TOYOTA

PRIUS

Petrol-Electric
Hybrid Synergy Drive

Emergency Response Guide

NHW20 PRIUS (2nd Generation)

Part No. TSO0334

FOREWORD

This guide was developed to educate and assist emergency responders in the safe handling of the Toyota Prius petrol – electric hybrid vehicle following an incident. Prius emergency response procedures are similar to other Toyota vehicles with the exception of the high voltage electrical system. It is important to recognize and understand the high voltage electrical system features and specifications of the Toyota Prius as they may not be familiar to emergency responders.

High voltage electricity powers an electric motor, generator, electric inverter compressor (for air conditioner) and inverter. All other conventional automotive electrical devices such as the headlights, radio, and gauges are powered from a separate 12-Volt battery. Numerous safeguards have been designed into the Prius to help ensure the high voltage, approximately 201-Volts, Nickel Metal Hydride (NiMH) Hybrid Vehicle (HV) battery pack is kept safe and secure in an accident.

The NiMH HV battery pack contains sealed batteries that are similar to rechargeable batteries used in laptop computers, cell phones, and other consumer products. The electrolyte is absorbed in the cell plates and will not normally leak out even if the battery is cracked. In the unlikely event the electrolyte does leak, it can be easily neutralized with a dilute boric acid solution or vinegar.

High voltage cables, identifiable by orange insulation and connectors, are isolated from the metal chassis of the vehicle. These cables are routed underneath and inboard the floor pan reinforcement which would not normally be accessed by emergency responders at the scene of an accident.

Additional topics contained in the guide include:

- Toyota Prius identification.
- Major hybrid component locations and descriptions.
- Extrication, fire, recovery, and other emergency response information.
- Roadside assistance information.

By following the information in this guide, emergency responders will be able to handle the Prius hybrid-electric vehicle as safely as the emergency response of a conventional petrol engine vehicle.

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The NHW20 model Toyota Prius is a petrol-electric hybrid vehicle went on sale worldwide in September 2003. Petrol-electric hybrid means the vehicle contains a petrol engine and an electric motor for power. Two energy sources are stored on board the vehicle:

1. Petrol stored in the fuel tank for the petrol engine.

2. Electricity stored in a high voltage Hybrid Vehicle (HV) battery pack for the electric motor.

The result of combining these two power sources is increased fuel economy and reduced emissions. The petrol engine also powers an electric generator to recharge the battery pack; so, unlike a pure all electric vehicle, the Prius never needs to be recharged from an external electric power source.

Depending on the driving conditions one or both sources are used to power the vehicle. The following illustrations demonstrate how the Prius operates in various driving modes.

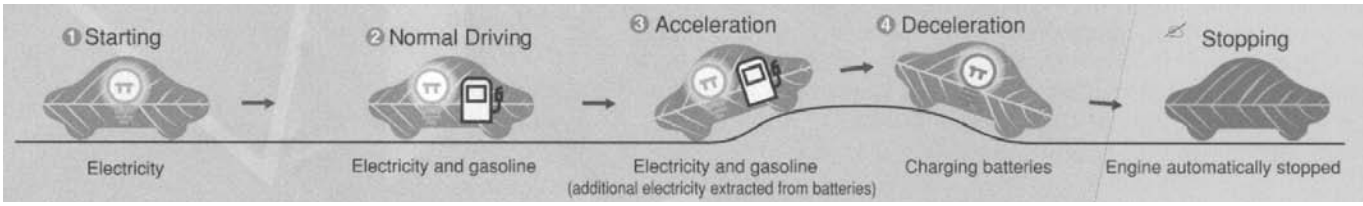
❶ On light acceleration at low speeds, the vehicle is powered by the electric motor. The petrol engine is shut off.

❷ During normal driving the vehicle is powered mainly by the petrol engine. The petrol engine is also used to recharge the battery pack.

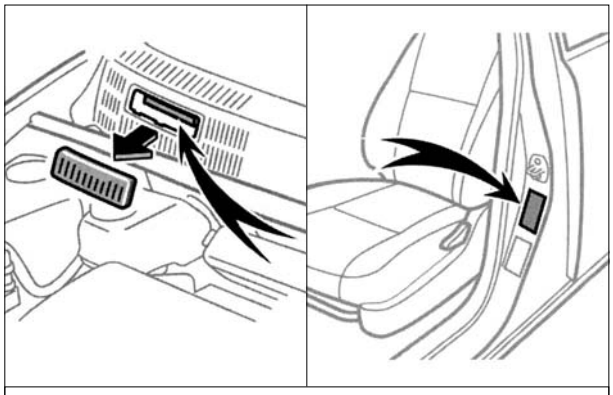
❸ During full acceleration, such as climbing a hill, both the petrol engine and the electric motor power the vehicle.

❹ During deceleration, such as braking, the vehicle regenerates the kinetic energy from the front wheels to produce electricity that recharges the battery pack.

❺ While the vehicle is stopped, the petrol engine and electric motor are off, however the vehicle remains on and operational.



PRIUS IDENTIFICATION



VIN Plate Locations

In appearance, the Prius NHW20 is similar to a 5-door hatch back door wagon. Exterior, interior, and engine compartment illustrations are provided to assist in identification.

The alphanumeric 17 character Vehicle Identification Number (VIN) is provided in the driver's side of the front windshield cowl and passenger 'B' pillar.

Example VIN: JTDKB22U840020208
(vehicle is identified by the first 6 alphanumeric characters **JTDKB2**)

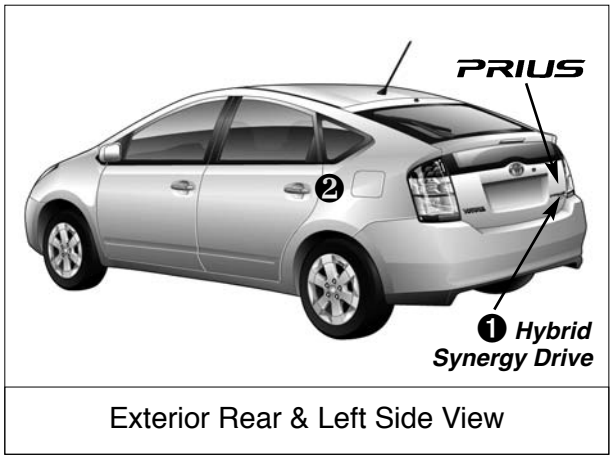
Exterior Front View

Exterior

❶ ***Hybrid Synergy Drive*** & PRIUS logos on trunk.

❷ Petrol fuel filler door located on left side quarter panel.

❸ Toyota logo on the hood.



Exterior Rear & Left Side View

Exterior Left Side View

Exterior Front & Left Side View

Interior View

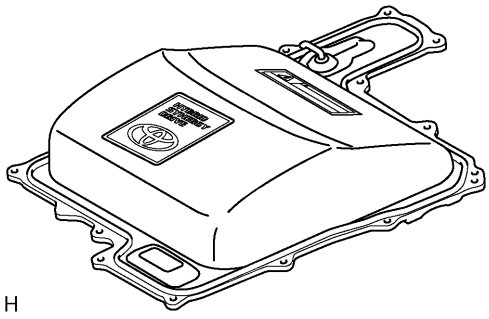
Interior

❹ Center cluster mounted automatic transmission shift selector lever.

