3. NOTICE FOR HYBRID SYSTEM

(a) PRECAUTIONS FOR HIGH-VOLTAGE CIRCUIT INSPECTION AND SERVICE

CAUTION:

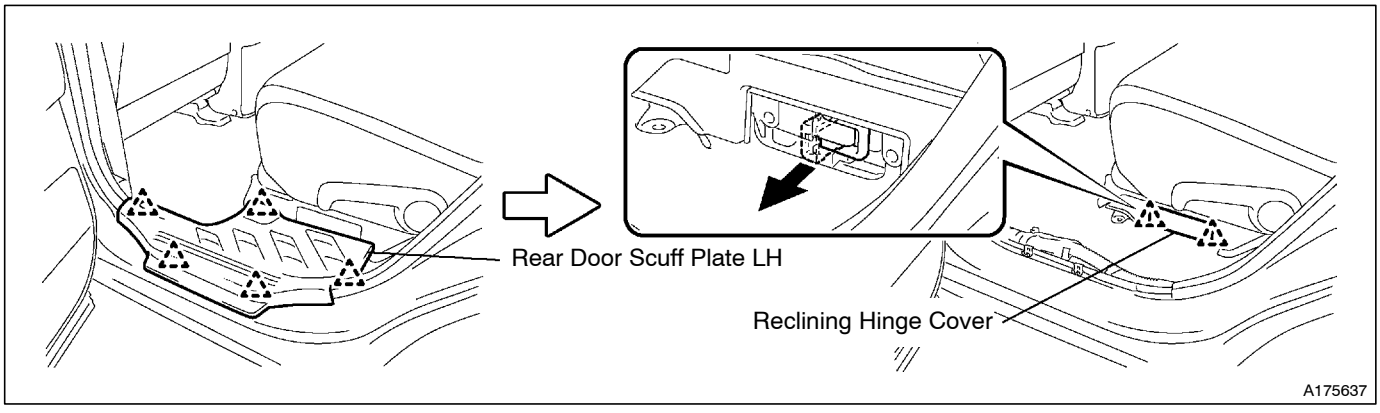
The HIGHLANDER HV has a hybrid system that operates at voltages up to 650 V. The hybrid system uses an HV battery that contains an electrolyte which is a strong alkali solution that includes potassium hydroxide. Be sure to follow the instructions in this manual to handle the system correctly. Failure to do so may result in serious injury or electrocution.

(1) Technicians must undergo special training to be able to service and inspect the high-voltage system.

(2) All high-voltage wire harnesses and connectors are colored orange. The HV battery and other high-voltage components have “High Voltage” caution labels. Do not carelessly touch these wires or components.

(3) When there is a problem with the wire harness or connector of a high-voltage circuit, repairs to the harness or connector should not be attempted. Replace damaged or malfunctioning high voltage cables or connectors.

(4) Before inspecting or servicing the high-voltage system, be sure to follow all safety measures, such as wearing insulated gloves and removing the service plug to prevent electrocution. Carry the removed service plug in your pocket to prevent other technicians from accidentally reconnecting it while you are servicing the vehicle.

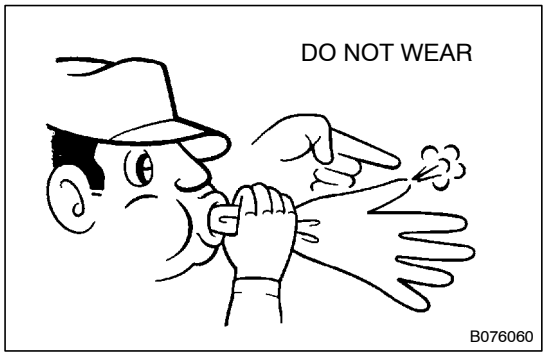


NOTICE:

After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

(5) After removing the service plug, wait 5 minutes before touching any of the high-voltage connectors and terminals.

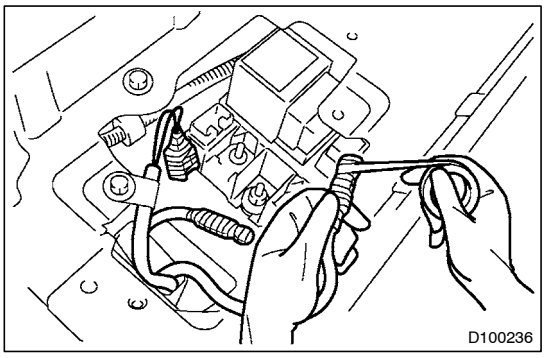
HINT:
Waiting for at least 5 minutes is required to discharge the high-voltage capacitor inside the inverter with converter assembly.



