CROSSFIRE

E1

SERVICE MANUAL

READ THIS MANUAL CAREFULLY!
It contains important safety information

⚠ WARNING This UTV should not be ridden by anyone under 16 years of age.

CROSSFIRE

Brief introduction to maintenance handbook of HS5DUTV-2

The handbook is edited by Technical Center of Chongqing Huansong Science And Technology Industrial Co., Ltd, and is supplied to dealers and technicians as document of technique. Mainly, the handbook gives methods to check, maintain and repair electric vehicles （EV）, and supplies some relevant technique and performance data. Some techniques and method inside may be used to check, maintain and repair other models of EV , although it is mainly for HS5DUTV-2.

Please read the handbook through and fully understand it; otherwise, any improper repairing and amounting would bring you problems, and accident may occur in your use.

Proper use and maintenance can guarantee EV being driven safely, reduce its malfunction, and help the vehicle remain its best performance.

The standards, performances and specifications mentioned in interpretation are based on the sample in design, and they are subject to changes according to the product’s improvement without prior notice.

First version, April 2017

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GENERAL INFORMATION

The text provides complete information on maintenance，tune-up repair and overhaul，Hundreds of photographs and illustrations created during the complete disassembly of four wheel electric vehicles （EV） guide the reader through every job，All procedures are in step-by-step format and designed for the reader who may be working on the EV for the first time.

WARNINGS, CAUTIONS AND NOTES

The terms ***WARNING*, CAUTION** and **NOTE** have specific meaning in this manual.

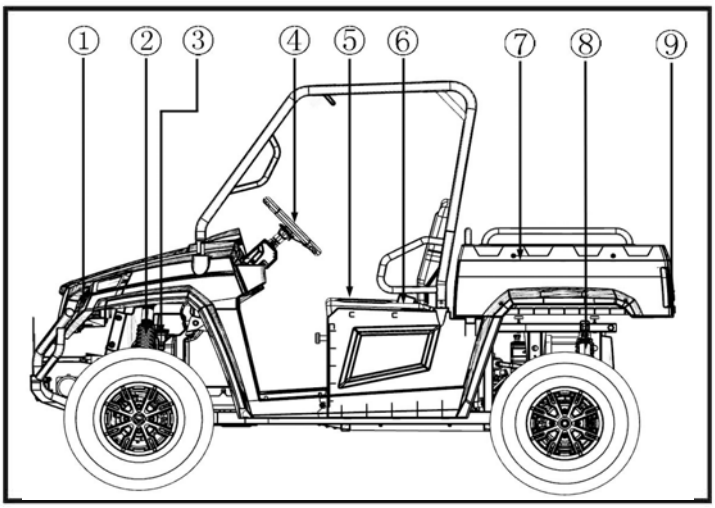
Warning work on this machine should be done by a trained technician. The voltage and current is a shock hazard and can kill.

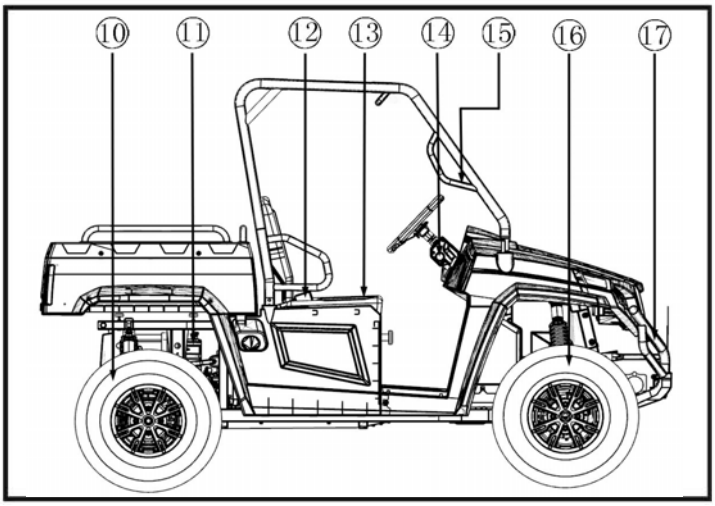
WARNING: ***emphasizes areas where injury or even death could result from negligence. Mechanical damage may also occur. WARNINGS are to be taken seriously***

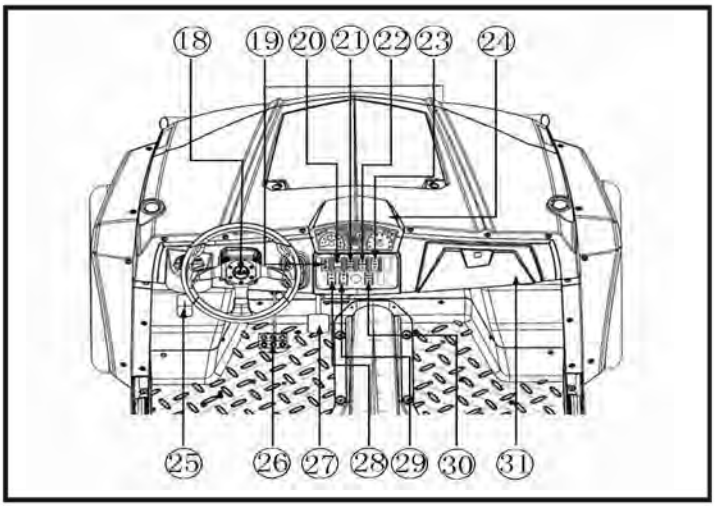
CAUTION: **emphasizes areas where equipment damage could result. Disregarding a CAUTION could cause permanent mechanical damage. though injury is unlikely.**

NOTE: **provides additional information to make a step or procedure easier or clearer. Disregarding a NOTE could cause inconvenience. but would not cause equipment damage or injury.**

DESCRIPTION





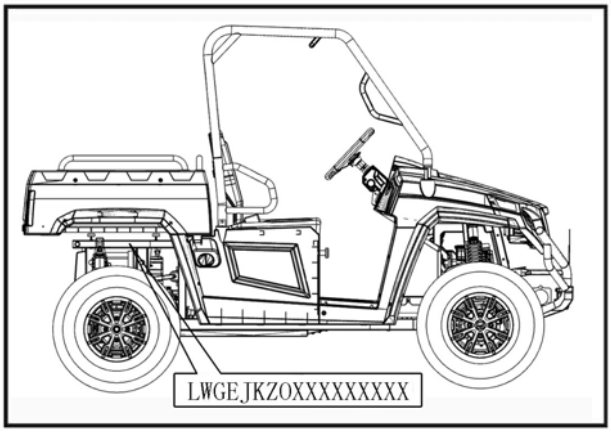


1. Headlight Assy
2. Front Shock Absorber Assembly Unit Qa(Gasbag Shock Absorber)
3. Disc brake cup
4. Steering Wheel Comp
5. Driver Seat
6. Driver Safety Belt
7. Rear Cargo
8. Rear Shock Absorber Assembly Unit Q(Gasbag Shock Absorber)
9. Rear Position Lamp Assy
10. Rear Tire
11. Induction AC motor
12. Passenger Safety Belt
13. Passenger Seat
14. Charge lamp
15. Passenger Handrail
16. Front Tire
17. Welding Assembly, Front Bumper
18. Horn Switch
19. The distance light switch
20. Two four-wheel drive switch
21. Front axle differential switch
22. Emergency lights switch
23. Left & right change Switch
24. Combination Instrument
25. Parking Pedal
26. Welding Assembly Brake Pedal
27. Accelerator Pedal Welding Assy
28. Select gear switch
29. Select mode switch
30. Winch switch
31. Carrying Case

NOTE:

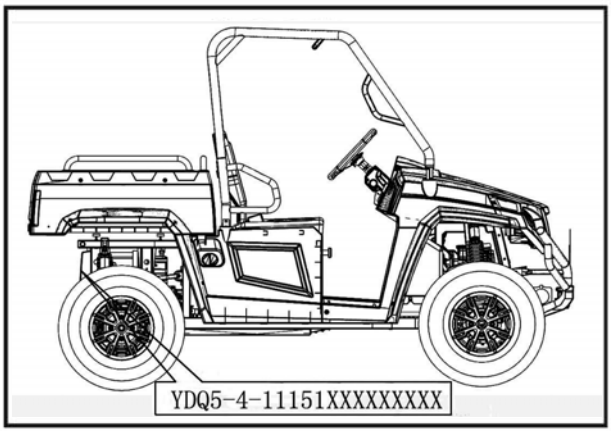
The vehicle you have purchased may differ slightly from those in the figures of this manual.

IDENTIFICATION CODE



Frame No.

Frame No. is carved on the right side of rear frame



Electric motor No.

Electric motor NO. Is behind the electric motor

SAFETY

Operator Safety

WARNING

Serious injury or death can result if you do not follow these instructions and procedures, which are outlined in further detail within your owner's manual.

1. Read this entire manual and all labels carefully. Follow the operating procedures described.
2. Never allow anyone under the age of 16 to operate this vehicle and never allow anyone without a valid driver's license to operate this vehicle.
3. Do not carry a passenger until you have at least two hours of driving experience with this vehicle.
4. No person under the age of 12 may ride as a passenger in this vehicle. All riders must be able to sit with backs against the seat, both feet flat on the floor and both hands on the steering wheel (if driving) or on a passenger hand hold.
5. The driver and all passengers must wear helmet, eye protection, gloves, long-sleeve shirt, long pants, over-the-ankle boots and seat belt at all times.
6. Always keep hands and feet inside the vehicle at all times. Always keep both hands on the steering wheel and both feet on the floorboards of the vehicle during operation.
7. Never permit a guest to operate this vehicle unless the guest has read this manual and all product labels.
8. To reduce rollover risk, be especially careful when encountering obstacles and slopes and when braking on hills or during turns.
9. This vehicle is for off-road use only. Never operate on public roads (unless marked for off-road use). Always avoid paved surfaces.
10. Never consume alcohol or drugs before or while operating this vehicle.
11. Never operate at excessive speeds. Always travel at a speed proper for the terrain, visibility and operating conditions, and your experience.
12. Never attempt jumps or other stunts.
13. Always inspect the vehicle before each use to make sure it's in safe operating condition. Always follow the inspection procedures described in this manual.
14. Always travel slowly and use extra caution when operating on unfamiliar terrain. Be alert to changing terrain.
15. Never operate on excessively rough, slippery or loose terrain.
16. Always follow proper procedures for turning. Practice turning at slow speeds before attempting to turn at faster speeds. Never turn at excessive speeds.
17. Always have this vehicle checked by an authorized HSUN dealer if it has been involved in an accident.
18. Never operate this vehicle on hills too steep for the vehicle or for your abilities. Practice on smaller hills before attempting larger hills.
19. Never allow unauthorized persons to repair this EV. This may affect vehicle performance and

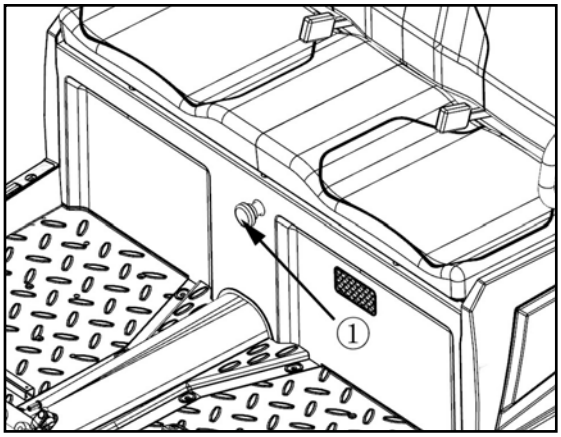
cause injury.

20. Do not wear loosen articles of clothing during operation, as these can be drawn into moving parts on the vehicle and could cause a severe injury to occur.
21. Always follow proper procedures for climbing hills as described in this manual. See page 50. Check the terrain carefully before attempting to climb a hill. Never climb hills with excessively slippery or loose surfaces. Never go over the top of a hill at high speed.
22. Always follow the proper procedures outlined in this manual for traveling downhill and for braking on hills. See page 50. Check the terrain carefully before descending a hill. Never travel downhill at high speed. Avoid going downhill at an angle, which would cause the vehicle to lean sharply to one side. Travel straight down the hill where possible.
23. Always check for obstacles before operating in a new area. Never attempt to operate over large obstacles such as large rocks or fallen trees. Always follow the proper procedures outlined in this manual when operating over obstacles. See page 51.
24. Always be careful of skidding or sliding. On slippery surfaces such as ice, travel slowly and exercise caution to reduce the chance of skidding or sliding out of control.
25. Never operate your vehicle in fast-flowing water or in water deeper than that specified in this manual. See page 37. Wet brakes may have reduced stopping ability. Test your brakes after leaving water. If necessary, apply them lightly several times to let friction dry out the pads.
26. Always be sure there are no obstacles or people behind your vehicle when operating in reverse. When it's safe to proceed in reverse, move slowly. Avoid turning at sharp angles in reverse.
27. Always use the proper size and type of tires specified in this manual. Always maintain proper tire pressure as specified on safety labels.
28. Never modify this vehicle through improper installation or use of non- HSUN -approved accessories.
29. Never exceed the stated load capacity for this vehicle. Cargo should be properly distributed and securely attached. Reduce speed and follow the instructions in this manual for hauling cargo or pulling a trailer. Allow a greater distance for braking.
30. Always set the park brake and remove the key when leaving the vehicle unattended.

- ***It is important to note that some vital statements throughout this manual and on the decals affixed to the vehicle are preceded by the words , WARNING, or CAUTION.***
- ***Do not leave children unattended on vehicle.***
- ***Turn key OFF and remove key when not in use. Place Forward/Reverse switch in NEUTRAL position. Step on the parking pedal. When repaired, the tires of the cart should be fixed by wedge-shaped objects***
- ***Improper use of the vehicle or failure to properly maintain it could result in decreased vehicle performance, severe personal injury, or death.***
- ***Any modification or change to the vehicle that affects the stability or handling of the vehicle, or increases maximum vehicle speed beyond factory specifications, could result in severe personal injury or death.***
- ***Check the vehicle for proper location of all vehicle safety and operation stickers and make sure they are in place and are easy to read. See Safety Decal and Feature Identification on page 4.***
- ***Only trained technicians should service or repair the vehicle or battery charger. Anyone doing even simple repairs or service should have knowledge and experience in electrical and mechanical repair. The appropriate instructions must be used when performing***

maintenance, service, or accessory installation.

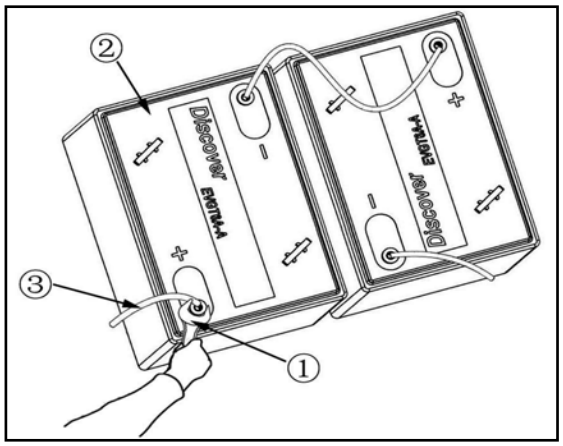
- ***Wear safety glasses or approved eye protection when servicing the vehicle or battery charger. Wear a full face shield and rubber gloves when working on or near battery.***
- ***Do not wear loose clothing or jewelry such as rings, watches, chains, etc., when servicing the vehicle or battery charger.***
- ***Use insulated tools when working near battery or electrical connections. Use extreme caution to avoid shorting of components or wiring.***



To avoid unintentionally starting the vehicle, disconnect the batteries as shown.

WARNING

Press the stop buttom to ensure the vehicle can stop in short time during driving. and the accelerator does not work after the electric buttom is pressed.



After disconnecting the batteries, wait 90 seconds for the controller capacitors to discharge.

1. Spanner 2. Battery 3. Connecting cable

Battery Safety

WARNING

The battery can not add the electrolyte, if insist to add the electrolyte into the battery, it will fail suddenly.

Potential Risk：

Lead Acid Battery is used in the vehicle, with 48V voltage, incorrect usage or operation may bring damages.

How to avoid the risk：

Operate/maintain and repair it follow the instruction of user's manual and service manual.

Repair it by the tools with insulated rubber tape.

The worker for repairing must be qualified and well trained.

Potential Risk：

Take care of the explosive gas while charging, hurt or even death may caused due to incorrect usage.

How to avoid the risk：

Leave the battery far away from the spark/fires and other fire source.

Ventilate the battery well while charging.

Potential Risk：

Lead Acid Battery is very dangerous if the battery cover is damaged, you may get venenated and get burned by touching.

How to avoid the risk：

Wear rubber glove and transparent mask to avoid the touching on skin/eyes by the exposed Lead Acid liquid.

Keep the child far away from the battery

Emergency Treatment：

External Treatment：

Wash by water

Internal Treatment：

Drink abundant water and milk and magnesium oxide liquid, and go to see the doctor.

Eyes Treatment：

Wash by water in 15 minutes and see the doctor.

Cleaning Parts

Cleaning parts is one of the more tedious and difficult service jobs performed in the home garage. Many types of chemical cleaners and solvents are available for shop use. Most are poisonous and extremely flammable. To prevent chemical exposure, vapor buildup, fire and serious injury, observe each product warning label and note the following:

1. Read and observe the entire product label before using any chemical. Always know what type of chemical is being used and whether it is poisonous and/or flammable.
2. Do not use more than one type of cleaning solvent at a time. If mixing chemicals is required, measure the proper amounts according to the manufacturer.
3. Work in a well-ventilated area.
4. Wear chemical-resistant gloves.
5. Wear safety glasses.
6. Wear a vapor respirator if the instructions call for it.
7. Wash hands and arms thoroughly after cleaning parts.
8. Keep chemical products away from children and pets.
9. Thoroughly clean all oil, grease and cleaner residue from any part that must be heated.
10. Use a nylon brush when cleaning parts. Metal brushes may cause a spark.
11. When using a parts washer, only use the solvent recommended by the manufacturer. Make sure the parts washer is equipped with a metal lid that will lower in case of fire.

Warning Labels

Most manufacturers attach information and warning labels to the EV These labels contain instructions that are important to personal safety when operating, servicing, transporting and storing the EV. Refer to the owner's manual for the description and location of labels. Order replacement labels from the dealers or manufacturer if they are missing or damaged.

SERIAL NUMBERS

Serial and identification numbers are stamped on various locations on the frame motor and controller. Record these numbers in the Quick Reference Data section in the front of the manual. Have these numbers available when ordering parts.

FASTENERS

Proper fastener selection and installation is important to ensure the motorcycle operates as designed and can be serviced efficiently. The choice of original equipment fasteners is not arrived at by chance. Make sure replacement fasteners meet all the same requirements as the originals

Many screws. Bolts and studs are combined with nuts to secure particular components. to indicate the size of a nut. Manufactures specify the internal diameter and the thread pitch

The measurement across two flats on a nut or bolt indicates the wrench size

WARNING

Do not install fasteners with a strength classification lower than what was originally installed by the manufacturer doing so may cause equipment failure and or damage

Torque Specifications

The material used in the manufacturing of the EV may be subjected to uneven stresses if the fasteners of the various subassemblies are not installed and tightened correctly. Fasteners that are improperly installed or work loose can cause extensive damage. it is essential to use an accurate torque wrench as described in this chapter

Self-Locking Fasteners

Several types of bolts. Screws and nuts incorporate a system that creates interference between the two fasteners. Interference is achieved in various ways. The most common types are the nylon insert nut and a dry adhesive coating on the threads of a blot.

Self-locking fasteners offer greater holding strength than standard fasteners, which improves their resistance to vibration. All self-locking fasteners cannot be reused. The materials used to from the lock become distorted after the initial installation and removal. Discard and replace self-locking fasteners after removing them. Do not replace self-locking fasteners with standard fasteners.

Washers

The two basic types of washers are flat washers and lock washers. Flat washers are simple discs with a hole to fit a screw or bolt. Lock washers are used to prevent a fastener from working loose. Washers can be used as spacers and seals. Or can help distribute fastener load and prevent the fastener from damaging the component

As with fasteners. When replacing washers make sure the replacement washers are of the same design and quality

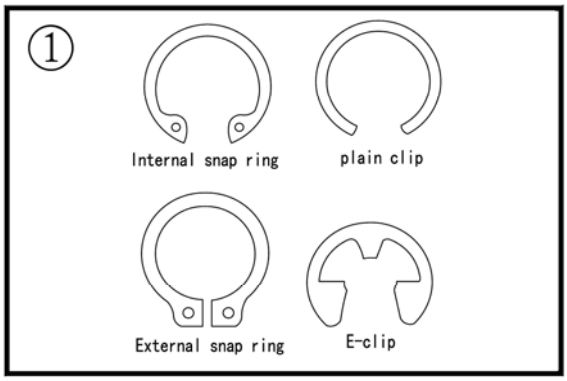
Cotter Pins

A cotter pin is a split metal pin inserted into a hole or slot to prevent a fastener from loosening. In certain applications, such as the rear axle on an UTV or motorcycle, the fastener must be secured in this way. For these applications. A cotter pin and castellated (slotted) nut is used.

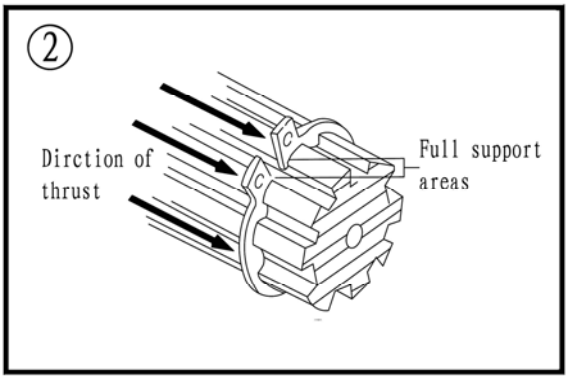
To use a cotter pin, first make sure the diameter is correct for the hole in the fastener. Aster correctly tightening the fastener and aligning the holes, insert the cotter pin through the hole and bend the ends over the fastener, Unless instructed to do so, never loosen a tightened fastener to align the holes. If the holes do not align. Tighten the fastener enough to achieve alignment

Cotter pins are available in various diameters and lengths. Measure the length from the bottom of the head to the tip of the shortest pin

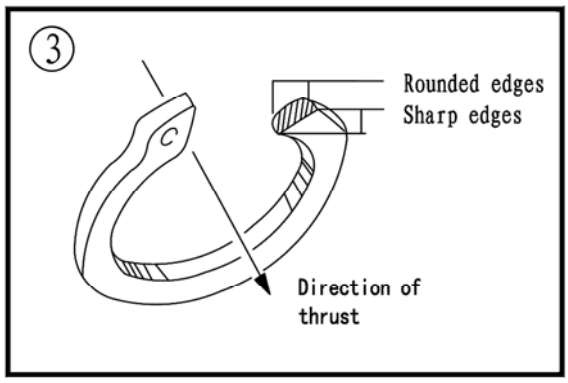
Snap Rings and E-clips



Snap rings (**Figure 1**) are circular-shaped metal retaining clips. They secure parts in place on parts such as shafts. External type snap rings are used to retain items on shafts. Internal type snap rings secure parts within housing bores. In some applications. in addition to securing the component(s). snap rings of varying thicknesses also determine endplay. These are usually called selective snap rings.



The two basic types of snap rings are machined and stamped snap rings. Machined snap rings (**Figure 2**) can be installed in either direction. Because both faces have sharp edges. Stamped snap rings (**Figure 3**) are manufactured with a sharp and a round edge. When installing a stamped snap ring in a thrust application, install the sharp edge facing away from the part producing the thrust.



E-clips are used when it is not practical to use a snap ring. Remove E-clips with a flat blade screwdriver by prying between the shaft and E-clip. To install an E-clip. Center it over the shaft groove and push or tap it into place

Observe the following when installing snap rings:

1. Remove and install snap rings with snap rings pliers. Refer to *Basic Tools* in this chapter
2. In some applications. it may be necessary to replace snap rings after removing them
3. Compress or expand snap rings only enough to install them. If overly expanded. Lose their retaining ability
4. After installing a snap ring. Make sure it seats completely
5. Wear eye protection when removing and installing snap rings

SHOP SIPPLIES

Lubricants and Fluids

Periodic lubrication help ensure a long service life for any type of equipment. Using the correct type of lubricant is as important as performing the lubrication service. Although in an emergency the wrong type is better than not using one, The following section describes the types of lubricants most often required. Make sure to follow the manufacturer’s recommendations for lubricant types

Engine oils

Engine oil for four-stroke the UTV engine use is classified by two standards: the American Petroleum Institute (API) service classification. The Society of Automotive Engineers (SAE) viscosity rating Standard classification

The API and SAE information is on all oil container labels. Two letters indicate the API service classification. The number or sequence of numbers and letter (10W-40SG for example) is the oil's viscosity rating. The API service classification and the SAE viscosity index are not indications of oil quality.

The APL service classification standards, The first letter in the classification S indicates that the oil is for gasoline engines. The second letter indicates the standard the oil satisfies .
The classifications are: MA (high friction applications) and MB(low frication applications).

NOTE

Refer to Engine Oil and Filter in Chapter Three for further information on API, SAE classifications.

Always use an oil with a classification recommended by the manufacturer, Using an oil with a different classification can cause engine damage.
Viscosity is an indication of the oil's thickness. Thin oils have a lower number while thick oil have a higher number. Engine oils fall into the 5-to50-weight range for single-grade oils.

Most manufactures recommend multi-grade oil. These oils perform efficiently across a wide range of operating conditions. Multi-grade oils are identified by a W after the first number, which indicates the low-temperature viscosity.

Engine oils are most commonly mineral (petroleum) based, but synthetic and semi-synthetic types are used more frequently. When selecting engine oil, follow the manufacturer's recommendation for type, classification and viscosity.

Greases

Grease is lubricating oil with thickening agents added to it. The National Lubricating Grease Institute (NLGI) grades grease. Grades range from No.000 to No.6, with No.6 being the thickest. Typical multipurpose grease is NLGI No.2. For specific applications, manufacturers may recommend water-resistant type grease or one with an additive such as molybdenum disulfide (MoS2).

Brake fluid

Brake fluid is the hydraulic fluid used to transmit hydraulic pressure (force) to the wheel brakes. Brake fluid is classified by the Department of Transportation (DOT). Current designations for brake fluid are DOT 3, DOT 4 and DOT 5, this classification appears on the fluid container.
Each type of brake fluid has its own definite characteristics. Do not intermix different types of brake fluid as this may cause brake system failure. DOT 5 brake fluid is silicone based. DOT 5 is not compatible with other brake fluids may cause brake system failure. When adding brake fluid, only use the fluid recommended by the manufacturer.

Brake fluid will damage any plastic, painted or plated surface it contacts. Use extreme care when working with brake fluid and remove any spills immediately with soap and water.

Hydraulic brake systems require clean and moisture free brake fluid. Never reuse brake fluid. Keep containers and reservoirs properly sealed.

WARNING

Never put a mineral-based (Petroleum) oil into the brake system. Mineral oil causes rubber parts in the system to causing complete brake failure.

Coolant

Coolant is a mixture of water and antifreeze used to dissipate engine heat. Ethylene glycol is the most common from of antifreeze. Check the UTV Manufacturer's recommendations when selecting antifreeze. Most require one specifically designed for aluminum engines. There types of antifreeze have additives that inhibit corrosion.

Only mix antifreeze with distilled water. Impurities in tap water may damage internal cooling system passages.

Cleaners, Degreasers and Solvents

Many chemicals are available to remove oil, grease and other residue from the UTV. Before using cleaning solvents, consider how they will be used and disposed of , particularly if they are not water-soluble. Local ordinances may types of cleaning chemicals. Refer to Safer in this chapter.

Use brake parts cleaner to brake system components. Brake parts cleaner leaves no residue. Use electrical contact cleaner is a powerful solvent used to remove fuel deposits and varnish from fuel system components. Use this cleaner carefully, as it may damage finishes.

Most solvents are designed to be used with a parts washing cabinet for individual component cleaning. For safety, use only nonflammable or high flash point solvents.

Gasket Sealant

Sealant is used in combination with a gasket or seal. In other applications, such as between crankcase halves, only a sealant is used. Follow the manufacturer's recommendation when using a sealant. Use extreme care when choosing a sealant different sealant based on its resistance to heat, various fluids and its sealing capabilities.

Gasket Remover

Aerosol gaskets remover can help remove stubborn gasket. This product can speed up the removal process and prevent damage to the mating surface that may be caused by using a scraping tool. Most of these types of products are very caustic. Follow the gasket remover manufacturer's instructions for use.

Thread locking Compound

A thread locking compound is a fluid applied to the threads of fasteners. After tightening the fastener, the fluid dries and becomes a solid filler between the threads. This makes it difficult for the fastener to work loose from vibration or hear expansion and contraction. Some thread locking compound sparingly. Excess fluid can run into adjoining parts.

CAUTION

Thread locking compounds are anaerobic and will stress, crack and attack most plastics. Use caution when using these products in areas where there are plastic components.

Thread locking compounds are available in a wide range of compounds for various strength, temperature and repair applications. Follow the manufacturer's recommendations regarding compound selection.

BASIC TOOLS

Most of the procedures in this manual can be carried out with basic hand tools and test equipment familiar to the home mechanic. Always use the correct tools for the job. Keep tools organized and clean. Store them in a tool chest with related tools organized together.

Quality tools are essential. The best are constructed of high-strength alloy steel. These tools are light, easy to use and resistant to wear. Their working surface is devoid of sharp edges and carefully polished. They have an easy-to-clean finish and are comfortable to use. Quality tools are a good investment.

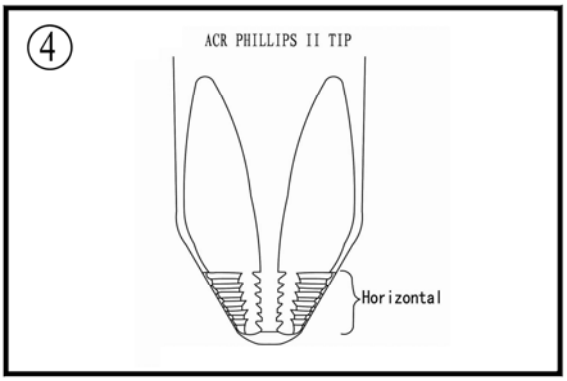
Some of the procedures in this manual specify special tools. In many cases the tools is illustrated in use. Those with a large tool kit may be able to replacement. However, in some cases, the specialized equipment or expertise may make it impractical for the home mechanic to attempt the procedure. When necessary, such operations are recommended to have a dealership or specialist perform the task. It may be less expensive to have a professional perform these jobs, especially when considering the cost of equipment.

When purchasing tools to perform the procedures covered in this manual, consider the tool's potential frequency of use. If a tool kit is just now being started. Consider purchasing a basic tool set from a quality tool combinations and offer substantial savings when complicated, specialized tools can be added.

Screwdrivers

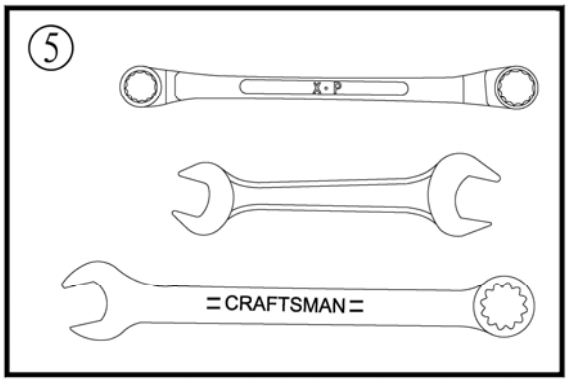
Screwdrivers of various lengths and types are mandatory for the simplest tool kit. The two basic types are the slotted tip (flat blade) and the Phillips tip. These are available in sets that often include an assortment of tip size and shaft lengths.

As with all tools, use a screwdriver designed for the job. Make sure the size of the fastener. Use them only for driving screws. Never use a screwdriver for prying or chiseling metal. Repair or replace worn or damaged screwdrivers. A worn tip may damage the fastener, making it difficult to remove.



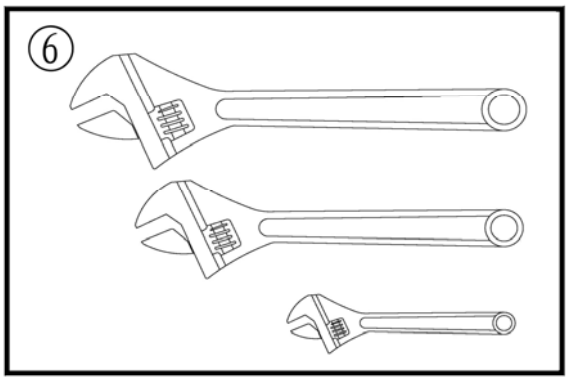
Phillips-head screws are often damaged by incorrectly fitting screwdrivers. Quality Phillips screwdrivers are manufactured with their crosshead tip machined to Phillips Screw Company specifications. Poor quality or damaged Phillips screwdrivers can back out (cam out) and round over the screw head. In addition. Weak or soft screw materials can make removal difficult.

The best type of screwdriver to use on Phillips screw is the ACR Phillips II screwdriver, patented by the horizontal anti-cam out ribs found on the driving faces or flutes of the screwdriver's tip (**figure 4**). ACR Phillips II screwdrivers were designed as part of a manufacturing drive system to be used with ACR Phillips II screws, but they work of tool companies offer ACR Phillips II screwdrivers in different Tip size and interchangeable bits to fit screwdriver bit holders.



NOTE

Another way to prevent cam out and to increase the grip of a Phillips screwdriver is to apply valve grinding compound or permute screw & socket Gripper onto the screwdriver tip. After loosening/tightening the screw, clean the screw recess to prevent engine oil contamination.



Wrenches

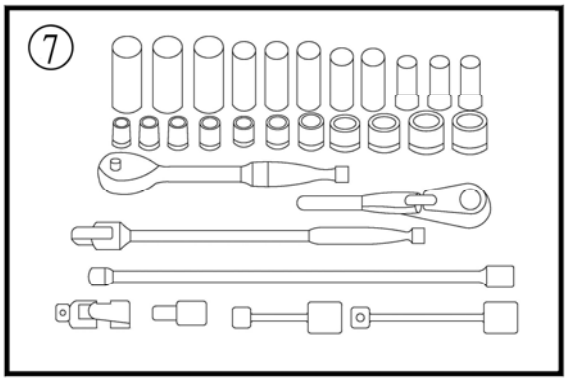
Open-end, box-end and combination wrenches (**figure 5**) are available in a variety of types and sizes.

The number stamped on the wrench refers to the distance of the fastener head.

The box-end wrench is an excellent tool because it grips the fastener on all sides. This reduces the chance of the tool slipping. The box-end wrench is designed with either a 6 or 12-point opening. For stubborn or damaged fasteners, the 6-point provides superior holding because it contacts the fastener across a wider area at all six edges. For general use, the 12-point works well. It allows the wrench to be removed and reinstalled without moving the handle over such a wide are.

An open-end wrench is fast and works best in areas with limited overhead access. It contacts the fastener at only two points and is subject to slipping if under heavy force, or if the tool or fastener is worn. A box-end wrench is preferred in most instances, especially when braking loose and applying the final tightness to a fastener.

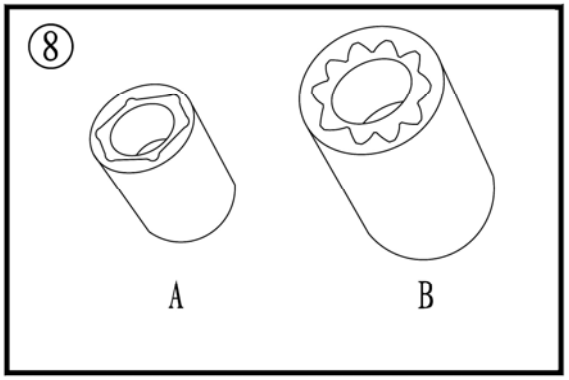
The combination wrench has a box-end on one end and an open-end on one end and an open-end on the other. This combination makes it a convenient tool.



Adjustable wrenches

An adjustable wrench or Crescent wrench (**Figure 6**) can fit nearly any nut or bolt head that has clear access around its entire perimeter. An adjustable wrench is best used as a backup wrench to keep a large nut or bolt from turning while the other end is being loosened or tightened with a box-end or socket wrench.

Adjustable wrenches contact the fastener at only two points, which makes them more subject to slipping off the fastener. Because one jaw is adjustable and may become loose, this shortcoming is aggravated. Make certain the solid jaw is the one transmitting the force.

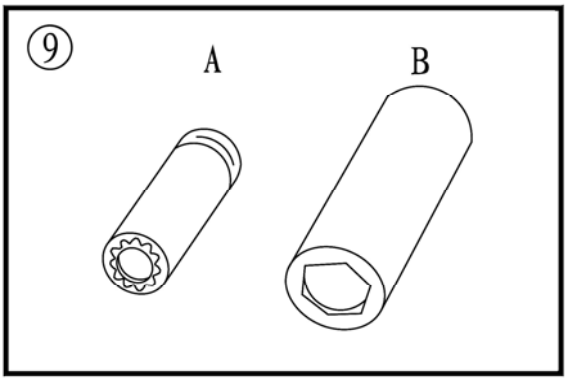


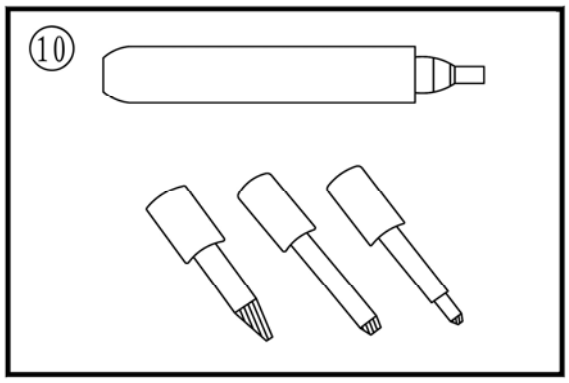
Socket Wrenches, Ratchets and Handles

Sockets that attach to a ratchet handle (**Figure 7**) are available with 6-point or 12-point openings (**Figure 8**) and different drive sizes. The drive size indicates the size of the square hole that accepts the ratchet handle. The number stamped on the socket is the size of the work area and must the fastener head

As with wrenches. a 6-point provides superior-holding ability. While a 12-point socket needs to be moved only half as for to reposition it on the fastener

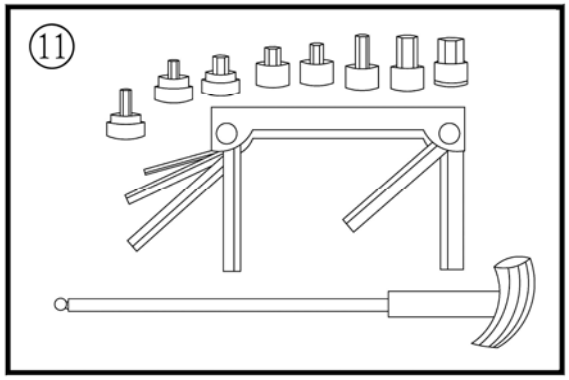
Sockets are designated for either hand or impact use. Impact sockets are made of thicker material for more durability. Compare the size and wall thickness of a 19-mmhand socket (A, **Figure 9**) and the 19-mm impact socket (B). Use impact sockets when using an impact driver or air tools. Use hand sockets with hand-driven attachments





WARNING

Do not use hand sockets with air or impact tools because they may shatter and cause injury. Always wear eye protection when using impact or air tools



Various handles are available for sockets. Use the speed handle for fast operation. Flexible ratchet heads in varying length allow the socket to be turned with varying force and at odd angles. Extension bars allow the socket setup to reach difficult areas. The ratchet is the most versatile. It allows the user to install or remove the nut without removing the socket

Sockets combined with any number of drivers make them undoubtedly the fastest. Safest and most convenient tool for fastener removal and installation

Impact Drivers

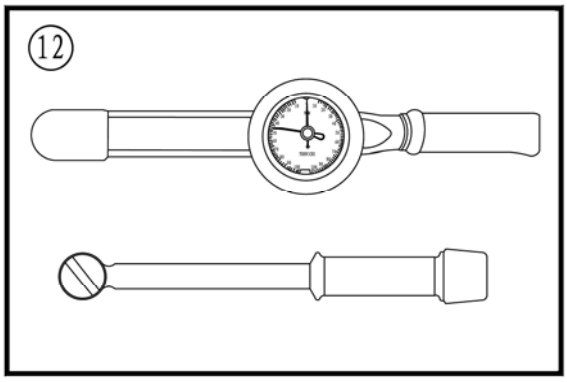
An impact driver provides extra force for removing fasteners by converting the impact of a hammer into a turning motion. This makes it possible to remove stubborn fasteners without damaging them. Impact drivers and interchangeable bits (**Figure 10**) are available from most tool suppliers. When using a socket with an impact driver. Make sure the socket is designed for impact use. Refer to *Socket Wrenches. Ratchets and handles* in this section.

