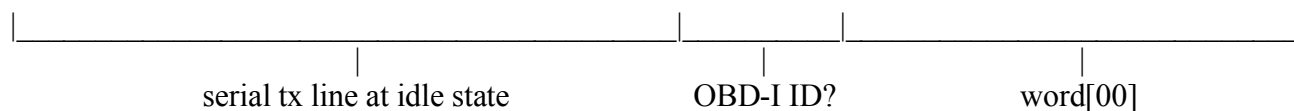


# Toyota OBD-I signal protocol

sample bitstream:

<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>1</i>
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30



serial framing: (word[##])

logic level	<i>0</i>	<i>1</i>	<i>1</i>	<i>1</i>	<i>0</i>	<i>0</i>	<i>0</i>	<i>1</i>	<i>0</i>	<i>1</i>	<i>1</i>
bit #	0	1	2	3	4	5	6	7	8	9	10
desc	start bit	data.0	data.1	data.2	data.3	data.4	data.5	data.6	data.7	stop bit	stop bit

data set layout:

bits	16	4	11	11	11	11	11	11	11	11	11
desc	idle	OBD ID	word[00]	word[01]	word[02]	word[03]	word[04]	word[05]	word[06]	...	word[12]

<i>Data #</i>	<i>Description</i>	<i>Scaling</i>	<i>Units</i>	<i>Example</i>
0x00	UNKNOWN			
0x01	Injector pulse width (INJ)	X / 10	mS	X = 43 = 4.3 mS
0x02	Ignition timing angle (IGN)	X - 90	° BTDC	X = 130 = 40° BTDC
0x03	Idle Air Control (IAC)	X	Step #	X = 125 = open 100%
0x04	Engine speed (RPM)	X * 25	RPM	X = 60 = 1500 RPM
0x05	Manifold Absolute Pressure (MAP)	X	kPa Abs.	X = 101 = 101 kPa Abs.
0x06	Engine Coolant Temperature (ECT)	<i>See Below</i>	V	<i>See Below</i>
0x07	Throttle Position Sensor (TPS)	X / 2	°	X = 32 = 16°
0x08	Speed (SPD)	X	km/h	X = 56 = 56 km/h
0x09	UNKNOWN			
0x10	UNKNOWN			
0x11	Flags (#1)			
0x12	Flags (#2)			

*Table: Data Register Table specific for MAP-based ECU/engine.*

*NOTE: for AFM-based engine, register 0x05 would be air/mass flow rate.*

# *Toyota OBD-I signal protocol*

<i>data #</i>	<i>Description</i>	<i>Status</i>
0x11.0	Cold Start UP	1=ON
0x11.1	Warm UP	1=ON
0x12.0	Start (Switch)	1=ON
0x12.1	Idle (throttle closed) Switch	1=ON
0x12.2	A/C Switch	1=ON
0x12.3	Neutral Switch	1=ON
0x12.7	Diagnostics condition	1=GOOD

*Table: Flag Register*

*NOTE: Unknown flags not listed.*

ECT calculation:

<i>Voltage Range</i>	<i>Calculation</i>
3.4V to 4.3V	$T_{ECT} = -20 + (4.3 - V_{ECT}) * 22.22$
2.4V to 3.4V	$T_{ECT} = 0 + (3.4 - V_{ECT}) * 20$
1.5V to 2.4V	$T_{ECT} = 20 + (2.4 - V_{ECT}) * 22.22$
0.9V to 1.5V	$T_{ECT} = 40 + (1.5 - V_{ECT}) * 33.33$
0.5V to 0.9V	$T_{ECT} = 60 + (0.9 - V_{ECT}) * 50$
0.3V to 0.5V	$T_{ECT} = 80 + (0.5 - V_{ECT}) * 100$

*Table: ECT calculation*