

RS422 Control for the CD5 Sensor Head

This manual describes method for using CD5 Sensor Head without the CD5 C Please read the Amplifier (Controller) and the Sensor Head Instruction Manua for functional details.

1. Wire Connections

Use only DOL-1212-G05M for the extension cable.

Brown	Power supply (12-24V +/-10%)
Blue	Power supply (0V)
Black	Non-inverting received input (RS422) (+)
Orange	Inverting received input (RS422) (-)
Red	Non-inverting transmitted output (RS422) (+)
Yellow	Inverting transmitted output (RS422) (-)
White	Laser off input
Gray	Synchronous input
Black (thicker)	Shield (connect to 0V)

2. Communication Specification

Communication method	RS-422
Baud rate [bps]	9.6k / 19.2k / 38.4k / 57.6k / 115.2k / 230.4k / 460.8k / 921.6k (Standard) / 1843.2k
Transmission code	ASCII (some codes are binary)
Data length	8 bit
Stop bit length	1 bit
Parity check	Nil
data classification	STX, ETX
Check code	Exclusive OR (XOR)

3. Transmission Data Format

STX	Command	Data	ETX	Check
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(a) Read result data once

STX	02H
Command	"M"
Data	"?"
ETX	03H
Check	71H

(b) Read result continuously

STX	02H
Command	"M"
Data	"1"
ETX	03H
Check	7FH

(c) Stop continuous reading

STX	02H
Command	"M"
Data	"0"
ETX	03H
Check	7EH

(d) Overwrite setting parameter

STX	02H
Command	Chose from "Command/Data table"
Data	Chose from "Command/Data table"
ETX	03H
Check	XOR (Command xor Data xor ETX)

(e) Read/Check setting parameter

STX	02H
Command	Chose from "Command/Data table"
Data	"?"
ETX	03H
Check	XOR (Command xor Data xor ETX)

4. Receiving Data format

STX	Data0	Data1	Data2	ETX	Check
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(a) Measurement result

STX	02H
Data0	Upper 8 bit(binary)
Data1	Middle 8 bit(binary)
Data2	Lower 8 bit(binary)
ETX	03H
Check	XOR (Data0 xor Data1 xor Data2 xor ETX)

(b) Setting parameter value

STX	02H
Data0	from "Command/Data table"
Data1	20H
Data2	20H
ETX	03H
Check	XOR (Data0 xor Data1 xor Data2 xor ETX)

(c) When overwriting is done without error

STX	02H
Data0	"<"
Data1	20H
Data2	20H
ETX	03H
BCC	3DH

(d) When sending Data is not recognized

STX	02H
Data0	"?"
Data1	20H
Data2	20H
ETX	03H
BCC	3CH

5. Communication protocol

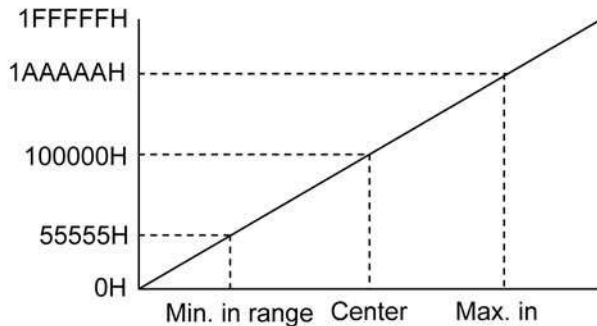
Basically, PC receives one Data after sending one Data.
 PC can send next Data after receiving Data.
 PC can send Stop Command only when sending Data continuously.

6. Binary Data format

6-1. Measurement result

Measurement result data consists of 24 bit binary data including three "0" from MSB.

Minimum data	0 (0H)
Minimum in measurement range	349525 (55555H)
Center in measurement range	1048576 (100000H)
Maximum in measurement range	1747626 (1AAAAAH)
Maximum data	2097151 (1FFFFFFH)



6-2. Shift value

This is used to shift the measurement result data.
Shift value consists of 24 bit binary data including sign bit at MSB.

