

GM · POWERTRAIN

P1641

OBD-II DIAGNOSTIC TROUBLE CODE (DTC)

P1641 · GM

EVAP Fuel Tank Pressure Sensor / Fan 1 Relay Circuit

This code sets when the powertrain control module (PCM) detects an abnormal voltage signal on the shared reference circuit that serves both the EVAP fuel tank pressure sensor and the engine cooling fan relay No. 1 control circuit. The PCM expects a predictable voltage on that line, and a short to ground, short to voltage, or open circuit triggers the code.

SYSTEM	CODE TYPE	SEVERITY	FIX DIFFICULTY	AREA
Powertrain	GM specific	Medium	Intermediate	Computer and output circuits

Symptoms you may notice

- Illuminated check engine light, often with no other noticeable symptoms
- Cooling fan may run continuously or fail to turn on when the engine gets hot
- Fuel tank pressure sensor readings that are stuck, erratic, or implausible on a scan tool
- A pending EVAP system monitor that will not complete, preventing an emissions test pass
- In rare cases, engine overheating if the fan relay circuit fault prevents fan operation

Common causes, most likely first

- 1 Chafed or broken wire in the shared reference circuit between the PCM, fuel tank pressure sensor, and fan relay
- 2 Corroded or loose connector terminals at the fuel tank pressure sensor or fan relay
- 3 Failed fuel tank pressure sensor internally shorting the reference circuit
- 4 Failed cooling fan relay No. 1 with a shorted coil or damaged internal contacts
- 5 Faulty powertrain control module driver for the shared circuit (less common)
- 6 Aftermarket alarm or remote start wiring tapped into the fan relay circuit
- 7 Water intrusion into the underhood fuse block or relay center causing corrosion



How to diagnose and fix it

- 1 Scan all modules for stored and pending codes, then record freeze-frame data for P1641 to see the conditions when it set
- 2 Inspect the fuel tank pressure sensor connector and fan relay socket for corrosion, loose pins, or pushed-back terminals
- 3 Disconnect the fuel tank pressure sensor and fan relay, then measure resistance and voltage on the shared reference circuit to check for shorts or opens
- 4 Wiggle-test the harness while watching live data for the fuel tank pressure sensor to reveal intermittent wiring faults
- 5 Substitute a known-good fan relay and clear the code to see if it returns
- 6 If the circuit and components check out, test the PCM driver with a load box or oscilloscope before condemning the PCM
- 7 Repair any damaged wiring with proper solder and heat-shrink, then clear codes and verify the EVAP monitor and fan operation

Shared circuit faults that fool technicians

- Because the fuel tank pressure sensor and fan relay share a reference line, a fault in either component or its wiring can set P1641, so replacing only the sensor often leaves the code unresolved.
- A cooling fan that runs constantly after key-off is a strong clue that the fan relay circuit is shorted to voltage rather than the sensor being at fault.
- The EVAP monitor will not run while P1641 is active, so an emissions test failure may be the first sign on a vehicle with no driveability complaints.
- Aftermarket accessories wired into the fan relay control circuit are a frequent cause on older GM trucks and SUVs, and the splice is often hidden under loom.
- A PCM that sets this code may still command the fan correctly through the relay, so always verify actual fan operation before assuming the driver is bad.

Can I keep driving with P1641?

You can usually drive the vehicle, but watch the coolant temperature gauge closely and avoid heavy loads or stop-and-go traffic if the cooling fan is not working. Have the circuit diagnosed soon, because an inoperative fan can lead to overheating and the EVAP monitor will stay incomplete.

Tools that help

- OBD-II scan tool with live data and bidirectional control
- Digital multimeter
- Test light or load box
- Wiring diagram for the specific GM vehicle
- Terminal pick and electrical contact cleaner



Reading P1641

- P** Powertrain: engine, transmission and emissions.
- 1** Manufacturer-specific code (GM): its meaning depends on the make.
- 6** Computer and output circuits.
- 41** The exact fault within that area.

Often seen with

P0452 Evaporative Emission System Pressure Sensor/Switch Low · **P0453** Evaporative Emission System Pressure Sensor/Switch High · **P0480** Cooling Fan 1 Control Circuit Malfunction · **P0481** Cooling Fan 2 Control Circuit Malfunction · **P0641** Sensor Reference Voltage 'A' Circuit/Open

See it working

Watch the animated explainer [How a Radiator Fan Relay Circuit Works](#) on Auto Veteran to see the parts involved moving.

Full guide, related articles and animations: <https://www.autoveteran.tech/dtc-codes/gm-p1641/>

