

# Starters

## HITACHI & MITSUBISHI

All Chrysler Corp. Imports;  
Datsun/Nissan; Isuzu; LUV & Mazda  
Models; Some Calif. Honda Civic Models

### DESCRIPTION

Starter is a conventional 12-volt, 4-pole brush-type motor. May be either direct or reduction gear drive. Solenoid mounted on starter shifts overrunning clutch and pinion to flywheel when starter is energized.

### HITACHI STARTER APPLICATION

Model	Type or Part No. (Man. Trans.)	Type or Part No. (Auto. Trans.)
<b>Datsun/Nissan</b>		
200SX	S114-229F	S114-295F
210	S114-160G	S114-163F
280ZX	S114-254D	S114-254D
310	S114-315	
<b>Maxima</b>		
Gasoline	S114-254D	S114-254D
Diesel	S13-65	S13-65
<b>Pickup</b>		
Gasoline	S114-229F	S114-295F
Diesel	S13-45	
<b>Sentra</b>		
Standard	S114-315	S114-317
Optional	S114-316	S114-318
<b>Honda</b>		
<b>Civic</b>		
(Calif.) <sup>1</sup>	<sup>2</sup> PC1-005	<sup>2</sup> PC1-005
<b>Isuzu</b>		
<b>I-Mark</b>		
Gasoline	<sup>3</sup> 8-94222-688-0	<sup>3</sup> 8-94222-688-0
Diesel	<sup>3</sup> 8-94236-347-1	<sup>3</sup> 8-94236-347-1
<b>P'UP</b>		
Gasoline	<sup>3</sup> 8-94222-688-0	<sup>3</sup> 8-94222-688-0
Diesel	<sup>3</sup> 5-81100-183-0	<sup>3</sup> 5-81100-183-0
<b>LUV</b>		
Gasoline	<sup>4</sup> S114-271	
Diesel	<sup>3</sup> 9-4030241	

- <sup>1</sup> — Some Calif. models use Nippondenso starters.
- <sup>2</sup> — Auto manufacturer's part number is preceded by prefix 31200.
- <sup>3</sup> — Auto manufacturer's part number.
- <sup>4</sup> — Auto manufacturer's part number is 9-4204438.

### MITSUBISHI STARTER APPLICATION

Model	Type or Part No. (Man. Trans.)	Type or Part No. (Auto. Trans.)
<b>Chrysler Corp. Imports</b>		
<b>Champ &amp;</b>		
Colt	MD034120	MD027400
<b>Challenger &amp;</b>		
Sapporo	MD027400	MD027382
<b>Arrow &amp; Ram-50</b>		
Pickups	MD027400	MD027382
<b>Mazda</b>		
626	<sup>1</sup> HE19-18-400R	<sup>1</sup> 8964-18-400R
<b>GLC</b>		
FWD	<sup>1</sup> E301-18-400R	<sup>1</sup> E301-18-400R
Wagon	<sup>1</sup> D501-18-400R	<sup>1</sup> D502-18-400R
RX7	<sup>1</sup> N221-18-400R	<sup>1</sup> N202-18-400A
<b>B2000</b>		
Pickup	<sup>1</sup> HE19-18-400R	
<b>B2200 Diesel</b>		
Pickup	<sup>1</sup> S211-18-400	

<sup>1</sup> — Auto manufacturer's part number.

### TESTING

#### STARTER PERFORMANCE TESTS

##### No Load Tests

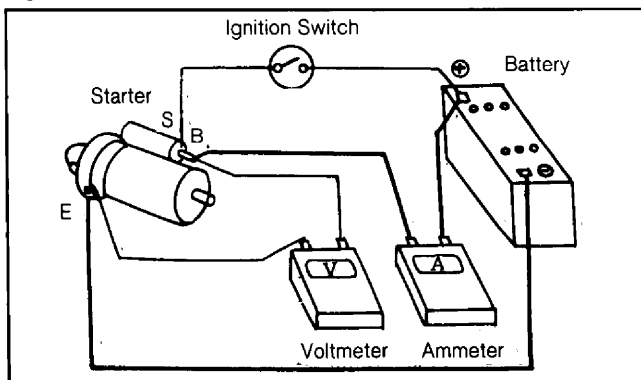
Connect starter in series with a 12-volt battery and an ammeter capable of at least a 1000 ampere reading. Connect voltmeter as shown in Fig. 1 and compare readings with Starter No Load Specifications.

