# B Series Laser Rangefinder Module User Manual

Version: R1

## **Revision History**

Version	Date	by	Description
R1	Aug./23/2019	ly	Initial

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## 1. Introduction

B series laser rangefinder module was developed for fast and precise distance measuring, even in difficult measurement conditions, like with poor reflect laser signal level.

Its lightweight make it suitable for size and weight limited applications, such as portable devices, dronesetc.

#### 1.1 Features

Features of the B8xx module include:

- 1. Small size:
  - 40mm width
  - 64mm long
  - 18mm height
- 2. Light Weight:

• <15g

- 3. Precise Distance Measuring
  - 1mm resolution
- 4. Long Measuring Distance
  - 100 meters

#### 1.2 Quick Start

For quick testing shipped module please jump to section 7 Demonstration, after that reading the rest sections for more details.

## 2. Key parameters

Accuracy	±3mm
Measuring Unit	millimeter
Measuring Range (without Reflection)	0.03-100m
Measuring Time	0.4~4 seconds
Laser Class	Class II
Laser Type	600~690nm, <1mW
Size	40*64*18mm
Weight	About 15g
Voltage	DC 2.5~3.3V
Operating Temperature	0-40 °C (32-104 °F )
Storage Temperature	-25~60 °C (-13~140 °F)

Table 2-1 key parameters

Under bad measure condition, like environment with strong light or the diffuse reflectance of measuring point over-high or low, the accuracy would have bigger amount of error:  $\pm 3 \text{ mm}+40\text{PPM}$ . And the accuracy will become worse as the distance increases. The calculation formula is longer than 10 meters, for every 10 meters increase, the error is increased by 0.5 mm.

## 3. Mechanical Data



Figure 3-1 Mechanical Size

## 4. Pin Information

At most 5 Pins need to power and control the laser rangefinder module.



All these pins list below:

Table 4-1 Pin List

Pin	Name	Function	Default	Description
5	PWREN	Digital Input	Low	Module power up enable pin, active HIGH
1	TXD	Digital Output	High	Module USART Transmit pin, Open-Drain
2	RXD	Digital Input	High	Module USART Receive pin, Open-Drain
3/4	VCC	Power	Power	Power supply, DC 2.5V~3.3V 300mA+
6	GND	Power	Ground	Module power ground

Application may need more than one laser range finder module to read out each distance. In multi-slave applications, beware to set address for each laser module before it be connected to the network to avoid the addressing conflict. After factory stage all modules address was set to 0x00 as default.



Figure 4-1 Multi-Module Wiring



#### 4.1.1 Self-soldering with module on board pads

Figure 4-2 Solder Connector

**!!!** Figure 4-2 Solder Connector shows NO pull-up resistor for module TXD/RXD, the USB2TTL converter has internal pull-up resistors for TXD/RXD pins. Please keep in mind module TXD/RXD pins are OPEN-DRAIN.

#### 5. Absolute maximum ratings

**!!!Note**: Exceeding one or more of the limiting values may cause module permanent damage!

Operating conditions	Min	Normal	Max	Units
Voltages	•	•	·	
VCC	-0.3	3.0	5.5	V
GND		0	0	V
TXD	-0.3		VCC+0.3	V
RXD	-0.3		VCC+0.3	V
PWREN	-0.3	VCC	4.0	V
Temperature		•	·	
Operating	0		+40	°C
Storage	-25		+60	°C

#### Table 5-1 Absolute Max. Ratings

Warning: Please note that normal operating voltage is DC2.5~3.3V.Voltage between DC3.3V~5.0V would not damage the module immediately,but itstill will burn the module! Don't use any power above DC3.3V.

