

Understanding DTC Codes

What is a DTC Code?

A Diagnostic Trouble Code (DTC) is a code that helps identify issues in your vehicle or fleet. These codes work with the check engine light or malfunction indicator lamp to signal a problem. The lamp signals that there is a problem with the DTC identifies the problem.

DTCs, also known as engine fault codes, can be read using a scanner plugged into your vehicle's diagnostic port.

Knowing how DTC codes work can help drivers and fleet managers quickly address vehicle issues. Here's what you need to know.

Where does a DTC come from?

DTCs (Diagnostic Trouble Codes) are created by a vehicle's onboard diagnostics (OBD) system when a fault is detected. The OBD system identifies the issue and alerts the driver through warnings like the check engine light.

It also allows external devices, like an OBD scanner, to connect to the vehicle's computer.

Older OBD systems (OBD-I) varied by manufacturer. Today, there are two main standards for reading DTCs:

- **OBD2** – Used in light- and medium-duty vehicles
- **J1939** – Used in heavy-duty vehicles

With OBD-II, a standard set of DTCs was developed, but manufacturers can still create their own codes, which may require a mechanic to interpret.

Reading OBDII DTCs

Use an OBD-II Scanner

- Connect an **OBD-II scanner** to the vehicle's diagnostic port (usually under the dashboard).
- Read the displayed **DTC(s)**.

DTC codes are five characters long, each providing specific details about the issue.

- **First Character (Letter):** Identifies the affected system:
 - **P (Powertrain):** Engine, transmission, fuel system
 - **C (Chassis):** Steering, suspension, braking
 - **B (Body):** Passenger compartment components
 - **U (Network):** Onboard computers and systems
- **Second Character (Digit):** Indicates if the code is standard or manufacturer-specific:
 - **0:** Standard SAE code (used across all OBD-II vehicles)
 - **1:** Manufacturer-specific code
 - **2 or 3:** Rare; usually manufacturer-specific
- **Third Character (Digit):** Identifies the subsystem at fault:
 - **1:** Fuel or air metering
 - **2:** Fuel/air metering injection
 - **3:** Ignition system
 - **4:** Emissions system
 - **5:** Speed and idle controls
 - **6:** Computer output circuit
 - **7 & 8:** Transmission issues
- **Fourth & Fifth Characters:** A number (00-99) pinpointing the exact issue.

For details on your specific code, refer to your vehicle manual or manufacturer.

Look Up the Code Meaning

- Use **repair manuals, online DTC databases, or manufacturer resources** to find code explanations.

Determine Severity

- Some codes indicate **minor issues** (e.g., loose gas cap – P0457).
- Others may signal **serious problems** (e.g., engine misfire – P0301).

Take Action

- If the check engine light is **flashing**, stop driving immediately.
- If it's **steady**, diagnose and repair the issue as soon as possible.

Common DTCs

Here are some common **Diagnostic Trouble Codes (DTCs)** and their meanings:

Powertrain (P-Codes) – Engine & Transmission Issues

- **P0300** – Random/multiple cylinder misfire detected
- **P0301-P0312** – Cylinder misfire detected (last digit indicates the cylinder number)
- **P0420** – Catalyst system efficiency below threshold (bank 1)
- **P0430** – Catalyst system efficiency below threshold (bank 2)
- **P0440** – Evaporative emission control system malfunction
- **P0455** – Large EVAP system leak detected (often a loose gas cap)
- **P0500** – Vehicle speed sensor malfunction
- **P0562** – System voltage low (possible alternator/battery issue)

Fuel & Air Issues

- **P0171** – System too lean (bank 1)
- **P0172** – System too rich (bank 1)
- **P0174** – System too lean (bank 2)
- **P0175** – System too rich (bank 2)

- **P0191** – Fuel rail pressure sensor circuit range/performance

Ignition & Emissions

- **P0130–P0167** – Oxygen sensor issues (varies by bank and sensor location)
- **P0401** – Exhaust gas recirculation (EGR) insufficient flow detected
- **P0410** – Secondary air injection system malfunction

Transmission Issues

- **P0700** – Transmission control system malfunction
- **P0730** – Incorrect gear ratio
- **P0740** – Torque converter clutch circuit malfunction

Reading J1939 (9pin or RP1226) DTCs

A J1939 DTC consists of the following components:

1. Suspect Parameter Number (SPN)

- Identifies the specific component or system with the fault (e.g., SPN 3251 = Turbocharger Boost Pressure).

2. Failure Mode Identifier (FMI)

- Describes the type of failure detected.
- Common FMIs include:
 - 0 – High signal input
 - 1 – Low signal input
 - 2 – Data erratic or incorrect
 - 3 – Voltage above normal
 - 4 – Voltage below normal
 - 5 – Current below normal
 - 6 – Current above normal
 - 7 – Mechanical failure
 - 8 – Abnormal frequency or pulse

3. Occurrence Count

- Shows how many times the fault has occurred.

4. Source Address (SA)

- Identifies which electronic control unit (ECU) reported the fault.

Steps to Read a J1939 DTC

1. Use a J1939-compatible diagnostic tool to scan the vehicle.
2. Retrieve the SPN and FMI values from the fault code.
3. Look up the SPN in a reference guide (e.g., manufacturer-specific documentation or online databases).
4. Interpret the FMI to understand the nature of the issue.
5. Check the occurrence count to see how often the fault has appeared.
6. Use the source address (SA) to determine which module reported the issue (e.g., engine control unit, transmission control module).

