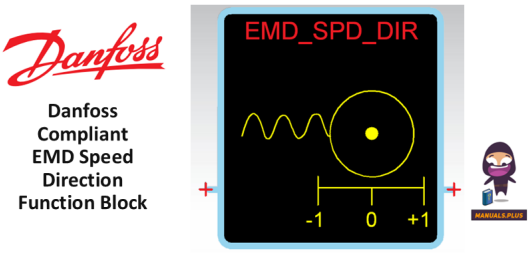

Danfoss Compliant EMD Speed Direction Function Block User Manual

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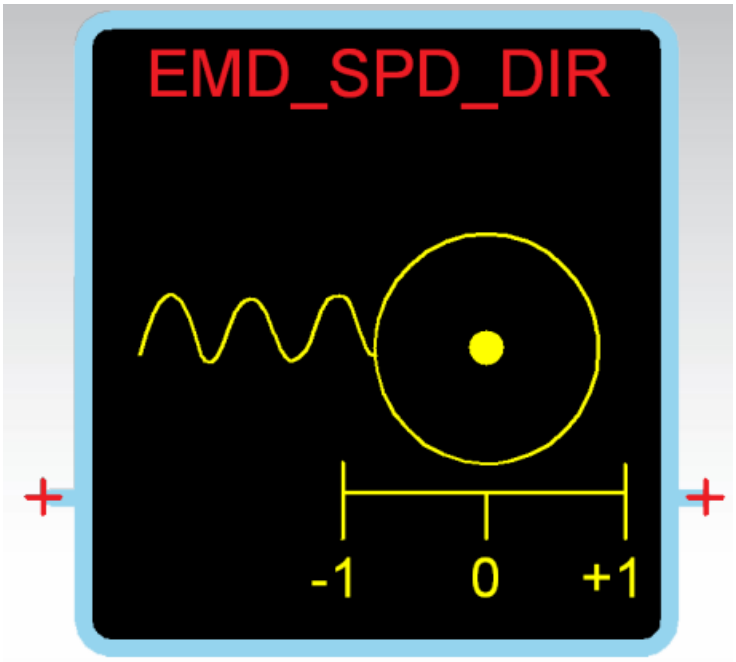
Danfoss Compliant EMD Speed Direction Function Block



Specifications

- Product Name: PLUS+1 Compliant EMD Speed Sensor Direction Function Block
- Output: RPM and directional signals
- Input Range:
  - Speed (Spd): 1,250 to 10,000,000
  - Direction (Dir In): 0 to 5,250 volts

Product Usage Instructions

Controller Configurations
The EMD_SPD_DIR Function Block outputs rpm and directional signals based on inputs from an EMD Speed Sensor. It can be used on both MC and SC controllers.

Controller Input Requirements
The controller input requirements for the EMD SPD DIR function block are as follows:

- **MC Controllers:**
  - Spd – MFIn – DirIn
- **SC Controllers:**
  - Spd – MFIn – DirIn – DigAn

Function Block Inputs
The EMD_SPD_DIR Function Block inputs are as follows:

- **Spd (Speed):** Bus Per U32 Count U16 – Range: 1,250 to 10,000,000
- **Dir In (Direction):** Bus Volt/Voltage U16 – Range: 0 to 5,250 volts

Function Block Outputs

The EMD_SPD_DIR Function Block outputs are as follows:

- **Status:** U16 – Range: 0 to 65,535
- **Fault:** U16 – Range: 0 to 1,000,000,000
- **RPM:** U16 – Range: 0 to 25,000
- **dRPM:** U16 – Range: 0 to 2,500
- **Dir:** S8 – Values: -1, 0, +1

FAQ

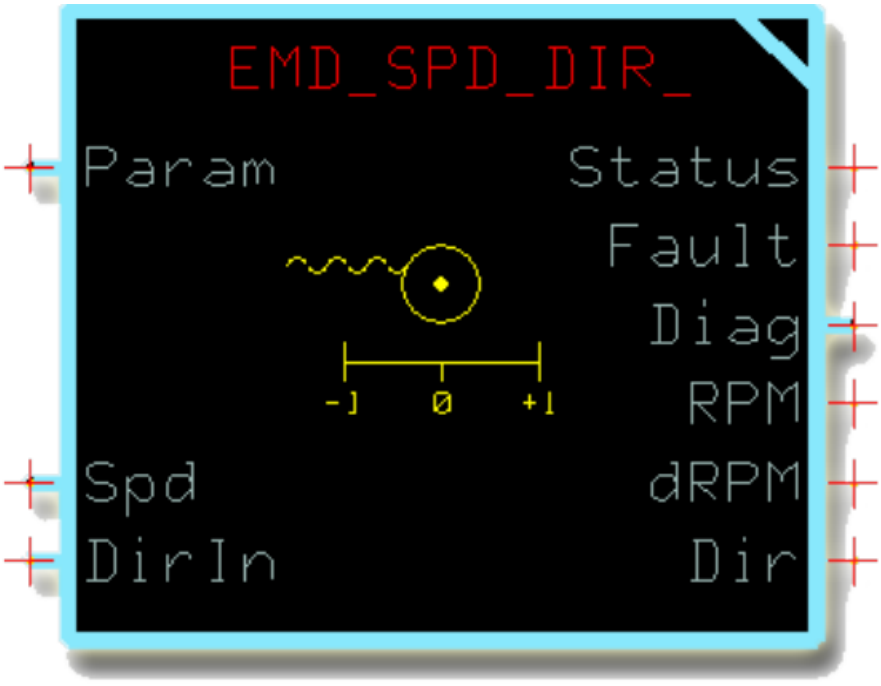
- **What is the purpose of the EMD_SPD_DIR Function Block?**
  The EMD_SPD_DIR Function Block outputs rpm and directional signals based on inputs from an EMD Speed Sensor.
- **What are the input requirements for the EMD_SPD_DIR function block on MC Controllers?**
  The input requirements for MC Controllers are Spd, MFIn, and DirIn.
- **What is the voltage range for the Direction input (Dir In) of the EMD_SPD_DIR Function Block?**
  The voltage range for the Direction input is from 0 to 5,250 volts.

