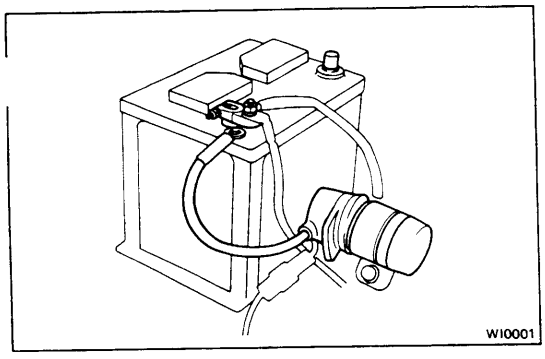
WINCH

TROUBLESHOOTING

Problem	Possible cause	Remedy	Page
Winch does not operate	Wiper fuse blown	Replace fuse and check for short	
	Main magnet switch faulty	Check main magnet switch	WI-3
	Remote control switch faulty	Repair or replace remote control switch	WI-4
	Winch gear damaged	Replace winch gear	WI-9
No side clockwise or counter clockwise operation	Sub-magnet switch fautly	Check sub-magnet switch	WI-3
	Remote control switch faulty	Replace remote control switch	WI-4
No self lock operation	Worn out clutch disc facing	Replace clutch outer disc	WI-9
	One-way clutch faulty	Replace one-way clutch	WI-9
Oil leak from winch drum	Oil seal damaged or worn	Replace oil seal	WI-9,18

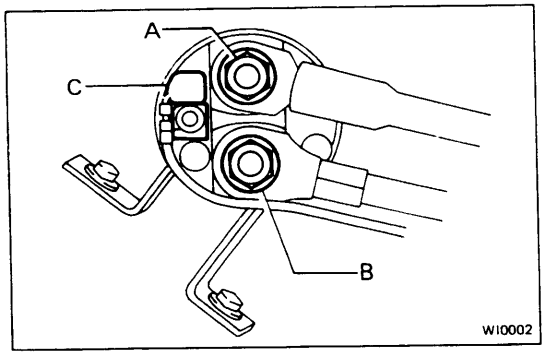


ON-VEHICLE INSPECTION

INSPECTION OF WINCH

1. **DISCONNECT BATTERY CABLE FROM NEGATIVE TERMINAL**

2. **DISCONNECT MAIN MAGNET SWITCH CABLE FROM BATTERY POSITIVE TERMINAL**



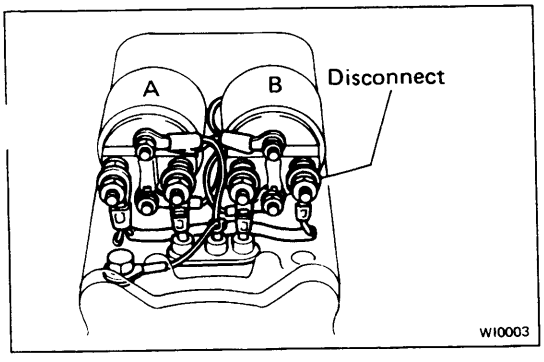
3. **CONNECT NEGATIVE CABLE TO BATTERY TERMINAL**

4. **CHECK MAIN MAGNET SWITCH**

Using an ohmmeter and voltmeter check that the main magnet switch operation with the remote control switch connector connected.

C terminal: Battery voltage

Terminals A and B: continuity



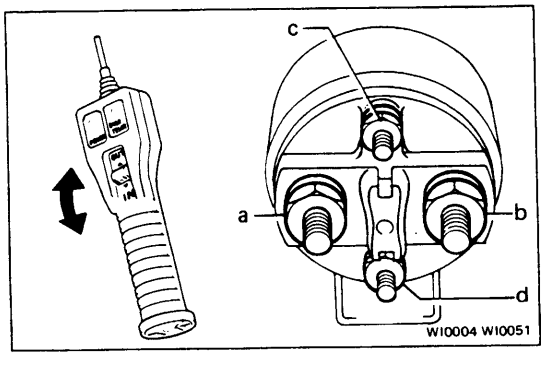
5. **CHECK SUB-MAGNET SWITCH**

(a) Remove the connector cover.

(b) Remove the sub-magnet switch cover.

(c) Disconnect the positive wire lead from terminal B of the sub-magnet switch B.

(d) Using an ohmmeter and voltmeter check the sub-magnet switch operation.



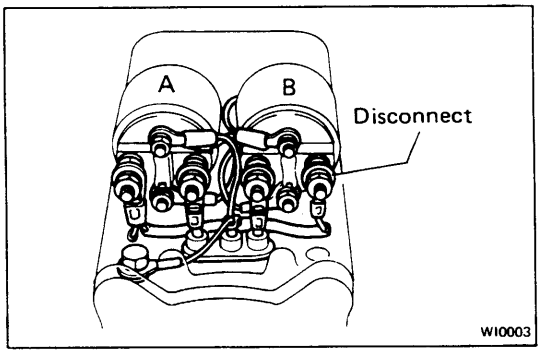
- Check operation of sub-magnet switch A and B, with the remote control switch in the NEUTRAL position.

Terminal d: No voltage
Terminals a and b: No continuity

- Check operation of sub-magnet switch A, with the remote control switch in the IN position.

Terminal d: Battery voltage

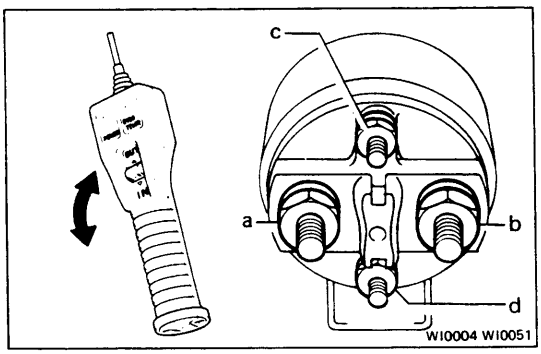
Terminals a and b: Continuity



- Check operation of sub-magnet switch B, with the remote control switch in the OUT position.

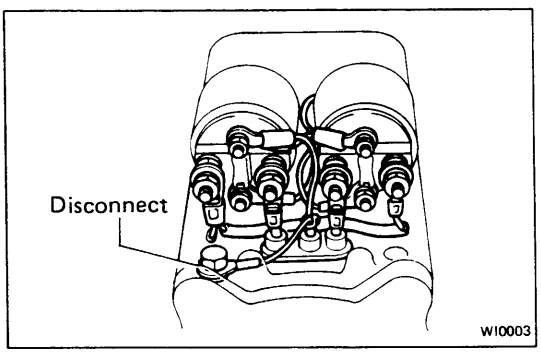
Terminal d: Battery voltage

Terminals a and b: Continuity



REMOTE CONTROL SWITCH

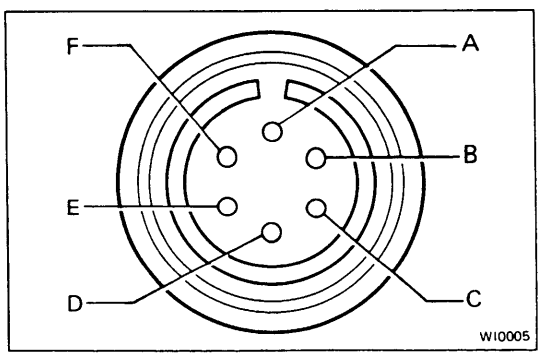
1. CHECK INDICATOR LIGHT AND BUZZER



(a) The power indicator light will light when the remo control switch connector is connected.

(b) The overheat temperature indicator light will light and the buzzer come on when the thermo switch lead wire is disconnected.

2. CHECK CONNECTOR TERMINAL



Using an ohmmeter, check for continuity.

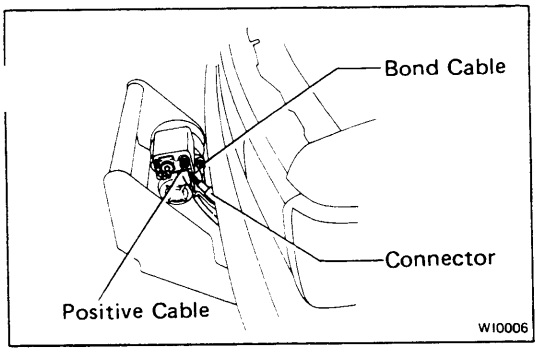
(a) Check for continuity between B and C.

(b) Check for continuity between B and E.

(c) Check for continuity between B and D with the remote control switch in the IN position.

(d) Check for continuity between B and F with the remote control switch in the OUT position.

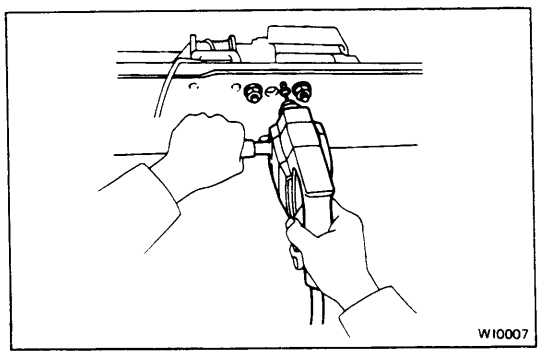
If there is no continuity, replace the remote control switch.



