

# TRACTION CONTROL SYSTEM

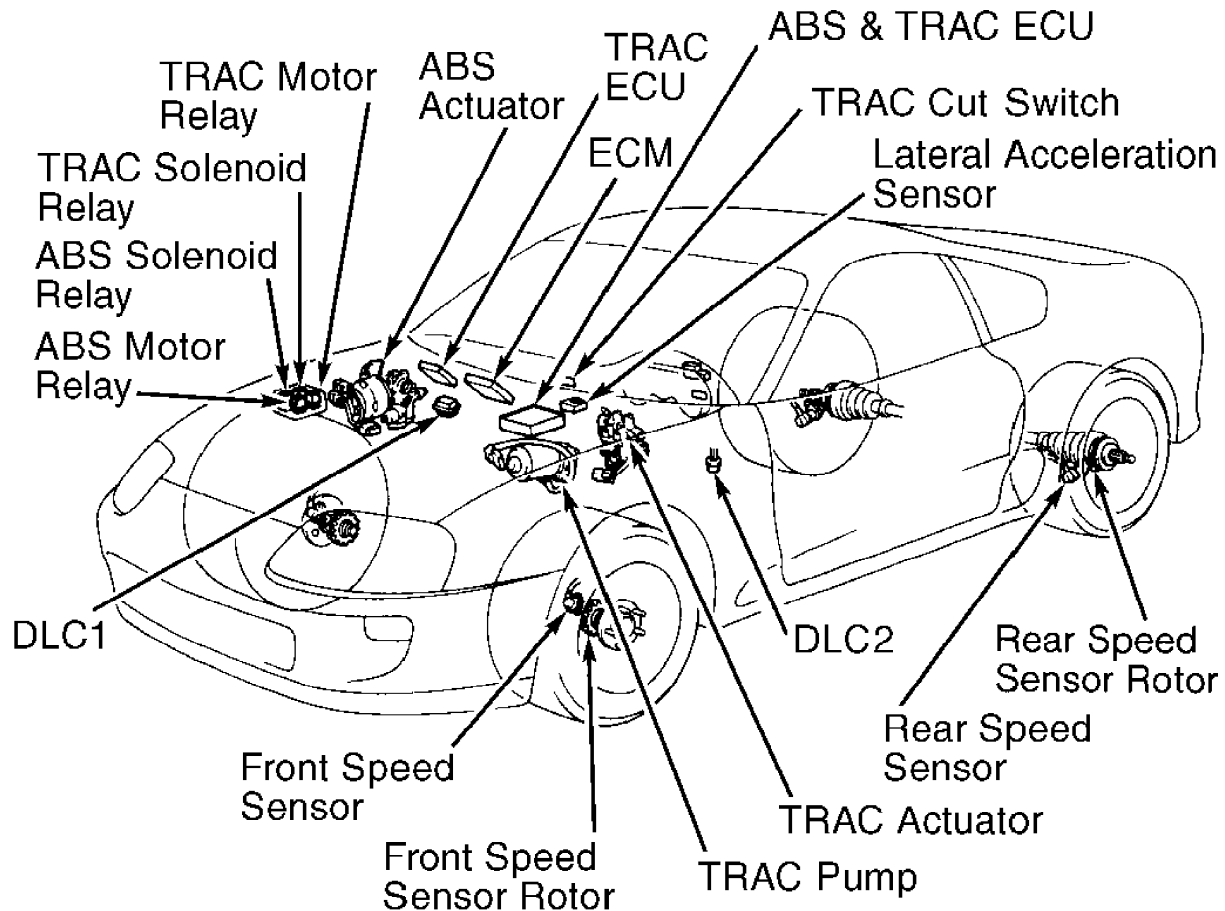
1998 Toyota Supra

1997-98 BRAKES  
Toyota - Traction Control  
Supra

## DESCRIPTION

Toyota Traction Control (TRAC) system controls engine torque and braking of the driving wheels. TRAC system is available as an option on Supra. TRAC system consists of an actuator, pump, speed sensors, integrated ABS/TRAC ECU, throttle control ECU, relays, solenoids, on-off switch, light indicator and warning switch.

Integrated with the ABS, TRAC helps avoid slippage of driving wheels during starting and acceleration. System maintains optimal driving control during changing road surface conditions upon acceleration. System eliminates need for subtle acceleration pedal operation and improves vehicle stability when starting, accelerating or turning on slippery roads. See Fig. 1.



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Fig. 1: Locating TRAC Components  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

## OPERATION

When either rear tire begins slipping during acceleration, TRAC system pulses the rear brakes and throttles back the engine to regain traction. The driver has the option of activating or deactivating TRAC system, or choosing SNOW mode. Located on the instrument panel is a TRAC OFF switch and TRAC indicator light, a SNOW switch and SNOW indicator light.

Pressing the TRAC OFF switch turns off TRAC system. Press TRAC OFF switch again turns on TRAC system. Pressing the SNOW switch turns on SNOW mode. Press SNOW switch again turns off SNOW mode. TRAC system is always operative after engine start. When TRAC system is operative, the TRAC indicator light blinks. When a malfunction occurs and ABS/TRAC ECU sets a diagnostic mode, this light blinks self-diagnostic results.

An actuator is fitted to the throttle body. The TRAC actuator controls sub-throttle valve according to signals from ABS/TRAC ECU, thus controlling the engine output.

Sensors fitted to the sub-throttle valve shaft convert the opening angle to voltage signal and send signal to ABS/TRAC ECU via engine and transmission ECU, controlling throttle position signals.

The TRAC system brake actuator consists of a pump and accumulator assembly which produces regulated fluid pressure in the disc brake calipers of the right and left rear wheels separately. This function is also controlled by signals from the ABS/TRAC ECU and throttle control ECU.

Brake fluid pressure in the right and left rear wheels is controlled separately in 3 control modes (pressure increase, holding and pressure reduction). This process is controlled by solenoid valves, pressure switches and sensors.

If a malfunction occurs while the TRAC system is inoperative, the throttle control ECU immediately turns off the TRAC throttle relay, TRAC motor relay and TRAC brake main relay.

