

DIY KOEO/KOER/Cylinder Balance Self-Test Procedure

By Joel5.0

<http://sbftech.com/index.php/topic,2471.0.html>

Definitions:

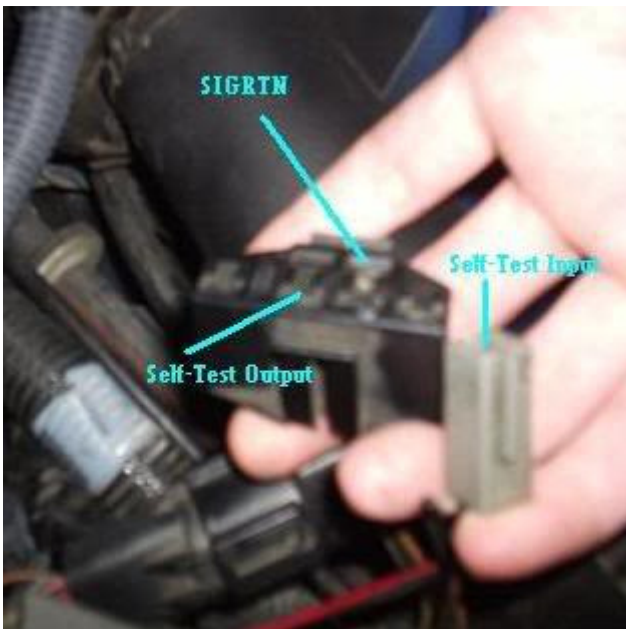
- KOEO = Key On Engine Off
- KOER = Key On Engine Running
- STO = Self-Test Output
- STI = Self-Test Input or trigger wire to initiate self-test routines
- CEL = Check Engine Light
- MIL = Malfunction Indicator Light = CEL
- ECM = Engine Control Module or computer
- DLC = Data Link Connector
- VIP = Vehicle Interface Port Connector = DLC
- SIGRTN = SIGNAL ReTURN or ground reference for sensors provided through ECM
- EEC-IV = Electronic Engine Control IV generation or Ford's OBD-I system
- OD Codes = On Demand Codes, this are the failures the system logs based on a real-time check, failure is present.
- CM Codes = Continuous Memory Codes, this are the failure codes the system has logged and saved in memory based on a failure the system detected at one point in time.
- R Codes = Engine Running Codes, this are the failure codes the system logs based on the KOER self-test routine.

Tools/Equipment:

- Analog VOM or 12-vdc Test Light
- Paper Clip or piece of Jumper Wire
- Pen and paper

Next...need to identify the VIP/DLC connector location. Using Ford Mustangs as reference, for '86-'93 models...it is located behind the LH/Driver side strut tower. For '94-'95 Mustangs, it is located behind the RH/Passenger side strut tower as shown below.