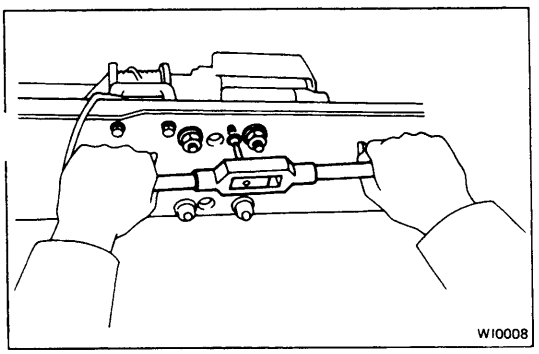
REMOVAL OF WINCH ASSEMBLY

1. **DISCONNECT BATTERY CABLE FROM NEGATIVE TERMINAL**

2. **DISCONNECT FOLLOWING WIRE HARNESS:**
   - Positive cable from the winch
   - Bond cable from the winch
   - Two terminal connectors

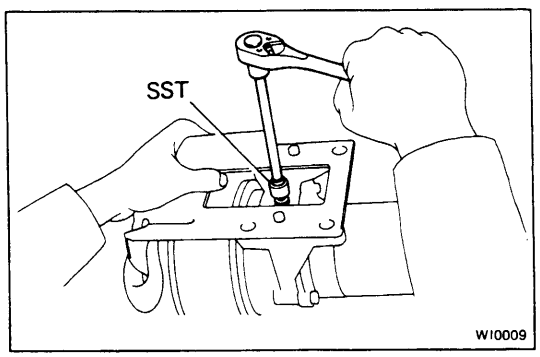


3. **REMOVE ANTI-THEFT BOLT**
   (a) Using a centering punch, mark the center of the winch anti-theft bolt.
   (b) Using a 3 - 4 mm (0.12 - 0.16 in.) drill, drill a hole into the winch anti-theft bolt.

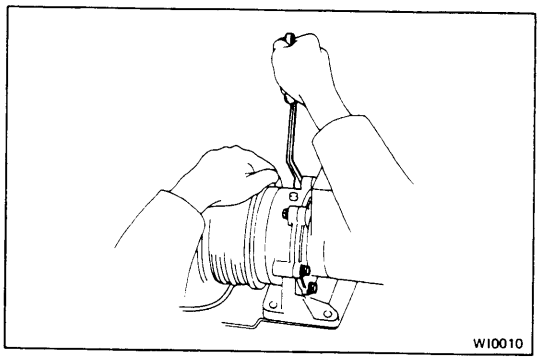


   (c) Using a screw extractor, remove the winch anti-theft bolt.

4. **REMOVE WINCH ASSEMBLY**
   (a) Remove the two bolts, then remove the wire guide.
   (b) Remove the four bolts and nuts, then remove the winch assembly from the bracket.



5. **DRAIN FLUID**
   Remove drain plug and drain fluid.
   SST 09313-30021



SEPARATE WINCH GEAR, MOTOR AND CONTROL UNIT

1. SEPARATE WINCH GEAR AND MOTOR

Remove the six bolts, and separate the winch gear case and winch motor with control unit.

2. REMOVE CONNECTOR COVER

3. REMOVE SUB-MAGNET SWITCH COVER

4. DISCONNECT FOLLOWING WIRE HARNESS:

(a) Motor lead wire from the sub-magnet switch

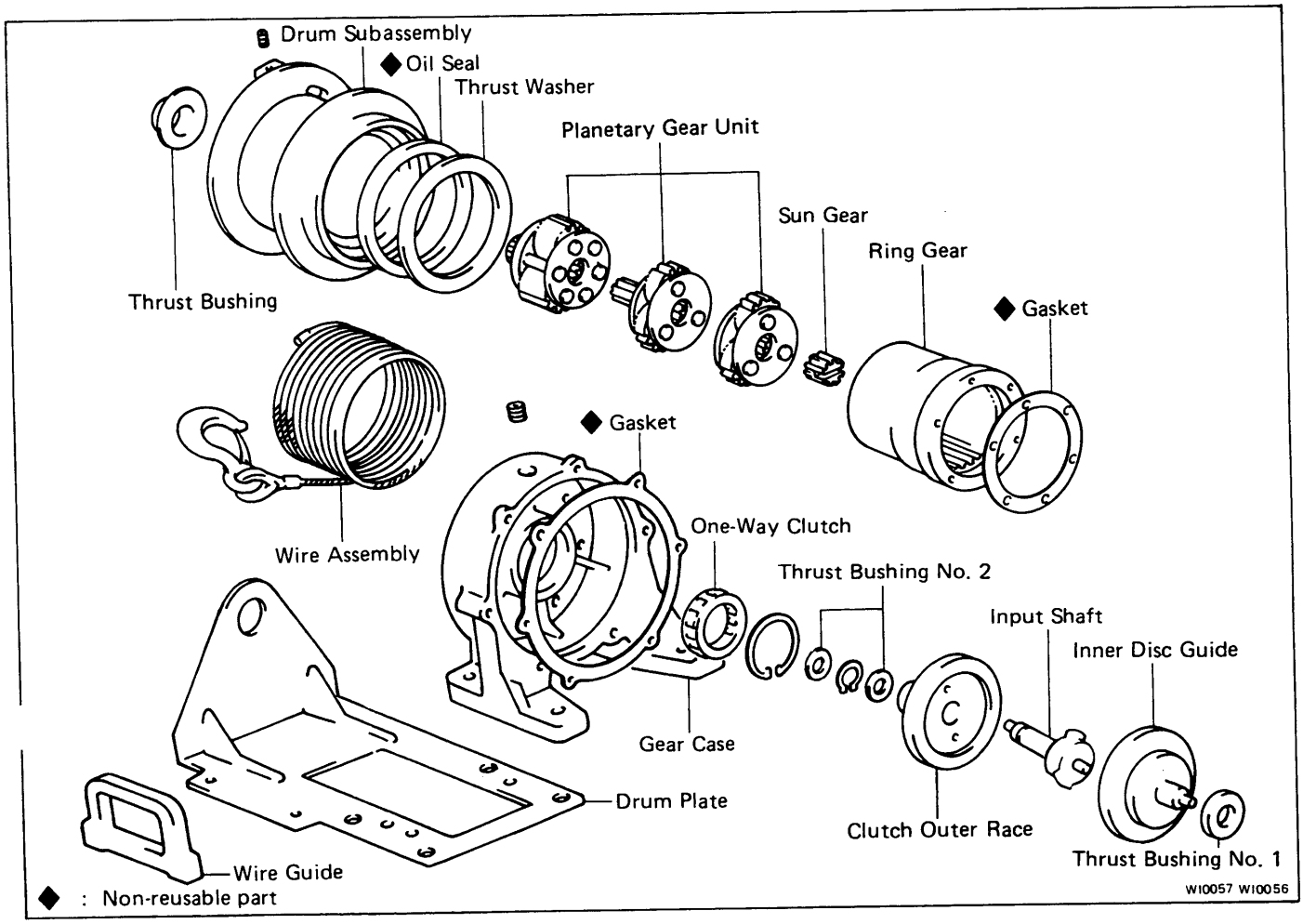
(b) Thermistor switch lead wire from the sub-magnet switch

5. REMOVE BASE FROM MOTOR

Remove the four bolts and two terminals. Then remove the base with the sub-magnet switches from the motor.

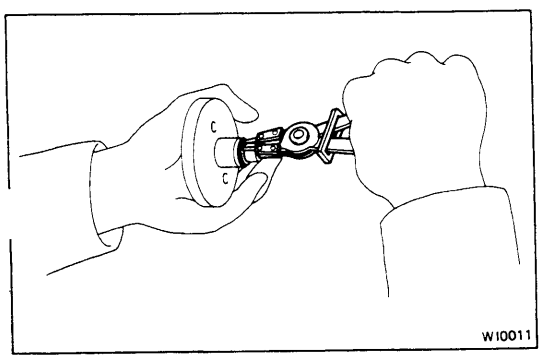
WINCH

COMPONENTS

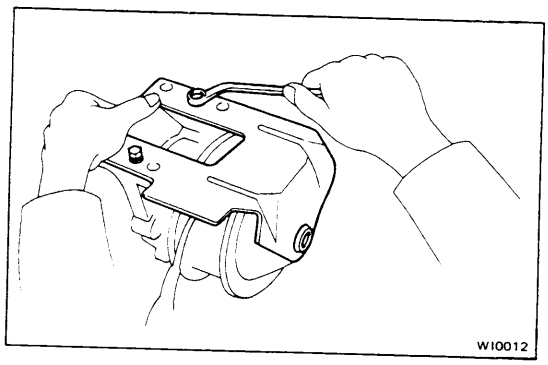


DISASSEMBLY OF WINCH

1. **REMOVE THRUST BUSHING NO.1**
2. **REMOVE CLUTCH OUTER RACE ASSEMBLY WITH INNER DISC GUIDE**
3. **REMOVE THRUST BUSHING NO.2**
4. **REMOVE INNER DISC GUIDE FROM CLUTCH OUTER RACE ASSEMBLY**

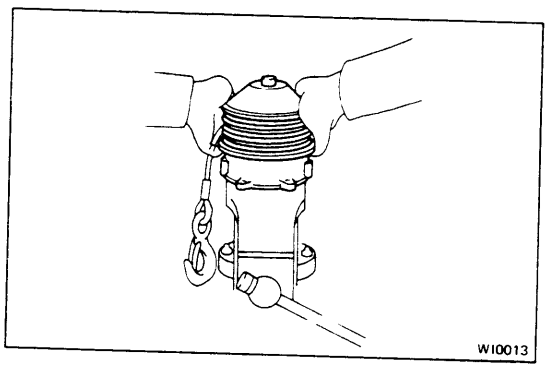


5. **REMOVE THRUST BUSHING NO.2 AND INPUT SHAFT FROM CLUTCH OUTER RACE**
   (a) Using snap ring pliers, remove the snap ring.
   (b) Remove thrust bushing No. 2 and the input shaft from the outer race.



