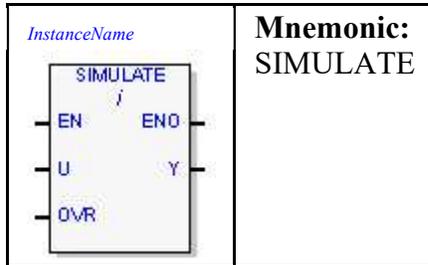


## Simulate (SIMULATE)



Refer to the above diagram:

- InstanceName (FBD only; required): Structure variable. Instance data of a block.

### Notes

- See also Other Languages section in this topic.
- Undo is available when you edit InstanceName.
- We recommend that you use a unique InstanceName for each function block instance.
- *i*: Solve order for a block instance.

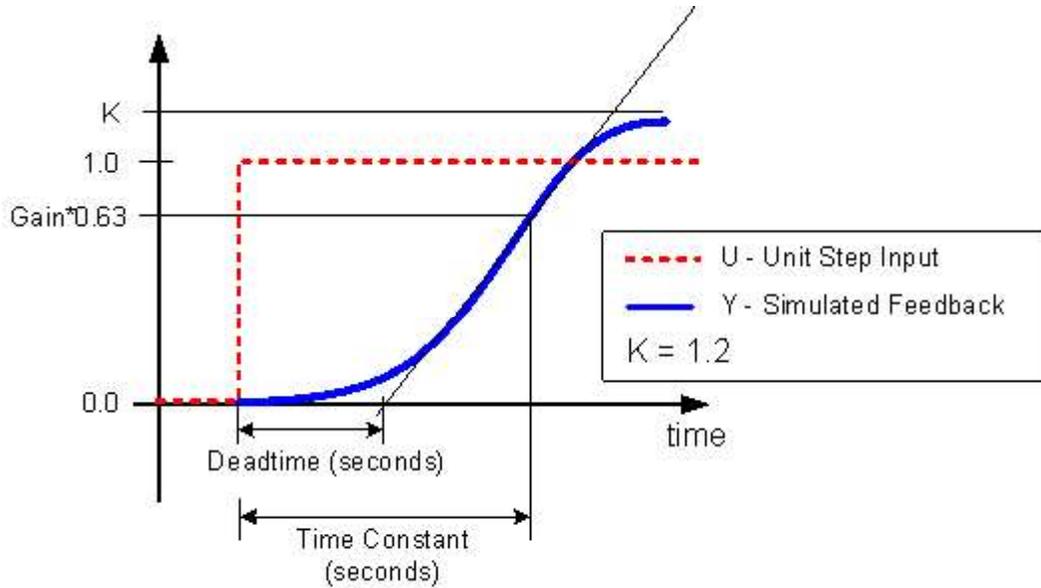
## Overview

A SIMULATE function block enables you to approximate a dynamic process model in order to simulate and analyze control strategies. The SIMULATE block can be configured to approximate a self regulating or integrating first order plus dead time (FOPDT) dynamic model.

## SIMULATE Functionality

### Self Regulating Process Model

The SIMULATE function block can be used to set up a three parameter FOPDT model for a self regulating process. The three parameters that characterize a self regulating process can be determined from the process's transient response to a unit step input.



The SIMULATE function block models a self regulating process with the transfer function:

**Note:** If the formula below does not appear properly, expand the width of the Windows panel.

$$\frac{Y(s)}{U(s)} = \frac{K \cdot e^{-Ts}}{1 + \tau \cdot s}$$

where:

K: Process Gain

T: Deadtime

t: Process Time Constant

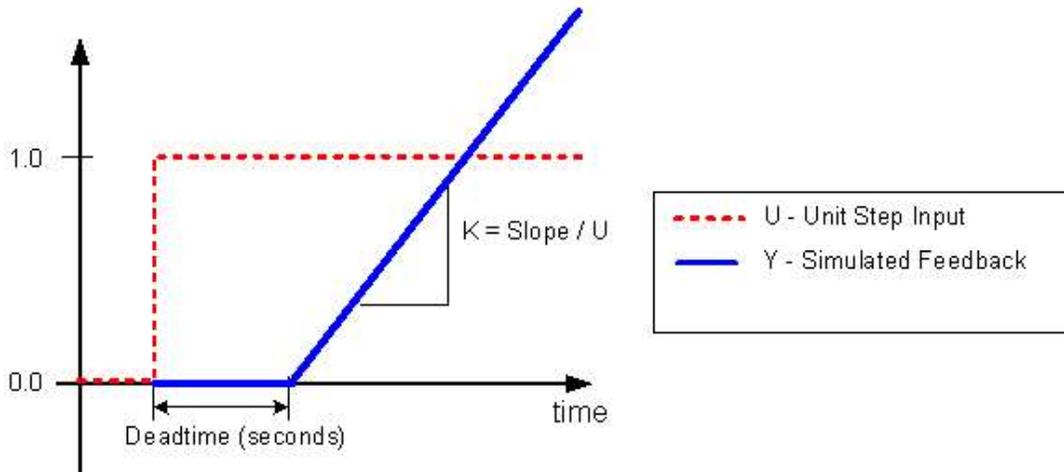
s: Laplace Variable

e: Base of the Natural Logarithm

The three parameters in self regulating transfer function that characterize the process are the Deadtime, Time Constant, and Gain as illustrated in the step response plot.

