

46.0 HIGH-PASS FILTER (Nth Order High-Pass Butterworth Filter)

This function can be used in UDC Control Block tasks only. It cannot be used in AutoMax Control Block tasks.



Function

This function provides a high-pass filter to attenuate input frequencies that are below the cutoff frequency in UDC tasks. The order parameter can be used to change the sharpness of the cutoff.

For ORDER=1, LAPLACE TRANSFER FUNCTION = $\frac{s}{s + \omega}$

For ORDER=2, LAPLACE TRANSFER FUNCTION = $\frac{s^2}{s^2 + \sqrt{2} s \omega + \omega^2}$

For ORDER=3, LAPLACE TRANSFER FUNCTION = $\frac{s^3}{s^3 + (2s^2 * \omega) + 2s\omega^2 + \omega^3}$

Program Statement

```
CALL HIGH_PASS_FILTER( INPUT = input%,           &
  WLD = ωld,                                     &
  ORDER = 1, 2, or 3                             &
  INITIAL_VALUE = initial_value%,               &
  RESET = reset@,                                &
  OUTPUT = output% )
```

Inputs

RESET =

BOOLEAN output reset. The default for this parameter is FALSE. This parameter will hold OUTPUT to INITIAL_VALUE when TRUE.

INITIAL_VALUE =

INTEGER initial value. The default for this parameter is zero. When RESET = TRUE, OUTPUT will equal INITIAL_VALUE.

INPUT =

INTEGER signal input. This parameter must be specified. There is no default.

WLD =

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

ORDER =

Order of the filter transfer function. The default for this parameter is 1. If you specify this parameter, it must be a literal value (1, 2, or 3).

Outputs

OUTPUT =

INTEGER signal output. This parameter must be specified.

46.1 HIGH_PASS_FILTER ω ld Limitations

ω ld low limit depends on the order.

ω ld must be equal to or less than 0.999π divided by T.

$$\text{Low Limit} = \begin{array}{ccc} \text{1st Order} & \text{2nd Order} & \text{3rd Order} \\ \frac{0.000004}{T} & \frac{.02}{T} & \frac{.1}{T} \end{array}$$

$$\text{High Limit} = \frac{0.999\pi}{T}$$

where:

T = scan period in seconds

= number of CPU clock ticks times 0.0005 seconds