If malfunction occurs while TRAC is operative, the ECU continues control (stops the control or fully opens the sub-throttle valve depending on the types of malfunction). If TRAC becomes inoperative, the engine and brake systems operate like vehicles without TRAC regulated. The ECU continues normal control even when a malfunction occurs.

## **BLEEDING BRAKE SYSTEM**

### **BRAKE BLEEDING PROCEDURES**

**CAUTION:** DO NOT allow reservoir to run dry during brake bleeding procedure. Use only clean brake fluid. Ensure no dirt or other foreign matter contaminates brake fluid. DO NOT mix different brands of brake fluid, as they may not be compatible. DO NOT spill brake fluid on vehicle, as it may damage paint. If brake fluid contacts paint, immediately wash with water.

1) If master cylinder is rebuilt or reservoir is empty, bleed master cylinder first. Bleed remaining wheels starting on wheel with longest hydraulic line and work toward wheel with shortest hydraulic line.

2) Raise and support vehicle. Ensure brake fluid reservoir remains at least half full during bleeding procedure. Connect one end of transparent vinyl tube to bleeder plug. Submerge other end of tube in a container half filled with clean brake fluid.

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

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

4) Refill brake fluid reservoir as necessary. Repeat step 3) until air is no longer discharged. Tighten bleeder plug to 73 INCH lbs. (8.3 N.m). Ensure fluid leakage is not present. Add fluid to reservoir. Repeat procedure for remaining wheels.

## ADJUSTMENTS

No adjustments to TRAC are required.

## TROUBLE SHOOTING

### SYMPTOM DIAGNOSIS

If a normal Diagnostic Trouble Codes (DTC) is displayed during DTC check but problem still occurs, check test or procedure for each problem symptom in order given. See PROBLEM SYMPTOMS table.

#### PROBLEM SYMPTOMS

Symptom	Circuit	TEST Or Procedure
TRAC Does Not Operate (1)	Check DTC, Confirm Normal Code Is Output	RETRIEVING DTC
TRAC Does Not Operate (1)	IG Power Source Circuit	DTC 51 & 52
TRAC Does Not Operate (1)	Speed Sensor Circuit	DTC 61-64
SLIP Indicator Light Abnormal	SLIP Indicator Light Circuit	SLIP INDICATOR LIGHT & SWITCH CIRCUIT
SNOW Indicator Light Abnormal	SNOW Indicator Light Circuit	SNOW INDICATOR LIGHT & SWITCH CIRCUIT
SNOW Indicator Light Abnormal	SNOW Mode Switch Circuit	SNOW MODE LIGHT & SWITCH CIRCUIT
TRAC OFF Indicator Light Abnormal (1)	TRAC OFF Indicator Light Circuit	TRAC OFF INDICATOR LIGHT & SWITCH CIRCUIT
TRAC OFF Indicator Light Abnormal (1)	TRAC OFF Switch Circuit	TRAC OFF LIGHT & SWITCH CIRCUIT
DTC Check Cannot Be Done (1)	TRAC OFF Indicator Light Circuit	TRAC OFF INDICATOR LIGHT & SWITCH CIRCUIT
DTC Check Cannot Be Done (1)	Tc Terminal Circuit	Tc TERMINAL CIRCUIT

(1) - If all circuits check okay and problem is still occurring, replace TRAC ECU.

## SELF-DIAGNOSTICS

NOTE: DO NOT start engine when retrieving DTC.

### RETRIEVING DTC

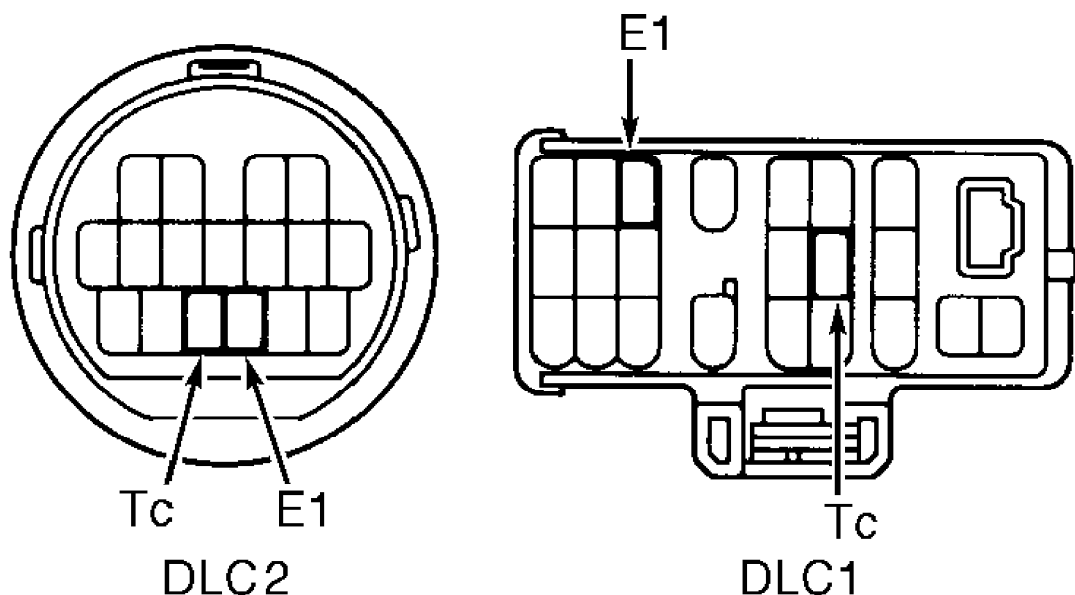
NOTE: There are 2 Data Link Connectors (DLC1 and DLC2). DLC1 is located in engine compartment on firewall to right of center line. DLC2 is located below left side of instrument panel.

1) Ensure battery voltage is at least 12 volts. Turn ignition on. The TRAC indicator light should go on for 3 seconds. Connect jumper wire between check connector terminals Tc and E1 of DLC1 or DLC2. See Fig. 2.

2) If TRAC system is functioning properly, TRAC light will blink 2 times per second. If a malfunction is detected, 4.5 seconds will elapse and ABS light will begin to flash a 2-digit DTC. First series of blinks indicates first digit of DTC. After a 1.5-second pause, second series of blinks indicates second digit of DTC. A 1.5-second pause separates first and second digits of DTC.

