Appendix A

Glossary of Terms

A

Accumulator - Used in transmission hydraulic systems to control shift quality. Absorbs the shock of pressure surges within a hydraulic circuit.

Autoprobe - A signal measurement device that when interfaced with the Diagnostic Tester Instrumentation port can be used for voltage, frequency, duty cycle, and pulse width measurements. When interfaced with the V-BoB the autoprobe provides signal input for oscilloscope functions.

Axis - The center line around which a gear or shaft rotates.

C

Cam-Cut Drum - A one-way roller clutch drum whose inner surface is machined with a series of ramped grooves into which rollers are wedged.

Centrifugal Force - The tendency of objects to move away from the center of rotation when rotated.

Clutch Pack - The assembly of clutch discs and steel plates what provides the frictional surfaces in multiplate clutch or brake.

Cut-Back Pressure - Modulated throttle pressure controlled by governor pressure and is used to reduce throttle pressure. Reduced throttle pressure results in a reduction of line pressure.

Coupling Range - The range of torque converter operation when there is no torque multiplication and the stator rotates with the impeller and turbine at nearly the same speed.

D

Data List - A preprogrammed list of information being transmitted from vehicle to scan tool. Depending on the vehicle and system being tested, the data list could have as few as 10 parameters or as many as 80.

Differential - The assembly of a carrier, pinion gears and side gears that allows the drive axles to rotate at different speeds as a vehicle turns a corner.

Direct Drive - A one-to-one (1:1) gear ratio in which the input shaft and output shaft rotate at the same speed.

Duty Cycle - An on-off electrical pulse applied to an electrical device. This cycle typically occurs at a fixed frequency and at a variable duty ratio.

Duty Ratio - The duty ratio is the percentage of time during one complete cycle that electrical current flows. A high duty ratio, 90% for example, means that current flow is on longer than it is off. A low duty ratio, 10% for example, means that current flow is off longer than it is on. A duty ration of 50% would be on half of the time and off half of the time.

F

Flexplate - The thin metal plate used in place of the flywheel that connects the engine crankshaft to the torque converter.

Freeze Frame - A single frame of stored data, representing data parameters at the moment a fault is stored.

Frequency - Number of times every second an alternating current goes through a complete cycle. Measured in the unit Hertz (Hz).

G

Gear Ratio - The number of turns made by a drive gear compared to the number of turns by the driven gear. Computed by the number of driven gear teeth divided by the number of drive gear teeth.

Gear Reduction - A condition when the drive gear rotates faster than the driven gear. Speed is reduced but torque is increased.

Governor Pressure - Modified line pressure that is directly related to vehicle speed. Governor pressure increases as vehicle speed increases and is one of the principle pressures used to control shift points.

H

Holding Device - Hydraulically operated bands, multiplate clutches, multiplate brakes and mechanically operated one-way clutches that hold members of the planetary gear set.

Hysteresis - The range between the “switching on” and “switching off” point of an actuator or sensor. This range prevents a condition in which the sensor closes and opens repeatedly.

I

Internal Ring Gear - A gear with teeth on its inner circumference.

L

Land - The large outer circumference of a valve spool that slides against the valve bore. A valley separates each land.

Line Pressure - Pressure developed by the transmission oil pump and regulated by the primary regulator valve. Line pressure applies all clutches and brakes. The source of all other pressures in the hydraulic system.

M

Multiplate Brake - Consists of alternating friction discs and steel plates, forced together by hydraulic pressure. Holds a planetary component to the transmission case.

Multiplate Clutch - A clutch consisting of alternating friction discs and steel plates, forced together by hydraulic pressure. Holds one rotating planetary component to another rotating component.

O

One-way Clutch - A mechanical holding device that prevents rotation of a planetary component in one direction and freewheels in the other direction.

Orifice - A small opening or restriction in a hydraulic passage used to regulate pressure and flow.

Overdrive - Occurs when the drive gear rotates at a slower speed than the driven gear. Speed of the driven gear is increased by torque is decreased.

P

Planetary Gear Set - A gear assembly consisting of a sun gear, ring gear and carrier assembly with planetary pinion gears.

Planetary Gear Unit - The assembly which includes the planetary gear set, holding devices and shafts which provide different gear ratios in the automatic transmission.

Planetary Carrier - Member of the planetary gear set that houses the planetary pinion gears.

Planetary Pinion Gears - Mounted to the planetary carrier by pinion shafts. Operate between the ring gear and sun gear.

R

Rotary Flow - The flow of oil in a torque converter that is in the same direction as the rotation of the impeller. Causes the stator to unlock and rotate.

S

Sensor - The generic name for a device that senses either the absolute value or a change in a physical quantity such as temperature, pressure or flow rate and converts that change into an electrical quantity signal.

Serial Data - Information about a computer system inputs, outputs, and other operating parameters which is transmitted from the vehicle to the scan tool on a single wire in the Data Link Connector (DLC).

Simpson Planetary Gear Set - Two planetary gear sets that share a common sun gear.

Snapshot - A mode of operation where basic diagnostic parameters are stored in the Diagnostic Tester during a road test and can be examined, printed, or transferred to a computer at the end of the test.

Sprag - A figure eight shaped locking element of a one-way sprag clutch. Multiple sprags are used to maintain the distance between the inner and outer race of the sprag clutch.

Square Wave - A digital, electronic signal which is either on or off. There is virtually no time between the on and off states.

Stall Speed - The maximum possible engine speed, measured in rpm with the turbine held stationary and the engine throttle wide open.

Sun Gear - The center gears of a planetary gear set around which the other gears rotate.

T

Throttle Pressure - Modified line pressure which is directly related to engine load. Throttle pressure increases with throttle opening. It is one of the major pressures used to control shift points.

Torque - Twisting or turning force measured in foot-pounds or inch-pounds.

Torque Converter - A fluid coupling used to connect the engine crankshaft and the input shaft of an automatic transmission. It is capable of increasing the torque developed by the engine by redirecting the flow of fluid to the vanes of the impeller.

Trip Cycle - Vehicle operation (following an engine off period) of duration and driving modes, such that all components and systems are monitored at least once by the diagnostic system.

Two-Trip Detection Logic - ECU diagnosis strategy which prevents a diagnostic code or the check engine light from coming on until the problem has duplicated itself twice, with a key off cycle in between.

V

Valley - The small diameter of the spool valve located between two lands. Fluid flows past these valleys when the lands expose fluid passages as they are moved within their bore of the valve body.

Valve Body - An aluminum casting which houses the valves in the transmission hydraulic system. Provides the passages for the flow of transmission fluid.

V-BoB - Vehicle Break-out Box.

Viscosity - The tendency of a liquid to resist flowing. High viscosity fluid is thick. Low viscosity fluid flows easily.

Vortex Flow - The path of oil flow in the torque converter that is at a right angle to the rotation of the impeller. The fluid flows from the impeller to the turbine and back to the impeller through the stator.

Circuit Inspection

Input Signals

Sensors produce different types of signals, that are either analog (variable voltage) or digital signal (on or off). The ECM will measure either voltage, amperage, or frequency of these signals.

