

E201-9B

Decoding the BiSS information

The E201-9B interrogates a BiSS C encoder and allows data to be read by a PC with simple ASCII commands via a USB connection and a virtual COM port. The features of the BiSS data transmission and the details of the data packets are described in this document.

E201-9B supports BiSS C bidirectional encoders.



Related products

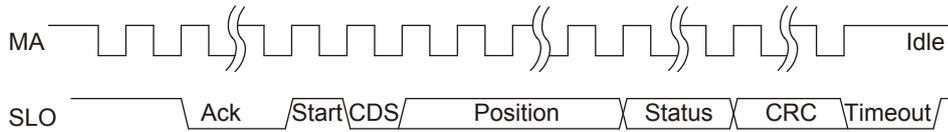


AksIM-2 & AksIM-4
Rotary Absolute
Magnetic Encoders



Orbis Rotary
Absolute Magnetic
Encoder

BiSS C timing diagram



MA line is idle high. Communication is initiated with first falling edge.

The encoder responds by setting SLO low on the second rising edge at MA.

When the encoder is ready for the next request cycle, it indicates this to the master by setting SLO high. The absolute position and the CRC data are in binary format and are sent with the MSB first.

Reading the encoder is started by sending the ASCII character "4" to the E201-9B interface. No CR character is required after the command.

The E201-9B sends back a 16-character hexadecimal string + CR, which includes 64 SLO bits synchronized with 64 clocks from MA.

Interface automatically detects and removes leading data (ACK, Start and CDS).

The data packet (containing position, status, and CRC) starts at the beginning of the returned 64-bit string.

The first N bits contain position data (for data length "N" see the section BiSS C interface in the data sheet of the encoder you are using), followed by two status bits and CRC.

The decoding of the data packet is described in two examples on the following page.

Example 1

Encoder used in example 1:

Type: Rotary absolute multiturn encoder, BiSS output

Resolution: 19 bits

Multiturn resolution: 16 bits

Status length: 2 bits (active low)

CRC length: 6 bits, polynomial $x^6 + x^1 + 1$ (Represented also as 0x43), inverted

Example of the response to the "4" command: **0002459ebc200000** (hex)

Response	Format
0 0 0 2 4 5 9 E B C 2 0 0 0 0 0	Hex
0000 0000 0000 0010 0100 0101 1001 1110 1011 1100 0010 0000 0000 0000 0000 0000	Binary
16 bits of MULTITURN = 0x2 = 2 counts	
0000 0000 0000 0010 0100 0101 1001 1110 1011 1100 0010 0000 0000 0000 0000 0000	MULTITURN
19 bits of SINGLETURN POSITION = 0x22CF5 = 142581 counts	
0000 0000 0000 0010 0100 0101 1001 1110 1011 1100 0010 0000 0000 0000 0000 0000	SINGLETURN POSITION
2 STATUS bits = 0x03	
0000 0000 0000 0010 0100 0101 1001 1110 1011 1100 0010 0000 0000 0000 0000 0000	STATUS
6 CRC bits = 0x21	
0000 0000 0000 0010 0100 0101 1001 1110 1011 1100 0010 0000 0000 0000 0000 0000	CRC
Ignored bits	
0000 0000 0000 0010 0100 0101 1001 1110 1011 1100 0010 0000 0000 0000 0000 0000	Ignored

Calculated multiturn position = 2 counts = 2

Calculated singleturn position = $\frac{142581 \text{ counts}}{2^{19}} \times 360 = 97.9026^\circ$

The status bits are 11. Since they are active low, the encoder operation is correct (no error, no warning).

Example 2

Encoder used in example 2:

Type: Rotary absolute multiturn encoder, BiSS output

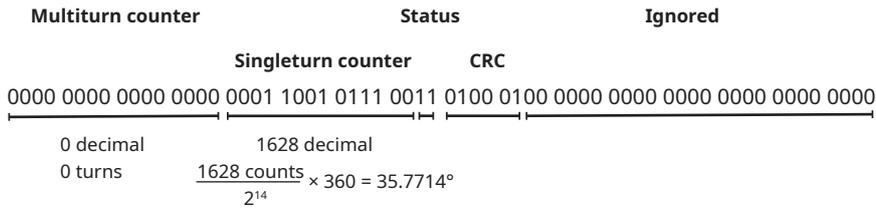
Resolution: 14 bits

Multiturn resolution: 16 bits

Status length: 2 bits (active low)

CRC length: 6 bits, polynomial $x^6 + x^1 + 1$ (Represented also as 0x43), inverted

Example of the response to the "4" command: **0000197344000000** (hex), which is decoded in binary as:



For CRC calculation example, refer to the document CRCD01, available at [RLS media center](#).

Recommended literature:

- Painless guide to CRC error detection algorithm; Ross N. Williams.
- Cyclic Redundancy Code (CRC) Polynomial Selection For Embedded Networks; P. Koopman, T. Chakravarty
- Data sheet L-9709-9005 BiSS C-mode (unidirectional) for Resolute encoders: <http://www.renishaw.com/en/>

Example 3

Encoder used in example 3:

Type: Rotary absolute singleturn encoder, BiSS output

Resolution: 19 bits

Status length: 2 bits (active low)

CRC length: 6 bits, polynomial $x^6 + x^1 + 1$ (Represented also as 0x43), inverted

Example of the response to the "4" command: **86611d8000000000** (hex)

Response																Format
8	6	6	1	1	D	8	0	0	0	0	0	0	0	0	0	Hex
1000	0110	0110	0001	0001	1101	1000	0000	0000	0000	0000	0000	0000	0000	0000	0000	Binary

19 bits of POSITION = 0x43308 = 275208 counts																
1000	0110	0110	0001	0001	1101	1000	0000	0000	0000	0000	0000	0000	0000	0000	0000	POSITION

2 STATUS bits = 0x03																
1000	0110	0110	0001	0001	1101	1000	0000	0000	0000	0000	0000	0000	0000	0000	0000	STATUS

6 CRC bits = 0x2C																
1000	0110	0110	0001	0001	1101	1000	0000	0000	0000	0000	0000	0000	0000	0000	0000	CRC

Ignored bits																
1000	0110	0110	0001	0001	1101	1000	0000	0000	0000	0000	0000	0000	0000	0000	0000	Ignored

Calculated multiturn position = 2 counts = 2

Calculated singleturn position = $\frac{275208 \text{ counts}}{2^{19}} \times 360 = 188.9703^\circ$

The status bits are 11. Since they are active low, the encoder operation is correct (no error, no warning).

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Document issues

Issue	Date	Page	Description
1	7. 9. 2023	-	New document

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