Revision history

Table of revisions

Date	Changed	Rev
December 2014		AA

EMD_SPD_DIR Function Block



Overview

This function block outputs rpm and directional signals based on inputs from an EMD Speed Sensor. On both MC and SC controllers, this function block receives its:

- Spd input through an MFIn input.
- DirIn input through either a second MFIn input or a DigAn input.

Controller Input Requirements for EMD Function Blocks
The following tables list the controller input requirements for the EMD SPD DIR, EMD SPD DIR A, and EMD SPD DIR D function blocks.

Input Connections—MC Controllers

Function Block	Function Block Input	Controller Input	Comment
EMD SPD DIR	**Spd**	**MFIn**	Determines speed via pulse signal from the sensor.
	DirIn	**MFIn**	Utilizes pull-up/pull-down resistors and voltage to detect open circuit failure of the direction signal.
EMD SPD DIR A	**Spd**	**MFIn**	Determines speed via pulse signal from the sensor.
	DirIn	**DigAn**	Only detects when direction signal voltage is outside the expected ranges but lacks pull-up/pull-down resistors for open circuit detection.
		AnIn	Only detects when direction signal voltage is outside the expected ranges but lacks pull-up/pull-down resistors for open circuit detection.
EMD SPD DIR D	**Spd**	**MFIn**	Determines speed via pulse signal from the sensor.
	DigDir	**DigIn**	Provides no fault detection for the direction signal.
		DigAn	Provides no fault detection for the direction signal.

Input Connections—SC Controllers

Function Block	Function Block Input	Controller Input	Comment
EMD SPD DIR	**Spd**	**MFIn**	Determines speed via pulse signal from the sensor. The controller input must be labeled **Dig**/**Ana**/**Freq**.
	DirIn	**MFIn**	Utilizes pull-up/pull-down resistors and voltage to detect open circuit failure of the direction signal.
		DigAn	Utilizes pull-up/pull-down resistors and voltage to detect open circuit failure of the direction signal.

Function Block Inputs

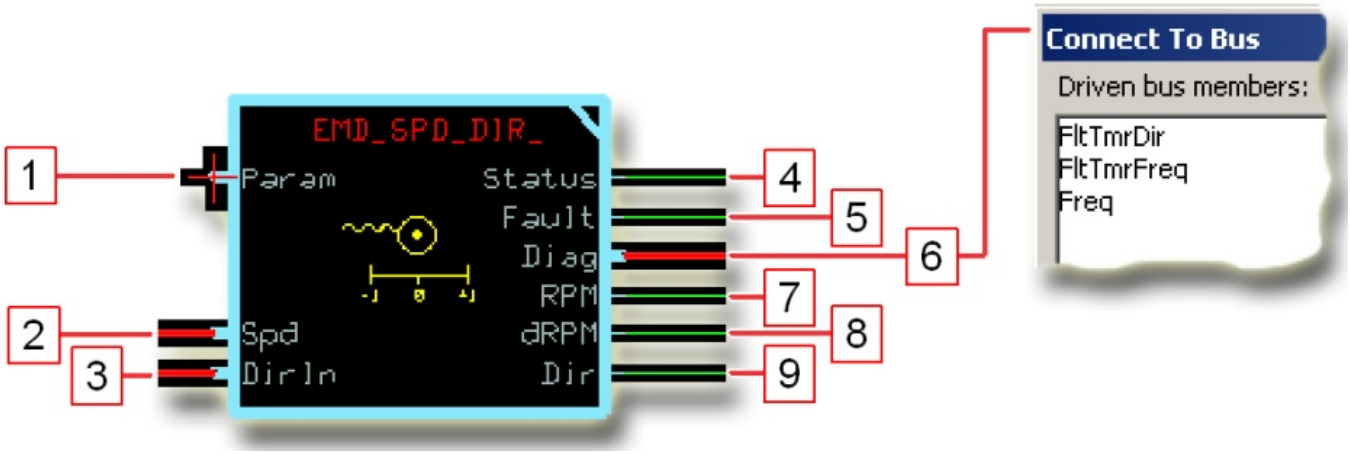
Item	Type	Range	Description
Param	Bus	——	Input for common parameters that can be applied to multiple function blocks. See ***About the Param Input*** on page 11 for more information.
Spd	Bus	——	Input for a bus with: • **Volt**/**Voltage**, **Per** (Period), and **Count** signals with the voltage, period, and count output by the **Speed Sensor**. • A **Config** sub-bus with signals that configure the controller input that receives these signals.
Per	U32	1,250 to 10,000,000	The measured period output by the **Speed Sensor**. The function block uses the **Per** signal, **Count** signal, and **Puls**/**Rev** parameter value to calculate its **RPM** output. 10,000 = 1,000 µs.
Count	U16	0 to 65,535	The measured count per program loop output by the **Speed Sensor**. The function block uses the **Per** signal, **Count** signal, and **Puls**/**Rev** parameter value to calculate its **RPM** output. 1,000 = 1,000.
Config	Sub-bus	——	Contains the signals that configure this input.
Dir In	Bus	——	Input for a bus with: • A **Voltage**/**Volt** signal with the voltage output by the **Speed Sensor**, which the block uses to determine direction. • A **Config** sub-bus with signals that configure the controller input that receives this signal.
Volt/**Voltage**	U16	0 to 5,250	The measured voltage of the direction signal that the **Speed Sensor** outputs, which the block uses to determine direction.
Config	Sub-bus	——	Contains the signals that configure this input.

Outputs
Function Block Outputs

Item	Type	Range	Description
Status	U16	——	Reports the function block's status. This function block uses a non-standard bitwise scheme to report its status and faults. • 0x0000 = Block is OK. • 0x0008 = **Puls**/**Rev** or **DirLockHz** parameter value is out of range.

