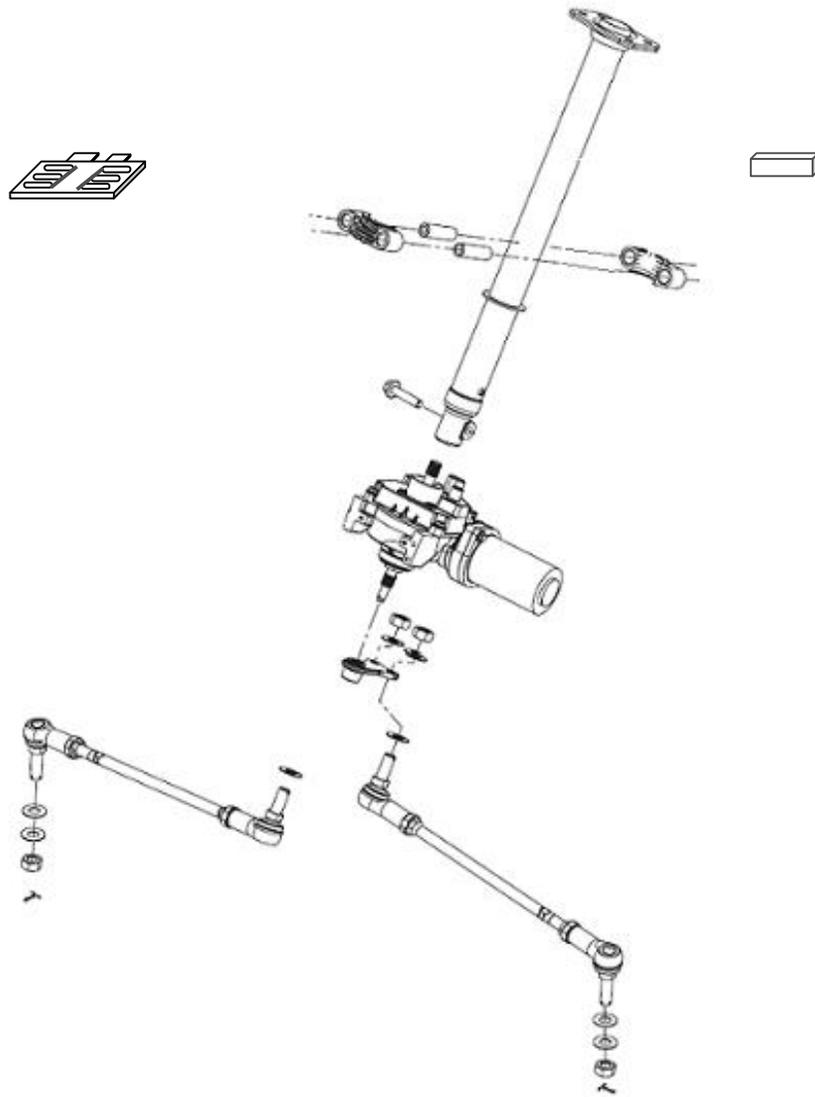


Mechanism Diagram



GENERAL

During assembly/installation, use the torque values and service products as in this section.

WARNING!

Torque wrench tightening specifications must be strictly adhered to.

Locking device (e.g.: locking tabs, elastic stop nuts, cotter pins, etc.) must be replaced.

Hoses, cables or locking ties removed during a procedure must be reinstalled as per factory standards.

SYSTEM DESCRIPTION (FEATURES)

The Electric Power Steering (EPS) provides a computer controlled, variable power assist, achieved by an electric motor to optimize the amount of steering input required by rider.