#### MITSUBISHI STARTER NO LOAD SPECIFICATIONS<sup>1</sup>

Application	Max. Amps	Min. RPM
<b>Chrysler Corp. Imports</b>		
<b>Arrow &amp; Ram-50</b>		
<b>Pickups</b>		
Man. Trans.	60	<sup>2</sup>
Auto. Trans.	62	<sup>2</sup>
<b>Challenger &amp; Sapporo</b>		
Man. Trans.	60	<sup>2</sup>
Auto. Trans.	90	<sup>2</sup>
<b>Champ &amp; Colt</b>		
Man. Transaxle	50	<sup>2</sup>
Auto. Transaxle	50	<sup>2</sup>
<b>Mazda</b>		
<b>626</b>		
Man. Trans.	53	6800
Auto. Trans.	60	6600
<b>GLC</b>		
FWD	53	6800
Wagon	53	6800
<b>RX7</b>		
Man. Trans.	50	5600
Auto. Trans.	100	3500
B2000 Pickup	53	6800
B2200 Pickup	180	3800

- <sup>1</sup> — Applied voltage of 11.5-12 volts.
- <sup>2</sup> — Information not available from manufacturer.

Fig. 1: Connections for No Load Test



## HITACHI & MITSUBISHI (Cont.)

### HITACHI STARTER NO LOAD TEST SPECIFICATIONS <sup>1</sup>

Application	Max. Amps	Min. RPM
Datsun/Nissan		
200SX	60	6000
210, 310, Pickup (Gas), Sentra & Stanza	60	7000
280ZX & Maxima	100	3900
Pickup (Diesel)	150	3500
Honda		
Calif. Civic	70	6000
Isuzu		
I-Mark		
Gasoline	<sup>2</sup>	<sup>2</sup>
Diesel	<sup>2</sup>	<sup>2</sup>
P'UP		
Gasoline	<sup>2</sup>	<sup>2</sup>
Diesel	120	4000
LUV		
Gasoline	70	6000
Diesel	120	4000

<sup>1</sup> — Applied voltage of 11.5-12 volts.

<sup>2</sup> — Information not available from manufacturer.

#### Load (Lock Torque) Test

Mount starter in a test stand to perform torque measurement test. Follow manufacturer's instructions for test stand operation. With voltage adjusted, ammeter reading and torque should be within specifications.

### HITACHI STARTER LOAD TEST SPECIFICATIONS <sup>1</sup>

Application	Amps (Max.)	Volts	Torque Ft. Lbs. (N.m)
Datsun/Nissan	<sup>2</sup>	<sup>2</sup>	<sup>2</sup>
Honda			
Calif. Civic	200	8	3.3 (4.5)
Isuzu	<sup>2</sup>	<sup>2</sup>	<sup>2</sup>
LUV			
Gasoline	200	7.4	3.6 (4.9)
Diesel	<sup>2</sup>	<sup>2</sup>	<sup>2</sup>

<sup>1</sup> — At turning speed of 1100-1200 RPM.

<sup>2</sup> — Information not available from manufacturer.

### MITSUBISHI STARTER LOAD TEST SPECIFICATIONS <sup>1</sup>

Application	Amps (Max.)	Volts	Torque Ft. Lbs. (N.m)
Chrysler Corp. Imports	<sup>2</sup>	<sup>2</sup>	<sup>2</sup>
Mazda			
626			
Man. Trans.	310	5	5.4 (7.5)
Auto. Trans.	500	5	8.3 (11.5)
GLC			
FWD	310	5	5.4 (7.5)
Wagon	310	5	5.4 (7.5)
RX7			
Man. Trans.	600	5	6.9 (9.6)
Auto. Trans.	1100	4	22.4 (31)
B2000 Pickup	310	5	5.4 (7.5)
B2200 Pickup	1050	2	21.7 (30)

<sup>1</sup> — Turning speed not specified by manufacturer.

<sup>2</sup> — Information not available from manufacturer.