3) If 2 or more DTC are stored, there will be a 2.5-second pause between each DTC. After all DTC are flashed, there will be a 4 second pause and all DTC will repeat. For code definitions, see DTC DEFINITIONS. For code testing, see DIAGNOSTIC TESTS.

4) After replacing or repairing components, clear DTC. If battery cable was disconnected during repairs, all stored DTC will be erased. If battery cable was not disconnected during repairs, see CLEARING DTC.



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Fig. 2: Identifying DLC1 & DLC2 Connector Terminals  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

### DTC DEFINITIONS

Check suspect components in order given. See COMPONENT TESTS. Checks consist mainly of a visual inspection and continuity checks. For complete testing, see appropriate DTC TEST under DIAGNOSTIC TESTS.

Code 11 - Throttle Control Relay Circuit Open  
Throttle control relay, TRAC fuse, throttle control relay circuit, throttle control ECU.

Code 12 - Throttle Control Relay Circuit Short  
Throttle control relay, throttle control relay circuit, throttle control ECU.

Code 21 - Sub-Throttle Valve Motor Circuit Open Or Short  
Sub-throttle valve motor, sub-throttle valve motor circuit, throttle control ECU.

Code 22 - Sub-Throttle Valve Motor Malfunction  
Sub-throttle valve motor, sub-throttle valve, sub-throttle position sensor, wiring harness, throttle control ECU.

Code 23 - Throttle Body Malfunction  
Sub-throttle valve, sub-throttle position sensor, throttle control ECU.

Code 24 - Sub-Throttle Position Sensor Leakage/Sub-Throttle Valve Stuck  
Sub-throttle valve, sub-throttle position sensor, wiring harness, throttle control ECU.

Code 31 - Throttle Position Sensor Signal Malfunction  
Throttle position sensor, wiring harness throttle control ECU.

Code 32 - Sub-Throttle Position Sensor Signal Malfunction  
Sub-throttle position sensor, sub-throttle valve motor, sub-throttle valve, wiring harness, throttle control ECU.

Code 41 - RPM Signal Open Or Short  
Wiring harness, ECM, throttle control ECU.

Code 42 - ECM Malfunction  
Wiring harness, ECM, throttle control ECU.

Code 43 - ECM Communication Circuit Malfunction  
Wiring harness, ECM, throttle control ECU.

Code 51 - Power Source Circuit  
Wiring harness, throttle control ECU.

Code 52 - Power Source Circuit  
Battery, voltage regulator, wiring harness, throttle control ECU.

Code 61 - Right Front Speed Sensor Circuit  
Speed sensor, wiring harness, throttle control ECU.

Code 62 - Left Front Speed Sensor Circuit  
Speed sensor, wiring harness, throttle control ECU.

Code 63 - Right Rear Speed Sensor Circuit  
Speed sensor, wiring harness, throttle control ECU.

Code 64 - Left Rear Speed Sensor Circuit

Speed sensor, wiring harness, throttle control ECU.

Code 71 - Emergency Fuel Cut (Sub-Throttle Motor Circuit Malfunction)

Sub-throttle valve motor, sub-throttle valve, throttle control ECU.

Code 72 - Emergency Fuel Cut

Sub-throttle valve motor, sub-throttle valve, throttle control ECU.

Code 81 - ABS ECU Malfunction

Wiring harness, ABS ECU, throttle control ECU.

TRAC Indicator Light Always On (TRAC ECU Malfunction)

Throttle control ECU.

TRAC Indicator Light Always On (TRAC OFF Switch On)

Throttle control ECU.

## CLEARING DTC

DTC are cleared by removing ECU-B fuse. Other memory systems will also be cleared.

## DIAGNOSTIC TESTS

### DTC 11 & 12: THROTTLE CONTROL RELAY CIRCUIT OPEN OR SHORT

1) Remove TRAC fuse from relay block No. 2. Check fuse. If fuse is okay, reinstall fuse and go to next step. If fuse is faulty, repair short in wiring or components and replace fuse.

2) Remove throttle control relay from relay block No. 5. Check voltage at relay cavity terminal No. 1. If 10-14 volts exists, go to next step. If 10-14 volts does not exist, repair wiring as necessary. See appropriate wiring diagrams under WIRING DIAGRAMS.

3) Check throttle control relay. See THROTTLE CONTROL RELAY under COMPONENT TESTS. Replace relay if faulty. If relay is okay, go to next step.

4) Check for open or short in wiring between throttle control relay and throttle control ECU. Repair wiring if necessary. If no problems are found, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

### DTC 21 & 22: SUB-THROTTLE VALVE MOTOR CIRCUIT

1) Disconnect sub-throttle valve motor connector. Check resistance between motor connector terminals No. 1 and 3. Check resistance between motor connector terminals No. 4 and 6. If resistance is 40-48 ohms, go to next step. If resistance is not 40-48 ohms, replace sub-throttle valve motor.

2) Remove throttle control ECU with connectors attached. Remove intake air duct. Disconnect sub-throttle valve motor connector. Turn ignition on. Check voltage (backprobe) between throttle control ECU connector T15 terminal No. 3 (Gray/Red wire) and ground with sub-throttle valve fully closed and fully open. Voltage should be 0-3 volts with throttle closed and 9-14 volts with throttle open. If voltage is as specified, go to step 4). If voltage is not as specified, go to next step.

3) Check for open or short in Gray/Red wire between throttle control ECU connector T15 terminal No. 3 and sub-throttle position sensor connector S5 terminal No. 2. Repair if necessary. If no problem

is found, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

4) Check sub-throttle position sensor. See SUB-THROTTLE POSITION SENSOR under COMPONENT TESTS. Adjust or replace if necessary. See D - ADJUSTMENTS article under ENGINE PERFORMANCE section. If sensor is okay, go to next step.

5) Check for open or short in White/Black wire between throttle control ECU connector T15 terminal No. 13 and ground. Check for open or short in Brown wire between throttle control ECU connector T15 terminal No. 26 and ground. Repair if necessary. If no problem is found, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

### **DTC 23: THROTTLE BODY MALFUNCTION**

1) Remove throttle control ECU with connectors attached. Remove intake air duct. Disconnect sub-throttle valve motor connector. Turn ignition on. Check voltage (backprobe) between throttle control ECU connector T15 terminal No. 3 (Gray/Red wire) and ground with sub-throttle valve fully closed and fully open. Voltage should be 0-3 volts with throttle closed and 9-14 volts with throttle open. If voltage is as specified, go to step 3). If voltage is not as specified, go to next step.

