

TRACTION CONTROL SYSTEM

1993 Saab 9000

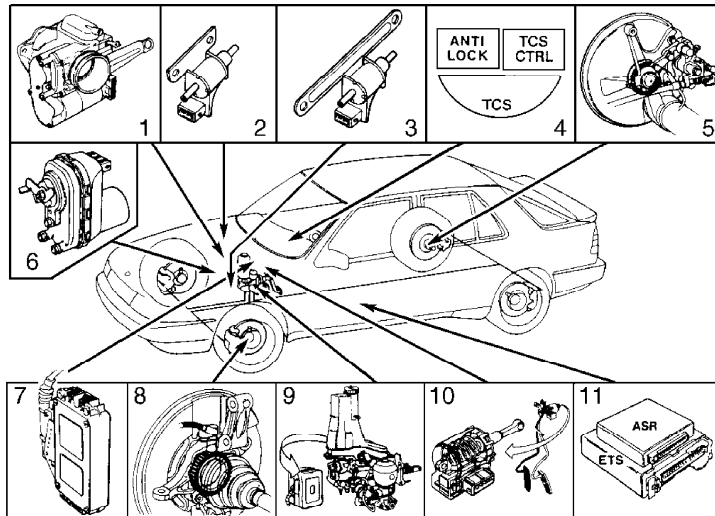
1993 BRAKES
Saab Traction Control
9000 Series

DESCRIPTION

Saab Traction Control System (TCS) operates in tandem with appropriate Anti-lock Braking (ABS) system. Saab 9000 series vehicles are equipped with Mark IV ABS. TCS is made up of 2 subsystems: ABS and Electronic Throttle System (ETS). System also incorporates a cruise control function. An additional Automatic Slip Reduction (ASR) system is used on automatic transmission models.

TCS uses many components already included in ABS system, including wheel sensors, hydraulic unit and valve block. TCS system consists of 2 different variations, one for manual transmission and one for automatic transmission. See Figs. 1 and 2.

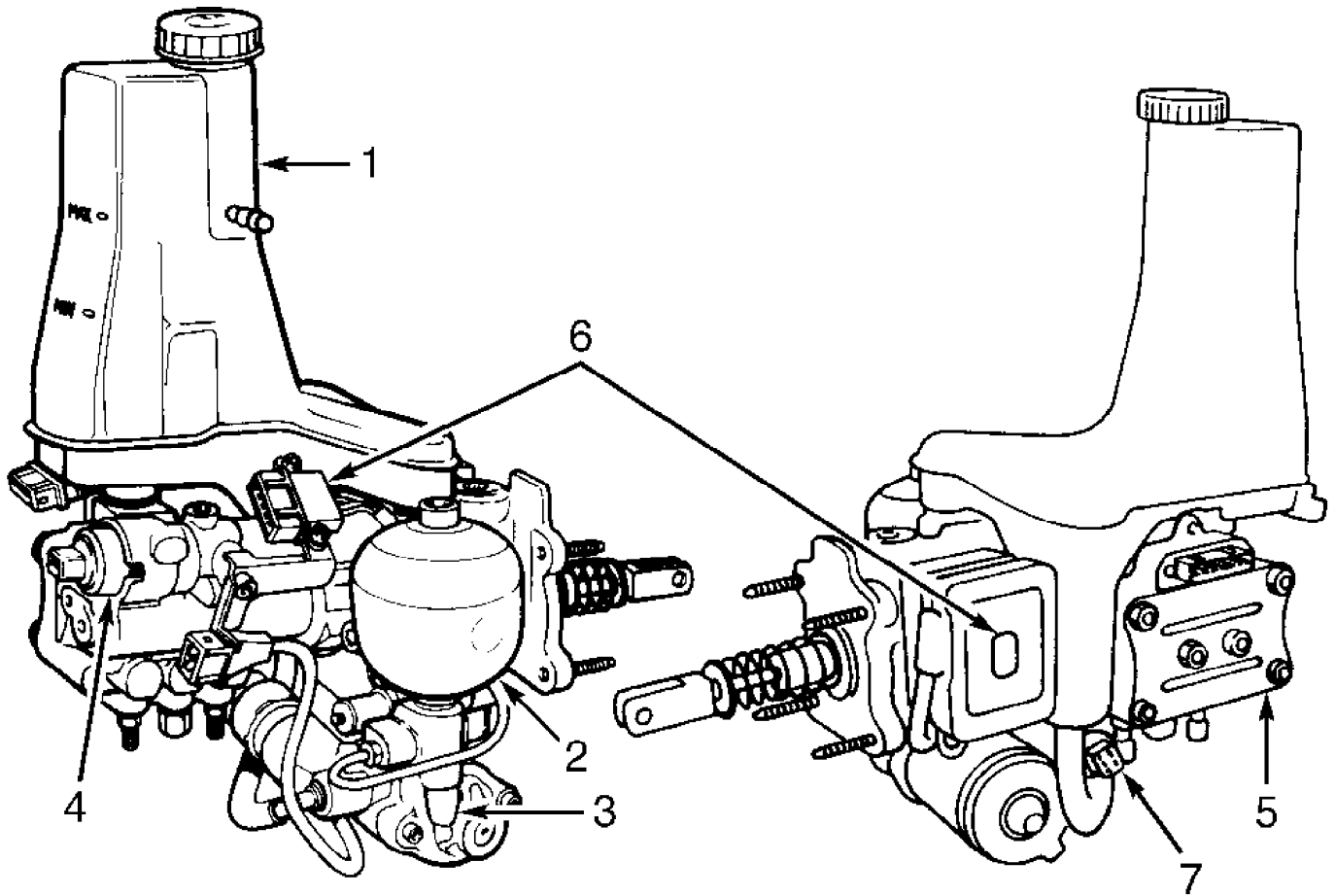
Manual transmission TCS has capability to apply front brakes independently during low speed wheel spin and also close throttle valve to reduce wheel spin at any speed. Automatic transmission TCS does not have capability to apply brakes during wheel spin conditions. Automatic transmission TCS does control operation of transmission kickdown cable in addition to controlling throttle valve. ABS components of system include a 55-terminal ECU (located on battery shelf), ABS hydraulic unit (with traction control valve block on manual transmission version), wheel speed sensors, and warning lights. See Fig. 3.



- | | |
|---------------------|--------------------------|
| 1. Throttle Housing | 7. TC/ABS ECU |
| 2. Safety Valve | 8. Wheel Sensor |
| 3. Control Valve | 9. TC/ABS Hydraulic Unit |
| 4. Warning Lights | 10. Pedal Sensor |
| 5. Wheel Sensor | 11. ASR & ETS ECU |
| 6. KDW Motor | |

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Fig. 1: Identifying TCS System Components
Courtesy of Saab-Scania of America, Inc.

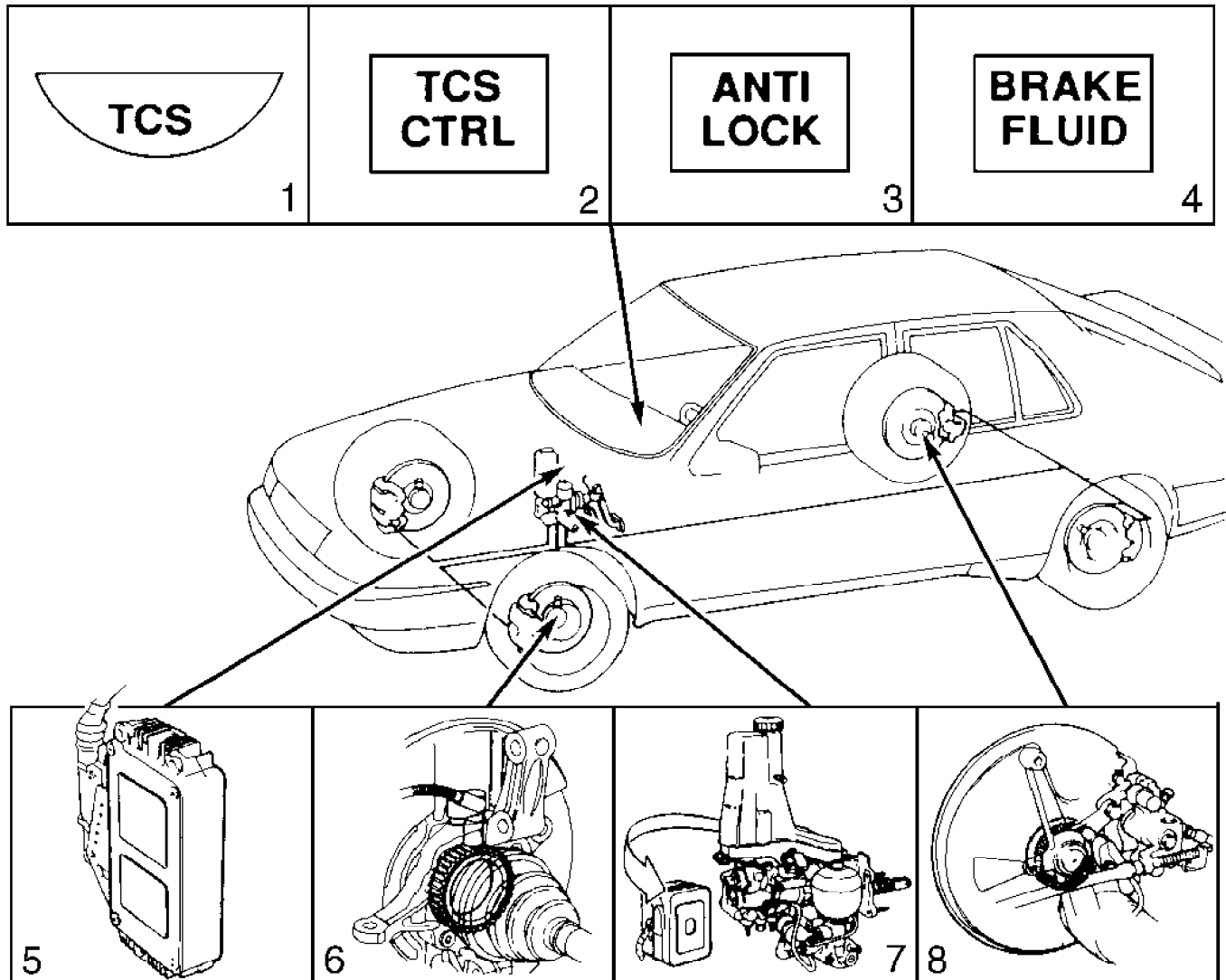


- 1. Brake Fluid Reservoir
- 2. Accumulator
- 3. High Pressure Pump
- 4. Main Valve

- 5. Valve Block
- 6. TC Block & Connector
- 7. Pressure Warning Switch

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Fig. 2: Identifying TC/ABS Hydraulic Unit Components
 Courtesy of Saab-Scania of America, Inc.



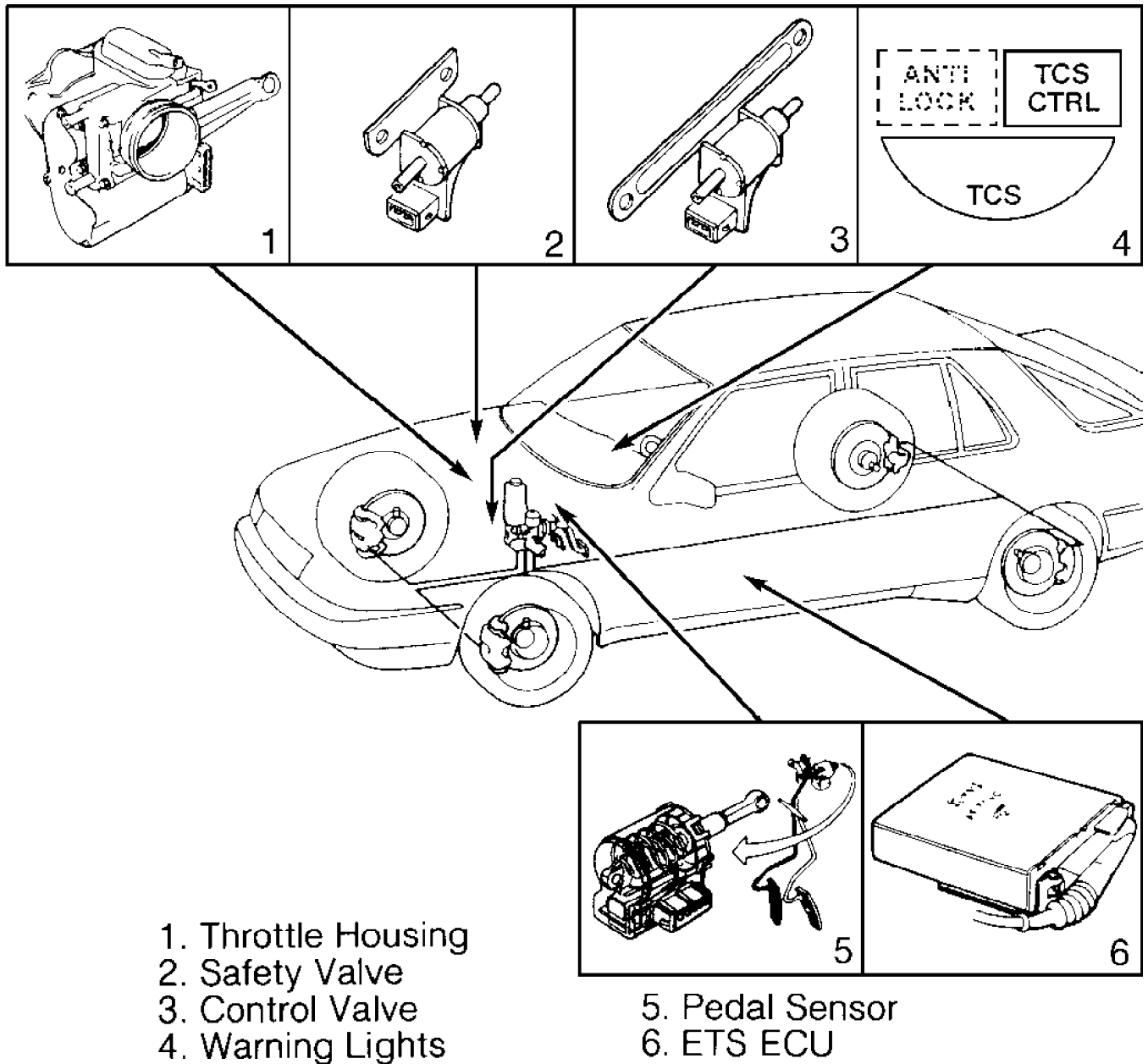
- 1. TCS Warning Light
- 2. TCS CTRL Warning Light
- 3. ANTI LOCK Warning Light
- 4. BRAKE FLUID Warning Light

- 5. TC/ABS ECU
- 6. Wheel Sensor
- 7. TC/ABS Hydraulic Unit
- 8. Wheel Sensor

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Fig. 3: Identifying TC/ABS System Components
 Courtesy of Saab-Scania of America, Inc.

Electronic Throttle System (ETS) utilizes a throttle cable only as an emergency limp-home measure, as it is an electronic (as opposed to mechanical) throttle operating system. Throttle is operated by a Pulse-Width Modulated (PWM) DC motor. ETS/ECU is located under driver's seat. See Fig. 4.



1. Throttle Housing
2. Safety Valve
3. Control Valve
4. Warning Lights

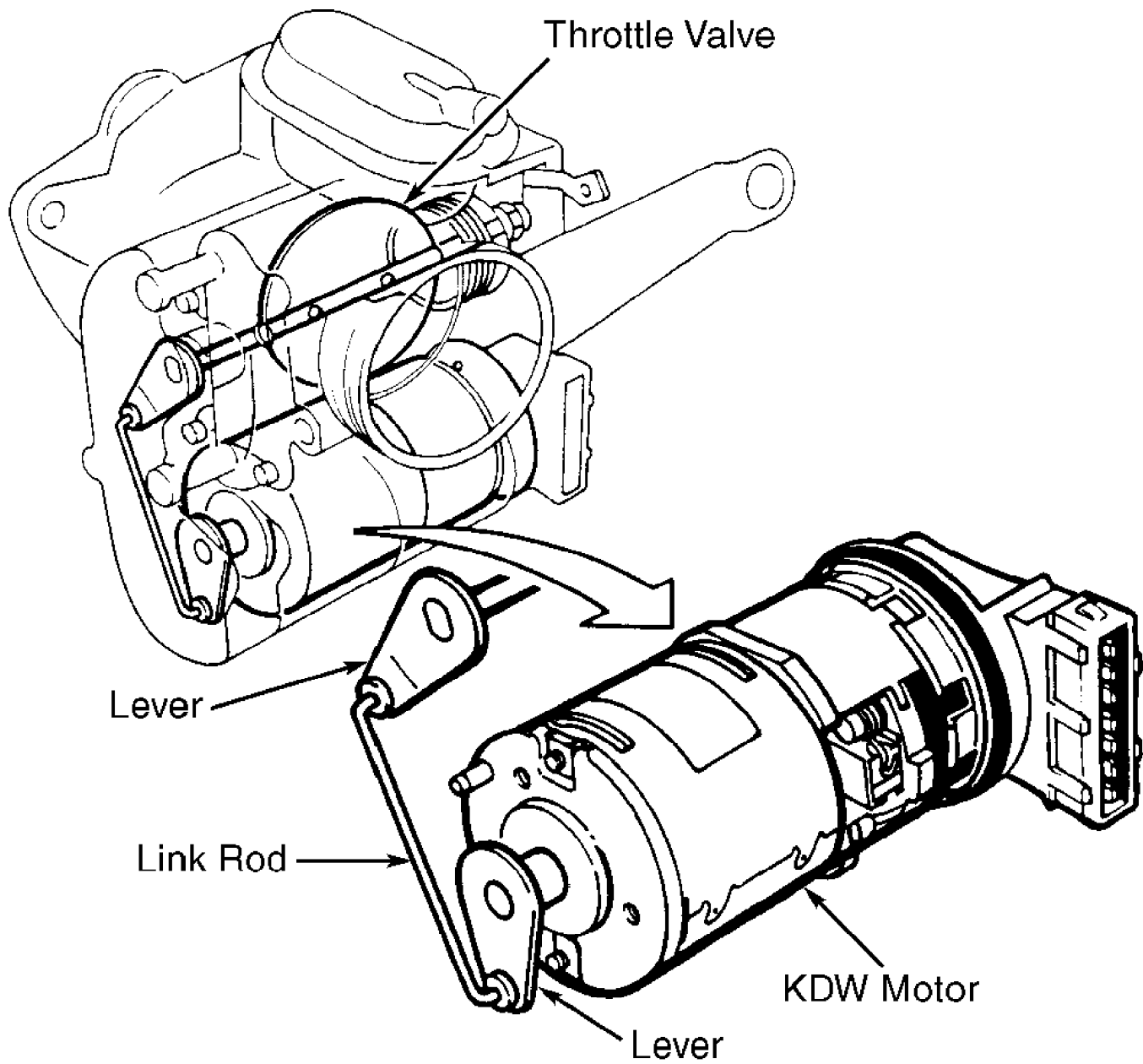
5. Pedal Sensor
6. ETS ECU

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Fig. 4: Identifying ETS System Components
 Courtesy of Saab-Scania of America, Inc.

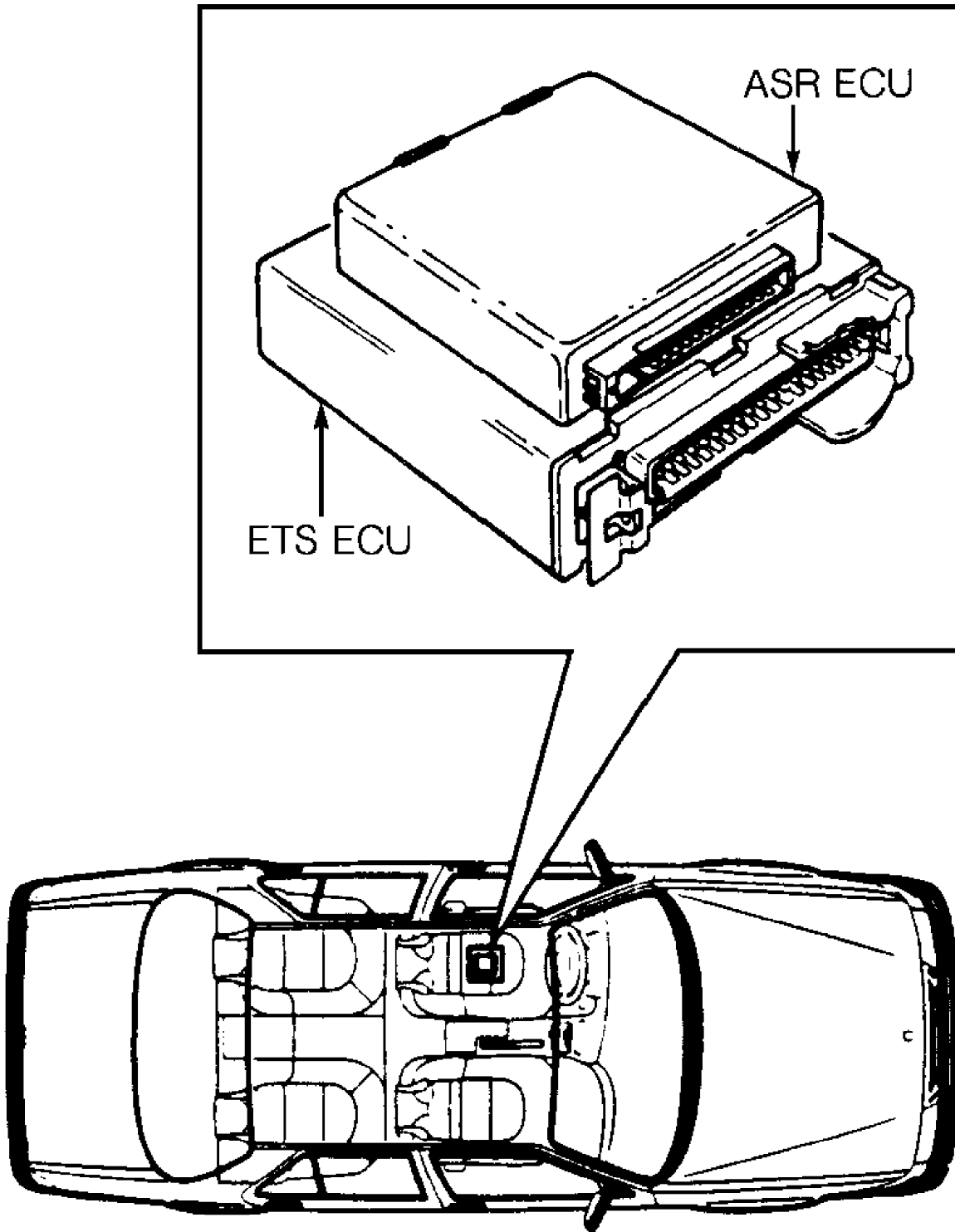
ETS components of system include a 38-pin ECU, throttle housing assembly, pedal potentiometer, and solenoid valves. ETS ECU is identical for both manual and automatic transmission versions. If a new ECU is installed, it must be calibrated in order to identify which version car it is being used on.

