowledge to:

- Properly perform steering and suspension inspection procedures
- Relate worn chassis components to vehicle handling, tire wear and ride quality concerns
- Identify various types of vehicle steering systems and their operations (hydraulic and electric)
- Inspect, properly diagnose and replace wheel hub bearings of all types

SS.106.1.WS | Calibrating Steering Angle Sensors

Workshop Length: 4 hours Tuition: *\$129.00 U.S. 0.4 CEUs awarded

This workshop combines classroom and hands-on activities to enhance the learning experience. The workshop starts with a description and operation segment on Steering Angle Sensors (SAS). We discuss the integration of these components within modern day safety systems included on today's vehicles. Theory and operation of these safety systems are reviewed and the special service procedures highlighted. Alignments are performed in the service bays while demonstrating SAS recalibration procedures.

After completing this workshop, the student will have the knowledge to:

- Understand the function of the Steering Angle Sensor (SAS) within various vehicle safety systems
- Locate and interpret SAS information within the scan tool datastream
- Perform SAS recalibration using an aftermarket scan tool
- Perform SAS recalibrations using the Hunter CodeLink tool

SS.107.1.WS | Electronic Suspension Diagnostics

Workshop Length: 4 hours Tuition: *\$129.00 U.S. 0.4 CEUs awarded

This workshop enhances the skills of the professional undercar technician in the areas of operation and diagnosis on electronically controlled suspension systems. We discuss techniques and procedures to replace, set up and calibrate suspension components, such as height sensors and electronic shocks and air springs, on vehicles with ECS (Electronically Controlled Suspension). Vehicle diagnostic strategies revolving around ride quality and handling issues are the focus. Air and Nitrogen suspension operation is discussed. Proven diagnostic strategies that address Service Suspension lights and vehicle stability concerns are discussed.

After completing this workshop, the student will have the knowledge to:

- Apply diagnostic tests to vehicles with ECS (Electronically Controlled Suspensions)
- Validate performance of suspension components on ECS equipped vehicles
- Understand scan tool data that identifies inputs and outputs on electronically controlled suspension equipped vehicles
- Identify different types of failed components on ECS (Electronically Controlled Suspension) equipped vehicles

**Tuition includes meal and classroom materials*

FIELD CLINICS



The high levels of quality found in Garage Gurus training is also found beyond the walls of our nationwide Garage Gurus Technical Support Centers. Our field clinics are held throughout the country all year long. Field clinics are local, three-hour presentations given by one of Garage Gurus ASE Certified Master Trainers on selected topics. These clinics are designed for the professional technician and are usually presented during the evening hours to maximize attendance and minimize time away from the shop.

WHAT'S INCLUDED

- Each clinic is designed to be approximately three hours of instruction with 30 minutes for dinner preceding the seminar.
- Twenty-five clinic kits are provided for each clinic.

FIELD CLINIC FEES

- Call your Federal-Mogul Motorparts representative for pricing.
- The clinic sponsor is responsible for location and meals.

TABLE OF CONTENTS

BRAKE

Brake System Technology 25

DRIVABILITY

Engine Performance Diagnostic Strategies..... 25

Diagnosing Variable Valve Timing..... 26

CAN Networks 26

IGNITION

How to Use Your Lab Scope for Diagnostics 27

Modern Ignition System Testing 27

STEERING AND SUSPENSION

Diagnosing Steering and Suspension Systems from A to Z 28

BRAKE

BRK.2021.1.FC | Brake System Technology

***Clinic Length: Approx. 3 hours Minimum of 25 attendees**

This clinic is designed to enhance the technician's ability to perform proper brake service procedures on today's vehicles utilizing Electronic Brake Control (EBC) systems. We discuss several Active Safety Systems and the operational strategies used on many new vehicles. Included in this technical seminar is an overview of stability control operation and the modern advancements within this safety technology. Newly mandated braking controls and the impact on vehicle braking performance are reviewed. Special service procedures on the base brake system are outlined. Brake by wire and automatic stop system control inputs and outputs are discussed. Yaw, lateral, accelerometer, wheel speed, active brake booster and brake pressure sensor testing procedures are outlined.

After completing this seminar, the student will have the knowledge to:

- Properly service today's automotive brake systems
- Diagnose Brake and Stability Control System warning lights
- Discuss base brake service issues that relate to braking performance issues
- Properly inspect, test and calibrate components within the electronic controlled brake system
- Evaluate scan tool data and fault codes through vehicle Case Study examples

DRIVABILITY

DRV.6021.1.FC | Engine Performance Diagnostic Strategies

***Clinic Length: Approx. 3 hours Minimum of 25 attendees**

This clinic is designed to keep technicians current on changing Engine Management Systems and diagnostic procedures for Asian and Domestic vehicles. The focus is on helping the technician become more proficient in interpreting the information the scan tool provides for engine performance diagnostics. We establish a foundation utilizing "strategy based diagnostics" to reduce diagnostic time and prevent Check Engine light comebacks. We discuss utilizing scan tool information to gain diagnostic direction to repair today's most seen Engine Performance concerns. Putting all the pieces together during an engine diagnostic is a lot like reading a road map; the key to success is finding the shortest path to the destination without getting lost.