Default ("0") 0 (0H) (MSB=0)
Maximum ("+699050") 699050 (AAAAAH) (MSB=0)
Minimum ("-699050") 9087658 (AAAAAH) (MSB=1)

6-3. Span value

This is used to change span of measurement result data.
It can be set from 0.0000 up to 3.9999
Product of this value and 32768 to be overwritten.

Default ("1.0000") 32768 (8000H) (= "1.0000" * 32768)
Minimum 0
Maximum ("3.9999") 131068 (1FFFCH) (= "3.9999" * 32768)

7. Command/Data table

(Bold is default value)

Function	Command	Data							Read/Write
number of	"A"	"0"	"1"	"2"	"3"	"4"	"5"	"6"	RW
		once	twice	4 times	8 times	16 times	32 times	64 times	
		"7"	"8"	"9"	"A"	"B"	"C"	"?"	
		128 times	256 times	512 times	1024 times	2048 times	4096 times	(read out)	
calibration (shift)	"H"	High Byte of shift value (binary)		(00H)					Write only
	"G"	Middle Byte of shift value (binary)		(00H)					
	"F"	Low Byte of shift value (binary)		(00H)					
calibration (span)	"O"	High Byte of span value (binary)		(00H)					Write only
	"P"	Middle Byte of span value (binary)		(80H)					
	"Q"	Low Byte of span value (binary)		(00H)					
target	"R"	"0"	"2"		"?"				RW
laser power	"L"	Surface	Ass Thickness		(read out)				
		"0"	"1"	"2"	"3"	"4"	"5"	"?"	RW
sensitivity	"S"	OFF	1	2	3	4	5(MAX)	(read out)	
		"0"	"1"	"2"	"3"	"4"	"5"	"6"	RW
		MIN	1	2	3	4	5	6	
communication speed	"B"	"7"	"8"	"9"	"A"	"B"	"?"		
		7	8	9	MAX	AUTO	(read out)		
		921.6k	1843.2k	(read out)					
receiving waveform	"T"	"0"	"1"	"2"	"3"	"4"	"5"	"6"	RW
		0	1	2	3	4	5	6	
		"7"	"8"	"9"	"A"	"B"	"C"	"D"	
		7	8	9	10	11	12	13	
		"E"	"F"	"?"					
14	AUTO	(read out)							
Sampling period (*)	"C"	"0"	"1"	"2"	"3"	"4"	"5"		RW
		100us	200us	400us	800us	1600us	3200us		
prevent mutual interference	"I"	"0"	"1"	"?"					RW
		OFF	ON	(read out)					
measurement value at alarm	"D"	"0"	"1"	"?"					RW
		Clamp	Hold	(read out)					
input type	"N"	"0"	"1"	"?"					RW
		PNP	NPN	(read out)					
reading out measurement	"M"	"0"		"1"		"?"			-
		Stop continuous read		Start continuous read		Read once			

(*) 25, 30, 85mm type : 100us, 350, 500, 2000mm type : 800us

8. Important point of communication speed

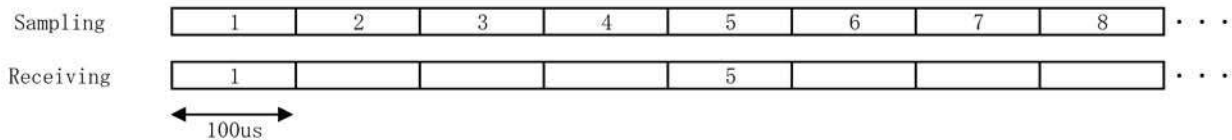
Set communication speed as needed every time before communicate because it's set 9.6kbps just after power ON.

Following table shows Baud rate for each Sampling period that the communication will be done completely in one sampling period.

Sampling period setting	Baud rate setting
100us	921.6kbps or more
200us	460.8kbps or more
400us	230.4kbps or more
800us	115.2kbps or more
1600us	57.6kbps or more
3200us	38.4kbps or more

You can setup slower Baud rate. Although, it will take longer time to complete the transfer.

Example: When Baud rate is 230.4kbps for 100us Sampling period, it will take 4 times longer. See following chart.