(6) Before wearing insulated gloves, make sure that they are not cracked, ruptured, torn, or damaged in any way. Do not wear wet insulated gloves.

(7) When servicing the vehicle, do not carry metal objects like mechanical pencils or scales that can be dropped accidentally and cause a short circuit.

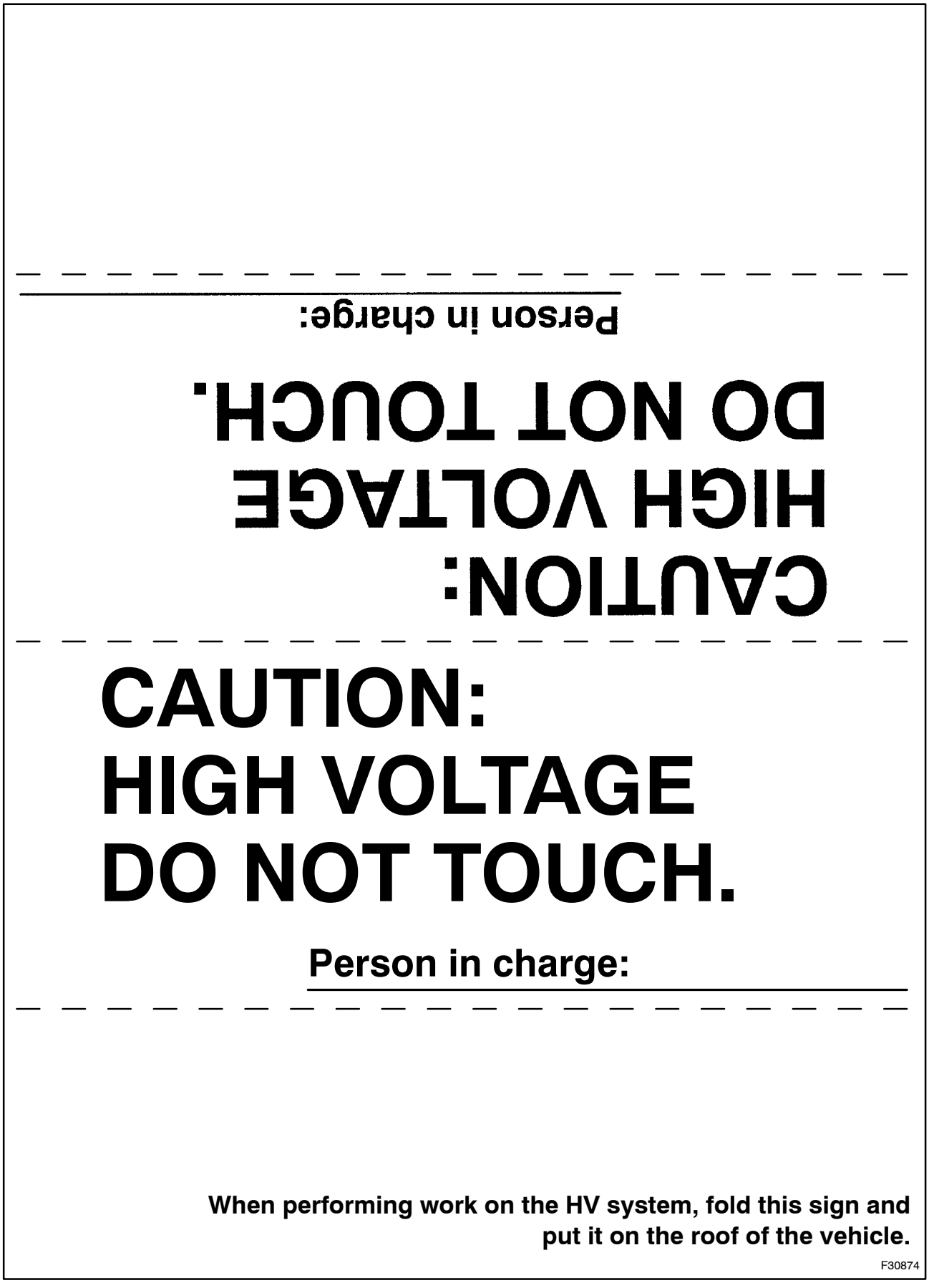
(8) Before touching a bare high-voltage terminal, wear insulated gloves and use a tester to make sure that the terminal voltage is 0 V.



(9) After disconnecting or exposing a high-voltage connector or terminal, insulate it immediately using insulating tape.

