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ANTI-LOCK BRAKE SYSTEM
Article Text

1993 Mazda RX7
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Sunday, August 19, 2001 10:59PM

ARTICLE BEGINNING

1993 BRAKES
Mazda Anti-Lock

RX7

DESCRIPTION

The Anti-Lock Brake System (ABS) control unit senses reductions in front and rear wheel speed and modulates hydraulic pressure to the brakes to prevent wheel lock-up. The ABS consists of a hydraulic unit, 4 wheel speed sensors and sensor rotors, valve relay, motor relay, pump motor and ABS control unit. An ABS warning light is located on the instrument panel.

NOTE: For more information on brake system, see BRAKE SYSTEM article in this section.

OPERATION

Under normal driving conditions, Anti-Lock Brake System (ABS) functions like a standard brake system. When vehicle speed reaches 3.8 MPH, ABS will diagnose pump motor by briefly operating motor. Pump motor operation may be heard inside vehicle.

ABS control unit controls ABS by detecting speed sensor signals and activating solenoid valve in hydraulic unit. Control unit also controls pump motor and self-diagnostic function. If a problem is detected in ABS, ABS will function like a conventional brake system. ABS warning light will also come on.

With detection of wheel lock-up, short pedal pulsations, occurring in rapid succession, will be felt in brake pedal and steering wheel. Vehicle body may also vibrate slightly. These conditions are normal. Pedal pulsation will continue until there is no longer a need for anti-lock function or until vehicle is stopped.

CAUTION: See ANTI-LOCK BRAKE SAFETY PRECAUTIONS in this article.

ANTI-LOCK BRAKE SAFETY PRECAUTIONS

* NEVER open a bleeder valve or loosen a hydraulic line while ABS is pressurized
* NEVER disconnect or reconnect any electrical connectors while ignition is on. Damage to ABS control unit may result.
* DO NOT attempt to bleed hydraulic system without first referring to the appropriate article.
* Only use specially designed brake hoses/lines on ABS-equipped vehicles.
* DO NOT tap on speed sensor components (sensor, sensor rings). Speed rings must be pressed, NOT hammered into hubs. Striking these components can cause demagnetization or a loss of

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polarization, affecting the accuracy of the speed signal returning to the ABS control unit.

* DO NOT mix tire sizes. Increasing the width, as long as tires remain close to the original diameter, is acceptable. Rolling diameter must be identical for all 4 tires. Some manufacturers recommend tires of the same brand, style and type. Failure to follow this precaution may cause inaccurate wheel speed readings.
* DO NOT contaminate speed sensor components with grease. Only use recommended anti-corrosion coating.
* When speed sensor components have been removed, ALWAYS check sensor-to-ring air gaps when applicable. These specifications can be found in each appropriate article.
* ONLY use recommended brake fluids. DO NOT use silicone brake fluids in an ABS-equipped vehicle.
* When installing transmitting devices (CB's, telephones, etc.) on ABS-equipped vehicles, DO NOT locate the antenna near the ABS control unit (or any control unit).
* Disconnect all on-board computers, when using electric welding equipment.
* DO NOT expose the ABS control unit to prolonged periods of high heat (185øF/85øC for 2 hours is generally considered a maximum limit).

BLEEDING BRAKE SYSTEM

CAUTION: DO NOT allow reservoir to run dry during brake bleeding procedure. If brake fluid is spilled, clean surface immediately, as brake fluid will damage painted surfaces. Use only DOT 3 brake fluid and DO NOT mix with any other types.

1) Raise and support vehicle. Ensure brake fluid reservoir is at least half full during bleeding procedure. When bleeding brake system, start with longest brakeline first. Remove bleeder cap. Connect one end of transparent vinyl tube to bleeder screw. Submerge other end of tube in a container half filled with clean brake fluid.

2) Have an assistant depress brake pedal several times and hold in depressed position. Loosen bleeder screw, and drain fluid into container. Tighten bleeder screw.

NOTE: Ensure brake pedal remains depressed until bleeder screw is tightened.

3) Refill brake fluid reservoir if necessary. Repeat step 2) until air is no longer discharged. Tighten bleeder screw to 52-78 INCH lbs. (6-9 N.m). Ensure fluid leakage is not present. Add fluid to reservoir. Repeat procedure for remaining wheels.

COMPONENT LOCATIONS

COMPONENT LOCATIONS TABLE
ÄÄ

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Application	Location
RX7	
ABS Control Unit	
RX7	Behind Side Trim In Luggage Compartment
Front Sensor Rotor	On Front Wheel Hub
Hydraulic Unit	Right Rear Of Engine Compartment
Motor & Valve Relays	On Hydraulic Unit
Pump Motor	On Hydraulic Unit
Rear Sensor Rotor	On Rear Drive Shaft
Wheel Speed Sensor	On Wheel Hub

ADJUSTMENTS

BRAKE PEDAL FREE PLAY

Depress pedal a few times to eliminate vacuum. Depress brake pedal by hand and check pedal free play. On RX7, pedal free play should be .12-.31" (3-8 mm). Adjust free play by loosening push rod lock nut. Turn push rod until correct free play is obtained. Tighten push rod lock nut to 17-25 ft. lbs. (23-34 N.m).

BRAKE PEDAL HEIGHT & STOPLIGHT SWITCH

1) Released pedal height is measured from carpet surface, on vertical portion of firewall, to pedal pad center. Disconnect stoplight switch electrical connector. Loosen lock nut on stoplight switch. Rotate switch away from pedal. Loosen push rod lock nut. Rotate push rod until correct pedal height is obtained. See BRAKE PEDAL HEIGHT SPECIFICATIONS table.

2) Adjust pedal free play. See BRAKE PEDAL FREE PLAY under ADJUSTMENTS. Tighten push rod lock nut. Tighten push rod lock nut to 17-25 ft. lbs. (23-34 N.m).

3) Rotate stoplight switch until it contacts pedal, and then rotate an additional 1/2 turn. Tighten stoplight switch lock nut to 10-13 ft. lbs. (14-18 N.m). Reconnect stoplight switch electrical connector.

4) Applied pedal height is measured from angled portion of firewall (without carpet) to pedal pad center. Start engine. Depress brake pedal with a pressure of 132 lbs. (60 kg).

5) Measure applied pedal height. See BRAKE PEDAL HEIGHT SPECIFICATIONS table. If distance is not as specified, check for air in system, rear brake adjustment or worn shoes or pads.

BRAKE PEDAL HEIGHT SPECIFICATIONS TABLE

Application	In. (mm)
Pedal Released	
RX7	6.5-6.9 (165-176)
Pedal Applied (1)	

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RX7 ..... 3.9 (100)

(1) - Minimum height.

PARKING/EMERGENCY BRAKE

1) Depress brake pedal several times. Pull parking brake lever with a force of 44 lbs. (20 kg). If stroke is 7-10 notches, parking brake is properly adjusted. If stroke is not 7-10 notches, raise and support rear of vehicle. Release parking brake lever.
2) Rotate cable adjusting nut at lever end of cable, located under console cover, until stroke is within specification. Ensure rear brakes do not drag. Ensure parking brake warning light illuminates when brake lever is pulled one notch.

DIAGNOSIS

ABS can only be diagnosed using ABS Tester (0000-42-0010) and Adapter Harness (49-H066-003 for RX7). ABS tester cannot diagnose ABS control unit. If a malfunction is detected in ABS and all other components in brake system are okay, replace ABS control unit.
If ABS tester is unavailable, test each component of ABS. See test procedures under TESTING. If all ABS components test okay, replace ABS control unit with a known good unit and retest system.

PRE-DIAGNOSIS INSPECTION

Visually inspect ABS components for possible cause of anti-lock problem. Visual inspection may help identify cause of simple malfunction.

DIAGNOSTIC PROCEDURE WITH ABS TESTER

ABS tester uses one display window and 2 switches for reading information from unit. Become thoroughly familiar with ABS tester displays and operation before proceeding. See Fig. 7. To diagnose ABS system, proceed to CONNECTING ABS TESTER under DIAGNOSIS. If ABS tester does not operate, check fuses, ignition switch and ignition circuit.

CONNECTING ABS TESTER

CAUTION: DO NOT drive vehicle with ABS Tester (0000-42-0010) connected.

Turn ignition off. Connect Adapter Harness (49-H066-003) between hydraulic unit harness connector and battery positive terminal. See Fig. 1. Remove luggage compartment side trim. Connect ABS Tester (0000-42-0010) harness to harness side of ABS control unit connector. Proceed to TESTING SEQUENCE charts under DIAGNOSING ABS. When diagnosing ABS, complete tests in the order given under TESTING

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SEQUENCE.

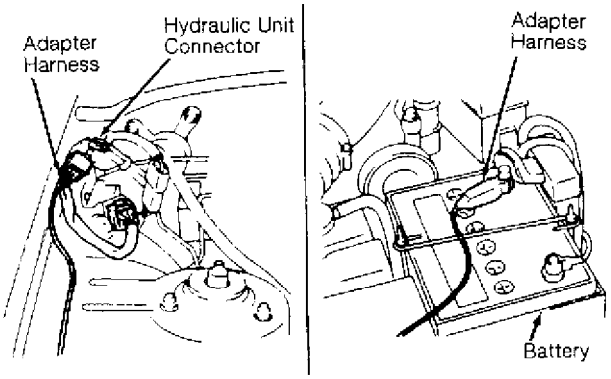

Fig. 1: Connecting ABS Tester & Adapter Harness (RX7)
Courtesy of Mazda Motors Corp.

TESTING

NOTE: Before testing ABS components, ensure battery and charging system are functioning properly. To prevent damage to ABS control unit connector, use very thin pins when probing connector.

ABS DIODE

Continuity Test

1) Check METER fuse and ABS warning light bulb. Check wiring harness between ABS warning light and ABS control unit, and between ABS warning light and hydraulic unit. Repair or replace as necessary. Disconnect hydraulic unit connector.