Automatic Slip Reduction (ASR) components of system include 25-pin ECU and Kickdown Wire (KDW) motor. See Fig. 5. ASR ECU is located on ETS ECU, under driver's seat. See Fig. 6. ASR system operates in much the same way as manual transmission version, except it is much more sensitive. Generally, the driver is not aware of its operation other than that the TCS light is on.



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Fig. 5: Locating KDW Motor
Courtesy of Saab-Scania of America, Inc.



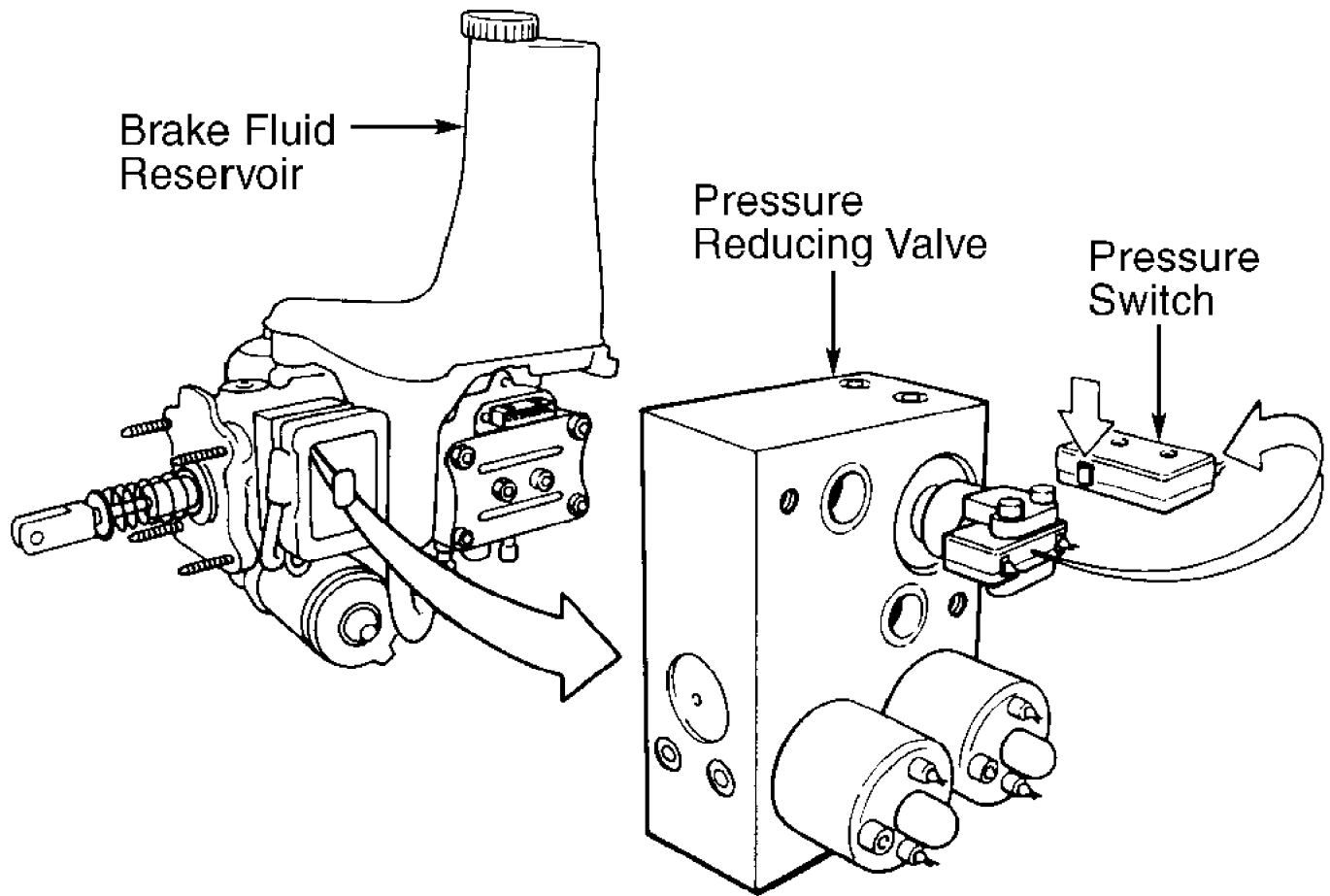
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Fig. 6: Locating ASR ECU
Courtesy of Saab-Scania of America, Inc.

OPERATION

TC/ABS ECU INPUT SIGNALS

TC/ABS ECU receives signals from 4 wheel sensors which provide input on wheel speed. TC/ABS ECU also receives signals from monitoring circuit for hydraulic pressure and brake fluid level. Pressure switch in TC block sends signals to TC/ABS ECU with information on whether the brake is activated and whether TC or ABS mode is operative (manual transmission version only). See Fig. 7. Signal from pressure switch is compared with input signal from brake light switch. TC/ABS ECU also communicates with ETS ECU. TC/ABS ECU is located on battery shelf. ETS ECU is located under driver's seat.



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Fig. 7: Locating Pressure Switch
Courtesy of Saab-Scania of America, Inc.

TC/ABS ECU OUTPUT SIGNALS

TC/ABS ECU sends signals to inlet and outlet valves, main valve, TC valves (manual transmission only), TC/ABS system relay, ports for communication with ETS ECU and Saab Intelligent Tester (ISAT), and warning lights.

TC/ABS SYSTEM SAFETY FEATURES

Overview

If pressure in accumulator is exhausted, power assistance for front wheel circuits and brake pressure for rear wheel circuit will also be lost. In this condition, braking can only be achieved by means of direct pedal pressure on front wheel circuits.

If fluid level in reservoir is low, there will still be power assistance for front wheel circuits and operating pressure for rear wheel circuit. Both ABS and TCS systems will be disabled.

BRAKE FLUID Warning Light

Light will come on to indicate either low pressure or low fluid level.

ANTI LOCK Warning Light

Light will come on when anything occurs that disables TC/ABS system such as ECU fault, sensor fault, valve fault, low pressure, or low fluid level.

TCS CTRL Warning Light

Light will come on if there is a communication fault between TC/ABS system and ETS system, or if there is a fault in either system.

TCS Indicator Light

This indicates TCS system is operating.

Internal Monitoring System

Internal monitoring system, which monitors levels of input and output signals, will break operating circuit to system relay if a fault should occur in TC/ABS ECU, a valve or wheel sensor, in power supply, or ground.

SERVICING

Manufacturer recommends replacing brake fluid every 30,000 miles.

BLEEDING BRAKE SYSTEM

See ANTI-LOCK BRAKE SYSTEM article in this section.

DIAGNOSIS & TESTING

RETRIEVING CODES (TC/ABS SYSTEM)

NOTE: To retrieve ETS codes, see RETRIEVING CODES (ETS SYSTEM)

1) Codes for TC/ABS system can only be retrieved with Saab Intelligent Tester (ISAT-86 10 651). Diagnostic Green connector is located under passenger's front seat. Saab Intelligent Tester (ISAT) can also send system command codes for activating system functions and clearing fault codes.

2) Ensure ignition switch is in DRIVE position. ISAT system number for TC/ABS system is No. 3. Always retrieve and note all stored fault codes before disconnecting battery or TC/ABS ECU.

3) If communication cannot be established between ISAT and TC, check wiring between TC/ABS ECU terminals No. 23 (Yellow wire) and No. 42 (Blue wire), and Green diagnostic connector. Ensure power feed and ground circuits to diagnostic connector are good and connector terminals are not damaged. In addition, be aware that some faults will disable ISAT communications abilities of TC/ABS ECU.

4) After fault codes stored in TC/ABS ECU have been transferred to ISAT, diagnosis function is completed. It is now

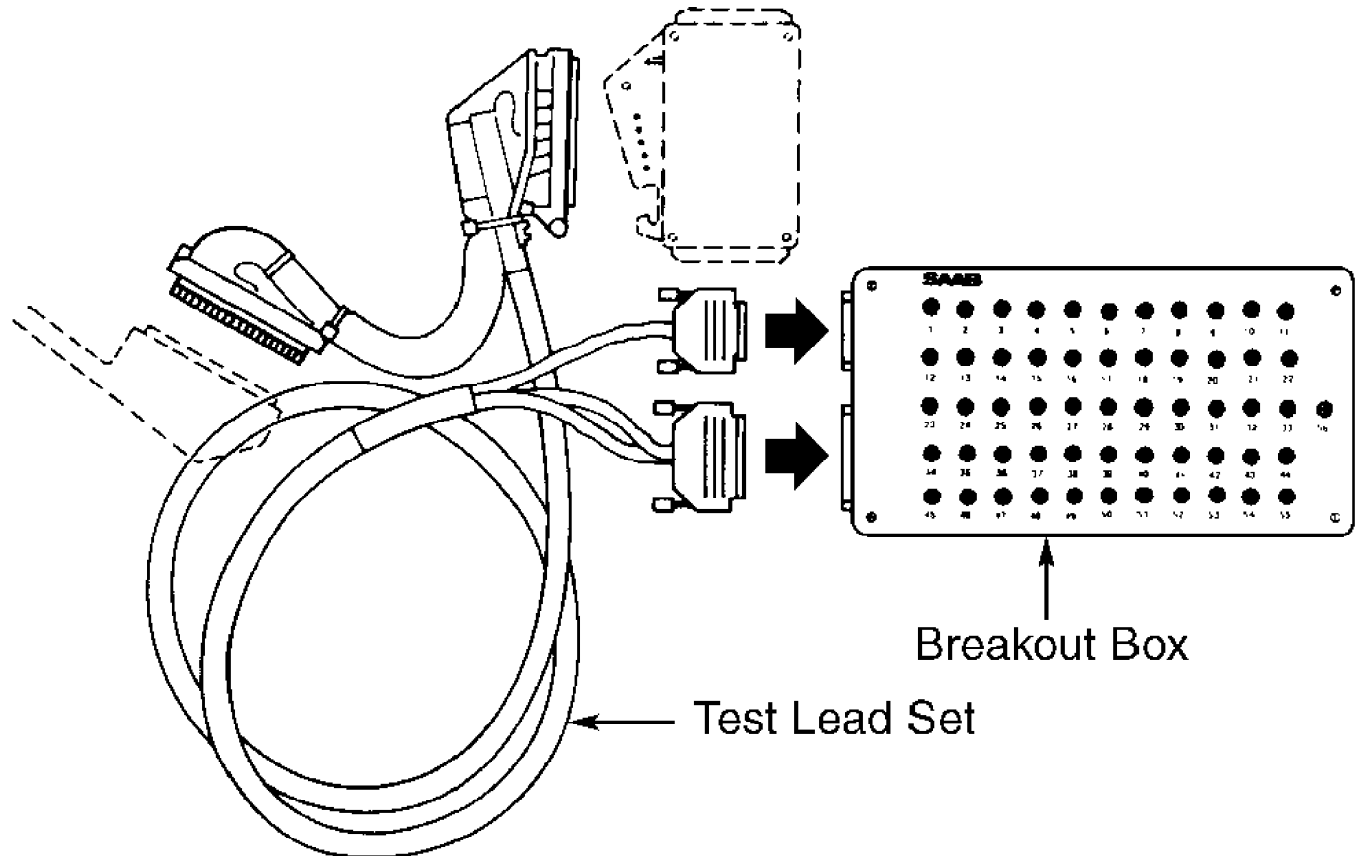
necessary to enter any command codes which apply to the problem present. It may be helpful to enter all command codes to determine whether certain signals and components are correct.

5) Ensure ignition is off before disconnecting TC/ABS ECU connector. Before tracing faults on a system, always start by checking ground and voltage circuits for TC/ABS ECU. Check all connectors by unplugging and plugging them back together. Start engine or drive vehicle again to check whether fault or faults return.

6) When first detected, a fault will be assigned a permanent fault code. If fault later disappears, fault will be intermittent. All signals around 12-volt level are proportional to battery voltage. These levels should be used as a rough guide. Zero voltage signal levels indicate ground.

7) If ISAT command codes are being used to test system while car is being driven, communication between ISAT and TC/ABS ECU will be broken if vehicle speed exceeds 12 MPH. If no fault codes can be read, even though warning lights are on, check warning light terminals No. 8 (Blue wire) and No. 51 (Brown wire) for a short circuit to voltage.

8) Because TC/ABS ECU connector on wiring harness is a molded plug, test probes cannot be connected to back of connector. Use Breakout Box (8611006) with Test Lead Set (8611030) which should be connected between TC/ABS ECU and connector. See Fig. 8. Many tests require TC/ABS ECU be disconnected.



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Fig. 8: Identifying Breakout Box & Test Lead Set
Courtesy of Saab-Scania of America, Inc.

WARNING: Under no circumstances should vehicle be driven with breakout box installed.

TC/ABS TROUBLE CODES TABLE

| Continuous Code (Intermittent Code) (1) | Problem |
|---|---|
| (775B1) | TC/ABS ECU Fault |
| (775B2) | TC/ABS ECU Fault (RAM) |
| E7061 (F7061) | No Communication With ETS |
| 32251 (22251) | System Relay Function Faulty |
| 35321 (25321) | Brake Light Switch Function Faulty |
| (36521) | Pressure Switch Function Faulty |
| (36522) | Safety Circuit Open Or Shorted |
| 44221 (24221) | No Signal From Left Front Wheel Sensor |
| 44222 (24222) | No Signal From Right Front Wheel Sensor |
| 44223 (24223) | No Signal From Left Rear Wheel Sensor |
| 44224 (24224) | No Signal From Right Rear Wheel Sensor |
| (2422A) | Incorrect Signal From Left Front Wheel Sensor (Greater Than 25 MPH) |
| (2422B) | Incorrect Signal From Right Front Wheel Sensor (Greater Than 25 MPH) |
| (2422C) | Incorrect Signal From Left Rear Wheel Sensor (Greater Than 25 MPH) |
| (2422D) | Incorrect Signal From Right Rear Wheel Sensor (Greater Than 25 MPH) |
| (24291) | Incorrect Signal From Left Front Wheel Sensor (Less Than 25 MPH) |
| (24292) | Incorrect Signal From Right Front Wheel Sensor (Less Than 25 MPH) |
| (24293) | Incorrect Signal From Left Rear Wheel Sensor (Less Than 25 MPH) |
| (24294) | Incorrect Signal From Right Rear Wheel Sensor (Less Than 25 MPH) |
| (24251) | Incorrect Signal From Left Front Wheel Sensor |
| (24252) | Incorrect Signal From Right Front Wheel Sensor |
| (24253) | Incorrect Signal From Left Rear Wheel Sensor |
| (24254) | Incorrect Signal From Right Rear Wheel Sensor |
| 53421 (33421) | Left Front Inlet Valve Inoperative |
| 53422 (33422) | Left Front Outlet Valve Inoperative |
| 53423 (33423) | Right Front Inlet Valve Inoperative |
| 53424 (33424) | Right Front Outlet Valve Inoperative |
| 53425 (33425) | Left Rear Inlet Valve Inoperative |
| 53426 (33426) | Left Rear Outlet Valve Inoperative |
| 53427 (33427) | Main Valve Fault |
| 53428 (33428) | NC TC-Block Valve Fault |
| 53429 (33429) | NO TC-Block Valve Fault |
| (234B1) | Hydraulic Fault In Left Front Outlet Valve |
| (234B2) | Hydraulic Fault In Right Front Outlet Valve |
| (234B3) | Hydraulic Fault In Left Rear Outlet Valve |
| (234B4) | Hydraulic Fault In Right Rear Outlet Valve |

(1) - Intermittent codes are in parentheses.

NOTE: Breakout box pin numbers match TC/ABS ECU terminal numbers.
 Diagnose all other trouble codes before diagnosing Codes
 3/22251

Trouble Codes 3/22251 (Loss Of Supply Voltage)

1) Connect breakout box to TC/ABS ECU. Connect voltmeter between breakout box pin No. 1 (ground) and breakout box pins No. 3, 33, and 35. If voltage is not present at all pins, check fuse and Red wire between fuse and TC/ABS ECU terminal No. 53.

2) If voltage is not present at one pin, check wiring between

TC/ABS ECU terminal No. 34 (Green wire) and system relay terminal No. 4, and between TC/ABS ECU terminal No. 33 (Yellow wire) and system relay terminal No. 1.

3) If voltage is present at pin No. 35 only, check system relay operating circuit (Red and Black wires) and that no other codes exist for faults that could cause break in circuit.

4) If voltage is not present at breakout box pins No. 34, 3, and 33, check ABS 10-amp fuse. If fuse is okay, check for voltage at TC/ABS ECU terminal No. 53. If voltage is not present, check Red/White voltage supply wire to ABS fuse. If voltage is present, check Green wire between relay terminal No. 86 and TC/ABS ECU terminal No. 34. Check for battery voltage at system relay terminal No. 85 (Black wire). If voltage is not present, check Black wire for an open circuit.

5) If battery voltage is present at breakout box pin No. 34 but not at pins No. 3 and 33, operating circuit is okay but TC/ABS ECU cannot ground the circuit because of another fault in ABS system.

6) If battery voltage is present at breakout box pin No. 34 but fault Code 3/22251 is still present, check resistance between breakout box pins No. 85 and 86. If resistance is approximately 75 ohms, relay is okay. If resistance is not approximately 75 ohms, replace relay.

Fault Code 36522 (ANTI-LOCK & TCS CTRL Lights On)

1) Turn ignition on. Enter ISAT command Code 201. If display shows 8B100, it indicates continuity between TC/ABS ECU terminals No. 8 and 51. If display shows 8B000, it indicates an open circuit.

2) Turn ignition off. Remove TC/ABS ECU and connect breakout box. Turn ignition on. Check for voltage between breakout box pin No. 8 and ground, and between pin No. 51 and ground. If voltage is present, check circuit between pins No. 8 and 51 for a short to voltage. If no voltage is present, turn ignition off. Reconnect TC/ABS ECU. Clear code and see if it returns. If code returns, go to ANTI-LOCK & TCS CTRL LIGHTS ON (WITHOUT CODE). If no other faults are found, install a new TC/ABS ECU.

ANTI-LOCK & TCS CTRL Lights On (Without Code)

1) Turn ignition on. Enter ISAT command Code 201. If display shows 8B100, it indicates continuity between TC/ABS ECU terminals No. 8 and 51. If display shows 8B000, it indicates an open circuit.

2) Turn ignition off. Remove TC/ABS ECU and connect breakout box. Measure resistance between breakout box pin No. 8 and ground, and between pin No. 51 and ground. No continuity should be present. If continuity is present, check wiring and connections for a short to ground. If wiring and connections are okay, go to ALL WARNING LIGHTS ON (INCLUDING BRAKE WARNING LIGHT).

All Warning Lights On (Including Brake Warning Light)

1) Turn ignition on. Ensure ABS pump is running and brake fluid level is okay. If fluid is low, check system for leaks and fill with DOT 4 brake fluid.

2) If pump is not running, check pump 30-amp fuse and pump relay operating circuit 10-amp fuse. If fluid level and pump are okay, go to next step.

3) Turn ignition on. Enter ISAT command Code 201. If display indicates 8B100, continuity is present in circuit. If display indicates 8B000, an open circuit is present. To check same circuit on breakout box, turn ignition off and connect breakout box. Ensure continuity is present between breakout box pins No. 8 and 51. If continuity is present, go to step 5).

4) If an open circuit is present, check for continuity in Blue wire between TC/ABS ECU terminal No. 8 and reservoir switch terminal No. 1, between reservoir switch terminals No. 1 (Blue wire)

and No. 2 (Blue/White wire), between reservoir terminal No. 2 (Blue/White wire) and pressure warning switch terminal No. 3 (Blue/White wire), between pressure warning switch terminals No. 3 (Blue/White wire) and No. 5 (Brown wire), and between pressure warning switch terminal No. 5 (Brown wire) and TC/ABS ECU terminal No. 51 (Brown wire). Repair as necessary.

5) Discharge accumulator and turn ignition on. Check for battery voltage between breakout box pin No. 14 and ground. If voltage is not present, go to step 8). If voltage is present, turn ignition off and check motor windings by measuring resistance between breakout box terminal No. 14 and ground. Resistance should be approximately 10 ohms. If resistance is not to specification, check resistance directly at motor terminals No. 1 (Yellow wire) and No. 2 (Black wire). If resistance is still not to specification, replace pump.