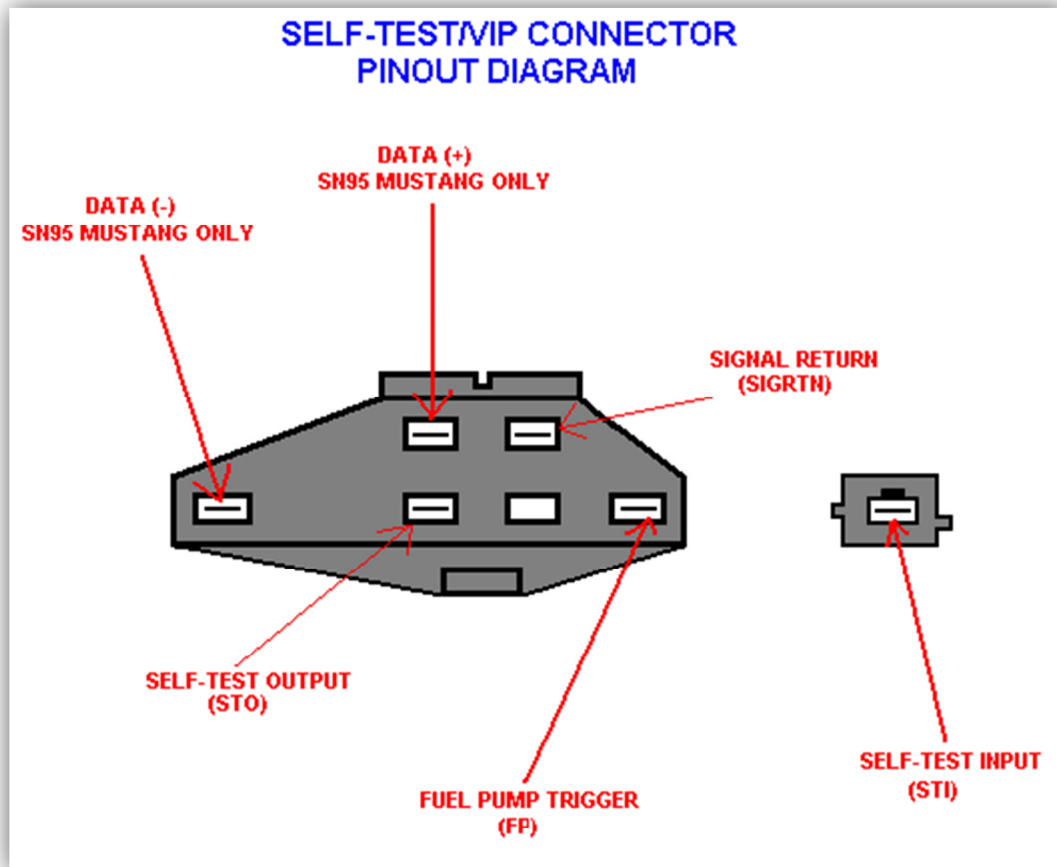
'86-'93 VIP/DLC Connector Location



'94-'95 VIP/DLC Connector Location



Now that the VIP/DLC connector has been found, check its terminals diagram below:

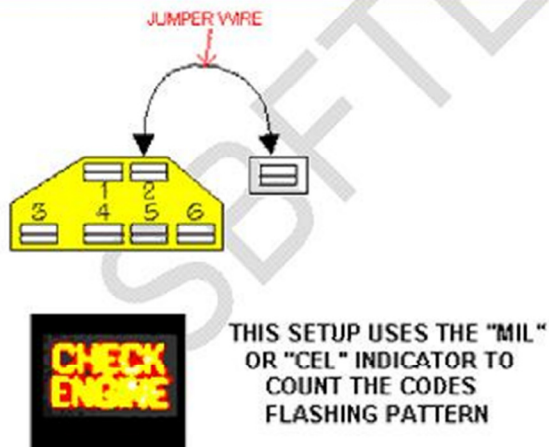
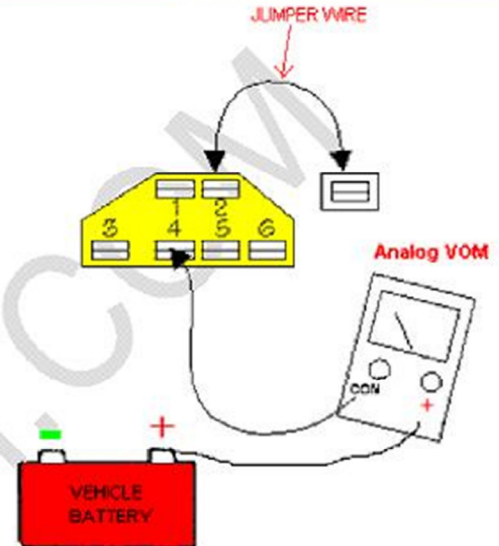
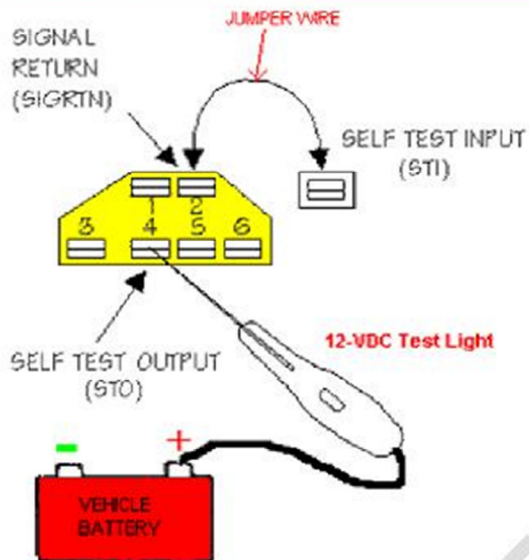


Set the jumper wire, 12-vdc test light or AVOM as shown in the following diagram.