2) On RX7, connect positive lead of DVOM to Green/Orange wire terminal and negative lead to Green/Yellow wire terminal of hydraulic unit connector. See Fig. 2.

3) On all models, ensure continuity is present between terminals. Reverse DVOM leads. Continuity should not be present with leads reversed. If ABS diode does not test as described, replace hydraulic unit.

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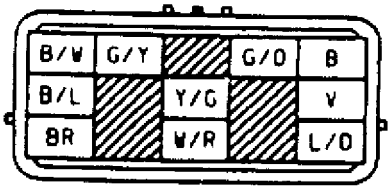


WIRE COLOR IDENTIFICATION

Color	Abbreviation
Blue	L
Black	B
Brown	BR
Green	G
Gray	GY
Light Green	LG
Orange	O
Red	R
White	W
Violet	V
Yellow	Y

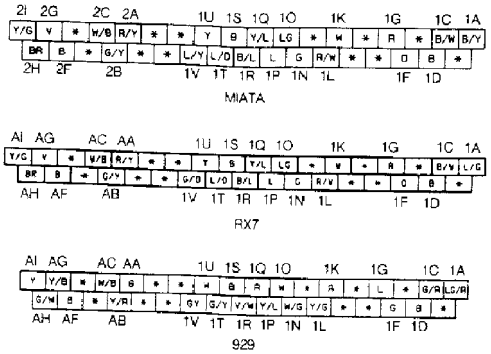
93E82416

Fig. 2: Hydraulic Unit Harness Connector Terminal ID (RX7)
Courtesy of Mazda Motors Corp.

ABS GROUND

Continuity Test

Using a DVOM, check for continuity between ground and following ABS control unit connector terminals: 1D, 1S and AF. See Fig. 3. If continuity is not present, repair wiring harness.



WIRE COLOR IDENTIFICATION

Color	Abbreviation
Blue	L
Black	B
Brown	BR
Green	G
Gray	GY
Light Green	LG
Orange	O
Red	R
White	W
Violet	V
Yellow	Y

93F82417

Fig. 3: Identifying Control Unit Harness Connector Terminals
Courtesy of Mazda Motors Corp.

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ABS WARNING LIGHT

Operational Test

1) Start engine and observe ABS warning light. Light should illuminate for a few seconds. If light does not illuminate as described, disconnect ABS control unit connector. Using a jumper wire, connect terminal 1V (Green/Orange wire) of ABS control unit connector to ground. See Fig. 3. Turn ignition on.

2) If ABS warning light illuminates, inspect ABS control unit. If light does not illuminate, remove instrument cluster. Remove and check ABS warning light bulb. Replace bulb if necessary. If bulb is okay, go to next step.

3) Using a DVOM, connect positive lead to terminal 2D (Black/Yellow wire) of instrument cluster and negative lead to terminal 1B (Green/Orange wire) of instrument cluster. See Fig. 4. If continuity is not present, replace instrument cluster. If continuity is present, repair wiring harness between instrument cluster and ABS control unit.

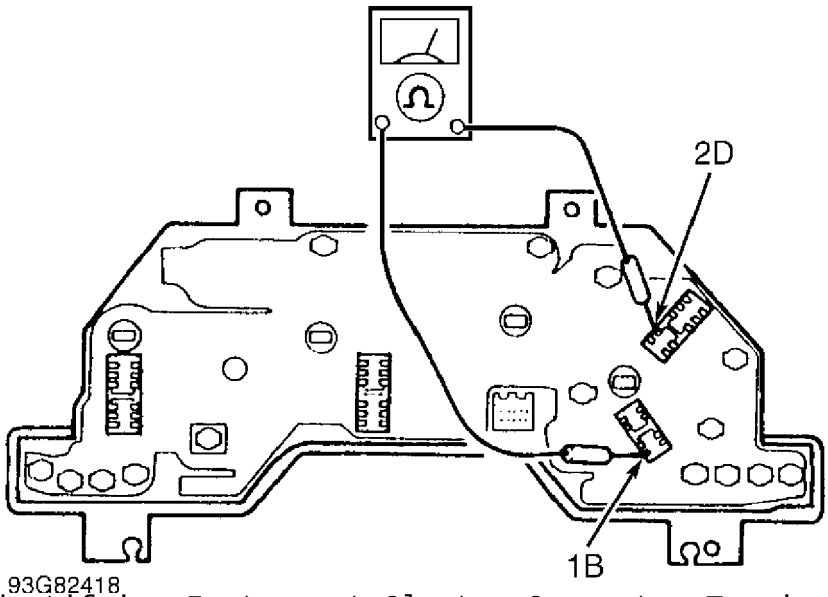

Fig. 4: Identifying Instrument Cluster Connector Terminals
Courtesy of Mazda Motors Corp.

STOPLIGHT SWITCH

Continuity Test

1) Disconnect stoplight switch connector. On RX7, using a DVOM, check continuity between Green/White wire and Green wire with brake pedal depressed.

2) Ensure continuity exists. Release pedal, and note reading on DVOM. Continuity should not be present. If continuity is not as specified, check STOP fuse and wiring harness. Check wiring harness between stoplight switch and ABS control unit. Repair or replace if necessary. If fuse and wiring harness are okay, replace switch.

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FRONT & REAR VALVES

Continuity Test

1) Disconnect hydraulic unit connector. Using a DVOM, measure continuity between following wires: Yellow/Green wire and Green/Yellow wire; Brown wire and Green/Yellow wire; Black/White wire and Green/Yellow wire. See Fig. 2. Continuity should be present in each measurement.

2) If continuity is not present, replace hydraulic unit. If continuity is present, check wiring harness between ABS control unit and hydraulic unit. Repair or replace if necessary.

HYDRAULIC UNIT

The only serviceable parts of hydraulic unit are the motor relay and valve relay. If other parts of unit malfunction, replace hydraulic unit.

MOTOR RELAY

Continuity Tests

1) Disconnect negative battery cable. Remove motor relay from hydraulic unit. Ensure continuity exists between terminals "B" and "C" of motor relay. See Fig. 5. Connect 12 volts to terminal "C", and ground terminal "B". Ensure continuity exists between terminals "A" and "D".

2) Replace relay if continuity is not as specified. If continuity is as specified, check wiring harness between motor relay and ABS control unit fuse (60 amps). Repair or replace if necessary.

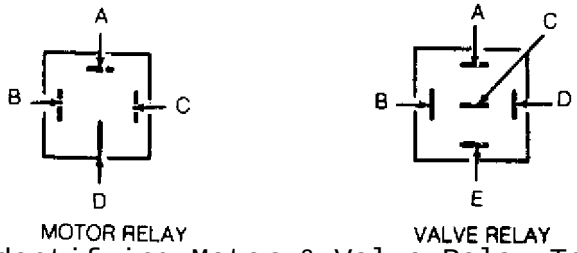

Fig. 5: Identifying Motor & Valve Relay Terminals
Courtesy of Mazda Motors Corp.

PUMP MOTOR

Voltage Test

1) Disconnect 2-pin connector at hydraulic unit. Using a DVOM, measure voltage between Black/Blue wire terminal of hydraulic unit connector and ground. Voltage should be 12 volts. If voltage is not as specified, check MAIN fuse and ABS fuse (60 amps). Also check wiring harness between battery and hydraulic unit. Repair or replace if necessary.

2) If voltage is 12 volts check continuity between Red/Yellow wire terminal of 2-pin hydraulic unit connector and ground. If

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continuity is not present, replace hydraulic unit.

VALVE RELAY

Continuity & Voltage Tests

1) Disconnect negative battery cable. Remove valve relay from hydraulic unit. Using a DVOM, check continuity between valve relay terminals "C" and "E", and between terminals "B" and "D". See Fig. 5.

2) Ensure continuity exists. Connect 12 volts to terminal "B", and ground terminal "D". Ensure continuity exists between terminals "A" and "E". Replace relay if continuity is not as specified.

3) If continuity is as specified, reconnect negative battery cable. Disconnect hydraulic unit connector. Measure voltage between White/Red wire terminal of hydraulic unit connector and ground. See Fig. 2. Voltage should be 12 volts. If voltage is not as specified, check MAIN fuse and ABS fuse (15 amps). Also check wiring harness between battery and hydraulic unit. Repair or replace if necessary.

WHEEL SPEED SENSORS

Sensor Resistance Test

Disconnect speed sensor connector. Using a DVOM, measure resistance between speed sensor connector terminals. Resistance should be 800-1200 ohms. On all models, if resistance is not as specified, replace speed sensor.

Harness Continuity & Voltage Tests

1) With ignition off and speed sensors connected, disconnect ABS control unit connector. Using a DVOM, check continuity between indicated ABS control unit terminals. See WHEEL SPEED SENSOR TESTS table. If continuity is not present, check wiring harness between wheel speed sensor and ABS control unit. Repair or replace if necessary.

2) If continuity exists, measure voltage between indicated ABS control unit terminals while rotating corresponding wheel one rotation per second by hand. See WHEEL SPEED SENSOR TESTS table. If voltage is not 50-60 millivolts, replace wheel speed sensor. If voltage is 50-60 millivolts, replace ABS control unit.

WHEEL SPEED SENSOR TESTS TABLE

Application	(1) Test Between ABS Control Unit Connector Terminals
Left Front	1K & 1G
Left Rear	1O & 1Q
Right Front	1U & 1F
Right Rear	1L & 1P

(1) - See Fig. 3 to identify ABS control unit terminals.

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WHEEL SPEED SENSOR ROTORS

Inspection

Perform a comprehensive visual inspection of sensor rotor. If any teeth are damaged or missing, or any other damage is noted, replace sensor rotor.

REMOVAL & INSTALLATION

ABS CONTROL UNIT

Removal & Installation

Disconnect negative battery cable. Remove luggage compartment side trim. Remove ABS control unit protector panel (if equipped). Disconnect ABS control unit electrical connector. Remove ABS control unit mounting nuts. Remove ABS control unit. To install, reverse removal procedure.

