

Brakes

Conventional Brake Components 19-1

VSA (Vehicle Stability Assist)

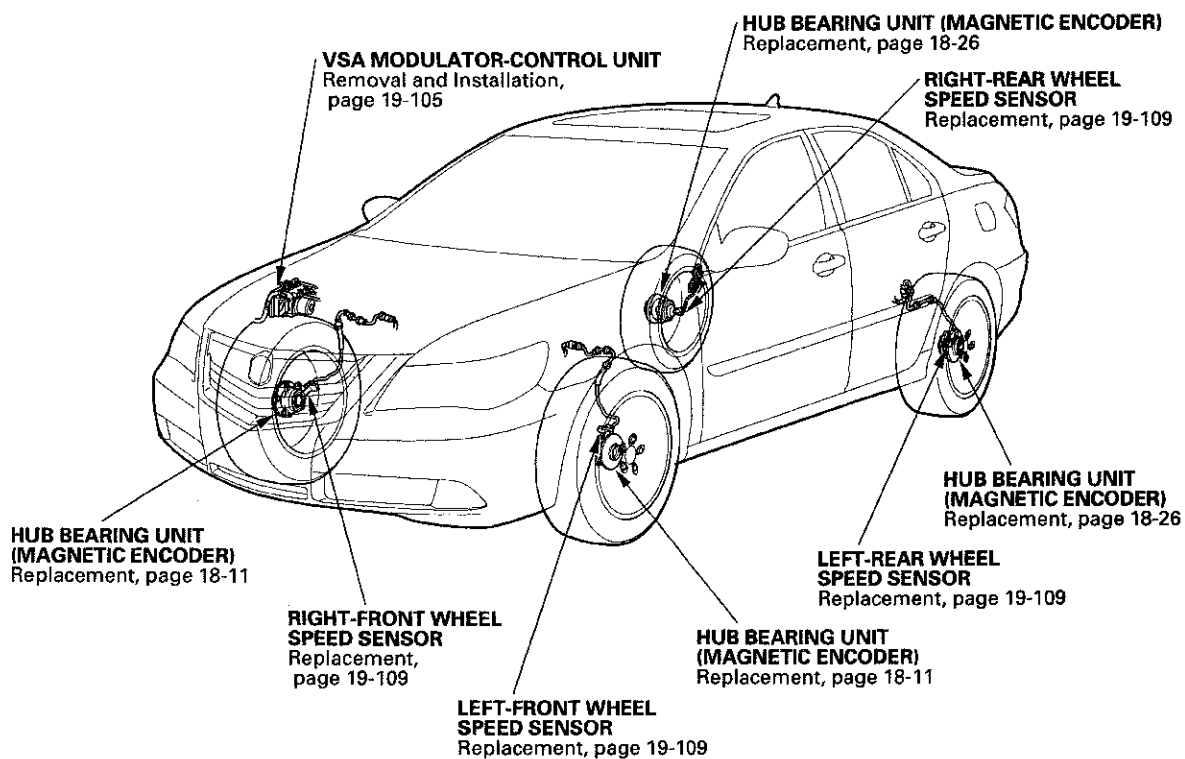
System Components

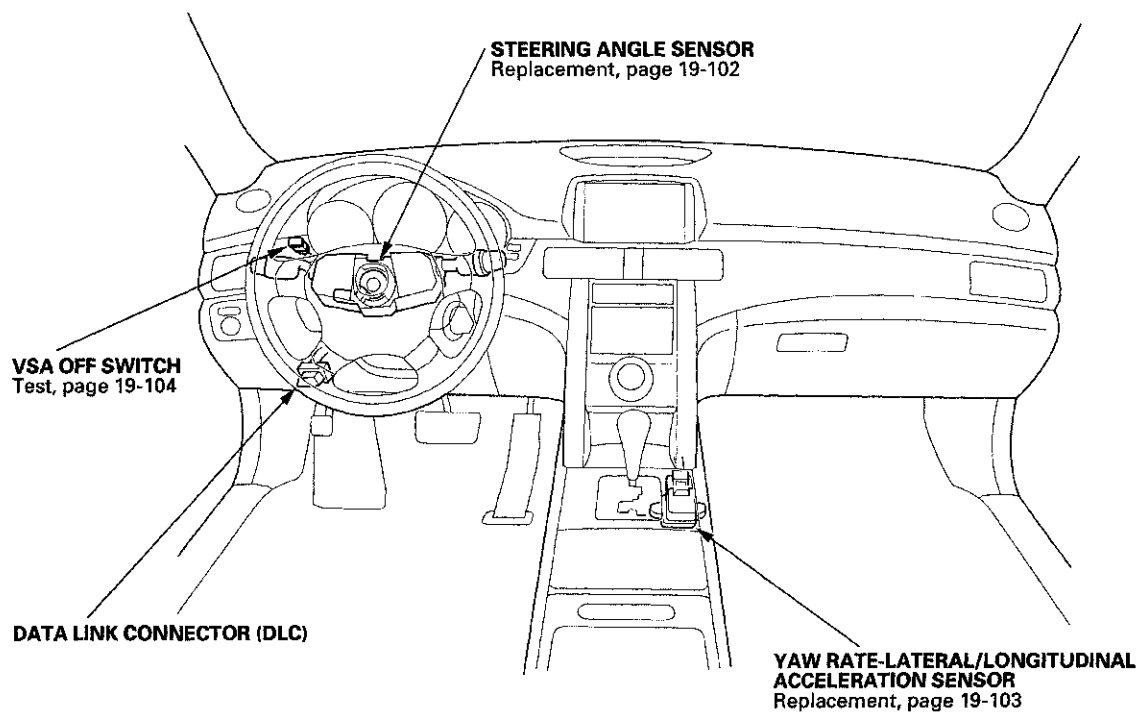
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VSA System Components

Component Location Index





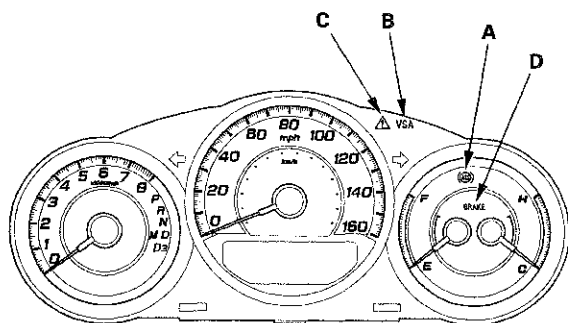
VSA System Components

General Troubleshooting Information

System Indicator

This system has four indicators: the ABS indicator (A), the VSA indicator (B), the VSA activation indicator (C) and the brake system indicator (D). When the system detects a problem, it illuminates the appropriate indicators. Depending on the failure, the control unit determines which indicators are turned on.

- When ABS function is lost: ABS indicator, VSA indicator, and VSA activation indicators turn on.
- When VSA function is lost: VSA indicator and VSA activation indicators turn on.
- When all functions are lost: All four indicators turn on.
- When the gauge control module detects F-CAN circuit problem: VSA indicator and brake system indicators turn on.



ABS/VSA Indicator

- If the system is OK, the ABS and VSA indicators will go off 2 seconds after turning the ignition switch to ON (II).
- The ABS and VSA indicators come on when the control unit detects a problem in the system. However, even though the system is operating properly, the activation indicator may come on under these conditions:
 - One drive wheel is stuck.
 - The vehicle goes into a spin.
 - The ABS or VSA continues to operate for a long time.
 - The vehicle is subjected to an electrical signal disturbance.
 - The VSA switch has been manually turned off.
 - When an abnormality in the TPMS (Tire Pressure Monitoring System) or low tire pressure is detected, VSA functions cannot be cancelled by pressing the VSA OFF switch.

To determine the actual cause of the problem, question the client about the problem, taking these conditions into consideration.

- When a problem is detected and the ABS indicator and VSA indicator come on, there are cases when the indicator stays on until the ignition switch is turned to LOCK (0), and cases when the indicator goes off automatically when the system returns to normal.
 - DTC 61 or 62:
The ABS and VSA indicators go off automatically when the system returns to normal.
 - DTC 11, 13, 15, 17, 31, 32, 33, 34, 35, 36, 37, 38, 53, 54, 71, 81, 112, 121, 122, 123 or 124:
The ABS and VSA indicators stay on until the ignition switch is turned to LOCK (0) whether or not the system returns to normal.
 - DTC 12, 14, 16, 18, 21, 22, 23, 24, 41, 42, 43, 44, 51 or 52:
The ABS and VSA indicators stay on until the system returns to normal after the vehicle is driven.
 - DTC 25, 26, 27, 28, 64, 65, 66, 68, 83, 84 or 86:
The VSA indicators stay on until the ignition switch is turned to LOCK (0) whether or not the system returns to normal.



Diagnostic Trouble Code (DTC)

- The memory holds all DTCs. However, when the same DTC is detected more than once, the more recent DTC is written over the earlier one. Therefore, when the same problem is detected repeatedly, it is memorized as a single DTC.
- The DTCs are indicated in ascending number order, not in the order they occur.
- The DTCs are memorized in the EEPROM. Therefore, the memorized DTCs cannot be erased by disconnecting the battery. Do the specified procedures to clear the DTCs.

Self-diagnosis

- Self-diagnosis can be classified into two categories:
 - Initial diagnosis: Done right after the ignition switch is turned to ON (II) and until the ABS and VSA indicators go off.
 - Regular diagnosis: Done right after the initial diagnosis until the ignition switch is turned to LOCK (0).
- When the system detects a problem, the VSA modulator-control unit shifts to fail-safe mode.

Kickback

The pump motor operates when the VSA modulator-control unit is functioning, and the fluid in the reservoir is forced out to the master cylinder, causing kickback at the brake pedal.

Pump Motor

- The pump motor operates when the VSA modulator-control unit is functioning.
- The VSA modulator-control unit checks the pump motor operation one time after completing initial diagnosis during regular diagnosis when the vehicle is driven over 10 mph (15 km/h).

Brake Fluid Replacement/Air Bleeding

Brake fluid replacement and air bleeding procedures are identical to the procedures used on vehicles without the VSA system (see page 19-9).

How to Troubleshoot DTCs

The troubleshooting procedures assume that the cause of the problem is still present, and the ABS and/or VSA indicator is still on. Following a troubleshooting procedure for a code that has been cleared but does not reset can result in incorrect diagnosis.

NOTE: Always troubleshoot fuel and emissions DTCs first.

1. Question the client about the conditions when the problem occurred, and try to reproduce the same conditions for troubleshooting. Find out when the ABS and/or VSA indicator came on, such as during activation, after activation, when the vehicle was traveling at a certain speed, etc. If necessary, have the client demonstrate the concern.
2. When the ABS or VSA indicator does not come on during the test-drive, check for loose connectors, poor contact of the terminals, etc. in the circuit indicated by the DTC before you start troubleshooting.
3. After troubleshooting, or the repairs are done, clear the DTCs, and test-drive the vehicle under the same conditions that originally set the DTCs. Make sure the ABS and VSA indicators do not come on.
4. Check for DTCs from other systems which are connected via F-CAN. If there are DTCs that are related to F-CAN, one possible cause was that the ignition switch was turned to ON (II) with the VSA modulator-control unit connector disconnected. Clear the DTCs. Check for fuel and emissions or powertrain DTCs first.

Intermittent Failures

The term "intermittent failure" means a system may have had a failure, but it checks OK now. If you cannot reproduce the condition, check for loose connections and terminals. Also check for ground and power connections related to the circuit that you are troubleshooting.

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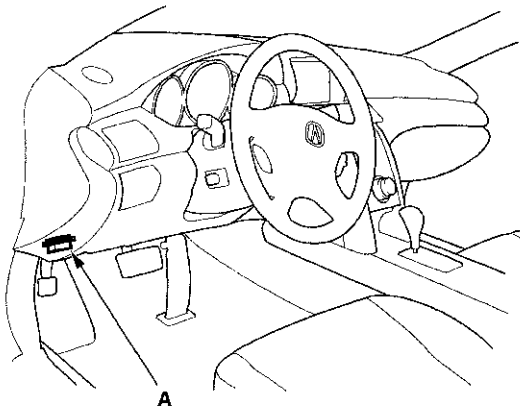
VSA System Components

General Troubleshooting Information (cont'd)

How to Use the HDS (Honda Diagnostic System)

NOTE: Make sure the battery is in good condition and fully charged.

1. If the system indicators stay on, connect the HDS to the data link connector (DLC) (A) located under the driver's side of the dashboard.



2. Turn the ignition switch to ON (II).
3. Make sure the HDS communicates with the vehicle and the VSA modulator-control unit. If it doesn't, troubleshoot the DLC circuit (see page 11-211).
4. Check the diagnostic trouble code (DTC) and note it. Also check the on-board snapshot data, and download any data found. Then refer to the indicated DTC's troubleshooting, and do the appropriate troubleshooting procedure.

NOTE:

- The HDS can read the DTC, the current data, and other system data.
- For specific operations, refer to the Help menu that came with the HDS.

How to Retrieve DTCs

1. With the ignition switch in LOCK (0), connect the HDS to the data link connector (DLC) under the driver's side of the dashboard.
2. Turn the ignition switch to ON (II).
3. Make sure the HDS communicates with the vehicle and the VSA modulator-control unit. If it doesn't, troubleshoot the DLC circuit (see page 11-211).
4. Follow the prompts on the HDS to display the DTC(s) on the screen. After determining the DTC, refer to the DTC troubleshooting. Do the all systems DTC check, and troubleshoot any powertrain DTCs first.
5. Turn the ignition switch to LOCK (0).

How to Clear DTCs

1. With the ignition switch in LOCK (0), connect the HDS to the data link connector (DLC) under the driver's side of the dashboard.
2. Turn the ignition switch to ON (II).
3. Make sure the HDS communicates with the vehicle and the VSA modulator-control unit. If it doesn't, troubleshoot the DLC circuit (see page 11-211).
4. Clear the DTC(s) by following the screen prompts on the HDS.
5. Turn the ignition switch to LOCK (0).

DTC Troubleshooting Index

DTC	Detection Item	Note
11	Right-front Wheel Speed Sensor (Short to Power/Short to Body Ground/Open)	(see page 19-65)
12	Right-front Wheel Speed Sensor (Electrical Noise/Intermittent Interruption)	(see page 19-69)
13	Left-front Wheel Speed Sensor (Short to Power/Short to Body Ground/Open)	(see page 19-65)
14	Left-front Wheel Speed Sensor (Electrical Noise/Intermittent Interruption)	(see page 19-69)
15	Right-rear Wheel Speed Sensor (Short to Power/Short to Body Ground/Open)	(see page 19-65)
16	Right-rear Wheel Speed Sensor (Electrical Noise/Intermittent Interruption)	(see page 19-69)
17	Left-rear Wheel Speed Sensor (Short to Power/Short to Body Ground/Open)	(see page 19-65)
18	Left-rear Wheel Speed Sensor (Electrical Noise/Intermittent Interruption)	(see page 19-69)
21	Right-front Magnetic Encoder (Wheel Bearing)	(see page 19-71)
22	Left-front Magnetic Encoder (Wheel Bearing)	(see page 19-71)
23	Right-rear Magnetic Encoder (Wheel Bearing)	(see page 19-71)
24	Left-rear Magnetic Encoder (Wheel Bearing)	(see page 19-71)
25	Yaw Rate Sensor	(see page 19-72)
26	Lateral Acceleration Sensor	(see page 19-74)
27	Steering Angle Sensor	(see page 19-76)
28	Longitudinal Acceleration Sensor	(see page 19-77)
31	ABS Solenoid	(see page 19-79)
32	ABS Solenoid	(see page 19-79)
33	ABS Solenoid	(see page 19-79)
34	ABS Solenoid	(see page 19-79)
35	ABS Solenoid	(see page 19-79)
36	ABS Solenoid	(see page 19-79)
37	ABS Solenoid	(see page 19-79)
38	ABS Solenoid	(see page 19-79)
41	Right-front Wheel Lock	(see page 19-80)
42	Left-front Wheel Lock	(see page 19-80)
43	Right-rear Wheel Lock	(see page 19-80)
44	Left-rear Wheel Lock	(see page 19-80)
51	Motor Lock	(see page 19-80)
52	Motor Stuck OFF	(see page 19-80)
53	Motor Stuck ON	(see page 19-82)
54	Fail-safe Relay	(see page 19-83)
61	Low +B-FSR Voltage	(see page 19-84)
62	High +B-FSR Voltage	(see page 19-84)
64	Sensor Power Voltage	(see page 19-85)
65	Brake Fluid Level	(see page 19-86)
66	VSA Pressure Sensor (Inside of VSA Modulator-Control Unit)	(see page 19-86)
68	Brake Pedal Position Switch	(see page 19-87)
71	Different Diameter Tire	(see page 19-88)
81	Central Processing Unit (CPU)	(see page 19-88)
83	PCM	(see page 19-90)
84	VSA Sensor Neutral Position	(see page 19-91)
86	F-CAN Communication	(see page 19-91)
107	TCS Operation	(see page 19-93)
108	VSA Operation	(see page 19-93)
112	Internal Power Source Stuck OFF	(see page 19-93)
121	VSA Solenoid	(see page 19-94)
122	VSA Solenoid	(see page 19-94)
123	VSA Solenoid	(see page 19-94)
124	VSA Solenoid	(see page 19-94)

VSA System Components

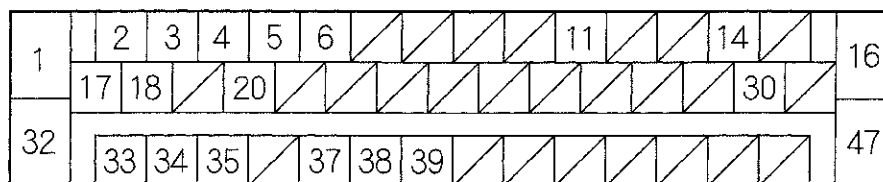
Symptom Troubleshooting Index

Symptom	Diagnostic procedure
ABS indicator does not come on	Symptom Troubleshooting (see page 19-95)
ABS indicator does not go off, and no DTCs are stored	Symptom Troubleshooting (see page 19-95)
Brake system indicator does not come on (check bulb operation with parking brake)	Symptom Troubleshooting (see page 19-97)
Brake system indicator does not go off, and no DTCs are stored	Symptom Troubleshooting (see page 19-98)
VSA indicator does not come on	Symptom Troubleshooting (see page 19-98)
VSA indicator does not go off, and no DTCs are stored	Symptom Troubleshooting (see page 19-99)
VSA activation indicator does not come on at start-up (bulb check)	Symptom Troubleshooting (see page 19-100)
VSA activation indicator does not go off, and no DTCs are stored	Symptom Troubleshooting (see page 19-101)
HDS does not communicate with the VSA modulator-control unit or the vehicle	Troubleshoot the DLC circuit (see page 11-211).