After completing this seminar, the student will have the knowledge to:

- Apply a logical flow of diagnosing Check Engine light concerns through understanding what the scan tool data is saying
- Utilize the graphing function of the scan tool to 'trend' important scan tool PID (Parameter Identification Data) relationships
- Diagnose emission related Check Engine light problems on vehicles through using generic and enhanced scan data analysis
- Interpret important engine performance sensor information and vehicle operating system strategies



DRV.6041.1.FC | Diagnosing Variable Valve Timing

***Clinic Length: Approx. 3 hours Minimum of 25 attendees**

This clinic will focus on the different types of variable valve timing (VVT) systems used by vehicle manufacturers today. After multi-valve technology became standard in engine design, VVT became the next step to enhance engine output, increasing engine power and torque output along with reducing emissions. Without VVT technology, engineers previously had to choose the best compromise in valve/cam timing and ended up sacrificing one thing to gain in another area. VVT allows the best of both worlds – increased performance and economy and lower emissions. There are a multitude of Diagnostic Trouble Codes (DTCs) that can set related to VVT faults stemming from oil contamination to inoperative cam actuators and oil control solenoids. We explain the variations of VVT systems used by manufacturers today and look at diagnostic tests that can be performed on this system using the scan tool and other diagnostic equipment to confidently diagnose these systems before the costly and labor-intensive engine teardown for service.

After completing this clinic, the student will have the knowledge to:

- Identify the VVT system types used by manufacturers
- Understand the VVT DTC stored in the Powertrain Control Module (PCM)
- Relate to the scan tool parameters used by various manufacturers to validate camshaft control and operation
- Realize the importance of lab scope testing to validate camshaft to crankshaft correlation
- Perform mechanical engine tests with a variety of test equipment to avoid timely engine teardowns for diagnostic purposes
- Utilize new scan tool information and techniques to reduce diagnostic time in the service bay for VVT related faults or symptoms

DRV.6081.1.FC | CAN Networks

***Clinic Length: Approx. 3 hours Minimum of 25 attendees**

Since many newer vehicles can have 30 or more onboard computers, this clinic helps technicians understand, identify and diagnose CAN (Controller Area Network) vehicle communication networks. We review network fundamentals to help the technician understand the need, strategy and protocol of CAN. To aid in diagnostics, various types of network topologies are reviewed and explained. To help pinpoint CAN failures, several electrical circuit integrity test methods are outlined to validate root cause of CAN communication failures. Application of the diagnostic strategies are highlighted through vehicle Case Studies shown throughout this seminar.

After completing this clinic, the student will have the knowledge to:

- Identify Network type and topology
- Utilize the proper tools and test procedures when diagnosing network fault
- Diagnose 'U' code failures on CAN networks
- Test for 'No Communication' faults on CAN networks

IGNITION

IGN.3021.1.FC | How to Use Your Lab Scope for Diagnostics

***Clinic Length: Approx. 3 hours Minimum of 25 attendees**

In this clinic, we will present how to set up and operate a lab scope for the purpose of testing automotive sensors and components of various types. As the saying goes, "A picture is worth a thousand words." We cover set up procedures, voltage and time base settings, and waveform capturing techniques. Waveforms captured from many different component types are reviewed to differentiate 'good' and 'bad' waveforms. A color clinic book is provided showcasing popular aftermarket lab scope waveforms for take home reference.

After completing this clinic, the student will have the knowledge to:

- Set up and capture automotive waveforms using a lab scope
- Configure lab scope settings for optimized viewing of waveforms
- Properly connect a lab scope to various solenoids, actuators, speed and position sensors and DC motors found under hood and undercar
- Identify when going for the lab scope is necessary
- Utilize multiple channels of the lab scope to aid in diagnostic situations

IGN.3031.1.FC | Modern Ignition System Testing

***Clinic Length: Approx. 3 hours Minimum of 25 attendees**

This clinic is designed to enhance the professional level technician's knowledge of modern ignition system diagnostics. P0300 misfire DTC diagnostic strategies are covered using modern scan tools and ignition system test equipment. Information covered reviews digital storage oscilloscopes (DSOs) patterns captured using current probes, inductive wands and voltage test leads to validate modern ignition system components ranging from crankshaft and camshaft position sensors to today's COP (Coil on Plug) assemblies. Misfire information obtained from the scan tool is explained and reviewed through Case Study vehicles. PCM (Powertrain Control Module) operational strategies are defined pertaining to OBD II Misfire Monitoring standards.

After completing this clinic, the student will have the knowledge to:

- Recognize different manufacturers' operational strategy during misfire conditions
- Navigate quickly through valuable scan tool data to gain diagnostic direction
- Accurately test crankshaft position and camshaft position sensors
- Distinguish the difference in testing procedures for conventional ignition coils versus 'smart coil' assemblies
- Interpret various ignition component waveforms captured from a DSO (Digital Storage Oscilloscope)
- Understand fuel trim corrections during misfire conditions to isolate system faults

**Call your Federal-Mogul Motorparts representative for pricing*

STEERING AND SUSPENSION

SS.1021.1.FC | Diagnosing Steering and Suspension Systems from A to Z

*Clinic Length: Approx. 3 hours Minimum of 25 attendees

This clinic enhances the skills of the professional undercar technician in the areas of mechanical and electronic steering and suspension systems. We discuss proper component inspection procedures on today's popular suspension and steering systems. Vehicle diagnostic strategies revolving around ride quality and handling issues are a focus with an emphasis on electronic shocks and air springs used on vehicles with ECS (Electronically Controlled Suspension). A description, operation and diagnostic segment on electric steer vehicles is included. Integration of these components within modern day safety systems result in special wheel alignment procedures after 'hard part' replacement. We discuss how to perform this service the 'right way' to restore proper vehicle handling and control. Calibrating various steering and suspension components after replacement is highlighted.