WARNING

Do not use hand sockets with air or impact tools because they may shatter and cause injury. Always wear eye protection when using impact or air tools

Allen Wrenches

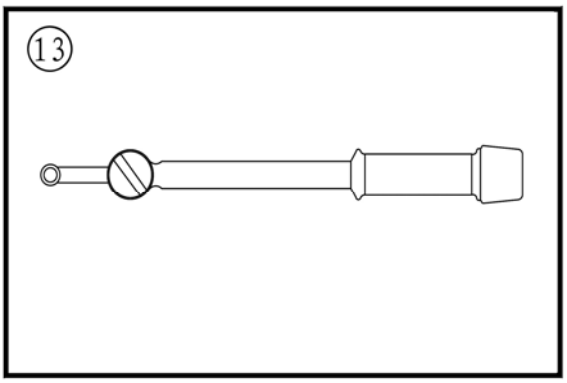
Use Allen or setscrew wrenches (**Figure 11**) on fasteners with hexagonal recesses in the fastener head. These wrenches are available in L-shaped bar. Socket and T-handle types. A metric set is required when working on most motorcycles. Allen bolts are sometimes called socket bolts.



Torque Wrenches

Use a torque wrench with a socket, torque adapter or similar extension to tighten a fastener to a measured torque. Torque wrenches come in several drive sizes (1/4, 3/8, 1/2 and 3/4) and have various methods of reading the torque value. The drive size indicates the size of the square drive that

accepts the socket, adapter or extension. Common methods of reading the torque value are the deflecting beam, the dial indicator and the audible click (**Figure 12**).

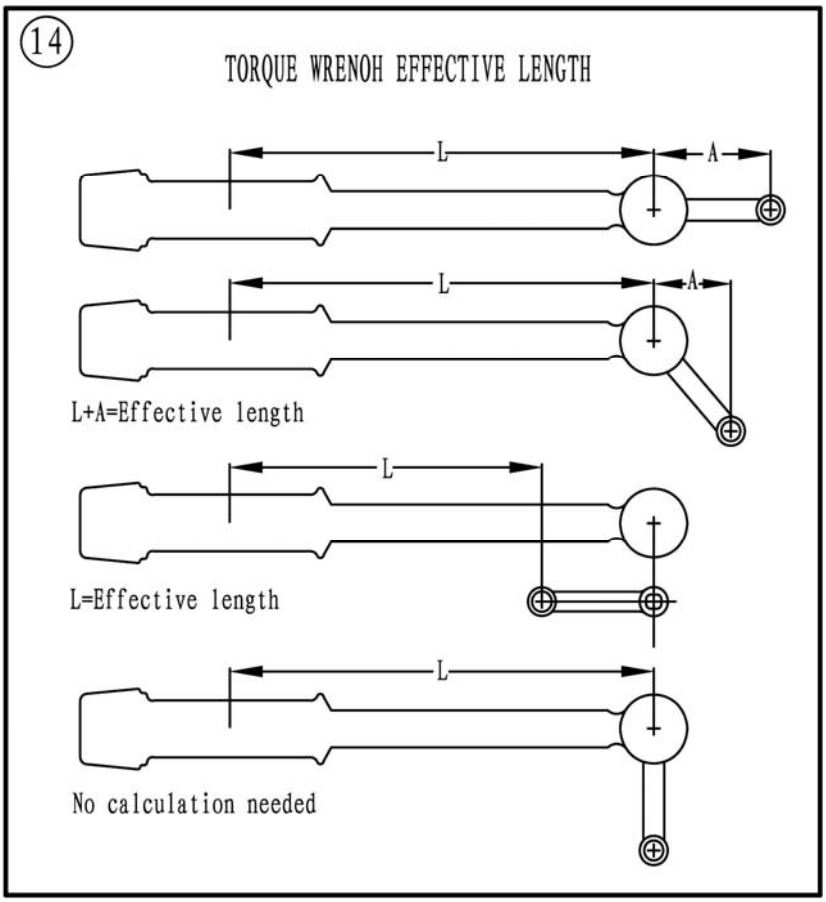


When choosing a torque wrench, consider the torque range, drive size and accuracy. The torque specifications in this manual provide an indication of the range required.

A torque wrench is a precision tool that must be properly cared for to remain accurate. Store torque wrenches in cases or separate padded drawers within a toolbox. Please refer to the followed manufacturer's instructions for their care and calibration.

Torque Adapters

Torque adapters or extensions extend or reduce the reach of a torque wrench. The torque adapter shown in (**Figure 13**) is used to tighten a fastener that cannot be reached because of the size of the torque wrench head, drive, and socket. If a torque adapter changes the effective lever length (**Figure 14**), the torque reading on the wrench will not equal the actual torque applied to the fastener. It is necessary to recalibrate the torque setting on the wrench to compensate for the change of lever length. When using a torque adapter at a right angle to the drive head, calibration is not required, because the effective length has not changed.



To recalculate a torque reading when using a torque adapter, use the following formula and refer to **Figure 14:**

$$TW = \frac{TA \times L}{L+A}$$

TW is the torque setting or dial reading on the wrench.

TA is the torque specification and the actual amount of torque that is applied to the fastener.

A is the amount that the adapter increases (or in some cases reduces) the effective lever length as measured along the centerline of the torque wrench.

L is the lever length of the wrench as measured from the center of the drive to the center of the grip.

The effective length is the sum of L and A.

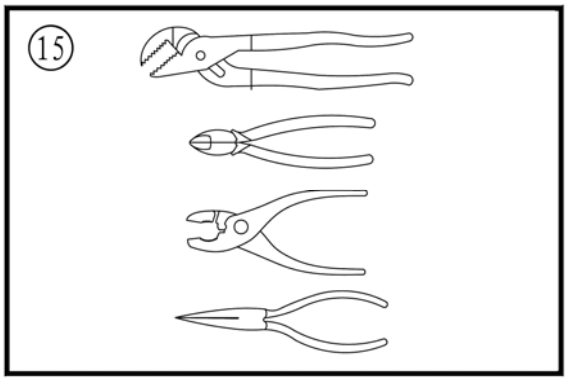
Example:

TA=20 ft.-lb.

A=3in.

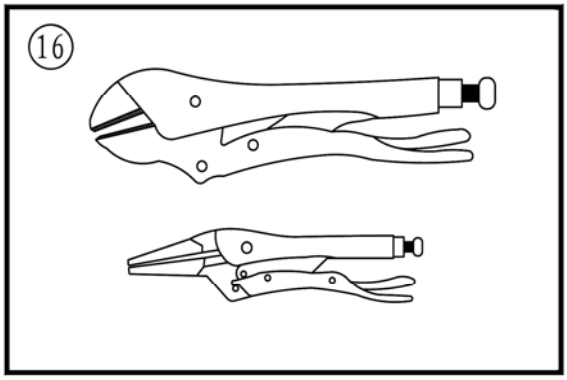
L=14in.

$TW=\frac{20\times14}{14+3}=\frac{280}{17}=16.5$ ft. - lb.

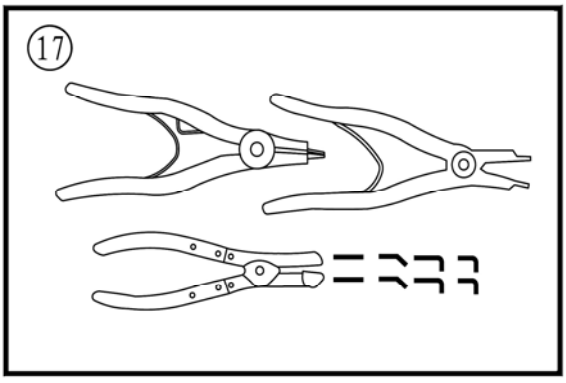


In this example, the torque wrench would be set to the recalculated torque value (TW = 16.5 ft. –lb.). When using a beam-type wrench, tighten the fastener until the pointer aligns with 16.5 ft. –lb. In this example, although the torque wrench is pre set to 16.5 ft. –lb., the actual torque is 20 ft. –lb.

Pliers



Pliers come in a wide range of types and sizes. Pliers are useful for holding, cutting, bending, and crimping. Do not use them to turn fasteners. **Figure 15 and Figure 16** show several types of useful pliers. Each design has a specialized function. Slip-joint pliers are general – purpose pliers used for gripping and bending. Diagonal cutting pliers are needed to cut wire and can be used to remove cotter pins. Use needle nose pliers to hold or bend small objects. Locking pliers (**Figure 16**), sometimes called Vise-Grips, are used to hold objects very tightly. They have many uses ranging from holding two parts together, to gripping the end of a broken stud. Use caution when using locking pliers, as the sharp jaws will damage the objects they hold.



Snap Ring Pliers

Snap ring pliers are specialized pliers with tips that fit into the ends of snap rings to remove and install them.

Snap ring pliers (**Figure 17**) are available with a fixed action (either internal or external) or convertible (one tool works on both internal and external snap rings). They may have fixed tips or interchangeable ones of various sizes and angles. For general use, select a convertible type pliers with interchangeable tips (**Figure 17**).

WARNING

Snap rings can slip and fly off when removing and installing them. Also, the snap ring pliers tips may break.

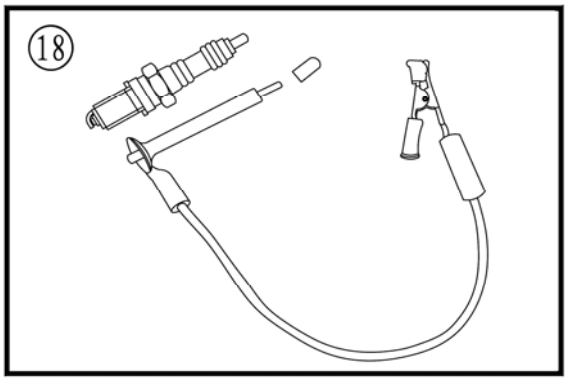
Always wear eye protection when using snap ring pliers.

Hammers

Various types of hammers are available to fit a number of applications. Use a ball-peen hammer to strike another tool, such as a punch or chisel. Use soft-faced hammers when a metal object must be struck without damaging it. Never use a metal-faced hammer on engine and suspension components because damage occurs in most cases.

Always wear eye protection when using hammers. Make sure the hammer face is in good condition and the handle is not cracked. Select the correct hammer for the job and make sure to strike the object squarely. Do not use the handle or the side of the hammer to strike an object.

Ignition Grounding Tool



Some test procedures require turning the engine over without starting it. To prevent damage to the ignition system from excessive resistance or the possibility of fuel vapor being ignited by an open spark, remove the spark plug cap and ground it directly to a good engine ground with the tool shown in (**Figure 18**)**.**

Make the tool shown from a No.6 screw and nut, two washers, length of tubing, alligator clip, electrical eyelet and a length of wire.

PRECISION MEASURING TOOLS

The ability to accurately measure components is essential to perform many of the procedures described in this manual. Equipment is manufactured to close tolerances, and obtaining consistently accurate measurements is essential to determine which components require replacement or further service.

Each type of measuring instrument is designed to measure a dimension with a certain degree of accuracy and within a certain range. When selecting the measuring tool, make sure it is applicable to the task.

As with all tools, measuring tools provide the best results if cared for properly. Improper use can damage the tool and cause inaccurate results. If any measurement is questionable, verify the measurement using another tool. A standard gauge is usually provided with micrometers to check accuracy and calibrate the tool if necessary.

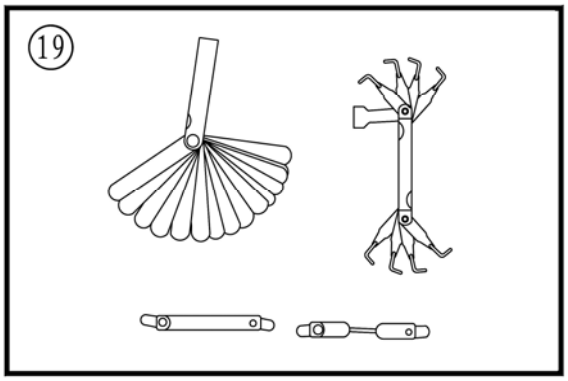
Precision measurements can vary according to the experience of the person performing the procedure. Accurate results are only possible if the mechanic possesses a feel for using the tool. Heavy-handed use of measuring tools produces less accurate results. Hold the tool gently by the fingertips to easily feel the point at which the tool contacts the object. This feel for the equipment produces more accurate measurements and reduces the risk of damaging the tool or component. Refer to the following sections for specific measuring tools.

Feeler Gauge

Use feeler or thickness gauges (**Figure19**) for measuring the distance between two surfaces.

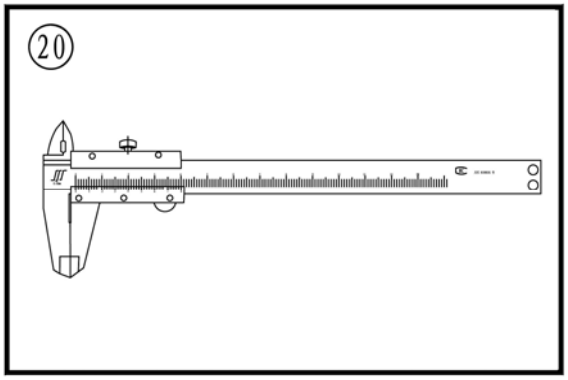
A feeler gauge set consists of an assortment of steel strips of graduated thickness. Each blade is marked with its thickness. Blades can be of various lengths and angles for different procedures.

A common use for a feeler gauge is to measure valve clearance. Use wire (round) type gauges to measure spark plug gap.



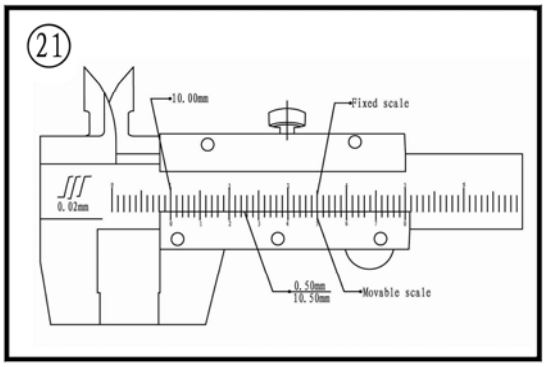
Calipers

Calipers (**Figure 20**) are excellent tools for obtaining inside, outside and depth measurements. Although not as precise as a micrometer, they allow reasonable precision, typically to within 0.02mm or 0.05 mm (0.001 in.). Most calipers have a range up to 150 mm (6 in.).



Calipers are available in dial, venire or digital versions. Dial calipers have a dial readout that provides convenient reading. Venire calipers have marked scales that must be compared to determine the measurement. The digital caliper uses a liquid-crystal display (LCD) to show the measurement.

Properly maintain the measuring surfaces of the caliper. There must not be any dirt or burrs between the tool and the object being measured. Never force the caliper to close around an object. Close the caliper around the highest point so it can be removed with a slight drag. Some calipers require calibration. Always refer to the manufacturer's instructions when using a new or unfamiliar caliper.



To read a vernire. Calipers refer to **Figure 21**. The fixed scale is marked in l-mm increments. Ten individual lines on the fixed scale equal 1 cm. The movable scale is marked in 0.05 mm (hundredth) increments. To obtain a reading, establish the first number by the location of the 0 line on the movable scale in relation to the first line to the left on the fixed scale. In this example, the number is 10 mm. To determine the next number, note which of the lines on the movable scale align with a mark on the fixed scale. A number of lines will seem close, but only one will align exactly. In this case, 0.50 mm is the reading to add to the first number. Adding 10 mm and 0.50 mm equals a measurement of 10.50 mm.

Micrometers

A micrometer is an instrument designed for linear measurement using the decimal divisions of the inch or meter (**Figure 22**). While there are many types and styles of micrometers, most of the

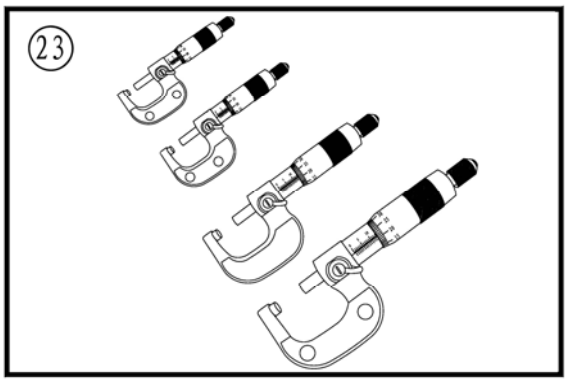
22

DECIMAL PLACE VALUES*

0.1	Indicates 1/10 (one tenth of an inch or millimeter)
0.01	Indicates 1/100 (one one-hundredth of an inch or millimeter)
0.001	Indicates 1/1000 (one one-thousandth of an inch or millimeter)

*This chart represents the values of figures placed to the right of the decimal point. Use it when reading decimals from one-tenth to one one-thousandth of an inch or millimeter. It is not a conversion chart (for example: 0.001 in. is not equal to 0.001 mm).

procedures in this manual call for an outside micrometer. Use the outside micrometer to measure the outside diameter of cylindrical forms and the thickness of materials.



A micrometer's size indicates the minimum and maximum size of a part that it can measure. The usual sizes (**Figure 23**) are 0-25mm (0-1 in.), 25-50 mm (1-2 in.), 50-75 mm (2-3 in.) and 75-100 mm (3-4 in.).

Micrometers that cover a wider range of measurements are available. These use a large frame with interchangeable anvils of various lengths. This type of micrometer offers a cost savings, but its overall size may make it less convenient.

When reading a micrometer, numbers are taken from different scales and added together. The following sections describe how to adjust, care for and read the measurements of various types of outside micrometers.

For accurate results, properly maintain the measuring surfaces of the micrometer. There cannot be any dirt or burrs between the tool and the measured object. Never force the micrometer to close around an object. Close the micrometer around the highest point so it can be removed with a slight drag.

Adjustment

Before using a micrometer, check its adjustment as follows:

1. Clean the anvil and spindle faces.

2A. To check a 0-1 in. or 0-25 mm micrometer:

a. Turn the thimble until the spindle contacts the anvil. If the micrometer has a ratchet stop, use it to ensure that the proper amount of pressure is applied.

b. If the adjustment is correct, the 0 mark on the thimble will align exactly with the 0 mark on the sleeve line. If the marks do not align, the micrometer is out of adjustment.

c. Follow the manufacturer's instructions to adjust the micrometer.

2B. To check a micrometer larger than 1 in. or 25 mm use the standard gauge supplied by the manufacturer. A standard gauge is a steel block, disc or rod that is machined to an exact size.

a. Place the standard gauge between the spindle and anvil, and measure its outside diameter or length. If the micrometer has a ratchet stop, use it to ensure that the proper amount of pressure is applied.

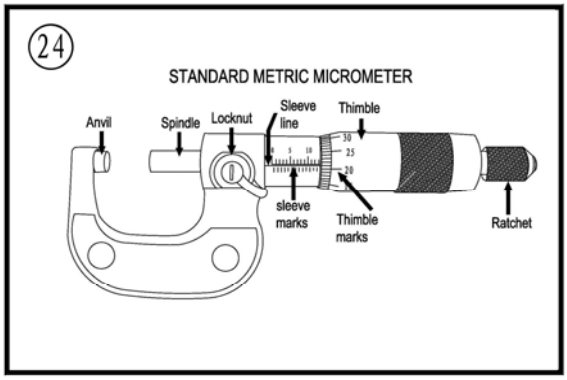
b. If the adjustment is correct, the 0 mark on the thimble will align exactly with the 0 mark on the sleeve line. If the marks do not align, the micrometer is out of adjustment.

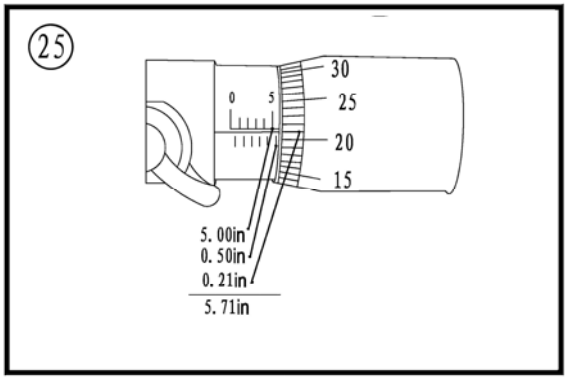
c. Follow the manufacturer's instructions to adjust the micrometer.

Care

Micrometers are precision instruments. They must be used and maintained with great care. Note the following:

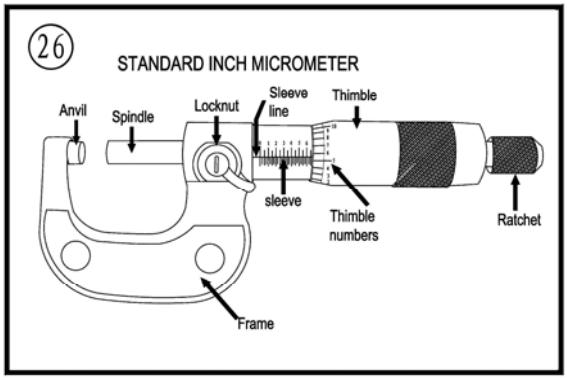
1. Store micrometers in protective cases or separate padded drawers in a tool box.
2. When in storage, make sure the spindle and anvil faces do not contact each other or another object. If they do, temperature changes and corrosion may damage the contact faces.
3. Do not clean a micrometer with compressed air. Dirt forced into the tool will cause wear.
4. Lubricate micrometers with WD-40 to prevent corrosion.





Metric micrometer

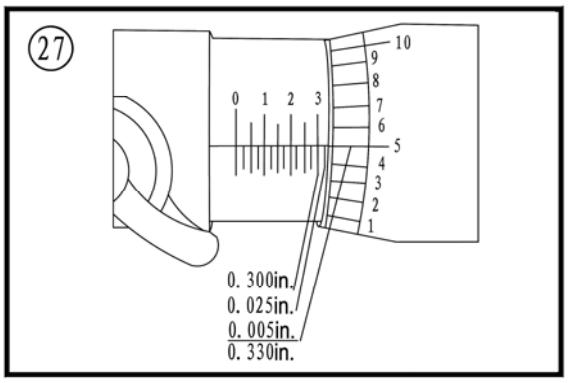
The standard metric micrometer (**Figure 24**) is accurate to one one-hundredth of a millimeter (0.01 mm). The sleeve line is graduated in millimeter and half millimeter increments. The marks on the upper half of the sleeve line equal 1.00 mm. Each fifth mark above the sleeve line is identified with a number. The number sequence depends on the size of the micrometer. A 0-25 mm micrometer, for example, will have sleeve marks numbered 0 through 25 in 5 mm increments. This numbering sequence continues with larger micrometers. On all metric micrometers, each mark on the lower half of the sleeve equals 0.50 mm.



The tapered end of the thimble has 50 lines marked around it. Each mark equals 0.01 mm. One completer turn of the thimble aligns its 0 mark with the first line lower half of the sleeve line or 0.50mm.

When reading a metric micrometer, add the number of millimeters and half-millimeters on the sleeve line to the number of one one-hundredth millimeters on the thimble. Perform the following steps while referring to **Figure 25**.

1. Read the upper half of the sleeve line and count the number of lines visible. Each upper line equals 1mm.
2. See if the half –millimeter line is visible on the lower sleeve line. If so, add 0.50mm to the reading in Step 1.
3. Read the thimble mark that aligns with the sleeve line. Each thimble mark equals 0.01mm.

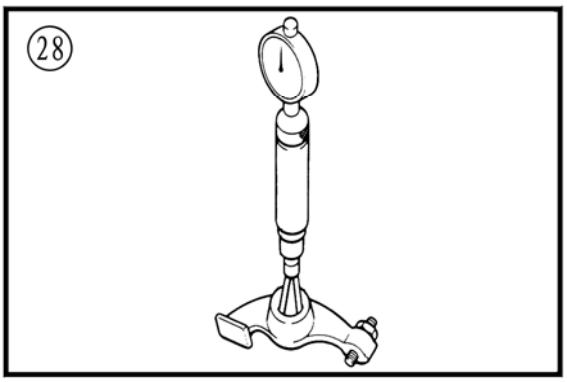


NOTE

If a thimble mark does not align exactly with the sleeve line. Estimate the amount between the lines. For accurate readings in two-thousandths of a millimeter (0.002mm), use a metric vernier micrometer.

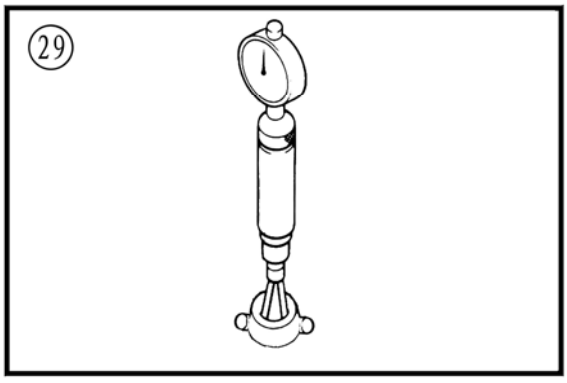
4. Add the readings from Steps 1-3.

Standard inch micrometer



The standard inch micrometer (**Figure 26**) is accurate to one-thousandth of an inch or 0.001. The sleeve is marked in 0.025 in. increments. Every fourth sleeve mark is numbered 1,2,3,4,5,6,7,8,9. These numbers indicate 0.100, 0.200, 0.300, and so on.

The tapered end of the thimble has 25 lines marked around it. Each mark equals 0.001 in. One complete turn of the thimble will align its zero mark with the first mark on the sleeve or 0.025 in.



To read a standard inch micrometer, perform the following steps and refer to **Figure 27**.

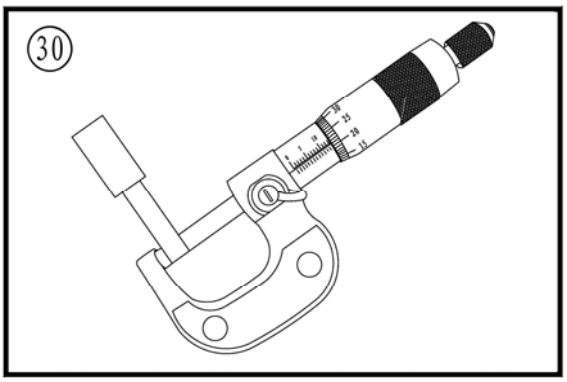
1. Read the sleeve and find the largest number visible. Each sleeve number equals 0.100 in.
2. Count the number of lines between the numbered sleeve mark and the edge of the thimble. Each sleeve mark equals 0.025 in.
3. Read the thimble mark that aligns with the sleeve line. Each thimble mark equals 0.01 in.

NOTE

If a thimble mark does not align exactly with the sleeve line, estimate the amount between the lines. For accurate readings in ten-thousandths of an inch (0.0001 in), use a vernier inch micrometer.

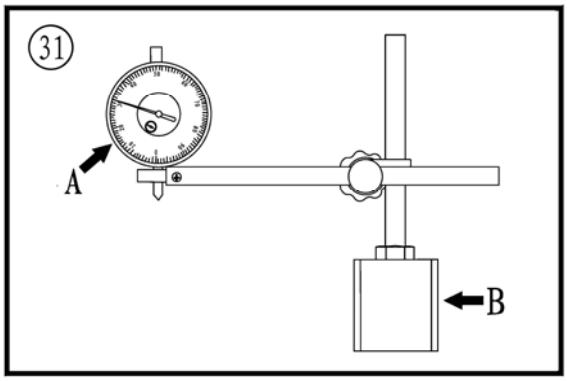
4. Add the readings from Steps 1-3.

Telescoping and Small Bore Gauges

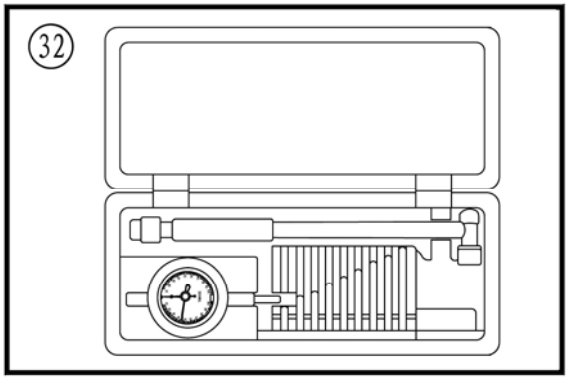


Use telescoping gauges (**Figure 28**) and small bore gauges (**Figure 29**) to measure bores. Neither gauge has a scale for direct readings. Use an outside micrometer to determine the reading.

To use a telescoping gauge, select the correct size gauge for the bore. Compress the movable post and. Care fully insert the gauge into the bore. Carefully move the gauge in the bore to make sure it is centered. Tighten the knurled end of the gauge to hold the movable post in position. Remove the gauge and measure the length of the posts. Telescoping gauges are typically used to measure cylinder bores.

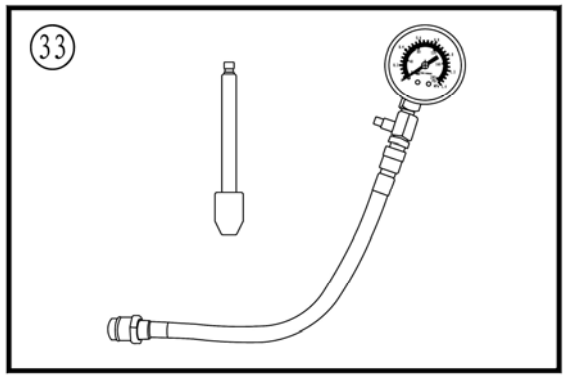


To use a small bore gauge, select the correct size gauge for the bore. Carefully insert the gauge into the bore. Tighten the knurled end of the gauge to carefully expand the gauge fingers to the limit within the bore. Do not over tighten the gauge because there is no built-in release. Excessive tightening can damage the bore surface and damage the tool. Remove the gauge and measure the outside dimension (**Figure 30**). Small bore gauges are typically used to measure valve guides.



Dial Indicator:

A dial indicator (**Figure 31**) is a gauge with a dial face and needle used to measure variations in dimensions and movements. Measuring brake rotor runout is a typical use for a dial indicator.



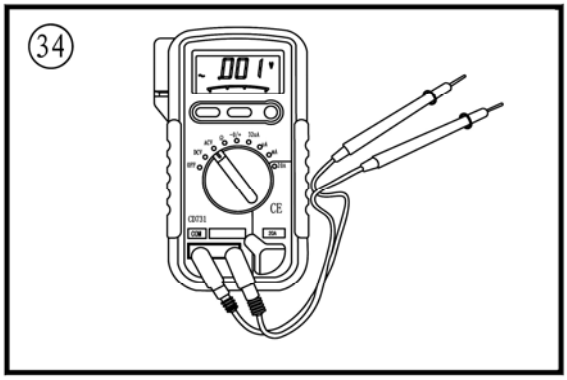
Dial indicators are available in various ranges and graduations and with three basic types of mounting bases: magnetic (B. **Figure 31**). Clamp, or screw-in stud. When purchasing a dial indicator, select on with a continuous dial (A, **Figure 31**).

Cylinder Bore Gauge

A cylinder bore gauge is similar to a dial indicator. The gauge set shown in **Figure 32** consists of a dial indicator, handle, and different length adapters (anvils) to fit the gauge to various bore sizes. The bore gauge is used to measure bore size, taper and out-of-round. When using a bore gauge, follow the manufacturer's instructions.

Compression Gauge

A compression gauge **(Figure 33**) measures combustion chamber (cylinder) pressure, usually in PSI or kg/ cm^2 . The gauge adapter is either inserted or screwed into the spark plug hole to obtain the reading. Disable the engine so it does not start and hold the throttle in the wide-open position when performing a compression test An engine that does not have adequate compression cannot be properly tuned. Refer to Chapter Three.



Multimeter

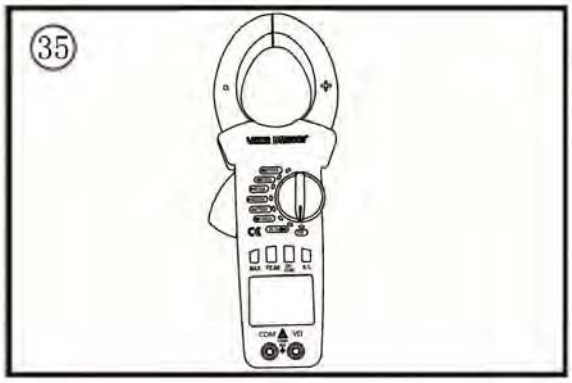
A multimeter **(Figure 34)** is an essential tool for electrical system diagnosis. The voltage function indicates the voltage applied or available to various electrical components. The ohmmeter function tests circuits for continuity, or lack of continuity, and measures the resistance of a circuit.

Some manufacturer's specifications for electrical components are based on results using a specific test meter. Results may vary if using a meter not recommended by the manufacturer. Such requirements are noted when applicable.

Ohmmeter (analog) calibration

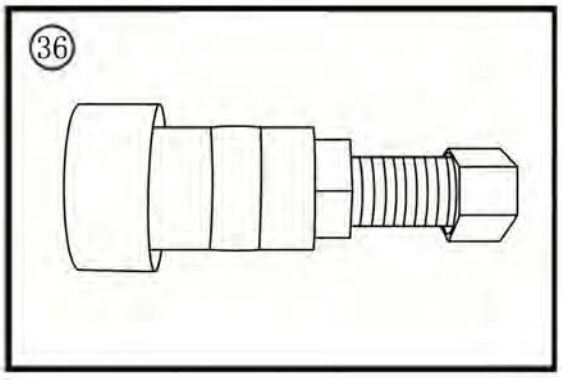
Each time an analog ohmmeter is used or if the scale is changed, the ohmmeter must be calibrated.

Digital ohmmeters do not require calibration.



1. Make sure the meter battery is in good condition.
2. Make sure the meter probes are in good condition.
3. Touch the two probes together and observe the needle location on the ohms scale. The needle must Align with the 0 mark to obtain accurate measurements.
4. If necessary, rotate the meter ohms adjust knob until the needle and 0 mark align.

Clip-on ammeter



1. Clip-on ammeter **(Figure 35)** is the basic tool for electrical system diagnosis which is used to measure the current of charging system and other electrical components work current.
2. Clip-on ammeter can measure direct current and alternating current. Please ensure that the instrument battery capacity is sufficient when work.
3. When measure the current, the calliper must seize the positive pole of the power. If seize the negative pole mistakenly, wrong result will appear.

Magneto puller

Magneto drawing **(figure 36)** is special tool to dismantle magneto rotor . firstly put the mandril into th e inside of shaft hole ,Turn the magneto rotor accordingly, screw magneto drawing and push-out ma gneto rotor

ELECTRICAL SYSTEM FUNDAMENTALS

A thorough study of the many types of electrical systems used in today's motorcycles is beyond the scope of this manual. However, a basic understanding of electrical basics is necessary to perform simple diagnostic tests.

Refer to Electrical Testing in Chapter Two for typical test procedures and equipment. Refer to Chapter Ten for specific system test procedures.

Voltage

Voltage is the electrical potential or pressure in an electrical circuit and is expressed in volts. The more pressure (voltage) in a circuit the more work can be performed.

Direct current (DC) voltage means the electricity flows in one direction. All circuits powered by a battery are DC circuits.

Alternating current (AC) means the electricity flows in one direction momentarily and then switches to the opposite direction. Alternator output is an example of AC voltage. This voltage must be changed or rectified to direct current to operate in a battery powered system.

Resistance

Resistance is the opposition to the flow of electricity within a circuit or component and is measured in ohms. Resistance causes a reduction in available current and voltage

Resistance is measured in an inactive circuit with an ohmmeter. The ohmmeter sends a small amount of current into the circuit and measures how difficult it is to push the current through the circuit.

An ohmmeter, although useful, is not always a good indicator of a circuit's actual ability under operating conditions. This is because of the low voltage (6-9 volts) the meter uses to test the circuit. The voltage in an ignition coil secondary winding can be several thousand volts. Such high voltage can cause the coil to malfunction, even though it tests acceptable during a resistance test.

Resistance generally. Increases with temperature. Perform all testing with the component or circuit at room temperature. Resistance tests performed at high temperatures may indicate high resistance readings and cause unnecessary replacement of a component.

Amperage

Amperage is the unit of measurement for the amount of current within a circuit. Current is the actual flow of electricity. The higher the current, the more work can be performed up to a given point. If the current flow exceeds the circuit or component capacity, it will damage the system.

Warning

If the current insulation damage, may cause short circuit fault which lead to short circuit or large current in components. It may cause a fire.

Thus, if the current of circuit or components measured by amperage exceeds the standard level, must check and repair electrical system at once.

BASIC SERVICE METHODS

Most of the procedures in this manual are straightforward and can be performed by anyone reasonably competent with tools. However, consider personal capabilities carefully before attempting any operation involving major disassembly.