6. REMOVE WINCH DRUM PLATE AND WINCH DRUM

(a) Remove the two bolts. Then remove the winch drum plate and the thrust bushing.

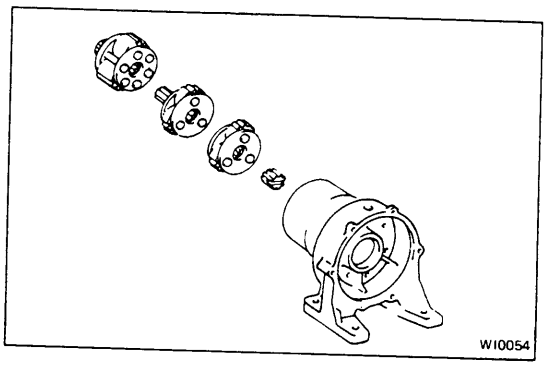


(b) Clamp the winch gear case in a vise.

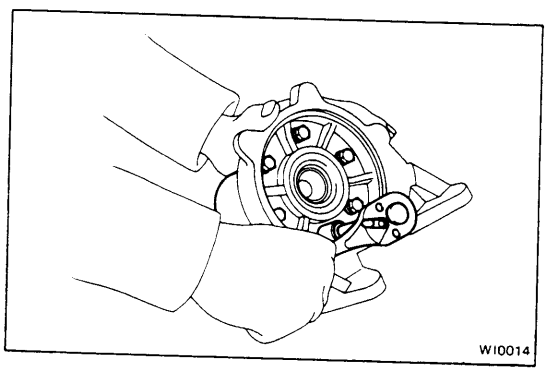
NOTE: Use a set of soft jaws in the vise to protect the winch gear case.

(c) Remove the winch drum.

NOTE: Be careful not to drop the planetary gear unit.



7. REMOVE PLANETARY GEAR UNIT NO. 3, NO. 2, NO. 1 AND SUN GEAR



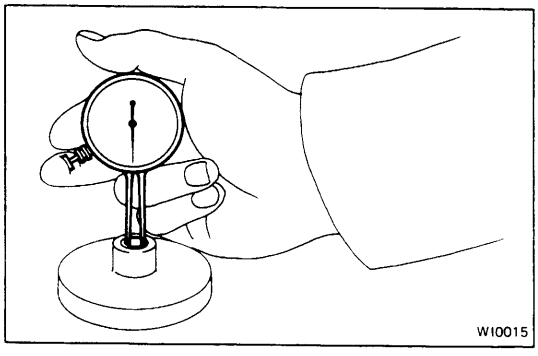
8. REMOVE RING GEAR

INSPECTION AND REPAIR OF WINCH

1. INSPECTION OF CLUTCH OUTER RACE FACING

(a) Do not peel off the facing.

(b) Confirm that the facing extends over the entire surface.

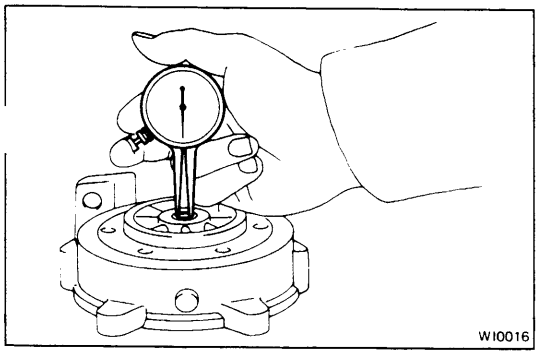


2. INSPECT CLUTCH OUTER RACE BUSHING

Using a dial indicator, measure the bushing bore.

Standard bore: 12.00 mm (0.4724 in.)
Maximum bore: 12.15 mm (0.4783 in.)

If the bushing bore is less than maximum, replace the clutch outer race subassembly.

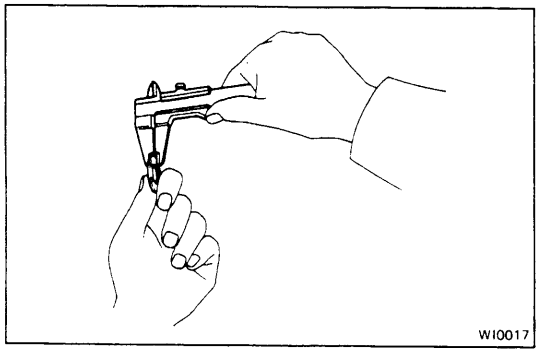


3. INSPECT WINCH GEAR CASE BUSHING

Using a dial indicator, measure the bushing bore.

Standard bore: 12.00 mm (0.4724 in.)
Maximum bore: 12.15 mm (0.4783 in.)

If the bushing bore is less than maximum, replace the gear case assembly.

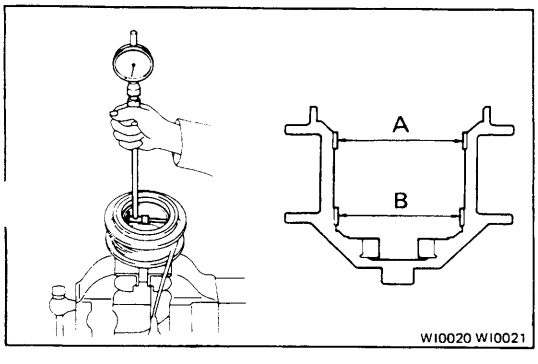


4. INSPECT THICKNESS OF THRUST BUSHING NO.1 AND NO.2

Using calipers, measure the thrust bushing thickness.

Standard thickness:	**No.1 2.0 mm (0.079 in.)**
Standard thickness:	**No.2 1.0 mm (0.039 in.)**
Minimum thickness:	**No.1 1.7 mm (0.067 in.)**
Minimum thickness:	**No.2 0.8 mm (0.031 in.)**

If the bushing thickness is less than minimum, replace the bushing.

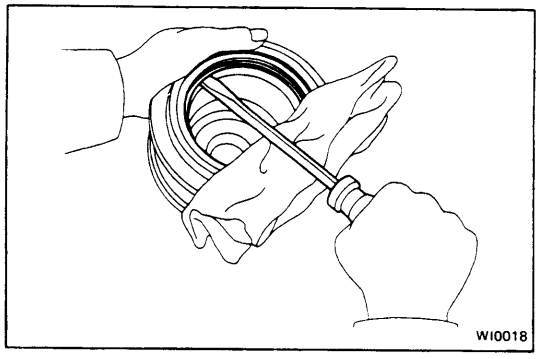


5. INSPECT WINCH DRUM BUSHING

Using a dial indicator, measure the bushing bore.

Standard bore:	**A 83.00 mm (3.2677 in.)**
	B 80.00 mm (3.1496 in.)
Maximum bore:	**A 83.08 mm (3.2709 in.)**
	B 80.08 mm (3.1527 in.)

If the bushing bore is less than maximum, replace the drum subassembly.



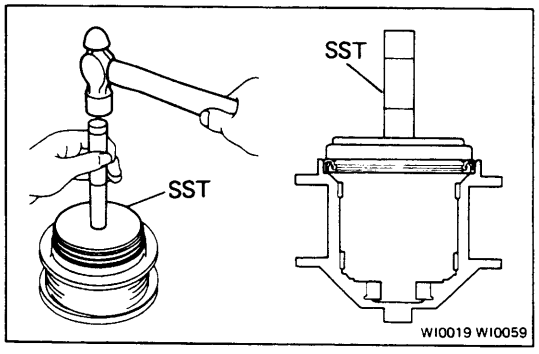
6. INSPECT WINCH DRUM OIL SEAL

(a) Check for damage.

(b) Check the oil seal lip for wear or damage.

7. IF NECESSARY, REPLACE OIL SEAL

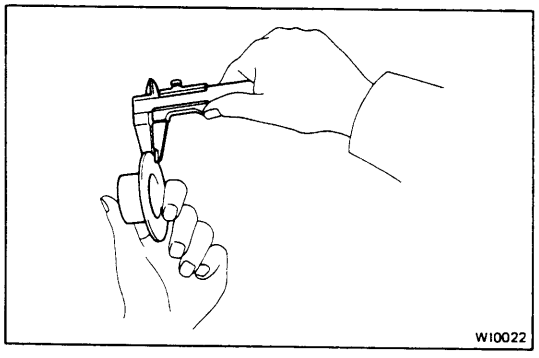
(a) Using a screwdriver, pry out the oil seal.



