

Logix5000

Function Block Programming

Source – Rockwell Publication 1756-RM006D-EN-P

Function Block (FB)

What is it?

Function Block programming is a graphical programming language which consists of sheets, input references, function blocks and output references.

Features

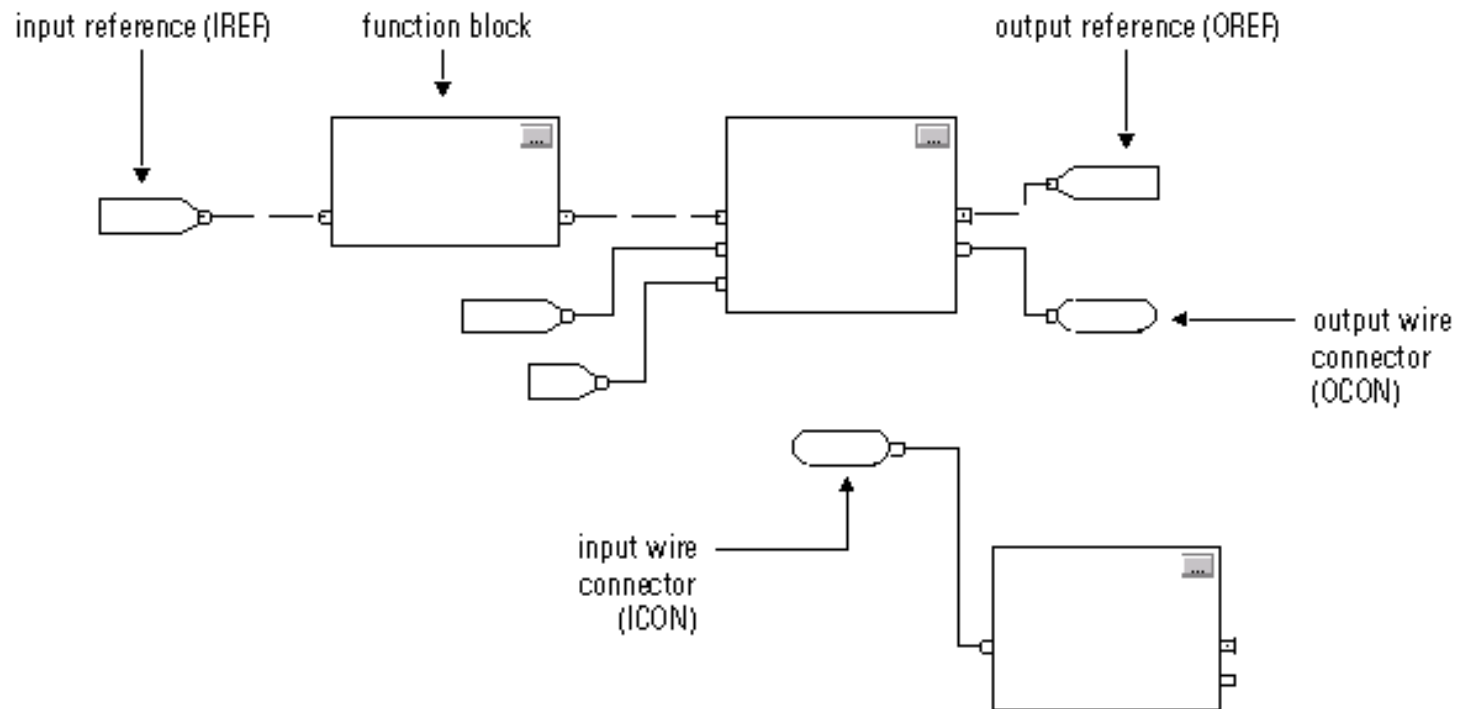
- One of the 4 programming languages outlined in IEC-16131-3
- Graphical
- Can handle large, complex processes
- Most applicable for process or drive applications

Advantages

- Easy to model actual process loops
- Enhanced PID control
- Uses less code than Ladder
- Easier to troubleshoot

Function Block (FB)

To control a device, use the following elements:



Function Block (FB)

Components

Sheets

- All programming is contained on sheets
- Unlimited number of sheets
- Standard sheet sizes for printing
- Limit number of components on a single sheet (usually 1 device/sheet)

Input References (IREF)

- Data fed into a function block
- Either a constant or a TAG

Output References (OREF)