The EPS system uses the following parameters to determine how much steering assist provides:

- Engine RPM
- Battery/electrical system voltage
- Vehicle speed
- EPS shaft torque sensor input.
- The amount of steering assist provided is dependent on the handlebar effort (steering torque), electrical power available and vehicle speed.
- The greater the handlebar effort (torque), the greater the assist will be.
- The slower the vehicle speed, the greater the assist will be.
- If the electrical system is activated but the engine is not running, there is no power assist provided. When the handlebar is in the straight-ahead position, there is no steering assist.
- Steering torque may also come from the wheels due to rough terrain. Steering kickback is reduced while providing feedback to the driver.
- The greater the power steering assist, the greater the load on the electrical system.
- When the electrical system is under high load (battery not at full charge, operating the vehicle for prolonged periods of time at low speed and low RPM which, requires higher power assist), the battery power reserve will gradually decrease. This further increases the load on the charging system and the electrical system voltage will drop. As system voltage drops, so does power steering assist.

NOTE: It is important to maintain the battery at full charge state of charge to ensure proper EPS operation. The magneto output is increased to 520 watts minimize battery drain and system voltage drop.

EPS Mode

The EPS system normally provides two rider selectable modes of operation.

MAX provides maximum steering assist for technical low speed riding in rough or muddy terrain or for touring.

MIN provides less steering assist for increased feedback and aggressive trail riding.

How to View EPS Mode Selection

- To view the active EPS assist mode, press MODE button from the dashboard and move to EPS select page, then press the RESET button to engage the EPS assist.

The active EPS mode will display in the middle right portion of speedometer.



How to Change EPS Mode

To change EPS mode, press the RESET button on the EPS function page, The EPS system will engage or disengage and display “MIN”, “MAX” and blank (OFF).

When EPS system is malfunction, the function block will displayed “FAIL”.

SYSTEM DESCRIPTION (COMPONENTS)

EPS Unit

- The EPS unit is a self-contained unit that includes the steering gear, the EPS module, the EPS motor and the torque sensor.
- The EPS module provides DC power to the motor. The amount and duration of that DC power is determined by the inputs to the EPS module. Reversing the polarity of the circuit current changes the direction in which the motor turns.
- The EPS motor does not “spin”, but rather turns in very small increments based on the amount, duration and direction of DC power delivered by the EPS module.

EPS unit protection

To protect the EPS electronic components, the steering assist behavior will change as follows.

CONDITION	EPS BEHAVIOR
When motor internal temperature reaches a certain temperature (EPS continuously estimates it)	Steering assist will gradually decrease.
EPS internal board temperature is above 85°C	
EPS internal board temperature is above 100°C	Steering assist is stopped.

When the EPS unit temperature is above 100°C, all the EPS function will stop but the steering can operate without power assist, when the EPS internal board temperature decrease below 90°C, the power steering will back to normal and steering assist should resume normal operation.

Steering Torque Sensor

- The steering column is connected to the shaft on the EPS unit. A small area of the EPS shaft is magnetized. Inside the EPS unit, a torque sensor surrounds the magnetized area of the EPS shaft.
- When the handlebar is turned, torque is applied to the shaft, which tends to twist the shaft slightly, deforming the magnetic field in the shaft. The sensor detects the torque by measuring the deviation of the magnetic field.
- The torque sensor is very sensitive and can detect very small changes in the magnetic field. The harder the handlebar is turned, the greater the magnetic deviation, the greater the power steering assist.

ADJUSTMENT

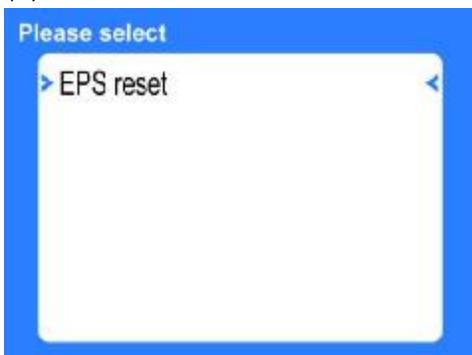
TORQUE OFFSET RESET

When replacing the following parts or adjusting steering alignment, the sensor torque offset must be reset to zero for proper system operation.

