

2001 ELECTRIC RANGER

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NOTE: Refer to the 2001 Ranger Workshop Manual for all Non-Electric Vehicle (EV) Specific

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General Information

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SECTION 100-00 General Information

VEHICLE APPLICATION: Ranger EV

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DESCRIPTION AND OPERATION

General Information

Format and Usage

The Electric Ranger is a combination of conventional and unique electric vehicle (EV) components and systems. The following procedures are designed to supplement the standard Ranger Workshop Manual for the EV specific components.

This supplement is designed to be the primary manual when working on the EV. All of the EV specific components are covered in this supplement. If a procedure is not outlined in this supplement, refer to the standard Ranger Workshop Manual.

Because the EV uses an electric motor rather than a gasoline engine, there are different and unique warnings and cautions. The procedures outlined are designed to encourage safe repair of the vehicle and should be carefully followed. The EV uses many electronic components that can be easily damaged if the procedures are not followed.

Acids

⚠ WARNING: Lead-acid batteries contain sulfuric acid. Avoid contact with skin, eyes or clothing. Also, shield your eyes when working near batteries to protect against possible splashing of the acid solution. In case of acid contact with the skin or eyes, flush immediately with water for a minimum of fifteen minutes and get prompt medical attention. If acid is swallowed, drink large quantities of milk or water, followed by milk of magnesia, a beaten egg, or vegetable oil. Call a physician immediately.

The drive battery pack for the Electric Ranger is composed of 39 8-volt lead acid battery modules which are wired in series. These batteries are similar in design to the battery in a gasoline powered vehicle. The batteries contain sulfuric acid which can cause severe skin or eye damage if allowed to contact these areas. Follow all safety precautions outlined in EV-Specific Precautions prior to working on the drive battery pack.

⚠ WARNING: Batteries normally produce explosive gases which can cause personal injury or death. Do not allow flames, sparks or lighted substances to come near the batteries. When charging or working near the batteries, always shield your face and protect your eyes. Always provide adequate ventilation.

Electric Shock

⚠ WARNING: The battery pack assembly can deliver in excess of 312 volts of DC power. Improper handling of the battery pack can result in injury or fatality. Only authorized personnel trained to work with battery pack components are permitted to handle the batteries.

There are two electrical systems on the EV. A high voltage system is used to power the motor/transaxle and many auxiliary loads such as the A/C system, power steering pump, heater and certain control components. High voltage wiring is identified by its orange color or orange wrapping on the harness. Components that have larger connectors, orange coverings on the wires, or warning labels contain high voltage. The second voltage system is used to operate the standard Ranger systems such as interior/exterior lighting, radio, blower motor and instrumentation. These components should be treated with extreme caution. Do not perform any service on them until all high voltage power has been disconnected.

EV-Specific Precautions

When working on the traction battery the following precautions must be taken.

1. A buffer zone must be placed around the vehicle or traction battery.
2. Rubber insulating gloves must be worn.
3. A face shield must be worn to shield the face and protect the eyes from electric arc.

DESCRIPTION AND OPERATION (Continued)**Welding Precautions**

The EV requires special care when welding is performed. The sensitive electric components can be damaged by the heat associated with gas welding and the electrical current from electric resistance welding. The following steps must be taken before any welding is done on the EV.

1. Disconnect the 12 volt battery ground cable.
2. If welding within 300 mm (12 in) of the traction battery, remove the traction battery
3. If welding more than 300 mm (12 in) away from the traction battery, disconnect the 76 pin low voltage connector.

4. Remove any electrical modules within 300 mm (12 in) of the welding area.
5. Disarm the passive restraint system. Follow the procedures outlined in the standard Ranger Workshop Manual.
6. Verify that the ignition is in the OFF position.

The traction battery can be stored out of the vehicle for up to 30 days without the serious damage to the battery. If possible, the traction battery should be fully charged prior to storage. After thirty days of storage, the battery should be fully charged. Proper storage will maximize traction battery life.

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SECTION 100-01 Identification Codes

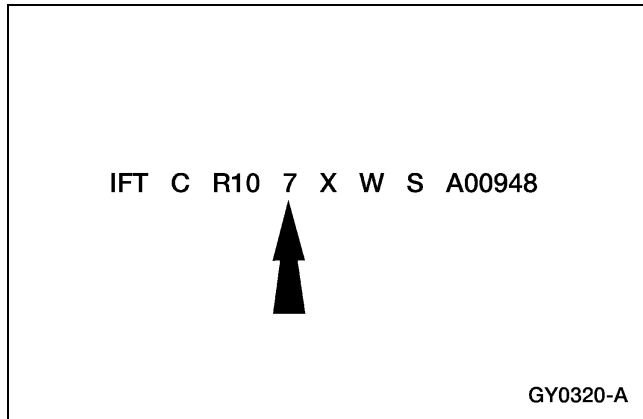
VEHICLE APPLICATION: Ranger EV

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DESCRIPTION AND OPERATION

Identification Codes

NOTE: For Electric Ranger Only.