## 6. Operation Protocol

## 6.1 USART Interface

- Baudrate: Auto Detect (9600bps ~115200bps recommend) OR Default 19200bps
- Start bits: 1 bit
- Data bits: 8 bits
- Stop bits: 1 bit
- Parity: none
- Flow control: none

#### **!!!IMPORTANT:** Fixed baudrate 19200bps will be used under one condition:

1. Auto baudrate stage time up (~2.5 seconds), no auto baudrate byte 0x55 received or wrong byte received;

#### 6.2 Control flow char

All communication commands are issued by master board, laser rangefinder module play slave role to answer master's request. The Ask & Answer flow though USART is shown as Figure 6-1.



Figure 6-1 Control Flow

In initial state, Slave module (laser rangefinder) is in power down mode before Master pull up the PWREN pin. After PWREN goes high, Slave will take about 100 milliseconds to do self-boot, and then entering auto baud rate detect stage.

Master transfer 1byte fixed data 0x55 to slave for auto baud rate, if success, slave will reply 1-byte data to master, which present the slave itself address. In one master and multi-slave communication situation, the self-address reply from the slaves may cause USART bus conflict, keep in mind this byte should be ignored.

Communication between master and slave has been established after the successful auto baud rate. Now master can send command frame to slave.

#### 6.3 Command Frame

Command frame may consist 6 parts as Table 6-1 shows.

Table 6-1 command structure

Bytes	0	1		2	3	4	5	6	7	8
Bits	[7:0]	[7]	[6:0]	[7:0]	[7:0]	[7:0]	[7:0]	[7:0]	[7:0]	[7:0]
Name	Head	R/W.	Address	Register		Payload count		Payload		Checksum
Data	0xAA	0	0x51	0x00	0x20	0x00	0x01	0x00	0x00	0x72

Table 6-1 shows the 1-shot measure request command from master to slave. In this command frame:

• Request frame always start with fixed head byte 0xAA, this byte can also be 0xEE during error

reply frame from slave to master, please refer to section 6.4.16 error reply frame;

- R/W indicate bit, 0: Master write to Slave, 1: Master read from Slave
- Slave address is 0x51, address has only 7-bits, so the address is from 0x00 to 0x7F, 0x00 is te default address before master issue module address change command, 0x7F is the broadcast address reserved for one-master to multi-slave network;
- Slave register is 0x0020 (REG\_MEA\_MODE, see register list 6.3.1 for more details);
- Payload data count write to register 0x0020 is 0x0001, this section may not present when R/W = 1, Master read from slave;
- The single data write to register 0x0020 is 0x0000, this section may not present when R/W = 1, Master read from slave;
- The frame checksum is 0x72, checksum = address byte + register bytes + payload count bytes + all payload bytes, byte overflow ignored;

#### 6.3.1 Control Registers

No.	Register	Name	Function		
1	0x0000	REG_ERR_CODE	System status code		
2	0x0006	REG_BAT_VLTG	Input voltage		
3	0x0010	REG_ADDRESS	Module address		
4	0x0012	REG_OFFSET	Module measure result offset		
5	0x0020	REG_MEA_START	Initiate measure		
6	0x0022	REG_MEA_RESULT	Measure result		
7	0x01BE	REG_CTRL_LD	Laser diode control		

#### Table 6-2 Registers

#### 6.4 Commands

#### 6.4.1 Read Module Latest Status

Table 6-3 cmd. Read Module Status

Bytes	0	1	2 3		4
Name	Head	RW/Address	Register		Checksum
Data	0xAA	0x80	0x00 0x00		0x80

- Type: Read command
- Slave address: 0x00
- Register address: 0x0000
- Function: master read out the module's status after previous command executed;
- Reply from slave:

Table 6-4 cmd. Reply Read Module Status

Bytes	0	1	2 3		4	5	6	7	8
Name	Head	<b>RW/Address</b>	Register		Payload count		Payload		Checksum
Data	0xAA	0x80	0x00	0x00	0x00	0x01	0xYY	0xZZ	Checksum

Byte 0xZZ is the status code replied from slave, see status codes Table 6-24 for details.

