

Data Parameters

*Current and Past
TMC Engines
Covered in this
Section*



Fig. B-1

TL874fB01

OBD Data Parameters

Signal Category	Display Item	Parameter Description	Units of Measurement	Normal Condition (warm idle, accessories off)
Oxygen Feedback	Target A/F (L & R)	Long term fuel trim (learned value) for left and right cylinder banks	0V to 5V	$2.50V \pm 1.25V$ (except 2JZ-GE = $2.50V \pm 1.85V$)
	A/F FB (L & R)	Loop status for left and right cylinder banks	ON or OFF	ON
	Ox Signal (L & R)	Main O2 sensor signal	Rich or Lean	Switching between rich and lean, no minimum switching frequency
Major Inputs	Engine Coolant Temperature (ECT)	Temperature of engine coolant	Degrees fahrenheit or celsius	80°C to 95°C (176°F to 203°F)
	Engine Speed	Engine rpm	Crankshaft revolutions per minute	Normal warm curb idle as specified in Repair Manual
	Air Flow Meter (VS)	Volume of air entering the engine	Volts	$2.50V \pm 0.5V$ (Except following engines: 22R-E = $6 \pm 1\text{m}^3/\text{hr}$ 3VZ-E = $2.8V \pm 0.6V$ 1FZ-FE = $1.8V \pm 0.6V$)
	Air Flow Meter (KS)	Volume of air entering the engine	milliseconds	$35 \pm 5\text{ms}$ (except '94 LS 400 = $40 \pm 5\text{ms}$)
	Mass Air Flow Meter	Mass of air entering engine	grams per second	$3.8 \pm 1.2\text{ gm/sec}$
	Intake Manifold Pressure (Intake Man.)	Absolute pressure in intake manifold	inches of mercury (in. HG), millimeters of Mercury (mmHG), Kilopascals (Kpa)	4A & 7A-FE = $9.8 \pm 1.2\text{ in. HG}$ ($250 \pm 30\text{ mmHG}$) 5S-FE = $9 \pm 2\text{ in. HG}$ ($230 \pm 50\text{ mmHG}$)
	Throttle	Throttle opening angle in degrees, 90° theoretical maximum	angle in degrees	0° (< 5° KOEO)
	IDL Signal	Throttle closed signal (closed IDL contact)	ON or OFF	ON
	STA Signal	Engine cranking signal	ON or OFF	OFF (except when ignition is switched to start position)

Normal Condition (warm, 2500 rpm, no load)	Cranking Values	Addition Information
2.50V \pm 1.25V	N/A	AFR feedback correction value, displayed as correction factor, 2.50V = no correction. 2.50V = lean correction for rich condition. > 2.50V = rich correction for lean condition. Part of basic injection calculation.
ON	N/A	AFR feedback loop status. Open indicates that ECM ignores feedback from the exhaust O2 sensor. Open loop is forced during accel, decel, and cold engine operation. Closed indicates final injection duration is corrected for O2 sensor feedback.
Switching between rich and lean, minimum 8 switches in ten seconds (use O2S/RPM test)	N/A	Signal voltage for main O2 sensor. High concentration of exhaust oxygen (lean condition) = LEAN (< 400 mv O2S voltage). Low concentration of exhaust oxygen (rich condition) = RICH (> 600mv O2S voltage)
80°C to 95°C (176°F to 203°F)	Actual temperature	Displayed value determined by comparing THW analog voltage signal to look-up table stored in Read Only Memory. 'Default =176°F if circuit open or shorted
Should agree with tachometer	> 100 rpm	Engine revolutions calculated by comparing Ne signal with microprocessor clock pulses.
N/A	N/A	Displayed value is same as analog voltage signal at VS terminal of ECM.
N/A	N/A	Displayed value represents time that Ks signal is low. As signal frequency increases, time decreases. (time displayed is reciprocal of signal frequency)
N/A	N/A	Displayed value calculated by comparing VG analog voltage signal to a look-up table stored in Read Only Memory.
N/A	N/A	Determined by comparing analog signal voltage at PIM terminal of ECM to look-up table stored in Read Only Memory.
N/A	N/A	Displayed value determined by comparing VTA analog signal voltage to look-up table stored in Read Only Memory. Note: some applications display this value in steps, skipping approximately 8° per step. Value should indicate >70°at WOT.
OFF	N/A	Display determined by status of voltage at IDL terminal of ECM. Low voltage will cause display to read ON, high voltage will read OFF.
OFF	ON	Display determined by status of voltage signal at STA terminal of ECM. High voltage will cause display to read ON. May not indicate ON unless engine is cranked >2 seconds.