Fault	U16	——	Reports the function block's faults. This function block uses a non-standard bitwise scheme to report its status and faults. • 0x0000 = Block is OK. • 0x0001 = **Per** signal in the function block's **Spd** input is too low. • 0x0002 = **Volt**/**Voltage** signal in the function block's **Spd** input is out of range. • 0x0004 = **Volt**/**Voltage** signal in the function block's **Dir** input is out of range.
Diag	Bus	——	Outputs a bus with **Freq**, **FltTmrDir**, and **FltTmrFreq** signals that are available for troubleshooting.
Freq	U32	0 to 1,000,000,000	The measured frequency of the Speed Sensor. 100,000 = 10,000 Hz.
FaultTmrFreq	U16	0 to 65,535	When a frequency fault: • Occurs, this output counts up the milliseconds until the function block makes a fault declaration. • Clears, the output counts down the milliseconds until the function clears the fault declaration. 1,000 = 1,000 ms.
FltTmrDir	U16	0 to 65,535	When a direction fault: • Occurs, this output counts up the milliseconds until the function block makes a fault declaration. • Clears, this output counts down the milliseconds until the function clears the fault declaration. 1,000 = 1,000 ms.
RPM	U16	0 to 2,500	Speed sensor revolutions per minute. The function block clamps this output at 2,500. 1 = 1 rpm.
dRPM	U16	0 to 25,000	Speed sensor revolutions per minute x 10 (deciRPM). The function block clamps this output at 25,000.
Dir	S8	-1, 0, +1	The Speed Sensor's direction of rotation. • -1 = Counterclockwise (CCW). • 0 = Neutral. • +1 = Clockwise (CW).

About Function Block Connections



About Function Block Connections

Item	Description
1.	Input for common parameters that can be applied to multiple function blocks.
2.	Input for a bus with: • The voltage, period, and count signals output by the **EMD Speed Sensor**. • A sub-bus with signals that configure the controller input that receives these signals.
3.	Input for a bus with: • The directional signal output by the **EMD Speed Sensor**. • A sub-bus with the signals that configure the controller input that receives these signals.
4.	Reports the status of the function block.
5.	Reports the faults of the function block.
6.	Outputs a bus with **Freq**, **FltTmrDir**, and **FltTmrFreq** signals that are available for troubleshooting.
7.	Speed sensor revolutions per minute.
8.	Speed sensor revolutions per minute x 10 (deciRPM).
9.	The Speed Sensor's direction of rotation. • -1 = Counterclockwise (CCW). • 0 = Neutral. • +1 = Clockwise (CW).

Status and Fault Logic
Unlike most other PLUS+1 compliant function blocks, this function block uses non-standard status and fault codes.

Status Logic

Status	Hex*	Binary	Cause	Response	Correction
A parameter is out of range.	0x0008	1000	**Puls**/**Rev**, **FaultDetTm**, or **DirLockHz** parameter is out of range.	The function block clamps the out-of-range value at either its upper or lower limit.	Get the out-of-range parameter back within its range.

* Bit 16 set to 1 identifies a standard Danfoss status or fault code.

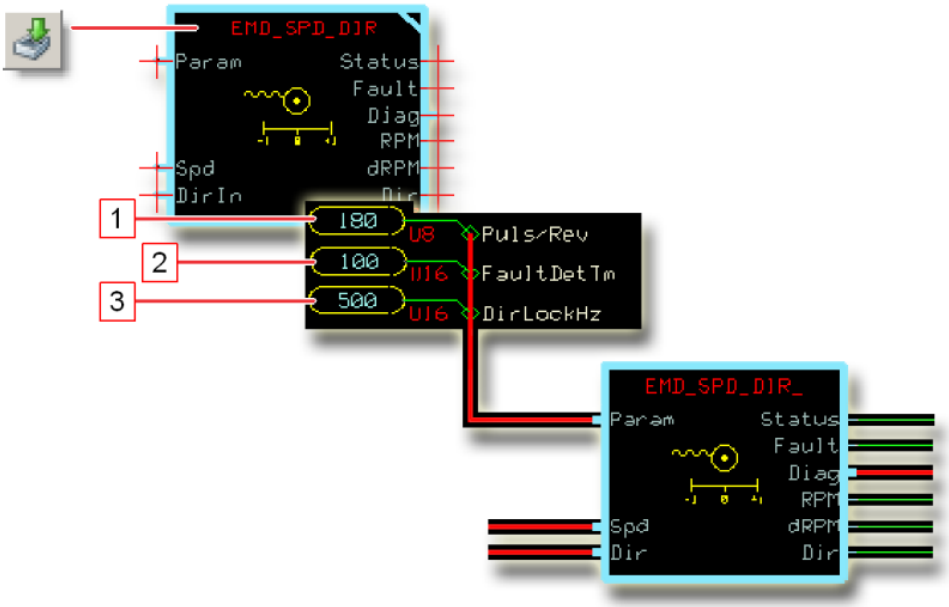
Fault Logic

Fault	Hex*	Binary	Cause	Response	Delay†	Latch‡	Correction
Per signal in the function block's **Spd** input is too low.	0x0001	0001	**Per** signal < 1,250 Hz.	The function block outputs its maximum **RPM** and **dRPM** values.	Y	N	Check for hardware issues, such as electrical noise, that can produce an invalid **Per** signal value.
Volt/**Voltage** signal in the function block's **Spd** input is out of range.	0x0002	0010	**Volt**/**Voltage** signal is between 1,000 and 2,500 mV and the block receives no pulses from the Speed Sensor.	The function block sets its **RPM** and **dRPM** outputs to 0.	Y	N	Check for hardware issues, such as electrical noise, that can produce an invalid **Volt** / **Voltage** signal value.
Volt/**Voltage** signal in the function block's **Dir** input is out of range.	0x0004	0100	**Volt**/**Voltage** signal is between 1,000 and 2,500 mV.	The function block sets its **Dir** output to 0.	Y	N	Check for hardware issues, such as electrical noise, that can produce an invalid **Volt** / **Voltage** signal value.

