



*Providing Crossfire Performance Advantages - 82, 83 & 84 CFI*

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## **ECM CHECK ENGINE CODES**

### **NOTE:**

Some of these codes may not apply to your CFI ECM, but will apply to a newer ECM version. Use this guide as a reference only. **Code 12** is NORMAL condition.

### **CODE 13**

Trouble Code 13 indicates that the exhaust stream oxygen content sensor (O2 sensor) is not responding as expected. When cold, the sensor is 'biased' by the ECM to about 450 millivolts. Before it warms to at least 600 deg F (315 deg C) it acts as an open circuit and when the ECM reads it, it reads the 450 mV bias. The ECM expects the sensor to warm in a short period of time and begin sending its own voltages.

#### **The conditions for setting this code are:**

- Engine running at least 40 seconds and
- No code 21 or 22 (TPS errors) present, and
- Coolant temperature is at least 118 deg F (48 deg C), and
- O2 sensor voltage not fluctuating (i.e. steady between 350 and 557 mV), and
- TPS signal indicates above idle (over 6%), and
- All the above conditions met for more than 8 seconds

#### **Typical causes for this code include:**

- 1) Defective or degraded O2 sensor
- 2) Deposit contaminated O2 sensor (running leaded fuel, RTV silicone deposits etc.)
- 3) Corroded/defective O2 sensor connection
- 4) Defective sensor ground circuit
- 5) Defective connection at ECM
- 6) Defective ECM

### **CODE 14**

Trouble Code 14 indicates that the Coolant Temperature Sensor (CTS) is reporting abnormally *high* readings. The CTS is used to control fuel mixture, timing, idle speed, TCC and EGR operations among others. The thermistor used has a low resistance when hot, rising as the coolant cools. This error then, indicates a very low resistance in the CTS circuit.

**The conditions for setting this code are:**

- The coolant temperature reported is > 284 deg F (140 deg C), and
- The above condition is present for more than 20 seconds

NOTE: A default temperature of 111 deg F is used while the error is present.

**Typical thermistor resistance values are:**

deg F	deg C	resistance (ohms)
210	100	185
160	70	450
100	38	1,800
70	20	3,400
40	4	7,500
20	-7	13,500
0	-18	25,000
-40	-40	100,000+

**Typical causes for this code include:**

- 1) Severe engine overheating
- 2) Defective Coolant Temperature Sensor (resistance too low)
- 3) Short circuit in CTS-ECM harness
- 4) Defective ECM

**CODE 15**

Trouble Code 15 indicates that the Coolant Temperature Sensor (CTS) is reporting abnormally *low* readings. The CTS is used to control fuel mixture, timing, idle speed, TCC and EGR operation, among others. The thermistor used has a high resistance when cold, lowering as the coolant warms. This error then, indicates a very high resistance in the CTS circuit.

**The conditions for setting this code are:**

- The coolant temperature reported is < -29 deg F (-34 deg C), and
- The above condition is present for more than 4 seconds

NOTE: A default temperature of 111 deg F is used while the error is present.

Refer to the Code 14 description for typical sensor resistance values.

**Typical causes for this code include:**

- 1) Open circuit in CTS-ECM harness
- 2) Defective Coolant Temperature Sensor (resistance too high)

- 3) Open sensor ground circuit
- 4) Defective ECM

### **CODE 21**

Trouble Code 21 indicates that the Throttle Position Sensor (TPS) is reading abnormally *high*. TPS volts should be close to 0.525 V at closed throttle and rise smoothly in about 0.02 volt increments to a maximum reading of about 4.85 volts at WOT.

#### **The conditions for setting this code are:**

- The engine is running, and
- Code 33 or 34 (MAF error) is not set, and
- TPS reading is > 4.90 volts
- or -
- TPS reading stays between 2.5 and 4.9 volts, and
- MAF reading is < 15 grams/second, and
- The above two conditions are present for more than 5 seconds

Note: During a Code 21 condition, the ECM uses a default TPS value of 2.6 volts. This will cause the engine to idle very high.

#### **Typical causes for this code include:**

- 1) Defective TPS
- 2) Short circuit in the TPS harness to +5 volt reference
- 3) Open sensor ground circuit
- 4) Defective ECM

### **CODE 22**

Trouble Code 22 indicates that the Throttle Position Sensor (TPS) is reading abnormally *low*. TPS volts should be close to 0.525 V at closed throttle and rise smoothly in about 0.02 volt increments to a maximum reading of about 4.85 volts at WOT.

#### **The conditions for setting this code are:**

- The engine is running, and
- TPS reading is < 0.20 volts

Note: During a Code 22 condition, the ECM uses a default TPS value of 2.6 volts. This will cause the engine to idle very high.