6) If resistance is to specification, check Yellow wire between motor terminal No. 1 and pump relay terminal No. 87. Check Black wire between motor terminal No. 2 and ground.

7) Check diode circuit between pump relay circuit terminal No. 87 (Yellow wire) and ground by removing relay and unplugging pump connector before checking resistance. Ensure diode has continuity in one direction and no continuity in other direction.

8) Turn ignition on. With pump not running, ensure battery voltage is present at breakout box terminal No. 50. If voltage is not present, ensure voltage is present at pump relay terminals No. 85 (Blue wire) and 86 (Red/White wire), and at 10-amp ABS fuse. Ensure continuity is present in wiring between pump relay terminal No. 86 (Red/White wire) and ignition switch.

9) If voltage is present at relay terminal No. 86 but not at terminal No. 85, install new relay. If voltage is present at TC/ABS ECU terminal No. 50, exciter circuit is okay but is not being grounded by pressure warning switch. To check switch, go to next step.

10) Turn ignition off. Discharge accumulator. Disconnect TC/ABS ECU. Check that pressure warning switch is closed by checking circuit continuity between breakout box pin No. 50 and ground. If circuit is open, check Blue wire between pump relay terminal No. 85 and pressure warning switch terminal No. 4. Ensure continuity is present between switch terminals No. 1 (Black wire) and No. 4 (Blue wire). Ensure switch Black ground wire has continuity to ground. If ground wire is okay, and no continuity is present between switch terminals No. 1 and 4, replace switch.

Fault Codes 4/24221, 2422A, 24251 & 24291 (Left Front Wheel Sensor)

1) Raise and support vehicle. Turn ignition on. Install breakout box. Set voltmeter to AC. scale. Connect voltmeter between breakout box pins No. 30 and 48. Voltage reading should be about .1-.5 volts AC as wheel is rotated.

2) Turn ignition off. Disconnect TC/ABS ECU connector. Check sensor winding continuity by measuring resistance between breakout box pins No. 30 and 48. Correct resistance is about 1100 ohms. Ensure wiring between sensor and TC/ABS ECU is not shorted to ground or voltage.

3) Ensure wheel sensor is not damaged and is securely installed. Ensure no play is present in wheel bearings. Check clearance between sensor and sensor wheel. Correct clearance is .001-.006" (.45-1.55 mm). Ensure TC/ABS ECU terminals No. 1 (Black wire) and No. 19 (Black wire) are correctly grounded. If no fault is found, test drive vehicle and see if fault code returns. If it does, replace TC/ABS ECU.

Fault Codes 4/24222, 2422B, 24252 & 24292 (Right Front Wheel Sensor)

1) Raise and support vehicle. Turn ignition on. Install

breakout box. Set voltmeter to AC scale. Connect voltmeter between breakout box pins No. 29 and 47. Voltage reading should be about .1-.5 volts AC as wheel is rotated.

2) Turn ignition off. Disconnect TC/ABS ECU connector. Check sensor winding continuity by measuring resistance between breakout box pins No. 29 and 47. Correct resistance is about 1100 ohms. Ensure wiring between sensor and TC/ABS ECU is not shorted to ground or voltage.

3) Ensure wheel sensor is not damaged and is securely installed. Ensure no play is present in wheel bearings. Check clearance between sensor and sensor wheel. Correct clearance is .001-.006" (.45-1.55 mm). Ensure TC/ABS ECU terminals No. 1 (Black wire) and No. 19 (Black wire) are correctly grounded. If no fault is found, test drive vehicle and see if fault code returns. If it does, replace TC/ABS ECU.

Fault Codes 4/24223, 2422C, 24253 & 24293 (Left Rear Wheel Sensor)

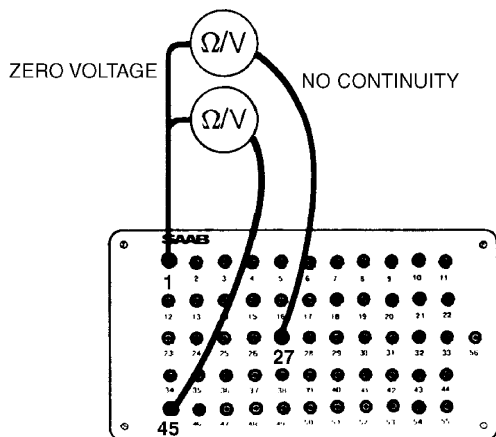
1) Raise and support vehicle. Turn ignition on. Install breakout box. Set voltmeter to a.c. scale. Connect voltmeter between breakout box pins No. 28 and 46. Voltage reading should be about .1-.5 volts AC as wheel is rotated.

2) Turn ignition off. Disconnect TC/ABS ECU connector. Check sensor winding continuity by measuring resistance between breakout box pins No. 28 and 46. Correct resistance is about 1100 ohms. Ensure wiring between sensor and TC/ABS ECU is not shorted to ground or voltage.

3) Ensure wheel sensor is not damaged and is securely installed. Ensure no play is present in wheel bearings. Check clearance between sensor and sensor wheel. Correct clearance is .001-.006" (.45-1.55 mm). Ensure TC/ABS ECU terminals No. 1 and 19 are correctly grounded. If no fault is found, test drive vehicle and see if fault code returns. If it does, replace TC/ABS ECU.

Fault Codes 4/24224, 2422D, 24254 & 24294 (Right Rear Wheel Sensor)

1) Raise and support vehicle. Turn ignition on. Install breakout box. Set voltmeter to AC scale. Connect voltmeter between breakout box pins No. 27 and 45. See Fig. 9. Voltage reading should be about .1-.5 volts AC as wheel is rotated.



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Fig. 9: Checking Voltage & Resistance Using Breakout Box
Courtesy of Saab-Scania of America, Inc.

2) Turn ignition off. Disconnect TC/ABS ECU connector. Check sensor winding continuity by measuring resistance between breakout box

pins No. 27 and 45. See Fig. 9. Correct resistance is about 1100 ohms. Ensure wiring between sensor and TC/ABS ECU is not shorted to ground or voltage.

3) Ensure wheel sensor is not damaged and is securely installed. Ensure no play is present in wheel bearings. Check clearance between sensor and sensor wheel. Correct clearance is .001-.006" (.45-1.55 mm). Ensure TC/ABS ECU terminals No. 1 and 19 are correctly grounded. If no fault is found, test drive vehicle and see if fault code returns. If code returns, replace TC/ABS ECU.

Fault Codes 5/33421 (Left Front Inlet Valve)

1) Ensure ignition is off. Connect breakout box to TC/ABS ECU connector. Ensure TC/ABS ECU connector is unplugged from TC/ABS ECU. Check resistance between TC/ABS ECU connector terminals No. 3 and 20. Correct resistance should be 5-7 ohms. If resistance is not to specification, go to next step. If resistance is to specification, erase code and test drive vehicle.

2) Check continuity in valve winding by measuring resistance between valve body terminals No. 6 (Green/White wire) and No. 7 (Green/Red wire). Resistance should be 5-7 ohms. If resistance is not to specification, replace hydraulic unit. If resistance is to specification, go to next step.

3) Ensure continuity is present between valve body connector terminal No. 6 and TC/ABS ECU terminal No. 20. Also check circuit between valve body connector terminal No. 7 (Green/Red wire) and system relay terminal No. 30 (White wire) for an open or short circuit. If all circuits are okay, replace TC/ABS ECU.

Fault Codes 5/33422 (Left Front Outlet Valve)

1) Ensure ignition is off. Connect breakout box to TC/ABS ECU connector. Ensure TC/ABS ECU connector is unplugged from TC ECU. Check resistance between TC/ABS ECU connector terminals No. 3 and 2. Correct resistance should be 3-4 ohms. If resistance is not to specification, go to next step. If resistance is to specification, erase code and test drive vehicle.

2) Check continuity in valve winding by measuring resistance between valve body terminals No. 5 (Yellow/Red wire) and No. 7 (Green/Red wire). Resistance should be 3-4 ohms. If resistance is not to specification, replace hydraulic unit. If resistance is to specification, go to next step.

3) Ensure continuity is present in Yellow/Red wire between valve body connector terminal No. 5 and TC/ABS ECU terminal No. 2. Also check circuit between valve body connector terminal No. 7 (Green/Red wire) and system relay terminal No. 30 (White wire) for an open or short circuit. If all circuits are okay, replace TC/ABS ECU.

Fault Codes 5/33423 (Right Front Inlet Valve)

1) Ensure ignition is off. Connect breakout box to TC/ABS ECU connector. Ensure TC/ABS ECU connector is unplugged from TC/ABS ECU. Check resistance between TC/ABS ECU connector terminals No. 3 and 38. Correct resistance should be 5-7 ohms. If resistance is not to specification, go to next step. If resistance is to specification, erase code and test drive vehicle.

2) Check continuity in valve winding by measuring resistance between valve body terminals No. 1 (Red/White wire) and No. 7 (Green/Red wire). Resistance should be 5-7 ohms. If resistance is not to specification, replace hydraulic unit. If resistance is to specification, go to next step.

3) Ensure continuity is present in Red/White wire between valve body connector terminal No. 1 and TC/ABS ECU terminal No. 38. Also check circuit between valve body connector terminal No. 7 (Green/Red wire) and system relay terminal No. 30 (White wire) for an open or short circuit. If all circuits are okay, replace TC/ABS ECU.

Fault Codes 5/33424 (Right Front Outlet Valve)

1) Ensure ignition is off. Connect breakout box to TC/ABS ECU connector. Ensure TC/ABS ECU connector is unplugged from TC/ABS ECU. Check resistance between TC/ABS ECU connector terminals No. 3 and 21. Correct resistance should be 3-4 ohms. If resistance is not to specification, go to next step. If resistance is to specification, erase code and test drive vehicle to see if code returns. If code returns, replace TC/ABS ECU.

2) Check continuity in valve winding by measuring resistance between valve body terminals No. 2 (Blue/Red wire) and No. 7 (Green/Red wire). Resistance should be 3-4 ohms. If resistance is not to specification, replace hydraulic unit. If resistance is to specification, go to next step.

3) Ensure continuity is present in Blue/Red wire between valve body connector terminal No. 2 and TC/ABS ECU terminal No. 21. Also check circuit between valve body connector terminal No. 7 (Green/Red wire) and system relay terminal No. 30 (White wire) for an open or short circuit. If all circuits are okay, replace TC/ABS ECU.

Fault Codes 5/33425 (Rear Inlet Valve)

1) Ensure ignition is off. Connect breakout box to TC/ABS ECU connector. Ensure TC/ABS ECU connector is unplugged from TC/ABS ECU. Check resistance between TC/ABS ECU connector terminals No. 3 and 54. Correct resistance should be 5-7 ohms. If resistance is not to specification, go to next step. If resistance is to specification, erase code and test drive vehicle to see if code returns. If code returns, replace TC/ABS ECU.

2) Check continuity in valve winding by measuring resistance between valve body terminals No. 3 (Brown/White wire) and No. 7 (Green/Red wire). Resistance should be 5-7 ohms. If resistance is not to specification, replace hydraulic unit. If resistance is to specification, go to next step.

3) Ensure continuity is present in Brown/White wire between valve body connector terminal No. 3 and TC/ABS ECU terminal No. 54. Also check circuit between valve body connector terminal No. 7 (Green/Red wire) and system relay terminal No. 30 (White wire) for an open or short circuit. If all circuits are okay, replace TC/ABS ECU.

Fault Codes 5/33426 (Rear Outlet Valve)

1) Ensure ignition is off. Connect breakout box to TC/ABS ECU connector. Ensure TC/ABS ECU connector is unplugged from TC/ABS ECU. Check resistance between TC/ABS ECU connector terminals No. 3 and 36. Correct resistance should be 3-4 ohms. If resistance is not to specification, go to next step. If resistance is to specification, erase code and test drive vehicle to see if code returns. If code returns, replace TC/ABS ECU.

2) Check continuity in valve winding by measuring resistance between valve body terminals No. 4 (Blue/White wire) and No. 7 (Green/Red wire). Resistance should be 3-4 ohms. If resistance is not to specification, replace hydraulic unit. If resistance is to specification, go to next step.

3) Ensure continuity is present in Blue/White wire between valve body connector terminal No. 4 and TC/ABS ECU terminal No. 36. Also check circuit between valve body connector terminal No. 7 (Green/Red wire) and system relay terminal No. 30 (White wire) for an open or short circuit. If all circuits are okay, replace TC/ABS ECU.

Fault Codes 5/33427 (Main Valve)

1) Ensure ignition is off. Connect breakout box to TC/ABS ECU connector. Ensure TC/ABS ECU connector is unplugged from TC/ABS ECU. Check resistance between TC/ABS ECU connector terminals No. 3 and 39. Correct resistance should be 4-5 ohms. If resistance is not to

specification, go to next step. If resistance is to specification, erase code and test drive vehicle to see if code returns. If code returns, replace TC/ABS ECU.

2) Check continuity in valve winding by measuring resistance between valve body terminals No. 1 (Green/Red wire) and No. 2 (Black wire). Resistance should be 4-5 ohms. If resistance is not to specification, replace hydraulic unit. If resistance is to specification, go to next step.

3) Ensure continuity is present in Green/Red wire between valve body connector terminal No. 1 and TC/ABS ECU terminal No. 3. Also check Black wire between main valve terminal No. 2 and TC/ABS ECU terminal No. 39. If all circuits are okay, replace TC/ABS ECU.

Fault Codes 5/33428 (TC Valve)

1) Ensure ignition is off. Connect breakout box to TC/ABS ECU connector. Ensure TC/ABS ECU connector is unplugged from TC/ABS ECU. Check resistance between TC/ABS ECU connector terminals No. 3 and 40. Correct resistance should be 6-8 ohms. If resistance is not to specification, go to next step. If resistance is to specification, erase code and test drive vehicle to see if code returns. If code returns, replace TC/ABS ECU.

2) Check continuity in valve winding by measuring resistance between valve body terminals No. 1 (Blue/Gray wire) and No. 5 (Green/Red wire). Resistance should be 6-8 ohms. If resistance is not to specification, replace hydraulic unit. If resistance is to specification, go to next step.

3) Ensure continuity is present in Blue/Gray wire between valve body connector terminal No. 1 and TC/ABS ECU terminal No. 40. Also check Green/Red wire between main valve terminal No. 5 and TC/ABS ECU terminal No. 3. If all circuits are okay, replace TC/ABS ECU.

Fault Codes 5/33429 (TC Valve)

1) Ensure ignition is off. Connect breakout box to TC/ABS ECU connector. Ensure TC/ABS ECU connector is unplugged from TC/ABS ECU. Check resistance between TC/ABS ECU connector terminals No. 3 and 47. Correct resistance should be 6-8 ohms. If resistance is not to specification, go to next step. If resistance is to specification, erase code and test drive vehicle to see if code returns. If code returns, replace TC/ABS ECU.

2) Check continuity in valve winding by measuring resistance between valve body terminals No. 4 (Yellow wire) and No. 5 (Green/Red wire). Resistance should be 6-8 ohms. Ensure continuity is present in Yellow wire between valve body connector terminal No. 4 and TC/ABS ECU terminal No. 37. Also check Green/Red wire between main valve terminal No. 5 and TC/ABS ECU terminal No. 3. If all circuits are okay, replace TC/ABS ECU.

Fault Codes 234B1, 234B2, 234B3 & 234B4

These codes are set if hydraulic function of outlet valves is in wrong mode for the respective wheel sensor. Perform diagnosis on all other codes first. Check wheel sensors. See ANTI-LOCK BRAKE SYSTEM article in this section. If wheel sensors are okay, replace hydraulic unit.

Fault Codes 775B1 (TC/ABS ECU Fault)

Erase fault code and test drive vehicle to determine whether code returns. If code returns, check TC/ABS ECU terminals No. 1 (Black wire) and No. 19 (Black wire) for ground and repair as necessary. If ground circuits are okay, replace TC/ABS ECU.

Fault Codes 775B2 (TC/ABS ECU RAM Fault)

Erase fault code and test drive vehicle to determine whether code returns. If code returns, replace TC/ABS ECU.

Fault Codes E/F7061 (Communication Between TC/ABS & ETS
Absent Or Faulty)

1) If another fault code is present, perform diagnosis on other code first. Disconnect ETS ECU connector. Turn ignition on. Set voltmeter to d.c. scale. Check voltage between TC/ABS ECU connector terminal No. 4 and ETS ECU terminal No. 32 (Black/White wire).

2) If voltage is about 10 volts, go to next step. If voltage is close to zero volts, check for short to ground in wire. If no short is present, replace TC/ABS ECU. If voltage is okay at TC/ABS ECU, but no voltage is present at ETS connector, check wiring for an open circuit. If wiring is okay, go to step 4).

3) Turn ignition off. Reconnect TC/ABS ECU and start engine. Set voltmeter to DC scale and check communication/reference signal by measuring between breakout box pins No. 1 and 24. Voltage should be about 5 volts DC. If voltage was correct in step 2) but incorrect in step 3), replace ETS ECU.

4) Turn ignition off. Disconnect TC/ABS system ECU. Turn ignition on. Check voltage between ETS ECU terminal No. 29 and TC/ABS ECU terminal No. 24. If about 10 volts are present, go to next step. If voltage is close to zero volts, check wire for a short to ground. If wire is okay, install new ETS ECU. If voltage is okay at ETS ECU but no voltage is present at TC/ABS ECU connector, check wire for an open circuit.

5) Turn ignition off. Reconnect TC/ABS ECU and start engine. Check communication/reference signal with voltmeter set to DC scale. Measure between breakout box pins No. 1 and 24. About 5 volts should be present. If voltage was okay in step 4), but incorrect in this step, install new TC/ABS ECU.

Fault Codes 3/25321 (Brake Light Switch Signal Absent Or Shorting To Ground)

1) This fault may also be present if pressure switch in TC block is faulty. See FAULT CODE 36521 (PRESSURE SWITCH IN TC BLOCK SIGNAL SHORTING TO GROUND).

2) Ensure ignition is off. Connect breakout box to TC/ABS ECU. Turn ignition on. Measure voltage between breakout box pin No. 32 and ground with foot off and on brake pedal. If battery voltage is not present with pedal depressed, go to next step. No voltage should be present with pedal released. If system is operating to specification, go to FAULT CODE 36521 (PRESSURE SWITCH IN TC BLOCK SIGNAL SHORTING TO GROUND).

3) Check fuse No. 24. If fuse is okay, ensure brake lights operate. Check voltage at brake lights. If voltage is not present, check wiring between TC/ABS ECU connector terminal No. 32 (Blue wire) and brake light switch (White wire). If wiring is okay, check brake light switch and replace as necessary. If brake light switch is okay, go to FAULT CODE 36521 (PRESSURE SWITCH IN TC BLOCK SIGNAL SHORTING TO GROUND).

Fault Code 36521 (Pressure Switch In TC Block Signal Short To Ground)

1) Turn ignition on and wait for pump to build up pressure in accumulator. After system has pressurized, turn ignition off and disconnect TC/ABS ECU connector. Connect breakout box to TC/ABS ECU connector. Ensure continuity is present between breakout box pins No. 13 and 26 when brake pedal is raised. Ensure no continuity is present between breakout box pins No. 13 and 26 when brake pedal is depressed.

2) If continuity is not as specified, check Brown/White wire between TC/ABS ECU connector terminal No. 13 and TC block connector terminal No. 2. Also check Black/White wire between TC/ABS ECU terminal No. 26 and TC block connector terminal No. 3. If pressure switch on TC block is defective, install new hydraulic unit. Perform

brake light switch test. See FAULT CODE 3/25321 (BRAKE LIGHT SWITCH SIGNAL ABSENT OR SHORTING TO GROUND). If no problems are found, replace TC/ABS ECU.

ANTI-LOCK Light Stays On

1) Install breakout box between TC/ABS ECU and its connector. Turn ignition on. If battery voltage is present at breakout box pin No. 52, go to next step. If battery voltage is not present at breakout box pin No. 52, check bulb and White wire between TC/ABS ECU terminal No. 58 and instrument panel terminal No. 8.

2) Turn ignition off. Disconnect TC/ABS ECU and ABS/TCS system relay. Check continuity between TC/ABS ECU terminals No. 52 (White wire) and No. 33 (Yellow wire), then reverse tester leads. Continuity should be present in one direction only. If continuity is not to specification, diode in circuit is defective.

TCS CTRL Light Stays On

1) Install breakout box between TC/ABS ECU and its connector. Turn ignition on. If battery voltage is present at breakout box pin No. 44, go to next step. If battery voltage is not present at breakout box pin No. 44, check bulb and Blue wire between TC/ABS ECU connector terminal No. 44 and instrument panel terminal No. 12. If bulb and wire are okay, go to next step.

2) Turn ignition off. Disconnect TC/ABS ECU and ABS/TCS system relay. Check continuity between TC/ABS ECU terminals No. 52 (White wire) and No. 33 (Yellow wire), then reverse tester leads. Continuity should be present in one direction only. If continuity is not to specification, diode in circuit is defective.

TCS Light Operating Incorrectly (Manual Transmission Only)

1) Install breakout box between TC/ABS ECU and its connector. Turn ignition on. If battery voltage is present at breakout box pin No. 7, go to step 2). If battery voltage is not present at breakout box pin No. 7, check bulb and Brown/Gray wire between TC/ABS ECU connector terminal No. 7 and tachometer connector terminal No. 6. Also check voltage feed (Green/White wire) to tachometer connector terminal No. 4.

