

# ATech Educator News

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April 2014

## Are two batteries better than one?

From time to time the ATech newsletter includes articles submitted by individuals who have demonstrated expertise in certain areas of automotive diagnostics, repair, and/or instruction. This month we are privileged to welcome Craig Von Batenburg of ACDC EV and Hybrid Training in Worcester, MA as our guest author.

### Holland

In March of 2014 I traveled to the Netherlands to train technicians into the new era of hybrid technology. I notice that when the differences and purpose of our beloved lead acid twelve volt battery and the relatively new Nickel Metal Hydride (NiMH) high voltage battery were explained to the students they were listening and taking notes. The Netherlands school system (often called Holland) has made hybrid and EV classes a must for college students. Due to favorable laws the plug-in cars now are selling well and hybrids are also doing fine on their own, much as they are here. Their cities are typical to the US with many cars, grid lock, pollution concerns and high gasoline prices.



*Don't forget about the 12 volt battery.*

### 3 Batteries

So what did I tell them about these two battery types? First that each hybrid has at least two batteries, some have three; the BMW Active Hybrid X6 and the first generation Lexus GS450h with optional sway bars. The 12 volt battery (Toyota calls it an auxiliary battery) has many functions on all hybrids. First it keeps memory alive (all ECU's in hybrids are 12 volt) and allows the computers to communicate with one another at each start up. If all is reported as OK from a high voltage safety standpoint, the 12 volt battery will provide power so that the 12v relays (called contactors) that isolate the high voltage battery pack will close and bring the NiMH battery on line. Second, the 12 volt battery is the power supply when the key is in the accessory position (just like a conventional car) and will provide power for emergency lights and more.

### Cranking the ICE

A third function for the 12 volt battery on Honda (not true anymore with the 2014 Accord HEV-PHEV) and GM Belt-Alternator Systems (BAS) both 36 and 120 volt hybrids, is to provide energy to a 12 volt starter that backs up the NiMH under certain conditions. Most other hybrids sold here from Toyota, Lexus, Nissan, GM, Chrysler, Ford, Lincoln, Hyundai, Kia, VW, Audi, BMW, Mercedes, Porsche, Acura and more do not have a 12 volt starter. Consider the 12 volt thinking on a "cranks but won't start" when a technician doesn't understand that difference. If you haven't used an amp clamp on a 12 volt battery with the min/max setting, try it and see what the amp requirement is on a car without a conventional starter. Or what effects a worn out a 12 volt has on a car that doesn't use conventional starting components. It can mess with your diagnostic thinking process.

### Jump Starting

If you experience a dead 12 volt (for example the dome



*DC-DC Converter is liquid cooled on Ford Escape 2005 - 2012.*

light was left on in your bay overnight) no matter what hybrid you have a 12 volt jumper box is all you need. Locate the 12 volt, (if it is in the trunk area you most likely have a glass mat type lead acid, more on that later) hook up the jumper box to the 12 volt itself (not the jumper lead in the under the hood fuse box) and start the vehicle up. Once it starts remove the jumper box and let the car run. Now "run" in hybrid terms may mean that the internal combustion engine (ICE) has warmed itself up and has shut itself off to save fuel and cut down tail pipe emissions. When this happens the 12 volt battery is still being charged; here is why. Once the NiMH battery comes on line (Most hybrids have a READY light with some exceptions) the NiMH is now supplying the twelve volt system with power by sending high voltage direct current to the DC-DC converter. It is the DC-DC converter that acts like the alternator in a conventional car and produces enough 12-14 volt dc to power all the 12 volt systems and keep the 12 volt lead acid battery topped off as well. The DC-DC converter draws its power from the NiMH high voltage battery pack, but only when the high voltage battery has been connected to the DC-DC converter.

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That is the job of the high voltage (HV) battery computer, relays (known as contactors, and the 12 volt battery as the main components).

### **Tools and Equipment**

Now that you have an idea how the two batteries

work together, what special tools and equipment must you be aware of? One city I visited, 'S-Hertogenbosch, was established in 1185 so the tools required then were pretty basic, just your normal wood working set. The good news about hybrids is that most of the tools and equipment you now own may be up to the task. If not, the upgrades will also help your accuracy with all cars.

We will start with the twelve volt lead acid. If you find that battery under the hood, there is nothing new as it is a common lead acid type. Note; the Civic Generation I Hybrid Electric Vehicle (HEV) (2003-2005) and Insight (all years) have a larger capacity battery available. Use what you have now and if your charging and testing equipment is getting old, look at the newer combination chargers – testers as they have come long way in speed and accuracy.

