



**ITU G.726 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.726 variable rate audio coder. The encoder compresses narrowband audio data in A-law,  $\mu$ -law or linear formats, at a sample rate of 8kHz, to data rates of 16 000, 24 000, 32 000 or 40 000 bps. G.726 supersedes G.721 and G.723, as the G.726 specification at 32 000 and 40 000 bps is identical to G.721 (32 000 bps only) and G.723 (32 000 and 40 000 bps).

G.726 is used in speech compression for speech storage, digital circuit multiplication and telephony multiplexing applications where the delay must be kept low to avoid side tone echo problems.

**Features and Performance**

- Please see Table 2 containing predicted figures for G.726 following further optimisation.

<b>G.726</b>	<b>Program Memory (Kbytes)</b>	<b>Tables (Kbytes)</b>	<b>Stack (Kbytes)</b>	<b>Data Memory (Kbytes)</b>	<b>Processing Load (MHz)</b>
Encoder	3.4	1.3	0.1	n * 0.1	n * 3.8
Decoder	4.4	1.3	0.2	n * 0.1	n * 4.0
Encoder + Decoder	4.9	1.3	0.2	n * 0.1	n * 7.9

**Table 1 : Current DSP Requirements for G.726**

<b>G.726</b>	<b>Program Memory (Kbytes)</b>	<b>Tables (Kbytes)</b>	<b>Stack (Kbytes)</b>	<b>Data Memory (Kbytes)</b>	<b>Processing Load (MHz)</b>
Encoder + Decoder	4.5	1.3	0.2	n * 0.2	n * 7.0

**Table 2 : Predicted DSP Requirements for G.726**

**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.726 specification uses an Adaptive Differential Pulse Code Modulation (ADPCM) algorithm. An important feature is that the coding/decoding delay is essentially zero, as the algorithm processes one sample at a time. The performance at the various bit rates for a single encode/decode is judged to be as follows:

- 40 000 bps** Identical to 64 000 bps PCM (G.711) for audio - passes 9 600 bps modem signals
- 32 000 bps** Identical to 64 000 bps PCM for audio
- 24 000 bps** Some degradation from 64 000 bps PCM for audio
- 16 000 bps** Considerable degradation from 64 000 bps PCM for audio but still intelligible

### 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.723.1, 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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