1. Front, in this manual, riders to the front of the EV, The front of any component is the end closest to the front the EV. The left and right sides refer to the position of the parts as viewed by the rider sitting on the seat facing forward.
2. Whenever servicing an engine or suspension component, secure the EV in a safe manner.
3. Tag all similar parts for location and mark all mating parts for position. Record the number and thickness of any shims when removing them. Identify parts by placing them in sealed and labeled plastic sandwich bags.
4. Tag disconnected wires and connectors with masking tape and a marking pen. Do not rely on memory alone.
5. Protect finished surfaces from physical damage or corrosion. Keep gasoline and other chemicals off painted surfaces.
6. Use penetrating oil on frozen or tight bolts. Avoid using heat where possible. Heat can warp, melt or affect the temper of parts. Heat also damages the finish of paint and plastics.
7. When a part is a press fit or requires a special tool to remove, the information or type of tool is identified in the text. Otherwise, if a part is difficult to remove or install, determine the cause before proceeding.
8. To prevent objects or debris from falling into the engine, cover all openings.
9. Read each procedure thoroughly and compare the illustrations to the actual components before starting the procedure. Perform the procedure in
10. Recommendations are occasionally made to refer service to a dealership or specialist. In these cases, the work can be performed more economically by the specialist than by the home mechanic.
11. The term replaces means to discard a defective part and replace it with a new part. Overhaul means to remove, disassemble, inspect, measure, repair and/or replace parts as required to recondition an assembly.
12. Some operations require using a hydraulic press. If a press is not available, have these operations performed by a shop equipped with the necessary equipment. Do not use makeshift equipment that may damage the motorcycle.
13. Repairs are much faster and easier if the EV is clean before starting work. Degrease the motorcycle with a commercial degreaser; follow the directions on the container for the best results. Clean all parts with cleaning solvent when removing them.

CAUTION

Do not direct high-pressure water at steering bearings, battery, wheel bearings, suspension and electrical components. Water may force grease out of the bearings and possibly damage the seals

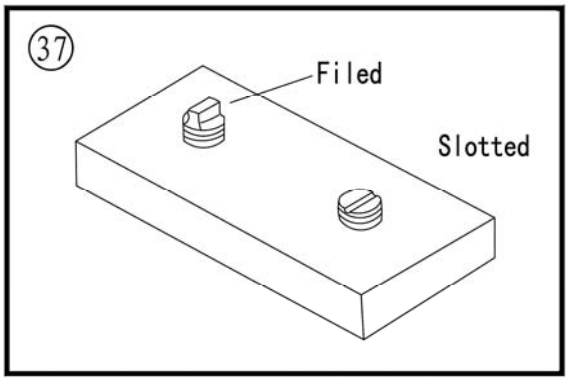
14. If special tools are required, have them available before starting the procedure. When special tools are required, they are described at the beginning of the procedure.
15. Make diagrams of similar-appearing parts. For instance, crankcase bolts are often not the same lengths. Do not rely on memory alone. Carefully laid out parts can become disturbed, making it difficult to reassemble the comports correctly.
16. Make sure all shims and washers are reinstalled in the same location and position.
17. Whenever rotating parts contact a stationary part, look for a shim or washer.
18. Use new gaskets if there is any doubt about the condition of old ones.
19. If using self-locking fasteners, replace them with new ones. Do not install standard fasteners in place of self-locking ones.
20. Use grease to hold small parts in place if they tend to fall out during assembly. Do not apply grease to electrical or brake components.

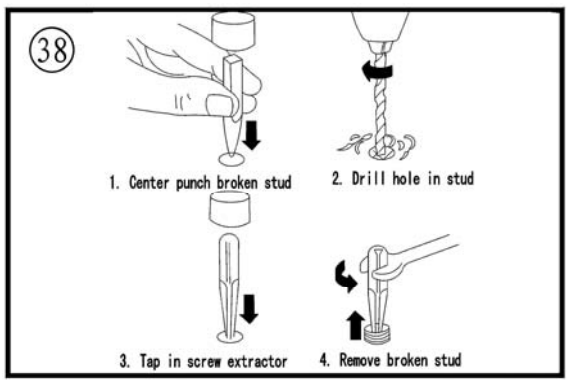
Removing Frozen Fasteners

If a fastener cannot be removed, several methods may be used to loosen it. First, apply a penetrating fluid. Apply it liberally and let it penetrate for 10-15 minutes. Rap the fastener several times with a small hammer. Do not hit it hard enough to cause damage. Reapply the penetrating fluid if necessary.

For frozen screws, apply penetrating fluid as described, the insert a screwdriver in the slot and rap the top of the screwdriver with a hammer. This loosens the rust so the screw can be removed in the normal way. If the screw head is too damaged to use this method, grip the head with locking pliers and twist the screw out.

Avoid applying heat unless specifically instructed. Heat may melt, warp or remove the temper from parts.





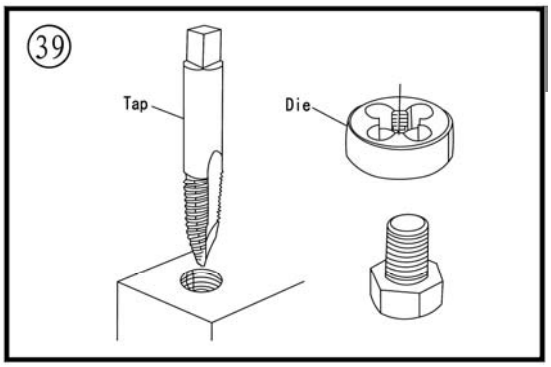
Removing Broken Fasteners

If the head breaks off a screw or bolt, several methods are available for removing the remaining portion. If a large portion of the remainder projects out, try gripping it with locking pliers. If the projecting portion is too small, file it to fit a wrench of cut a slot in it to fit a screwdriver (**Figure 37**)

If the head breaks off flush, use a screw extractor. To do this, center punch the exact center of the

remaining portion of the screw or bolt. Drill a small hole in the screw and tap the extractor into the hole. Back the screw out with a wrench on the extractor (**Figure 38**)

Repairing Damaged Threads

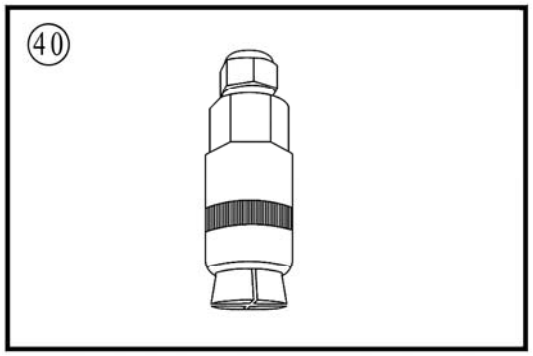


Occasionally, threads are stripped through carelessness or impact damage. Often the threads can be repaired by running a tap (for internal threads on nuts) or die (for external threads on bolts) through the threads (**Figure 39**). To clean or repair spark plug threads, use a spark plug tap.

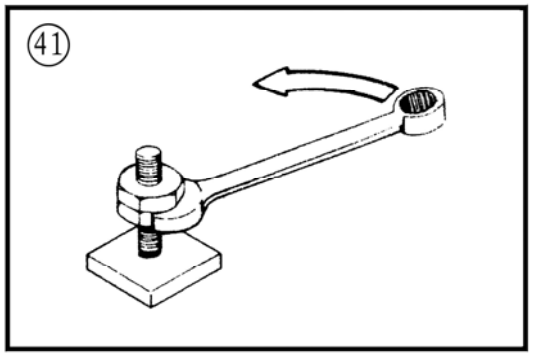
If an internal thread is damaged, it may be necessary to install a Helical or some other type of thread insert. Follow the manufacturer's instructions when installing their insert.

If it is necessary to drill and tap a hole, refer to **Table 8** for metric tap and drill sizes.

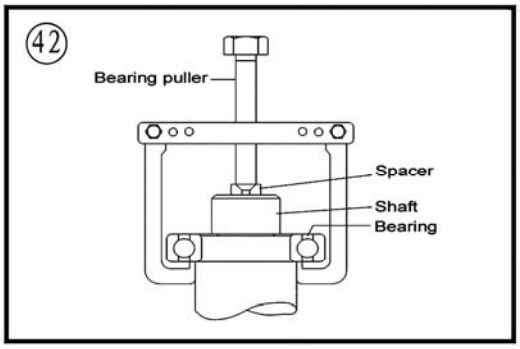
Stud Removal/Installation



A stud removal tool **(Figure 40)** is available from most tool suppliers. This tool makes the removal and installation of studs easier. If one is not available, thread two must onto the stud and tighten them against each other. Remove the stud by turning the lower nut **(Figure 41).**



1. Measure the height of the stud above the surface.
2. Thread the stud removal tool onto the stud and tighten it, or thread two nuts onto the stud.
3. Remove the stud by turning the stud remover or the lower nut.
4. Remove any thread locking compound from the threaded hole. Clean the threads with an aerosol parts cleaner.
5. Install the stud removal tool onto the new stud or thread two nuts onto the stud.
6. Apply thread locking compound to the threads of the stud.
7. Install the stud and tighten with the stud removal tool or the top nut.
8. Install the stud to the height noted in Step 1 or its torque specification.
9. Remove the stud removal tool or the two nuts.

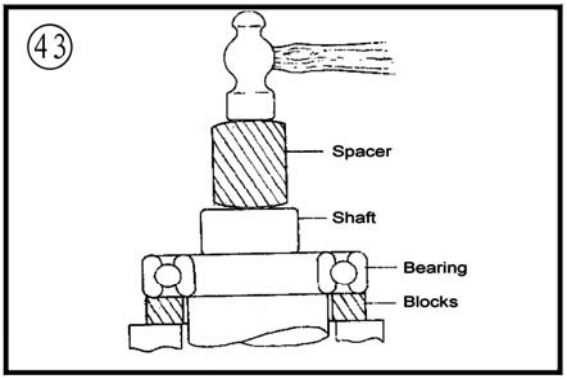


Removing Hoses

When removing stubborn hoses, do not exert excessive force on the hose or fitting. Remove the

hose, do not exert excessive force on the hose or fitting. Remove the hose clamp and carefully insert a small screwdriver or pick tool between the fitting and hose. Apply a spray lubricant under the hose and carefully twist the hose off the fitting. Clean the fitting of any corrosion or rubber hose material with a wire brush Clean the inside of the hose thoroughly. Do not use any lubricant when installing the hose (new or old). The lubricant may allow the hose to come off the fitting, even with the clamp secure.

Bearings

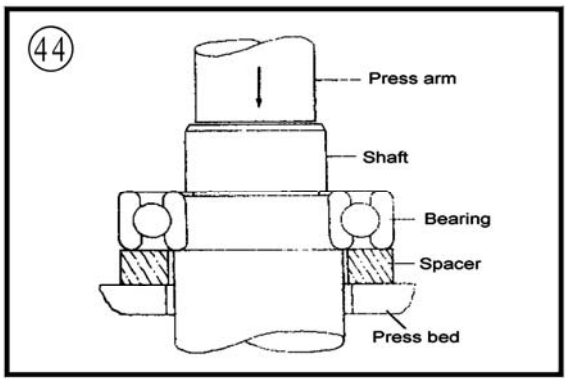


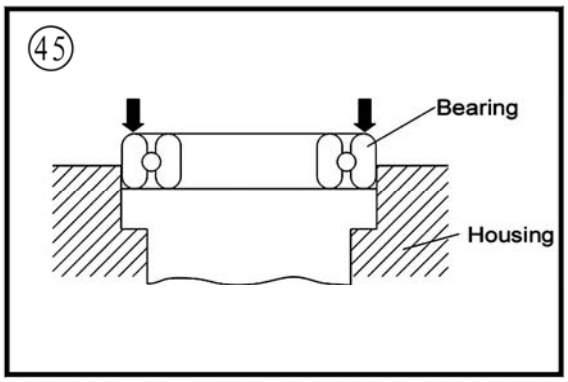
Bearings are used in the engine and transmission assembly to reduce power loss, heat and noise resulting from friction. Because bearings are precision parts, they must be maintained with proper lubrication and maintenance. If a bearing is damaged, replace it immediately. When installing a new bearing, take care to prevent damaging it. Bearing replacement procedures are included in the individual chapters where applicable; however. Use the following sections as a guideline.

NOTE

Unless otherwise specified, install bearings with the manufacturer's mark or number facing outward.

Removal





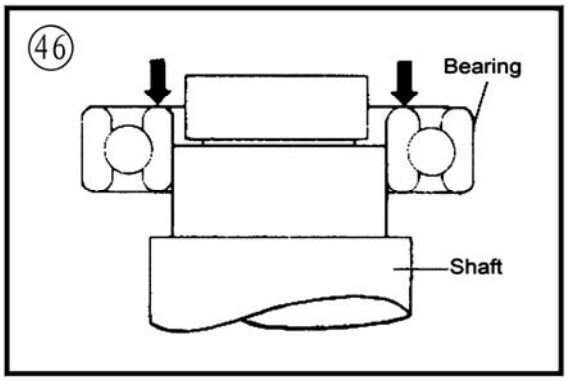
While bearing are normally removed only when damaged, there may be times when it is necessary to remove a bearing that is in good condition. However, improper bearing removal will damage the bearing and possibly the shaft or case. Note the following when removing bearings:

1. When using a puller to remove a bearing from a shaft, take care that the shaft is not damaged. Always place a piece of metal between the end of the shaft and the puller screw. In addition, place the puller arms next to the inner bearing race. See **Figure 42.**
2. When using a hammer to remove a bearing from a shaft. do not strike the hammer directly against the shaft. Instead, use a brass or aluminum rod between the hammer and shaft **(Figure 43)** and make sure to support both bearing races with wooden blocks as shown.
3. The ideal method of bearing removal is with a hydraulic press. Note the following when using a press:
   a. Always support the inner and outer bearing races with a suitable size wooden or aluminum spacer **(Figure 44).** If only the outer race is supported, pressure applie against the balls

and/or the inner race will damage them.

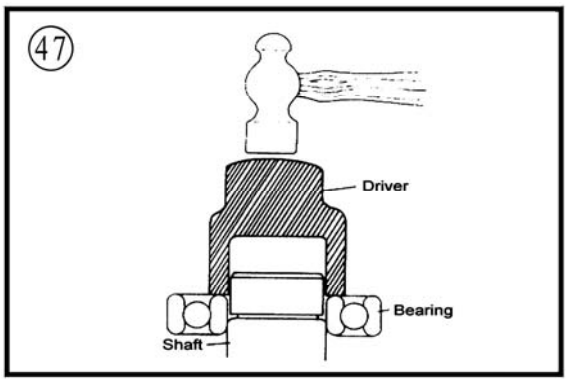
b. Always make sure the press arm **(Figure 44)** aligns with the center of the shaft. If the arm is not centered, it may damage the bearing and/or shaft.

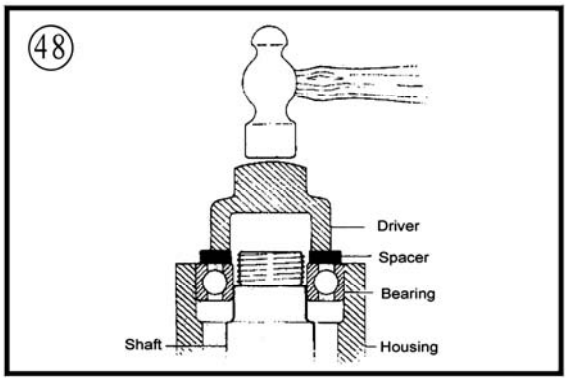
c. The moment the shaft is free of the bearing. It drops to the floor. Secure or hold the shaft to prevent it from falling.



Installation

1. When installing a bearing in a housing, apply pressure to the outer bearing race **(Figure 45).** When installing a bearing on a shaft, apply pressure to the inner bearing race **(Figure 46).**
2. When installing a bearing as described in Step 1, some type of driver is required. Never strike the bearing directly with a hammer or it will damage the bearing. When installing a bearing, use a piece of pipe or a driver with a diameter that matches the bearing inner race. **Figure 47** Shows the correct way to use a driver and hammer to install a bearing.
3. Step 1 describes how to install a bearing in a case half or over a shaft However, when installing a bearing over a shaft and into the housing at the same time, a tight fit is required for both outer and inner bearing races. In this situation, install a spacer underneath the driver tool so that pressure is applied evenly across both races. See **Figure 48.** If the outer race is not supported as shown, the balls will push against the outer bearing race and damage it





Interference Fit

1. Follow this procedure when installing a bearing over a shaft. When a tight fit is required, the bearing inside diameter is smaller than the shaft. In this case. Driving the bearing on the shaft using normal methods may cause bearing damage. Instead, heat the bearing before installation. Note the following:
   a. Secure the shaft so it is ready for bearing installation.
   b. Clean all residues from the bearing surface of the shaft. Remove burrs with a file or sandpaper.
   c. Fill a suitable pot or beaker with clean mineral oil. Place a thermometer rated above 120℃(248°F) in the oil. Support the thermometer so it does not rest on the bottom or side of the pot.
   d. Remove the bearing from its wrapper and secure it with a piece of heavy wire bent to hold it in the pot. Hang the bearing in the pot so it does not touch the bottom or sides of the pot.

e. Turn the heat on and monitor the thermometer. When the oil temperature rises to approximately 120℃(248°F), remove the bearing from the pot and quickly install it. If necessary, place a socket on the inner bearing race and tap the bearing into place. As the bearing chills, it will tighten on the shaft, so install it quickly. Make sure the bearing is installed completely.

2. Follow this step when installing a bearing in a housing. Bearings are general installed in a housing with a slight interference fit Driving the bearing into the housing using normal methods may damage the housing or cause bearing damage. Instead, heat the housing before the bearing is installed. Note the following:

CAUTION

Before heating the housing in this procedure, wash the housing thoroughly with detergent and water. Rinse and rewash the cases as required to remove all traces of oil and other chemical deposits

a. Heat the housing to approximately 100℃ (212°F) in an oven or on a hot plate. An easy way to check that it is the proper temperature is to place tiny drops of water on the housing; if they sizzle and evaporate immediately, the temperature is correct. Heat only one housing at a time.

CAUTION

Do not heat the housing with a propane or acetylene torch. Never bring a flame into contact with the bearing or housing. The direct heat will destroy the case hardening of the bearing and will likely warp the housing.

b. Remove the housing from the oven or hot plate, and hold onto the housing with welding gloves. It is hot!

NOTE

Remove and install the bearings with a suitable size socket and extension.

c. Hold the housing with the bearing side down and tap the bearing out. Repeat for all bearings in the housing.

d. Before heating the bearing housing, place the new bearing in a freezer if possible. Chilling a bearing slightly reduces its outside diameter while the heated bearing housing assembly is slightly larger due to heat expansion. This makes bearing installation easier.

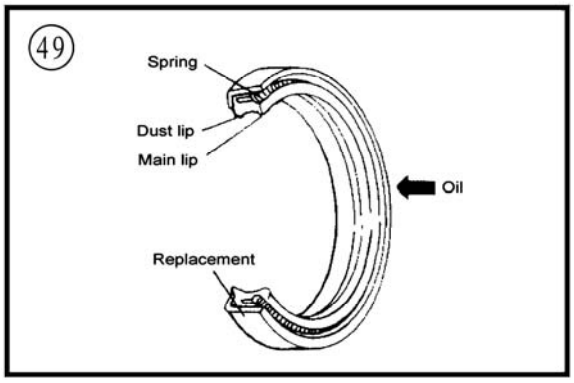
NOTE

Always install bearings with the manufacturer's mark or number facing outward.

e. While the housing is still hot. Install the new bearing(s) into the housing. Install the bearings by hand. if possible. If necessary, lightly tap the bearing(s) into the housing with a driver placed on the outer bearing race (**Figure 45**). Do not install new bearings by driving on the inner-bearing race. Install the bearing(s) until it seats completely.

Seal Replacement

Seals (**Figure 49**) contain oil, water, grease or combustion gasses in a housing or shaft. Improperly removing a seal can damage the housing or shaft. Improperly installing the seal can damage the seat. Note the following:



1. Prying is generally the easiest and most effective method of removing a seal from the housing. However. Always place a rag underneath the pry tool to prevent damage to the housing. Note the seal's installed depth or if it is installed flush.
2. Pack waterproof grease in the seal lips before the seal is installed.
3. In most cases, install seals with the manufacturer's numbers or marks facing out.
4. Install seals with a socket or driver placed on the outside of the seal as shown in. Drive the seal squarely into the housing until it is to the correct depth or flush as noted during removal. Never install a seal by hitting against the top of it with a hammer.

BASIC DRIVING AND OPERATING METHODS

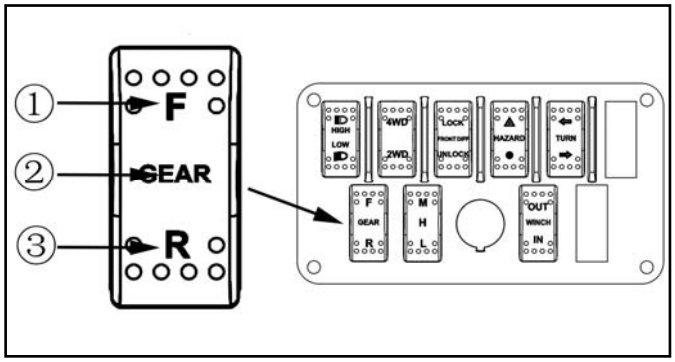
Please read and truly comprehend the content of this manual, pay attention to those contents which marked with ", caution, warning". Make sure all drivers already comprehended contents of this manual and all operating skills before driving.

WARNING:

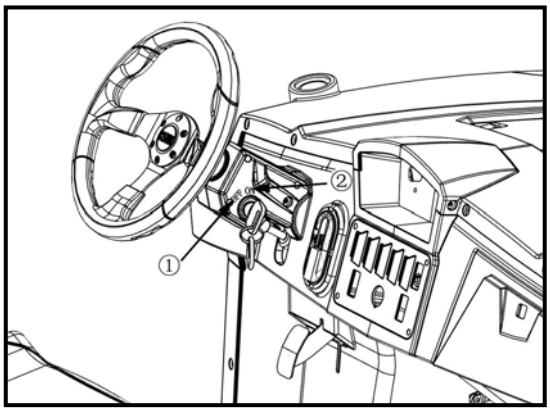
- ***Make sure the road or place whether is suitable for driving or not.***
- ***Make sure is there any related warning sign and obey.***
- ***Make sure all drivers already comprehended contents of this manual and all operating skills.***
- ***To guide the driver for his first driving.***

Proper Driving Methods

1. Use the steering wheel to make the wheel to the right direction and make sure there are no obstructions on the road
2. Make sure the **F/GEAR/R** switch is in **GEAR** position.



3、Turn the key switch to "**ON**" position, dash board will be lit, indicating whether the battery is fully charged, As shown below,

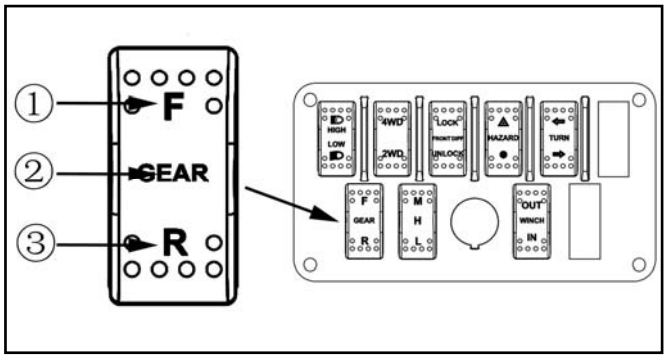


4. Turn the **forward / reverse** switch to the desired position.

F： Forward.

Center position： Neutral（N）.

R： Reverse (At this moment, the buzzer will make sound signal)



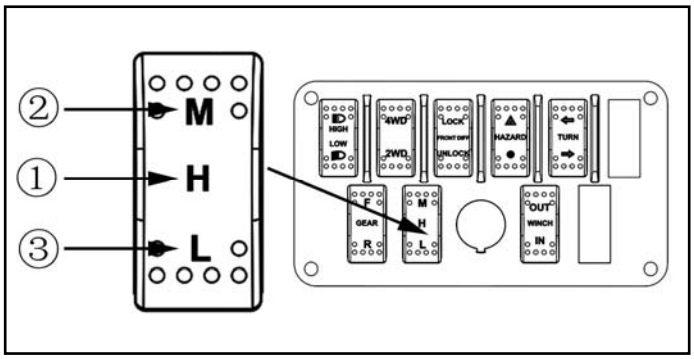
1. Forward
2. Neutral
3. Reverse

5、Switch mode switch **M/H/L**

H：High Speed Mod

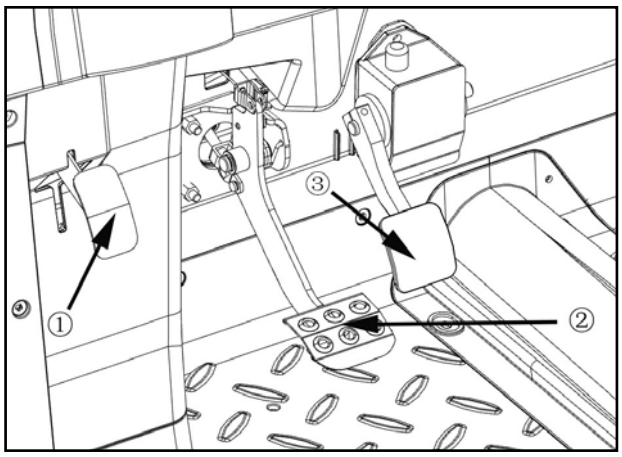
M：Economical Mod

L：Climbing Mod



1. High Speed Mod
2. Economical Mod
3. Climbing Mod

6、Press down the accelerator pedal, brake pedal will automatically open, EVs will start moving.



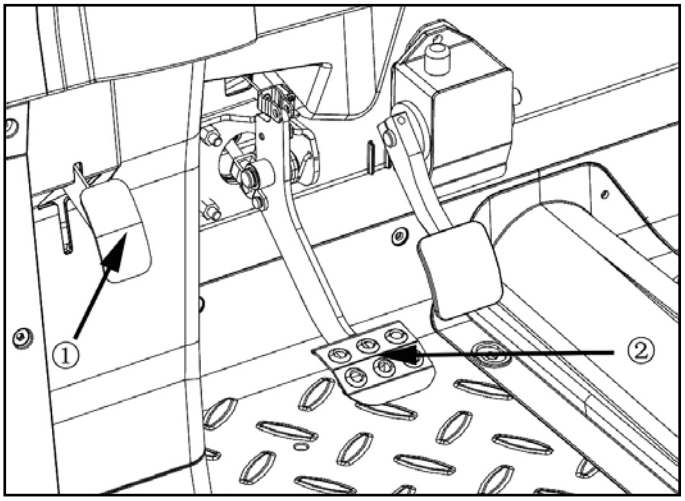
1. Parking pedal
2. Brake Pedal
3. Accelerate pedal

7. Slowly press down the accelerator pedal, EV can increase speed, press the pedal to the end, you can achieve maximum speed.

8. Release the accelerator pedal and press down the brake pedal, you can make EV to stop moving.

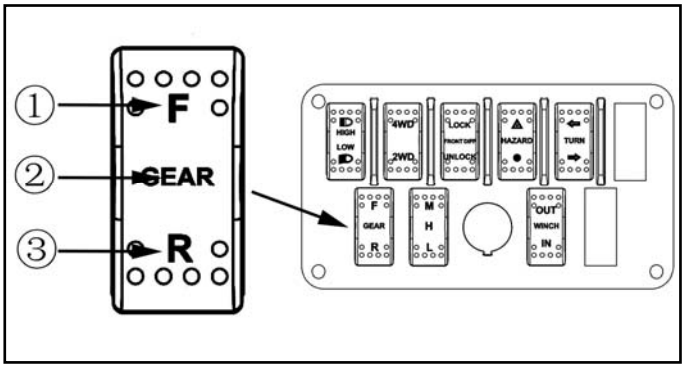
Operation Before Leaving The EV

1. Press park brake pedal until it locks and holds vehicle.



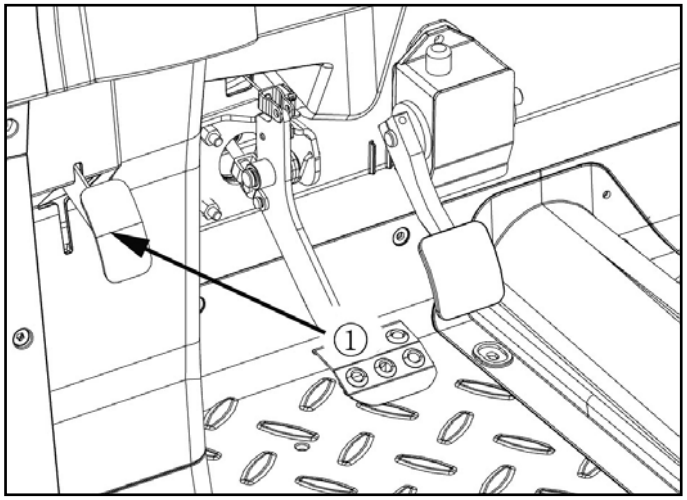
1. Parking Pedal
2. Brake pedal

2. Place **F/GEAR/R** switch in **GEAR** position.



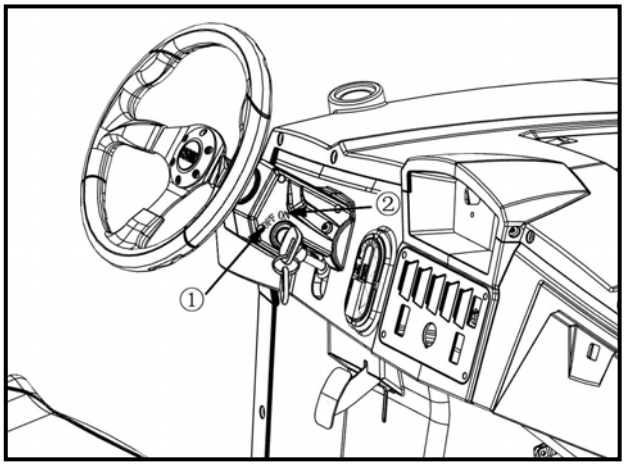
1. Forward
2. Neutral
3. Reverse

3. Press the parking pedal



1. Parking Pedal

4. Turn key **OFF** and remove key when not in use.



1. OFF
2. ON

Motor Braking Function

Electric motor braking provides speed regulation functions.

1. For parked vehicle, beeping alarm indicates vehicle roll away. In operation, beeping alarm indicates reduction in motor braking.
2. Apply brakes to further reduce vehicle speed as required.

DAILY SAFE CHECKING

Before driving, it is necessary to make a daily safe checking of the vehicle. so that you can found any possible problem and failure.

If you find any failure, adjustment or maintenance must be carried out immediately; otherwise you may cause serious injury or property damage.

Daily Safe Checking Items

General: All the parts should be in place and properly installed. Be sure that all nuts, bolts, and screws are tight.

Fasteners: Check all nuts, bolts, screws if loosened, re-tighten loose fasteners.

Tires: Check tire pressure is correct or not. Make a visual inspection of tire abrasion, if the tires were worn out or have more severe cracks or unusual drum package, replace it with the new tire.

WARNING:

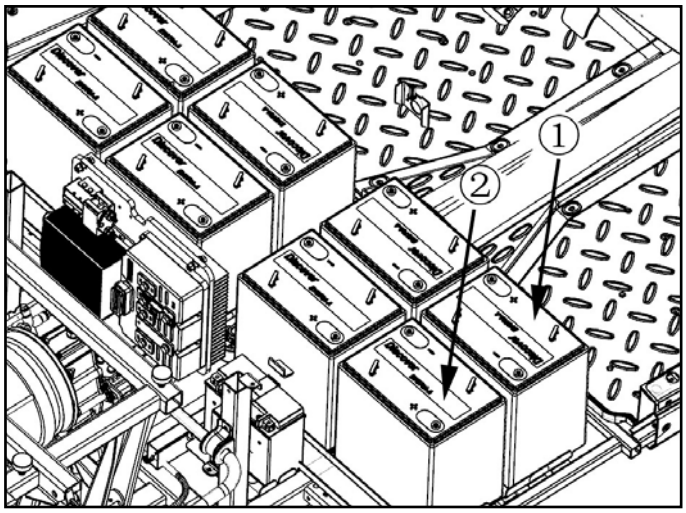
Left/right tires must be replaced at the same time. Otherwise, there will be deviation and other failures which led to loss of control or roll-over accident.

Wheel (rim): Check whether the wheel rust or collision deformation, if there is serious corrosion or deformation, please change the wheel, otherwise, the tires may fell out from the wheel and cause the accident.

Battery: Check whether the battery acid spill out of the battery surface, and check whether the battery cover is loose or not.

NOTE

If the battery cover is loose, it will cause the rubber pressure valve off. The battery would quickly get damaged.



1. Battery
2. Cover

Charger cord, plug, and socket: Visual check for cracks, looseness and abrasion of wire insulation. Hand check if cable plugs and sockets are loose. If the fault is found, please go to the dealer to conduct a comprehensive inspection on the charger. Otherwise fire may happen because of the heat or short circuit.

Performance Checking Items

1. Check if the headlights and its switch work normally.
2. Check if the turn signal and its switch work normally.
3. Check if emergency lights and its switch work normally.
4. Check if the "forward / reverse" switch works normally.
5. Check if the brake pedal or accelerator pedal could automatically return to position.
6. Check the braking performance to ensure that EV can fully stop in a short distance under a stable and rapid braking force.
7. Check if parking brake pedal can be reliably locked. And when the brake pedal or accelerator pedal

is depressed, the parking brake pedal should be checked if it could be automatically reset.

WARNING:

When the brake pedal is depressed by appropriate pressure, EV should smoothly and continuously stop.
If the EV suddenly changes lanes or could not stop or suddenly stops or brings about harsh braking noise, please immediately check and adjust the brake system.
If the power of depressing the brake pedal is strong, the EV would fiercely brake. While if the power is continuous and moderate, the EV would finish the brake progress moderately.

8. Check if the parking brake function can meet the requirement. When the parking brake pedal is depressed until it is locked, the EV can stop in a slope no more than 20% (11°) degree.
9. Check if the reverse buzzer works normally. The reverse buzzer will sound as a reminding to the driver that he is doing the reverse when the **Forward/Reverse** handle or switch is at the **REVERSE** position.
10. Check the steering wheel. If there is any looseness or play in the steering wheel, please adjust it immediately.
11. Check if there is any abnormal noise during the driving.
12. Check if the maximum speed of the EV does not exceed 40km/h. EV is not allowed to be driven at a speed higher than 40km/h.

MAINTENCE AND ADJUSTMENT OF THE EV

To ensure trouble-free vehicle performance, it is very important to follow an established preventive maintenance program. Meanwhile, regular maintenance can greatly extend the service life of EV.

Regular and consistent vehicle maintenance can prevent vehicle downtime and expensive repairing cost that could be resulted because of neglect. This will also prevent further damage to the vehicle and avoid the possibility of injury.

If you are not eligible or technologically limited for regulated maintenance, please contact your local distributor/dealer to perform all repairs or semiannual or annual periodic service.

NOTE

- **If any problems are found during scheduled inspection or service, do not operate the vehicle until repairs are made. Failure to make necessary repairs could result in fire, property damage, severe personal injury, or death.**
- **Only trained technicians could serve or repair the vehicle and its battery charger. The appropriate instructions must be used when performing maintenance, service, or accessory installation.**
- **Hot! Do not attempt to serve a hot motor.**
- **To avoid unintentionally starting the vehicle during the process of repairing, please disconnect the battery.**
- **After disconnecting the batteries, wait 90 seconds for the controller capacitors to discharge. The maintenance can be done only after this step.**

- **To maintain the EVs or battery chargers, you must wear certified safety glasses to protect eyes. When working nearby the battery, you must wear face shield and rubber gloves.**
- **When maintaining close to the electrical system or upon the electrical system, use the insulated tools. To be more careful to avoid parts or electrical short circuit.**
- **Both the Periodic Service Schedule and Periodic Lubrication Schedule must be followed to keep vehicle in optimum operating condition.**
- **If the vehicle is constantly subjected to heavy use or used under severe operating conditions, the frequency of the preventive maintenance procedure should increase, compared with that recommended in the periodic service and lubrication schedules.**

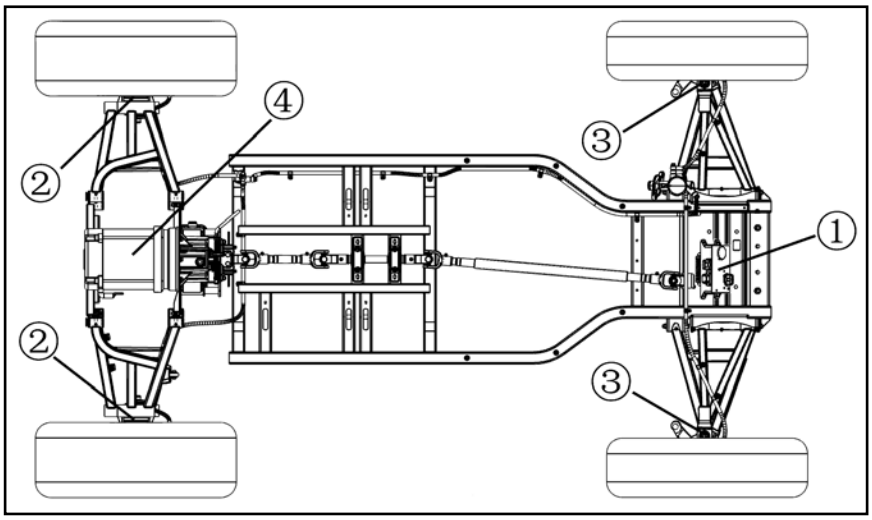
Periodic Service Schedule

REGULAR INTERVAL	SERVICE
Daily service by owner	Pre-Operation and Daily Safety Checklist
	Performance Inspection
	Batteries
Weekly service by owner	Check the battery weekly, charge the battery in time
Monthly service by owner or trained technician	Check the battery monthy, charge the battery in time
	Clean the surface of the battery
	Check the wear and air pressure of the tire, and adjust or replace it if necessary.
	Thoroughly wash vehicle including the underside
Semiannual service by trained technician only (every 50 hours of operation or 100 rounds of EV)	Check the Brake System.
	Check brake shoes, replace if necessary
	Lubricate brake system per Lubrication Schedule
	Check brake cables; replace them if necessary
	Electrical wires and connections: Check the tightness and safety; Replace if necessary
	Check the front wheel alignment and camber
Annual service by trained technician only (every 100 hours of operation or 200 rounds of EV)	Thoroughly check the battery, if one or some battery units are failed, must change the full battery set.
	Clean and lubricate all rotating joints
	Check the frame, swing arm and replace the damaged parts, correct for small deformation, painting make-up for rusting
	Check and clean the rear axle, replace the damaged parts, and add the required lubricants.

