



Mercury ECU/ACU/PCU Rough Idle Diagnostics

Common Problems of Rough Idle:

Radio Frequency Interference (RFI): Most commonly caused by use of non-resistor spark plugs.

*The ACU is more sensitive than some Stock Mercury ECUs, so it is imperative that Resistor Spark Plugs are used with the ACU. See spark plug specifications at <https://brucato.com/technical-resources/>.

Faulty or Incorrectly adjusted Throttle Position Sensor (TPS): On some Mercury motors, the TPS calibrates fuel delivery up to about 3000 RPM.

*The ACU does not use the TPS, so this is only applicable to Mercury ECUs.

Faulty Fuel Injectors: Either dirty or flooding fuel injectors. Causes rough running, especially at idle. Fuel injectors should be removed and cleaned individually. www.Brucato.com

Leaking O-Rings: Check O-Rings inside of Laser Injection Air-box.

Float Valve: Leaking float valve or improperly adjusted float in the VST (Vapor Separator Tank). This could cause excess fuel to dump into the Air-Box through the VST overflow.

Leaking Diaphragm Low Pressure Pump: A leak can cause fuel leaking directly into the crankcase.

Faulty Air Temperature Sensor: Will cause hard starting and rough idle. Air temp sensor should be checked with an Ohm Meter with a Cold Start Ignition Test.

*ACU and PCU only.

Incorrect fuel pressure: Can be caused by a bad fuel pressure regulator, or restricted return. On Laser EFI motors, look under the Fuel Pressure Regulator. There is a screen in the return port of the VST that could become clogged and causes an increase of pressure. Check that the regulator's vacuum reference hose is reducing fuel pressure at idle.

MAP Sensor Hose or Fitting: Clogged or leaking MAP sensor hose or fitting. ACU will receive the wrong manifold pressure value.

*Stock Laser Injected Mercury motors use a TPS value up to about 3000 RPM, so may be less affected, depending on severity of the problem.

Broken or Chipped Reeds: Will cause erratic engine vacuum, particularly at idle.

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Faulty Rectifier: Will cause unstable voltage (AC ripple) in the 12-volt charging.

Causes problems with the ACU processing. This can be tested by temporarily disconnecting and insulating the charging system, then idling the engine. If the problem goes away, then there is a charging system issue. Usually a bad rectifier, sometimes a bad stator.



Faulty Idle Bleed Recirculation System: Usually, a clogged or stuck check valve, or clogged or leaking hose. Will cause rough running, especially at idle.

Fouled, or improperly gapped Spark Plugs: Causes misfiring at low RPM, where the Ignition strength is at its weakest = Rough Idle. Be sure to gap spark plugs at no more than .035" (35 thousandths of an inch).

Weak or faulty Ignition System: = Rough Idle. Can be tested on the motor with a Spark Gap Tester. Remove all spark plugs and DISCONNECT THE ECU/ACU.

With the spark gap tester connected to each of the spark plug leads, set the Spark Gap Tester to 7/ 16" (11mm). At cranking speed, each coil should be able to produce a strong blue spark across the gap on every revolution.

At this time, take note that each cylinder is firing in correct sequence, and that there is no double firing.

Incorrect Ignition Timing: Check that the Ignition Timing is set to factory specifications. Please note that there are specifications for both Wide Open Throttle, and Idle. Most of the Laser Injected motors have one or more modules that alter the Ignition Timing (Idle Stabilizer, Detonation Module, Shift Interrupt Module). It is not uncommon for these modules to malfunction. There is no reliable bench test for these modules.

ALWAYS verify TDC (Top Dead Center), before setting your Ignition timing!

It's not in the service manual, but highly recommended, that you index your flywheel for all six cylinders, and use the timing light on EVERY cylinder to verify that each is getting the correct timing. A variation of one or two degrees is fairly common. We have seen some engines with variation of more than 4 degrees, though. On a recreational boat, more than two degrees must be addressed.

For High Performance applications, closer tolerances are recommended.

Always set your Ignition Timing with the most advanced cylinder in mind.

Faulty ECU or ACU: Can be tested on our bench tester. Look for incorrect fuel curve for application, or a corrupt fuel curve. Look for clogged or pinched MAP sensor hose. Look for incorrect potentiometer settings.

Tip for diagnosis: let the engine idle rough for a while. Without revving it, shut the motor. Remove all six spark plugs, keeping them in order, 1-6. (looking at the back of the motor, the left bank is numbered top to bottom 1-3-5, the right bank is numbered 2-4-6.)

Inspect and compare the plugs to each other. Do they all look similar?
Are only some of them wet or dry?

Make note of any pattern. If only one complete bank (either 1-3-5, or 2-4-6) is affected, then it is likely an Ignition related issue. A bad Switchbox or Stator would be the top suspects.

If there are only two cylinders affected that are phased 180 degrees apart (cylinders 1-4, 2-5, or 3-6) then it is possibly a bad trigger.

If it is only two cylinders that are paired together as 1-2, 3-4, or 5-6, then it could be a bad ECU, a bad Coil, a bad Switchbox, a bad harness.



If all six sparkplugs look the same, it could be almost anything on the above list, but fuel pressure, RFI, Bad Air Temperature Sensor, weak Ignition System, or incorrect Ignition timing, top the list of suspects.

If it is one individual cylinder that is affected, it could be a bad Spark Plug, Spark Plug Wire, Coil, Fuel Injector, Reed, or mechanical problem on that motor.

Recommended Troubleshooting procedure:

For your engine to operate, it needs Compression, Fuel, and Spark.
In order, this is how I would initially check a motor with idle problems
(most other issues as well)

Compression Test: Check all six cylinders for compression at cranking speed.
They should be within 10% of each other. Higher than that, I would visually inspect the cylinders.

Ignition Test: Pull all six plugs, keeping them in order. Inspect for pattern as outlined, above.
Using a dial indicator, verify the pointer location for the flywheel. Mark the WOT Ignition timing on the flywheel. Do this on every cylinder and number each mark on the flywheel for the cylinder. A silver sharpie works good for this.

Connect Spark Gap Tester, setting the gap to 7/16". Disconnect ECU.
At cranking speed, you should see a strong blue spark at every cylinder.
Also, note that the sparks appear in sequence, without any double firing.
Anything less indicates a faulty ignition system.

Starting at the #1 Cylinder, check WOT Ignition Timing and Idle Timing, per the Service Manual. Repeat for cylinders 2-6.
Take note that the timing light is firing on only the correct cylinder.

Fuel Test: Check for proper fuel pressure at the fuel rail per service manual.
On Laser EFI motors check that the low-pressure pump is pumping to the VST.
Ohm Test the Air Temperature Sensor.
Test and adjust the TPS (not needed with the ACU).
Inspect the MAP sensor hose for kinks, tears, clogs, or trapped fluid.
Inspect MAP sensor fitting on the Plenum by attaching a length of hose to it.
You should be able to blow through it freely.
Disconnect the 16 pin Cannon Plug from the ECU, look for corrosion or bent/broken pins.
Verify that the ECU enrichment wire from the ECU harness is connected properly.