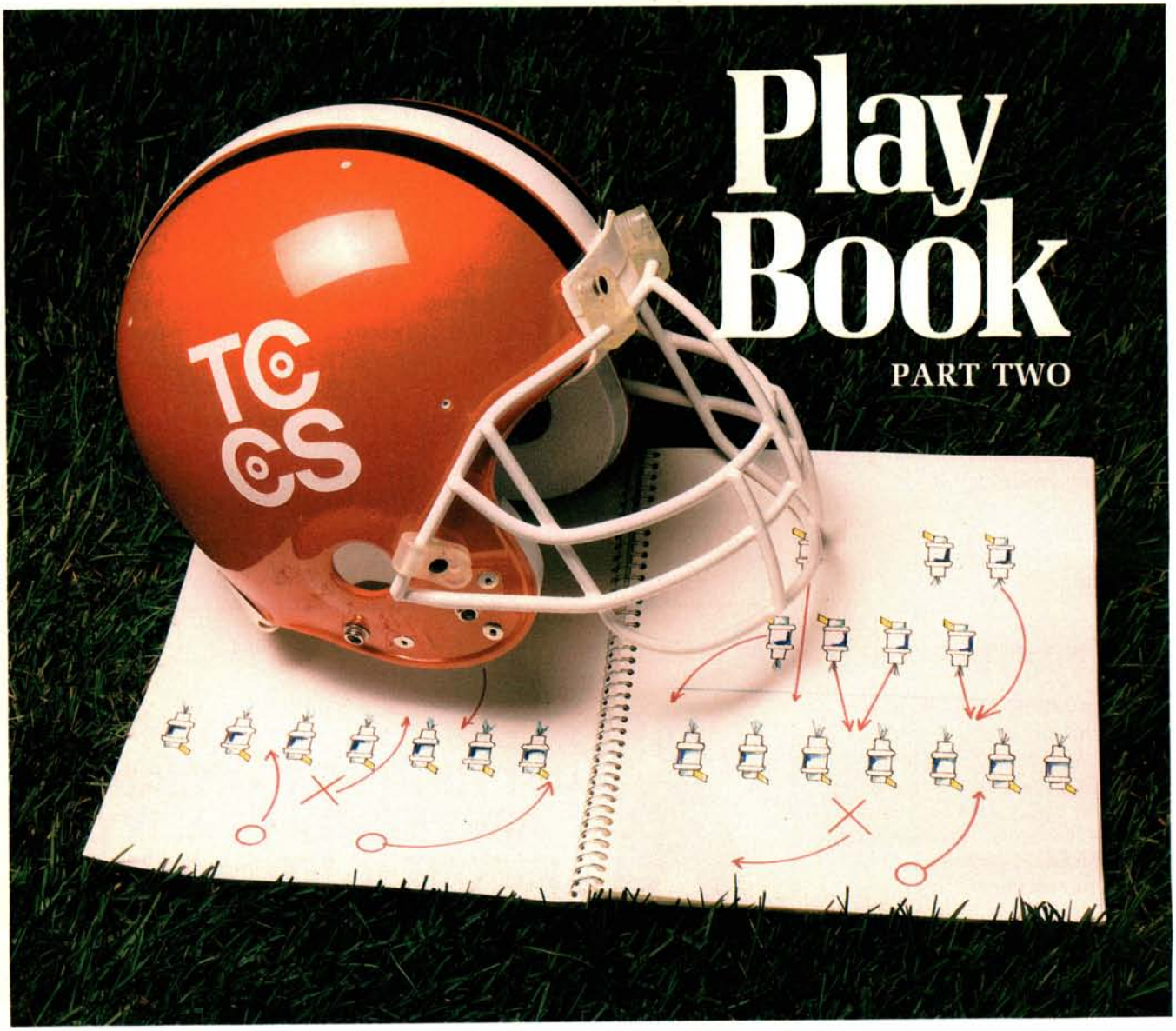
Play Book

PART TWO



We spent most of last month explaining how the TCCS team plays the game of engine management. By now you should understand how each player does its job, as well as some of the formations that the team uses at the line of scrimmage.

The first part of our report this month (we'll call it a TCCS Injury Report) includes repair tips on a variety of TCCS-equipped Toyota models. In most cases, the information applies only to the specific models or model years listed.