Periodic Lubrication Schedules

PERIODIC LUBRICATION SCHEDULE			
REGULAR INTERVAL	**LUBRICATION PARTS**	**LUBRICATION POINTS**	**RECOMMENDED LUBRICANT**
Semiannual service by trained technician (every 50 hours of operation or 100 rounds of EV)	Charger receptacle	1	WD-40
	Lubricate the brake system After each maintenance and service manual	2	lithium grease
	Front wheel steering knuckle	3	lithium grease
Annual service by trained technician only (every 100 hours of operation or 200 rounds of EV)	Rear axle shaft and oil seal	4	GL-5 Heavy gear lubricants

Diagram Of Regular Lubricant Points



THE STORAGE AND CLEANING

Cleaning

1. Use sponge or soft cloth to clean EV, the water with daily use pressure is enough.
2. Manufacturer does not recommend using any pressure cleaning or steam cleaning methods on EVs for cleaning. Because this cleaning method will make electronic parts get wet, which can cause a short circuit, corrosion and electrical components malfunction.
3. Do not use polishing wax. Otherwise the plastic cover would result in wear and tear on the surface.
4. Acid, oil, paint and gum leaked from battery should be removed immediately to prevent causing permanent stains.
5. The seats of the vehicle will last longer with proper cleaning. Please use soft cloth and 10% liquid soap and warm water to clean.
6. Dust and dirt embedded in the gap can be removed with a soft brush. As it is hard to remove the serious pollution, scratches or stains, because the case is the PP plastic, Only changing the new plastic cover can solve the problem.

NOTE

Some chemicals or hard cleaning supplies will make EV surface lose their luster.
Dispose of waste water properly.

Storage

1. Press the stop buttom, remove the key, and leave the **Forward/Reverse** switch in the **NEUTRAL** position during storage. Press the stop buttom. This is to prevent unintentionally starting the vehicle or a fire hazard.
2. Do not attempt to charge frozen batteries or batteries with bulged cases. Discard the battery. Frozen batteries can explode.

WARNING:

Batteries in a low state of charge will freeze at low temperatures.
To avoid exposing electrical components to moisture and subsequent damages, do not use any type of pressure washing or steam cleaning equipment to wash the vehicle.

3..Take off one of the conductors connecting the eight batteries to ensure the absolute security by cutting the link of the battery pack.

4.. Each month, conduct a supplementary charge of the battery. Every three months, drive the EV and fully use the battery and fully recharge the battery.

5. Every six months to conduct a site related to periodic lubrication.

6..The tire should be inflated to the allowed higher pressure, so it can prevent the tire from pressing badly by the EV during long time. If the storage time is long, please use the solid frame to lift the EV and make the tire off the ground.

WARNING:

Please keep the EV stored in a dry, cool place.
The battery must be charged every month.
Do not use parking bodies during storage. In order to prevent EV from accidentally rolling wheels, please put wedges under the four wheels.
Thoroughly clean the body, seat, battery box, and EV bottom and all the other places which can be cleaned.

IMPORTANT ELECTRICAL COMPONENTS

Motor，Controller

Adopting renowned international companies' motor and controller, this EV is with advanced performance, high reliability, strong protection, and etc. If the repair requires parts replacement, be sure to purchase the original parts to guarantee the EVs in best performance condition and providing the highest security assurance. We will provide a full range of maintenance spare parts to our customers.

Battery

With the maintenance-free ,dedicated traction power lead-acid battery, the EV is with the features of high capacity, long cycle life, and recyclability.

Since the Lead-acid batteries have no "Memory", then during its working, you should make sure to recharge it once it has been used. Especially when the battery is used up, you must immediately charge it. Because when the battery is used up and without being immediately charged, the battery will be easily damaged.

WARNING:

- ***Battery – Explosive gases! Do not smoke. Keep sparks and flames away from the vehicle and service area. Ventilate when charging or operating vehicle in an encised area, Wear a full face shield and rubber gloves when working on or near batteries,***
- ***Charge batteries in a well-ventilated area only. Batteries emit hydrogen while being charged. Hydrogen is an explosive gas and must never exceed a level of 2% of the air.***
- ***Battery – Poison! Contains acid! Causes severe burns. Avoid contact with skin, eyes, or clothing. Antidotes:***
  – External: Flush with water. Call a physician immediately.
  – Internal: Drink large quantities of milk or water followed with milk of magnesia or vegetable oil. Call a physician immediately.
  – Eyes: Flush with water for 15 minutes. Call a physician immediately.
- ***Wear safety glasses or approved eye protection when servicing the vehicle or battery charger. Wear a full face shield and rubber gloves when working on or near batteries.***
- ***Use insulated tools when working near batteries or electrical connections. Use extreme caution to avoid shorting of components or wiring.***
- ***Press the stop buttom, before disconnecting the batteries.***
- ***After disconnecting the batteries, wait 90 seconds for the controller capacitors to discharge.***
- ***If the battery is damaged, the entire battery must be replaced; if only a few of them are replaced, the battery will soon be damaged again.***
- ***Apply "Battery Terminal Conductive paste" on battery terminal when reloading battery after maintenance / maintenance.***

NOTE

On all vehicles, turn off all accessories before charging batteries.

Battery Charger

Each EV is equipped with a special battery charger.

A special matching test upon battery and its charger has been done. Other types of charger will fail to

charge. If other charger is used to charge, it may undercharge, overcharge and affect the usage of the battery.

WARNING:

- **The charging area must be ventilated. Hydrogen level in the air must never exceed 2%. The total volume of air in the charging area must be changed five times per hour, Exhaust fans should be located if necessary.**
- **To connect the charger plug to the vehicle receptacle, grasp the plug handle and push the plug straight into the receptacle. And then put the charger plug to AC power receptacle. Fully charged, remove the charger in the opposite order. Or it could damage the plug and receptacle and could cause battery to explode.**
- **Do not charge the vehicle batteries with the vehicle covered or enclosed. Any enclosure or cover should be removed or unzipped and pulled back when batteries are being charged. An accumulation of hydrogen gas could result in an explosion.**
- ***Only trained technicians are allowed to repair or service the charger. Any problems encountered in the maintenance of the charger, please contact your local distributor/dealer.***
- ***Each charger should have its own dedicated 25 ampere separately protected (circuit breaker or fuse) single phase branch circuit, in accordance with all applicable electrical codes for the location.***
- ***Connect the charger with AC power cord, and ensure voltage and frequency of 90~265V/45~65HZ.***
- ***An extension cord or electrical outlet must accept a three-prong plug. Improper receptacle can cause fire or personal injury.***
- ***Do not operate the charger if it has received a sharp blow, was dropped, or otherwise damaged in any way.***
- ***Have worn, cut, or damaged power cords or wires replaced immediately.***
- ***Do not use the charger near fuels, grain dust, solvents, thinners, or other flammables. objects. Chargers can ignite flammable materials and vapors.***
- ***Do not expose to rain or any liquid. Keep the charger dry.***
- ***Never push objects of any kind into the charger through cabinet slots. They may touch dangerous voltage points or cause an electrical short circuit that could result in fire or electrical shock.***
- ***Do not allow clothing, blankets, or other material to cover the charger.***
- ***Do not block or cover the charger ventilation slots. The slots provide ventilation and protect the charger from overheating.***
- ***Install arrester for the input AC cable. Arrester will help to protect the element of the charger and the EV, avoid the lightning strike.***
- ***Connect the charger AC supply cord to a properly grounded, three-wire outlet of the proper voltage and frequency as shown on the charger.***
- ***Do not use an extension cord to plug the charger. Please ask the eligible electrician to install the extension cord. Improper using the extension cord can result in fire in case of the overheating.***

To reduce the risk of electric shock, the battery charger must be grounded. The charger is equipped with an AC electric cord having an equipment-grounding conductor and a grounding type plug. The AC plug must be connected to an appropriate receptacle that is properly installed and grounded in accordance with the National Electrical Code and all local codes and ordinances. See the owner's

manual supplied with the charger for specific operating instructions before using the charger.
The use of an extension cord with the charger should be avoided. If an extension cord must be used, use a three-conductor no. 12 AWG (American Wire Gauge) or no. 14 SWG (British Standard Wire Gauge), heavy-duty cord with ground, properly wired and in good electrical condition. Keep it as short as possible (no more than 12 feet (3.7 m)). Place all cords so they will not be stepped on, tripped over, or otherwise subject to dam-age or stress.

Charging Batteries

WARNING:

- ***Be sure all wire connections at the receptacle and the fuse link are clean and tight.***
- ***Do not rock or bend the plug. To connect the charger plug to the vehicle receptacle, grasp the plug handle and push the plug straight into the receptacle***
- ***Do not pull on the DC cord Do not twist, rock or bend the plug. To disconnect the charger plug from the vehicle receptacle, grasp the plug by the handle and pull the plug straight out of the receptacle.***
- ***Do not connect a charger to the receptacle if the charger cord, plug, or the vehicle receptacle is broken, damaged in any manner, or does not make a good electrical connection. Fire or personal injury can result, Have it replaced by a quslified service person immediately.***
- ***Failure to follow these instructions could result in damage to the charger cord, the plug, and (or) the vehicle receptacle.***
- ***Do not use a charger if:***
  - ***The plug is too loose or does not make a good connection***
  - ***The plug and receptacle feel hotter than normal during charge.***
  - ***The plug pins or receptacle contacts are bent or corroded.***
  - ***The plug, receptacle, or cords are cut, worn, have any exposed wires or are damaged in any way.***
- ***Using the charger with any of the above symptoms could result in a fire, property damage, personal injury, or death.***

NOTE

Before charge the vehicle, make sure to close all of the switches, including the power switch of the accessories which are installed in the vehicle.
Do not charge the battery at a low temperature. When the temperature is below 5 ℃, please charge it indoors. Charging at low temperature cannot fully charge it, and affect its usage. Do not attempt to charge frozen battery or battery with bulged cases. Frozen battery can explode.

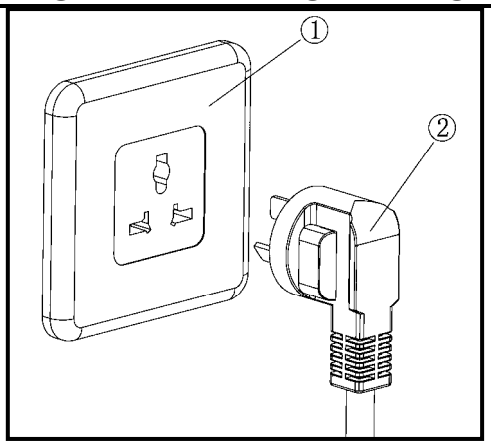


Figure 2 Correct Insertion Figure 1 of Charge AC Plug

Plug And Receptacle

The charger cord, plug, and receptacle are wear items and should be inspected daily. Visually inspect them for cracks, loose connections, and frayed wiring, they must be replaced when worn or damaged. If charger plug or receptacle show sighs of corrosion or the plug is difficult to insert or remove, the receptacle contacts and plug terminals should be cleaned with a good electrical contact cleaner or lightly sprayed spray lubricant. The plug should then be inserted and removed several times to ensure ease of insertion, ease of removal, and good electrical contact.

STORAGE

Several months of non-use can cause a general deterioration of the EV, This is especially true in areas of extreme temperature variations. This deterioration can be minimized with careful preparation for storage. A properly stored EV is much easier to return to service.

Storage Area Selection

When selecting a storage area, consider the following:

1. The storage area must be dry. A heated area is best, but not necessary. It should be insulated to minimize extreme temperature variations.
2. If the building has large window areas, mask them to keep sunlight off the EV .
3. Avoid buildings in industrial areas where corrosive emissions may be present. Avoid areas close to saltwater.
4. Consider the area's risk of fire, theft or vandalism. Check with an insurer regarding EV coverage while in storage.

Preparing the EV for Storage

The amount of preparation a EV should undergo before storage depends on the expected length of non-use, storage area conditions and personal preference. Consider the following list the minimum requirement:

1. Wash the EV thoroughly. Make sure all dirt, mud and other debris are removed.
2. Lubricate the drive chain..
3. Apply a protective substance to the plastic and rubber components. Make sure to follow the manufacturer's instructions for each type of product being used.

4. Place the EV on a work stand with both wheels off the ground.
5. Cover the EV with old bed sheets or something similar. Do not cover it with any plastic material that will trap moisture.

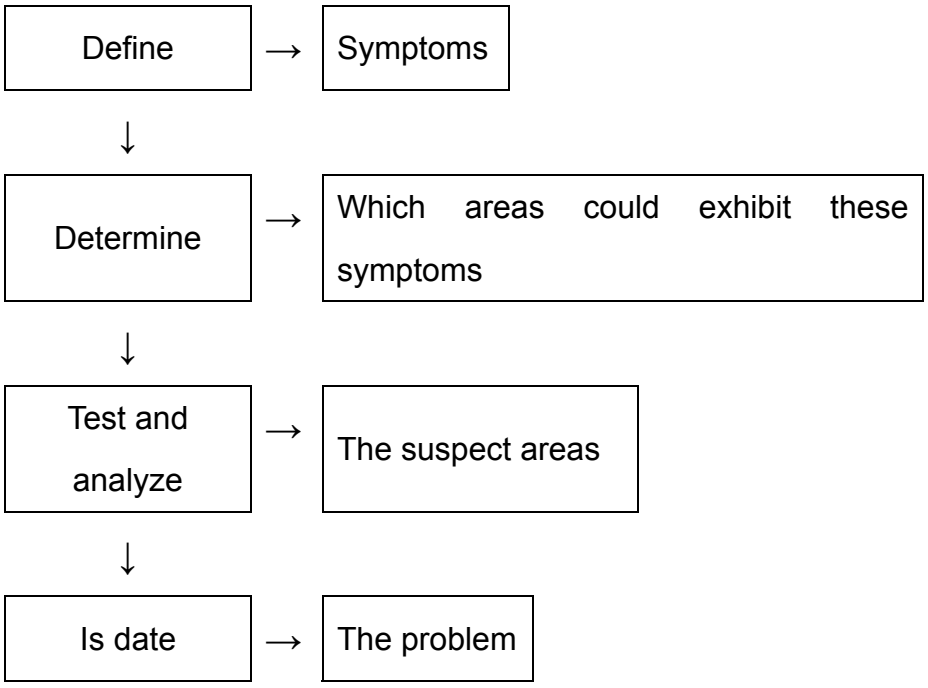
Returning the EV to Service

The amount of service required when returning a EV to service after storage depends on the length of non-use and storage conditions. In addition to performing the reverse of the procedure, note the following:

1. Make sure the brakes, accelarator, controller and motor stop switch work properly before operating the EV. valuate the service intervals to determine which areas require service.
2. If the EV has been in storage for longer than four months, charge the battery first，and thoroughly check the battery, if one or some battery are failed, must change the full set of battery。
3. When change the controller, paste the thermally conductive silicone grease between the controller and radiator plate.
4. After the maintenance, to paste the “conductive paste on battery.

TROVBLESHOOTING

Diagnose electrical and mechanical problems by following an orderly procedure and remembering the basic operating requirements



By following a systematic approach, the possibility of unnecessary parts replacement can be avoid, always start with the simple and most obvious checks when troubleshooting, This would include the Fuse, Fault code and Various electrical switches, fuel vale position and spark plug cap tightness

Proper maintenance as described in Chapter Three reduces the necessity for troubleshooting. Even with the best of care, however, the EV may develop problems that require trouble shooting.

If the problem cannot be solved. Stop and evaluate all conditions prior to the problem. If the EV must be taken to a repair facility, the mechanic will want to know as many details as possible.

For removal, installation and test procedures for some components, refer to the specific chapter. When applicable, tables at the end of each chapter also provide specifications and service limits.

ELECTRICAL TESTING

This section describes basic electrical testing and test equipment use.

Preliminary Checks and Precautions

Refer to the color wiring diagrams at the end of the manual for component and connector identification; Use the wiring diagrams to determine how the circuit should work by tracing the current paths from the power source through the circuit components to ground. Also, check any circuits that share the same fuse (if used), ground or switch. If the other circuits work properly and the shared wiring is good, the cause must be in the wiring used only by the suspect circuit. If all related circuits are faulty at the same time, the probable cause is a poor ground connection or a blown fuse (if used).

As with all troubleshooting procedures, analyze typical symptoms in a systematic manner. Never assume any thing and do not overlook the obvious like a blown fuse or an electrical connector that has separated. Test the simplest and most obvious items first and try to make tests at easily accessible points on the EV.

Before starting any electrical troubleshooting, perform the following:

1. Check the fuse if the fuse is blown, replace it.
2. Inspect the battery. Make sure it is fully charged, and the battery leads are clean and securely attached to the battery terminals.
3. Disconnect each electrical connector in the suspect circuit and make sure there are no bent terminals in the electrical connector
4. Make sure the terminals on the end of each wire are pushed all the way into the connector. If not. Carefully push them in with a narrow blade screwdriver
5. Check the wires where they connect to the terminals for damage
6. Make sure all terminals within the connector are clean and free of corrosion. Clean them. If necessary. And pack the connectors with dielectric grease
7. Push the connectors with dielectric grease. The connectors are fully engaged and locked together
8. Never pull the electrical wires when disconnecting an electrical connector-pull only on the connector

Intermittent Problems

Intermittent problems are problems that do not occur all the time and can be difficult to locate. For example. When a problem only occurs when the EV is ridden over rough roads (vibration) or in wet conditions (water penetration). It is intermit-ten. To locate and repair intermittent problems. Simulate the condition when testing the compo-nets. Note the following:

1. Vibration---This is a common problem with loose or damaged electrical connectors
   a. Perform a continuity test as described in the appropriate service procedure. Or under *Continuity Test* in this section

b. Lightly pull or wiggle the connectors while repeating the test. Do the same when checking the wiring harness and individual components. especially where the wires enter a housing or connector

c. A change in meter readings indicates a poor connection. Fine and repair the problem or replace the part. Check for wires with cracked or broken insulation

NOTE

An analog ohmmeter is useful when making this type of test. Slight needle movements are apparent when indicating a loose connection

2. Heat – This is another common problem with connectors or plugs that have loose or poor connections. As these connections heat up. The connection or joint expands and separates. Causing an open circuit. Other heat related problem occur when a component creates its own heat as it starts to fail or go bad

   a. Troubleshoot the problem to help isolate the problem or area

   b. To check a connector. Perform a continuity test as described in the appropriate service procedure. Or under *Continuity test* in this chapter. Then repeat the test while heating the ground. If the lamp comes on. The problem is the connection between the lamp and Connector with a heat gun or hair dryer. If the meter reading was normal (continuity) when the connector was cold, then fluctuated or read infinity when heat was applied, the connection is bad.

c. To check a component, wait until the engine is clod, then start and run the engine. Note operational differences when the engine is cold and hot.

d. If the engine does not start, isolate and remove the component. First test it at room temperature, and then after heating it with a hair dryer. A change in meter readings indicates a temperature problem.

CAUTION

A heat gun or hair dryer will quickly raise the heat of the component being tested. Do not apply heat directly to the ICM or use heat in excess of 60℃ (140℉) on any electrical component. If available, monitor heat with an infrared thermometer.

3. Water—when this problem occurs in wet conditions, or in areas with high humidity, start and run the engine in a dry area. Then, with the engine running, spray water related problems repair themselves after the component becomes hot enough to dry itself.

Electrical Component Replacement

Most EV dealerships and parts suppliers will not accept the return of any electrical part. If you cannot determine the exact cause of any electrical system malfunction. If you purchase a new electrical component(s), install it, and then find that the system still does not work properly, you will probably be unable to return the unit for a refund.

Consider any test results carefully before replacing a component that teats only slightly out of specification, especially resistance. A number of variables can affect test results dramatically. These include: the testing meter's internal circuitry, ambient temperature and conditions under which the

machine has been operated. All instructions and specifications have been for accuracy: however. Successful test results depend to a great degree upon individual accuracy.

Test Equipment

A test light can be constructed from a 12-volt light bulb with a pair of test leads carefully soldered to the bulb. To check for battery voltage in a circuit, attach one lead to ground and the other lead to various points along the circuit. The bulb lights when battery voltage is present.

A voltmeter is used in the same manner as the test light to find out if battery voltage is present in any given circuit. The voltmeter, unlike the test light, also indicates how much voltage is present at each test point. When using a voltmeter, attach the positive lead to the component or wire to be checked and the negative lead to a good ground.

Ammeter

An ammeter measures the flow of current (amps) in a circuit when connected in series in a circuit, the ammeter determines if current is flowing through the circuit and if that current flow is excessive because of a short in the circuit. Current flow is often referred to as current draw. Comparing actual current draw in the circuit or component to the manufacturer's specified current draw provides useful diagnostic information.

Self-powered Test Light

A self-powered test light can be constructed from a 12-volt light bulb, a pair of test leads and a 12-volt battery. When the test leads are touched together, the light bulb should go on.

Use a self-powered test light as follows:

1. Touch the test leads together to make sure the light bulb goes on. If not, correct the problem before using it in a test procedure.
2. Select two points within the circuit where there should be continuity.
3. Attach one lead of the self-powered test light to each point.
4. If there is continuity, the self-powered test light bulb will come on.
5. If there is on continuity, the self-powered test light bulb will not come on, indicating an open circuit.

Ohmmeter

An ohmmeter measures the resistance (in ohms) to current flow in a circuit or component. Like the self-powered test light, an ohmmeter contains its own power source and should not be connected to a live circuit.

Ohmmeter may be analog type (needle scale) or digital type (LCD or LED readout). Both types of ohmmeter have a switch that allows the user to select different ranges of resistance for accurate readings. The analog ohmmeter also has a set-adjust control which is used to zero or calibrate the meter (digital ohmmeters do not require calibration).

An ohmmeter is used by connecting its test leads to the terminals or leads of the circuit or component to be tested. If an analog meter id used, is must be calibrated by touching the teat leads together and turning the set-adjust knob until the meter needle reads zero. When the leads are

uncrossed, the needle reads zero. When the leads are uncrossed, the needle should move to the other end of the scale indicating infinite resistance.

During a continuity test, a reading of infinity indicates that there is an open in the circuit or component. A reading of zero indicates continuity, that is, there is no measurable resistance in the meter needle falls between these two ends of the scale, this indicates the actual resistance, multiply the meter reading by the ohmmeter scale. For example, a meter reading of 5 multiplied by the R×100 scale is 5000 ohms of resistance.

CAUTION

Never connect an ohmmeter to a circuit which has power applied to it. Always disconnect the battery negative lead before using an ohmmeter.

Jumper Wire

A jumper wire is a simple way to bypass a potential problem and isolate it to a particular point in a circuit. If a faulty circuit works properly with a jumper wire installed, an open exists between the two jumper points in the circuit.

To troubleshoot with a jumper wire, fist use the wire to determine if the problem is on the ground side or the load side of a device. Test the ground by connecting a jumper between the lamp and a good ground. If the lamp does not come on with the jumper installed. The lamp's connection to ground is good so the problem is between the lamp and the power source.

To isolate the problem. Connect the jumper between the battery and the lamp. If it comes on. The problem is between these two points. Next. Connect the jumper between the battery and the fuse side of the switch. If the lamp comes on. The switch is good. By successively moving the jumper from one point to another. The problem can be isolated to a particular place in the circuit

Pay attention to the following when using a jumper wire:

1. Make sure the jumper wore gauge (thickness) is the same as that used in the circuit being tested. Smaller gauge wire will rapidly overheat and could melt
2. Install insulated boots over alligator clips. This prevents accidental grounding. Sparks or possible shock when working in cramped quarters
3. Jumper wires are temporary test measures only. Do not leave a jumper wire installed as a permanent solution. This creates a severe fire hazard that could easily lead to complete loss off the motorcycle
4. When using a jumper wire always install an inline fuse/fuse holder (available at most auto supply stores or electronic supply stores) to the jumper wire. Never use a jumper wire across any load (a component that is connected and turned on). This would result in a direct short and will blow the fuse(s)

Test Procedures

Voltage Test

Unless otherwise specified. Make all voltage tests with the electrical connectors still connected. Insert the test leads into the backside of the connector and make sure the test lead touches the

electrical wire or metal terminal within the connector housing. If the test lead only touches the wire insulation. There will be a false treading

Always check both sides of the connector as one side may be loose or corroded. Thus preventing electrical flow through the connector. This type of test can be performed with a test or a voltmeter. A voltmeter gives the best results

NOTE

If using a test light. It does not make any difference which test lead is attached to ground

1. Attach the voltmeter negative test lead to a good ground (bare metal). Make sure the part used for ground is not insulated with a rubber gasket or rubber grommet
2. Attach the voltmeter positive test lead to the point to be tested
3. Turn the ignition switch on. If using a test light. The test light will come on if voltage is present. If using a voltmeter. Note the voltage reading. The reading should be within I volt of battery voltage. If the voltage is less. There is a problem in the circuit

Voltage Drop Test

The wires. Cables. Connectors and switches in an electrical circuit are designed to carry current with low resistance. This endures that current can flow through the circuit with a minimum loss of voltage. Voltage drop indicates where there is resistance in a circuit. A higher than normal amount of resistance in a circuit decreases the flow of current and cause the voltage to drop between the source and destination in the circuit.

Because resistance causes voltage to drop. A voltmeter is used to measure voltage drop when current is running through the circuit. If the circuit has no resistance. There is no voltage drop so the voltmeter indicates 0 volts. The greater the resistance in a circuit. The greater the voltage drop reading.

To perform a voltage drop:

1. Connect the positive meter test lead to the electrical source (where electricity is coming from).
2. Connect the voltmeter negative test lead to the electrical load (where the electricity is going).
3. If necessary, activate the component(s) in the circuit. For example. If checking the voltage in the starter circuit, it would be necessary to push the starter button.
4. Read the voltage drop (difference in voltage between the source and destination) on the voltmeter. Note the following:
   a. The voltmeter should indicate 0 volts. If there is a drop of 0.5 volts or more. There is a problem within the circuit. A voltage drop reading of 12 volts indicates an open in the circuit.
   b. A voltage drop of 1 or more volts indicates that a circuit has excessive resistance.
   c. For example, consider a starting problem where the battery is fully charged but the starter motor turns over slowly. Voltage drop would be the difference in the voltage at the batter (source) and the voltage at the starter (destination) as the engine is being started (current is flowing through the batter cables). A corroded battery cable would cause a high voltage drop (high resistance) and slow engine cranking.
   d. Common sources of voltage drop are loose or contaminated connectors and poor ground

connections.

Peak Voltage Test

Peak voltage tests check the voltage output of the ignition coil and ignition pulse generator at normal cranking speed. These tests make it possible to identify ignition system problems quickly and accurately.

Peak voltage tests require a peak voltage adapter or tester. See Chapter Ten, Ignition System Testing.

Continuity Test

A continuity test is used to determine the integrity of a circuit, wire or component. A circuit has continuity if it forms a complete circuit, that is, if there are no opens in either the electrical wires or components within the circuit. A circuit with an open. On the other hand, has no continuity.

This type of test can be performed with a self-powered test light or an ohmmeter. An ohmmeter gives the best results. If using an analog ohmmeter, calibrate the meter by touching the leads together and turning the calibration knob until the meter reads zero.

1. Disconnect the negative battery cable.
2. Attach one test lead (test light or ohmmeter) to one end of the part of the circuit to be tested.
3. Attach the other test lead to the other end of the part or the circuit to be tested.
4. The self-powered test lead comes on if there is continuity. An ohmmeter reads 0 or very low resistance if there is continuity. A reading of infinite resistance if there is continuity. A reading of infinite resistance indicates no continuity, the circuit is open.

Testing for A Short With A Self-Powered Test Light or Ohmmeter

1. Disconnect the negative battery cable.
2. Remove the blown fuse.
3. Connect one test lead of the test light or ohmmeter to the load side (battery side) of the fuse terminal in the starter relay.
4. Connect the other test lead to a good ground (bare metal). Make sure the part used for a ground is not insulated with a rubber gasket or rubber grommet.
5. With the self-powered test light or ohmmeter attached to the fuse terminal and ground, wiggle the wiring harness relating to the suspect circuit at various intervals. Start next to the fuse terminals and work away from the fuse terminal. Watch the self-powered test light or ohmmeter while progressing along the harness.
6. If the test light blinks or the needle on the ohmmeter moves, there is a short-to-ground at that point in the harness.

Testing for A Short With A Test Light or Voltmeter

1. Remove the blown fuse.
2. Connect the test light or voltmeter across the fuse terminals in the starter relay. Turn the ignition switch ON and check for battery voltage.

3. With the test light or voltmeter attached to the fuse terminals, wiggle the wiring harness relating to the suspect circuit at various intervals. Start next to the fuse terminal a work systematically away from the fuse terminal. Watch the test light or voltmeter while progressing along the harness.
4. If the test light blinks or if the needle on the voltmeter moves, there is a short-to-ground at that point in the harness.

BRAKE SYSTEM

The front and rear brake units are critical to riding performance and safety. Inspect the front and rear brakes frequently and repair any problem immediately. When replacing or refilling the brake fluid, use only DOT 4 brake fluid from a closed container.

Always check the brake operation before riding the motorcycle.

Soft or Spongy Brake Lever or Pedal

Operate the front brake lever or rear brake pedal and check to see if the lever travel distance increases. If the lever travel does increase while being operated, or feels soft or spongy, there may be air in the brake line. In this condition, the brake system is not capable of producing sufficient brake force. When there is an increase in lever or pedal travel or when the brake feels soft or spongy, check the following possible causes:

1. Air in system.

WARNING

If the fluid level drops too low, air can enter the hydraulic system through the master cylinder. Air can also enter the system from loose or damaged hose fittings. Air in the hydraulic system causes a soft or spongy brake lever action. This condition is noticeable and reduces brake performance. When it is suspected that air has entered the hydraulic system, flush the brake system and bleed the brakes as described in Chapter Fifteen.

2. Low brake fluid level.

WARNING

As the brake pads wear, the brake fluid level in the master cylinder reservoir drops. Whenever adding brake fluid to the reservoir, visually check the brake pads for wear. If it does not appear that there is an increase in pad wear, check the brake hoses, lines and banjo bolts for leaks.

3. Leak in the brake system.
4. Contaminated brake fluid.
5. Plugged brake fluid passages.
6. Damaged brake lever or pedal assembly.

7. Worn or damaged brake pads.
8. Warped brake disc.
9. Contaminated brake pads and disc.

WARNING

A leaking fork seal can allow oil to contaminate the brake pads and disc.

10. Worn or damaged master cylinder cups and/or cylinder bore.
11. Worn or damaged brake caliper piston seals.
12. Contaminated master cylinder assembly.
13. Contaminated brake caliper assembly.
14. Brake caliper not sliding correctly on slide pins.
15. Sticking master cylinder piston assembly.
16. Sticking brake caliper pistons.

Brake Drag

When the brakes drag, the brake pads are not capable of moving away from the brake disc when the brake lever or pedal is released. Any of the following causes, if they occur, would prevent correct brake pad movement and cause brake drag.

1. Warped or damaged brake disc.
2. Brake caliper not sliding correctly on slide pins.
3. Sticking or damaged brake caliper pistons.
4. Contaminated brake pads and disc.
5. Plugged master cylinder port.
6. Contaminated brake fluid and hydraulic passages.
7. Restricted brake hose joint.
8. Loose brake disc mounting bolts.
9. Damaged or misaligned wheel.
10. Incorrect wheel alignment.
11. Incorrectly installed brake caliper.
12. Damaged front or rear wheel.

Hard Brake Lever or Pedal Operation

When applying the brakes and there is sufficient brake performance but the operation of brake lever feels excessively hard, check for the following possible causes:

1. Clogged brake hydraulic system.
2. Sticking caliper piston.
3. Sticking master cylinder piston.
4. Glazed or worn brake pads.
5. Mismatched brake pads.
6. Damaged front brake lever.
7. Damaged rear brake pedal.
8. Brake caliper not sliding correctly on slide pins.

9. Worn or damaged brake caliper seals.

Brake Grabs

1. Damaged brake pad pin bolt. Look for steps or cracks along the pad pin bolt surface.
2. Contaminated brake pads and disc.
3. Incorrect wheel alignment.
4. Warped brake disc.
5. Loose brake disc mounting bolts.
6. Brake caliper not sliding correctly on slide pins.
7. Mismatched brake pads.
8. Damaged wheel bearings.

Brake Squeal or Chatter

1. Contaminated brake pads and disc.
2. Incorrectly installed brake caliper.
3. Warped brake disc.
4. Incorrect wheel alignment.
5. Mismatched brake pads.
6. Incorrectly installed brake pads.
7. Damaged or missing brake pad spring or pad retainer.

Leaking Brake Caliper

1. Damaged dust and piston seals.
2. Damaged cylinder bore.
3. Loose caliper body bolts.
4. Loose banjo bolt.
5. Damaged banjo bolt washers.
6. Damaged banjo bolt threads in caliper body.

Leaking Master Cylinder

1. Damaged piston secondary seal.
2. Damaged piston snap ring/ snap ring groove.
3. Worn or damaged master cylinder bore.
4. Loose banjo bolt washers.
5. Damaged banjo bolt washers.
6. Damaged banjo bolt threads in master cylinder body.
7. Loose or damaged reservoir cap.

SPECIFICATIONS

HOW TO CONVERSION TABLE OF UNIT

（1）How to use conversion table

All the specified documents in this manual are taken SI and Metric as unit. With the following conversion table, metric unit could be conversed into imperial unit.

Sample:

METRIC	MULTIPLY	IMPERIAL
mm	0.03937	=in
2mm ×	0.03937	=0.08in

Conversion table

Conversion between metric and imperial			
	Know unit	Multiply	Product
Torque	m·kg	7.233	ft·lb
	m·kg	86.794	in·lb
	cm·kg	0.0723	ft·lb
	cm·kg	0.8679	in·lb
Weight	kg	2.205	lb
	g	0.03527	oz
Length	km/hr	0.6214	mph
	km	0.6214	mi
	m	3.281	ft
	m	1.094	yd
	cm	0.3937	in
	mm	0.03937	in
Volume/capacity	cc（cm^3）	0.03527	oz（IMP liq.）
	cc（cm^3）	0.06102	cu·in
	lit（liter）	0.8799	qt（IMP liq.）
	lit（liter）	0.2199	gal（IMP liq.）
Others	kg/mm	55.997	lb/in
	kg/cm^2	14.2234	psi（lb/in^2）
	Centigrade	9/5（℃）+32	Fahrenheit（°F）

（2）Definition of unit

Unit	Read	Definition	Measurement
mm	Millimetre	1 mm=10^{-3}Meter	Length
cm	Centimetre	1 cm =10^{-2}Meter	Length
kg	Kilogram	1 kg =10^3Gram	Weight
N	Newton	1N=1 kg×meter/$second^2$	Force
N.m	Newton meter	1 Nm=1Newton×1meter	Torque
kgf.m	Meter Kilogram	1 kgf.m =1Meter×1kgf	Torque
Pa	Pascal	1 Pa=1Newton/$1meter^2$	Pressure
N/mm	Newton per millimeter	1 N/mm =1Newton/ millimeter	Rigid of spring
L	Litre	—	Volume of capacity
cm^3	Cubic centimeter		
r/min	Revolutions per minute	—	Rotational speed

VEHICLE SPECIFICATIONS

Item	Standard
Dimensions:	
Overall length	2,800mm (110.23 in)
Overall width	1,615mm（63.58 in）
Overall height	1,850mm（72.83 in）
Seat height	860mm（33.85 in）
Wheelbase	1,850mm（72.83 in）
Minimum ground clearance	260mm（10.24 in）
Minimum turning radius	3,420mm (134.64 in)
Basic weight:	824kg (1816.6 lbs)
Max. speed:	25 MPH (40.2 km/h)
Motor:	
Model	YDQ5-4-11151
Motor type	AC induction motor
Power	5Kw
Rated torque	3630rpm
Voltage	33V
Capacity	125A
频率	125.6Hz
Cooling mechanism	Air
Controller：	
Model	450 - Amp Sevcon GEN4 controller with multi-mode driving and regenerative braking
On-board charger:	
Model	Delta Q 120-volt AC input; 48-volt DC output
Transmission:	
Main gear case	Direct drive with low-noise gears
Gear Shift	Electronic Gear Select H/M/L
Gearbox Transmission Ratio	14.14
Rear Bridge Transmission Ratio	3.7
Front Bridge Transmission Ratio	3.7
Gear shift system	F, N, R gears driven by direction of electric motor
Chassis	
Frame type	Steel tube frame
Trail	26.0mm（1.02 in）
Toe-in	8～18 mm （0.31～0.71 in）

SPECIFICATIONS

Item		Standard
Tire		
Type		Tubeless
Size	Front	26×9-14 6PR
	Rear	26×11-14 6PR
Pressure of front wheel		20psi (138kPa)
Pressure of rear wheel		20psi (138kPa)
Brake		
Front brake	Type	Hydraulic disc brake
	Operation	Foot operation
Rear brake	Type	Hydraulic disc brake
	Operation	Foot operation
Suspension		
Front suspension		Independent, Dual A-arm type
Rear suspension		Independent, Dual A-arm type
Shock absorber		
Front shock absorber		Coil spring/airbag damping
Rear shock absorber		Coil spring/airbag damping
Wheel travel		
Front wheel travel		160mm (6.30 in) (min) /235mm (9.25 in) (max)
Rear wheel travel		180mm (7.09 in) (min) /235mm (9.25 in) (max)
Headlight type		HS1
Bulb wattage×quantity		
Headlight		12V，35W/35W × 2
Front Position Lamp		12V，0.5W（LED）
Front direction indicator		12V，0.7 W（LED）
Rear direction indicator		12V，0.75W（LED）
Rear position lamp		12V，0.5W（LED）
Brake Lamp		12V，1W （LED）
Neutral		LED
Reverse		LCD screen
Coolant temperature		LCD screen，Code display
Parking brake		LED
Four-wheel drive		LCD screen
Differential gear lock		LCD screen

CHASSIS SPECIFICATIONS

Item		Standard	Limit
Steering system			
Type		Rack and pinion	----
Front suspension			
Shock absorber travel		140 mm (5.51 in)	----
Spring free length		294 mm (11.57 in)	----
Spring rate		19.04N/mm(1.94kg/mm)	----
Stroke		30-140 mm (1.18 ~ 5.51in)	----
Rear suspension			
Shock absorber travel		140 mm (5.51 in)	----
Spring free length		168mm (6.61 in)	----
Spring rate		39.15N/mm (3.99 kg/mm)	----
		62.5N/mm (6.37 kg/mm)	----
Stroke		30 ~ 88 mm (1.18 ~ 3.46in)	----
		88 ~ 140mm (3.46 ~ 5.51 in)	----

Front wheel			
Type		Aluminum Alloy wheel	----
Rim size		12×6 AT (min) /14×7 AT (max)	----
Rim material		A356	----
Rim runout limit	radial	----	1.0 mm (0.04in)
	lateral	----	1.0 mm (0.04 in)
Rear wheel			
Type		Aluminum Alloy wheel	----
Rim size		12×8 AT(min) /14×9 AT (max)	----
Rim material		A356	----
Rim runout limit	radial	----	2.0 mm (0.08 in)
	lateral	----	2.0 mm (0.08 in)
Brake lever and brake pedal			
Accelerator pedal free play		2 ~ 3mm (0.079 ~ 0.118 in)	----
Brake pedal free play		2 ~ 3mm (0.079 ~ 0.118 in)	----
Parking brake cable free play		2 ~ 3 mm (0.079 ~ 0.118 in)	----