2) If TCS light does not light when system is operating, and no other warning lights are on, replace TC/ABS ECU.

BRAKE FLUID Light

1) Check if light is working by turning ignition switch to a position between START and DRIVE. If light does not come on, check bulb. If light does not come on if pressure is low, go to next step. If light does not come on when fluid level is low, go to step 4).

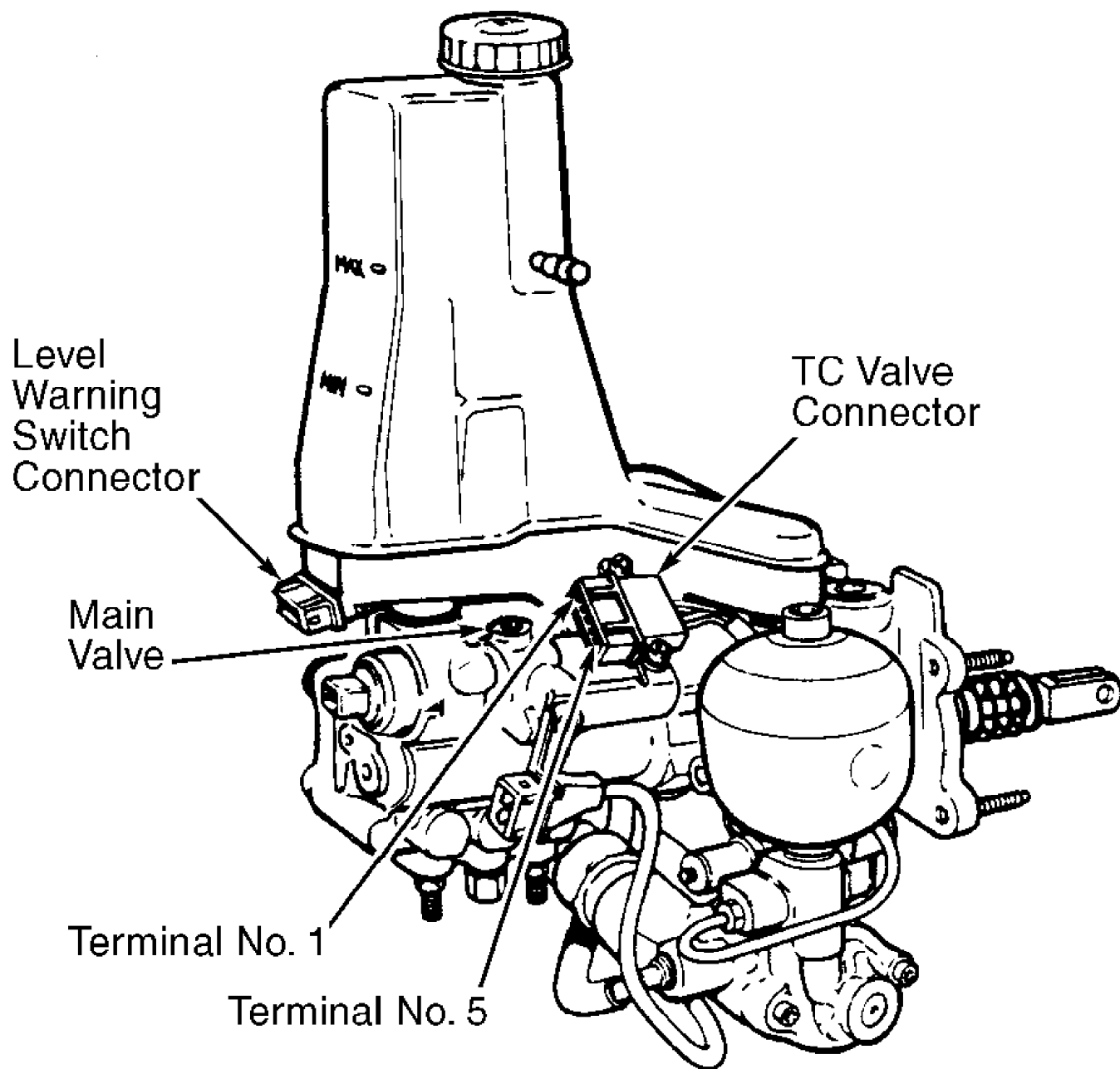
2) Disconnect brake fluid pressure warning switch. Turn ignition on. Check for battery voltage at pressure switch connector terminal No. 2 (White wire). If voltage is not present, check White wire for continuity between pressure switch connector terminal No. 2 and instrument panel connector terminal No. 11.

3) If voltage is present at pressure switch connector terminal No. 2, turn ignition off and depressurize system. Ensure continuity is present between pressure warning switch connector terminals No. 1 and 2. If continuity is not present, replace switch. If continuity is present and switch is okay, check Black wire between pressure switch connector terminal No. 1 and ground.

4) Ensure level warning switch connector is disconnected. See Fig. 10. Turn ignition on. Check for battery voltage at reservoir switch connector terminal No. 4 (White wire). If voltage is not present, check White wire between reservoir switch connector terminal No. 4 and instrument panel connector terminal No. 11. If voltage is present, turn ignition off and go to next step.

5) Check level switch by ensuring circuit is closed when

float is pressed down, and circuit is open when float is up. If float does not operate to specification, install new reservoir. If float does operate to specification, check Black wire at terminal No. 3 for good continuity to ground.



93J84961

Fig. 10: Identifying Level Warning Switch Connector
Courtesy of Saab-Scania of America, Inc.

RETRIEVING CODES (ETS SYSTEM)

NOTE: To retrieve TC/ABS codes, see RETRIEVING CODES (TC/ABS SYSTEM).

1) Codes for ETS system can only be retrieved with Saab Intelligent Tester (ISAT-86 10 651). Diagnostic Black connector is located under passenger's front seat. ISAT can also clear fault codes.

2) Ensure ignition switch is in DRIVE position. ISAT system number for ETS system is No. 3. Always retrieve and note all stored fault codes before disconnecting battery or ETS ECU. See ETS SYSTEM FAULT CODES table.

3) If communication cannot be established between ISAT and ETS ECU, check wiring between ETS ECU terminals No. 9 and 34, and Black diagnostic connector. Ensure power feed and ground circuits to diagnostic connector are good and connector terminals are not damaged. In addition, be aware that some faults will disable ISAT communications abilities of ETS ECU.

4) After fault codes stored in ETS ECU have been transferred to ISAT, diagnosis function is completed. It is now necessary to enter any command codes which apply to the problem present. It may be helpful to enter all command codes to determine whether certain signals and components are correct. Refer to instructions supplied with ISAT.

5) Ensure ignition is off before disconnecting ETS ECU connector. Before tracing faults on a system, always start by checking ground and voltage circuits for ETS ECU. Check all connectors by unplugging and plugging them back together. Start engine or drive vehicle again to check whether fault or faults return.

6) When first detected, a fault will be assigned a permanent fault code. If fault later disappears, fault will be intermittent. All signals around 12-volt level are proportional to battery voltage. These levels should be used as a rough guide. Zero voltage signal levels indicate ground.

7) ETS ECU connector can be backprobed with test probes. However, TC/ABS ECU connector on wiring harness is a molded plug; test probes cannot be connected to back of connector. Use Breakout Box (8611006) with Test Lead Set (8611030) if diagnosis calls for probing TC/ABS ECU.

WARNING: Under no circumstances should vehicle be driven with breakout box installed.

Automatic Transmission Calibration

1) Calibration must be performed at 5000 mile service, after replacement of any major system components, or after any major engine or transmission work. This is because adaptive values created by system before major repairs may no longer be valid.

2) Before calibration, adjust kickdown cable by loosening clamp on cable sheath. Leave kickdown cable attached to lever. Move lever to fully extended position (right side of vehicle), against mechanical stop. Hold lever in this position until completed with step 3).

3) Pull kickdown cable sheath past kickdown position to full throttle mechanical stop in transmission. Tighten kickdown cable sheath clamp while holding full throttle position.

4) Start engine and bring it to normal operating temperature. Turn engine off. Connect ISAT and Capacitor Lead (86 11 048) to Black diagnostic connector. Turn ignition on. Select DIAG, ONE system from ISAT menu, and enter system No. 3. Check if any fault codes are stored in memory. If fault codes are present, perform whatever diagnosis is necessary. See ETS SYSTEM FAULT CODES table. Erase fault codes before proceeding.

5) Ensure ignition is on, but engine not running. Enter command Code No. 971. Several seconds after entering command code No. 971, ISAT will terminate communications. Wait 30 seconds while ASR and ETS store baseline settings.

6) Reestablish communication with ISAT. With ignition on,

engine off, enter command Code No. 973. After TCS CTRL light goes on, start engine but do not touch pedals. Wait for idle to stabilize at around 850 RPM. When TCS CTRL light starts to flash, press and hold cruise control SET SPEED button within 10 seconds, and keep SET SPEED button depressed until calibration process is complete (TCS CTRL light will shut off). ETS ECU will pull KDW to its maximum position and idle position, and will also increase engine speed to about 3000 RPM.

NOTE: Calibration procedure will be discontinued if SET button is not depressed within 10 seconds of TCS CTRL light beginning to flash, SET button is depressed before TCS CTRL light starts to flash, SET button is released before calibration process is completed, SET button is inoperative, pedal is depressed, vehicle starts to roll, or gear selector position is changed.

7) When calibration is complete, TCS CTRL light will shut off. Stop ISAT communications, turn off engine, and recheck to see if any fault codes were stored during calibration procedure.

8) If a new ETS ECU is installed, coding for engine variant must be entered by ISAT. For automatic transmission equipped vehicles, enter ISAT command Code 97A. ISAT should now display 802.3TA.

Manual Transmission Calibration

1) Calibration must be performed at 5000 mile service, after replacing any major system components, or after major engine or transmission work. This is because adaptive values created by system before major repairs are carried out may no longer be valid.

2) Start engine and bring it to normal operating temperature. If engine will not operate correctly during warm-up cycle, establish ISAT communications and enter command Code No. 974 in order to enter basic data and enable warm-up to be completed.

3) Turn engine off. Connect ISAT to Black diagnostic connector under passenger's seat. Ensure Adapter Lead (86 11 048) with capacitor is installed in test harness. Turn ignition on. Select DIAG, ONE system from the menu, and enter system No. 3. Check if any fault codes are stored in memory.

4) If fault codes are present, perform diagnosis as necessary. See ETS SYSTEM FAULT CODES table. Erase fault codes before continuing.

5) To enter baseline setting, enter command Code No. 971. ISAT will display 8A971. After several seconds, display will change to 8D971, indicating that basic setting has been made and system is ready for calibration.

6) With ignition still on, but engine not running, enter command Code No. 973. Once TCS CTRL light goes on, start engine, but do not touch the pedals. Wait for idle to stabilize at 850 RPM. ETS ECU will raise engine speed to about 3000 RPM.

NOTE: Calibration procedure will be discontinued if a pedal is depressed or vehicle starts to roll.

7) When calibration process is complete, TCS CTRL light will shut off. Terminate communications, turn engine off, and check if any fault codes were stored during calibration procedure.

8) If a new ETS ECU is installed, coding for engine variant must be entered by ISAT. For manual transmission equipped vehicles, enter ISAT command Code 977. ISAT should now display 802.3TS.

ETS SYSTEM FAULT CODES TABLE

Permanent Code (Intermittent Code)

Problem

Automatic Transmission

| | | |
|-------|---------|---|
| 42220 | (22220) | No Voltage To ETS ECU Terminal No. 22 &/Or 13 |
| 42241 | (22241) | Voltage 18 Volts Or Greater |
| 42252 | (22252) | Voltage 6 Volts Or Less |
| 42320 | (22320) | Signal Absent |
| 43691 | (23691) | KDW Motor Wire Taught |
| 43692 | (23692) | KDW Motor Wire Loose |
| 44020 | (24020) | Communication With TC/ABS Disabled |
| 44021 | (24021) | No Communication With TC/ABS |
| 44090 | (24090) | Faulty Signal From TC/ABS |
| 44221 | (24221) | RPM Signal Absent |
| 44260 | (24260) | Speed Signal From TC/ABS Absent |
| 44261 | (24261) | Speedometer Signal Absent |
| 44262 | (24262) | No Signal From Wheel Sensors/ABS System ECU |
| 44290 | (24290) | Speedometer Signal Corrupted |
| 44291 | (24291) | Speedometer Signal Faulty |
| 44295 | (24295) | No Signal From Left Front Wheel Sensor |
| 44296 | (24296) | No Signal From Right Front Wheel Sensor |
| 44297 | (24297) | No Signal From Left Rear Wheel Sensor |
| 44298 | (24298) | No Signal From Right Rear Wheel Sensor |
| 44390 | (24390) | Signal Indicating Speed Greater Than 7000 RPM |
| 44391 | (24391) | RPM Signal Increase Too Rapid |
| 44420 | (24420) | Load Signal, RPM Signal Absent |
| 44490 | (24490) | RPM Signal Corrupted/High During Deceleration |
| 44690 | (24690) | RPM Ratio Faulty |
| 44691 | (24691) | Engine Rev Signal Missing |
| 45240 | (25240) | Throttle Potentiometer Signal High |
| 45241 | (25241) | Pedal Potentiometer Signal High |
| 45242 | (25242) | Throttle Potentiometer Signal Ground High |
| 45243 | (25243) | Pedal Potentiometer Signal Ground High |
| 45244 | (25244) | KDW Potentiometer, Signal Ground High |
| 45245 | (25245) | KDW Potentiometer, Signal Voltage Too High |
| 45250 | (25250) | Throttle Potentiometer Signal Low |
| 45251 | (25251) | Pedal Potentiometer Signal Low |
| 45252 | (25252) | Throttle Potentiometer Signal Ground Low |
| 45253 | (25253) | Pedal Potentiometer Signal Ground Low |
| 45254 | (25254) | KDW Potentiometer Signal Ground Too Low |
| 45255 | (25255) | KDW Potentiometer Signal Ground Too Low |
| 45290 | (25290) | Throttle Potentiometer Signal Faulty |
| 45291 | (25291) | Pedal Potentiometer Signal Faulty |
| 45292 | (25292) | Deviation In Signal From ETS Throttle & Pedal Potentiometers |
| 45360 | (25360) | Pedal Switch Faulty |
| 45391 | (25391) | No Drive Signal With Ign. On & Road Speed Greater Than 1.8 MPH |
| 45720 | (25720) | Throttle Switch Constantly Off |
| 45721 | (25721) | Pedal Switch Constantly Off |
| 45722 | (25722) | Brake/Clutch Pedal Switch Faulty |
| 45723 | (25723) | Brake Signal From ETS But Not From TC |
| 45724 | (25724) | Brake Signal From TC But Not From ETS |
| 45770 | (25770) | Throttle Switch Constantly On |
| 45771 | (25771) | Pedal Switch Constantly On |
| 45780 | (25780) | Throttle Switch Voltage High |
| 45781 | (25781) | Pedal Switch Voltage High |
| 45791 | (25791) | Kickdown Point Not Detected |
| 457B1 | (257B1) | Kickdown Wire Not Detected |
| 457B2 | (257B2) | Kickdown Wire Adjustment Incorrect |
| 46221 | (26221) | Temperature Sensor Temperature Low |
| 46271 | (26271) | Temperature Sensor Temperature High |
| 53240 | (33240) | System Relay Current High |
| 53250 | (33250) | System Relay Current Low |
| 53270 | (33270) | System Relay Constantly Activated |
| 53440 | (33440) | Safety Valve Current High |

53450 (33450) Safety Valve Current Low
53630 (33630) Idling Control Not Operating
55780 (35780) Throttle Switch Voltage Low
55781 (35781) Pedal Switch Voltage Low
58341 (38341) Idling Speed Low
58351 (38351) Idling Speed High
62490 (72940) ETS ECU Fault: PID Regulator
67190 (77190) ETS ECU Fault: RAM Fault
67191 (77191) ETS ECU Fault: ROM Fault
67192 (77192) ETS ECU Fault: EEPROM Fault
67193 (77193) ETS ECU Fault: EEPROM Fault
67196 (77196) ETS ECU Fault: Time Function
67290 (77290) ETS ECU Fault: D/A Converter Fault
672B1 (772B1) ETS ECU Error: D/A Converter For KDW Motor
67390 (77390) ... ETS ECU Fault: Speed Control Greater Than 12 MPH
67391 (77391) ETS ECU Fault: Speed Control Less Than 30 MPH
67590 (77590) Internal Monitoring
67591 (77591) ETS ECU Fault: Reset Function
67592 (77592) Internal Monitoring
67593 (77593) ETS ECU Fault: Safety Switch No. 30
67594 (77594) ETS ECU Fault: Safety Switch No. 31
67595 (77595) ETS ECU Fault: Safety Switch No. 32
675B0 ETS ECU Fault: Calibration Not Completed
675B1 ETS ECU Fault: Calibration Impossible
675B2 ETS ECU Fault: Engine Variant Not Specified
675B3 (775B3) EEPROM ETS ECU Error
675B4 (775B4) Monitoring ETS ECU Error
675B5 (775B5) ROM ETS ECU Error
68170 (78170) Software Fault: System Relay
68331 (78331) Short Circuit In Output Stage Of KDW Motor
68340 (78340) ETS ECU Fault: Transistor For System Relay
68341 (78341) ETS ECU Fault: Safety Valve
68342 (78342) ETS ECU Fault: TCS CTRL Light
68390 (78390) ETS ECU Fault: Throttle Control Faulty
68391 (78391) ETS ECU Fault: GR Flip-Flop
683B0 (783B0) ETS ECU Fault: Throttle Control
683B1 (783B1) KDW Motor, Output Stage Incorrect Function
E7590 (D7590) Safety System Activated
E75B1 (D75B1) Serial Interface Communication Error
E75B2 (D75B2) Communication Interrupted Communication Error
E75B3 (D75B3) Communication Cannot Be Reinstated
Communication Error

Manual Transmission

675B0 ETS ECU Fault: Calibration Not Completed
675B1 ETS ECU Fault: Calibration Impossible
675B2 ETS ECU Fault: Engine Variant Not Specified
683B0 (783B0) ETS ECU Fault: Throttle Control
E7590 (D7590) Safety System Activated
42220 (22220) No Voltage To Terminal No. 22 &/Or No. 13
42241 (22241) Battery Voltage Greater Than 18 Volts
42252 (22252) Battery Voltage Less Than 6 Volts
42320 (22320) Signal Absent (Ignition Pulses Detected)
44020 (24020) Communication With TC/ABS Disabled
44021 (24021) No Communication With TC/ABS
44090 (24090) Faulty Signal From TC/ABS
44221 (24221) RPM Signal Absent
44260 (24260) Speed Signal From TC/ABS Absent
44261 (24261) Speedometer Signal Absent
44290 (24290) Speedometer Signal Corrupted
44291 (24291) Speedometer Signal Faulty
44390 (24390) RPM Sensor Signal Indicates Speed
Greater Than 7000 RPM
44391 (24391) RPM Sensor Signal Too Rapid

| | | | |
|-------|---------|-------|--|
| 44420 | (24420) | ..... | RPM Load Signal Absent |
| 44490 | (24490) | ..... | RPM Signal Corrupted/High During Deceleration |
| 44690 | (24690) | ..... | RPM Signal Ratio Faulty |
| 45240 | (25240) | ..... | Throttle Potentiometer Signal High |
| 45241 | (25241) | ..... | Pedal Potentiometer Signal High |
| 45242 | (25242) | ..... | Throttle Potentiometer Signal Ground High |
| 45243 | (25243) | ..... | Pedal Potentiometer Signal Ground High |
| 45250 | (25250) | ..... | Throttle Potentiometer Signal Low |
| 45251 | (25251) | ..... | Pedal Potentiometer Signal Low |
| 45252 | (25252) | ..... | Throttle Potentiometer Signal Ground Low |
| 45253 | (25253) | ..... | Pedal Potentiometer Signal Ground Low |
| 45290 | (25290) | ..... | Throttle Potentiometer Signal Faulty |
| 45291 | (25291) | ..... | Pedal Potentiometer Signal Faulty |
| 45360 | (25360) | ..... | Pedal Switch Faulty |
| 45720 | (25720) | ..... | Throttle Switch Constantly Off |
| 45721 | (25721) | ..... | Pedal Switch Constantly Off |
| 45722 | (25722) | ..... | Brake/Clutch Pedal Switch Faulty |
| 45723 | (25723) | ..... | Brake Signal From ETS But Not From TC |
| 45724 | (25724) | ..... | Brake Signal From TC But Not From ETS |
| 45770 | (25770) | ..... | Throttle Switch Constantly On |
| 45771 | (25771) | ..... | Pedal Switch Constantly On |
| 45780 | (25780) | ..... | Throttle Switch Voltage High |
| 45781 | (25781) | ..... | Pedal Switch Voltage High |
| 46221 | (26221) | ..... | Temperature Sensor: Temperature Low |
| 46271 | (26271) | ..... | Temperature Sensor: Temperature High |
| 53240 | (33240) | ..... | System Relay Current High |
| 53250 | (33250) | ..... | System Relay Current Low |
| 53270 | (33270) | ..... | System Relay Constantly Activated |
| 53440 | (33440) | ..... | Safety Valve Current High |
| 53450 | (33450) | ..... | Safety Valve Current Low |
| 53630 | (33630) | ..... | Idling Control Not Operating |
| 55780 | (35780) | ..... | Throttle Switch Voltage Low |
| 55781 | (35781) | ..... | Pedal Switch Voltage Low |
| 58341 | (38341) | ..... | Idling Speed Low |
| 58351 | (38351) | ..... | Idling Speed High |
| 62490 | (72940) | ..... | ETS ECU Fault: PID Regulator |
| 67190 | (77190) | ..... | ETS ECU Fault: RAM Fault |
| 67191 | (77191) | ..... | ETS ECU Fault: ROM Fault |
| 67192 | (77192) | ..... | ETS ECU Fault: EEPROM Fault |
| 67193 | (77193) | ..... | ETS ECU Fault: EEPROM Fault |
| 67196 | (77196) | ..... | ETS ECU Fault: Time Function |
| 67290 | (77290) | ..... | ETS ECU Fault: D/A Converter Fault |
| 67390 | (77390) | ... | ETS ECU Fault: Speed Control Greater Than 12 MPH |
| 67391 | (77391) | ..... | ETS ECU Fault: Speed Control Less Than 30 MPH |
| 67590 | (77590) | ..... | Internal Monitoring |
| 67591 | (77591) | ..... | ETS ECU Fault: Reset Function |
| 67592 | (77592) | ..... | Internal Monitoring |
| 67593 | (77593) | ..... | ETS ECU Fault: Safety Switch No. 30 |
| 67594 | (77594) | ..... | ETS ECU Fault: Safety Switch No. 31 |
| 67595 | (77595) | ..... | ETS ECU Fault: Safety Switch No. 32 |
| 68170 | (78170) | ..... | Software Fault: System Relay |
| 68340 | (78340) | ..... | ETS ECU Fault: Transistor For System Relay |
| 68341 | (78341) | ..... | ETS ECU Fault: Safety Valve |
| 68342 | (78342) | ..... | ETS ECU Fault: TCS CTRL Light |
| 68390 | (78390) | ..... | ETS ECU Fault: Throttle Control Faulty |
| 68391 | (78391) | ..... | ETS ECU Fault: GR Flip-Flop |

NOTE: If the following code is permanent, it will not be possible to establish communications with ISAT.