❺ Instrument cluster (speedometer, fuel gauge, warning lights) located in dash and near the base of the windshield.

❻ LCD monitor (fuel consumption, radio controls) located below the instrument cluster.

Instrument Cluster & LCD Monitor



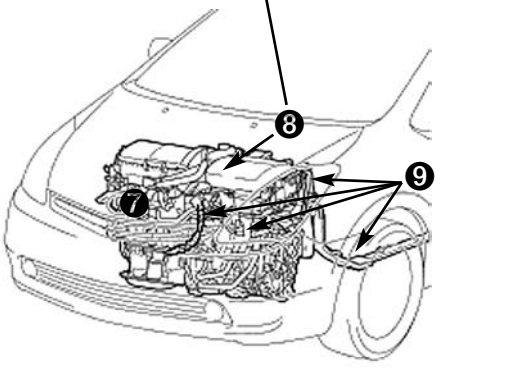
Toyota Synergy Drive Logo on Inverter

Engine Compartment

❼ 1.5 litre aluminum alloy petrol engine.

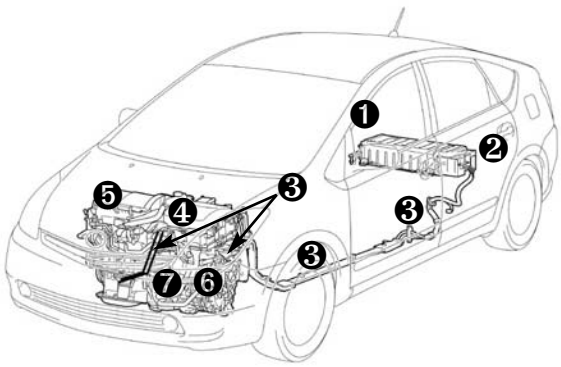
❽ High voltage inverter with the ***Toyota Synergy Drive*** logo on the cover.

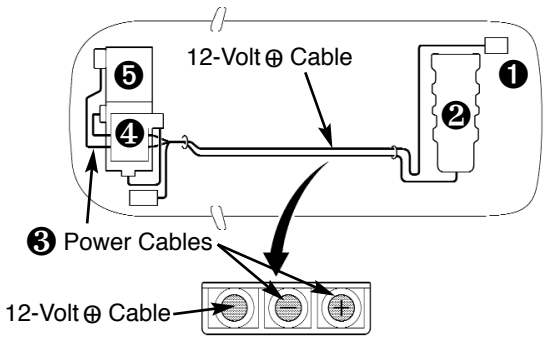
❾ Orange colored high voltage power cables.



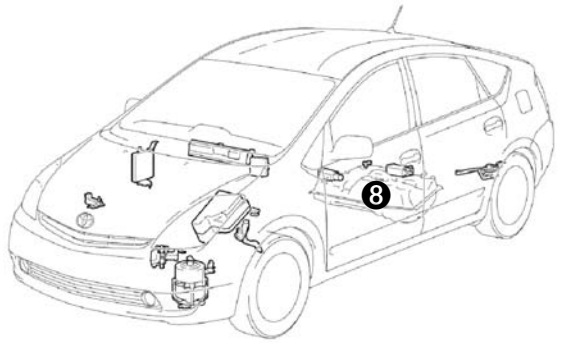
Engine Compartment

HYBRID COMPONENT LOCATIONS & DESCRIPTIONS





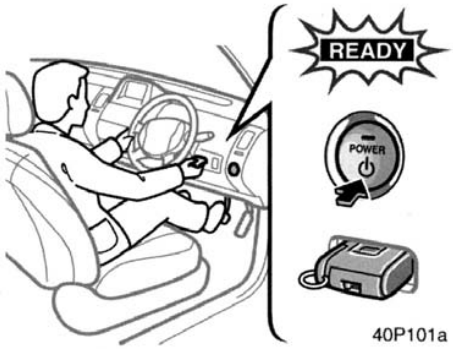
Section A-A Power Cable



COMPONENT	LOCATION	DESCRIPTION
12-Volt Auxiliary Battery ❶	Luggage, RH Side	Low voltage lead-acid battery that controls all electrical equipment except electric motor generator and inverter.
Hybrid Vehicle (HV) Battery Pack ❷	Luggage, Mounted to Cross Member & Behind Rear Seat	201.6-Volts Nickel Metal Hydride (NiMH) battery pack consisting of 28 low voltage (7.2-volts) modules connected in series.
Power Cables ❸	Under Carriage & Engine Compartment	Orange colored power cables carry high voltage Direct Current (DC) between the HV battery pack and inverter. Also carries 3 phase Alternating Current (AC) between inverter, motor and generator.
Inverter ❹	Engine Compartment	Converts 200V DC electricity from HV battery pack to 500V DC electricity that drives the electric motor. Also, converts AC from electric generator and motor (regenerative braking) to DC that recharges the HV battery pack.
Petrol Engine ❺	Engine Compartment	Provides two functions: 1) powers vehicle; 2) powers generator to recharge the HV battery pack. The engine is started and stopped under control of the vehicle computer.
Electric Motor ❻	Engine Compartment	3 Phase AC permanent magnetic electric motor contained in the transaxle. Used to power the vehicle.
Electric Generator ❼	Engine Compartment	3 Phase AC generator contained in the transaxle. Used to recharge the HV battery pack.
Fuel Tank ❽ and Fuel Lines	Undercarriage, RH Side	Fuel tank provides petrol via a single fuel line to the engine. The fuel line is routed along RH side under the floor pan.

Specifications

Petrol Engine:	1.5 litre Aluminum Alloy Engine 57KW
Electric Motor:	50 KW, Permanent Magnet Motor
Transmission:	Automatic Only
HV Battery:	201.6-Volts Sealed NiMH
Curb Weight:	1,295kg
Fuel Tank:	45 litres
Frame Material:	Steel Unibody & Steel Body Panels and Aluminum engine food/back door



POWER button

Instrument Cluster **READY** Indicator

The vehicle starts and becomes operational by inserting key to key-slot and pushing 'POWER' button with the brake pedal depressed. However, the petrol engine does not idle like a typical vehicle and will start and stop automatically. It is important to recognise and understand the **READY** indicator provided in the instrument cluster. When lit, it informs the driver the vehicle is on and operational even though the petrol engine may be off and the engine compartment is silent.

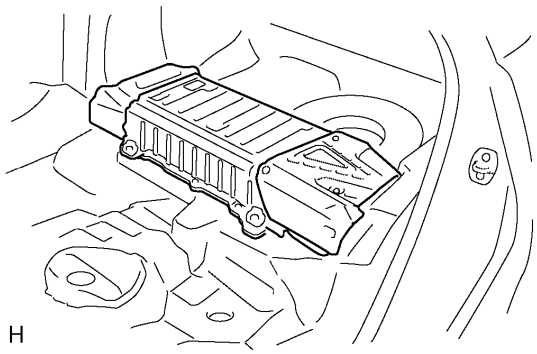
Optional Smart Entry & Start system allows you to operate the "POWER" button without the key being inserted into the key slot.

