

CAS, The Cam Angle Sensor for a 1994 miata

The CAS unit sits on the back of your motor and is spun by one of the camshafts, . Its job is to signal the position of the pistons in the motor.

Looks likeMazda buys them from Mitsubishi, as there was a Mitsu logo on this one.

The CAS is not the same on the 90-93 1.6 miata and the 94-97 1.8 miata. They are located in different positions on the two engines.



90-93 Miata -left side of valve cover

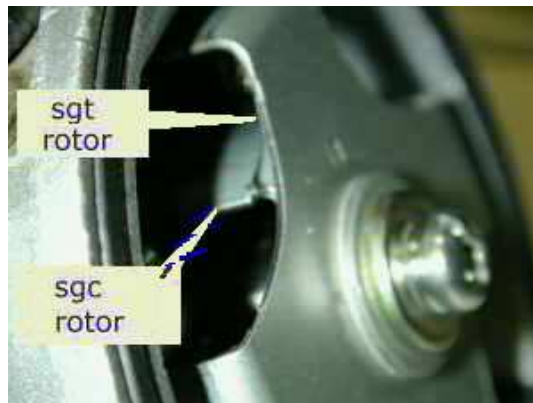
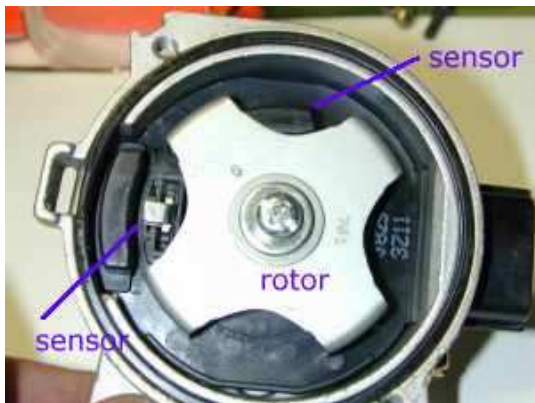


94-97 Miata - right side of valve cover



I have not verified for myself that the CAS units between the two engines can be interchanged. Electrically, I believe they will work, but the shape of the CAS body differs. Some people say they have mixed them successfully.

The two different CAS do have a different internal construction. The 94-97 models use magnetic sensors. The 90-93 model uses an optical sensor. Here is a breakdown of the magnetic sensor design.