These tips were given to us by technicians who repair nothing but Toyotas for a living and are intended to provide you with a list of likely possibilities. These are high percentage answers to TCCS problems seen on a recurring basis.

Our photo captions (we'll call them a Scouting Report) cover more basic TCCS troubleshooting information. This is the stuff that's often overlooked when we go looking for the "high tech fix."

The TCCS system uses similar components on a variety of Toyota models. So problems that affect one model will very often affect others as well. These general tips may be a good place to start if you want to get an idea of a TCCS system's general health.

If you still haven't found the answers to your problems after going through both reports, a systematic approach to troubleshooting is still your best bet. Identify the symptoms, then determine the areas that might be responsible for the problem. The scatter gun approach is definitely out.

Test all TCCS components according to the methods recommended in the service manual. Take plenty of notes, then compare your findings to recommended specifications.

—By Karl Seyfert

TCCS Injury Report

MR-2 Idle Speed

Following the correct cooling system bleeding procedure is very important on MR-2 models. Air may become trapped in the cooling system if the system isn't properly bled using the three air bleed valves. See the "Bubble Trouble" article in the February 1989 issue of *Import Service* for a detailed description of MR-2 bleeding procedures.

Trapped air can pocket in the throttle body's idle air bypass valve coolant cavity. This can cause big changes in idle speed as the temperature inside the coolant cavity changes. This confuses the air bypass valve because it doesn't know if the engine is warm or cold.

Make sure that all air is removed from the cooling system to correct the fluctuating idle speed. This allows a steady flow of coolant through the air bypass coolant cavity that's the same temperature as the coolant in other parts of the engine.

MR-2 Engine Miss

Leaking cylinder head core plugs can cause an intermittent engine miss on MR-2 models. The leaking core plugs may allow engine oil and/or coolant to collect in the valley between the twin camshaft housings.

If the leak is bad enough, either of these liquids can ground the plug wires and interrupt the secondary ignition to the spark plugs. This area of the head is normally covered by a plate, which makes it impossible to spot the source of the leak without doing some disassembly first.

4 X 4 Turbo Truck Idle

An intermittent rough idle or stumbling on acceleration may be caused by defective fuel injectors. This is usually an intermittent condition, making it especially hard to diagnose. The injectors will usually pass all bench tests with flying colors too.

If you are unable to spot which injector or injectors is at fault, try swapping injectors between cylinders. It should take about 30 minutes to remove the fuel rail and swap the injectors. If the intermittent miss moves from the old injector location to the new one, you've found your defective injector.

Also make sure that oil isn't being sucked into the intake manifold due to faulty turbocharger shaft seals. Any oil that's making it into the cylinders can foul the plugs and cause a rough idle.

Hot Restart Problems

If a TCCS-equipped engine runs rough or stumbles after a hot soak restart, the problem can often be traced to poor fuel quality. The problem can be exaggerated on Van models because engine heat stays trapped in the engine compartment longer after engine shutdown.

Van hot restart problems may also be caused by a defective fuel pump. Weak fuel pump check balls allow residual fuel pressure to drop after the engine is shut off. Because of the high engine compartment heat, the low pressure fuel boils in the fuel lines. The injectors get a mixture of fuel and bubbles of air when the engine is cranked, making it hard to restart.

A fluctuating idle speed on Van models may be caused by reversed vacuum hoses at the A/C idle up vacuum switching valve. The vacuum switching valve is located on the right side of the engine valve cover, toward the rear of the engine.

Engine Steam Cleaning

Some TCCS systems are more sensitive to moisture under the hood than others. 3S-FE distributor caps on late model Celicas and Camrys will retain moisture if the engine is washed or exposed to a lot of moisture. This can cause an intermittent or steady engine miss as the water provides an unwanted path to ground for the secondary spark.

1986 Camrys can have similar problems if the engine wiring harness connectors located near the left engine/transaxle mount get hosed down. Separate the connectors, check for moisture, corrosion, or other damage, and repair as necessary.

Distributors

A "screeching noise" combined with a rough idle, poor performance, or stalling may be caused by failed distributor shaft bushings on Van or Celica/Camry models equipped with 2S-E engines. Distributor-related TCCS trouble codes (usually Code 3 and/or Code 1) may also be stored in the ECU's memory.

