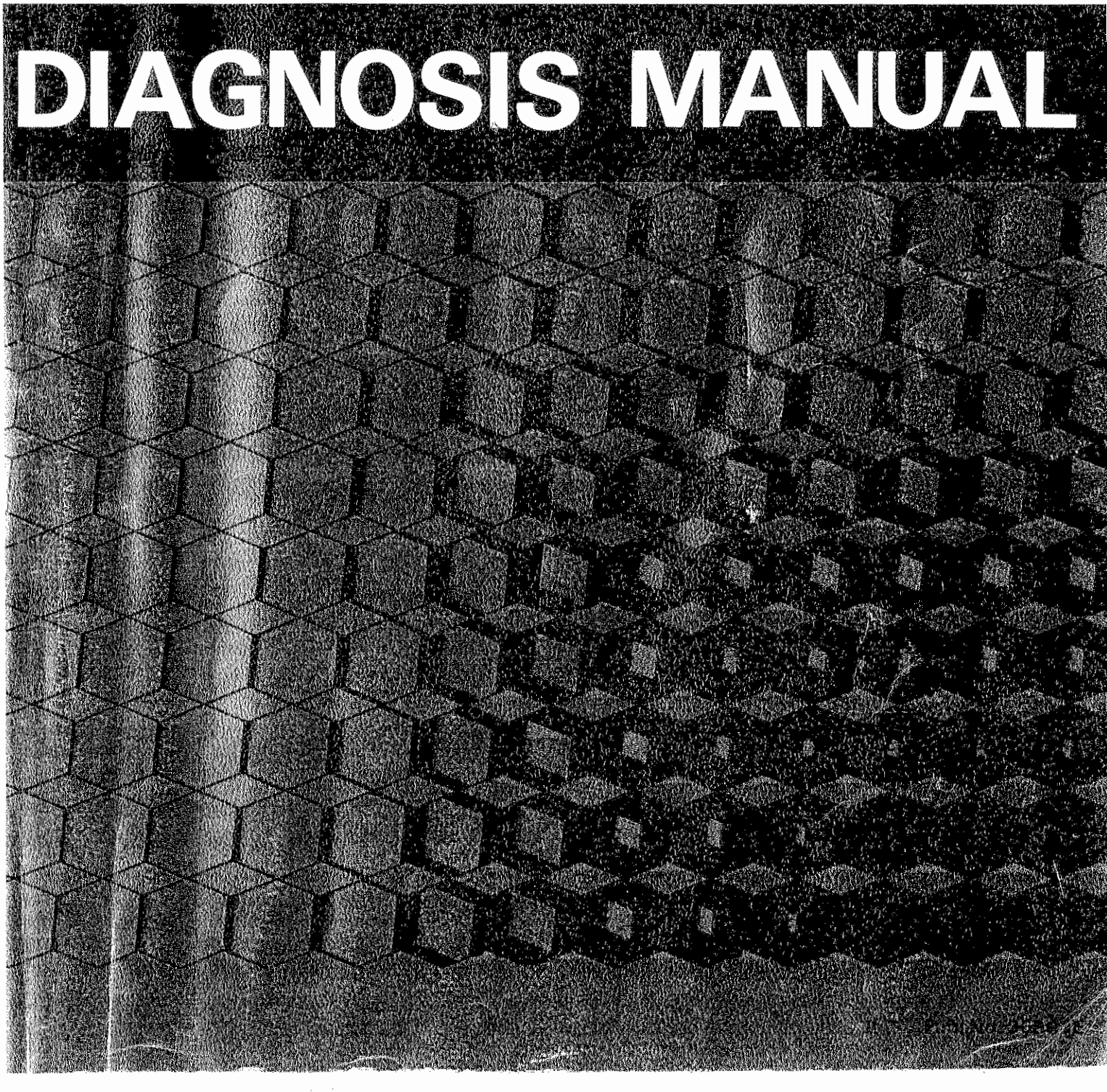
TOYOTA

TOYOTA COMPUTER-CONTROLLED SYSTEM

For Corolla and Celica 4A-GE Engine

DIAGNOSIS MANUAL



FOREWORD

The TCCS (Toyota Computer-Controlled System) has been designed, based upon the very latest in electronic technology, to control the ignition timing and the amount of fuel injected into the intake manifold by means of an ECU (Electronic Control Unit).

