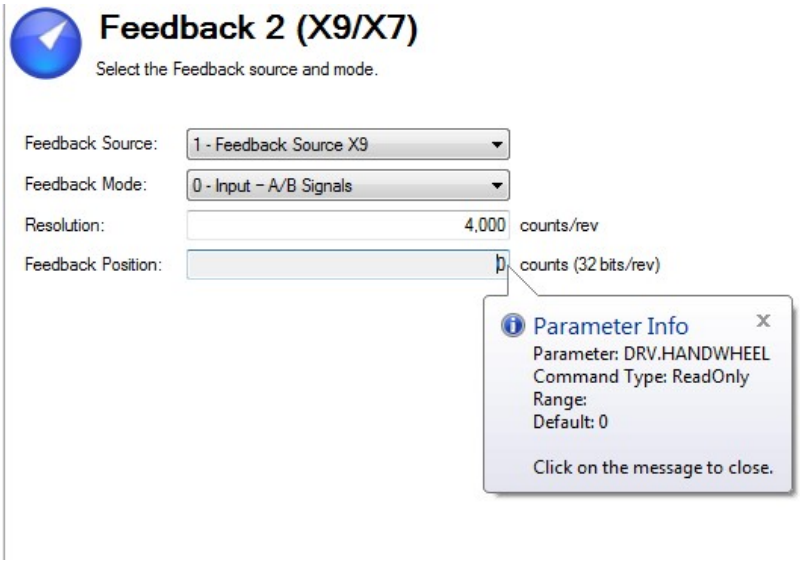
How to check proper counting of a master encoder on an AKD follower drive.

In this example, X9 is used for the master encoder input (source) and this application note assumes the recommended AquadB differential line drive (RS422/RS485 type) encoder. The feedback mode is thus “0-Input-A/B Signals”.

The resolution is in units of counts/rev. This is post-quadrature counts so for example if you have an encoder with 1000 lines/rev (pre-quad) then the number of counts/rev on the input of the AKD will be 4x or 1000 x 4 = 4000 counts/rev.

The displayed feedback position on the Feedback 2 screen is the drive parameter “DRV.HANDWHEEL”.



DRV.HANDWHEEL

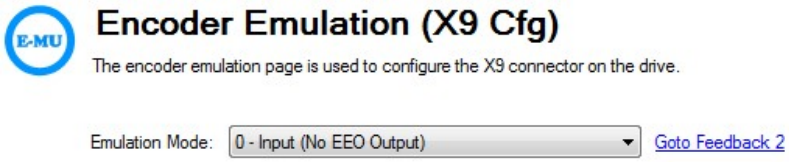
General Information	
Type	R/O Parameter
Description	Reads the EEO input value.
Units	1/4,294,967,296 rev
Range	0 to 4,294,967,295 rev
Default Value	0 rev
Data Type	Integer
Start Version End Version	M_01-00-00-000 M_01-03-00-000

Description

When the EEO is selected as an input (DRV.EMUEMODE =3,4,5), this parameter reads the EEO value (where 4,294,967,296 is a full revolution, then the value rolls over). DRV.EMURES defines the how many counts constitute a revolution on the EEO. This parameter represents the feedback 2 positions when feedback 2 is configured to be active.

When secondary feedback is selected (DRV.EMUEMODE is 0 and FB2.SOURCE = 1 (X9), or FB2.SOURCE = 2 (X7)), this parameter represents the secondary feedback position (where 4,294,967,296 is a full revolution, then the value rolls over). FB2.ENCRES defines how many counts define a revolution for the secondary feedback.

DRV.EMUEMODE = 0 when X9 is used as an input (per above), so the value displayed for DRV.HANDWHEEL has a range of 0 - 4,294,967,296 for 1 revolution and then the value rolls over. In this example with the resolution set for 4000 counts per rev, the DRV.HANDWHEEL value is 0 - 4000 counts input = 0 - 4,294,967,296. Since the value continues to roll over, using this parameter to check for correct counts from the master encoder isn't very useful.



FB2.P however will display the position from the secondary feedback.

The position can be read as 32-bit counts or in customer units.

FB2.P

General Information	
Type	R/O Parameter
Description	Reads position from the secondary feedback.
Units	Depends on FB1.PUNIT counts or custom units.
Range	N/A
Default Value	N/A
Data Type	U64
See Also	FB1.HALLSTATE
Start Version	M_01-05-08-000

The above has a typo. The units of FB2.P will depend on FB2.PUNIT. There are 2 choices (see below).