(b) Using SST and a hammer, drive in a new winch drum oil seal to the winch drum as shown.

SST 09218-56030

Oil seal drive in depth: 0 – 1.0 mm (0 – 0.039 in.)

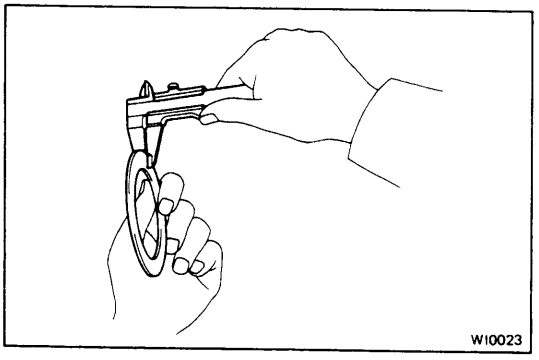


8. INSPECT WINCH DRUM THRUST BUSHING

Using calipers, measure the thrust bushing thickness.

Standard thickness: 1.5 mm (0.059 in.)
Minimum thickness: 1.0 mm (0.039 in.)

If the thrust bushing thickness is less than minimum, replace the thrust bushing.



9. INSPECT WINCH DRUM THRUST WASHER

Using calipers, measure the thrust washer thickness.

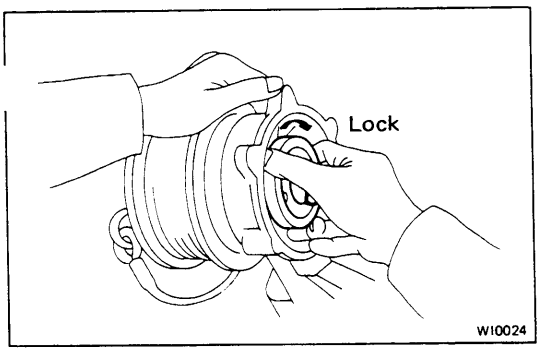
Standard thickness: 2.0 mm (0.079 in.)
Minimum thickness: 1.6 mm (0.063 in.)

If the thrust washer thickness is less than minimum, replace the thrust washer.

10. INSPECT PLANETARY GEAR UNIT NO.1, NO.2, NO.3 AND SUN GEAR

(a) Turn each bearing by hand while appling inward force.

If resistance is felt or if the bearing sticks, replace the planetary gear unit assembly.

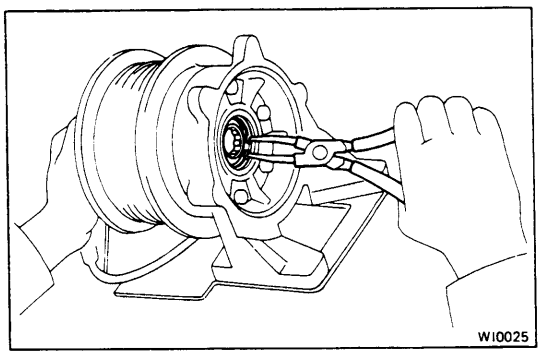


11. CHECK OPERATION OF ONE-WAY CLUTCH

(a) Install the clutch outer race to the winch gear case.

(b) Hold the winch gear case and turn the clutch outer race. The clutch outer race should turn freely counter-clockwise and should lock clockwise.

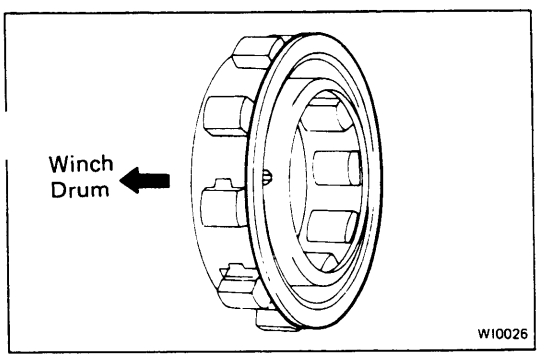
If the one-way clutch does not work properly, replace it.



12. REPLACE ONE-WAY CLUTCH

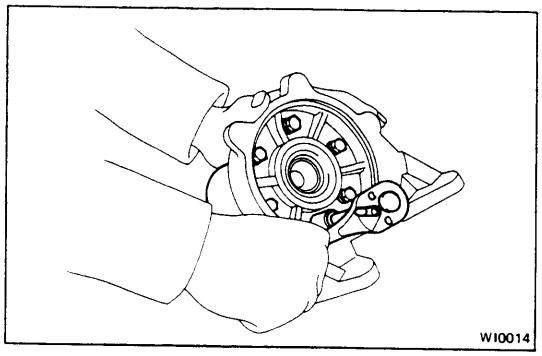
(a) Using snap ring pliers, remove the snap ring from the winch gear case.

(b) Remove the one-way clutch from the winch gear case.



(c) Install the one-way clutch to the winch gear case.

(d) Using snap ring pliers, install the snap ring to the winch gear case.



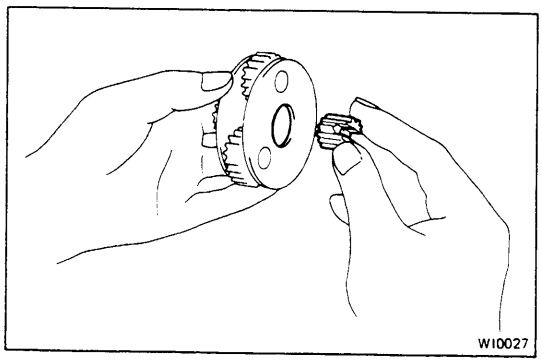
INSTALLATION OF WINCH

1. INSTALL RING GEAR

(a) Install a new gasket on the winch gear case.

(b) Install and torque the mount bolts uniformly.

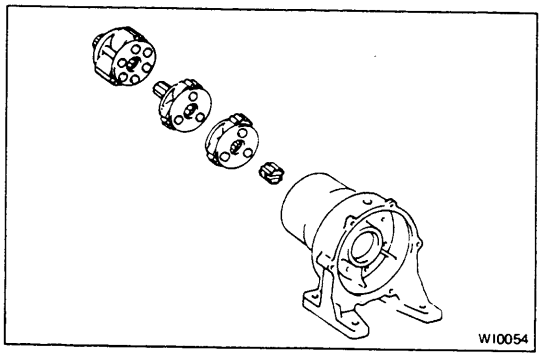
Torque: 195 kg-cm (14 ft-lb, 19 N·m)



2. INSTALL PLANETARY GEAR UNIT AND SUN GEAR

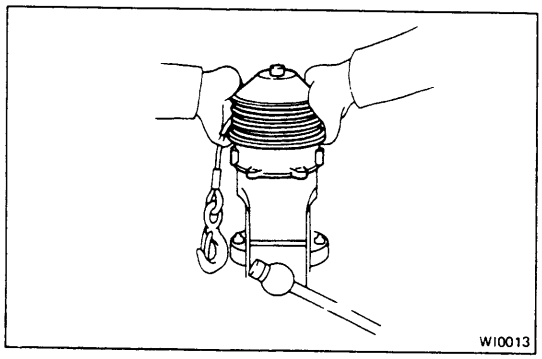
(a) Apply automatic transmission fluid to each gear.

(b) Install the sun gear to planetary gear unit No.1.



(c) Install planetary gear unit No.1 with the sun gear to the ring gear.

(d) Install planetary gear units No.2 and No.3 to the ring gear.

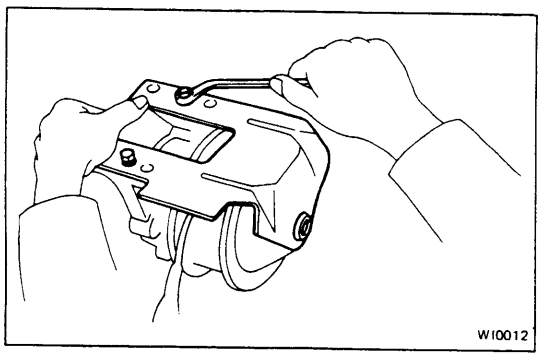


3. INSTALL WINCH DRUM AND WINCH DRUM PLATE

(a) Apply MP grease to the winch drum oil seal, winch drum bushing, thrust bushing and thrust washer.

(b) Install the winch drum with the thrust washer to the winch gear case.

(c) Install the winch drum plate with thrust bushing.



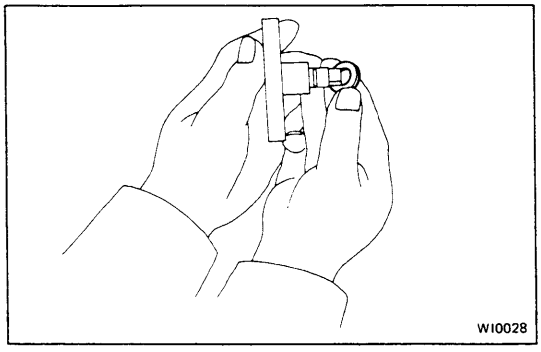
(d) Install and torque the bolts.