#### 6.4.2 Read Hardware Version Number

Table 6-5 cmd	. Read HW	version
---------------	-----------	---------

Bytes	0	1	2	3	4
Name	Head	RW/Address	Register		Checksum
Data	ta 0xAA 0x80		0x00	0x0A	0x8A

- Type: Read command
- Slave address: 0x00
- Register address: 0x000A
- Function: master read out the module's HW version number;
- Reply from slave:

Table 6-6 cmd. Reply Read HW version

Bytes	0	1	2	3	4	5	6	7	8
Name	Head	<b>RW/Address</b>	Register		Payload count		Payload		Checksum
Data	0xAA	0x80	0x00	0x0A	0x00	0x01	0xVV	0xYY	sum

HW version number is 0xVVYY.

#### 6.4.3 Read Software Version Number

Table 6-7 cmd. Read HW version

Bytes	0	1	2	3	4
Name	Head	RW/Address	2   3     Register		Checksum
Data	0xAA	0x80	0x00	0x0C	0x8C

- Type: Read command
- Slave address: 0x00
- Register address: 0x000C
- Function: master read out the module's SW version number;
- Reply from slave:

Table 6-8 cmd. Reply Read SW version

Bytes	0	1	2	3	4	5	6	7	8
Name	Head	<b>RW/Address</b>	Register		Payload count		Payl	oad	Checksum
Data	0xAA	0x80	0x00	0x0C	0x00	0x01	0xVV	0xYY	sum

SW version number is 0xVVYY.

#### 6.4.4 Read Module Serial Number

Table 6-9 cmd. Read Serial version

Bytes	0	1	2	3	4
Name	Head	RW/Address	Reg	ister	Checksum
Data	0xAA	0x80	0x00	0x0E	0x8E

- Type: Read command
- Slave address: 0x00
- Register address: 0x000E
- Function: master read out the module's serial number;
- Reply from slave:

Bytes	0	1	2	3	4	5	6	7	8
Name	Head	<b>RW/Address</b>	Register		Payloa	Payload count		oad	Checksum
Data	0xAA	0x80	0x00	0x0E	0x00	0x01	0xSS	0xNN	sum

Table 6-10 cmd. Reply Read Serial Number

HW version number is 0xSSNN.

#### 6.4.5 Read Input Voltage

Table 6-11 cmd. Read HW version

Bytes	0	1	2	3	4
Name	Head	RW/Address	Reg	ister	Checksum
Data	0xAA	0x80	0x00	0x06	0x86

- Type: Read command
- Slave address: 0x00
- Register address: 0x0006
- Function: master read out the module's input voltage in mV with BCD encode;
- Reply from slave:

Table 6-12 cmd. Reply Read HW version

Bytes	0	1	2	3	4	5	6	7	8
Name	Head	<b>RW/Address</b>	Register		Payload count		Payload		Checksum
Data	0xAA	0x80	0x00	0x06	0x00	0x01	0x32	0x19	sum

Input voltage = 3219mV.

#### 6.4.6 Read Measure Result

Table 6-13 cmd. Read Measure Result

Bytes	0	1	2 3		4	
Name	Head	RW/Address	Reg	ister	Checksum	
Data	0xAA	0x80	0x00	0x22	0xA2	

- Type: Read command
- Slave address: 0x00
- Register address: 0x0022
- Function: master read out the distance measure result;
- Reply from slave:

Table 6-14 cmd. Reply Measure Result

Bytes	0	1	2	3	4	5	6:9	10:11	12
Name	Head	RW/ Address	Reg	ister	Pay co	load unt	Payload Distance	Payload SQ	Check sum
Data	0xAA	0x00	0x00	0x22	0x00	0x03	0xAABBCCDD	0x0101	Check sum