SPECIFICATIONS

Item	Standard	Limit
Front disc brake		
Type	Dual	----
Disc outside diameter × thickness	200× 3.5 mm (7.87 × 0.14 in)	----
Pad thickness inner	6.0 mm (0.24 in)	----
Pad thickness outer	6.0 mm (0.24 in)	----
Master cylinder inside diameter	19.0mm (0.75in)	----
Caliper cylinder inside diameter	25.0mm （1.57in）	----
Brake fluid type	DOT 3	----
Rear disc brake		
Type	Dual	----
Disc outside diameter × thickness	183×4 mm (7.20× 0.16in)	----
Pad thickness inner	6.0 mm (0.24 in)	----
Pad thickness outer	6.0 mm (0.24 in)	----
Master cylinder inside diameter	19.0mm (0.75in)	----
Caliper cylinder inside diameter	22.6mm （0.89in）	----
Brake fluid type	DOT 3	----

12V SYSTEM ELECTRICAL SPECIFICATIONS

Item	Standard	Limit
Voltage	12 V	----
Battery		
Specific gravity	1.32，18Ah	----
Power supply		
DC-DC	FDC-LV-13V8-AL	----
Output	13.8V/500W	
Circuit breaker		
Type	Fuse	----
Lighting system fuse	15 A×1	
Instrument insurance	15 A×1	----
Auxiliary DC jack fuse 、horn、	15 A×1	----
Four-wheel drive fuse		----
绞盘保险	10A×1	----
Instrument often energized	5A×1	----
insurance		----
Signaling system fuse	10 A×1	
Backup fuse(odometer)	5 A×1	
	10 A×1	
	15 A×1	

48V SYSTEM ELECTRICAL SPECIFICATIONS

Item	Standard	Limit
Controller parameter3		----
Working voltage	48 VDC	
Voltage range	36V-48VDC	
PWM frequency	15KHz	
Overvoltage protective voltage	69.6V	
low-voltage protective voltage	49.3V	
Pulling motor current limit	380A	
overheat protective temperature	85℃	
low-temperature	-30℃	
protective temperature	-40℃ to -30℃，80℃ to 90℃	
Battery parameter		
Rated voltage	6 V ×8	----
Rated capacity	260Ah/220Ah	----
Specific gravity	1.2875	
Motor parameter		
Rated volt	33V	----
Rated power	5.5KW	
Maximum power	13.7KW	
Current rating	114A	
Rated speed	3630rpm	
Maximum power	7250rpm	
Rated torque	11N.m	
Maximum torque	125N.m	
Rated frequency	125.6Hz	
Protection class	IP55	
Duty	S2 60min	
Charger parameter		
Model	HK-H-48-25	
Rated input voltage	AC90V-AC265V	
Rated frequency	45-65Hz	
Rated Power	1.8KW	
Full load efficiency	≥93%	
Working temperature	-35℃~+85℃	
Structure	All-closed, have fan, natural air cooling	
Protection function	Input Over-voltage Protection, Input Under-voltage Protection, Output Over-voltage Protection, Output Under-voltage Protection, Output Over-current Protection, Over-temperature Protection, Short-circuit Protection,	

SPECIFICATIONS

Item	Standard	Limit
	Battery Reverse Connect Protection, Power-off Protection.	
DC/DC		
Model	FDC-LV-13V8-AL	
Rated input voltage	30-100V	
Peak current	46A	
Rated Power	500W	
Output voltage	13.8V	
Full load efficiency	≥90%	
Working Temperature	-40℃~+60℃	
Protection class	IP67	
Protection function	Input Over-voltage Protection, Input Under-voltage Protection, Output Over-voltage Protection, Output Over-current Protection, Over-temperature Protection, Short-circuit Protection.	
Protection Item	Standard	Limit
Structure	non-output opposing connection All-closed, no fan, natural air cooling	
Circuit breaker		
Type	Fuse	----
Controller's main fuse	425A	
Cable's main fuse	30A	

LUBRICATION PIONTS AND LUBRICANT TYPES

CHASSIS

Lubrication points	Lubricant
Lip of oil seal (full)	Light lithium-base grease
o-ring(full)	Light lithium-base grease
Steering shaft (upper end ,lower end)	Light lithium-base grease
Ball connection of steering pushing rod	Light lithium-base grease
Front wheel fork(ball-shaped joint)	Light lithium-base grease
Front wheel bearing	Grease used for bearing
Front & rear brake	Light lithium-base grease
Dust-proof ring of brake	Light lithium-base grease
Joint of front brake cable	Light lithium-base grease
Front brake lever axle and rear brake lever axle	Light lithium-base grease
Adjusting nut and pin of front brake cable	Light lithium-base grease
Adjusting nut and pin of rear brake cable	Light lithium-base grease
Rear brake pedal pivot and brake pedal axle hole	Light lithium-base grease
Throttle rotating frame shaft and end section of throttle cable	Light lithium-base grease
Reverse gear lever pivot	Light lithium-base grease
Connection bolt of rear wheel fork and frame,rear wheel fork bearing	Light lithium-base grease
Rubber sleeve and rear wheel fork	Seal gum
Rear shock absorber bushing	Light lithium-base grease

MAINTENANCE AND ADJUSTMENT OF THE EV

NOTE:

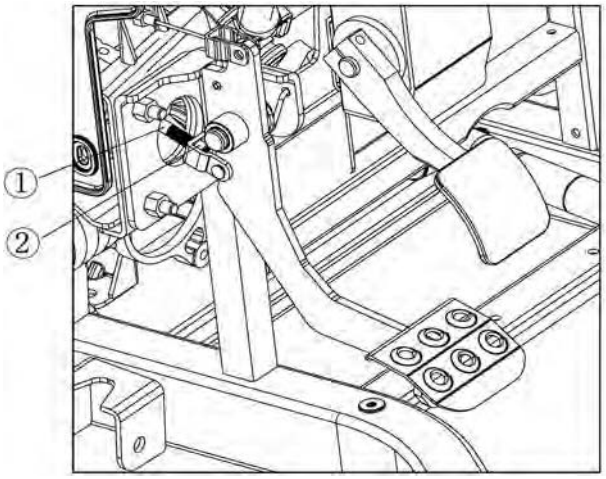
The correct maintenance and adjustment are necessary to ensure vehicle and normal driving
The repair personnel should be familiar with the contents of this article.

MAINTENANCE SCHEDULE

ITEM	ROUTINE	Whichever comes first ⇨		EVERY			INITAL	
			month	1	3	6	6	12
			km	320	1,200	2,400	2,400	4,800
			(mi)	(200)	(750)	(1,500)	(1,500)	(3,000)
			hours	20	75	150	150	300
Front brake*	• Check operation/ fluid leakage. • Correct if necessary.			○	○	○	○	○
Rear brake*	• Check operation. • Adjust if necessary.			○	○	○	○	○
Wheel	• Check balance/damage/ • Repair if necessary.			○		○	○	○
Front and rear suspension*	• Check operation. • Correct if necessary.					○		○
Wheel bearing*	• Check bearing assemblies for looseness /damage. • Replace if necessary.			○		○	○	○
Steering system*	• Check operation./Replace if damaged • check toe-in./Adjust if necessary.			○	○	○	○	○
Drive shaft universal joint*	• Lubricate with lithium–soap–based grease.					○	○	○
Axle boots*	• Check operation. • Replace if damaged.			○	○	○	○	○
Fittings and fasteners*	•Check all chassis fittings and fasteners. • Correct if necessary.			○	○	○	○	○
Transmission breather system*	• Check breather hose for cracks of damage. • Replace if necessary.					○	○	○
Final gear oil Differential gear oil	• Check oil level /oil leakage. • Replace			○				○
Lights and switches*	• Check operation. • Adjust headlight beams.			○	○	○	○	○

NOTE:

- **Recommended brake fluid: DOT 3**
- **Brake fluid replacement:**
- **When disassembling the master cylinder or caliper, replace the brake fluid. Normally check the brake fluid level and add fluid as required.**
- **On the inner parts of the master cylinder and caliper, replace the oil seals every two years.**
- **Replace the brake hoses every four years, or if cracked or damaged.**



ADJUSTING THE BRAKE PEDAL

1. Check:
   • brake pedal free play a Out of specification → adjust.

NOTE:

The end of the brake rod ① should lightly contact the brake master cylinder.

Brake pedal free play
0 mm (0.0 in)

2. Adjust:
   • brake pedal free play

a. Loosen the locknut ②

b. Turn brake rod ① in or out until the correct free play is obtained.

Turning in	**Free play is increased.**
Turning out	**Free play is decreased.**

c. Tighten the locknut to specification.

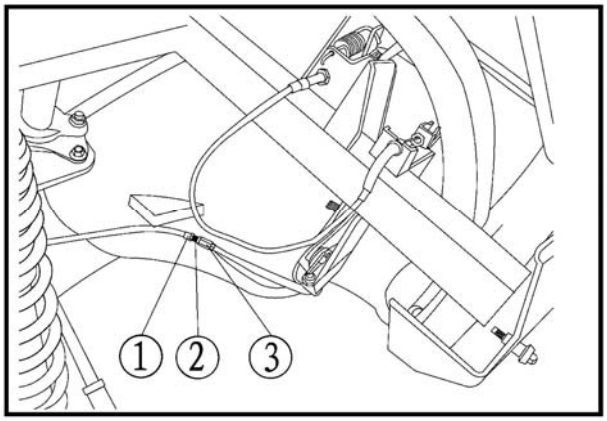
Locknut
17 Nm (1.7 m · kg, 12 ft · lb)

NOTE:

Make sure that there is no brake drag on the front or rear wheels.

ADJUSTING THE PARKING BRAKE

1. Shift the drive select lever into neutral gear.
2. Remove:
   • lift the hood up
   Refer to “SEATS” in chapter5
3. Check:
   • parking brake cable free play
   Out of specification → Adjust.。



Parking brake cable free play
2 ~ 3 mm (0.079 ~ 0.118 in)

4. Adjust:
   • parking brake cable free play

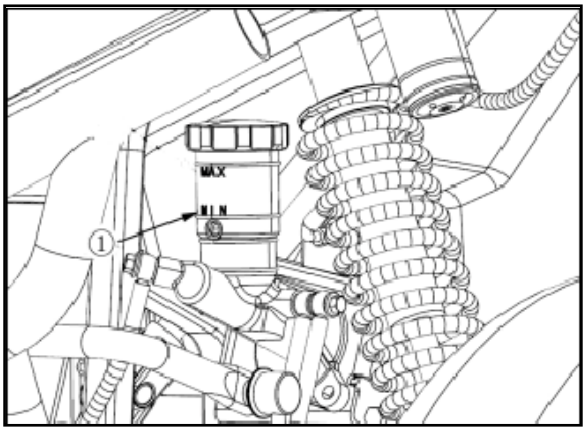
a. Pull back the adjuster cover ①.

b. Loosen the locknut ②.
c. Turn the adjuster ③ in or out until the correct free play is obtained.

Turning in	**Free play is increased.**
Turning out	**Free play is decreased.**

d. Tighten the locknut ②.
e. Slide the adjuster cover 1 to its original position.
5. Install:
• closed the hood

CHECKING THE BRAKE FLUID LEVEL



1. Place the vehicle on a level surface.

NOTE:

When checking the brake fluid level, make sure that the top of the brake fluid reservoir top is horizontal.

2. Lift the hood up.
3. Check:
brake fluid level Fluid level is under "MIN" level line ① ⟶ Fill up.

NOTE:

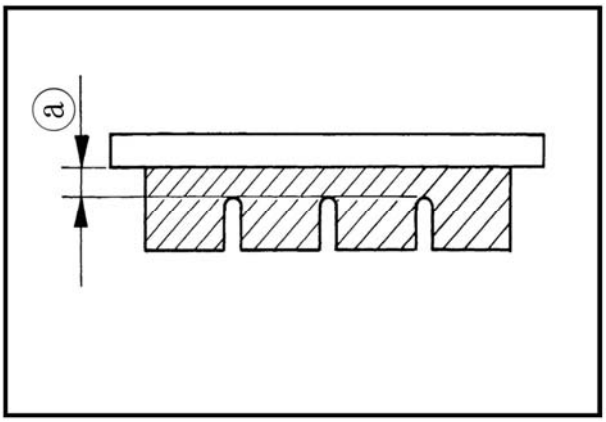
Brake fluid may erode painted surfaces or plastic parts. Always clean up spilled fluid immediately.

WARNING:

- ***Use only the designed quality brake fluid: otherwise, the rubber seals may deteriorate, causing leakage and poor brake performance.***
- ***Refill with the same type of brake fluid: mixing fluids may result in a harmful chemical reaction and lead to poor performance.***
- ***Be careful that water does not enter the master cylinder when refilling. Water will significantly lower the boiling point of the fluid and may result in a vapor lock.***

4. Close the hood.

CHECKING THE FRONT BRAKE PADS

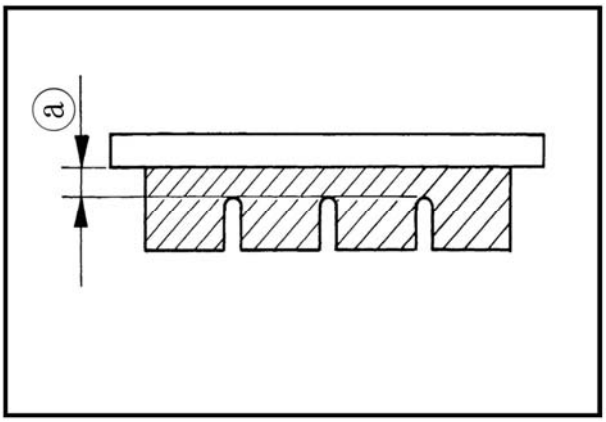


1. Remove:
   • front wheels
2. Check:
   • brake pads
   Wear indicator groove ⓐ almost disappeared
   Replace the brake pads as a set.

Brake pad wear limit ⓐ
1.5 mm (0.06 in)

3. Operate the brake pedal.
4. Install:
   • front wheels

CHECKING THE REAR BRAKE PADS



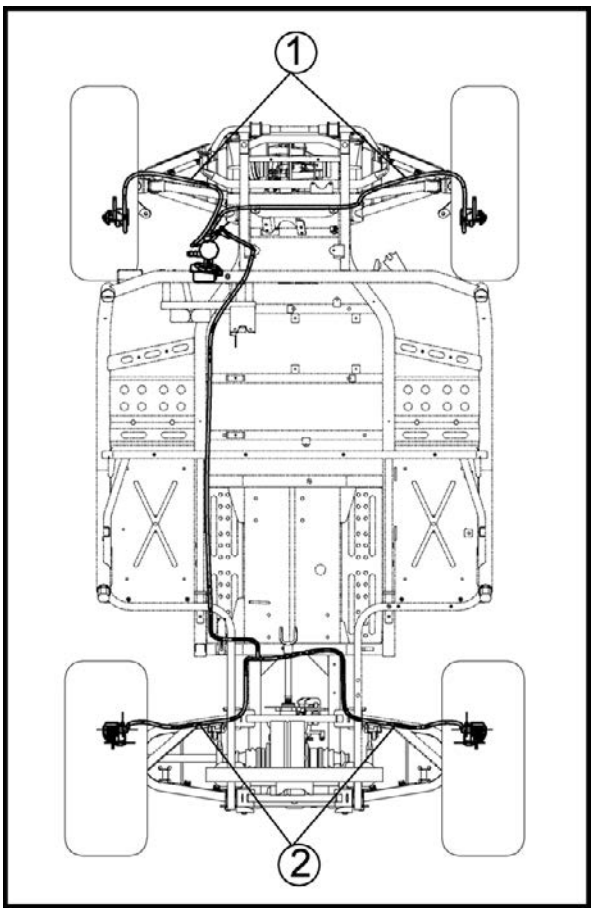
1. Check:
   • brake pads
   Wear indicator groove ⓐ almost disappeared
   Replace the brake pads as a set.
   Refer to “FRONT AND REAR BRAKES” in chapter 5.

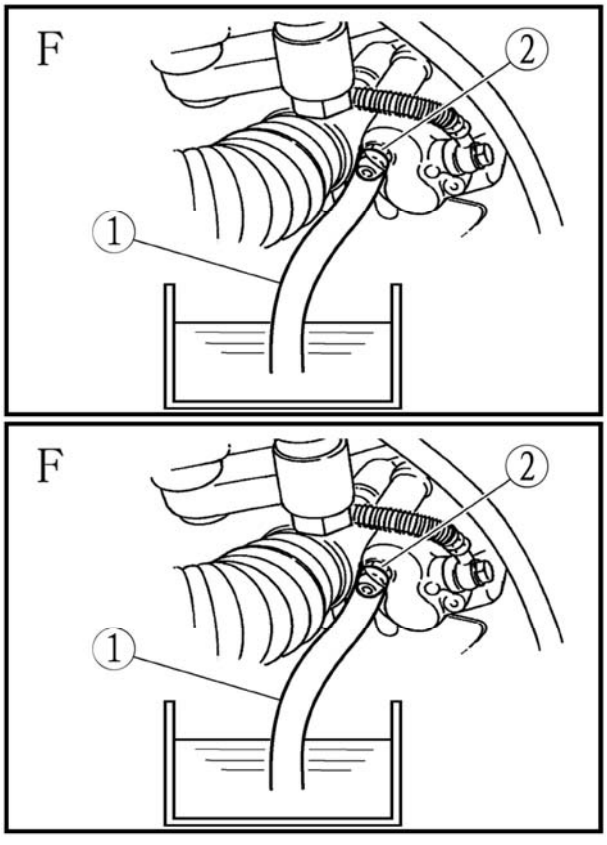
Brake pad wear limit ⓐ
1.5 mm (0.06 in)

1. Operate the brake pedal.

CHECKING THE BRAKE HOSES AND BRAKE PIPES

1. Remove:
   • seat
   • console
   Refer to “SEATS” in chapter 5
2. Lift the hood up.
3. Lift the cargo bed.
4. Check:
   • front brake hoses ①
   • rear brake hoses ②
   Cracks/wear/damage → Replace.
   Fluid leakage → Replace all damaged parts.





NOTE:

Hold the vehicle in an upright position and apply the brake pedal.

5. Install:
   - console
   - seat

BLEEDING THE HYDRAULIC BRAKE SYSTEM

WARNING:

Bleed the brake system if:

- ***The system has been disassembled.***
- ***A brake hose or brake pipe have been loosened or removed.***
- ***The brake fluid has been very low.***

The brake operation has been faulty. A loss of braking performance may occur if the brake system is not properly bled.

1. Bleed:
   - brake system

a. Add the proper brake fluid to the reservoir.
b. Install the diaphragm. Be careful not to spill any fluid or allow the reservoir to overflow.
c. Connect the clear plastic hose ① tightly to the caliper bleed screw ②.
   Ⓕ Front
   Ⓡ Rear
d. Place the other end of the hose into a container.
e. Slowly apply the brake pedal several times.
f. Push down on the pedal and hold it.
g. Loosen the bleed screw and allow the pedal to travel towards its limit.
h. Tighten the bleed screw when the pedal limit has been reached, then release the pedal.
i. Repeat steps (e) to (h) until all the air bubbles have disappeared from the fluid.
j. Tighten the bleed screw.

NOTE:

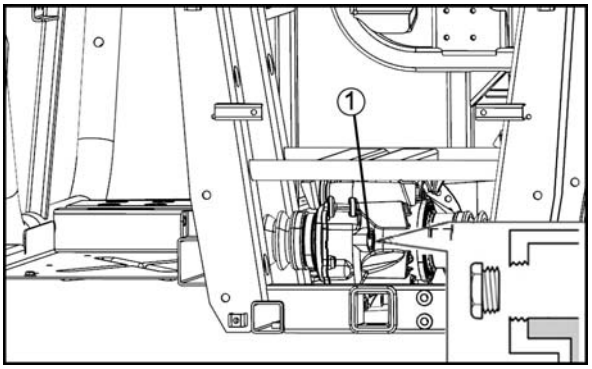
If bleeding is difficult, it may be necessary to let the brake fluid settle for a few hours. Repeat the bleeding procedure when the tiny bubbles in the system have disappeared.

k. Add brake fluid to the proper level.

WARNING:

Check the operation of the brake after bleeding the brake system.

CHECKING THE FINAL GEAR OIL LEVEL



1. Place the vehicle on a level surface.
2. Remove:
   • oil filler plug ①
3. Check:
   • oil level
   Oil level should be up to the brim of the hole.
   Oil level low → Add oil to the proper level.

Recommended oil
SAE 80 API "GL-4" Hypoid gear oil

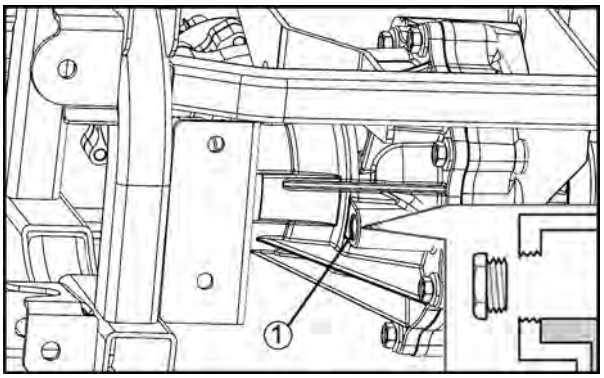
WARNING:

Take care not allow foreign material to enter the final gear case.

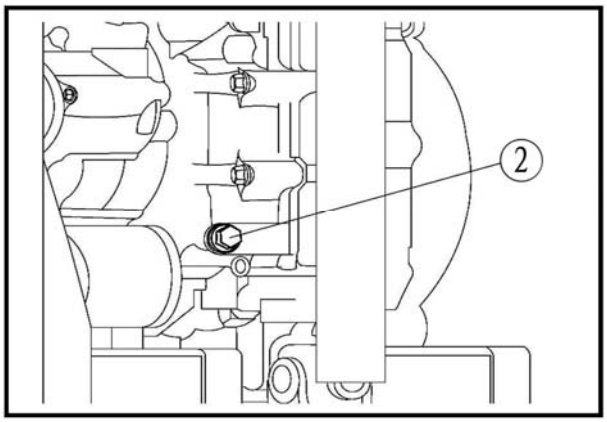
4. Install:
   • oil filler plug

Tightening torque
23 Nm (2.3 m·kgf, 16.3 ft·lbs)

CHANGING THE FINAL GEAR OIL



1. Place the vehicle on a level surface.
2. Place a container under the final gear case to collect the used oil.
3. Remove:
   • oil filler plug ①



• Final gear oil drain bolt ②
• Fill:
final gear case

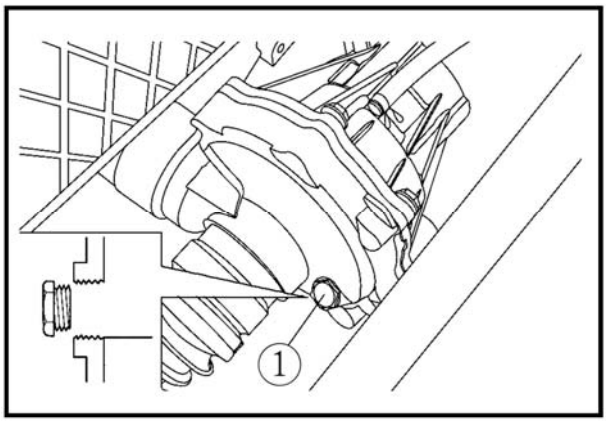
Periodic oil change
0.25 L (0.22 Imp qt)
Total amount
0.28 L (0.25 Imp qt)

WARNING :

Take care not to allow foreign material to enter the final gear case.

• Install:
oil filler plug and Final gear oil drain bolt

20 Nm (2.0 m·kgf, 14 ft·lbs)



CHECKING THE DIFFERENTIAL GEAR OIL

1. Place the vehicle on a level surface.
2. Remove:
Remove the differential gear oil filler bolt and check the oil level. It should be up to the brim of the filler hole. If the level is low, add sufficient oil of the recommended type to raise it to the specified level
• Differential gear oil drain bolt ①
3. Check:
• oil level
Oil level should be up to the brim of hole.
Oil level low → Add oil to proper level.

WARNING :

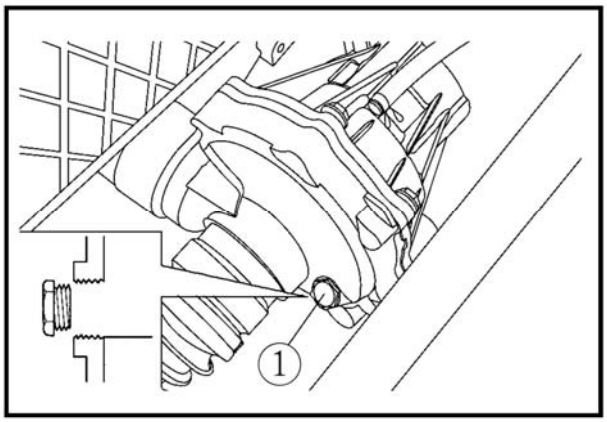
Take care not allow foreign material to enter the differential gear case.

4. Install:
• oil filler plug

23 Nm (2.3 m · kg, 17 ft · lb)

CHANGING THE DIFFERENTIAL GEAR OIL

1. Place the vehicle on a level surface.
2. Place a receptacle under the differential gear case.



3. Remove:
  • Differential gear oil drain bolt ①
2. Drain:
  • differential gear oil
5. Install:
  • drain plug

10 Nm (1.0 m · kg, 7.2 ft · lb)

NOTE:

Check the gasket (drain plug). If it is damaged, replace it with new one.

6. Fill:
  • differential gear case

Periodic oil change
0.25 L (0.22 Imp qt, 0.26 US qt)
Total amount
0.28L (0.25 Imp qt, 0.3 US qt)

NOTE:

If gear oil is filled to the brim of the oil filler hole, oil may start leaking from the differential gear case breather hose. Therefore, check the quantity of the oil, not its level.

WARNING :

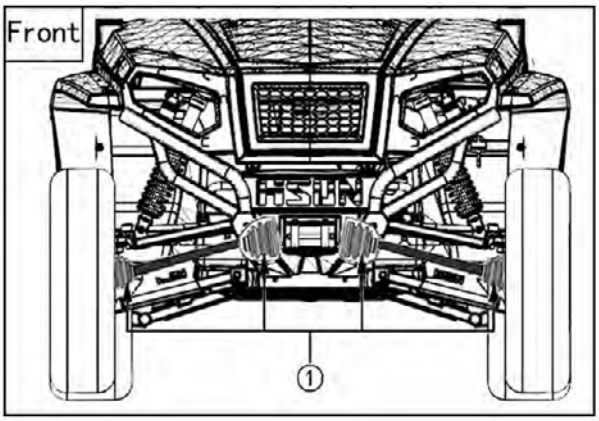
Take care not to allow foreign material to enter the differential gear case.

7. Install:
• oil filler plug

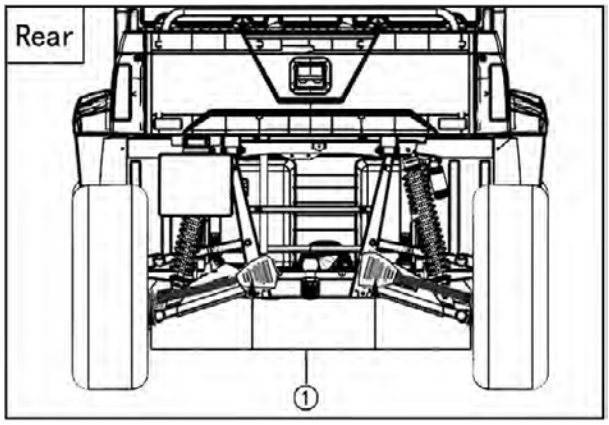
23 Nm (2.3 m · kg, 17 ft · lb)

CHECKING THE CONSTANT VELOCITY JOINT DUST BOOTS

1. Check:
 • dust boots ①
 Damage → Replace.
 Refer to "FRONT CONSTANT VELOCITY JOINTS," in chapter 5.



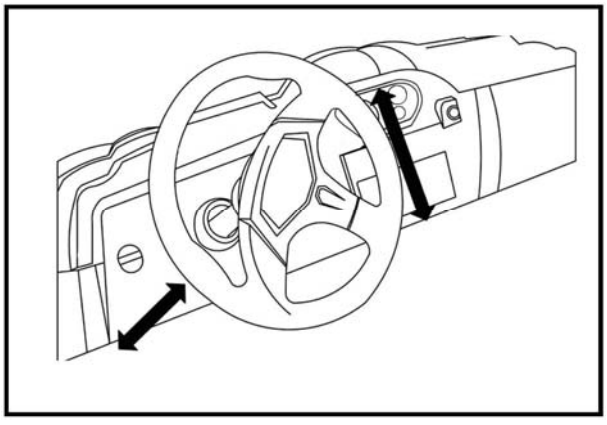
Ⓕ Front

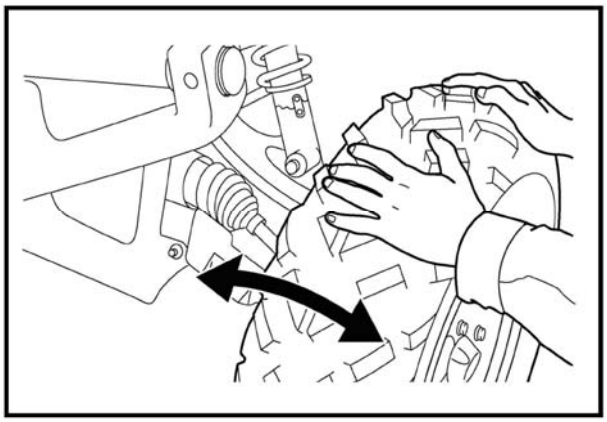


Ⓡ Rear

CHECKING THE STEERING SYSTEM

1. Check:
 Place the vehicle on a level surface.
 • steering assembly bearings Try to the steering wheel up and down, and back and forth.
 Excessive play → Replace the steering shaft assembly.
 • tie-rod ends
 Turn the steering wheel to the left and right until it stops completely, and then move the steering wheel slightly in the opposite direction. Tie-rod end (s) have vertical play → Replace the tie-rod end(s).
 • Raise the front end of the vehicle so that there





is no weight on the front wheels.

• Check:

Ball joints and/or wheel bearings Move the wheels laterally back and forth. Excessive free play → Replace the front arms (upper and lower) and/or wheel bearings.

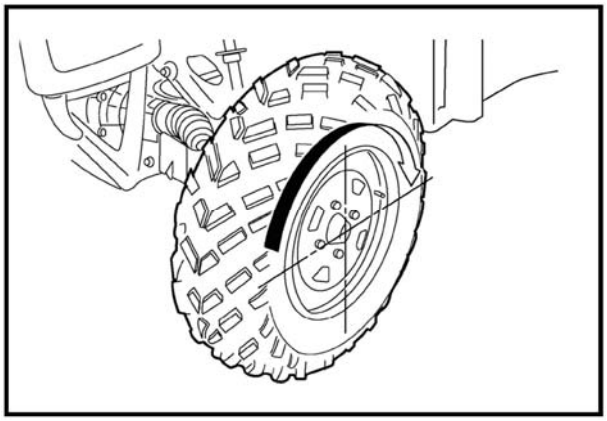
ADJUSTING THE TOE-IN

1. Place the vehicle on a level surface.
2. Measure:

• toe-in

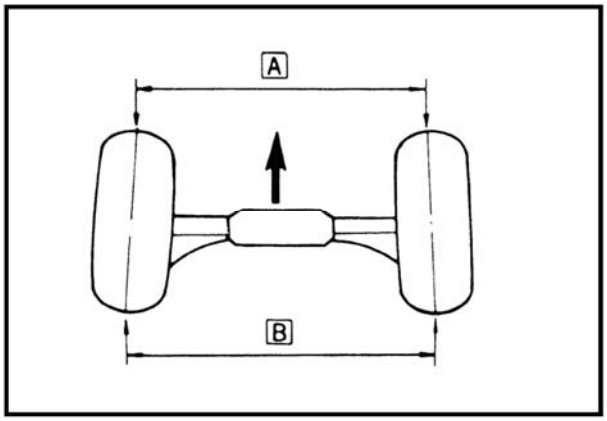
Out of specification → Adjust.

Toe-in
0 ~ 10 mm (0.00 ~ 0.39 in)
(with tires touching the ground)



NOTE:

Before measuring the toe-in, make sure that the tire pressure is correct.



a. Mark both front tire tread centers.
b. Face the steering wheel straight ahead.
c. Measure distance Ⓐ between the marks.
d. Rotate the front tires 180° until the marks are exactly opposite one another.
e. Measure distance Ⓑ between the marks.
f. Calculate the toe-in using the formula given below.

Toe-in=Ⓑ-Ⓐ

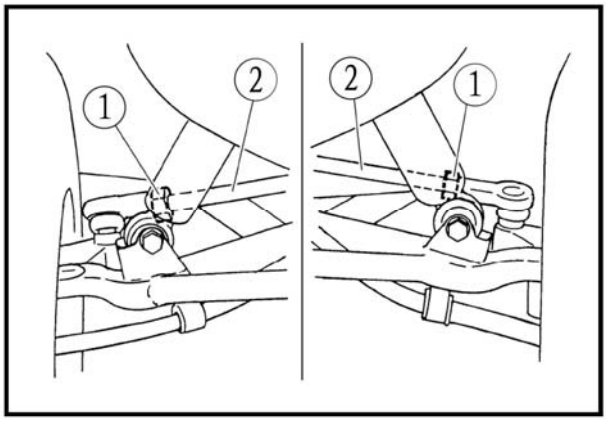
g. If the toe-in is incorrect, adjust it.
3. Adjust:

• toe-in

WARNING:

Make sure that left / right tension rods have turned the same turns . Otherwise the UTV will still go UTV left and right even though . Operate the UTV to go forward straightly with steering bar , easily causing to getting

out of contor and accident . After adjusting the toe-in correctly drive the UTV to move forward a span of distance by fastering the steering bar so as to make , sure if the Steering bar is pormal , if not , adjust the tension rod left or right within the specification .



a. Mark both tie-rods ends. This reference point will be needed during adjustment.
b. Loosen the locknut (tie-rod end) ① on each tie-rod.
c. The same number of turns should be given to both the right and left tie-rods ② until the specified toe-in is obtained. This is to keep the length of the rods the same.
d. Tighten the rod end locknut on each tie-rod.

Locknut (rod end)
40 Nm (4.0 m · kg, 29 ft · lb)

ADJUSTING THE FRONT AND REAR SHOCK ABSORBERS

WARNING :

These shock absorber assemblies contain highly pressurized nitrogen gas, read and understand the following information before handling the shock absorber assemblies.

• Do not tamper with or attempt to open the cylinder assemblies.

• Do not subject the shock absorber assemblies to an open flame or other high heat source. This may cause the unit to explode due to excessive gas pressure.

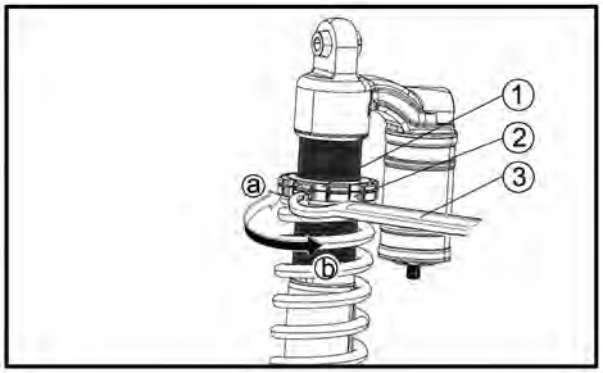
• Do not deform or damage the cylinders in any way. Cylinder damage will result in poor damping performance.

• Do not dispose of a damaged or worn out shock absorber assembly yourself. Take the shock absorber assembly to a HSUN dealer for any service.

The spring preload, rebound damping and compression damping forces of the front and rear shock absorber assemblies can be adjusted to suit the operating conditions.

NOTE:

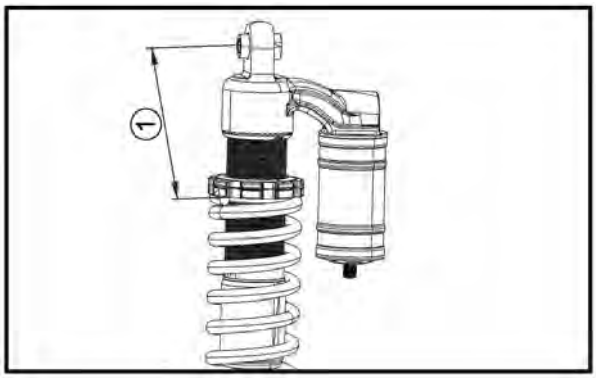
Never turn an adjusting mechanism beyond the minimum and maximum settings.



Spring preload

1. Loosen the locknut.
2. Turn the spring preload adjusting nut in direction ⓐ to increase the spring preload and thereby harden the suspension, and in direction ⓑ to decrease the spring preload and thereby soften the suspension.
   - Locknut ①
   - Spring preload adjusting nut ②
   - Special wrench ③

- A special wrench can be obtained at a HSUN dealer to make this adjustment.
- The spring preload setting is determined by measuring distance A, shown in the illustration. The shorter distance A is, the lower the spring preload; the longer distance A is, the higher the spring preload. With each complete turn of the adjusting nut.
  - Distance A ①

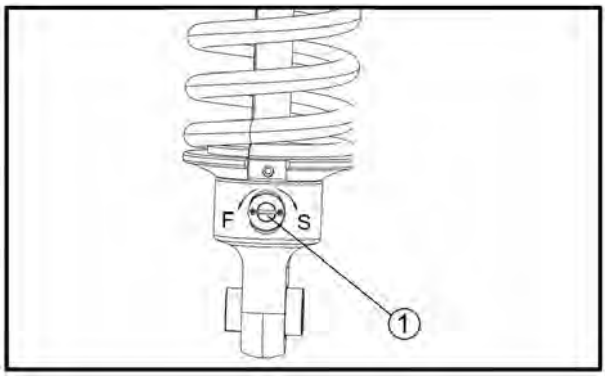


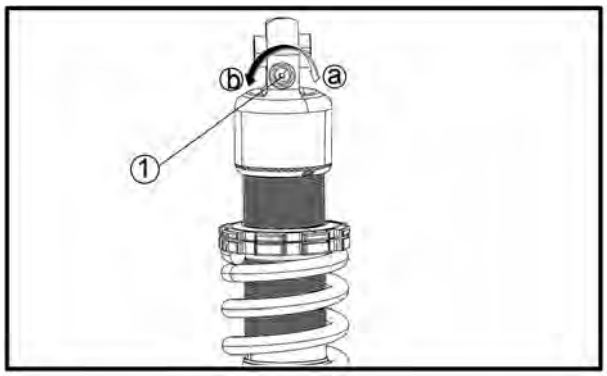
Spring travel setting(Front)
Minimum(soft): 375mm(14.76in)
Maximum(hard): 490mm(19.29in)
Spring travel setting(Rear)
Minimum(soft): 402mm(15.83in)
Maximum(hard): 490mm(19.29 in)

3. Tighten the locknut.

NOTE:

Always tighten the locknut against the adjusting nut, and then tighten it to the specified torque.





