

STARTER - HITACHI & MITSUBISHI

1992 Infiniti G20

1992 ELECTRICAL
Starters - Hitachi & Mitsubishi

G20, M30, Q45

DESCRIPTION

Starter is a conventional 12-volt, 4-pole, brush-type motor with reduction gear drive. When starter is energized, starter-mounted solenoid shifts the overrunning clutch and drive gear into the flywheel.

APPLICATION

STARTER APPLICATION TABLE

Model	Current Draw Amps	Starter Model No.
G20	90	Hitachi S114-701B
"	50-75	Mitsubishi MLT72985A
M30	Less Than 100	Hitachi S114-484A
"	70	Mitsubishi M3T26785
Q45	50-75	Mitsubishi MLT74781A

ON-VEHICLE TESTING

ENGINE WON'T START

1) If engine cranks abnormally, go to step 6). If engine does not crank, ensure starter turns. If starter does not turn, go to step 2). If starter turns, ensure gear shaft turns. If gear shaft does not turn, check reduction gear, armature and gear shaft for damage, and replace as necessary. If gear shaft turns, check pinion clutch for damage, and replace as necessary.

2) If starter does not turn, check fuse and fusible link. Replace as necessary. If fuse and fusible link are okay, check battery for proper charge. Charge as necessary. Check battery terminals for corrosion and looseness. Service as necessary.

3) If battery charge and terminals are okay, check starter system components and wiring. Repair wiring or replace ignition switch, inhibitor switch or starter relay as necessary.

4) If starter components and wiring are okay, ensure starter relay movement is heard. If starter relay movement cannot be heard, replace relay. If starter relay movement can be heard, ensure pinion and ring gear mesh properly. If pinion and ring gear do not mesh properly, adjust pinion extension length. See PINION EXTENSION LENGTH under BENCH TESTING.

5) Check shift lever for defects. Check return springs and pinion for sliding condition. Replace as necessary. If pinion and ring gear mesh properly, remove starter from engine. Ensure starter turns under no-load condition. If starter does not turn, disassemble starter, and check components. If starter turns, check starter solenoid, and replace as necessary.

6) Check battery charge. Check terminals for looseness and corrosion. Service as necessary. Check starter draw while cranking. If starter draw is excessive, repair or replace starter as necessary. If engine continues to crank abnormally, check engine for mechanical

faults.

7) If starter will not stop turning when ignition is turned off, repair or replace ignition switch, starter relay or starter solenoid.

BENCH TESTING

STARTER SOLENOID TEST

Disconnect battery ground cable. Disconnect "M" terminal of starter. Check for continuity between "S" terminal and solenoid body. If continuity is not present, replace solenoid. Check for continuity between terminals "S" and "M". If continuity is not present, replace solenoid.

PINION/CLUTCH

Inspect pinion/clutch assembly gear teeth and armature shaft gear teeth. Inspect condition of ring gear teeth. Replace pinion/clutch if any gear teeth are damaged or excessively worn. Pinion should rotate smoothly in one direction and lock in opposite direction. Replace if abnormal resistance is felt.

BRUSH & BRUSH HOLDER

Perform insulation test between brush holder (positive side) and its base (negative side). If continuity exists, replace brush holder. Ensure brushes move smoothly and are not worn beyond specification. If brush holder sliding surface is dirty, clean it. Check brush spring pressure with brush spring detached from brush. See MINIMUM BRUSH LENGTH & BRUSH SPRING TENSION table. Replace as necessary.

MINIMUM BRUSH LENGTH & BRUSH SPRING TENSION (1)

Application	In. (mm)	Lbs. (kg)
G20		
Hitachi .....	.43 (11)	3.96-4.86 (1.8-2.2)
Mitsubishi .....	.47 (12)	3.1-5.7 (1.4-2.6)
M30		
Hitachi .....	.47 (12)	4.0-4.9 (1.8-2.2)
Mitsubishi .....	.45 (11.5)	3.1-5.7 (1.4-2.6)
Q45 .....	.47 (12)	3.1-5.7 (1.4-2.6)

(1) - With new brush.

