

STARTER - REDUCTION GEAR

Article Text

1993 Mazda 929

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Thursday, March 25, 1999 12:10AM

ARTICLE BEGINNING

1993 ELECTRICAL

Mazda Starters - Reduction Gear

B2200 A/T, B2600i, MPV, MX-3 V6,
MX-6, Protege A/T, 626, 929

NOTE: The following figures are courtesy of Mazda Motors Corp.

DESCRIPTION

The Nippondenso reduction gear starter is a conventional 12-volt, 4-pole, brush-type starter. The integral solenoid is attached to the drive housing.

B2200 A/T, MPV V6, MX-3 V6 M/T, MX-6 M/T, 626 M/T & 929

Gear reduction is performed by coaxial planetary gear set.
See Fig. 1.

B2600i, MPV 4-Cylinder, MX-3 V6 A/T, MX-6 A/T & 626 A/T

Gear reduction is performed by offset gear and shaft assembly. See Fig. 1.

NOTE: For information on B2200 M/T, MX-3 4-Cylinder and Protege M/T, see STARTER - DIRECT DRIVE article in the ELECTRICAL section.

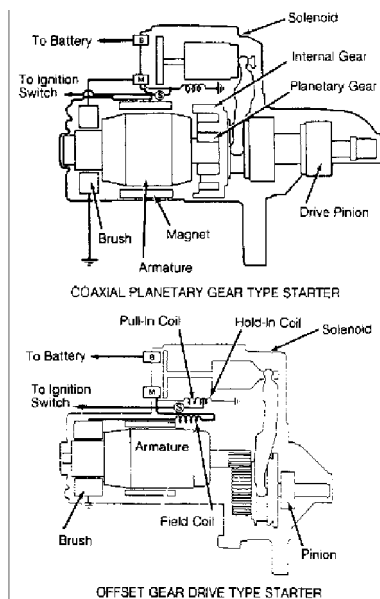


Fig. 1: Nippondenso Reduction Gear Type Starters

TROUBLE SHOOTING

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NOTE: See TROUBLE SHOOTING - BASIC PROCEDURES article in the GENERAL INFORMATION section.

ON-VEHICLE TESTING

CIRCUIT TEST

If starter does not operate, check voltage at starter "S" terminal with ignition switch in START position (and clutch depressed on M/T). See Fig. 1. If voltage is greater than 8 volts, repair or replace as required. If voltage is less than 8 volts, check ignition switch, inhibitor switch (A/T), interlock switch (M/T) and wiring.

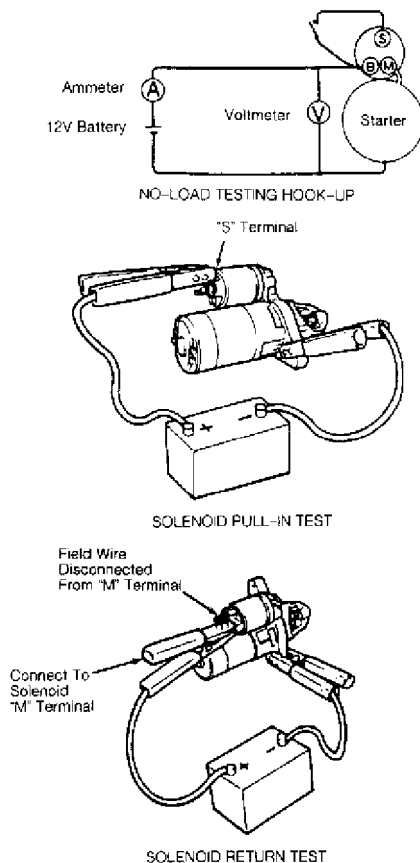


Fig. 2: Testing Reduction Gear Starter Circuits

BENCH TESTING

NO-LOAD TEST

Connect fully-charged 12-volt battery, voltmeter and ammeter to starter. See Fig. 2. Using remote starter wires or jumper, engage solenoid. Starter should spin smoothly. Compare readings with specifications. See NO-LOAD TEST SPECIFICATIONS table. If voltage is less than specified, amperage is more than specified or shaft speed is

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less than specified, disassemble and inspect starter components.