#### 6.4.7 Set Module Address

Table 6-15 cmd. Set Module Address

Bytes	0	1	2	3	4	5	6	7	8
Name	Head	<b>RW/Address</b>	Register		Payloa	Payload count		oad	Checksum
Data	0xAA	0x00	0x00	0x10	0x00	0x01	0x00	0xYY	sum

- Type: Write command
- Slave address: 0x00
- Register address: 0x0010
- Function: master set slave's address, this address will not lost after module power off;
- Reply from slave:

Table 6-16 cmd. Reply Set Module Address

Bytes	0	1	2	3	4	5	6	7	8
Name	Head	<b>RW/Address</b>	Register		Payload count		Payl	oad	Checksum
Data	0xAA	0x00	0x00	0x10	0x00	0x01	0x00	0xYY	sum

Slave address set to 0xYY (!!!Beware: address only take bit[6:0], other bits will be ignored).

**!!!** Note: Do not set slave address to broadcast address 0x7F, this address is reserved for one master to multi-slave network which needs all slave to measure distance at the same time, and no slave reply measure result until master ask one of them to.

#### 6.4.8 Set Module Measure Offset

Bytes	0	1	2	3	4	5	6	7	8
Name	Head	<b>RW/Address</b>	Register		Payload count		Payl	oad	Checksum
Data	0xAA	0x00	0x00	0x12	0x00	0x01	0xZZ	0xYY	sum

- Type: Write command
- Slave address: 0x00
- Register address: 0x0012
- Function: master set slave's measure offset. For example, if the offset 0xZZYY = 0x7B(+123), it means the final output of measure result will **PLUS** 123 millimeters, if the offset 0xZZYY = 0xFF85(-123), it means the final output of measure result will **MINUS** 123 millimeters.
- Reply from slave:

Table 6-17 cmd. Reply Set Module Address

Bytes	0	1	2	3	4	5	6	7	8
Name	Head	<b>RW/Address</b>	Register		Payload count		Payl	oad	Checksum
Data	0xAA	0x00	0x00	0x12	0x00	0x01	0xZZ	0xYY	sum

#### 6.4.9 Turn On or Turn Off Laser

Table 6-18 cmd. Turn on/off Laser

Bytes	0	1	2	3	4	5	6	7	8

Name	Head	<b>RW/Address</b>	Register		Payload count		Payload		Checksum
Data	0xAA	0x00	0x01	0xBE	0x00	0x01	0x00	0xZZ	Checksum

- Type: Write command
- Slave address: 0x00
- Register address: 0x01BE
- Function: turn on or turn off laser beam, if 0xZZ = 0x01 laser on, 0xZZ = 0x00 laser off.
- Reply from slave:

Table 6-19 cmd. Reply Turn On/Off Laser

Bytes	0	1	2	3	4	5	6	7	8
Name	Head	<b>RW/Address</b>	Register		Payload count		Payload		Checksum
Data	0xAA	0x00	0x01	0xBE	0x00	0x01	0x00	0xZZ	Checksum

#### 6.4.10 Start 1-shot Auto Distance Measure

Bytes	0	1	2	3	4	5	6	7	8
Name	Head	<b>RW/Address</b>	Register		Payload count		Payload		Checksum
Data	0xAA	0x00	0x00	0x20	0x00	0x01	0x00	0x00	0x21

- Type: Write command
- Slave address: 0x00
- Register address: 0x0020
- Function: Initiate slave to do 1-shot measure in auto mode, for measure modes please refer to section 6.5.
- Reply from slave:

Table 6-20 cmd. Reply 1-shot Auto Measure

Bytes	0	1	2	3	4	5	6:9	10:11	12
Name	Head	RW/ Address	Reg	Register		load unt	Payload Distance	Payload SQ	Check sum
Data	0xAA	0x00	0x00	0x22	0x00 0x03		0x03 0xAABBCCDD		Check sum

- Type: Reply from slave
- Slave address: 0x00
- Register address: 0x0022
- Function: Reply measure result to master, measure result = 0xAABBCCDD millimeters (frame byte6 = 0xAA, byte7 = 0xBB, byte8 = 0xCC, byte9 = 0xDD) and signal quality = 0x101, less signal quality number stands for stronger laser signal and more reliable distance result.