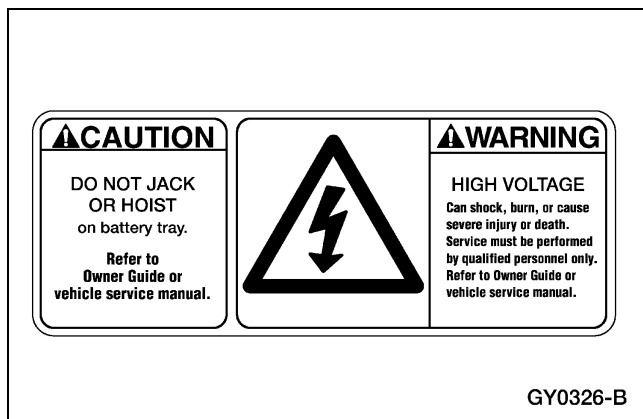


The Vehicle Identification Number (VIN) is located on a tab on the driver’s side dashboard and on the Vehicle Certification Label. The Electric Vehicle (EV) can be identified by checking the engine identification number on the VIN tag. This is the eighth digit on the tag, which indicates the battery pack that is installed in the Electric Vehicle. A number 7 indicates a Lead Acid Battery Pack (PbA) and a number 1 indicates a Nickel Metal Hydride Battery Pack (NiMH). For other VIN information, refer to the **Ranger Workshop Manual**.

Warnings

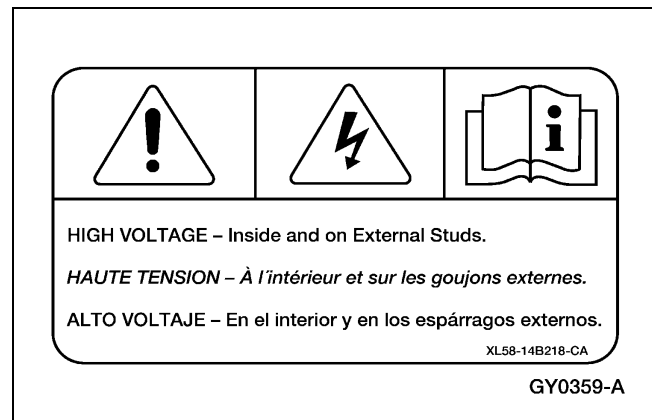
The Electric Ranger contains many unique electrical components. The components that operate using high voltage are labeled to warn of the potential danger for electric shock. In addition to the high voltage, some of the components also generate high levels of heat. These are labeled to protect people from possible burns.

Traction Battery Tray Label



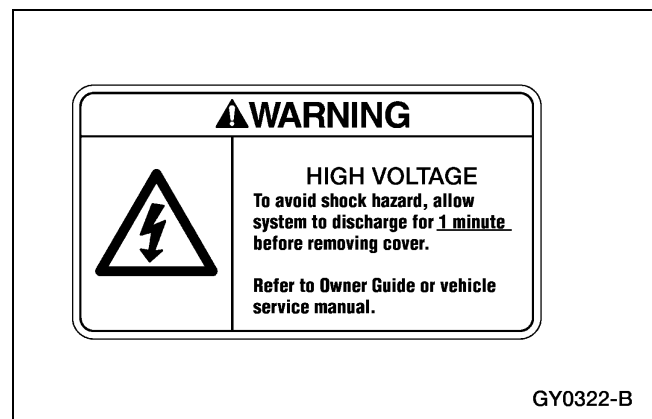
The Traction Battery Tray warning label is located on the left and right sides of the traction battery. The label warns of the potential for electric shock if an unauthorized person attempts to service the traction battery. The label also cautions against lifting the vehicle by the traction battery.

High Voltage Warning Label



The High Voltage warning label has three icons that contain a general warning, a high voltage warning, and an icon to inform technicians that the proper service information should be used prior to servicing the vehicle.