Fault Code 2/42220 (No Voltage To ETS ECU Terminal No. 22 &/Or 13)

1) Check fuse No. 21. With ETS ECU disconnected, check for a good ETS ECU ground by measuring resistance between ETS ECU terminal No. 1 (Black wire) and ground. If resistance is greater than about one ohm, check Black wire and ground.

2) If resistance is about one ohm or less, turn ignition on and check voltage drop to ground at ETS ECU terminal No. 1 (Black wire). Voltage drop should be less than .1 volt.

3) Check system relay control at ETS ECU terminal No. 13 (Blue wire). With system relay activated, less than 1.5 volts should be present at ETS ECU terminal No. 13. With system relay not activated, approximately 12 volts should be present.

4) Check power in from system relay at ETS ECU terminal No. 22 (Blue/Red wire). With system relay energized, about 12 volts should be present at ETS ECU terminal No. 22. With system relay de-energized, about zero volts should be present. If voltages are as specified, go to next step. If voltages are not as specified, check relay wiring. If relay wiring is okay, install a new relay. If system still does not operate correctly, replace ETS ECU.

Fault Codes 2/42241 (Voltage 18 Volts Or Greater At ETS ECU Pin No. 25)

1) Check battery. Ensure starting and charging systems are operating correctly. Turn ignition off. Check for battery voltage at ETS ECU terminal No. 13, supply side of 22-amp ETS fuse, and system relay terminal No. 30 (Red wire).

2) If voltage is to specification, turn ignition on. Check for battery voltage at ETS ECU terminal No. 25 (Green/White wire). If battery voltage is present, ensure battery ground and ground under intake manifold are secure.

Fault Codes 2/42252 (Voltage 6 Volts Or Less At ETS ECU Pin No. 25)

1) Check battery. Ensure starting and charging systems are operating correctly. Turn ignition off. Check for battery voltage at ETS ECU pin No. 13, supply side of 22-amp ETS fuse, and system relay terminal No. 30 (Red wire).

2) If voltage is to specification, turn ignition on. Check for battery voltage at ETS ECU terminal No. 25 (Green/White wire). If battery voltage is present, ensure battery ground and ground under intake manifold are secure.

NOTE: If following fault code is permanent, communications cannot be established with ISAT.

Fault Codes 2/42320 (Signal Absent; Limp-Home Mode)

Check that voltage is reaching ETS ECU terminal No. 25 (Green/White wire). If not, check fuse No. 13. If fuse is okay, check voltage supply to fuse. If fuse and voltage supply are okay, go to FAULT CODE 2/42220 (NO VOLTAGE TO ETS ECU TERMINAL NO. 22 &/OR 13) and perform steps 1) through 3). If resistance and voltage measurements are to specification, replace ETS ECU.

Fault Codes 2/43691 & 2/43692 (KDW Motor Wire Tight/Loose)

1) Check KDW basic setting. Go to AUTOMATIC TRANSMISSION CALIBRATION. If KDW basic setting is okay, clear fault code, recalibrate, test drive vehicle, and check whether or not fault code sets again. If fault code sets again, check automatic transmission for any faults that would affect KDW setting or KDW travel.

2) If no KDW linkage faults are present, clear fault code, recalibrate, and test drive vehicle again. If fault reoccurs, install a new ASR ECU.

NOTE: If ignition key is turned to START position too quickly,

voltage differences in switch may cause ANTI LOCK and TCS CTRL lights to come on, also producing fault Code 2/44021. If fault code is only intermittent, do not replace ETS ECU.

Fault Codes 2/44020, 2/44021, 2/44090 & 2/44260 (Various Signals Absent)

1) If ANTI LOCK light is on, go to ANTI-LOCK LIGHT STAYS ON under TC/ABS SYSTEM. Disconnect ETS ECU. Ensure TC/ABS system ECU is connected. Turn ignition on. If voltage at ETS ECU connector terminal No. 32 (Black/White wire) is about 10 volts, go to next step. If voltage is not about 10 volts, check Black/White wire between ETS ECU terminal No. 32 and TC/ABS ECU terminal No. 4 for an open circuit or a short to ground.

2) Ensure connector for ETS ECU is connected. Disconnect TC/ABS ECU. Connect breakout box to TC/ABS ECU. Turn ignition on. If voltage at breakout box pin No. 24 is about 10 volts, go to next step. If voltage is not about 10 volts, check Green/White wire between ETS ECU terminal No. 20 and TC/ABS ECU terminal No. 24.

3) Reconnect all ECU connectors. Start and idle engine. Set voltmeter to DC scale. Check for an approximate 5-7 volt DC signal at ETS terminal No. 32 and TC/ABS terminal No. 4. If voltage signal is present, it indicates that ETS is communicating by providing a pulsed ground signal.

4) With all components connected, engine idling, and car stationary, check for approximately 5-7 volts DC at ETS terminal No. 32 and TC/ABS terminal No. 4 (Black/White wire). This indicates ETS is communicating by providing a pulsed ground signal.

5) With all components connected, engine idling, and car stationary, check for approximately 5-7 volts DC at TC/ABS terminal No. 24 and ETS terminal No. 29 (Green/White wire). This indicates that TC/ABS is communicating by providing a pulsed ground signal.

6) If voltage checks are not to specification, replace TC/ABS ECU. If voltage checks are still not to specification, replace ETS ECU.

Fault Codes 2/44221, 2/44390 & 2/44391 (RPM Signal Faulty Or Absent)

1) Measure voltage at ETS ECU connector (backprobe) terminal No. 12 (Orange wire). At least 2 volts AC should be present while cranking. About 3 volts AC should be present at idle. Voltage may increase slightly as RPM increases. If voltages are to specification, possible fault exists in DI/APC system. See appropriate article in ENGINE PERFORMANCE section.

2) If voltages are not to specification, check Orange wire between ETS ECU terminal No. 12 and DI/APC (Engine Management) ECU terminal No. 29 for an open circuit or short to ground. See appropriate COMPUTERIZED ENGINE CONTROL article in ENGINE PERFORMANCE section. If wire is okay, replace ETS ECU.

Fault Codes 2/44261, 2/44290 & 2/44291 (Speedometer Signal Absent Or Faulty)

1) Connect Adapter Lead (8611048) and ISAT to Black diagnostic connector under front passenger's seat. Enter ISAT command Code 280. Current speed should now be displayed on ISAT. If not, check Green/Red and Green wires between speed sensor terminal No. 2 and ETS ECU terminal No. 10. If wires are okay, go to next step.

2) Check speed pulses to ETS ECU terminal No. 10 (Green/Red wire) with wheels alternately rotating and stationary. With wheels stationary, signal voltage should be zero or 12 volts (depending on wheel position). With wheels turning, signal voltage should be about 6 volts DC.

3) Check if speedometer is operating correctly. If speedometer does not operate correctly, disconnect speedometer 2-pin

connector. Set voltmeter to AC scale. Measure signal voltage from speed sensor (at transmission). Signal level should increase within 0-5 volt range as speed increases.

4) Ensure Electronic Display Unit (EDU) is operating correctly. If EDU does not operate correctly, check if voltage is present at speed sensor terminal No. 1 (Green/White wire). Ensure speed sensor terminal No. 3 (Black wire) is grounded. If voltages and grounds are okay, replace ETS ECU. If problem still persists, replace TC/ABS ECU.

Fault Codes 2/44262 (No Signal From Wheel Sensors/ABS System ECU)

1) If ABS fault codes are present, diagnose ABS codes first. Go to RETRIEVING CODES (TC/ABS SYSTEM). If no ABS fault codes are present, check Gray, Blue, Yellow, and Green wires between TC/ABS ECU and ASR ECU. Check connectors for an open circuit or poor connection.

2) If no problems are found with wiring or connector, clear fault codes, test drive vehicle, and check whether fault code sets again. If code sets again, install new TC/ABS ECU.

Fault Codes 2/44295 (No Signal From Left Front Wheel Sensor)

1) If ANTI LOCK light is off, go to step 2). If ANTI LOCK light is on, a fault is present in ABS system. Connect ISAT to Green diagnostic connector under passenger's front seat. Check for ABS system fault codes. If fault Codes 24221, 44221, 2422A, 4422A, 24251, 44251, 24291, or 44291 are obtained from ABS system, diagnose these codes first. See RETRIEVING CODES (TC/ABS) under DIAGNOSIS & TESTING. If none of these fault codes are present, go to next step.

2) Check digital signal at ASR ECU terminal No. 10 (Yellow wire) with a logic probe. With ignition on, a steady pulse should be present. This is a test pulse. Frequency of pulse should increase as wheel is spun by hand.

3) If correct pulse signal is not found, check wiring between TC/ABS ECU and ASR ECU for open or short circuits to ground or voltage. Disconnect TC/ABS ECU and ASR ECU. Measure resistance between ASR ECU connector terminals No. 10 and 13. No continuity should be present.

4) Turn ignition on. Check for shorts to voltage by measuring voltage between ASR ECU connector terminals No. 10 and 13. Correct reading is zero volts.

5) Turn ignition off. Connect breakout box to TC/ABS ECU connector. Measure resistance between ASR ECU connector terminal No. 10 and breakout box pin No. 10. Continuity should be present.

6) If voltage or continuity measurements are not to specification, check Yellow wire and connectors for an open circuit. If voltage or continuity measurements are to specification, and an intermittent fault was indicated, recheck all readings while wiggling Yellow wire, especially at connectors.

7) If no faults can be found, clear all fault codes and test drive car. Recheck for stored fault codes in both ABS system and ETS system. If ETS fault codes reoccur, install a known good ASR ECU and road test vehicle.

Fault Codes 2/44296 (No Signal From Right Front Wheel Sensor)

1) If ANTI LOCK light is off, go to step 2). If ANTI LOCK light is on, a fault is present in ABS system. Connect ISAT to Green diagnostic connector under passenger's front seat. Check for ABS system fault codes. If fault Codes 24222, 44222, 2422B, 4422B, 24252, 44252, 24292, or 44292 are obtained from ABS system, diagnose these codes first. See RETRIEVING CODES (TC/ABS) under DIAGNOSIS & TESTING. If none of these fault codes are present, go to next step.

2) Check digital signal at ASR ECU terminal No. 9 (Blue wire) with a logic probe. With ignition on, a steady pulse should be

present. This is a test pulse. Frequency of pulse should increase as wheel is spun by hand.

3) If correct pulse signal is not found, check wiring between TC/ABS ECU and ASR ECU for open or short circuits to ground or voltage. Disconnect TC/ABS ECU and ASR ECU. Measure resistance between ASR ECU connector terminals No. 9 (Blue wire) and No. 13 (Black wire). No continuity should be present.

4) Turn ignition on. Check for shorts to voltage by measuring voltage between ASR ECU connector terminals No. 9 (Blue wire) and No. 13 (Black wire). Correct reading is zero volts.

5) Turn ignition off. Connect breakout box to TC/ABS ECU connector. Measure resistance between ASR ECU connector terminal No. 9 and breakout box pin No. 11. Continuity should be present.

6) If voltage or continuity measurements are not to specification, check Blue wire and connectors for an open circuit. If voltage or continuity measurements are to specification, and an intermittent fault was indicated, recheck all readings while wiggling Blue wire, especially at connectors.

7) If no faults can be found, clear all fault codes and test drive car. Recheck for stored fault codes in both ABS system and ETS system. If ETS fault codes reoccur, install a known good ASR ECU and road test vehicle.

Fault Codes 2/44297 (No Signal From Left Rear Wheel Sensor)

1) If ANTI LOCK light is off, go to step 2). If ANTI LOCK light is on, a fault is present in ABS system. Connect ISAT to Green diagnostic connector under passenger's front seat. Check for ABS system fault codes. If fault Codes 24223, 44223, 2422C, 4422C, 24253, 44253, 24293, or 44293 are obtained from ABS system, diagnose these codes first. See RETRIEVING CODES (TC/ABS) under DIAGNOSIS & TESTING. If none of these fault codes are present, go to next step.

2) Check digital signal at ASR ECU terminal No. 8 with a logic probe. With ignition on, a steady pulse should be present. This is a test pulse. Frequency of pulse should increase as wheel is spun by hand.

3) If correct pulse signal is not found, check wiring between TC/ABS ECU and ASR ECU for open or short circuits to ground or voltage. Disconnect TC/ABS ECU and ASR ECU. Measure resistance between ASR ECU connector terminals No. 8 (Gray wire) and No. 13 (Black wire). No continuity should be present.

4) Turn ignition on. Check for shorts to voltage by measuring voltage between ASR ECU connector terminals No. 8 (Gray wire) and No. 13 (Black wire). Correct reading is zero volts.

5) Turn ignition off. Connect breakout box to TC/ABS ECU connector. Measure resistance between ASR ECU connector terminal No. 8 (Gray wire) and breakout box pin No. 12. Continuity should be present.

6) If voltage or continuity measurements are not to specification, check Gray wire and connectors for an open circuit. If voltage or continuity measurements are to specification, and an intermittent fault was indicated, recheck all readings while wiggling Gray wire, especially at connectors.

7) If no faults can be found, clear all fault codes and test drive car. Recheck for stored fault codes in both ABS system and ETS system. If ETS fault codes reoccur, install a known good ASR ECU and road test vehicle.

Fault Codes 2/44298 (No Signal From Right Rear Wheel Sensor)

1) If ANTI LOCK light is off, go to step 2). If ANTI LOCK light is on, a fault is present in ABS system. Connect ISAT to Green diagnostic connector under passenger's front seat. Check for ABS system fault codes. If fault Codes 24224, 44224, 2422D, 4422D, 24254, 44254, 24294, or 44294 are obtained from ABS system, diagnose these codes first. See RETRIEVING CODES (TC/ABS) under DIAGNOSIS & TESTING.

If none of these fault codes are present, go to next step.

2) Check digital signal at ASR ECU terminal No. 21 (Green wire) with a logic probe. With ignition on, a steady pulse should be present. This is a test pulse. Frequency of pulse should increase as wheel is spun by hand.

3) If correct pulse signal is not found, check wiring between TC/ABS ECU and ASR ECU for open or short circuits to ground or voltage. Disconnect TC/ABS ECU and ASR ECU. Measure resistance between ASR ECU connector terminals No. 21 (Green wire) and No. 13 (Black wire). No continuity should be present.

4) Turn ignition on. Check for shorts to voltage by measuring voltage between ASR ECU connector terminals No. 21 (Green wire) and No. 13 (Black wire). Correct reading is zero volts.

5) Turn ignition off. Connect breakout box to TC/ABS ECU connector. Measure resistance between ASR ECU connector terminal No. 21 (Green wire) and breakout box pin No. 9. Continuity should be present.

6) If voltage or continuity measurements are not to specification, check Green wire and connectors for an open circuit. If voltage or continuity measurements are to specification, and an intermittent fault was indicated, recheck all readings while wiggling Green wire, especially at connectors.

7) If no faults can be found, clear all fault codes and test drive car. Recheck for stored fault codes in both ABS system and ETS system. If ETS fault codes reoccur, install a known good ASR ECU and road test vehicle.

NOTE: If fault occurs intermittently on following test, ECU replacement is not necessary

Fault Codes 2/44420 & 2/44490 (Communication/RPM Signal Incorrect)

1) Connect Adapter Lead (8611048) and ISAT to Black diagnostic connector located under front passenger's seat. Enter ISAT command Code 281. Display should now show pulse length of load signal in micro seconds. At idle, this should be about 25 micro seconds and at full throttle about 500 micro seconds.

2) To perform an alternative check, disconnect ISAT lead from diagnostic socket. Use ISAT PULS function to verify if there is a measurable change in pulse width and frequency at ETS ECU as throttle is increased.

3) Exact pulse width and frequency that ISAT PULS function displays is not critical. It is important readings change with engine speed and load. If readings do not change, check White and Blue/Red wires between ETS terminal No. 27 and LH system ECU terminal No. 25 for an open circuit or short to ground.

4) If wiring is okay, perform appropriate engine performance testing for LH system ECU. See appropriate article in ENGINE PERFORMANCE section. If problem is still not found, replace LH system ECU and ETS ECU.

Fault Codes 2/44690 (Relationship Between RPM Signal, TD & Load Signal Incorrect)

Perform test procedure for incorrect communication/RPM signal. Go to FAULT CODES 2/44420 & 2/44490 (COMMUNICATION/RPM SIGNAL INCORRECT). Also perform test procedure for an absent or faulty RPM signal. Go to FAULT CODES 2/44221, 2/44390 & 2/44391 (RPM SIGNAL FAULTY OR ABSENT).

Fault Codes 2/44691 (RPM Signal Missing)

1) If TCS CRTL light is on and TCS system is in limp home mode, RPM signal may be missing from ETS ECU. If this is the case, perform fault tracing procedures for fault Codes 24221, 44221, 24390,

44390, 24391, and 44391. Set voltmeter to AC scale and check RPM signal at ASR ECU terminal No. 18.

2) At least 2 volts AC should be present during cranking. About 3 volts AC should be present at idle. Voltage may increase slightly as engine speed increases.

3) If voltages are not to specification, check RPM signal wire from ETS ECU to ASR ECU for an open or short circuit. Disconnect ETS ECU and ASR ECU. Measure resistance in Orange wire between ETS ECU connector terminal No. 12 and ASR ECU connector terminal No. 18. If no problem is found in Orange wire, clear fault codes. Test drive vehicle. If code sets again, replace ASR ECU.

NOTE: To perform following test, vacuum must be raised in vacuum unit in throttle housing to release spring. In addition, disconnect intake boot at throttle housing so throttle valve can be moved by hand.

Fault Codes 2/45240, 2/45242, 2/45250, 2/45252 & 2/45290
(Throttle Potentiometer Signal Faulty Or Missing)

1) Turn ignition off. Disconnect ETS ECU connector. Check resistance between ETS ECU connector terminals No. 3 (Yellow/White wire) and No. 5 (White wire). About 900-1200 ohms should be present. Check resistance between ETS ECU connector terminals No. 3 (Yellow/White wire) and No. 16 (Blue/White wire). With throttle valve held closed, about 5-50 ohms should be present. With throttle valve held open, about 800-1100 ohms should be present.

2) Check resistance between ETS ECU connector terminals No. 5 (White wire) and No. 16 (Blue/White wire). With throttle valve held closed, about 900-1200 ohms should be present. With throttle valve held open, about 100-300 ohms should be present. If resistances are to specification, go to step 5). If resistances are not to specification, go to next step.

3) Ensure ignition is still off and ETS ECU is disconnected. Check resistance between throttle housing terminals No. 2 (Yellow/White wire) and No. 6 (White wire). About 900-1200 ohms should be present. Check resistance between throttle housing terminals No. 2 (Yellow/White wire) and No. 4 (Blue/White wire). With throttle valve held closed, about 5-50 ohms should be present. With throttle valve held open, about 800-1100 ohms should be present.

4) Ensure ignition is still off and ETS ECU is disconnected. Check resistance between throttle housing terminals No. 4 (Blue/White wire) and No. 6 (White wire). With throttle valve held closed, about 900-1200 ohms should be present. With throttle valve held open, about 100-300 ohms should be present. If all resistance measurements are incorrect, replace throttle housing. If resistance measurements were incorrect in steps 1) and 2), but were within specification in steps 3) and 4), check and repair wiring as necessary. If all resistance measurements were correct, go to next step.

5) Reconnect all components. Turn ignition on. Check voltage signals at ETS ECU connector. See ETS ECU VOLTAGE SIGNALS table. If voltages are to specification and code still persists, replace ETS ECU. If voltages are not to specification, check wiring as necessary.

ETS ECU VOLTAGE SIGNALS TABLE

| ETS ECU Terminal No. (Wire Color) | Approximate Volts |
|-----------------------------------|-------------------|
| 3 (Yellow/White) | 5 |
| 5 (White) | .1-.2 |
| 16 (Blue/White) | (1) 4 |

(1) - Specification is for volts at idle. Voltage should decrease to .1 volt at full throttle.

