E201-9B
Decoding the BiSS information

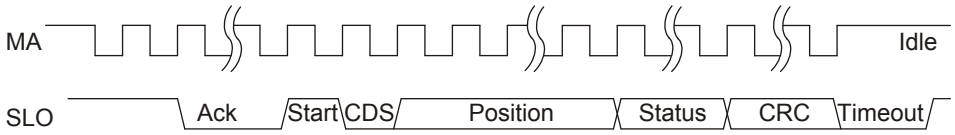
The E201-9B interrogates a BiSS C encoder and allows data to be read by a PC with simple ASCII commands via a USB connection and a virtual COM port. The features of the BiSS data transmission and the details of the data packets are described in this document.
E201-9B supports BiSS C bidirectional encoders.

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**	**10**11	1100	0010	0000	0000	0000	0000	0000	**SINGLETURN POSITION**

2 STATUS bits = 0x03																
0000	0000	0000	0010	0100	0101	1001	1110	101**1**	**1**100	0010	0000	0000	0000	0000	0000	**STATUS**

6 CRC bits = 0x21																
0000	0000	0000	0010	0100	0101	1001	1110	1011	1**100**	**001**0	0000	0000	0000	0000	0000	**CRC**

Ignored bits																
0000	0000	0000	0010	0100	0101	1001	1110	1011	1100	001**0**	**0000**	**0000**	**0000**	**0000**	**0000**	**Ignored**

Calculated multiturn position = 2 counts = 2

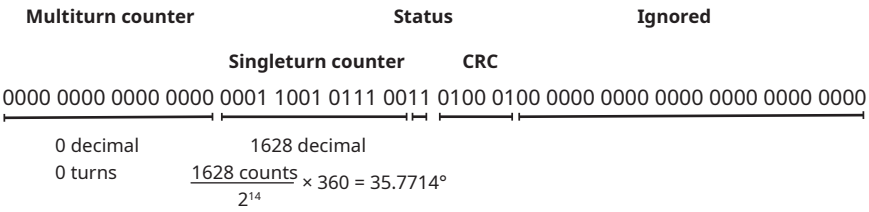
Calculated singleturn position = $\frac{142581 \text{ counts}}{2^{19}} \times 360 = 97.9026°$

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 (undirectional) 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**	**000**1	1101	1000	0000	0000	0000	0000	0000	0000	0000	0000	0000	**POSITION**
2 STATUS bits = 0x03																
1000	0110	0110	0001	000**1**	**1**101	1000	0000	0000	0000	0000	0000	0000	0000	0000	0000	**STATUS**
6 CRC bits = 0x2C																
1000	0110	0110	0001	0001	1**101**	**100**0	0000	0000	0000	0000	0000	0000	0000	0000	0000	**CRC**
Ignored bits																
1000	0110	0110	0001	0001	1101	100**0**	**0000**	**0000**	**0000**	**0000**	**0000**	**0000**	**0000**	**0000**	**0000**	**Ignored**

Calculated multiturn position = 2 counts = 2

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

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

Head office

RLS Merilna tehnika d. o. o.

Poslovna cona Žeje pri Komendi
Pod vrbami 2
SI-1218 Komenda
Slovenia

T +386 1 5272100
E mail@rls.si

www.rls.si

Global support

Visit our **website** to contact your nearest sales representative.

Document issues

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