9. Example of communication

Example 1

Sending (number of averaging is 32 times)

STX	Command	Data	ETX	BCC
	"A"	"5"		
02H	41H	35H	03H	77H

Receiving (with no problem)

STX	Data0	Data1	Data2	ETX	BCC
	">"	" "	" "		
02H	3EH	20H	20H	03H	3DH

Example 2

Sending (reading out number of times of sending)

STX	Command	Data	ETX	BCC
	"A"	"?"		
02H	41H	3FH	03H	7DH

Receiving (32 times)

STX	Data0	Data1	Data2	ETX	BCC
	"5"	" "	" "		
02H	35H	20H	20H	03H	36H

Example 3

Sending (reading out measurement result)

STX	Command	Data	ETX	BCC
	"M"	"?"		
02H	4DH	3FH	03H	71H

Receiving (10C3E4H)

STX	Data0	Data1	Data2	ETX	BCC
	10H	C3H	E4H		
02H	10H	C3H	E4H	03H	34H

10. Control input

10-1. Laser off input

When input type is set as NPN

- Laser is OFF by connecting to 0V
- Laser is ON by connecting to 12~24V or leave open

When input type is set as PNP

- Laser is OFF by connecting to 12~24V
- Laser is ON by connecting to 0V

10-2. Synchronous input

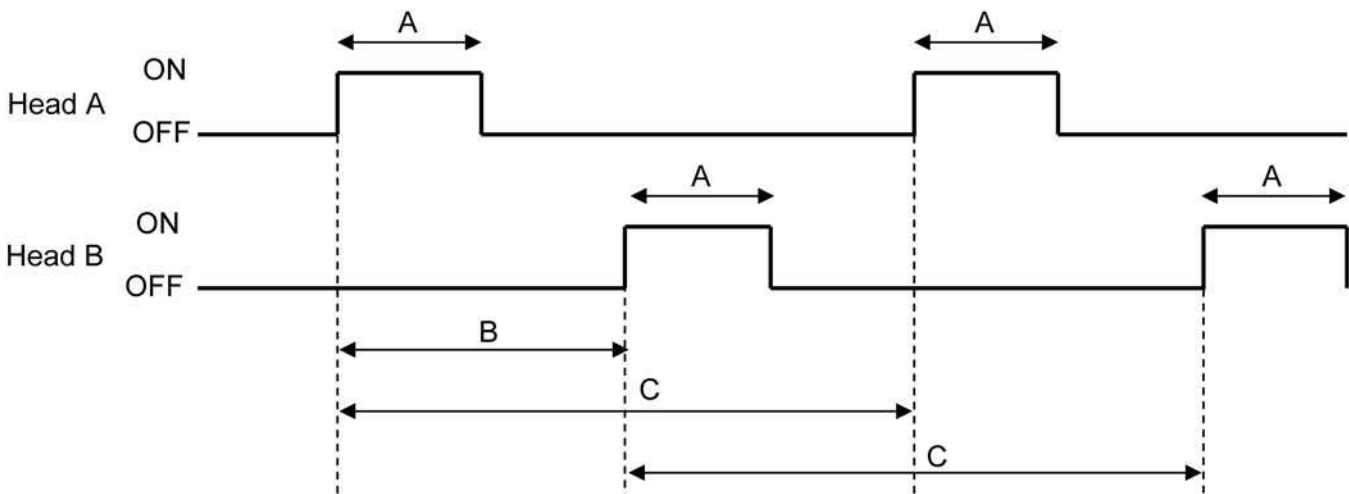
Enables preventing mutual interference between 2 sensor heads by let them work alternately.

If there is no need to prevent mutual interference, set as follows.

- Set "prevent mutual interference" OFF
- If it's NPN, leave or connect to 12~24V. If it's PNP, connect to 0V

If there is need to prevent mutual interference, set as follows.

- Set "prevent mutual interference" ON
- Input Synchronous signal as follows.



	NPN			PNP		
ON	0V			12~24V		
OFF	~24V or Open			0V or Open		

	Sampling period : 100us		Sampling period : 800us			
A	50us					
B	300us			2400us		
C	600us			4800us		

All of these value are typical value