Application Note #5485

Connecting a Fagor Absolute Linear Encoder

This application note describes the configuration and use of a Fagor Linear Absolute Encoders model number SVA-170-5-B with a Galil Accelera Series Controller. Though the Accelera series controller is described in this setup, the encoder described is compatible with other Galil controllers. The setup procedure for the encoder is not described, only the interface to the controller.

The Fagor linear encoder maintains absolute position and sends that information to the controller via SSI interface. The default number of bits of absolute position data the encoder will return is 32 bits. Note that the Galil controller can read only up to 31 bits of absolute position data, allowing 1 bit as a sign bit. Therefore, if the encoder is going to be used in its default configuration, the last bit of position data will not be read. This will effectively reduce the resolution of the position data from the standard 0.1um resolution by half to 0.2um resolution.

This issue can be addressed by taking advantage of the user configurability of the Fagor encoder to change the number of bits it outputs to 31. This is done by enabling the 'Transmit the last bit as 0' setting on the encoder. The table below illustrates how changing that setting effects the data output by the controller for the same absolute position by eliminating the last bit and left shifting the data so it can be read fully by the controller.

Table 1: Illustration of data output by the encoder in default setting and with the 'Transmit last bit as a 0' set. X indicates the bit is always 0. Highlighted data is the data read by the controller when configured for 31 bit SSI data. Both data outputs specify the same absolute position.

Setting	MSB	Data (30 bits)	LSB
Default:	0	10101010101010101010101010101010	1
Transmit LSB as 0 Enabled	1	01010101010101010101010101010101	**X**

See the Fagor encoder user manual for more information on its user configurability.

The Galil controller must be configured for SSI to read the absolute information coming from the controller. This is a standard option available for the DMC-40x0 Accelera Series Controller. When using the interface cable EC-6B-D-N, the following color code can be used to connect to the controller.

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Table 2: Encoder wiring for a DMC-40x0

Fagor Encoder		DMC-40x0	
Function	**Wire Color**	**-I200**	**-I000**
Data	Gray (small)	Pin 15	Pin 4
/Data	Pink	Pin 23	Pin 12
Clock	Black	Pin 24	Pin 11
/Clock	Purple	Pin 6	Pin 9
5V	Brown	Pin 9	Pin 15
5V Sense	Red (Large)	Pin 9	Pin 15
0V	White	Pin 10	Pin 5
0V Sense	Gray (large)	Pin 10	Pin 5

The command to give the DMC-40x0 to read the SSI encoder data is:

SIn = 1, 31, 31, 0 <24>1

where n designates the axis you wish to set,
1 indicating the main encoder is to use the SSI data,
31 indicating the total number of bits to read,
31 again indicating the total number of single turn bits,
0 indicating the number of status bits,
<24 indicating a clock speed to the encoder of 400kHz,
and >1 indicating that the encoder would output binary data.

More information about the SSI protocol can be found in Application Note 2438.
http://www.galilmc.com/support/appnotes/optima/note2438.pdf

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