2) Check for open or short in Gray/Red wire between throttle control ECU connector T15 terminal No. 3 and sub-throttle position sensor connector S5 terminal No. 2. Repair if necessary. If no problem is found, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

3) Check sub-throttle position sensor. See SUB-THROTTLE POSITION SENSOR under COMPONENT TESTS. Adjust or replace if necessary. See D - ADJUSTMENTS article under ENGINE PERFORMANCE section. If sensor is okay, go to next step.

4) Check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

### **DTC 24: SUB-THROTTLE POSITION SENSOR LEAKAGE/SUB-THROTTLE VALVE STUCK**

1) Remove throttle control ECU with connectors attached. Remove intake air duct. Disconnect sub-throttle valve motor connector. Turn ignition on. Check voltage (backprobe) between throttle control ECU connector T15 terminal No. 19 (Green/Orange wire) and ground with sub-throttle valve fully closed and fully open. Voltage should be 0.3-0.8 volts with throttle closed and 3.2-4.9 volts with throttle open. If voltage is as specified, go to step 3). If voltage is not as specified, go to next step.

2) Check for open or short in Green/Orange wire between throttle control ECU connector T15 terminal No. 19 and ECM connector E10 terminal No. 39. Repair if necessary. If no problem is found, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

3) Check sub-throttle position sensor. See SUB-THROTTLE POSITION SENSOR under COMPONENT TESTS. Adjust or replace if necessary. See D - ADJUSTMENTS article under ENGINE PERFORMANCE section. If sensor is okay, go to next step.

4) Check for open or short in Brown wire between throttle control ECU connector T15 terminal No. 26 and ground. Repair if necessary. If no problem is found, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

### **DTC 31: THROTTLE POSITION SENSOR (TPS) SIGNAL MALFUNCTION**

1) Check for TPS code from ECM. If no TPS code exists, go to next step. If TPS code exists, diagnose and repair ECM code first. See G - TESTS W/CODES article in ENGINE PERFORMANCE section.

2) Remove throttle control ECU with connectors attached. Remove intake air duct. Disconnect vacuum hose from throttle opener. Turn ignition on. Apply vacuum to throttle opener to open throttle. Check voltage (backprobe) between throttle control ECU connector T15 terminal No. 4 (Red wire) and ground with throttle fully closed and fully open. Voltage should be 0-3 volts with throttle closed and 9-14 volts with throttle open. If voltage is as specified, go to step 4). If voltage is not as specified, go to next step.

3) Check for open or short in Red wire between throttle control ECU connector T15 terminal No. 4 and TPS connector T2 terminal No. 3. Repair if necessary. If no problem is found, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

4) Check voltage (backprobe) between throttle control ECU connector T15 terminal No. 6 (Violet/Yellow wire) and ground with throttle fully closed and fully open. Voltage should be 0.3-0.8 volts with throttle closed and 3.2-4.9 volts with throttle open. If voltage is as specified, go to step 6). If voltage is not as specified, go to next step.

5) Check for open or short in Violet/Yellow wire between throttle control ECU connector T15 terminal No. 26 and ECM connector E10 terminal No. 40. Repair if necessary. If no problem is found, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

6) Check throttle position sensor. See THROTTLE POSITION SENSOR under COMPONENT TESTS. Adjust or replace if necessary. See D - ADJUSTMENTS article under ENGINE PERFORMANCE section. If sensor is okay, go to next step.

7) Check for open or short in Brown wire between throttle control ECU connector T15 terminal No. 26 and ground. Repair if necessary. If no problem is found, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

## **DTC 32: SUB-THROTTLE POSITION SENSOR SIGNAL MALFUNCTION**

1) Check for DTC P1400 and P1401 from ECM. If no codes exist, go to next step. If either or both codes exist, diagnose and repair ECM codes first. See G - TESTS W/CODES article in ENGINE PERFORMANCE section.

2) Remove throttle control ECU with connectors attached. Remove intake air duct. Disconnect sub-throttle valve motor connector. Turn ignition on. Check voltage (backprobe) between throttle control ECU connector T15 terminal No. 3 (Gray/Red wire) and ground with sub-throttle valve fully closed and fully open. Voltage should be 0-3 volts with throttle closed and 9-14 volts with throttle open. If voltage is as specified, go to step 4). If voltage is not as specified, go to next step.

3) Check for open or short in Gray/Red wire between throttle control ECU connector T15 terminal No. 3 and sub-throttle position sensor connector S5 terminal No. 2. Repair if necessary. If no problem is found, go to next step.

4) Check voltage (backprobe) between throttle control ECU connector T15 terminal No. 6 (Violet/Yellow wire) and ground with throttle fully closed and fully open. Voltage should be 0.3-0.8 volts with throttle closed and 3.2-4.9 volts with throttle open. If voltage is as specified, go to step 6). If voltage is not as specified, go to next step.

5) Check for open or short in Violet/Yellow wire between



throttle control ECU connector T15 terminal No. 26 and ECM connector E10 terminal No. 40. Repair if necessary. If no problem is found, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

6) Check throttle position sensor. See THROTTLE POSITION SENSOR under COMPONENT TESTS. Adjust or replace if necessary. See D - ADJUSTMENTS article under ENGINE PERFORMANCE section. If sensor is okay, go to next step.

7) Disconnect sub-throttle valve motor connector. Check resistance between motor connector terminals No. 1 and 3. Check resistance between motor connector terminals No. 4 and 6. If resistance is 40-48 ohms, go to next step. If resistance is not 40-48 ohms, replace sub-throttle valve motor.

8) Check for open or short in Brown wire between throttle control ECU connector T15 terminal No. 26 and ground. Repair if necessary. If no problem is found, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

#### **DTC 41: RPM SIGNAL OPEN OR SHORT**

1) Check for open or short in Pink/Blue wire between throttle control ECU connector T15 terminal No. 16 and ECM connector E10 terminal No. 38. Repair if necessary. If no problem is found, go to next step.