OBD Data Parameters (continued)

Signal Category	Display Item	Parameter Description	Units of Measurement	Normal Condition (warm idle, accessories off)
Other Inputs	Vehicle Speed	Road speed of vehicle	miles or kilometers per hour	0 mph/kph vehicle stopped
	A/C Signal	Air conditioning switch status	ON or OFF	On when A/C compressor is running
	PNP Signal	Park/Neutral safety switch status	N-P or Gear	N-P when in neutral or park, GEAR when in any forward or reverse gear
	Knock Retard	Status of ignition spark knock retard	ON or OFF	OFF
Outputs	Injector	Injection duration of #10 injector or injection group	Milliseconds injection time	1.8 to 50ms (see parameter definition)
	Ignition	Timing advance of cylinder #1	Degrees before top dead center crankshaft angle (CA)	5° to 20°
	IAC Step #	Commanded position of step type idle speed control valve	Steps	35 ± 15 steps (see additional information)
	ISC Duty	Commanded duty ratio to Rotary Solenoid Idle Air Control Valve	Percentage of time that voltage is high on RSO (open) coil	5% to 60% (see parameter definitions)

Normal Condition (warm, 2500 rpm, no load)	Cranking Values	Addition Information
0 mph/kph vehicle stopped	N/A	Displayed value calculated by comparing the pulsed vehicle speed sensor signal to the ECM internal clock pulse.
Cycles ON/OFF with A/C compressor (with A/C on)	N/A	Display determined by status of voltage at A/C terminal of the ECM.
N-P when in neutral or park, GEAR when in any forward or reverse gear	N/A	
OFF	N/A	May indicate ON during stall test or rapid acceleration.
Refer to engine control specifications in appendix	N/A	Normal values will vary with engine model, refer to engine control specifications in appendix. Duration decreases cold to warm and increases with load.
N/A	N/A	Computed timing advance (in addition to initial timing set with distributor), timing of IGT signal with respect to NE and G signals.
N/A	N/A	Commanded, not actual position. 125 steps = fully open (maximum by-pass air). 0 steps = fully closed (valve seated position). If valve is mechanically stuck, commanded position will continue to change until 0 or 125 steps are achieved. 2JZ-GE = 20 -25 steps, 1UZ-FE = 30 - 40 steps, 1FZ-FE = 30 - 50 steps
N/A	N/A	Duty ratio increases when A/C is ON or A/T is in GEAR.

OBD II Data Parameters

Signal Category	Display Item	Parameter Description	Units of Measurement/ Range	Normal Condition (warm idle, accessories off)
Oxygen Feedback	Fuel Sys (#1 & #2)	Loop status, cylinder bank 1 & 2	CLOSED or OPEN	CLOSED
	Short FT (#1 & #2)	Short term fuel trim, cylinder bank 1 & 2	% correction to injection duration. Range 0% \pm 35%	0% \pm 35%
	Long FT (#1 & #2)	Long term fuel trim, cylinder bank 1 & 2	% correction to basic injection duration. Range 0% \pm 35%	0% \pm 35%
	O2S (B1, S1 & B2, S1)	Main O2 sensor signal voltage, cylinder bank 1 & 2	0 to 1000 millivolts	Varying between 0 to 1000 millivolts, no minimum switching frequency
	O2S (B1, B2)	Sub-O2 sensor signal voltage, cylinder bank 1	0 to 1000 millivolts	Typically fixed voltage (does not vary significantly)
	O2 FT (B1, S1 & B2, S1)	Main O2 sensor fuel trim, cylinder bank 1 & 2 (same as Short FT)	% correction to basic injection duration	0% \pm 35%
	Total FT (B1 & B2)	Average total fuel trim, cylinder bank 1 & 2	Decimal value with normal range of 0.8 to 1.2. Normal value is 1.0	0.8 to 1.2 (80% to 120%)
	O2 LR (B1, S1 & B2, S1)	Main O2 sensor lean to rich switch time, cylinder bank 1 & 2	Time in milliseconds	0 to 1000 millivolts
	O2 RL (B1, S1 & B2, S1)	Main O2 sensor rich to lean switch time, cylinder bank 1 & 2	Time in milliseconds	0 to 1000 millivolts
	AFS (B1, S1 & B2, S1)	Voltage output of A/F sensor, cylinder bank 1 & 2	volts	Idling 2.8V - 3.8V
Major Inputs	Coolant Temperature (ECT)	Temperature of engine coolant	Degrees fahrenheit or celsius	80°C to 95°C (176°F to 203°F)
	Engine Speed (rpm)	Engine rpm	Crankshaft revolutions per minute	700 rpm \pm 50 rpm
	Mass Air Flow (MAF)	Mass of air entering the engine	grams per second	2.4 to 4.8 gm/sec