YOKE ASSEMBLY INSPECTION

Hitachi (G20)

If magnet inside yoke has any cracks, replace as an assembly.

Mitsubishi (G20 & Q45)

Mitsubishi starter uses a pole piece bonded to inside of yoke. Check pole piece for cracks and that it is still secured to yoke. The holder may move a little because it is not bonded to yoke. Replace as an assembly if needed.

FIELD COIL TEST

M30

Check continuity between field coil positive terminal and positive brushes. If no continuity, replace yoke assembly. Check for continuity between field coil positive terminal and yoke assembly. If continuity exists, replace yoke assembly.

ARMATURE TEST

1) Check continuity between 2 side-by-side commutator bars. Check each segment the same way. If no continuity exists, replace armature. Check for continuity between each commutator bar and armature shaft. If continuity exists, replace armature.

2) If commutator surface is rough, sand lightly using No. 500 or 600 grit sandpaper. Using a micrometer or vernier caliper, measure commutator diameter. If commutator diameter is not within specification, replace armature. See MINIMUM COMMUTATOR DIAMETER table.

3) Check depth of insulating mold between commutator bars. If depth is less than .008" (.2 mm), using a hacksaw blade, undercut to .020-.031" (.5-.8 mm).

MINIMUM COMMUTATOR DIAMETER

Application	In. (mm)
G20	
Hitachi	1.260 (32)
Mitsubishi	1.134 (28.8)
M30	
Hitachi	1.260 (32)
Mitsubishi	1.500 (38.1)
Q45	1.134 (28.8)

PINION EXTENSION LENGTH

Hitachi (G20 & M30)

1) Disconnect "M" terminal lead from solenoid. Compare relative positions of pinion when solenoid is energized and when pinion is pulled out by hand. See Fig. 1 or 2.

2) On G20, difference between measurements should be .002-.0591" (.05-1.5 mm). On M30, difference between measurements should be .002-.0315 (.05-.8 mm). If measurements are not as specified, remove solenoid, and install appropriate adjusting plate between solenoid and starter housing. Adjusting plates come in 2 thicknesses, .020" (.5 mm) and .031" (.8 mm).