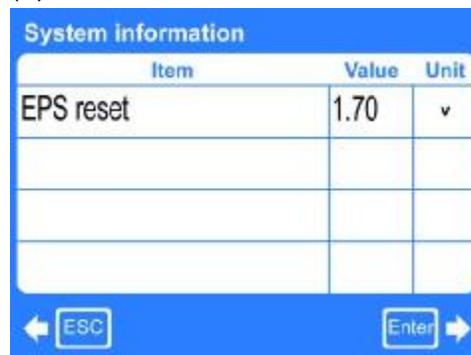
PART ADJUSTED OR REPLACED	WHAT TO DO
- EPS unit - Steering column bearing - Tie Rod - Tie Rod end - Knuckle - Wheel bearing - Ball joint - Front suspension A-arm - Steering alignment-	Reset Torque Offset in Setting, EPS

1. Ensure proper STEERING ALIGNMENT, refer to appropriate Shop Manual subsection.
2. Connect vehicle to the diagnostic tool.
3. Choose the setting tab as following step.

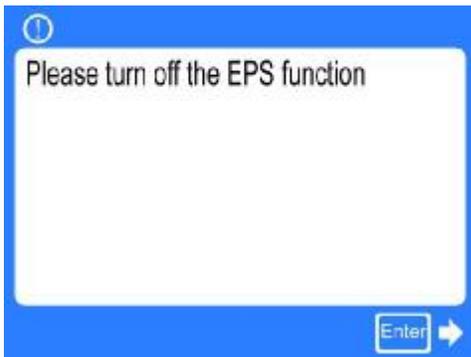
(1)



(2)



(3)



(4)



NOTICE: Ensure handlebar is free and centered within ± 10 degrees of center position.
There **MUST NOT** be any effort applied to the steering column.

EPS MODE

1. To view the active EPS mode, press the MODE button on the dashboard.
The active EPS mode will be blinking and displayed in the middle right portion of speedometer.



2. To change EPS mode, press the RESET button, the EPS system will toggle to the other available mode, which engage or disengage, “MIN” or “MAX”.

TROUBLESHOOTING

NO POWER STEERING

1. EPS malfunction.

- If the CHECK ENGINE light is on and a EPS FAULT message is visible in the dashboard, check for fault code using diagnostic tool and carry out service action.

2. No power to EPS unit.

- Carry out an EPS unit FUSE test as detailed in the subsection. Replace as required.
- Carry out an EPS unit INPUT VOLTAGE test (POWER SIDE) as detailed in this subsection. Repair or replace wiring/connectors as required.

- Carry out an EPS unit INPUT VOLTAGE test (CONTROL SIDE) as detailed in this subsection. Repair or replace wiring/connectors as required.

3. NO ground to EPS unit.

- Carry out an EPS unit GROUND CIRCUIT test as detailed in this subsection. Repair or replace wiring/connectors as required.

4. No engine RPM signal from ECU.

- If engine RPM can be displayed in the dashboard when the engine is running, carry out an EPS unit COMMUNICATION LINK (can) CONTINUITY test as detailed in this subsection. Repair or replace wiring/connectors as required.
- If engine RPM cannot be displayed in the dashboard, use diagnostic tool to check for applicable fault codes. Carry out service actions.

LOW POWER STEERING ASSIST

1. Low battery voltage.

- Check battery terminals. Clean, repair, replace or tighten as required.
- Test battery voltage. Recharge or replace battery as required.
- Carry out an EPS unit INPUT VOLTAGE test (POWER SIDE) as detailed in this subsection. Ensure power connector pins are clean, corrosion free, tight and make good contact. Repair or replace wiring/connectors as required.
- Carry out an EPS SYSTEM LOAD TEST as detailed in this subsection.

2. Low input voltage to EPS unit.

- Carry out an EPS unit INPUT VOLTAGE test (POWER SIDE) as detailed in this subsection. Ensure power connector pins are clean, corrosion free, tight and make good contact. Repair or replace wiring/connectors as required.