Normal Condition (warm, 2500 rpm, no load)	Ignition Switch On, Engine Not Running	Engine Cranking	Addition Information
CLOSED during cruise condition	N/A	N/A	AFR feedback loop status. Open indicates that ECM ignores feedback from the exhaust oxygen and AF sensor. Open loop is forced during accel, decel, and cold engine operation. Closed indicates final injection duration is corrected for O2 sensor feedback.
0% \pm 35%	N/A	N/A	AFR feedback correction value, applied to injection duration (after basic injection calculation). Positive value = rich correction for lean condition. Negative value = lean correction for rich condition. Value should be varying during closed loop.
0% \pm 35%	N/A	N/A	AFR feedback correction value, part of basic injection calculation. Positive value = rich correction for lean condition. Negative value = lean correction for rich condition. Value should remain stable during closed loop.
Varying between 0 to 1000 millivolts, minimum 8 switches in ten seconds	N/A	N/A	Signal voltage (in millivolts) for main O2 sensor. High concentration of exhaust oxygen (lean condition) = low signal voltage (< 400 mv). Low concentration of exhaust oxygen (rich condition) = high signal voltage (> 600mv)
Typically fixed low voltage (except when driving under normal road load)	N/A	N/A	Signal voltage (in millivolts) for sub O2 sensor. High concentration of post catalyst oxygen = low signal voltage (< 400 mv). Low concentration of post catalyst oxygen = high signal voltage (> 600mv)
0% \pm 35%	N/A	N/A	AFR feedback correction value (same as Short, FT), displayed as the percentage of rich or lean correction applied to injection duration. Positive value = rich correction. Negative value = lean correction. Should closely follow Short FT. Percentage will vary with different engines.
0.8 to 1.2 (80% to 120%)	N/A	N/A	Total correction including basic and correct injection duration values. Normal value is 1.00. < 1.00 = reduced duration (lean correction for rich condition). > 1.00 = increased duration (rich correction for lean condition).
N/A	N/A	N/A	Time in milliseconds for signal voltage to go from > 600 mv to < 400 mv. Switching time is effected by the age and condition of the O2 sensor. Faster switching times are desirable.
N/A	N/A	N/A	Time in milliseconds for signal voltage to go from < 400 mv to > 600 mv. Switching time is effected by the age and condition of the O2 sensor. Faster switching times are desirable.
3.3V (Range 2.8V - 3.8V)	N/A	N/A	Signal voltage for A/F sensor. A rich condition is below 3.3V, a lean condition above 3.3V. In closed lope, the ECM maintains a 3.3V output signal.
80°C to 95°C (176°F to 203°F)	Actual temperature	Actual temperature	Displayed value determined by comparing THW analog voltage signal to look-up table stored in Read Only Memory.
Should agree with tachometer	N/A	> 100	Engine revolutions calculated by comparing Ne signal with microprocessor clock pulses.
7.9 to 16.2 gm/sec	ON	N/A	Displayed value calculated by comparing VG analog voltage signal to a look-up table stored in Read Only Memory.