System Description

VSA Modulator-Control Unit Inputs and Outputs for 47P Connector (Connector Disconnected)



Wire side of female terminals

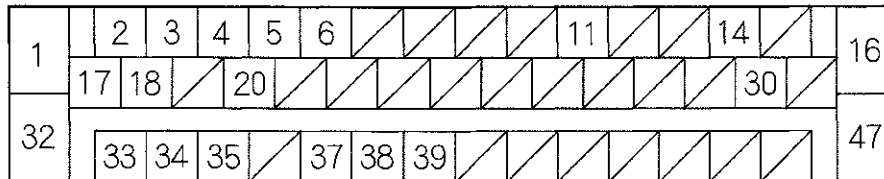
Terminal number	Wire color	Terminal sign	Description	Signal
1	WHT	FSR +B	Power source for the fail-safe relay	Battery voltage (about 12 V) at all times
2	YEL	RL +B	Detects left-rear wheel speed	
3	RED	RL-GND	sensor signal	
4	RED	FL +B	Detects left-front wheel speed	
			sensor signal	
5	PNK	RR +B	Detects right-rear wheel speed	
6	BRN	RR-GND	sensor signal	
11	BLU	K-LINE	Communications with HDS	
14	WHT	CANH	F-CAN communication circuit	
16	RED	MR +B	Power source for the motor relay	Battery voltage (about 12 V) at all times
17	PNK	FR-GND	Detects right-front wheel speed	
18	GRN	FR +B	sensor signal	
20	GRN	FL-GND	Detects left-front wheel speed	
			sensor signal	
30	RED	CANL	F-CAN communication circuit	

(cont'd)

VSA System Components

System Description (cont'd)

VSA Modulator-Control Unit Inputs and Outputs for 47P Connector (Connector Disconnected)



Wire side of female terminals

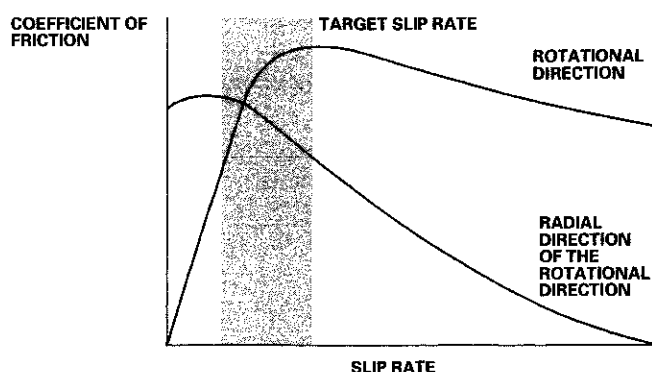
Terminal number	Wire color	Terminal sign	Description	Signal
32	BLK	GND	Ground for the VSA modulator-control unit	Continuity
33	BRN	SGND	Ground for the sensors	Continuity
34	YEL	YAW	Detects yaw rate sensor signal	—
35	PNK	SVCC	Power source for the sensors	—
37	GRN	GLAT	Detects lateral acceleration sensor signal	—
38	YEL	IG1	Power source for activating the system	With ignition switch in ON (II): battery voltage (about 12 V)
39	WHT	GLONG	Detects longitude acceleration sensor signal	—
47	BLK	MR-GND	Ground for the pump motor	Continuity

ABS (Anti-lock Brake System) Features

When the brake pedal is pressed while driving, the wheels can lock before the vehicle comes to a stop. In such an event, the maneuverability of the vehicle is reduced if the front wheels are locked, and the stability of the vehicle is reduced if the rear wheels are locked, creating an extremely unstable condition. The ABS precisely controls the slip rate of the wheels to ensure maximum grip force from the tires, and it thereby ensures maneuverability and stability of the vehicle.

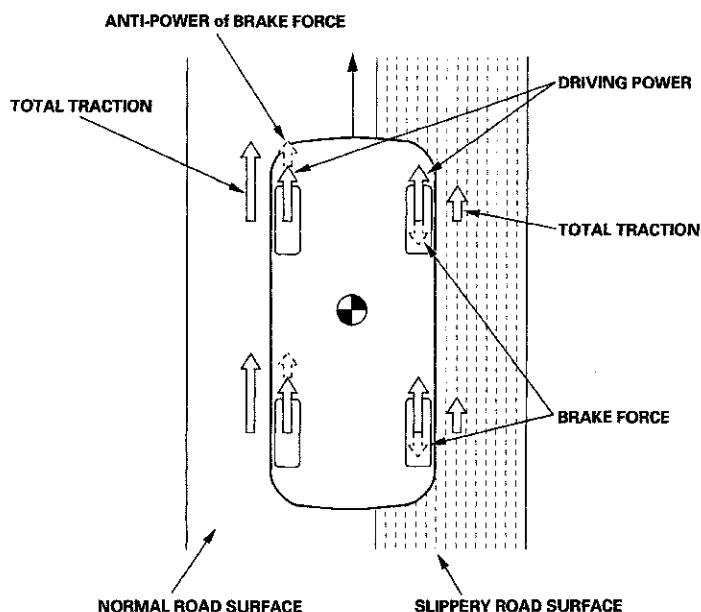
The ABS calculates the slip rate of the wheels based on the vehicle speed and the wheel speed, then it controls the brake fluid pressure to reach the target slip rate.

Grip Force of Tire and Road Surface



TCS (Traction Control System) Features

The TCS provides low-speed traction. When a drive wheel loses traction on a slippery road surface and starts to spin, the VSA modulator-control unit applies brake pressure to slow the spinning wheel. At that time, the VSA modulator-control unit sends a traction control signal to the PCM to reduce engine power.



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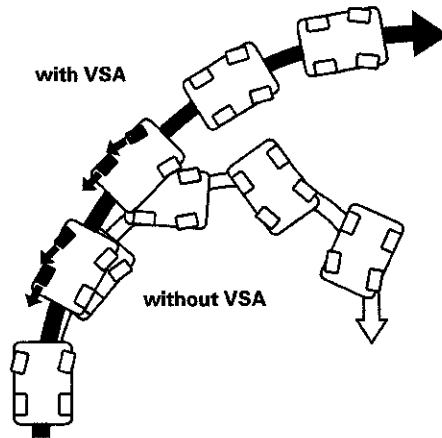
VSA System Components

System Description (cont'd)

VSA (Vehicle Stability Assist) System Features

Oversteer control

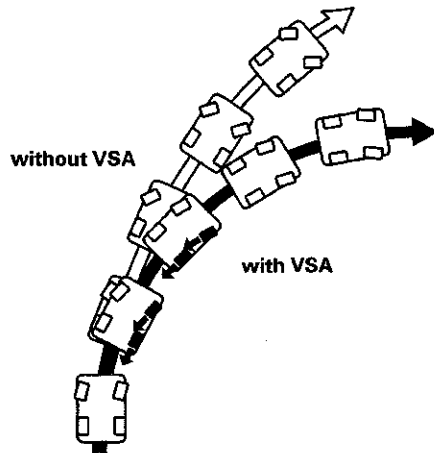
Applies the brakes to the front and rear outside wheels



The brake makes the yaw rate opposite to the turning direction

Understeer control (in acceleration)

- Applies the brakes to the front and rear inside wheels
- Controls the engine torque



The brake increases the yaw rate toward the turning direction

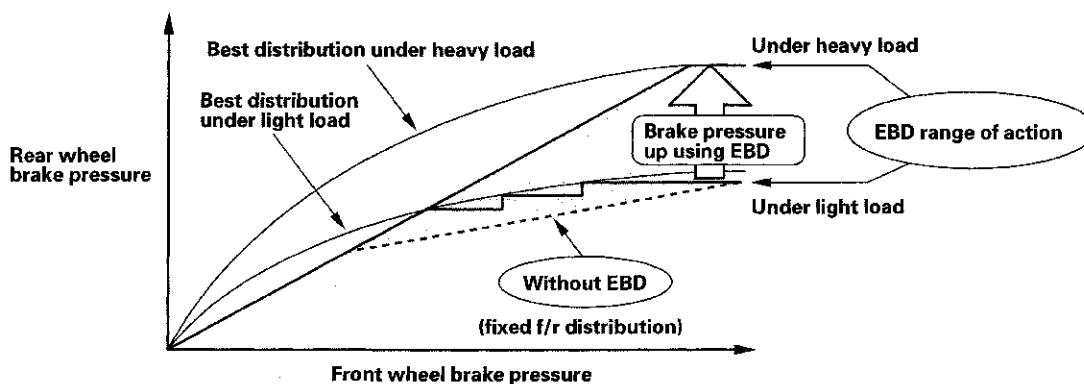
The throttle control effect

- reduces vehicle speed
- increases cornering force

EBD (Electronic Brake Distribution)

EBD has been added to the VSA system. EBD eliminates the need for an external, mechanical proportioning valve and improves overall braking performance.

When the vehicle is heavily loaded, most of the increase in weight is born by the rear wheels, increasing braking capability. Proportioning valves maintain a fixed distribution of brake pressure between the front and the rear wheels, making it very difficult to fully utilize increased rear wheel braking capability. EBD varies brake pressure distribution according to load, using input from the wheel speed sensors, which improves overall braking performance.



Normal Braking

Under normal braking conditions, brake pressure is evenly distributed between the front and rear brakes, and EBD is not used.

Firm Braking

Under hard braking conditions, the VSA modulator-control unit monitors wheel speed in order to allow a maximum amount of brake distribution individually to the rear wheels. Once the VSA modulator-control unit detects that one or both rear wheels are nearing their maximum braking potential, the inlet valve closes for one or both rear wheels, maintaining the current pressure. If the traction is improved, and the wheel(s) is no longer nearing its limits, the VSA modulator-control unit will open the inlet solenoid allowing additional pressure to be distributed to the rear wheel. The rear wheels are controlled independently of each other during EBD function.

If during EBD function the VSA modulator-control unit determines that the wheels are beginning to slip more than a predetermined amount, the control unit abandons EBD control and shifts to select low 3-channel ABS control.

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VSA System Components

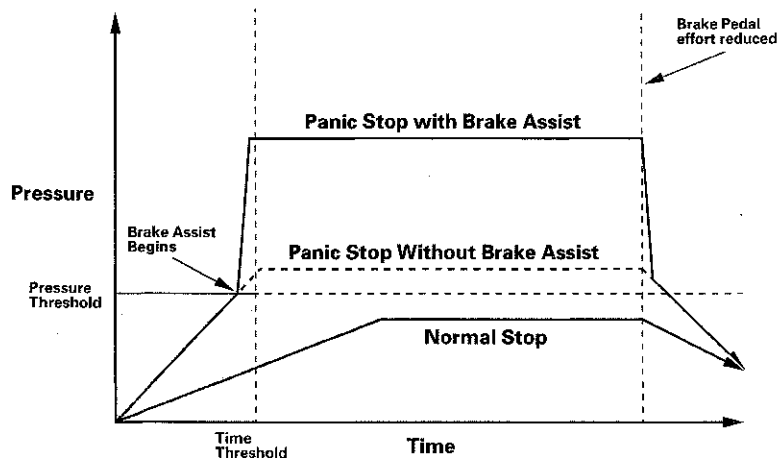
System Description (cont'd)

Brake Assist

Brake assist has been added to the VSA system. Brake assist helps ensure that any driver can achieve the full braking potential of the vehicle by increasing brake system pressure in a panic situation, bringing the vehicle into a full ABS stop.

Each time the ignition switch is turned ON (II), the VSA modulator-control unit learns the current driver's normal braking characteristics by monitoring the brake pressure sensor and the brake pedal position switch at each stop. Using these inputs and their values, the VSA modulator-control unit is able to learn the driver's normal braking habits, and then determine the difference between a normal stop and a panic stop for the individual driver of the vehicle. If during a panic stop the VSA modulator-control unit determines that the brake system pressure increases above a learned threshold in less than a learned amount of time, the VSA modulator-control unit engages brake assist.

Because the brake system pressure crossed the threshold before the time threshold had expired, the VSA modulator-control unit goes into brake assist mode.



Normal Braking

During normal braking conditions, brake assist does not affect brake system pressure.

Panic Stop

During a panic stop, the control unit turns the VSA pump ON, and opens the inlet valve. This brings the brake system pressure up high enough to cause a full ABS stop. As soon as the brake pedal is released, brake assist is stopped and the brake system returns to normal operation.

Modulator Unit

The modulator unit consists of the inlet solenoid valve, the outlet solenoid valve, the VSA normally open (NO) solenoid valve, the VSA normally closed (NC) solenoid valve, the reservoir, the pump, the pump motor, and the damping chamber.

The modulator controls the caliper fluid pressure directly. It is a circulating-type modulator because the brake fluid circulates through the caliper, the reservoir, and the master cylinder.

The hydraulic control has three modes: Pressure intensifying, pressure retaining, and pressure reducing.

The hydraulic circuit is an independent four channel type, one channel for each wheel.

ABS Control

Pressure intensifying mode

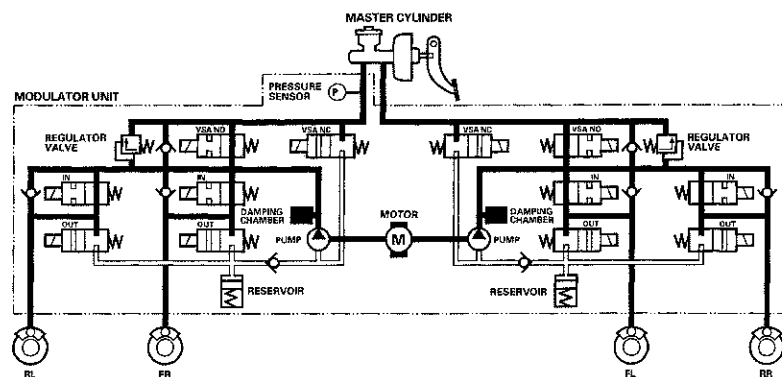
VSA NO valve open, VSA NC valve closed, inlet valve open, outlet valve closed.

Master cylinder fluid is pumped out to the caliper.

Pump motor

When starting the pressure reducing mode, the pump motor is ON. When stopping ABS operation, the pump motor is OFF.

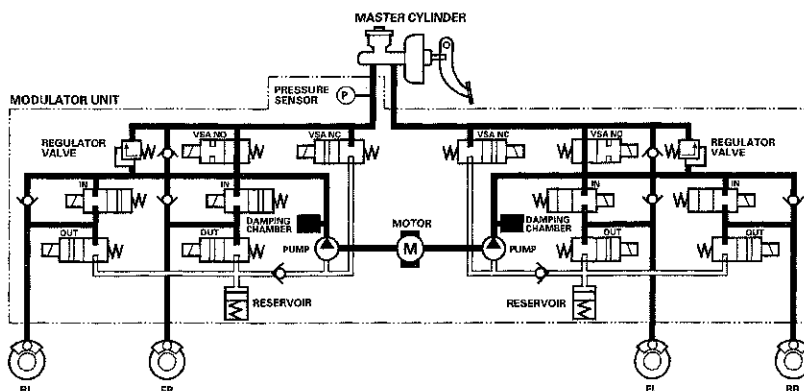
The reservoir fluid is pumped out by the pump, through the damping chamber, to the master cylinder.



Pressure retaining mode

VSA NO valve open, VSA NC valve closed, inlet valve closed, outlet valve closed.

The caliper fluid is retained by the inlet valve and outlet valve.



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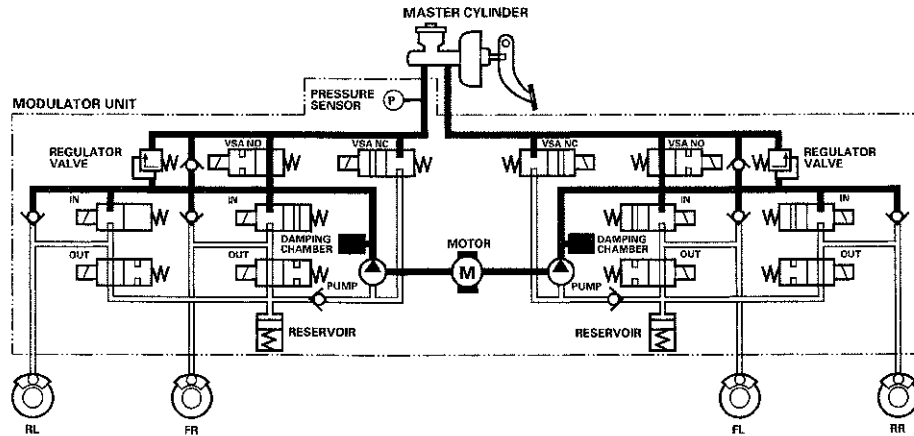
VSA System Components

System Description (cont'd)

Pressure reducing mode

VSA NO valve open, VSA NC valve closed, inlet valve closed, outlet valve open.