High-Voltage Label - High-Voltage Power Distribution Box

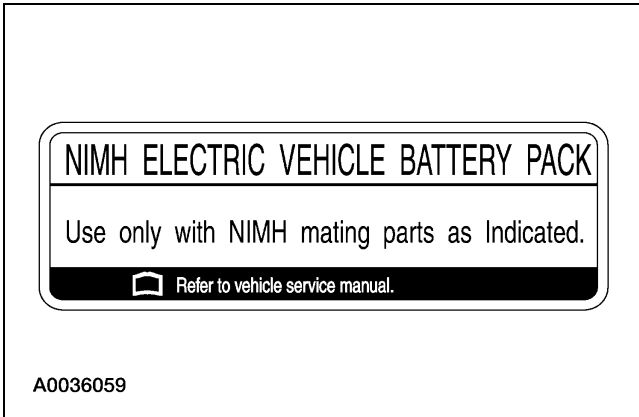


The High-Voltage - High-Voltage Power Distribution Box warning label is located on the high-voltage power distribution box (HVPDB) below the HVPDB cover. This label warns of the need to allow the vehicle to discharge electrically for one minute before removing the inner HVPDB cover.

DESCRIPTION AND OPERATION (Continued)

Nickel Metal Hydride (NiMH) Battery Pack

This label indicates a Nickel Metal Hydride (NiMH) battery pack.



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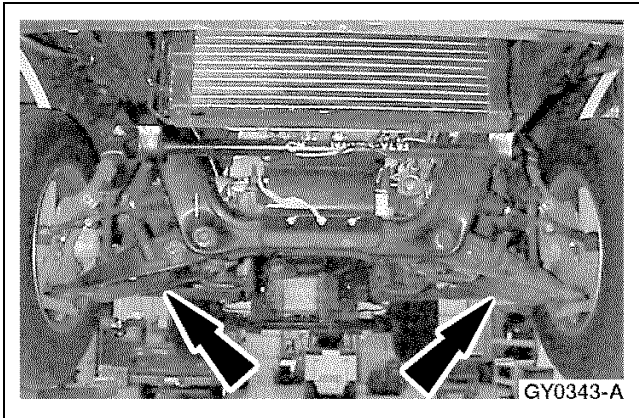
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VEHICLE APPLICATION: Ranger EV

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GENERAL PROCEDURES

Jacking




Jacking Points —Front

1. Set the parking brake and block the rear wheels.
2. Position the jack under the front A arms and lift the vehicle.

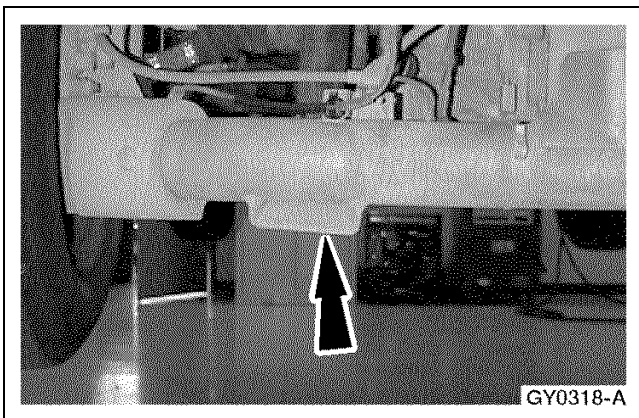
Jacking Point —Rear

1. Block the front wheels.

 **CAUTION: Do not lift the vehicle from any point on the axle other than the pads as axle damage may result.**

2. **NOTE:** LH pad shown, RH similar.

Position the jack under the rear axle pad(s) and lift the vehicle. The pads are part of the rear shock absorber mounting points.



3. Lift the vehicle.

GENERAL PROCEDURES (Continued)**Towing****Pre-Towing Instructions**

⚠ WARNING: Tow truck operators should not attempt to service, recharge or operate the vehicle under any circumstances. This vehicle is made up of complex electrical systems, and these operations must be performed by authorized personnel only. Improper handling could result in vehicle damage, personal injury, or death.

⚠ WARNING: If the vehicle does not operate properly, do not attempt to jump-start the 12-volt battery or push the vehicle. This could result in vehicle damage, personal injury, or death.

⚠ WARNING: Failure to turn the vehicle off before servicing may result in personal injury or death.

⚠ CAUTION: Do not disconnect the halfshafts if the motor/transaxle is inoperable. This may result in damage to the motor/transaxle.

1. Verify that the key is in the OFF position.
2. Position the front wheels straight ahead and lock the steering wheel in place using a steering wheel locking device.
3. Depress the brake pedal and release the parking brake.

