**Simulink Onramp Documentation**

**Introduction**

Simulink is a graphical programming environment for modelling, simulating, and analysing multidomain dynamical systems. It is widely used in industries such as automotive, aerospace, and control systems engineering for system-level design and simulation.

**Basic Functions**

1. Model Creation:

* To create a new model, open Simulink and click on **File > New > Model**.
* Drag and drop blocks from the Simulink Library Browser onto the model canvas to create your system.

2. Simulation:

* Start simulation by clicking the **Play** button in the Simulink toolbar.
* Simulink simulates the model based on the specified solver settings and displays simulation results.

3. Analysis:

* Analyse simulation results using tools such as Simulink Data Inspector and Simulation Data Explorer.

**Basic Blocks**

1. Add Block:

* **Description:** Performs element-wise addition of its inputs.
* **Inputs:** Two or more signals to be added together.
* **Output:** The sum of the input signals.

2. Math Function Block:

* **Description:** Performs mathematical operations on its input signals.
* **Operation:** Choose from a variety of mathematical operations such as addition, subtraction, multiplication, division, trigonometric functions, etc.

3. Integrator Block:

* **Description:** Integrates its input signal with respect to time.
* **Input:** Signal to be integrated (usually a derivative).
* **Output:** Integrated signal, representing the accumulated area under the input signal curve over time.

4. Constant Block:

* **Description:** Outputs a constant value.
* **Parameter:** Specify the constant value to be output.

5. Gain Block:

* **Description:** Multiplies its input signal by a constant gain.
* **Parameter:** Specify the gain value.

6. Ramp Block:

* **Description:** Outputs a signal that ramps up or down linearly over time.
* **Parameters:** Specify the slope and initial value of the ramp.

7. Scope Block:

* **Description:** Displays signals during simulation for visualization and analysis.
* **Usage:** Connect signals of interest to the Scope block inputs.

8. Step Block:

* **Description:** Outputs a step function at a specified time.
* **Parameters:** Specify the step height and time of the step.

9. Logical Operator Block:

* **Description:** Performs logical operations such as AND, OR, NOT, etc.
* **Operation:** Choose the desired logical operation from the block parameters.

10. Saturation Block:

* **Description:** Limits the output signal within specified upper and lower bounds.
* **Parameters:** Set the upper and lower saturation limits.

11. Product Block:

* **Description:** Computes the product of its input signals.
* **Inputs:** Two or more signals to be multiplied together.
* **Output:** The product of the input signals.

12. Divide Block:

* **Description:** Computes the division of its inputs.
* **Inputs:** Dividend and divisor signals.
* **Output:** The result of the division operation.

13. Derivative Block:

* **Description:** Computes the derivative of its input signal.
* **Input:** Signal to be differentiated.
* **Output:** The derivative of the input signal with respect to time.

14. Discrete Transfer Function Block:

* **Description:** Represents a discrete transfer function in the z-domain.
* **Parameters:** Specify the numerator and denominator coefficients of the transfer function.

15. Switch Block:

* **Description:** Selects one of its input signals based on a control signal.
* **Inputs:** Multiple signals to choose from and a control signal.
* **Output:** The selected input signal based on the control signal.

16. Transfer Function Block:

* **Description:** Represents a continuous-time transfer function in the Laplace domain.
* **Parameters:** Specify the numerator and denominator coefficients of the transfer function.

17. Discrete Integrator Block:

* **Description:** Integrates its input signal in discrete time.
* **Input:** Signal to be integrated.
* **Output:** Integrated signal in discrete time.

18. Pulse Generator Block:

* **Description:** Generates a periodic pulse signal.
* **Parameters:** Set the pulse amplitude, width, period, and phase.

19. Delay Block:

* **Description:** Delays its input signal by a specified amount of time.
* **Parameters:** Set the delay time.

20. Transport Delay Block:

* **Description:** Models a time delay in a dynamic system.
* **Parameters:** Specify the delay time and initial condition.

21. Unit Delay Block:

* **Description:** Delays its input signal by one time step in discrete time.
* **Input:** Signal to be delayed.
* **Output:** Delayed signal by one time step.

22. Comparator Block:

* **Description:** Compares two input signals and outputs a logical value indicating whether one signal is greater than, less than, or equal to the other.
* **Inputs:** Two signals to be compared.
* **Output:** Logical value indicating the result of the comparison

23. Relational Operator Block:

* **Description:** Performs relational operations such as greater than, less than, equal to, etc.
* **Operation:** Choose the desired relational operation from the block parameters.

24. Signal Analysis Block:

* **Description:** Performs signal analysis functions such as FFT (Fast Fourier Transform), power spectral density estimation, and peak detection.
* **Usage:** Connect the signal of interest to the Signal Analysis block input.