Analog and Digital Signals

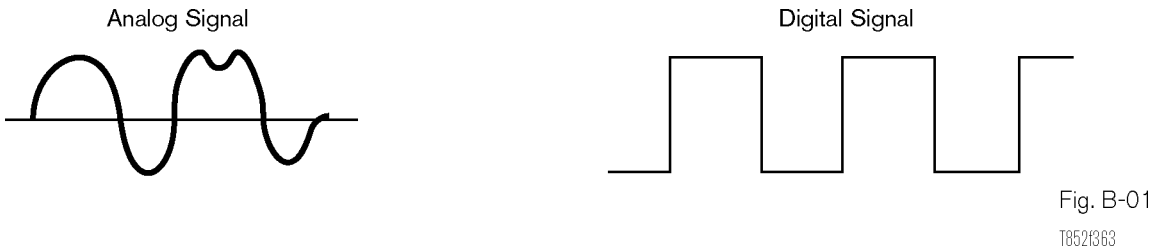


Fig. B-01
T852f363

Analog Signal

An analog signal is a variable signal and is usually measured by voltage or frequency. The voltage of the signal can be at any given point in a given range.

Digital Signal

A digital signal has only two states; high or low. This signal is often measured in volts or frequency. Digital signals are useful for indicating on/off, yes/no, high/low, or frequency. A digital signal is a signal that stays high or low for an extended period of time, sometimes called a discrete signal. Typically in circuits that involve switches, such as the Stop Lamp signal and Park/Neutral switch signal, the ECM is looking for a change in mode. Some sensors, such as the MRE speed sensor produce a digital signal and the ECM is measuring the frequency.

Amplitude

Amplitude is a measurement of strength, such as voltage. Amplitude can be measured from peak to peak, or from a reference point.

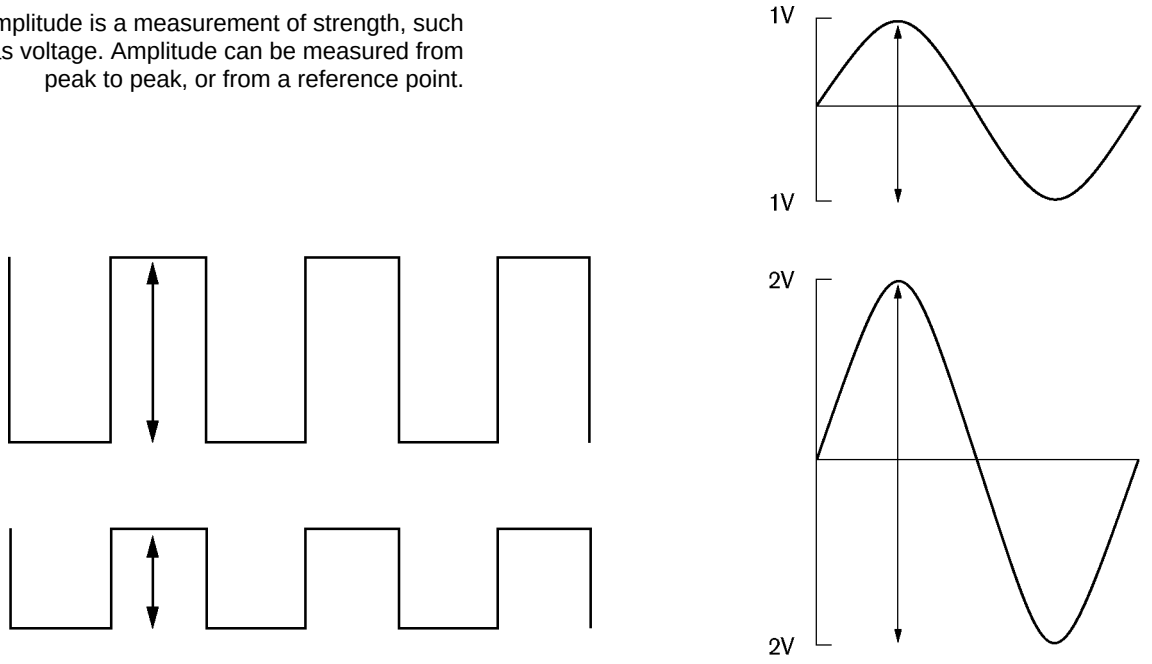


Fig. B-02

T8521364/T8521380

Frequency

Some signals are measured by frequency. A frequency is defined as the number of cycles per second. A cycle is a process that repeats from a common starting point. The unit for measuring frequency is called Hertz (Hz).

Frequency should not be confused with period. A period is the time it takes for the signal to repeat and is expressed as time. A 1 Hz signal lasts 1 second. A 2 Hz signal has a period of 0.5 seconds.

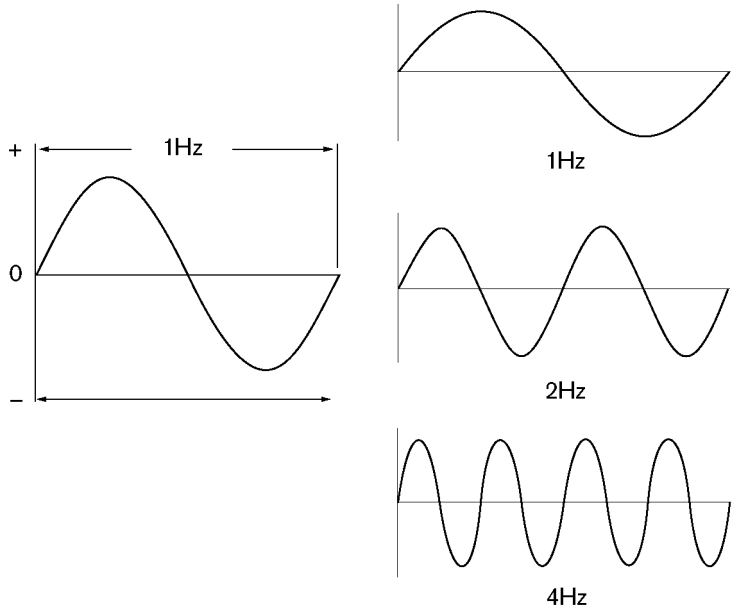
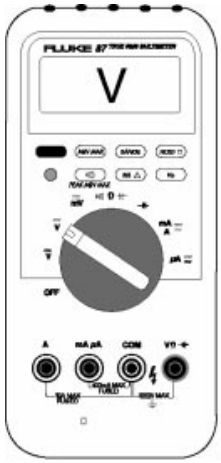


Fig. B-03

T8521365/T8521381

DC Voltage

Direct current is where the current flows in one direction. Though current flow and voltage can be variable, the direction always remains the same. The DVOM must be in the DC scale to measure DC voltage.



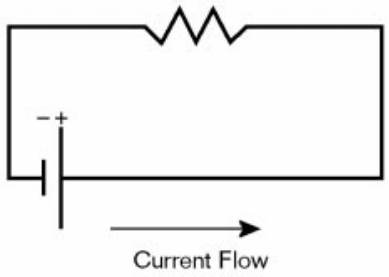
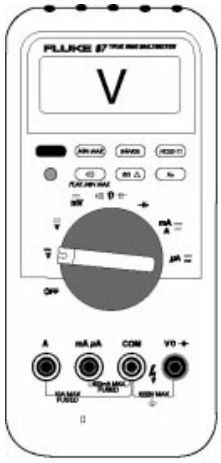


Fig. B-04
T8521380/T8521387

AC Voltage

Alternating current is where the direction of current flow changes. Current will travel from positive to negative, and then reverse course going to negative then positive. The DVOM must be in AC scale to measure AC voltage. There are different methods for measuring AC voltage and some DVOMs use what is known as a True RMS (Root Mean Square) to measure voltage. It is important for you to realize that the meter specified by the manufacturer must be used to obtain accurate results when compared to manufacturer's specifications.