Approved Towing Methods**Front Wheel Lift Towing**

⚠ CAUTION: There are three approved methods for towing the Electric Ranger. Use of other than the specified methods may cause vehicle damage.

1. Place the gear selector in neutral (N).
2. Lock the front wheels in a straight ahead position with a steering wheel locking device. Do not rely on the column lock to hold the wheels.


GENERAL PROCEDURES (Continued)

3. Secure the tires to the wheel lift.
4. On normal roads, limit speed to 88km/hr (55mph). On rough roads, limit speed to 56km/hr (35 mph).

Rear Wheel Lift Towing


1. Lock the front wheels in a straight ahead position with a steering wheel locking device. Do not rely on the column lock to hold the wheels. If a front wheel locking device is not available, position wheel dollies underneath the front wheels.
2. Secure the tires to the wheel lift.
3. On normal roads, limit speed to 88km/hr (55mph). On rough roads, limit speed to 56km/hr (35 mph).

Flatbed Towing

 **CAUTION: Do not pull the vehicle onto the flatbed by the rear axle.**

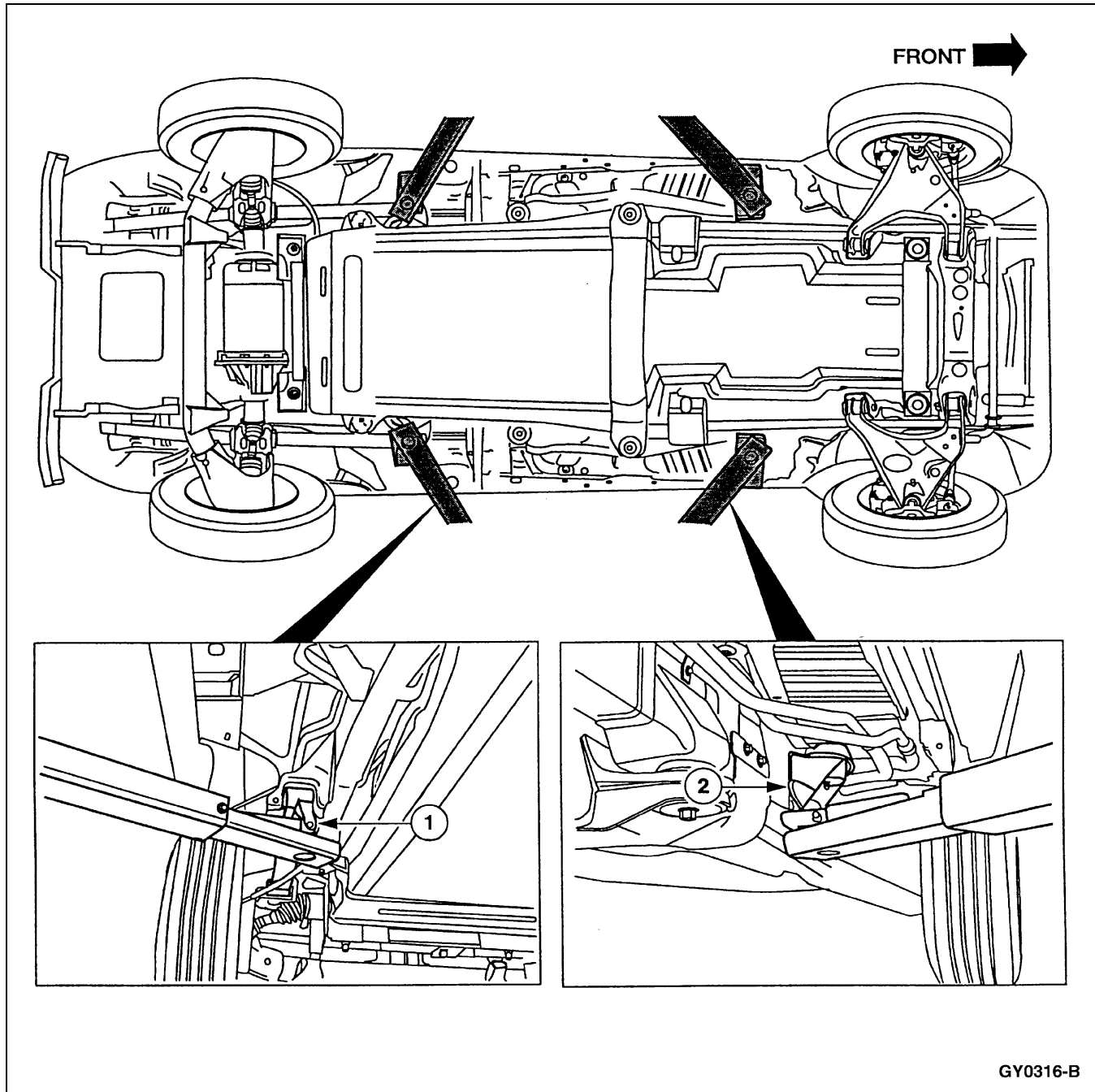
1. Position the vehicle on the flatbed.
2. Secure the vehicle to the flatbed before towing.