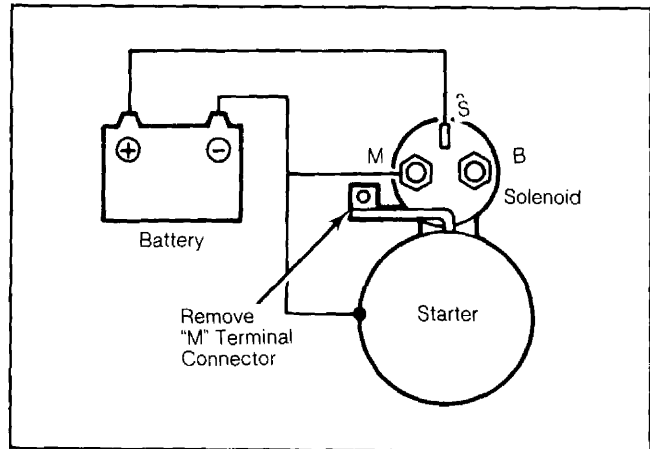
### SOLENOID TESTS

**NOTE:** Make tests with solenoid removed from starter or remove solenoid lead to starter before testing. Ensure that solenoid plunger and sleeve are clean and dry before performing tests. Make tests in less than 10 seconds to prevent coil damage.

#### Pull-In Coil Test

1) Connect jumper between positive post of 12-volt battery and "S" terminal. Connect a second jumper to negative battery terminal and touch "M" (MT) terminal (and between terminal "S" and switch body). See Fig. 2.

Fig. 2: Connections for Conducting Solenoid Pull-In Test



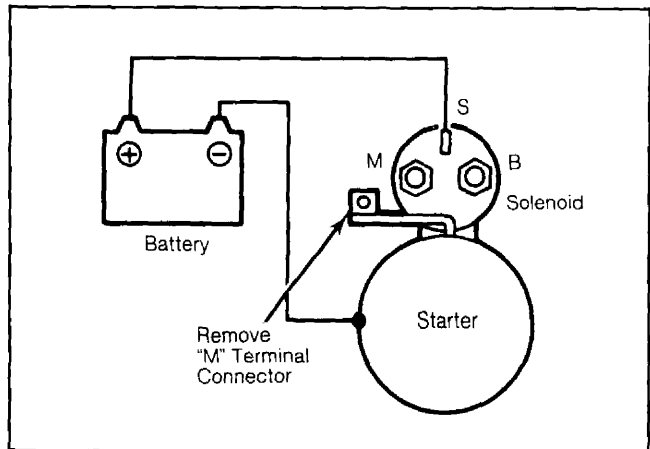
Be sure to remove solenoid -to-starter lead before testing.

2) If pinion moves outward (or plunger is forcefully attracted), pull-in coil is good. If not, replace magnetic switch.

#### Hold-In Coil Test

1) Connect a jumper wire between the "M" (MT) terminal and the solenoid case. Apply 8 volts to the "S" terminal to pull in the plunger. See Fig. 3. Disconnect lead to "M" (MT) terminal.

Fig. 3: Connections for Conducting Solenoid Hold-In Test



Test in less than 10 seconds to avoid solenoid damage.

2) If pinion remains out (plunger remains attracted), hold-in coil is good. If it moves in, replace magnetic switch

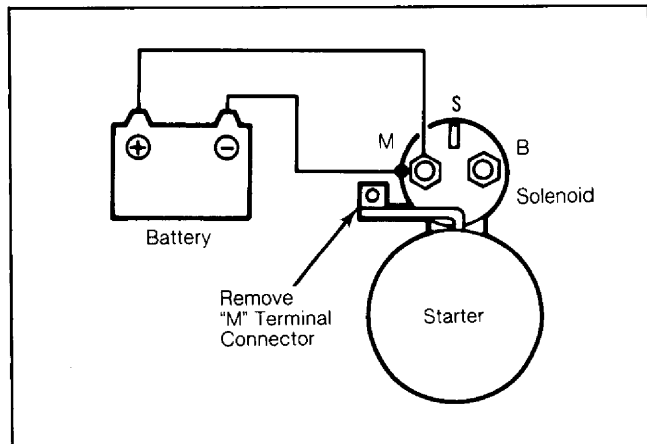
# Starters

## HITACHI & MITSUBISHI (Cont.)

### Return Test

1) Apply 12 volts between "M" (MT) terminal and the solenoid case. Pull pinion out and release it (push plunger into solenoid body by hand). See Fig. 4.