The caliper fluid flows through the outlet valve to the reservoir.

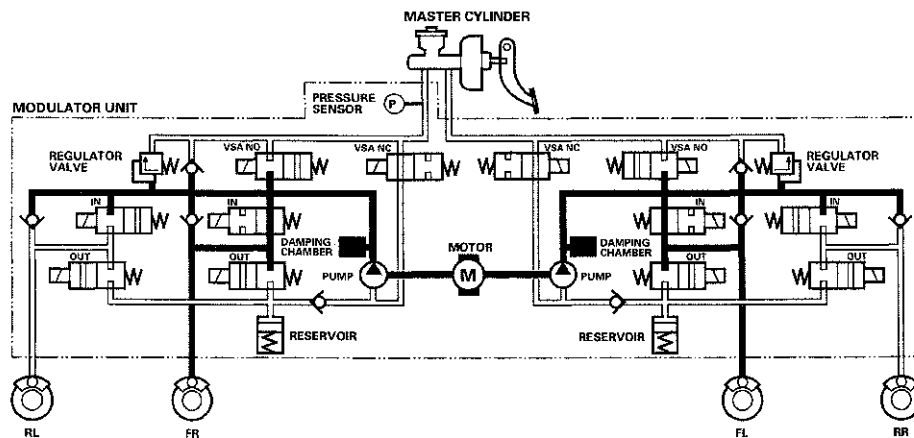


TCS Control

Pressure intensifying mode

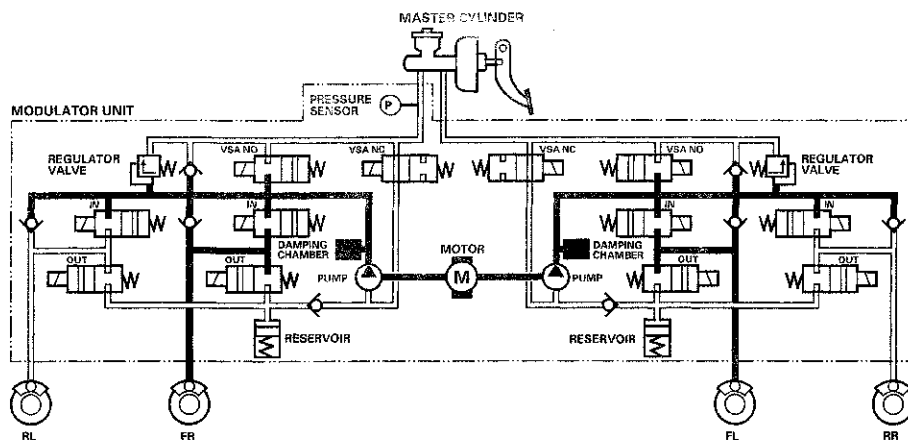
VSA NO valve closed, VSA NC valve open, inlet valve open, outlet valve closed, pump motor ON.

The reservoir and the master cylinder fluid is pumped out by the pump, through the damping chamber, to the front caliper.



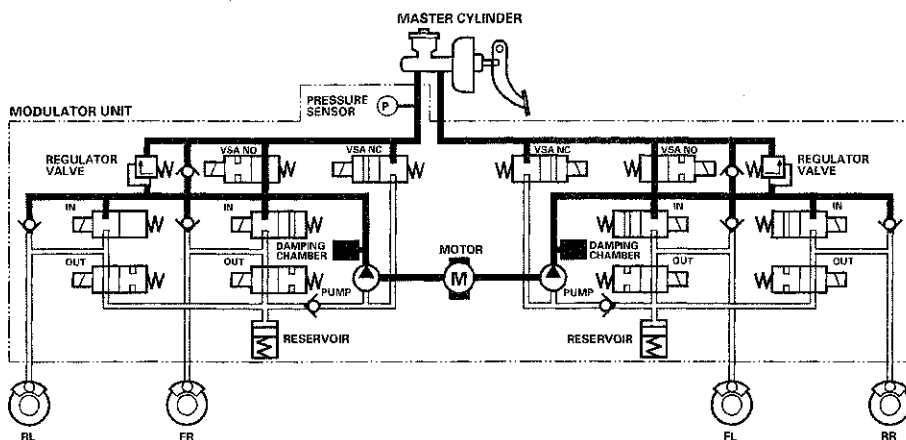
Pressure retaining mode

VSA NO valve closed, VSA NC valve open, inlet valve closed, outlet valve closed, pump motor ON.
Front caliper fluid is retained by the inlet valve and the outlet valve.



Pressure reducing mode

VSA NO valve open, VSA NC valve closed, inlet valve closed, front outlet valve open, pump motor ON.
The caliper fluid flows through the outlet valve to the reservoir.



(cont'd)

VSA System Components

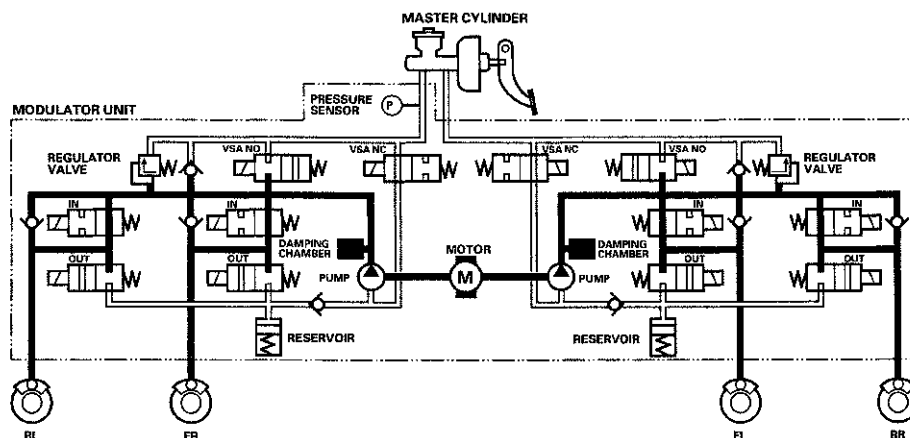
System Description (cont'd)

VSA Control

Pressure intensifying mode

VSA NO valve closed, VSA NC valve open, inlet valve open, outlet valve closed, pump motor ON.

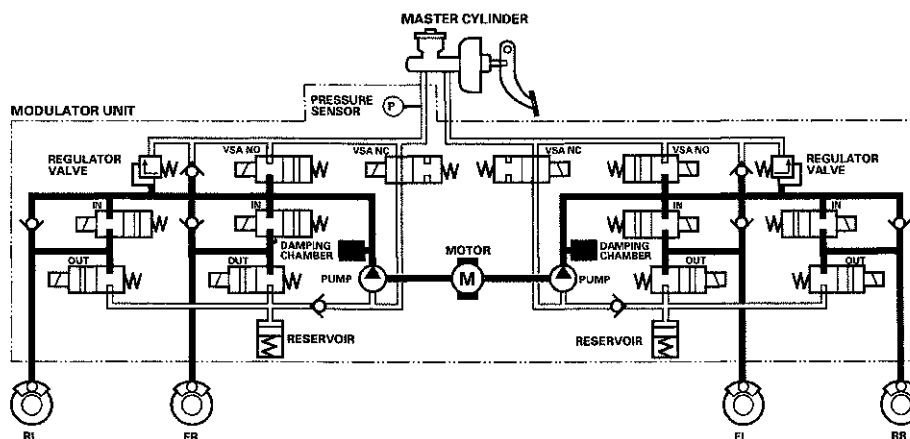
The reservoir and the master cylinder fluid is pumped out by the pump, through the damping chamber, to the front and rear calipers.



Pressure retaining mode

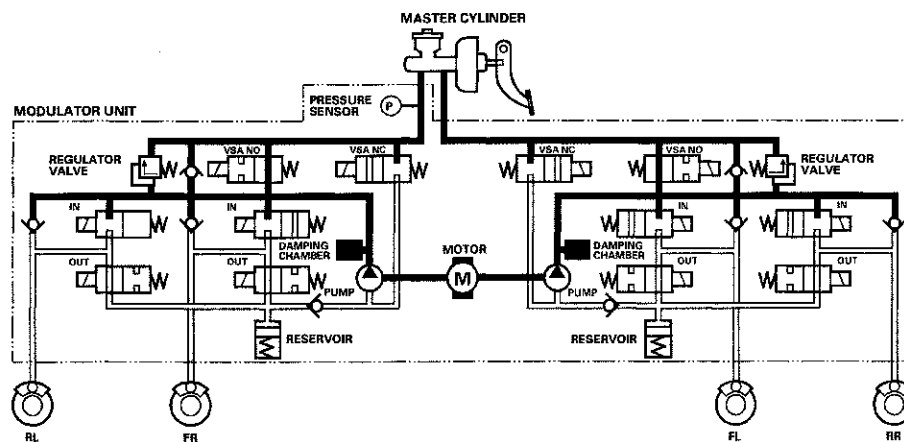
VSA NO valve closed, VSA NC valve open, inlet valve closed, outlet valve closed, pump motor ON.

The front and rear caliper fluid is retained by the inlet valve and the outlet valve.



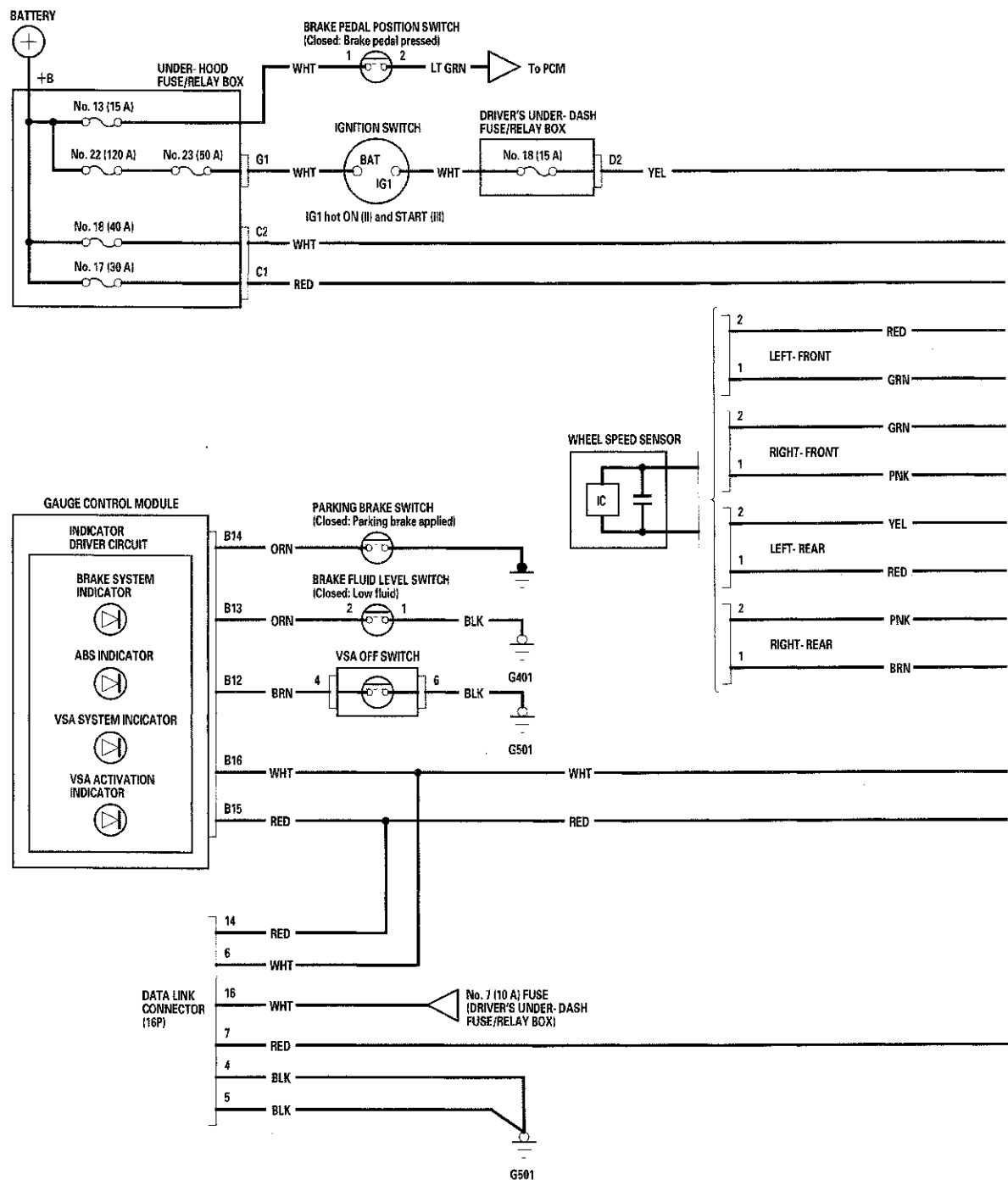
Pressure reducing mode

VSA NO valve open, VSA NC valve closed, inlet valve closed, outlet valve open, pump motor ON.
The caliper fluid flows through the outlet valve to the reservoir.

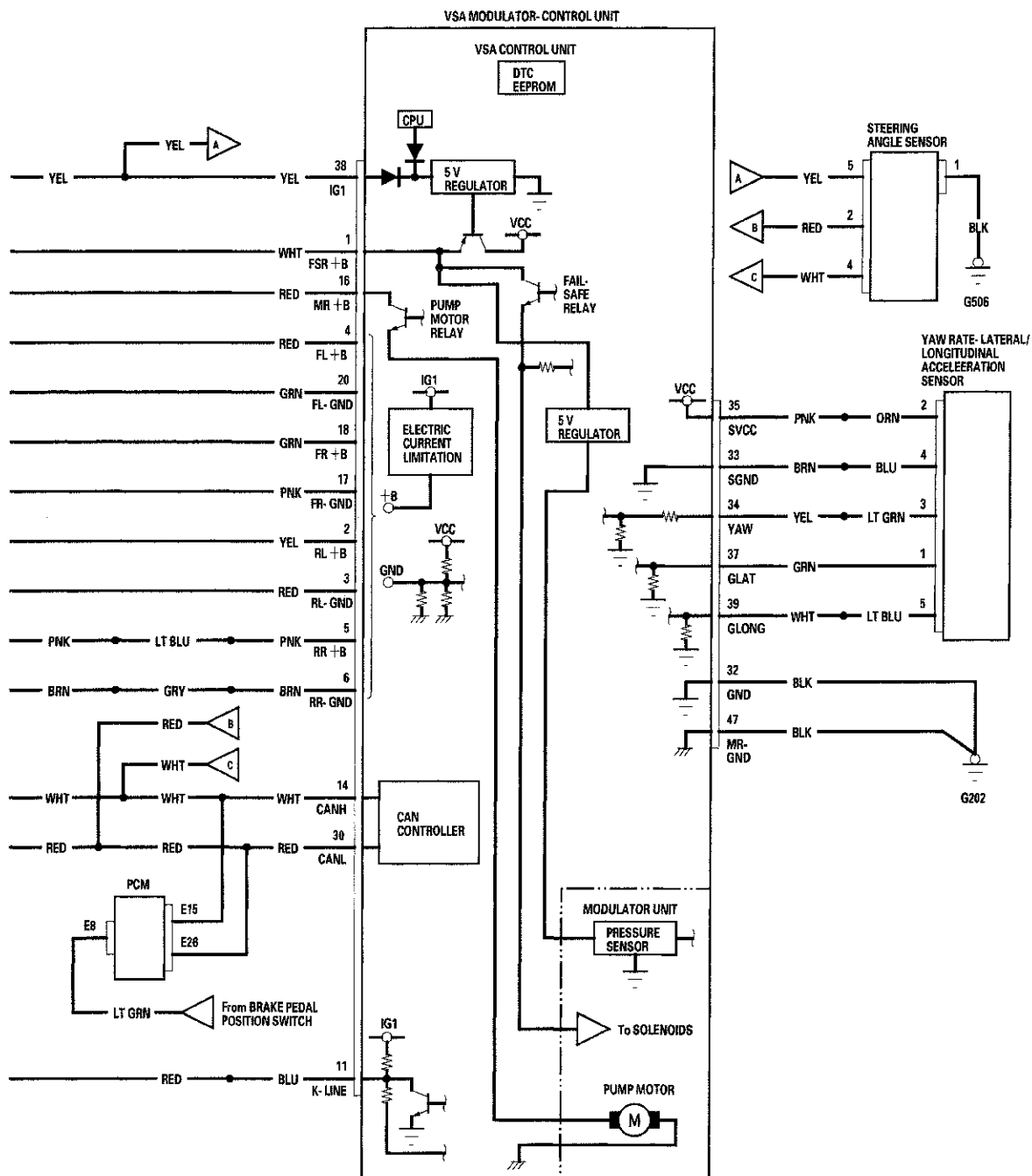


VSA System Components

Circuit Diagram



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VSA System Components

Circuit Diagram (cont'd)

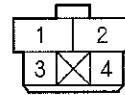
UNDER-HOOD FUSE/RELAY BOX
CONNECTOR C (2P)



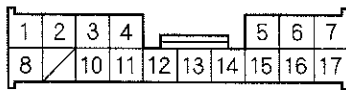
BRAKE FLUID LEVEL SWITCH
2P CONNECTOR



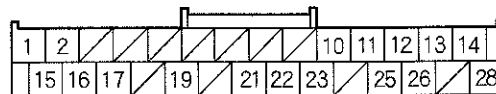
BRAKE PEDAL POSITION SWITCH
4P CONNECTOR



DRIVER'S UNDER-DASH FUSE/RELAY BOX
CONNECTOR D (17P)



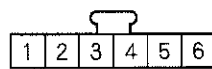
GAUGE CONTROL MODULE CONNECTOR B (28P)



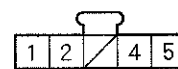
UNDER-HOOD FUSE/RELAY BOX
CONNECTOR G (2P)



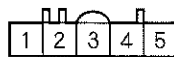
VSA OFF SWITCH 6P CONNECTOR



STEERING ANGLE SENSOR
5P CONNECTOR



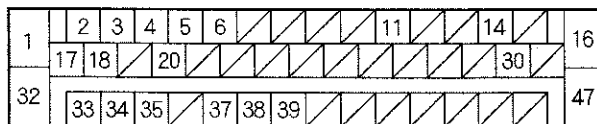
YAW RATE-LATERAL/LONGITUDINAL
ACCELERATION SENSOR 5P CONNECTOR



PCM CONNECTOR E (31P)



VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



WHEEL SENSOR 2P CONNECTOR



Wire side of female terminals

DATA LINK CONNECTOR (16P)



Terminal side of female terminals

DTC Troubleshooting

DTC 11, 13, 15, 17: Wheel Speed Sensor (Short to Power/Short to Body Ground/Open)

1. Turn the ignition switch to ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
4. Test-drive the vehicle at 19 mph (30 km/h) or more.