Torque: 195 kg-cm (14 ft-lb, 19 N·m)

NOTE: When tightening the bolts, be sure the winch drum is tight against the thrust washer and there is no clearance.

4. INSTALL INPUT SHAFT WITH THRUST BUSHING TO CLUTCH OUTER RACE GUIDE

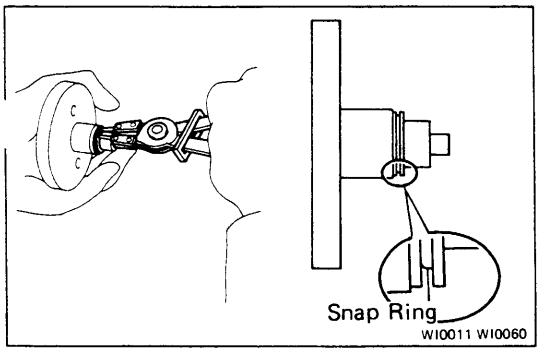
CAUTION: Soak a new clutch outer race in automatic transmission fluid for at least two hours before assembly.



(a) Apply MP grease to the winch gear case bushing and the clutch outer race bushing.

(b) Install input shaft to the clutch outer race.

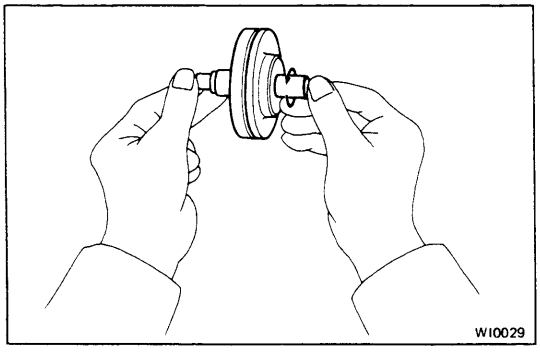
(c) Install the thrust bushing No.2 to the input shaft.



(d) Using snap ring pliers, install the snap ring to the input shaft.

CAUTION: Install a new snap ring into the groove, being careful not to spread it apart too much and facing it into the direction shown.

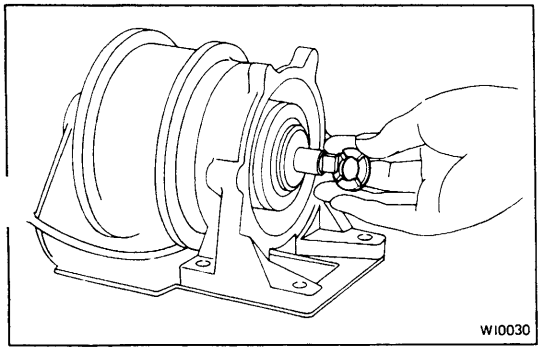
(e) Install the thrust bushing No.2 to the input shaft.



5. INSTALL INNER DISC GUIDE TO CLUTCH OUTER RACE ASSEMBLY

NOTE: Install the inner disc guide, turning it counterclockwise.

6. INSTALL CLUTCH OUTER RACE ASSEMBLY AND INNER DISC GUIDE TO WINCH GEAR CASE

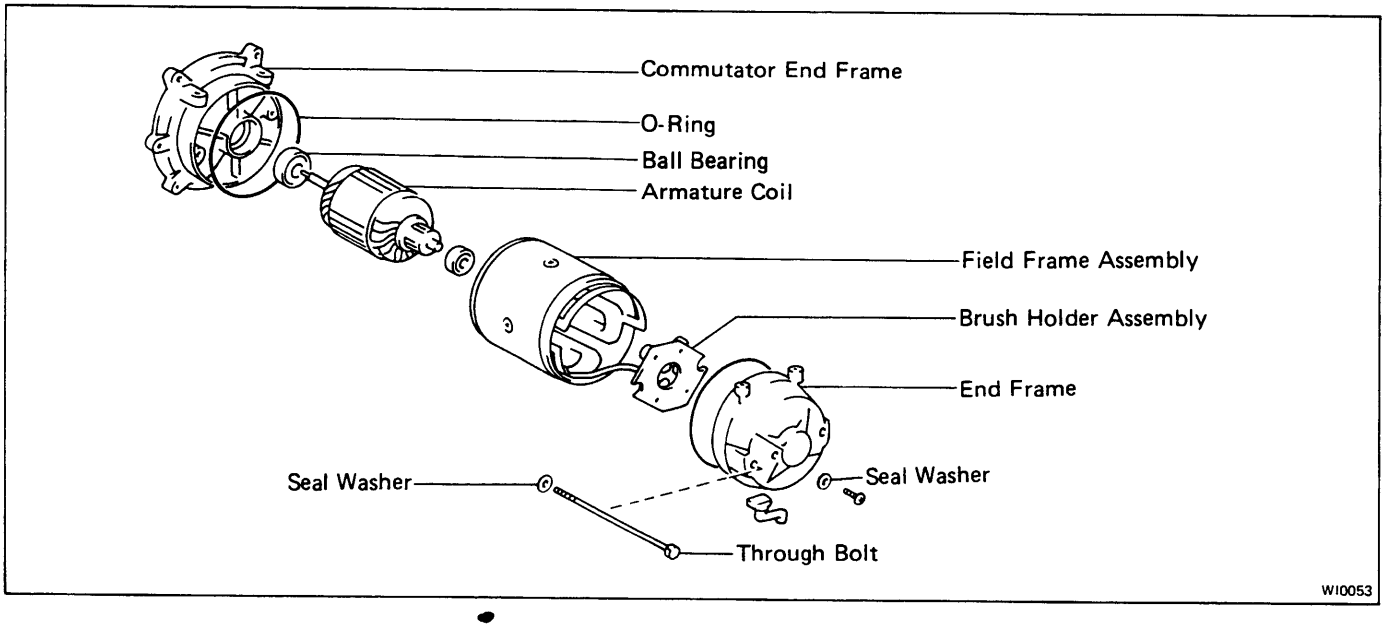


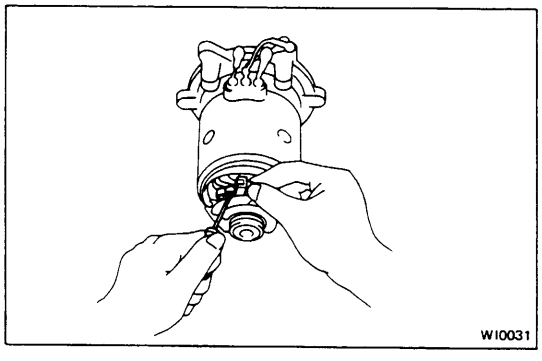
7. INSTALL THRUST BUSHING NO.1

CAUTION: Install thrust bushing No. 1 facing the groove toward the inner disc guide.

MOTOR

COMPONENTS



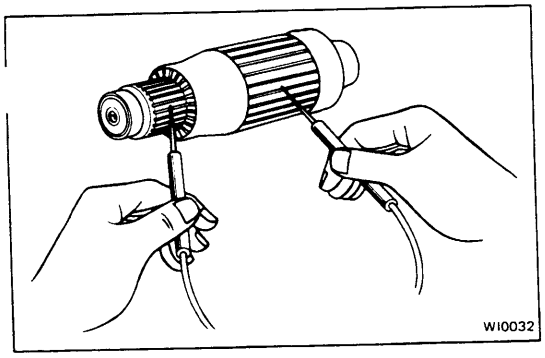


DISASSEMBLY OF WINCH MOTOR

1. **REMOVE END COVER AND FIELD FRAME WITH BRUSH HOLDER**
   (a) Remove the two through bolts and two screws. Then remove the end frame.
   (b) Using a screwdriver, remove the brushes from the brush holder.
   (c) Remove the field frame with the brush holder from the end frame.

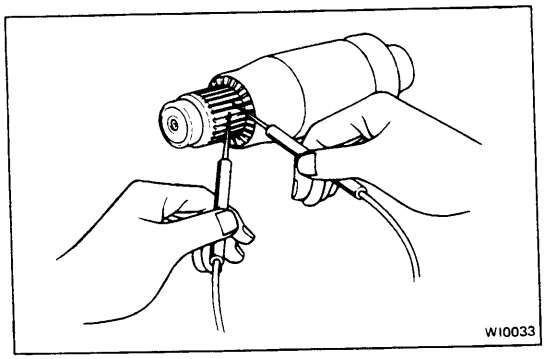
2. **REMOVE ARMATURE FROM COMMUTATOR END FRAME**

INSPECTION OF WINCH MOTOR ARMATURE COIL



1. INSPECT THAT COMMUTATOR IS NOT GROUNDED

Using an ohmmeter, check that there is no continuity between the commutator and armature core.
If there is contiunity, replace the armature.



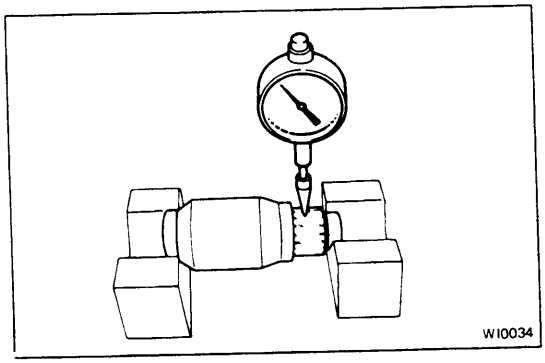
2. INSPECT COMMUTATER FOR OPEN CIRCUIT

Using an ohmmeter, check for continuity between the segment of the commutator.
If there is no continuity between any segment, replace the armature.