3. Faulty EPS ground circuit.

- Carry out an EPS GROUND CIRCUIT test. Ensure EPS ground connector pins and frame ground post are clean, corrosion free, tight and make good contact. Repair or replace wiring/connector as required.

ASYMMETRICAL POWER STEERING ASSIST (SIDE TO SIDE)

1. Torque sensor not reset to zero.

- Ensure steering alignment is within specification and carry out the TORQUE OFFSET RESET procedure detailed in this subsection.

2. Check the DTC code, the code refer to below list:

DTC	DTC explanation
C1511	Torque sensor connector loose
C1512	Torque sensor T1 signal abnormal
C1513	Torque sensor T2 signal abnormal
C1514	Torque sensor T1 & T2 signal abnormal
C1515	Torque sensor reset abnormal

C1521	Motor sensor connector loose
C1522	Motor sensor PWM1 signal abnormal
C1523	Motor sensor PWM2 signal abnormal
C1524	Motor sensor INDEX abnormal
C1525	Motor sensor PWM & INDEX abnormal
C1526	Motor sensor Qex abnormal
C1532	Controller current sensor abnormal
C1531	Controller drive IC abnormal
C1533	Controller temperature sensor abnormal
C1536	Controller voltage too high
C1537	Controller voltage too low
C1538	Controller overheat
C1539	Controller low temperature

PROCEDURES

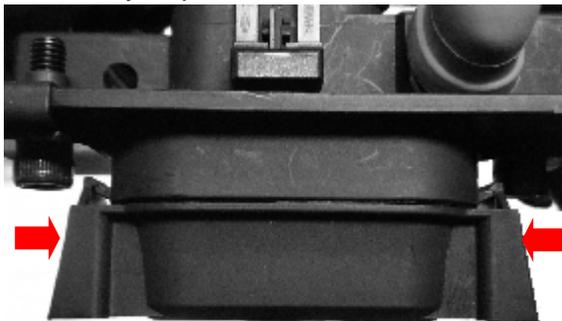
EPS UNIT

EPS unit Power Fuse Test

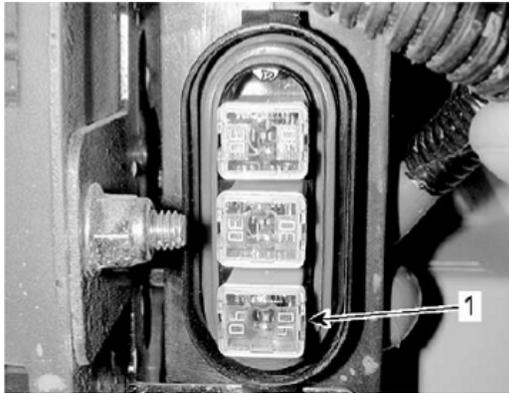
A 40 A EPS fuse located in the rear fuse box next to the voltage rectifier unit provides power for the EPS motor.



1. To remove fuse box cover, simultaneously squeeze tabs inwards on each end of fuse box cover as you pull downward on the cover.



2. Using voltmeter set to Ω selection, remove and test the EPS fuse.



3. Replace fuse as required.

EPS unit Input Voltage Test (Power Side)

1. Disconnect the EPS power connector.
2. Test for 12 VDC EPS motor power at pin as per following table.

VOLTMETER PROBE POSITION		VOLTAGE
EPS power connector pin A	Battery ground	Battery voltage

If NO voltage is measured, test the 40 A EPS fuse in the rear fuse box. If good, check wires and connector pins. Replace or repair defective parts and reset faulty codes.