HYDRAULIC UNIT

Removal & Installation

Disconnect negative battery cable. Disconnect hydraulic unit electrical connector. Using Flare Nut Wrench (49-0259-770B), disconnect brakelines from hydraulic unit. Remove hydraulic unit mounting bolts and nuts. Remove hydraulic unit. To install, reverse removal procedure. Tighten mounting bolts and nuts to specification. See TORQUE SPECIFICATIONS table at the end of this article. Bleed air from system. See BLEEDING BRAKE SYSTEM.

FRONT WHEEL SPEED SENSOR ROTOR

Removal

Raise and support vehicle. Remove front wheel assemblies. Remove brake caliper and wire aside. Remove grease cap. Remove rotor. Remove ABS wheel speed sensor. Remove wheel bearing lock nut. Remove wheel hub. Using chisel and hammer, remove sensor rotor from hub.

Installation

To install, reverse removal procedure. Install NEW sensor rotor on hub using Installer (49-H028-204). Tighten bolts and nuts to specification. See TORQUE SPECIFICATIONS table at the end of this article.

REAR WHEEL SPEED SENSOR ROTOR

Removal

Raise and support vehicle. Remove rear wheel assemblies. Remove wheel bearing lock nut. Remove I-arm bolt from steering knuckle. Remove drive axle. Using chisel and hammer, remove sensor rotor from drive axle.

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Installation

To install, reverse removal procedure. Install NEW sensor rotor on drive axle using Installer (49-F026-104). Tighten bolts and nuts to specification. See TORQUE SPECIFICATIONS table at the end of this article.

WHEEL SPEED SENSOR

Removal & Installation

Raise and support vehicle. Remove wheel assemblies. Disconnect wheel speed sensor electrical connectors. Remove speed sensor mounting bolt. Remove wheel speed sensor from vehicle. To install, reverse removal procedure. Tighten mounting bolts to specification. See TORQUE SPECIFICATIONS table at the end of this article.

VALVE & MOTOR RELAYS

Removal & Installation

Disconnect negative battery cable. Remove relay cover from hydraulic unit. Remove valve and motor relays. See Fig. 6. To install, reverse removal procedure.

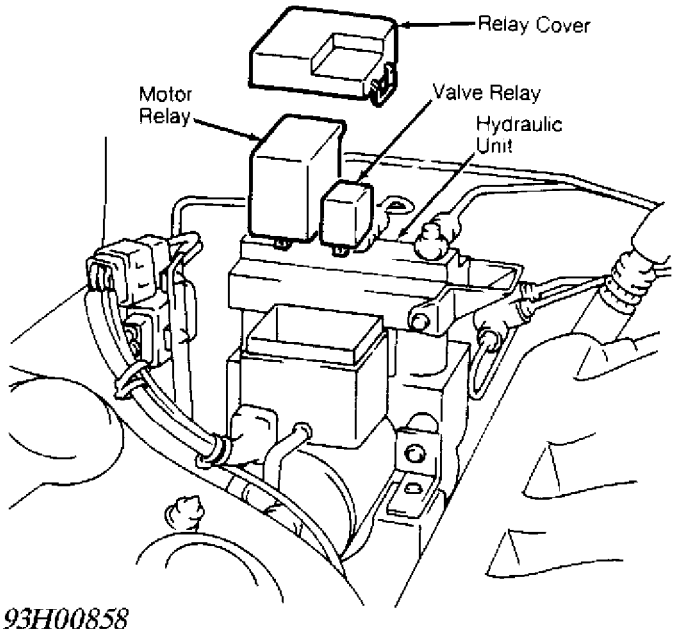

Fig. 6: Locating Valve Relay & Motor Relay
Courtesy of Mazda Motors Corp.

TORQUE SPECIFICATIONS

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TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
Brake Caliper Mounting Bolts	
RX7	
Front	58-72 (79-98)
Rear	34-49 (46-66)
Brakeline Nuts	10-16 (14-22)
Drive Shaft-To-Flange Nuts	40-47 (54-64)
Hydraulic Unit Brakeline Union Bolts	
RX7	18-26 (24-35)
Hydraulic Unit Mounting Nuts	14-19 (19-26)
I-Arm-To-Steering Knuckle Bolt (RX7)	44-54 (59-73)
Speed Sensor Mounting Bolt	12-16 (16-22)
Wheel Bearing Lock Nut	
RX7	
Front	131-173 (177-235)
Rear	174-231 (236-314)
Wheel Lug Nuts	65-87 (88-118)

DIAGNOSING ABS

ABS TESTER OPERATION

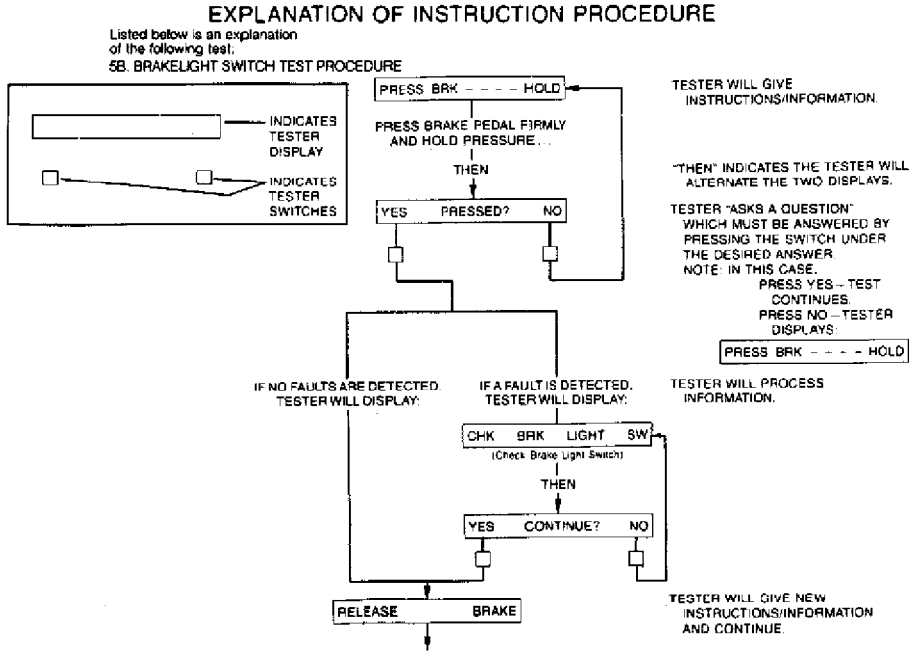

Fig. 7: Operating ABS Tester
Courtesy of Mazda Motors Corp.