(10) Bolts and nuts high-voltage terminals should be tightened firmly to the specified torque. Both insufficient and excessive torque can cause failure.

(11) Use the “CAUTION: HIGH VOLTAGE. DO NOT TOUCH DURING OPERATION” sign to notify other technicians that the high-voltage system is being inspected and/or repaired.


CAUTION:
HIGH VOLTAGE
DO NOT TOUCH.
Person in charge:
CAUTION:
HIGH VOLTAGE
DO NOT TOUCH.
Person in charge:
When performing work on the HV system, fold this sign and put it on the roof of the vehicle.
F30874

(12) After servicing the high-voltage system and before reinstalling the service plug, check again that you have not left a part or tool inside, that the high-voltage terminals are firmly tightened, and that the connectors are correctly connected.

(13) When installing hybrid system components such as the HV battery, make sure that the polarity of all connections is correct.

(b) ACTIONS TO BE TAKEN FOR VEHICLE DAMAGED BY IMPACT

CAUTION:

The HIGHLANDER HV has a hybrid system that operates at voltages up to 650 V. The hybrid system uses an HV battery that contains an electrolyte which is a strong alkali solution that includes potassium hydroxide. Be sure to follow the instructions in this manual to handle the system correctly. Failure to do so may result in serious injury or electrocution.

(1) Items to be prepared for the accident site

- Protective clothing (insulated gloves, rubber gloves, goggles, and safety shoes)
- Saturated boric acid solution 20 L (obtain 800 g of boric acid powder, put it into a container, and dissolve it in water)
- Red litmus paper
- ABC fire extinguisher (effective against both oil flames and electrical flames)
- A shop rag or piece of cloth (for wiping off the electrolyte)
- Insulating tape (for insulating cable)
- Electrical tester

(2) Actions to be taken at the accident site

CAUTION:

- **Do not touch any bare cables that may have high-voltage. If a cable must be touched or if accidental contact is possible, wear insulated gloves and insulate the cable using insulating tape.**
- **If the vehicle catches on fire, use an ABC fire extinguisher to extinguish the fire. Trying to extinguish a fire using only a small amount of water can be more dangerous than effective. Use a substantial amount of water or wait for firefighters.**
- **Visually check the HV battery and the immediate area for any electrolyte leakage. Do not touch any leaked liquid because it could be highly alkaline electrolyte.**
- **Work on the vehicle only after the vehicle has been pulled out of the water.**

1. Check the vicinity of the hybrid vehicle battery for any leakage of the electrolyte.

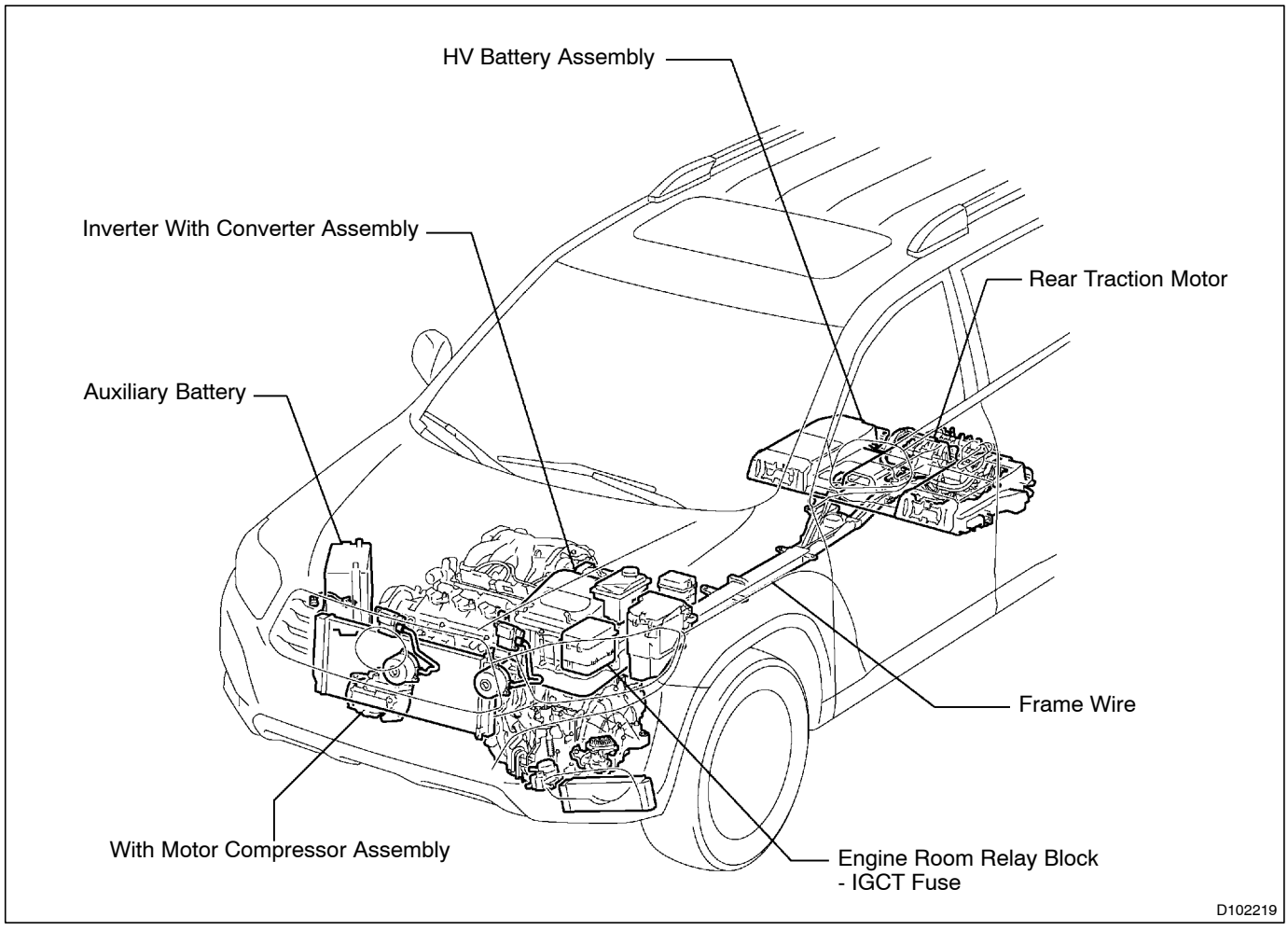
   CAUTION:

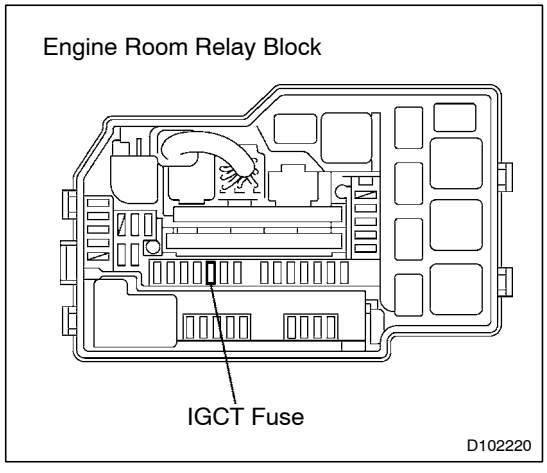
   Do not touch any leaked liquid because it could be highly alkaline electrolyte. Wear rubber gloves and goggles, neutralize the liquid with saturated boric acid solution, and then apply red litmus paper to the liquid. Check that the paper does not turn blue. Wipe the neutralized liquid with a shop rag or piece of cloth.

2. If damage to any of the high-voltage components and cables is suspected, cut the high-voltage circuit using the following procedure.

   CAUTION:

   Be sure to wear insulated gloves, goggles, and safety shoes.





3. Turn the power switch off.

   HINT:
   If the power switch cannot be turned off, remove the IGCT fuse from the engine room relay block or disconnect the cable from the negative terminal of the auxiliary battery.

4. Wear insulated gloves, and then remove the service plug.

   NOTICE:

   After removing the service plug grip, do not turn the power switch on (READY), unless instructed by the repair manual because this may cause a malfunction.

(3) Moving the damaged vehicle
If any of the following conditions are met, tow the vehicle away using a tow truck.

- One or more of the high-voltage components and cables are damaged.
- Components related to driving, the transaxle, or the fuel system are damaged.
- The master warning light is on.
- The READY light does not come on when attempting to turn the power switch on (READY).

CAUTION:

Before towing the vehicle away using a tow truck, disconnect the cable from the negative (–) terminal of the auxiliary battery and remove the service plug.

NOTICE:

Perform the procedure below if the READY light turns off , or there are abnormal noises, unusual smells, or strong vibrations while driving:

1. Park the vehicle in a safe place.
2. Shift the shift lever to the “P” position, and apply the parking brake.
3. Turn the power switch off, and disconnect the power cable from the negative (–) terminal of the auxiliary battery.
4. Remove the service plug while wearing insulated gloves.