NOTE: Drive the vehicle on a straight section of road, not on a lift.

5. Check for DTCs with the HDS.

Is DTC 11, 13, 15, and/or 17 indicated?

YES—Go to step 6.

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). Check for loose or poor connections. ■

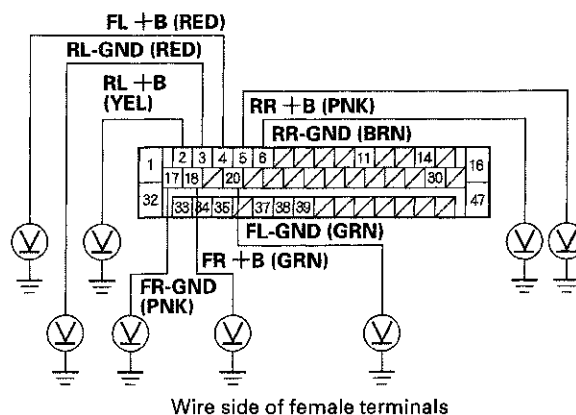
6. Turn the ignition switch to LOCK (0).
7. Disconnect the VSA modulator-control unit 47P connector.

8. Turn the ignition switch to ON (II).

9. Measure the voltage between body ground and the appropriate wheel speed sensor +B and GND terminals of the VSA modulator-control unit 47P connector individually (see table).

DTC	Appropriate Terminal	
	+B	GND
11 (Right-front)	FR +B: No. 18	FR-GND: No. 17
13 (Left-front)	FL +B: No. 4	FL-GND: No. 20
15 (Right-rear)	RR +B: No. 5	RR-GND: No. 6
17 (Left-rear)	RL +B: No. 2	RL-GND: No. 3

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Is there 0.1 V or more?

YES—Repair a short to power in the wire between the VSA modulator-control unit and the appropriate wheel speed sensor. ■

NO—Go to step 10.

(cont'd)

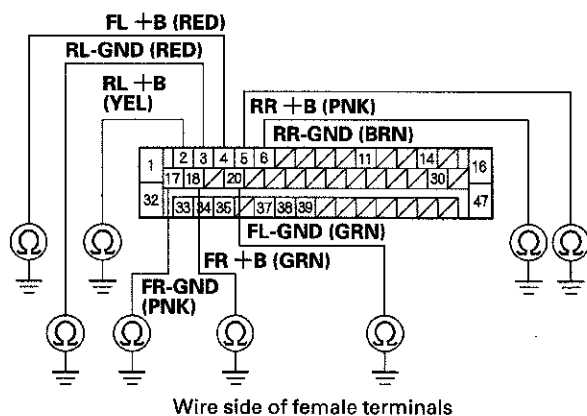
VSA System Components

DTC Troubleshooting (cont'd)

10. Turn the ignition switch to LOCK (0).
11. Check for continuity between body ground and the appropriate wheel speed sensor +B and GND terminals of the VSA modulator-control unit 47P connector individually (see table).

DTC	Appropriate Terminal	
	+B	GND
11 (Right-front)	FR +B: No. 18	FR-GND: No. 17
13 (Left-front)	FL +B: No. 4	FL-GND: No. 20
15 (Right-rear)	RR +B: No. 5	RR-GND: No. 6
17 (Left-rear)	RL +B: No. 2	RL-GND: No. 3

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Is there continuity?

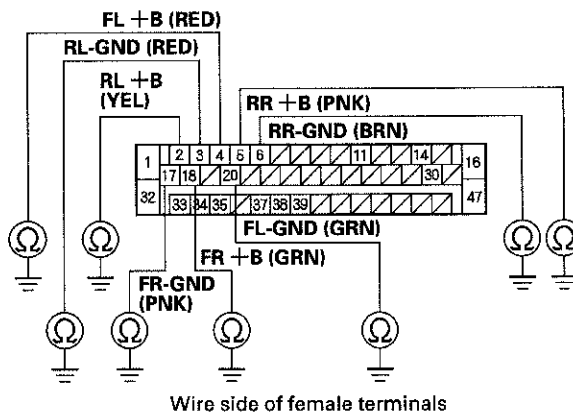
YES—Go to step 12.

NO—Go to step 14.

12. Disconnect the appropriate wheel speed sensor 2P connector.
13. Check for continuity between body ground and the appropriate wheel speed sensor +B and GND terminals of the VSA modulator-control unit 47P connector individually (see table).

DTC	Appropriate Terminal	
	+B	GND
11 (Right-front)	FR +B: No. 18	FR-GND: No. 17
13 (Left-front)	FL +B: No. 4	FL-GND: No. 20
15 (Right-rear)	RR +B: No. 5	RR-GND: No. 6
17 (Left-rear)	RL +B: No. 2	RL-GND: No. 3

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Is there continuity?

YES—Repair a short to body ground in the wire between the VSA modulator-control unit and the wheel speed sensor. ■

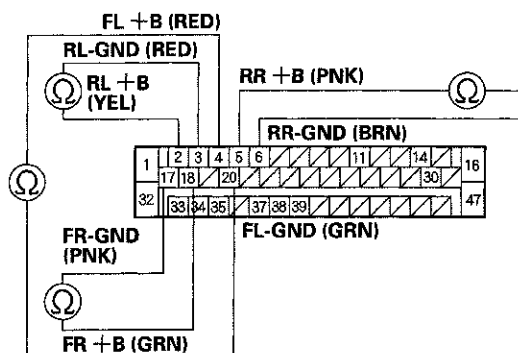
NO—Replace the appropriate wheel speed sensor (see page 19-109). ■

14. Disconnect the appropriate wheel speed sensor 2P connector.

15. Check for continuity between the appropriate wheel speed sensor +B and GND terminals of the VSA modulator-control unit 47P connector (see table).

DTC	Appropriate Terminal	
	+B	GND
11 (Right-front)	FR +B: No. 18	FR-GND: No. 17
13 (Left-front)	FL +B: No. 4	FL-GND: No. 20
15 (Right-rear)	RR +B: No. 5	RR-GND: No. 6
17 (Left-rear)	RL +B: No. 2	RL-GND: No. 3

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

Is there continuity?

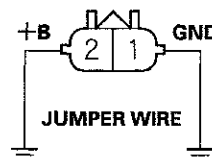
YES—Repair a short in the wires between the VSA modulator-control unit and the wheel speed sensor. ■

NO—Go to step 16.

16. Connect the wheel speed sensor 2P connector terminals No. 1 and No. 2 to body ground with a jumper wire.

DTC	Appropriate Wheel Speed Sensor
11	Right-front
13	Left-front
15	Right-rear
17	Left-rear

WHEEL SPEED SENSOR 2P CONNECTOR



Terminal side of female terminals

(cont'd)

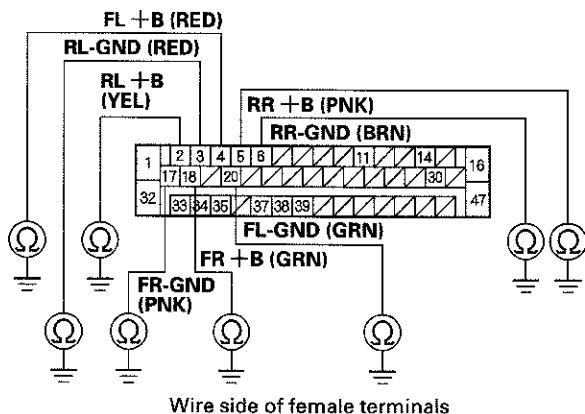
VSA System Components

DTC Troubleshooting (cont'd)

17. Check for continuity between body ground and the appropriate wheel speed sensor +B and GND terminals of the VSA modulator-control unit 47P connector individually (see table).

DTC	Appropriate Terminal	
	+B	GND
11 (Right-front)	FR +B: No. 18	FR-GND: No. 17
13 (Left-front)	FL +B: No. 4	FL-GND: No. 20
15 (Right-rear)	RR +B: No. 5	RR-GND: No. 6
17 (Left-rear)	RL +B: No. 2	RL-GND: No. 3

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

Is there continuity?

YES—Go to step 18.

NO—Repair an open in the wire between the VSA modulator-control unit and the wheel speed sensor. ■

18. Substitute the appropriate wheel speed sensor with the opposite side wheel speed sensor, or with a known-good wheel speed sensor (see page 19-109).

19. Reconnect all connectors.

20. Turn the ignition switch to ON (II).

21. Clear the DTC with the HDS.

22. Test-drive the vehicle at 19 mph (30 km/h) or more.

NOTE: Drive the vehicle on the road, not on a lift.

23. Check for DTCs with the HDS.

Is the same DTC indicated that is indicated in step 4?

YES—Check for loose terminals or poor connections at the VSA modulator-control unit 47P connector. If connections are good, replace the VSA modulator-control unit (see page 19-105), and recheck. ■

NO—Replace the original wheel speed sensor (see page 19-109). ■



DTC 12, 14, 16, 18: Wheel Speed Sensor (Electrical Noise/Intermittent Interruption)

NOTE: If the ABS and the VSA indicator comes on because of electrical noise, the indicator will go off when you test-drive the vehicle at 19 mph (30 km/h) after the system returns to normal.

1. Turn the ignition switch to ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
4. Test-drive the vehicle around a number of corners.

NOTE: Drive the vehicle on the road, not on a lift.

5. Check for DTCs with the HDS.

Is DTC 12, 14, 16 or 18 indicated?

YES—Go to step 6.

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

6. Turn the ignition switch to LOCK (0).

7. Check the appropriate wheel speed sensor and magnetic encoder for debris or damage (see page 19-108).

DTC	Appropriate Magnetic Encoder	Note
12	Right-front	Remove the front hub bearing unit (see page 18-12).
14	Left-front	
16	Right-rear	Remove the rear hub bearing unit (see page 18-27).
18	Left-rear	

Is there debris or damage?

YES—Clean or replace the wheel speed sensor or magnetic encoder. ■

NO—Go to step 8.

8. Disconnect the VSA modulator-control unit 47P connector.

(cont'd)

VSA System Components

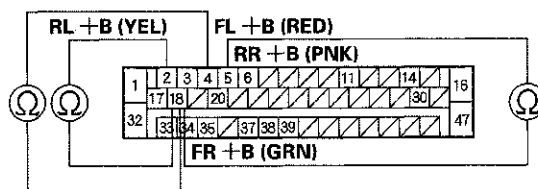
DTC Troubleshooting (cont'd)

9. Check for continuity between the appropriate wheel speed sensor +B terminal and other wheel speed sensor +B terminals of the VSA modulator-control unit 47P connector (see table).

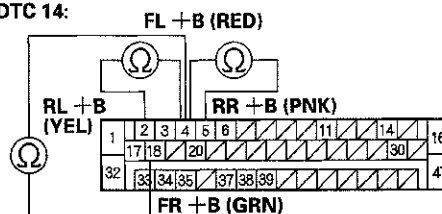
DTC	Appropriate Terminal	Other Terminals		
12	FR +B: No. 18	No. 4	No. 5	No. 2
14	FL +B: No. 4	No. 18	No. 5	No. 2
16	RR +B: No. 5	No. 18	No. 4	No. 2
18	RL +B: No. 2	No. 18	No. 4	No. 5

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR

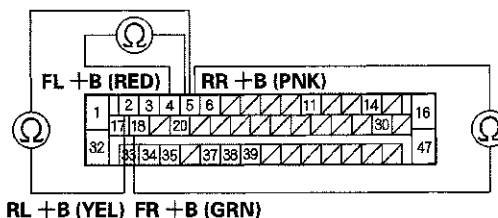
DTC 12:



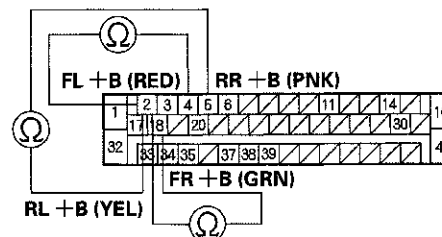
DTC 14:



DTC 16:



DTC 18:



Wire side of female terminals

Is there continuity?

YES—Repair a short in the wire between the appropriate wheel speed sensor and the other wheel speed sensor. ■

NO—Go to step 10.

10. Substitute a known-good wheel speed sensor for the appropriate wheel speed sensor (see table).

DTC	Appropriate Wheel Speed Sensor
12	Right-front
14	Left-front
16	Right-rear
18	Left-rear

11. Turn the ignition switch to ON (II).
12. Clear the DTC with the HDS.
13. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
14. Test-drive the vehicle around a number of corners.

NOTE: Drive the vehicle on the road, not on a lift.

15. Check for DTCs with the HDS.

Is DTC 12, 14, 16 or 18 indicated?

YES—Check for loose terminals or poor connections at the VSA modulator-control unit 47P connector. If connections are good, replace the VSA modulator-control unit (see page 19-105), and recheck. ■

NO—Replace the original wheel speed sensor or encoder (see page 19-109). ■

DTC 21, 22, 23, 24: Magnetic Encoder (Wheel Bearing)

1. Turn the ignition switch to ON (II).
2. Clear the DTC with the HDS.
3. Test-drive the vehicle at 19 mph (30 km/h) or more.
4. Check for DTCs, with the HDS.

Is DTC 21, 22, 23 or 24 indicated?

YES—Go to step 5.

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

5. Inspect the appropriate magnetic encoder for damage, debris, and correct installation (see table).

DTC	Appropriate Encoder	Note
21	Right-front	Remove the front hub bearing unit (see page 18-12).
22	Left-front	
23	Right-rear	Remove the rear hub bearing unit (see page 18-27).
24	Left-rear	

Is the magnetic encoder OK?

YES—Check for loose terminals or poor connections at the VSA modulator-control unit 47P connector. If connections are good, replace the VSA modulator-control unit (see page 19-105), and recheck. ■

NO—Remove the debris from the magnetic encoder, or replace the wheel bearing unit: ■

- Front hub bearing unit (see page 18-12)
- Rear hub bearing unit (see page 18-27)

VSA System Components

DTC Troubleshooting (cont'd)

DTC 25: Yaw Rate Sensor

NOTE: If DTC 27 or 64 is stored at the same time as DTC 25, troubleshoot those DTCs first, then recheck for DTC 25.

1. Turn the ignition switch to ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
4. Test-drive the vehicle around a number of corners.

NOTE: Drive the vehicle on the road, not on a lift.

5. Check for DTCs with the HDS.

Is DTC 25 indicated?

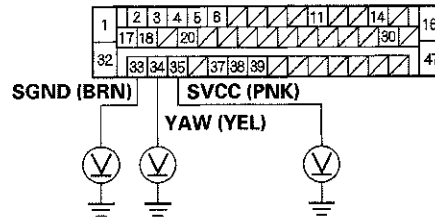
YES—Go to step 6.

NO—The system is OK at this time. Check for loose terminals or poor connections. ■

6. Turn the ignition switch to LOCK (0).
7. Disconnect the VSA modulator-control unit 47P connector and the yaw rate-lateral/longitudinal acceleration sensor 5P connector.
8. Turn the ignition switch to ON (II).

9. Measure the voltage between body ground and the VSA modulator-control unit 47P connector terminals No. 33, No. 34, and No. 35 individually.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

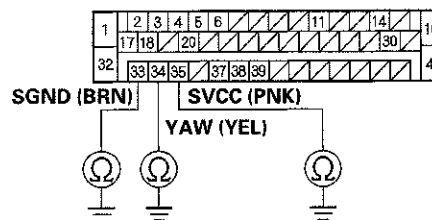
Is there 0.1 V or more?

YES—Repair a short to power in the wire between the VSA modulator-control unit and the yaw rate-lateral/longitudinal acceleration sensor. ■

NO—Go to step 10.