6.4.11 Start 1-shot Slow Distance Measure

Bytes	0	1	2	3	4	5	6	7	8
Name	Head	<b>RW/Address</b>	Reg	Register		d count	Payl	oad	Checksum

Data         0xAA         0x00         0x00         0x20         0x00         0x01         0x00         0x01         0x22
---

- Type: Write command
- Slave address: 0x00
- Register address: 0x0020
- Function: Initiate slave to do 1-shot measure in slow mode.
- Reply from slave: same as 1-shot auto mode.

#### 6.4.12 Start 1-shot Fast Distance Measure

Bytes	0	1	2	3	4	5	6	7	8
Name	Head	<b>RW/Address</b>	Register		Payload count		Payload		Checksum
Data	0xAA	0x00	0x00	0x20	0x00	0x01	0x00	0x02	0x23

- Type: Write command
- Slave address: 0x00
- Register address: 0x0020
- Function: Initiate slave to do 1-shot measure in fast mode.
- Reply from slave: same as 1-shot auto mode.

#### 6.4.13 Start Continuous Auto Distance Measure

Bytes	0	1	2	3	4	5	6	7	8
Name	Head	<b>RW/Address</b>	Register		Payload count		Payload		Checksum
Data	0xAA	0x00	0x00	0x20	0x00	0x01	0x00	0x04	0x25

- Type: Write command
- Slave address: 0x00
- Register address: 0x0020
- Function: Initiate slave to do continuous measure in auto mode.
- Reply from slave: same as 1-shot auto mode.

#### 6.4.14 Start Continuous Slow Distance Measure

Bytes	0	1	2	3	4	5	6	7	8
Name	Head	<b>RW/Address</b>	Register		Payload count		Payload		Checksum
Data	0xAA	0x00	0x00	0x20	0x00	0x01	0x00	0x05	0x26

- Type: Write command
- Slave address: 0x00
- Register address: 0x0020
- Function: Initiate slave to do continuous measure in slow mode.
- Reply from slave: same as 1-shot auto mode.

Bytes	0	1	2	3	4	5	6	7	8
Name	Head	<b>RW/Address</b>	Register		Payload count		Payload		Checksum
Data	0xAA	0x00	0x00	0x20	0x00	0x01	0x00	0x06	0x27

6.4.15 Start Continuous Fast Distance Measure

- Type: Write command
- Slave address: 0x00
- Register address: 0x0020
- Function: Initiate slave to do continuous measure in fast mode.
- Reply from slave: same as 1-shot auto mode.

#### 6.4.16 Error Reply from Slave

If any error occurred during measuring stage, laser rangefinder module will reply error report frame:

#### Table 6-21 Error Reply

Bytes	0	1	2	3	4	5	6	7	8
Name	Head	<b>RW/Address</b>	Register		Payload count		Payload		Checksum
Data	0xEE	0x00	0x00	0x00	0x00	0x01	0x00	0x0F	0x10

- Type: Reply from slave
- Slave address: 0x00
- Register address: 0x0000
- Function: report error status code to master, the error code = 0x000F, please refer section 6.6 status codes for its meaning.

#### 6.4.17 Exit from Continuous Measure

Master transfer one byte 0x58 (upper case character 'X') to stop continuous measure mode immediately.

#### 6.4.18 Start Multi-slaves Measure

Master send out 1-shot measure commands to slave address 0x7F, that will make all online slaves to measure distance at the same time, but none of them will return its measure result to master until master ask each one to return the measure result. Before master send out the reading measure result command, master should read the slave's status code to make sure there was no error occurred during this slave measuring.