Rebound damping force

Turn the rebound damping force adjusting screw ① in direction **S** to increase the rebound damping force and thereby harden the damping, and in direction **F** to decrease the rebound damping force and thereby soften the damping.

Compression damping force

Turn the compression damping force adjusting screw ① (use 2.5 allen wrench) in direction ⓐ to increase the compression damping force and thereby harden the damping, and in direction ⓑ to decrease the compression damping force and thereby soften the damping.

WARNING :

·Suspension components become hot during operation. Never touch the compression damping force adjusting screw, the rebound damping force adjusting screw or the oil reservoir with your bare hand or skin until suspension components have cooled.

·Always adjust the shock absorber assemblies on the left and right side to the same setting. Uneven adjustment can cause poor handling and loss of stability, which could lead to an accident.

CHECKING THE TIRES

WARNING :

• TIRE CHARACTERISTICS

a. Tire characteristics influence the handling of vehicle's. If other tire combinations are used, they can adversely affect your vehicle's handling characteristics and are therefore not recommended.

	Size	Type
Front	6PR	26 × 9-12
Rear	6PR	26× 10-12

- ***TIRE PRESSURE***

  Recommended tire pressure

  Front 70Kpa

  Rear 70KPa

  when seating the tire beads. Higher pressure may cause the tire to burst. Inflate the tires slowly and carefully. Fast inflation could cause the tire to burst.

- ***MAXIMUM LOADING LIMIT***

a. Vehicle loading limit (total weight of cargo, operator, passenger and accessories, and tongue weight): 869kg

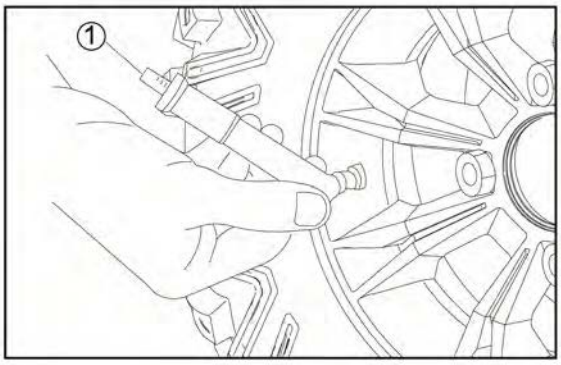
b. Cargo bed: 159kg

c. Trailer hitch:

Pulling load (total weight of trailer and cargo): 259 kg

Be extra careful of the vehicle balance and stability when towing a trailer.

1. Measure:
   - Tire pressure (cold tire pressure) Out of → specification Adjust.



NOTE:

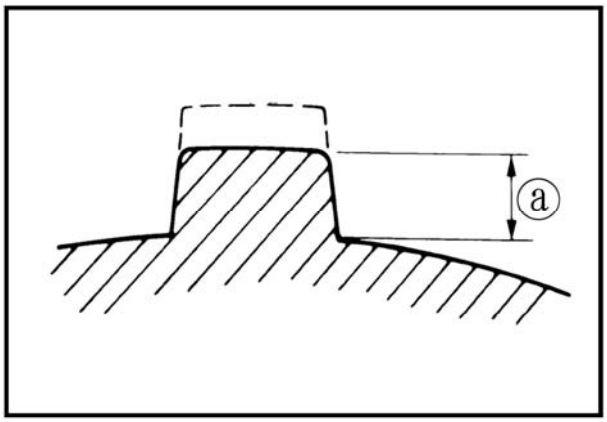
- **The tire pressure gauge ① is included as standard equipment.**
- **If dust or the like is stuck to this gauge, it will not provide the correct readings. Therefore, take two measurements of the tire's pressure and use the second reading.**

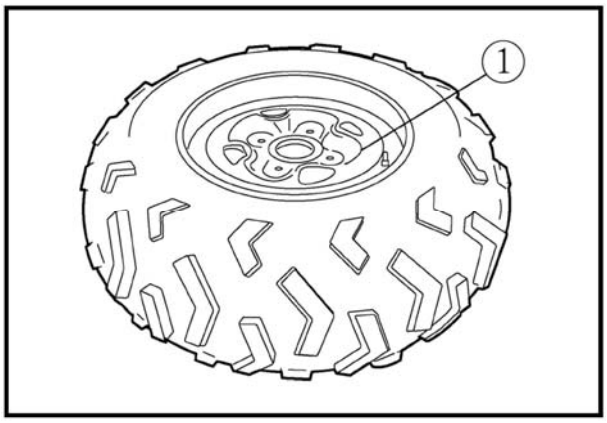
WARNING:

Uneven or improper tire pressure may adversely affect the handling of this vehicle and may cause loss of control.

- ***Maintain proper tire pressures.***
- ***Set tire pressures when the tires are cold.***
- ***Tire pressures must be equal in both front tires and equal in both rear tires.***

2. Check:
   - tire surfaces





Wear/damage ⓐ → Replace.

Tire wear limit ⓐ
Front and rear: 3.0 mm (0.12 in)

WARNING :

It is dangerous to ride with a worn-out tire.

When tire wear is out of specification, replace the tire immediately.

CHECKING THE WHEELS

1. Check:
• Wheels ①
Damage/bends → Replace.

NOTE:

Always balance the wheel when a tire or wheel has been changed or replaced.

WARNING :

- ***Never attempt even small repairs to the wheel.***
- ***Ride conservatively after installing a tire to allow it to seat itself properly on the rim.***

CHECKING AND LUBRICATING THE CABLES

WARNING :

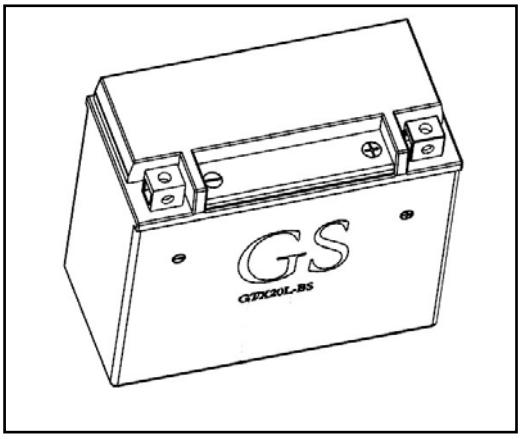
A damaged cable sheath may cause corrosion and interfere with the cable movement. An unsafe condition may result so replace a damaged cable as soon as possible.

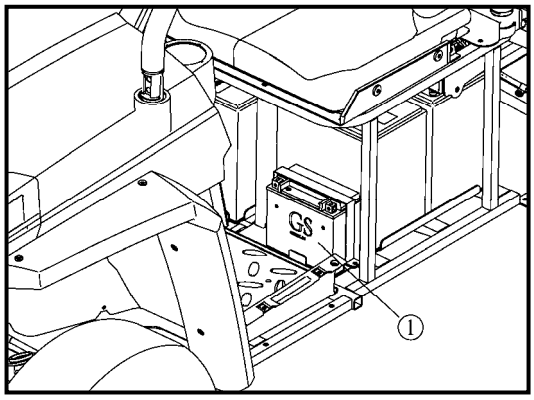
1. Check:
• cable sheath Damage → Replace.
• cable operation Unsmooth operation → Lubricate or replace.

NOTE:

Hold the cable end up and apply several drops of lubricant to the cable.

2. Apply:
• lithium-soap-based grease (onto end of the cable) lithium-soap-based.





ELECTRICAL

CHECKING AND CHARGING THE BATTERY

WARNING :

Batteries generate explosive hydrogen gas and contain electrolyte which is made of poisonous and highly caustic sulfuric acid. Therefore, always follow these preventive measures:

- ***Wear protective eye gear when handling or working near batteries.***
- ***Charge batteries in a well-ventilate2d area.***
- ***Keep batteries away from fire, sparks or open flames (e.g., welding equipment, lighted cigarettes).***
- ***DO NOT SMOKE when charging or handling batteries.***
- ***KEEP BATTERIES AND ELECTROLYTE OUT OF REACH OF CHILDREN.***
- ***Avoid bodily contact with electrolyte as it can cause severe burns or permanent eye injury.***

FIRST AID IN CASE OF BODILY CONTACT:

EXTERNAL

- ***Skin — Wash with water.***
- ***Eyes — Flush with water for 15 minutes and get immediate medical attention.***

INTERNAL

Drink large quantities of water or milk followed with milk of magnesia, beaten egg or vegetable oil. Get immediate medical attention.

WARNING :

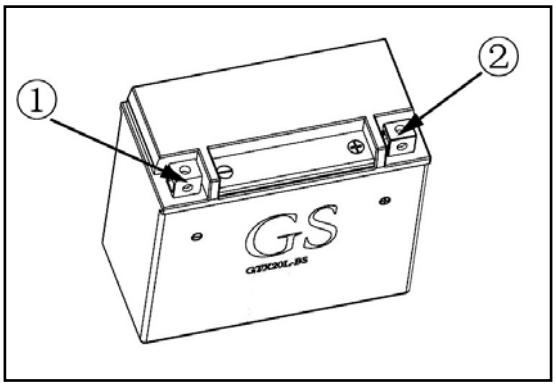
- ***This is a sealed battery. Never remove the sealing caps because the balance between cells will not be maintained and battery performance will deteriorate.***
- ***Charging time, charging amperage and charging voltage for an MF battery are different from those of conventional batteries. The MF battery should be charged***

as explained in the charging method illustrations. If the battery is overcharged, the electrolyte level will drop considerably.

• Therefore, take special care when charging the battery.

NOTE:

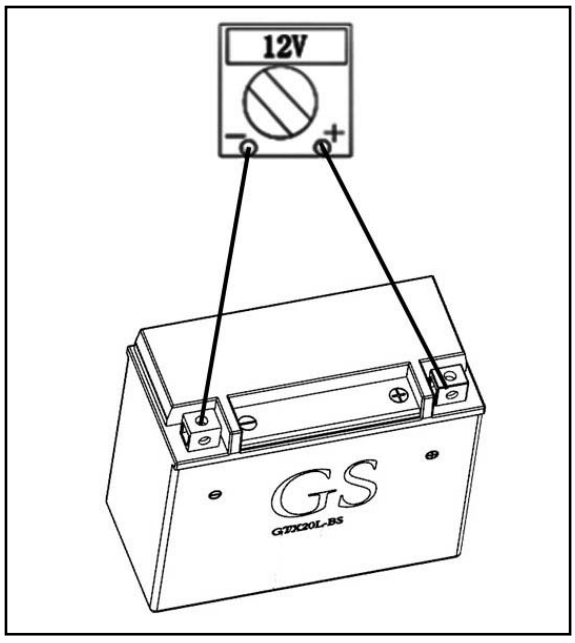
Since MF batteries are sealed, it is not possible to check the charge state of the battery by measuring the specific gravity of the electrolyte. Therefore, the charge of the battery has to be checked by measuring the voltage at the battery terminals.



1. Remove:
• Lift the hood up.
• battery case cover
• Disconnect:
battery leads

NOTE:

First, disconnect the negative battery lead ①, and then the positive battery lead ②.



• Remove:
battery
• Check:
battery charge

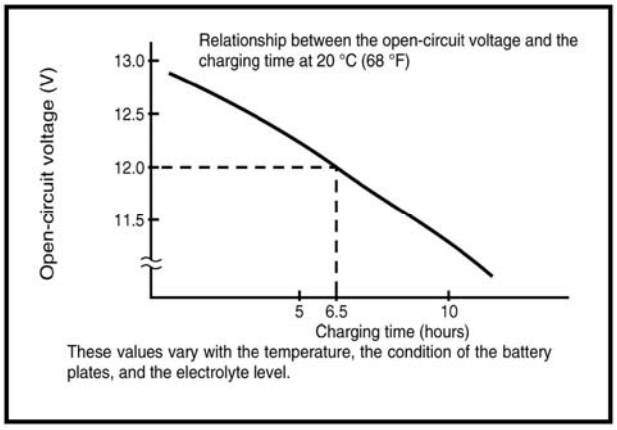
a. Connect a pocket tester to the battery terminals.

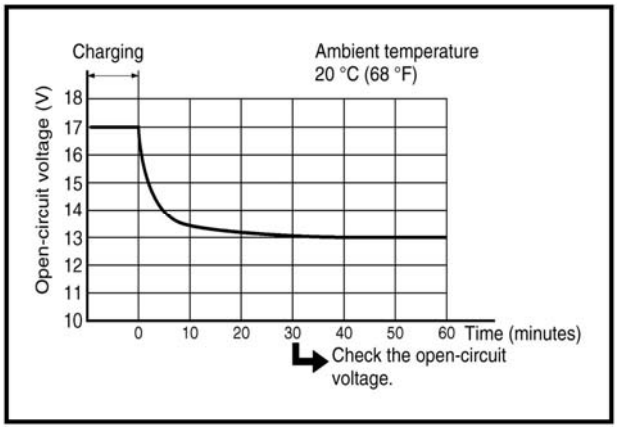
Positive tester probe → positive battery terminal
Negative tester probe → negative battery terminal

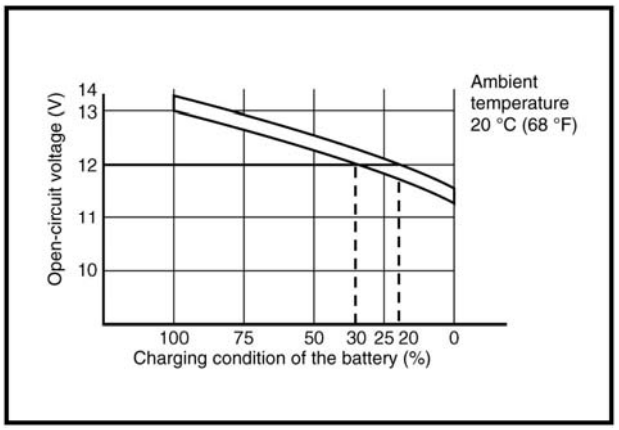
NOTE:

- **The charge state of an MF battery can be checked by measuring its open-circuit voltage (i.e., the voltage when the positive terminal is disconnected).**
- **No charging is necessary when the open-circuit voltage equals or exceeds 12.8V.**

b. Check the charge of the battery, as shown in the charts and the following example.







Example

c. Open-circuit voltage = 12.0 V

d. Charging time = 6.5 hours

e. Charge of the battery = 20 ~ 30%

2. Charge:

• battery(refer to the appropriate charging method illustration) .

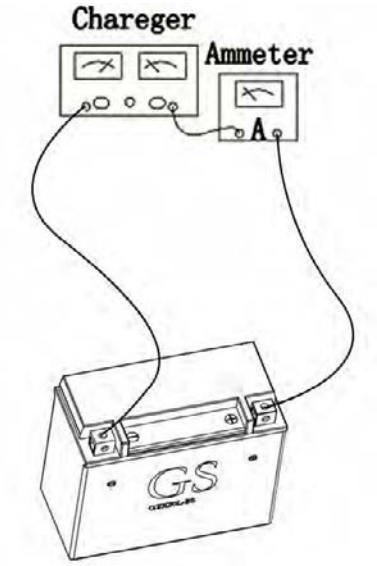
WARNING :

Do not quick charge a battery.

NOTE:

- **Never remove the MF battery sealing caps.**
- **Do not use a high-rate battery charger since it forces a high-amperage current into the battery quickly and can cause battery overheating and battery plate damage.**
- **If it is impossible to regulate the charging current on the battery charger, be careful not to overcharge the battery.**
- **When charging a battery, be sure to remove it from the vehicle. (If charging has to be done with the battery mounted on the vehicle, disconnect the negative battery lead from the battery terminal.)**
- **To reduce the chance of sparks, do not plug in the battery charger until the battery charger leads are connected to the battery.**
- **Before removing the battery charger lead clips from the battery terminals, be sure to turn off the battery charger.**
- **Make sure the battery charger lead clips are in full contact with the battery terminal and that they are not shorted. A corroded battery charger lead clip may generate heat in the contact area and a weak clip spring may cause sparks.**
- **If the battery becomes hot to the touch at any time during the charging process, disconnect the battery charger and let the battery cool before reconnecting it. Hot batteries can explode!**
- **As shown in the following illustration, the open-circuit voltage of an MF battery stabilizes about 30 minutes after charging has been completed. Therefore, wait 30 minutes after charging is completed before measuring the open-circuit voltage.**

Charging method using a variable-current



(voltage) charger

NOTE:

- **Leave the battery unused for more than 30 minutes before measuring its open-circuit voltage.**
- **Set the charging voltage to 16 ~17 V. (If the charging voltage is lower, charging will be insufficient, if it is higher, the battery will be over-charged.)**

Measure the open-circuit voltage prior to charging.

↓

Connect a charger and ammeter to the battery and start charging.

↓

Is the amperage higher than the standard charging amperage written on the battery?

YES → **Adjust the voltage to obtain the standard charging amperage**

NO → **Adjust the charging voltage to 20 ~ 25 V**

↓

Monitor the amperage for 3 ~ 5 minutes. Is the standard charging amperage exceeded?

YES → **Adjust the voltage to obtain the standard charging amperage**

NO → **If the amperage does not exceed the standard charging amperage after 5 minutes, replace the battery.**

↓

Set the timer to the charging time determined by the open circuit voltage.

↓

If the required charging time exceeds 5 hours, it is advisable to check the charging amperage after 5 hours. If there is any change in the amperage, readjust the voltage to obtain the standard charging amperage.

↓

Leave the battery unused for more than 30 minutes before measuring its open-circuit voltage.
12.8 V → Charging is complete.
12.0 ~ 12.7 V → Recharging is required.

Charging method using a constant voltage charger

NOTE:

Leave the battery unused for more than 30 minutes before measuring its open-circuit voltage.

Measure the open-circuit voltage Prior to charging.

↓

Connect a charger and ammeter to the battery and start charging.

↓

Is the amperage higher than the standard charging amperage written on the battery?

YES → **Charge the battery until the charging voltage reaches 15 V.**

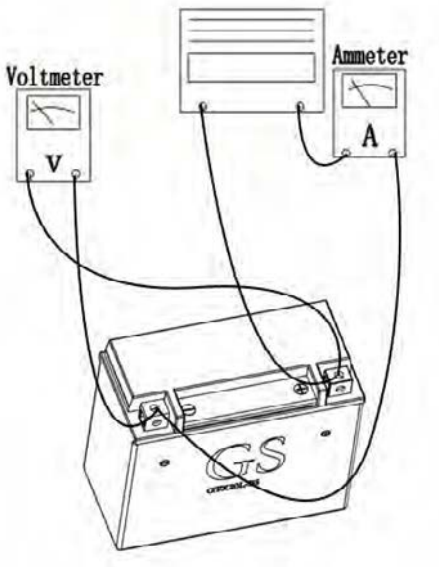
NOTE:

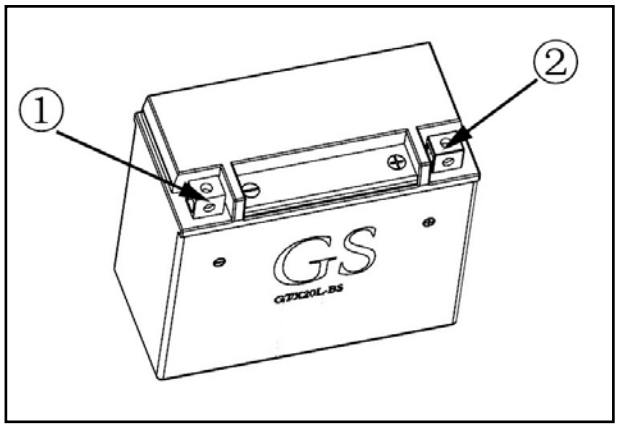
Set the charging time to a maximum of 20 hours.

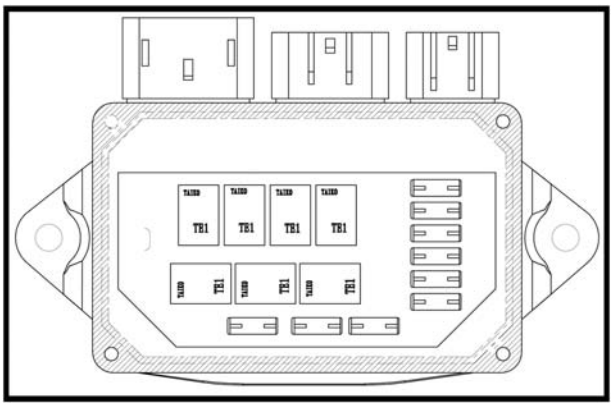
↓

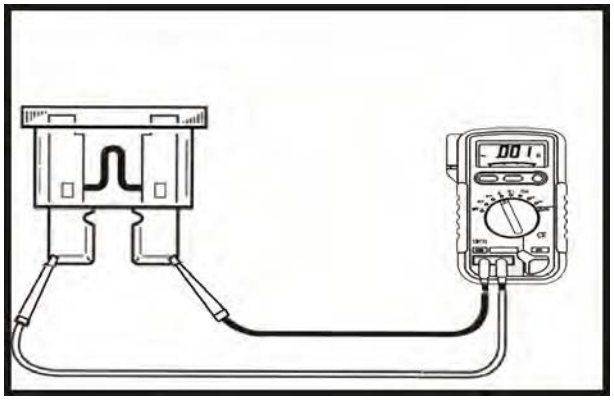
Leave the battery unused for more than 30 Minutes before measuring its open-circuit voltage.
12.8 V → Charging is complete.
12.0 ～12.7 V → Recharging is required.
Under 12.0 V → Replace the battery

NO → **This type of battery charger cannot charge an MF battery. A variable ended.**









NOTE:

Constant amperage chargers are not suitable for charging MF batteries.

3. Install:
- battery
- Connect:
  battery leads

NOTE:

First, connect the positive battery lead ①, and then the negative battery lead ②.

- Check:
  Battery terminals Dirt → Clean with a wire brush.
  Loose connection → Connect properly.
- Lubricate:
  battery terminals
- Install:
  battery case cover
- Close the hood.

CHECKING THE FUSES

NOTE:

Always turn off the main switch when checking or replacing a fuse. Otherwise, a short circuit may occur.

1. Remove:
- lift the hood up.
- battery case cover

2. Check:
- fuses

a. Connect the pocket tester to the fuse and check it for continuity.。

NOTE:

Set the tester to the "Ω × 1" position.

b. If the tester indicates"∞", replace the fuse.

3. Replace:
- blown fuse

a. Turn off the ignition.
b. Install a new fuse of the proper amperage.
c. Turn on switches to verify operation of the

related electrical devices.

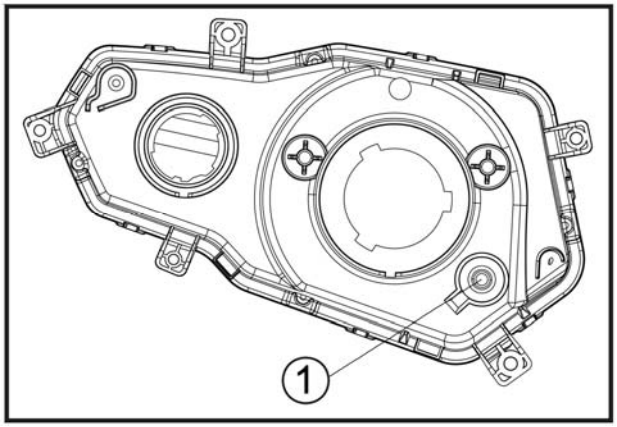
d. If the fuse immediately blows again, check the electrical circuit.

Description	Current rating	Quantity
Instrument often electric fuse	5A	1
Jenny motor assembly	10A	1
Signaling system fuse	10A	1
Instrument fuse switch power supply	15A	1
DC/2WD/4WD/horn power supply socket fuse	15A	1
Headlamps power fuse	15A	1
Reserve	5A	1
Reserve	10A	1
Reserve	15A	1

WARNING :

ever use a fuse with a rating other than that specified. Never use other materials in place of a fuse. An improper fuse may cause extensive damage to the electrical system, a malfunction of the lighting and ignition systems and could possibly cause a fire.

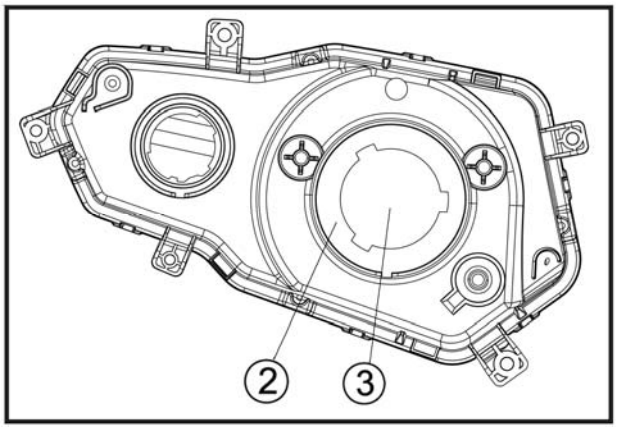
4. Install:
   • battery case cover
5. Close the hood.



ADJUSTING THE HEADLIGHT BEAM

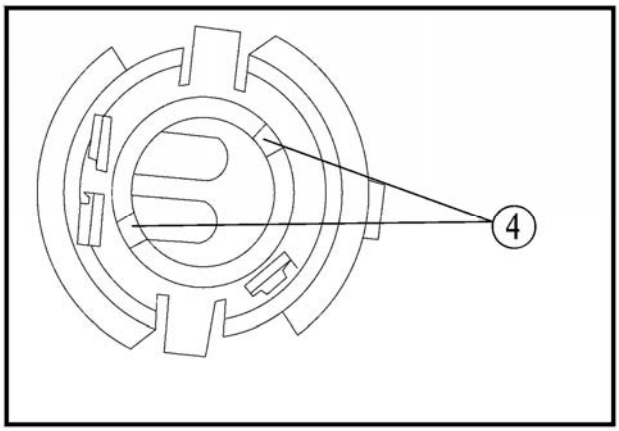
1. Adjust:
   • headlight beam (vertically)
   • turn the adjuster ① in or out.

Turning in	**Headlight beam raised.**
Turning out	**Headlight beam lowered.**



CHANGING THE HEADLIGHT BULB

Remove:
• Lift the hood up.
• headlight bulb holder cover ②
• headlight bulb holder (with bulb) ③
• bulb



NOTE:

Remove the defective bulb by unhooking the headlight bulb holder tabs ④.

WARNING:

Keep flammable products and your hands away from the bulb while it is on, since it* will *be hot. Do not touch the bulb until it cools down.

2. Install:
   • bulb new
     Secure the new bulb with the headlight bulb holder.

NOTE:

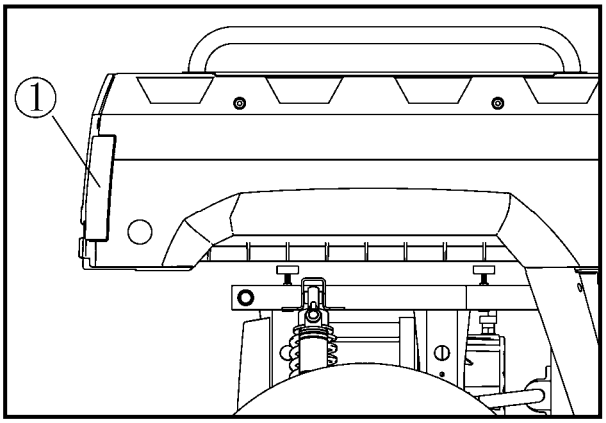
Avoid touching the glass part of the bulb.
Keep it free from oil; otherwise, the transparency of the glass, life of the bulb, and luminous flux will be adversely affected. If oil gets on the bulb, thoroughly clean it with a

cloth moistened with alcohol or lacquer thinner.

- headlight bulb holder (with bulb)
- headlight bulb holder cover
- Close the hood.

CHANGING THE TAIL/BRAKE LIGHT BULB

1. Remove:
   - Rear panel
   - tail/brake light bulb holder ①
   - bulb



NOTE:

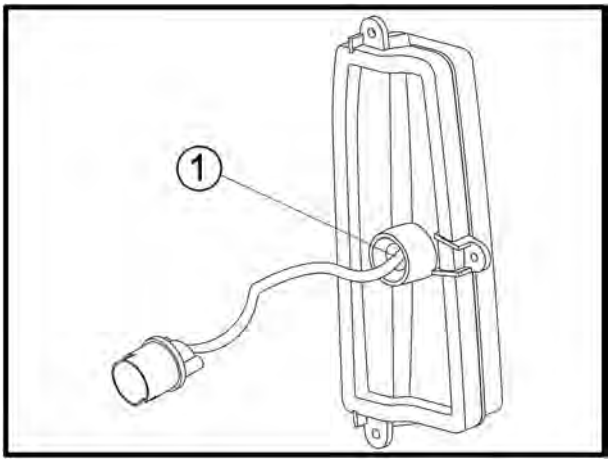
Turn the bulb holder counterclockwise and remove the defective bulb.

WARNING:

Keep flammable products and your hands away from the bulb while it is on, since it will be hot. Do not touch the bulb until it cools down.

2. Install:
   - bulb new

     Secure the new bulb with the tail/brake light bulb holder.



NOTE:

Avoid touching the glass part of the bulb.
Keep it free from oil; otherwise, the transparency of the glass, life of the bulb, and luminous flux will be adversely affected. If oil gets on the bulb, thoroughly clean it with a cloth moistened with alcohol or lacquer thinner.

- tail/brake light bulb holder (with bulb)①

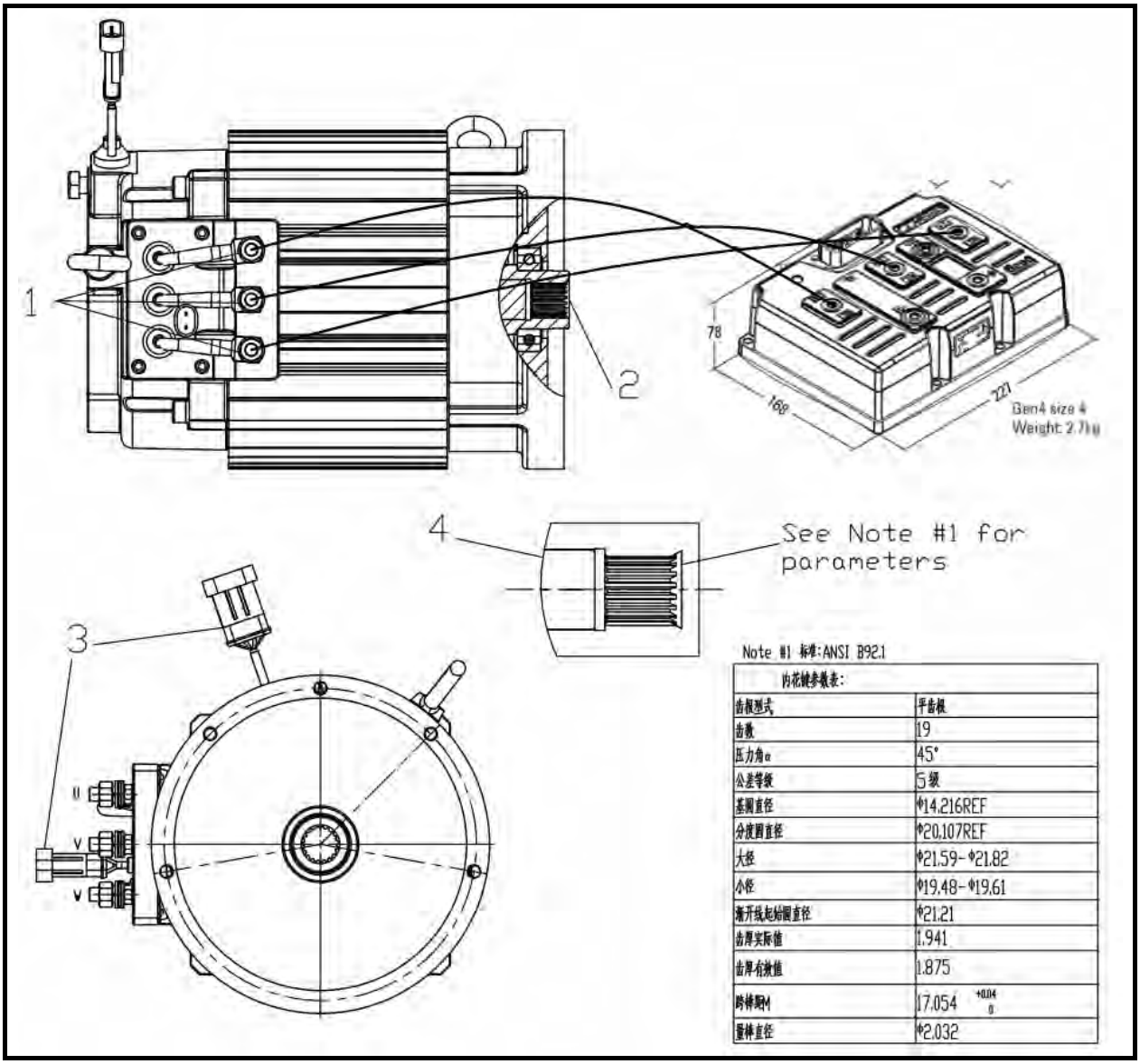
INSPECTION AND REPAIRING OF MOTOR

Inspection and solution of the common failure of motor

S/N	Failure	Inspection	Solution
1	Rotating speed of motor is not able to change.	1. Check the sensor of acceleration.	Change the damaged throttle sensor.
		2. Check the cables.	Repair cable.
		3. Check the connect cable of the motor sensor.	Repair connecting wire or change controller.
		4. Check the controller.	Change the damaged controller.
2	Speed become slow or power become weak.	1. Check the battery, whether the voltage of battery is less than standard value.	Charge the battery.
		2. Check the battery for damage.	Repair the battery or change the damaged battery.
		3. Check the controller for damage.	Change the damaged controller.
		4. Check the sensor of acceleration.	Change the damaged throttle sensor.
		5. Check the functionality of output of the rotate speed sensor.	Change the damaged rotate speed sensor.
		6. Check the sensor between the motor and the controller, whether the socket is open circuit or not.	Repair or change the damaged plug or socket.
3	Maximum speed exceeded 24km/h.	1. Check the controller.	Change the damaged controller.
		2. Check the parameter of the controller for incorrect setting.	Reset the controller with portable programmer.
4	Driving mileage decreased after full electricity charged.	1. Check the battery.	Change the damaged battery or re-match the battery.
		2. Check the controller.	Change the damaged controller.
		3. Check the motor armature winding for partial short circuit.	Change the damaged motor.
		4. Check the cables.	Repair.

S/N	Failure	Inspection	Solution
5	Can not run while accelerating.	1. Check the power of the battery.	Charge the battery.
		2. Check cables, whether the function of acceleration protection is broken or not.	Repair the cable or change the damaged throttle sensor.
		3. Check the connecting wires between the batteries if loose.	Fasten the fixing bolt of conductor terminal.
		4. Check the sensor socket of motor if properly connected.	Reinsert the plug and socket, to ensure good contact.
		5. Check the motor armature winding for turnoff.	Change the damaged motor.
		6. Check the motor's field winding for turnoff.	Change the damaged motor.
		7. Check the controller for damage.	Change the damaged controller.
		8. Check the sensor of acceleration.	Change the damaged throttle sensor.
		9. Check whether the carbon brushes are excessive wear.	Change the new carbon brushes.
		10 Check the “forward / reverse” switch for water penetration.	Remove the water form the switch.
		11.Check the switch of “Forward/Reverse”.	Change the damaged switch.
6	Can not reverse.	1. Check the switch of “Forward/Reverse”	Change the damaged switch.
		2. Check the controller.	Change the damaged controller.
7	When the motor rotate it makes noise.	1. Check the motor bearing for damage.	Change the damaged bearing.
		2. Check the spline of motor output shaft for damage.	Change the damaged spline.