10. Turn the ignition switch to LOCK (0).
11. Check for continuity between body ground and the VSA modulator-control unit 47P connector terminals No. 33, No. 34, and No. 35 individually.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

Is there continuity?

YES—Repair a short to body ground in the wire between the VSA modulator-control unit and the yaw rate-lateral/longitudinal acceleration sensor. ■

NO—Go to step 12.

12. Check for continuity between the VSA modulator-control unit 47P connector terminal No. 35 and the yaw rate-lateral/longitudinal acceleration sensor 5P connector terminal No. 2.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR

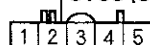
Wire side of female terminals



SVCC (PNK)



SVCC (ORN)



YAW RATE-LATERAL/LONGITUDINAL ACCELERATION SENSOR 5P CONNECTOR

Wire side of female terminals

Is there continuity?

YES—Go to step 13.

NO—Repair an open in the wire between the VSA modulator-control unit and the yaw rate-lateral/longitudinal acceleration sensor. ■

13. Check for continuity between the VSA modulator-control unit 47P connector terminal No. 33 and the yaw rate-lateral/longitudinal acceleration sensor 5P connector terminal No. 4.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR

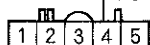
Wire side of female terminals



SGND (BRN)



SGND (BLU)



YAW RATE-LATERAL/LONGITUDINAL ACCELERATION SENSOR 5P CONNECTOR

Wire side of female terminals

Is there continuity?

YES—Go to step 14.

NO—Repair an open in the wire between the VSA modulator-control unit and the yaw rate-lateral/longitudinal acceleration sensor. ■

14. Check for continuity between the VSA modulator-control unit 47P connector terminal No. 34 and the yaw rate-lateral/longitudinal acceleration sensor 5P connector terminal No. 3.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR

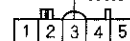
Wire side of female terminals



YAW (YEL)



YAW (LT GRN)



YAW RATE-LATERAL/LONGITUDINAL ACCELERATION SENSOR 5P CONNECTOR

Wire side of female terminals

Is there continuity?

YES—Go to step 15.

NO—Repair an open in the wire between the VSA modulator-control unit and the yaw rate-lateral/longitudinal acceleration sensor. ■

15. Substitute a known-good yaw rate-lateral/longitudinal acceleration sensor (see page 19-103).
16. Reconnect all of the disconnected connectors.
17. Turn the ignition switch to ON (II).
18. Clear the DTC with the HDS.
19. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
20. Test-drive the vehicle around a number of corners.
- NOTE: Drive the vehicle on the road, not on a lift.
21. Check for DTCs with the HDS.

Is DTC 25 indicated?

YES—Check for loose terminals or poor connections at the VSA modulator-control unit 47P connector. If connections are good, replace the VSA modulator-control unit (see page 19-105), and recheck. ■

NO—Replace the original yaw rate-lateral/longitudinal acceleration sensor (see page 19-103). ■

VSA System Components

DTC Troubleshooting (cont'd)

DTC 26: Lateral Acceleration Sensor

NOTE: If DTC 27 or 64 is stored at the same time as DTC 26, troubleshoot those DTCs first, then recheck for DTC 26.

1. Turn the ignition switch to ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
4. Test-drive the vehicle around a number of corners.

NOTE: Drive the vehicle on the road, not on a lift.

5. Check for DTCs with the HDS.

Is DTC 26 indicated?

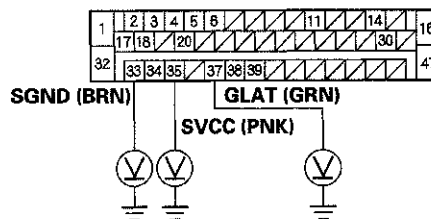
YES—Go to step 6.

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

6. Turn the ignition switch to LOCK (0).
7. Disconnect the VSA modulator-control unit 47P connector and the yaw rate-lateral/longitudinal acceleration sensor 5P connector.
8. Turn the ignition switch to ON (II).

9. Measure the voltage between body ground and the VSA modulator-control unit 47P connector terminals No. 33, No. 35, and No. 37 individually.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

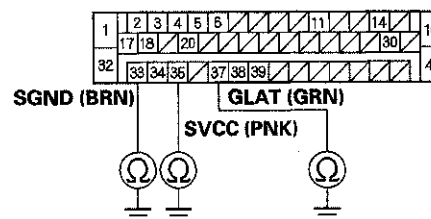
Is there 0.1 V or more?

YES—Repair a short to power in the wire between the VSA modulator-control unit and the yaw rate-lateral/longitudinal acceleration sensor. ■

NO—Go to step 10.

10. Turn the ignition switch to LOCK (0).
11. Check for continuity between body ground and the VSA modulator-control unit 47P connector terminals No. 33, No. 35, and No. 37 individually.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

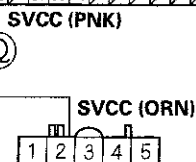
Is there continuity?

YES—Repair a short to body ground in the wire between the VSA modulator-control unit and the yaw rate-lateral/longitudinal acceleration sensor. ■

NO—Go to step 12.

12. Check for continuity between the VSA modulator-control unit 47P connector terminal No. 35 and the yaw rate-lateral/longitudinal acceleration sensor 5P connector terminal No. 2.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR
Wire side of female terminals



**YAW RATE-LATERAL/LONGITUDINAL
ACCELERATION SENSOR 5P CONNECTOR**
Wire side of female terminals

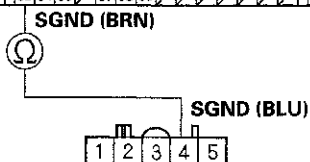
Is there continuity?

YES—Go to step 13.

NO—Repair an open in the wire between the VSA modulator-control unit and the yaw rate-lateral/longitudinal acceleration sensor. ■

13. Check for continuity between the VSA modulator-control unit 47P connector terminal No. 33 and the yaw rate-lateral/longitudinal acceleration sensor 5P connector terminal No. 4.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR
Wire side of female terminals



**YAW RATE-LATERAL/LONGITUDINAL
ACCELERATION SENSOR 5P CONNECTOR**
Wire side of female terminals

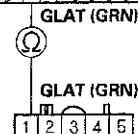
Is there continuity?

YES—Go to step 14.

NO—Repair an open in the wire between the VSA modulator-control unit and the yaw rate-lateral/longitudinal acceleration sensor. ■

14. Check for continuity between the VSA modulator-control unit 47P connector terminal No. 37 and the yaw rate-lateral/longitudinal acceleration sensor 5P connector terminal No. 1.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR
Wire side of female terminals



**YAW RATE-LATERAL/LONGITUDINAL
ACCELERATION SENSOR 5P CONNECTOR**
Wire side of female terminals

Is there continuity?

YES—Go to step 15.

NO—Repair an open in the wire between the VSA modulator-control unit and the yaw rate-lateral/longitudinal acceleration sensor. ■

15. Substitute a known-good yaw rate-lateral/longitudinal acceleration sensor (see page 19-103).
16. Reconnect all of the disconnected connectors.
17. Turn the ignition switch to ON (II).
18. Clear the DTC with the HDS.
19. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
20. Test-drive the vehicle around a number of corners.

NOTE: Drive the vehicle on the road, not on a lift.

21. Check for DTCs with the HDS.

Is DTC 25 indicated?

YES—Check for loose terminals or poor connections at the VSA modulator-control unit 47P connector. If connections are good, replace the VSA modulator-control unit (see page 19-105), and recheck. ■

NO—Replace the original yaw rate-lateral/longitudinal acceleration sensor (see page 19-103). ■

VSA System Components

DTC Troubleshooting (cont'd)

DTC 27: Steering Angle Sensor

1. Turn the ignition switch to ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
4. Test-drive the vehicle around a number of corners.

NOTE: Drive the vehicle on the road, not on a lift.

5. Check for DTCs with the HDS.

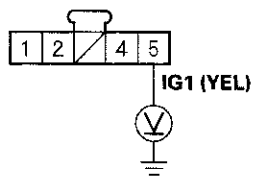
Is DTC 27 indicated?

YES—Go to step 6.

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

6. Turn the ignition switch to LOCK (0).
7. Disconnect the steering angle sensor 5P connector.
8. Turn the ignition switch to ON (II).
9. Measure the voltage between the steering angle sensor 5P connector terminal No. 5 and body ground.

STEERING ANGLE SENSOR 5P CONNECTOR



Wire side of female terminals

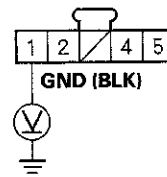
Is there battery voltage?

YES—Go to step 10.

NO—Repair an open in the wire between the No. 18 (15 A) fuse in the driver's under-dash fuse/relay box and the steering angle sensor. ■

10. Turn the ignition switch to LOCK (0).
11. Reconnect the steering angle 5P connector.
12. Measure the voltage between the steering angle sensor 5P connector terminal No. 1 and body ground.

STEERING ANGLE SENSOR 5P CONNECTOR



Wire side of female terminals

Is there 0.1 V or less?

YES—Replace the steering angle sensor (see page 19-102). ■

NO—Repair an open in the wire between the steering angle sensor and body ground (G506). If the wire is OK, check for a poor connection at body ground (G506). ■



DTC 28: Longitudinal Acceleration Sensor

NOTE: If DTC 27 or 64 is stored at the same time as DTC 28, troubleshoot those DTCs first, then recheck for DTC 28.

1. Turn the ignition switch to ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
4. Test-drive the vehicle around a number of corners.

NOTE: Drive the vehicle on the road, not on a lift.

5. Check for DTCs with the HDS.

Is DTC 28 indicated?

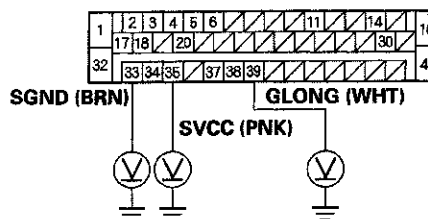
YES—Go to step 6.

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

6. Turn the ignition switch to LOCK (0).
7. Disconnect the VSA modulator-control unit 47P connector and the yaw rate-lateral/longitudinal acceleration sensor 5P connector.
8. Turn the ignition switch to ON (II).

9. Measure the voltage between body ground and the VSA modulator-control unit 47P connector terminals No. 33, No. 35, and No. 39 individually.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

Is there 0.1 V or more?

YES—Repair a short to power in the wire between the VSA modulator-control unit and the yaw rate-lateral/longitudinal acceleration sensor. ■

NO—Go to step 10.

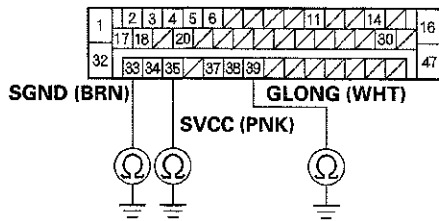
(cont'd)

VSA System Components

DTC Troubleshooting (cont'd)

10. Turn the ignition switch to LOCK (0).
11. Check for continuity between body ground and the VSA modulator-control unit 47P connector terminals No. 33, No. 35, and No. 39 individually.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

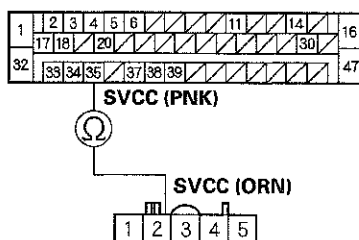
Is there continuity?

YES—Repair a short to body ground in the wire between the VSA modulator-control unit and the yaw rate-lateral/longitudinal acceleration sensor. ■

NO—Go to step 12.

12. Check for continuity between the VSA modulator-control unit 47P connector terminal No. 35 and yaw rate-lateral/longitudinal acceleration sensor 5P connector terminal No. 2.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



YAW RATE-LATERAL/LONGITUDINAL
ACCELERATION SENSOR 5P CONNECTOR
Wire side of female terminals

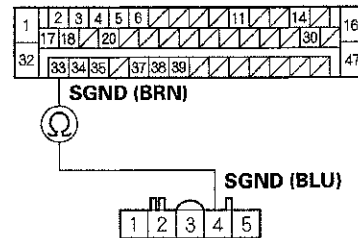
Is there continuity?

YES—Go to step 13.

NO—Repair an open in the wire between the VSA modulator-control unit and the yaw rate-lateral/longitudinal acceleration sensor. ■

13. Check for continuity between the VSA modulator-control unit 47P connector terminal No. 33 and yaw rate-lateral/longitudinal acceleration sensor 5P connector terminal No. 4.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



YAW RATE-LATERAL/LONGITUDINAL
ACCELERATION SENSOR 5P CONNECTOR
Wire side of female terminals

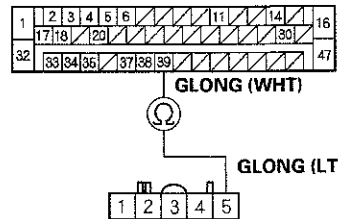
Is there continuity?

YES—Go to step 14.

NO—Repair an open in the wire between the VSA modulator-control unit and the yaw rate-lateral/longitudinal acceleration sensor. ■

14. Check for continuity between the VSA modulator-control unit 47P connector terminal No. 39 and yaw rate-lateral/longitudinal acceleration sensor 5P connector terminal No. 5.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



YAW RATE-LATERAL/LONGITUDINAL
ACCELERATION SENSOR 5P CONNECTOR
Wire side of female terminals

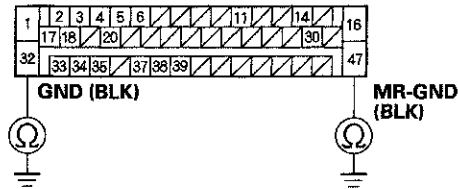
Is there continuity?

YES—Go to step 15.

NO—Repair an open in the wire between the VSA modulator-control unit and the yaw rate-lateral/longitudinal acceleration sensor. ■

15. Check for continuity between body ground and the VSA modulator-control unit 47P connector terminals No. 32 and No. 47 individually.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

Is there continuity?

YES—Go to step 16.

NO—Repair open in the wire between the VSA modulator-control unit and body ground (G202). If the wire is OK, check for a poor connection at body ground (G202). ■

16. Substitute a known-good yaw rate-lateral/longitudinal acceleration sensor.
17. Clear the DTC with the HDS.
18. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
19. Test-drive the vehicle around a number of corners.

NOTE: Drive the vehicle on the road, not on a lift.

20. Check for DTCs with the HDS.

Is DTC 28 indicated?

YES—Check for loose terminals or poor connections at the VSA modulator-control unit 47P connector. If connections are good, replace the VSA modulator-control unit (see page 19-105), and recheck. ■

NO—Replace the yaw rate-lateral/longitudinal acceleration sensor (see page 19-103). ■

DTC 31, 32, 33, 34, 35, 36, 37, 38: ABS Solenoid

1. Turn the ignition switch to ON (II).
2. Clear the DTC with the HDS.
3. Check for DTCs with the HDS.

Does the ABS indicator come on, and are DTCs 31, 32, 33, 34, 35, 36, 37, and/or 38 indicated?

YES—Check for loose terminals or poor connections at the VSA modulator-control unit 47P connector. If connections are good, replace the VSA modulator-control unit (see page 19-105), and recheck. ■

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

VSA System Components

DTC Troubleshooting (cont'd)

DTC 41, 42, 43, 44: Wheel Lock

1. Turn the ignition switch to ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0).
4. Check for brake drag; test-drive the vehicle using the brakes often, raise the vehicle on a lift, rotate each tire by hand.

Do the brakes drag?

YES—Repair the brake drag. ■

NO—Go to step 5.

5. Check the installation of the appropriate wheel speed sensor and magnetic encoder for damage, debris, or excessive air gap (see page 19-108).

DTC	Appropriate Magnetic Encoder	Note
41	Right-front	Remove the driveshaft outboard joint from the appropriate wheel hub (see page 16-4).
42	Left-front	
43	Right-rear	Remove the hub bearing unit (see page 18-27).
44	Left-rear	

Is it correct?

YES—If the DTC does not reappear, the most probable cause for the DTC is that the vehicle might have lost traction in poor weather and spun around. ■

NO—Reinstall or replace the wheel speed sensor (see page 19-109) or wheel bearing unit: ■

- Front hub bearing unit (see page 18-12).
- Rear hub bearing unit (see page 18-27).

DTC 51: Motor Lock

DTC 52: Motor Stuck OFF

1. Turn the ignition switch to ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
4. Test-drive the vehicle around a number of corners.

NOTE: Drive the vehicle on the road, not on a lift.

5. Check for DTCs with the HDS.

Is DTC 51 or 52 indication?

YES—Go to step 6.

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

6. Turn the ignition switch to LOCK (0).
7. Check the No. 17 (30 A) fuse in the under-hood fuse/relay box.

Is the fuse OK?

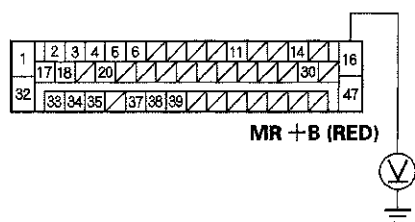
YES—Reinstall the fuse, and go to step 8.

NO—Replace the fuse, and recheck. If the No. 17 (30 A) fuse blows again, repair short to ground in the wire between the No. 17 (30 A) fuse in the under-hood fuse/relay box and the VSA modulator-control unit, then replace the fuse and recheck. ■



8. Disconnect the VSA modulator-control unit 47P connector.
9. Measure the voltage between the VSA modulator-control unit 47P connector terminal No. 16 and body ground.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

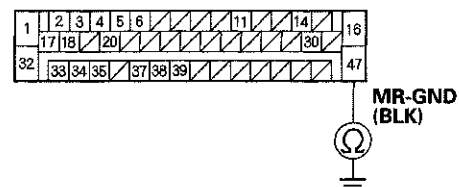
Is there battery voltage?

