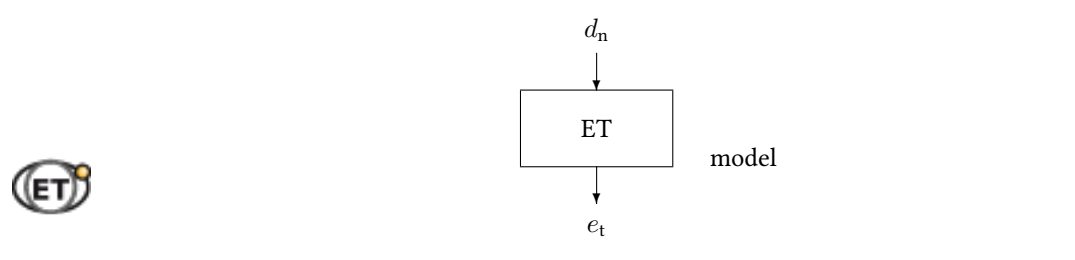


Block ET

The ET block calculates the equation of time.



|            |        |
|------------|--------|
| Name       | ET     |
| Function   | em0003 |
| Inputs     | 1      |
| Outputs    | 1      |
| Parameters | 1      |
| Strings    | 0      |
| Group      | S      |

Inputs

- 1
- Day of the year  $d_n$

Outputs

- 1
- Equation of time  $e_t$  / min

Parameters

- 1
- Approximation
- 0
- Spencer
- 1
- Wagner
- 2
- Duffie Beckman
- 3
- DIN 5034 Teil 2
- 4
- Woolf 1968
- 5
- Lamm 1981

Strings

None

**Description** The equation of time  $e_t$  describes the difference between true solar time  $t_\tau$  and mean solar time  $t_\mu$

$$e_t = t_\tau - t_\mu$$

A relatively simple formula for the equation of time is given by Duffie and Beckman

$$e_t = 9.87 \sin(2B) - 7.53 \cos(B) - 1.5 \sin(B)$$

where

$$B = \frac{360(d_n - 81)}{364}$$

According to Spencer the Fourier series

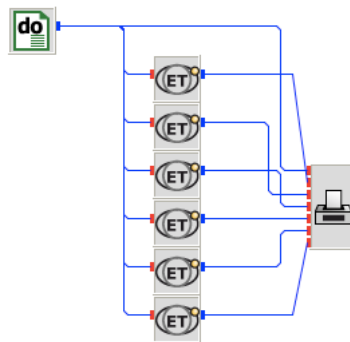
$$e_t = (0.000075 + 0.001868 \cos(d) - 0.032077 \sin(d) - 0.014615 \cos(2d) - 0.04089 \sin(2d))(180 \cdot 4/\pi)$$

yields more precise results.  $d$  denotes the **day angle** defined by

$$d = \frac{2\pi(d_n - 1)}{365}$$

Both formulas are implemented in the **ET** block.

**et.vseit**



A **DO** block provides the days of a year starting from 1 to 365. Six **ET** blocks calculate the equation of time for the different approximations starting with Spencer's Fourier series (upper block) to Lamm's approximation (lower block).

The `PLOT` block shows that the differences are nearly negligible.

