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# A-law algorithm

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This article includes a [list of references](#), related reading or [external links](#), but its sources remain unclear because it lacks [inline citations](#).

Please [improve](#) this article by introducing more precise citations. *(February 2013)*

An **A-law algorithm** is a standard [companding](#) algorithm, used in [European 8-bit PCM digital communications](#) systems to optimize, *i.e.*, modify, the [dynamic range](#) of an [analog signal](#) for digitizing.

It is similar to the [μ-law algorithm](#) used in [North America](#) and [Japan](#).

For a given input *x*, the equation for A-law encoding is as follows,

$$F(x) = \operatorname{sgn}(x) \begin{cases} \frac{A|x|}{1+\ln(A)}, & |x| < \frac{1}{A} \\ \frac{1+\ln(A|x|)}{1+\ln(A)}, & \frac{1}{A} \leq |x| \leq 1, \end{cases}$$

where *A* is the compression parameter. In Europe, *A* = 87.6<sup>'''</sup>.

A-law expansion is given by the inverse function,

$$F^{-1}(y) = \operatorname{sgn}(y) \begin{cases} \frac{|y|(1+\ln(A))}{A}, & |y| < \frac{1}{1+\ln(A)} \\ \frac{\exp(|y|(1+\ln(A))-1)}{A}, & \frac{1}{1+\ln(A)} \leq |y| < 1. \end{cases}$$

The reason for this encoding is that the wide [dynamic range](#) of [speech](#) does not lend itself well to efficient linear digital encoding. A-law encoding effectively reduces the dynamic range of the signal, thereby increasing the [coding](#) efficiency and resulting in a signal-to-[distortion](#) ratio that is superior to that obtained by linear encoding for a given number of bits.

## Comparison to μ-law [\[edit\]](#)

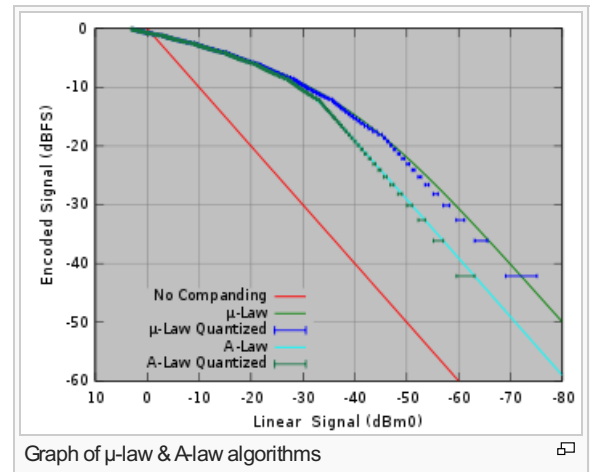
The [μ-law algorithm](#) provides a greater larger dynamic range than the A-law at the cost of worse proportional distortion for small signals. By convention, A-law is used for an international connection if at least one country uses it.



## See also [\[edit\]](#)

- [μ-law algorithm](#)
- [Audio level compression](#)
- [Signal compression](#)
- [Companding](#)
- [G.711](#)
- [DS0](#)

## External links [\[edit\]](#)

- [Waveform Coding Techniques](#) - Has details of implementation (but note that the A-law equation is incorrect)



- [A-Law and  \$\mu\$ -law Companding Implementations Using the TMS320C54x](#)  (PDF)
- [A-law implementation in C-language with example code](#) 

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	Dictionary type	Byte pair encoding · DEFLATE · Lempel–Ziv (LZ77 / LZ78 (LZ1 / LZ2) · LZJB · LZMA · LZO · LZRW · LZS · LZSS · LZW · LZWL · LZX · LZ4 · Statistical)	
	Other types	BWT · CTW · Delta · DMC · MTF · PAQ · PPM · RLE	
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