After completing this clinic, the student will have the knowledge to:

- Relate worn chassis components to vehicle handling, tire wear and ride quality concerns
- Define the operation of electronically assisted steering systems (column drive, rack motor drive, belt drive)
- Validate performance of steering and suspension components on ECS equipped vehicles
- Understand the function and calibration needs of the Steering Angle Sensor (SAS) within various vehicle safety systems
- Recognize scan tool functional tests, data stream interpretation and output controls to complete electronic steering and suspension service procedures

**Call your Federal-Mogul Motorparts representative for pricing*

ONLINE COURSES



TABLE OF CONTENTS

BRAKE

Fundamentals of Automotive Brake Systems	30
Brake Systems, Inspections and Service.....	30
Low Copper Friction.....	30
Brake Friction Wear Analysis	31
Wagner Brake Features & Benefits.....	31

ENGINE AND SEALING

Modern Engine Sealing.....	32
Head Gasket Replacement Tips	32
Ford 6.0L Powerstroke Head Gasket – Diagnosis.....	32
Ford 6.0L Powerstroke Head Gasket – Teardown	33
Ford 6.0L Powerstroke Head Gasket – Inspection & Analysis	33
Ford 6.0L Powerstroke Head Gasket – Machining.....	33
Ford 6.0L Powerstroke Head Gasket – Reassembly.....	34

IGNITION

Modern Ignition Systems – Ignition Coil Operation & Control (Primary & Secondary).....	34
Modern Ignition Systems – Inputs	34
Modern Ignition Systems – Misfire Monitoring.....	35
Modern Ignition Systems – Basic Testing	35
Modern Ignition Systems – Advanced Testing.....	35
Modern Ignition Systems – Reading Spark Plugs	36

STEERING AND SUSPENSION

Steering and Suspension Overview.....	36
Suspension Basics	36
Steering Basics.....	37
Alignment Basics Part I.....	37
Alignment Basics Part II: Equipment.....	37
Steering and Suspension Components.....	38

TECHNICAL LUNCH AND LEARN PRESENTATIONS.....	39
---	-----------



BRAKE

BRK.201.1.LMS | Fundamentals of Automotive Brake Systems

Course Length: Approx. 30 minutes Tuition: \$9.95 U.S. 0.05 CEUs awarded

This online course is designed with a combination of digital media and online testing to enhance the technician's ability to identify and explain the major components in a vehicle brake system.

After completing this online course, the student will have the knowledge to:

- Recognize all brake components
- Recognize the components and importance of the master cylinder
- Identify disc brake caliper, wheel cylinder, drum and disc brake components and operation
- Review characteristics and requirements of brake fluid

BRK.202.1.LMS | Brake Systems, Inspection and Service

Course Length: Approx. 30 minutes Tuition: \$9.95 U.S. 0.05 CEUs awarded

This online course is designed with a combination of digital media and online testing to enhance the technician's ability to identify proper inspection and service procedures for complete disc brake service.

After completing this online course, the student will have the knowledge to:

- Properly inspect brake rotors, friction and the hydraulic system
- Define customer brake concerns
- Describe runout and parallelism (disc thickness variation) of a brake rotor
- State recommended brake service procedures
- Identify proper brake fluid bleeding procedures
- Explain proper break-in procedures

BRK.204.1.LMS | Low Copper Friction

Course Length: Approx. 30 minutes Tuition: FREE

This online course is designed with a combination of digital media and online testing to enhance the technician's ability to identify low copper friction legislation and the way it is changing the brake service industry. We identify specific requirements that are required of brake pad manufacturers moving forward.

After completing this online course, the student will have the knowledge to:

- Identify requirements for brake pad manufacturers
- Identify the function of copper in brake pads
- Identify how copper in brake pads affects the environment
- Describe the low copper content legislation in new brake pad formulation
- Recognize the need to use low copper friction

BRK.205.1.LMS | Brake Friction Wear Analysis

Course Length: Approx. 30 minutes Tuition: \$9.95 U.S. 0.05 CEUs awarded

This online course is designed with a combination of digital media and online testing to enhance the technician's ability to identify disc brake friction pad wear. We review the cause, effect and symptoms of irregular brake pad wear. Quality brake service procedures are identified.

After completing this online course, the student will have the knowledge to:

- Identify normal wear
- Identify premature wear
- Identify brake pad glazing
- Identify brake pad taper wear
- Identify brake pad excessive heat damage
- Recommend brake service procedures to prevent these failures

BRK.212.1.LMS | Wagner Brake Features and Benefits

Course Length: Approx. 30 minutes Tuition: FREE

This online course is designed with a combination of digital media and online testing to enhance the technician's ability to identify the features and benefits of Wagner® Brand products.

After completing this online course, the student will have the knowledge to:

- Explain why Wagner is a leading brand in braking
- Describe different types of application-specific friction material
 - Ceramic
 - Semi-metallic
- Understand what 'post-curing' of brake friction material means
- Explain the Wagner Brake friction line description
 - OE^x
 - TQ
 - QS
 - SD
- Present the benefits of using premium brake rotors

ENGINE AND SEALING

VID.401.1.LMS | Modern Engine Sealing

Course Length: Approx. 30 minutes Tuition: FREE

This online course covers the different engine gasket and seal locations common on today's modern engine. Many of these gasket locations can be potential leak problems as the engine ages. These leaks can lead to service opportunity for the repair shops. Identifying the engine system and components where these gaskets are designed to seal can help a service professional understand the function and what the service opportunity looks like. This course helps the service professional identify what is required to service or replace various engine gaskets and seals.