Lifting

 **CAUTION: Do not allow the hoist to contact the traction battery pack.**

1. Position the vehicle over a side post hoist.

GENERAL PROCEDURES (Continued)



2. Position the hoist pad extensions.
 - 1 Locate the rear hoist pad extensions on the front of the rear leaf spring hanger eyes.
 - 2 Locate the front hoist pad extensions on the front cab mount extensions.

3. Carefully lift the vehicle.

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VEHICLE APPLICATION: Ranger EV

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DESCRIPTION AND OPERATION

Condenser Fan


 **WARNING: Disconnect the cooling fan prior to performing any underhood repairs because the fan could cycle.**

The two-speed cooling fan is located behind the radiator, attached to the fan shroud. The cooling fan is controlled by the interface adapter assembly (IAA) that will energize the cooling fan under the following conditions:

- Coolant temperature is higher than normal.
- A/C compressor is on in A/C and Defrost modes when the vehicle speed does not provide enough airflow through the condensor.

Cooling fan noise will be noticed when the vehicle is turned on and the coolant is hot or the A/C is turned on. The fan operation can be verified visually.

Condenser Fan —Postal Ranger EV

 **WARNING: Disconnect the cooling fan prior to performing any underhood repairs because the fan could cycle.**

The two-speed cooling fan is located behind the radiator, attached to the fan shroud. The cooling fan is controlled by the interface adapter assembly (IAA) that will energize the cooling fan under the following conditions:

- Coolant temperature is higher than normal.

Cooling fan noise will be noticed when the vehicle is turned on and the coolant is hot. The fan operation can be verified visually.

Power Steering Pump

The power steering pump is located in the underhood compartment between the card table and the inner fender. The power steering pump operates whenever the vehicle is turned on. Pump operation is controlled based upon vehicle speed and steering demands.

The power steering pump will create a whine when operated. This whine can be identified by turning the vehicle on and turning the steering wheel with the vehicle stationary. This will cause the pump motor to increase speed, which will increase the volume and pitch of the whine. Once the steering wheel has been turned and the wheel is released, the pump motor will decrease to minimum speed.

Traction Battery Cooling/Ventilation Fan

The NiMH traction battery has a recirculation fan and a cooling fan that operate independently of each other to cool the traction battery. The cooling fan exchanges warm air from inside the traction battery with cooler outside air, while the recirculation fan circulates the cool air around the battery modules. The fans will operate during charging or during vehicle usage if the temperature of the modules becomes too high. The sound of the fans when operating is similar to that of an electric radiator cooling fan.

Transaxle

The transaxle is located in the rear of the vehicle between the rear wheels and contains the electric motor that powers the vehicle. A faint whine may be heard from the transaxle while the vehicle is in motion. The transaxle produces a low-level gear whine directly related to the vehicle speed.

Vacuum Pump

The vacuum necessary for operation of the Electric Vehicle brake and climate control systems is provided by an electrically driven vacuum pump. This pump is located in the underhood compartment underneath the card table and is visible from the bottom of the vehicle.

Upon start-up of the Electric Vehicle, the first prominent noise that is heard is the vacuum pump. The vacuum pump noise is identified as a buzzing that occurs when the vehicle is first turned on. With the vehicle on and stationary, pump operation will be noticed when the brakes are applied or if the climate control is being operated. The pump will activate to maintain a preset range of vacuum in the system. Constant vacuum pump operation may indicate a vacuum leak.

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SECTION 100-05 Standard Service Procedures

VEHICLE APPLICATION: Ranger EV

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GENERAL PROCEDURES

Rubber Insulating Gloves Testing

NOTE: The rubber insulating gloves that are to be worn while working on all high-voltage systems on the Ranger and the Postal Ranger EV are rated for use on equipment of up to 1000 volts. They must be inspected before use and must always be worn in conjunction with the leather outer glove. Any hole in the rubber insulating glove is a potential entry point for high voltage.