Since the TCCS is provided with many sensors, which keep the computer informed of engine operating conditions, and with actuators, which operate as the ECU's "hands and feet" to do the actual work, the TCCS looks very complicated on the surface. Technicians may therefore get the impression that an engine equipped with TCCS is totally different from other types of engines.

It must not be forgotten, however, that *since the TCCS does nothing more than control the ignition timing and the supply of fuel, the engine itself is almost exactly the same an ordinary engine.*

Therefore, if something goes wrong with an engine equipped with TCCS, there is a good chance that the problem is in another part of the engine and does not involve the TCCS at all.

And even if the trouble is found to be in the TCCS, the ECU is equipped with a self-diagnosis system, which allows the problem to be easily identified.

For the above reasons, this manual explains the most ideal method of troubleshooting the 1983 and later 4A-GE engines, and tells how to carry out the necessary repairs.

The section of this manual entitled GENERAL INFORMATION contains the information that must be known by the technician before inspection and repair can be carried out.

All information in this manual is based on the latest product information at the time of publication. However, specifications and procedures are subject to change without notice.

TOYOTA MOTOR CORPORATION

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ABBREVIATIONS USED IN THIS MANUAL

A/C	—	Air Conditioner
BTDC	—	Before Top Dead Center
C	—	Condition(s)
DP	—	Dash Pot
ECU	—	Electronic Control Unit
EFI	—	Electronic Fuel Injection
ESA	—	Electronic Spark Advance
FL	—	Fusible Link
J/B	—	Junction Block
L	—	Location
N	—	Note(s)
OK	—	Normal
P	—	Procedure
SST	—	Special Service Tool
S/W	—	Switch

GENERAL INFORMATION

HOW TO USE THIS MANUAL

ARRANGEMENT

This manual is divided into the following sections.

Basic Engine Inspection Chart

The Basic Engine Inspection Chart is the basic chart of this manual and is used to determine whether or not troubles originate with the TCCS system. You should begin all troubleshooting at step 1 of this chart regardless of the symptom.

TCCS Initial Inspection & Symptom Charts

The TCCS Initial Inspection Chart is used for a pre-test of concerning TCCS problems.
The Symptom Charts are to be used only if the problem has not been corrected even after steps of the Basic Engine Inspection Chart and the TCCS Initial Inspection Chart have been completed.

System or Parts Inspection Charts

The Fuel System Chart, etc., are used to determine whether or not the corresponding systems or part is operating normally.
These charts should not be used independently of the Basic Engine Inspection Chart and the TCCS Initial Inspection Chart since that chart will direct you to the relevant System or Parts Inspection Chart if this is necessary.

Diagnostic Code Charts

When the diagnostic system outputs a code, the chart corresponding to that code should be used. These charts should not be used independently of the Basic Engine Inspection Chart or the TCCS Initial Inspection Chart since their use will be indicated as necessary by this chart.

Removal, Installation & Adjustment

This contains directions for the removal, installation and adjustment of all relevant parts, test gauges, etc.

Again we repeat: Always begin troubleshooting with step 1 of the Basic Engine Inspection Chart and go to the other charts only if the Basic Engine Inspection Chart so directs.

The first four of the above-mentioned charts use the following troubleshooting symbols.

C Condition
P Procedure
OK Normal
N Note(s)

HOW TO USE THIS MANUAL

Taking Customer's Report

Find our first from the customer what the problem seems to be and under what conditions it occurs, and record this information on the Basic Engine & TCCS Initial Inspection Check Sheet (included at the back of this manual). It goes without saying that you must check to see if the problem that the customer is complaining about actually exists, and if so, you must correct it.