After completing this online course, the student will have the knowledge to:

- Identify service opportunities for today's engine repair business
- Recognize what engine gasket and seal service entails in the bay
- Understand all components on the engine that seal water, fuel and oil

VID.402.1.LMS | Head Gasket Replacement Tips

Course Length: Approx. 30 minutes Tuition: FREE

This online course covers the proper service procedures and inspection methods that are necessary to be performed when servicing an engine's cylinder head gaskets. During this video based training we review cleaning tips for the cylinder head and block, inspection methods for the cylinder head, head gasket preparation tips, bolt preparation and proper bolt torquing procedures.

After completing this online course, the student will have the knowledge to:

- Remove and inspect the cylinder head for service
- Understand surface finish on both the cylinder block and the cylinder head
- Perform proper head gasket installation
- Properly install and torque head bolts using a torque angle method

ENG.407.1.LMS | Ford 6.0L Powerstroke Head Gasket – Diagnosis

Course Length: Approx. 30 minutes Tuition: \$9.95 U.S. 0.05 CEUs awarded

This online course covers the symptoms and preliminary diagnostics of a Powerstroke 6.0L diesel truck that has a leaking cylinder head gasket concern. We look at different diagnostic tests that can be performed through the use of the scan tool to aid in the validation of a failed cylinder head gasket. The Powerstroke 6.0L Ford diesel engine has a host of inherent engine design flaws. We examine many different components of this engine architecture that can create similar symptoms to those you would experience on an application with failed head gaskets.

After completing this online course, the student will recognize the correct procedures to:

- Diagnose a leaking head gasket on a Ford Powerstroke 6.0L diesel engine
- Know what to look for on a 6.0L Ford diesel that has a coolant consumption problem
- Access valuable scan tool diagnostic tests to quickly pinpoint engine concerns

ENG.408.1.LMS | Ford 6.0L Powerstroke Head Gasket – Teardown

Course Length: Approx. 30 minutes Tuition: \$9.95 U.S. 0.05 CEUs awarded

This online course discusses the steps involved to tear down the 6.0L Powerstroke engine. Due to the size of the engine and the tight packaging between the frame rails, it is oftentimes easier to remove the cab of the truck when majorly servicing engine components such as cylinder heads. We discuss the steps involved for this timely procedure while demonstrating some shortcuts along the way. During the teardown process we also highlight several other key areas of concern on the 6.0L Powerstroke engine.

After completing this online course, the student will recognize the correct procedures to:

- Recognize the steps involved to remove the cylinder heads on the Powerstroke 6.0L engine
- Identify areas of concern during the 6.0L diesel engine teardown
- Point out telltale signs of a leaking head gasket during component inspection after cylinder head removal

ENG.409.1.LMS | Ford 6.0L Powerstroke Head Gasket – Inspection & Analysis

Course Length: Approx. 30 minutes Tuition: \$9.95 U.S. 0.05 CEUs awarded

This online course covers the steps involved to inspect all of the engine components after the cylinder heads have been removed from the Powerstroke 6.0L diesel engine. We highlight specific cleaning procedures necessary to prepare the engine parts for inspection. The procedures involved for checking the cylinder heads and engine block for flatness and straightness are also discussed. We perform magnetic particle testing to validate cylinder head casting integrity. We walk through the steps involved to pressure test the cylinder heads to test for cracks and coolant leak paths. After all tests are performed we will be able to decide if the parts can be reinstalled.

After completing this online course, the student will recognize the correct procedures to:

- Recognize the steps involved to properly clean the engine components prior to reinstallation
- Locate areas of concern within the cylinder heads
- Pinpoint problematic areas on the engine block
- Decide if the engine components will need to go to a machine shop for additional inspection or repair

ENG.410.1.LMS | Ford 6.0L Powerstroke Head Gasket – Machining

Course Length: Approx. 30 minutes Tuition: \$9.95 U.S. 0.05 CEUs awarded

This online course examines the service of the cylinder head from the machine shop's perspective. We review cylinder head machining practices in order to restore a damaged cylinder head's surface back to proper condition to be reinstalled. We address the surface finish requirements necessary for the replacement MLS head gasket to work properly and discuss practices and tooling requirements necessary to achieve it. Surface finish measuring with a profilometer is demonstrated in the video. Valve recession measuring is overviewed, as this is a critical concern on a diesel engine's cylinder head.

After completing this online course, the student will recognize the correct procedures to:

- Identify cylinder head surface finish needs before reinstallation of the cylinder head during head gasket service
- Understand the machine shop processes used to recondition a cylinder head's surface
- Recognize what to expect as far as service standards from a machine shop

ENG.411.1.LMS | Ford 6.0L Powerstroke Head Gasket – Reassembly

Course Length: Approx. 30 minutes Tuition: \$9.95 U.S. 0.05 CEUs awarded

This online course examines the reassembly procedure on the Powerstroke 6.0L diesel engine head gasket replacement. We explain proper head gasket and cylinder head fastener selections and focus on head torquing procedures required for the repair to be a permanent one. We define cylinder head clamp load, torque to yield bolts and MLS head gasket construction to ensure the details of proper head gasket installation and torquing can be understood. Procedure and parts selection is everything when it comes to a long-lasting repair on this engine platform.