Vehicle Operation

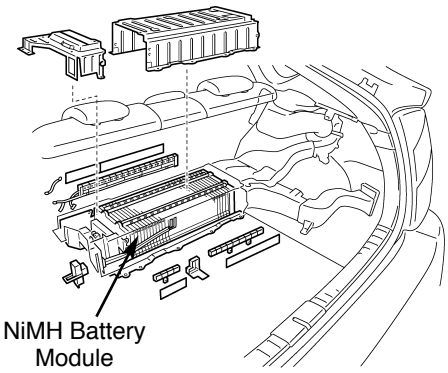
- With the Prius, the petrol engine may stop and start at any time while the **READY** indicator is on.
- Never assume the vehicle is shut off just because the engine is off. Always look for the **READY** indicator status. The vehicle is shut off when the **READY** indicator is off.
- The vehicle may be powered by:
  1. The electric motor only.
  2. The petrol engine only.
  3. A combination of both the electric motor and the petrol engine.

  The vehicle computer determines the mode in which the vehicle operates to improve fuel economy and reduce emissions. The driver cannot manually select the mode.

HYBRID VEHICLE (HV) BATTERY PACK AND AUXILIARY BATTERY



HV Battery Pack



HV Battery Pack Metal Case and NiMH Battery Module

The Prius contains a high voltage, Hybrid Vehicle (HV) battery pack and a low voltage auxiliary battery. The HV battery pack contains non-spillable, sealed Nickel Metal Hydride (NiMH) battery modules and the auxiliary battery is a typical automotive lead-acid type.

HV Battery Pack

- The HV battery pack is sealed in a metal case and is rigidly mounted to the luggage floor pan cross member behind the rear seat. The metal case is isolated from high voltage and concealed by a fabric liner in the luggage.
- The HV battery pack consists of 28 low voltage (7.2-Volts) NiMH battery modules connected in series to produce approximately 201-Volts. Each NiMH battery module is non-spillable and sealed in a plastic case.
- The electrolyte used in the NiMH battery module is an alkaline of potassium and sodium hydroxide. The electrolyte is absorbed into the battery cell plates and will form a gel that will not normally leak, even in a collision.
- In the unlikely event the battery pack is overcharged, the modules vent gases directly outside the vehicle through a vent hose connected to each NiMH battery module.

HV BATTERY PACK	
Battery pack voltage	201-Volts
Number of NiMH battery modules in the pack	28
Battery pack weight	39Kg
NiMH battery module voltage	7.2-Volts
NiMH battery module dimensions	276x20x106mm
NiMH Battery module weight	1040g

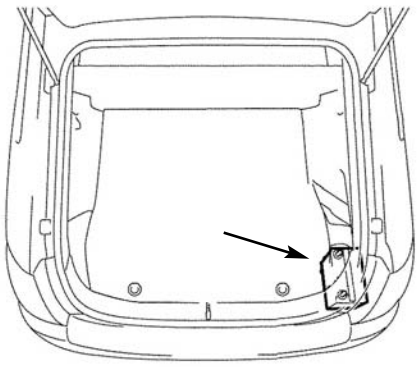
HYBRID VEHICLE (HV) BATTERY PACK AND AUXILIARY BATTERY

Components Powered by the HV Battery Pack

- Electric Motor
- Electric Generator
- Electric Powered A/C Compressor
- Inverter
- Power Cables

HV Battery Pack Recycling

- The HV battery pack is recyclable. Contact the nearest Toyota dealer or the Toyota Customer Relations Centre on 1800 252 097 for information.



12-Volt Auxiliary Battery

Auxiliary Battery

- The Prius also contains a lead-acid 12-Volt battery. This 12-Volt auxiliary battery powers the vehicle electrical system similar to a conventional vehicle. As with other conventional vehicles, the auxiliary battery is grounded to the metal chassis of the vehicle.
- The auxiliary battery is located in the luggage. It also contains a hose to vent gases outside the vehicle if overcharged.

The HV battery pack powers the high voltage electrical system with direct current (DC) electricity. A positive and a negative power cable are routed from the battery pack, under the vehicle floor pan, to the inverter. Occupants in the vehicle and emergency responders are separated from high voltage electricity by the following systems:

High Voltage Safety System

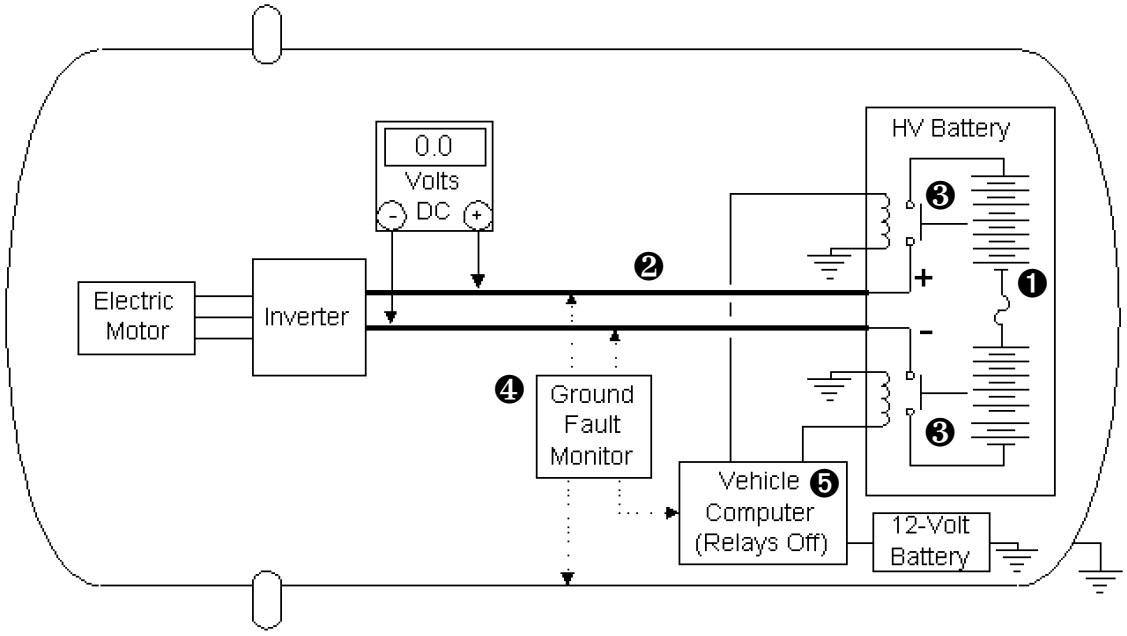
- A high voltage fuse ❶ provides short circuit protection in the HV battery pack.
- The positive and negative power cables ❷ connected to the HV battery pack are controlled by 12-Volt normally open relays ❸. When the vehicle is shut off, the relays stop electricity flow from the HV battery pack.