- Data generated from a function block
- Fed into another FB or TAG

Function Block (FB)

Components

Function Block

- A block of code to perform a function on the input data
- Many are PROGRAM or OPERATOR selectable
- Each FB uses a TAG to store configuration and status information

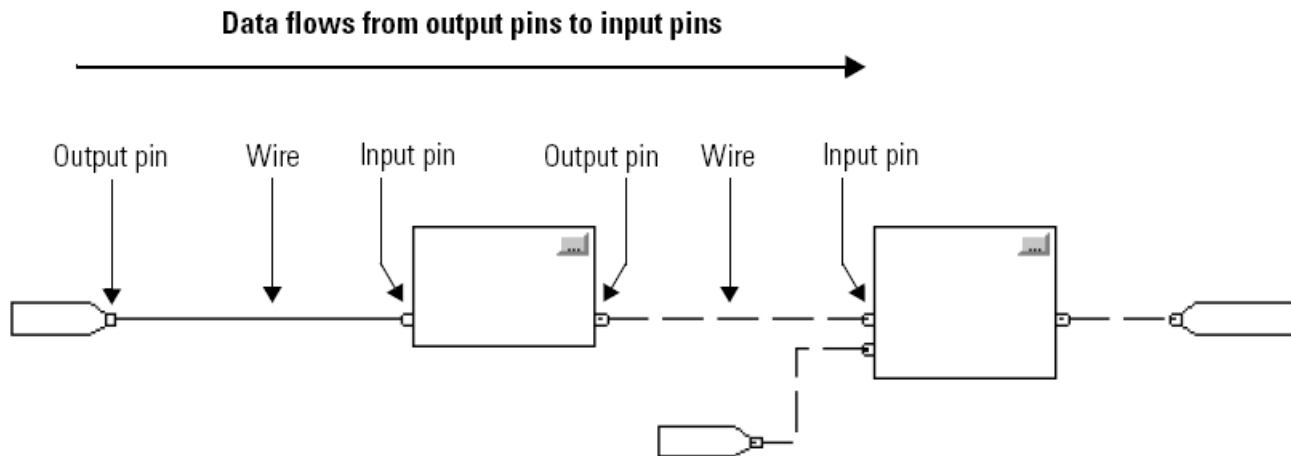
Wire Symbols

SINT, INT, DINT or REAL 

BOOL 

Function Block (FB)

Data Flow



Data Latching

Data from an IREF is latched for the scan of the FB. The data is latched from the Controller and Program scoped tags. IREF data is updated at the beginning of each scan.

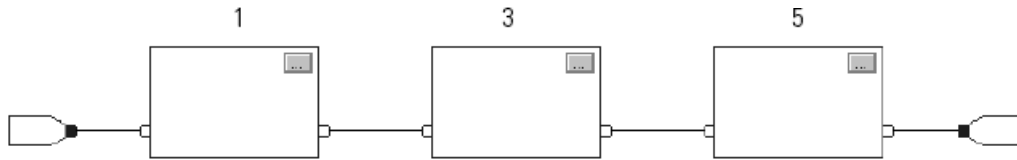
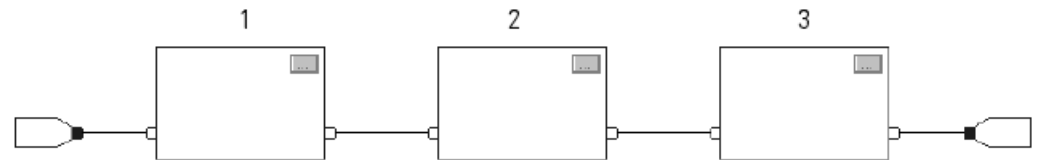
Function Block (FB)

Order of Execution

RSLogix5000 automatically determines the order of execution when you:

- Verify routine
- Verify project
- Download to a controller

Wired sequentially: 1 – 2 – 3



2 Groups Wired sequentially:

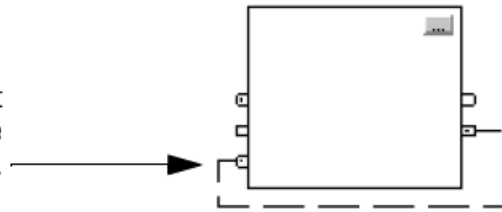
Execution order only relative to blocks that are wired together

