

## GLOSSARY OF TERMS

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### A

**Ampere** - The unit for measuring the rate of electrical current flow in a circuit.

**Anti-squeal Shims** - A single or multiple metal plates located between the brake pad and caliper to reduce brake squeal.

**Arcing** - A grinding process that machines drum brake lining to the proper curvature for a given drum size

**Asbestos** - The generic name of a group of minerals used in brake friction materials and made up of individual fibers. Poses a serious health hazard if inhaled or ingested.

**Atmospheric Pressure** - The pressure on the earth's surface caused by the weight of air in the atmosphere. **At sea level** - 14.7 psi.

**Automatic Adjusters** - Brake adjusters that use shoe movement or parking brake application, to continually reset the lining to drum clearance.

### B

**Backing Plate** - A pressed steel plate attached to the vehicle suspension. The wheel cylinder and shoes are mounted to the backing plate. Braking torque is transferred from the brake shoes through the backing plate to the suspension.

**Brake Dust** - The dust created when brake friction materials wear during brake application.

**Brake Fade** - The partial or total loss of braking power occurring when excessive heat is absorbed by brake components reducing friction.

**Brake Lines** - The network of steel tubing and rubber hoses used to transmit brake hydraulic pressure from the master cylinder to the wheel cylinders.

### C

**Caliper** - Mounted to the steering knuckle or suspension and houses the piston or pistons. Converts the action of hydraulic pressure on the piston to mechanical force used to apply brake pads against the rotor.

**Coefficient of Friction** - A numerical value expressing the amount of friction between two objects. Obtained by dividing force by the weight of an object.

**Compensating Port** - The opening between the fluid reservoir and pressure side of the master cylinder piston.

**Cup Seal** - Circular rubber seals with a depressed center surrounded by a raised sealing lip. Seals in one direction only allowing fluid to bypass it in the opposite direction.

### D

**Disc Brake** - Brake system which uses brake pads rubbing against the sides of a brake rotor to generate friction to stop a vehicle.

**Drum** - Rotating part of the drum brake assembly which turns with the wheel. Brake shoes are forced to contact the drum creating friction necessary to stop the vehicle.

**Dual Servo Brake** - A drum brake that has servo action in forward and reverse directions.

**E**

**Energy** - The capacity or ability to do work.

**Equalizer** - A bracket or cable guide in parking brake linkage used to ensure both brakes receive equal application force.

**F**

**Friction** - The resistance to motion between two surfaces in contact.

**Friction Modifiers** - Additives used to alter the friction coefficient of a brake lining material.

**G**

**Gas Fade** - Brake fade caused by hot gases and dust particles that reduce friction in a brake system under hard prolonged braking.

**Glazed Lining** - An overheated brake lining with a smooth shiny appearance.

**Hygroscopic** - An affinity or attraction for water.

**I**

**Inertia** - The property of a body at rest to remain at rest, and a body in motion to remain in motion in a straight line unless acted upon by an outside force.

**Intermediate Lever** - A parking brake linkage component used to increase parking brake application force.

**K**

**Kinetic Energy** - The energy of mass in motion.

**L**

**Lateral Runout** - Side to side movement of the friction surfaces of a brake rotor.

**Leading-Trailing Brake** - A non-servo brake with one shoe energized and one de-energized. The brake assembly works as well in forward or reverse. (see self energizing action)

**Lining Fade** - Brake fade caused a drop in the lining coefficient of friction as a result of excessive heat under hard prolonged braking.

**Lockheed Master Cylinder** - A master cylinder design having a compensating port and inlet port.

**M**

**Master Cylinder** - Converts mechanical pressure from the brake pedal into hydraulic pressure for the wheel cylinders.

**Mechanical Fade** - Brake fade caused by heat expansion of the brake drum away from the brake shoes.

**P**

**Parallelism** - A measurement of the two rotor surfaces that are an equal distance apart at every point around the circumference.

**Pad Wear Indicator** - Attaches to the brake pad and projects beyond the metal backing to contact the rotor when the lining has worn. The squealing sound warns the driver of worn pads.

**Pedal Height** - The distance from the melt sheet of the floor and the top of the brake pedal with the pedal retracted. Adjusted with the push rod.

**Pedal Freeplay** - The travel of the brake pedal from the retracted position to the point that resistance in the brake pedal is felt as the pushrod contacts the booster or master cylinder.

**Pedal Reserve Distance** - The distance from the melt sheet of the floor and the top of the brake pedal with the pedal depressed.

**Portless Master Cylinder** - A master cylinder design which does not use a compensating port. A single passage is open from the reservoir to the cylinder controlled by a mechanical valve.

**Proportioning Valve** - A valve in the brake hydraulic system that reduces pressure to the rear brakes to achieve better brake balance.