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TESTING SEQUENCE

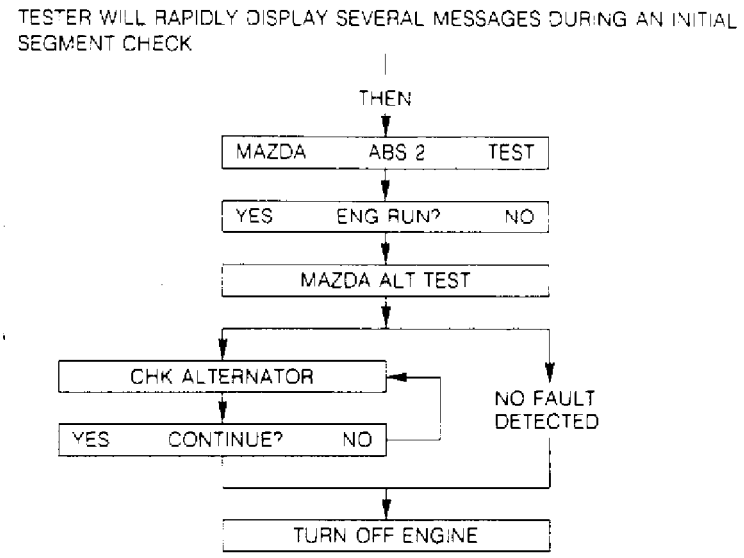

Fig. 8: ABS Testing Sequence: Chart 1 of 9
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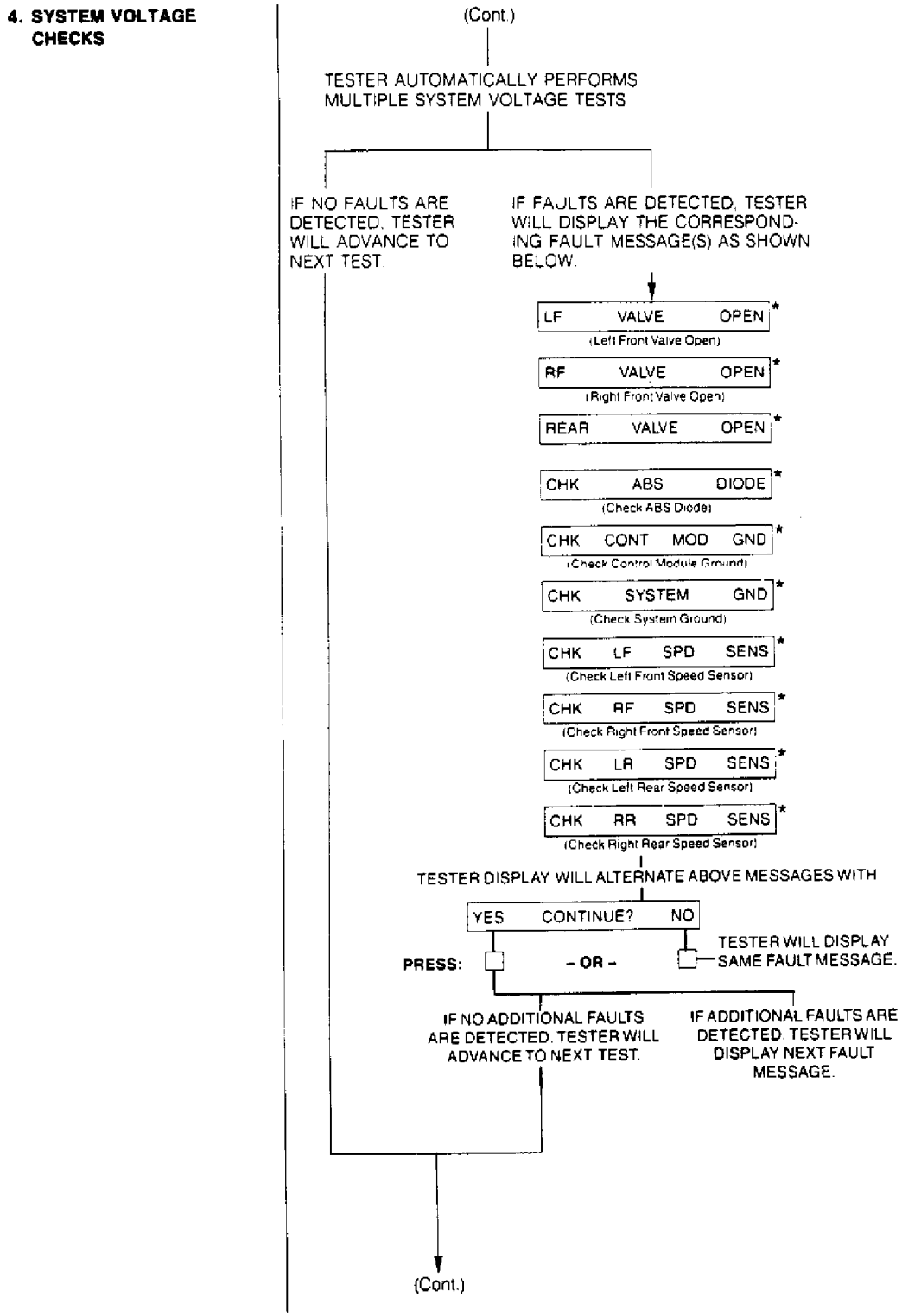

Fig. 9: ABS Testing Sequence: Chart 2 of 9
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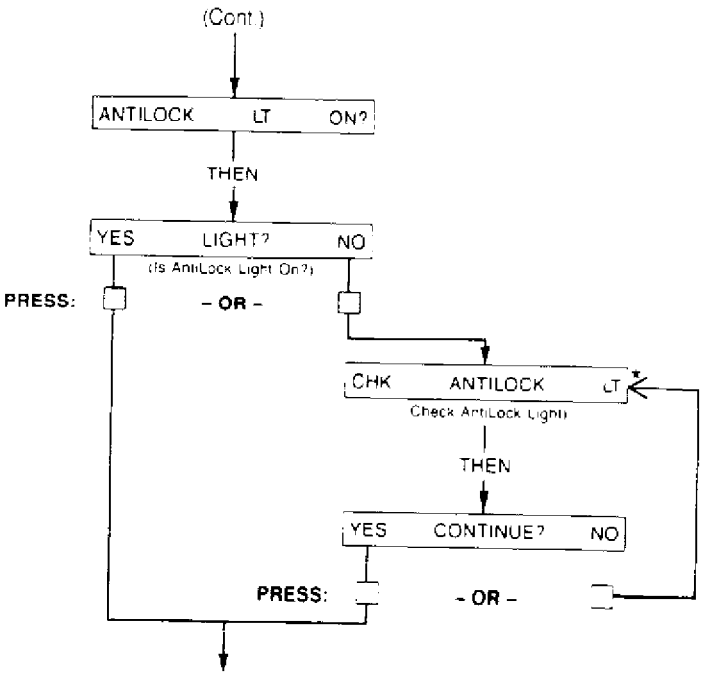

Fig. 10: ABS Testing Sequence: Chart 3 of 9
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5C. PUMP TEST

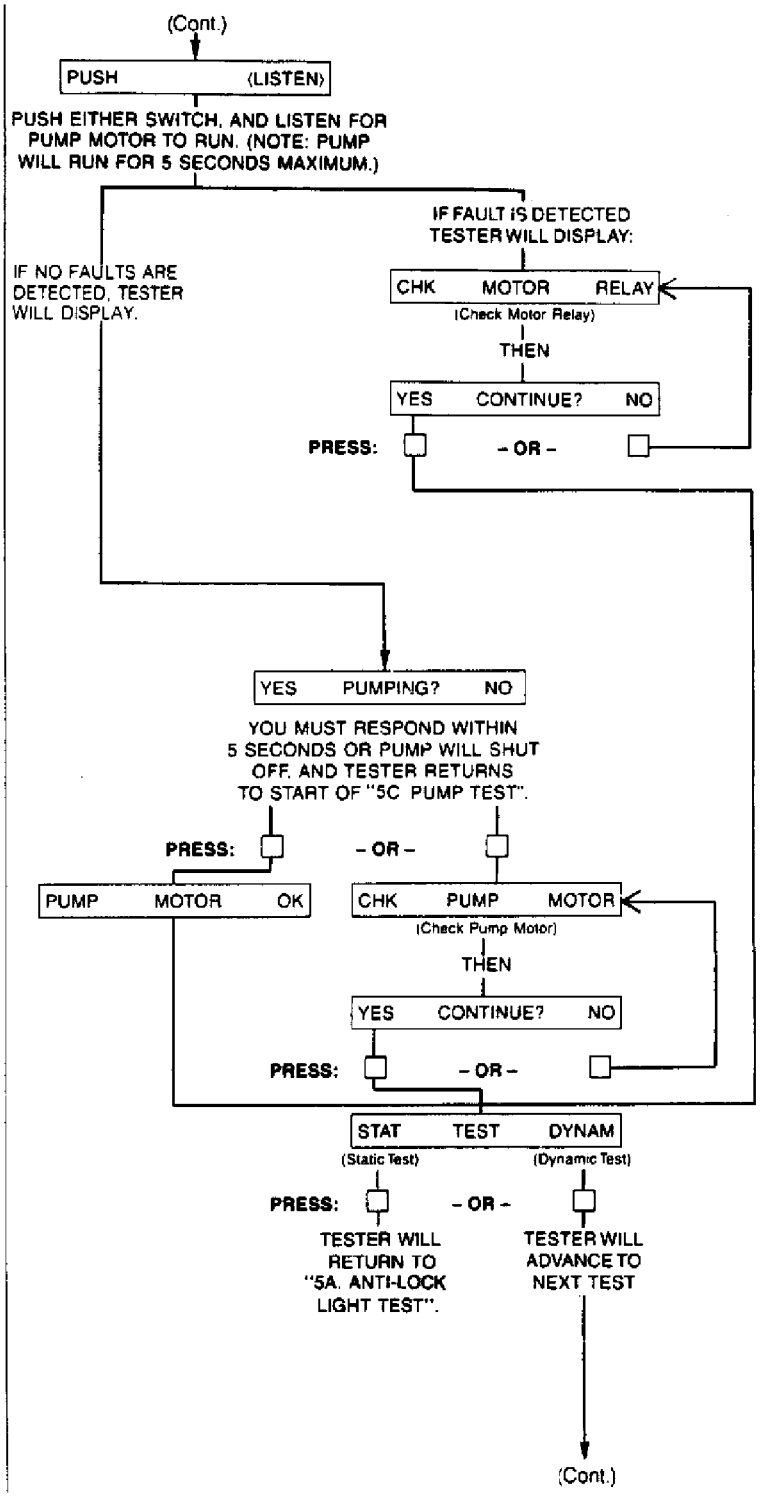

Fig. 11: ABS Testing Sequence: Chart 4 of 9
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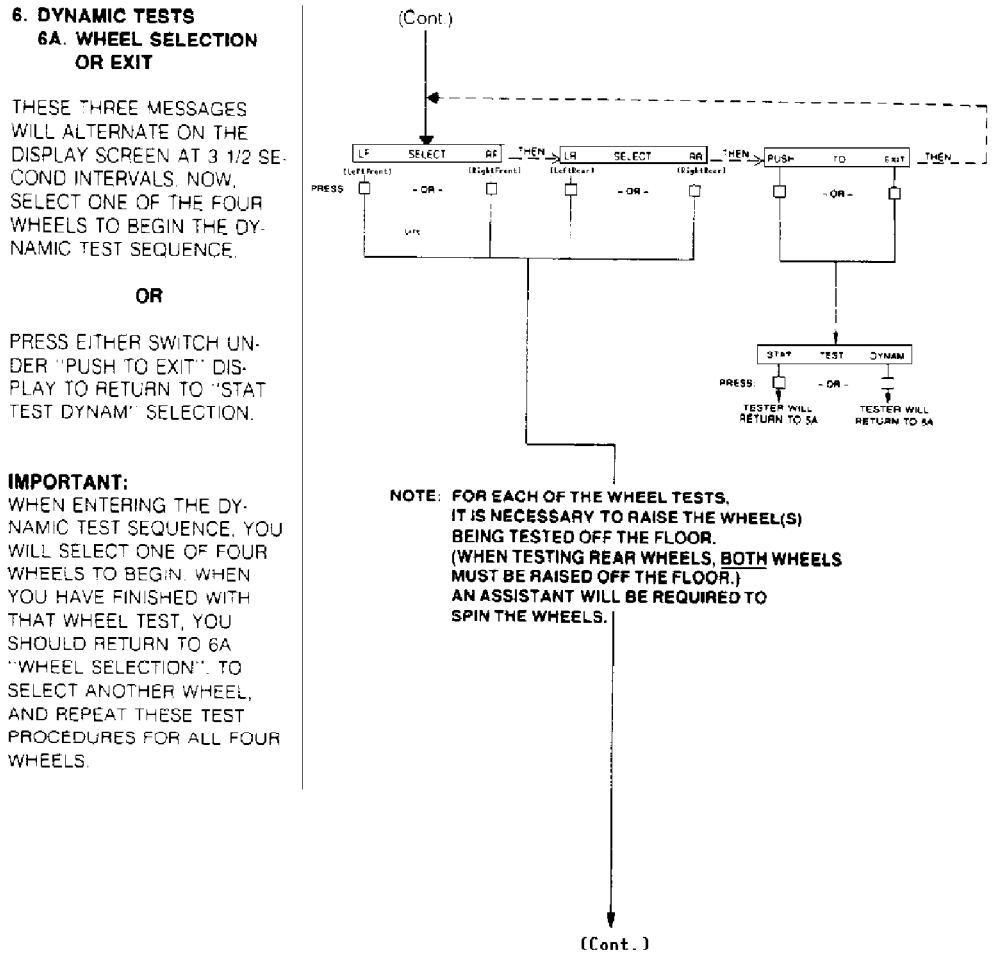