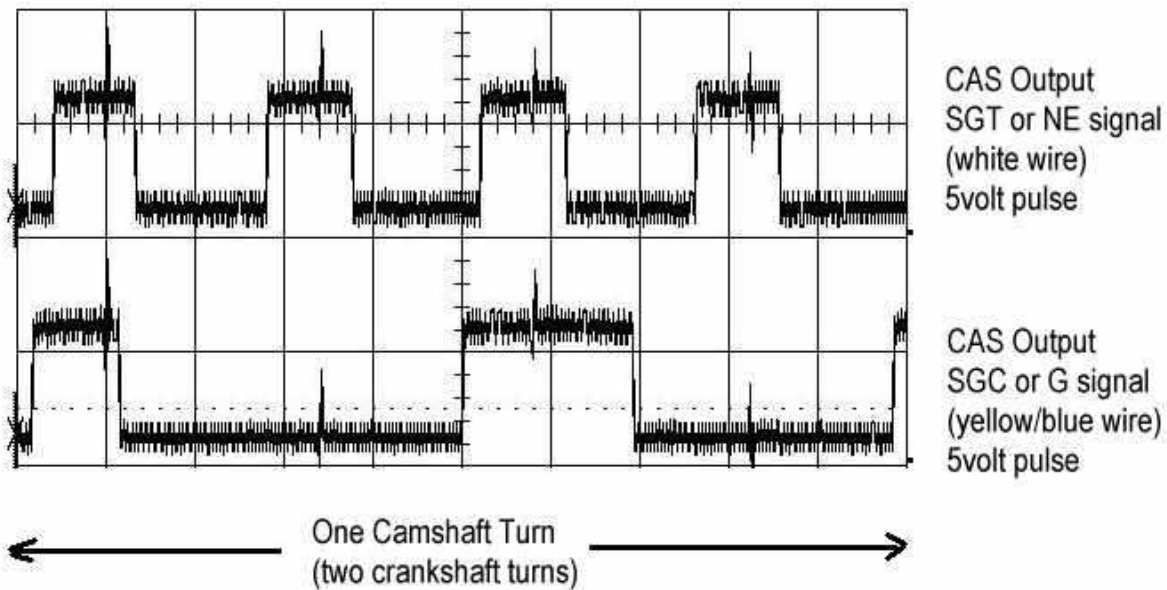
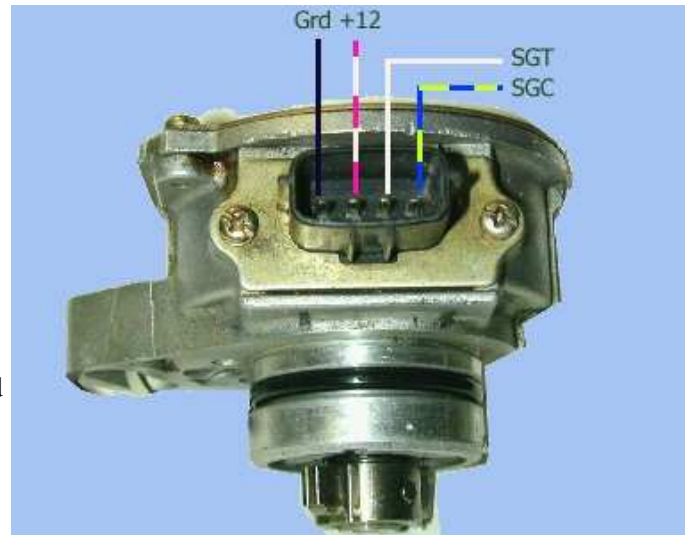
Inside the 1994 CAS are two Hall effect magnetic sensors. The rotor breaks the magnetic field as it swings past each sensor and causes the CAS to send a pulse.

The outer rotor has four arms. There is a second rotor underneath it with two arms. The two arms on that rotor are of unequal lengths and will cause the CAS to send unequal length pulses.

What the CAS does

The CAS has four wires. Two are for +12 power and ground. The other two are the output signals read by the engine computer.

The signals are called SGC and SGT on the 1.8 engine. They are called NE and G signals on the 1.6 engine. The computer can decode the position of the engine camshaft and the engine speed from these two signals. With this information, it calculates when to send spark to the spark plugs and fuel to the fuel injectors.



Here are the pulses taken with a digital storage oscilloscope with motor idling. The oscilloscope settings were 5 volts and 5 msec. The above trace represents one revolution of the CAS, which is two revolutions of the motor. You can see the two unequal pulses from the SGC. The engine computer uses the unequal length of SGC to tell when the cylinder #1 of the motor is at top dead center (TDC). This happens when the #1 piston is at the top of the compression stroke. The SGT pulses are all the same. The computer knows it is time to fire a spark plug when an SGT pulse occurs.

By the way, I believe the computer looks for the longer pulse on the SGC signal to tell when the engine is at TDC.

The miata engine computer will return error codes if it detects a problem with the CAS signals.

1.8 miata (94-95)	1.6 miata (90-93)	Color of Wire on connector
Code 03 (no SGT signal)	Code 02 (no NE signal)	white
Code 04 (no SGC signal)	Code 03 (no G signal)	yellow/blue

In my opinion, the best way to test the CAS is to hook an engine scope up to a running engine and look at the pulses. If the engine is running, the CAS is working. If the SGT pulse were missing, the engine will not start or run. I have disconnected the SGT signal and verified this. If the SGC signal were missing, the engine would not run either.

By the way, my empirical results are when I disconnected the SGT signal, I got a code 04, not an 03. And when I completely disconnected the CAS, I only got an 04. Data taken 10-31-2002

One comment. It is not unusual for one of the wires in the CAS plug to break. I have seen this happen on a friends car where the yellow/blue wire broke. The car did not start of course, nut when checking for spark, one coil did fire. I can't recall which one.

[More on CAS testing](#)

Disclaimer: Not a certified auto mechanic. Not a Mazda technician. The information on this page is my own interpretation and may be flat-ass wrong. Use at your own discretion.