OBD II Data Parameters (continued)

Signal Category	Display Item	Parameter Description	Units of Measurement/Range	Normal Condition (warm idle, accessories off)
Major Inputs (cont.)	Throttle Pos (TP)	% of theoretical maximum throttle opening	Percentage	7% to 11% (Higher KOEO)
	CTP SW	Closed throttle position signal (closed IDL contact)	ON or OFF	ON
	Starter Sig	Engine cranking signal	ON or OFF	Off (except when ignition is switched to start position)
	Calc Load	Percent of maximum possible engine load	Percentage	12.9% to 25.2%
Other Inputs	EGRT Gas	Temperature of exhaust gas recirculation intake port	Degrees fahrenheit or celsius	> Intake air temperature, < Engine Coolant temperature
	Vehicle Spd (VSS)	Road speed of vehicle	Miles or kilometers per hour	0 mph/kph vehicle stopped
	Intake Air	Temperature of air entering the intake manifold	Degrees fahrenheit or celsius	Approximately same as understood ambient air temperature
	A/C Sig	Air conditioning switch status	ON or OFF	On when compressor is on
	PNP SW	Park/Neutral switch signal status	ON or OFF	On with transmission in P or N, otherwise Off
	Electrical Load Sig	Status of electrical load from rear window defogger and/or taillight circuit	ON or OFF	On when taillight and/or rear window defogger relay is on
	Stop Light SW	Status of stop lamps	ON or OFF	On when brake pedal is depressed (stop light switch contacts closed)

Normal Condition (warm, 2500 rpm, no load)	Ignition Switch On, Engine Not Running	Engine Cranking	Addition Information
N/A	throttle opener > idle value	7% to 11%	Displayed valve determined by comparing VTA analog Signal voltage to look-up table stored in Read Only Memory. Each 5V signal amplitude equals 10% throttle opening (65% to 75% wide open throttle)
OFF	On (unless throttle opener holds throttle valve open)	On (unless throttle opener holds throttle valve open)	Displayed value determined by monitoring signal voltage at IDL terminal of ECM. With CTP (IDL) switch contact closed, voltage is low, ON will be displayed on data stream.
OFF	OFF	ON	Displayed value determined by monitoring signal voltage at STA terminal of ECM. When ignition is switched to START position, voltage goes high, ON will be displayed on data stream.
11.7% to 23.9%	N/A	N/A	Displayed value is calculated mathematically using the formula: actual air volume ÷ maximum possible air volume x 100%.
Increase in temperature EGR valve opens	N/A	N/A	Value is determined by comparing THG analog voltage signal to look-up table in Read Only Memory. Use active test to confirm operation.
0 mph/kph vehicle stopped	N/A	0 mph	Displayed value calculated by comparing the pulsed vehicle speed sensor signal to the ECM internal clock pulse.
Approximately same as underhood air temperature	Same as ambient air temperature, with cold engine	Same as ambient air temperature, with cold engine	Value is determined by comparing THA analog voltage signal to look-up table in Read Only Memory. Same as ambient and coolant temperature after 8 hour cold soak.
On when compressor is on	N/A	N/A	ON when compressor clutch is energized (voltage low at ECM). OFF when compressor cycles off due to low evaporator temperature.
ON with transmission in P or N, otherwise OFF	ON with transmission in P or N, otherwise OFF	N/A	ON when PNP switch is closed, voltage low at NSW terminal of ECM.
ON when taillight and/or rear window defogger relay is on	N/A	N/A	ON whenever taillight or rear window defogger relay(s) are energized, voltage high at ECM.
ON when brake pedal is depressed (stop light switch contacts closed)	N/A	N/A	ON when stop light switch closed, voltage high at STP terminal of ECM.

OBD II Data Parameters (continued)