Checking the distributor shaft and bushings may not reveal any obvious binding or looseness. Extremely tight bushings have been known to damage the camshaft, however. Replace the distributor housing and shaft assembly to repair the problem.

Poor 3S-FE engine performance on Celicas and Camrys may be caused by oil leaking around the distributor shaft seals. The distributor is horizontally mounted, so any leakage can interrupt the distributor's signals to the ECU. Remove the distributor cap and check for leaks.

EFI Fuses

A TCCS system that repeatedly blows the EFI fuse may have high current draw in the fuel pump circuit. This can be caused by a bad fuel pump. Another possible cause on models equipped with an in-tank fuel pump unit is a fuel pump supply wire that has shorted to ground as it passes through the fuel tank cover plate.

Sluggish Camrys

Some 1984-5 Camrys may have a big loss of power at freeway speeds while climbing a slight incline. The car may slow to a crawl or stall in extreme cases, even though the gas pedal is planted on the floor. Pulling to the side of the road, then accelerating again usually returns the engine to normal operation.

This condition can occur after driving for two, 20, or 100 miles. It's totally random. Hours of diagnostic time have been spent checking fuel pressure, fuel supply, fuel filters, and anything else that might keep the engine from getting enough fuel. Hard-won experience has shown that the cause of this intermittent problem is a defective oxygen sensor. Replace the oxygen sensor and the problem disappears.

The ECU gives the engine added enrichment because of the incline and greater throttle opening. The oxygen sensor reads the rich mixture in the exhaust and starts sending a rich signal back to the ECU. But instead of a slight change in the voltage signal, the oxygen sensor tells the ECU that the mixture is VERY rich. The ECU responds the only way that it knows how, by leaning out the mixture.

As long as the oxygen sensor keeps telling the ECU that the mixture is too rich, the ECU is going to try to compensate by trying to make the mixture even leaner. It's pretty hard to keep a car going 60 MPH when it's only getting as much fuel as it would need to idle.

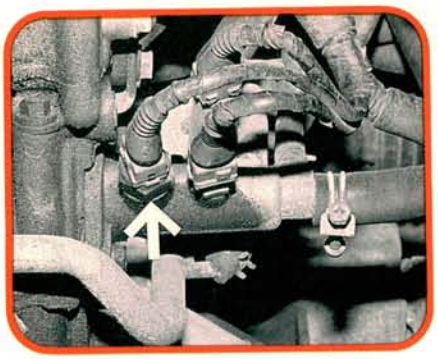
No trouble codes are set by this problem because the ECU has been getting a signal from the oxygen sensor the whole time. The ECU only recognizes an oxygen sensor failure if the sensor stops signalling entirely.

Torque Converter Symptoms

This driveability problem may be caused by normal transaxle operation, not by the engine or TCCS system. The Camry 140E automatic transaxle includes a locking torque converter for improved fuel economy. The locking converter is designed to engage or disengage, depending on vehicle speed and load.

A carbon buildup around the intake valves may cause a slight loss of engine performance. While this power loss may not be great enough to be noticed by the average driver, it can make the converter rapidly engage and disengage under some conditions as the automatic transaxle control unit searches for the best combination of power and economy.

The customer may interpret the slight jerking caused by the torque converter clutch engagement and disengagement as an engine driveability problem. If you suspect the torque converter, disconnect the single wire connector at the shift selector side of the transaxle to safely disable the converter's lock-up solenoid. Take the customer for a test ride. If his driveability problem is gone, you've found the cause.



1

If the engine is hard to start when cold, the problem may be a faulty cold start injector time switch (arrow). Replacement injector time switches that allow the cold start injector to open at higher engine temperatures are available as replacement parts for several Toyota models.

2

Hard starting problems after the car has been sitting in the sun for a few hours may also be traced to a faulty cold start injector time switch. The heat tricks the injector time switch into thinking the engine is warm enough to start without extra enrichment. Compare the switch terminal resistances to specifications.

3

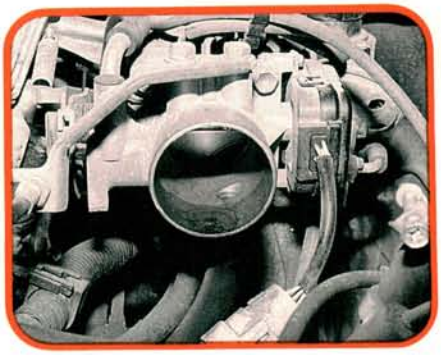
A clogged cold start injector (arrow) can also cause starting problems. The injector may become clogged if the car has been operated in a warm climate for an extended period. Remove the injector from the manifold, then trigger it with an auxiliary power source to check injector volume and spray pattern.