YES—Go to step 10.

NO—Repair an open in the wire between the No. 17 (30 A) fuse and the VSA modulator-control unit. ■

10. Check for continuity between the VSA modulator-control unit 47P connector terminal No. 47 and body ground.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

Is there continuity?

YES—Go to step 11.

NO—Repair an open in the wire between the VSA modulator-control unit and body ground (G202). If the wire is OK, check for a poor connection at body ground (G202). ■

(cont'd)

VSA System Components

DTC Troubleshooting (cont'd)

11. Reconnect the VSA modulator-control unit 47P connector.
12. Turn the ignition switch to ON (II).
13. Clear the DTC with the HDS.
14. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
15. Test-drive the vehicle at 19 mph (30 km/h) or more.
16. Check for DTCs with the HDS.

Is DTC 51 or 52 indicated?

YES—Check for loose terminals or poor connections at the VSA modulator-control unit 47P connector. If connections are good, replace the VSA modulator-control unit (see page 19-105), and recheck. ■

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

DTC 53: Motor Stuck ON

1. Turn the ignition switch to ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
4. Test-drive the vehicle around a number of corners.

NOTE: Drive the vehicle on the road, not on a lift.

5. Check for DTCs with the HDS.

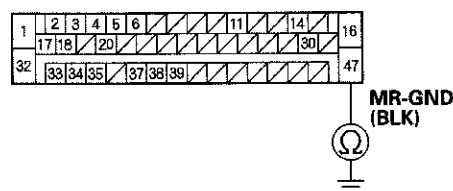
Is DTC 53 indicated?

YES—Go to step 6.

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

6. Turn the ignition switch to LOCK (0).
7. Disconnect the VSA modulator-control unit 47P connector.
8. Check for continuity between the VSA modulator-control unit 47P connector terminal No. 47 and body ground.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

Is there continuity?

YES—Go to step 9.

NO—Repair an open in the wire between the VSA modulator-control unit and body ground (G202). If the wire is OK, check for a poor connection at body ground (G202). ■

9. Reconnect the VSA modulator-control unit 47P connector.
10. Turn the ignition switch to ON (II).
11. Clear the DTC with the HDS.
12. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
13. Test-drive the vehicle at 19 mph (30 km/h) or more.

NOTE: Drive the vehicle on the road, not on a lift.

14. Check for DTCs with the HDS.

Is DTC 53 indicated?

YES—Check for loose terminals or poor connections at the VSA modulator-control unit 47P connector. If connections are good, replace the VSA modulator-control unit (see page 19-105), and recheck. ■

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

DTC 54: Fail-safe Relay

1. Turn the ignition switch to ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
4. Test-drive the vehicle around a number of corners.

NOTE: Drive the vehicle on the road, not on a lift.

5. Check for DTCs with the HDS.

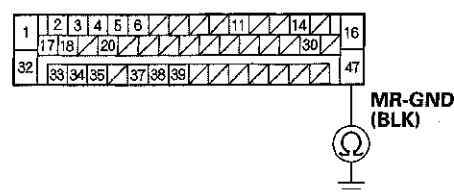
Is DTC 54 indicated?

YES—Go to step 6.

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

6. Turn the ignition switch to LOCK (0).
7. Disconnect the VSA modulator-control unit 47P connector.
8. Check for continuity between the VSA modulator-control unit 47P connector terminal No. 47 and body ground.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

Is there continuity?

YES—Go to step 9.

NO—Repair an open in the wire between the VSA modulator-control unit and body ground (G202). If the wire is OK, check for a poor connection at body ground (G202). ■

(cont'd)

VSA System Components

DTC Troubleshooting (cont'd)

9. Reconnect the VSA modulator-control unit 47P connector.
10. Turn the ignition switch to ON (II).
11. Clear the DTC with the HDS.
12. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
13. Test-drive the vehicle at 19 mph (30 km/h) or more.

NOTE: Drive the vehicle on the road, not on a lift.

14. Check for DTCs with the HDS.

Is DTC 54 indicated?

YES—Check for loose terminals or poor connections at the VSA modulator-control unit 47P connector. If connections are good, replace the VSA modulator-control unit (see page 19-105), and recheck. ■

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

DTC 61, 62: Low/High Voltage

1. Turn the ignition switch to ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
4. Test-drive the vehicle around a number of corners.

NOTE: Drive the vehicle on the road, not on a lift.

Does the ABS indicator come on?

YES—Go to step 5.

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

5. Check for DTCs with the HDS.

Is DTC 61 or 62 indicated?

YES—Check the battery (see page 22-91) and the charging system (see page 4-30). ■

NO—Do the appropriate troubleshooting for the DTC indicated. ■

DTC 64: Sensor Power Voltage

1. Turn the ignition switch to ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
4. Test-drive the vehicle around a number of corners.

NOTE: Drive the vehicle on the road, not on a lift.

5. Check for DTCs with the HDS.

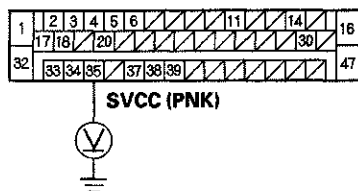
Is DTC 64 indicated?

YES—Go to step 6.

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

6. Turn the ignition switch to LOCK (0).
7. Disconnect the VSA modulator-control unit 47P connector and the yaw rate-lateral/longitudinal acceleration sensor 5P connector.
8. Turn the ignition switch to ON (II).
9. Measure the voltage between the VSA modulator-control unit 47P connector terminal No. 35 and body ground.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

Is there 0.1 V or more?

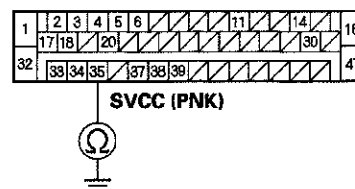
YES—Repair a short to power in the wire between the VSA modulator-control unit and the yaw rate-lateral/longitudinal acceleration sensor. ■

NO—Go to step 10.

10. Turn the ignition switch to LOCK (0).

11. Check for continuity between the VSA modulator-control unit 47P connector terminal No. 35 and body ground.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

Is there continuity?

YES—Repair a short to body ground in the wire between the VSA modulator-control unit and the yaw rate-lateral/longitudinal acceleration sensor. ■

NO—Go to step 12.

12. Turn the ignition switch to ON (II).
13. Clear the DTC with the HDS.
14. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
15. Test-drive the vehicle at 19 mph (30 km/h) or more.

NOTE: Drive the vehicle on the road, not on a lift.

16. Check for DTCs with the HDS.

Is DTC 64 indicated?

YES—Check for loose terminals or poor connections at the VSA modulator-control unit 47P connector. If connections are good, replace the VSA modulator-control unit (see page 19-105), and recheck. ■

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47) and check connections at the VSA modulator-control unit 47P connector and body ground (G202). ■

VSA System Components

DTC Troubleshooting (cont'd)

DTC 65: Brake Fluid Level

1. Check the brake fluid level in the master cylinder reservoir.

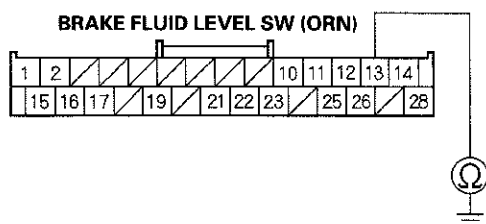
Is the brake fluid level OK?

YES—Go to step 2.

NO—Inspect the brake system for fluid leaks. If no leaks are found, check for worn brake pads. ■

2. Disconnect gauge control module connector B (28P) and the brake fluid level switch 2P connector.
3. Check for continuity between gauge control module connector B (28P) terminal No. 13 and body ground.

GAUGE CONTROL MODULE CONNECTOR B (28P)



Is there continuity?

YES—Repair a short to body ground in the wire between gauge control module connector B and the brake fluid level switch. ■

NO—Go to step 4.

4. Check the brake fluid level switch (see page 19-11).

Is the switch OK?

YES—Do the troubleshooting for the gauge control module (see page 22-396). ■

NO—Replace the reservoir (brake fluid level switch located) on the master cylinder (see page 19-19). ■

DTC 66: VSA Pressure Sensor (Inside of VSA Modulator-Control Unit)

1. Turn the ignition switch to ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
4. Check for DTC s with the HDS.

Is DTC 64 indicated?

YES—Do the troubleshooting for DTC 64 (see page 19-85). ■

NO—Go to step 5.

5. Check the BRAKE PRESS in the VSA DATA LIST with the HDS without pressing the brake pedal.

Is there over 0.8 MPa or more?

YES—Go to step 6.

NO—Replace the VSA modulator-control unit (see page 19-105). ■



6. Press the brake pedal until BRAKE SWITCH in the VSA DATA LIST is turned ON with the HDS.

7. Check the BRAKE PRESS in the VSA DATA LIST with the HDS.

Is there 0 MPa?

YES—Go to step 8.

NO—Check the brake pedal position switch. If necessary, replace the switch (see page 19-6). ■

8. Do the VSA sensor neutral position memorization (see page 19-104).

9. Start the engine and press the brake pedal until BRAKE PRESS in the VSA DATA LIST is 15 MPa with the HDS.

10. Check for DTCs with the HDS.

Is DTC 66 indicated?

YES—Check for loose terminals or poor connections at the VSA modulator-control unit 47P connector. If connections are good, replace the VSA modulator-control unit (see page 19-105), and recheck. ■

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

DTC 68: Brake Pedal Position Switch

1. Check for other DTCs in the PGM-FI system.

Are other DTCs indicated?

YES—Do the appropriate troubleshooting for the DTCs. ■

NO—Go to step 2.

2. Check the brake pedal position switch (see page 19-6).

Is the switch OK?

YES—Go to step 3.

NO—Adjust or replace the brake pedal position switch (see page 19-6). ■

3. Turn the ignition switch to ON (II).

4. Clear the DTC with the HDS.

5. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.

6. Test-drive the vehicle at 19 mph (30 km/h) or more.

NOTE: Drive the vehicle on the road, not on a lift.

7. Check for DTCs with the HDS.

Is DTC 68 indicated?

YES—Go to step 8.

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

8. Troubleshoot the brake pedal position switch circuit (see page 11-311).

Is the brake pedal position switch circuit OK?

YES—Substitute a known-good PCM and recheck: ■

- If the problem is gone, replace the original PCM.
- If the problem continues, replace the VSA modulator-control unit (see page 19-105).

NO—Repair the brake pedal position switch circuit. ■

VSA System Components

DTC Troubleshooting (cont'd)

DTC 71: Different Diameter Tire

1. Turn the ignition switch to ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
4. Test-drive the vehicle at 19 mph (30 km/h) or more.

NOTE: Drive the vehicle on the road, not on a lift.

5. Check for DTCs with the HDS.

Is DTC 71 indicated?

YES—Go to step 6.

NO—Confirm that tire inflation is set to spec. The vehicle is OK at this time. Refer to intermittent failures (see page 19-47). ■

6. Check that all four tires are the specified size and are inflated to the proper specification.

Are all four tires the correct size and properly inflated?

YES—Go to step 7.

NO—Install the correct tires or set the tires to the correct inflation, and retest. ■

7. With the vehicle on level ground, mark each tire with a small spot of grease. Roll the vehicle until each of the tires makes two grease spots on the floor.
8. Measure and record the distance between the two grease spots.

Is the difference between the shortest and the longest measurement more than 10 %?

YES—Replace the tire/tires that is smaller or larger than the others. ■

NO—Check for loose terminals or poor connections at the VSA modulator-control unit 47P connector. If connections are good, replace the VSA modulator-control unit (see page 19-105). ■

DTC 81: Central Processing Unit (CPU)

1. Turn the ignition switch to ON (II).
2. Check for other system DTCs with the HDS.

Is another system DTC indicated?

YES—Do the appropriate troubleshooting for the DTC. ■

NO—Go to step 3.

3. Clear the DTC with the HDS.
4. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
5. Test-drive the vehicle at 19 mph (30 km/h) or more.

NOTE: Drive the vehicle on the road, not on a lift.

6. Check for DTCs with the HDS.

Is DTC 81 indicated?

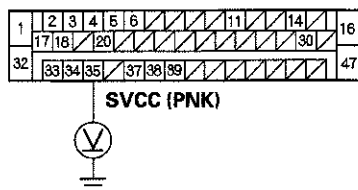
YES—Go to step 7.

NO—The vehicle is OK at this time. Refer to intermittent failures (see page 19-47). ■

7. Turn the ignition switch to LOCK (0).
8. Disconnect the VSA modulator-control unit 47P connector and the yaw rate-lateral/longitudinal acceleration sensor 5P connector.
9. Turn the ignition switch to ON (II).

10. Measure the voltage between the VSA modulator-control unit 47P connector terminal No. 35 and body ground.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

Is there 0.1 V or more?

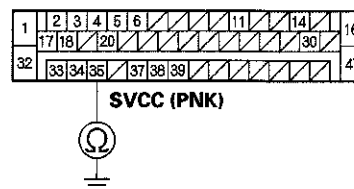
YES—Repair a short to power in the wire between the VSA modulator-control unit and the yaw rate-lateral/longitudinal acceleration sensor. ■

NO—Go to step 11.

11. Turn the ignition switch to LOCK (0).

12. Check for continuity between the VSA modulator-control unit 47P connector terminal No. 35 and body ground.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

Is there continuity?

YES—Repair a short to body ground in the wire between the VSA modulator-control unit and the yaw rate-lateral/longitudinal acceleration sensor. ■

NO—Check for loose terminals or poor connections at the VSA modulator-control unit 47P connector. If connections are good, replace the VSA modulator-control unit (see page 19-105), and recheck. ■

VSA System Components

DTC Troubleshooting (cont'd)

DTC 83: PCM

1. Turn the ignition switch to ON (II).
2. Check for DTCs with the HDS.

Is DTC 86 indicated?

YES—Do the troubleshooting for DTC 86 (see page 19-91). ■

NO—Go to step 3.

3. Clear the DTC with the HDS.
4. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
5. Test-drive the vehicle at 19 mph (30 km/h) or more.

NOTE: Drive the vehicle on the road, not on a lift.

6. Check for DTCs with the HDS.

Is DTC 83 indicated?

YES—Go to step 7.

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

7. Check for fuel and emissions systems DTCs with the HDS.

Are any PCM DTCs indicated?

YES—Do the applicable troubleshooting for the PGM-FI system DTC. ■

NO—Go to step 8.

8. Check the gear position indicator.

Does the D indicator come on while neutral position (N) is selected or is a PCM DTC indicated?

YES—Do the applicable troubleshooting for the A/T system. ■

NO—Check for loose terminals at the PCM connectors, and go to step 9.

9. Clear the DTC with the HDS.
10. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
11. Test-drive the vehicle at 19 mph (30 km/h) or more.

NOTE: Drive the vehicle on the road, not on a lift.

12. Check for DTCs with the HDS.

Is DTC 83 indicated and no PCM's DTC?

YES—Substitute a known-good PCM, and recheck. If the code returns, check for loose terminals or poor connections at the VSA modulator-control unit 47P connector. If connections are good, replace the VSA modulator-control unit (see page 19-105), and recheck. ■

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■



DTC 84: VSA Sensor Neutral Position

1. Turn the ignition switch to ON (II).
2. Clear the DTC with the HDS.
3. Do the VSA sensor neutral position memorization (see page 19-104).
4. Test-drive the vehicle at 19 mph (30 km/h) or more.

NOTE: Drive the vehicle on the road, not on a lift.

5. Check for DTCs with the HDS.

Is DTC 84 indicated?

YES—Substitute a known-good VSA modulator-control unit then retest. If the VSA modulator-control unit was substituted, go to step 1.

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). Check for loose terminals or poor connections. ■

DTC 86: F-CAN Communication

1. Turn the ignition switch to ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
4. Check for fuel and emissions systems DTCs with the HDS.

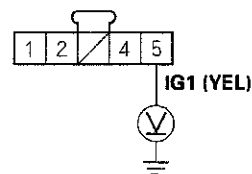
Is another system DTCs indicated?

YES—Do the applicable troubleshooting for the PCM. ■

NO—Go to step 5.

5. Measure the voltage between the steering angle sensor 5P connector terminal No. 5 and body ground.

STEERING ANGLE SENSOR 5P CONNECTOR



Wire side of female terminals

Is there battery voltage?

YES—Go to step 6.

NO—Repair an open in the wire between the No. 18 (15 A) fuse in the driver's under-dash fuse/relay box and the steering angle sensor. ■

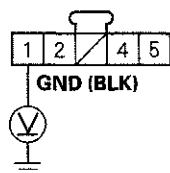
(cont'd)

VSA System Components

DTC Troubleshooting (cont'd)

6. Measure the voltage between the steering angle sensor 5P connector terminal No. 1 and body ground.

STEERING ANGLE SENSOR 5P CONNECTOR



Wire side of female terminals

Is there 0.2 V or less?

YES—Go to step 7.