**R**

**Radial Runout** - A change in dimension from the center of a round object to its outer edge (radius).

**Residual Pressure** - A constant pressure held in the brake hydraulic circuit when the brakes are not applied.

**Rotor Phase Matching** - Repositioning the rotor on the spindle hub to obtain the least amount of rotor-run-out.

**S**

**Self Energizing Action** - A characteristic of drum brakes in which the rotation of the drum increases the application force of a brake shoe by wedging it tighter against the drum surface.

**Servo Brake** - A drum brake that uses the stopping power of one shoe to help increase the application force of the other shoe.

**Slip Ratio** - The difference between the vehicle's body speed and the speed of the wheels measured as a percentage.

**T**

**Tandem Booster** - A vacuum power booster that uses two diaphragms to increase brake application force.

**Tandem Master Cylinder** - A master cylinder design having two pistons providing pressure to separate hydraulic circuits.

**Thickness Variation** - Differences in parallelism measurements made on the circumference of a rotor. If great enough will cause feedback through the brake pedal.

**Tire Slip** - The difference between vehicle speed and the speed of the tire tread moving along the pavement.

**Torque** - The turning or twisting force applied at the end of a rotation shaft.

**Traction** - The amount of grip between the tire tread and the road surface



# A.B.S. COMPARISON CHART

MODEL ITEM	Supra (87,88)	Supra (89-92)	Cressida (88-91)	Camry 4WD (88-91)	Camry 2WD (88, 89)	Camry 4WD (89-91)	Camry 2WD, 4WD (90-93)	Camry (95-96)	Camry (92-95) Except 94, 96 TMM	RAV4 (96) Corolla, Tercel, Paseo (93-96)	MR2 (91-95)	Previa 2WD, 4WD (91-96)	Land Cruiser (93-96)	Avalon (95, 96) TMM Camry (94-96)	4 Runner (94-96) T100 (95, 96) Tacoma (95, 96)	Truck (90-95) T100 (93-94) 4 Runner (90-93) Rear Wheel A.B.S.	Supra (94-96)	
POWER SOURCE	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Motor	Power Steering Pump	Motor	
SOLENOID VALVES BY-PASS VALVE	3 Position (4) No	(3) Yes No	(3) No	(4) No	(4) No	(4) No	(4) No	(4) No	(4) No	2 Position (8) No	(3) No	(3) No	(3) No	(3) Mechanical valve	2 Position (6) No	Solenoid valve (1) Mechanical By-pass	(4) No	
RESERVOIR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	P/S press, regulator Brake press, regulator	Yes	
DAMPER	No	Yes	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
ACTUATOR LOCATION	Engine Compartment	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	
CONTROL RELAY	Camry/ In actuator (2) Celica/Behind left suspension tower (1)	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	In actuator Near actuator <sup>5</sup>	
FRONT SPEED SENSORS (ROTOR)	2 (Front axle hub) 96 teeth	2 (W58: Reverse gear) 39 teeth (R154, A340E: Trans output shaft) 32 teeth	2 48 teeth	2 96 teeth	2 96 teeth	2 96 teeth	2 96 teeth	2 96 teeth	2 96 teeth	2 96 teeth	2 96 teeth	2 96 teeth	2 96 teeth	2 96 teeth	2 96 teeth	2 96 teeth	2 96 teeth	2 96 teeth
REAR SPEED SENSORS (ROTOR)	2 (Rear axle hub)	2 (Rear axle hub)	2 48 teeth	2 48 teeth	2 48 teeth	2 48 teeth	2 48 teeth	2 48 teeth	2 48 teeth	2 48 teeth	2 48 teeth	2 48 teeth	2 48 teeth	2 48 teeth	2 48 teeth	2 48 teeth	2 48 teeth	2 48 teeth
"G" SENSORS	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
COMPUTER	3 Channel control	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	
Read diag. Codes	A.B.S. Check Connector	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	
Sensor(s) Check mode	Speed sensor	No	Speed TDCL (Tc)	Speed & G <sup>1</sup> Tc conn.	Speed & G <sup>1</sup> Tc term.	Speed sensor Tc, Tc term.	Speed sensor Tc, Tc term.	Speed sensor Tc, Tc term.	Speed sensor Tc, Tc term.	Speed sensor Tc, Tc term.	Speed sensor Tc, Tc term.	Speed & G <sup>1</sup> Tc, Tc term.	Speed & G <sup>1</sup> Tc, Tc term.	Speed & G <sup>1</sup> Tc, Tc term.	Speed & G <sup>1</sup> Tc, Tc term.	Speed & G <sup>1</sup> Tc, Tc term.	Speed sensor Tc, Tc term.	
SSTs	TOY220036	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	
09990-00150-01	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	
09990-00163	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	
09990-00165 <sup>2</sup>	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	
09990-00200	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	
09990-00210	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	
09990-00250	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	
09990-00300	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	
09990-00360	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	←	

