The Analyzer

THE WISCONSIN VEHICLE INSPECTION PROGRAM

WIVIP HELP LINE
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Top Story

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Sales of hybrid vehicles jump in 2021

As the fleet of hybrids continues to grow, shops need to be ready

Ensuring you are educated about how to complete an efficient and customer focused emissions test is becoming more important as the hybrid vehicle fleet grows. In fact, according to analytics firm Wards Intelligence (as reported by Reuters), US sales of hybrid cars jumped **76%** to **801,550** new vehicles in 2021.

Hybrid vehicles are designed to meet strict emissions standards and to provide improved fuel economy over conventional vehicles. However, hybrid emissions control systems experience the same causes of long-term deterioration that affects other vehicles. Emissions control system malfunctions on hybrids can cause emissions to sharply increase. By ensuring that hybrid emissions related problems are identified and then properly repaired, emissions levels will remain low over the life of the vehicle.

This quarter's issue is devoted to understanding how emissions testing pertains to hybrid vehicles, how hybrid DTCs differ from conventional vehicles, and when hybrid specialists need to be consulted about repairs.

The testing process is straightforward. With the hybrid vehicle placed under load so that the gasoline engine is engaged, the inspector connects to the vehicle's OBDII port. Once connected, information from the vehicle's Powertrain Control Module (PCM) is downloaded. If there is a Diagnostic Trouble Code (DTC) stored and the vehicle's Malfunction Indicator Lamp (MIL) is commanded on, the vehicle will fail the inspection. Readiness monitor criteria are the same for hybrid vehicles, allowing two monitors unset for 1996 -2000 model year vehicles and one monitor for 2001 and newer vehicles.

The **Technicians** section on the WIVIP website (accessible via login and password) contains program news and useful tips for Wisconsin technicians, including information about hybrid vehicles. Contact Opus for assistance with access issues.

Inside this issue:

Do your customers need to renew?

Don't forget to ask emissions inspection and core business customers if they would like their registration renewed!

The Technician's Bench

Understanding hybrid vehicle DTCs

While operating a hybrid-electric vehicle as designed emits less emissions overall than a similar sized gasoline-only powered vehicle, the potential for high emissions is still present. Hybrid-electric vehicles are equipped with all the standard emissions control devices as gasoline powered vehicles. If any of these emissions control devices should deteriorate or fail during the life of the vehicle, the emissions could potentially exceed allowable limits during gasoline operating periods. The vehicle emissions test is designed to identify potential emissions control problems before any significant emissions increases occur.

A good representative example is the Toyota Prius, which includes three generations that are currently part of the testable emissions fleet, as seen in the table below.

Toyota Prius: 2001 – 2015			
Generation	**Generation 1**	**Generation 2**	**Generation 3**
Model years	2001 – 2003	2004 – 2009	2010 – 2015
Gasoline engine	1.5 liter	1.5 liter	1.8 liter
Electric motor	44 hp	67 hp	80 hp
Battery	40 modules, 6.0-amp hours, 288 volts.	28 modules, 6.5-amp hours, 201.6 volts	28 modules, 6.5-amp hours, 201.6 volts

So, what can go wrong, emissions wise, with a hybrid vehicle? The problems can be divided into two groups: Battery Related DTCs and Non-Battery Related DTCs.

Battery related DTCs

Battery Related DTCs can be divided into *high voltage* DTCs, *battery pack* DTCs and *cooling system* DTCs. The chart at right shows the most common battery related DTCs for the Toyota Prius.

Gen 1	
P3006	Battery SOC are Uneven (Battery Pack)
P3130	Inverter Cooling Pump (Cooling System)
P3000	HV Battery Malfunction (High Voltage)
P3125	Converter & Inverter Assembly Malfunction (High Voltage)
P3009	Leak Detected (High Voltage)
P3140	Interlock Malfunction (High Voltage)
Gen 2	
P3000	HV Battery Malfunction (Battery Pack)
P0A80	Replace Hybrid Battery Pack (Battery Pack)
P0A93	Inverter Cooling System Performance (Cooling System)
GEN 3	
P0A80	Replace Hybrid Battery Pack (Cooling System)

Special tools and training

We recommend that technicians without special tools and training for working on hybrids should leave most of the battery DTC issues to a hybrid specialist. The WIVIP website lists recognized repair facilities that customers and PIFs can leverage—many of which offer hybrid repair services. **Technical Assistance Centers** are also available via the **Facilities** tab on the WIVIP website. Open the tab labelled **Recognized Repair Facility Listing** to search for a facility near you.

The Technician's Bench *(continued from page 2)*

Non-battery related DTCs

When reviewing the list of DTCs that can occur in hybrid vehicles such as the Prius, the issues do not look much different from issues found in non-hybrid vehicles. In fact, many of the most common DTCs in hybrids are also the most common in conventional vehicles and can be diagnosed and repaired in similar ways. The chart below describes the most common non-battery related DTCs found in the Prius hybrids.

Gen 1	
P0420	Catalyst Efficiency – Bank 1
P0440	Evaporative Emission System
P0300/01/02/03/04	Misfire
P0171	System Lean Bank 1
P1120	APP Sensor Circuit Malfunction
Gen 2	
P1121	Coolant Control Valve Position Sensor Stuck
P1116	Coolant Temp Sensor Stack for Coolant Heat Storage
P0420	Catalyst Efficiency Ban 1
P0300/01/02/03/04	Misfire
P0138	Oxygen Sensor Circuit High Voltage
P0441	Evap Incorrect Purge Valve
Gen 3	
P0401	EGR Flow Insufficient
P0300/01/02/03/04	Misfire
P0441	Evap Incorrect Purge Flow
P0455	Evap Large Leak Detected
P0031	A/F Sensor Heater Control Circuit Low

If you would like to see more emissions-related subjects in future editions of The Analyzer, please send your ideas to wisconsin@OpusInspection.com.

"Many of the most common DTCs in hybrids are also the most common in conventional vehicles and can be diagnosed and repaired in similar ways."

Hybrid emissions warranties

Hybrid emissions warranties vary by vehicle manufacturer and model. Technicians should encourage vehicle owners to check their owner's manual or contact the vehicle manufacturer directly for emissions warranty information. This will help the consumer better understand the warranty coverage for their vehicle and whether any necessary repairs will be covered under warranty.

Please welcome four new Private Inspection Facilities (PIFs) to our Wisconsin Vehicle Inspection Program (WIVIP) family!

- **Brian's Auto Service & Repair—Sheboygan Falls**
- **Heppe's Service—Milwaukee**
- **M&M Complete Car Care—Milwaukee**
- **Sticky Tintz, LLC—Sheboygan**

Interested in joining the WIVIP team as a PIF?

It's easy!

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