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Diagnostic Trouble Codes and Possible Causes

By Jim Brink

toytech@off-road.com

All Toyota vehicles with electronic fuel injection utilize the Toyota EFI or TCCS engine management system. This system incorporates many features to enhance performance, emissions, and drivability. One feature is the **Self Diagnostic System**. The self diagnostic system monitors engine operations and when a particular sensor or input varies out of specified operating parameters, the "**Check Engine**" will be illuminated.

The check engine lamp alerts the driver or technician that a problem exists in the EFI/TCCS ECU or **Engine Control Unit** or "computer." When the check engine light is illuminated, it is indicating that a problem in the engine management system has been detected. At this time, a "code" may be stored in the ECU which pinpoints a possible component in the EFI/TCCS system. By checking the trouble codes, a possible problem could be narrowed down to a number of causes. While not an exact diagnostic tool, the check engine light and self-diagnostic system can get the individual working on his/her truck close to a possible fault, and, hopefully, to a successful repair.

Listed below are one and two digit trouble codes for the EFI/TCCS systems and *possible* causes. As mentioned above, this is not an exact science. Many other component failures can cause similar symptoms that can "mask" the actual cause. EFI/TCCS computer interrogation is one of the **last steps** to engine diagnostics. A thorough inspection of the simple items should be done prior to any computer-related repairs. Sometimes it's the simple things that will get ya'. In addition, use caution when working on the electrical system of your vehicle. Not only is the electrical system delicate to water, static electricity, and outright physical abuse, the ignition system puts out high voltage as well and you can be seriously injured if you do not exercise basic safety.

READING THE TROUBLE CODES

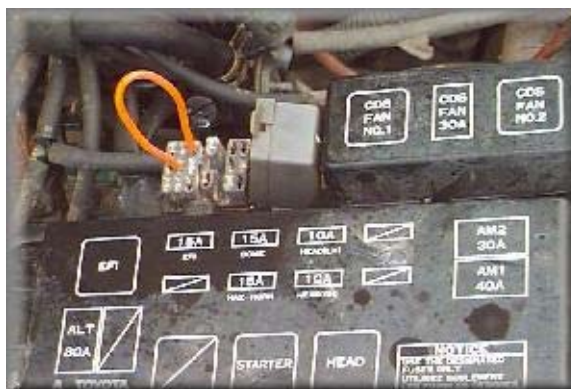
Reading the diagnostic trouble codes is very easy. You will need a paper clip to short the check connectors of the diagnostic connector. The diagnostic connector comes in two types. The early system is located on the inner-left fender well and is a round, green connector, usually located near the air cleaner. Simply jump the two terminals in this connector with the ignition switch in the "ON" position and the engine off. Later models, '87 and newer use a multiple terminal "**DIAGNOSTIC**" connector which is a small, rectangular-shaped grey "box", usually located near the right fender in the engine compartment. To get codes out of this type of connector, jump the "**TE1**" and "**E1**" terminals. Finding these terminals is easy as the inside cover of the diagnostic connector contains a schematic of the connector pinouts. If the underhood emission decal (VECI) is

still intact on your vehicle, the proper pins for this are outlined there as well.

The trouble codes will appear as flashes of the check engine lamp. Be sure the ignition key is on, the engine off, and your foot off of the accelerator when reading the codes. Two different codes may appear: One-digit and two digit. One digit codes have an approximate 4.5 second delay between flashes with the check engine light illuminating for about a half of a second. Multiple codes have a 2.5 second delay between them. For example a code two flashes the check engine lamp two times in a little over one second: **I I**.

If two codes are stored, such as a code two and a code four, the lamp may flash as such: **...I I...I I I I**.

Crude examples but you get the idea. Two digit codes are similar but will flash the lamp with the first number first and the second number last. An example of a code twelve is **I ...II** and a code twenty four is **I I I...IIII**.



Later-model EFI/TCCS Diagnostic Connector

(Photo courtesy of Chris Geiger)

TROUBLE CODES AND POSSIBLE CAUSES

ONE-DIGIT	TWO-DIGIT	POSSIBLE CAUSE OF CODE/SYMPTOM
1	NONE	SYSTEM NORMAL
--	11	LOSS OF POWER SUPPLY TO ECU --IGNITION SWITCH/CIRCUIT --MAIN RELAY/CIRCUIT --ECU
6	12	RPM SIGNAL-NO SIGNAL TO ECU FROM DISTRIBUTOR ("Ne" OR "G") AFTER ENGINE HAS BEEN CRANKED --DISTRIBUTOR/CIRCUIT --STARTERSIGNAL CIRCUIT --IGNITER/IGNITER CIRCUIT --ECU