2) Remove throttle control ECU with connectors attached. Turn ignition on. Check voltage (backprobe) between throttle control ECU connector T15 terminal No. 16 (Pink/Blue wire) and ground. Start engine. Recheck voltage. Voltage should be 3-6 volts with ignition on and 2-3 volts with engine idling. If voltage is as specified, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary. If voltage is not as specified, check ECM. See G - TESTS W/CODES article in ENGINE PERFORMANCE section. Replace ECM if necessary.

#### **DTC 42: ECM MALFUNCTION**

1) Check for engine DTC from ECM. If light stays on, go to next step. If codes exist, diagnose and repair ECM codes first. See G - TESTS W/CODES article in ENGINE PERFORMANCE section.

2) Check for open or short in Pink wire between throttle control ECU connector T15 terminal No. 17 and ECM connector E9 terminal No. 67. Repair if necessary. If no problem is found, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

#### **DTC 43: ECM COMMUNICATION CIRCUIT MALFUNCTION**

Check for open or short in Black wire between throttle control ECU connector T15 terminal No. 7 and ECM connector E10 terminal No. 27. Check for open or short in White wire between throttle control ECU connector T15 terminal No. 20 and ECM connector E10 terminal No. 26. Repair if necessary. If no problem is found, check throttle control ECU and ECM. For ECU, see THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary. For ECM, see G - TESTS W/CODES article in ENGINE PERFORMANCE section. Replace ECM if necessary.

#### **DTC 51 & 52: POWER SOURCE CIRCUIT**

1) Check battery voltage. If battery voltage is 10-14 volts, go to next step. If voltage is not 10-14 volts, repair charging system

or replace battery.

2) Check for open or short on Blue/Red wire between ECU connector T16 terminal No. 9 and throttle control relay. Repair if necessary. If no problems are found, go to next step.

3) Remove throttle control ECU with connectors attached. Turn ignition on. Check voltage (backprobe) between throttle control ECU connector T16 terminal No. 9 (Blue/Red wire) and ECU connector T15 terminal No. 13 (White/Black wire). If 9-14 volts exists, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary. If voltage is not 9-14 volts, go to next step.

4) Check continuity between ECU connector T15 terminal No. 13 (White/Black wire) and ground. If resistance is one ohm or less, check for open circuit between battery and ECU connector T16 terminal No. 9. See appropriate wiring diagram under WIRING DIAGRAMS. If resistance is more than one ohm, repair White/Black wire or connection to ground.

## DTC 61, 62, 63, & 64: SPEED SENSOR CIRCUIT

NOTE: If ABS speed sensor DTC also exists, diagnose ABS DTC first. See ANTI-LOCK article.

1) Check for open or short on speed sensor signal harness wiring between ABS ECU and throttle control ECU. See SPEED SENSOR CIRCUITS table. Repair if necessary. If no problems exist, go to next step.

### SPEED SENSOR CIRCUITS

ABS ECU Connector/Terminal	Wire Color	Throttle Control ECU Connector/Terminal
A20/7 .....	Light Green/Black .....	T16/16
A20/20 .....	Orange .....	T16/8
A20/6 .....	Yellow/Black .....	T16/15
A20/19 .....	Gray/Red .....	T16/7

2) Disconnect suspect speed sensor connector. See FRONT WHEEL SPEED SENSOR or REAR WHEEL SPEED SENSOR under REMOVAL & INSTALLATION in ANTI-LOCK article for steps necessary to access connectors. Ensure sensor connector terminals are not damaged or corroded. Check resistance between sensor connector terminals No. 1 and 2. Resistance should be 600-2500 ohms (front) or 650-1800 ohms (rear). Check resistance between sensor connector terminals and ground. Continuity should not exist. If continuity is as specified, go to next step. If resistance is not as specified, replace sensor.

3) Check for open or short in wiring between speed sensor and ABS ECU. See SPEED SENSOR TO ABS ECU CIRCUIT table. If any open or short circuit is found, repair circuit as necessary. If circuits are okay, ensure connector terminals are okay. If connectors are okay, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

### SPEED SENSOR TO ABS ECU CIRCUIT

Sensor Terminal No. (Wire Color)	ECU Connector/ Terminal No.
Right Front	
1 (Blue) .....	A21/9
2 (Red) .....	A21/3
Left Front	

1 (Black)	.....	A21/2
2 (White)	.....	A21/8
Right Rear		
1 (Blue)	.....	A20/10
2 (Pink)	.....	A20/23
Left Rear		
1 (Light Green)	.....	A20/9
2 (Violet)	.....	A20/22

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## DTC 71 & 72: EMERGENCY FUEL CUT

1) Disconnect sub-throttle valve motor connector. Check resistance between motor connector terminals No. 1 and 3. Check resistance between motor connector terminals No. 4 and 6. If resistance is 40-48 ohms, go to next step. If resistance is not 40-48 ohms, replace sub-throttle valve motor.

2) Remove throttle control ECU with connectors attached. Remove intake air duct. Disconnect sub-throttle valve motor connector. Turn ignition on. Check voltage (backprobe) between throttle control ECU connector T15 terminal No. 3 (Gray/Red wire) and ground with sub-throttle valve fully closed and fully open. Voltage should be 0-3 volts with throttle closed and 9-14 volts with throttle open. If voltage is as specified, go to step 4). If voltage is not as specified, go to next step.

3) Check for open or short in Gray/Red wire between throttle control ECU connector T15 terminal No. 3 and sub-throttle position sensor connector S5 terminal No. 2. Repair if necessary. If no problem is found, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

4) Check sub-throttle position sensor. See SUB-THROTTLE POSITION SENSOR under COMPONENT TESTS. Adjust or replace if necessary. See D - ADJUSTMENTS article under ENGINE PERFORMANCE section. If sensor is okay, go to next step.

5) Check for open or short in White/Black wire between throttle control ECU connector T15 terminal No. 13 and ground. Check for open or short in Brown wire between throttle control ECU connector T15 terminal No. 26 and ground. Repair if necessary. If no problem is found, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

## DTC 81: ABS ECU MALFUNCTION

1) Check for ABS DTC from ABS ECU. If light stays on, go to next step. If codes exist, diagnose and repair ABS system codes first. See ANTI-LOCK article.