**Fig. 4: Connections for Conducting Return Test**



Connect battery to "M" terminal and solenoid case.

2) If the case is short-circuited, the plunger will be attracted. If nothing happens, the solenoid is satisfactory.

## OVERHAUL

### DISASSEMBLY

**NOTE:** Procedures may vary slightly between conventional and reduction gear starters.

1) Loosen nut securing connecting plate to magnetic switch "M" terminal. Remove screws securing magnetic switch and remove switch (solenoid) assembly. Remove through bolts and brush cover assembly, then tap yoke assembly loose with wooden mallet. Remove yoke, armature assembly and pinion shift lever.

2) Remove pinion stop ring from end of armature shaft by pushing stop ring to clutch side. Remove snap ring and overrunning clutch assembly from armature shaft.

### PARTS REPLACEMENT & TESTING

#### Brushes & Springs

Check brush spring tension using a spring scale. Check brush contact surface condition and brush length. Check lead clip and wire connections and condition of brush holders. Replace as required. See Brush Spring Tension and Brush Length (Minimum).

#### Armature

Check external condition of armature for scoring or other damage. Measure shaft distortion with dial indicator. Replace armature if shaft bend exceeds .003" (.08 mm) on Datsun and LUV, and .004" (.10 mm) on all other models.

#### Commutator

1) Inspect commutator for roughness, grooves, burns or pitting. Sand lightly with 500 grit sandpaper if necessary. Check commutator for out-of-round and mica insulators undercut to a depth of .020-.031" (.5-.8 mm).

### BRUSH SPRING TENSION

Application	Lbs. (kg)
Chrysler Corp. Imports	2.9-3.7 (1.3-1.7)
Datsun/Nissan	
200SX & 210	3.1-4.0 (1.4-1.8)
280ZX & Maxima (Gas)	3.5-4.4 (1.6-2.0)
310, Sentra & Stanza	4.0-4.9 (1.8-2.2)
Maxima (Diesel)	6.0-7.3 (2.7-3.3)
Pickup	
Gasoline	3.1-4.0 (1.4-1.8)
Diesel	6.8-9.0 (3.1-4.1)
Honda, Isuzu & LUV	3.5 (1.6)
Mazda	
B2000 & B2200 Pickups	3.1-3.9 (1.4-1.8)
RX7	3.1-5.6 (1.4-2.5)
All Other Models	2.8-3.8 (1.3-1.7)

### MINIMUM BRUSH LENGTH

Application	In. (mm)
Chrysler Corp. Imports	.45 (11.5)
Datsun/Nissan	
280ZX, 310, Sentra, Stanza & Maxima (Gas)	.43 (11)
Maxima (Diesel)	.35 (9)
200SX, 210, Pickup (Gas)	.47 (12)
Pickup (Diesel)	.28 (7)
Honda	.47 (12)
Isuzu & LUV	
Gasoline	.47 (12)
Diesel	.35-.37 (9-9.5)
Mazda	.45 (11.5)

2) If necessary, commutator may be turned less than .04" (1 mm) from original size and mica undercut. Replace if excessively worn.

#### Field Coil

1) Check field coil continuity by connecting test probe of circuit tester or an ohmmeter to the field coil positive terminal and brush holder. If circuit is open, replace field coil.

2) Check for grounding of field coils by placing one probe of circuit tester on starter housing and other probe to field coil positive terminal. If little or no resistance, field coil is grounded and must be replaced.

#### Overrunning Clutch Assembly

1) Inspect pinion assembly and sleeve. Sleeve should slide freely on armature shaft and spline. If damage or resistance is noted, replace assembly.

2) Check pinion and flywheel teeth for excessive rubbing or damaged teeth. Replace as required.

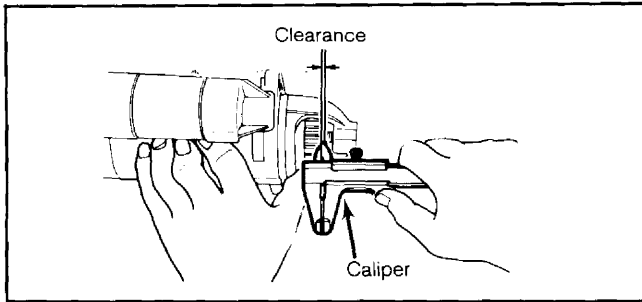
#### Pinion Gear Clearance

1) The clearance between the pinion gear and stop collar should be .012-.098" (.3-2.5 mm) on Hitachi starters, and .02-.08" (.51-2.03 mm) on Mitsubishi when solenoid is engaged. Adjust as necessary by changing shims between solenoid and starter yoke. See Fig. 5.