NO-LOAD TEST SPECIFICATIONS TABLE

AA

Application	Specification
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B2200 A/T

Voltage (Minimum)	11.0
Amperage (Maximum)	90
Shaft Speed (Minimum RPM)	3000

B2600i

A/T

Voltage (Minimum)	11.5
Amperage (Maximum)	100
Shaft Speed (Minimum RPM)	3000

M/T

Voltage (Minimum)	11.5
Amperage (Maximum)	90
Shaft Speed (Minimum RPM)	4000

MPV

4-Cylinder

Standard (1.2kW)

Voltage (Minimum)	11.5
Amperage (Maximum)	90
Shaft Speed (Minimum RPM)	4000

Heavy Duty (1.4kW)

Voltage (Minimum)	11.5
Amperage (Maximum)	100
Shaft Speed (Minimum RPM)	3000

V6

Voltage (Minimum)	11.0
Amperage (Maximum)	90
Shaft Speed (Minimum RPM)	2900

MX-3 V6

A/T

Voltage (Minimum)	11.0
Amperage (Maximum)	70
Shaft Speed (Minimum RPM)	2200

M/T

Voltage (Minimum)	11.0
Amperage (Maximum)	90
Shaft Speed (Minimum RPM)	2900

MX-6 & 626

4-Cylinder

Voltage (Minimum)	11.0
Amperage (Maximum)	90
Shaft Speed (Minimum RPM)	3000

V6

A/T

Voltage (Minimum)	11.0
Amperage (Maximum)	70
Shaft Speed (Minimum RPM)	2200

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M/T

Voltage (Minimum)	11.0
Amperage (Maximum)	90
Shaft Speed (Minimum RPM)	2900
Protege A/T & 929	(1)

(1) - Information is not available from manufacturer.

AA

SOLENOID TESTS

NOTE: Perform solenoid tests with starter assembled and field wire from starter disconnected at solenoid "M" terminal.
See Fig. 2.

CAUTION: DO NOT engage starter solenoid for more than 10 seconds during testing or damage to coil winding may result.

Solenoid Pull-In Test

Connect positive battery lead to solenoid "S" terminal and negative battery lead to starter body. See Fig. 2. Starter pinion drive gear should extend quickly and maintain this position. If starter pinion drive gear does not extend, replace solenoid.

Solenoid Return Test

Connect positive battery lead to solenoid "M" terminal and ground negative battery lead to starter body. See Fig. 2. Using screwdriver, pry overrunning clutch pinion drive outward. Release screwdriver and ensure overrunning clutch pinion drive returns to original position.

Solenoid Hold-In Test

Remove solenoid from starter. Connect positive battery lead to solenoid "S" terminal and negative battery lead to solenoid case. Push plunger into switch. If plunger stays in solenoid, hold-in windings are okay. If plunger does not stay in solenoid, replace solenoid.

Solenoid

1) Disconnect all wires from solenoid, including "M" wire between solenoid and starter. Using ohmmeter, ensure there is continuity between "S" and "M" terminals, and between "S" terminal and solenoid body. See Figs. 1 and 2. If continuity does not exist between these terminals, replace solenoid.

2) Ensure continuity does not exist between "M" and "B" terminals. If continuity exists between these terminals, solenoid is shorted. Replace solenoid.

PINION GAP ADJUSTMENT

1) Disconnect field wire from solenoid "M" terminal. See Fig. 2. Connect positive battery lead to "S" terminal and negative

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battery lead to starter case. Starter pinion drive gear will extend outward and stop.

2) Quickly measure pinion gap between end of pinion drive and circlip retainer. See Fig. 3. DO NOT operate starter solenoid for more than 10 seconds. Pinion gap should be .02-.08" (0.5-2.0 mm).

3) If pinion gap is not within specification, adjust by increasing or decreasing thickness of solenoid shims located between solenoid and drive housing.