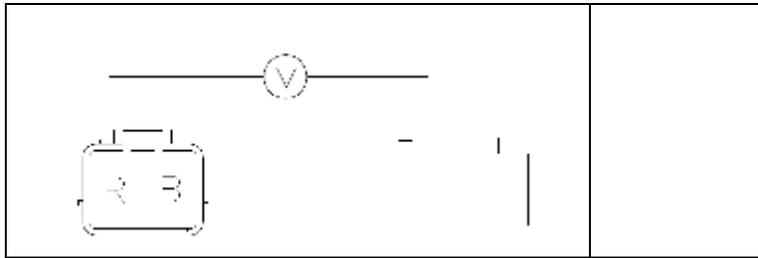
If battery voltage is measured, carry out the following EPS UNIT INPUT VOLTAGE TEST (CONTROL SIDE).

NOTE: This test may also be carried out by connecting a 12 VDC test light between each EPS power connector pins (A and B) and the battery (-) negative terminal. The test light must come on bright.

EPS Unit Input Voltage Test (Control Side)

1. Disconnect EPS control connector and turn ignition switch ON.
2. Set the ignition switch to ON.
3. Test for 12 VDC power to the EPS module pin as per following table.

VOLTMETER PROBE POSITION		VOLTAGE
EPS control connector (pin R) and battery ground		Battery voltage



If NO voltage is measured, check wires and connector pins from EPS unit to the Relays/Speedo fuse in front fuse box. Replace or repair defective parts and reset faulty codes. If battery voltage is measured, carry out the following EPS UNIT GROUND CIRCUIT TEST.

NOTE: This test may also be carried out by connecting a 12 VDC test light between the EPS control connector (pin A) and the battery (-) negative terminal. The test light must come on bright.

EPS Unit Ground Circuit Test

1. Disconnect the EPS ground connector (GDN)
2. Test for continuity between PINS to battery ground.

VOLTMETER PROBE POSITION		READING
EPS GDN connector pin B	Battery ground	Continuity (close to 0 Ω)

If there is NO continuity or a high resistance is measured, check wires and connector pins from EPS unit to chassis ground post. Replace or repair defective parts and reset faulty codes.

If there is good continuity, carry out the following EPS UNIT COMMUNICATION LINK (CAN) CONTINUITY TEST.

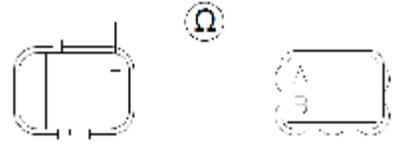
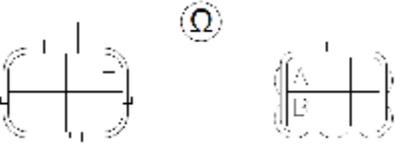
NOTE: This test may also be carried out by connecting a 12 VDC test light between each GDN connector pin and the battery (+) positive terminal. The test light must come on bright.

EPS Unit Communication Link (CAN) Continuity Test

NOTE: EPS unit must receive an RPM signal to provide power steering assist.

Disconnect the EPS control connector and the diagnostic connector.

Test continuity of CAN Bus Wires at PINS.

VOLTMETER PROBE POSITION	RESISTANCE 20°C
EPS control connector (pin CAN H) and diagnostic connector (pin A) 	Below 1 Ω
EPS control connector (pin CAN L) and diagnostic connector (pin B)	
	

If resistance measured is out of specification, check wires and connector pins. Carry out repairs as required and reset faulty codes using CAM Bus software.

If resistance measured is good, replace the EPS unit and reset faulty codes using CAN Bus software.

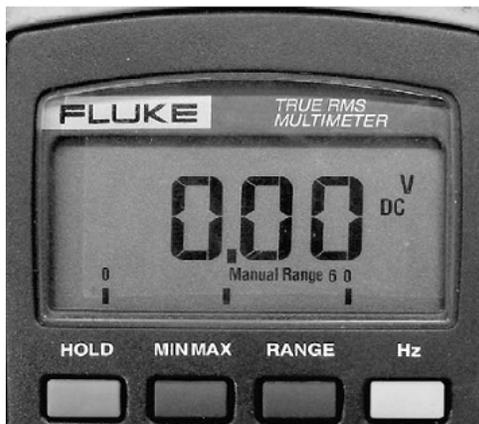
EPS System Load Test

If the charging system cannot sustain normal voltage when the EPS is operating, EPS Assit may be greatly reduced or nonexistent. Carry out the following steps.