Basic Engine Inspection

Begin your inspection at Step 1 of the Basic Engine Inspection Chart, and work your way down the chart *a step at a time,* checking off each step on the Check Sheet as you complete it. If you come to an instruction directing you to another chart, carry out the instructions that appear in that chart, then, if necessary, return to where you left off on the Basic Engine Inspection Chart and continue on.

BASIC ENGINE & TCCS INITIAL INSPECTION CHECK SHEET

(NOTE: This check sheet should be copied and the copies used rather than the original.)

CUSTOMER'S NAME	MAKE & MODEL OF AUTO	ODOMETER READING

REGISTRATION YEAR	HOW OFTEN DOES PROBLEM OCCUR ?	WHEN DID PROBLEM BEGIN ?
/ /	CONTINUALLY INTERMITTENTLY → (TIMES A DAY)	ABOUT DAYS AGO

OUTSIDE TEMP. WHEN PROBLEM OCCURS		WEATHER	FUEL REMAINING IN TANK	COOLANT TEMP.
Hot, Warm, Cool, Cold	( )° C	Clear, Cloudy, Raining, Snowing	F, 3/4, 1/2, 1/4, E	( )° C

CUSTOMER'S COMPLAINT	

BASIC ENGINE INSPECTION	RESULTS (STANDARD)			
Ignition timing	°BTDC (10° BTDC)			
Idle RPM	rpm (800 ± 50 rpm)			
CO concentration	% (1.5 ± 0.5 %)			
Spark test	good · no good			
Distributor cap, Rotor, Spark plug cord	good · no good			
Spark plug (F.O.: Fouled (dry), F.W.: Fouled (wet), B.: Burnt, O.K.: Normal)	#1	#2	#3	#4
Throttle linkage	good · no good			
Air filter	good · no good			
Air leakage	present · absent			
Compression kg/cm² (or kPa)	#1	#2	#3	#4
Valve clearance mm (in.)		#1	#2	#3	#4
Intake				
Exhaust				

TCCS INITIAL INSPECTION	RESULTS (STANDARD)		
Diagnostic code	normal code · code ( )		
Fuel pressure kg/cm² (or kPa)	CRANKING 2.3 – 2.7 (32 – 38, 226 – 264)	RACING 2.3 – 2.7 (32 – 38, 226 – 264)	IDLING 1.9 – 2.2 (27 – 31, 187 – 216)

After Completion of Repairs

After finishing a repair job, recheck the following:

1. Are all connectors, hoses, etc., firmly hooked up ?
2. Have all sub-wires been removed from their check connectors ?
3. Have all rubber caps been replaced on their connectors ?

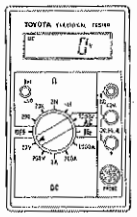
Finally, if a particular problem caused a diagnostic code to be output by the ECU, be sure to clear the ECU's memory (as explained on p. 4-7), then re-check to make sure that the memory has been cleared. Do this by restarting the engine and checking to make sure that the ECU is outputting a normal code (see p. 3-2).

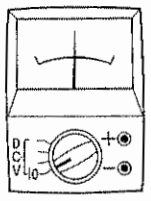
NOTE: All charts have been gathered together in outline form and made into a small booklet, which is included at the back of this manual.
This booklet may be pulled out and used separately so that, once you have become accustomed to working on the TCCS, you can work directly from it without step by the necessity of going through the manual step every time.

NECESSARY TOOLS & EQUIPMENT

CIRCUIT TESTERS

Digital Type Analog Type



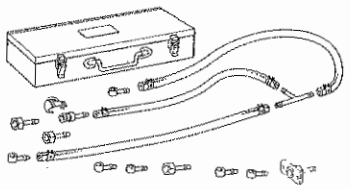


NOTE:

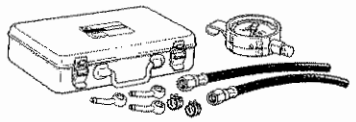
Use a circuit tester with a high-impedance (10kΩ/V minimum).