WARNING:

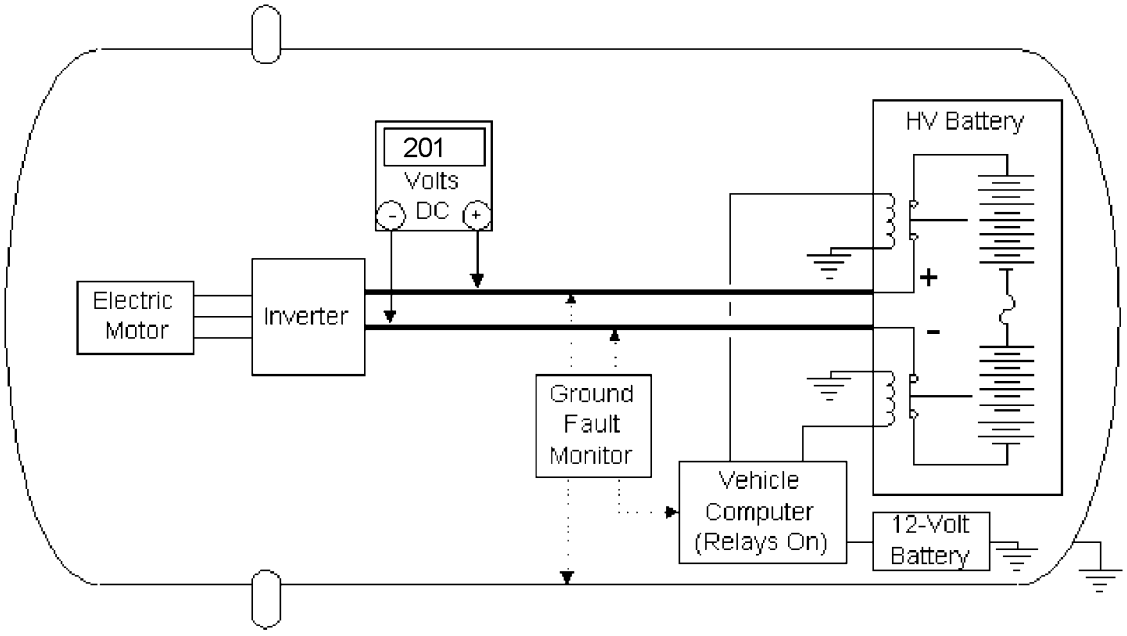
- *Power remains in the high voltage electrical system for 5 minutes after the HV battery pack is shut off.*
- ***Never** touch, cut, or open any orange high voltage power cable or high voltage component.*

- Both power cables ❷ are isolated from the metal chassis, so there is no possibility of shock by touching the metal chassis.
- A ground fault monitor ❹ continuously monitors for high voltage leakage to the metal chassis while the vehicle is running. If a malfunction is detected, the vehicle computer ❺ will illuminate the master warning light in the instrument cluster and the hybrid warning light in the LCD display.
- The HV battery pack relays will automatically open to stop electricity flow in a collision sufficient to active the front SRS airbags.

HIGH VOLTAGE SAFETY

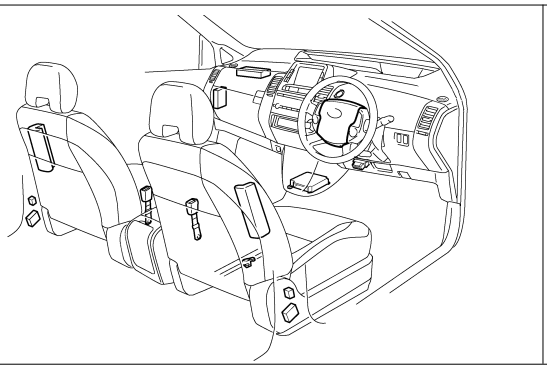


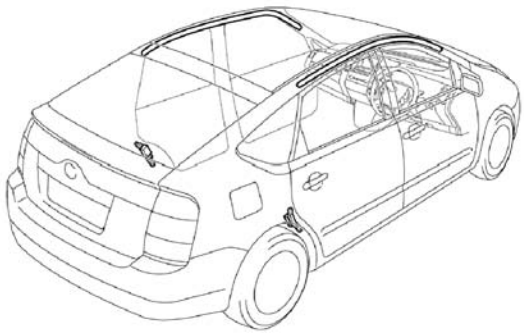
High Voltage Safety System – Vehicle Shut Off (**READY** off)



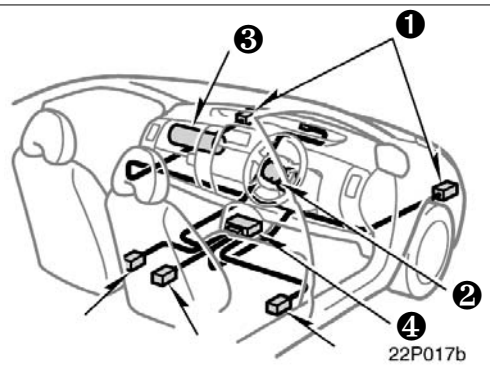
High Voltage Safety System – Vehicle On and Operational (**READY** on)

SRS AIRBAGS AND SEAT BELT PRETENSIONERS

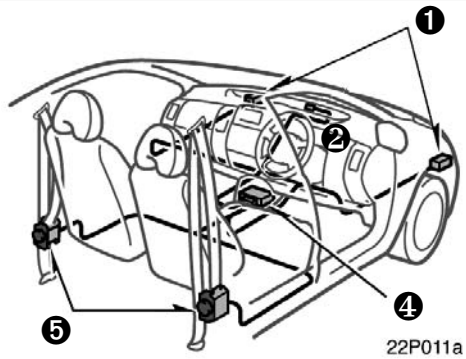




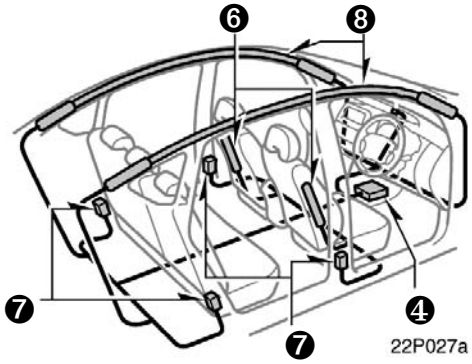
SRS Airbag and Pretensioner Components



Front Seat Airbag Components



Front Seat Belt Pretensioner Components



Front Seat Side Airbag and Curtain Shield Airbag Components

The NHW20 Prius includes as standard equipment driver and passenger front SRS airbags and front seat belt pretensioners. Side impact SRS airbags contained in the front seats and curtain sealed SRS airbags built in roof pillars are optional equipment.

The SRS system is equipped with a back up source that powers the SRS airbags up to 90 seconds after disconnecting the 12-Volt auxiliary battery.