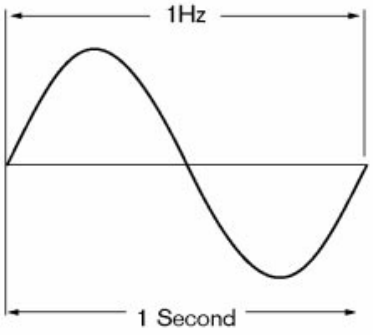


Fig. B-05
T8521308/T8521365

Output Signals and Circuits

To correctly interpret an oscilloscope pattern and DVOM reading, the technician needs to know the type of output circuit and how the test device is connected to the circuit.

Power Side Switched Circuit

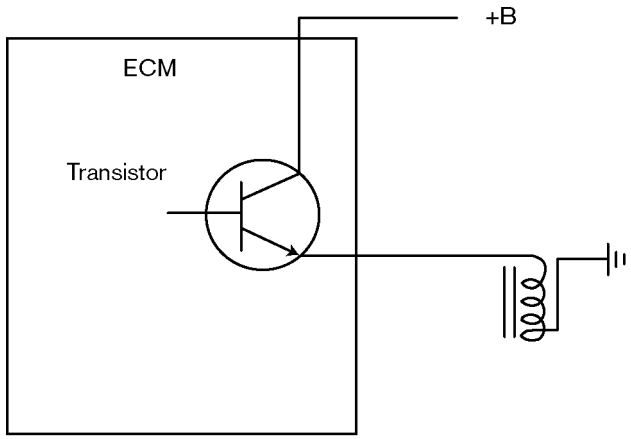


Fig. B-06
T852f366

Power Side Switched Circuit

A power side switched circuit will have voltage applied to the device when the circuit is switched on. When the transistor (think of the transistor as a switch) is turned on, current and voltage are applied to the device turning it on. The transistor is between power and the device. This is why they are commonly called power or power side switched circuits.

Ground Side Switched Circuit

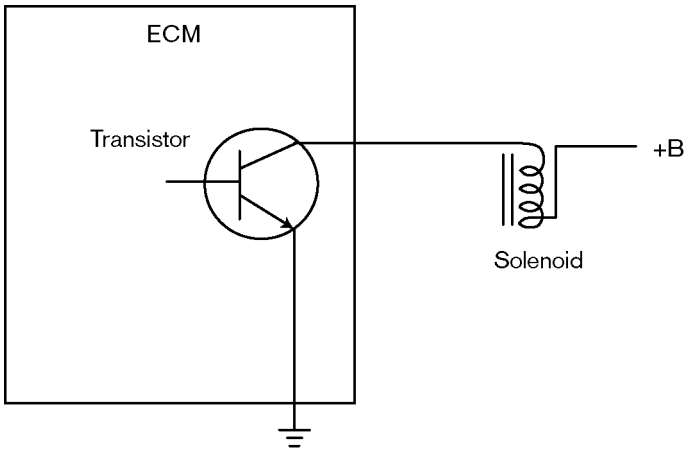


Fig. B-07
T852f367

Ground Side Switched Circuit

A ground side switched circuit has the transistor (switch) placed between the device and ground. When the transistor is turned on, the circuit now has a ground and current flows in the circuit. When the transistor is turned off current flow stops. Note that there is voltage present at the load and up to the transistor whenever the transistor is off.

Square Wave Duty Ratio Signals

When A and B are equal in length, the pulsewidth is 50%. This is a true square wave signal. A voltmeter connected to this circuit will measure half the supply voltage. The signal is said to have a low duty ratio when the on time is less than 50%.

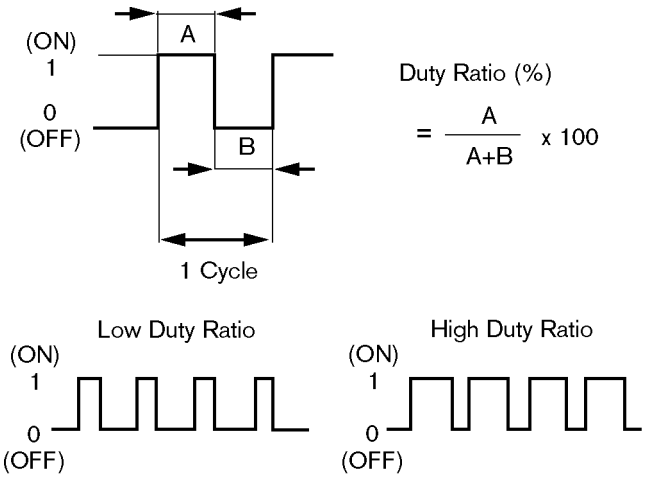


Fig. B-08
T852f368

Output Control Signals

Many devices, such as fuel injectors, EVAP purge, EGR VSV, rotary solenoid, alternator field circuit, etc. need to be modulated so that the desired output is achieved. There are a variety of control signals that can be used to regulate devices. Typically, the control signal changes the on/off time. This type of signal is often referred to as a pulse width modulated (PWM) signal and the on time is referred to as the pulsewidth. The duty cycle is the time to complete the on/off sequence. This can be expressed as a unit of time or as a frequency. The duty ratio is the comparison of the time the circuit is on versus the time the circuit is off in one cycle. This ratio is often expressed as a percentage or in milliseconds (ms).

PWM Signal

Each signal has the same frequency, only the pulsewidth has changed. The low duty ratio will have a lower current output.

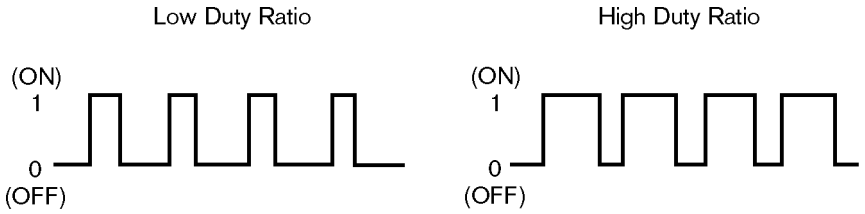
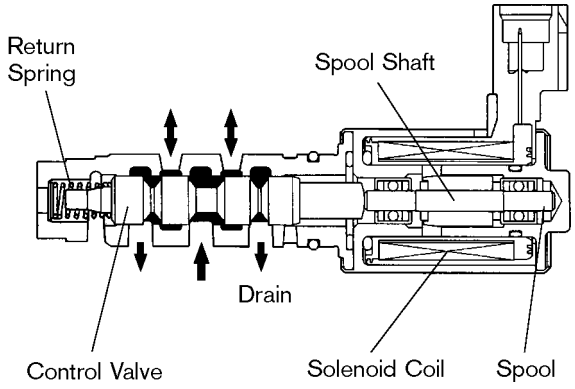


Fig. B-09
T852f368

Duty Ratio Solenoid

As the duty ratio (On time) increases, current flow through the solenoid increases moving the control valve. Oil pressure is then applied to the component that needs to be regulated, such as the variable valve timing mechanism, or lock-up control. In this example, Oil pressure increases as current increases. Other duty ratio solenoids can work in the opposite manner. Increasing current will decrease oil flow.