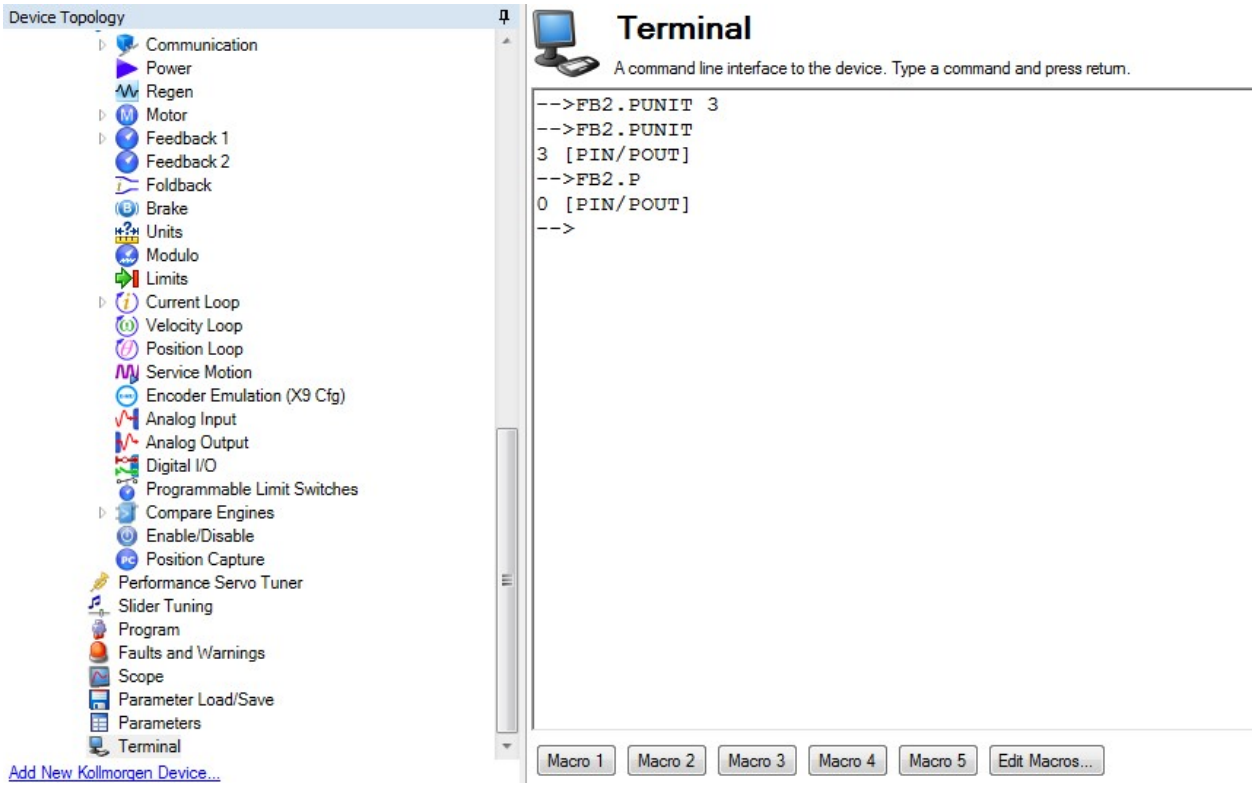
When FB2.PUNIT=0 then the value is in 32.32 format where the upper 32bit word of the 64bit parameter keeps track of the number of turns and the lower 32bit word keeps track of the counts within a given turn.

Description

FB2.PUNIT sets the position unit for FB2.P.

Value	Description
0	Counts (32 bit format)
3	(FB2.PIN/FB2.POUT) per revolution.

For this test, FB2.PUNIT is set to 3 using Workbench terminal.



To scale the FB2.P value and correlate it to the number of counts per rev (recall the Feedback 2 was setup for 4000 counts per rev in this example), the FB2.PIN and FB2.POUT (FB2 gearing parameters must be utilized).

In this case, FB2.PIN is set to 4000 (set this to whatever counts per rev of your encoder and was entered in the Feedback 2 screen). Set FB2.POUT = 1.

The terminal snapshot below shows where on power up FB2.P is zero.

-->FB2.PIN 4000

-->FB2.POUT 1

-->

-->FB2.P

0 [PIN/POUT]

Turned master encoder 1, 2, and 3 revolutions and queried FB2.P each time. Each time was approximately in multiples of 4000 counts, so this confirms the drive is reading the master encoder correctly.

-->FB2.P

4007 [PIN/POUT]

-->FB2.P

8005 [PIN/POUT]

-->FB2.P

12005 [PIN/POUT]

-->

Note this is a basic check where the encoder is turned very slowly and doesn't account for the potential of missed or additional counts due to noise and variation of signal at high speeds. Always calculate your maximum expected frequency input to the AKD X9 input. The specification is shown below. The 3Mhz is based on per channel (A+, A-, B+, B-).

8.13.1.2 Connector X9 Input

Technical characteristics

- Electrical interface: RS-485
- Maximum signal input frequency: 3MHz
- Input signal voltage range: +12 V to -7 V
- Supply voltage (only applicable to Incremental Encoder Input): +5 V ±5%
- Maximum supply current: 250 mA

Pin	Pulse/Direction	CW/CCW	Incremental Encoder	Encoder with EnDat 2.2
1	Pulse+	CW+	A+	CLOCK+
2	Pulse-	CW-	A-	CLOCK-
3	GND	GND	GND	GND
4	Direction+	CCW+	B+	DATA+
5	Direction-	CCW-	B-	DATA-
6	Shield	Shield	Shield	Shield
7	-	-	Zero+	-
8	-	-	Zero-	-
9	-	-	+ 5 V (supply, output)	+5V (supply, output)

NOTICE Maximum cable length of an external incremental encoder using X9 is dependant on cable voltage drop and external encoder power requirements. See the calculation example in the *WorkBench Online Help* chapter "Electronic Gearing".

To calculate the maximum frequency, use the encoder in this application note as an example.

1000 pulses (each channel)	500 rev (max. speed of master enc).	1 min	=	8.3 kHz
1 rev of master encoder	min	60 sec		