

HYBRID VEHICLE SAFETY REQUIREMENTS

The number of hybrid vehicles that are currently on the road and those that will be in the near future can pose a genuine threat to technicians that call the ATSG Help Line for technical assistance on servicing and repairing these vehicles.

What does an electric chair have in common with a hybrid vehicle?

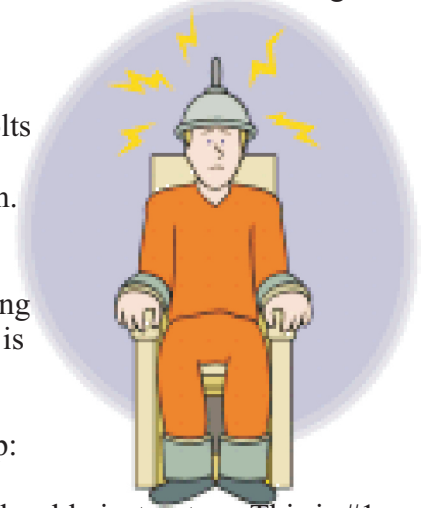
Both can kill you!

These vehicles have battery packs that can deliver between 144 and 330 volts to the hybrid's electric motors. This voltage can be bumped up to 650 volts by the inverter, certainly more than enough to cause severe injuries or death.

Therefore, in order to protect all parties involved in technical assistance as well as the technician working on one of these vehicles, ATSG is establishing a "required criteria" program that must be satisfied before a hybrid vehicle is touched.

The following list of safety requirements ***must*** be met by the repairing shop:

- Formal Hybrid Vehicle Training. Seek out professional classes by knowledgeable instructors. This is #1 on the list for a good reason.
- Hybrid vehicle identification. A hybrid vehicle may appear to be an ordinary vehicle, look for the common identifiers that let you know this is a hybrid vehicle....***Never Assume that it's not!***
- When road testing a hybrid vehicle, be mindful of pedestrian safety. When operating on electric motors only, these vehicles run silent. Someone stepping into the path of the vehicle you are driving may not hear you coming. ***Especially if that person is sight impaired!***
- **ALWAYS** pay close attention to all hazard warning labels.
- Beware of **ORANGE** or **BLUE** colored cables, these are the high voltage lines. Before going near any of the high voltage components, locate and turn OFF the high voltage battery "disconnect switch". Wait 15 to 30 minutes for the capacitors to discharge before touching anything, then VERIFY, with A CAT III voltmeter that the voltage level has dropped to 12 volts or less.
- Make certain the vehicle ignition key is OFF and removed from the ignition switch and put in a safe place away from the vehicle. The vehicles use "stop/start" engine technology, if the key is left in the ON position and your hands are in contact with rotating components, the engine could start up at any time. Make certain the "ready lamp" in the instrument cluster is off.
- Before actual work begins, the work area should be secured by cones or yellow "caution" tape. This will prevent a coworker from turning the system back on. Only one technician should be designated to work on a hybrid vehicle at any given time.
- Before disassembly of any component, special gloves **MUST** be worn that are at least class "O" and are rated to 1,000 volts.
- These gloves must be tested before and after each use to insure that no damage has occurred to them, electricity can find its way through a pin hole. Check them by trapping air inside each glove and look and listen for leaks, this is an OSHA requirement.
- **NEVER** use gloves that are past their expiration date, they should be replaced immediately.
- These gloves are not meant to withstand sharp objects or other severe usage, they will be damaged. There are leather gloves that go over them to prevent damage to the insulating gloves.
- Do not assume that the high voltage circuits have no voltage, check them with a CAT III voltmeter that is rated for 1,000 volts. The meter leads must have the same rating. Immediately replace any lead that has damaged insulation.





Technical Service Information

HYBRID VEHICLE SAFETY REQUIREMENTS...CONTINUED

- Try to limit the amount of metal items you wear when working on or near high voltage components such as jewelry, belt buckles and wrist watches, this includes steel tipped shoes.
- Purchase a Pull-Off pole to pull an electrocution victim off the vehicle, DO NOT TOUCH this person with your hands or you will be an electrocution victim.
- An insulated pull-off pole should be in an obvious location in the event a technician cannot let go of a high voltage circuit they accidentally came in contact with.
- **NEVER** use AC voltage powered test equipment when probing high voltage circuits and NEVER pierce any high voltage cables.
- Use only approved insulated tools when working on high voltage components even if the system is off.
- Be certain to torque to specifications, any high voltage connection, loose connections create high resistance in the circuit and could cause catastrophic damage when there is high amperage behind it.
- Once the vehicle is in the midst of the repair process, it should not be moved until repairs are complete. If the vehicle must be pushed to some other location in the shop with the drive axles in place, the technician MUST once again check for the presence of high voltage within the hybrid system. When the vehicle is pushed with the drive axles installed, the motor rotor is turned and will generate electricity into the system. These vehicles are equipped with regenerative braking which also creates electricity in the hybrid system.
- If any repairs are required that cause the technician to be in proximity with the electric motors rotor, he or she should be aware that this component is an extremely strong magnet and can cause death to someone who has a pacemaker.
- Be extremely careful of the hybrid batteries, they contain electrolyte that is far more corrosive than 12 volt battery electrolyte, it can dissolve human tissue, wear protective clothing. Spills should be handled in accordance with protocols for hazardous materials.
- If you intend to ship expired hybrid batteries back to the manufacturer for disposal, you must be DOT HazMat certified.
- Always be conscious of fire hazards and have approved fire extinguishers in prominent locations throughout the shop.
- Be very careful when working on a hybrid vehicle that has been in an accident. The hybrid system does not share its ground with the body, this could change as a result of collision damage.
- In the event that a hybrid or electric vehicle is equipped with Lithium Ion batteries, be aware that these batteries must remain cool, if these type of batteries are allowed to overheat, they can burst into flames. Some such equipped vehicles may use the HVAC system to keep these batteries cool. The AC system in these vehicles MUST be totally operational.

ALL SAFETY REQUIREMENTS FOR HYBRID VEHICLE REPAIR LISTED HERE MUST BE MET....IT COULD SAVE YOUR LIFE!

This document requires the repairing technicians signature and date that he or she understands and agrees with its contents . Once the document is received by the ATSG technical consultant with the signature and date, technical assistance pertaining to transmission repairs will be granted at which time ATSG will be held free of any liability in the event of injury or death. **When this document has been signed and dated, fax it back to ATSG at 305-670-7734 or E-Mail it to miami@atsg.biz.**

Technician Signature: _____

Date: _____

Revised 03/19/13