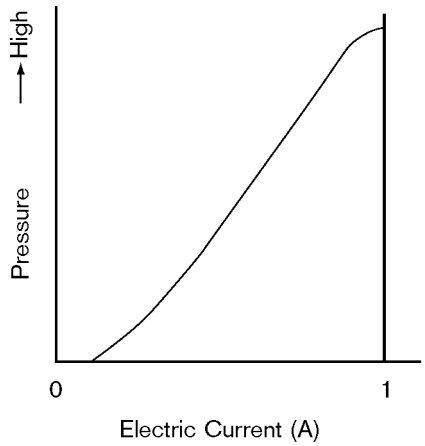


Fig. B-10
T852f370/T852f371

Fixed Duty Cycle Variable Duty Ratio (Pulse Width Modulated) Signal

This type of output control signal is defined by having a fixed duty cycle (frequency) with a variable duty ratio. With this type of signal only the ratio of on to off time varies. The ratio of on to off time modulates the output.

Variable Duty Cycle Variable Duty Ratio Signal

Duty cycle frequency has changed.
Duty ratio has changed.

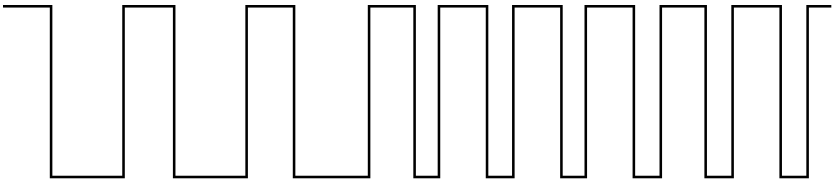


Fig. B-11
T8521372

Variable Duty Cycle/Variable Duty Ratio Signal

This signal varies the frequency of the duty cycle and the duty ratio. An excellent example is the signal used to control the fuel injector. As engine RPMs increase the fuel injector activation increases. As engine load increases, the duration of the fuel injector increases. It is easy to observe this type of control signal on the oscilloscope. With the oscilloscope connected to the fuel injector ECM terminal, as the engine RPMs (frequency) increase there will be more fuel injector cycles on the screen. As engine load increases, the on time (pulsewidth) also increases.

Measuring and Interpreting Signals

Oscilloscopes and many DVOMs can measure the pulsewidth, duty ratio, and frequency. For the technician to correctly interpret the reading oscilloscope line trace, the technician needs to know how the DVOM/oscilloscope is connected and the type of circuit.

Measuring Available Voltage On a Ground Side Switched Circuit

When the circuit is on, the DVOM will measure nearly 0 volts at the ECM.

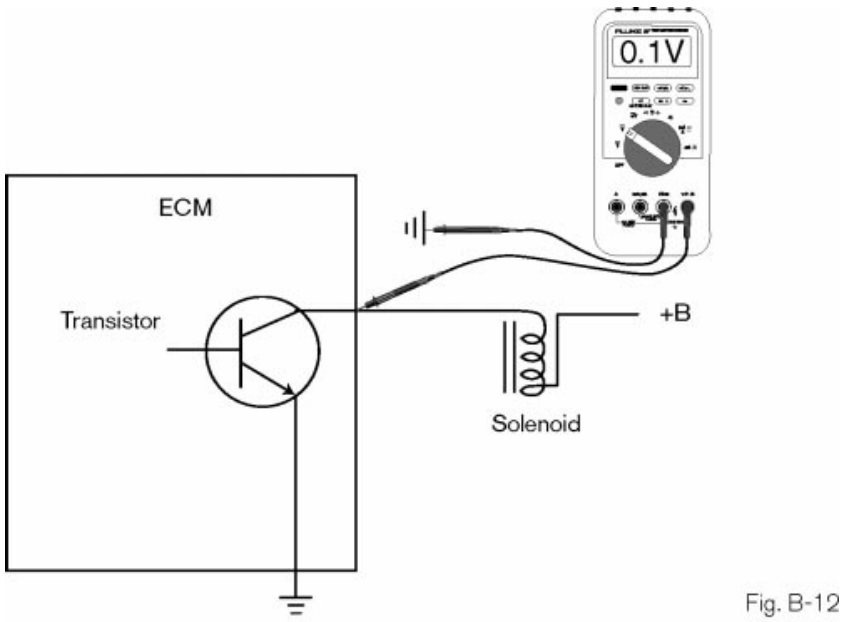


Fig. B-12
T852f382

Ground Side Switch Voltage Pattern Interpretation

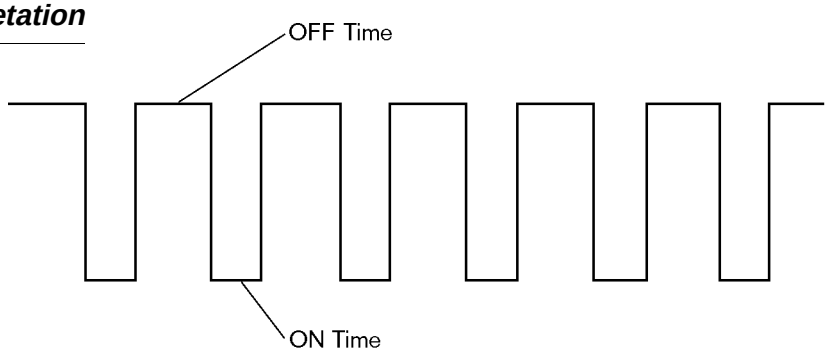


Fig. B-13
T852f373

Ground Side Switch Circuit Interpretation

With an oscilloscope connected at the ECM on a ground side switched circuit, the on time will be represented by the low (nearly 0 volts) voltage line trace. The voltage trace should be at supply voltage when the circuit is off and nearly 0 volts when the circuit is on. The on time (pulsewidth) is amount of time at 0 volts. If trace line does not go to nearly 0 volts, there may be a problem with the ground side of the circuit.

A DVOM in many cases can be substituted for the oscilloscope. When using a DVOM with a positive (+) or negative (-) trigger, select negative (-) trigger. Then the DVOM reading will represent the on time, usually as a percentage or in ms. On the voltage scale, the DVOM will read +B when the circuit is off and nearly 0 volts when the circuit is on.

Measuring Across the Load

Connecting at the ECM is the most common point used in the Repair Manual procedures. However, it is also possible to connect the oscilloscope or DVOM across the device. If this is done, the interpretation is different. The DVOM will read 0 volts when the circuit is off, and nearly +B when the circuit is on.

