

5-Day Workshop: Being Profitable in Hybrid & Electric Vehicle Diagnostics and Service



Who Should Attend?

- Automotive Technicians
- Shop Management
- Service Advisors/Writers/Managers
- Fleet Techs and Managers

What you will learn and be able to perform after this workshop:

- High Voltage (HV) Safety
- How to Safely Disable High Voltage Systems
- Personal Protection Equipment (Gloves, Eye Protection, etc.)
- Understanding HV Vehicle Safety Systems
- Key Services that you can perform on all H/EV's
- How to do them
- List of Services and Menu items to kick start this area of the business
- Failure Modes associated with systems and components
- Testing & Diagnostic techniques
- Scan Tool
- Scopes
- Specialized Test Equipment
- On Vehicle TEAM projects

Location, Hotel, Payment, and registration info at:
futuretechauto.com/store/p83/macsworkshop2020

This Boot Camp is sponsored and hosted by the Mobile Air Conditioning Society (MACS) Worldwide

MACS
225 S. Broad Street
Lansdale, PA 19446



Sponsored By



Price: \$1,995.00

Dates: May 17-21, 2021

Hours: 8:30AM – 4:30PM

Pre-requisites: None

Daily lunch, snacks, and beverages are included in registration price

Event Contact (MACS):

Marion Posen
215-631-7020 x304
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Event Contact (FutureTech):

FutureTech Customer Relations
360.207.7770
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Instructor



Dr. Mark Quarto
Quarto Technical Services

Being Profitable in Hybrid & Electric Vehicle Diagnostics and Service

Workshop Topics

HEV, PHEV, EREV, and BEV Systems

- HEV, PHEV, EREV, and BEV Definitions
 - Advantages and Disadvantages
- HEV, PHEV, EREV, and BEV Architectures
 - Systems and Components
 - Series
 - Parallel
- Series-Parallel

HEV, PHEV, EREV, and BEV Systems Operation

- HEV and PHEV System operation
 - Power source blending
 - Modes of operation
 - Fuel Economy and Performance
 - Battery Capacity vs. Electric Range
- EREV System operation
 - Modes of operation
 - Battery Capacity vs. Range
- BEV System operation
 - Modes of operation
- Battery Capacity vs. Range

High Voltage Electrical Safety, Tools, and PPE: Make Sure You Maintain Protection

- Electrical Safety
 - General precautions
 - ac vs. dc electric power
 - Ground paths and circuits
- Analysis Tools and Personal Protective Equipment (PPE)
 - Specialized equipment
 - Minimum equipment specifications/ratings
 - Frequency of testing PPE

High Voltage Vehicle Safety Systems: Vehicle Systems That Keep You Safe

- Safety systems, symbols, and overview
- Service / manual disconnect systems
- Interlock systems
- Active and Passive High Voltage bus discharge systems
- Isolation fault detection and systems testing
- Collision detection and high voltage systems
- Failure Modes: Causes and Effects

High Voltage NiMH and Lithium Battery Systems, Diagnostics & Testing

- Definitions
- Battery pack components/configurations
- Battery ratings and specifications
 - Capacity
 - Power
 - State of Charge
 - Specifications
- Battery SOH testing using a drive cycle (BATTSCAN)
- Failure Modes: Causes and Effects
- Battery pack Servicing

High Voltage NiMH and Lithium Battery Systems, Diagnostics & Testing

- Architectures of Electric Powertrains
 - Types
 - Locations
 - Components
- Electric Machine Testing & Electrical Properties
 - Field Testing
 - Insulation and Resistance Testing
 - Motor Circuit Analysis Testing
 - Analysis: Interpretation of test results
- Failure Modes: Causes and Effects
- Basic Diagnostic Codes

3-Phase Power Control Systems – Operation, Testing & Diagnostics

- Functional overview
- Design Configuration
 - Components
 - Waveforms
- Propulsion Torque and Speed
- Regenerative (Electric) Braking
- Testing and equipment hook-up
- Capturing Inverter waveforms
- Waveform analysis
- Failure Modes: Causes and Effects
- Basic Diagnostic Codes

Electric Propulsion – Motor Generator Sensing Systems, Testing & Diagnostics

- System overview
- Controller inputs
- Resolver Configurations
- Electric motor position sensors
 - Types
 - Testing
- Current sensor
 - Types
 - Functions
- Failure Modes: Causes and Effects
- Basic Diagnostic Codes

dc-dc Converter Systems – Operation, Testing & Diagnostics

- Types of converters
 - Buck
 - Boost
- Locations & Configurations
- Output tests
 - Current
 - Voltage
- Failure Modes: Causes and Effects
- Basic Diagnostic Codes

**High Voltage Electric Heating and Cooling Systems:
A/C Systems supporting Cabin and Battery Pack Cooling Systems Operation, Testing &
Diagnostics**

- Cabin & Battery Heating Systems
 - Immersion Heating Systems
 - PTC Heaters
 - (Battery Pack) Grid Heating Systems
- Cabin & Battery Cooling Systems
 - Electric Air Conditioning Compressor Systems
 - Battery Cooling Systems
 - Conditioned Forced Air Cooling
 - Liquid Cooling (Chiller)
 - Air Conditioning Direct Cooling
- Failure Modes: Causes and Effects

ON-VEHICLE TEAM PROJECTS

- Course Participants will have an opportunity to work with vehicle systems, based on projects that have been outlined.