2) Remove throttle control ECU with connectors attached. Turn ignition on. Check voltage (backprobe) between throttle control ECU connector T16 terminal No. 5 (Blue wire) and ground. If 9-14 volts exists, go to next step. If voltage is not 9-14 volts, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

3) Check for short in Blue wire between throttle control ECU connector T16 terminal No. 5 and ABS ECU connector A20 terminal No. 11. Repair if necessary. If no problem is found, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

## CIRCUIT TESTS

### SLIP INDICATOR LIGHT CIRCUIT

1) Check SLIP indicator light. See INSTRUMENT PANEL article in ACCESSORIES/SAFETY EQUIPMENT section. Repair if necessary. If no problems are found, go to next step.

2) Check for open or short in White wire between SLIP indicator light and throttle control ECU connector T16 terminal No. 2. See appropriate wiring diagram under WIRING DIAGRAMS. Repair if necessary. If no problems are found, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

## **SNOW INDICATOR LIGHT & SWITCH CIRCUIT**

1) Remove SNOW switch. Disconnect switch connector. Check continuity between switch terminals No. 6 and 8. Continuity should exist with switch pushed in. Continuity should not exist with switch released. If switch is okay, go to next step. Replace switch if continuity is not as specified.

2) Check for open or short on Red/Black wire between throttle control ECU connector T16 terminal No. 14 and SNOW switch terminal No. 8. Check for open or short on White/Black wire between TRAC OFF switch terminal No. 6 and ground. See appropriate wiring diagram under WIRING DIAGRAMS. Repair if necessary. If no problems are found, go to next step.

3) Check SNOW indicator light. See INSTRUMENT PANEL article in ACCESSORIES/SAFETY EQUIPMENT section. Repair if necessary. If no problems are found, go to next step.

4) Check for open or short in Pink/Blue wire between SNOW indicator light and throttle control ECU connector T16 terminal No. 11. See appropriate wiring diagram under WIRING DIAGRAMS. Repair if necessary. If no problems are found, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

## **TRAC OFF INDICATOR LIGHT & SWITCH CIRCUIT**

1) Check for traction control DTC. See SELF-DIAGNOSTICS. If no DTC exist, go to next step. If any DTC exist, diagnose and repair DTC first.

2) Remove TRAC OFF switch. Disconnect switch connector. Check continuity between switch terminals No. 4 and 6. Continuity should exist with switch pushed in. Continuity should not exist with switch released. If switch is okay, go to next step. Replace switch if continuity is not as specified.

3) Check for open or short on Light Green wire between throttle control ECU connector T16 terminal No. 6 and TRAC OFF switch terminal No. 4. Check for open or short on White/Black wire between TRAC OFF switch terminal No. 6 and ground. See appropriate wiring diagram under WIRING DIAGRAMS. Repair if necessary. If no problems are found, go to next step.

4) Check TRAC OFF indicator light. See INSTRUMENT PANEL article in ACCESSORIES/SAFETY EQUIPMENT section. Repair if necessary. If no problems are found, go to next step.

5) Check for open or short in Light Green/Red wire between TRAC OFF indicator light and throttle control ECU connector T16 terminal No. 10. See appropriate wiring diagram under WIRING DIAGRAMS. Repair if necessary. If no problems are found, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

## **Tc TERMINAL CIRCUIT**

1) Turn ignition on. Check voltage between terminals Tc and E1 of DLC1 or DLC2. If 10-14 volts exists, go to next test or

procedure in TROUBLE SHOOTING. If 10-14 volts does not exist, go to next step.

2) Check for open or short in wiring between Tc terminals of DLC1/DLC2 and throttle control ECU connector T16 terminal No. 3. Check for open or short on wiring between E1 terminals of DLC1/DLC2 and ground. See appropriate wiring diagram under WIRING DIAGRAMS. Repair if necessary. If no problems are found, check throttle control ECU. See THROTTLE CONTROL ECU PIN VOLTAGE TESTS under PIN VOLTAGE. Replace ECU if necessary.

## COMPONENT TESTS

NOTE: For component tests not listed, see appropriate DIAGNOSTIC TEST. TRAC ECU values can be measured using Toyota Hand-Held Tester and Break-Out Box. TRAC circuits and harness can also be tested by backprobing TRAC ECU connectors. See TRACTION CONTROL ECU PIN VOLTAGE TEST under PIN VOLTAGE.

## SUB-THROTTLE POSITION SENSOR

Disconnect sub-throttle position sensor connector. Check resistance between sensor terminals No. 1 and 3. Resistance should change smoothly from 340-6300 ohms (throttle closed) to 2400-10,800 ohms (throttle open). Check resistance between sensor terminals No. 1 and 2. Resistance should be less than 500 ohms (throttle closed) to more than one megohm (throttle open). Replace sensor if resistance is not as specified.

## THROTTLE POSITION SENSOR

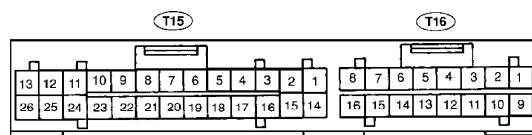
Disconnect throttle position sensor connector. Check resistance between sensor terminals No. 1 and 4. Resistance should be 3100-7200 ohms. Check resistance between sensor terminals No. 2 and 4. Resistance should change smoothly from 340-6300 ohms (throttle closed) to 2400-11,200 ohms (throttle open). Replace sensor if resistance is not as specified.

## THROTTLE CONTROL RELAY

Check resistance between relay terminals No. 4 and 6. Resistance should be 80 ohms. Check continuity between relay terminals No. 1 and 3. Continuity should not exist. Apply battery voltage to relay terminals No. 4 and 6. Check continuity between relay terminals No. 1 and 3. Continuity should exist. Replace relay if resistance or continuity is not as specified.

## PIN VOLTAGE

### THROTTLE CONTROL ECU PIN VOLTAGE TEST



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Fig. 3: Identifying Throttle Control ECU Terminals  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

Disconnect throttle control ECU connectors T15 and T16. Measure voltage between following ABS ECU connector terminals. See

Fig. 3. If voltage is not as specified, repair wire harness or replace components as necessary. If voltage is as specified, replace ECU.

T16-1 & T15-26  
Voltage 10-14 volts.