1. Roll the glove up from the open end until the lower portion of the glove begins to balloon from the resulting air pressure. If the glove leaks any air it must not be used.
2. The gloves should not be used if they exhibit any signs of wear and tear.
3. The leather gloves must always be worn over the rubber insulating gloves in order to protect them.
4. The rubber insulating gloves must be class "O" and meet all of the American Safety Testing Materials Standards.

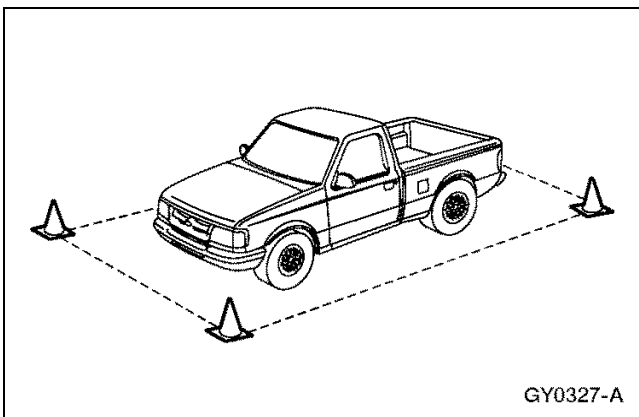
Buffer Zone

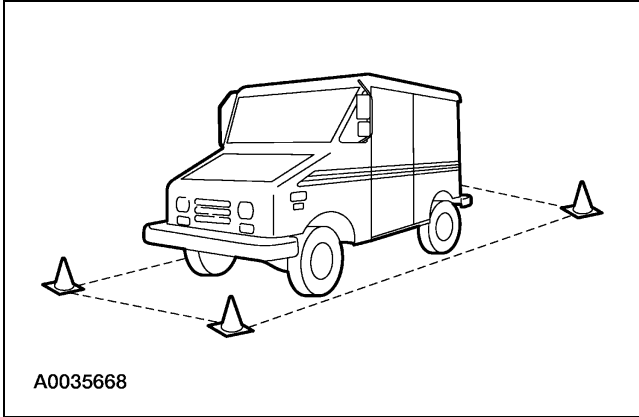
1. **NOTE:** The buffer zone is required only when working with the high-voltage systems on the Electric Vehicle.

Position the vehicle in the service bay.

2. **NOTE:** For Electric Ranger.

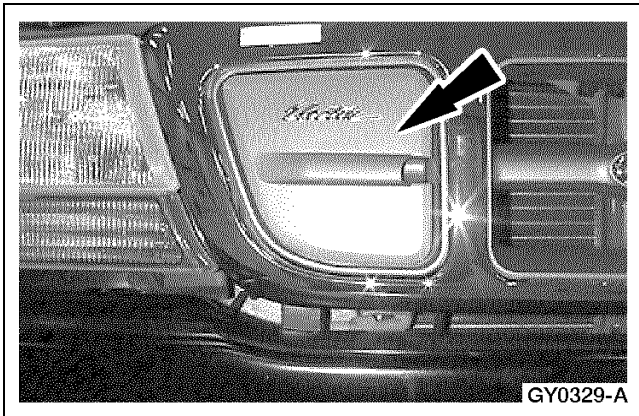
Position four orange cones around the corners of the vehicle to mark off a one meter (three feet) perimeter around the vehicle.



GENERAL PROCEDURES (Continued)

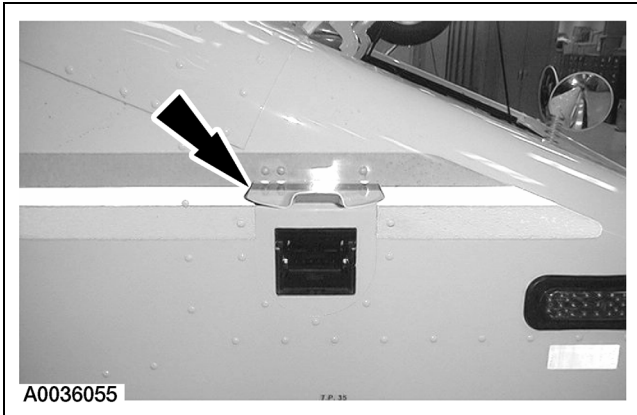
3. **NOTE:** For Postal Ranger EV.
Position four orange cones around the corners of the vehicle to mark off a one meter (three feet) perimeter around the vehicle.

4. Do not allow any unauthorized personnel into the buffer zone during repairs involving high-voltage. Only personnel trained for service on the high voltage systems of the EV are to be permitted in the buffer zone.