Fig. 12: ABS Testing Sequence: Chart 5 of 9
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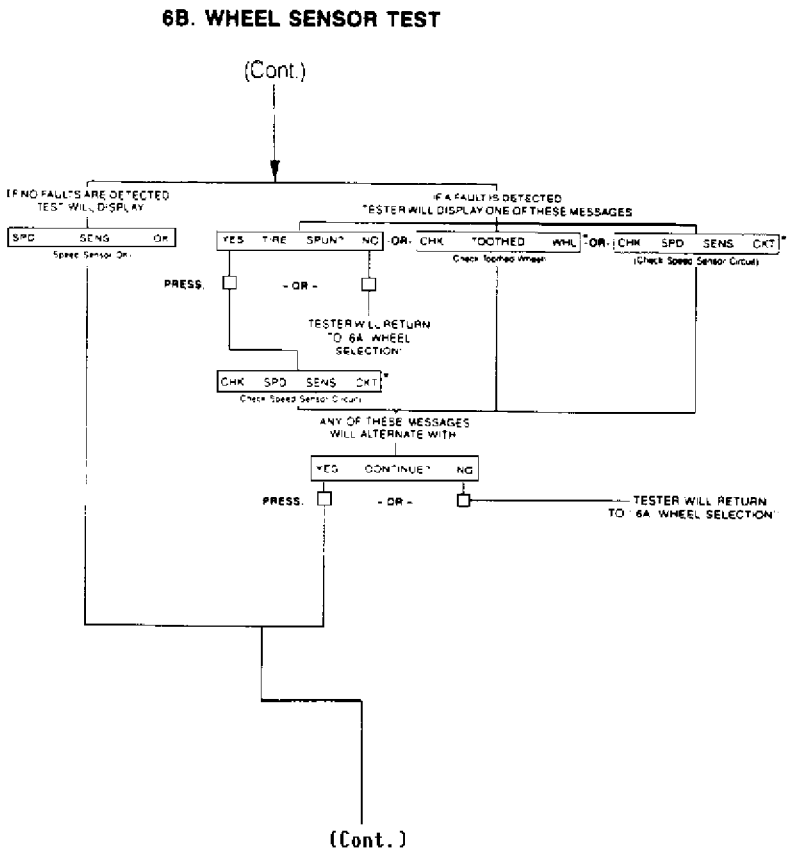

Fig. 13: ABS Testing Sequence: Chart 6 of 9
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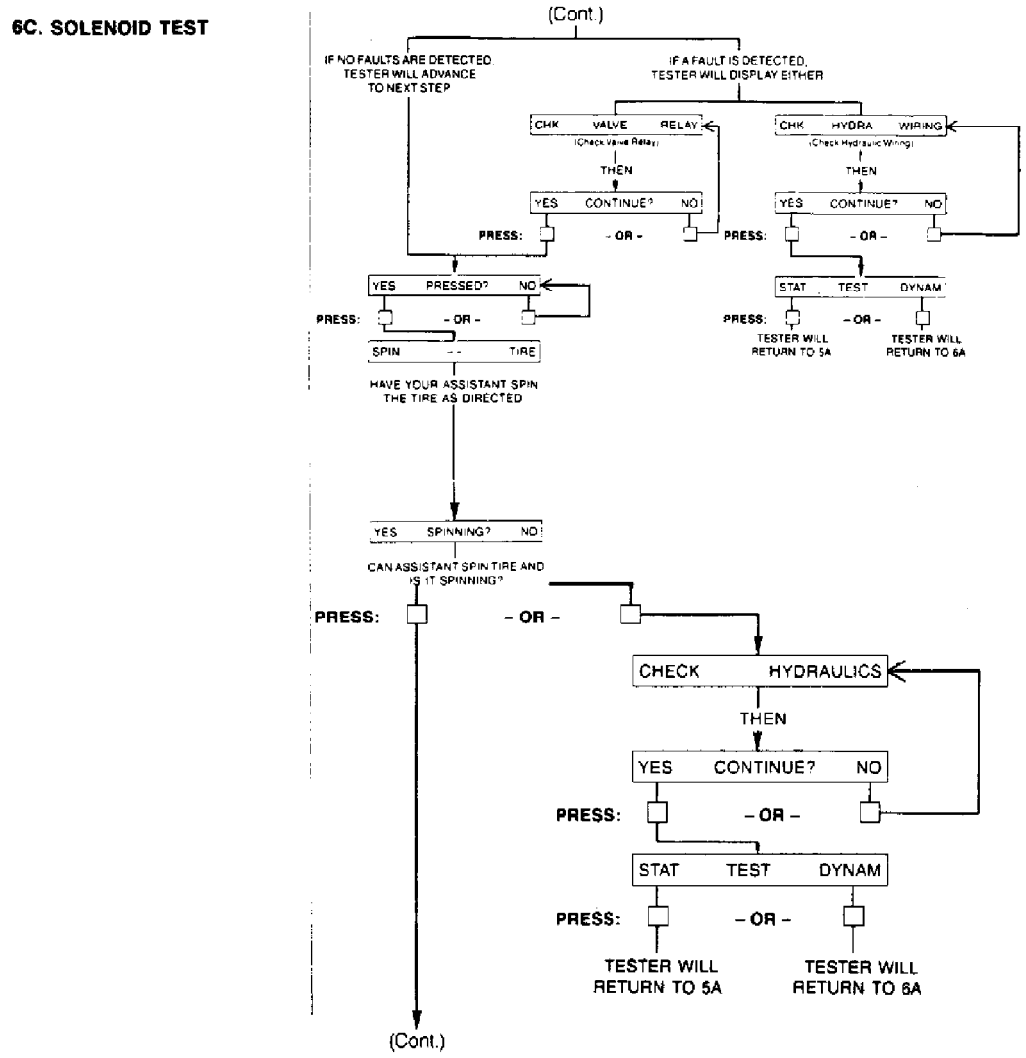

Fig. 14: ABS Testing Sequence: Chart 7 of 9
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6C. SOLENOID TEST