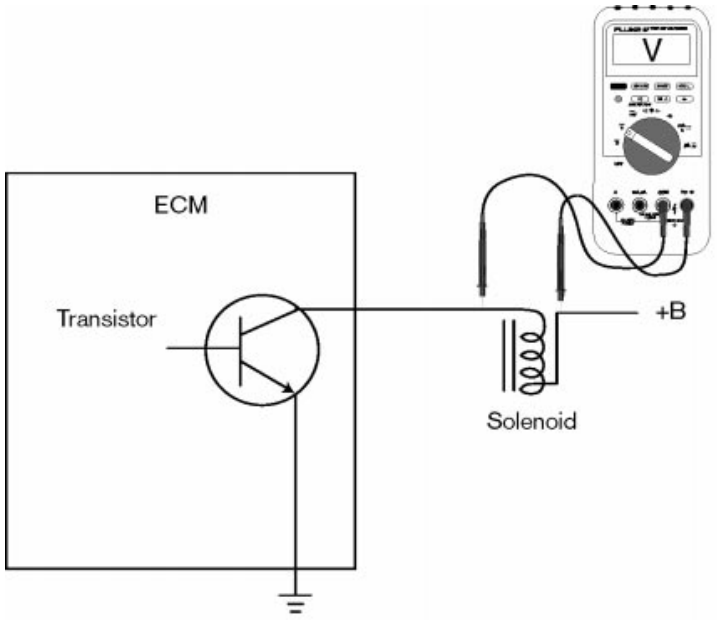


Fig. B-14
T8521383

Measuring Across the Load Pattern Interpretation

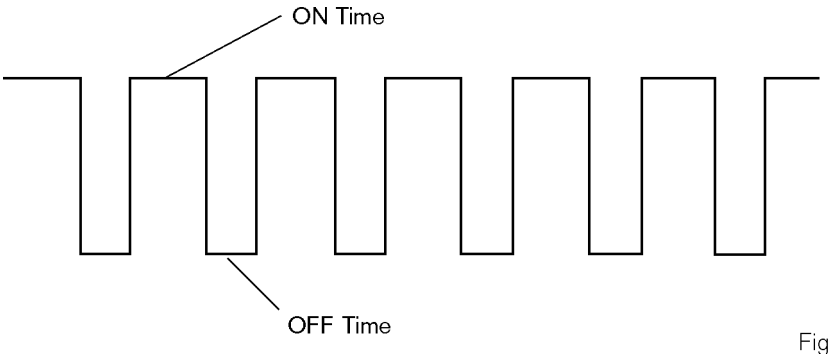


Fig. B-15
T8521373

Measuring Available Voltage on a Power Side Switched Circuit

When the circuit is on, the DVOM will measure +B at the ECM.

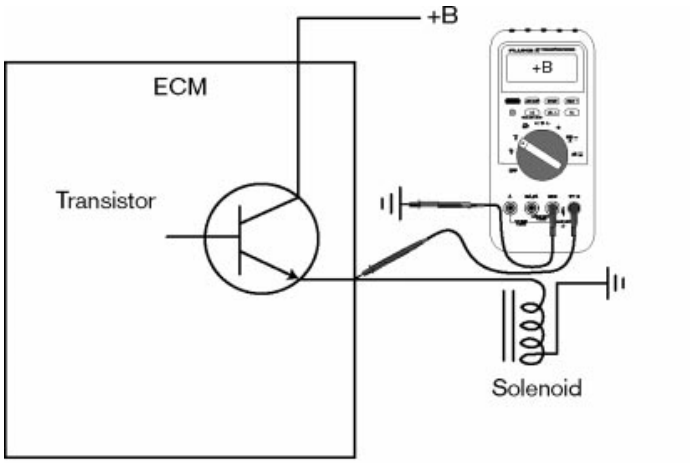


Fig. B-16
T8521384

Pattern Interpretation for a Power Side Switched Circuit

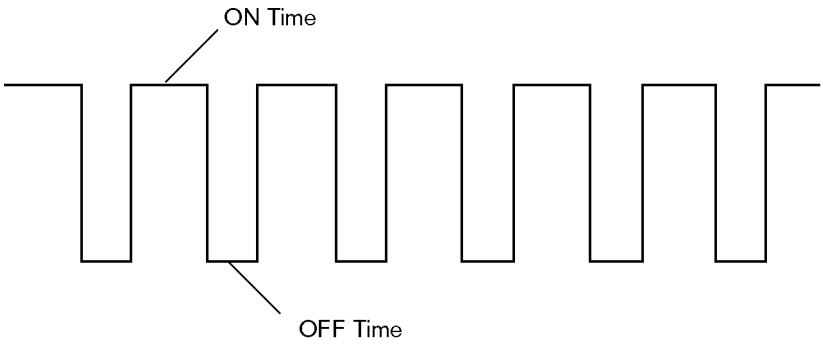


Fig. B-17
T8521373

Power Side Switch Circuit Interpretation

With an oscilloscope/DVOM connected at the ECM on a hot side switched circuit, the on time will be represented by the high (supply voltage) voltage line trace. The voltage trace should be at supply voltage when the circuit is on and at 0 volts when the circuit is off. The on time (pulsewidth) is the amount of time at supply voltage. If trace line does not go to supply voltage, there may be a problem with the supply side of the circuit.

When using a DVOM select positive (+) trigger. Then the DVOM reading will represent the on time, usually as a percentage or in ms.

Checking Circuit Operation Across The Load

The DVOM will measure nearly +B volts when the circuit is on.

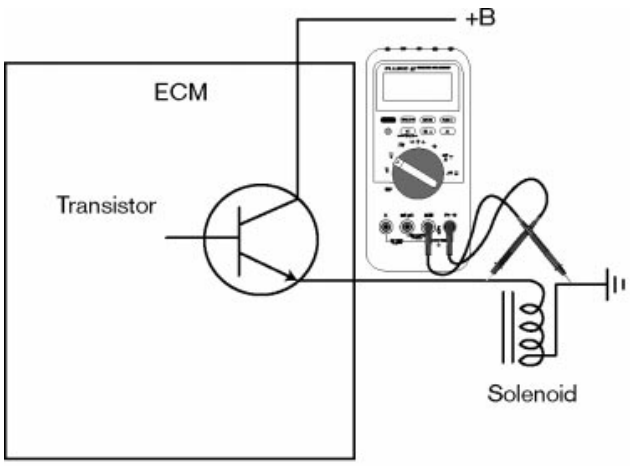


Fig. B-18
T8521369

Appendix C

ECT Diagnostic Information

Fig. 1

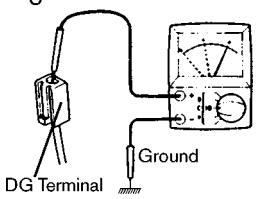


Fig. 2

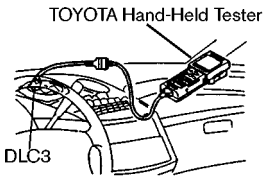


Fig. 3

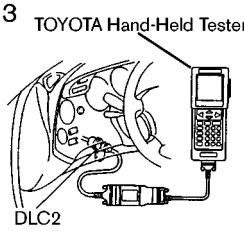


Fig. 4

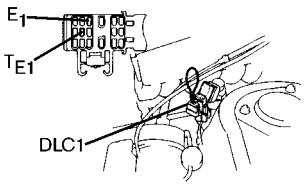


Fig. 5

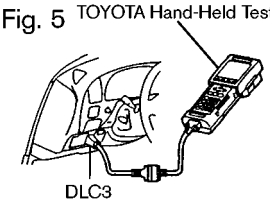


Fig. 6

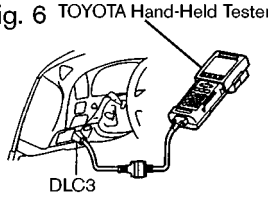


Fig. 7

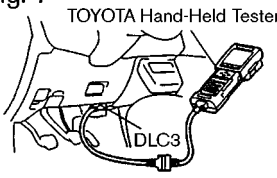
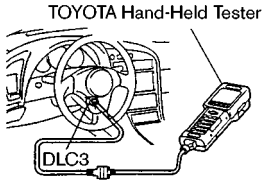


