

SAMPLES PER SECOND

Samples per second is also called 'sample rate' and 'frequency in Hertz'. There are certain rules around this in engineering but what does "samples per second" actually mean for you in the automotive workshop?

Some signals are slow (e.g. temperature sensor) and some are fast (e.g. CANBUS signals). Each variation of the voltage (the signal) is being measured and processed into a response by the ECU in the vehicle.

You as a diagnostic technician, need to see all the variations so you can understand why the ECU responds in a certain manner.

A slow sample rate used on for example a crank shaft sensor will result in missed pulses (teeth) or uneven width pulses (teeth) where there are perfectly evenly constructed teeth.

Slow sample rate

The uneven signals as a result of a slow sample rate cannot be used for, for example RPM mathematics, to find misfires.

CANBUS signals are uneven pulses, when measured with a too slow sample rate, the CAN analyser can not decipher the codes which are being transmitted, nor can faults be found in the system.

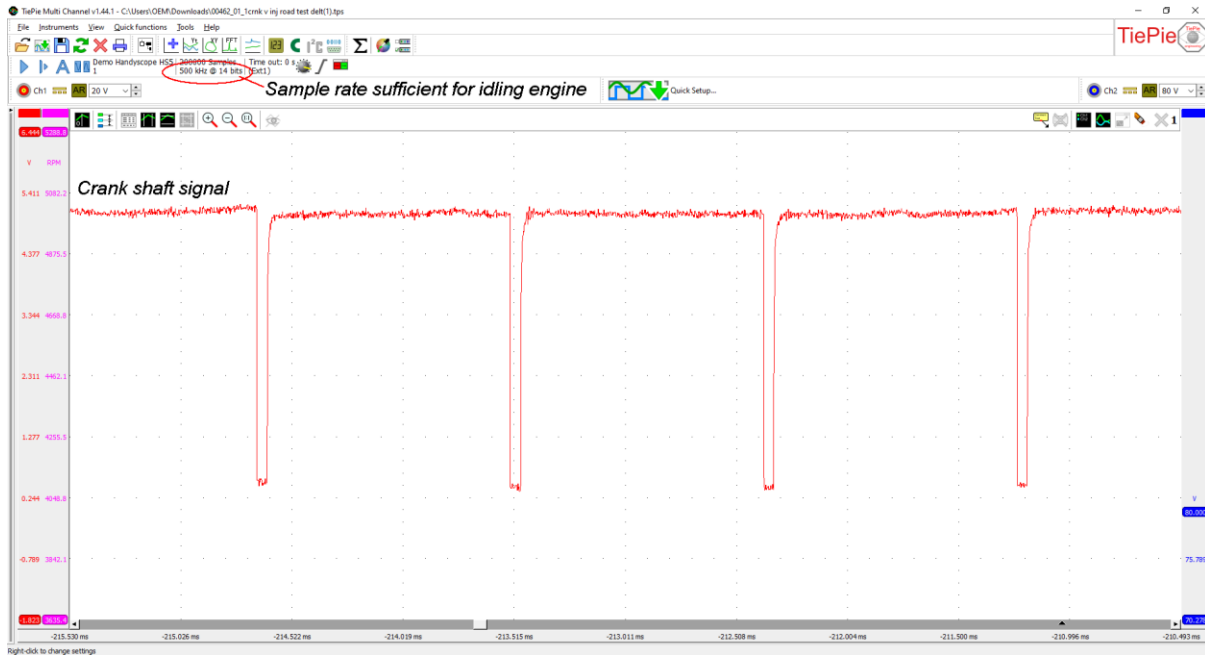
High sample rate

To run always at maximum speed (sample rate) of the scope generates huge files and will make it almost impossible to transfer the files to other users or technical support over the internet. Also any laptop or PC will be strained to its maximum creating crashes if too many other processes are being run in the background of the scope.

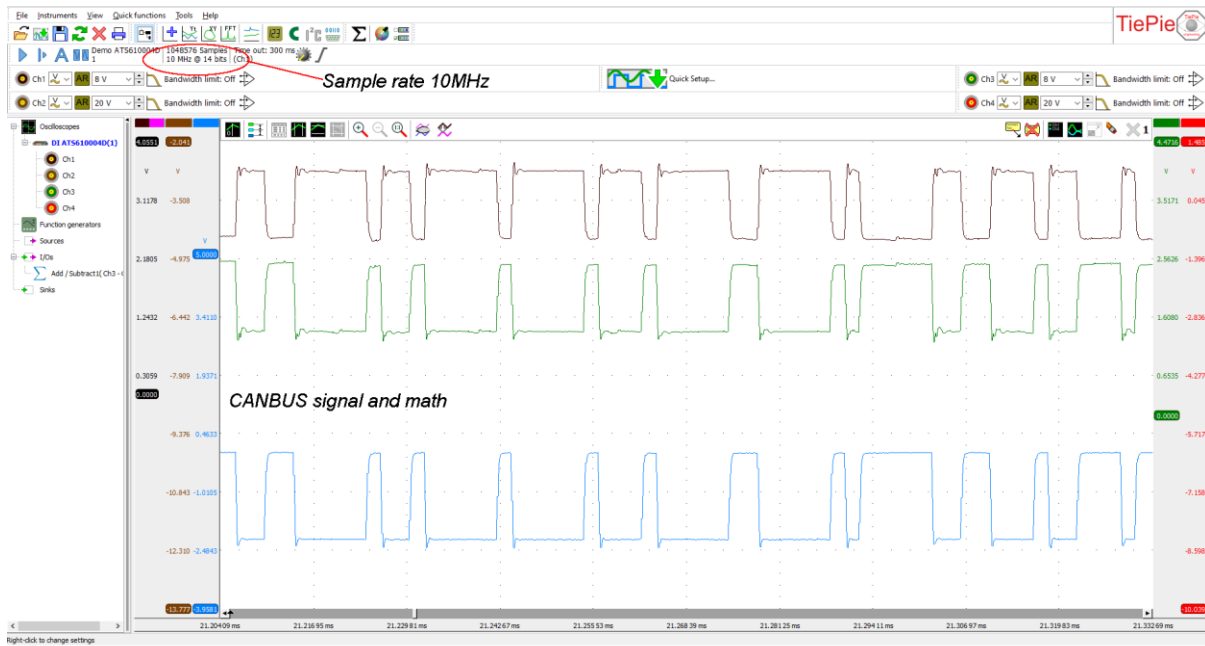
When measuring one channel for example the ATS6004XM-1000, 1000MHz scope measures 1Million times per second, however the processor will drop to 500million times per second when 2 channels are being used, and down to 200million samples when 4 channels are being used.



Sample rate set too slow (20kHz) for this crankshaft signal on this idling engine. Some pulses are samples only once, and some are not fully measured. At higher revs the problem only gets worse.



Same crankshaft signal, but sampled fast enough for an idling engine at 500kHz.



CANBUS recording at sufficient speed for this speed CAN network.