SOUND SCOPE

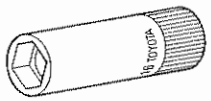
INJECTION MEASURING TOOL SET (SST 09268-41045)



FUEL PRESSURE GAUGE (SST 09268-45011)



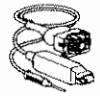
SPARK PLUG WRENCH (SST 09155-16100)



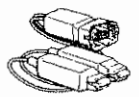
SERVICE WIRE

For checking injector operation

(SST 09842-30050)



(SST 09842-30020)



Short-circuiting wire

Clip type jumper wire

SYSTEM DESCRIPTION

FUNCTIONS

TCCS is short for Toyota Computer Controlled System. The TCCS totally controls the engine, such as fuel injection, ignition timing and self-diagnosis, with the ECU (Electronic Control Unit) incorporating the latest electronics technology.

These contorls are extremely accurate to ensure optimum fuel supply and optimum ignition timing, and both engine output power and fuel efficiency are improved.

The TCCS contains the following three functions.

EFI

EFI is short for Electronic Fuel Injection.

The EFI detects engine rpm, intake manifold pressure, coolant temperature and other engine conditions via sensors, and supplies an optimum amount of fuel from the injectors to best suit the engine condition at that time.

ESA

ESA is short for Electronic Spark Advance.

The ESA replaces the conventional governor advance and vacuum advance mechanisms.

Optimum ignition timing data for each engine condition is stored in the memory circuit of the ECU which detects the engine conditions by means of sensors, and selects an optimum ignition timing data from memory for the current engine condition. The ECU then sends a signal to the igniter to generate spark at the specific timing.

DIAGNOSIS

ECU contains a built-in self-diagnosis system.

The ECU constantly monitors each sensor.

Whenever a malfunction is detected, the ECU warns the driver by means of the "CHECK ENGINE" warning light in the instrument panel. At the same time, it retains in memory the particular sensor system that detected the malfunction. This information is not erased when the ignition switch is turned off.

Therefore, the system having a malfunction can be easily identified by checking the contents of the memory during repair work.

COMPONENTS

Electronic Control Unit (ECU)

The ECU is the "brains" of the TCCS. It uses the following sensors, switches, and signals to keep itself informed at all times of the current engine operating condition so that it can control the engine accordingly.

Vacuum Sensor

The vacuum sensor manifold pressure changes the absolute pressure in the manifold into a voltage signal, which is supplied to the ECU. The ECU then reduces the amount of fuel injection when the pressure is low, and increases the amount when the pressure is high. If the manifold pressure is low (vacuum is high), the voltage signal from vacuum sensor is low; if pressure is high, the voltage signal is high.

Water Temp. Sensor

The water temp. sensor is located at the cylinder head rear plate and detects the temperature of the coolant. When the temperature of the coolant is low, the electrical resistance of the water temp. sensor is high; when the temperature is high, the resistance is low.

Intake Air Temp. Sensor

The intake air temp. sensor is located at air intake chamber. When the intake air temperature is low, the electrical resistance of the intake air temp. sensor is high; when the temperature is high, the resistance is low.

Throttle Position Sensor

The throttle position sensor is built into the throttle body. This sensor linealy converts the throttle valve opening angle into voltage signals.

Speed Sensor

The speed sensor is located inside the speedometer, and outputs four pulsed signals for each revolution of the speedometer cable.

G and Ne Signals

The G and Ne signals are generated by the timing rotors and pick-up coils located inside the distributor. These signals are used by the ECU to detect the engine speed (RPMs) and crankshaft angle.

Air Conditioner Switch

The ECU uses the output from the air conditioner switch to determine whether or not the air conditioner is operating.