Fig. 8



CODE	TROUBLE AREA
38****	Open or short circuit in fluid temerature sensor or harness
41***	Severed throttle position sensor or short circuit, or severed wire harness or short circuit
42	Speed sensor No. 1 (back-up speed sensor) bad, or wire in its wire harness disconnected or shorted
44*	Rear wheel speed sensor bad (no speed sensor signal), wire in harness disconnected/ shorted
46****	Wiring of solenoid valve No. 4 disconnected/ shorted, or wire in its wire harness disconnected/shorted
61	Speed sensor No. 2 (main speed sensor) bad, no "FR" signal (on All-Trac Camry), or wire in harness disconnected/shorted
62	Wiring of solenoid valve No. 1 disconnected/ shorted, or wire in its wire harness disconnected/shorted
63	Wiring of solenoid valve No. 2 disconnected/ shorted, or wire in its wire harness disconnected/shorted
64	Wiring of solenoid valve No. 3 disconnected/ shorted, or wire in its wire harness disconnected/shorted
65**	Severed No. 4 solenoid or short circuit, or severed wire harness or short circuit
67****	O/D direct clutch speed sensor, or wire in its harness disconnected/shorted
73*	Wiring of No. 1 center differential control solenoid valve disconnected/shorted, or wire in its wire harness disconnected/shorted
74*	Wiring of No. 2 center differential control solenoid valve disconnected/shorted, or wire in its wire harness disconnected/shorted
77****	Wiring of solenoid valve No. 5 disconnected/ shorted, or wire in its wire harness disconnected/shorted
86***	Open or shorted engine speed sensor or wire harness
88***	Open or shorted ECM, TCM or wire harness
88****	Open or short circuit in communication circuit between TRAC ECU and TCM; TRAC ECU malfunction

* A540H All-Trac Camry Only
** A340H 4x4 Truck Only
*** A442F Land Cruiser
**** A340E Supra (JZA)

SCAN CODE	TROUBLE AREA
P0500	Open or short in (No. 1[a]) vehicle speed sensor or circuit, combination meter, ECM, automatic transaxle[1], [ABS speed sensor or circuit ABS ECU][3]
P0710	Open or short in ATF temperature sensor or circuit, ECM, automatic transmission assembly
P0711	Open in ATF temperature sensor or circuit, ECM
P0715	Open or short in O/D direct clutch speed sensor or circuit, ECM
P0720	No. 1 vehicle speed sensor, combination meter, harness or connector between No. 1 vehicle speed sensor and ECM, ECM
P0750	Shift solenoid valve No. 1 is stuck open or closed, valve body is blocked up or stuck, automatic transaxle[1]
P0753	Open or short circuit in shift solenoid valve No. 1 or circuit, ECM
P0755	Shift solenoid valve No. 2 is stuck open or closed, valve body is blocked up or stuck, automatic transaxle[1]
P0758	Open or short circuit in shift solenoid valve No. 2 or circuit, ECM
P0765	Shift solenoid S4 stuck, valve body blocked or stuck
P0768	Open or short in solenoid S4 or circuit, ECM
P0770	Shift solenoid valve SL (SLU[†]) is stuck open or closed, valve body is blocked or stuck, lock-up clutch, automatic transaxle[1]
P0773	Open or short in shift solenoid valve SL or circuit, ECM
P1520	Open or short in stop light switch or circuit, ECM
P1700	Open or short in No. 2 (front[2]) vehicle speed sensor or circuit, ECM
P1705	Open or short in direct clutch speed sensor or circuit, ECM
P1715	Open or short in rear speed sensor or circuit, ECM
P1725	Open or short in input turbine speed sensor or circuit, ECM
P1730	Open or short in counter gear speed sensor or circuit, ECM
P1755	Open or short in shift solenoid valve SLU or circuit, ECM
P1760	Open or short in shift solenoid valve ST (SLU[‡]) or circuit, ECM
P1765	Open or short in shift solenoid valve SLN or circuit, ECM
P1770	Open or short in shift solenoid valve SLD or circuit, ECM
P1780	Short in park/neutral position switch or circuit, ECM
P1790	Open or short in ST solenoid or circuit, ECM

[1] Except 1998 T100/1998-99 4Runner, Tacoma, and Land Cruiser/ 2000 Tundra
[2] 1998-99 RAV4 (A540H)
[3] 1998-99 Sienna, 4Runner
[a] 1998 T100/1998-99 Camry, Celica, 4Runner/1999 Tacoma, Land Cruiser
[†] 1998 Supra (2JZ-GE)
[‡] 1998 Supra, 1998-99 Land Cruiser