If the 12 volt battery is in the back of the car you most



*Honda DC-DC Converter uses forced air and cooling fins.*

likely have an Advanced Glass Mat (AGM) battery and now you have a newer technology battery and one that can get the best of you. An AGM battery is still a lead acid battery but in Toyota's design the acid is held in white fiberglass pouches located between the lead plates. It is recognized by a vent tube. If the battery is near a tail light then you have located the 12 volt that feeds the body and HV battery ECUs. If the 12 volt in the center of the trunk it is for a computerized sway bar (12 volt operated) that may be on some high end Lexus hybrids and provides back up power in the event of a disrupted power supply to the active sway bar clutch. It is also an AGM design. If an AGM battery is dead you can still use a jumper box but not a conventional charger. I have tried using my motorcycle charger that is made for extended storage but



learned the hard way (two AGM batteries heading to the recycling center) that a quality AGM charger is the only way to go if you need to charge the battery outside of the car. One trick here; for over 45 years we have been told that the alternator is not a battery charger and if used as one the expected life of that alternator will be dramatically shortened. This as a true statement but it may not apply to all hybrids as the water cooled DC-DC converters seem to be up to the job. So in a pinch if the 12 volt is dead and the hybrid car is OK, just start it up and let the car be the charger if the DC-DC converter uses liquid (remember it can charge the 12 volt AGM with the ICE off as long as the READY light is on). Honda used all air cooled DC-DC converters until M/Y 2014 Accord so use caution there.

Is it time to evaluate your tools and equipment so that your new purchases can work on hybrid vehicles as well as conventional cars and trucks?

Craig Van Batenburg, CEO of ACDC

[www.fixhybrid.com](http://www.fixhybrid.com)

Note: If any of our readers would like to submit their own articles for publication, please contact ATech at [instructors@atechtraining.com](mailto:instructors@atechtraining.com) or [atechtraining.com](http://atechtraining.com).



## Spring 2014 ICAIA Conference



**Illinois College  
Automotive  
Instructors  
Association**

**April 3<sup>rd</sup> & 4<sup>th</sup>, 2014**

Hosted by:  
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Website: <http://www.icaia.org/>

**Stop by our booth to see a complete demonstration of our GM S.E.T. Troubleshooting Program (18002TR), GM S.E.T. Troubleshooting Trainer (18002TT), Applied Electrical Trainer (4810), and Lighting System (821FJ)!**

## ATMC Annual Conference



AUTOMOTIVE TRAINING MANAGERS COUNCIL

**April 7<sup>th</sup> - 9<sup>th</sup>, 2014**

Location:  
**Emory Hotel and Conference Center**  
Atlanta, GA

Website: <http://www.atmc.org/>

**Based on the theme “Continuing our Momentum” the conference promises to provide the best networking opportunity in the auto and truck training industry as well as pertinent presentations and discussion sessions.**



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Applied Electrical Trainer, Dr FuelCell Car, Planetary Gear, & Starter System Troubleshooting

# GM J1850 OBD II System (model 2652)



## Features:

- The [GM J1850 OBD II System Trainer](#) is based on a GM 3.4L V6 and a 4T65E Transmission.
- Uses Actual Automotive Components Including:
  - » PCM
  - » Throttle Body with Idle Air Control Motor and Throttle Position Sensor
  - » Mass Air Flow Sensor
  - » Fuel Rail with Fuel Pump, Fuel Pressure Regulator, and 6 Injectors
  - » Instrument Panel Cluster
  - » A/C, Fan (1, 2, & 3), and Fuel Pump Relays
  - » Oxygen Sensors (2)
  - » EGR, Canister Purge, and Vent Valves
- Aids in Developing Real-World System Skills and Knowledge
- Additional Lamps to Indicate Operation and Control of the Following:
  - » Air Conditioning On
  - » Brake Switch
  - » Evaporative Purge and Vent
  - » Exhaust Gas Recirculation
  - » Fans (Left/Right)
  - » Fuel Pump Relay On

## GM J1850 OBD II System (model 2652) Cont...

- » Ignition
- » Module Mode/Ignition Control Mode
- » O<sub>2</sub> Heaters
- » Starter Enable
- » Transmission (Shift Solenoids 1 & 2) and PWM Torque Converter Clutch
- Performs Actual Service Manual Diagnostic Procedures
- DVOM/Oscilloscope Measurement Tip Jacks for:
  - » Engine Coolant Temperature (with disconnect switch)
  - » Input Speed Sensor
  - » Intake Air Temperature (with disconnect switch)
  - » Manifold Absolute Pressure
  - » Mass Air Flow
  - » Pressure Control Solenoid
  - » Throttle Position Sensor
  - » Vehicle Speed Sensor
- Direct User Control of the Following Functions:
  - » Air Conditioning Pressure
  - » Engine Coolant Temperature
  - » Fuel Trim
  - » Intake Air Temperature
  - » Mass Air Flow
  - » Transmission Shifting
- Fault Codes, used for Diagnostics, can be Inserted Either Locally with the Keypad, or Remotely via Instructor's PC and ATech Network System (ANS)
- Compatible with OBD II Scan Tools for Performing Diagnostics on Code, No-Code, OBD II, and Intermittent Faults
- Runs OBD II Monitors and Drive Cycles
- Interface Connection for use with GM Electronic Ignition Trainer (model 1772)
- Compatible with ATech Instructor Management Program
- Courseware is Included (Student Manual, Instructor Guide, and Service Manual Information)

### Dry Panel Option (model DRY)

#### Dry Option: Simulated Fuel Injection/Pump

- Toyota OBD II System (Dry) - model 2671/80 DRY
- GM J1850 OBD II System (Dry) - model 2652 DRY



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**ATech**  
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# CAT SPRING 2014 Conference

April 25<sup>th</sup> & 26<sup>th</sup>, 2014



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