4

The auxiliary air regulator can still cause problems on early systems. Internal deposits, or failure of the regulator's bi-metal switch may cause the regulator to stick closed or fail to fully open when the engine is cold. The regulator has been replaced by an idle speed control valve on later TCCS systems.

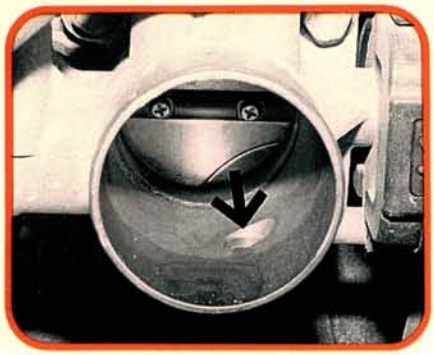
5

Check the throttle switch's IDL and E2 terminals for continuity at idle. A binding throttle linkage, or a misadjusted throttle switch may keep the switch contacts open at idle. The throttle switch should open when the throttle plate is opened approximately 0.025 inch.



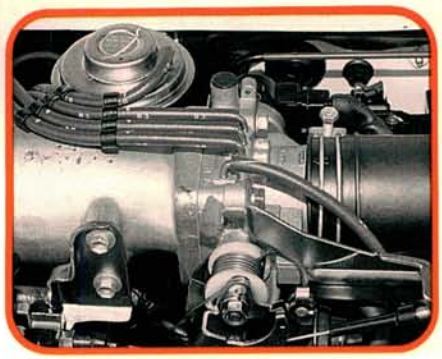
6

Carbon deposits inside the throttle housing can also cause the throttle plate to stick in different positions, giving the engine a different idle speed each time the throttle is closed. Remove the inlet hose, then clean the inside of the throttle housing. Lubricate the throttle shaft bushings with spray lubricant.



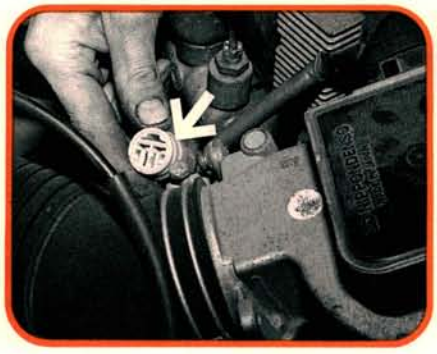
7

Don't let carburetor cleaner drain into this large hole (arrow) when removing throttle housing carbon deposits. The hole supplies air to the auxiliary air regulator or idle speed control. The loosened deposits can get sucked into the regulator, causing it to stick. You'll have a no fast idle complaint on your hands.



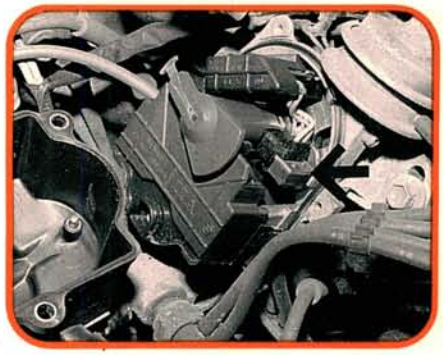
8

Vacuum leaks or extra air passing the throttle plate may cause the idle speed to cycle up and down rapidly. The ECU will turn off the injectors if idle speed goes above approximately 1800 RPM with a closed throttle switch. The idle speed then drops, the control signal resumes, and the cycle repeats itself.



9

Ignition timing should return to its base setting when the check connector (arrow) is grounded on systems with Electronic Spark Advance (ESA). Make sure the throttle switch is closed before adjusting the timing because timing will not return the base setting if the throttle switch is misadjusted or damaged.



10

Distributor-related trouble codes, stalling at idle, and/or no hot restart on 2S-E Camry and Celica engines may be caused by the distributor's signal generator. Signal generator failure is usually temperature related and most often occurs when engine is at or near operating temperature.

