# *Cam Trigger instructions*

**<u>PLEASE READ THESE INSTRUCTIONS CAREFULLY, THIS SENSOR IS VITAL TO YOUR ENGINE RUNNING PROPERLY AND MUST BE WIRED AND CONFIGURED PROPERLY!!</u>**

Follow the Helms manual for instructions on installing the cam gear. It will be installed on the exhaust cam.  Make sure you tighten the cam gear adjustment bolts before starting the vehicle!

You will bolt the sensor bracket to the front of the cylinder head, where the power steering bracket goes.  If you are still using power steering with the cam trigger, the bracket will fit between the power steering bracket and the cylinder head.  You will probably need to get longer bolts if you're doing it this way.  The bolts are M10 x 1.25.

Thread the sensor into the bracket with 1 locking nut, adjust the sensor air gap (distance between the face of the sensor and the face of the magnet) to .040" and tighten the locking nut.

<span style="color:red">**If you are installing this kit with an AEM EMS computer, please follow these wiring instructions.**</span>

**Metripack connector at extension harness side, male**

A: Black - Ground at ECU
B: White - Crank trigger

E: Green - Cam trigger

F: Red - switched 12v at ECU

**Metripack connector at sensor, female**

A: Blue - Ground
B: Yellow - North pole - Crank trigger
E: Green - South pole – Cam trigger
F: Red - switched 12V

### Wiring at ECU for OBD1:

**12v - Red - Pin A25** - splice the red wire from the T1 cam trigger harness here
**Ground - Black - Pin A23** - splice the black wire from the T1 cam trigger harness here. If you're using shielded wire, splice the bare wire from the harness in with the ground wire.
**Cam signal - Green - Pin B11** - cut the wire and hook the Green wire from the cam trigger harness into the ecu side, leaving the engine side of the cut wire disconnected. Tape off the end of the cut wire.
**Crank signal - White - Pin B15** - cut the wire and hook the White wire from the cam trigger harness into the ecu side, leaving the engine side of the cut wire disconnected. Tape off the end of the cut wire.

### Wiring at ECU for OBD2A:

**12v - Red - Pin A11** - splice the red wire from the T1 cam trigger harness here
**Ground - Black - Pin A10** - splice the black wire from the T1 cam trigger harness here. If you're using shielded wire, splice the bare wire from the harness in with the ground wire.
**Cam signal - Green - Pin C4** - cut the wire and hook the Green wire from the cam trigger harness into the ecu side, leaving the engine side of the cut wire disconnected. Tape off the end of the cut wire.
**Crank signal - White - Pin C2** - cut the wire and hook the White wire from the cam trigger harness into the ecu side, leaving the engine side of the cut wire disconnected. Tape off the end of the cut wire.

### Wiring at ECU for OBD2B:

**12v - Red - Pin B1** - splice the red wire from the T1 cam trigger harness here
**Ground - Black - Pin B2** - splice the black wire from the T1 cam trigger harness here. If you're using shielded wire, splice the bare wire from the harness in with the ground wire.
**Cam signal - Green - Pin C29** - cut the wire and hook the Green wire from the cam trigger harness into the ecu side, leaving the engine side of the cut wire disconnected. Tape off the end of the cut wire.
**Crank signal - White - Pin C8** - cut the wire and hook the White wire from the cam trigger harness into the ecu side, leaving the engine side of the cut wire disconnected. Tape off the end of the cut wire.