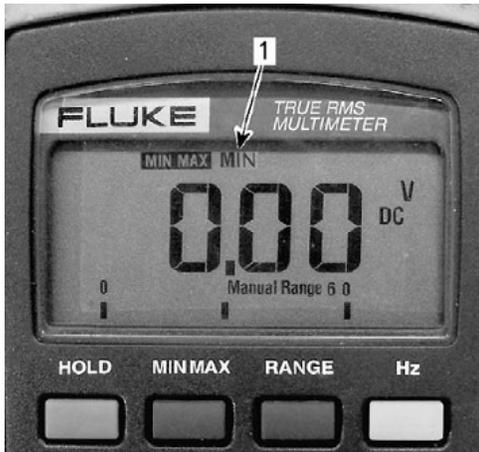
1. Connect the red lead of voltmeter set to VDC to the rear fuse box battery terminal.
2. Connect the black voltmeter lead to the battery ground.
3. Measure the battery voltage.

NOTE: If battery voltage is low, recharge battery.

4. Ensure the vehicle transmission is set to N.
5. Start the engine.
6. Note the voltage on the voltmeter with the engine running (charging system voltage).
7. Press the RANGE button repeatedly to select Manual Range 60.



8. Press the MIN MAX button on the voltmeter to engage the MIN function.



9. Turn the handlebar momentarily against the steering frame stops to each side.

NOTE: Do not hold steering against frame stops for an extended period of time.

10. Read the MIN charging system voltage recorded while the handlebar was turned against each stop.

EPS SYSTEM LOAD TEST			
PROBE POSITION		STEERING POSITION	VOLTAGE READING
Battery (-) terminal	Rear fuse box battery terminal	LH stop	AT least 12 VDC
		RH stop	

NOTE: Turning the handlebar momentarily against the frame stops generates maximum EPS load (maximum current draw on electrical system). Electrical system must sustain at least 12 VDC for proper EPS operation.



If the electrical system cannot sustain at least 12 VDC, check the following:

- Battery.
- Battery connections.
- EPS unit power and ground connections.
- Charging system.
- Frame and engine ground studs.

If the previously listed items, carry out the following EPS UNIT CURRENT TEST.

EPS Unit Current Test

1. Connect vehicle to the latest BUS software.
2. Click on the Rear Data button.
3. Choose the Monitoring page tab.
4. At the bottom of the Monitoring page, choose the EPS tab.
5. With the vehicle engine running in N, turn the handlebar side to side, momentarily against each stop and observe the indications on the BUS EPS Monitoring page.

The EPS Torque Sensor Nm increase with torque applied to the handlebar.

The EPS Current ammeter should increase proportionately to the torque applied and decrease with the torque as steering assist is provided.

NOTE: Increase and decrease in torque and current readings is very brief as steering assist is quickly provided. Current draw should remain within green scale but may momentarily peak to 60 amps, then drop off close to 0 amps as torque applied is nulled out by steering assist. A residual torque of 2 NM with a corresponding current draw is acceptable.

If current draw tends to remain high, carry out the following:

- Steering alignment check.
- Steering column shim adjustment at half bushings as described in the EPS UNIT INSTALLATION procedure detailed in this section.
- TORQUE OFFSET RESET procedure detailed in this section.
- Replace EPS unit.