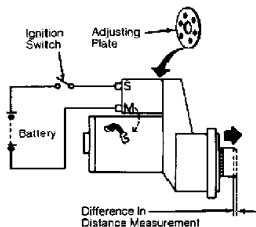
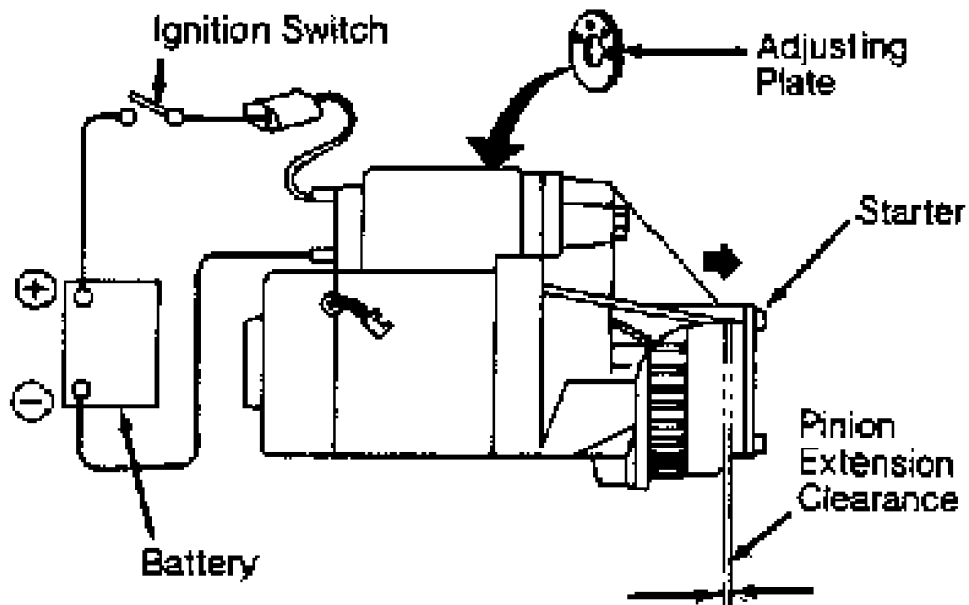
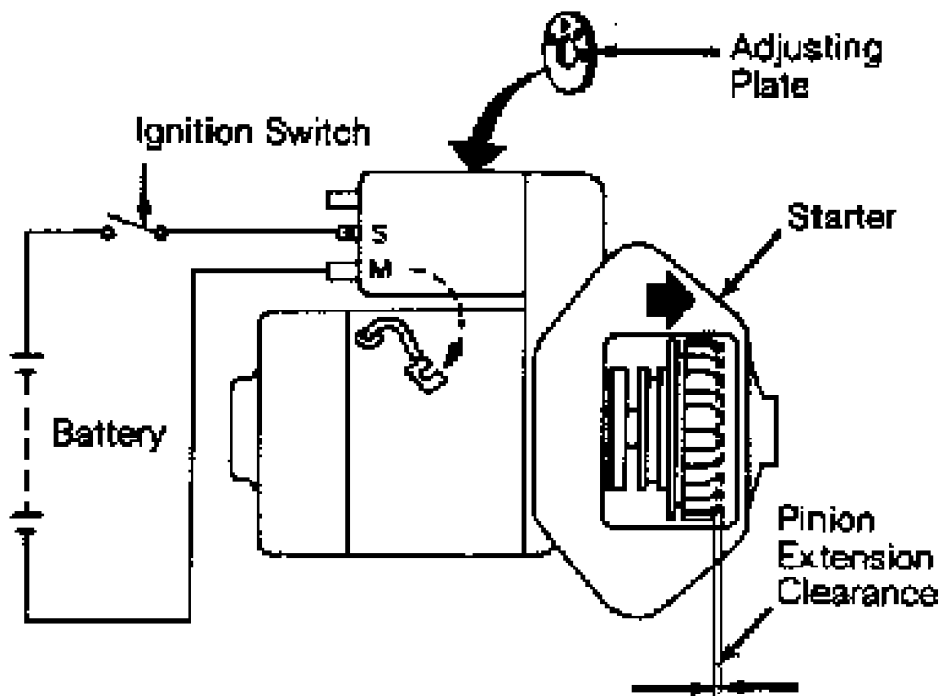


Fig. 1: Checking Hitachi Starter Pinion Extension Clearance (G20)
Courtesy of Nissan Motor Co., U.S.A.



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Fig. 2: Checking Starter Pinion Extension Clearance (M30)
 Courtesy of Nissan Motor Co., U.S.A.

Mitsubishi (G20 & Q45)

1) Disconnect "M" terminal lead from solenoid. Energize

solenoid. Push pinion back by hand to remove slack, and measure distance between pinion and pinion stopper. See Fig. 3.

2) Clearance should be .020-.079" (.5-2.0 mm). If measurement is not as specified, remove solenoid, and install appropriate adjusting plate between solenoid and starter housing. Adjusting plates come in 2 thicknesses, .020" (.5 mm) and .031" (.8 mm).