Transmission Model	Engine Model	Vehicle Model		N D Squat Control	Diagnostic Codes	Cancel Out Diagnostic Codes	Diagnostic Code Access	O/D Cancel Temperature (3rd)	Manual Mode "L" "2" "D" "R"
A-340E	3RZ-FE	96-98	T100	3rd - 1st	P0500-P1780 (11)	Scan Tool	Fig. 5, 6	140°F	1st, 3rd, O/D, R
		96-00	4Runner						
	3VZ-E	89-95	Truck		42 thru 64 (5)	EFI 15A	Fig. 4	158°F	
		93, 94	T100					140°F	
	5VZ-FE	95-98	T100		P0500-P1780 (11)	Scan Tool	Fig. 5, 6		
		98, 01	4Runner				Fig. 6		
		95-97	Tacoma				Fig. 5, 6		
		98, 01	Tacoma						
	7M-GE	87-92	Supra		42 thru 64 (5)	RADIO No. 1 15A	Fig. 4	140°F (95°F)	
		89-92	Cressida			EFI 15A			
	7M-GTE	87-92	Supra			RADIO No. 1 15A			
	2JZ-GE	93.5-95	Supra		38 thru 64 (6)	EFI 15A	Fig. 4, 5		
		96, 97	Supra		P0500-P1780 (11)	Scan Tool			
		98	Supra		P0500-P1780 (12)		Fig. 5	140°F	
	2JZ-GTE	93.5-96	Supra		38 thru 89 (10)	EFI 15A	Fig. 3, 5	140°F (95°F)	
		97, 98	Supra		P0500-P1780 (14)	Scan Tool			
	2TZ-FZE	94.5, 95	Previa		P0720-P1780 (9)		Fig. 4, 4	158°F	
		96, 97	Previa		P0500-P1780 (11)				
	5VZ-FE	00-01	Tundra		P0500-P1780 (13)		Fig. 6	140°F	
		01	Sequoia						
A-340E	2UZ-FE	00-01	Tundra	3rd - 1st	P0500-P1780 (13)	Scan Tool	Fig. 6	140°F	1st, 3rd, O/D, R
		01	Sequoia						
A-340H	3VZ-E	89-95	Truck	3rd - 1st	42 thru 65 (6)	EFI 15A	Fig. 4	158°F	1st, 3rd, O/D, R
A-340F	22R-E	90-95	Truck	3rd - 1st	42 thru 64 (5)	EFI 15A	Fig. 4	158°F	1st, 3rd, O/D, R
	3RZ-FE	95, 96	Tacoma		P0500-P1780 (11)	Scan Tool	Fig. 5, 6	140°F	1st, 3rd, O/D, R
		96-00	4Runner						
		97-01	Tacoma						
	3VZ-E	93, 94	T100		42 thru 64 (5)	EFI 15A	Fig. 4		
	5VZ-FE	95, 96	Tacoma		P0500-P1780 (11)	Scan Tool	Fig. 5,6		
		95-98	T100						
		96-01	4Runner						
		97-01	Tacoma						
	2TZ-FZE	94.5, 95	Previa		P0720-P1780 (9)		Fig. 2	158°F	
		96, 97	Previa		P0500-P1780 (11)				
	5VZ-FE	00-01	Tundra		P0500-P1780 (13)		Fig. 6	140°F	
	2UZ-FE	00-01	Tundra		P0500-P1780 (13)		Fig. 6		
		01	Sequoia						
A-343F	1FZ-FE	96, 97	Land Cruiser	3rd - 1st	P0500-P1780 (11)	Scan Tool	Fig. 5	131°F	1st, 3rd, O/D, R
	2UZ-FE	98, 01	Land Cruiser		P0500-P1780 (13)		Fig. 6		1st, 3rd, O/D, R
A-442F	1FZ-FE	93, 94	Land Cruiser	3rd - 1st	41 thru 88 (9)	DOME 10A	Fig. 4	131°F	1st, 3rd, O/D, R
		95	Land Cruiser		P0710--P1780 (10)	Scan Tool			
A-46DE, A-46DF	2TZ-FZE	91-94	Previa	3rd - 1st	42 thru 64 (5)	EFI 15A	Fig. 4	158°F	1st, 3rd, O/D, R
A-140E	3S-FE	89-91	Camry	2nd - 1st	42 thru 64 (5)	DOME 20A	Fig. 4	122°F	
	3S-GE	88, 89	Celica					158°F	
	5S-FE	92-95	Camry		42 thru 64 (4)	EFI 15A	Fig. 4, 5	122°F	
		96-01	Camry		P0500-P1780 (9)	Scan Tool	Fig. 5, 6		
		99-01	Solara						
		94, 95	Celica		42 thru 64 (4)	EFI 15A	Fig. 4		
		96-99	Celica		P0500-P1780 (9)	Scan Tool	Fig. 5, 6 Fig. 8 (99)		
	5S-FNE	00-01	Camry				Fig. 7		
A-241E	5S-FE	90-93	Celica	2nd -1st	42 thru 64 (5)	EFI 15A	Fig. 4	122°F	1st, 3rd, O/D, R
		91-93	MR2						
		94, 95	MR2						
	3S-FE	96, 97	RAV4		P0750-P1780 (9)	Scan Tool	Fig. 5		
A-244E	5E-FE	92-95	Paseo	2nd - 1st	42 thru 64 (5)	EFI 15A	Fig. 4	127°F	1st, 3rd, O/D, R
		96, 97	Paseo		P0500-P1780 (10)	Scan Tool	Fig. 6		
A-245E	7A-FE	93-95	Corolla	2nd - 1st	42 thru 64 (4)	EFI 15A	Fig. 4	131°F	1st, 3rd, O/D, R
		96, 97	Corolla		P0500-P1780 (9)	Scan Tool	Fig. 5		
	1ZZ-FE	98, 01	Corolla				Fig. 6	140°F	
A-246E	7A-FE	94, 95	Celica	2nd - 1st	42 thru 64 (4)	EFI 15A	Fig. 4	131°F	1st, 3rd, O/D, R
		96, 97	Celica		P0500-P1780 (9)	Scan Tool	Fig. 5		
A-247E	3S-FE	98, 00	RAV4	2nd - 1st	P0500-P1780 (9)	Scan Tool	Fig. 7	140°F (98) 122°F (99)	1st, 3rd, O/D, R
A-540E	2VZ-FE	88-91	Camry	2nd - 1st	42 thru 64 (5)	EFI 15A	Fig. 4	145°F (100°F)	1st, O/D, O/D, R
	3VZ-FE	92, 93	Camry					140°F	
	1MZ-FE	98, 00	Sienna		P0500-P1780 (10)	Scan Tool	Fig. 6		
A-541E	1MZ-FE	94-01	Camry	2nd - 1st	P0500-P1780 (11)	Scan Tool	Fig. 5, 6	131°F (94) 140°F (95-01)	1st, 3rd, O/D, R (94) 1st, O/D, O/D, R (95-01)
		99-01	Solara						
		95-01	Avalon		P0500-P1780 (11)*		Fig. 5, 6	140°F	1st, 3rd, O/D, R (94) 1st, O/D, O/D, R (95-01)
		01	Sienna		P0500-P1780 (11)		Fig. 6		1st, O/D, O/D, R
A-540H	3S-FE	89-91	Camry	2nd - 1st	44 thru 74 (7)	DOME 20A	Fig. 4	122°F	1st, O/D, O/D, R
		96-00	RAV4	3rd - 1st 2nd - 1st (98-00)	P0500-P1780 (13)	Scan Tool	Fig. 5 (96,97) Fig. 7 (98-00)	140°F	1st, 3rd, O/D, R (96, 97) 1st, O/D, O/D, R (98, 00)
U-140F	1AZ-FE	01	RAV4	3rd - 1st	P0500-P1790 (16)	Scan Tool	Fig. 6	140°F	3rd, 3rd, 3rd, R
	1AZ-FE	01	Highlander						
U-140E	1MZ-FE	01	Highlander	3rd - 1st	P0500-P1790 (16)	Scan Tool	Fig. 6	140°F	3rd, 3rd, 3rd, R
U-240E	2ZZ-FE	00-01	Celica	3rd - 1st	P0500-P1790 (16)	Scan Tool	Fig. 6	140°F	1st, O/D, O/D, O/D
U-241E	1AZ-FE	01	RAV4	3rd - 1st	P0500-P1790 (16)	Scan Tool	Fig. 6	140°F	3rd, 3rd, 3rd, R
	2AZ-FE	01	Highlander						
U-340E	1NZ-FE	00-01	ECHO	3rd - 1st	P0500-P1790 (14)	Scan Tool	Fig. 6	140°F	3rd, 3rd, 3rd, R
U-341E	1ZZ-FE	00-01	Celica	3rd - 1st	P0500-P1790 (16)	Scan Tool	Fig. 6	140°F	3rd, 3rd, 3rd, R

Appendix D

A/T Clutch Application Chart

U-140E, U-140F, U-240E, U-241E

Shift Lever Position	Gear Position	C1	C2	C3	B1	B2	B3	F1	F2
P	Park						■		
R	Reverse		■			■	■		
N	Neutral						■		
D	1st	■					■	■	■
	2nd	■			■		■		■
	3rd	■	■				■		■
	O/D	■	■	■					
2	1st	■					■	■	■
	2nd	■			■		■		■
L	1st	■				■	■	■	■

A14-0L, A-140E, A-540E, A-540H, A-541E

Shift Lever Position	Gear Position	C0	C1	C2	B0	B1	B2	B3	F0	F1	F2
P	Park	■									
R	Reverse	■		■				■			
N	Neutral	■									
D	1st	■	■						■		■
	2nd	■	■				■		■	■	
	3rd	■	■	■			■		■		
	O/D		■	■	■		■				
2	1st	■	■						■		■
	2nd	■	■			■	■		■	■	
	3rd*	■	■	■			■		■		
L	1st	■	■				■		■		■
	2nd**	■	■			■	■		■	■	

* Downshift only - no upshift ** Does Not Apply to A-140L

U-340E, U-341E

Shift Lever Position	Gear Position	C1	C2	C3	B1	B2	B3	F1	F2
P	Park								
R	Reverse			■			■		
N	Neutral								
D	1st	■							■
	2nd	■				■		■	
	3rd	■	■			■			
	O/D		■		■	■			
2	1st	■							■
	2nd	■			■	■		■	
L	1st	■					■		■

A-240E, A-240L, A-241E, A-241H

Shift Lever Position	Gear Position	C1	C2	B0	B1	B2	B3	F0	F1	F2	F3
P	Park										
R	Reverse		■				■				
N	Neutral										
D	1st	■						■		■	■
	2nd	■				■		■	■		■
	3rd	■	■			■		■			■
	O/D	■	■	■		■					
2	1st	■						■		■	■
	2nd	■			■	■		■	■		■
	3rd*	■	■			■		■			■
L	1st	■					■	■		■	■
	2nd	■			■	■		■	■		■