After completing this online course, the student will recognize the correct procedures to:

- Recognize the importance of cleaning threads and replacing head bolts
- Understand the benefits of MLS cylinder head gaskets
- Define what torque to yield (TTY) head bolts are and why they need to be replaced
- Understand bolt torque versus bolt stretch

IGNITION

IGN.301.1.LMS | Modern Ignition Systems – Ignition Coil Operation and Control (Primary & Secondary)

Course Length: Approx. 30 minutes Tuition: \$9.95 U.S. 0.05 CEUs awarded

This online course covers the fundamentals of ignition coils. An overview of coil design and operation is included. Methods on how to test different ignition types are emphasized. Primary and secondary ignition patterns are broken down into an understandable format. Ignition module control is highlighted.

After completing this online course, the student will recognize the correct procedures to:

- Recognize the evolution of ignition coil design and the different types used by manufacturers
- Understand ignition coil operation
- Analyze a primary ignition scope waveform
- Analyze a secondary ignition scope waveform
- Identify different ignition control module types

IGN.302.1.LMS | Modern Ignition Systems – Inputs

Course Length: Approx. 30 minutes Tuition: \$9.95 U.S. 0.05 CEUs awarded

This online course identifies the different ignition inputs used by the PCM to trigger the ignition system. We review the different types of crankshaft position sensors (CKP) and camshaft position sensors (CMP) used by vehicle manufacturers. We identify various locations of these components as well as Diagnostic Trouble Codes (DTCs) that can set when they fail. We demonstrate what an intermittent CKP fault acts like through exploring a live vehicle demonstration captured on video. There are several examples shown of bad components captured using both a scan tool and a digital storage oscilloscope (DSO).

After completing this online course, the student will recognize the correct procedures to:

- Identify different types of CKP and CMP sensors used today
- Recognize likely locations of these components on the vehicle
- Define the relationship of how these vital inputs are used by the vehicle's Powertrain control module (PCM)
- Choose the best avenue for testing for a particular CKP or CMP sensor related fault

IGNITION

IGN.303.1.LMS | Modern Ignition Systems – Misfire Monitoring

Course Length: Approx. 30 minutes Tuition: \$9.95 U.S. 0.05 CEUs awarded

In this online course we review how the PCM uses the CKP and CMP inputs to run misfire detection. The misfire monitor is one of the continuously run On-Board Diagnostics (OBD) monitors whose logic is stored within the PCM. Engine misfires can lead to excessive hydrocarbon emissions and are mandated by the Federal Government to be detected by the vehicle's engine management system. The reliability of this system is critical. The PCM uses the CKP and CMP sensors as its primary inputs to detect engine misfire.

After completing this online course, the student will recognize the correct procedures to:

- Understand misfire detection logic employed by the PCM
- Recognize the relationship between the CKP and CMP
- Understand how a misfire DTC sets
- Differentiate between a Type A and Type B misfire
- Identify when a CKP relearn is necessary to be performed

IGN.304.1.LMS | Modern Ignition Systems – Basic Testing

Course Length: Approx. 30 minutes Tuition: \$9.95 U.S. 0.05 CEUs awarded

In this online course we look at basic ignition system tests that can be performed by most general technicians. The practice of using basic spark testers, a digital volt-ohm meter (DVOM), performing thorough visual inspections and using an inductance ignition tester are discussed.

After completing this online course, the student will recognize the correct procedures to:

- Identify simple tests that can be performed during the initial diagnosis of an ignition misfire
- Recognize visual signs of fault within various ignition system components
- Understand the path of least resistance when it comes down to pinpointing an ignition system fault
- Perform basic DVOM tests on the ignition system and coil

IGN.305.1.LMS | Modern Ignition Systems – Advanced Testing

Course Length: Approx. 30 minutes Tuition: \$9.95 U.S. 0.05 CEUs awarded

In this online course we look at the best diagnostic methods to use when trying to pinpoint an ignition system fault. Many OEs today advocate the use of a DSO for testing of many different vehicle systems. As with any modern-day vehicle repair, the use of the right tool for the job makes life easier. Many technicians struggle with learning the proper methods to test the performance of an ignition system. We take the fear out of using DSOs and give several detailed examples of how and when to use the right tool for the job.

After completing this online course, the student will recognize the correct procedures to:

- Connect the DSO and test the primary voltage of an ignition system
- Connect the DSO and test the secondary voltage output of an ignition coil
- Current ramp the primary side of an ignition coil using a low amp current probe
- Establish a relationship between the primary current and the primary voltage
- Set up a sync within an ignition waveform to identify faulted cylinders

IGN.306.1.LMS | Modern Ignition Systems – Reading Spark Plugs**Course Length: Approx. 30 minutes Tuition: \$9.95 U.S. 0.05 CEUs awarded**

In this online course we explain how to interpret different types of spark plug signs that are indicators of potential problems. We dispel common misunderstandings amongst technicians as to what the definition of heat range is for a spark plug. Installation tips are provided, as well as common things to watch for when setting the gap on a spark plug.

After completing this online course, the student will recognize the correct procedures to:

- Understand the heat range of a spark plug
- Recognize the effects of induction cleaning on the spark plugs in your engine
- Differentiate spark plug installation torque procedures for gasket style and tapered spark plugs
- Identify different signs of failure on a spark plug (i.e. carbon tracking, voltage leaks, etc.)