11

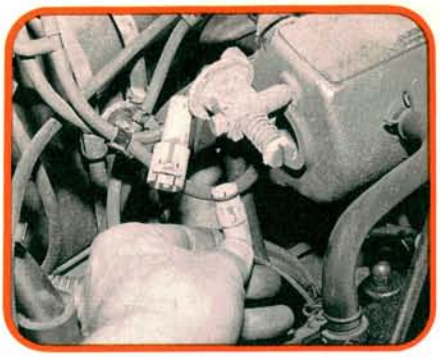
The coolant temperature sensor can lose its accuracy over time. The sensor still signals the ECU, but it may tell the ECU that coolant temperature is 170 degrees when it's really 190 degrees. Check the sensor's accuracy by comparing resistance values to specifications over a range of coolant temperatures.

12

Proper supply voltage and grounds are important to proper TCCS operation. A weak battery may cause a drop in ECU supply voltage during starting. The ECU's injector pulse width and other output signals can become inaccurate when supply voltage drops. This can cause hard starting or flooding problems.

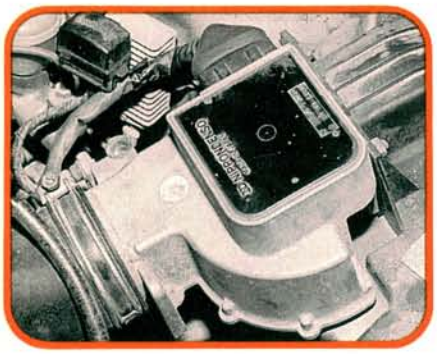
13

Measuring minimum and maximum voltage readings will tell you if the oxygen sensor is sluggish. In some cases, quicker may not be better. Rapid oxygen sensor cycling during closed loop idle operation may cause a rough idle as the ECU tries to keep up. This will not set an oxygen sensor trouble code.



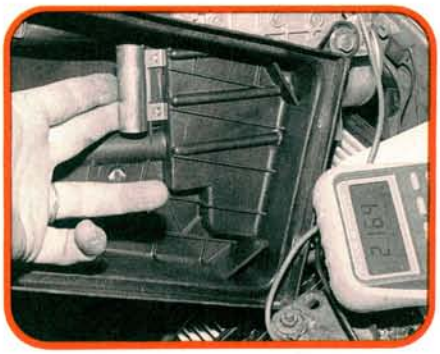
14

Run the engine at fast idle until the system switches to closed loop. Disconnect the oxygen sensor's harness connector. Idle speed should rise 200 RPM or less if the sensor is operating normally. Suspect an overactive oxygen sensor if there is a larger change in idle speed and quality after the sensor is disconnected.



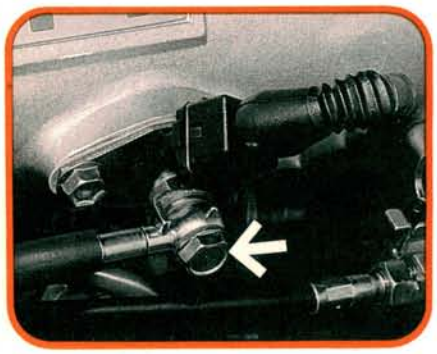
15

Older TCCS systems may develop a "dead spot" during acceleration or at steady cruising speeds. This can often be traced to poor contact at the air flow meter's wiper contacts. The dead spot is usually intermittent, so air flow meter trouble codes are seldom stored in the ECU's memory.



16

Remove the air flow meter harness connector and air cleaner housing. Now position the air flow meter so you can reach the meter flap. The air flow meter's resistance should change gradually as the meter flap is slowly opened and closed. Sudden jumps to an open circuit point to a wiper contact problem.



17

The best place to check fuel system pressure on most TCCS systems is at the cold start injector. Remove the injector's banjo fitting (arrow), then attach a fuel pressure gauge to the line. Turn the ignition on, then jumper the FP and +B terminals at the check connector. Compare pump pressure to specifications.

18

Locate the fuel return hose (arrow), then pinch it closed with hose pliers. Fuel pump pressure should rise to approximately 57 PSI. Remove the pliers, turn off the ignition, then watch for residual fuel pressure loss. Fuel leaks, a bad fuel pressure regulator, or fuel pump check ball problems can cause pressure loss.