* Bit 16 set to 1 identifies a standard Danfoss status or fault code.
† A delayed fault is reported if the detected fault condition persists for a specified delay time. A delayed fault cannot be cleared until the fault condition remains undetected for the delay time.
‡ The function block maintains a latched fault report until the latch releases.

Function Block Parameters

Enter the top-level page of the **EMD_SPD_DIR** function block to view and change this function block's parameters.



Function Block Parameters

Item	Type	Range	Description
1. Puls/Rev	U8	20–120, 180	Number of pulses per revolution of the Speed Sensor. Refer to the *EMD Speed Sensor Technical Information* (Danfoss part L1017287) for the correct value.
2. FaultDetTm	U16	0–65,535	Sets the time between when the function block detects a: • Fault condition and then makes a fault declaration. • Cleared fault condition and then clears the fault declaration. 1,000 = 1,000 ms.
3. DirLockHz	U16	0–8,000	Sets the frequency above which the function block's **Dir** output locks. Above this frequency, the function block does not report changes in direction. 1,000 = 1,000 Hz.

About the Param Input
Use the Param input to input external parameter values to this function block.

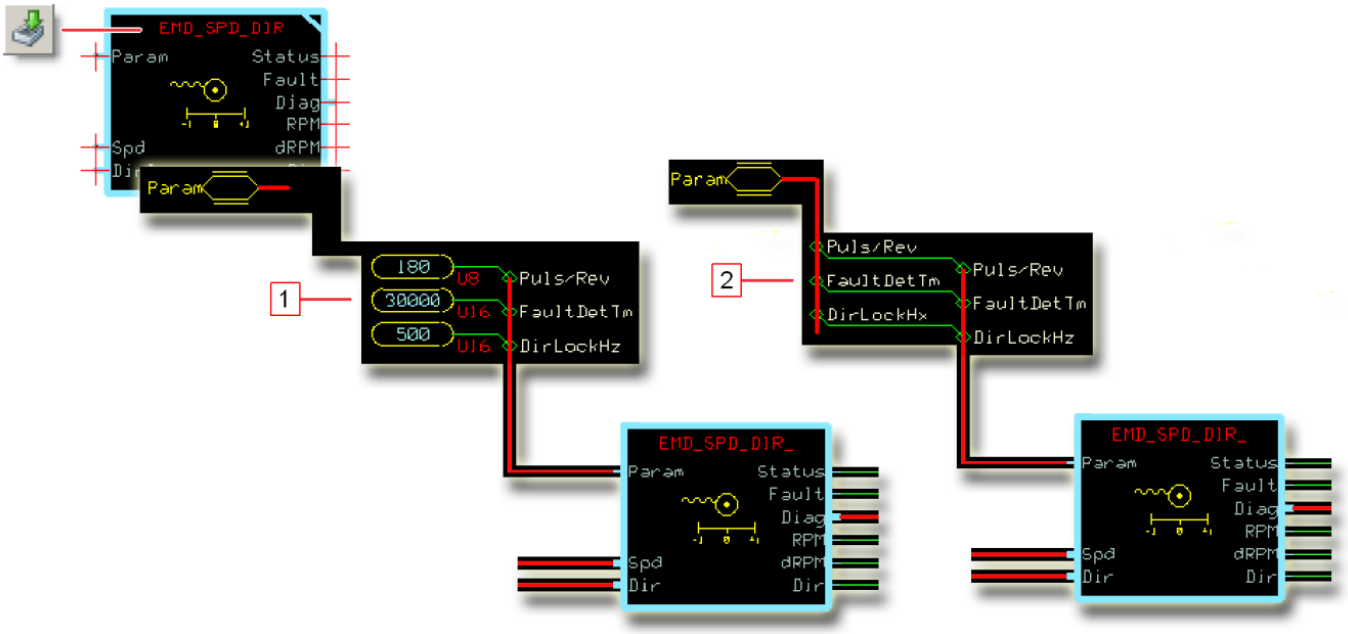


Figure Details

Item	Description
1.	Inside the function block's top-level page before you modify this page to accept common parameters through its **Param** input.
2.	Inside the function block's top level page after you modify this page to accept common parameters through its **Param** input.

Controller Configurations
Inputs on MC and SC controllers require configuration to work with this function block. See:

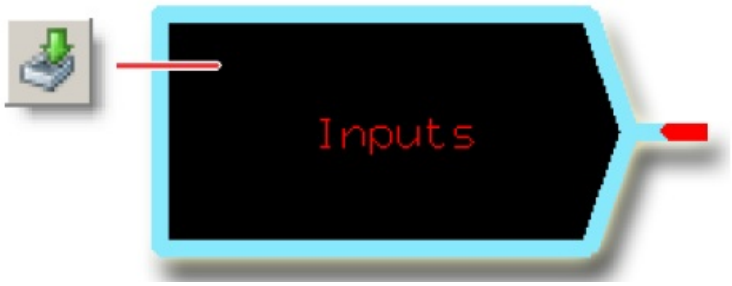
- MC Controller Configurations on page 12.
- SC Controller Configurations on page 16.

MC Controller Configurations
Input Configurations

Function Block Input	Compatible Input Type	Configuration Action
Spd	**MFIn**	Delete the: • **PinConfig0** route. • **PinConfig1** route.
DirIn	**MFIn**	Delete the: • **PinConfig0** route. • **PinConfig1** route.
	DigAn	Delete the: • **PinConfig0** route. • **PinConfig1** route.