--	13	<p>SAME AS ABOVE BUT AFTER ENGINE HAS RUN AT 1,000-1,500 RPM</p> <p>--DISTRIBUTOR/DISTRIBUTOR CIRCUIT</p> <p>--ECU</p>
3	14	<p>IGNITION SIGNAL--NO "IGF" SIGNAL TO ECU</p> <p>--IGNITER/IGNITER CIRCUIT</p> <p>--IGNITER AND IGNITION COIL/CIRCUIT</p> <p>--ECU</p>
5	21	<p>OXYGEN SENSOR SIGNAL/OXYGEN SENSOR HEATER SIGNAL</p> <p>OPEN OR SHORT IN OXYGEN SENSOR OR OXYGEN SENSOR SIGNAL</p>
4	22	<p>WATER TEMPERATURE SENSOR SIGNAL--OPEN OR SHORT IN WATER TEMP. SENSOR SIGNAL</p> <p>--WATER TEMPERATURE SENSOR CIRCUIT</p> <p>--WATER TEMPERATURE SENSOR</p> <p>--ECU</p>
8	24	<p>INTAKE AIR TEMPERATURE SENSOR SIGNAL--OPEN OR SHORT IN INTAKE AIR TEMP. SIGNAL</p> <p>--INTAKE AIR TEMPERATURE CIRCUIT</p> <p>--INTAKE AIR TEMPERATURE SENSOR</p> <p>--ECU</p>
--	25	<p>AIR/FUEL RATIO LEAN INDICATOR--LEAN SIGNAL SENT TO ECU FROM O2 SENSOR</p> <p>--INJECTOR FAULT(S)</p> <p>--FUEL PRESSURE</p> <p>--OXYGEN SENSOR</p> <p>--AIRFLOW METER OR MAP SENSOR</p> <p>--IGNITION</p> <p>--ECU</p>
--	26	<p>AIR/FUEL RATIO RICH INDICATOR</p> <p>--SAME AS ABOVE</p> <p>--COLD START INJECTOR</p>
--	27	<p>SUB-OXYGEN SENSOR CIRCUIT OR SUB-OXYGEN SENSOR HEATER CIRCUIT</p> <p>--SUB OXYGEN SENSOR/HEATER/CIRCUIT</p> <p>--ECU</p>

--	28	No.2 OXYGEN SENSOR/OXYGEN SENSOR HEATER --SAME AS CODE 21
2	31	MANIFOLD AND/OR AIRFLOW METER SENSOR SIGNAL CIRCUIT --AIRFLOW METER/CIRCUIT --MANIFOLD PRESSURE SENSOR/CIRCUIT --ECU
--	32	AIRFLOW METER SIGNAL (VANE-TYPE) --AIRFLOW METER./CIRCUIT --ECU
14	34	TURBOCHARGER PRESSURE--ABNORMAL TURBOCHARGER PRESSURE --TURBO CHARGER --AIRFLOW METER/MANIFOLD/TURBOCHARGER PRESSURE SENSOR --INTERCOOLER SYSTEM --ECU
--	35	TURBOCHARGER PRESSURE SENSOR SIGNAL --TURBOCHARGER PRESSURE SENSOR --ECU
7	41	THROTTLE POSITION SENSOR SIGNAL--OPEN OR SHORT IN TPS SIGNAL --TPS SENSOR --TPS SIGNAL/CIRCUIT --ECU
9	42	VEHICLE SPEED SENSOR SIGNAL CIRCUIT--NO SPD. SIGNAL FOR SEVERLA SECONDS WHILE VEHICLE IS OPERATED UNDER HEAVY LOAD (TPS/MAP/AIR FLOW INPUTS) --SPEED SENSOR/CIRCUIT --ECU
10	43	STARTER SIGNAL--NO "STA" SIGNAL TO ECU UNTIL ENGINE SPEED EXCEEDS 800RPM --IGNITION SWITCH/CIRCUIT --ECU
11	51	SWITCH SIGNALS IDL (tps) CONTACTS OFF, NEUTRAL START SWITCH OFF, A/C SWITCH "ON" SIGNAL TO ECU WITH DIAGNOSTIC CHECK CONNECTOR SHORTED

		--A/C SWITCH/CIRCUIT --A/C AMPLIFIER --TPS/CIRCUIT --NEUTRAL START SWITCH/CIRCUIT --ECU
12	52	KNOCK SENSOR SIGNAL--OPEN OR SHORT IN KNOCK SENSOR SIGNAL --KNOCK SENSOR/CIRCUIT ECU
13	53	KNOCK CONTROL SIGNAL IN ECU --ECU
--	71	EGR VALVE MALFUNCTION--EXHAUST GAS TEMPERATURE BELOW SPEC. FOR EGR CONTROL --EGR SYSTEM --EGR GAS TEMPERATURE SENSOR/CIRCUIT
--	72	AIR CONDITIONER COMPRESSOR RELAY/RELAY SIGNAL --A/C COMPRESSOR RELAY/CIRCUIT --ECU

While a lot of the possible faults in the EFI system point to the ECU itself, it should be noted that ECU failure is not common. The ECU should be replaced only as a last resort or if all diagnoses points to a bad ECU. Usually, troublesome EFI problems are a result of poor grounds, shorted wiring, and bad connectons at sensors. When all else fails, carefully consult your factory repair manual. It contains more comprehensive diagnostic information and great electrical wiring diagrams.

Happy "Diagnosticating!"

Jim Brink (toytech@off-road.com) - Toyota/ASE Certified Master Automotive Technician - <http://www.off-road.com/~toytech>

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