Airbag and Sensor Locations

- Two front SRS airbag sensors ❶ are mounted in the engine compartment for the driver ❷ and passenger ❸ airbags.
- The SRS computer ❹, which also contains a sensor, is mounted on the floor pan near the center console.
- Front seat pretensioners are mounted in the center pillar ❺.
- Optional side impact SRS airbags are contained in the front seats ❻. The sensors are mounted in the center pillar and rear pillar ❼.
- Optional curtain shield SRS airbags are contained in roof pillars ❽. The sensors are mounted in the center pillar and rear pillar ❼.

EMERGENCY RESPONSE

On arrival, emergency responders should follow their standard operating procedures for vehicle incidents. Emergencies involving the Prius may be handled like other vehicles except as noted in these guidelines for Extrication, Fire, Overhaul, Recovery, Spills, First Aid, and Submersion.

WARNING:

- ***Never*** *assume the Prius is shut off simply because it is silent.*
- *Always observe the instrument cluster for the* ***READY*** *indicator status to verify whether the vehicle is on or shut off.*

Extrication

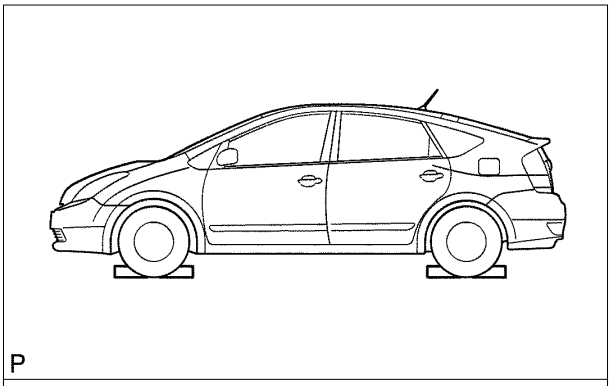
- Immobilise Vehicle
  - Chock wheels and set the parking brake.
  - Push the **P** (park) switch. Confirm indicator light on the switch is ON.
- Disable Vehicle (HV battery pack, SRS airbags, & petrol fuel pump)
  - Push **POWER** button, confirm that the **READY** indicator is OFF on the combination meter. Remove key from the vehicle and keep it at least 5 m away from vehicle.
  - Disconnect 12-Volt auxiliary battery.

  OR (if the POWER button is inaccessible)

  - Disconnect the 12-Volt auxiliary battery.
  - Remove the HEV Fuse (20A: Yellow) in the engine compartment as shown in the illustration.

WARNING:

- *After disabling the vehicle, power is maintained for* ***90 seconds*** *in the SRS system and* ***5 minutes*** *in the high voltage electrical system.*
- *If either of the disabling steps above cannot be performed, proceed with caution as there is no assurance that the high voltage electrical system, SRS, or fuel pump are disabled.*
- ***Never*** *touch, cut, or open any orange high voltage power cable or high voltage component.*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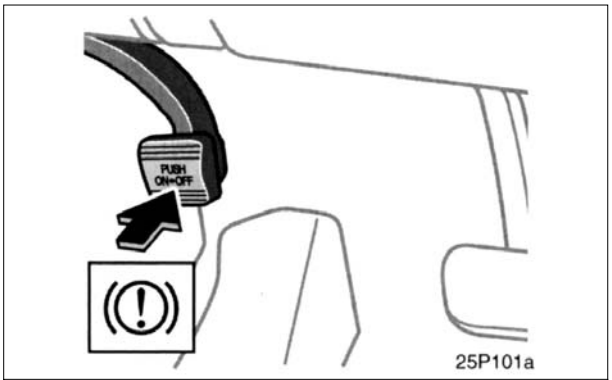
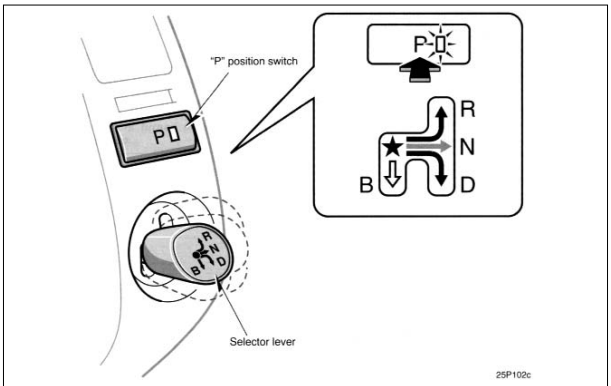
Chock Wheels

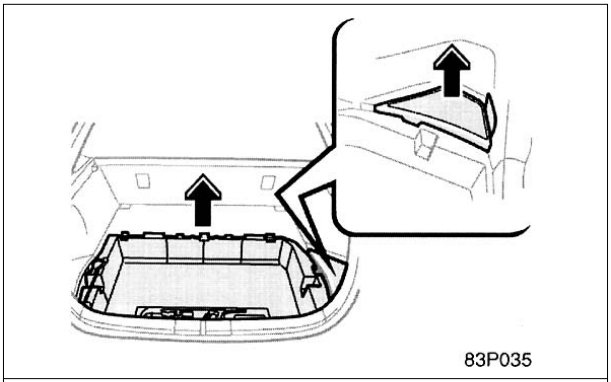


Set Parking Brake

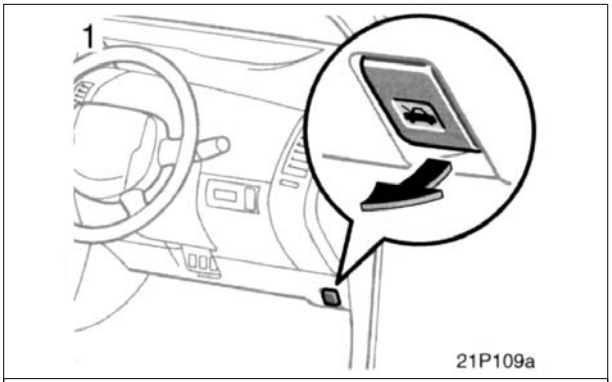


Push P Switch To Park and Confirm Indicator Light On

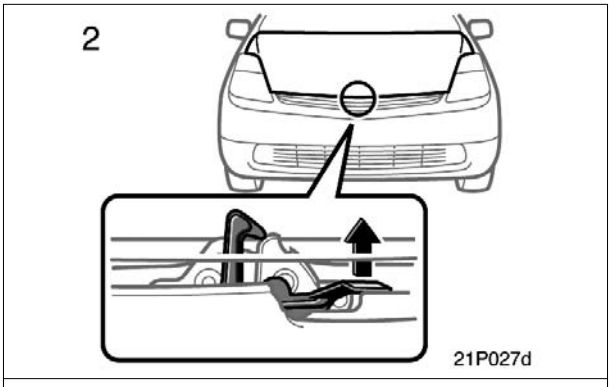
Push POWER Switch and Confirm READY indicator Off



