Spitronics - ECU - Testing Hall Crank Sensors - Guide

1. Overview

This document helps diagnose problems with **Hall / optical crank trigger sensors**.

👉 Work through each step in order.

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2. Function / Concept

A Hall sensor provides a **digital switching signal**:

- ON/OFF voltage signal (typically 0V ↔ 12V)
- Requires:
  - Power supply
  - Ground
  - Signal output

ECU requires:

- Clean switching signal
- Stable RPM
- Clear voltage transition

If signal is:

- Missing → No RPM
- Weak / partial → No detection
- Noisy → Erratic RPM

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3. Setup / Configuration

Before testing, ensure:

3.1 Basic ECU Setup

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

3.2 Firmware

- Correct firmware for trigger pattern loaded
- Verify via **Device Information** button

3.3 Jumper Settings

- Set for **Hall sensor**

Callisto:

- 12V position
- 2-pin jumper **CLOSED**

Mercury2:

- 2-pin jumper **CLOSED**

⚠ Note: Jumper location may be opposite than other products

3.4 Battery Voltage

- Cranking voltage:
  - ✓ Good: ≥ 11V
  - ⚠ Weak: < 10V
  - ❌ Problem: < 9V

Low voltage causes:

- Weak switching signal
- ECU may not detect transitions

i See: Power Connection

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4. Practical Procedure

4.1 Check for Errors

- Check error display (bottom of screen)
- Resolve all errors first

i See: Error Codes

4.2 Check RPM Signal

Crank engine and observe RPM:

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

Possible causes:

- Incorrect edge setting
- Wrong firmware
- Electrical interference
- Mechanical 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
- Shows sensing diameter

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

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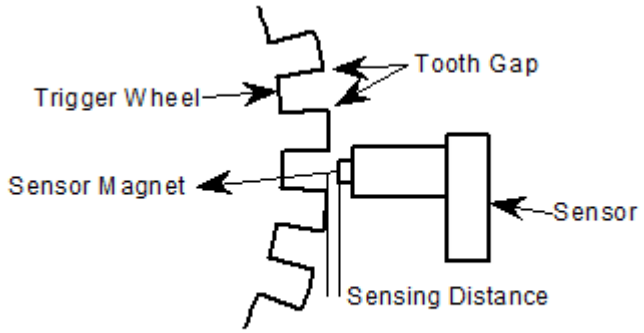
5. Sensor Testing



⚠ Hall sensors require **power to operate**

👉 Cannot be tested like magnetic sensors

5.1 Ground Continuity

- Measure ECU ground → sensor ground
- Expected: **0 ohms**

5.2 Power Supply Continuity

- Measure sensor power → ignition supply
- Expected: close to **0 ohms** (filter components inside ECU)

5.3 Signal Wire Continuity

- Measure sensor signal → ECU input (P1 - Pin 12)
- Disconnect P1 if needed

⚠ Do not damage female pins

5.4 Power Check (Live Test)

- Connect P1
- Switch ignition ON

Measure at sensor:
- Negative ↔ Positive

Expected:
- ~12V DC

5.5 Signal Switching Test

- Measure: sensor signal ↔ negative

Expected:
- ~12V (no target)
- ~0V when metal target present

⚠ Logic may be inverted on some sensors

✓ Only requirement: clear voltage change

If voltage does NOT drop below ~1V:
- ECU will not detect signal

5.6 Pull-up Test

If no signal voltage:
- Check pull-up jumper is **CLOSED**

If still no voltage:
- Disconnect signal wire
- Measure ECU side

Results:
- ✓ 12V present → sensor faulty (shorting signal)
- ❌ No 12V → ECU pull-up not active

5.7 Cranking Signal Test

- Sensor installed
- Measure signal ↔ negative
- Set meter to AC volts
- Crank engine

Expected:
- ~12V AC switching signal

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6. Errors During Starting / Running

6.1 Ignition Interference

- Incorrect signal edge setting, Faling ↔ Rising
- Coils create spikes
- Sensor wiring must be screened

👉 Screen grounded at ECU only

6.2 ECU Reset

Symptoms:
- ECU restarts
- Software disconnects

Causes:
- Power supply issue
- Relay wiring

6.3 High RPM Errors

Possible causes:
- Buckled trigger wheel
- Unbalanced wheel
- Large sensing gap
- Small tooth pitch
- Large sensor sensing area

Additional:
- Sensor may require pull-up resistor
- Sensor may 5V Type → Needs slight modification

👉 Add 1kΩ resistor:
- Signal → Positive

6.4 Test Signal

- Ensure **test signal is OFF**

6.5 Signal Fade

RPM drops or fades:

Possible causes:
- Incorrect sensor gap

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

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7. Notes / Warnings

⚠ Hall sensors require correct power supply
⚠ No switching = no RPM
⚠ Weak switching = unreliable signal

8. Reference Links

ℹ More Info:
- Hardware Manuals → Jumper Settings
- Hardware Manuals → Power Connection
- Troubleshooting Guides → Error Codes