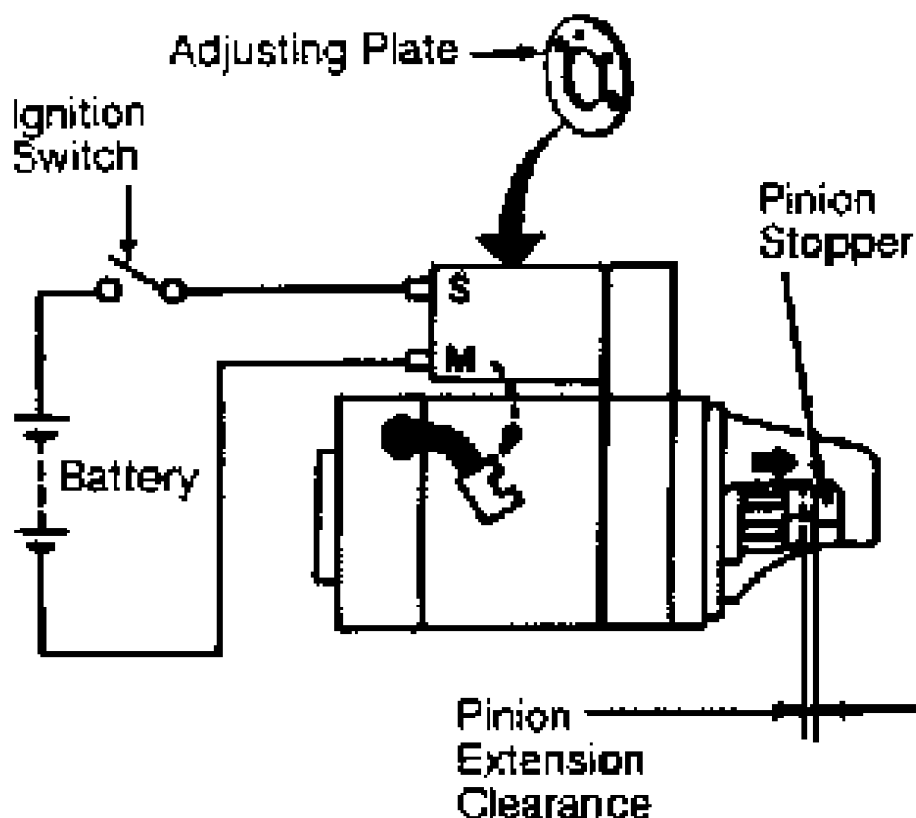


Fig. 3: Checking Mitsubishi Starter Pinion Extension Clearance (G20 & Q45)

Courtesy of Nissan Motor Co., U.S.A.

Mitsubishi (M30)

1) Disconnect motor lead from solenoid. Pull pinion out by hand until it contacts stopper, and measure distance between housing and nose of pinion. Energize solenoid, and measure distance between housing and nose of pinion. See Fig. 2.

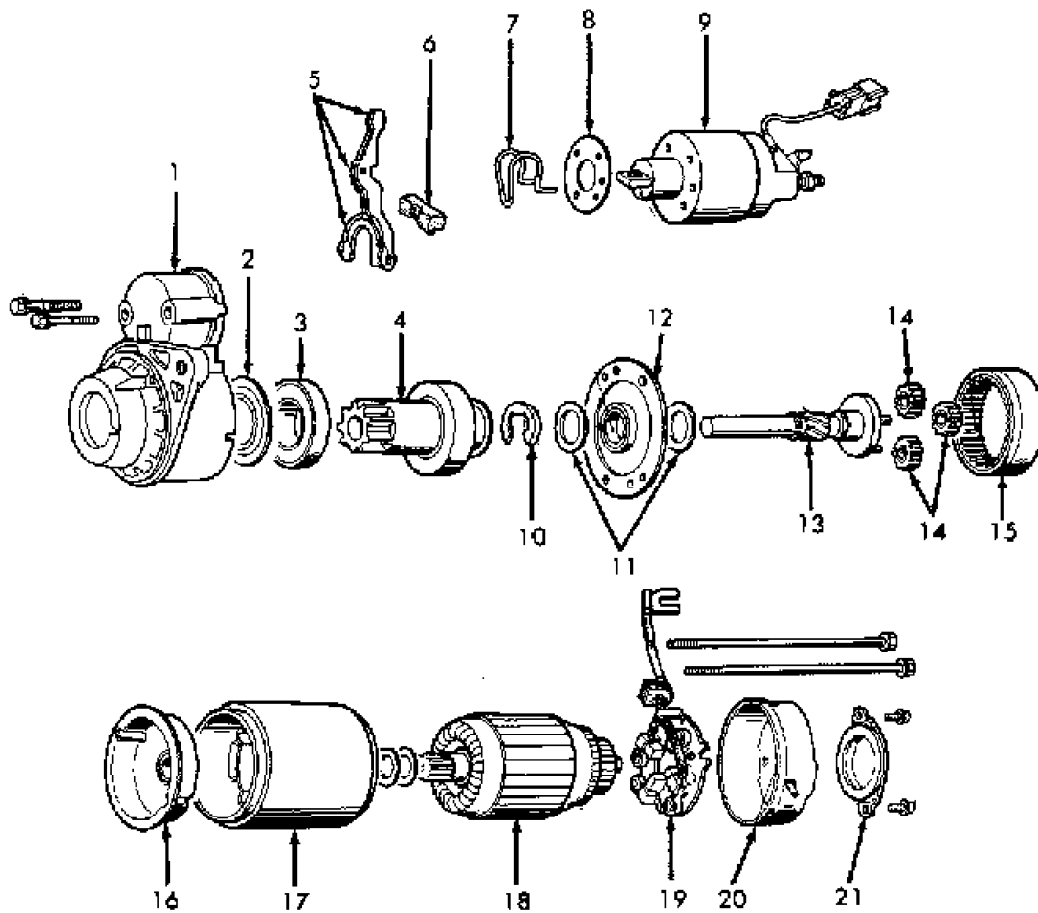
2) Difference between these measurements should be .012-.079" (.3-2.0 mm). If measurement is not as specified, remove solenoid, and install appropriate adjusting plate between solenoid and starter housing. Adjusting plates come in 2 thicknesses, .020" (.5 mm) and .031" (.8 mm).