Bytes	0	1	2 3		4	5	6	7	8	
Name	Head	<b>RW/Address</b>	Register		Payloa	d count	Payl	oad	Checksum	
Data	0xAA	0x7F	0x00	0x20	0x00	0x01	0x00	0x00	0xA0	

Table 6-22 Broadcast Measuring

- Type: Write command
- Slave address: 0x00
- Register address: 0x0020

- Function: Initiate all slave to do 1-shot measure in auto mode
- Reply from slave: NO REPLY

After sending this command out, master polling each slave address for their status, if slave replies its status code with 0x0000, means no error, then send Read-measure-Result command to read back the distance. Measure result for each slave will NOT overwrite until next successful measure command with a new distance result.

#### 6.5 Measure Modes

There are 2 types of measure mode, 1-shot and continuous.

- 1-shot gives only 1 measure result for each distance measure request command;
- Continuous measuring continuous to reply distance result as more as 255 times if master not break the measuring cycles. To break the continuous measuring, master need to send 1 byte 0x58 (upper case character 'X' in ASCII) during measuring.

Each measure mode has 3 working attributes:

- Auto, module returns Measure Result & Signal Quality(SQ), Less SQ value stands for more reliable distance result, in this mode module adjust reading speed according to the laser reflect level;
- Slow, distance read for higher accuracy;
- Fast, distance read for lower accuracy, but higher speed.

Attribute Modes	Auto	Slow	Fast
1-shot	1-shot Auto	1-shot Slow	1-shot Fast
Continuous	Continuous Auto	Continuous Slow	Continuous Fast
Measure Speed	Auto	Slow	Fast
Measure Accuracy	Auto	High	Low

Table 6-23 Measuring Modes

### 6.6 Status Codes

Table	6-24	status	codes

Status Code	Description
0x0000	No error
0x0001	Power input too low, power voltage should >= 2.2V
0x0002	Internal error, don't care
0x0003	Module temperature is too low(< -20 $^\circ$ C)
0x0004	Module temperature is too high(> +40℃)
0x0005	Target out of range
0x0006	Invalid measure result
0x0007	Background light too strong
0x0008	Laser signal too weak
0x0009	Laser signal too strong
0x000A	Hardware fault 1
0x000B	Hardware fault 2
0x000C	Hardware fault 3
0x000D	Hardware fault 4
0x000E	Hardware fault 5
0x000F	Laser signal not stable
0x0010	Hardware fault 6
0x0011	Hardware fault 7
0x0081	Invalid Frame

## 7. Demonstration

### 7.1 Wiring to USB2TTL converter

For test purpose, Pin.PWREN tied to RTS line. When RTS asserted, RTS line goes low, so de-assert RTS to power module, module then start to boot.



Figure 7-1 Wiring

### 7.2 Serial Port Test Software

Before start the command test, we need to:

- 1. Plug & Install CH341 USB2TTL converter driver on your computer;
- 2. Download & install the trial version serial port test software before start, software download page : http://www.geshe.com/en/support/download;
- 3. Start the software and follow the steps:

After starting the PC soft you have 2 options:

- 1. Create a new project;
- 2. load configuration file and do some modify according to your serial port number;

• Create New Project from scratch.

•			Geshe Beacon - CO	/I3 9600,8,1,N	- 0	23
					a 🍟 🖣	
	New		Protocol Excitation Project Ctrl+N	<ul> <li>Clear</li> <li>Topmost</li> </ul>		
	Open 🕨	Î	Direct Excitation Project Ctrl+Shift+N	iew		
	Close					-
X	Settings					
•	Register					
3	Help F1					
	About					
×	Exit Alt+F4	-				
Ready				Send 0	Recv 0 OCOM3 9600,8,1,N	::. ۷