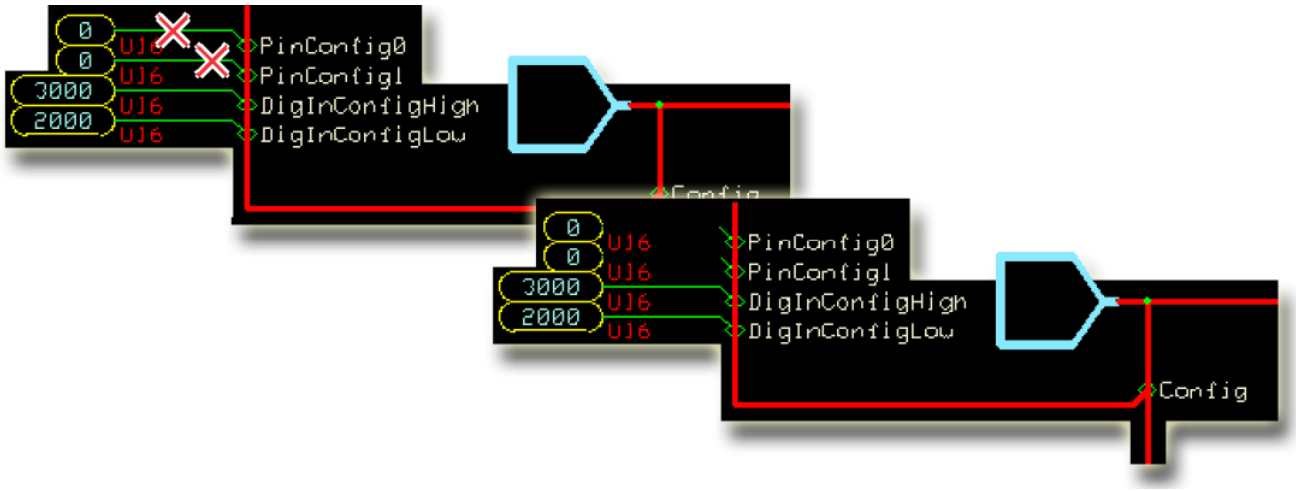
Controller Configurations
How to Configure an MFIn for the Spd Input

1. In the GUIDE template, enter the Inputs page.



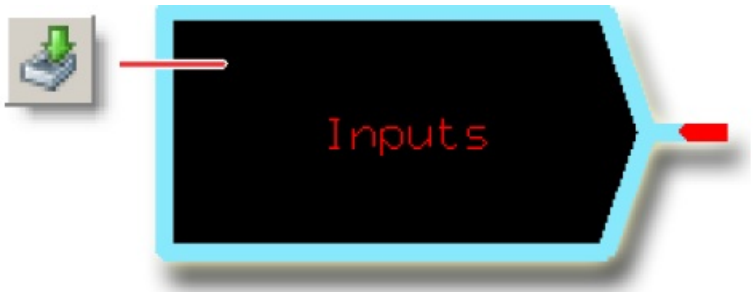
2. Enter the MFIn that receives the input signal.

3. Make the changes that are shown in the following figure.



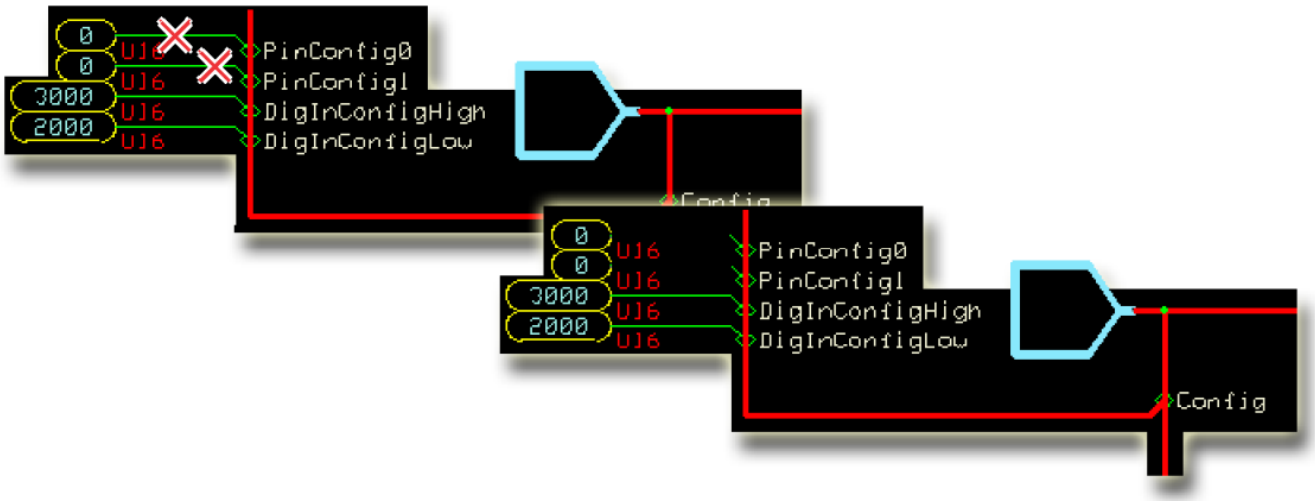
Controller Configurations
How to Configure a MFIn for the DirIn Input

1. In the GUIDE template, enter the Inputs page.



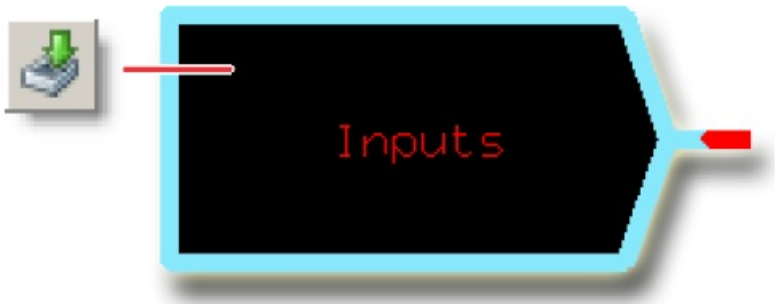
2. Enter the MFIn that receives the input signal.