Fault Codes 2/45241, 2/45243, 2/45251, 2/45253 & 2/45291
(Pedal Potentiometer Signal Faulty Or Missing)

1) Connect ISAT to Black diagnostic connector located under front passenger's seat. Ensure ignition is off. Enter ISAT command Code 27A. ISAT reply should be about 80010 with accelerator at idle and about 80070 with accelerator fully depressed.

2) Ensure ignition is off and disconnect ETS ECU. Check resistance between ETS ECU connector terminals No. 2 (Yellow/Red wire) and No. 4 (Yellow wire). Resistance should be 900-1200 ohms. Check resistance between ETS ECU connector terminals No. 4 (Yellow wire) and No. 17 (Yellow/Green wire). Resistance should be 5-50 ohms at idle, and 900-1200 ohms with accelerator pedal fully depressed.

3) Measure resistance between ETS ECU connector terminals No. 2 (Yellow/Red wire) and No. 17 (Yellow/Green wire). Resistance should be 900-1200 ohms at idle, and 5-50 ohms with pedal fully depressed. If resistances are within specification, go to step 7). If resistances are not within specification, go to next step.

4) Turn ignition off. Disconnect pedal potentiometer connector. Check resistance between pedal potentiometer terminals No. 3 (Yellow wire) and No. 4 (Yellow/Red wire). Resistance should be 900-1200 ohms. Check resistance between pedal potentiometer terminals No. 3 (Yellow wire) and No. 2 (Yellow/Green wire). Resistance should be 5-50 ohms with accelerator pedal at idle, and 900-1200 ohms with accelerator pedal fully depressed.

5) Check resistance between pedal potentiometer terminals No. 4 (Yellow/Red wire) and No. 2 (Yellow/Green wire). Resistance should be 900-1200 ohms with accelerator pedal at idle, and 5-50 ohms with pedal fully depressed. If resistances are not to specification, replace pedal potentiometer.

6) If resistances were incorrect in steps 2) and 3), but within specification in steps 5) and 6), check wiring and repair as necessary. If resistances were correct in all steps, go to next step.

7) Reconnect all components. Turn ignition on. Check voltage signal at ETS ECU connector terminal No. 2 (Yellow/Red wire). Voltage should be about 5 volts. Check voltage signal at ETS ECU connector terminal No. 4 (Yellow wire). Voltage should be about .1-.2 volts. Check voltage signal at ETS ECU terminal No. 17 (Green/Yellow wire). About .1 volts should be present when accelerator is at idle, and increase to about 4 volts when accelerator is depressed to full throttle. If voltages are not as specified, replace ETS ECU.

Fault Codes 2/45244, 2/45245, 2/45254 & 2/45255 (KDW
Potentiometer Signal Incorrect)

1) Turn ignition off. Disconnect ASR ECU connector. Check resistance between ASR ECU terminals No. 11 (Yellow/Red wire) and No. 15 (Red wire). Resistance should be 900-1100 ohms.

2) Check resistance between ASR ECU terminals No. 11 (Yellow/Red wire) and No. 22 (Blue/Red wire). About 5-100 ohms should be present with throttle at idle position (KDW fully retracted). About 900-1100 ohms should be present with throttle fully depressed (KDW fully extended).

3) Measure resistance between ASR ECU terminals No. 22 (Blue/Red wire) and 15 (Red wire). About 900-1100 ohms should be present with throttle at idle position (KDW fully retracted). About 5-100 ohms should be present with throttle fully depressed (KDW fully extended). If resistances are to specification, go to step 6). If resistances are not to specification, go to next step.

4) Ensure ignition is off. Disconnect potentiometer connector. Measure resistance between potentiometer terminals No. 2 (Yellow/Red wire) and No. 6 (Red wire). About 900-1100 ohms should be present. Measure resistance between potentiometer terminals No. 2

(Yellow/Red wire) and No. 5 (Blue/Red wire). About 5-100 ohms should be present with throttle at idle (KDW fully retracted). About 900-1100 ohms should be present with throttle fully depressed (KDW fully extended).

5) Measure resistance between potentiometer terminals No. 5 (Blue/Red wire) and No. 6 (Red wire). About 900-1100 ohms should be present with throttle at idle (KDW fully retracted). About 5-100 ohms should be present with throttle fully depressed (KDW fully extended). If resistances are not to specification, replace KDW motor/potentiometer assembly. If resistances were incorrect in steps 1) through 3), but were within specification in steps 4) and 5), check and repair wiring as necessary.

6) If all resistances were with specification, reconnect all components. Turn ignition on. Check voltage at ASR ECU connector terminal No. 11 (Yellow/Red wire). About 4.5-5.0 volts should be present. If voltage is not 4.5-5.0 volts, check Yellow/Red wire between potentiometer connector and ASR ECU terminal No. 11 (Yellow/Red wire) for an open circuit or short to ground.

7) Ensure there is a good ground at ASR ECU terminal No. 15 (Red wire) by checking voltage at ASR ECU terminal No. 15 (Red wire) with all components connected and ignition on. About .1-.2 volts should be present. If voltage is not .1-.2 volts, check Red wire between potentiometer connector and ASR ECU terminal No. 15 for an open circuit or short to ground.

8) Check potentiometer output signal at ASR ECU terminal No. 22 (Blue/Red wire) with all components connected and ignition on. KDW motor should be in fixed position about halfway through its travel. About 2.5 volts should be present. If voltage is not to specification, check Blue/Red wire between potentiometer connector and ASR ECU terminal No. 22 for an open circuit or short to ground. If wiring is okay and code persists, replace ASR ECU.

Fault Codes 2/45292 (Deviation In Signals Between Throttle Potentiometer & Pedal Potentiometer)

1) If TCS CTRL light is on and system is in limp home mode, check for fault Codes 25240, 25241, 25242, 25243, 25250, 25251, 25252, 25253, 25290, 25291, 45240, 45241, 45242, 45243, 45250, 45251, 45252, 45253, 45290, and 45291 from ETS system. If any fault codes are present, perform test procedures for these codes first. If other codes are not present, go to next step.

2) Ensure all components are connected. Turn ignition on. Check voltage signals by backprobing at ASR ECU connector. See FAULT CODE 2/45292 VOLTAGE SPECIFICATIONS table.

FAULT CODE 2/45292 VOLTAGE SPECIFICATIONS TABLE

| Terminal No. (Wire Color) | Approximate Voltage |
|---------------------------|---------------------|
| 1 (Gray/Green) | (1) .1 |
| 3 (Blue/White) | (2) 4 |
| 7 (Yellow/Red) | 5 |
| 20 (Yellow/White) | 5 |

(1) - Specification is for accelerator at idle position. About 4 volts should be present at full throttle.

(2) - Specification is for accelerator at idle position. About .1 volt should be present at full throttle.

3) If any voltages in FAULT CODE 2/45292 VOLTAGE SPECIFICATIONS table are not to specification, check wiring and connectors between ETS ECU and ASR ECU for an open or short circuit.

4) If wiring is okay, clear fault codes. Test drive vehicle.

Check if fault codes return. If codes return, replace ASR ECU.

Fault Codes 2/45391 (No Drive Signal With Ignition On & Vehicle Speed Greater Than 2 MPH)

1) This signal is also used by engine management (fuel and ignition) system. First check engine management system for fault Codes 25723 or 45723. See appropriate COMPUTERIZED ENGINE CONTROLS article in ENGINE PERFORMANCE section. If codes are present, perform appropriate testing for that code. If fault codes are not present, go to next step.

2) Ensure all components are connected. Turn ignition on. Backprobe for battery voltage at ASR ECU connector terminal No. 16 (Orange wire) with transmission selector in R, D, 3, 2, or 1 positions. Move transmission selector to N and P positions and recheck voltage. About zero voltage should be present.

3) If voltages are not to specification, check Orange wire for an open or short circuit. If wiring is okay and/or if voltages were to specification, clear fault codes and test drive vehicle. If fault code(s) return, replace ASR ECU.

NOTE: If fault Codes 45720 and 78390 both occur, perform test procedure for Code 45240. See FAULT CODES 2/45240, 2/45242, 2/45250, 2/45252 & 2/45290 (THROTTLE POTENTIOMETER SIGNAL FAULTY OR MISSING)

Fault Codes 2/45720, 2/45770, 2/45780 & 3/55780 (Signal From Safety Switch On Throttle Housing Faulty Or Absent)

1) Ensure all components are connected. Turn ignition on. Check voltage by backprobing at ETS ECU terminal No. 28 (Black/White wire). With throttle closed, about one volt should be present. With throttle one-half open or more, 7-10 volts should be present.

2) Disconnect throttle housing connector. Check resistance between throttle housing terminals No. 3 (Blue wire) and No. 5 (Black/White wire). With throttle valve in idle position, about 27 k/ohms should be present. With accelerator depressed one-half way, about 500 ohms should be present. If resistances are not to specification, replace throttle housing. If resistances are to specification, go to next step.

3) Turn ignition on. Check voltage at throttle housing connector terminal No. 3 (Blue wire). Battery voltage should be present. If voltage is not present, check fuse. If fuse is okay, check voltage lead to fuse for an open circuit or short to ground.

4) Ensure a good ground is present at throttle housing connector terminal No. 5 (Black/White wire) by tracing wire to ETS ECU terminal No. 28. If ground circuit is intact, replace ETS ECU.

Fault Codes 2/45360, 2/45721, 2/45771, 2/45781 & 3/55781 (Pedal Potentiometer Safety Switch Signal Faulty Or Missing)

1) Before beginning test procedure, ensure movement of pedal sensor is not blocked by floor mat or other items. Ensure all components are connected. Turn ignition on. Check voltage by backprobing at ETS ECU terminal No. 14 (Gray/White wire).

2) With pedal released, voltage should be about one volt. With pedal depressed about one-half way, voltage should be about 7-9 volts. If voltages are to specification, go to step 4). If voltages are not to specification, go to next step.

3) Turn ignition off. Disconnect pedal potentiometer connector. Check resistance between pedal potentiometer terminals No. 1 (Blue wire) and No. 5 (Gray/White wire). About 14.7 k/ohms should be present with throttle valve in idling position. About 470 ohms should be present with accelerator one-half depressed. If resistances are not to specification, replace pedal potentiometer. If resistances are to specification, go to next step.

4) Turn ignition on. Measure voltage between pedal potentiometer connector terminal No. 1 (Blue wire) and ground. Battery voltage should be present. If battery voltage is not present, check fuse No. 15, Blue wire, and Blue/Red wires to system relay for an open circuit or short to ground.

5) Ensure a good ground is present at potentiometer connector terminal No. 5 by checking Gray/White wire between potentiometer connector terminal No. 5 and ETS ECU terminal No. 14 for an open circuit or short to voltage. If all wiring is intact, replace ETS ECU.

Fault Code 2/45722 (Signal From Brake Pedal/Clutch Pedal Switch Faulty Or Absent)

1) Connect ISAT to Black diagnostic connector under front passenger's seat. Enter ISAT command Code 205. Without depressing either brake or clutch pedal, reading on ISAT should be 8B005. With either pedal depressed, reading should be 8B105.

2) To perform an alternative procedure, ensure all components are connected. Turn ignition on. Check voltage by backprobing ETS ECU terminal No. 36 (White wire). With both pedals released, about battery voltage should be present. With both pedals depressed, less than one volt should be present.

3) If voltage is not to specification, check clutch and brake switches. Adjust or replace as necessary. Ensure battery voltage is brake switch terminal No. 1 (Black wire). If voltage is not to specification, check fuse No. 15. If fuse is okay, check voltage supply to fuse.

4) Check White wire between brake switch terminal No. 2 and ETS ECU terminal No. 36 for an open or short circuit. If wire is intact, replace ETS ECU.

Fault Codes 2/45723 & 2/45724 (Brake Signal Faulty Or Absent)

1) Connect ISAT to Black diagnostic connector under passenger's front seat. Enter ISAT command Code 206. With foot off brake pedal, reading should be 8B006. With pedal depressed, reading should be 8B106.

2) To perform an alternative procedure, ensure all components are connected. Turn ignition on. Check voltage by backprobing ETS ECU terminal No. 15 (White wire). With brakes released, zero volts should be present. With brakes applied, about battery voltage should be present. If voltages are to specification, go to step 5).

3) If voltages are not to specification, check fuse No. 24. If fuse is okay, check voltage lead to fuse. Also check if brakelight switch operates correctly. If not, adjust or replace as necessary.

4) Check Red wire between fuse No. 24 and brakelight switch. Also check White wire between brakelight switch and ETS ECU terminal No. 15. If wires are intact, go to next step.

5) If all circuits and components are okay but code(s) persists, replace TC/ABS ECU. If codes still persist after replacing TC/ABS ECU, replace ETS ECU.

Fault Codes 2/45791, 2/457B1 & 2/457B2 (KDW Faulty)

1) If these codes occurred only during calibration, clear fault code and test drive vehicle. If fault code reoccurs on road test, check KDW motor connections, linkage, etc. If any other KDW fault codes are present, perform appropriate testing for that code.

2) Also check automatic transmission linkage for any faults which can interfere with KDW motor. Clear fault codes and test drive vehicle. If fault code(s) reoccur, replace ASR ECU.

Fault Codes 2/46221 & 2/46271 (Temperature Sensor Signal Faulty Or Absent)

1) Ensure ignition is off. Disconnect ETS ECU connector. Check resistance between ETS ECU connector terminal No. 33 (Yellow

wire) and ground. Ensure resistance reading is correct for present temperature. See TEMPERATURE SENSOR RESISTANCE SPECIFICATIONS table.

TEMPERATURE SENSOR RESISTANCE SPECIFICATIONS TABLE

| Temperature °F (°C) | Approximate Ohms |
|---------------------|------------------|
| -4 (-20) | 14000 |
| 14 (-10) | 9000 |
| 32 (0) | 5800 |
| 50 (10) | 3800 |
| 68 (20) | 2600 |
| 86 (30) | 1700 |
| 176 (80) | 320 |

2) If resistances are incorrect, measure resistance directly at temperature sensor. If resistances are also incorrect at temperature sensor, replace temperature sensor.

3) If resistances are correct, check Yellow wire between temperature sensor terminal No. 2 and ETS ECU terminal No. 33 for an open circuit or short to ground. If wiring is okay, reconnect all components and turn ignition on. Check for voltage by backprobing ETS ECU terminal No. 33 (Yellow wire). See TEMPERATURE SENSOR VOLTAGE SPECIFICATIONS table.

TEMPERATURE SENSOR VOLTAGE SPECIFICATIONS TABLE

| Temperature °F (°C) | (1) Approximate Voltage |
|---------------------|-------------------------|
| -4 (-20) | 4 |
| 68 (20) | 12.3 |
| 176 (80) | 1.51 |

(1) - A reading of 5 volts indicates an open circuit. A reading of zero volts indicates a short to ground.

4) If voltages are not to specification, replace coolant temperature sensor. If voltages are to specification and code persists, replace ETS ECU.

Fault Codes 3/53240, 3/53250 & 3/53270 (System Relay Control Signals Faulty Or Absent)

1) Turn ignition on. Check battery voltage by backprobing at ETS ECU terminal No. 22 (Blue/Red wire). If battery voltage is not present, go to next step. If battery voltage is present, clear fault code and road test vehicle. If fault reoccurs, go to next step. If fault does not reoccur, replace ETS ECU.

2) Ensure ignition is on. Check exciter circuit to system relay voltage by backprobing ETS ECU terminal No. 13 (Blue wire). Less than 1.5 volts should be present. If voltage for terminals No. 13 (Blue wire) and No. 22 (Blue/Red wire) are zero volts, check Blue wire between ETS ECU connector terminal No. 13 and system relay terminal No. 85. In addition, ensure battery voltage is reaching system relay terminals No. 30 (Red wire) and No. 86 (Red wire).

3) If voltage reading is battery voltage at ETS ECU terminal No. 13 (Blue wire) and zero volts at ETS terminal No. 22 (Blue/Red wire), ground terminal No. 13 (Blue wire). Battery voltage should now be at terminal No. 22 (Blue/Red wire).

4) If battery voltage is not at terminal No. 22 (Blue/Red wire), check Blue/Red wire between ETS ECU terminal No. 22 and system relay terminal No. 87 for an open or short circuit. If wiring is okay,

replace system relay.

Fault Codes 3/53440 & 3/53450 (Safety Valve Signal Faulty Or Absent)

1) Check fuse No. 15 and replace as necessary. Disconnect safety valve connector. Measure resistance between valve terminals. If resistance is about 30 ohms, go to next step. If resistance is not about 30 ohms, replace safety valve.

2) Ensure safety valve connector is still disconnected. Turn ignition on. If voltage is present at valve connector terminal No. 1 (Blue wire), go to next step. If voltage is not present at valve connector terminal No. 1 (Blue wire), check Blue wire from connector terminal No. 1 to fuse No. 15 for an open or short circuit.

3) Ensure there is a good ground at safety valve connector terminal No. 2. Check Brown/White wire between connector terminal No. 2 and ETS ECU terminal No. 35 for an open or short circuit. If ground is okay, reconnect all components. Turn ignition on. Check voltage at ETS ECU terminal No. 35 (Brown/White wire).

4) About one volt should be present if system is operational (safety valve energized). If system is deactivated (safety valve deenergized), zero volts should be present. Battery voltage may be present if system relay stayed energized. If voltages are to specification but fault code persists, replace ETS ECU.

Fault Codes 3/53630 (Throttle Actuator Motor Malfunction)

1) Raise vacuum in vacuum unit in throttle housing to release spring. In addition, disconnect intake boot at throttle housing so throttle valve can be moved by hand.

2) Ensure ignition is off. Disconnect ETS ECU. Measure resistance between ETS ECU connector terminals No. 20 (Green wire) and No. 21 (Green/White wire). Move throttle valve slowly through its entire travel, allowing it to stop at each point so resistance readings can stabilize. Resistance should be less than 200 ohms. If resistance is within specification, go to step 4). If resistance is at any time greater than 200 ohms, go to step 3).

NOTE: It is normal for resistance to increase greater than specification while motor is rotated. This is because of brushes moving along the commutator. Compare resistance to specification only with throttle valve held stationary.

3) Disconnect throttle housing connector. Measure resistance of motor between throttle housing terminals No. 1 (Green wire) and No. 7 (Green/White wire). If resistance was greater than 200 ohms in step 2) but is to specification now, check and repair wiring as necessary. If resistance was too high in both tests, replace throttle housing.

4) Check Green wire between throttle housing terminal No. 1 and ETS ECU terminal No. 20 for an open or short circuit. Also check Green/White wire between throttle housing terminal No. 7 and ETS ECU terminal No. 21 for an open or short circuit. If wiring is okay and fault code persists, replace ETS ECU.

Fault Codes 3/58341 & 3/58351 (ETS ECU Idling Control Function Outside Adaptive Limits)

Check for leaks in induction system. Induction system includes both intake and discharge sides of turbo, downstream and upstream sides of throttle housing, and purging valve on evaporative emission canister.

Fault Codes 672B1 & 772B1 (TCS CTRL Light On, No Control Of KDW)

Ensure KDW motor and circuits are okay. See FAULT CODES 68331 & 78331 (SHORT CIRCUIT IN OUTPUT STAGE FOR KDW MOTOR). If no problems

are found with KDW motor or connectors, clear fault codes, test drive vehicle, and check whether fault code is set again. If fault code sets again, replace ASR ECU.

NOTE: Ensure engine is at normal operating temperature. Do not touch brake or clutch pedals during calibration.

Fault Codes 675B0 & 675B1 (Calibration Incomplete)

Clear fault codes and initiate recalibration. See AUTOMATIC TRANSMISSION CALIBRATION or MANUAL TRANSMISSION CALIBRATION under RETRIEVING CODES (ETS SYSTEM). If calibration cannot proceed, check brake light switch and switches for brake and clutch pedals. If switches are okay, replace TCS ECU.

Fault Code 675B2 (Engine Variant Not Selected)

On manual transmission equipped vehicles, enter ISAT command Code 977. ISAT display should show 802.3TS. On automatic transmission equipped vehicles, enter ISAT command Code 97A. ISAT display should show 802.3TA.

Fault Codes 6/775B3 & 6/775B5 (ASR ECU Error, EEPROM ROM Error)

Clear fault codes, test drive vehicle, and check whether fault code sets again. If code sets again, replace ASR ECU.

NOTE: Following malfunction can be caused by interference from other vehicles or other external sources of interference.

Fault Codes 675B4 & 775B4 (ASR ECU Error)

1) Clear fault code. Test drive vehicle and check whether fault code sets again. If code sets again, check electrical system for loose connections, particularly battery and alternator.

2) Ensure resistor spark plugs are installed. In addition, ensure all ignition suppression components are okay. If no problems are found, clear code and test drive vehicle again. If code returns, replace ASR ECU.

Fault Codes 68331 & 78331 (Short Circuit In Output Stage For KDW Motor)

1) Check KDW motor to see if it is binding. If motor is not binding, turn ignition off. Disconnect ASR ECU connector. Measure motor resistance between ASR ECU terminals No. 23 (Blue/White wire) and No. 24 (White wire). Move linkage arm slowly through its travel. With linkage arm stationary in any position, resistance should be less than 20 ohms. If resistance is correct, go to step 3). If resistance at any time is greater than 20 ohms, go to next step.

NOTE: It is normal for resistance reading to increase above specification while motor is being rotated. This is due to brushes moving along commutator. Compare resistance to specification only with arm stationary.

2) Disconnect KDW connector. Measure resistance between motor terminals No. 1 (White wire) and No. 7 (Blue/White wire). Move linkage arm slowly through its travel. With linkage arm stationary in any position, resistance should be less than 20 ohms. If resistance is correct, go to next step. If resistance at any time is greater than 20 ohms, replace motor/potentiometer assembly.