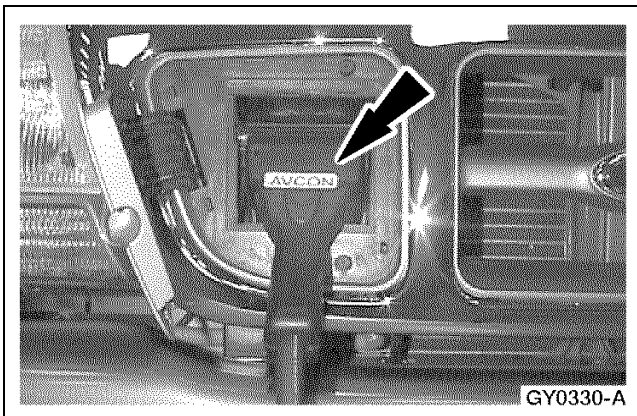
Traction Battery Charging

1. Pull the vehicle up to a power control station (PCS).
2. Place the gear selector in the park (P) position and remove the key from the ignition.
3. **NOTE:** For Electric Ranger.
Open the charger inlet access door.

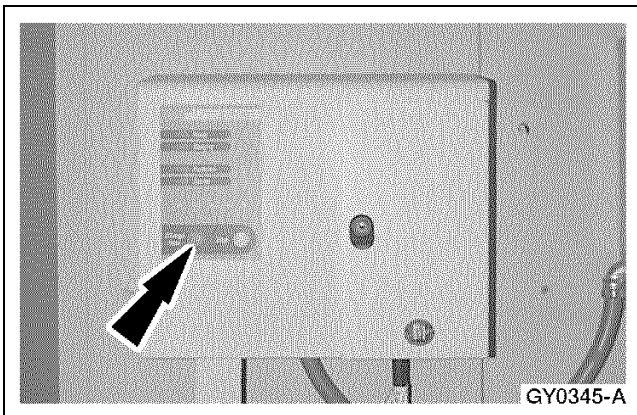
GENERAL PROCEDURES (Continued)



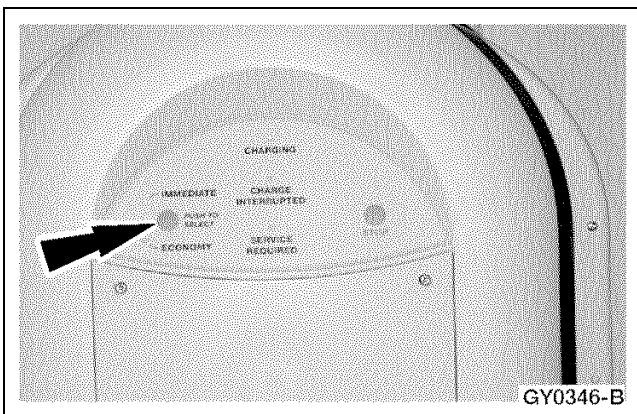
4. **NOTE:** For Postal Ranger EV.
Open the charger inlet access door.



5. **NOTE:** Electric Ranger shown, Postal Ranger EV similar.
Insert the PCS connector into the charger inlet and push the connector down until it locks into place.

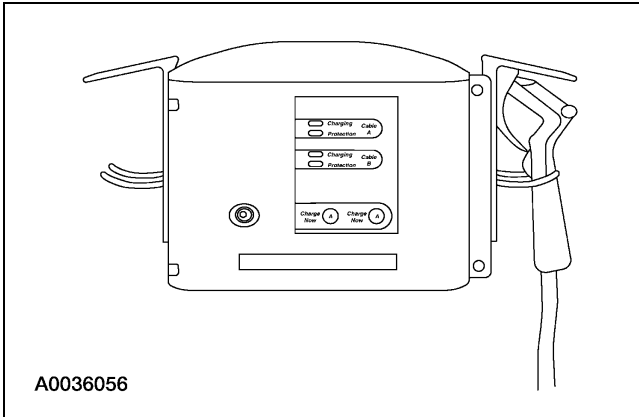


6. If using the EVI PCS and immediate charging of the vehicle is desired, press the Charge Now button. If the economy mode is desired, no further steps are necessary. The EVI unit is equipped with an autostart feature. If the unit is in the economy mode when it is connected to the vehicle, charging will begin automatically.



7. **NOTE:** For Electric Ranger.
The SCI PCS will autostart in either the immediate or economy modes. If using the SCI PCS, press the select button to choose either immediate or economy charging. Charging will begin automatically.