3. Make the changes that are shown in the following figure.



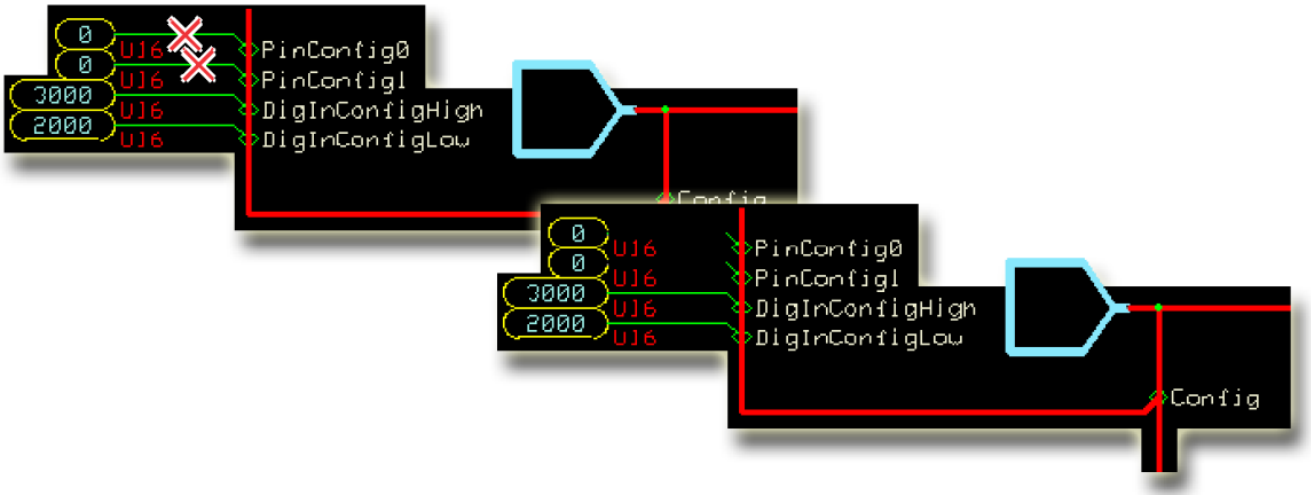
How to Configure a DigAn for the DirIn Input

1. In the GUIDE template, enter the Inputs page.



2. Enter the DigAn page that receives the input signal.

3. Make the changes that are shown in the following figure.



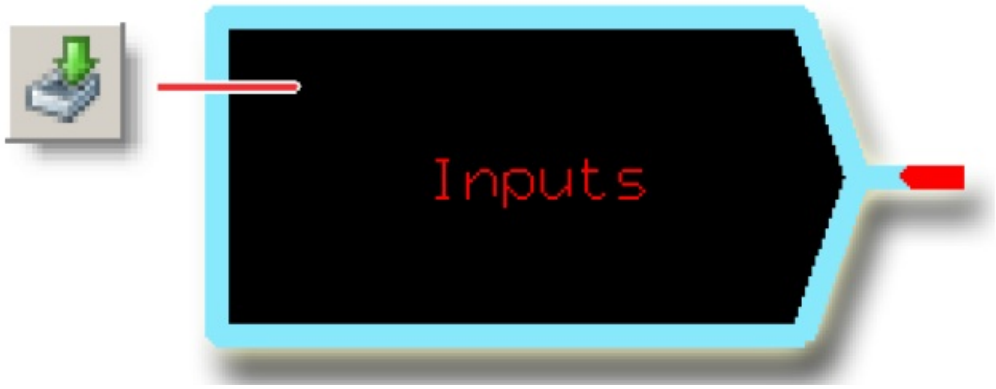
SC Controller Configurations
Input Configurations

Function Block Input	Compatible Input Type	Configuration Action
Spd	**MFIn***	Delete the: • **Bias** route. • **Range** route. • **Input Mode** route.†
DirIn	**MFIn**	Delete the: • **Bias** route. • **Range** route. • **Input Mode** route.†
	DigAn	Delete the: • **Bias** route. • **Range** route.

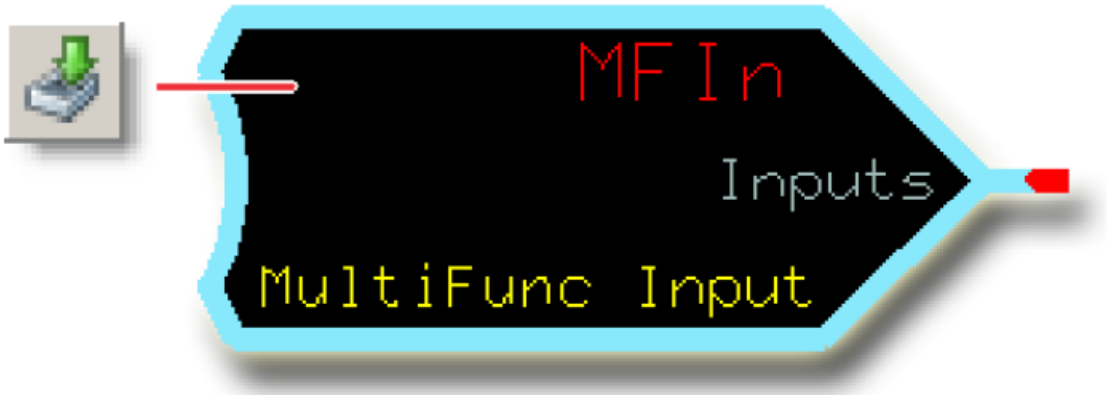
* The MFIn that you use must be labeled Dig/Ana/Freq.
† If present.