**ECU**

12v

Ground

X    Cam Signal

X    Crank Signal

Splice red from
cam trigger

Hook green from
cam trigger into
ecu, tape other end

Splice bare wire (shield)
from cam trigger harness

Hook white wire
from cam trigger
into ecu, tape
other end

Splice black from
cam trigger
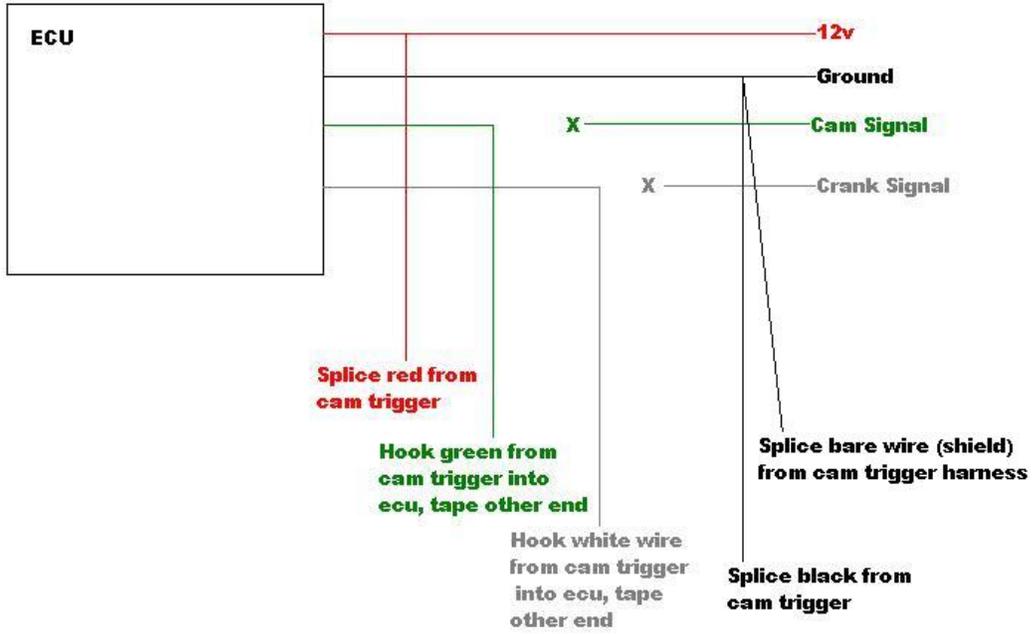
# For installation other than an AEM EMS ecu

The ecu configuration for this sensor setup will depend on which ecu you're using.  This will work with any ecu that can accept a hall signal (square wave) on the trigger inputs.  The "crank" trigger signal will see 6 pulses per engine revolution (12 per cycle, 2 revolutions per engine cycle.  The "cam" trigger signal will only see 1 pulse per engine cycle.  There should also be a setting somewhere in the ecu that will ask you "cam" trigger position relative to TDC.  You'll have to find out exactly what your ecu is looking for, for this parameter, and then measure to get the number in the ballpark.  With a Motec your "crip" will be around 487.  Once you get close, you should be able to get the car running and then sync the timing, which is all this setting is really for.

The wiring is as follows:

Red - power - This power source needs to be picked up directly from the ecu, and must be a switched power source.  The sensor will work on anything from 8-16 volts.  The sensor is basically just taking whatever voltage you put into it and putting the same thing out on the output.  Think of it like a relay, as the output is just a simple on/off signal in a square wave form.  It's best to talk to the manufacturer of the ecu and find out what they recommend for power on these signals.  This is the same with any hall sensor.  Most ECUs work fine with a 12v source.  Motec uses an 8v power source for this.

Blue - ground - again, this needs to be picked up directly from the ecu from a sensor ground.  This is just the ground for the sensor, it's not your input signal to the ecu, but an input to the sensor.

Green - cam position - this is the output from the sensor to the input of the ecu for "cam" position, the single pulse per cycle signal.

Yellow - crank position - this is the output from the sensor to the input of the ecu for "crank" position, the 6 pulses per revolution signal.  This signal is what the ecu derives RPM from.  If you get the crank and cam signals backwards, you'll see around 20 cranking RPM, where when correct you'll see 200-250 cranking RPM.

# *AEM EMS software configuration*

You must make several configuration changes in order for the AEM ECU to recognize the signal properly.

1. Open your AEM calibration file

2. Go to Setup >> Sensors >> Cam/Crank Sensor >> Options Cam/Crank Setup

3. Make the following changes if you're still running a single channel ignition system and the distributor for spark distribution:
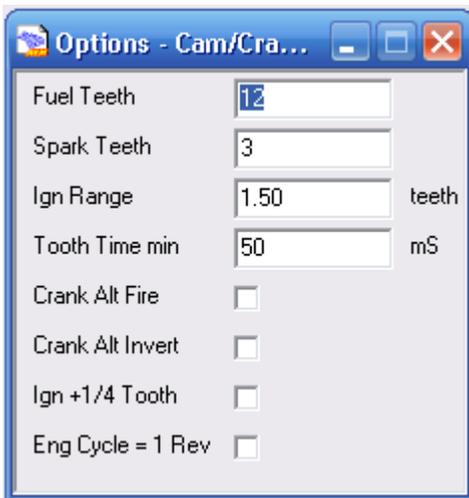