MOTOR MECHANICAL STRUCTURE：

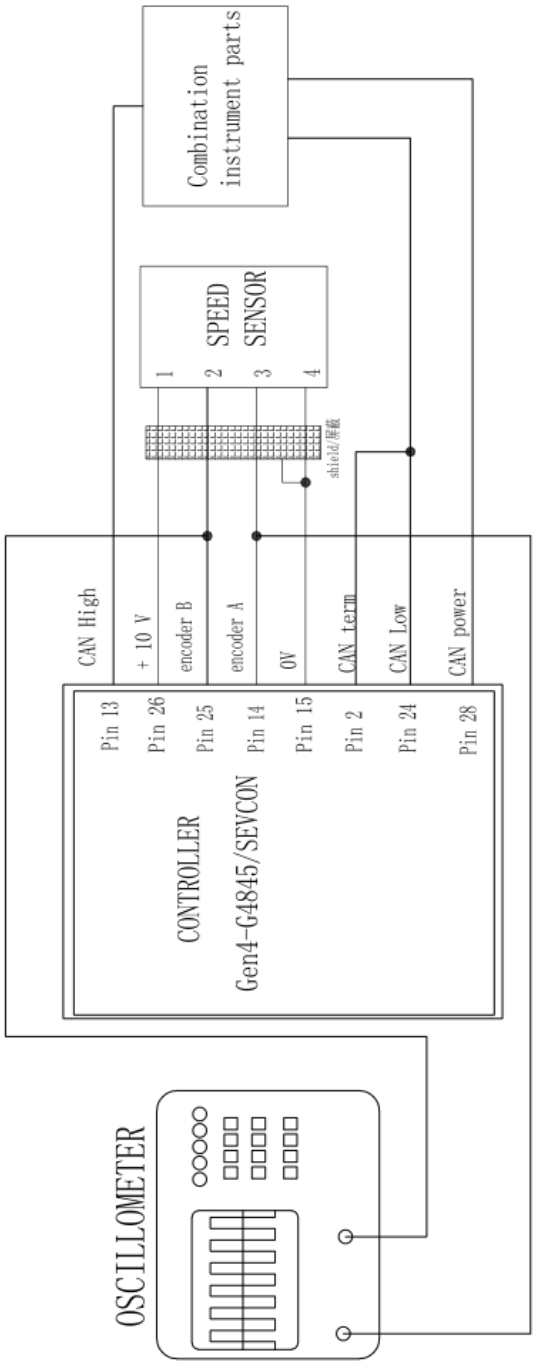


Note #1 标准:ANSI B92.1

内花键参数表:	
齿根型式	平齿根
齿数	19
压力角α	45°
公差等级	5级
基圆直径	Φ14.216REF
分度圆直径	Φ20.107REF
大径	Φ21.59-Φ21.82
小径	Φ19.48-Φ19.61
渐开线起始圆直径	Φ21.21
齿厚实际值	1.941
齿厚有效值	1.875
跨棒距M	17.054 $^{+0.04}_{0}$
量棒直径	Φ2.032

No.	Part Name	Remarks
1.	Binding post	
2.	Output shaft	
3.	Socket connector	
4.	Bearing	

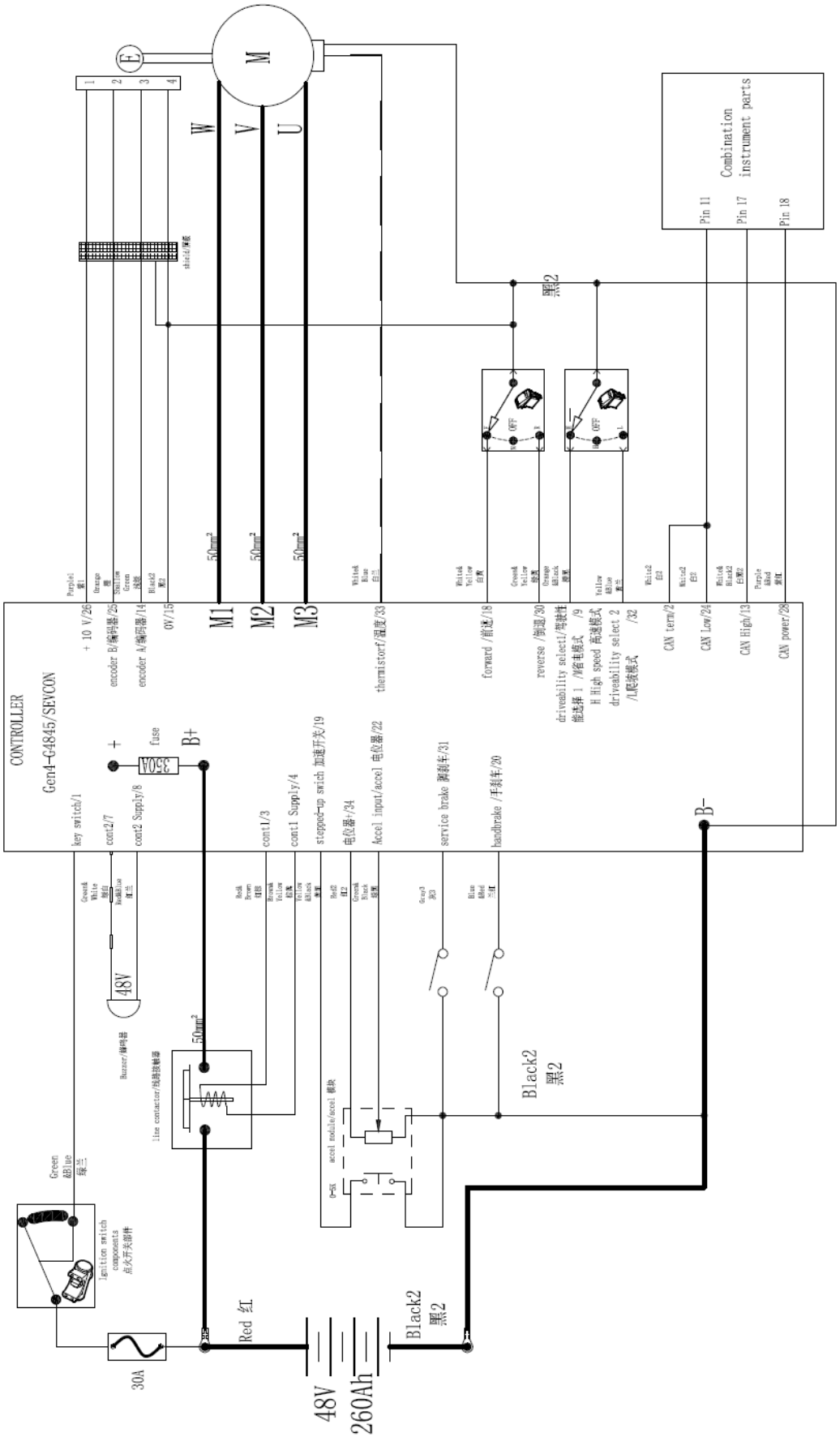
SPEED SENSOR DIAGRAM

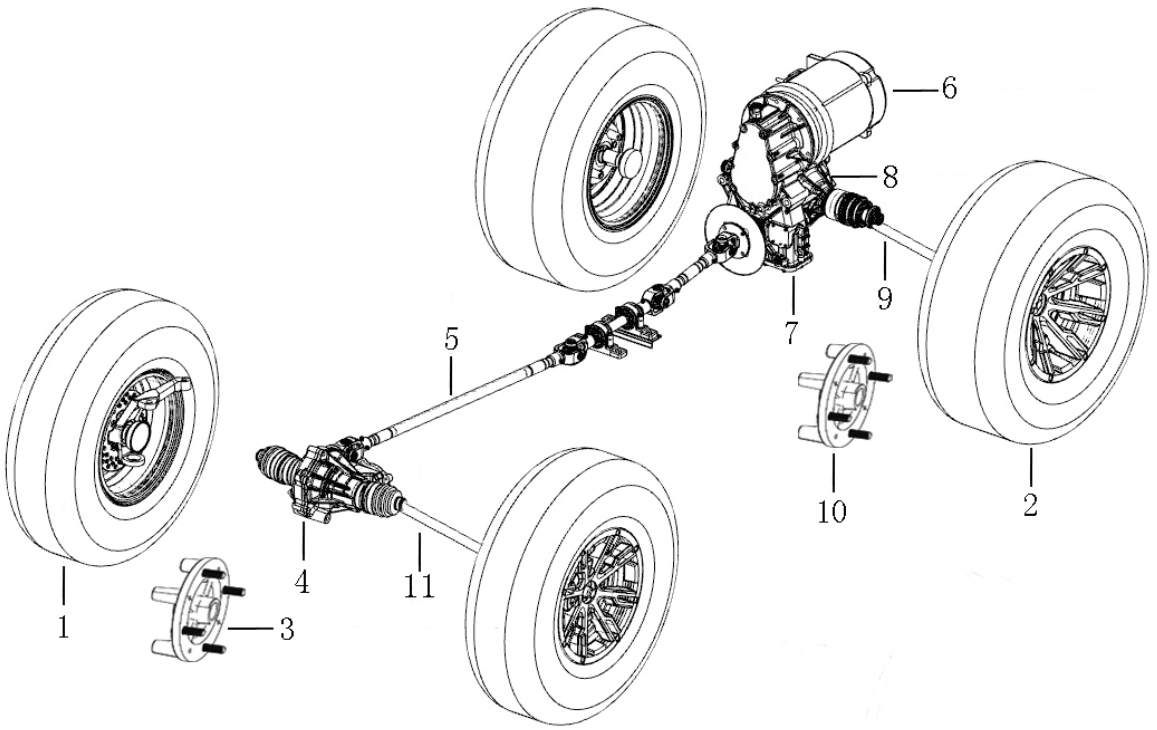


Test methods：

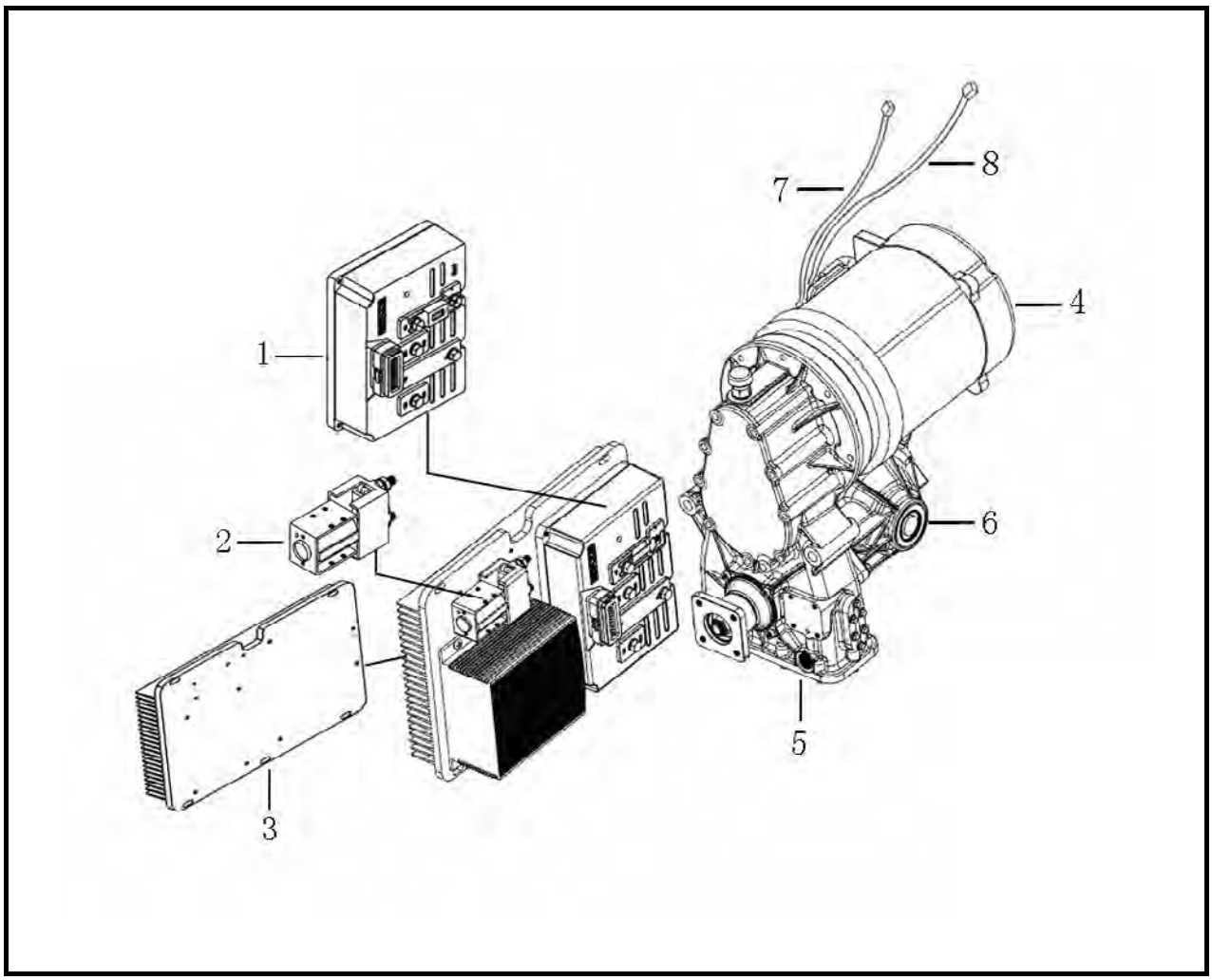
For each rotation of the motor, output four pulseson the V-out .Need to use the oscilloscope when testing.

MOTOR AND CONTROLLER WIRING DIAGRAM

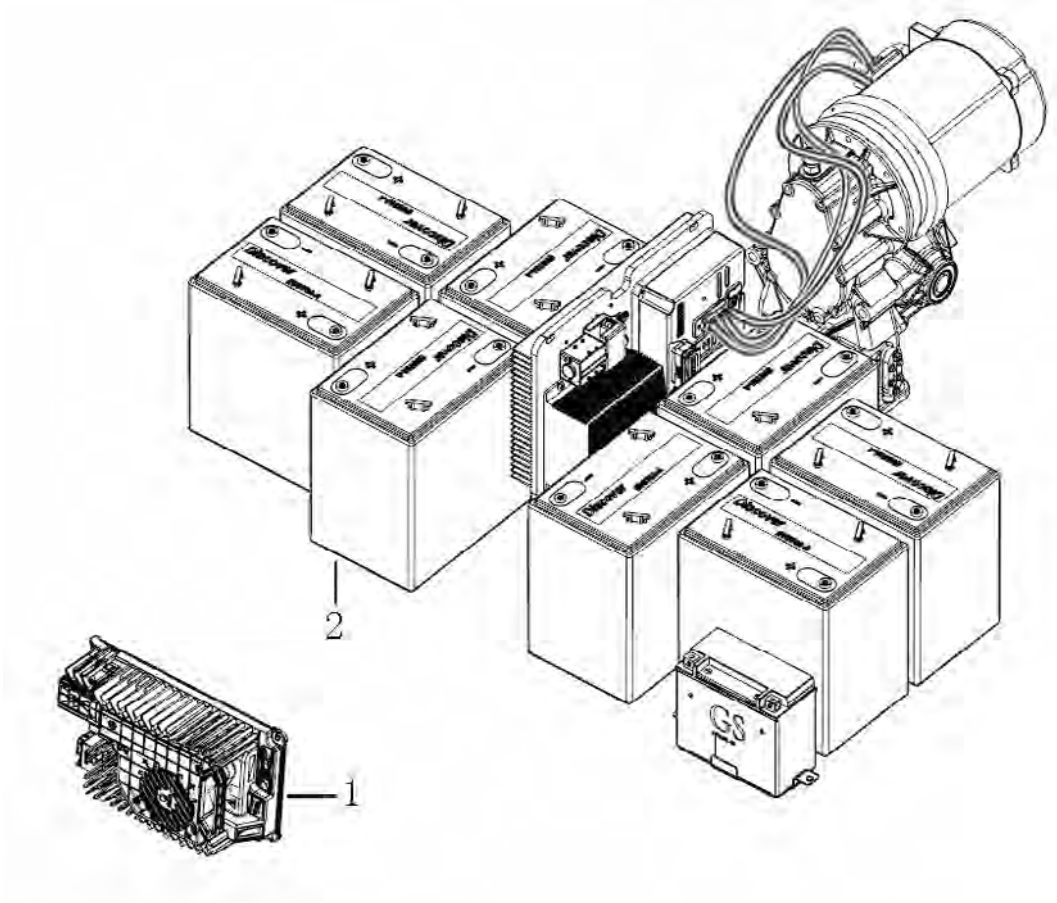




No.	Part Name	Qty	Remarks
1	Front Tire	2	
2	Rear Tire	2	
3	Front hub assembly base	1	
4	Front Bridge	1	
5	Mid transmission Alex front bridge	1	
6	Drive motor assy	1	
7	Decelerate Box	1	
8	Rear Bridge	1	
9	Rear half axle	2	
10	Rear hub assembly base	1	
11	Front half axle	2	



No.	Part Name	Qty	Remarks
1	Motor Controller	1	
2	Main Connector Assy	1	
3	Aluminum Plate	1	
4	Drive Motor Assy	1	
5	Decelerate Box	1	
6	Rear Bridge	1	
7	Temperature Sensor	1	
8	Phase Sensor	1	



No.	Part Name	Qty	Remarks
1	Charger	1	
2	Battery Assy	1	

FAULT CODE

Failure Code	Message	Description
4481	Handbrake Fault	Handbrake is active when direction selected.
4541	Fan Fault	No speed feedback from external heatsink fans
4542	Low Oil	Low Oil
4543	Hydraulic filter	Hydraulic Filter
4544	Pump Current Low	Pump motor is not drawing sufficient current
4545	Isolation Fault	Isolation fault detected between logic and power frame
4546	No Motor Speed Signal	No speed feedback from motor
4547	Tow Mode	Tow mode has been activated
4548	Steer Sensor Warning	Invalid steer sensor state
4549	Pulsed Enable	Pulsed enable signal not present, unable to enable bridge
454A	Bridge Enable Delayed	Unable to complete power on checks to allow the bridge to enable
454B	MOSFET s/c tests waiting	MOSFET / IGBT s/c tests at power up are being held off
454C	Electrolyte Low Level	Battery Electrolyte Low Level detected
454D	Electrolyte Cutout Level	Battery Electrolyte Low Level detected and cutbcak
4581	Throttle Fault (Warn)	Warning level throttle fault. Used for Renault Twizy
4582	Safety Case 1	Throttle appears to be stuck. This fault will clear if throttle starts to work again.
4583	Safety Case 2	Throttle appears to be stuck. This fault will latch and can only be cleared by repairing the throttle and recycling power.
4584	Analogue Output Over Current (warn)	Contactor driver over current
4585	Analogue Output Off with Failsafe (warn)	Contactor driver not working
4586	Analogue Output Over Temperature (warn)	Contactor driver over temperature
4587	Analogue Output Under Current (warn)	Contactor driver unable to achieve current target in current mode
4588	Analogue Output Short Circuit (warn)	Contactor driver MOSFET short circuit detected
4589	Analogue supply (warn)	Analogue supply is >10% out of range
458A	Seat (warning)	seat regen settings applied
45C1	BDI Warning	BDI remaining charge (0x2790,1) is less than BDI Warning level (0x2C30,5)

Failure Code	Message	Description
45C2	BDI Cutout	BDI remaining charge (0x2790,1) is less than BDI Cutout level (0x2C30,4)
\ 45C3	Low Battery Cut	Battery voltage (0x5100,1) is less than Under Voltage limit (0x2C02,2) for longer than the protection delay (0x2C03,0)
45C4	High Battery Cut	Battery voltage (0x5100,1) is greater than Over Voltage limit (0x2C01,2) for longer than the protection delay (0x2C03,0)
45C5	High Capacitor Cut	Capacitor voltage (0x5100,3) is greater than Over Voltage limit (0x2C01,2) for longer than the protection delay (0x2C03,0)
45C6	Vbat below rated min	Battery voltage (0x5100,1) is less than rated minimum voltage for controller for longer than 1s. NOTE: This fault is sometimes seen at power down.
45C7	Vbat above rated max	Battery voltage (0x5100,1) is greater than rated maximum voltage for controller for longer than 1s.
45C8	Vcap above rated max	Capacitor voltage (0x5100,3) is greater than rated maximum voltage for controller for longer than 1s.
45C9	Motor in low voltage cutback	Motor control (DC link) has entered low voltage cutback region.
45CA	Motor in high voltage cutback	Motor control (DC link) has entered high voltage cutback region.
45CD	KL15/30 Too Low	The voltage applied to the KL15/30 is below the controller rated minimum
4601	Device too cold	Low heatsink temperature (0x5100,4) has reduced power to motor
4602	Device too hot	High heatsink temperature (0x5100,4) has reduced power to motor
0x4603	Motor in thermal cutback	High measured (0x4600,3) or estimated (0x4602,8) motor temperature has reduced power to motor
4604	Motor too cold	Low Measured temperature has reached -30deg
4681	Unit in preoperational	Controller is in pre-operational state
4682	IO can't init	Controller has not received all configured RPDOs at power up
4683	RPDO Timeout (warning)	One or more configured RPDOs not received with 3s at start up or 500ms during normal operation.

Failure Code	Message	Description
46C1	Encoder Alignment Warning	Encoder is not aligned properly.
46C2	SinCos Tracking Warning	SinCos Encoder Min Max Values are heading towards a voltage rail or converging together.
46C3	Fault Ride Through	A fault ride through event has been encountered, but operation is allowed to continue although the system may be derated
46C4	Motor Pull-Out Warning	The open loop VF induction motor software has detected a pulled-out condition, it will automatically attempt to restart.
46C5	Stator Resistance Error	Stator resistance thermal compensation has failed due to the estimated value being too different from the configured value
46C6	Encoder PLL Deactivated Warning	Encoder PLL has turned off due to poor tracking
4701	CAN warning	Vehicle is operating in reduced power mode as some CAN messages are not being received (Renault only)
4741	Scheduler stack overflow warning	This warning is set if any task has between 10% and 20% of its stack free.
4742	Internal supply out of range warning	An internal logic supply rail has gone out of range
4781	CANopen anon EMCY level 1	EMCY message received from non-Sevcon node and anonymous EMCY level (0x2830,0) is set to 1.
4782	24V Supply Low	
4783	24V Supply High	
47C1	Vehicle Service Required	Vehicle service next due time (0x2850,5) has expired. If supported Service driveability profile (0x2925) will activate.
4881	Seat Fault	Valid direction selected with operator not seated or operator is not seated for a user configurable time in drive.
4882	Two Direction Fault	Both the forward and reverse switches have been active simultaneously for greater than 200 ms.
4883	SRO Fault	FS1 active for user configurable delay (0x2914,2) without a direction selected.
4884	Sequence Fault	Any drive switch active at power up.
4885	FS1 Recycle Fault	FS1 active after a direction change and FS1 recycle function enabled (0x2914,1 bit 1)
0x4886	Inch Fault	Inch switch active along with any drive switch active (excluding inch switches), seat switch indicating operator present or handbrake switch active.

Failure Code	Message	Description
4887	Overload Fault	Vehicle overloaded
4888	Raised and Tilted Fault	Scissor lift platform raised and tilted
4889	Pothole Fault	Scissor lift pothole protection active
488A	Traction Inhibit Fault	Traction function inhibited using traction inhibit switch (0x2137)
488B	Illegal Mode Change Fault	Vehicle changed from traction mode to pump mode (or vice versa) when direction selected
488C	Tilt Sensor Fault	Aichi error code (0x3802,0) set to 0x02
488D	Belly fault	Belly function has activated.
488E	Mom dir fault	Fault with momentary direction selection switch
4941	Motor Overspeed	
4942	PST Fault	An issue has occurred with the PST unit
4981	Throttle Fault	Throttle value (0x2620,0) is greater than 20% at power up.
4982	E-Brake Wire off	Wire-off detected in electrobrake circuit
4983	Direction Change	Direction is changed and vehicle speed is greated than allowed in 0x2929,2
49C2	Entering Cutback	Controller has entered thermal or voltage cutback region
4A01	Cutback	Thermal or voltage cutback factors have reduced belowed user defined levels.
4A81	RPDO Timeout (drive inhibit)	One or more configured RPDOs not received with 3s at start up or 500ms during normal operation.
4B01	CAN off bus (drive inhibit)	CANbus off fault condition detected on multinode system. NOTE: This fault was added for Aichi, to replace Very Severe CAN off fault
4B02	Ren Data	Data missing from CAN (Renault only)
4B03	IO Data Error	Vehicle application subsystem is not receiving control or status information.
4B81	CANopen anon EMCY level 2	EMCY message received from non-Sevcon node and anonymous EMCY level (0x2830,0) is set to 2.
4C41	Too many slaves	Number of slaves (0x2810,0) set higher than maximum allowed number of slaves
4D01	Circuit Breaker Open	
4D02	Circuit Breaker Welded	
4D03	DC Link Collapsed	
4D04	Circuit Breaker Timeout	Time to close breaker of GpAC has expired
4D41	Motor Isolation Fault	Motor isolation contactor is open circuit
4D42	Motor Open Circuit Fault	Motor terminal is open circuit or disconnected from controller

Failure Code	Message	Description
4D43	Motor stalled	No speed feedback from motor
4DC3	Power Supply Critical	Battery voltage has dropped below critical level
4E81	RPDO Timeout (severe)	One or more configured RPDOs not received with 3s at start up or 500ms during normal operation.
4EC1	Cant Establish Fld Curr	Controller is unable to control a current in the field winding
4EC2	Pulsing Disabled	The motor control protection subsystem unexpectedly disabled the PWM
4F01	Unexpected slave state	CANopen slave has changed to unexpected state
4F02	EMCY send failed	Unable to transmit EMCY message
4F41	Internal Fault	Internal software fault
4F42	Out of memory	Out of memory
4F43	General DSP error	Unknown error raised by motor model code
4F44	Timer Failed	Unable to allocate timer
4F45	Queue Error	Unable to post message to queue
4F46	Scheduler Error	Unable to create task in scheduler
4F47	DSP Heartbeat Error	Communication lost between host and DSP processors
4F48	I/O SS Error	Internal software fault
4F49	GIO SS Error	Internal software fault
4F4A	LCM SS Error	Internal software fault
4F4B	LCP SS Error	Internal software fault
4F4C	OBD SS Error	Internal software fault
4F4D	VA SS Error	Internal software fault
4F4E	DMC SS Error	Internal software fault
4F4F	TracApp SS Error	Internal software fault
4F50	New Powerframe Detected	New power frame detected.
4F51	DSP Not Detected	Communication lost between host and DSP processors
4F52	DSP Comms Error	Communication lost between host and DSP processors (or IOP and MCP)
4F53	App Manager SS Error	Internal software fault
4F54	Autozero range error	Current sensor auto-zero current out of range
4F55	DSP parameter error	Communication error between host and DSP processors
4F56	Motor in wrong direction	Motor rotation detected as wrong direction. No longer supported
4F57	Motor stalled	Motor rotation stalled. No longer supported
4F81	CANopen anon EMCY level 3	EMCY message received from non-Sevcon node and anonymous EMCY level (0x2830,0) is set to 3.

Failure Code	Message	Description
5041	Bad NVM Data	EEPROM or flash configuration data corrupted and data can not be recovered.
5042	VPDO Out of Range	VPDO mapped to non-existent or invalid object
5043	Static Range Error	At least one configuration object is out of range
5044	Dynamic Range Error	At least one configuration object is out of dynamic range. This is where one objects range depends on another object.
5045	Auto-configuration Fault	Unable to automatically configure I/O and vehicle setup.
5046	Voltage autoconfig error	Unable to set battery voltage
5081	Invalid Steer Switches	Steering switches are in an invalid state
5101	Line Contactor o/c	Line contactor did not close when coil is energized.
5102	Line Contactor welded	Line contactor closed when coil is denergized.
5141	Beltloader Fault	Unable to change between traction and pump motors on beltloader.
5142	Ren Signal	Fault signalled by Renault vehicle network
5143	VERLOG	VERLOG signal failure
5181	Digital Input Wire Off	Digital input wire-off
5182	Analogue Input Wire Off	Analogue input outside of allowed range (0x46cX)
5183	Analogue Output Over Current	Contactor driver over current
5184	Analogue Output On with No Failsafe	Internal hardware failsafe circuitry not working
5185	Analogue Output Off with Failsafe	Contactor driver not working
5186	Analogue Output Over Temperature	Contactor driver over temperature
5187	Analogue Output Under Current	Contactor driver unable to achieve current target in current mode
5188	Analogue Output Short Circuit	Contactor driver MOSFET short circuit detected
51C1	Power Supply Interrupt	Not used
51C2	Capacitor Precharge Failure	Capacitor voltage (0x5100,3) did not rise above 5V at power up
51C3	KL15/30 Too High	The voltage applied to the KL15/30 is above the controller rated maximum
5201	Heatsink overtemp	Controller heat sink has reached critical high temperature, and has shut down.
52C1	Encoder Fault	Encoder input wire-off is detected.
52C2	Motor Overcurrent Fault	Motor current exceeded controller rated maximum
52C3	Current Control Fault	Motor controller unable to maintain control of motor currents

Failure Code	Message	Description
52C4	Motor Overspeed Fault	Motor control tripped due to motor overspeed
52C5	Encoder Alignment Severe	Encoder is not aligned properly.
52C6	di/dt fault (suspected s/c)	Large rate of change of current detected multiple times. Suspected MOSFET, motor or wiring short circuit.
52C7	Vcap Overvotlage (software overvoltage)	Measured capacitor voltage has exceeded controller maximum.
5301	CANBUS Fault	CANbus fault condition detected on multinode system.
5302	Bootup not received	CANopen slave has not transmitted boot up message at power up
5303	LPRX queue overrun	CANbus fault condition detected on multinode system.
5304	LPTX queue overrun	CANbus fault condition detected on multinode system.
5305	HPRX queue overrun	CANbus fault condition detected on multinode system.
5306	HPTX queue overrun	CANbus fault condition detected on multinode system.
5307	CAN overrun	CANbus fault condition detected on multinode system.
5308	CAN off bus	CANbus fault condition detected on multinode system.
5309	Nodeguarding Failed	Not used
530A	Short PDO received	Received RPDO doesn't contains enough bytes
530B	CANopen Heartbeat Failed	Heartbeat not received within configured time out (0x1016)
530C	CANopen slave in wrong state	CANopen slave has changed to unexpected state
530D	CAN ESTAT set	Internal CANbus fault
530E	SDO HDL Error	Internal CANbus fault
530F	SDO Timeout Error	Internal CANbus fault
5310	SDO Abort Error	Internal CANbus fault
5311	SDO State Error	Internal CANbus fault
5312	SDO Toggle Error	Internal CANbus fault
5313	SDO Rec Error	Internal CANbus fault
5314	SDO Len Error	Internal CANbus fault
5315	SDO Send Error	Internal CANbus fault
5316	SDO unknown event	Internal CANbus fault
5317	SDO Bad SRC	Internal CANbus fault
5318	SDO bad error number	Internal CANbus fault

Failure Code	Message	Description
5319	Motor slave in wrong state	Motor slave in wrong state
531A	Ren Protocol	CAN device on Renault Twizy not responding
5341	Invalid DSP Protocol	DSP reports invalid protocol version on dual processor platform
5342	OSC Watchdog Fault	Internal hardware fault
5343	Fault List Overflow	Attempting to set too many faults.
5344	DSP SPI Comms Fault	Communication error between host and DSP processors (or gate drive and MCP)
5345	Scheduler stack overflow fault	Less than 10% of the stack is free on one of the RTOS tasks.
5346	Internal supply out of range fault	An internal logic supply rail has gone out of range
5381	CANopen anon EMCY level 4	EMCY message received from non-Sevcon node and anonymous EMCY level (0x2830,0) is set to 4.
5441	Incompatible hardware version	Detected controller hardware version incompatible with software
5442	Calibration Fault	Calibration settings in controller are out of range
54C1	PFOvervoltage	Voltage on B+ terminal exceeds rated maximum for controller
54C2	Powerframe Fault	Motor current exceeded controller rated maximum
54C3	MOSFET s/c M1>B+	MOSFET / IGBT s/c detection on M1 top devices
54C4	MOSFET s/c M1>B-	MOSFET / IGBT s/c detection on M1 bottom devices
54C5	MOSFET s/c M2>B+	MOSFET / IGBT s/c detection on M2 top devices
54C6	MOSFET s/c M2>B-	MOSFET / IGBT s/c detection on M2 bottom devices
54C7	MOSFET s/c M3>B+	MOSFET / IGBT s/c detection on M3 top devices
54C8	MOSFET s/c M3>B-	MOSFET / IGBT s/c detection on M3 bottom devices
54C9	MOSFET s/c checks incomplete	Unable to complete MOSFET / IGBT s/c tests at power up
54CA	Pump Mosfet S/C	MOSFET / IGBT s/c detection Pump Mosfet Devices
54CA	IGBT M1 Low Driver Fail	IGBT driver failure
54CB	IGBT M1 High Driver Fail	IGBT driver failure
54CC	IGBT M2 Low Driver Fail	IGBT driver failure
54CD	IGBT M2 High Driver Fail	IGBT driver failure
54CE	IGBT M3 Low Driver Fail	IGBT driver failure
54CF	IGBT M3 High Driver Fail	IGBT driver failure
5741	Invalid Powerframe Rating	Unable to identify hardware
5781	CANopen anon EMCY level 5	EMCY message received from non-Sevcon node and anonymous EMCY level (0x2830,0) is set to 5.

MALFUNCTION INSPECTION

Appearance malfunction inspection		
No.	Phenomenon	Measure
1	Plastic cover damaged	1. Replace new plastic cover.
		2. Check whether installation supporter deformed, repairing or re-painting is needed before replacing new plastic cover.
		3. Re-paste decals and re-rivet warning labels.
2	Bumper damaged	1. Replace new bumper.
		2. Check whether installation supporter deformed or damaged, repairing or re-painting is needed before replacing new bumper.
3	Frame toe-board damaged	1. Replace new frame toe-board.
		2. Check whether gearbox and differential of front and rear axle damaged or leakage.
		3. Check plastic cover whether deformed or damaged, repairing deformed or damaged plastic cover.
4	Warning labels	Replace damaged and vague warning labels
Brake system malfunction inspection		
No.	Phenomenon	Measure
1	Locked braking system	1. Check whether brake disc plates deformed.
		2. Check whether hydraulic cylinder of brake clamp locked or brake clamp assembly parts deformed.
2	Brake performance degressive	1. Check whether disc plates abrasion exceeded limits.
		2. Check whether brake shoe of clamp abrasion exceeded limits or polluted by friction material such as oil.
		3、Check whether the oil cup of brake fluid lack oil.
3	Grinding noises emerged from front brake or brake plate become red during drive due to superheat.	1. Check whether brake plate deformed.
		2. Check whether hydraulic cylinder of brake clamp locked or brake clamp assembly parts deformed.
4	Grinding noises emerged from rear brake or brake plate become red during drive	1. Check whether brake plate deformed.
		2. Check whether hydraulic cylinder of brake clamp locked or brake clamp assembly parts deformed.
		3. Check whether rear brake clamp parking institution running flexible or return accurately.
5	Off tracking by braking at high-speed	1. Check whether front brake power deviation from left and right is within specified scope.
		2. Check whether front brake power degressive caused to rear wheel locked before front wheel in brake process.
		3. Check whether left and right absorber spring force deviation is exceeded specified value.

5	Off tracking by braking at high-speed	4. Check whether front wheel and front wheel axle nut loosen or damaged.
		5. Check whether front wheel hub inner spline and front wheel axle outer spline worn or loosen.
		6. Check whether rubber cushion connected to front suspension rocker and frame damaged.

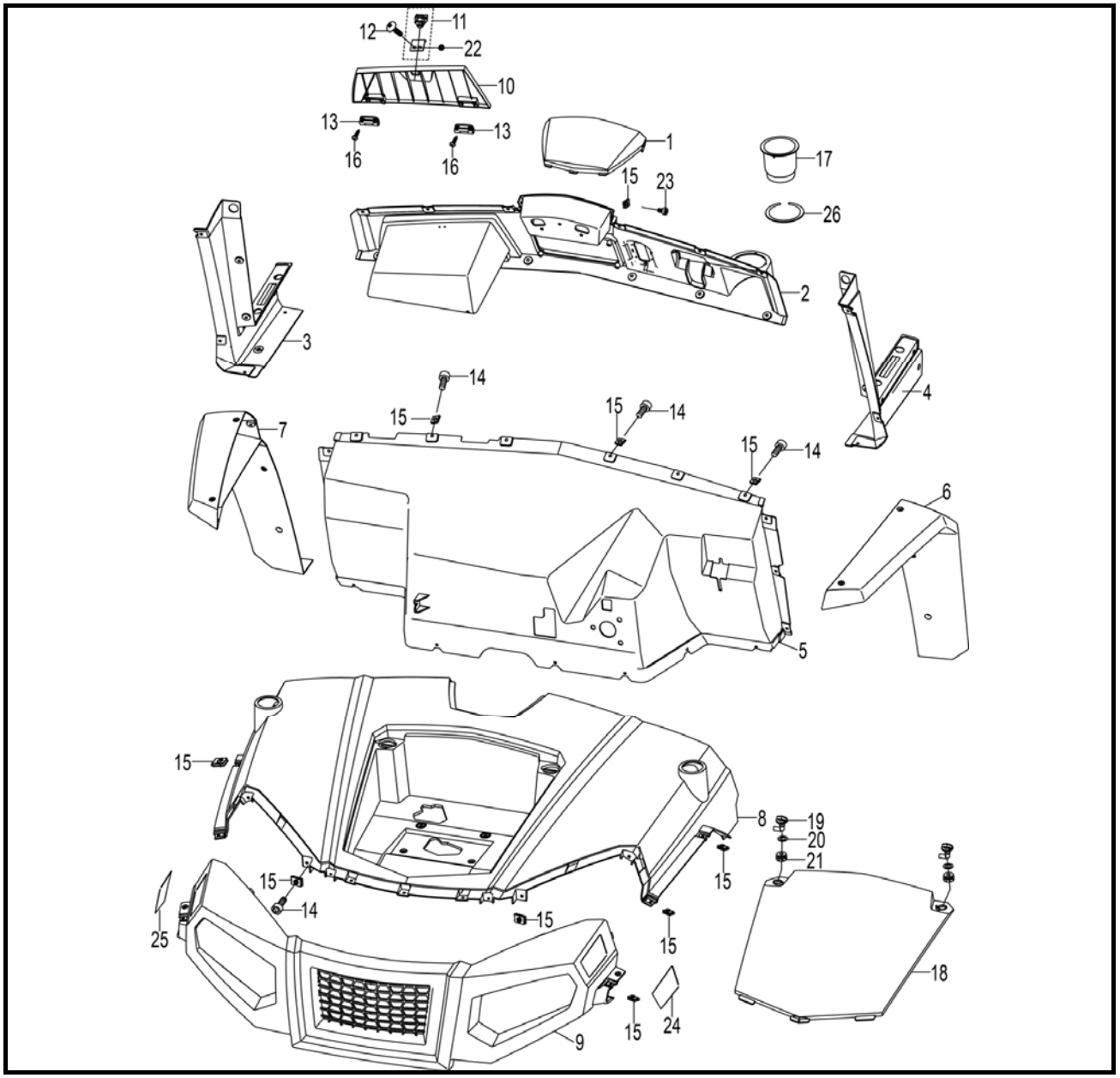
Other system malfunction inspection

No.	Phenomenon	Measure
1	Steering wheel loosen, shift up and down	1. Check whether steering wheel clip loosen or damaged.
		2. Check whether steering column clip and clip seat loosen or damaged.
		3. Check whether steering column bottom end inner bearing damaged.
2	Front wheel steering clearance excessive	1. Check whether tie-rod and steering column locknut loosen or damaged, or steering knuckle and steering column locknut loosen or damaged.
		2. Check whether tie-rod two ball joint damaged.
3	Front wheel sway during drive	1. Check whether steering knuckle bearing damaged.
		2. Check whether king pin ball joint damaged.
		3. Check whether front wheel and axle locknut loosen or damaged.
		4. Check whether front wheel hub inner spline and front wheel axle outer spline worn or loosen.
		5. Check whether rubber cushion connected to front suspension rocker and frame damaged.
4	Rear wheel sway during drive	1. Check whether rear axle bearing damaged.
		2. Check whether sliding bearing connected to rear axle bearing housing and rocker loosen or damaged.
		3. Check whether rear wheel and axle locknut loosen or damaged.
		4. Check whether rear wheel hub inner spline and rear wheel axle outer spline worn or loosen.
		5. Check whether rubber cushion connected to rear suspension rocker and frame damaged.
5	Wheel hop during drive	1. Check whether wheel rim deformed.
		2. Check whether front and rear axles bent.
		3. Check whether tyre aging and deformed.
6	Absorber become soft and comfortability depressed	1. Check whether over loading.
		2. Check whether absorber spring become soft.
		3.Check whether absorber lost of damping force incompression and prolongation.