STEERING AND SUSPENSION**SS.101.1.LMS | Steering and Suspension Overview****Course Length: Approx. 30 minutes Tuition: FREE**

This online course is designed for the technician in the undercar/alignment area. It provides an overview of the entire suspension and steering systems used on common vehicle applications today. Special emphasis is placed on how all system components work in unison to provide proper handling, ride quality and tire wear. The importance of each component and system is related to wheel alignment and customer satisfaction. At the conclusion, the student can understand the value in listening to and analyzing the system, and communicating the results of a chassis inspection to the vehicle owner in order to restore proper alignment, system function and extended tire life.

After completing this online course, the student will have the knowledge to:

- Identify the steering and suspension systems that make up the vehicle chassis
- Understand how suspension mounting points are anchored to the vehicle frame and are critical inspection points
- Recognize how a change in one component affects others in the steering system, suspension system and/or in the frame
- Diagnose the need for a front end alignment based on uneven tire wear or handling problems

SS.102.1.LMS | Suspension Basics**Course Length: Approx. 30 minutes Tuition: \$9.95 U.S. 0.05 CEUs awarded**

This online course is designed with a combination of media and online testing systems to enhance the technician's ability to properly diagnose automotive and light truck suspension systems. We define the function and diagnostic procedures for chassis system components and discuss suspension geometry, component parts and their relationship to wheel alignment. Customer communication skill tips are also included following the industry preferred Motorist Assurance Program (MAP) guidelines.

After completing this online course, the student will have the knowledge to:

- Identify the common suspension systems in use today
- Practice discussing needs with the vehicle owner in an understandable fashion
- Utilize acquired skills to test and locate problems in a common suspension system
- Demonstrate inspection and proper service procedures on common suspension systems

STEERING & SUSPENSION**SS.103.1.LMS | Steering Basics****Course Length: Approx. 30 minutes Tuition: \$9.95 U.S. 0.05 CEUs awarded**

This online course familiarizes the technician with the various automotive and light truck steering systems in use today. We define system function, steering geometry and component relationship to wheel alignment. Proper diagnostic methods of components and vehicle symptoms are included. Industry preferred MAP inspection and communication guidelines are stressed.

After completing this online course, the student will have the knowledge to:

- Review the operation of modern steering systems and steering geometry
- Demonstrate developed skills to locate concerns with steering components
- Practice discussing inspection results of the steering system to the vehicle owner using MAP guidelines
- Utilize acquired skills to perform quality steering system service

SS.104.1.LMS | Alignment Basics Part I**Course Length: Approx. 30 minutes Tuition: FREE**

This online course is designed to enhance the technician's ability in the areas of modern wheel alignment geometry and service. Today's wheel alignment is much more than just adjusting the angles to specs. The material reviews diagnostic skills to reduce comebacks and make alignment more profitable.

After completing this online course, the student will have the knowledge to:

- Explain the importance of wheel alignment and when it is necessary
- Practice discussing the importance of proper chassis height and parts integrity and their relationship to wheel alignment
- Interpret tire wear patterns and spot underlying causes
- Educate the vehicle owner to desire quality repairs for extended tire life and optimum vehicle control and handling
- Identify camber, caster and toe and their relationship to tire wear and handling
- Interpret steering axis inclination (SAI), included angle and Ackermann angle to find collision damaged components

SS.105.1.LMS | Alignment Basics Part II: Equipment**Course Length: Approx. 30 minutes Tuition: FREE**

This online course picks up where Alignment Basics Part I ends and includes the use and understanding of the typical alignment machine. Common errors are discussed, as well as the importance of good customer communication. A good alignment includes taking the time to perform a thorough inspection including chassis height and component parts. Valuable reference materials available from MOOG® are also covered in this module.

After completing this online course, the student will have the knowledge to:

- Review the features of the modern alignment machine
- Utilize alignment equipment to capture camber, caster, toe, SAI, included angle and toe out on turns (Ackermann angle)
- Understand common errors made related to alignment
- Understand the importance of good customer communication

SS.106.1.LMS | Steering and Suspension Components

Course Length: Approx. 30 minutes Tuition: FREE

This online course provides an overview of common steering and suspension components. The description, location and purpose of each component is described in detail. Special emphasis is placed on how each component works as part of a team to provide optimum tire life, good handling, ride quality and vehicle safety. Common driveline component descriptions are also included in this module. Wear characteristics are provided for key suspension and steering components to provide the technician with the knowledge needed to explain the importance of proper system repair to the vehicle owner.

After completing this online course, the student will have the knowledge to:

- Locate and inspect all primary steering and suspension components
- Identify the most common mounting styles for ball joints
- Recognize main components of strut assemblies and the functions associated to each part.
- Understand which steering and suspension components attach to the centerlink of the vehicle.

TECHNICAL LUNCH AND LEARN PRESENTATIONS



The Lunch and Learn training presentation brings an ASE Certified Guru-on-the-Go right to the technician's location. These presentations range in duration from 30-90 minutes, during which, the Guru-on-the-Go delivers the latest in specific vehicle systems and diagnostics in a shop environment. The use of hands-on demonstrations (where applicable) makes this a fully interactive training experience for all technicians. Lunch and Learn training presentations are free – please contact your Federal-Mogul Motorparts representative for details.