Make the following changes if you're running a 2-channel ignition in a wasted spark configuration:

Make the following changes if you're running a 4-channel ignition setup:

**Options - Cam/Cra...**

| | |
|---|---|
| Fuel Teeth | 12 |
| Spark Teeth | 12 |
| Ign Range | 1.50 teeth |
| Tooth Time min | 50 mS |
| Crank Alt Fire | ☐ |
| Crank Alt Invert | ☐ |
| Ign +1/4 Tooth | ☐ |
| Eng Cycle = 1 Rev | ☐ |

4. Go to Setup >> Cam/Crank Sensor >> Advanced Cam/Crank >> Options – Sync Setup

Make the following changes:

**Options - Sync Se...**

| | |
|---|---|
| Sync Early | ☑ |
| Crank Sync Skip | ☐ |
| Missing | 0 teeth |
| MX Sync Test | 12 tooth |
| MX Time | 0 % |
| Sync Teeth | 1 |
| Sync Err R/S | 11 |
| Sync Ignore | 0 rpm |
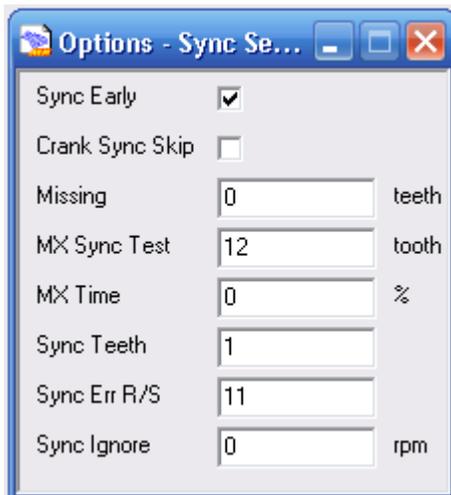
5. Go to Setup >> Sensors >> Cam/Crank Sensor >> Advanced Cam/Crank Setup >> Tooth Control Table

Set tooth control at 5 from position 0 –11, 3 on position 12, and 0 for the remaining table.
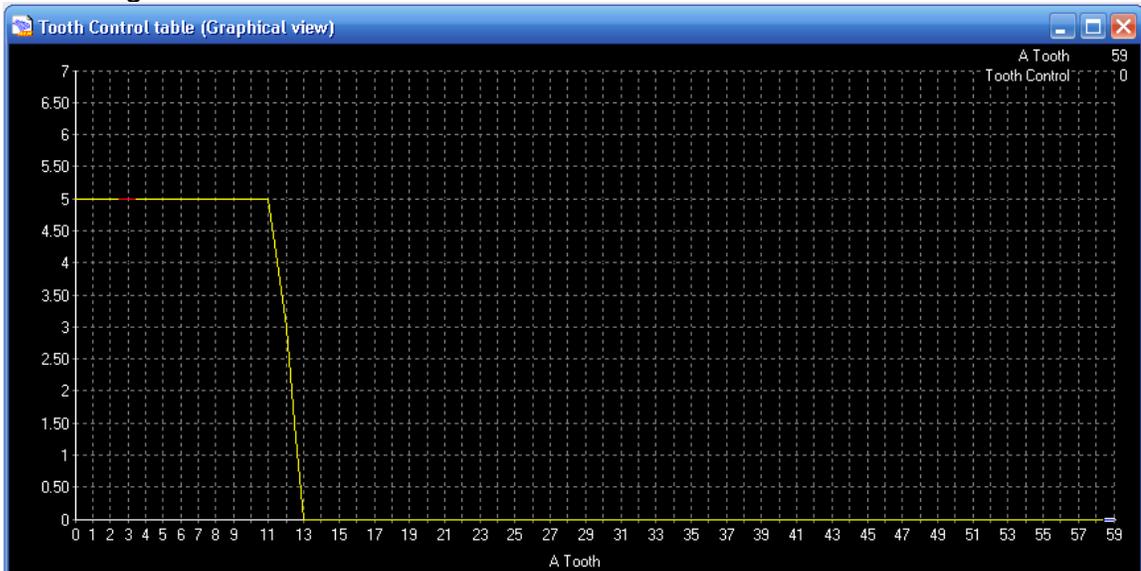