DIY Key On Engine Off (KOEO) and Key On Engine Running (KOER) Diagnostic Connectors Setup

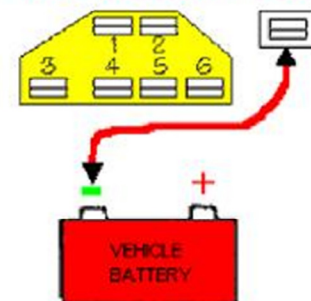


TEST CONNECTORS



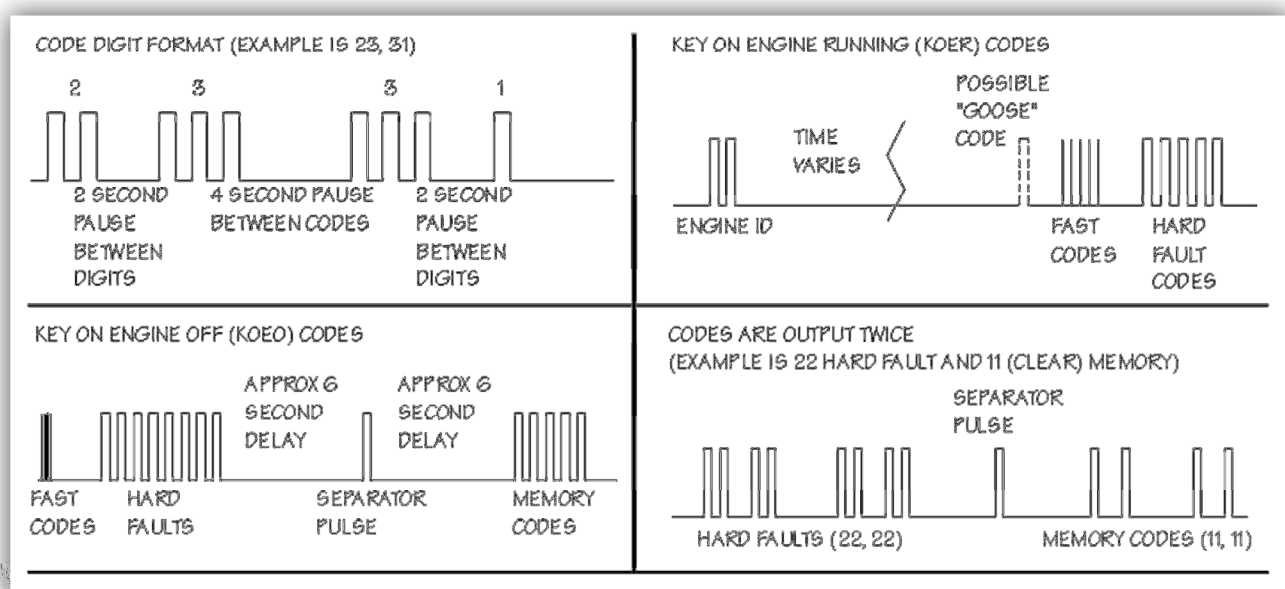