(4) Actions required after moving the damaged vehicle

1. Procedure

   If you see any liquid on the road surface, it could be highly alkaline electrolyte leakage. Wear rubber gloves and goggles, neutralize the liquid with saturated boric acid solution, and then apply red litmus paper to the liquid. Check that the paper does not turn blue. Wipe the neutralized liquid with a shop rag or piece of cloth.

(5) Items to be prepared (when repairing a damaged vehicle)

- Protective clothing (Insulated gloves, rubber gloves, goggles, and safety shoes)
- Saturated boric acid solution 20 L (obtain 800 g of boric acid powder, put it into a container, and dissolve it in water)
- Red litmus paper
- A shop rag or piece of cloth (for wiping off the electrolyte)
- Insulating tape (for insulating cables)
- Electrical tester

(6) Precautions to be observed when servicing a damaged vehicle

CAUTION:

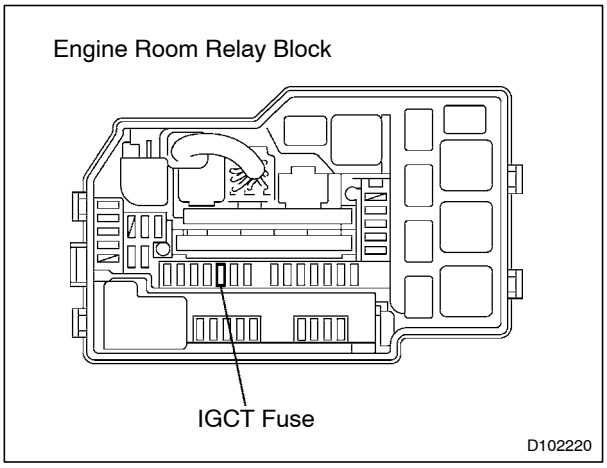
Always follow instructions to ensure safety.

1. Wear insulated or rubber gloves, goggles, and safety shoes.
2. Check the HV battery and immediate area for any electrolyte leakage.

   CAUTION:

   - **Do not touch any leaked liquid because it could be highly alkaline electrolyte. Wear rubber gloves and goggles, neutralize the liquid with saturated boric acid solution, and then apply red litmus paper to the liquid. Check that the paper does not turn blue. Wipe the neutralized liquid with a shop rag or piece of cloth.**
   - **If the electrolyte comes in contact with your skin, use a saturated boric acid solution or a large amount of water to wash it off. If the electrolyte comes in contact with an article of clothing, take it off immediately.**
   - **If the electrolyte comes in contact with your eyes, call out loudly for help. Do not rub your eyes. Wash them immediately with a large amount of water and seek medical care.**

3. Do not touch any bare cables that could be high voltage cable. If a cable must be touched or if accidental contact is possible, follow the following instructions: 1) wear insulated gloves and goggles, 2) measure the voltage between the cable and body ground using an electrical tester, and 3) insulate the cable using insulating tape.



4. If damage to any of the high-voltage components and cables is suspected, cut the high-voltage circuit using the procedure below.

   CAUTION:

   Do not touch any bare cables that may have high-voltage. If a cable must be touched or if accidental contact is possible, wear insulated gloves and insulate the cable using insulating tape.

5. Turn the power switch off.

   HINT:
   If the power switch cannot be turned off, remove the IGCT fuse from the engine room relay block or disconnect the cable from the negative terminal of the auxiliary battery.

6. Wear insulated gloves, and then remove the service plug.

(7) Precautions to be taken when disposing of the vehicle

1. Disposing of HV battery
   When scrapping the vehicle, remove the HV battery from the vehicle and return it to the location specified by the manufacturer. Any damaged HV battery should also be returned to the specified location.

   CAUTION:

   - **After removing the HV battery, keep it away from water. Water may heat the battery, resulting in a fire.**
   - **Accidents such as electric shocks could result if the vehicle and its HV battery are disposed of improperly or abandoned. Therefore, make sure to return any HV battery using the prescribed recovery route through a TOYOTA dealer.**

(8) Precautions to be observed when towing

1. Tow the damaged vehicle with its front and rear wheels lifted off the ground.

   CAUTION:

   Towing the damaged vehicle with its wheels on the ground will cause the motor to generate electricity. This electricity could, depending on the nature of the damage, leak and cause a fire.

(9) Towing with the 4 wheels on the ground

CAUTION:

- **If the damaged vehicle needs to be towed using a rope, do not exceed 30 km/h (19 mph), tow only for a limited distance and then have the vehicle towed by a truck.**
- **Turn the power switch on (IG) and shift the shift lever to the N position.**
- **If any abnormality is present in the damaged vehicle during towing, stop towing immediately.**