Variable Reluctance Sensors

This type of crank position sensor is the most common type employed in automotive engine control applications and usually consists of a toothed wheel that passes across the face of the sensor. (Do not confuse with "Hall Effect" sensors that normally use a blade type trigger wheel that cuts through a slotted style sensor).
Reluctor sensors generate an alternating voltage that has both positive and negative values that cross through the zero volt line as the teeth pass the sensor. There are two such "zero crossings" for every tooth that passes the sensor, and it is important that the correct one (polarity) is chosen to ensure accurate, stable trigger pulses.
The polarity is easily changed by swapping the two wires connected to the sensor/pickup during the wiring installation of the ECU. In most cases the wiring diagram supplied for any specific application will show wire colours, pin locations or connector pinouts to ensure the polarity is correct.
For some applications however, this information was not available prior to dispatch, so the correct polarity must be determined by the installer. This may be done in a number of ways depending on the type of test equipment available:

NOTE: The reluctor waveform polarities shown / used here are for "conventional" systems, or at least for the most common majority of applications.
There are exceptions to the rule (notably Honda) where the factory ECU's trigger on the positive slope so require special attention. For single pick-ups where both connections of the sensor are available (floating), then normal testing and connection procedures apply. In the case of shared pick-ups (one sensor "shared" between factory ECU and after-market controller) or where multiple sensors share a common connection, then the Link controller must be configured to accept this reverse polarity.
(This may be a user settable option or may require customizing to suit. Consult your local dealer if in doubt)

Determining the Correct Polarity

Distributor mounted sensor/s.

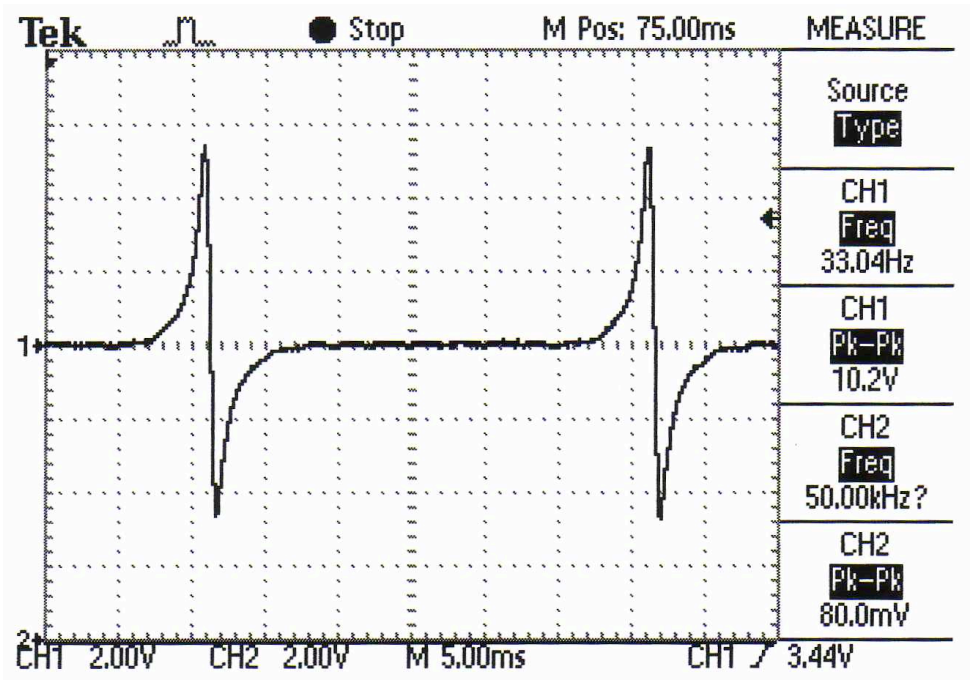
If the distributor uses multiple sensors within the unit then close examination of the wiring to each sensor will probably reveal a wire (connection) common to all sensors. (It may require the use of an ohm-meter to confirm the connection). This common wire should be connected to the Link screened cable braid / screen, and the other side of the sensor/s to the appropriate remaining signal wires of the screened cable.

Oscilloscope testing.