#### **Typical causes for this code include:**

- 1) Maladjusted TPS

- 2) Defective TPS
- 3) No +5 volt reference to TPS
- 4) TPS-return to ECM is shorted to ground or to sensor ground
- 5) Defective ECM

NOTE: The TPS must be adjusted to about 0.525 volts at closed throttle for the ECM to auto-zero properly. If necessary, adjust the TPS to bring the voltage up or down to this value at closed throttle.

### CODE 23

Trouble Code 23 indicates that the Manifold Air Temperature (MAT) sensor is reporting abnormally *low* readings. When the air is cold, the thermistor in the sensor has a high resistance, which falls as the air charge warms. Low readings thus indicate a possible bad sensor or open in the MAT circuit.

**The conditions for setting this code are:**

- MAT reading is < -40 deg F (-40 deg C)

NOTE: A default MAT value indicating 82 deg F is used while Code 23 is present.

**Typical thermistor resistance values are:**

deg F	deg C	resistance (ohms)
210	100	185
160	70	450
100	38	1,800
70	20	3,400
40	4	7,500
20	-7	13,500
0	-18	25,000
-40	-40	100,000+

**Typical causes for this code include:**

- 1) Defective MAT sensor
- 2) Open sensor ground circuit
- 3) Dirty or corroded connection(s) at MAT and/or ECM
- 4) Open circuit between the ECM and the MAT sensor
- 5) Defective ECM

## **CODE 24**

Trouble Code 24 indicates that the Vehicle Speed Sensor (VSS) is reporting an abnormally low reading when other sensors indicate it should be higher.

### **The conditions for setting this code are:**

- No Code 33 or 34 (MAF Error) is present, and
- The vehicle speed signal indicates < 4 MPH and
- Engine speed is between 1400 and 4400 RPM, and
- During a low load condition (LV8 between 50 and 99), and
- Transmission not in Park or Neutral, and
- All conditions met for more than 20 seconds

### **If the code was logged when the vehicle was in motion, the following should be checked:**

- 1) Defective or corroded VSS connections
- 2) Maladjusted TPS sensor. The TPS should read about 0.525 volts at closed throttle
- 3) Defective speedometer cable
- 4) Bad or missing speedometer drive gear(s) in tail shaft housing of the transmission
- 5) Defective VSS
- 6) Defective ECM

## **CODE 25**

Trouble Code 25 indicates that the Manifold Air Temperature (MAT) sensor is reporting abnormally *high* readings. When the air is hot, the thermistor has a low resistance, which rises as the air temperature cools. High readings thus indicate a possible bad sensor or short in the MAT circuit.

### **The conditions for setting this code are:**

- MAT reading is > 275 deg F (135 deg C), and
- The engine has been running for more than 16 seconds, and
- The vehicle speed is > 40 MPH

Refer to the Code 23 description for typical sensor resistance values.

### **Typical causes for this code include:**

- 1) Defective MAT sensor
- 2) MAT signal shorted to ground or to sensor ground
- 3) Defective ECM

## **CODE 31**

Trouble Code 31 indicates that the Wastegate Solenoid may not be functioning correctly. The wastegate solenoid is controlled by a Pulse Width Modulated (PWM) signal from the ECM. The ECM controls turbo boost by varying the PWM waveform (duty cycle) to the wastegate. The wastegate responds by bleeding off exhaust pressure upstream of the turbine, thus controlling boost pressure.

### **The conditions for setting this code are:**

- The ECM is commanding a solenoid duty cycle of between 5% and 94%, and
- No electrical feedback is being received from the solenoid, and
- The above conditions are met for 2 seconds.

### **Typical causes for this code include:**

- 1) Poor or corroded connections between the ECM and the wastegate solenoid
- 2) Open or shorted solenoid
- 3) Defective, sticking or maladjusted wastegate linkage
- 4) Defective ECM

Ensure correct operation of other engine subsystems, including but not limited to the TPS and MAF sensors and check the wastegate actuation hardware.

## **CODE 32**

Trouble Code 32 indicates that the Exhaust Gas Recirculation (EGR) valve diaphragm is not where the ECM expects it to be. The ECM controls the diaphragm with a Pulse-Width Modulated (PWM) waveform. The EGR has a vacuum bleed solenoid that adjusts the vacuum applied to the EGR valve based on this pulse width. If there is sufficient vacuum at the EGR valve, a switch closes to send a signal back to the ECM. The absence of this signal is the bases for code 32.