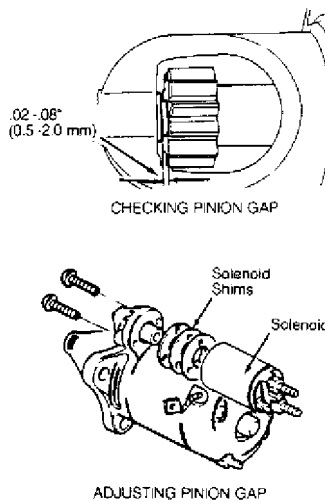


Fig. 3: Checking & Adjusting Pinion Gap

ARMATURE TEST

1) Place armature in growler. Turn on growler and hold a piece of hacksaw blade over armature. Slowly rotate armature. If hacksaw blade is attracted to core or if it vibrates, replace armature.

2) Remove armature from growler. Using an ohmmeter, check continuity between commutator and core. If continuity exists, replace armature. Check continuity between commutator and shaft. If continuity exists, replace armature.

3) Check continuity between each commutator segment. If an open exists between any 2 segments, replace armature.

COMMUTATOR TEST

1) Clean surface and polish with No. 400 sandpaper, if required. If surface is scored, out of round or pitted, turn commutator in a lathe.

2) Maximum commutator runout and minimum diameter of commutator must not exceed specification after turning. See COMMUTATOR SPECIFICATIONS table.

3) Commutator mica undercut depth should be .020 -.030" (.50 -.80 mm). Minimum mica undercut depth is .008" (.20 mm). If not within specification, undercut to standard depth.

COMMUTATOR SPECIFICATIONS TABLE

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Application			
		Maximum Runout In. (mm)	Minimum Diameter In. (mm)
B2200 A/T004 (.10)	1.13 (28.8)
B2600i			
A/T	.....	.002 (.05)	1.24 (31.4)
M/T	.....	.002 (.05)	1.08 (27.4)
MPV			
4-Cylinder			
1.2 kW	.....	.002 (.05)	1.08 (27.4)
1.4 kW	.....	.002 (.05)	1.24 (31.4)
V6	.....	.004 (.10)	1.13 (28.8)
MX-3 V6			
A/T	.....	.004 (.10)	1.24 (31.4)
M/T	.....	.004 (.10)	1.14 (29.0)
MX-6 & 626			
A/T	.....	.004 (.10)	1.24 (31.4)
M/T	.....	.004 (.10)	1.13 (28.8)
Protege A/T	.....	.004 (.10)	1.13 (28.8)
929	.....	.002 (.05)	1.13 (28.8)

BRUSH TEST

1) Connect one ohmmeter lead to positive brush holder and other lead to negative brush holder. If continuity exists, brush holder assembly is shorted. Replace brush holder assembly.

2) Check brush length. See BRUSH LENGTH SPECIFICATIONS table. If brush length is less than specified, replace brushes. Using spring scale, check spring tension. If tension is less than specified, replace brush holder. See BRUSH TENSION SPECIFICATIONS table. Ensure brushes move freely in holders.

BRUSH LENGTH SPECIFICATIONS TABLE

Application			
		Standard In. (mm)	Minimum In. (mm)
B2200 A/T	.....	.69 (17.5)	.39 (10.0)
B2600i			
A/T	.....	.67 (17.0)	.45 (11.5)
M/T	.....	.63 (16.0)	.35 (9.0)
MPV			
4-Cylinder			
1.2 kW63 (16.0)	.35 (9.0)
1.4 kW67 (17.0)	.45 (11.5)
V669 (17.5)	.39 (10.0)
MX-3 V6			
A/T67 (17.0)	.45 (11.5)
M/T71 (18.0)	.43 (11.0)

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MX-6 & 626

A/T67 (17.0)45 (11.5)
M/T69 (17.5)47 (12.0)
Protege A/T & 92969 (17.5)39 (10.0)

AA

BRUSH TENSION SPECIFICATIONS TABLE

AA

Application	Standard Ft. Lbs. (N)	Minimum Ft. Lbs. (N)
B2200 A/T, B2600i & MPV	.... (1)	..... (1)
MX-3 V6		
A/T	..... 4.3 (19.2)	..... 2.0 (8.8)
M/T	..... 4.6 (20.6)	..... 1.5 (6.9)
MX-6 & 626		
4-Cylinder	..... 3.9-5.3 (17.6-23.6)	..... 1.5 (6.9)
V6		
A/T	..... 3.7-4.9 (16.3-21.9)	..... 2.0 (8.8)
M/T	..... 3.7-5.1 (16.7-22.5)	..... 2.1 (9.3)
Protege A/T	..... 2.9-5.5 (13.0-25.0)	..... 1.5 (7.0)
929	..... 4.2-5.0 (19.0-22.0)	..... 1.5 (7.0)

(1) - Information is not available from manufacturer.