6. Go to Fuel >> Advanced Fuel >> Injector Phasing >> Options – Injection Phasing

Make the following changes:

7. Go to Ignition >> Advanced Ignition >> Ign. Phasing >> Options – Ign. Phasing

Make the following changes:

| Options - Ign Phasing | | |
|---|---|---|
| Ignition Sync | 0.43 | teeth |
| Pickup Delay Comp | 150.00 | uSec |
| Ign Tooth #01 | 6.00 | teeth |
| Ign Tooth #02 | 3.00 | teeth |
| Ign Tooth #03 | 9.00 | teeth |
| Ign Tooth #04 | 0.00 | teeth |
| Ign Tooth #05 | 0.00 | teeth |
| Ign Tooth #06 | 0.00 | teeth |
| Ign Tooth #07 | 0.00 | teeth |
| Ign Tooth #08 | 0.00 | teeth |
| Ign Tooth #09 | 0.00 | teeth |
| Ign Tooth #10 | 0.00 | teeth |

Note: The ignition sync may change when you calibrate the base ignition timing.

8. Now you need to configure the EMS for the ignition type you are using.
9. Go to Ignition >> Advanced Ignition >> Coil Dwell Setup >> Coil Dwell Wizard.  If you have any type of ignition amplifier (MSD, AEM, Crane, M&W, Autronic) then you will need to click the box for "All CDI systems". If you are using the oem ignition setup, with the stock coil and ignitor, you will choose "Honda Internal Coil (92-01)".
10. Go to Ignition >> Advanced Ignition >> Coil Dwell Setup >> Options - Coil Dwell

Make the following changes:
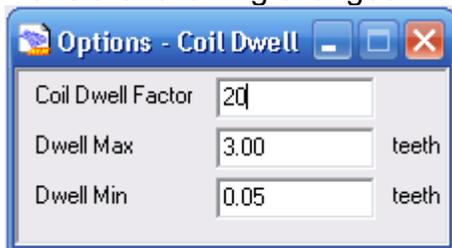
| Options - Coil Dwell | | |
|---|---|---|
| Coil Dwell Factor | 20 | |
| Dwell Max | 3.00 | teeth |
| Dwell Min | 0.05 | teeth |

11. Now you must setup the ECU itself for the new trigger signal.  If you have an older AEM box, models 1000, 1010, or 1020, then some resistors need to be added to the board.  You can send your EMS to AEM or to T1 for these modifications.

    If you have a newer box, models 1040, 1050, or 1060, then there are jumpers inside that must be moved.  If you do not feel comfortable taking the ecu apart yourself, please send the EMS to AEM or T1 for the modification.  Should you decide to do this mod yourself, you will need to remove the board from the housing.  The board is 2 pieces that need to be separated.  Unscrew all the screws holding the boards together and slowly and carefully work the two boards apart.  This part is tricky, go slow and do not bend the boards too far or pull to hard, just work them apart slowly.

    Inside, on the bottom board, find jumpers JPT1 and JPT2.  If you're looking at the board with the harness connector to your left, they will be on the left side of the board, near the harness connector.  There are a total of 4 jumpers there, JPT1, JPT2, JPT3, and JPT4.  Do not move JPT3 or JPT4.

    Assemble everything in the reverse of removal.  Plug in the ecu and upload the calibration you've setup.

    Now you're ready to start the car.  Once running, be sure to re-sync the ignition base timing, this is very important!

    If you are having trouble starting the car, triple check that all the wiring is correct.  Watch the stat sync'd parameter during cranking, if stat sync'd comes on, then everything is working right on the cam trigger.

    If you have any problems, you can log "stat sync'd" "T2Per" and "Crank tooth period" parameters.  These are all that apply to the cam trigger and will easily show if you're missing a signal.

    If you have any other questions, feel free to give us a call, we'll be happy to walk you through the setup and installation. Thanks for your support, and good luck with your project!

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