<sup>1</sup> 4WD only  
<sup>2</sup> Celica only  
<sup>3</sup> Tacoma and 96 4Runner  
<sup>4</sup> 96 Model only  
<sup>5</sup> RAV4 only  
<sup>6</sup> Tacoma and 96 4Runner  
<sup>7</sup> 96 Model only

# DIAGNOSTIC CODES

MODEL	TRUCK	PREVIA	CRESSIDA	SUPRA (Z480)	SUPRA (MA70)	CELICA	CAMRY	COROLLA	TERCEL	AVALON	DIAGNOSIS	POSSIBLE TROUBLE AREAS
•	•	•	•	•	•	•	•	•	•	•	Open or short in solenoid relay circuit	-- Solenoid relay circuit wire harness and connectors
•	•	•	•	•	•	•	•	•	•	•	Open or short in solenoid relay circuit	-- Control relay
•	•	•	•	•	•	•	•	•	•	•	Open circuit in pump motor relay circuit	-- Control relay
•	•	•	•	•	•	•	•	•	•	•	Short circuit in pump motor relay circuit	-- Pump motor relay circuit wire harness and connectors
•	•	•	•	•	•	•	•	•	•	•	Open or short in TRAC solenoid relay circuit	-- TRAC solenoid relay circuit
•	•	•	•	•	•	•	•	•	•	•	B+ short in TRAC solenoid relay circuit	-- TRAC solenoid relay circuit
•	•	•	•	•	•	•	•	•	•	•	Open or short in TRAC motor relay circuit	-- TRAC solenoid relay circuit
•	•	•	•	•	•	•	•	•	•	•	B+ short in TRAC motor relay circuit	-- Actuator, SFR circuit
•	•	•	•	•	•	•	•	•	•	•	Open or short circuit in 3 position solenoid of right front wheel	-- Actuator, SFR circuit
•	•	•	•	•	•	•	•	•	•	•	Open or short circuit in 3 position solenoid of left front wheel	-- Actuator, SFR circuit
•	•	•	•	•	•	•	•	•	•	•	Open or short circuit in 3 position solenoid of right rear wheel	-- Actuator, SRL circuit
•	•	•	•	•	•	•	•	•	•	•	Open or short circuit in 3 position solenoid of left rear wheel	-- Solenoid
•	•	•	•	•	•	•	•	•	•	•	Short circuit in solenoid valve circuit	-- TRAC actuator (SRC) circuit
•	•	•	•	•	•	•	•	•	•	•	Open or short in TRAC actuator solenoid circuit (SRC circuit)	-- Circuit wire harness and connectors
•	•	•	•	•	•	•	•	•	•	•	Right front wheel speed sensor signal malfunction	-- Speed sensor circuit
•	•	•	•	•	•	•	•	•	•	•	Left front wheel speed sensor signal malfunction	-- Speed sensor circuit
•	•	•	•	•	•	•	•	•	•	•	Right rear wheel (or rear) speed sensor signal malfunction	-- Sensor rotor & sensor circuit
•	•	•	•	•	•	•	•	•	•	•	Left rear wheel speed sensor signal malfunction	-- Speed sensor wire harness and connectors
•	•	•	•	•	•	•	•	•	•	•	Open circuit in left front (or right rear) wheel speed sensor	-- Speed sensor circuit
•	•	•	•	•	•	•	•	•	•	•	Open circuit in right front (or left rear) wheel speed sensor	-- Speed sensor circuit
•	•	•	•	•	•	•	•	•	•	•	Wrong left and right rear rotors (FRONT hubs on Cressida)	-- Sensor rotors
•	•	•	•	•	•	•	•	•	•	•	Open circuit in right rear speed sensor circuit	-- Speed sensor wire harness and connectors
•	•	•	•	•	•	•	•	•	•	•	Open circuit in left rear speed sensor circuit	-- Battery
•	•	•	•	•	•	•	•	•	•	•	Low battery voltage (9.5V or lower)	-- Voltage regulator
•	•	•	•	•	•	•	•	•	•	•	Abnormally high battery voltage (16.2V or higher)	-- Deceleration sensor - Sensor installation
•	•	•	•	•	•	•	•	•	•	•	Malfunction in deceleration sensor	-- Sensor wire harness/connectors
•	•	•	•	•	•	•	•	•	•	•	Open or short circuit in deceleration sensor	-- Deceleration sensor
•	•	•	•	•	•	•	•	•	•	•	Malfunction in deceleration sensor	-- Center/rear differential lock circuit
•	•	•	•	•	•	•	•	•	•	•	Open or short in center/rear differential lock circuit	-- Pump motor or relay - Circuit wire harness/connectors
•	•	•	•	•	•	•	•	•	•	•	Actuator pump motor locked or open in pump motor circuit	-- EFI+, EFI-, TRC+, TRC- circuit
•	•	•	•	•	•	•	•	•	•	•	ECM communication circuit malfunction	-- Brake level warning switch circuit
•	•	•	•	•	•	•	•	•	•	•	Brake fluid reservoir level low	-- TRAC pump motor circuit
•	•	•	•	•	•	•	•	•	•	•	Open circuit in TRAC pump motor circuit	-- ABSO, BRC, BRP circuit
•	•	•	•	•	•	•	•	•	•	•	ABS & TRAC ECU communication circuit malfunction	-- Malfunction in ECU
•	•	•	•	•	•	•	•	•	•	•	Malfunction in computer	-- Computer
•	•	•	•	•	•	•	•	•	•	•	Malfunction in computer	