COMMUTATOR

1. INSPECT COMMUTATOR FOR DIRTY OR BURNT SURFACE

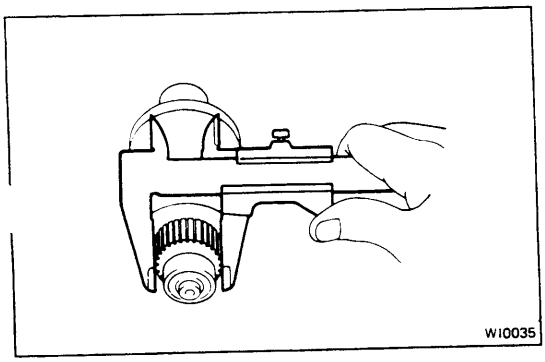
If the surface is dirty or burnt, correct with sandpaper (NO.400) or a lathe.



2. INSPECT COMMUTATOR CIRCLE RUNOUT

Using a dial indicator, measure the circle runout of the commutator.
If the circle runout is greater than the maximum, correct with a lathe.

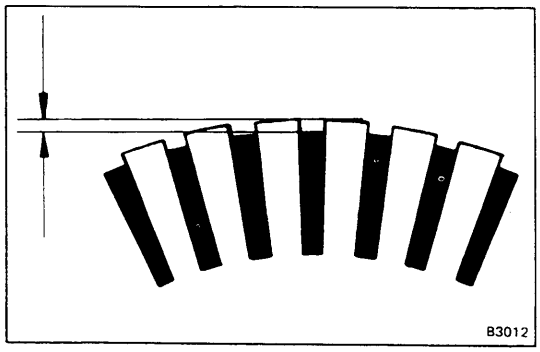
Maximum runout: 0.4 mm (0.157 in.)



3. MEASURE DIAMETER OF COMMUTATOR

Using calipers, measure the diameter of the commutator.
If the diameter of the commutator is less than the minimum, replace the armature.

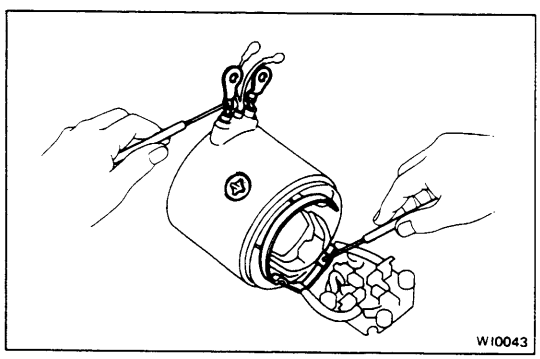
Standard diameter: 28.0 mm (1.102 in.)
Minimum diameter: 27.0 mm (1.063 in.)



4. INSPECT UNDERCUT DEPTH

Check that the undercut depth is clean and free of foreign particles. Then smooth off the edge.
If the undercut depth is less than the minimum, correct with a hacksaw blade.

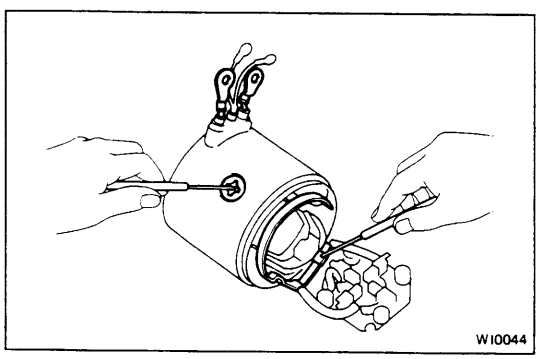
Standard undercut depth: 0.5 – 0.8 mm (0.020 – 0.031 in.)
Minimum undercut depth: 0.2 mm (0.008 in.)



FIELD COIL

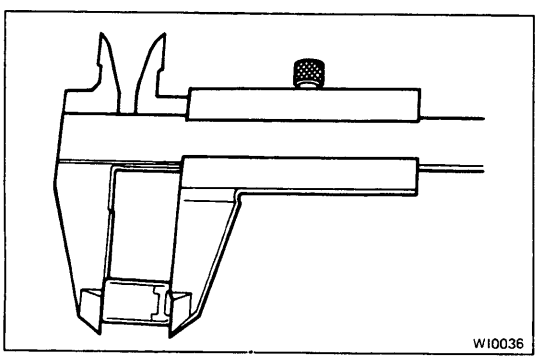
1. INSPECT FIELD COIL FOR OPEN CIRCUIT

Using an ohmmeter, check for continuity between the lead wire and field brush lead.
If there is no continuity, replace the field coil.



2. INSPECT THAT FIELD COIL IS NOT GROUNDED

Using an ohmmeter, check for continuity between the field coil brush lead and field frame.
If there is continuity, repair or replace the yoke sub-assembly.



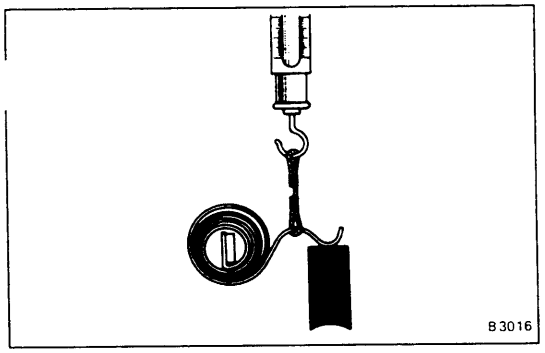
BRUSH

MEASURE BRUSH LENGTH

Using calipers, measure length of the brush.

Standard length: 16.0 mm (0.630 in.)
Minimum length: 10.5 mm (0.413 in.)

If the brush length is less than the minimum, replace the brush holder assembly.



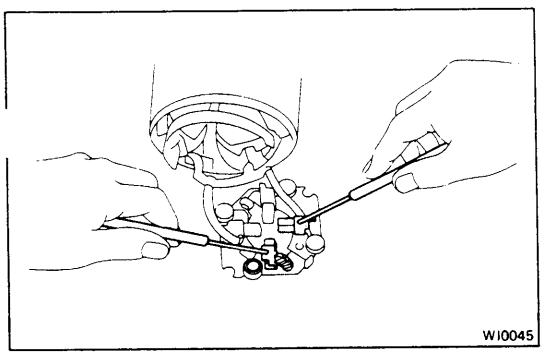
BRUSH SPRING

MEASURE BRUSH SPRING LOAD

Using a pull scale, measure the installed load of the brush spring.

Standard installed load: 1.6 kg (3.5 lb)
Minimum installed load: 1.0 kg (2.2 lb)

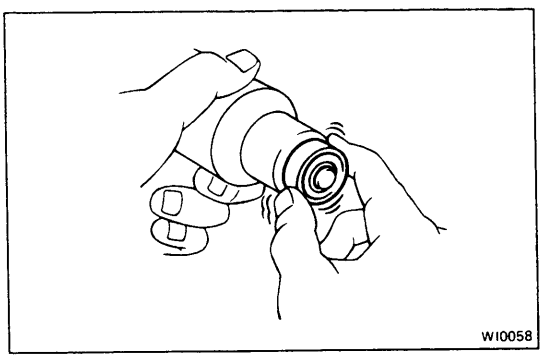
NOTE: Take the pull scale reading at the very instant the brush spring separates from the brush.



BRUSH HOLDER

INSPECT BRUSH HOLDER

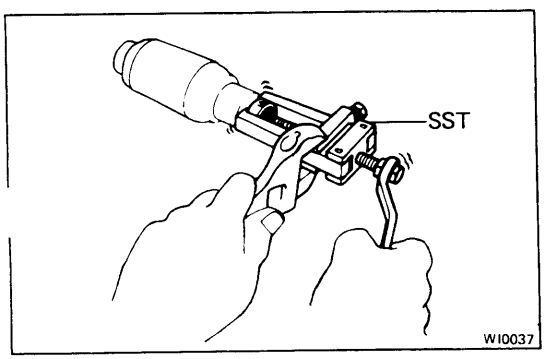
Using an ohmmeter, check for continuity between the positive and negative brush holders.
If there is continuity replace the brush holder assembly.



BEARING

1. INSPECT BEARING

Turn each bearing by hand while applying inward force. If resistance is felt or if the bearing sticks, replace the bearing.

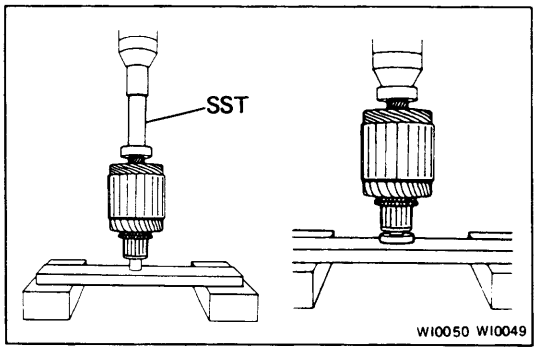


2. IF NECESSARY, REPLACE BEARINGS

(a) Using SST, remove the two bearings from the armature shaft.