### **The conditions for setting this code are:**

- No vacuum to EGR (switch open), and
- Code 33 or 34 (MAF error) is not present, and
- Engine running and LV8 is less than 100, an

- Coolant temperature is > 118 deg F (48 deg C), and
- The EGR solenoid duty cycle is < 65%, and
- The above conditions are met for more than 25 seconds

**Typical causes for this code include:**

- 1) Faulty EGR valve-to-ECM connection
- 2) Plugged EGR passages and/or sticking EGR valve
- 3) Defective EGR valve
- 4) Defective ECM

**CODE 33**

Trouble Code 33 - Manifold absolute pressure (MAP) sensor signal voltage high - pressure low/vacuum high

**Test conditions for this code are:**

Ignition "OFF", clear codes by disconnecting battery for five minutes

Disconnect MAP sensor connector

Diagnostic terminals not grounded (shorted) "A & B"

Start Engine and run for one minute or until "Check Engine Light (CEL) comes on

Ignition "ON" engine "OFF"

Ground Diagnostic terminals (short) "A & B" and note code

**Troubleshooting this code:**

CEL code 33 sets after above procedure

Check for open in ground CKT 469

Check for short in CKT 432

CKT 432 OK, Replace ECM

CEL code 34 sets after above procedure

Check for plugged or leaking sensor vacuum line

Vacuum line OK, Replace MAP sensor

**CODE 34**

Trouble Code 34 - Manifold absolute pressure (MAP) sensor signal voltage low - pressure high/vacuum low

**Test conditions for this code are:**

Ignition "OFF", clear codes by disconnecting battery for five minutes

Disconnect MAP sensor connector and jumper harness connector pins "B to C"

Diagnostic terminals not grounded (shorted) "A & B"

Start Engine and run for one minute or until "Check Engine Light (CEL) comes on

Ignition "ON" engine "OFF"

Ground Diagnostic terminals (short) "A & B" and note code

**Troubleshooting this code:**

CEL code 33 sets after above procedure

Replace MAP sensor

CEL code 34 sets after above procedure  
Remove jumper from connector pins "B to C"  
Check voltage between harness connector pins "A" and "C"

Reading 4 to 6 volts  
Disconnect ECM Black connector, check for open or short to ground in CKT 432  
CKT 432 OK, ECM Black connector bad or ECM bad

Reading below 4 volts  
Disconnect ECM White connector, check for open or short to ground in CKT 416  
CKT 416 OK, ECM White connector bad or ECM bad

## **CODE 42**

Trouble Code 42 indicates that there may be a malfunction in the Electronic Spark Timing (EST) system.

During cranking, the timing is controlled by the ignition module while the ECM monitors the engine speed. When the engine speed exceeds 400 RPM, the ECM sends a BYPASS signal to the ignition module which switches the timing to ECM control. The ECM calculates what the timing should be then "tells" the ignition module via the EST circuit.

An open or ground in the EST circuit will stall the engine and set a Code 42. The engine can be re-started but it will run on ignition module timing.

### **The conditions for setting this code are:**

- System in BYPASS mode but the ignition module is still controlling timing
- or -
- Engine speed > 600 RPM with no EST pulses (ECM controlled timing) going to the ignition module for 200 milliseconds.

### **Typical causes for this code include:**

- 1) BYPASS line is open or grounded
- 2) EST line is open or grounded
- 3) PROM or CALPACK not seated properly in the ECM
- 4) Poor connections between ignition module and ECM
- 5) Poor routing of EST harness and/or poor quality ignition wires (EMI induced electrical noise)
- 6) Faulty or incorrect ignition module
- 7) Faulty ECM

## **CODE 43**

Trouble Code 43 indicates that there may be a malfunction in the Electronic Spark Control (ESC) circuit.

ESC is used to sense spark knock (pinging) and retard the timing to eliminate it. A knock sensor (located at the rear of the engine block) sends signals to an ESC module which then signals the

ECM that knocking is being detected. The ECM will retard the timing by as much as 20 degrees in 1 degree increments. A loss of knock sensor signal or loss of ground at the ESC module will cause the signal at the ECM to remain high. The ECM will act as if no knock is present, and may possibly result in engine damage, if there is detonation.

Loss of the ESC signal to the ECM will cause the ECM to constantly retard the timing to its maximum. This results in sluggish performance and a Code 43.

**The conditions for setting this code are:**

- Engine is running
- ESC input signal has been low more than 2.23 seconds

**Typical causes for this code include:**

- 1) Open or shorted knock sensor
- 2) Loose knock sensor
- 3) Excessive mechanical noise within engine
- 4) Improper or incorrectly installed PROM or CALPACK in the ECM or defective ECM
- 5) Intermittent open in the EST line to the ignition module

**CODE 44**

Trouble Code 44 indicates that the O2 sensor is showing a persistently *high* exhaust oxygen content (lean), despite the efforts of the ECM to increase injector on-time (thus increasing fuel delivered). Integrator and BLM numbers may indicate > 128 by a substantial margin.