Function Block (FB)

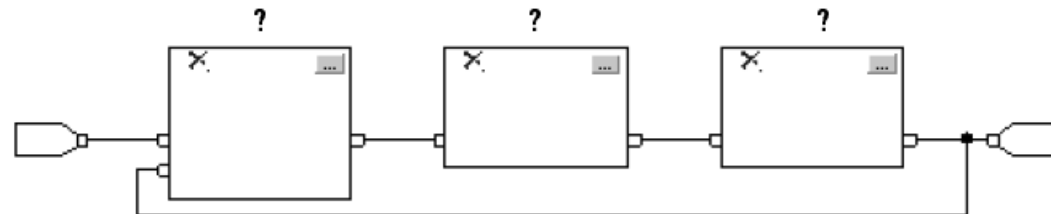
Order of Execution

Resolving Loops

This input pin uses an output that the block produced on the previous scan.



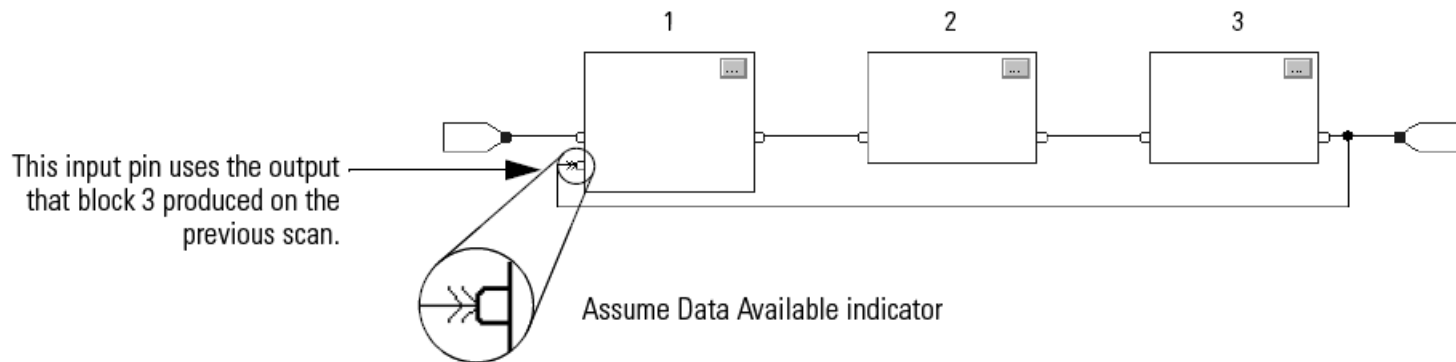
If a group of blocks are in a loop, the controller cannot determine which block to execute first. In other words, it cannot resolve the loop.



Function Block (FB)

Order of Execution

Resolving Loops



Identify the block to execute first by marking the input wire with 'Assume Data Available' indicator.

The 'Assume Data Available' indicator defines the data flow within the loop.

Do not use more than once!

Function Block (FB)

Instructions

Approximately 90+ instructions available.

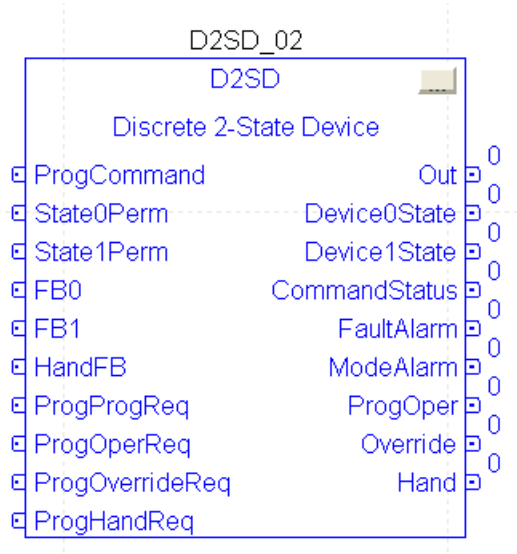
We'll look at a few instructions.

