



## ITU G.729/G.729+B Speech Coder

**SIGNALS+SOFTWARE**



### 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 algorithms implemented are the ITU-T recommendations G.729 and G.729 Annex B fixed rate speech coders for internet and multimedia communications. The encoder G.729 compresses linear narrowband speech data at a sample rate of 8kHz to a data rate of 8 000 bps.

G.729 Annex B comprises of G.729 with the additional option of Annex B. Annex B 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 3 containing predicted figures for G.729+B following further optimisation.

| G.729             | Program Memory (Kbytes) | Tables (Kbytes) | Stack Memory (Kbytes) | Static Memory (Kbytes) | Processing Load (MHz) |
|-------------------|-------------------------|-----------------|-----------------------|------------------------|-----------------------|
| Encoder           | 58.3                    | 1.3             | 4.9                   | n * 1.8                | n * 13.5              |
| Decoder           | 27.9                    | 0.3             | 4.9                   | n * 2.0                | n * 3.8               |
| Encoder + Decoder | 72.3                    | 4.4             | 4.9                   | n * 3.8                | n * 17.3              |

**Table 1 : Current DSP Requirements for G.729**

| G.729+B           | Program Memory (Kbytes) | Tables (Kbytes) | Stack Memory (Kbytes) | Static Memory (Kbytes) | Processing Load (MHz) |
|-------------------|-------------------------|-----------------|-----------------------|------------------------|-----------------------|
| Encoder           | 58.3                    | 1.5             | 4.9                   | n * 2.1                | n * 13.4              |
| Decoder           | 27.9                    | 0.3             | 4.9                   | n * 2.0                | n * 3.7               |
| Encoder + Decoder | 72.3                    | 4.8             | 4.9                   | n * 4.1                | n * 17.1              |

**Table 2 : DSP Current Requirements for G.729+B**

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

| <b>G.729+B</b>    | <b>Program Memory (Kbytes)</b> | <b>Tables (Kbytes)</b> | <b>Stack Memory (Kbytes)</b> | <b>Static Memory (Kbytes)</b> | <b>Processing Load (MHz)</b> |
|-------------------|--------------------------------|------------------------|------------------------------|-------------------------------|------------------------------|
| Encoder + Decoder | 75K                            | 4.8K                   | 4.9K                         | n * 4.1K                      | n * 11                       |

**Table 3 : Predicted DSP Requirements for G.729+B**

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

**Technical Notes**

The ITU-T G.729 uses a linear predictive analysis-by-synthesis coding, Conjugate-Structure Algebraic-Code-Excited Linear Prediction (CS-ACELP). The coder operates on 10ms frames to extract the parameters of the CELP coding model. The decoder uses two filters. One is based on a 10th order Linear Prediction (LP) filter, the other is based on an adaptive-codebook approach. Additional performance enhancement is achieved by use of a Post Filter.

**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 for G.729 and G.729+B 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.723.1, G.726, G.728, G.729A, G.729A+B 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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