OVERHAUL

1) For exploded view of starter, see Fig. 4, 5, 6 or 7. When

assembling starter, place high temperature grease on rear cover, gear case, frictional pinion surface, moving portion of shift lever and solenoid plunger.

2) On M30 Mitsubishi starter, assemble gear case, pinion assembly, idler gear, adjusting washers and center bracket. Turn idler gear by hand in axial direction and check end play between idler gear and rear of gear case. See Fig. 8. End play should be .004-.020" (.1-.5 mm). Adjust by installing adjusting washer between idler gear and center bracket. M30 with Hitachi starter, G20 and Q45 have no end play requirements.



- | | | |
|--------------------|--------------------|--------------------|
| 1. Gear Case | 8. Adjusting Plate | 15. Internal Gear |
| 2. Bearing Cover | 9. Solenoid | 16. Center Bracket |
| 3. Bearing | 10. "E" Clip | 17. Yoke Assembly |
| 4. Pinion Assembly | 11. Thrust Washer | 18. Armature |
| 5. Lever | 12. Center Bracket | 19. Brush Holder |
| 6. Dust Cover | 13. Pinion Shaft | 20. Rear Cover |
| 7. Spring | 14. Planetary Gear | 21. Dust Cover |

Fig. 4: Exploded View Of Hitachi Starter (G20)
 Courtesy of Nissan Motor Co., U.S.A.