<sup>1</sup> Except All-Trac    <sup>2</sup> All-Trac only    <sup>3</sup> Rear wheel solenoid    <sup>4</sup> By-pass solenoid (87, 88)    <sup>5</sup> Wrong both front hubs (Cressida only)    <sup>6</sup> 93 Camry 9.5V or lower of 16.2V or higher    <sup>7</sup> 94 Celica and Camry    <sup>8</sup> Except 96 Model  
<sup>9</sup> w/TRAC    <sup>10</sup> 4Runner only    <sup>11</sup> Tacoma only    <sup>12</sup> RAV4 only    <sup>13</sup> Except RAV4

# SPEED SENSOR CODES

MODEL	TRUCK	PREVIA	CRESSIDA	DIAGNOSIS	TROUBLE AREA
•	•	•	•	Low voltage, right front speed sensor signal	Speed sensor of installation
•	•	•	•	Low voltage, left front speed sensor signal	
•	•	•	•	Low voltage, right rear speed sensor signal	
•	•	•	•	Low voltage, left rear speed sensor signal	
•	•	•	•	Abnormal change, right front speed sensor signal	
•	•	•	•	Abnormal change, left front speed sensor signal	
•	•	•	•	Abnormal change of right rear speed sensor signal	Sensor rotor
•	•	•	•	Abnormal change of left rear speed sensor signal	
•	•	•	•	Deceleration sensor is faulty	Deceleration sensor

<sup>1</sup> One rear speed sensor (transmission mount)    <sup>2</sup> 4WD only

## Appendix C

# HANDLING ASBESTOS

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In 1986 the Occupational Safety and Health Administration (OSHA) established workplace standards for repair facilities that perform brake and clutch repair to reduce the level of asbestos in the workplace. The following is a summary of the workplace standard. You should obtain specific compliance advice from your company's attorney or OSHA specialist. Additionally there may be state or local regulations that may be applicable. Encourage your employee to establish an information and training program for all employees.

Controlling asbestos residue in the workplace is of importance to everyone. Using compressed air to remove the brake dust from brake assemblies may endanger the health of everyone in the workplace and should never be done.

When touching a hot exhaust manifold, one knows immediately that continued contact will result in tissue damage and sustained levels of pain. The immediate response is to pull away from the source of heat; not so with substances such as asbestos. Damage caused by asbestos may have a latency period of 15 to 30 years before symptoms occur and can be diagnosed. Asbestos does not melt, burn, breakdown, dilute or digest, it remains indestructible inside the body. Controlling asbestos residue is the only rational course of action.

Special vacuum cleaner equipment recommended by OSHA, utilize High Efficiency Particulate Air (HEPA) filters that are very efficient in removing asbestos fibers. Most asbestos fibers in brake dust are smaller than four tenths of a micron in size. Therefore, a special vacuum and filter system is required to prevent these fibers from getting airborne. A regular shop vacuum is insufficient for containing these small fibers and should never be used for this purpose as it will further broadcast the asbestos throughout the shop. Asbestos can spread 75 feet from the point of origin if a shop vacuum is used.

Some of the systems recommended by OSHA encase the brake assembly and allow the technician to blow the brake dust loose with a regulated internal air nozzle, while the system vacuum cleaner draws the dust into its filter. Once the brake dust has been removed, the brake assembly can be worked on. Also vacuum the dust from the brake drum using the OSHA recommended vacuum, before servicing it.

There are other OSHA approved systems consisting of a low velocity solvent which moistens the brake dust until it is stuck together and collected in a tray or basin. Using a brake cleaner propellant or water to wash down the brake dust should not be done as it will also cause some of the dust to become airborne. Later, when the cleaner or water evaporates, the dust again may become airborne.

In all cases avoid breathing asbestos when performing clutch and brake services. Make every effort to effectively collect the dust in these operations with OSHA approved methods. If you wear a respirator, make sure that it is OSHA approved for working with asbestos and that it fits properly around the corner of the face. Even if you use a respirator for your protection, you must also use an approved collection system to protect others in the workplace.