2) On Mazda B2200 models, projection distance (starter housing to front face of gear) should be .67" (17 mm).

## HITACHI & MITSUBISHI (Cont.)

**Fig. 5: Measuring Pinion Edge-to-Pinion Stopper Clearance**



### Pinion Case Bearing

Inspect bearing for wear and check side play. If clearance exceeds .008" (.2 mm), replace bearing. New

bearing clearance should be .001-.004" (.025-.10 mm) for Hitachi or .002-.004" (.05-.10 mm) for Mitsubishi starters.

**NOTE:** Ensure that bearing is installed so that end of bearing is flush with gear case end.

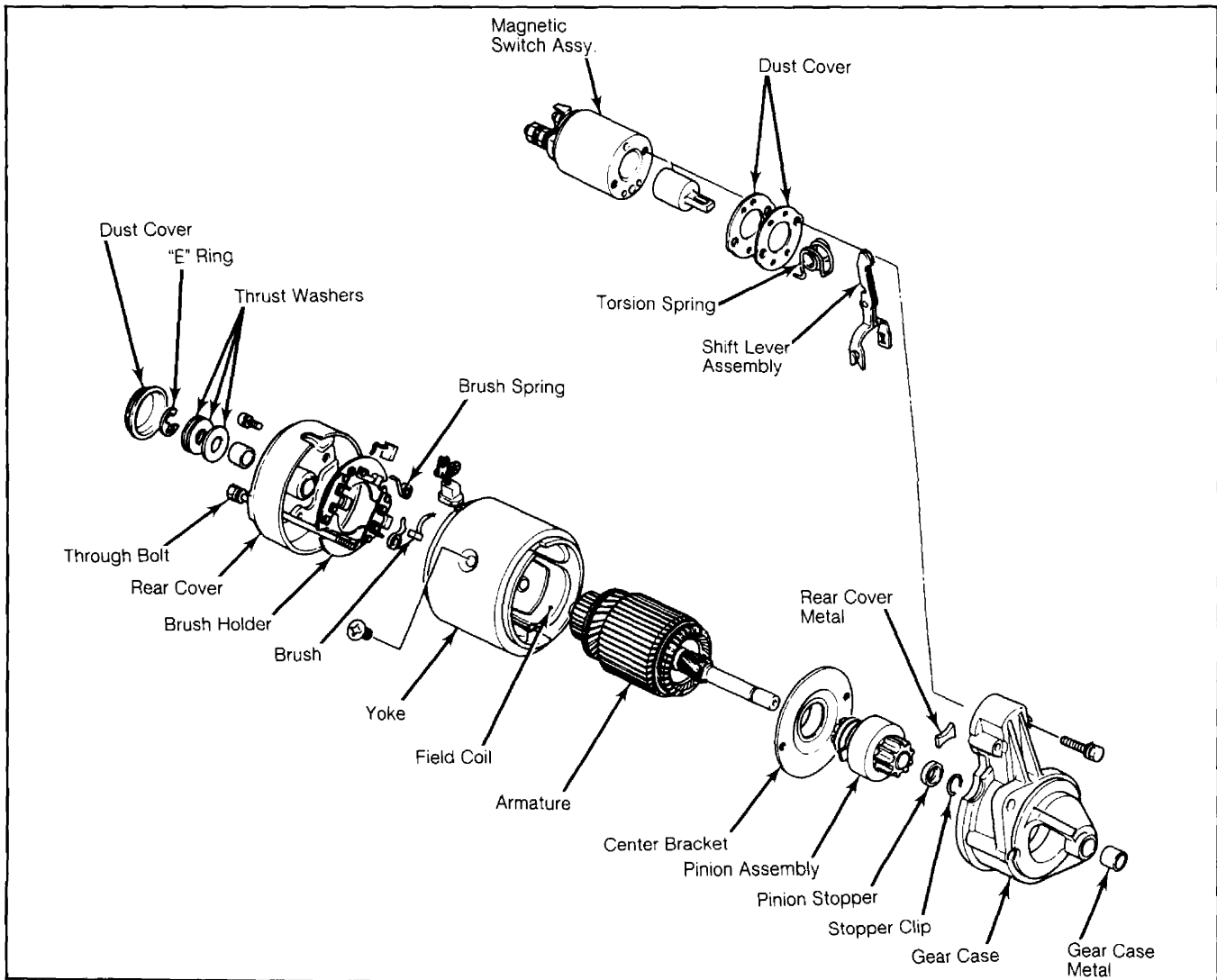
