

TROUBLE SHOOTING

- N.B. • Never turn the ignition switch ON when ECU-IG and IGN fuses are taken out.
- Never turn the ignition switch ON when any of the connectors for the steering control computer is disconnected. (It is OK to do so when all the connectors are disconnected.)

How to carry out trouble shooting

- 1 Battery voltage check
 - Standard 10 – 14 V (when engine is stopped)
- 2 Lamp check
 - (1) Check that the 4WS indicator lamp and warning lamp stay on for about 2 seconds when the ignition switch is turned ON.

- 3 Diagnosis check
- 4 Check the trouble chart

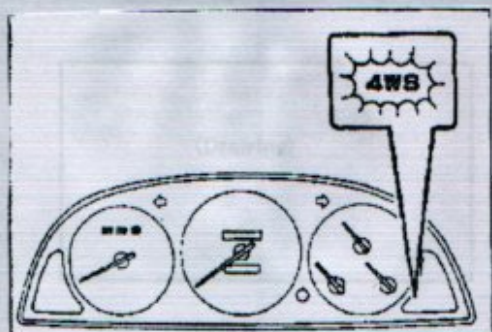
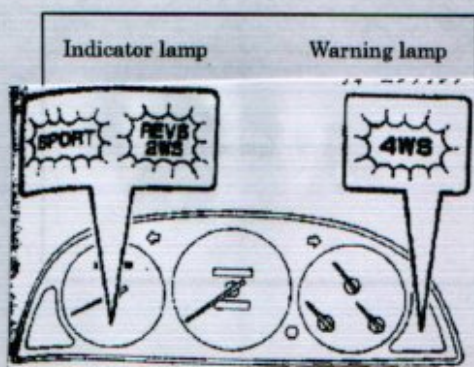
Diagnosis check

- 1 Fail safe function

- (1) Carry out fail control check when failure occurs in the signal system of the 4WS system, and display the failure by turning the 4WS warning lamp on.

<note> • To reset the fail safe function, turn the ignition switch OFF.

- List of control details when the fail safe function is on.



Failure position	Drive motor	Control details
Main motor <ul style="list-style-type: none"> • motor short • motor cable disconnected • motor functioning failure • relay failure 	Backup motor	Carrying out normal mode control <ul style="list-style-type: none"> • As the vehicle speed increases, it drives only in the in-phase direction. • It does not drive in the opposite phase direction.
Backup motor <ul style="list-style-type: none"> • motor cable disconnected • motor functioning failure • motor power cable disconnected 	Main motor	Carrying out normal mode control <ul style="list-style-type: none"> • As the vehicle speed increases, it drives only in the in-phase direction. • It does not drive in the opposite phase direction.
Speed sensor	Main motor	Carrying out normal mode control <ul style="list-style-type: none"> • As the vehicle speed increases, it drives only in the in-phase direction. • It does not drive in the opposite phase direction.
Steering control sensor <ul style="list-style-type: none"> • sensor cable disconnected • sensor failure 	Backup motor	Driving up to in-phase MAX, and the control stops.
Computer <ul style="list-style-type: none"> • control failure • computer power cable disconnected 	Backup motor	Driving up to in-phase MAX, and the control stops.

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Outputting the diagnosis code "32"

Disconnect backup motor connector of rear steering angle ratio converter.



Set the battery voltage to between the MB ↔ GND terminals of the backup motor connector, and check that the voltage between the VK ↔ VE terminals of the steering control computer is as follows:

Battery connection		Voltage between VK ↔ VE terminals
MB	GND	
+	-	Up
-	+	Down

→ NO

- Backup motor failure
- Wire harness failure

↓ YES

- Connect backup motor connector.
- Check the ignition switch is OFF and disconnect the computer connector. Then turn the ignition switch ON.



When a short-circuit occurs between the RLY2 ↔ GND2 terminals of the vehicle side connector of the computer, does the backup motor work ?