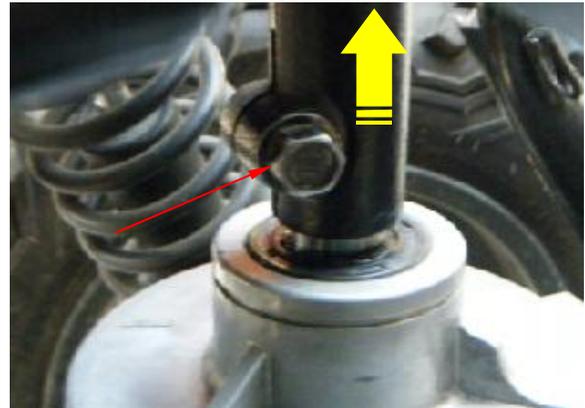
EPS Unit Removal

Refer the Chapter 13 to remove the following items:

- Both internal fender.
- The front bumper.
- Disconnect the wiring of headlamp and power source.
- The front cover.
- The inlet tube.

Loose the handle steering lock nut.
Lift up and dismantling the steering shaft.

Torque: 280~320 kgf-cm

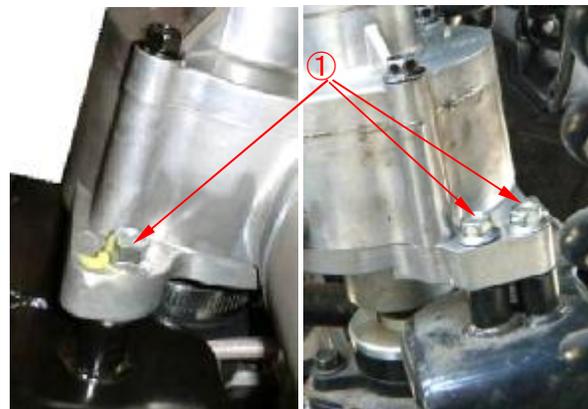


Disconnect the wiring on the motor.
Disconnect the wiring on the controller.



Remove the three mounting bolts ① of EPS body.

Torque: 250~300 kgf-cm

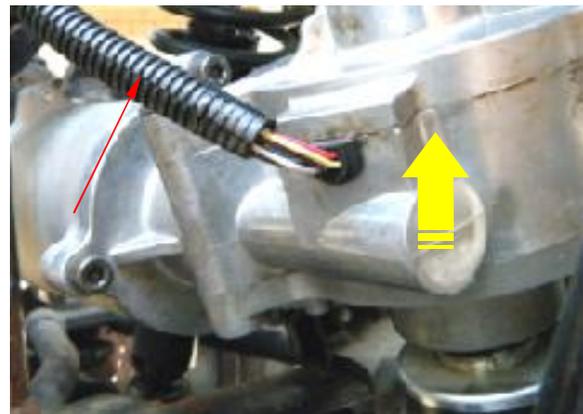


Loose the clamp of anti-dust rubber.



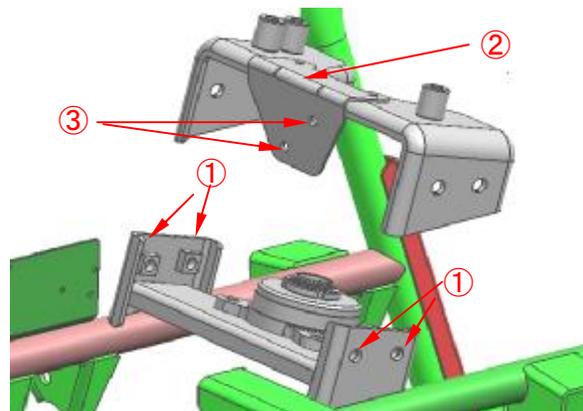
Lift up and dismounting the EPS unit.
Take out the EPS unit from the left side of vehicle.

NOTE: Be careful do not damage the cable of torque sensor.



Remove the four bolts ① and the bracket ②.
Remove the two bolts ③ and dismounting the brake distributor.