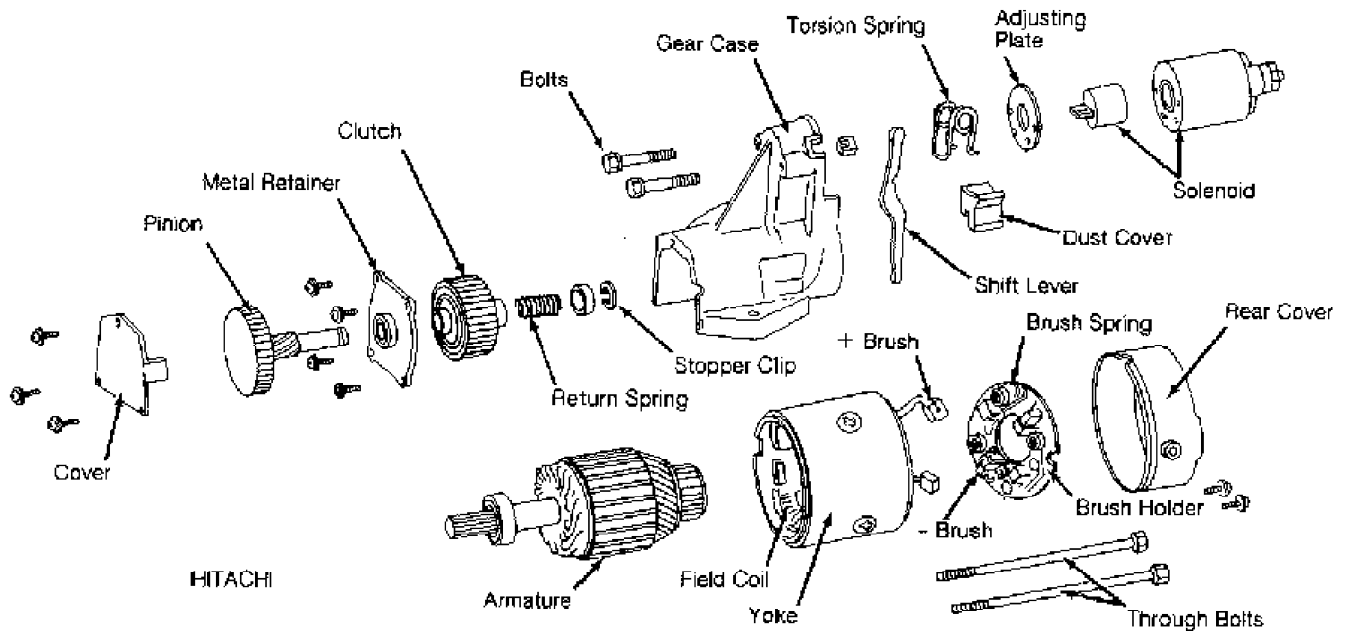


Fig. 5: Exploded View Of Hitachi Starter (M30)
 Courtesy of Nissan Motor Co., U.S.A.

