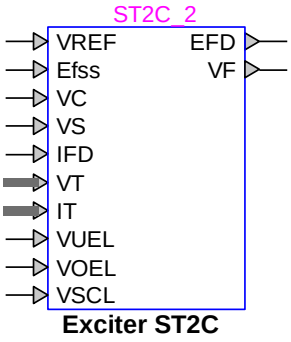
Exciters and Governors: Exciter ST2C



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1 Description

This device is an implementation of an IEEE type ST2C excitation system model. This device is implemented as described in [1]. Implementation details can be viewed by inspecting the subcircuit of this device.

1.1 Pins

This device has 13 pins:

Pin name	Type	Description	Units
VREF	Input	Reference voltage of the stator terminal voltage	pu
Efss	Input	Steady-state field voltage at t = 0, for initialization	pu
VC	Input	Terminal voltage of synchronous machine, transducer output	pu
VS	Input	Power System Stabilizer signal	pu
IFD	Input	Field current	pu
VT	Input, bundle	Terminal voltage (phasor)of synchronous machine (magnitude and voltage)	pu
IT	Input, bundle	Current (phasor)of synchronous machine (magnitude and voltage)	pu
VUEL	Input	Under Excitation Limiter signal	pu
VOEL	Input	Over Excitation Limiter signal	pu
VSCL	Input	Stator Current Limiter signal	pu
EFD	Output	The field voltage signal	pu
VF	Output	The excitation system stabilizer signal	pu

1.2 Parameters

The default set of parameters can be found in [1].

1.2.1 Data tab

The parameters on the Data tab are:

1. **Gain K_{PR}**: Voltage regulator proportional gain
2. **Gain K_{IR}**: Voltage regulator integral gain
3. **Maximum regulator output V_{PImax}**: Maximum regulator output voltage
4. **Minimum regulator output V_{PImin}**: Minimum regulator output voltage
5. **Gain K_A**: Voltage regulator gain
6. **Time constant T_A**: Voltage regulator time constant
7. **Maximum regulator output V_{Rmax}**: Maximum regulator output
8. **Minimum regulator output V_{Rmin}**: Minimum regulator output
9. **Gain K_F**: Rate feedback gain
10. **Time constant T_F**: Rate feedback time constant
11. **Rectifier loading factor K_C**: Rectifier loading factor proportional to commutating reactance
12. **Gain K_P**: Potential circuit (voltage) gain coefficient
13. **Phase angle $Theta_P$**: Potential circuit phase angle (degrees)
14. **Gain K_I**: Compound circuit (current) gain coefficient
15. **Reactance X_L**: Reactance associated with potential source
16. **Maximum exciter voltage V_{Bmax}**: Maximum available exciter voltage
17. **Gain K_E**: Exciter field proportional constant
18. **Time constant T_E**: Exciter field time constant
19. **Maximum generator field voltage E_{FDmax}**: Maximum generator field voltage
20. **Under Excitation Limiter option**: see explanations below.
21. **Over Excitation Limiter option**: see explanations below.
22. **Stator Current Limiter option**: see explanations below.

There are two possible selections for the Under Excitation Limiter option:

1. VUEL not available or added to the reference voltage
2. VUEL connected to the high value gate (HV gate)

There are two possible selections for the Over Excitation Limiter option:

1. VOEL not available or added to the reference voltage
2. VOEL connected to the low value gate (LV gate)

There are three possible selections for the Stator Current Limiter option:

1. VSCL not available or added to the reference voltage: this option can be selected when the VSCL input signal is zero (not connected) or when it is connected and added to the reference voltage.
2. VSCL connected to the high value gate (HV gate).
3. VSCL connected to the low value gate (LV gate).

2 Initial conditions

The reference voltage VREF can be manually or automatically set by connecting or not connecting the input signal VREF, respectively. When VREF is not connected (the signal is zero), the reference voltage is internally found from the steady-state solution. When VREF is connected, its initial value must match the per unit steady-state voltage of the stator terminal voltage, since otherwise the generator voltage will not start at the actual steady-state.

3 References

[1] “IEEE Recommended Practice for Excitation System Models for Power System Models for Power System Stability Studies,” IEEE Standard 421.5-2016.