Brake Noise and Its Root Cause

Presentation Length: Approx. 30 minutes

Tech Tips:

- Pinpointing causes of brake noise
- Service Tips for noise prevention

Brake Burnish Procedure

Presentation Length: Approx. 30 minutes

Tech Tips:

- Brake rotor refinishing procedures
- Seating in NEW brake pads

Understanding Coefficient of Friction

Presentation Length: Approx. 30 minutes

Tech Tips:

- Explain brake friction formulations
- Understand the causes of brake fade

How to Prevent Brake Comebacks

Presentation Length: Approx. 45 minutes

Tech Tips:

- Proper brake system service
- Lubrication points during brake service

Wheel Speed Sensors

Presentation Length: Approx. 45 minutes

Tech Tips:

- Differentiate types of wheel speed sensors
- Diagnostic tests for wheel speed sensors

Tire Pressure Sensors

Presentation Length: Approx. 45 minutes

Tech Tips:

- Indirect vs. Direct sensors
- Relearning position

Introduction to ABS

Presentation Length: Approx. 60 minutes

Tech Tips:

- ABS components and operation
- Locating and ABS faults

Electrical Properties and Digital Multi-meter (DMM) Use

Presentation Length: Approx. 60 minutes

Tech Tips:

- Application of Ohm's Law on vehicle circuits
- Voltage drop testing

Understanding Network Communications

Presentation Length: Approx. 60 minutes

Tech Tips:

- Identify different network voltages
- Identify different communication bus types

Engine Sealing Properties

Presentation Length: Approx. 45 minutes

Tech Tips:

- Gasket installation and bolt torquing
- Fel-Pro Problem Solver applications

Engine Parts Failure Analysis

Presentation Length: Approx. 60 minutes

Tech Tips:

- Internal engine noise diagnostics
- Reading worn engine parts

Ford Coil-On-Plug (COP) 3 Valve Triton Engine

Presentation Length: Approx. 30 minutes

Tech Tips:

- Spark plug installation
- Broken spark plug extraction

What is Fuel Trim and Why Is It Important

Presentation Length: Approx. 60 minutes

Tech Tips:

- Diagnosing engine vacuum leaks
- O2 sensor validation

Chrysler Evaporative Emissions (EVAP)

Presentation Length: Approx. 60 minutes

Tech Tips:

- Natural vacuum leak detection diagnostics
- Smoke machine testing

Diagnostic Alignment Angles

Presentation Length: Approx. 30 minutes

Tech Tips:

- Vehicle handling and performance
- Use of SAI (Steering Axis Inclination) and IA (Included Angle)

Steering and Suspension Angles Explained

Presentation Length: Approx. 45 minutes

Tech Tips:

- Wheel alignment procedures and adjustment (camber, caster, toe)
- Alignment aid installations

Steering and Suspension Inspection Procedures

Presentation Length: Approx. 45 minutes

Tech Tips:

- Ball joint inspection
- Steering linkage inspection

Why Do I Have to Recalibrate Electronic Sensors after Alignment

Presentation Length: Approx. 60 minutes

Tech Tips:

- Hunter CodeLink SAS reset procedures
- Scan tool SAS reset procedures

Electric Power Steering

Presentation Length: Approx. 60 minutes

Tech Tips:

- Locating causes of 'right' to 'left' steering biases
- Interpreting scan tool information for EPS systems



HEAVY DUTY COURSES



TABLE OF CONTENTS

WORKSHOPS

HD Foundation Brake Workshop 40
 HD Air Disc Brake Workshop 41
 HD Bearings and Seals Workshop..... 41

ONSITE FIELD CLINICS

HD Foundation Brake Clinic 41
 HD Air Disc Brake Clinic 42
 HD Bearings and Seals Clinic..... 42

TECHNICAL LUNCH AND LEARN PRESENTATIONS

HD Foundation Brakes..... 42
 HD Air Disc Brakes..... 42
 HD Bearings and Seals 42

HEAVY DUTY TRAINING WORKSHOPS

The in-class workshop experience allows students to work hand-in-hand with a Garage Gurus HD Master Trainer at one of our conveniently located Technical Support Centers (TSCs).

HD.701.1.WS | HD Foundation Brake Workshop

Workshop Length: 4 Hours Tuition: \$129.00 per person 10 Student Maximum

This workshop is designed with a combination of classroom and hands-on education to enhance the technician’s ability to properly diagnose and service Heavy-Duty Truck Foundation Brakes. Emphasis is placed on defining CVSA (Commercial Vehicle Safety Alliance) Out-of-Service Criteria. In addition, we define the function of the brake system components. We overview diagnostic procedures used to understand air balance, mechanical balance, torque balance and friction balance.

After completing this workshop, the student will have the knowledge to:

- Properly identify foundation brake components and their function
- Understand Out-of-Service conditions and repairs
- Identify failed components and repair procedures
- Perform measurements on foundation brake components

HD.702.1.WS | HD Air Disc Brake Workshop

Workshop Length: 4 Hours Tuition: \$129.00 per person 10 Student Maximum

This workshop emphasizes classroom and hands-on experience to increase the technician’s ability to properly diagnose and service Heavy-Duty Air Disc Brakes. We discuss CVSA (Commercial Vehicle Safety Alliance) Out-of-Service Criteria and define the function of the disc brake system components. We highlight the understanding air balance and friction balance.

After completing this workshop, the student will have the knowledge to:

- Properly identify air disc brake components and their function
- Understand Out-of-Service conditions and repairs
- Identify failed components and repair procedures
- Perform brake related measurements

HD.801.1.WS | HD Bearings and Seals Workshop

Workshop Length: 4 Hours Tuition: \$129.00 per person 10 Student Maximum

This workshop is designed with a combination of classroom and hands-on education to enhance the technician’s ability to properly diagnose and service wheel end bearings and seals. We define the function of bearings, seals and hubcaps. We focus on proper removal, cleaning and installation procedures. We perform proper end play torque procedures.