This method requires an oscilloscope (or "tunescope" with an external probe) and the ability to be able rotate the engine / distributor either manually or via the starter motor. Connect the 'scope probe to one side of the pickup and the "earth" clip to the other. Crank / rotate the engine and watch the display trace;

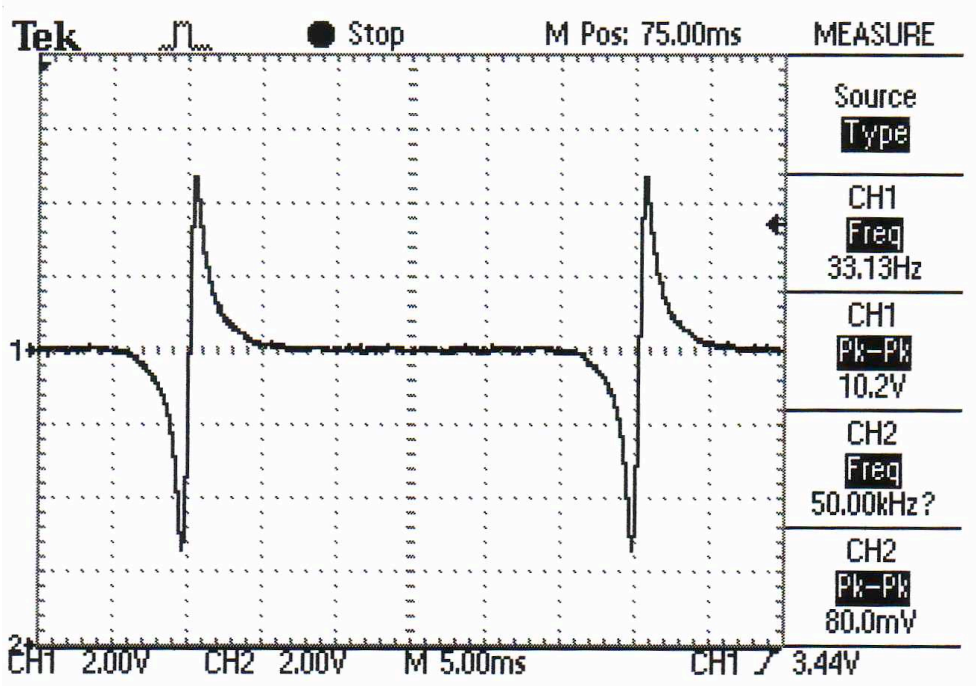
Correct

The waveform rises in a positive direction first, then rapidly falls to the negative peak value secondly (crossing the zero volt line on the way).
If this is the case, then connect the 'scope-probe-side of the pickup to the signal wire, and the earth clip side to the screened cable braid/screen.



Incorrect

The waveform falls in a negative direction first, then up through zero volts in the positive direction secondly.
In this case, connect the 'scope-probe-side of the pickup to the screened cable braid/screen, and the earth clip side to the signal wire.
NOTE: This is "normal" for Honda engines.



LED test light method.

This test requires the use of a commonly available LED test light (filament bulb types not suitable). It will be assumed for this exercise that the POSITIVE LEAD of the light is RED, and the NEGATIVE lead is BLACK. (Test across a battery first to confirm which is positive and negative.

1. If possible remove the pick-up from the engine/distributor, although the test can be done in-situ if access is OK.
2. Connect the LED tester to the two pick-up wires, and look directly into the end of the LED. The amount of light produced is quite small so do this under subdued lighting.
3. Bring a piece of iron/steel (rulers are good) RAPIDLY toward the pick-up. If the LED flashes then connect the pick-up wire connected to the RED test lead to the SIGNAL wire of the screened cable.
4. If the LED flashes as the piece of steel is RAPIDLY moved AWAY from the pick-up then connect the pick-up wire connected to the BLACK test lead to the signal wire of the screened cable.

Timing light method.

This method requires that the pick-up and trigger “wheel” are visible while the engine is being cranked, or at least part of the trigger wheel or front pulley onto which some white marks have been (temporarily) placed. Also, the control system needs to be fully wired and functional at least for ignition purposes anyway. (The fuel system need not be functional for this test).

1. If the pick-up is not visible while cranking then (manually) align a trigger tooth* exactly into the center of the pickup and make two aligned white lines on the front pulley/flywheel where they may be seen.

2. Fully wire the system including igniter and coil assemblies. The HT lead from the coil (or at least 1 coil of a multi-coil system) should be terminated with a spark plug or similar, and the clamp probe of a regular timing light placed around this HT lead in the normal manner. (“Dial-back” timing lights are NOT recommended)

3. Crank engine and point timing light at pick-up or temporary marks. The light should flash EXACTLY as the tooth crosses the center of the pick-up face. If not, reverse the polarity and re-test. (Incorrect polarities will flash in somewhere in the space between teeth).

   * some high tooth count “wheels” only trigger on multiples of teeth. It may be necessary to figure out which is an “active” tooth when making external marks.