* AW Only A-240E, A-241E

A-43D, A-43DE, A-44DL, A-45DL, A-45DF

Shift Lever Position	Gear Position	C0	C1	C2		B0	B1	B2	B3		F0	F1	F2
				I.P.	O.P.				I.P.	O.P.			
P	Park	■							■	■			
R	Reverse	■		■	■				■	■	■		
N	Neutral	■											
	1st	■	■								■		■
D	2nd	■	■					■			■	■	
	3rd	■		A45DL A45DF	A45DE A45DL			■			■		
	O/D		■	A45DL A45DE	A45DE A45DL	■							
	1st	■	■								■		■
2	2nd	■	■				■	■			■	■	
L	1st	■	■						■	■	■		■

I.P. - Inner Piston O.P. - Outer Piston

A-340E, A-340F, A-340H, A-343F

Shift Lever Position	Gear Position	C0	C1	C2	B0	B1	B2	B3		F0	F1	F2
								I.P.	O.P.			
P	Park	■										
R	Reverse	■		■				■	■	■		
N	Neutral	■										
D	1st	■	■							■		■
	2nd	■	■				■			■	■	
	3rd	■	■	■			■			■		
	O/D		■	■	■		\					
2	1st	■	■							■		■
	2nd	■	■			■	■			■	■	
	3rd	■	■	■			■			■		
L	1st	■	■					■	■	■		■
	2nd*	■	■			■	■			■	■	

* Downshift only in the L range and 2nd gear - no upshift

I.P. - Inner Piston O.P. - Outer Piston

TRANSFER
CLUTCH, BRAKE AND SOLENOID

Transfer gear position	No. 4 Solenoid	C3	C4	B4
H2	OFF	■		
H4	OFF	■	■	
L4	OFF		■	■

Customer Interview Sheet

Customer Interview Sheet

Automatic Transmission/Transaxle

Date:	Service Advisor Name:
Customer's Name:	Vehicle License No.:
	Vehicle VIN:
Repair Order No.	Vehicle Model:
Odometer Reading	Production Date:

Date Problem Occurred:	
How Often Does Problem Occur? ◯ Continuously ◯ Intermittently (_____times a day)	
When Does the Problem Occur? ◯ Shortly after start-up in AM. ◯ After engine at operating temperature.	

Symptoms	Vehicle does not move ◯ Any position ◯ Particular position ____
	No up-shift (◯ 1st to 2nd ◯ 2nd to 3rd ◯ 3rd to O/D)
	No down-shift (◯ O/D to 3rd ◯ 3rd to 2nd ◯ 2nd to 1st)
	Harsh Upshift (◯ 1st to 2nd ◯ 2nd to 3rd ◯ 3rd to 4th)
	Shift point (◯ Too high ◯ Too low)
	Converter lock-up malfunction
	Harsh engagement (◯ N to D ◯ N to R ◯ Lock-up ◯ Any drive position)
	Slip or shudder
	No kick-down
	No engine braking on deceleration
	Other

MIL Light	◯ Goes OFF when engine starts ◯ Remains ON when engine starts

ECT Analyzer

ECT Analyzer

The ECT Analyzer is designed to determine if a transmission malfunction is ECM/electrical circuit related or in the transmission. The analyzer is connected at the solenoid electrical connector either directly or by using an adapter harness. Each adapter harness has a tag attached to it to identify the model application. Also, consult TSB SS94-003 for the specific harness application and part number. The checker is used on models as early as 1983 on up to 1994. The Diagnostic Tester performs a similar function on vehicles with DLC2 or 3 and therefore no harnesses were developed for later models.

ECT Analyzer (Checker)

The analyzer is connected at the solenoid electrical connector either directly or by using an adapter harness.

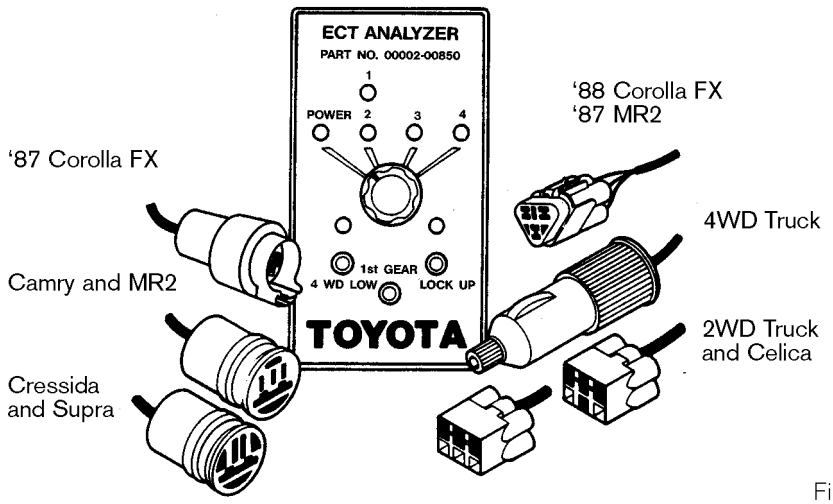


Fig. 7-01
T273f282

The vehicle is driven using the analyzer to shift the transmission. If the transmission operates properly with the ECT Analyzer, the fault lies between the solenoid connectors up to and including the ECM. On the other hand, if the transmission does not operate properly with the analyzer, the fault is likely to be in the transmission. This would include a failure of the solenoid or a mechanical failure of the transmission. A solenoid may test out electrically and fail mechanically because the valve sticks. Apply air pressure to the solenoid; air should escape when the solenoid is energized and should not escape when the solenoid is not energized.

Operating Instructions

Two technicians are required when testing with the ECT Analyzer. One technician must actually drive the vehicle, and the second technician will change gears by rotating the knob.

CAUTION

The analyzer leads should be routed away from hot or moving engine components to avoid damage to the tester.

CAUTION Choose a safe test area where there are no pedestrians, traffic or obstructions.

Testing for proper gear shifting:

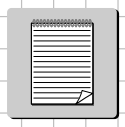
1. The driver and passengers should wear seat belts.
2. Depress the service brake pedal.
3. Start the engine and move the vehicle gear selector to Drive.
4. Rotate the gear selector knob on the ECT Analyzer to the “1-2” position. The transmission will shift to second gear.
5. Press and hold the first gear button. The transmission will shift to first gear.
6. Release the parking brake.
7. Accelerate to 10 mph.
8. Release the first gear button. The transmission should shift to second gear.
9. Accelerate to 20 mph.
10. Rotate the selector knob to the number “3” position. The transmission should shift into third gear.
11. Accelerate to 25 mph.
12. Rotate the selector knob to the number “4” position. The transmission should shift to fourth gear.
13. Release the accelerator and coast.
14. Rotate the selector knob to the number “3” position. The transmission should downshift into third gear.
15. Apply the brakes, and stop the vehicle. Testing is complete.

Testing for lockup operation:

1. Operate the vehicle and ECT Analyzer up to fourth gear.
2. Accelerate to 40 mph.

3. Press and hold the “Lockup” button to engage the lockup clutch. Observe the tachometer and note a slight reduction in the engine rpm. (Is more noticeable when the vehicle is going up a slight hill due to converter slippage.)
4. Release the “Lockup” button to disengage the lockup clutch.
5. Apply vehicle brakes, and bring the vehicle to a halt.
   Test is complete.

Testing for lockup can also be performed with the vehicle stopped, but with the engine running. With the gearshift selector in “D”, press the “Lockup” button to engage the lockup clutch. With the converter in lockup, the engine idle rpm will drop significantly or stall. If there is no change in the engine idle rpm, the lockup function is not operational.



Notes