SST 09286-46011

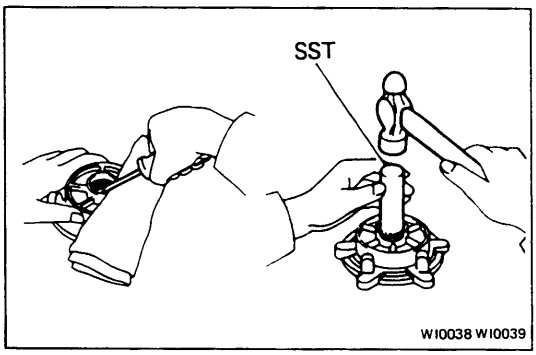
CAUTION: When removing the front bearing, use a spacer to prevent the armature shaft groove from widening.



(b) Using SST and a press, tap the front bearing into the shaft.

SST 09201-31010

(c) Using a press, install the rear bearing into the shaft.



END FRAME OIL SEAL

INSPECT END FRAME OIL SEAL

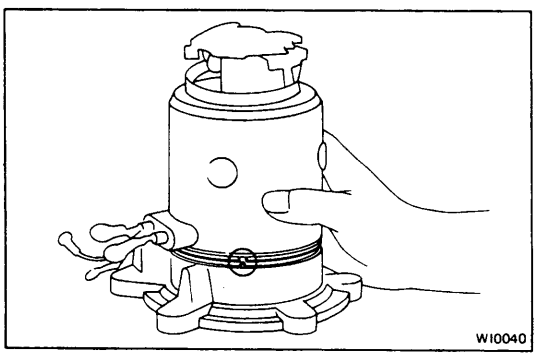
If necessary, replace the end frame oil seal.

(a) Using a screwdriver, remove the end case oil seal.

(b) Using SST and a hammer, install the end frame oil seal.

SST 09236-00101

(c) Apply MP grease to the oil seal.

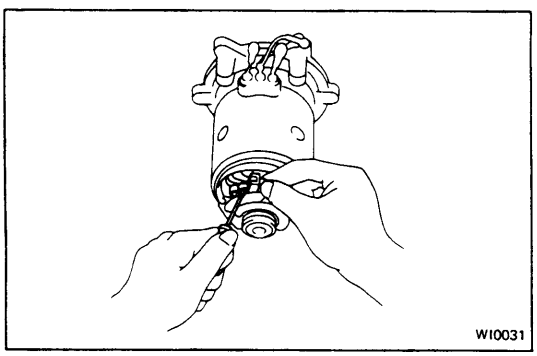


ASSEMBLY OF WINCH MOTOR

1. **INSTALL ARMATURE COIL TO COMMUTATOR END FRAME**

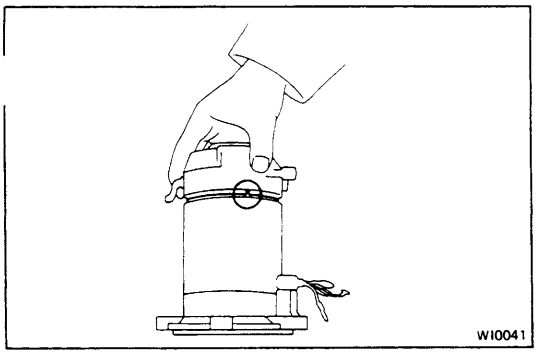
2. **INSTALL FIELD FRAME WITH BRUSH HOLDER AND O-RING**

CAUTION: Match the protrusion of the field frame with the end frame.



3. **INSTALL BRUSH TO BRUSH HOLDER**

Using a screwdriver, hold the spring back and install the brush into the brush holder, and install the four brushes.

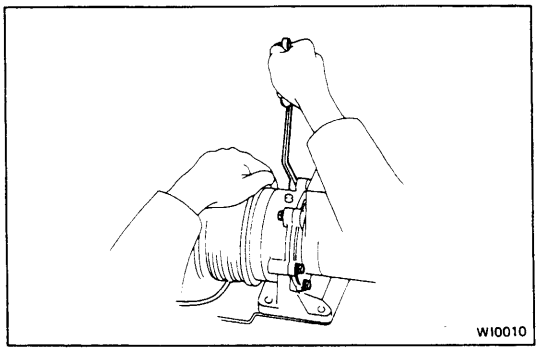


4. **INSTALL END COVER**

(a) Install the two screws to the end cover.

(b) Install the two through bolts to the end cover.

CAUTION: Match the protrusion of the end cover with the field frame.



5. **INSTALL WINCH MOTOR TO WINCH GEAR**

(a) Install the winch motor with a new gasket.

(b) Install and torque the bolts.

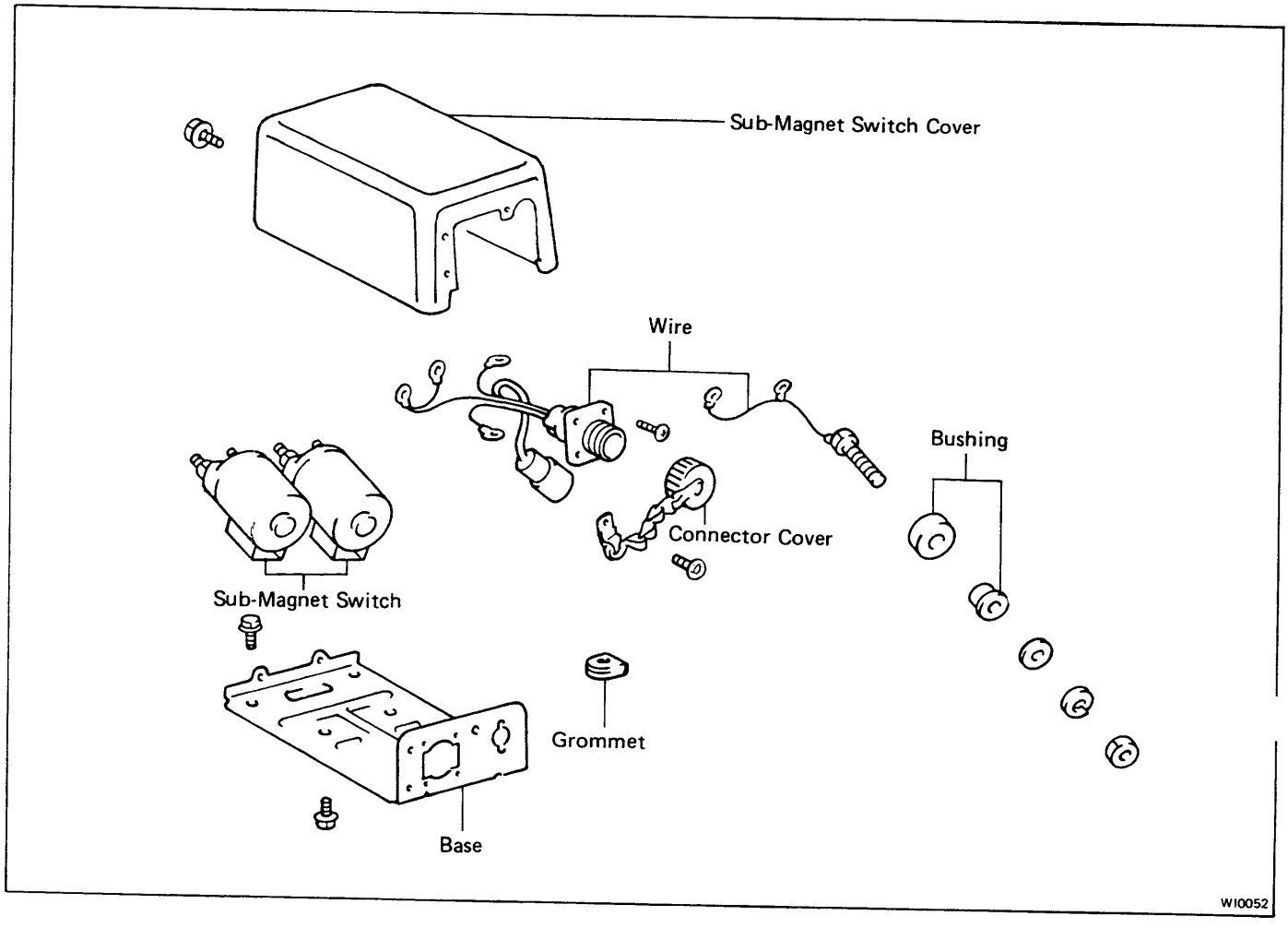
Torque: 195 kg-cm (14 ft-lb, 19 N·m)

6. **INSTALL DRAIN PLUG AND FILL WINCH AUTOMATIC TRANSMISSION FLUID**

Fluid grade: ATF DEXRON II
Capacity: 200 cc (12.2 cu in.)
Torque: 175 kg-cm (13 ft-lb, 17 N·m)

SUB-MAGNET SWITCH

COMPONENTS



DISASSEMBLY OF SUB-MAGNET SWITCHES AND REMOTE CONTROL SWITCH

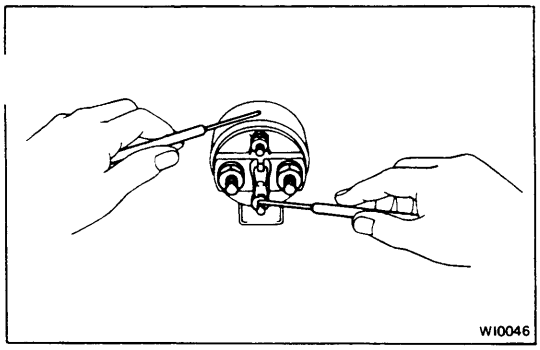
1. **DISCONNECT LEAD WIRE FROM SUB-MAGNET SWITCHES**

2. **REMOVE BASE**

   Remove the four bolts and two terminals.
   Then remove the base with the sub-magnet switches.