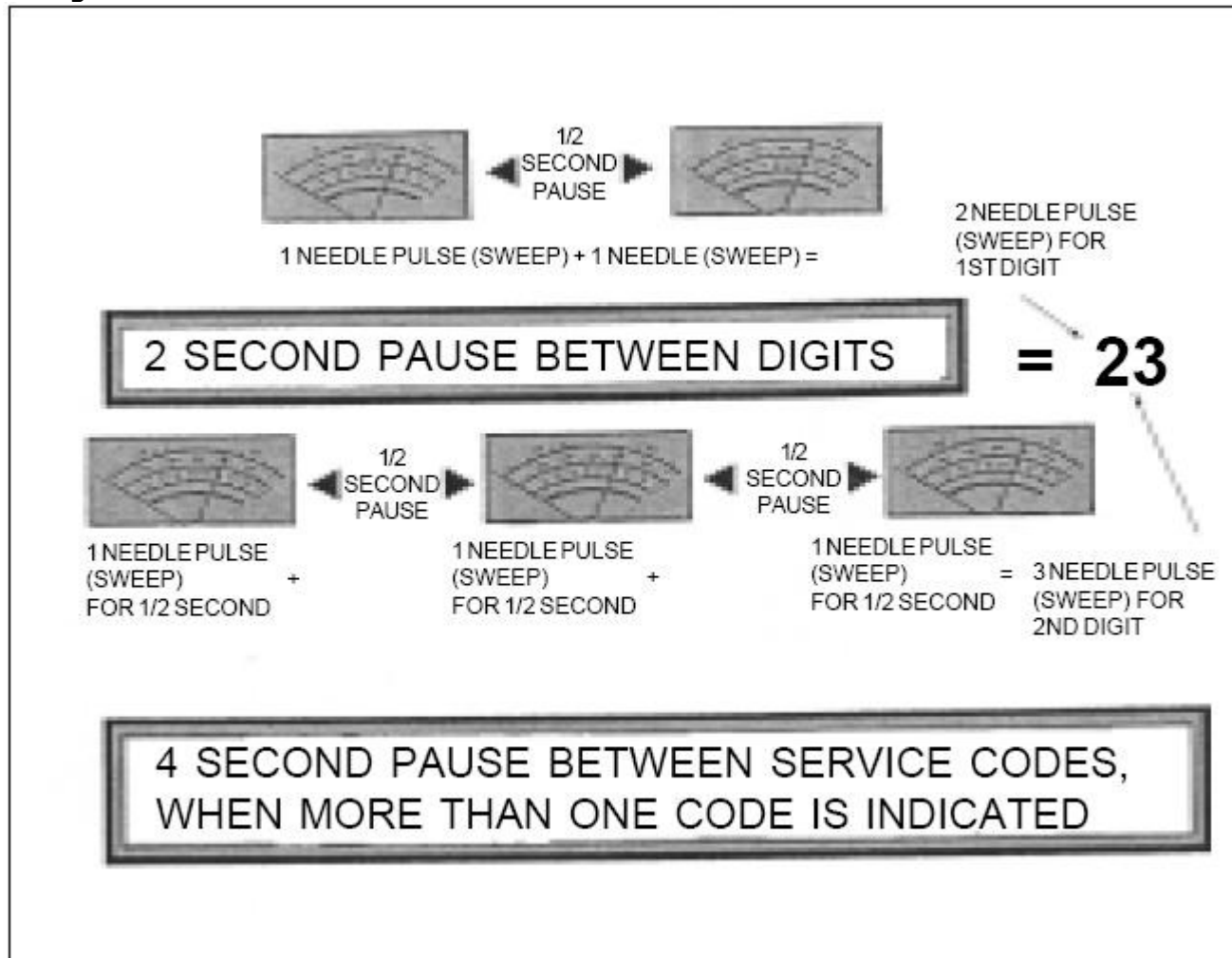
THIS ALTERNATE JUMPING PROCEDURE IS USED WHEN A "NO CODES" CONDITION IS PRESENT IN COMBINATION WITH ANY OF THE METHODS FOR THE CODES FLASHES.