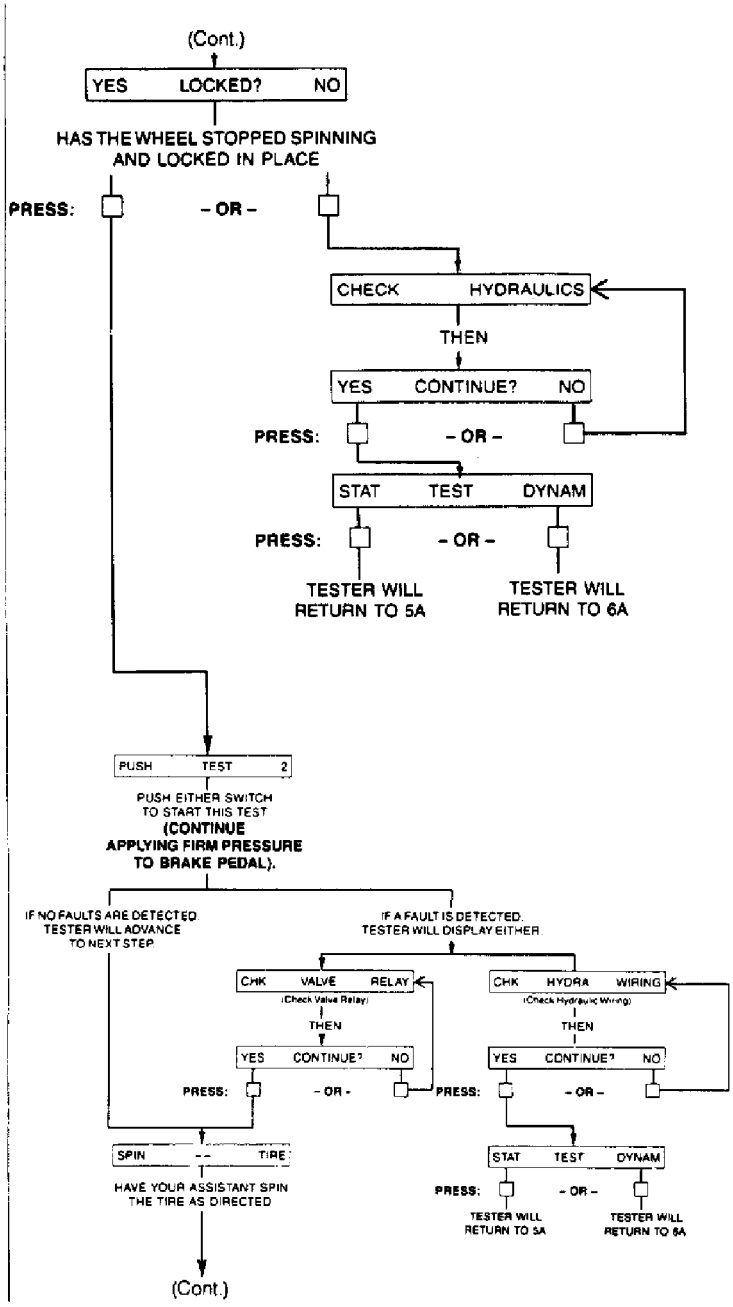

Fig. 15: ABS Testing Sequence: Chart 8 of 9
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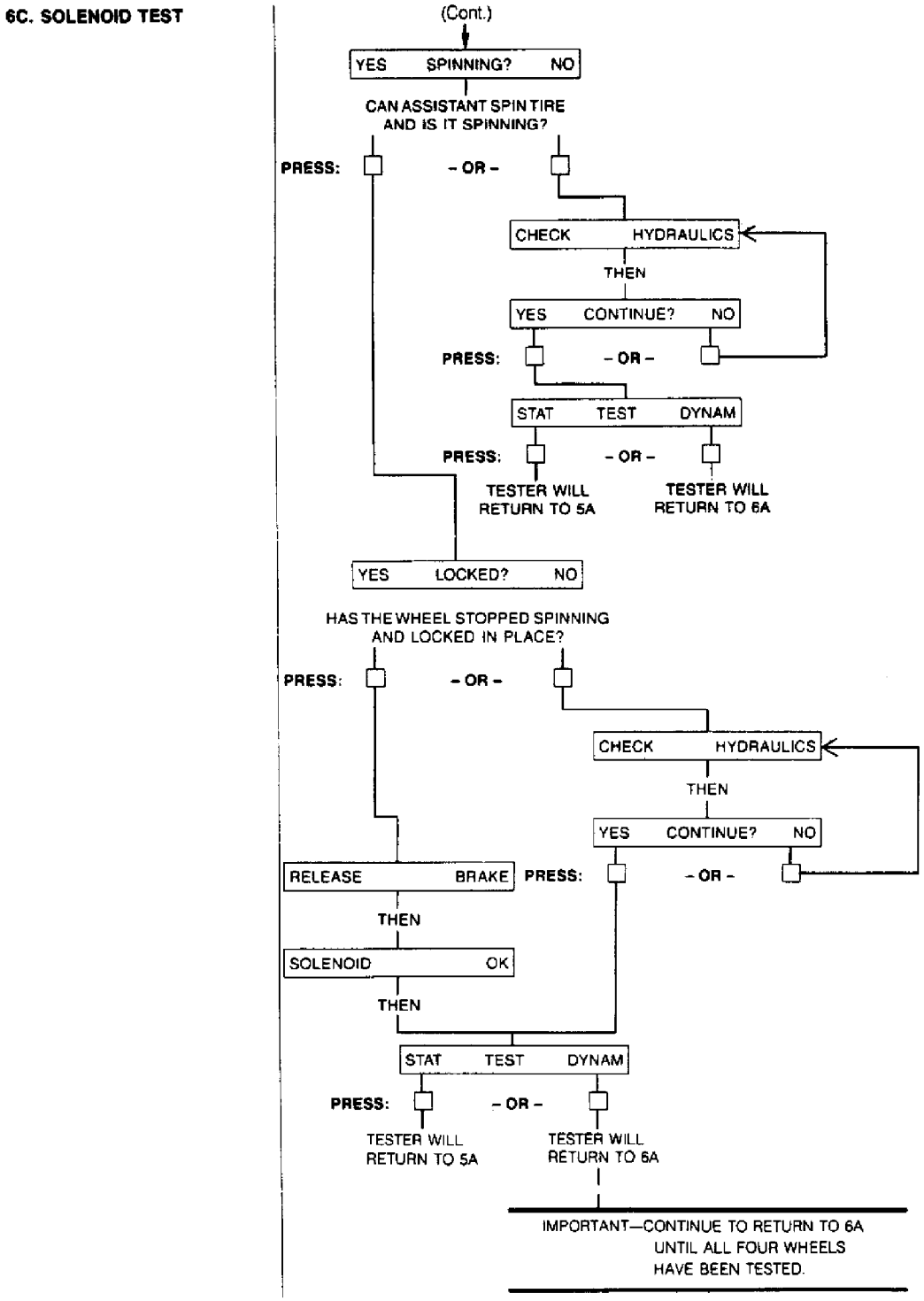

Fig. 16: ABS Testing Sequence: Chart 9 of 9
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WIRING DIAGRAMS

ANTI-LOCK BRAKE SYSTEM
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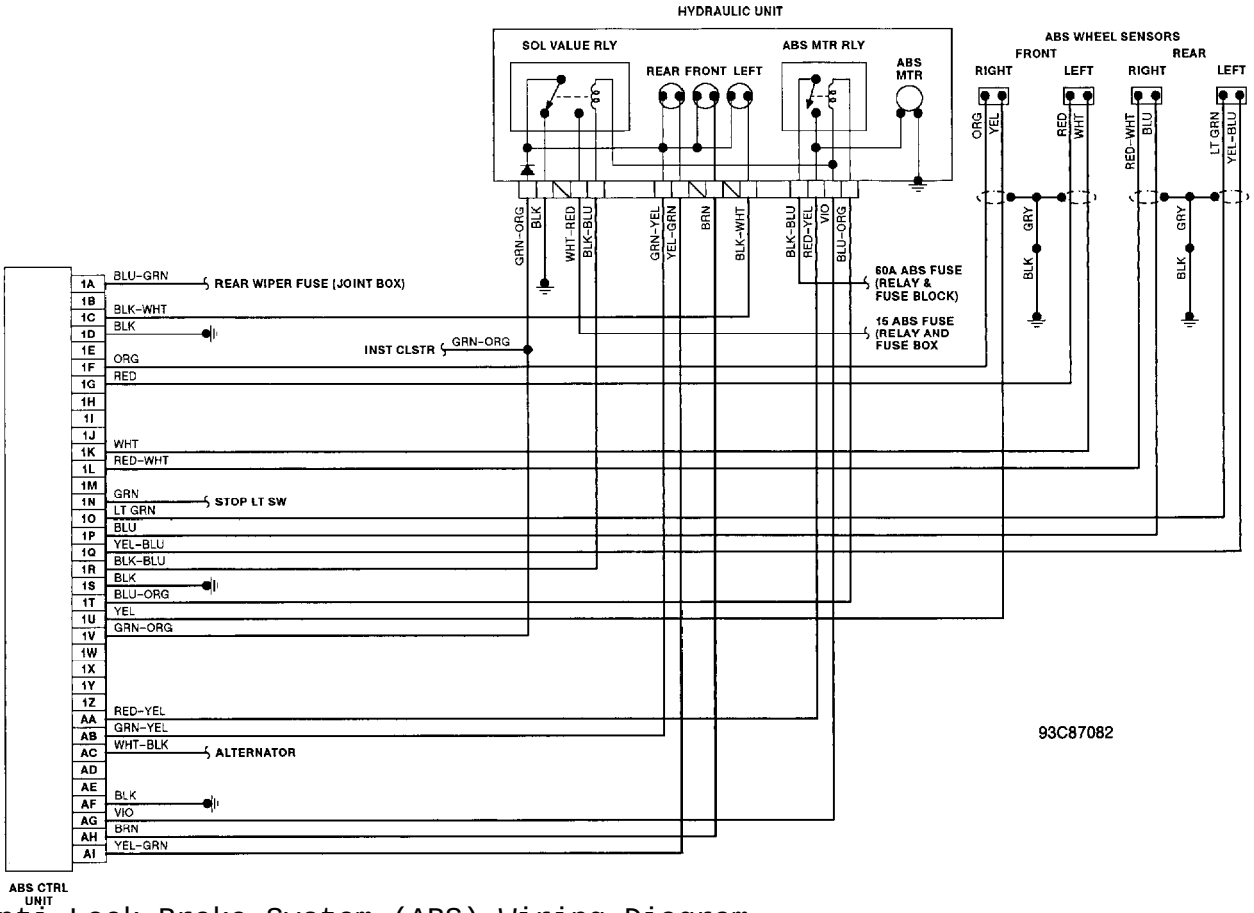

Fig. 17: Anti-Lock Brake System (ABS) Wiring Diagram

END OF ARTICLE

BRAKE SYSTEM
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ARTICLE BEGINNING

1993 BRAKES
Mazda Disc & Drum

RX7

NOTE: For information on anti-lock brake systems, see ANTI-LOCK BRAKE SYSTEM article in this section.

DESCRIPTION & OPERATION

All models use hydraulic-operated brake system with a tandem master cylinder, proportioning valve and a power brake unit. All models are equipped with front disc brakes and either rear disc or drum brakes.

BLEEDING BRAKE SYSTEM

BRAKE LINE BLEEDING SEQUENCE TABLE

Application	Sequence
RX7	Longest Line First

ADJUSTMENTS

PARKING/EMERGENCY BRAKE

1) Depress brake pedal several times. Pull parking brake lever with a force of 44 lbs. (20 kg). If stroke is 7-10 notches, parking brake is properly adjusted. If stroke is not 7-10 notches, raise and support rear of vehicle. Release parking brake lever.
2) Rotate cable adjusting nut at lever end of cable, located under console cover, until stroke is within specification. Ensure rear brakes do not drag. Ensure parking brake warning light illuminates when brake lever is pulled one notch.

BRAKE PEDAL FREE PLAY

With engine off, depress pedal a few times to eliminate vacuum. Depress brake pedal by hand and check pedal free play. See BRAKE PEDAL FREE PLAY SPECIFICATIONS table. Adjust play by loosening push rod lock nut. Turn push rod until correct free play is obtained. On B2200 and B2600i, tighten push rod lock nut to 15-21 ft. lbs. (20-28 N.m). On all other models, tighten push rod lock nut to 18-25 ft. lbs. (24-34 N.m).

BRAKE PEDAL FREE PLAY SPECIFICATIONS TABLE

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Application	In. (mm)
RX7	.12-.31 (3-8)

BRAKE PEDAL HEIGHT & STOPLIGHT SWITCH

1) Released pedal height is measured from carpet surface on vertical portion of firewall to pedal pad center. Disconnect stoplight switch electrical connector. Loosen lock nut on stoplight switch. Rotate switch away from pedal. Loosen push rod lock nut. Rotate push rod until correct pedal height is obtained. See BRAKE PEDAL HEIGHT SPECIFICATIONS table.