AA

FIELD WINDING TEST

1) Connect one ohmmeter lead to field coil lead ("M" terminal lead). Connect other lead to soldered portion of brush lead. If continuity does not exist, repair or replace field coil.

2) Check field coil for shorts to ground by connecting ohmmeter lead to field coil lead. Connect other lead to field coil housing. If continuity exists, repair or replace field coil.

OVERRUNNING CLUTCH PINION DRIVE

Hold overrunning clutch housing and turn pinion gear by hand. If pinion turns in both directions, clutch is faulty. Replace clutch. DO NOT clean overrunning clutch with solvent, as it is packed with grease and sealed by manufacturer.

REMOVAL & INSTALLATION

MPV - 4WD

Removal & Installation

1) Disconnect negative battery cable. Remove power steering drive belt. Remove power steering pump pulley. Remove alternator. Remove undercovers. Remove power steering pump leaving hoses attached. Remove A/T fluid cooler line brackets. Remove front drive shaft.

2) Remove starter wiring harness bracket, heat shield and A/T

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fluid cooler line bracket. Disconnect starter wires. Remove fuel and brake line cover on frame rail. Remove starter bolts and starter.

3) To install, reverse removal procedure. Tighten starter mounting bolts to specification. See TORQUE SPECIFICATIONS.

MX-6 & 626 A/T

Removal & Installation

1) Drain coolant. Disconnect negative battery cable. Remove intake air duct and air cleaner housing. Disconnect accelerator cable from throttle body. Remove throttle body.

2) Disconnect shift cable from transaxle. Remove shift cable bracket. Remove starter bracket. Disconnect starter wires. Remove starter bolts and starter.

3) To install, reverse removal procedure. Tighten starter mounting bolts to specification. See TORQUE SPECIFICATIONS.

ALL OTHERS

Removal & Installation

Disconnect negative battery cable. Raise vehicle on hoist. Remove undercover. Disconnect wiring from starter. Remove differential lock assembly on 4WD models. On MX-6, Protege A/T and 626, remove support brace from under intake manifold. Remove starter mounting bolts and starter. To install starter, reverse removal procedure. Tighten starter mounting bolts to specification. See TORQUE SPECIFICATIONS.

OVERHAUL

NOTE: Overhaul procedures are not available from manufacturer. Use illustrations for exploded views of starters. See Figs. 4 and 5.

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1. Rear Cover
2. Brush Plate
3. Field Coil Housing
4. Rear Bearing
5. Armature
6. Front Bearing
7. Circlip Cover
8. Circlip
9. Thrust Washer
10. Solenoid
11. Solenoid Shims
12. Center Support Plate
13. Pinion Drive
14. Seal
15. Spring
16. Yoke Lever
17. Front Housing
18. Pinion Drive Gear
19. Nut

[illegible]

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Application	Ft. Lbs. (N.m)
Alternator Adjusting Bolt (MPV 4WD)	14-19 (19-26)
Alternator Pivot Bolt (MPV 4WD)	27-38 (37-51)
Front Drive Shaft Bolt (MPV 4WD)	36-43 (49-58)
Intake Manifold Brace Bolt/Nut (MX-3 V6, MX-6, Protege A/T & 626)	27-38 (37-51)
Power Steering Bracket Bolt (MPV 4WD)	23-34 (31-46)
Power Steering Pulley Nut (MPV 4WD)	29-43 (39-58)
Starter Mounting Bolt B2200 A/T, B2600i, MPV, MX-3 V6, MX-6 V6, Protege A/T & 626 V6	27-38 (37-51)
MX-6, 626 4-Cylinder & 929	24-33 (33-45)

INCH Lbs. (N.m)

Battery Cable Connection (At Starter)	78-113 (9-13)
Fluid Cooler Line Bracket Bolt (MPV 4WD)	69-95 (8-11)
Wiring Harness & Heat Shield Bolt (MPV 4WD)	69-95 (8-11)

AA

END OF ARTICLE