

Machine Model InfiniteBusSignalGen

This model extends the functionality of an infinite bus model. Of course in power system dynamics an infinite bus is characterized by a fixed voltage magnitude and frequency. This model makes it easy to change both the voltage magnitude and frequency, hence making it easy to see how other models in the system respond to frequency and voltage disturbances. Presently the model has the ability to do either unit step changes, ramp changes, or constant frequency sinusoidal changes. Up to five separate time segments (changes) can be modeled.

The model dialog is shown as follows. It has two general fields (DoRamp and StartTime,Sec) and then five sets of five fields corresponding to each of the time segments. These fields are described below.

Generator Information for Current Case

Bus Number: 2 | Find By Number | Status: ☐ Open ☒ Closed
Bus Name: Bus 2 | Find By Name | Energized: ☐ NO (Offline) ☒ YES (Online)
ID: 1 | Find ...
Area Name: Home (1)
Labels: no labels
Generator MVA Base: 100.00
Fuel Type: Unknown
Unit Type: UN (Unknown)

Power and Voltage Control | Costs | OPF | Faults | Owners, Area, etc. | Custom | Stability

Machine Models | Exciters | Governors | Stabilizers | Other Models | Step-up Transformer | Terminal and State

Insert | Delete | Gen MVA Base: 100.0 | Show Block Diagram
Type: Active - InfiniteBusSignalGe | ☒ Active (only one may be active) | Set to Defaults

Parameters
PU values shown/entered using device base of 100.0 MVA

DoRamp		Speed Freq(Hz) 1		Speed Freq(Hz) 2		Speed Freq(Hz) 3		Speed Freq(Hz) 4		Speed Freq(Hz) 5	
0		0.0000		0.0000		0.0000		0.0000		0.0000	
Start Time, Sec		Duration (Sec) 1		Duration (Sec) 2		Duration (Sec) 3		Duration (Sec) 4		Duration (Sec) 5	
1.0000		1.0000		1.0000		1.0000		1.0000		1.0000	
Volt Delta(PU) 1		Volt Delta(PU) 2		Volt Delta(PU) 3		Volt Delta(PU) 4		Volt Delta(PU) 5		Volt Delta(PU) 6	
0.1000		-0.1000		0.0000		0.0000		0.0000		0.0000	
Volt Freq(Hz) 1		Volt Freq(Hz) 2		Volt Freq(Hz) 3		Volt Freq(Hz) 4		Volt Freq(Hz) 5		Volt Freq(Hz) 6	
0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	
Speed Delta(Hz) 1		Speed Delta(Hz) 2		Speed Delta(Hz) 3		Speed Delta(Hz) 4		Speed Delta(Hz) 5		Speed Delta(Hz) 6	
0.0000		0.0000		0.0000		0.0000		0.0000		0.0000	

OK | Save | Cancel | Help | Print

General Options

- **DoRamp** is an integer option that determines whether the non-sinusoidal changes should be discrete (**DoRamp** = 0) or ramping (**DoRamp** = 1). The default is zero.
- **Start Time, Sec** is the number of seconds before the first event occurs. The default is zero.

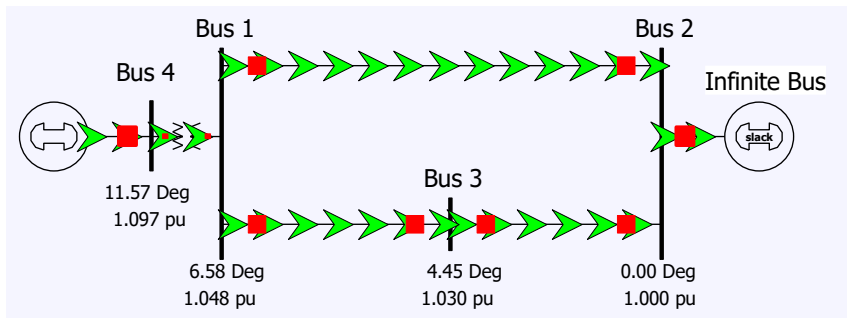
Segment Fields

The next five fields are associated with each time segment.