2) Adjust pedal free play. See BRAKE PEDAL FREE PLAY under ADJUSTMENTS. Tighten push rod lock nut. Tighten push rod lock nut to 18-25 ft. lbs. (24-34 N.m).

3) Rotate stoplight switch until it contacts pedal and then rotate an additional 1/2 turn. Tighten stoplight switch lock nut to 10-13 ft. lbs (14-18 N.m). Reconnect stoplight switch electrical connector.

4) Applied pedal height is measured from angled portion of firewall (without carpet) to pedal pad center. Start engine. Depress brake pedal with 132 lbs. (60 kg) pressure.

5) Measure applied pedal height. See BRAKE PEDAL HEIGHT SPECIFICATIONS table. If distance is not as specified, check for air in system, rear brake adjustment or worn shoes or pads.

BRAKE PEDAL HEIGHT SPECIFICATIONS TABLE

Application	In. (mm)
Pedal Released	
RX7	6.5-6.9 (165-175)
Pedal Applied (1)	
RX7	3.9 (100)

(1) - Minimum height.

TESTING

PROPORTIONING VALVE

1) Connect 2 pressure gauges to proportioning valve. One to input port and other to output port. Bleed brake system. See BLEEDING BRAKE SYSTEM. Depress brake pedal until pressure gauge reads as specified and check output pressure. See PROPORTIONING VALVE PRESSURE SPECIFICATIONS table.

2) Depress brake pedal again, applying additional pressure. Recheck output pressure. See PROPORTIONING VALVE PRESSURE SPECIFICATIONS table. If output pressure is not as specified, replace valve.

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PROPORTIONING VALVE PRESSURE SPECIFICATIONS TABLE

Application	Inlet Pressure psi (kg/cmý)	Outlet Pressure psi (kg/cmý)
RX7	569 (40)	527-611 (37-43)
	853 (60)	626-739 (44-52)

POWER BRAKE UNIT

1) With engine off, depress brake pedal several times. Press and hold brake pedal and start engine. If brake pedal moves down slightly immediately after engine starts, power brake unit is operating. If brake pedal does not move as specified, go to next step.
2) Run engine for 1-2 minutes. Stop engine. Press brake pedal several times and note if first pedal stroke is longer than subsequent strokes. If first pedal stroke is longer than subsequent strokes, power brake unit is operating. If length of strokes is equal, test check valve and vacuum hose between vacuum source and power brake unit. Repair as necessary, and go to next step.
3) Start engine. Press and hold brake pedal. Stop engine. Hold pedal down for about 30 seconds. If pedal height remains at same height, power brake unit is operating. If pedal height recedes, test check valve and vacuum hose between vacuum source and power brake unit. Repair as necessary.

REMOVAL & INSTALLATION

FRONT DISC BRAKE PADS

Removal & Installation
1) Raise and support front of vehicle. Remove front wheel assemblies. Remove "M" clip. See Fig. 1. Remove pad pins. Remove "M" spring. Remove pads and shims. Replace pad if lining thickness is less than specified. See MINIMUM PAD LINING SPECIFICATIONS (FRONT) table.
2) To install, reverse removal procedure. Use Disc Brake Expander (49-0221-600C) and an old pad to push piston fully inward to install disc pads. Ensure shims are installed with arrows facingdirection of forward rotor rotation.

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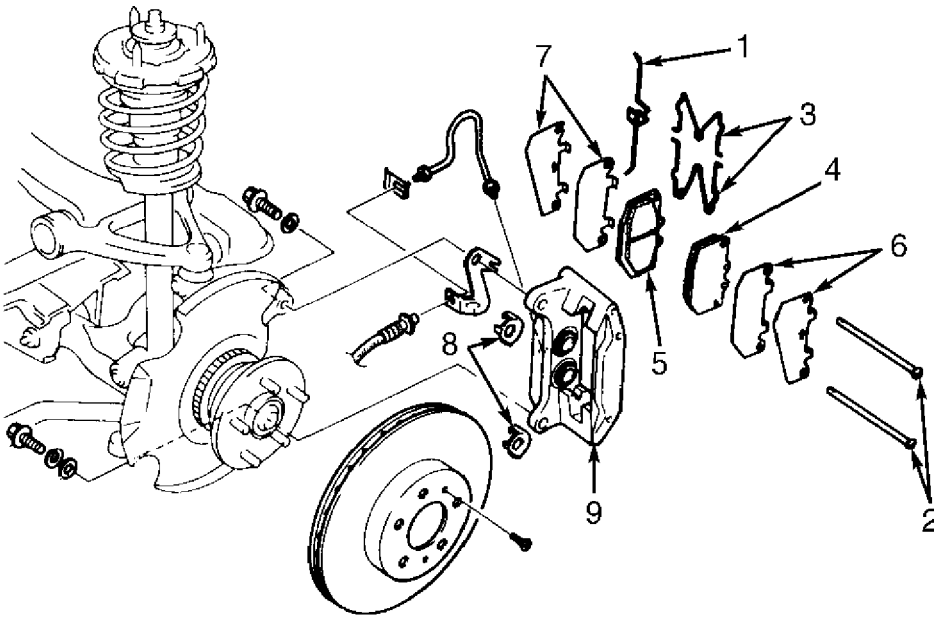

1. "M" Clip
2. Pad Pins
3. "M" Springs
4. Outer Pad
5. Inner Pad
6. Outer Shims
7. Inner Shims
8. Guard Plates
9. Caliper

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Fig. 1: Exploded View Of Front Disc Brake Assembly (RX7)
Courtesy of Mazda Motors Corp.

MINIMUM PAD LINING SPECIFICATIONS TABLE (FRONT)

Application	Thickness In. (mm)
RX7	.04 (1.0)

FRONT DISC BRAKE CALIPER

Removal & Installation

Raise and support front of vehicle. Remove front wheel assemblies and disconnect brake hose. Plug all openings. Remove front disc brake pads. See FRONT DISC BRAKE PADS under REMOVAL & INSTALLATION. Remove remaining mounting bolt(s). Remove caliper from vehicle. To install, reverse removal procedure. Bleed air from system.

FRONT BRAKE ROTOR

Removal & Installation

1) Raise and support front of vehicle. Remove front wheel assemblies. Remove front disc brake caliper with brake hose connected. Support caliper using rope. Remove grease cap (if equipped). Remove rotor-to-hub screws (if equipped). Remove rotor.

2) Machine rotor if lateral runout exceeds specification.

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Replace rotor if measured thickness is less than specified minimum thickness. See DISC BRAKE SPECIFICATIONS table at end of this article. To install, reverse removal procedure.

REAR DISC BRAKE PADS

Removal & Installation

1) Raise and support rear of vehicle. Remove rear wheel assemblies. Remove lower guide bolt from caliper. Rotate caliper upward and support using wire. Remove "V" spring. Remove pads, shims and guide plates. Replace pad if lining thickness is less than .04" (1.0 mm).

2) To install, reverse removal procedure. Use Disc Brake Piston Wrench (49-FA18-602) to rotate piston clockwise to install disc pads. Ensure grooves in piston are aligned.

REAR BRAKE CALIPER

Removal & Installation

1) Raise and support rear of vehicle. Remove rear wheel assemblies. Release parking brake and disconnect parking brake cable from caliper. Disconnect brake hose from caliper.

2) Remove lower guide bolt from caliper. Rotate caliper upward. Pull caliper toward center of vehicle to slide it off of caliper mount. To install, reverse removal procedure. Bleed air from system.

REAR BRAKE ROTOR

Removal & Installation

1) Raise and support vehicle. Remove rear wheel assemblies. Remove rear brake caliper with brake hose connected. Support caliper using wire. Remove rotor-to-hub screws (if equipped). Remove rotor.

2) Machine rotor if lateral runout exceeds specification. Replace rotor if measured thickness is less than specified minimum thickness. See DISC BRAKE SPECIFICATIONS table.

3) To install, reverse removal procedure. Check end play at grease cap. If end play exceeds .002" (.05 mm), check lock nut torque or replace wheel bearings.

REAR AXLE BEARING & OIL SEAL

NOTE: For information on models with sealed wheel bearings, see appropriate article in the SUSPENSION section.

MASTER CYLINDER

Removal

Disconnect fluid level sensor electrical connector. See Fig. 2. Disconnect and plug brake lines at master cylinder to prevent entry of dirt and loss of fluid. Remove nuts attaching master cylinder to firewall or power brake unit. Remove master cylinder from vehicle.

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Installation

1) Place Adjustment Gauge (49-F043-001) onto master cylinder. Turn screw on adjuster gauge until it contacts piston. Remove adjuster gauge. Apply 19.7 in. Hg to power brake unit.

2) Invert adjuster gauge and place it on power brake unit. Adjust push rod on power brake unit until there is no clearance between push rod and adjuster gauge screw. To install master cylinder, reverse removal procedure. Bleed air from system.