T16-9 & T15-26  
Ignition on, engine off, voltage 10-14 volts.

T15-1 & T15-26  
Ignition on, engine off, voltage 10-14 volts.

T15-4 & T15-26  
Ignition on, throttle closed, voltage 0-3 volts.

T15-4 & T15-26  
Ignition on, throttle open, voltage 9-14 volts.

T15-6 & T15-26  
Ignition on, throttle closed, voltage 0.3-0.8 volts.

T15-6 & T15-26  
Ignition on, throttle open, voltage 3.2-4.9 volts.

T15-3 & T15-26  
Engine running, sub-throttle closed, voltage 0.3-0.8 volts.

T15-3 & T15-26  
Engine running, sub-throttle open, voltage 3.2-4.9 volts.

T15-6 & T15-26  
Engine running, sub-throttle closed, voltage 0.3-0.8 volts.

T15-6 & T15-26  
Engine running, sub-throttle open, voltage 3.2-4.9 volts.

T16-16 & T15-26  
Driving about 30 MPH, pulse generation.

T16-8 & T15-26  
Driving about 30 MPH, pulse generation.

T16-15 & T15-26  
Driving about 30 MPH, pulse generation.

T16-7 & T15-26  
Driving about 30 MPH, pulse generation.

T16-10 & T15-26  
Ignition on, TRAC OFF light on, voltage 0-3 volts.

T16-10 & T15-26  
Ignition on, TRAC OFF light off, voltage 9-14 volts.

T16-2 & T15-26  
Ignition on, SLIP light on, voltage 0-3 volts.

T16-2 & T15-26  
Ignition on, SLIP light off, voltage 9-14 volts.

T16-6 & T15-26  
Ignition on, TRAC OFF switch pressed, voltage 0-3 volts.

T16-6 & T15-26  
Ignition on, TRAC OFF switch released, voltage 9-14 volts.

T16-4 & T16-12  
Ignition on, voltage 9-14 volts.

T16-11 & T15-26  
Ignition on, SNOW light on, voltage 0-3 volts.

T16-11 & T15-26  
Ignition on, SNOW light off, voltage 9-14 volts.

T16-14 & T15-26  
Ignition on, SNOW mode switch pressed, voltage 0-3 volts.

T16-14 & T15-26  
Ignition on, SNOW mode switch released, voltage 9-14 volts.

T15-12 & T15-13  
Engine running, throttle closed, pulse generation.

T15-11 & T15-13  
Engine running, throttle closed, pulse generation.

T15-25 & T15-13  
Engine running, throttle closed, pulse generation.

T15-24 & T15-13  
Engine running, throttle closed, pulse generation.

T15-16 & T15-26  
Idling, pulse generation.

T15-9 & T15-26  
Ignition on (normal), pulse generation.

T15-9 & T15-26  
Ignition on (abnormal), 9-14 volts.

T15-17 & T15-26  
Ignition on, ECM normal, voltage 0-2 volts.

T15-17 & T15-26  
Ignition on, ECM abnormal, 4.5-5.5 volts.

T15-7 & T15-26  
Ignition on, pulse generation.

T15-20 & T15-26  
Ignition on, pulse generation.

T15-8 & T15-26  
Ignition on, pulse generation.

T15-21 & T15-26  
Ignition on, pulse generation.

T16-3 & T15-26  
Ignition on, engine off, voltage 4.5-5.5 volts.

T16-5 & T15-26  
Ignition on, ABS ECU normal, voltage 9-14 volts.

T16-5 & T15-26

Ignition on, ABS ECU abnormal, voltage 0-3 volts.