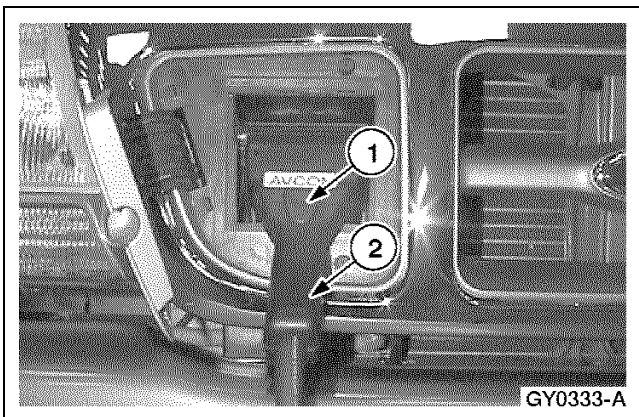
GENERAL PROCEDURES (Continued)



8. **NOTE:** For Postal Ranger EV.

The SCI PCS will autostart in either the immediate or economy modes. If using the SCI PCS, press the select button to choose either immediate or economy charging. Charging will begin automatically.

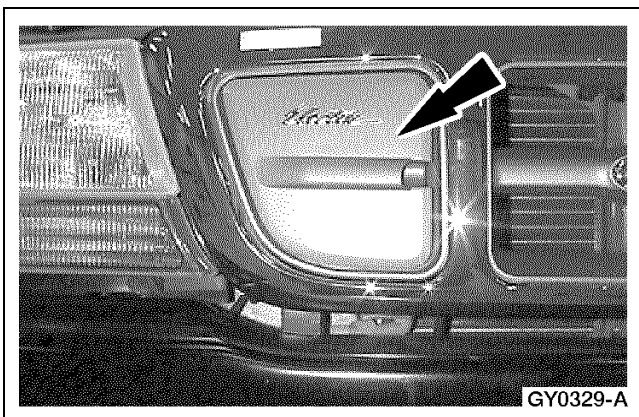
9. If vehicle charging verification is necessary, connect the New Generation STAR (NGS) Tester to the vehicle and monitor the battery control module (BCM) PID OPSTATE with the ignition key in the OFF position and the vehicle connected to the PCS. To determine what the PID OPSTATE indicates, refer to [Section 100-07](#).
10. If the vehicle is not charging, refer to Traction Battery Charging Diagnosis and Testing, [Section 414-03A](#) or [Section 414-03B](#).



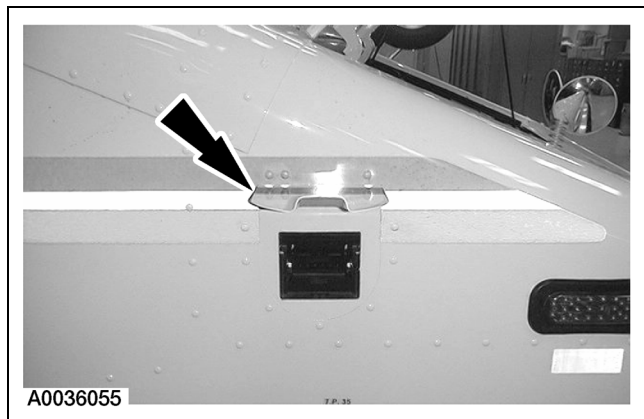
11. **NOTE:** Electric Ranger shown, Postal Ranger EV similar.

After charging, disconnect the PCS connector.

- 1 Press and hold the release button.
- 2 Lift and disconnect the PCS connector.




12. Close the charger inlet access door.

GENERAL PROCEDURES (Continued)

13. **NOTE:** For Postal Ranger EV.
Close the charger inlet access door.

Traction Battery Auxiliary Load High-Voltage Connector**Disconnect**

1.  **WARNING:** The nominal traction battery voltage is 300 volts DC. The buffer zone must be set up and insulated rubber gloves and a face shield must be worn. Failure to follow these precautions may result in severe personal injury or death. Observe the EV-specific precautions. Refer to [Section 100-00](#).
 - 1 Set up the buffer zone.
 - 2 Test and wear the rubber insulating gloves.
 - 3 Wear the face shield.
2. If connected, disconnect the vehicle from the power control station (PCS).
3. Disconnect the auxiliary battery ground cable.
4. Raise and support the vehicle. Refer to [Section 100-02](#).
5. **NOTE:** The connector is located at the front of the traction battery on the right side. Disconnect the four-pin high-voltage auxiliary load connector.
 - Pull out the red locking clip while pulling apart the connector.