- D2SD - Discrete 2 State Device
- SCL - Scale
- ALM - Alarm
- SEL - Select
- PIDE - Enhanced PID

Function Block (FB)

Instructions

D2SD - Discrete 2 State Device



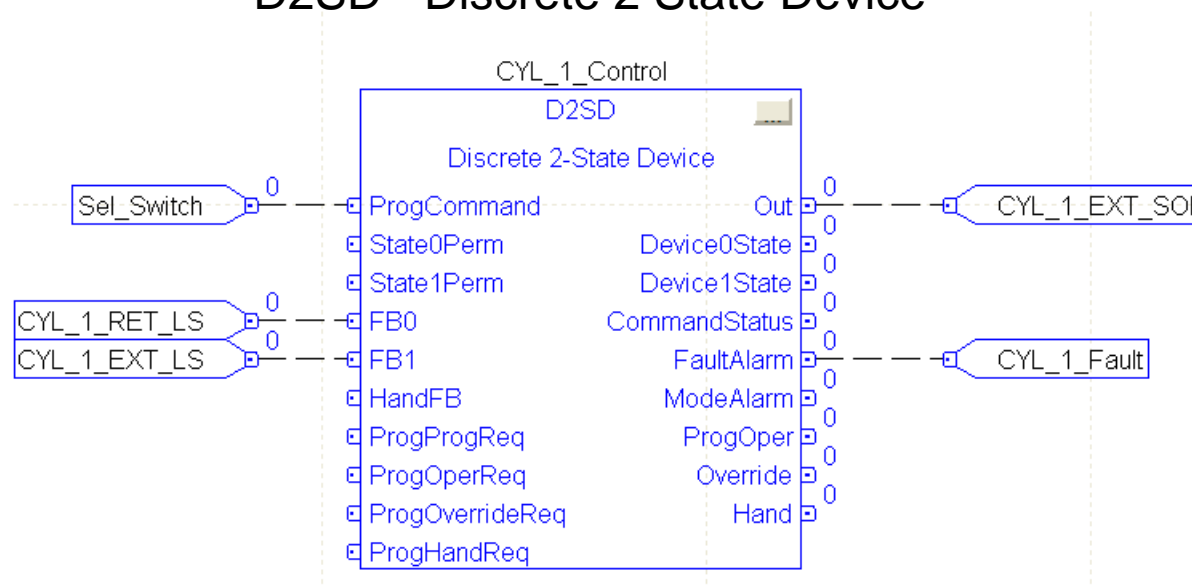
Controls a discrete device which has only two possible states such as on/off, open/closed, etc.

- Feedback options for monitoring fault times
- Output can be reversed
- Program / Operator control
- Output can be overridden on fault

Function Block (FB)

Instructions

D2SD - Discrete 2 State Device



- Sel_Switch is used to extend CYL_1.
- Retract and Extend L/S's are used as feed back signals to determine if cylinder takes too long to extend or retract piston.

Function Block (FB)

Instructions

D2SD - Discrete 2 State Device

Properties - D2SD_01

Configure | Parameters | Tag

Feedback States

	Feedback	
	0	1
State0	1	0
State1	0	1

Output Reverse

Fault

Time: s

Latch alarm

Program value reset

Override

Override State:

Override on initialize

Override on fault alarm

Status: OK

Execution Order Number: 1

Never display description in a routine

OK Cancel Apply Help

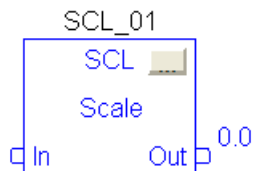
Function Block (FB)

Instructions

SCL - Scale

Provides scaling for any analog signal.