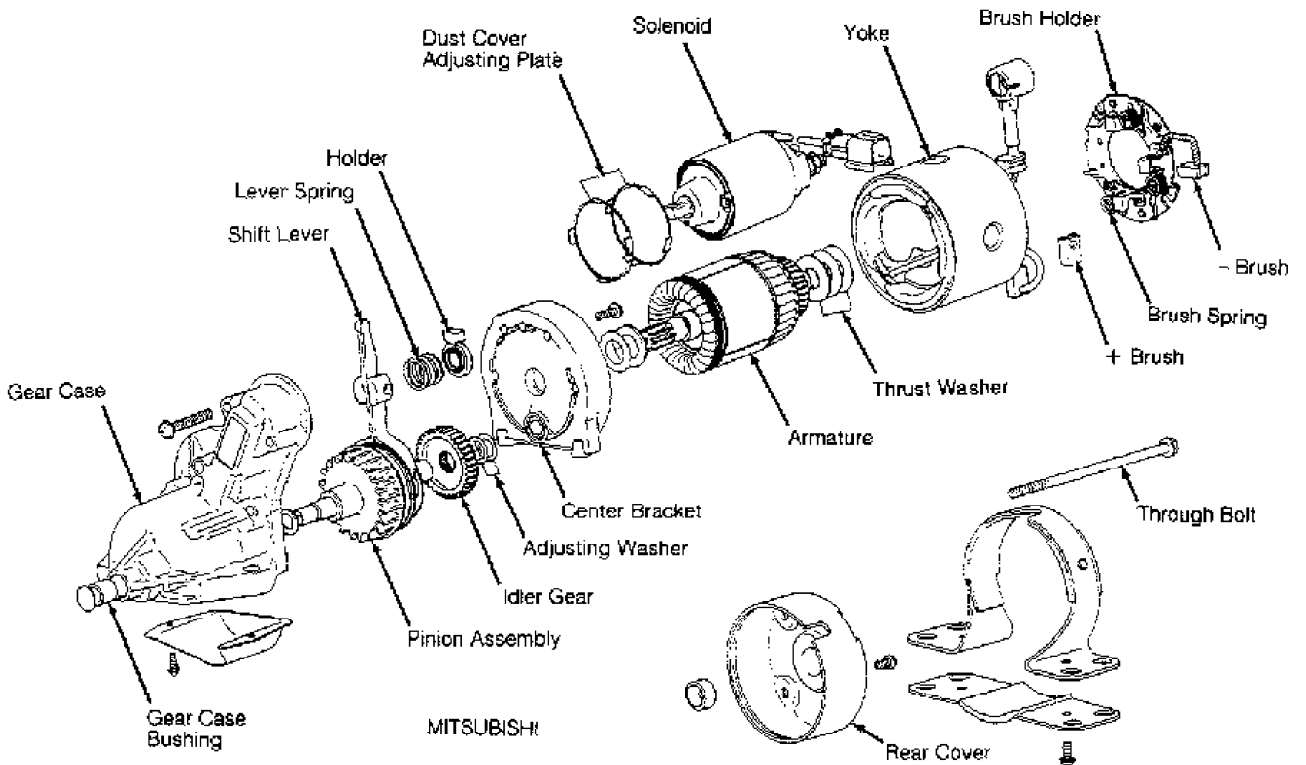


Fig. 6: Exploded View Of Mitsubishi Starter (M30)
 Courtesy of Nissan Motor Co., U.S.A.