TEST LIGHT - AVOM - CHECK ENGINE INDICATOR



Codes flashing/needle sweeping patterns comes in two flavors, '86-'93 Mustangs, pre-'91 Fords follow a **2-digit pattern** and SN95 Mustangs and post-'91 Fords follow a **3-digit pattern** as shown below:

2-Digit Codes



Codes Itemization:

- OD or "O" Codes:

These codes are the first set of codes flashed during the KOEO self-test. They are the codes displayed previous to the "10" separator code.

- CM or "M":

These codes are the ones flashed after the "10 Separator" during the KOEO self-test. These are codes the system logged during the previous 40 ignition cycles and were stored in memory.

- R Codes:

These codes are flashed after the Engine ID code (2 = 4 Cyl., 3 = 6 Cyl. and 4 = 8 Cyl.) in the KOER self-test.

It is important that the codes get itemized to determine if they're "hard failures", intermittent or logged by operator error (operating the car with a sensor disconnected), since their definition may vary depending on the type of code. OK, let's run the self-tests.

Running a KOEO self-test:

1. Setup the VIP/DLC connector jumper as described above.
2. Turn Ignition On.
3. Count the flashing/needle-sweep pattern.
4. Write down the codes logged.
5. Start a topic with your problem in the Electronic Engine Management section.

Running a KOER self-test:

1. Setup the VIP/DLC connector jumper as described above.
2. Start the engine...make sure the gas pedal is not touched.
3. Watch for the Engine ID code to be flashed.
4. At this time the engine will increase idle speed, activate system actuators, check sensor inputs, idle will fluctuate, etc. The KOER routine usually takes 2-3 minutes to run, at the end of which the idle speed stabilizes and codes will start to flash.
5. Start counting the codes pattern.
6. Write down the codes logged.
7. Start a topic with your problem in the Electronic Engine Management section

Running a Cylinder Balance self-test:

The cylinder balance test checks that all cylinders are producing the same amount of power. To do so the system will turn off each cyl. injector, record rpm loss and compare it to the other cylinders. This test can be done three times in a row, each time it is repeated after the first one,

the rpm difference value to ID a passing/failing cylinder will be lower (stricter).

If a cylinder is shown as weak in the third test (provided you run it a third time), it should be considered **non-contributing**. The tests may be repeated as often as needed if the throttle is depressed within two minutes of the last code output. Subsequent tests, after the 3rd. cycle, will use the percentage from the third test instead of selecting even lower values.

1. Run a KOER self-test as described above and wait until all codes are flashed, DO NOT TURN ENGINE OFF.
2. Within 2 minutes of the last code output, do a brief WOT.
3. Engine rpms should raise and the test initiated.
4. The elapse time of this test is 2-4 minutes after which time....the codes will be output.
5. Write down the codes logged. (90 = PASS, 10 = Cyl. #1 Fail, 20 = Cyl. #2 Fail.....)
6. If a code 90 (System Pass) was obtained, repeat 1-5 for a 2nd. run and goto 7.
7. Start a topic with your problem in the Electronic Engine Management section.

Check for the codes definitions/code type at
<http://sbftech.com/index.php/topic,849.0.html>

Clearing EEC-IV Codes:

1. Disconnect battery (-) terminal for 3-5 minutes.
2. The above will cause a code 15 (Keep Alive Memory (KAM) Test Failed) to be logged since power was removed from the system memory.
3. To clear this code (or any other codes) you could also use the alternate/quick procedure.

Alternate Procedure to Clear Codes:

1. Setup the system to run a KOEO self-test.
2. Turn Ignition On.
3. As soon as the codes start to flash, disconnect the STI jumper wire.
4. Turn Ignition Off, set the system to run a KOEO self-test again, and confirm code 15 is cleared from memory (CM codes).

KOEO/KOER Wiggle (Continuous) Tests:

CONTINUOUS MONITOR MODE (WIGGLE TEST)

The Continuous Monitor Mode allows technician to attempt a recreation of intermittent fault while monitoring the system. This mode, also called the wiggle test, may be used in both KOEO SELF-TEST and KOER SELF-TEST. The CIRCUIT TESTS specify the use of this procedure to identify intermittent faults in specific circuits or components.

KOEO Wiggle Test Procedure

Connect test equipment. See [Fig. 2](#). Turn ignition on and activate self-test with jumper lead or diagnostic tester. Wait 10 seconds, deactivate, and then reactivate self-test. Wiggle test mode is now activated. Tap, move and wiggle the suspected sensor and/or harness area. If a fault is detected, a service code may be stored in memory and indicated at the diagnostic tester or "Scan" tool. Record or retrieve code and perform test indicated by appropriate CONTINUOUS MEMORY CODES chart under SERVICE CODE REFERENCE CHARTS.

KOER Wiggle Test Procedure

Connect test equipment. See [Fig. 2](#). Turn ignition off and wait 10 seconds. Start engine. Activate self-test with jumper lead or diagnostic tester. Wait 10 seconds, deactivate, and then reactivate self-test. DO NOT turn engine off. KOER wiggle test mode is now activated. Tap, move and wiggle the suspected sensor and/or harness area. If a fault is detected, a service code may be stored in memory and indicated at the diagnostic tester or "Scan" tool. Record or retrieve code and perform test indicated in appropriate CONTINUOUS MEMORY CODES chart under SERVICE CODE REFERENCE CHARTS.

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