How to Configure an MFIn for the Spd Input

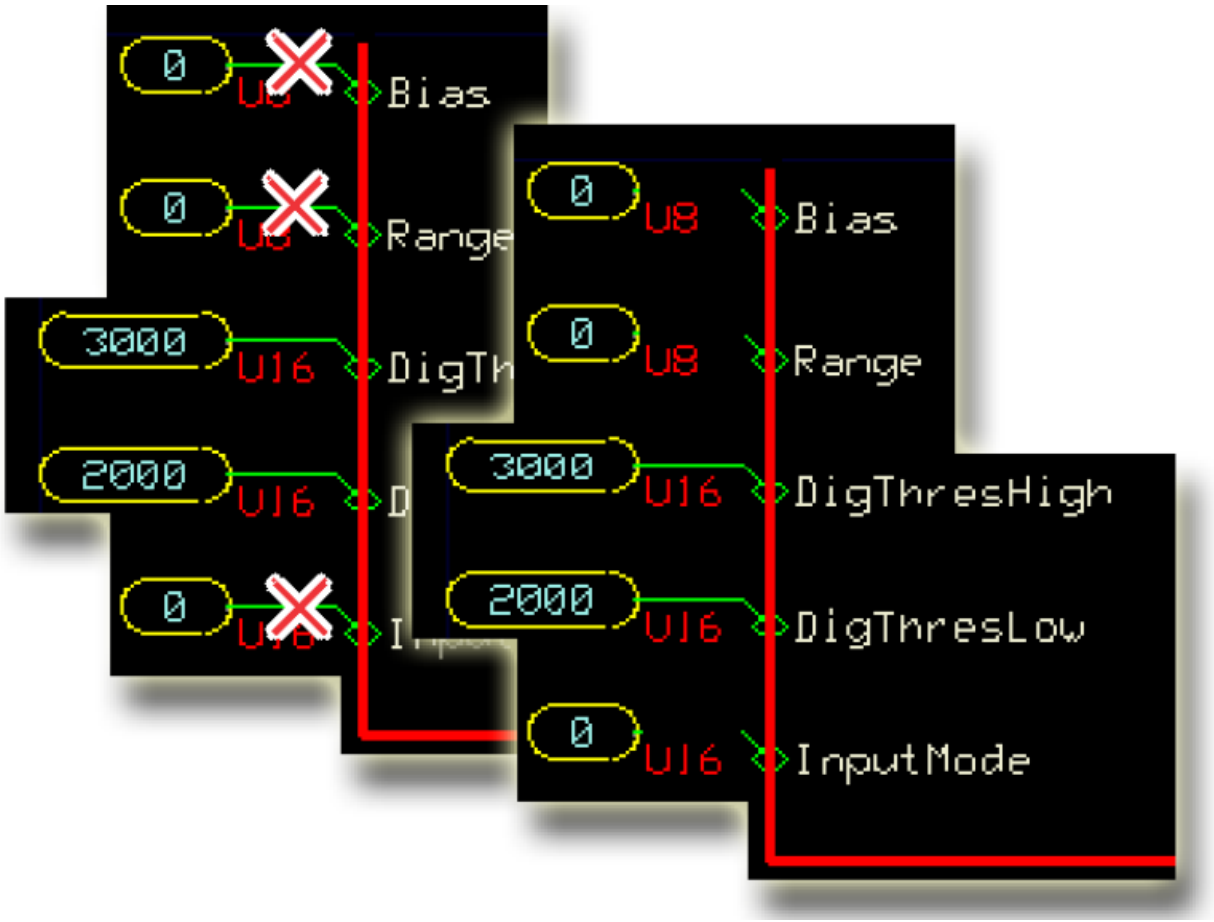
1. In the GUIDE template, enter the Inputs page.



2. Enter the MFIn that receives the input signal.

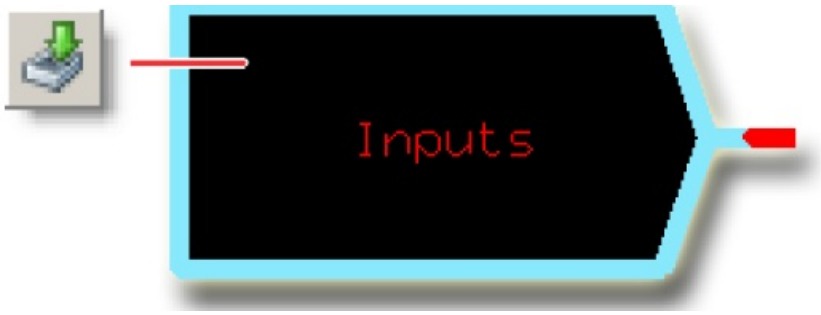


3. Make the changes that are shown in the following figure.



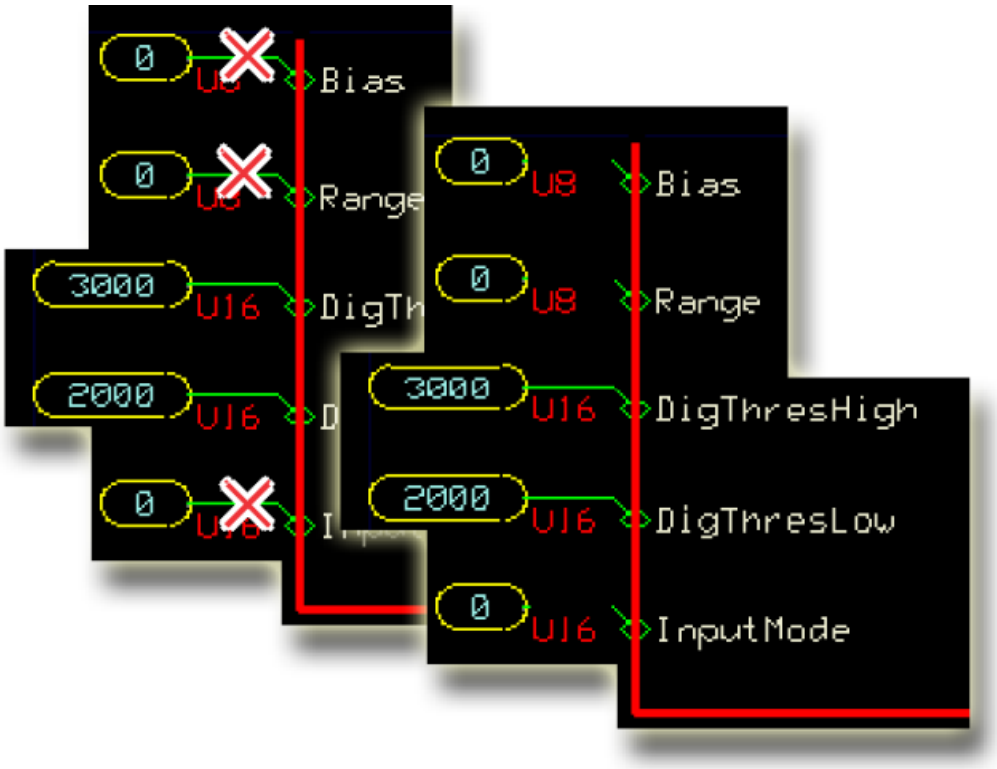
How to Configure an MFIn for the DirIn Input