- **Volt Delta(PU)** : is the per unit magnitude of the voltage change to simulate.
- **Volt Freq(Hz)** : is the frequency of the sinusoidal function to apply to the voltage disturbance. If this value is greater than zero then the voltage disturbance is a sin function with a magnitude of VoltDeltaPU. Set this field to zero when simulating a unit step or ramp disturbance. The default is zero.
- **Speed Delta (Hz)** : is the magnitude of the speed (frequency) change to simulate.
- **Speed Freq(Hz)** : is the frequency of the sinusoidal function to apply to the speed disturbance.
- **Duration (Sec)** : is the duration of the event in seconds. Both the voltage and frequency events have the same duration, with the usual expectation that either one or the other will be applied. If the duration value is negative then this event is ignored. A value of zero indicates the event continues until the end of the simulation (except when a zero is used with a ramp event the ramp is assumed to be a unit step).

These fields are then repeated for the next time segment. Up to five segments can be simulated. The changes are cumulative, so the value assumed at the beginning of the next segment is the value that existed at the end of the previous time segment. The model used is very similar to the PLAYINGEN model.

As an example, consider four bus system shown in upper-left figure on the following page with the generator at bus 2 represented with an **InfiniteBusSignalGen** model. The signal generator is set to run flat for 1 seconds (**Start Time,Sec** = 1), then ramp the voltage up by 0.1 per unit over two seconds, ramp it back down over two seconds, hold flat for one second, then start a 0.1 per unit, 2 Hz oscillation until the end. This input data is shown in bottom-left figure on the next page with the results shown in upper-right. In the results figure the Blue line shows the infinite bus voltage (bus 2), while the red shows the terminal voltage for the other generator (bus 4). The middle-right figure shows a similar test with the generator frequency except the frequency of the change is dropped to 0.5 Hz. Again blue shows the generator 2 value, in this case speed, while red shows the generator 4 speed. When the frequency of the infinite bus speed variation approaches the natural frequency of the bus 4 generator (about 1.8 Hz, calculated through single machine infinite bus analysis), resonance can be seen to occur. This is shown in lower-right figure; note now the input frequency has a magnitude of just 0.1 Hz and the simulation has been extended to twenty seconds.



Generator Information for Current Case

Bus Number: 2
 Bus Name: Bus 2
 ID: 1
 Area Name: Home (1)
 Labels: no labels
 Generator MVA Base: 100.00
 Fuel Type: Unknown
 Unit Type: UN (Unknown)

Status: ☒ Open
☐ Closed
 Energized: ☐ NO (Offline)
☒ YES (Online)

Power and Voltage Control: Costs OFF Faults Owners, Area, etc. Custom Stability

Machine Models: Exciters Governors Stabilizers Other Models Step-up Transformer Terminal and State

Insert Delete Gen MVA Base 100.0 Show Block Diagram

Type: Active - InfiniteBusSignalGe ☒ Active (only one may be active) Set to Defaults

Parameters
 PU values shown/entered using device base of 100.0 MVA

DoRamp	Speed Freq(Hz) 1	Speed Freq(Hz) 2	Speed Freq(Hz) 3	Speed Freq(Hz) 4
1	0.0000	0.0000	0.0000	0.0000

Start Time, Sec	Duration (Sec) 1	Duration (Sec) 2	Duration (Sec) 3	Duration (Sec) 4
1.0000	2.0000	2.0000	1.0000	1.0000

Volt Delta(PU) 1	Volt Delta(PU) 2	Volt Delta(PU) 3	Volt Delta(PU) 4
0.1000	-0.1000	0.0000	0.1000

Volt Freq(Hz) 1	Volt Freq(Hz) 2	Volt Freq(Hz) 3	Volt Freq(Hz) 4
0.0000	0.0000	0.0000	2.0000

Speed Delta(Hz) 1	Speed Delta(Hz) 2	Speed Delta(Hz) 3	Speed Delta(Hz) 4
0.0000	0.0000	0.0000	0.0000

OK Save Cancel Help Print

