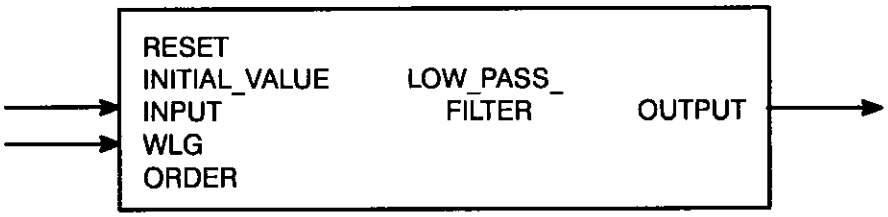
47.0 LOW_PASS_FILTER (Nth Order Low-Pass Butterworth Filter)

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 low-pass filter to attenuate input frequencies that are above 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 = $\frac{\omega}{s + \omega}$

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

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

Program Statement

```
CALL LOW_PASS_FILTER( INPUT = input%,                    &
    WLG = ωlg,                                           &
    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.

WLG =

REAL lag 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.

47.1 LOW_PASS_FILTER ωlg Limitations

ωlg low limit depends upon the order.
ωlg must be equal to or less than 0.999c divided by T.

	1st Order	2nd Order	3rd Order
Low Limit =	$\frac{0.000004}{T}$	$\frac{.02}{T}$	$\frac{.1}{T}$

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

where:

T = scan period in seconds
= number of CPU clock ticks times 0.0005 seconds