

41.0 DIFFERENTIATOR LAG

This function can be used in AutoMax Control Block tasks and UDC Control Block tasks.



Function

$$\text{LAPLACE TRANSFER FUNCTION} = \frac{s/\omega_lg}{1 + (s/\omega_lg)}$$

Program Statement

```
CALL DIFF_LAG(INPUT=input%,                                &
              WLG=wlg,                                     &
              WM=nnn.n,                                    &
              INITIAL_VALUE=initial_value%,               &
              RESET=reset@ ,                               &
              OUTPUT=output%)
```

Inputs

R (RESET) =

BOOLEAN device reset. The default for this parameter is FALSE. When this parameter is TRUE, OUTPUT will be held at INITIAL_VALUE.

IV (INITIAL_VALUE) =

INTEGER initial value. The default for this parameter is zero.

I (INPUT) =

INTEGER signal input. This parameter must be specified as a variable name only (literal value not accepted).

WLG (ω_lg) =

REAL lag frequency in radians/second. This parameter must be specified. You must include a decimal point in the actual value.

WM (ω_m) =

REAL mapping frequency in radians/second. If specified, this parameter must be entered explicitly as a real literal. The default value for this parameter is ω_s divided by 20 where ω_s is the frequency in rad/sec. You must include a decimal point in the actual value.

Outputs

O (OUTPUT)=

INTEGER signal output. This parameter must be specified.

41.1 DIFF_LAG ω_m Limitations

ω_m is equal to or greater than 0.0013872 divided by TICKS

ω_m is equal to or less than 253.866 divided by TICKS.

$$\begin{aligned}\text{Low Limit} &= \left(\frac{2}{T} \right) \text{ARCTAN} (2^{-18}) \\ &= \left(\frac{2 (2^{-18})}{T} \right) \\ &= \frac{2^{-17}}{T} \\ &= \frac{0.0013872}{\text{TICKS}}\end{aligned}$$

$$\begin{aligned}\text{High Limit} &= \frac{2\pi}{4.5T} \\ &= \frac{253.866}{\text{TICKS}}\end{aligned}$$

where:

T = scan period in seconds

= number of CPU clock ticks times tick rate

2^{-18} = 3.814697266E-06

Refer to section 51.0 Special Coefficient Restrictions, for further restriction notes.

41.2 DIFF_LAG ω lg Limitations

ω lg is equal to or greater than 0.00137573 divided by TICKS. ω lg is equal to or less than 256.055 divided by TICKS.

$$\begin{aligned} \text{Low Limit} &= C(2^{-18}) \\ &= \frac{\omega m(2^{-18})}{\text{TAN}\left(\frac{\omega m * T}{2}\right)} \end{aligned}$$

$$\begin{aligned} \text{High Limit} &= 0.71C \\ &= \frac{0.71\omega m}{\text{TAN}\left(\frac{\omega m * T}{2}\right)} \end{aligned}$$

If ωm is defaulted ($\omega m = \omega s \div 20$):

$$\begin{aligned} \text{Low Limit} &= (2^{-18}) \frac{1.9835}{T} \\ &= \frac{0.00137573}{\text{TICKS}} \end{aligned}$$

$$\begin{aligned} \text{High Limit} &= .071 \left(\frac{1.9835}{T} \right) \\ &= \frac{256.055}{\text{TICKS}} \end{aligned}$$

where:

T = scan period in seconds
= number of CPU clock ticks times tick rate

ωs = scan frequency in radians/second

$$= \frac{2\pi}{T}$$

C = bilinear mapping constant

$$= \frac{\omega m}{\text{TAN}\left(\frac{\omega m * T}{2}\right)}$$

$$2^{-18} = 3.814697266E-06$$

Refer to section 51.0, Special Coefficient Restrictions, for further restriction notes. ■