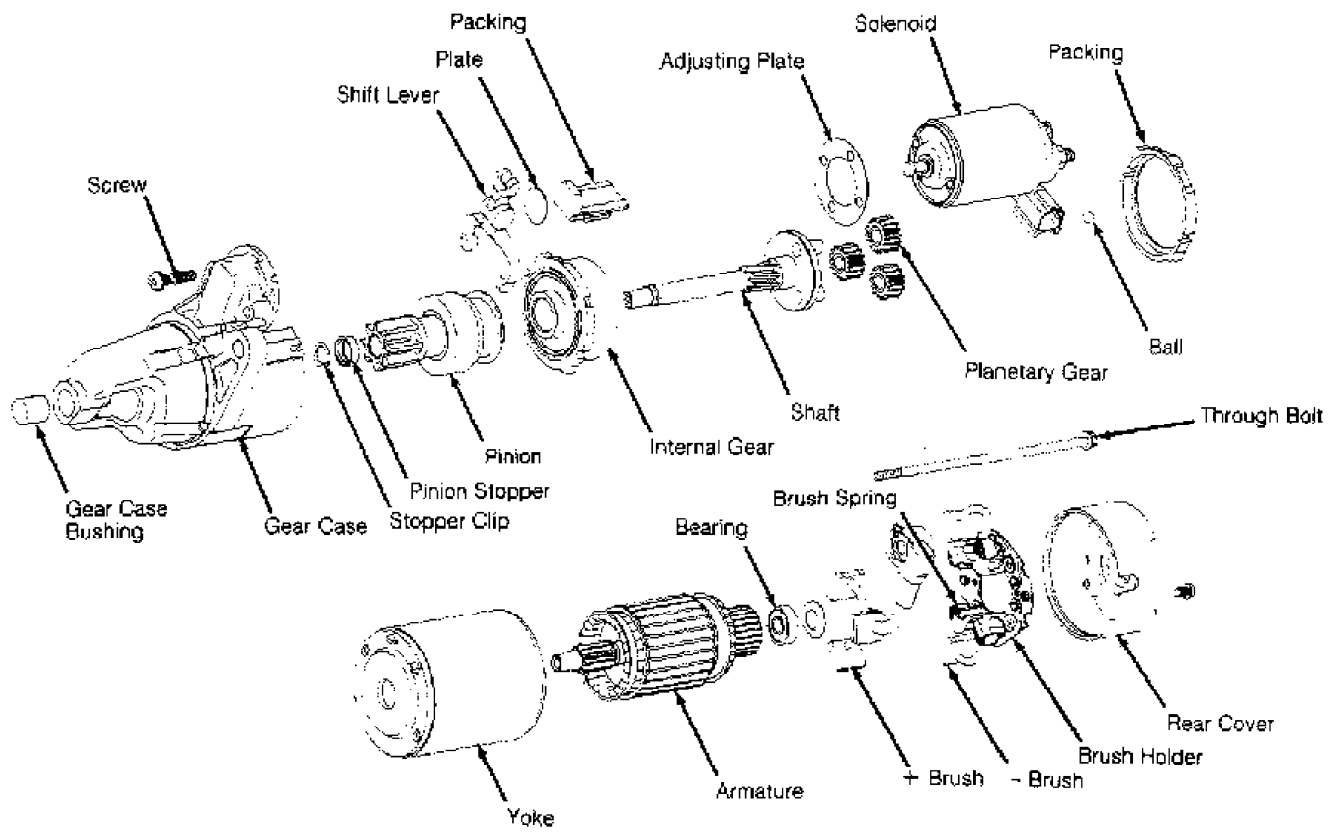


Fig. 7: Exploded View Of Mitsubishi Starter (G20 & Q45)
 Courtesy of Nissan Motor Co., U.S.A.

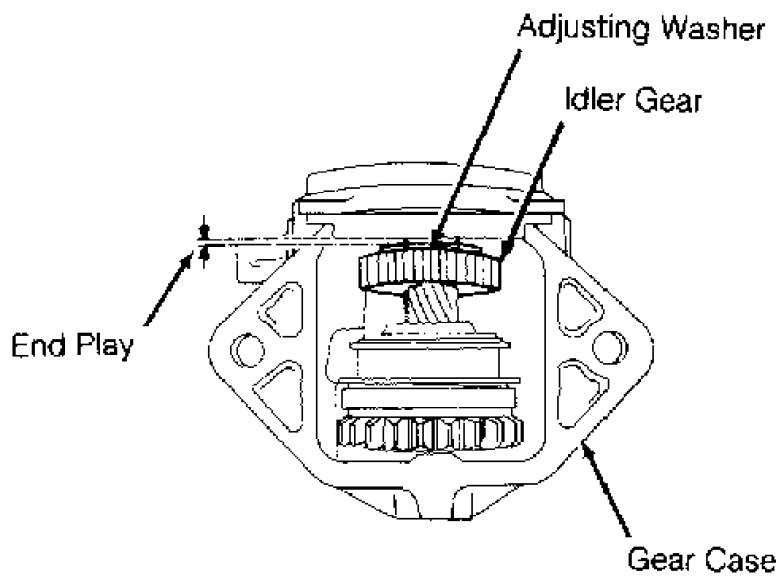


Fig. 8: Checking Pinion End Play (M30 With Mitsubishi Starter)
 Courtesy of Nissan Motor Co., U.S.A.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS (G20)

Application	INCH Lbs. (N.m)
Battery Cable Stud Nut	
Hitachi	65-87 (7.4-9.8)
Mitsubishi	89-106 (10-12)
Case Through Bolts	
Hitachi	43-57 (4.9-6.4)
Mitsubishi	39-63 (4.4-7.1)
Solenoid Bolts	
Hitachi	57-73 (6.4-8.3)
Mitsubishi	36-67 (4.1-7.6)

TORQUE SPECIFICATIONS (M30)

Application	INCH Lbs. (N.m)
Battery Cable Stud Nut	65-87 (7.4-9.8)
Case Through Bolts	
Hitachi	43-57 (4.9-6.4)
Mitsubishi	43.2-63 (4.9-6.9)
Solenoid Bolts	
Hitachi	56.4-69 (6.4-7.8)
Mitsubishi	34.8-69 (3.9-7.8)

TORQUE SPECIFICATIONS (Q45)

Application	INCH Lbs. (N.m)
Battery Cable Stud Nut	89-106 (10-12)
Case Through Bolts	50-92 (5.6-10.4)
Solenoid Bolts	36-67 (4.1-7.6)