- REAL input

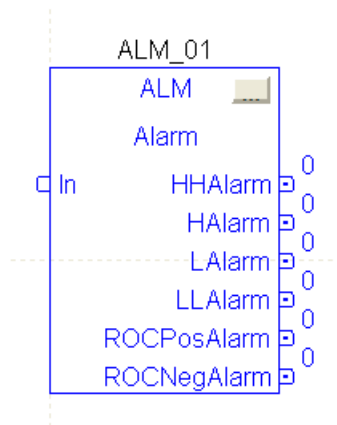


Parameters		Tag			
	Vis	Name	Value	Type	Description
	<input type="checkbox"/>	EnableIn	1	BOOL	Enable Input. If False, the instruction will not exec...
	<input checked="" type="checkbox"/>	In	0.0	REAL	The analog signal input to the instruction.
	<input type="checkbox"/>	InRawMax	0.0	REAL	The maximum value attainable by the input to the...
	<input type="checkbox"/>	InRawMin	0.0	REAL	The minimum value attainable by the input to the ...
	<input type="checkbox"/>	InEUMax	0.0	REAL	The maximum scaled value of the input.
	<input type="checkbox"/>	InEUMin	0.0	REAL	The minimum scaled value of the input.
	<input type="checkbox"/>	Limiting	0	BOOL	Limiting selector. If TRUE, Output will be limited t...
	<input type="checkbox"/>	EnableOut	0	BOOL	Enable Output.
	<input checked="" type="checkbox"/>	Out	0.0	REAL	This is the output of the Scaling instruction repres...
	<input type="checkbox"/>	MaxAlarm	0	BOOL	The above maximum input alarm indicator.
	<input type="checkbox"/>	MinAlarm	0	BOOL	The below minimum input alarm indicator.
	<input type="checkbox"/>	Status	16#0000_0000	DINT	Bit mapped status of the function block.
	<input type="checkbox"/>	InstructFault	0	BOOL	Instruction generated a fault
	<input type="checkbox"/>	InRawRangeInv	0	BOOL	InRawMin <= InRawMax

Function Block (FB)

Instructions

ALM - Alarm



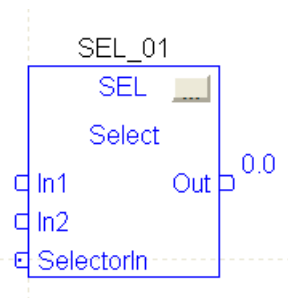
Provides alarming for any analog signal.

- REAL input
- Deadband
- ROC (rate of change) for positive and negative

Function Block (FB)

Instructions

SEL - Select



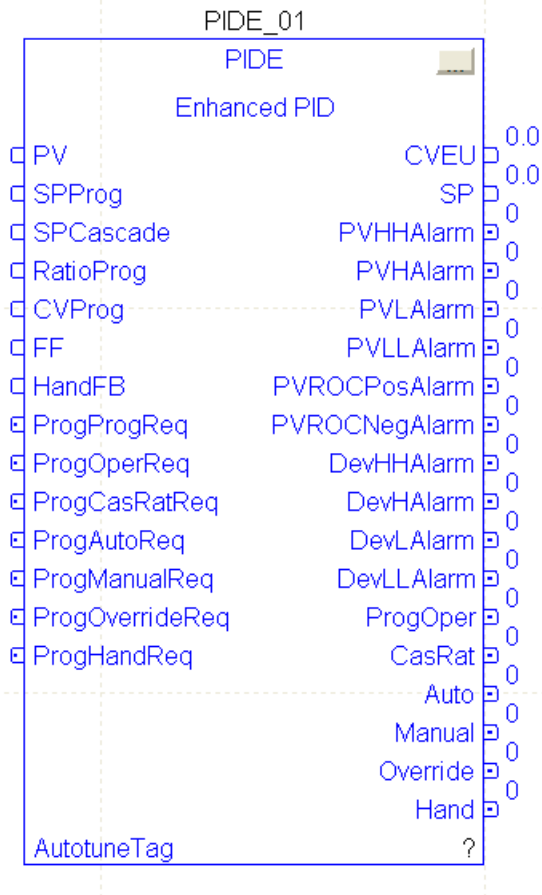
Uses a digital input to select one of two analog inputs.

		Parameters	Tag			
	Vis	Name	Value	Type	Description	
I	<input type="checkbox"/>	EnableIn		1 BOOL	Enable Input. If False, the ...	
I	<input checked="" type="checkbox"/>	In1	0.0	REAL	The first analog signal inp...	
I	<input checked="" type="checkbox"/>	In2	0.0	REAL	The second analog signa...	
I	<input checked="" type="checkbox"/>	SelectorIn		0 BOOL	The input which selects b...	
O	<input type="checkbox"/>	EnableOut		0 BOOL	Enable Output.	
O	<input checked="" type="checkbox"/>	Out	0.0	REAL	The selected output of the...	

Function Block (FB)

Instructions

PIDE – Enhanced PID



Used to adjust an analog output (CV) based on a setpoint (SP) and a process variable (PV).

- Feed forward
- Cascade
- Ratio
- Autotune
- Program / Operator control
- Manual control
- Alarming