1. In the GUIDE template, enter the Inputs page.



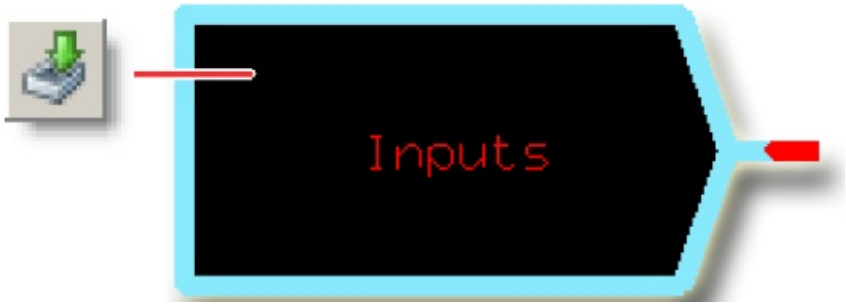
2. Enter the MFIn that receives the input signal.

3. Make the changes that are shown in the following figure.

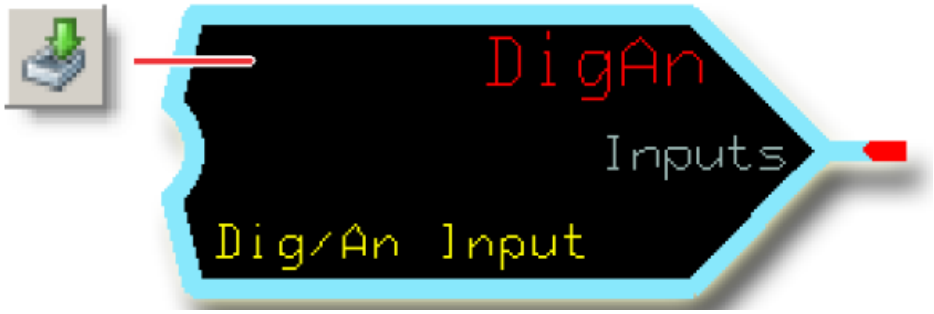


How to Configure a DigAn for the DirIn Input

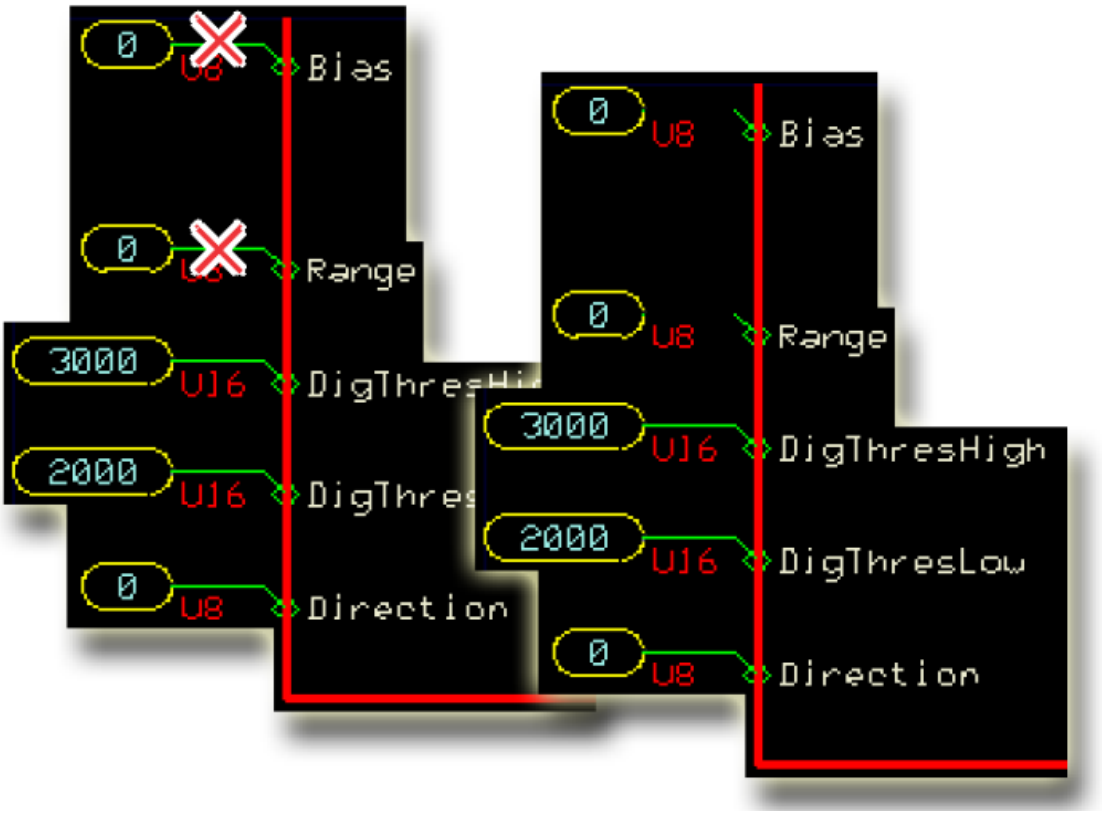
1. In the GUIDE template, enter the Inputs page.



2. Enter the DigAn that receives the input signal.



3. Make the changes that are shown in the following figure.



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