→ NO

- Steering control relay failure
- Wire harness failure

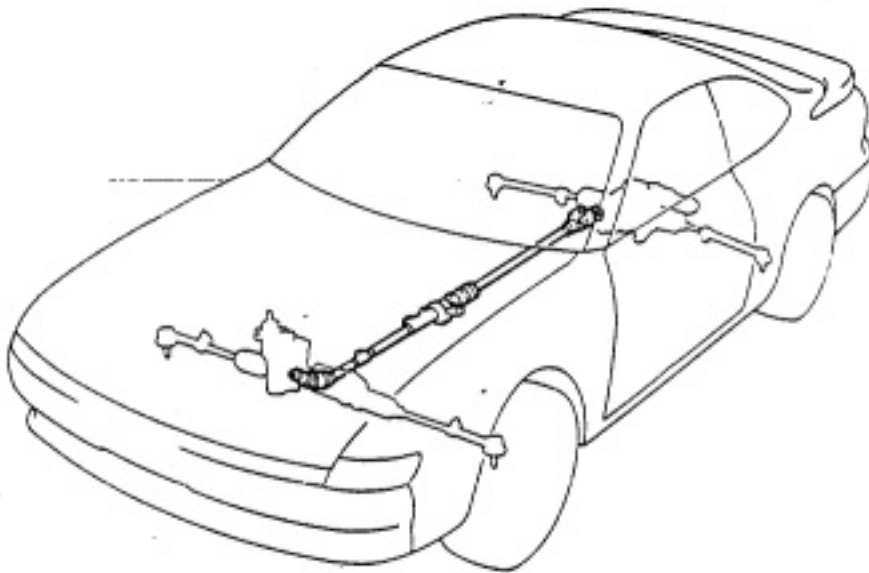
↓ Yes

Steering control computer failure

4WS

Four wheel steering, as far as Toyota is concerned, is only fitted to Japanese domestic product. This means that there is no English language information available except what we fathom out ourselves.

Shane Laker of Papakura Toyota has done quite a bit of work on this system and has prepared quite a bit of what follows.



Operation

The turning effort input by the driver is relayed to the rear steering mechanism by a shaft as shown above. What the rear mechanism does with it is controlled by an ECU via two electric motors attached to the mechanism.

At speeds lower than 45km/hr the rear wheels are steered in the opposite direction to the front wheels. At speeds higher than 45km/hr the rear wheels are steered in the same direction as the front wheels. At low speeds this enables a tighter turning circle, and at high speeds it helps prevent the rear wheels from breaking away on corners, so preventing oversteer.

The system utilises the speed sensors used for ABS where applicable, otherwise there is one speed sensor on the LF wheel.

Depending on your driving skills, reversing could be difficult with this system. So there is a button on the dash marked REV 2WS. This puts the system in two wheel steer mode for reversing. One of the two motors on the rear mechanism is called a back up motor. Press the REV 2WS button with the engine running and reverse selected, and the back up motor will cause the rear wheels to motor to the straight ahead position.

The other motor called the main motor, is used to change from the low speed to the high speed mode.

Self Diagnosis

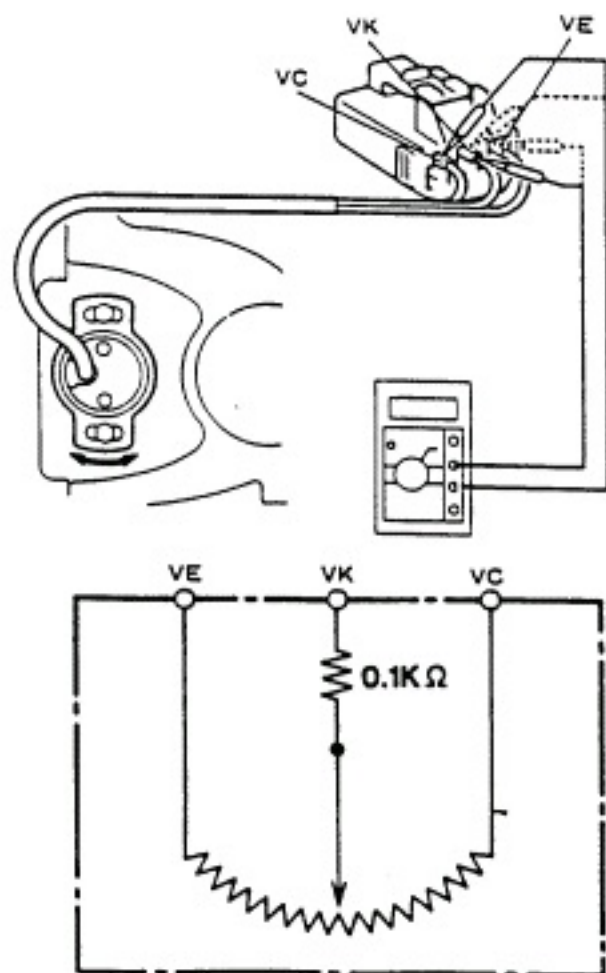
If there is an electrical problem the 4WS light will come up on the dash. To access the codes, bridge Tc and E1 in the check connector.