Torque: 280~320 kgf-cm

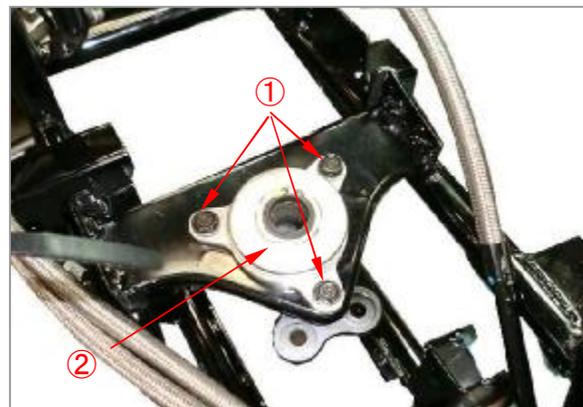


Remove the three bolts ①.
Lift up and remove the steering lower bearing seat ②.

Torque: 280~320 kgf-cm

Installation

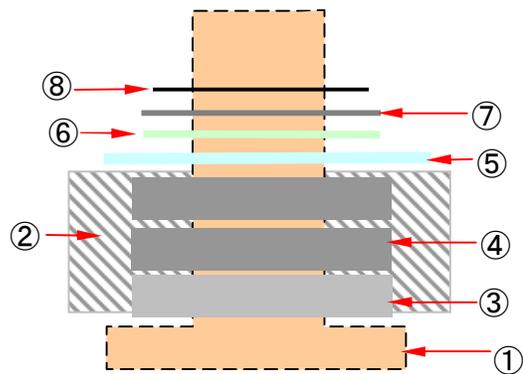
Install the EPS in the reverse order of removal.



Steering lower Bearing Seat

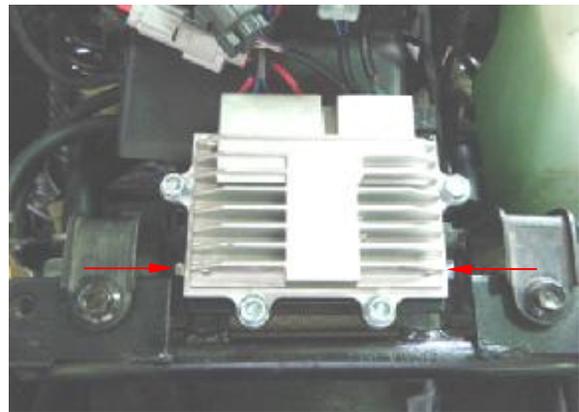
Refer to the picture for install new bearing and seal into the bearing seat then assemble the bearing seat assembly.

- ① Steering Pad.
- ② Bearing Seat
- ③ Oil Seal
- ④ Bearing x 2
- ⑤ Cap 、 ⑥ Washer
- ⑦ Plate Nut 、 ⑧ Circlip



Control Unit Removal

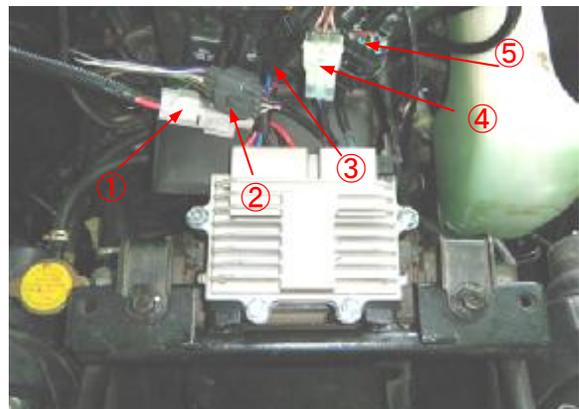
Remove two mounting bolts.



Disconnect the wiring as follow:.

- 1. To fuse box.
- 2. To ECU, Speed Sensor and Ignition.
- 3. To Motor Power.
- 4. To Torque Sensor.
- 5. To Motor Control.

Remove the control unit.



Installation

Install the control in the reverse order of removal.

Fuse Removal

Simultaneously squeeze tabs inwards on each end of fuse box cover as you pull downward on the cover.

Replace the damage fuse.