Signal Category	Display Item	Parameter Description	Units of Measurement	Normal Condition (warm idle, accessories off)
Major Outputs	Ign Advance	Timing advance of cylinder #1	Degrees before top dead center	12° ± 5° BTDC
	Injector	Injection duration of cylinder #1	Milliseconds injection on time	2.2 to 5.7ms
	IAC Duty Ratio	Rotary solenoid intake air control valve duty ratio	% of time that voltage is high on the RSO (open) coil.	30% to 38%
Misfire Data	Misfire RPM	Engine Rpm when misfire code sets	Crankshaft revolutions per minute	With 0 misfires detected: 0 rpm
	Misfire Load	Engine load when misfire code sets	grams per engine revolution	With 0 misfires detected: 0 g/r
	Misfire Cyl #1 - 8	Misfire rate detected in each individual cylinder	Percentage per 1000 crankshaft revolutions	No misfires detected = 0%
	Ignition	Ignition events expected every 1000 crankshaft revolutions	Ignition events (6 cyl = 0 to 3000, 4 cyl = 0 to 2000, 8 cyl = 0 to 4000)	0 to 3000 (6 cyl)
Other Outputs	FC IDL	Fuel cut with CTP (IDL) switch contacts closed, engine rpm above specified threshold	ON or OFF	OFF
	FC TAU	Fuel cut which takes place as result of light load deceleration (CTP switch contact open)	ON or OFF	OFF
	Intake Ctrl VSV	Status of ACIS VSV	ON or OFF	OFF
	EGR System	Status of EGR system	ON or OFF	OFF
	Fuel Pres Up VSV	Status of FPU VSV	ON or OFF	OFF (will be ON during and for short time after high temperature restart)
	A/C Idle Up VSV	Status of A/C Idle Up VSV	ON or OFF	OFF with A/C off, ON if A/C is on with compressor running
	A/C Cut Sig	Status of A/C cut signal from ECM to A/C control assembly	ON or OFF	ON with A/C switch off, OFF with A/C switched on

Normal Condition (warm, 2500 rpm, no load)	Ignition Switch On, Engine Not Running	Engine Cranking	Additional Information
N/A	N/A	N/A	Calculated by comparing relationship between crankshaft position sensor (Ne) and camshaft position sensor (G) signals. Gap on Ne timing rotor (36-2 tooth configuration) identifies #1 cylinder TDC. G signal identifies 90° BTDC, #1 cylinder compression.
N/A	N/A	Milliseconds injection on time	Determined by monitoring and displaying commanded injector driver duration for #1 cylinder. NOTE: injector may read normal pulse during failsafe fuel cut.
N/A	N/A	N/A	Duty ratio applied to RSO coil of Rotary Solenoid Idle Air Control Valve. Longer duty ratio (higher percent open time) = greater idle air by-pass volume = higher idle speed.
With 0 misfires detected: 0 mph	N/A	N/A	Freeze frame data stored when misfire is detected by OBD II software. This parameter represents engine rpm at the moment misfire code was set.
With 0 misfires detected: 0 g/r	N/A	N/A	Freeze frame data stored when misfire is detected by OBD II software. This parameter represents engine load at the moment misfire code was set.
No misfires detected = 0%	N/A	N/A	Percentage of misfire for each individual cylinder. Formula: Cylinder misfires + total ignition events per 1000 crankshaft revolution cycle (i.e 6 cyl engine experiences 300 misfires during 1000 crank revolutions, 300 + 3000 = 10% misfire rate).
0 to 3000 (6 cyl)	N/A	N/A	Ignition event counter used to determine the percentage of ignition misfire occurring. Counter resets every 1000 crankshaft revolutions. Vehicle must be in closed loop and a time requirement satisfied before counting begins.
OFF (will go ON with closed throttle above threshold rpm)	N/A	N/A	Signal will be ON when closed throttle deceleration is detected above specified rpm threshold.
OFF (will go ON during rapid deceleration with CTP [IDL] switch contacts open)	N/A	N/A	Signal will be ON when decel fuel cut is commanded by ECM with CTP switch open.
OFF (ON above specified throttle % and below specified rpm)	N/A	N/A	Display will indicate ON when ECM energizes VSV (Voltage low at ACIS terminal of ECM, ACIS air valve closes, high speed torque mode).
ON (within specified throttle, rpm and load range)	OFF	OFF	Display will indicate ON when ECM de-energizes VSV (voltage high at EGR terminal of ECM, vacuum allowed to pass to the modulator/EGR valve). When VSV is on, EGR system is off. NOTE: some systems may use reverse EGR VSV logic, consult repair manual.
OFF (will be ON during and for short time after high temperature restart)	N/A	ON (during high engine temp. cranking)	Display will indicate ON when ECM energizes VSV (voltage low at FPU terminal of ECM, vacuum bleed to fuel pressure regulator open to atmosphere, hot restart mode)
OFF with A/C off, ON if A/C is on with compressor running	N/A	N/A	Display will indicate ON when ECM energizes VSV (voltage low at ACV terminal of ECM, compressor clutch energized)
ON with A/C switch off, OFF with A/C switched on	N/A	N/A	With A/C switch on, display will indicate On when ECM pulls ACT terminal low (requests A/C compressor cut due to heavy load operation).