### CLEANING & INSPECTION

Clean all disassembled parts. Do not use grease dissolving solvent on overrunning clutch, armature assembly, solenoid assembly or field coils due to possible damage. Inspect all parts for damage or wear and replace as required.

### REASSEMBLY

To reassemble, reverse disassembly procedure. Fill rear case on reduction gear models with grease. Lightly oil pinion and all bearing surfaces.

**Fig. 6: Disassembled View of a Typical Hitachi Conventional Starter**

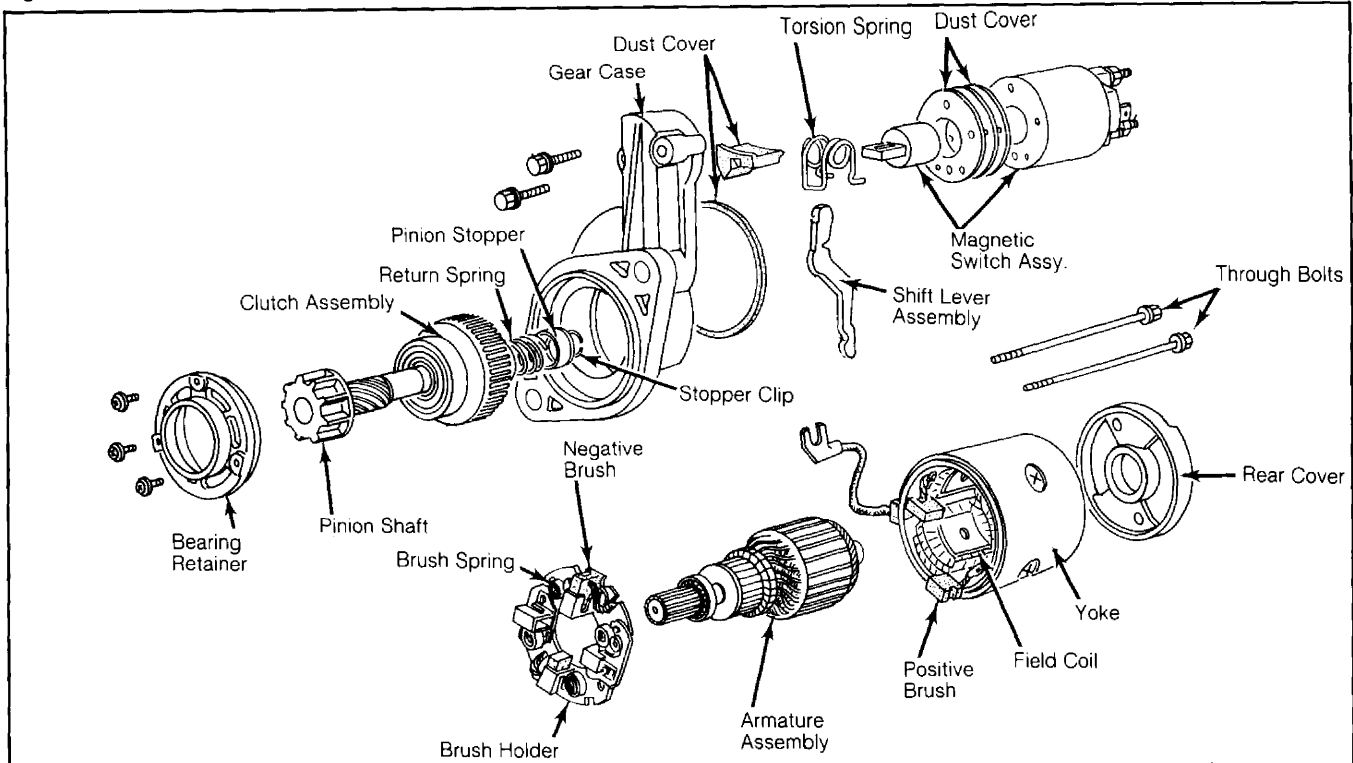


Starter illustrated is for Datsun/Nissan Pickups with gasoline engine.