### Integrating Process Model

The SIMULATE function block can be used to set up a two parameter FOPDT model for an integrating process. An integrating process is one in which an open loop steady state cannot be achieved as shown by the following step response.



The SIMULATE block models an integrating process with the transfer function:

$$\frac{Y(s)}{U(s)} = \frac{K \cdot e^{-Ts}}{s}$$

where:

K: Process Gain

T: Deadtime

s: Laplace Variable

e: Base of the Natural Logarithm

The two parameters in the integrating transfer function that characterize the process are the Deadtime and Gain as illustrated in the step response plot.

### Input Parameters

Input Name	Definition	Data Type	Description
EN	Optional	BOOL variable, bit reference in non-BOOL variable	Enable input. When set to Yes, SIMULATE solves. When set to No, SIMULATE does not solve. When SIMULATE is not solving, the states of the variables within the block, are not changing, so no faceplate commands or time calculations will be performed. When re-activated, the dT will be the difference between enabled solves.
U		REAL variable	Manipulated variable. This is typically output from a PID or ADV_PID block. Default: 0.0.

OVR		BOOL variable, bit reference in non-BOOL variable	When set to On, the output is set equal to the input.
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### Output Parameters

Output Name	Definition	Data Type	Description
ENO (FBD and ST only.)	Optional	BOOL variable, bit reference in non-BOOL variable	ENO is set to Yes if EN is set to Yes.
Y		REAL variable	Simulated feedback signal

### Configuration Parameters

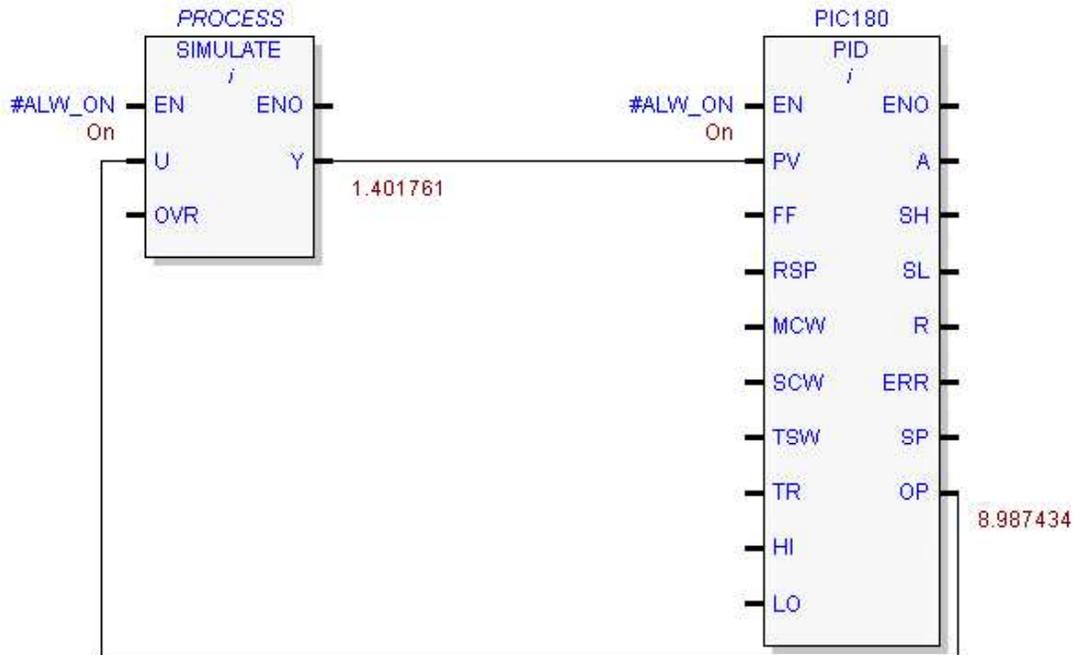
Configuration parameters of a function block instance are configured in the Inspector when selecting the instance variable in the Variables tab of the Navigator.

Values of configuration parameters are stored in the member variables of the function block instance data.

The configuration parameter names in the Inspector and the corresponding member variable names are listed in the table below.

Configuration Parameter	Valid Settings	Data Type	Member Name	Public	Description
FOPDT Model	Self Regulating, Integrating	REAL variables	TYPE	Read / Write	First Order Plus Deadtime Model. Default: Self Regulating.
Process Gain	REAL range		K		Default: 1.0.
Process Deadtime (Seconds)			DEADTIME		Default: 4.0.
Process Time Constant (Seconds)	$\geq 0.0$		TC		Default: 30.0.

Example



Other Languages

SIMULATE can also be used in LD and ST.

LD	ST
	<p style="text-align: center;"><i>InstanceName(U := , OVR := , Y =&gt; );</i></p>

Refer to the above diagram:

- **????** (LD only; required): Structure variable. Instance data of a block.