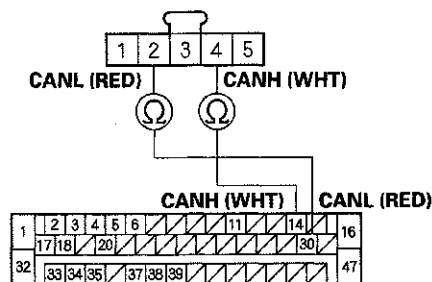
NO—Repair an open in the wire between the steering angle sensor and body ground (G506). If the wire is OK, check for a poor connection at body ground (G506). ■

7. Disconnect the VSA modulator-control unit 47P connector and the steering angle sensor 5P connector.

8. Check for continuity between the VSA modulator-control unit 47P connector terminals No. 14 and No. 30, and the steering angle sensor 5P connector terminals No. 2 and No. 4 individually.

STEERING ANGLE SENSOR 5P CONNECTOR

Wire side of female terminals



VSA MODULATOR-CONTROL UNIT 47P CONNECTOR

Wire side of female terminals

Is there continuity?

YES—Replace the steering angle sensor (see page 19-102). ■

NO—Repair an open in the wire between the steering angle sensor and VSA modulator-control unit. ■



DTC 107: TCS Operation

DTC 108: VSA Operation

NOTE: When DTC 107 or 108 is stored, VSA activation indicator will come on and ABS/VSA indicator will not come on.

1. Turn the ignition switch to ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
4. Test-drive the vehicle at 19 mph (30 km/h) or more.

NOTE: Drive the vehicle on the road, not on a lift.

5. Check for DTCs with the HDS.

Is DTC 107 or 108 indicated?

YES—Check for loose terminals or poor connections at the VSA modulator-control unit 47P connector. If connections are good, replace the VSA modulator-control unit (see page 19-105), and recheck. ■

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

DTC 112: Internal Power Source Stuck OFF

NOTE: If the battery cable was disconnected three times with the ignition switch ON (II), this DTC may be stored.

1. Turn the ignition switch to ON (II).
2. Check for other system DTCs with the HDS.

Is another system DTC indicated?

YES—Do the appropriate troubleshooting for the DTC. ■

NO—Go to step 3.

3. Clear the DTC with the HDS.
4. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
5. Test-drive the vehicle at 19 mph (30 km/h) or more.

NOTE: Drive the vehicle on the road, not on a lift.

6. Check for DTCs with the HDS.

Is DTC 112 indicated?

YES—Go to step 7.

NO—The vehicle is OK at this time. Refer to intermittent failures (see page 19-47). ■

(cont'd)

VSA System Components

DTC Troubleshooting (cont'd)

7. Turn the ignition switch to LOCK (0).
8. Inspect G202 for a clean and tight connection.

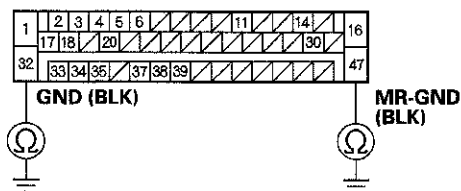
Is G202 clean and properly connected?

YES—Go to step 9.

NO—Repair the connection at G202. ■

9. Disconnect the VSA modulator-control unit 47P connector.
10. Check for continuity between body ground and VSA modulator-control unit 47P connector terminals No. 32 and No. 47 individually.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

Is there continuity?

YES—Check for loose terminals or poor connections at the VSA modulator-control unit 47P connector. If connections are good, replace the VSA modulator-control unit (see page 19-105), and recheck. ■

NO—Repair the open or high resistance between the VSA modulator-control unit and the body ground (G202). ■

DTC 121, 122, 123, 124: VSA Solenoid

1. Turn the ignition switch to ON (II).
2. Clear the DTC with the HDS.
3. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.
4. Test-drive the vehicle at 19 mph (30 km/h) or more.

NOTE: Drive the vehicle on the road, not on a lift.

5. Check for DTCs with the HDS.

Is DTC 121, 122, 123 or 124 indicated?

YES—Check for loose terminals or poor connections at the VSA modulator-control unit 47P connector. If connections are good, replace the VSA modulator-control unit (see page 19-105), and recheck. ■

NO—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

Symptom Troubleshooting

ABS indicator does not come on

1. Turn the ignition switch to ON (II), and watch the ABS indicator.

Does the ABS indicator come on for several seconds?

YES—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

NO—Go to step 2.

2. Apply the parking brake.

Does the brake system indicator come on?

YES—Go to step 3.

NO—Repair an open in the gauge control module indicator power source circuit. ■

3. Turn the ignition switch to LOCK (0).
4. Disconnect the VSA modulator-control unit 47P connector.
5. Turn the ignition switch to ON (II).

Does the VSA indicator come on?

YES—Go to step 6.

NO—Do the troubleshooting for the gauge control module (see page 22-396). ■

6. Turn the ignition switch to LOCK (0).
7. Substitute a known-good VSA modulator-control unit (see page 19-105).
8. Turn the ignition switch to ON (II).

Does ABS indicator come on?

YES—Replace the VSA modulator-control unit (see page 19-105). ■

NO—Do the troubleshooting for the gauge control module (see page 22-396). ■

ABS indicator does not go off, and no DTCs are stored

1. Check the No. 18 (40 A) fuse in the under-hood fuse/relay box.

Is the fuse OK?

YES—Reinstall the fuse, and go to step 2.

NO—Replace the fuse, and recheck. If the fuse is blown, check for a short to body ground in this fuse circuit. If the circuit is OK, replace the VSA modulator-control unit (see page 19-105). ■

2. Check the No. 18 (15 A) fuse in the driver's under-dash fuse/relay box.

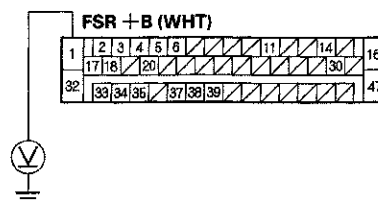
Is the fuse OK?

YES—Reinstall the fuse, and go to step 3.

NO—Replace the fuse, and recheck. If the fuse is blown, check for a short to body ground in this fuse circuit. If the circuit is OK, replace the VSA modulator-control unit (see page 19-105). ■

3. Disconnect the VSA modulator-control unit 47P connector.
4. Measure the voltage between the VSA modulator-control unit 47P connector terminal No. 1 and body ground.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

Is there battery voltage?

YES—Go to step 5.

NO—Repair an open in the wire between the No. 18 (40 A) fuse in the under-hood fuse/relay box and the VSA modulator-control unit. ■

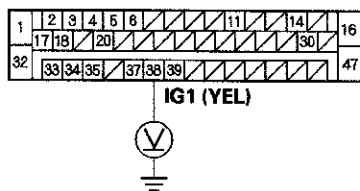
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VSA System Components

Symptom Troubleshooting (cont'd)

5. Turn the ignition switch to ON (II).
6. Measure the voltage between the VSA modulator-control unit 47P connector terminal No. 38 and body ground.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

Is there battery voltage?

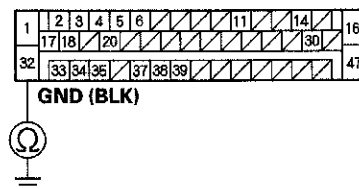
YES—Go to step 7.

NO—Repair an open in the wire between the No. 18 (15 A) fuse in the driver's under-dash fuse/relay box and the VSA modulator-control unit. ■

7. Turn the ignition switch to LOCK (0).

8. Check for continuity between the VSA modulator-control unit 47P connector terminal No. 32 and body ground.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

Is there continuity?

YES—Check for loose terminals or poor connections at the VSA modulator-control unit 47P connector. Substitute a known-good gauge control module, and recheck. If the test results are the same, substitute a known-good VSA modulator-control unit (see page 19-105), and recheck. ■

NO—Repair an open in the wire between the VSA modulator-control unit and body ground (G202). If the wire is OK, check for a poor connection at body ground (G202). ■

Brake system indicator does not come on (check bulb operation with parking brake)

1. With the parking brake applied, turn the ignition switch to ON (II), and watch the brake system indicator.

Does the brake system indicator come on?

YES—The brake system indicator is OK at this time. ■

NO—Go to step 2.

2. Turn the ignition switch to LOCK (0), then turn it to ON (II) again.

Does the ABS indicator come on for several seconds?

YES—Go to step 3.

NO—Repair an open in the indicator power source circuit. If necessary, substitute a known-good gauge control module, and recheck. ■

3. Turn the ignition switch to LOCK (0).

4. Release the parking brake.

5. Turn the ignition switch to ON (II).

Does the brake system indicator come on for several seconds?

YES—Go to step 6.

NO—Check for loose terminals or poor connections at the gauge control module connectors. If connections are good, replace the gauge control module (see page 22-419), and recheck. ■

6. Apply the parking brake.

Does the brake system indicator come on?

YES—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

NO—Go to step 7.

7. Turn the ignition switch to LOCK (0).

8. Disconnect the parking brake switch connector (see page 19-11).

9. Turn the ignition switch to ON (II).

10. Measure the voltage between the parking brake switch connector terminal and body ground.

Is there battery voltage?

YES—Replace the parking brake switch (see page 19-11). ■

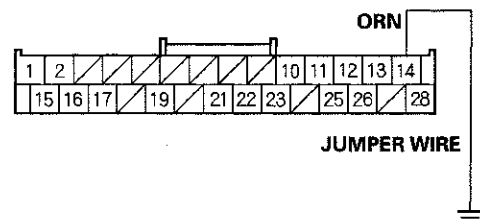
NO—Go to step 11.

11. Turn the ignition switch to LOCK (0).

12. Remove the gauge control module (see page 22-419). Leave the gauge control module connectors connected.

13. Connect gauge control module connector B (28P) terminal No. 14 to body ground with a jumper wire.

GAUGE CONTROL MODULE CONNECTOR B (28P)



Wire side of female terminals

14. Turn the ignition switch to ON (II).

Does the brake system indicator come on and stay on?

YES—Repair an open in the wire between the gauge control module and the parking brake switch. ■

NO—Replace the gauge control module (see page 22-419). ■

VSA System Components

Symptom Troubleshooting (cont'd)

Brake system indicator does not go off, and no DTCs are stored

1. Turn the ignition switch to ON (II).

2. Release the parking brake.

Does the brake system indicator go off after several seconds?

YES—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

NO—Go to step 3.

3. Check the brake fluid level (see page 19-9).

Is the level OK?

YES—Go to step 4.

NO—Inspect the brake system for fluid leak. If no leaks are found, replace all worn brake pads. ■

4. Check the ABS indicator.

Does the ABS indicator stay on?

YES—Read the DTC (see page 19-48), and do the applicable troubleshooting for the DTC. ■

NO—Check the brake system indicator circuit: ■

- Short to body ground between the gauge control module and the parking brake switch.
- Short to body ground between the gauge control module and the brake fluid level switch.
- Parking brake switch stuck ON.
- Brake fluid level switch stuck ON.
- Faulty gauge control module.

VSA indicator does not come on

1. Turn the ignition switch to ON (II), and watch the VSA indicator.

Does the VSA indicator come on for several seconds?

YES—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

NO—Go to step 2.

2. Apply the parking brake.

Does the brake system indicator come on?

YES—Go to step 3.

NO—Repair an open in the gauge control module indicator power source circuit. ■

3. Turn the ignition switch to LOCK (0).

4. Disconnect the VSA modulator-control unit 47P connector.

5. Turn the ignition switch to ON (II).

Does the VSA indicator come on?

YES—Go to step 6.

NO—Do the troubleshooting for the gauge control module (see page 22-396). ■

6. Turn the ignition switch to LOCK (0).

7. Substitute a known-good VSA modulator-control unit (see page 19-105).

8. Turn the ignition switch to ON (II).

Does the VSA indicator come on?

YES—Check for loose terminals or poor connections at the VSA modulator-control unit 47P connector. If connections are good, replace the VSA modulator-control unit (see page 19-105), and recheck. ■

NO—Do the troubleshooting for the gauge control module (see page 22-396). ■

VSA indicator does not go off, and no DTCs are stored

1. Check the No. 18 (40 A) fuse in the under-hood fuse/relay box.

Is the fuse OK?

YES—Reinstall the fuse, and go to step 2.

NO—Replace the fuse, and recheck. If the fuse is blown, check for a short to body ground in this fuse circuit. If the circuit is OK, replace the VSA modulator-control unit (see page 19-105). ■

2. Check the No. 18 (15 A) fuse in the driver's under-dash fuse/relay box.

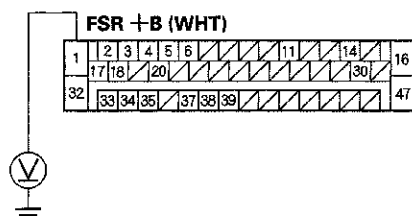
Is the fuse OK?

YES—Reinstall the fuse, and go to step 3.

NO—Replace the fuse, and recheck. If the fuse is blown, check for a short to body ground in this fuse circuit. If the circuit is OK, replace the VSA modulator-control unit (see page 19-105). ■

3. Disconnect the VSA modulator-control unit 47P connector.
4. Measure the voltage between VSA modulator-control unit 47P connector terminal No. 1 and body ground.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

Is there battery voltage?

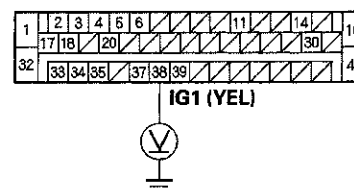
YES—Go to step 5.

NO—Repair an open in the wire between the No. 18 (40 A) fuse and the VSA modulator-control unit. ■

5. Turn the ignition switch to ON (II).

6. Measure the voltage between VSA modulator-control unit 47P connector terminal No. 38 and body ground.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

Is there battery voltage?

YES—Go to step 8.

NO—Repair an open in the wire between the No. 18 (15 A) fuse in the driver's under-dash fuse/relay box and the VSA modulator-control unit. ■

7. Turn the ignition switch to LOCK (0).

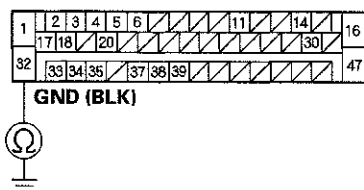
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VSA System Components

Symptom Troubleshooting (cont'd)

8. Check for continuity between VSA modulator-control unit 47P connector terminal No. 32 and body ground.

VSA MODULATOR-CONTROL UNIT 47P CONNECTOR



Wire side of female terminals

Is there continuity?

YES—Check for loose terminals or poor connections at the VSA modulator-control unit 47P connector. Substitute a known-good gauge control module, and recheck. If the test results are the same, substitute a known-good VSA modulator-control unit and recheck. ■

NO—Repair an open in the wire between the VSA modulator-control unit and body ground (G202). ■

VSA activation indicator does not come on at start-up (bulb check)

1. Turn the ignition switch to ON (II), and watch the VSA activation indicator.

Does the VSA activation indicator come on for several seconds?

YES—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

NO—Go to step 2.

2. Apply the parking brake.

Does the brake system indicator come on?

YES—Go to step 3.

NO—Repair an open in the gauge control module indicator power source circuit. ■

3. Turn the ignition switch to LOCK (0).
4. Substitute a known-good VSA modulator-control unit (see page 19-105).
5. Turn the ignition switch to ON (II).

Does the VSA activation indicator come on?

YES—Replace the VSA modulator-control unit (see page 19-105). ■

NO—Do the troubleshooting for the gauge control module (see page 22-396). ■

VSA activation indicator does not go off, and no DTCs are stored

1. Turn the ignition switch to ON (II), and watch the VSA indicator.

Does the VSA indicator go off?

YES—The system is OK at this time. Refer to intermittent failures troubleshooting (see page 19-47).

NO—Go to step 2. ■

2. Turn the ignition switch to LOCK (0).
3. Check the VSA OFF switch (see page 19-104).

Is the switch OK?

YES—Go to step 4.

NO—Replace the VSA OFF switch (see page 19-104). ■

4. Turn the ignition switch to ON (II).
5. Clear the DTC with the HDS.
6. Do the VSA sensor neutral memorization (see page 19-104).
7. Clear the DTC with the HDS.
8. Check the VSA activation indicator.

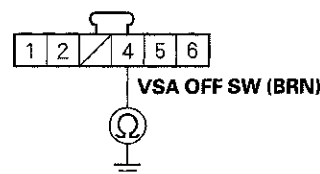
Does the VSA activation indicator go off?

YES—The system is OK at this time. Refer to intermittent failures (see page 19-47). ■

NO—Go to step 9.

9. Turn the ignition switch to LOCK (0).
10. Disconnect the VSA OFF switch 6P connector.
11. Remove the gauge control module, and disconnect gauge control module connector B (28P) (see page 22-419).
12. Check for continuity between the VSA OFF switch 6P connector terminal No. 4 and body ground.

VSA OFF SWITCH 6P CONNECTOR



Wire side of female terminals

Is there continuity?

