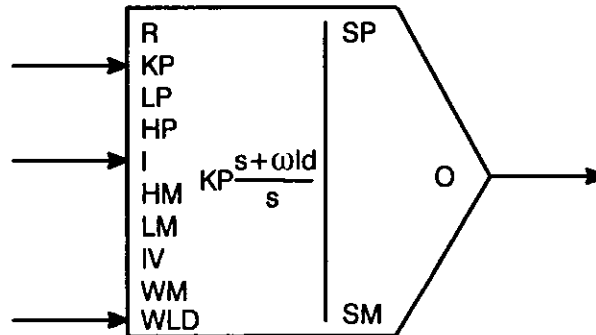


49.0 PROPORTIONAL + INTEGRAL

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



Function

$$\text{LAPLACE TRANSFER FUNCTION} = KP \left(\frac{s + \omega d}{s} \right)$$

Program Statement

```
CALL PROP_INT(INPUT = input%,           &
              KP = Kp,                  &
              WLD = wld,                 &
              WM = nnn.n,               &
              INITIAL_VALUE = initial_value%, &
              LIMIT_PLUS = limit_plus%,  &
              LIMIT_MINUS = limit_minus%, &
              RESET = reset@,           &
              HOLD_PLUS = hold_plus@,    &
              HOLD_MINUS = hold_minus@,  &
              SATURATED_PLUS = saturated_plus@, &
              SATURATED_MINUS = saturated_minus@, &
              OUTPUT = output%)
```

Inputs

R (RESET) =

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

KP (KP) =

REAL proportional gain. This parameter must be specified. You must include a decimal point in the actual value.

LP (LIMIT_PLUS) =

INTEGER integrator upper limit. The default for this parameter is 32767. This parameter will limit OUTPUT from becoming more positive. It will not prevent the output value from becoming more negative.

HP (HOLD_PLUS) =

BOOLEAN integrator hold plus. The default for this parameter is FALSE. When this parameter is TRUE, INTEGRATOR will be prevented from becoming more positive. It will be permitted to go more negative. If KP changes, the output will change even if HOLD_PLUS is TRUE.

I (INPUT) =

INTEGER signal input. This parameter must be specified.

HM (HOLD_MINUS) =

BOOLEAN integrator hold minus. The default for this parameter is FALSE. When this parameter is TRUE, INTEGRATOR will be prevented from becoming more negative. It will be permitted to go more positive. If KP changes, the output will change even if HOLD_MINUS is TRUE.

LM (LIMIT_MINUS) =

INTEGER integrator lower limit. The default for this parameter is -32768. This parameter will limit OUTPUT from becoming more negative. It will not prevent the output value from becoming more positive.

IV (INITIAL_VALUE) =

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

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. You must include a decimal point in the actual value.

WLD (ω_{ld}) =

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

Outputs

SP (SATURATED_PLUS) =

BOOLEAN SATURATED plus output. This parameter is optional. TRUE if OUTPUT% reaches LIMIT(+).

O (OUTPUT) =

INTEGER signal output. This parameter must be specified.

SM (SATURATED_MINUS) =

BOOLEAN saturated minus output. This parameter is optional. TRUE if OUTPUT% reaches LIMIT(-).

49.1 PROP_INT ω_m Limitations

ω_m is equal to or greater than 2^{-17} divided by T. ω_m is equal to or less than $.9\pi$ divided by T.

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

$$\text{High Limit} = \frac{.9\pi}{T}$$

where:

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

Refer to section 51.0, Special Coefficient Restrictions, for further restrictions.

49.2 PROP_INT ω_{ld} Limitations

ω_{ld} is equal to or greater than C times 2^{-18} divided by KP. ω_{ld} is equal to or less than $.9\pi$ divided by T.

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

$$\text{High Limit} = \frac{.9\pi}{T}$$

If ω_m is defaulted ($\omega_m = \omega_s \div 20$):

$$\text{Low Limit} = \left(\frac{2^{-18}}{KP} \right) \left(\frac{1.9835}{T} \right)$$

where:

C = bilinear mapping constant

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

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

T = scan period in seconds

= number of CPU clock ticks times tick rate

ωs = scan frequency in radians/second

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

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

49.3 PROP_INT KP Limitations

KP is equal to or greater than 0.001. KP is equal to or less than 128.0.

Low Limit = .001

High Limit = 128.0

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