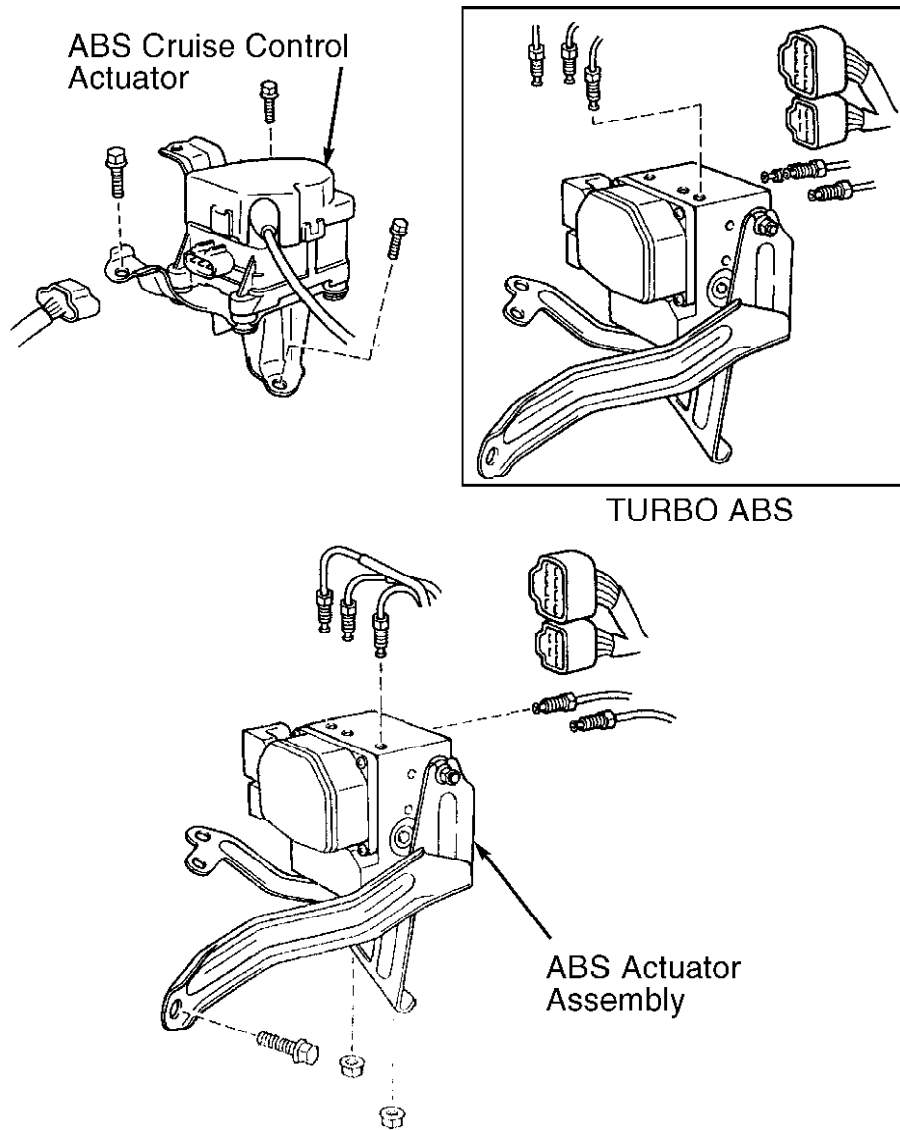
## REMOVAL & INSTALLATION

### TRAC ACTUATOR

#### Removal & Installation

1) Remove cruise control actuator. Disconnect brakelines from TRAC actuator. Remove bolts and TRAC actuator assembly. See Fig. 4.

2) To install, reverse removal procedures. Tighten assembly mounting bolts. See TORQUE SPECIFICATIONS. Bleed brake system. See BLEEDING BRAKE SYSTEM.



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Fig. 4: Removing & Installing ABS Actuator  
Courtesy of Toyota Motor Sales, U.S.A., Inc.

## OVERHAUL

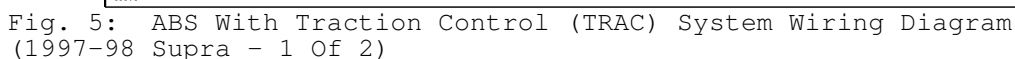


DO NOT attempt to overhaul or disassemble TRAC actuator or pump motor. If defective, replace entire assembly.

**TORQUE SPECIFICATIONS**

TORQUE SPECIFICATIONS		
<hr/>		
Application	Ft. Lbs. (N.m)	
Brakeline Connections .....	11	(15)
Pressure Hose Bolt .....	34	(46)
Pump Assembly Nuts & Bolts .....	14	(19)
	INCH Lbs. (N.m)	
Actuator Assembly-To-Bracket Bolts .....	48	(5.4)
Bleeder Plug .....	73	(8.3)
Pump Assembly Bracket Bolts .....	69	(7.8)
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**WIRING DIAGRAMS**



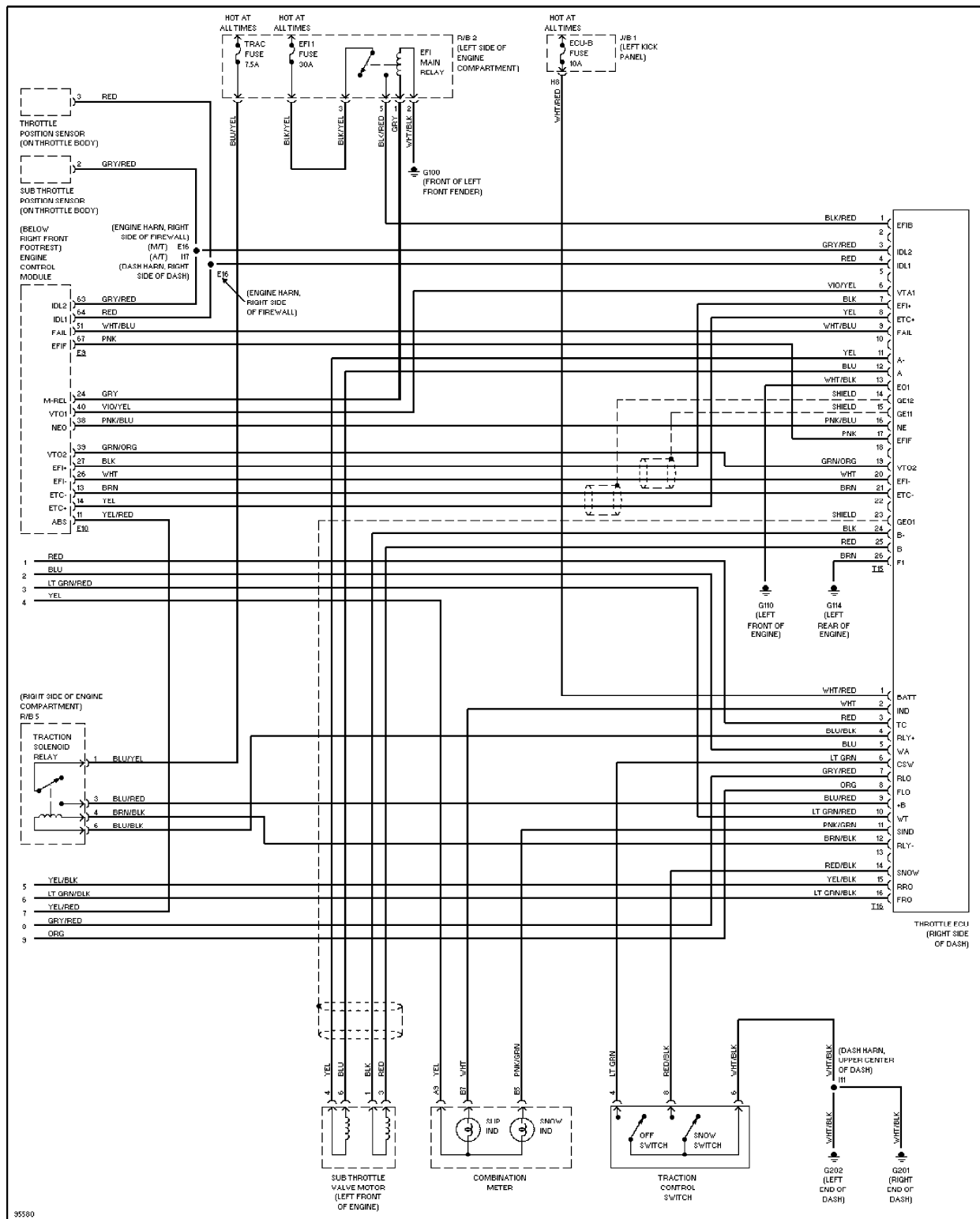


Fig. 6: ABS With Traction Control (TRAC) System Wiring Diagram (1997-98 Supra - 1 Of 2)