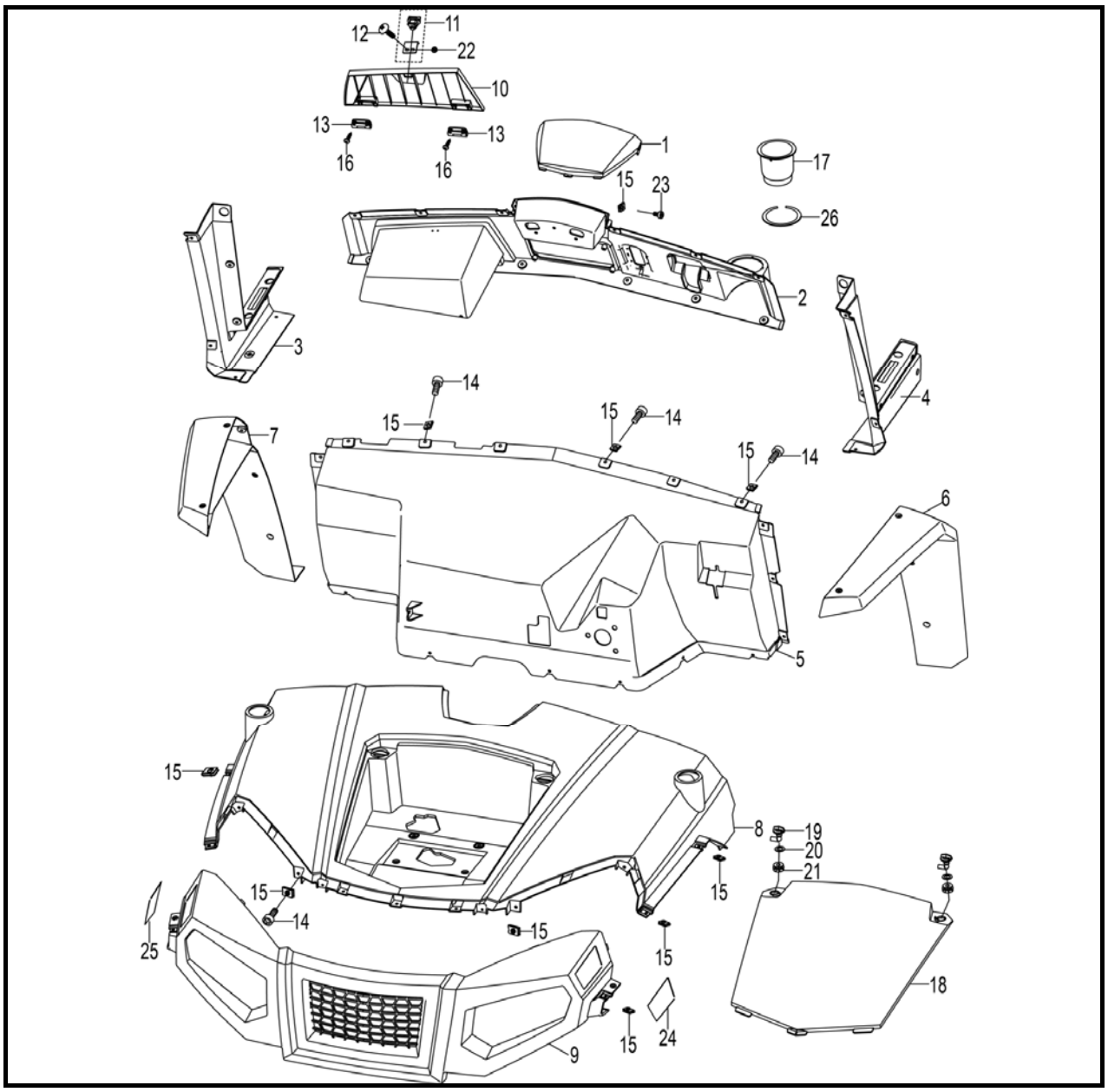
No.	Phenomenon	Measure
7	Front and rear axles arise abnormal sound during drive	1. Check whether front and rear axles splines damaged.
		2. Check whether gears of front gearbox and differential over worn.
		3. Check whether rear gearbox gears over worn.
		4. Check whether axle universal joint rubber boot damaged or universal joint damaged.
8	Fail to shift into four-wheel-drive or lock differential.	1. Check whether four wheel drive switch normal.
		2. Check whether power divider damaged.
		3. Check whether differential mechanical conversion agency locked or damaged.
9	Rear axle differentiation lock failure	1. Check whether the switch of rear axle differentiation lock on the dashboard is damaged .
		2. Check whether the differential mechanical conversion mechanism within the rear axle reducer is damaged.

PANEL AND CARGO BED

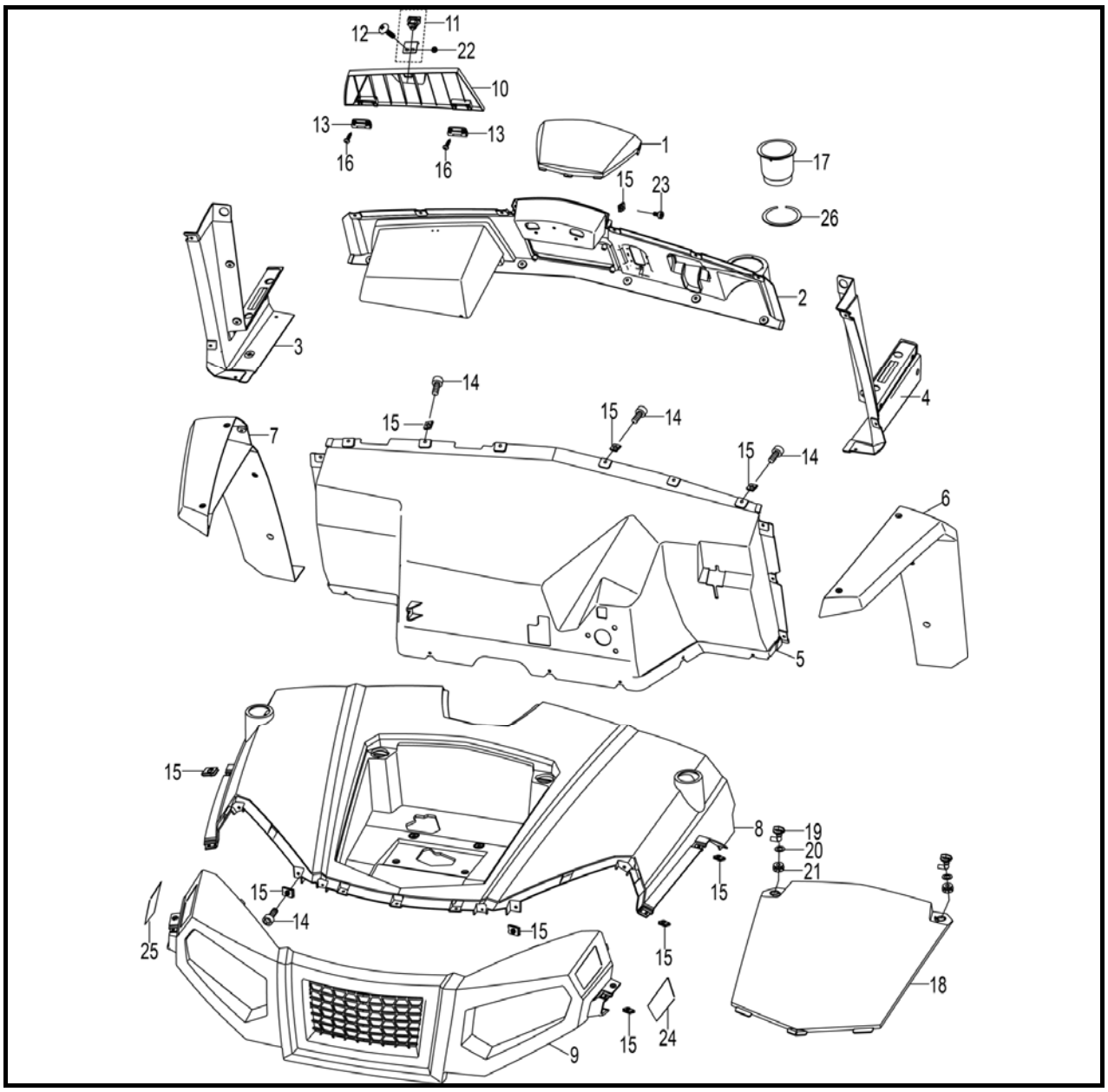
Front Panel



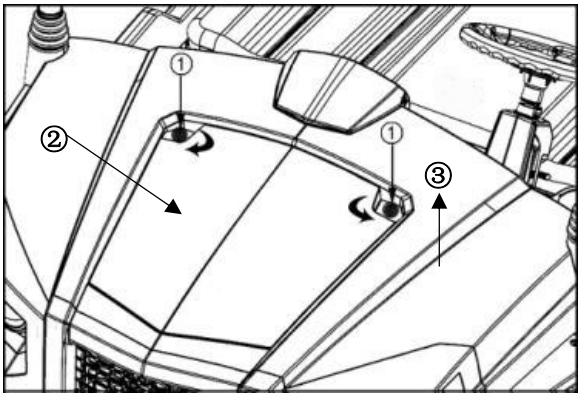
No.	Part Name	Qty	Remarks
	Removing the front panel		
1	Instrument mask	1	
2	Instrument panel	1	
3	Right back plate I ,cabin outside	1	
4	Left back plate I ,cabin outside	1	
5	Front fender	1	
8	Front left wheel regula l	1	
9	Headlight mounting plate	1	



No.	Part Name	Qty	Remarks
10	Sundry box cover	1	
11	Lock of sundry box	1	
12	Big pan head screw with cross recess M5×16	2	
13	Plastic hinge, sundry box	2	
14	Socket hexagon plain head screw M6×16,green	58	
15	Nut clamp M6×2	40	
16	Cross small plate head tapping screw ST4.8×13	4	
17	Water cup cover	1	
18	Bright white front panel	1	
19	Knob switch	2	



No.	Part Name	Qty	Remarks
20	Washer Φ15×Φ22×1	2	
21	Rubber sleeve, knob switch	2	
22	Hexagon flange nut M5	2	
23	Socket hexagon plain head screws M6×12	2	
24	Front left reflector	1	
25	Front right side reflector	1	
26	Cup cover circlip	1	



DIASSEMBLING THE HOOD

Remove:

① Switch

② Hood

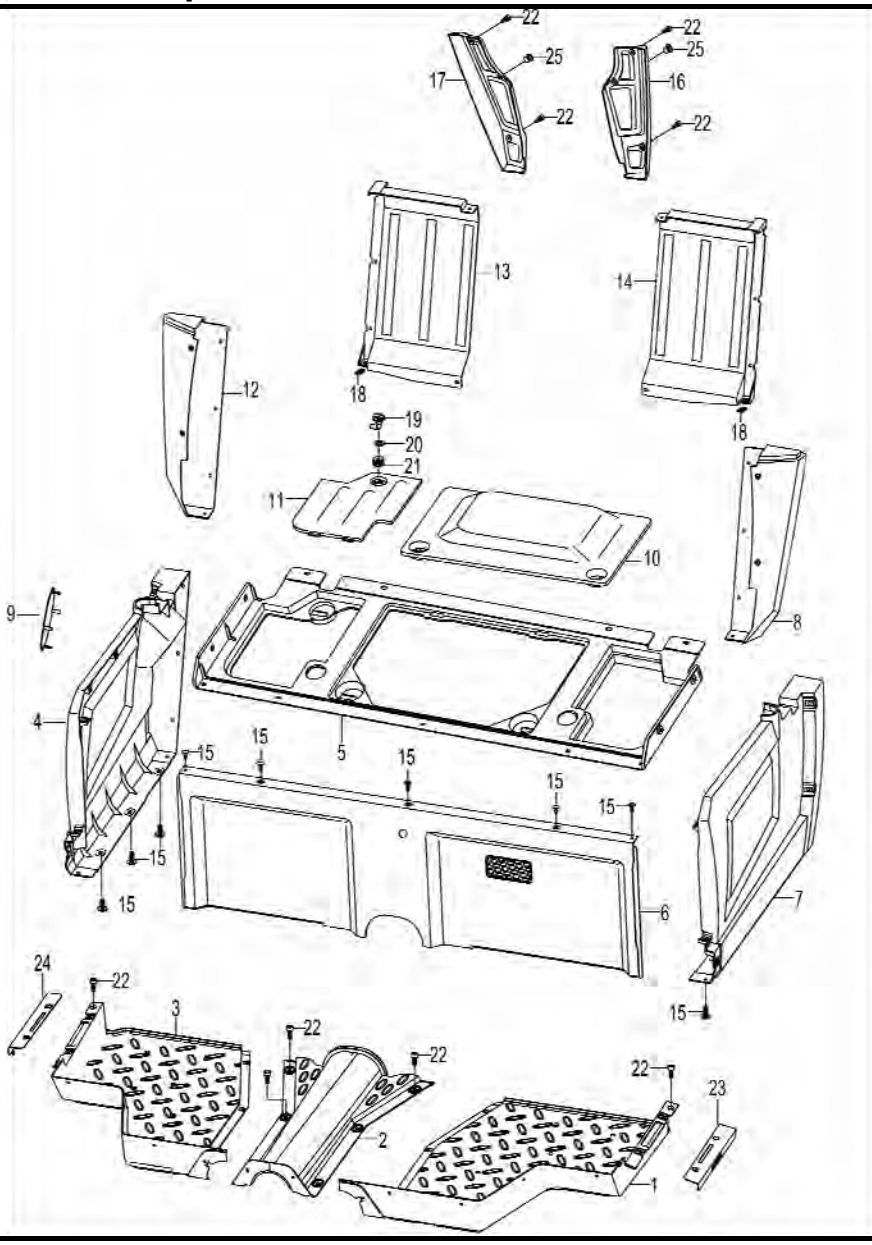
③ Release

To open the hood, pull up the switch to release the latch and open the hood .

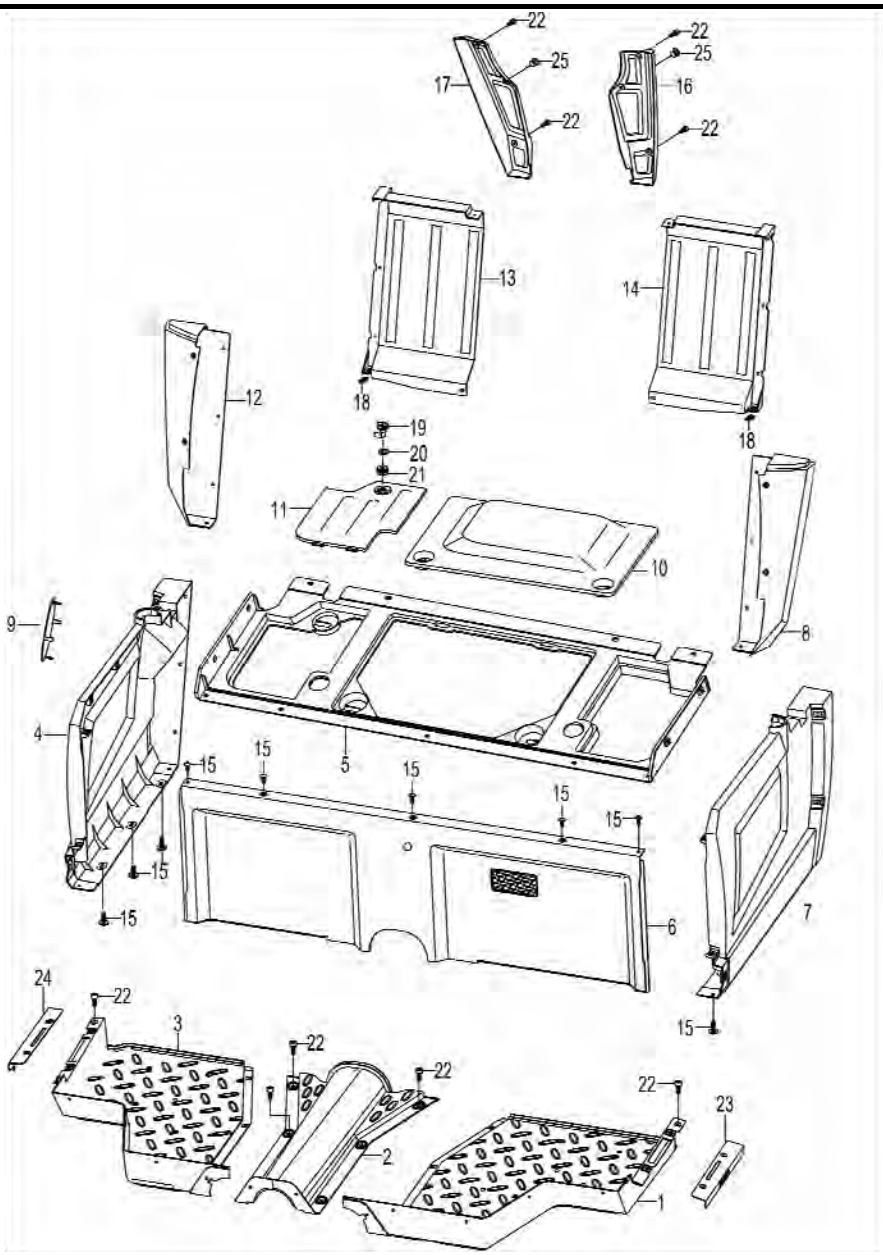
CAUTION:

- **Never open operator's seat while the engine is running.**
- **Support hood with the other hand while unlocking support link.**

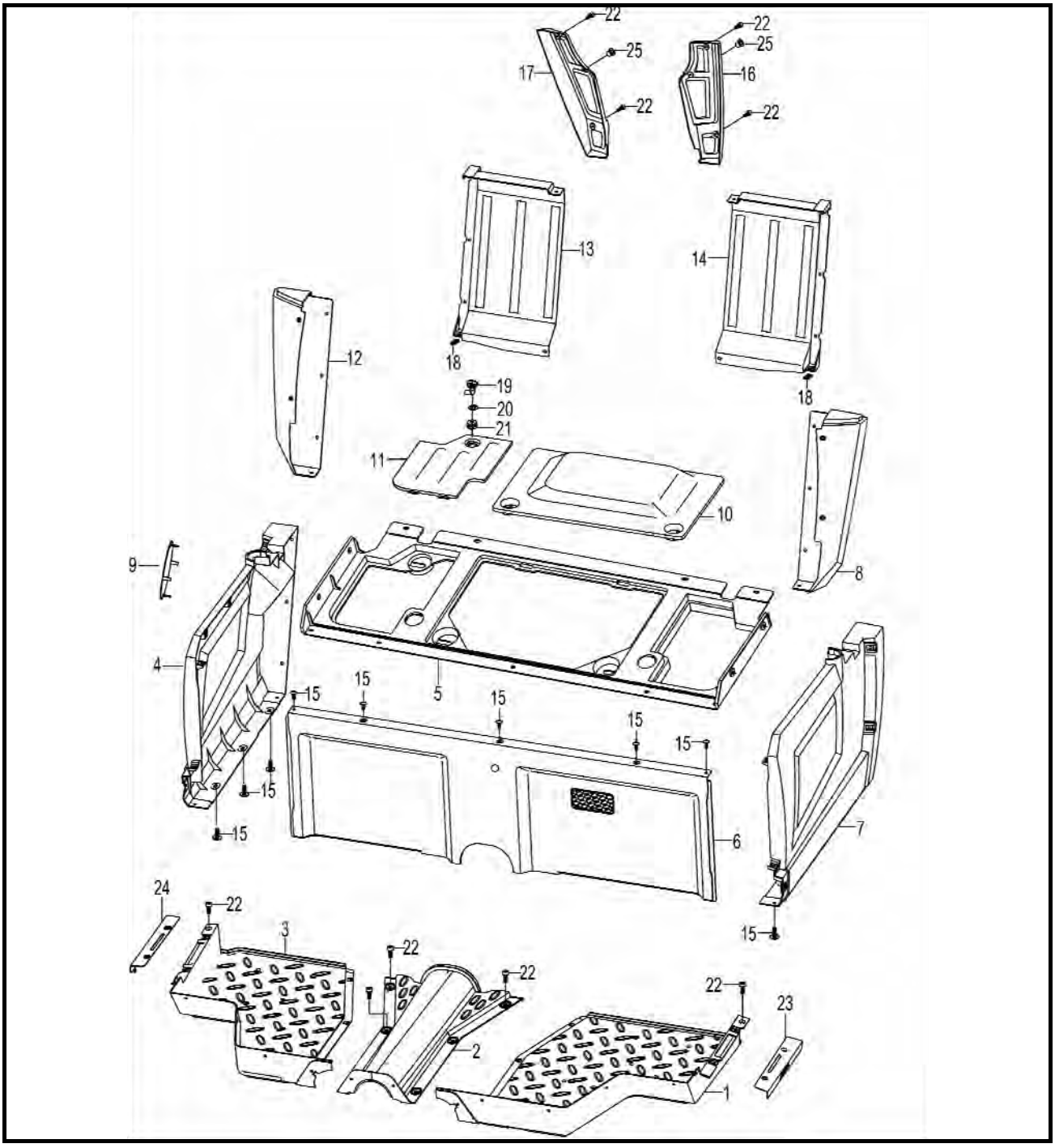
Side Cover, Footrest part



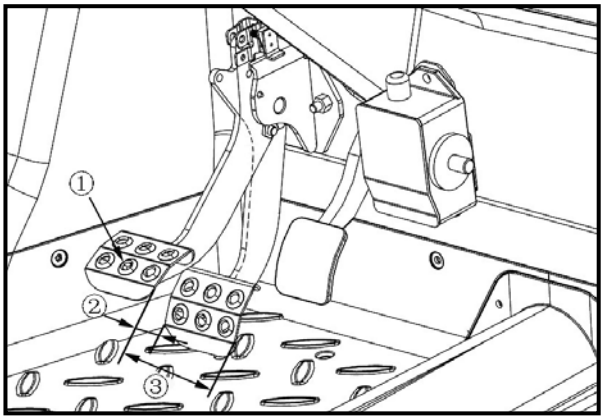
No.	Part Name	Qty	Remarks
	Removing the side cover footrest part		
1	Left footrest	1	
2	Middle protective plate, footrest	1	
3	Right footrest	1	
4	Right backplate Ⅱ,cabin outside	1	
5	Lower backplate I, seat cushion	1	
6	Lower backplate Ⅱ, seat cushion	1	
7	Left backplate Ⅱ,cabin outside	1	
8	Rear left wheel regula Ⅰ	1	
9	Tank Opening Decorative Cover	1	



No.	Part Name	Qty	Remarks
10	View window plate	1	
11	Right Cover, seat sundry box	1	
12	Rear right wheel regula Ⅰ	1	
13	Rear fender Ⅱ	1	
14	Rear fender Ⅰ	1	
15	Cross Plate Head Screw M6×16	33	
16	Rear Protective Plate Ⅰ	1	
17	Rear Protective Plate Ⅱ	1	
18	Nut clamp M6×2	42	
19	Knob switch	1	
20	Washer Φ15×Φ22×1	1	



No.	Part Name	Qty	Remarks
21	Rubber Sleeve, Knob Switch	1	
22	Socket Hexagon Screw M6×16	33	
23	Decorative sheet, front left backplate	1	
24	Decorative sheet, front right backplate	1	
25	Rearview mirror rubber pad	2	



CHECKING THE BRAKE PEDAL

① Brake pedal

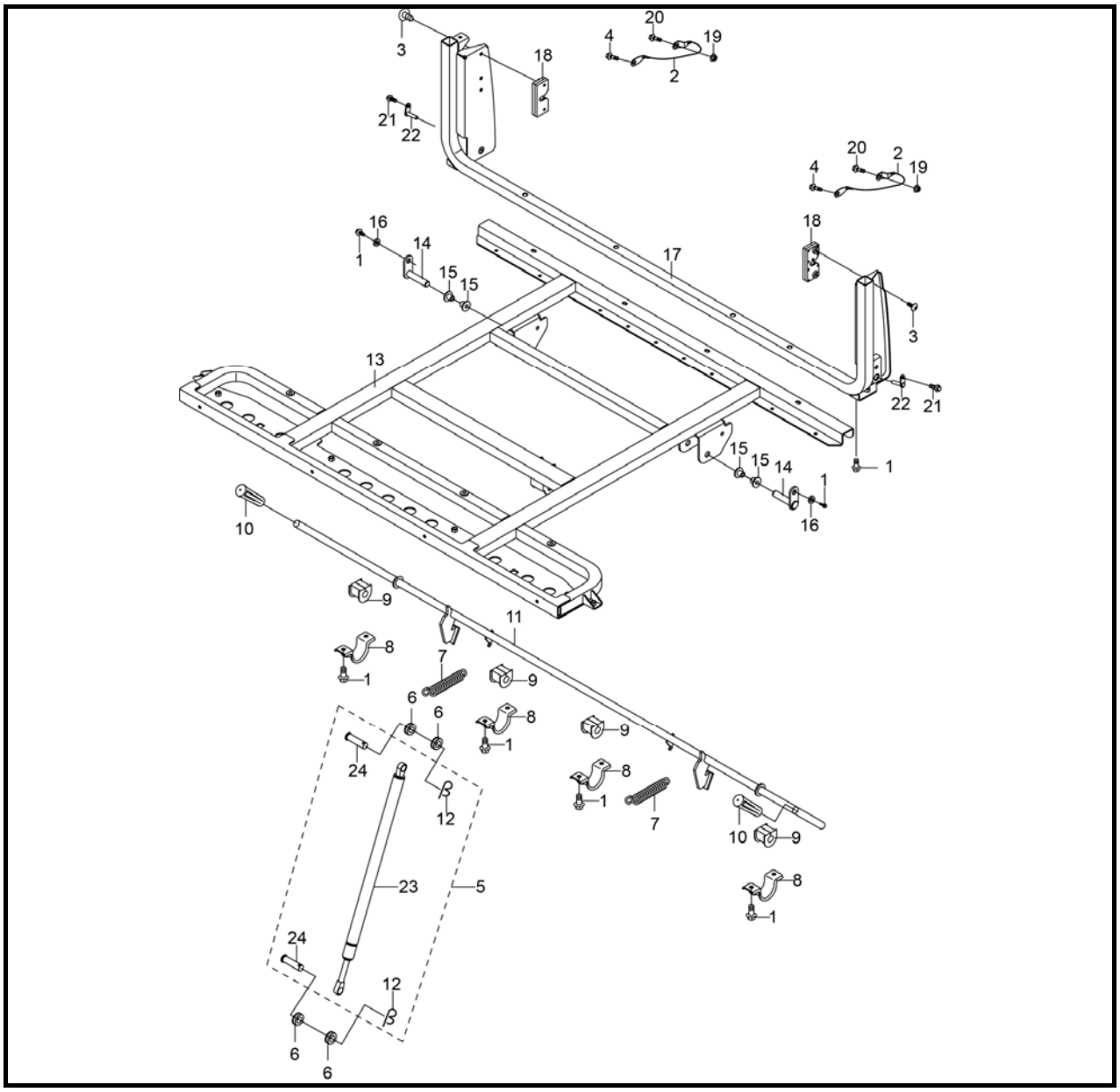
② Free travel

③ Pedal stroke

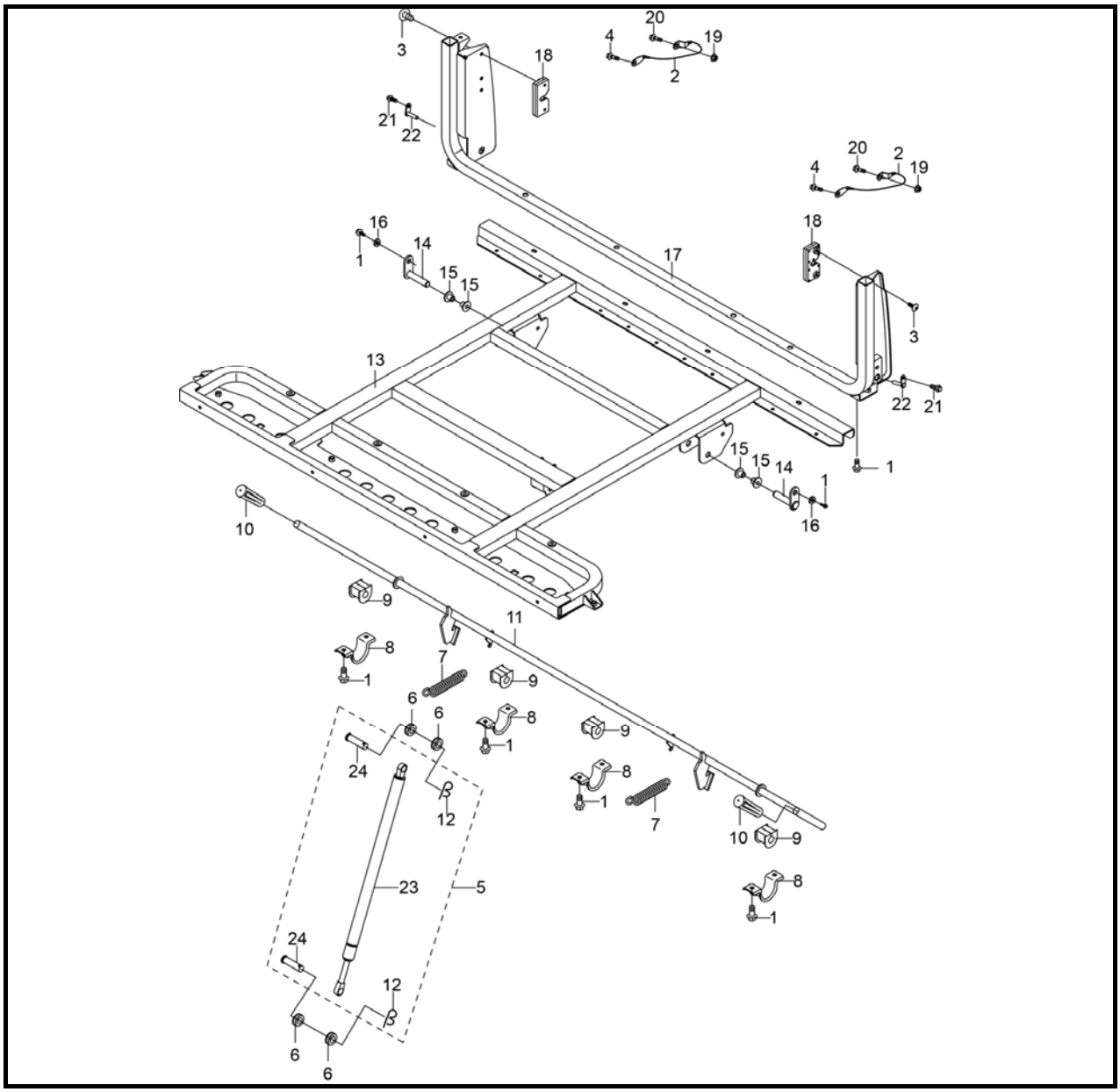
Inspect the brake pedals for free clearance and smooth operation.

Adjust if incorrect measurement is found.

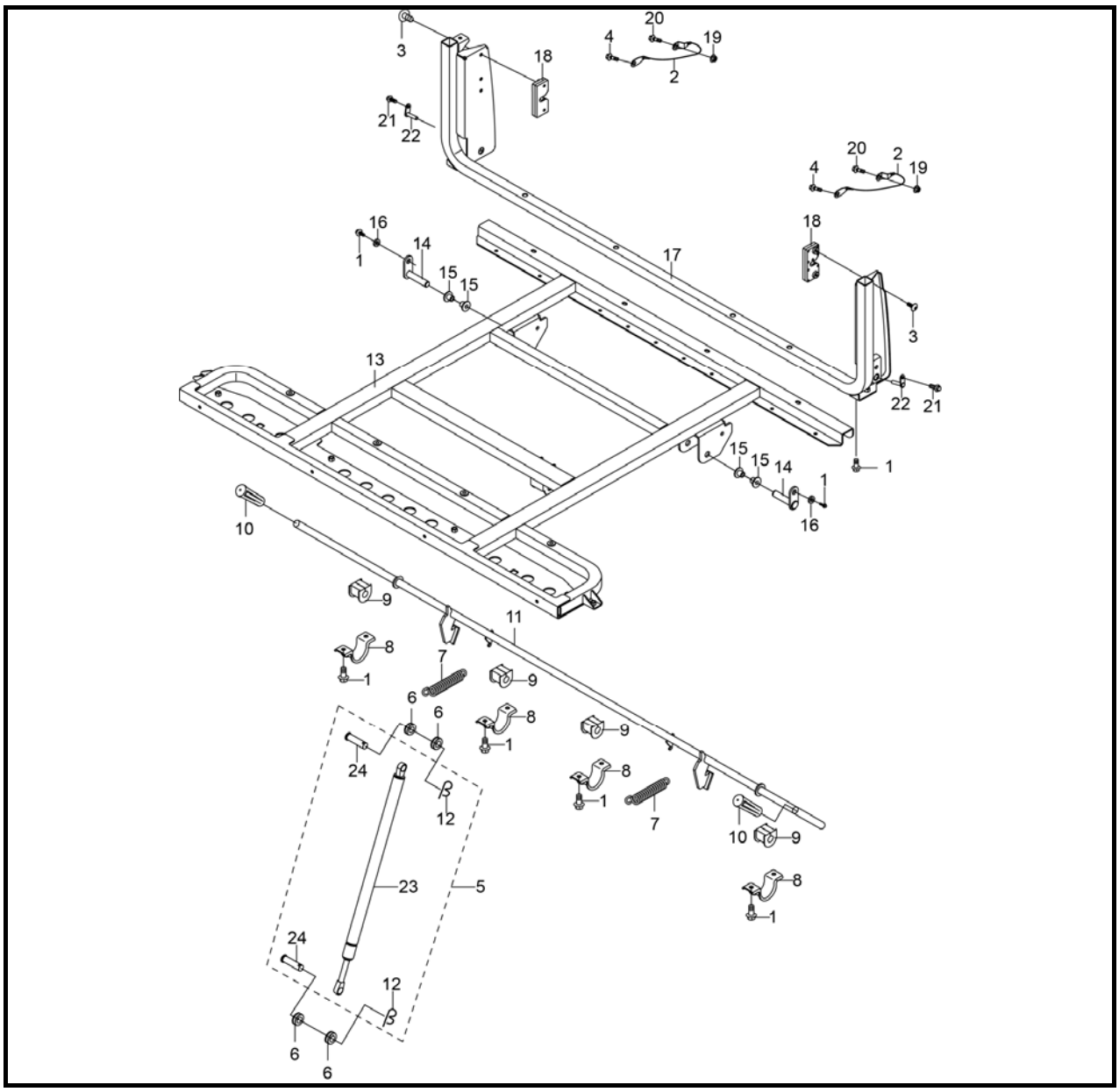
Cargo Rack



No.	Part Name	Qty	Remarks
	Removing the cargo rack		
1	Hexagon flange bolt M6×16	6	
2	Cargo bed door cable	2	
3	Big pan head screw with cross recess M6×20	8	
4	Bolt, bed cable M6×12	2	
5	Bed gas spring	1	
6	Flat rubber washer Φ13×10	4	
7	Tension spring H	2	
8	Mounting cap, cushion rubber	4	

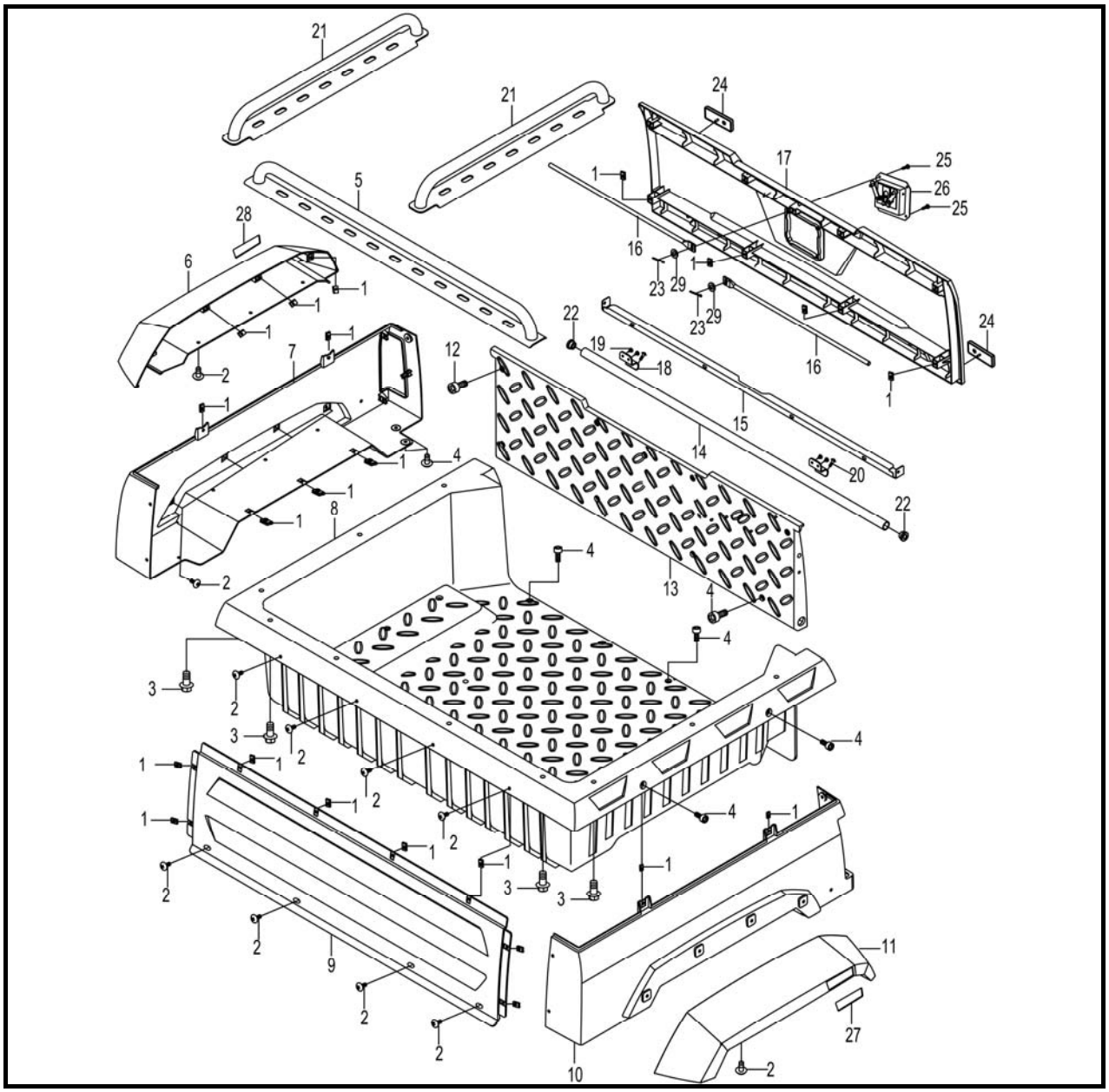


No.	Part Name	Qty	Remarks
9	Damping cover, balancing lever Φ14×29	4	
10	Handle gum cover	2	
11	Invert bracket assy, carrier	1	
12	R-pin B	2	
13	Cargo bed plate assy	1	
14	Container shaft assy	2	
15	Turn up plastic liner Φ12×Φ18	4	
16	Spring washer 6	2	
17	Cargo bed door mounting assy	1	



No.	Part Name	Qty	Remarks
18	Door panel lock assy	2	
19	Hexagon flange nut M6	2	
20	Bolt, bed cable M6×12	2	
21	Hexagon flange bolt M8×12	2	
22	Container hinge plate	2	
23	Cargo gas spring assy	1	
24	Step cotter pin Φ12×47	2	

Cargo Bed



No.	Part Name	Qty	Remarks
	Removing the cargo bed		
1	Nut clamp M6×2	36	
2	Screw M6×16	14	
3	Hexagon flange bolt M8×20	13	
4	Inner hexagon bolt with pan M6×16	8	
5	Front bed guardrail	1	
6	Rear right wheel regula Ⅱ	1	
7	Front panel, R	1	
8	Plastic bed	1	