**The conditions for setting this code are:**

- No Code 33 or Code 34 (MAF Error) present, and
- The O2 sensor voltage remains below 250 mVolts, and
- The ECM is in Closed Loop control, and
- The above conditions exist for more than 50 seconds.

**Typical causes for this code include:**

- 1) O2 sensor defective or lead shorted
- 2) Lean injectors (dirty or blocked)
- 3) Water in fuel
- 4) Exhaust leaks upstream of O2 sensor
- 5) Fuel pressure or volume too low
- 6) MAF sensor reading lower airflow than is actually present
- 7) Vacuum leaks
- 8) Incorrect or poorly calibrated PROM

**CODE 45**

Trouble Code 45 indicates that the O2 sensor is showing persistently *low* exhaust oxygen content (rich), despite the efforts of the ECM to decrease injector on-time (thus decreasing fuel delivered). Integrator and BLM numbers may indicate < 128 by a substantial margin.

**The conditions for setting this code are:**

- No Code 34 or Code 35 (MAF error) present, and
- The O2 sensor voltage remains above 752 mV, and
- The ECM is in Closed Loop control, and
- Throttle position is < 2 percent or > 20 percent, and
- The above conditions exist for more than 20 seconds.

**Typical causes for this code include:**

- 1) O2 sensor defective or contaminated (if incorrect RTV sealant or too much RTV is used, this may happen)
- 2) Leaking fuel injectors
- 3) Fuel pressure too high
- 4) EMI interference from poor plug wires
- 5) Evaporative Emission system defect
- 6) TPS and/or EGR problem
- 7) MAF sensor reading higher airflow than is actually present

## CODE 51

Trouble Code 51 indicates that the ECM sensed a fault in the PROM.

When the PROM was initially created, a checksum number representing the total of all the cell values was also stored. The ECM uses this checksum as one way to determine if the content of any cell has changed. A Code 51 causes the ECM to enter Back-Up mode which uses the CALPAK for default sensor values.

**The conditions for setting this code are:**

- Power has just been applied to the ECM
- The calculated checksum does not match the stored checksum.
- or -
- The engine was just started, and
- Either of two specific PROM locations do not contain the expected value. (One location should have 1's in the odd numbered bits and the other has 1's in the even numbered bit positions.)

**Typical causes for this code include:**

- 1) Incorrectly installed PROM module
- 2) Defective PROM module
- 3) Defective ECM

**CODE 52**

Trouble Code 52 indicates that the ECM sensed a fault with the CALPACK. The CALPACK is a plug-in module separate from the PROM that contains preset calibrations used by the system during "limp home" (backup) mode. The ECM continuously checks for its presence while power is applied.

**The conditions for setting this code are:**

- The ECM does not sense the CALPACK

**Typical causes for this code include:**

- 1) Incorrectly installed CALPACK module
- 2) Incorrect CALPACK module for this vehicle
- 3) Defective or incorrectly inserted PROM
- 4) Defective ECM

**CODE 53**

Trouble Code 53 refers to a feature never actually installed on any turbo Regal. This code was reserved when these vehicles were being developed, in the event that water injection hardware would be installed in production vehicles.

Since water injection was never actually used, this code should never appear.

**Typical causes for this code include:**

- 1) Incorrect PROM installed in the ECM
- 2) PROM incorrectly installed in the ECM
- 3) Defective PROM

Some after market PROMs, particularly those designed as "off road use only" may not properly deal with trouble codes. If it is suspected this is causing a Code 53, contact the PROM manufacturer.

**CODE 54**

Trouble Code 54 is not used by the turbo cars. If this code does appear, it is probably due to a loose connection or bad ground. If a computer is connected to the car's ALDL connector when the code appears, check the computer cable connections.

**CODE 55**

Trouble Code 55 indicates that the Analog-to-Digital (A/D) converter in the ECM is faulty. This converter reads sensors (e.g., TPS, Oxygen) and converts their analog voltage output to a digital number for use by the ECM. If the converter fails, the ECM sets this code.

**The conditions for setting this code are:**

- The A/D Converter has failed to properly read a sensor after 24 attempts.

**Typical causes for this code include:**

- 1) Defective or incorrectly inserted PROM
- 2) Defective ECM

If replacing the ECM, be sure to transfer both the PROM and the CALPACK from the old unit. If the old ECM also indicated PROM failure (Code 51) or a bad CALPACK (Code 52), be sure to verify these components are fully operational in the new unit. If they are not, they too will have to be replaced.

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