3) Check Black/White wire between ASR ECU terminal No. 23 to KDW motor terminal No. 7 for an open circuit or short to ground. In addition, check White wire between ASR ECU terminal No. 24 to KDW motor terminal No. 1 for an open circuit or short to ground. If wiring is okay and code is still present, replace ASR ECU.

Fault Codes 6/78390 (Malfunction In Throttle Valve Control)

1) Check if other fault codes are present. If other fault codes are present, repair those fault codes first. If other codes are not present, go to next step.

2) Check for leaks in vacuum circuit by starting engine. Disconnect hose between non-return valve and intake manifold. If this causes arm on throttle housing to retract, there is a system leak. To pinpoint leak, pinch hoses, one at a time, from non-return valve via safety valve to throttle housing. Replace any components that may be causing leak.

3) If a leak is not present, raise vacuum in throttle housing vacuum unit to release spring. In addition, disconnect intake boot at throttle housing so throttle valve can be moved by hand.

4) Ensure ignition is off. Disconnect ETS ECU connector. Measure resistance between ETS ECU connector terminals No. 20 (Green wire) and No. 21 (Green/White wire). Move throttle valve slowly through its entire travel. Stop throttle valve at several points so resistance reading can stabilize. Resistance should be less than 200 ohms. If resistance is within specification, go to step 6). If resistance is at any time greater than 200 ohms, go to step 5).

NOTE: It is normal for resistance to increase greater than specification while motor is rotated. This is because of brushes moving along the commutator. Compare resistance to specification only with throttle valve held stationary.

5) Disconnect throttle housing connector. Measure resistance of motor between throttle housing terminals No. 1 (Green wire) and No. 7 (Green/White wire). If resistance was greater than 200 ohms in step 4) but is to specification now, check and repair wiring as necessary. If resistance was too high in both tests, replace throttle housing.

6) Check Green wire between throttle housing terminal No. 1 and ETS ECU terminal No. 20 for an open or short circuit. Also check Green/White wire between throttle housing terminal No. 7 and ETS ECU terminal No. 21 for an open or short circuit. If wiring is okay and fault code persists, replace ETS ECU.

Fault Codes 6/783B0 (ETS ECU Drive Circuit To Throttle Actuator Motor Faulty)

Replace throttle housing. If problem persists, replace ETS ECU.

Fault Codes 683B1 & 783B1 (ASR ECU Error; KDW Motor Output Stage Faulty)

Check KDW motor and connections. If motor and connections are okay, clear fault codes. Test drive vehicle. Check whether fault code returns. If code reoccurs, replace ASR ECU.

NOTE: When following fault code is stored in memory, vehicle may remain in limp-home mode until fault has been cleared using ISAT.

Fault Codes D/E7590 (Limp-Home Mode Selected; TCS CTRL Light On)

1) Check if other fault codes are present. If other codes are present, perform testing for those codes first. If no other codes are present, go to next step.

2) Clear fault code and test drive vehicle to determine if code reoccurs. If code reoccurs, connect a vacuum gauge between safety valve and throttle housing vacuum chamber. Start engine and ensure vacuum is raised in throttle housing vacuum chamber. Also ensure throttle linkage arm moves out of throttle housing and slackens cable.

NOTE: Most electrical failures in ETS system will shut down safety valve and cause no vacuum to be available at vacuum chamber.

3) With engine running and good vacuum shown on vacuum gauge, disconnect check valve from intake manifold (leave check valve connected to safety valve). If this causes throttle housing arm to retract, a leak is present in the system.

4) To pinpoint leak, turn engine off. Reconnect check valve, start engine to raise vacuum, and pinch hoses one at a time before disconnecting them to locate leak. If no leak is present, replace throttle housing. If fault code is still present, replace ETS ECU.

Fault Codes D/E75B1, D/E75B2 & D/E75B3 (Communication Fault Between ASR Control Unit & ETS Control Unit)

1) Ensure all components are connected. Start and idle engine. Ensure about 5-7 volts are present by backprobing at following terminals:

- * ETS Terminal No. 32 (Black/White wire)
- * ETS Terminal No. 29 (Yellow wire)
- * ASR Terminal No. 14 (Yellow wire)
- * ASR Terminal No. 2 (Black/White wire)

NOTE: Communication signal that is being measured above is a DC reference signal from one ECU which has a good ground signal pulsed by other ECU. If a voltage close to zero or 10 volts is measured, it most likely indicates a broken wire or a short to ground.

2) Ensure all components are connected, engine is idling, and vehicle is stationary. Connect a logic probe to each terminal noted in step 1). Logic probe should indicate a pulse signal by illuminating HI and LO logic level indicators.

3) Turn ignition off. Disconnect ETS ECU and ASR ECU connectors. Ensure continuity is present in Yellow wire between ASR ECU terminal No. 14 and ETS ECU terminal No. 29. Also ensure continuity is present in Black/White wire between ASR ECU terminal No. 2 and ETS ECU terminal No. 32.

4) Turn ignition on. Ensure ETS ECU and ASR ECU are still disconnected. Check wires in step 3) for a short to ground or voltage and repair as necessary. If not faults were found with any wiring or system, replace ASR ECU. If problem persists, replace ETS ECU.

Fault Code 6/7XXXX (ETS ECU Fault)

If another fault code exists that begins with a 2, 3, 4, or 5 (2XXXX, 3XXXX, 4XXXX, or 5XXXX), diagnose that fault first. Clear fault codes and test drive vehicle to see if fault reoccurs. If fault reoccurs, replace ETS ECU.

AIR CONDITIONING/CLIMATE CONTROL INOPERATIVE

1) With Automatic Climate Control (ACC) set to LO, enter ISAT command Code 550. If A/C relay is operating, go to next step. If A/C relay is not operating, check Black wire between ETS ECU terminal No. 38 and relay terminal No. 85. Also check Yellow wire between ETS ECU terminal No. 37 and pressure switch on receiver for an open circuit or short to ground. If all wiring is okay, go to next step.

2) With all components connected, A/C switched on, and engine running, check voltage signal at ETS ECU terminals No. 37 (Yellow wire) and No. 38 (Black wire). See A/C VOLTAGE SIGNAL SPECIFICATIONS table.

A/C VOLTAGE SIGNAL SPECIFICATIONS TABLE

| ETS ECU Terminal No. (Wire Color) | Specification |
|------------------------------------|---------------|
| 37 (Yellow Wire) | |
| A/C On | 10-12 Volts |
| A/C Off | Zero Volts |
| 38 (Black Wire) | |
| A/C Relay Energized | About 1 Volt |
| A/C Relay De-Energized (1) | 10-12 Volts |
| A/C Relay DeEnergized (2) | Zero Volts |
| (1) - With request signal present. | |
| (2) - With A/C switched off. | |

CRUISE CONTROL MALFUNCTION

Cruise Control System Malfunctioning Or Not Working At All

1) Perform test procedure for fault Code 2/45722. See FAULT CODE 2/45722 (SIGNAL FROM BRAKE PEDAL/CLUTCH PEDAL SWITCH FAULTY OR ABSENT). If problem is still present, go to next step.

2) Turn ignition on. To check controls at cruise control stalk switch with a voltmeter, see CRUISE CONTROL STALK SWITCH VOLTAGE CHECK table. If voltages are to specification, go to step 6). To check controls at cruise control stalk switch with an ISAT, go to next step.

CRUISE CONTROL STALK SWITCH VOLTAGE CHECK TABLE

| Application | Specification |
|--------------------------------------|---------------------|
| Terminal No. 18 (Yellow Wire) | |
| RESUME | |
| Switch Depressed | Battery Voltage |
| Switch Released | Zero Volts |
| Terminal No. 19 (Red/White Wire) | |
| SET | |
| Switch Depressed | Battery Voltage |
| Switch Released | Zero Volts |
| Terminal No. 31 (Red Wire) | |
| ON Or OFF | |
| Switch ON | (1) Battery Voltage |
| Switch OFF | (1) Zero Volts |
| Brake & Clutch Switches (White Wire) | |
| Either Pedal Depressed | Less Than One Volt |
| Both Pedals Released | (1) Battery Voltage |

(1) - Specification is approximate.

3) To check ON/OFF function, enter ISAT command Code 202. When switch is in ON position, 8B102 should be displayed. When switch is in OFF position, 8B002 should be displayed. If display is not as indicated, check Red wire between cruise control switch terminal No. 1 to ETS ECU terminal No. 31 for an open circuit or short to ground.

4) Check SET SPEED function by entering ISAT command Code 203. When SET SPEED is pressed, ISAT should display 8B103. With SET SPEED released, ISAT should display 8B003. If display is not as indicated, check Red/White wire between cruise control switch terminal No. 2 and ETS ECU terminal No. 19 for an open circuit or short to ground.

5) Check RESUME function by entering ISAT command Code 204. When RESUME is pressed, ISAT should display 8B104. With RESUME

released, ISAT should display 8B004. If display is not as indicated, check Yellow wire between cruise control switch terminal No. 3 and ETS ECU terminal No. 18 for an open circuit or short to ground. If all specifications are correct, go to next step.

6) Ensure ignition is on. Ensure battery voltage is present at cruise control switch terminal No. 4 (Blue wire). If battery voltage is not present, check Blue wire for a short to ground. If battery voltage is present, replace switch. If cruise control system still does not operate correctly, replace ETS ECU.

TURBO BY-PASS VALVE/CONTROL VALVE FAULT

Control Valve For Turbo By-Pass Valve Faulty

1) Ensure all vacuum lines are connected. If vacuum lines are okay, enter ISAT command Code 552. If control valve is not operating, disconnect control valve connector and measure resistance between valve terminals. If about 30 ohms are not present, replace valve.

2) If control valve operates in step 1), turn ignition on. Check for battery voltage between control valve connector terminal No. 2 (Blue wire) and ground. If battery voltage is present, go to next step. If battery voltage is not present, check Blue wire between connector terminal No. 2 and fuse for an open circuit or short to ground.

3) Ensure there is a good connection at control valve connector terminal No. 1 (Gray wire). Do this by checking Gray wire between connector terminal No. 1 and ETS ECU terminal No. 6 for an open circuit or short to ground. Check turbo by-pass valve for leaks in vacuum hoses. If all components check okay, replace ETS ECU.

REMOVAL & INSTALLATION

NOTE: For removal and installation procedures for ABS components, see ANTI-LOCK BRAKE SYSTEM article in this section.

TC/ABS ECU

Removal & Installation

TC/ABS ECU is located next to battery. Disconnect negative battery cable. Remove 2 TC/ABS mounting screws. Lift out TC/ABS ECU. Disconnect electrical connector. See Fig. 11. To install, reverse removal procedure.

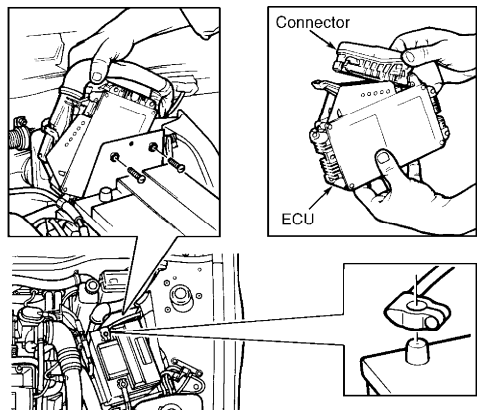
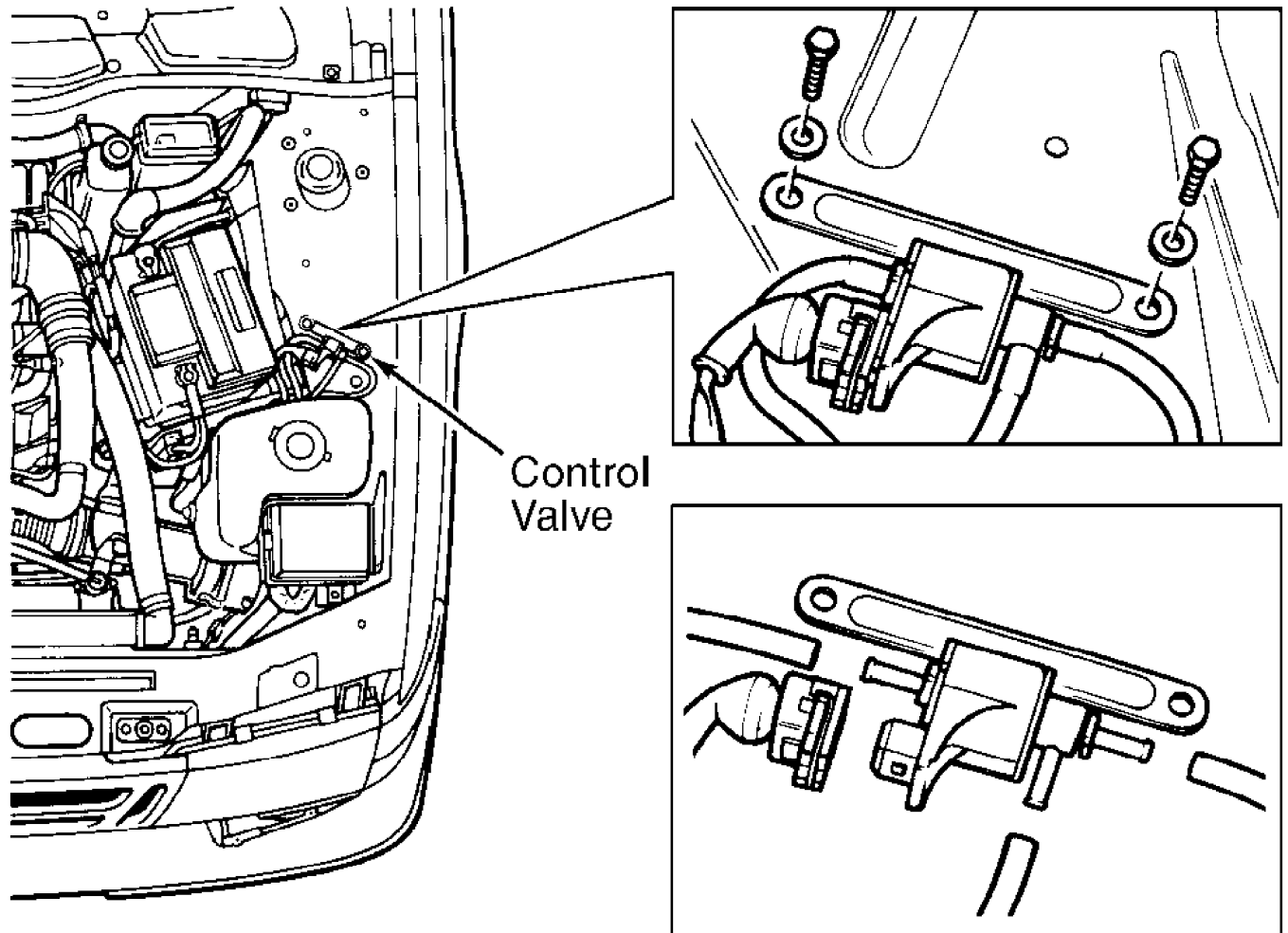


Fig. 11: Removing TC/ABS ECU
Courtesy of Saab-Scania of America, Inc.

CONTROL VALVE FOR TURBO BY-PASS VALVE

Removal & Installation

Valve is located in engine compartment on left inner fender. Remove 2 mounting screws. Disconnect electrical connector and 3 vacuum lines. See Fig. 12. To install, reverse removal procedure.



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Fig. 12: Removing Control Valve For Turbo By-Pass Valve
Courtesy of Saab-Scania of America, Inc.

SAFETY VALVE

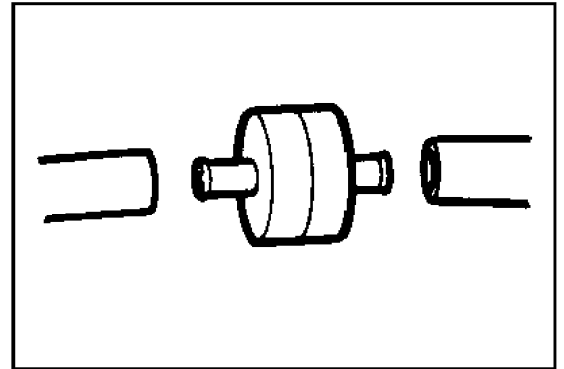
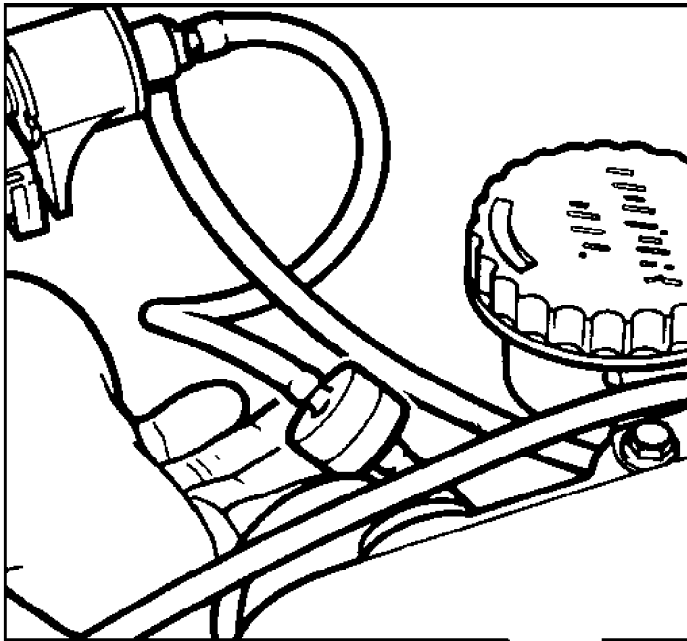
Removal & Installation

Safety Valve is located on false bulkhead panel on right side of vehicle. Remove 2 mounting screws. Disconnect electrical connector and vacuum hoses. To install, reverse removal procedure.

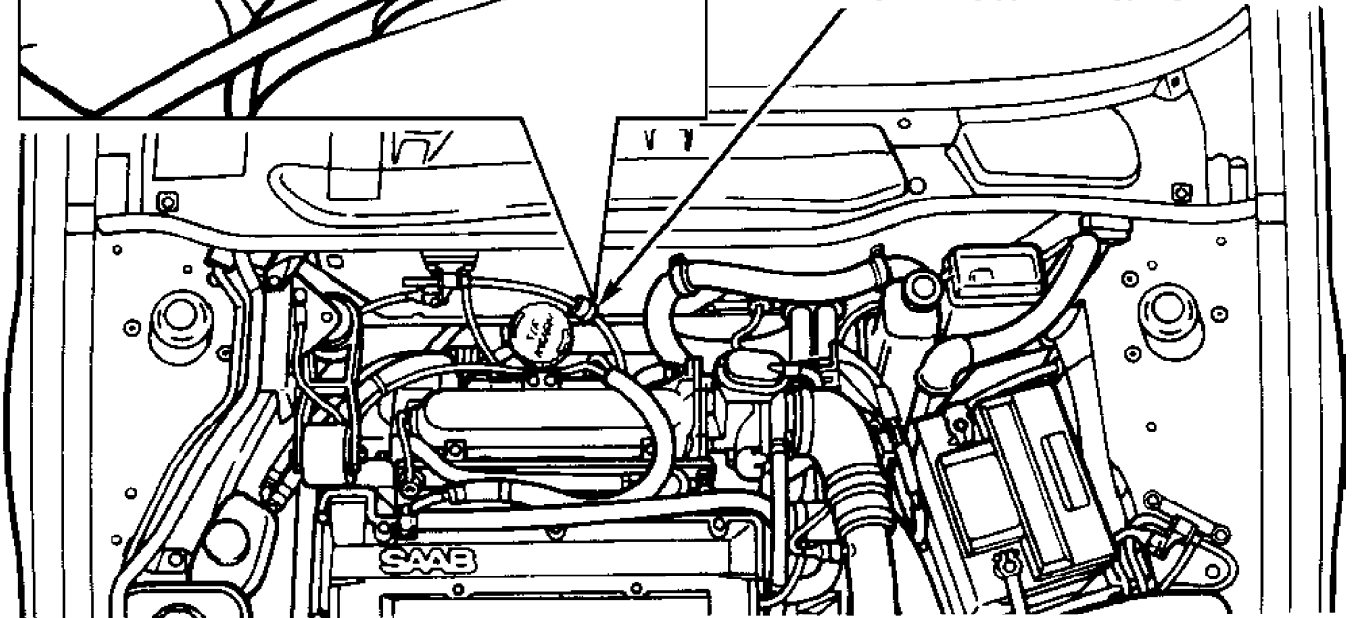
NON-RETURN VALVE

Removal & Installation

Valve is located in vacuum hose between safety valve and intake manifold. To remove valve, disconnect vacuum hoses. See Fig. 13. To install, reverse removal procedure.



Non-Return Valve



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Fig. 13: Removing Non-Return Valve
 Courtesy of Saab-Scania of America, Inc.