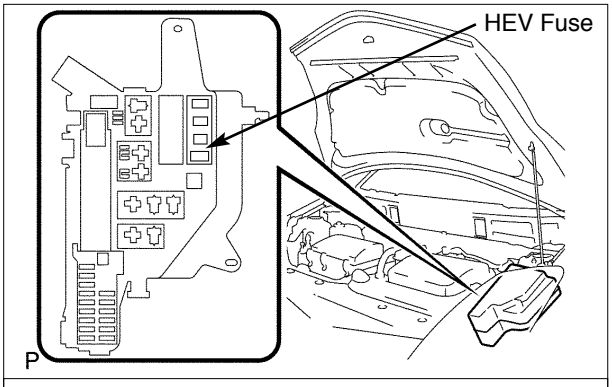
12-Volt Auxiliary Battery Cover



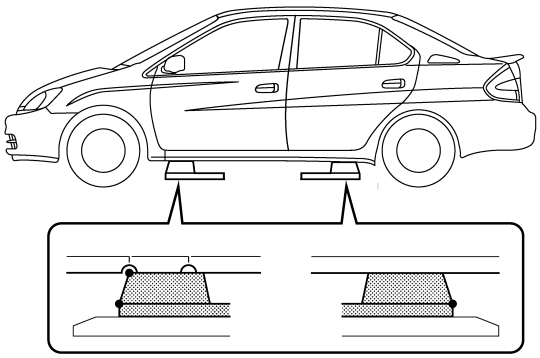
Remote Hood Release



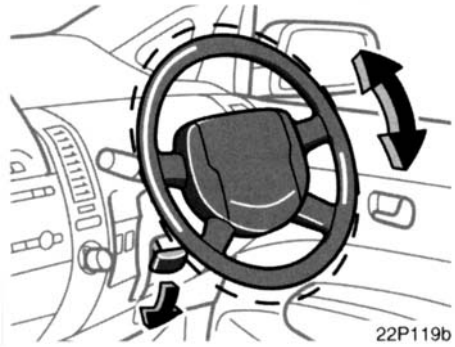
Hood Latch Release



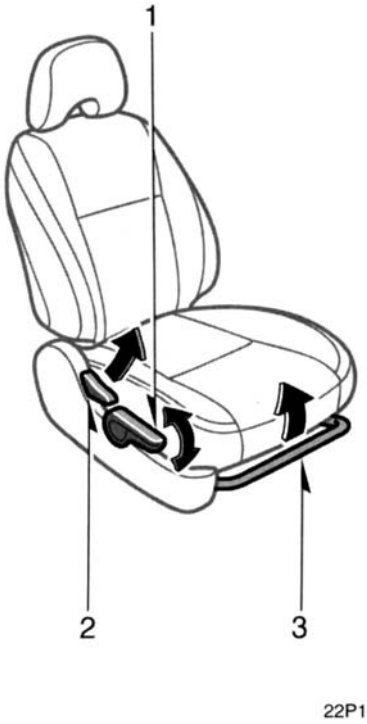
HEV Fuse (20 A: Yellow)



Cribbing Points



Tilt Steering Control



Front Seat Controls

Extrication (continued)

- Stabilise Vehicle
  - Support at (4) points directly under the front and rear pillars.
  - Do not place jacking supports under the high voltage power cables, exhaust system, or fuel tank.

- Access Patients
  - Glass Removal

    Use normal glass removal procedures as required.

  - Door Removal/Displacement

    Doors can be removed by conventional rescue tools – hand, electric and hydraulic.

    In certain situations, it may be easier to pry back the body to expose and unbolt the hinges.

  - Dash Displacement

    Displace the dash by using a conventional dash roll, Modified Dash Roll, or jacking the dash.

  - Roof Removal

    The roof should not be cut, as the curtain shield SRS airbags may be equipped roof pillar.

  - Rescue Lift Air Bags

    Responders should not place rescue lift airbags under the high voltage power cables, exhaust system, or fuel tank.

  - Steering and Seat Controls

    Tilt steering and seat controls are shown in the illustration.

Fire

Approach and extinguish a fire using proper vehicle fire fighting practices.

- Extinguishing Agent

  Water has been proven to be a suitable extinguishing agent.

- Initial Fire Attack
  - Perform a fast, aggressive fire attack.
  - Divert the runoff from entering watershed areas.

  Attack teams may not be able to identify a Prius until the fire has been knocked down and hazard assessment operations have commenced.

- Fire in the HV Battery Pack

  Should a fire occur in the NiMH HV battery pack, the incident commander will have to decide whether to pursue an offensive or defensive attack.

WARNING:

- *Potassium hydroxide and sodium hydroxide are key ingredients in the NiMH battery module electrolyte.*
- *The modules are contained within a metal case and access is limited to a small opening on the top.*
- *The cover should **NEVER** be breached or removed under any circumstances, including fire. Doing so may result in severe electrical burns, shock or electrocution.*

When allowed to burn themselves out, the Prius NiMH battery modules burn rapidly and can quickly be reduced to ashes except for the metal alloy cell plates.

Offensive Fire Attack

Flooding the HV battery pack, located in the luggage, with copious amounts of water at a safe distance will effectively control the HV battery pack fire by cooling the adjacent NiMH battery modules to a point below their ignition temperature. The remaining modules on fire, if not extinguished by the water, will burn themselves out.

Defensive Fire Attack

If the decision has been made to fight the fire using a defensive attack, the fire attack crew should pull back a safe distance and allow the NiMH battery modules to burn themselves out. During this defensive operation, fire crews may utilise a water stream or fog pattern to protect exposures or to control the path of smoke.

Hazard Assessment

During hazard assessment, if not already done, immobilise and disable the vehicle. See illustrations on page 13.

- Immobilise Vehicle
  - Chock wheels and set the parking brake.
  - Push the **P** (park) switch. Confirm indicator light on the switch is ON.
- Disable Vehicle (HV battery pack, SRS airbags, & petrol fuel pump)
  - Push **POWER** button, confirm that the **READY** indicator is OFF on combination meter. Remove key from the vehicle and keep it at least 5 m away from vehicle.
  - Disconnect 12-Volt auxiliary battery.

  OR (if the POWER button is inaccessible):

  - Disconnect the 12-Volt auxiliary battery.
  - Remove the HEV Fuse (20A: Yellow) in the engine compartment.

WARNING:

- *After disabling the vehicle, power is maintained for **90 seconds** in the SRS system and **5 minutes** in the high voltage electrical system.*
- *If either of the disabling steps above cannot be performed, proceed with caution as there is no assurance that the high voltage electrical system, SRS, or fuel pump are disabled.*
- *Never touch, cut, or open any orange high voltage power cable or high voltage component.*

Recovery/Recycling NiMH HV Battery Pack

Clean up of the HV battery pack can be accomplished by the vehicle recovery crew without further concern from runoff or spill. For information regarding recycling of the HV battery pack, contact the nearest Toyota dealer or the Toyota Customer Relations Centre on 1800 252 097 for information.

Spills

The Prius contains the same common automotive fluids used in other Toyota vehicles, with the exception of NiMH electrolyte used in HV battery pack. The NiMH battery electrolyte is a caustic alkaline (pH 13.5) that is damaging to human tissue. The electrolyte, however, is absorbed in the cell plates and will not normally spill or leak out even if a battery module is cracked. A catastrophic crash that would breach both the metal battery pack case and the plastic battery module would be a rare occurrence.