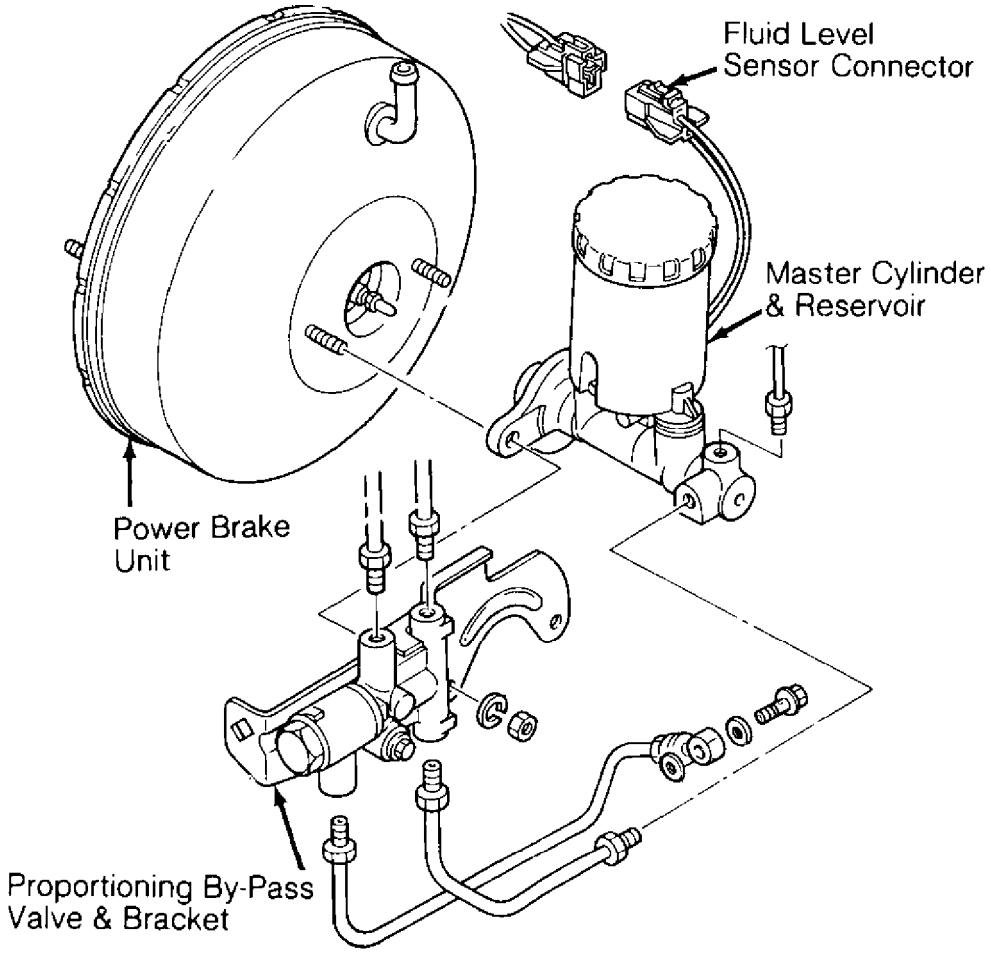

Fig. 2: Removing Master Cylinder (Miata Shown; RX7 Similar) Courtesy of Mazda Motors Corp.

POWER BRAKE UNIT

Removal & Installation

Remove master cylinder from power brake unit. See MASTER CYLINDER under REMOVAL & INSTALLATION. Disconnect vacuum line at power brake unit. See Fig. 3. From inside vehicle, remove cotter pin and clevis pin. Separate push rod from brake pedal. Remove power brake unit-to-firewall nuts. Remove power brake unit. To install, reverse removal procedure. Bleed air from system.

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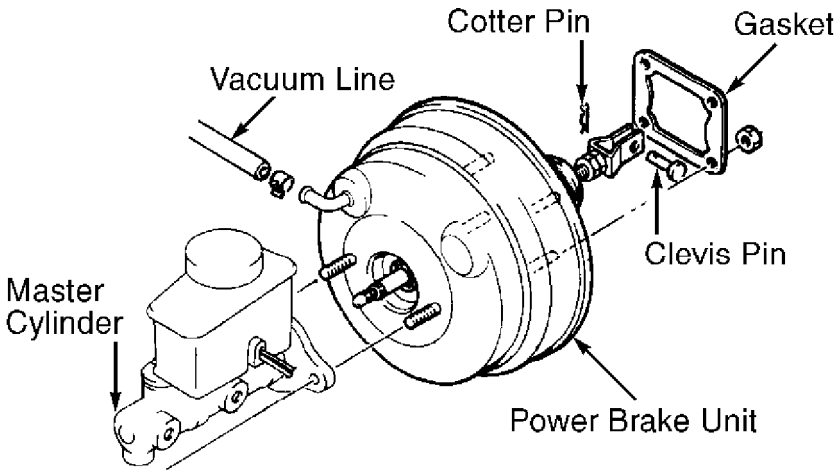

Fig. 3: Removing Power Brake Unit
Courtesy of Mazda Motors Corp.

OVERHAUL

NOTE: Use appropriate illustrations for exploded view of rear caliper assembly, master cylinder and power brake unit. See Figs. 4-6.

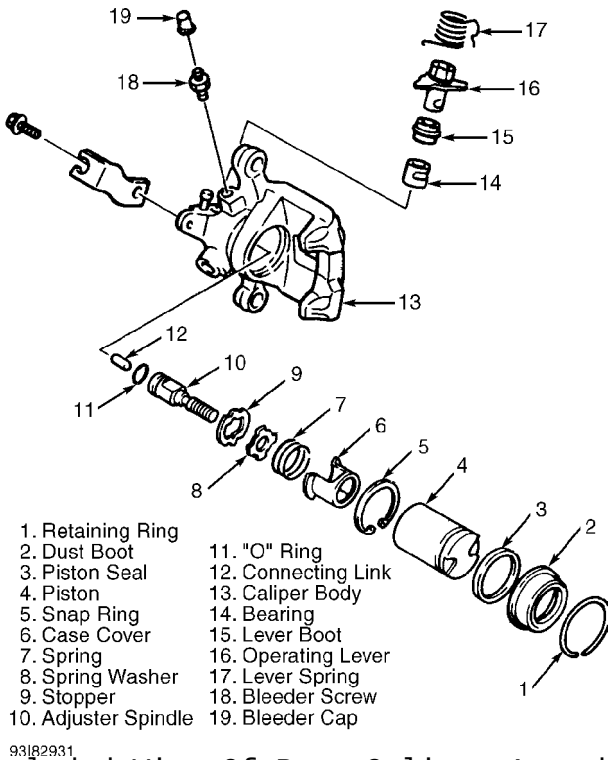

Fig. 4: Exploded View Of Rear Caliper Assembly (RX7)
Courtesy of Mazda Motors Corp.

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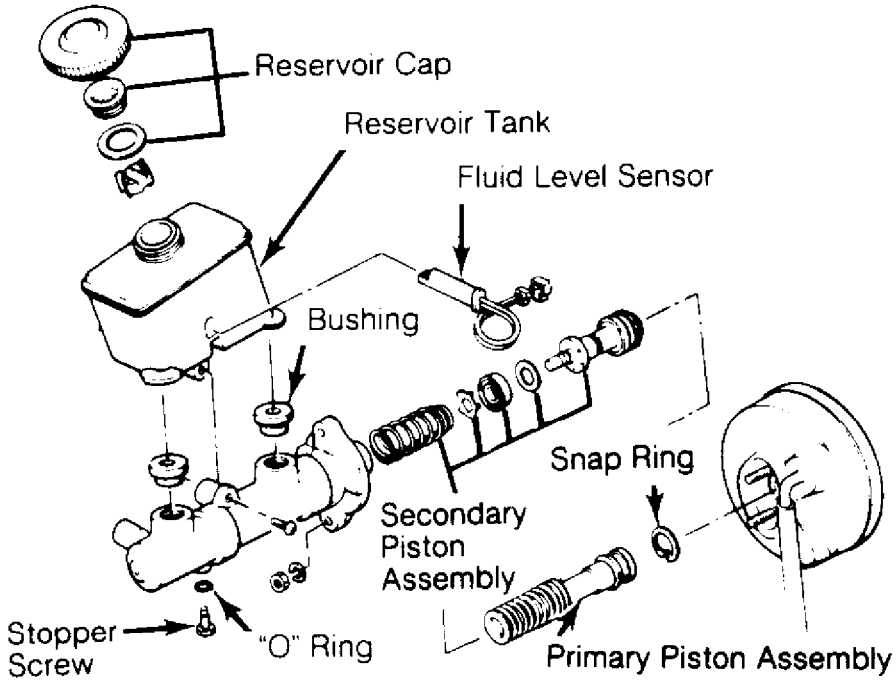

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Fig. 5: Exploded View Of Typical Master Cylinder
Courtesy of Mazda Motors Corp.

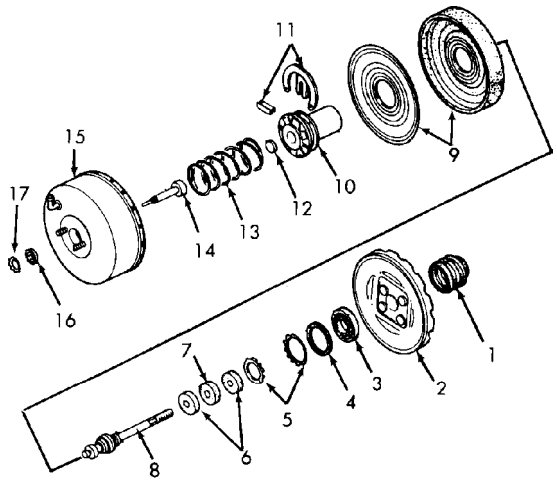

Fig. 6: Exploded View Of Power Brake Unit
Courtesy of Mazda Motors Corp.

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TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS TABLE

Application	Ft. Lbs. (N.m)
Caliper Guide Bolt	
RX7	
Rear	46-62 (63-84)
Caliper Mounting Bracket Bolt	
RX7	
Front	58-72 (78-98)
Rear	34-49 (46-67)
Wheel Lug Nut	
RX7	65-87 (88-118)
	INCH Lbs. (N.m)
Wheel Cylinder Mounting Bolt	
RX7	88-108 (10-12)

DISC BRAKE SPECIFICATIONS

DISC BRAKE SPECIFICATIONS TABLE

Application	In. (mm)
RX7	
Front (1)	
Original Thickness	.87 (22)
Discard Thickness	.79 (20)
Rear (1)	
Original Thickness	.79 (20)
Discard Thickness	.71 (18)

(1) - Maximum lateral runout is .004" (.10 mm).

END OF ARTICLE