Resolver (ACIM)

This version of the Resolver and its associated **Hardware Configurations** have been archived. If starting a new project, consider using a different Hardware Configuration.

Resolver Configuration Page

In the **System Explorer** window configuration tree, expand the **Power Electronics Add-On** custom device and select **Circuit Model >> ACIM >> Resolver** to display this page. Use this page to configure the Resolver sensor model.This page includes the following components:

Name	Specifies the name of the resolver.
Description	Specifies a description for the resolver.

Angle Conditioning

	Symbol	Units	Default	Description
Number of Pole Pairs	pp		1	A gain applied to the mechanical angle of the machine, $_m$, before it is translated to an electrical resolver signal. Modify this parameter if the resolver is attached to a gear box rather than connected directly to the rotor. To generate resolver signals whose speed corresponds to the mechanical speed of the machine, set this value to 1. See the **Resolver Model Equations** for more information.
Angle Offset	Offset	Degrees	0°	Offset from the mechanical angle of the machine $_m$.
Reverse Speed			Disabled	Reverses the direction of the resolver when enabled.

	Symbol	Units	Default	Description
Sine.Sine Gain	Sin.Sin		0.999985	Sine gain applied to the **Sine** output signal. See the **Resolver Model Equations** for more information.
Sine.Cos Gain	Sin.Cos		0	Cosine gain applied to the **Sine** output signal. See the **Resolver Model Equations** for more information.
Cos.Sin Gain	Cos.Sin		0	Sine gain applied to the **Cosine** output signal. See the **Resolver Model Equations** for more information.
Cos.Cos Gain	Cos.Cos		0.999985	Cosine gain applied to the **Cosine** Output signals. See the **Resolver Model Equations** for more information.

	Symbol	Units	Default	Description
Sampling Frequency	T_s	MHz	1MHz	The frequency at which the Excitation Carrier signal is sampled to determine the **Sine** and **Cosine** outputs. See **Resolver Excitation Signal** for more information.
Phase Delay	T_{pd}	microseconds	0us	Creates a phase delay in the output **Sine** and **Cosine** signals. This is used to simulate a physical delay in non-ideal resolvers.

Resolver Model Description

A resolver is a sensor that provides feedback about the angular position and velocity of a rotating component, such as the rotor of an electrical motor.

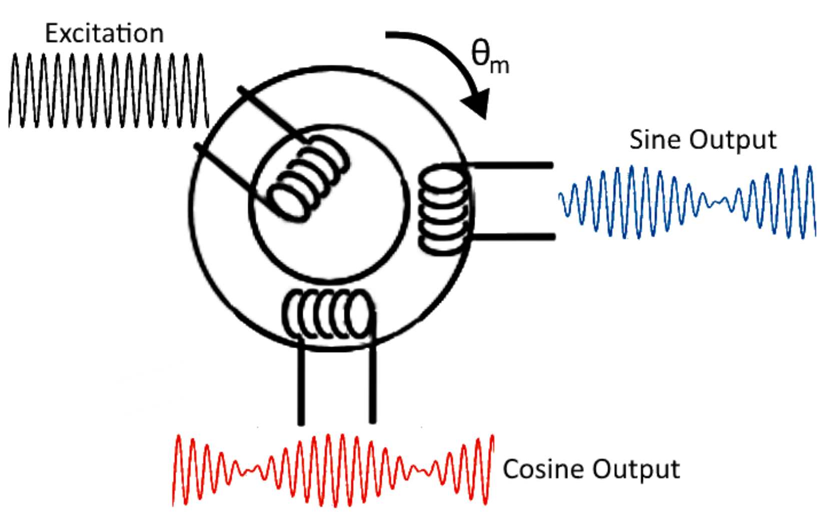

Figure 1. An example of a operating resolver where a sinusoidal excitation signal is input into the resolver and the result is two output signals, Sine Output and Cosine Output

During operation, a sinusoidal excitation signal is provided to the resolver. The resolver modulates the input excitation signal to produce two outputs representing sin(x) and cos(x), where x is the angle of the rotor. From the sin(x) and cos(x) signals controllers are reconstituted to calculate angular position of the machine.