After completing this workshop, the student will have the knowledge to:

- Properly identify wheel end components and their function
- Identify failed components and repair procedures
- Perform bearing adjustment
- Understand end play

HEAVY DUTY ONSITE FIELD CLINICS

The field clinic brings the Garage Gurus HD ASE Certified Master Trainer to the technician’s location.

HD.701.1.FC | HD Foundation Brake Clinic

***Course Length: 3 Hours 10 Student Maximum**

This clinic is a hands-on education to enhance the technician’s ability to service Heavy-Duty Truck Brakes. We discuss components, service procedures, diagnostic procedures and out of service criteria. Emphasis is placed on brake balance.

After completing this clinic, the student will have the knowledge to:

- Properly service foundation brakes
- Inspect and identify component failure modes
- Utilize the proper service tools



**Call your Federal-Mogul Motorparts representative for pricing*



HD.702.1.FC | HD Air Disc Brake Clinic

***Course Length: 3 Hours 10 Student Maximum**

This clinic provides the technician the ability to properly service Heavy-Duty Air Disc Brakes. We define the function of the disc brake system components and discuss inspection and service procedures. We overview system balance and proper maintenance.

After completing this clinic, the student will have the knowledge to:

- Understand maintenance simplicity vs. foundation brakes
- Relate repairs procedures to failed components
- Discuss brake performance issues in relation to basic design

HD.801.1.FC | HD Bearings and Seals Clinic

***Course Length: 3 Hours 10 Student Maximum**

This clinic will focus on the technician's ability to properly service wheel end bearings and seals. Procedures for cleaning, inspection and installation will be emphasized. Proper identification of hub types and fasteners are discussed.

After completing this clinic, the student will have the knowledge to:

- Understand proper seal removal and installation
- Identify the proper service tools
- Recognize common failure modes

**Call your Federal-Mogul Motorparts representative for pricing*

TECHNICAL LUNCH AND LEARN PRESENTATIONS

The Lunch and Learn training presentation brings an ASE Certified Garage Gurus HD On-the-Go trainer right to the technician's location. These presentations range in duration from 30-90 minutes, during which the trainer delivers the latest in specific heavy-duty vehicle systems and diagnostics in a shop environment. The use of hands-on demonstrations (where applicable) makes this a fully interactive training experience for all technicians. Lunch and Learn training presentations are free – please contact your Federal-Mogul Motorparts representative for details.

HD Foundation Brakes

45 Minute Foundation Brake Maintenance Inspection

Tech Tips:

- Foundation brake camshaft identification
- Standard stroke vs. long stroke brake chambers

HD Air Disc Brakes

45 Minute Air Disc Brake Maintenance Inspection

Tech Tips:

- Air disc brake pad removal and installation
- Air disc brake maintenance inspection

HD Bearings and Seals

45 Minute Bearings and Seals Installation

Tech Tips:

- Hub mounted seal installation
- Spindle mounted seal installation

HOW TO REGISTER



Website FMgaragegurus.com

HelpDesk GarageGurus@FMMotorparts.com

Phone Registration 888-771-6005

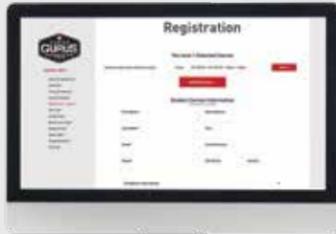
Student Registers for Garage Gurus Course

Student selects desired workshop and course date from one of the following:

1 Schedule and workshop descriptions posted online at www.FMgaragegurus.com



Complete online and click submit



2 Simply calling 888-771-6005 for assistance



Student is to complete the "Student Registration" form provided online at www.FMgaragegurus.com. Completion of all fields is required to expedite registration process. By clicking submit, registration forms are automatically sent to GarageGurus@fmmotorparts.com email box. Garage Gurus admin will process registration and email a confirmation letter. Student should call 888-771-6005 with credit card payment information or for assistance in completing the registration process.



About CASE Continuing Education Units (CEUs)

The Continuing Education Unit (CEU), is commonly used by many organizations as the standard unit of measure to quantify adult education and training activities. The International Association of Continuing Education and Training (IACET) defines the CEU as "ten contact hours of participation in organized continuing education experience under responsible, qualified direction and instruction." The CASE CEU was introduced under this program to represent an automotive industry-specific unit of measure that not only quantifies the ten hours of training, but also qualifies the training as having been provided in accordance with the CASE Standards. Therefore, only ASE-accredited CASE Providers are authorized to issue CASE CEUs. One CASE CEU is equal to ten (10) contact hours of participation in a CASE Activity. One "contact hour" is equal to a minimum of fifty (50) minutes of instructional time within one clock hour.



EXCLUSIVELY FOR TECHNICIANS AND SHOP OWNERS.



GARAGE REWARDS

Get Yourself Some Swag.

Earn points redeemable for gear from the brands you use every day. It's FREE to join and you don't have to purchase anything to be eligible.



Join online at GarageRewards.com

EVERYTHING YOU NEED TO KNOW.

FMgaragegurus.com



www.FMgaragegurus.com

Gurus Tech Hotline

800-325-8886

#garagegurus

Abex



ANCO

BECKARNEY

CHAMPION

FELPRO

FERODO

FP DIESEL

MOOG

National
Oil Seals & Bearings

SEALED
POWER

SPEED
PRO

WAGNER