ETS ECU

Removal & Installation

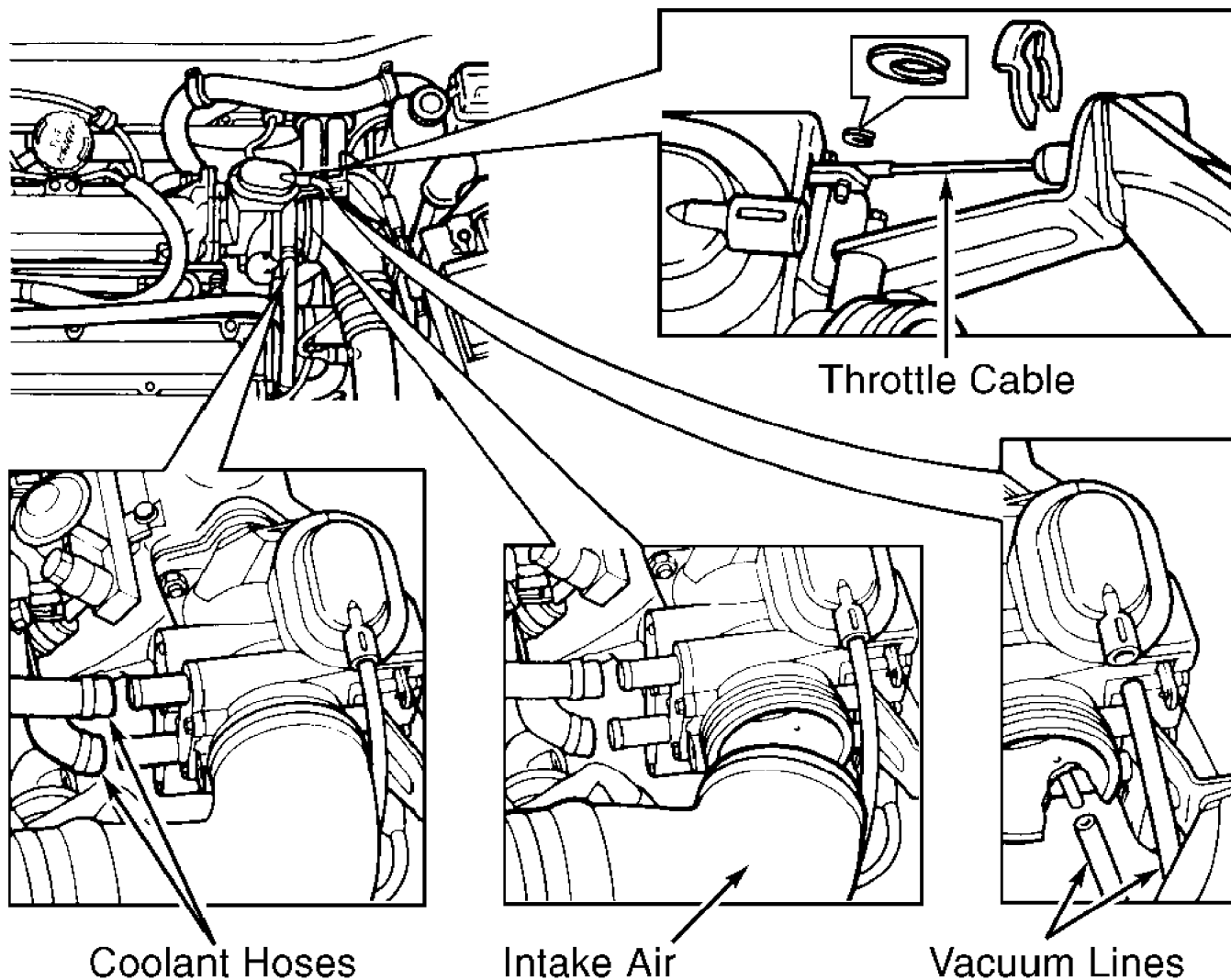
ETS ECU is located under driver's seat. Move driver's seat to full forward position with back rest angled backward. Disconnect negative battery cable. Loosen 2 clips holding carpet up under seat. Remove 2 fastening screws for protecting plate and move plate to side. Remove control unit. Disconnect ETS ECU electrical connector. To install, reverse removal procedure.

THROTTLE HOUSING

Removal & Installation

1) Drain enough coolant to lower level in system to below throttle housing. Disconnect 2 coolant hoses from housing. Disconnect

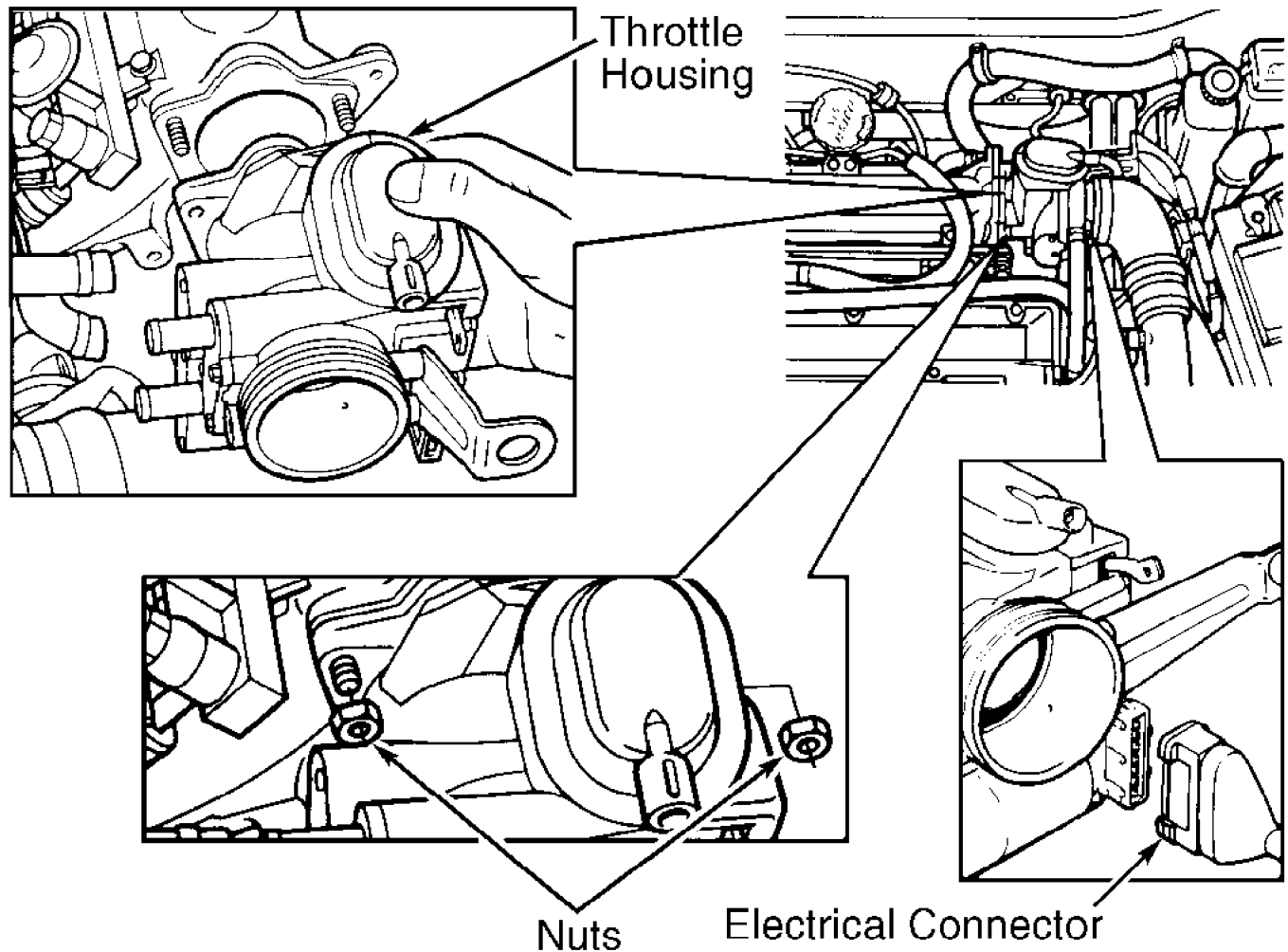
rubber elbow for intake air and move to one side. Disconnect 2 vacuum hoses. See Fig. 14.



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Fig. 14: Removing Throttle Housing (1 Of 2)
Courtesy of Saab-Scania of America, Inc.

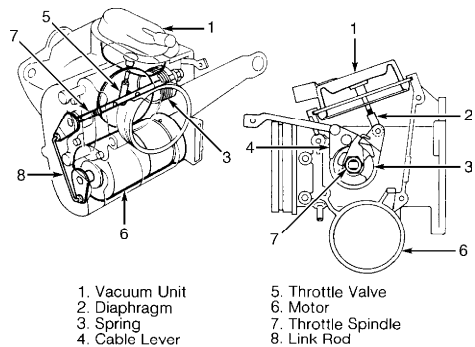
2) Remove 2 clips and disconnect throttle cable from throttle housing. Disconnect electrical connector. Remove nut at bottom of throttle housing. Remove bolt at bottom of throttle housing and swivel brace out of the way. See Fig. 15.



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Fig. 15: Removing Throttle Housing (2 Of 2)
 Courtesy of Saab-Scania of America, Inc.

3) Remove throttle housing nuts. Remove housing and O ring. If housing is being replaced, transfer throttle cable hardware to new housing. See Fig. 16. To install, reverse removal procedure.



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Fig. 16: Identifying Throttle Housing Components
 Courtesy of Saab-Scania of America, Inc.

WIRING DIAGRAM

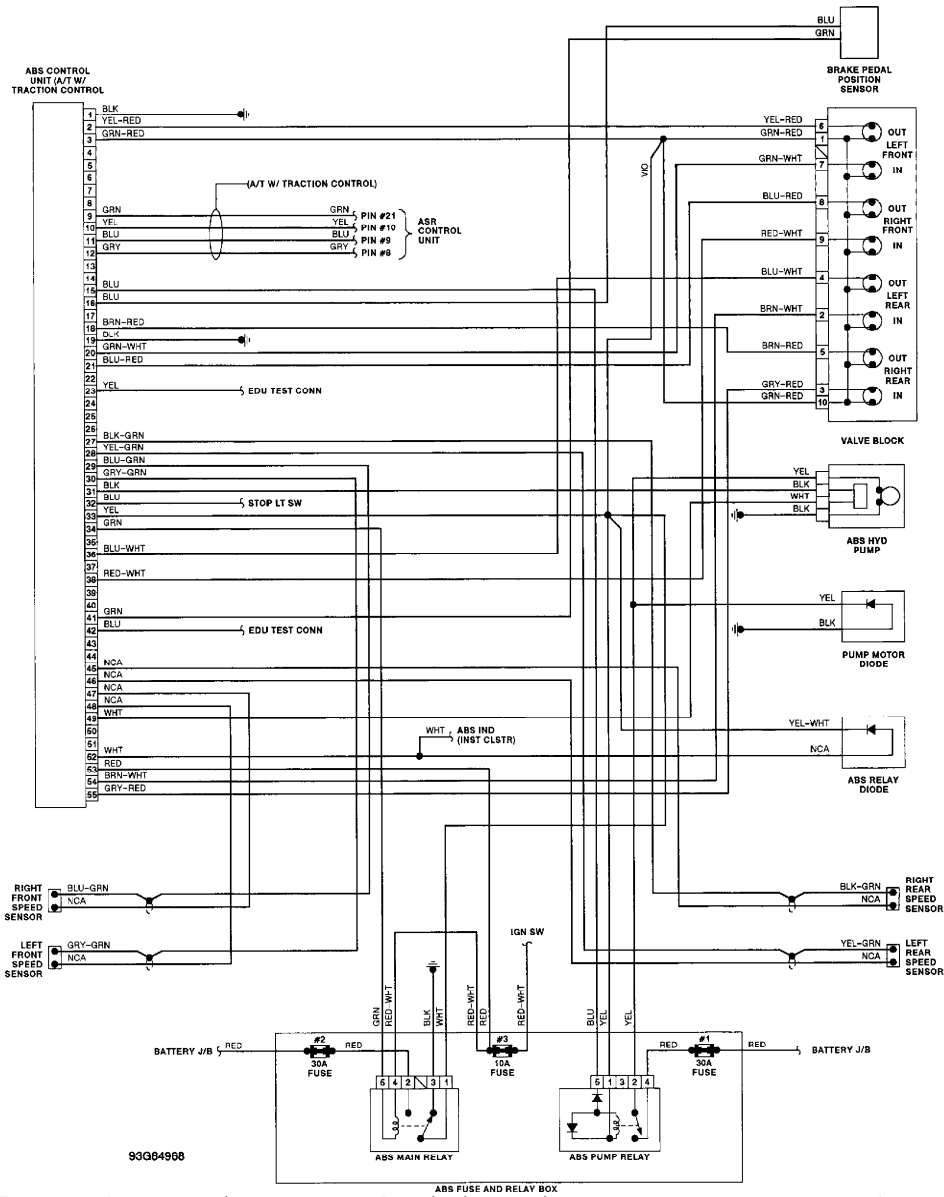
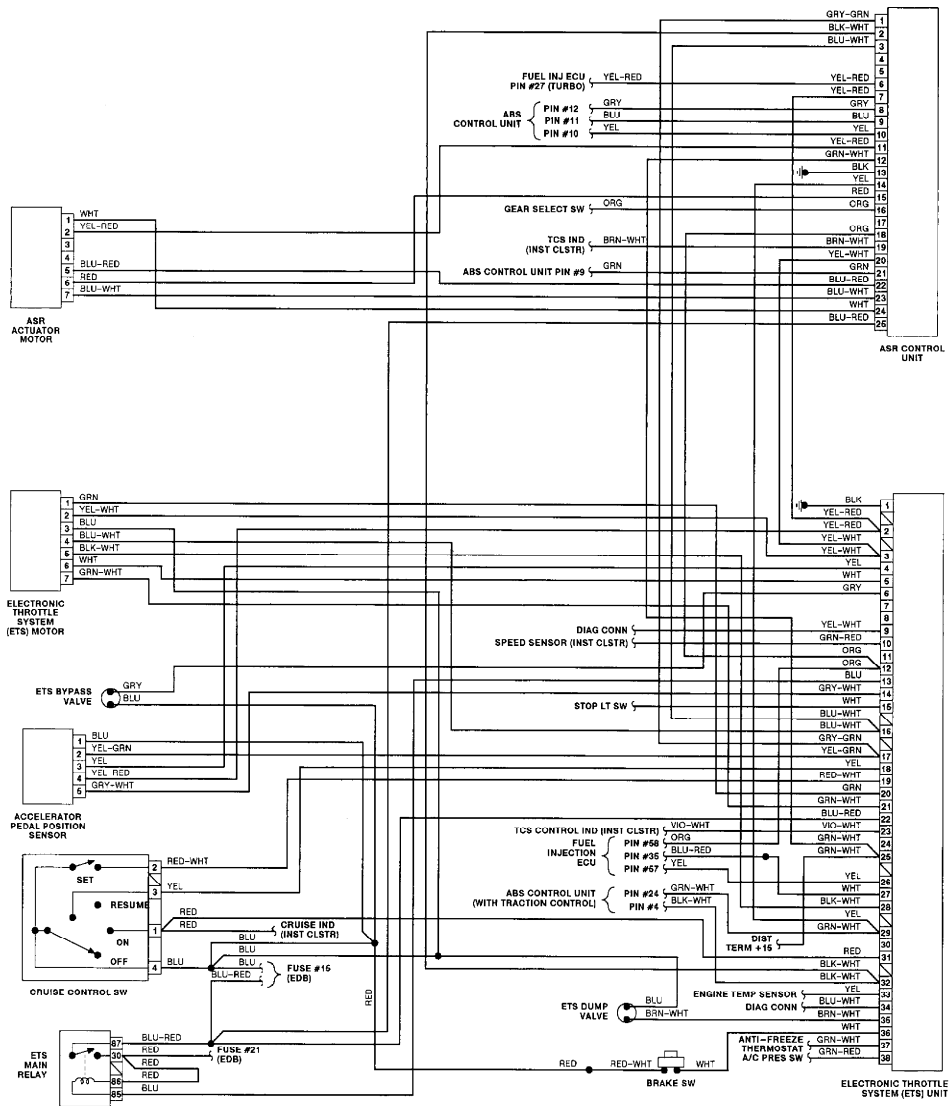


Fig. 17: Saab Traction Control Wiring Diagram (Auto Trans - 1 of 2)



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Fig. 18: Saab Traction Control Wiring Diagram (Auto Trans - 2 of 2)

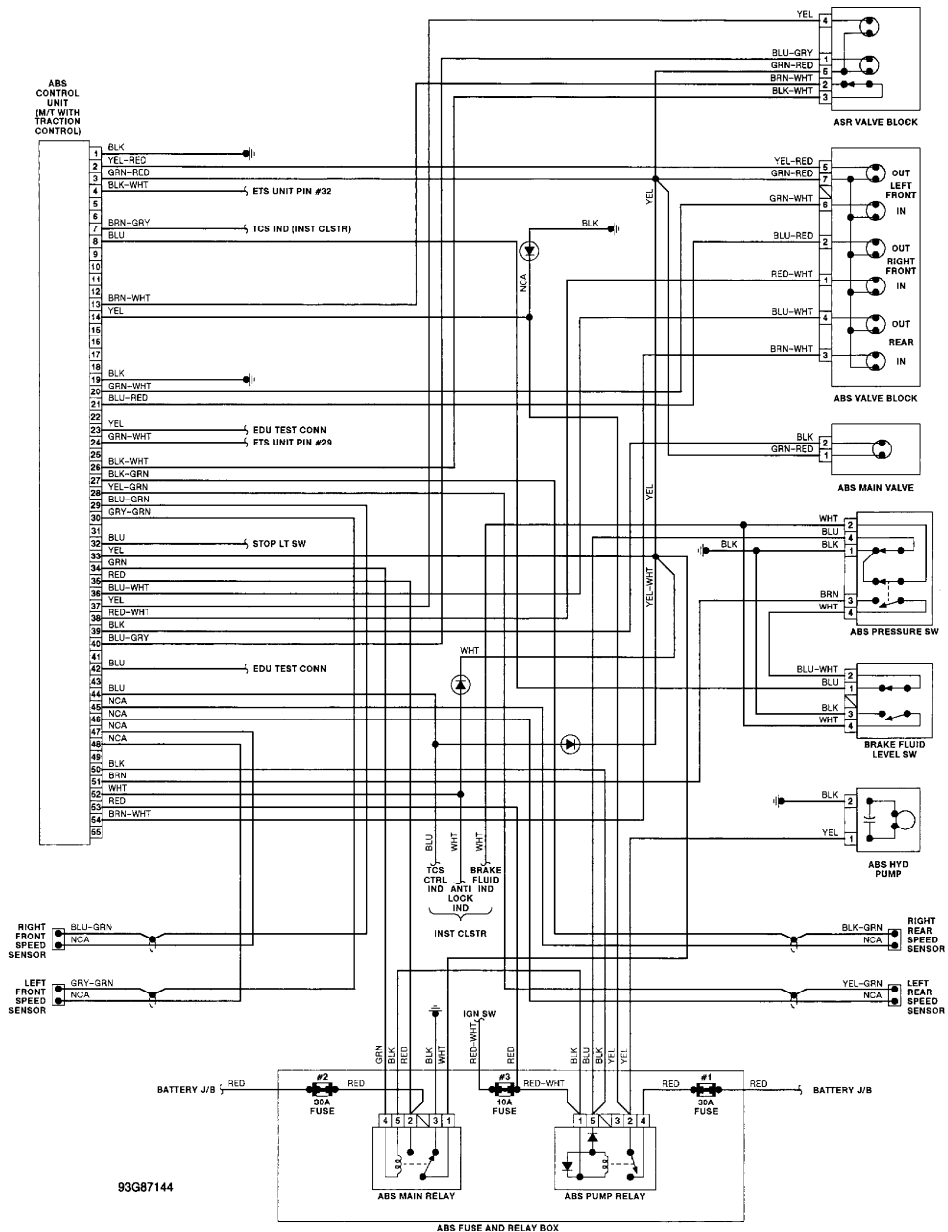


Fig. 19: Saab Traction Control Wiring Diagram (Man Trans - 1 of 2)

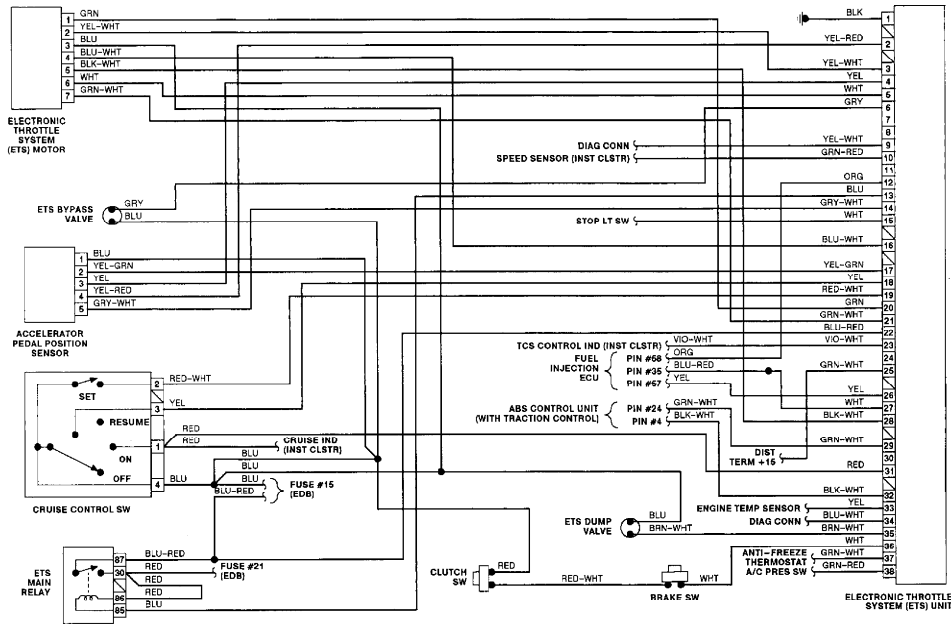


Fig. 20: Saab Traction Control Wiring Diagram (Man Trans - 2 of 2)