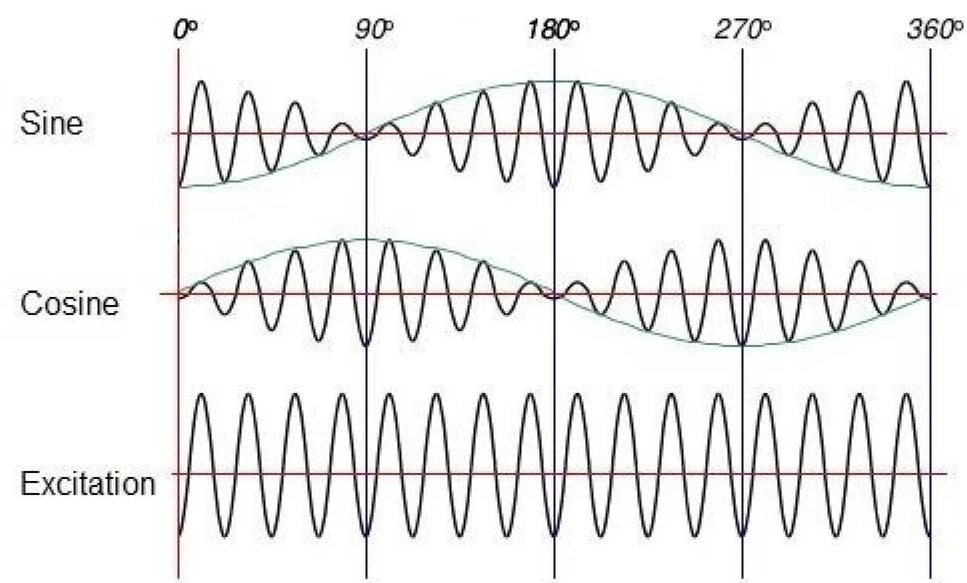

Figure 2. Sine and Cosine signals generated by a resolver with an input Excitation sinusoidal signal.

Resolver Model Equations

The resolver model outputs are calculated using the following sets of equations:

(1)
$$Sine\ Output = [Sin.Sin * sin(pp(\theta_m - \theta_{Offset})) + Sin.Cos * cos(pp * \theta_m - \theta_{Offset}))] * Excitation$$

(2)
$$Cosine\ Output = [Cos.Sin * sin(pp(\theta_m - \theta_{Offset})) + Cos.Cos * cos(pp * \theta_m - \theta_{Offset}))] * Excitation$$

Where Sin.Sin, Sin.Cos, Cos.Sin, and Cos.Cos represent gains that are applied to simulate a non-ideal resolver. To simulate an ideal resolver, set the **Sin.Sin** and **Cos.Cos** gains to 1, set the **Sin.Cos** and **Cos.Sin** gains to 0, set the **pp** to 1, and set the $_{\textbf{Offset}}$ to 0. This results in the following equations:

(3)

$$Sine\ Output = sin(\theta_m) * Excitation$$

(4)

$$Cosine\ Output = cos(\theta_m) * Excitation$$

Resolver Excitation Signal

For this resolver model, the excitation signal must be provided through an Analog Input channel. To confirm the index of the channel to use, refer to the pinout information for your hardware configuration in the **Archived Hardware Configurations** section. In most cases, the following channels are used:

Motor 1	Analog Input 00
Motor 2 (if available)	Analog Input 01

The amplitude of the excitation signal must be within a **-1V to 1V** range. If inputting a signal outside this range, use the **Gain** parameter for the **Analog Input** channel to manipulate the amplitude. Also note that the input signal must not exceed the specified voltage limitations of the hardware in any case. Typically, this hardware range is -10V to 10V, although the exact value can be confirmed on the description page of the **Hardware Configuration**.