To cancel the codes, remove the STOP fuse for 10 seconds

Code	System	Diagnosis	
11	ECU	IG1 is ON 2 secs after IG2 when IG switch is ON Back up motor worked when IG switch turned ON	
12	Power for Driver	Input main motor signal to ECU when main relay is off, steering control driver is moved	Main relay
13	Steering Control Driver	Input main motor signal to ECU when main motor is not working	
21	Main Motor Short	Short signal from steering control driver four times	Main motor Main relay ECU-Driver circuit
22	Main Motor Open	Output main motor signal but current is less than 2A and steering control sensor signal is less than normal	Main motor or circuit
23	Main Motor Seized	Over current to main motor Output main motor signal but steering control sensor signal is less than normal	Main motor or circuit
24	Main Motor Wrong Signal	Wrong direction of signals from ECU (main motor) and steering control sensor	Main motor or circuit
31	Back up Motor Open	Open circuit in back up motor system (at 5km/hr or more)	Back up motor or circuit

32	Back up Motor	No changing signal of steering control sensor when back up motor signal is output	Steering control relay Back up motor
41	Speed Sensor	One speed sensor signal is 25km/hr or more while another is 0km/hr for more than 2 secs	Speed sensor or circuit
42	Steering Control Sensor Signal	Signal doesn't change when back up motor is operated Steering control sensor signal is less than normal for several secs Main motor signal and current is normal	Steering control sensor or circuit
43	Steering Control Sensor Short or Open	No steering control sensor signal	Steering control sensor or circuit

The steering control sensor is mounted on the rear rack mechanism and has 3 terminals as shown below.

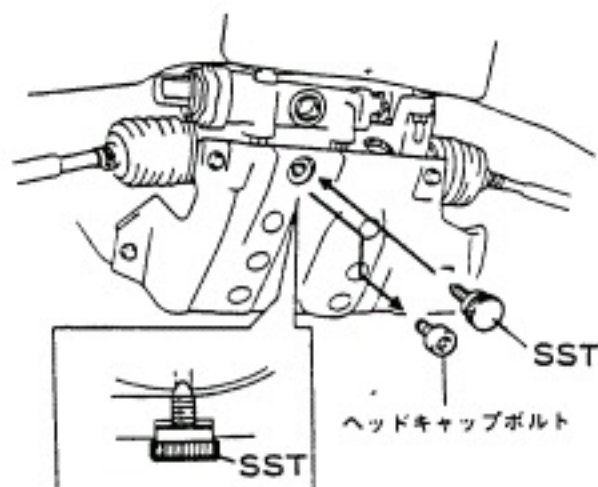


Repairs

If you have removed the motors or the sensor, ensure that the sensor is correctly adjusted.

Disconnect the sensor and measure its resistance between VC and VE. Divide this value by 2 and add $0.1\text{k}\Omega$. This should be the resistance between VK and VE when the sensor is in its central position. Adjust the sensor to this position with the rack in its central position.

The rack is centred as shown.



With the rack centred and the sensor correctly adjusted the steering rods should be of equal length and the wheels at the correct alignment.

The most common problem seems to be that the rear steering mechanism doesn't change mode at 45km/hr. That is, it always steers the same way as the front wheels or, in some cases, always steers opposite to the front wheels. Both instances can be just as much of a problem. There will usually be a fault code.

Sometimes the cause is that one of the motors wears out and/or seizes. To check this out, remove the motors and run them up on the bench.

More often the rack has become jammed. So with the motors removed, use a square drive tool to turn the shaft where the motor fits, and un-jam the rack.

The wiring diagram that follows is for a 1990 ST180 series Celica/Corona and may or may not be applicable to vehicles that you encounter.