Similar to using baking soda to neutralize a lead-acid battery electrolyte spill, a dilute boric acid solution or vinegar is used to neutralise a NiMH battery electrolyte spill.

For further information, refer to the Material Safety Data Sheets (MSDS) on page 21.

- Handle NiMH Electrolyte Spills Using The Following Personal Protective Equipment (PPE):
  - Splash shield or safety goggles. Fold down helmet shields are not acceptable for alkaline spills.
  - Rubber, latex or Nitrile gloves.
  - Apron suitable for alkaline.
  - Rubber boots.
- Neutralise NiMH Electrolyte
  - Use a boric acid solution or vinegar.
  - Boric acid solution – 800 grams boric acid to 20 litres water.

First Aid

Emergency responders may not be familiar with a NiMH electrolyte exposure when rendering aid to a patient. Exposure to the electrolyte is unlikely except in a catastrophic crash or through improper handling. Utilise the following guidelines during an exposure.

WARNING:

The NIMH battery electrolyte is a caustic alkaline (pH 13.5) that is damaging to human tissue.

- Wear Personal Protective Equipment (PPE)
  - Splash shield or safety goggles. Fold down helmet shields are not acceptable for acid or alkaline spills.
  - Rubber, latex or Nitrile gloves.
  - Apron suitable for alkaline.
  - Rubber boots.

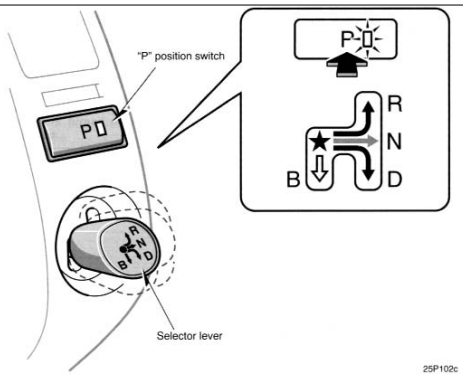
First Aid (continued)

- Absorption
  - Perform gross decontamination by removing affected clothing and properly disposing of the garments.
  - Rinse the affected areas with water for 20 minutes.
  - Transport to the nearest emergency medical care facility.
- Inhalation Non-Fire Situations
  - No toxic gases are emitted under normal conditions.
- Inhalation Fire Situations
  - Toxic gases are given off as the by-product of combustion. All responders in the Hot Zone should wear the proper PPE for fire fighting including SCBA.
  - Remove patient from the hazardous environment to a safe area and administer oxygen.
  - Transport to the nearest emergency medical care facility.
- Ingestion
  - Do not induce vomiting.
  - Allow patient to drink large quantities of water to dilute electrolyte (Never give water to an unconscious person).
  - If vomiting occurs spontaneously, keep patients head lowered and forward to reduce the risk of aspiration.
  - Transport to the nearest emergency medical care facility.

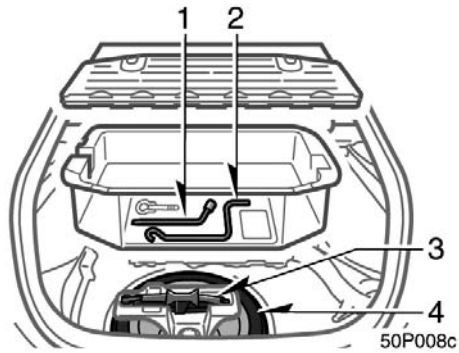
Submersion

To safely handle a Prius that is fully or partially submerged in water, disable the high voltage electrical system and SRS airbags.

- Remove vehicle from the water.
- Drain water from the vehicle if possible.
- Follow the extrication and vehicle disabling procedure (page 12).



Move to N position for a few seconds



Spare Tyre and Tool Location

No special or unusual handling is necessary for Prius roadside assistance. The vehicle may be handled like other Toyota vehicles and the following information may be useful for guidance.

Towing

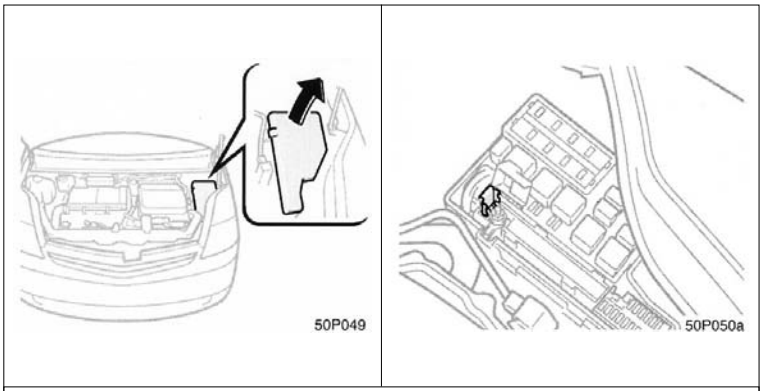
The Prius is a front wheel drive vehicle. Tow with the front wheels off the ground.

- To shift the vehicle to neutral, push **POWER** button and confirm combination meter illuminated, press the brake, and move the lever to the **N** (neutral) position for a few seconds. (The indicator on P switch will be OFF. Shift position indicator [square mark] around “N” on combination meter is illuminated, when vehicle shift to neutral.)
- If the indicator on P switch cannot be switched OFF or combination meter cannot be illuminated, the vehicle cannot shift to neutral.

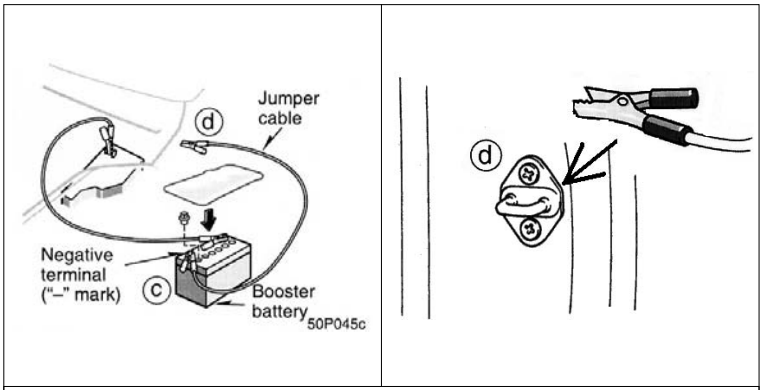
NOTE: Whenever the vehicle is IG-OFF/ACC, the shift position always stays Park position.

Spare Tyre

The spare tyre, jack, and tools are provided in the luggage compartment as shown in the illustration. The spare tyre is for temporary use only (do not exceed 80 km/h).



12-Volt auxiliary battery jumper terminal (positive +)



12-Volt Battery Jumper Cable Connections

Jump Starting

The 12-Volt auxiliary battery may be jump started if the vehicle does not start and the instrument cluster gauges/lights are dim or off after pushing **POWER** button with key in slot.

- The 12-Volt auxiliary battery jumper positive terminal is located in the engine compartment. Follow the numbered sequence to connect the jumper cables as shown in the illustration.
- The high voltage HV battery pack cannot be jump started.