Example J1939 DTC Interpretation

DTC: SPN 3251 FMI 4

- SPN 3251 → Turbocharger Boost Pressure
- FMI 4 → Voltage below normal
- Meaning: The vehicle's turbo boost sensor is reporting lower-than-expected voltage, which could indicate a faulty sensor, wiring issue, or turbocharger malfunction.

Common J1939 DTCs

Here are some common **J1939 Diagnostic Trouble Codes (DTCs)** used in heavy-duty vehicles and equipment:

Engine & Fuel System Issues

- **SPN 51 FMI 2** – Accelerator pedal position sensor fault
- **SPN 84 FMI 2** – Vehicle speed sensor fault
- **SPN 97 FMI 3** – Engine oil pressure sensor circuit fault
- **SPN 102 FMI 4** – Intake manifold pressure sensor voltage low
- **SPN 104 FMI 3** – Engine oil temperature sensor fault

- **SPN 110 FMI 4** – Coolant temperature sensor voltage low
- **SPN 157 FMI 3** – Battery voltage abnormal
- **SPN 3055 FMI 2** – Fuel pressure sensor circuit error

Exhaust & Emissions System

- **SPN 4094 FMI 4** – SCR inlet NOx sensor voltage low
- **SPN 411 FMI 3** – EGR valve position sensor circuit fault
- **SPN 4364 FMI 5** – SCR system efficiency low (DEF system issue)
- **SPN 5246 FMI 0** – Aftertreatment system fault detected

Transmission & Drivetrain

- **SPN 639 FMI 9** – CAN communication error with transmission
- **SPN 1328 FMI 3** – Transmission oil temperature sensor circuit fault
- **SPN 560 FMI 4** – Clutch actuator control voltage low
- **SPN 171 FMI 3** – Transmission input shaft speed sensor fault

Brakes & Chassis

- **SPN 639 FMI 2** – ABS system communication failure
- **SPN 792 FMI 5** – Brake switch circuit fault
- **SPN 1808 FMI 8** – Air suspension system abnormal frequency

Electrical & Communication Issues

- **SPN 627 FMI 2** – J1939 network data link error
- **SPN 636 FMI 9** – ECU power supply voltage abnormal
- **SPN 524285 FMI 14** – Body control module fault

Tools for fleet managers

Scanners built to read codes are readily available for purchase and can be a good tool for fleet managers to use to manually read codes. But depending on the size and make-up your fleet there are better options. GPS devices like DQT's GPS include a built in DTC system. If a DTC code occurs the system will capture it and your fleet manager will be alerted.

Using DQT to Understand DTCs

Using DQT as GPS telematics provider can help a fleet manager effectively monitor and manage Diagnostic Trouble Codes (DTCs) in real-time, improving maintenance efficiency and reducing downtime.

1. Real-Time DTC Alerts & Notifications

- The telematics system **automatically detects and reports DTCs** from fleet vehicles.
- Fleet managers receive **real-time alerts** via email, SMS, or dashboard notifications when a fault occurs.
- Critical issues (e.g., engine overheating or transmission faults) can be flagged immediately.

2. Remote Diagnostics & Code Interpretation

- DQT GPS integrates with OBD-II and J1939 diagnostic ports, allowing fleet managers to view DTCs remotely without needing a physical scanner.
- The system can decode the fault and provide detailed descriptions of the issue, helping managers understand the severity.

3. Predictive Maintenance & Preventative Actions

- Telematics systems track vehicle health trends and notify fleet managers before minor issues become major failures.
- Predictive analytics can suggest when a component is likely to fail, helping schedule proactive repairs.

4. Repair Prioritization & Maintenance Scheduling

- The system can rank DTC severity levels, helping fleet managers decide which vehicles need immediate service and which can wait.
- Automatic scheduling can be triggered for vehicles that repeatedly log certain codes.

5. Cost Reduction & Fuel Efficiency

- Fixing minor engine faults early prevents costly breakdowns.
- Monitoring issues like fuel system inefficiencies (SPN 157 FMI 3 – Low Fuel Pressure) can improve fuel economy and reduce expenses.

6. Compliance & Reporting

- Many telematics systems store historical DTC data, helping with compliance reports for safety inspections.
- Fleet managers can generate reports on vehicle performance, uptime, and common recurring issues.

7. Driver Coaching & Behavior Monitoring

- Some DTCs are triggered due to aggressive driving (e.g., high RPMs, excessive braking).
- Telematics platforms can link DTC events to driver behavior, allowing managers to provide coaching to prevent future issues.

Example in Action:

Scenario: A truck in the fleet logs SPN 3251 FMI 4 (Turbocharger Boost Pressure Low)

- The GPS telematics system detects the fault and alerts the fleet manager.
- The system suggests potential causes (e.g., clogged air filter, boost leak).
- The fleet manager schedules maintenance before a breakdown occurs, avoiding towing costs and delivery delays.

To ensure your fleet operates efficiently and avoids costly downtime, understanding and managing DTC codes is essential. With DQT's solutions, fleet managers gain real-time insights into vehicle health, allowing them to respond proactively to diagnostic trouble codes. Our system provides instant alerts, remote diagnostics, predictive maintenance tools, and compliance reporting to keep your fleet running smoothly.

Reach out to DQT today to learn how our solutions can help streamline maintenance, improve efficiency, and reduce costs for your fleet.