YES—Repair a short to body ground in the wire between the gauge control module and the VSA OFF switch. ■

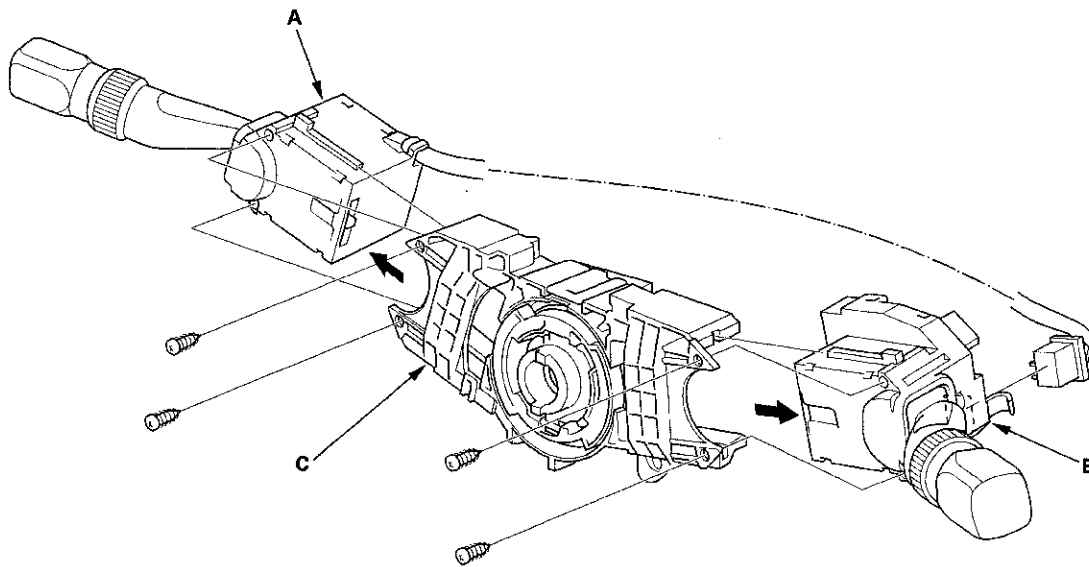
NO—Check for loose terminals or poor connections at the gauge control module connectors. If connections are good, replace the gauge control module (see page 22-419) and recheck. ■

VSA System Components

Steering Angle Sensor Replacement

NOTE: Do not damage or drop the combination switch as the steering angle sensor is sensitive to shock and vibration.

1. Make sure the ignition switch is in LOCK (0).
2. Remove the steering wheel (see page 17-22).
3. Remove the steering column cover and combination switch assembly (see page 17-25).
4. Remove the combination light switch (A) and the wiper/washer switch (B).



5. Replace the combination switch body complete (C).
6. Install the combination switch in the reverse order of removal.

NOTE: Do not remove the steering angle sensor from the combination switch body.

7. Do the VSA sensor neutral position memorization (see page 19-104).
8. Do the adaptive front lighting control unit learning procedure (see page 22-267).

Yaw Rate-Lateral/Longitudinal Acceleration Sensor Replacement

NOTE:

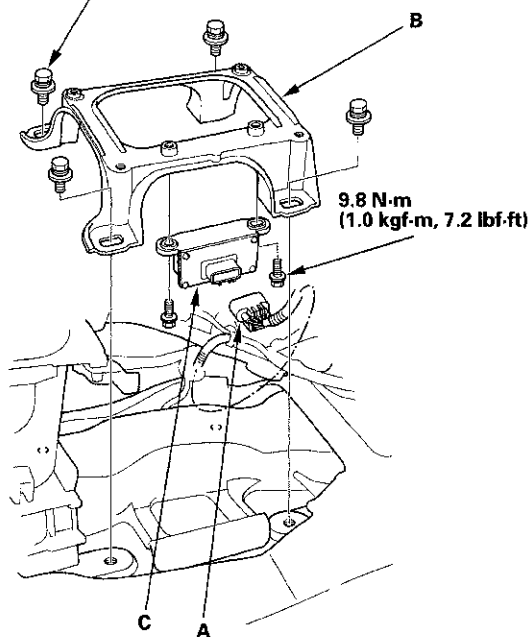
- Do not damage or drop the sensor as it is sensitive.
- Do not use power tools.

1. Make sure the ignition switch is in LOCK (0).
2. Remove the center console side panel (see step 5 on page 20-93).
3. Remove the center console panel (see step 1 on page 20-92).
4. Remove the shift lever mounting bolts (see step 7 on page 14-231).

NOTE: Only remove items needed to gain access.

5. Remove the yaw rate-lateral/longitudinal acceleration sensor bracket attachment bolts, and then disconnect the sensor connector (A).

9.8 N·m
(1.0 kgf·m, 7.2 lbf·ft)



6. Pull out the yaw rate-lateral/longitudinal acceleration sensor bracket (B) with the yaw rate-lateral/longitudinal acceleration sensor.
7. Remove the sensor mounting bolts, and then separate the sensor (C) from the bracket.

8. Install the sensor in the reverse order of removal.

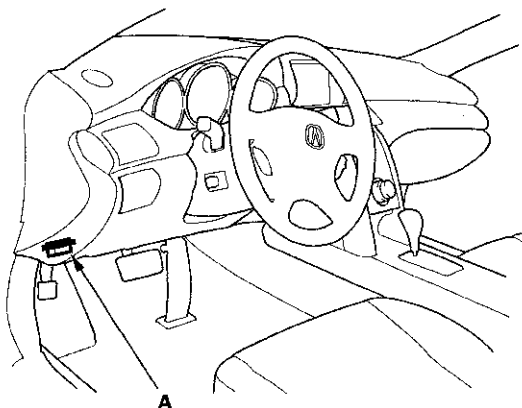
9. Do the VSA sensor neutral position memorization (see page 19-104).

VSA System Components

VSA Sensor Neutral Position Memorization

NOTE: Make sure to connect and disconnect the HDS to the 16P data link connector (DLC) with the ignition switch in LOCK (0).

1. Start the engine, let it idle.
2. Slowly drive the vehicle straight without operating the steering wheel for 3 m (10 ft) or more, then park the vehicle on a flat ahead surface while holding the steering wheel in the straight ahead position.
3. With the ignition switch in LOCK (0), connect the HDS to the 16P data link connector (DLC) (A) under the driver's side of the dashboard.



4. Turn the ignition switch to ON (II).
5. Do the VSA sensor neutral position memorization with the HDS.

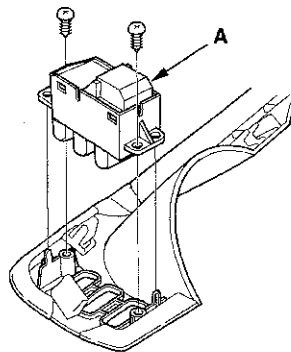
NOTE:

- VSA neutral position memorized by clearing DTC with the HDS.
- Do not press the brake pedal during this procedure.
- Make sure the HDS communicates with the vehicle and the VSA modulator-control unit. If it doesn't troubleshoot the DLC circuit (see page 11-211).

6. Turn the ignition switch to LOCK (0).

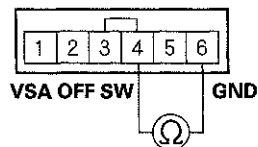
VSA OFF Switch Test

1. Remove the instrument fascia (see page 20-99).
2. Remove the VSA OFF switch (A) from the switch panel.



3. Disconnect the VSA OFF switch 6P connector.
4. Check for continuity between the VSA OFF switch 6P connector terminals No. 4 and No. 6. There should be continuity when the button is pressed, and no continuity when the button is released.

VSA OFF SWITCH 6P CONNECTOR



Terminal side of male terminals

5. Install the VSA OFF switch in the reverse order of removal.

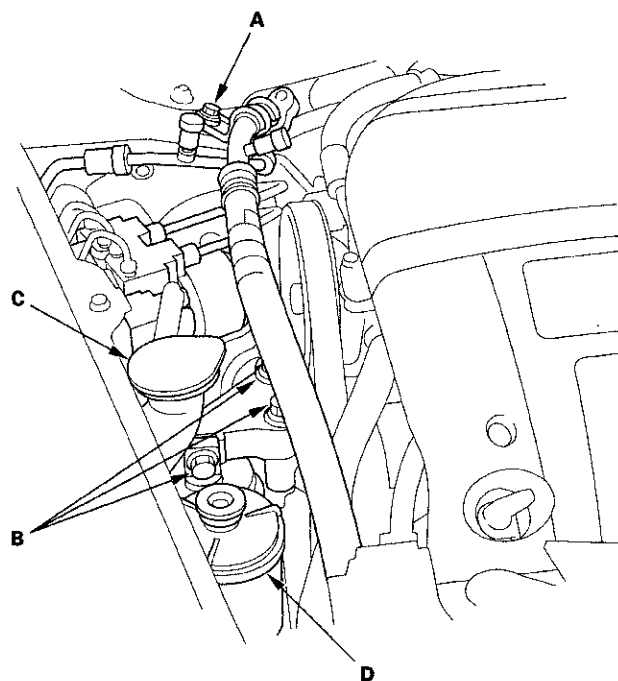
VSA Modulator-Control Unit Removal and Installation

NOTE:

- Do not spill brake fluid on the vehicle; it may damage the paint. If brake fluid gets on the paint, wash it off immediately with water.
- Be careful not to damage or deform the brake lines during removal and installation.
- To prevent the brake fluid from flowing, plug and cover the hose ends and joints with a shop towel or equivalent material.

Removal

1. Make sure the ignition switch is LOCK (0).
2. Remove the right upper fender trim (see page 20-162).
3. Remove the A/C line mounting bolt (A).



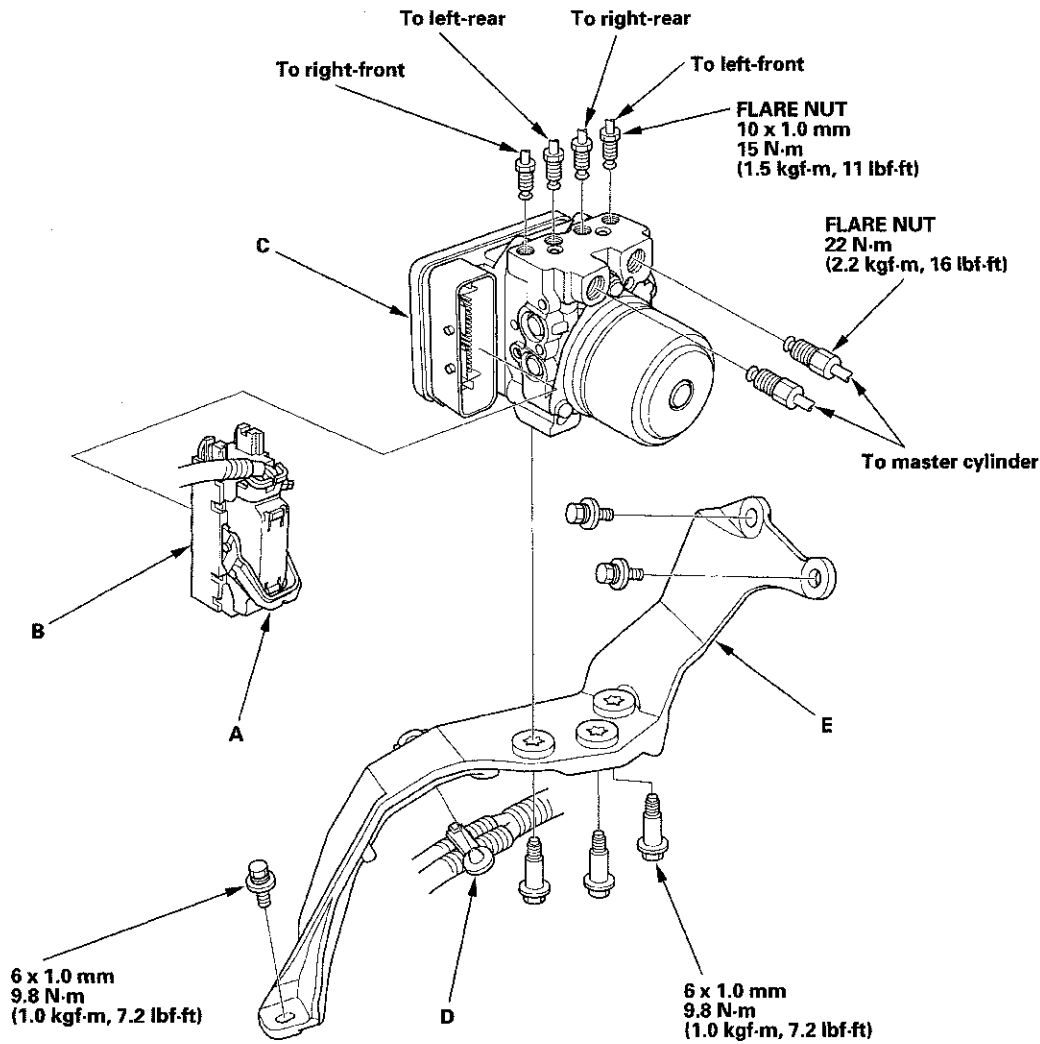
4. Remove the engine mount bracket mounting bolts (B).
5. Remove the upper portion of the washer reservoir (C).
6. Remove the power steering fluid reservoir (D) bracket.

(cont'd)

VSA System Components

VSA Modulator-Control Unit Removal and Installation (cont'd)

7. Pull down the lock (A) of the VSA modulator-control unit 47P connector (B), and the connector disconnects itself.



8. Disconnect the six brake lines from the VSA modulator-control unit (C).
9. Disconnect the harness clip (D).
10. Remove the three 6 mm bolts, then remove the VSA modulator-control unit with bracket (E) from the body.
11. Remove the three 6 mm bolts, then remove the VSA modulator-control unit from the bracket.



Installation

1. Install the VSA modulator-control unit to the bracket, then tighten the three 6 mm bolts.
2. Install the VSA modulator-control unit/bracket on the body, then tighten the three 6 mm bolts.
3. Reconnect the six brake lines, then tighten the nuts.
4. Align the connecting surface of the VSA modulator-control unit 47P connector.
5. Carefully push in the lock of the VSA modulator-control unit 47P connector until you hear it click into place, then confirm the connector is fully seated.
6. Install the power steering fluid reservoir bracket and upper portion of the washer reservoir.
7. Install the engine mount bracket mounting bolts.
8. Install the A/C line mounting bolt.
9. Install the right upper fender trim (see page 20-162).
10. Bleed the brake system, starting with the front wheels (see page 19-9).
11. Do the VSA sensor neutral position memorization (see page 19-104).
12. Start the engine, and check that the ABS and VSA indicators go off.
13. Test-drive the vehicle, and check that the ABS and VSA indicators do not come on.
14. If the brake pedal is now spongy, there may be air trapped in the modulator and then induced into the normal brake system during modulation. Bleed the brake system again, starting with the front wheels (see page 19-9).

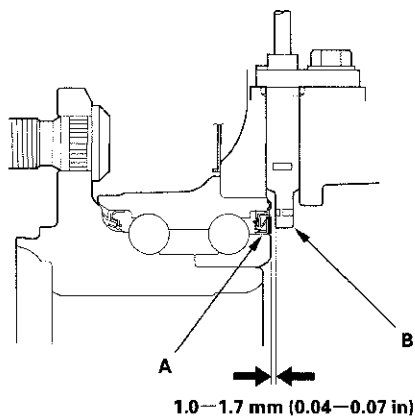
VSA System Components

Wheel Speed Sensor Inspection

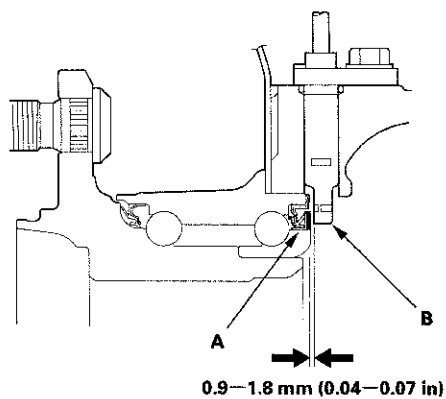
NOTE: The outer board joint must be removed to inspect the magnetic encoder.

- Front driveshaft removal (see page 16-4).
 - Rear driveshaft removal (see page 16-28).
1. Clean the magnetic encoder, and make sure no metal or other debris is stuck to the magnetic encoder surface.
 2. Check the magnetic encoder (A) for damage. If cracked or damaged, replace the encoder (wheel bearing).
- Front hub bearing unit replacement (see page 18-11).
 - Rear hub bearing unit replacement (see page 18-26).

Front



Rear



3. Measure the air gap between the wheel speed sensor (B) and the magnetic encoder all the way around while rotating the encoder.

Standard:

Front: 1.0–1.7 mm (0.04–0.07 in)

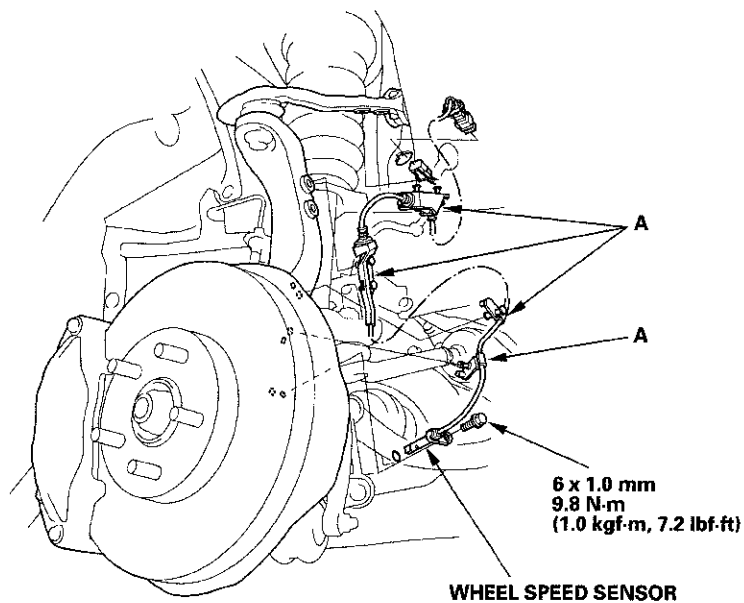
Rear: 0.9–1.8 mm (0.04–0.07 in)

Wheel Speed Sensor Replacement

NOTE:

- Install the sensor carefully to avoid twisting the wires.
- Replace the clamps (A) when the wheel speed sensors are removed or replaced.

Front



Rear