Alarm & Immobiliser

The vehicle comes standard with a keyless remote alarm and a coded key immobiliser system.

- The vehicle may only be started with a learned immobiliser coded key.
- To disable the alarm use the unlock button on the keyless remote, unlock either front door lock with the key, or turn the ignition switch on.

MATERIAL SAFETY DATA SHEET

Nickel/Metal Hydride Battery (EV-MPGR5R02)

SECTION I – Chemical Product & Company

Manufacturer's Name Panasonic EV Energy Co., Ltd.	Manufacturer's Emergency Telephone Number (81)-53-577-3112. Munehisa Ikoma
Manufacturer's Mailing Address 555 Sakai juku, Kosai, Shizuoka 431-0452 JAPAN	Data Prepared Sep. 19, 2003
	Signature of Preparer (Optional)

SECTION II – Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity: Common Name (s))	OSHA PEL ACGIH TLV	Other Limits Recommended	Formulation (	
Ni (OH)2			0~16%	W
NiOOH			1~17%	W
MmNiCoMnAl			2~21%	W
(MmNiCoMnAl) Hx			3~22%	W
KOH and NaOH and LiOH			14%	W

Other Material:

Battery Case: Plastics (PPE/PP/HSBBC/HSIBC Blend)

PPE: Poly Phenylene Ether, PP: Polypropylene

HSBBC: Hydrogenated Styrene Butadiene Block Copolymer

HSIBC: Hydrogenated Styrene Isoprene Block Copolymer

Separater: Polypropylene-Polyolefine mixed Sheet

SECTION III – Physical/Chemical Characteristics

	Specific Gravity (H_2O=1) 1.9
Vapor Pressure (mm Hg) N/A	Melting Point N/A
Vapor Density (Air=1) N/A	Evaporation Rate (Butyl Acetate =1) N/A
Solubility in Water (v/v) N/A	

Appearance and Odour

Note:

- Nickel/Metal hydride battery is solid and sealed by the plastic case. It will not generate any gas in the static condition. In the atmosphere, and in the water, it retains the solid condition.
- In the non-static condition, it may generate oxygen (0_2) when overcharged status and hydrogen (H2) when overdischarged. Via the safety vent inside the Nickel/Metal hydride battery, these gases may vent out of the case to the atmosphere. Spe of gas generation and volume of gas generation depend upon the charging or discharging condition.

SECTION IV – Fire and Explosion Hazard Date

Flash Point (Method Used)	Flammable Limits	LEL	UEL
N/A			

Note:

- No flash or explosion in the normal situation.
- Flash may be possible in the following cases:
  – Sparking in the case of the short-circuit.
  – Intentionally discharging the cell and/or the module battery with extremely high current.
- Explosion may be possible in the following case:

  The Cell itself will not explode if abused because of its safety vent mechanism. However, if the cell is housed in a seal vessel, the cell may explode with an ignition source because of the combination of oxygen (0_2) and hydrogen (H_2) gases generated by the cell.
- Unusual fire and explosion hazards.

Extinguishing media

• CO_2 • Sand • Large amounts of water

Special Fire-fighting Procedures

N/A

Unusual fire and explosion hazards

- In abnormal usage, there is the possibility of explosion.
- The abnormal usage conditions:
  – Cell was overcharged and overdischarged.
  – Cell was higher than 100°C.
  – Cell is discharged and charged in a sealed vessel with an ignition source.

SECTION V – Reactivity Data

Stability	Unstable		Conditions to Avoid
Stable	Stable	○	

Incompatibility (Materials to Avoid)

N/A

Hazardous Decomposition or By-products

- Disassembling the module battery – • Danger of short-circuiting.
- Disassembling the single cell – • Danger of short-circuiting.
  • Alkaline liquid out.
  • Alkaline liquid to the skin.

Hazardous	May Occur		Conditions to Avoid
Polymerisation	Will Not Occur	○	

SECTION VI – Health Hazard Data

Route (s) Entry: Inhalation? Skin? Ingestion?

- Inhalation: Any poisonous gas will not be generated. Inhalation of the gas is not harmful.
- Skin: In the normal situation, damage to skin will not occur. However, in the abused situation, the electrolyte (alka-line liquid) may leak out of the case which may damage the skin if touched.
- Ingestion: No ingestion.

Health Hazards (Acute and Chronic)

Will not give any hazards in the long run. However, leaked liquid may damage the skin if touched.

Carcinogenicity: TNP? IARC Monographs? OSHA Regulated?

No Carcinogen

Signs and Symptoms of Exposure

–

Medical Conditions Generally Aggravated by Exposure

–

Emergency and First Aid Procedures

(A) In case the battery case is cracked and broken:
Alkaline electrolyte flows out. If your skin and eye contact it, it causes very serious sore.

Element of alkaline electrolyte : KOH, NaOH, LiOH(PH_{14})

(B) In case the battery is burned:

A mixed steam is generated. If you inhale it a lot, it causes a stimulation of the mucous membrane,giddiness or vomit.
Main element of a mixed steam:

Carbon monoxide(CO), Carbon dioxide(CO_2), Sulfur oxide(SO_X) 1,3-Butadiene(C_4H_6), Benzene(C_6H_6), Toluene(C_7H_8),Syrene(C_8H_8), and alkaline mist of KOH, NaOH and LiOH.

Emergency treatment(See Section 8)

(A) In case the alkaline electrolyte happen to put into your eye;
Immediately wash your eyes for more than 15 minutes(in every nook and corner of eyelid, including inside of it) with a lot of water and than promptly recieve medical treatment from a doctor(oculist).

(B) In case the alkaline electrolyte contact your skin;
Immediately wash it off with a lot of water. And quickly take off clothes and shoes polluted and then promptly receive medical treatment from a doctor.

(C) In case inhale a mixed steam or alkalinemist;
Avoid inhaling by standing on the windward side
If inhale, immediately wrap person in a blanket, keep quiet and move to another place where there is fresh air. Then carry out the inhalation of oxygen and also promptly receive medical treatment from a doctor.

SECTION VII – Precautions for Safe Handling and Use

Steps to be Taken in Case Material is Released or Spilled

Do not disassemble the module and cell. If disassemble the module and the cell, should be stored under water immediately and precaution that alkaline liquid leaked out of the module and cell.

Waste Disposal Method

Dispose of it based on the means instructed by car manufacturers or distributors.
Insulate the output terminal of module or battery-pack during transportation.
The discharged condition is preferable for disposal.

SECTION VIII – Control Measures

Respiratory Protection (Specify Type)
In the normal condition, it is not needed specifically.

Ventilation	Local Exhaust	Special
	Mechanical (General)	Other

Note

- The module battery should not be placed in a sealed vessel.
- The module battery requires ventilation during usage.

Protective Gloves Rubber	Eye Protection Wear splash proof goggles

Note

- In the case of disassembling the cell and/or the module battery, protection against the anti-alkaline must be used.

Other Protective Clothing of Equipment

N/A

Work/Hygienic Practices

N/A