3. **REMOVE MAGNET SWITCHES**

   Remove the two bolts. Then remove the sub-magnet switches from the base.

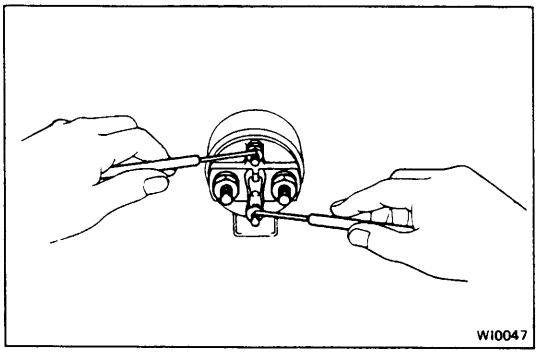


INSPECTION AND REPAIR OF SUB-MAGNET SWITCH

1. **INSPECT THAT SOLENOID COIL IS NOT GROUNDED**

   Using an ohmmeter, check for continuity between the solenoid coil lower terminal and frame.

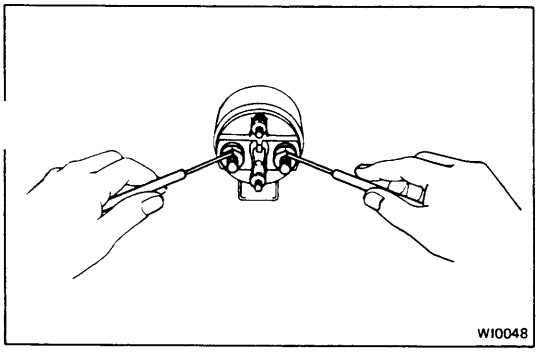
   If there is continuity, replace the sub-magnet switch.



2. **INSPECT SOLENOID COIL FOR OPEN CIRCUIT**

   Using an ohmmeter, check for continuity between the solenoid coil terminals.

   If there is no continuity, replace the sub-magnet switch.



3. **INSPECT THAT MAIN TERMINAL HAS NO CONTINUITY**

   Using an ohmmeter, check for continuity between the sub-magnet switch's main terminals.

   Since the solenoid is not magnetized, the main terminal should have no continuity.

   If necessary, replace the magnet switch.

ASSEMBLY OF SUB-MAGNET SWITCH

1. **INSTALL SUB-MAGNET SWITCH TO BASE**

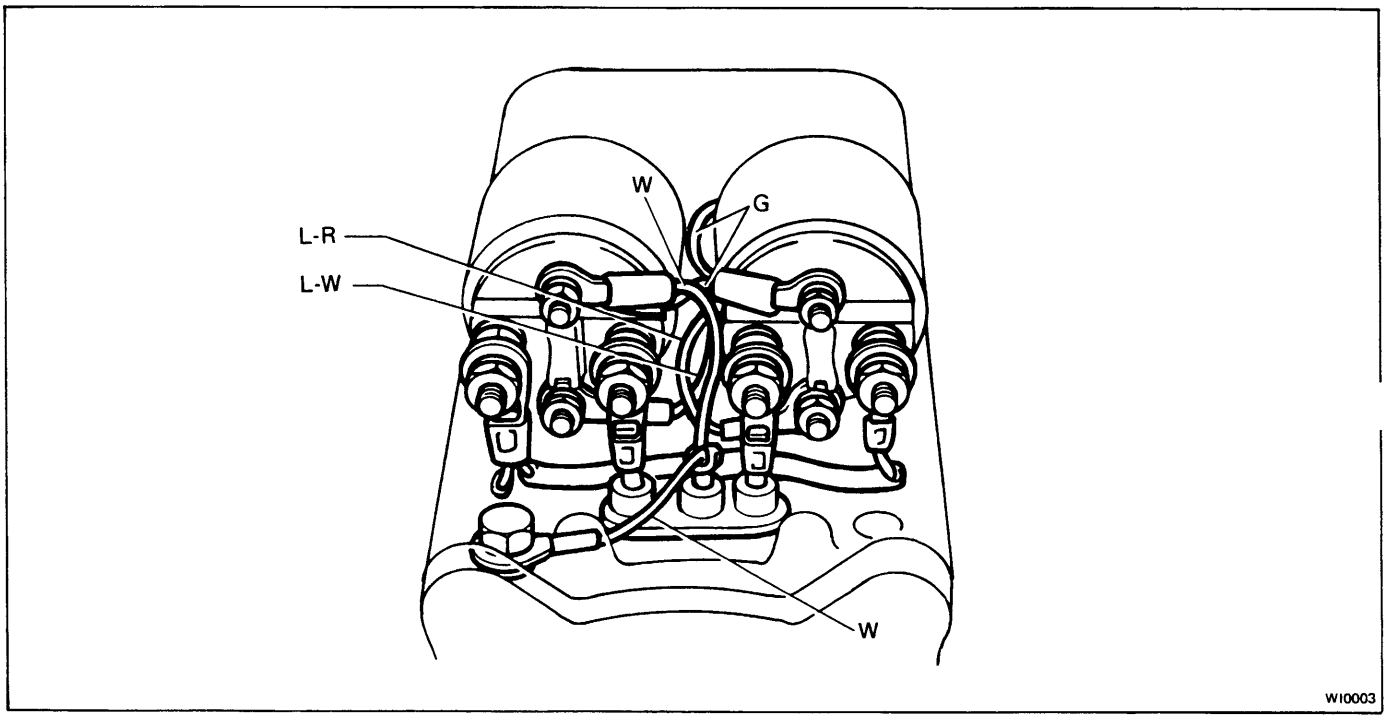
2. **INSTALL BASE WITH SUB-MAGNET SWITCH TO MOTOR**

   Install the four bolts with two terminals to the base with the magnet switch.

3. **CONNECT FOLLOWING WIRES:**

   - Solenoid control lead
   - Thermo switch lead
   - Positive lead

   NOTE: Assemble the terminals as shown below.



4. **INSTALL SUB-MAGNET SWITCH COVER**

5. **INSTALL CONNECTOR COVER**

6. **INSTALL WINCH ASSEMBLY AND ANTI-THEFT BOLT**

   (a) Install the winch assembly to the bracket.

   (b) Install the four mount bolts and nuts by hand.

   (c) Install the anti-theft bolt by hand.

   (d) Torque the four mount bolts and nuts.

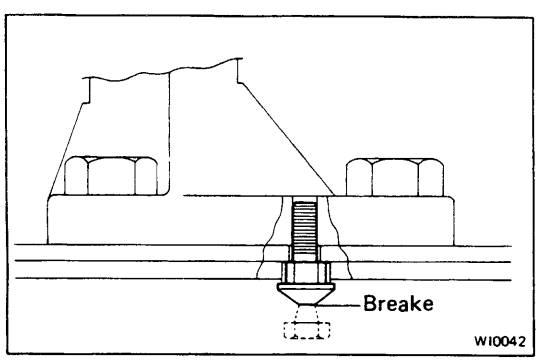
   Torque: 930 kg-cm (67 ft-lb, 91 N·m)

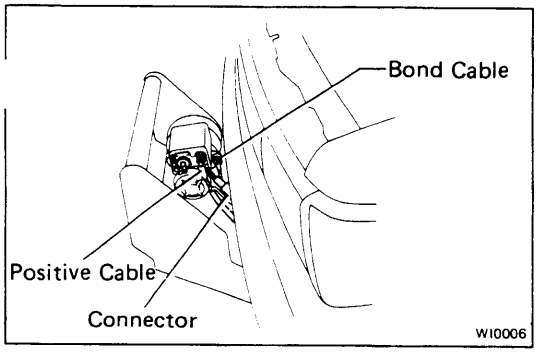
   (e) Install the wire guide and torque the two bolts.

   Torque: 190 kg-cm (14 ft-lb, 19 N·m)

   (f) Torque the anti-theft bolt untill the bolt head break off.

   Torque: 40 — 70 kg-cm (35 — 60 in.-lb, 4.0 — 6.8 N·m)





7. **CONNECT FOLLOWING WIRE HARNESS:**
   - Two terminal conectors
   - Bond cable
   - Positive cable

8. **INSTALL MAIN MAGNET SWITCH**
   (a) Install the main magnet switch to the vehicle.
   (b) Connect the connector.
   (c) Connect the cable.

9. **CONNECT NEGATIVE CABLE TO BATTERY**

BRACKET

COMPONENTS