



# ITU G.723.1 Speech Coder



## Processor

Motorola StarCore™ MSC8101 DSP.

## Background

**SIGNALS+SOFTWARE** are developing a complete suite of communication software for the Motorola MSC8100 family of DSPs. The initial development platform, the MSC8101, utilizes the StarCore™ 140 four ALU (Algorithmic Logic Unit) DSP core. This device also has 512kb memory and a Communications Processor Module (CPM) making it a versatile device for communication applications.

The algorithm implemented is the ITU-T recommendation G.723.1 dual rate speech coder for internet and multimedia communications. The encoder compresses linear narrowband speech input data, at a sample rate of 8kHz, to data rates of 5 300 or 6 400 bps. The encoder includes an optional High Pass Filter and the decoder includes an optional Post Filter.

The G.723.1 algorithm implements silence compression techniques to reduce the transmitted bit rate during the silent intervals of speech. Voice Activity Detection (VAD) and Comfort Noise Generation (CNG) algorithms are used to enable the transmission of Silence Descriptor (SID) frames during the periods of silence. This provides the additional advantage of using lower processing loads and DSP bandwidth resource during silence intervals.

## Features and Performance

- Passes all ITU-T test vectors
- Please see Table 2 containing predicted figures for G.723.1 following further optimisation.

G.723.1	Program Memory (Kbytes)	Tables (Kbytes)	Stack (Kbytes)	Data Memory (Kbytes)	Processing Load (MHz)
Encoder	34.7	18.9	3.2	n * 1.6	n * 8.3
Decoder	19.7	18.0	1.7	n * 0.5	n * 2.5
Encoder + Decoder	42.8	19.0	3.2	n * 2.2	n * 10.8

**Table 1 : Current DSP Requirements for G.723.1**

G.723.1	Program Memory (Kbytes)	Tables (Kbytes)	Stack (Kbytes)	Data Memory (Kbytes)	Processing Load (MHz)
Encoder + Decoder	40	19	3.5	n * 2.2	n * 9.5

**Table 2 : Predicted DSP Requirements for G.723.1**

**Note:** Processing loads quote worst-case scenarios and n represents the number of channels. Program memory table values are initialisation values. Kbytes equal 1024 bytes.

## Technical Notes

The G.723.1 specification encodes speech and audio signals using linear predictive analysis-by-synthesis coding. The higher 6 400 bps data rate requires the use of a Multiple Maximum Likelihood Quantisation (MP-MLQ) excitation signal. The lower 5 300 bps data rate uses Conjugate-Structure Algebraic-Code-Excited Linear Prediction (CS-ACELP).

### Interface Details

For convenience the individual software functions are supplied as a single library module. The library contains all the object code that is required to link in to a user's top-level application code. The audio functions are either callable as C functions or as assembly functions.

### Availability

Code is available now, for a one-off payment and/or royalties depending on the commercial application.

Also available for StarCore™ are a full range of vocoders including G.711, G.722, G.726, G.728, G.729, G.729A, G.729B, G.729AB and other communication algorithms.

### SIGNALS+SOFTWARE

**SIGNALS+SOFTWARE** was founded in 1992 as a developer of high quality Digital Signal Processing application software for the communications industry. Supplying to a whole range of customers, including large blue chip corporations, **SIGNALS+SOFTWARE** has quickly established itself as the world leader in DSP software design and production.

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