

Spitronics - Testing Magnetic Crank Sensors - Guide

1. Overview

This document helps diagnose problems with **magnetic crank trigger sensors**.

👉 Work through each step in order.

2. Function / Concept

A magnetic crank sensor generates an **AC voltage signal** when the trigger wheel passes the sensor.

ECU requires:

- Clean signal
- Stable RPM
- Minimum $\pm 1V$ peak-to-peak

If signal is:

- Weak → No RPM
 - Noisy → Erratic RPM
 - Missing → No start
-

3. Setup / Configuration

Before testing, ensure:

3.1 Basic ECU Setup

- Startup procedure completed
 - Only **P1** connector is connected
 - All other connectors disconnected
 - Comms cable connected
 - ECU connected to software
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3.2 Firmware

- Correct firmware for trigger pattern loaded
 - Verify via **Device Information** menu on the software tree
-

3.3 Jumper Settings

- Set for **magnetic sensor**
- Callisto:
 - 5V position
 - 2-pin jumper **OPEN**

- Mercury3:
 - 2-pin jumper **OPEN**

⚠ Note: Jumper location may be opposite than other products

3.4 Battery Voltage

Cranking voltage:

- ✓ Good: $\geq 11V$
- ⚠ Weak: $< 10V$
- ✗ Problem: $< 9V$

Low voltage causes:

- Weak sensor signal
- Signal below detection threshold

i See: Power Connection

4. Practical Procedure

4.1 Check for Errors

- Look at error display (bottom of screen)
- Resolve all errors before proceeding

i See: Error Codes

4.2 Check RPM Signal

Crank engine and observe RPM:

- ✓ 100–300 RPM constant → OK
- ✗ No RPM → No signal
- ⚠ Erratic RPM → Do NOT start

Possible causes of erratic RPM:

- Incorrect edge setting
- Wrong firmware
- Electrical interference

4.3 No RPM Condition

If:

- No errors
- No RPM

👉 ECU is not detecting crank signal
Proceed to sensor testing

4.4 Sensor Size vs Trigger Wheel

Ensure correct matching:

- Sensor magnet must be **smaller than tooth gap**
- Oversized sensing area:
 - Weak signal
 - Poor resolution

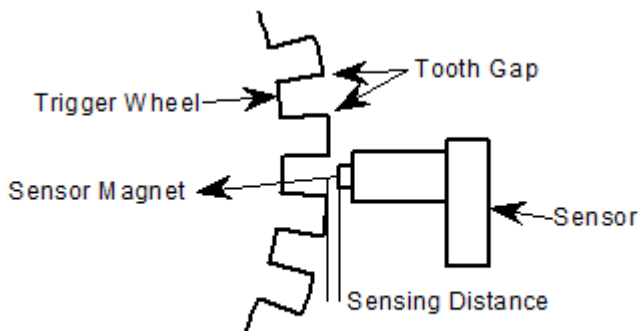
👉 Quick check:

- Use iron filings on sensor tip
- Magnetic field shows sensing diameter

Possible fixes:

- Increase sensing gap (if signal strong enough)
- Use smaller sensor
- Use lower tooth count wheel

5. Sensor Testing

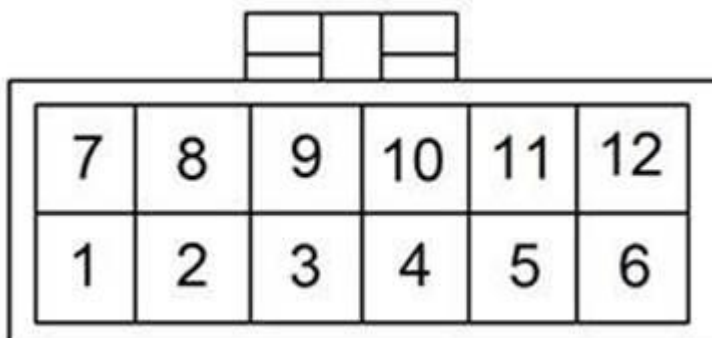


5.1 Ground Check (Test Point A)

- Thick black ECU ground → good earth
- Thin black harness wires → same point

👉 This is **Test Point A**

5.2 Resistance Test



Harness Connector Pin View

- Disconnect P1
- Multimeter → 2000Ω scale

Measure:

- Pin 12 ↔ Pin 6

Expected:

- 300–2000 Ω

Check:

- Same reading both probe directions

If no reading:

- Wiring fault
- Sensor not connected

⚠ Do not damage female pins

5.3 AC Voltage Test

- Set multimeter to AC volts (20V range)
- Measure same pins
- Crank engine

Expected:

- Above 1V peak-to-peak

If low voltage:

- Sensor gap too large
- Dirty sensor
- Weak magnet
- Incorrect sensor for wheel
- Welded tooth gear which may distort magnetism from the sensor

Typical gap:

- < 1 mm
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6. Errors During Starting / Running

If startup tests pass but issues occur:

6.1 Ignition Interference

- Coils generate spikes
- Sensor wiring must be screened

👉 Screen must be grounded at ECU only

6.2 ECU Reset

Symptoms:

- ECU restarts

- Software disconnects briefly

Causes:

- Power supply issue
- Relay wiring problem

6.3 High RPM Errors

Possible causes:

- Buckled trigger wheel
- Unbalanced wheel
- Large sensor gap
- Small tooth pitch
- Sensor magnet too large
- 2-pin jumper incorrectly ON

6.4 Test Signal

- Ensure **test signal is OFF**

6.5 Signal Fade

RPM drops or fades:

Possible causes:

- Sensor gap too small or too large
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6.6 Spark Plug Interference

Incorrect components can cause noise:

- Use:
 - Resistor plugs for COP
 - Non-resistor plugs for HT leads
- Use:
 - Carbon HT leads
 - NOT copper leads

Check in dark:

- Look for arcing

👉 Keep sensor wiring away from HT leads

7. Notes / Warnings

⚠ Weak signal = unreliable RPM

⚠ Erratic RPM = do NOT attempt start

⚠ Incorrect wiring can damage ECU or sensor

8. Reference Links

i More Info:

- [Troubleshooting Guides](#) → [Error Codes](#)
- [Hardware Manuals](#) → [Power Connection](#)
- [Hardware Manuals](#) → [Jumper Settings](#)