# Starters

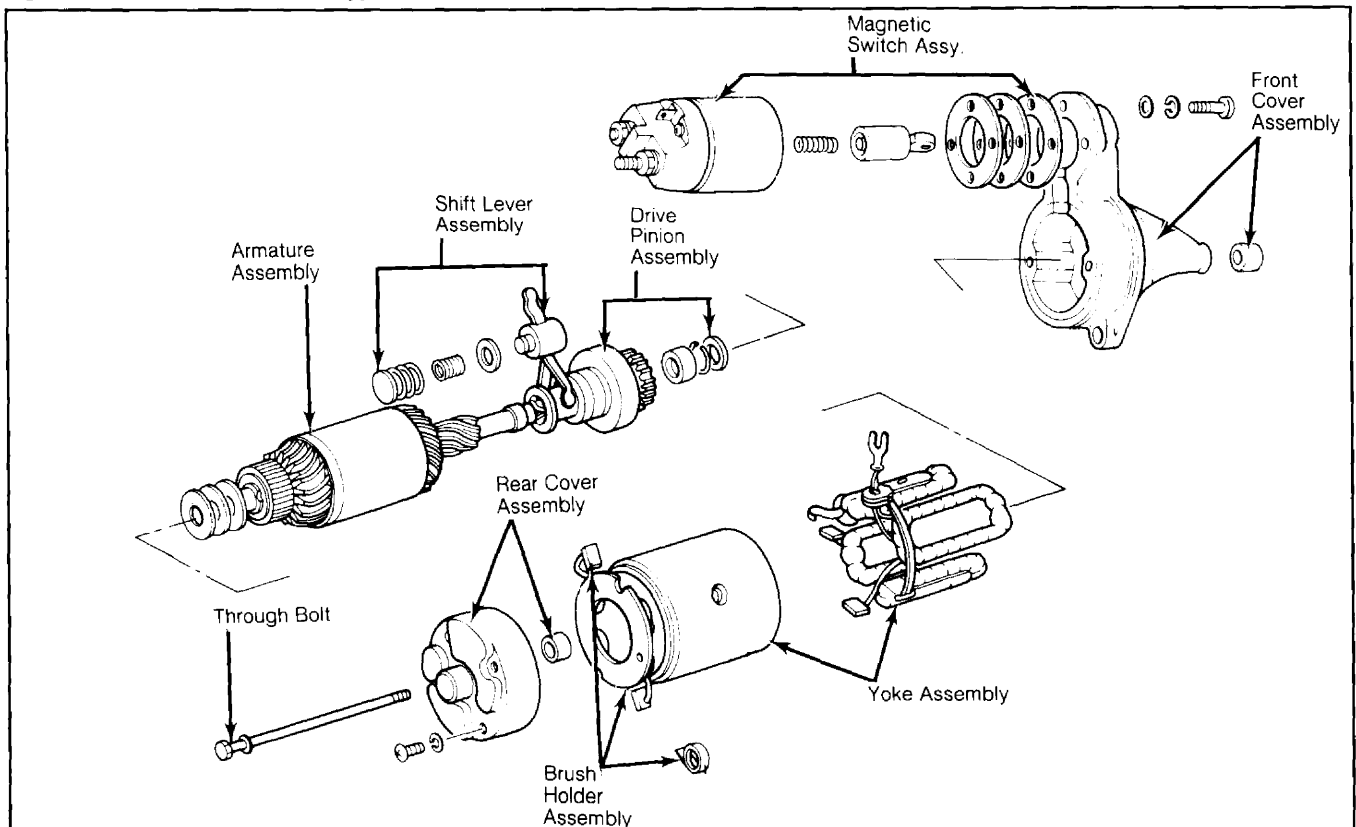
## HITACHI & MITSUBISHI (Cont.)

**Fig. 7: Disassembled View of Typical Hitachi Reduction Gear Starter**



Starter illustrated is for Datsun/Nissan Maxima with gasoline engine.

**Fig. 8: Disassembled View of Typical Mitsubishi Conventional Starter**



Starter illustrated is for Mazda B2200 Diesel Pickup.