#### Figure 7-2 Create New Project

• Load Configuration file "GeseDemoConfig.bsp" from test file folder

•		Geshe Beacon - COM3 19200,8,1,N 📼 🗉
		à 🗑 👻
	New	Protocol Excitation Project Ctrl+O
	Open 🔸	Direct Excitation Project Ctrl+Shift+O Excite Stop Add Save Paste Delete Properties
	Close	Direct Excitation Explorer
10.00	<u></u>	Name Data Format Data
-	Save Ctrl+S	🔰 Auto Baud Hex 🝷 55
	Save As	🌹 Rd. Status Hex 🝷 AA 80 00 00 80
-		🌹 Rd. HW Hex 🝷 AA 80 00 0A 8A
H	Save All Ctrl+Shift+S	🌹 Rd.SW Hex 💽 AA 80 00 0C 8C
222	C-111-1-1	👂 Rd. SN 🛛 Hex 💽 AA 80 00 0E 8E
20.	setungs	🌹 Rd. Voltagi Hex 👻 AA 80 00 06 86
	Register	🌹 Laser On Hex 💌 AA 00 01 BE 00 01
		🌹 Laser Off 🛛 Hex 📼 🗛 00 01 BE 00 01
	Help F1	📕 1shot Auto Hex 📼 AA 00 00 20 00 01
	About	👂 1shot Slow Hex 💌 AA 00 00 20 00 01
		🃁 1shot Fast Hex 💌 AA 00 00 20 00 01
×	Exit Alt+F4	🔰 Cntinus Exi Hex 🝷 58
		🎽 🖉 🖓 🖓 🖓 🖉
		🎐 Cntinus Slc Hex 🔽 🖌 AA 00 00 20 00 01
		🌹 Cntinus Fa: Hex 🔽 🖌 AA 00 00 20 00 01
		🍯 Set Offset Hex 🔽 AA 00 00 12 00 01
Open	succeeded	Send 0 Recv 0 🥥 COM3 19200,8,1,N

Figure 7-3 Load Config. File

Serial Port parameters Configuration, select the Port No. after plug the USB2TTL converter according to your computer, COM7 on my computer. Baud rate can be any of you want, 9600bps 19200bps, 115200bps etc.

Remember to assert RTS box to power off module before start test.

•	Geshe Bea	on - COM	7 19200,8,1,N DTF	R RTS			- 0	23
	Home Tools					6	s 🍟 🛤	0
(U) Open	Port: COM7 ▼ StopBits: 1 ▼ RTS: ♥ BaudRate: 19200 ▼ Parity: None ▼ DTR: ♥ DataBits: 8 ▼ Handshake: None ▼ Communication	Clea	r most Excite Stop	Add Sav	ve Paste Kott Edit	ies		
Data		-	Direct Excitation Ex	plorer		di		
Re Re	gister Geshe Beacon software and execute communication test by Buil	din	Name	Data Forma	Data	Latency(ms)	Active	
1		1	Auto Baudrate	Hex 💌	55	0	7	
		9	Rd. Status	Hex 🔹	AA 80 00 00 80	0		
		<b>y</b>	Rd. HW	Hex 🔹	AA 80 00 0A 8A	0		
		9	Rd.SW	Hex 💌	AA 80 00 0C 8C	0		
		9	Rd. SN	Hex 💌	AA 80 00 0E 8E	0		
		19	Rd. Voltage	Hex 🔹	AA 80 00 06 86	0		
		4	Laser On	Hex 🔹	AA 00 01 BE 00 01 00 01 C1	0		
		9	Laser Off	Hex 💌	AA 00 01 BE 00 01 00 00 C0	0		
		9	1shot Auto	Hex 💌	AA 00 00 20 00 01 00 00 21	0		
		9	1shot Slow	Hex 🔹	AA 00 00 20 00 01 00 01 22	0		
		<b>y</b>	1shot Fast	Hex 🔹	AA 00 00 20 00 01 00 02 23	0		
		9	Cntinus Exit	Hex 💌	58	0		
		9	Cntinus Auto	Hex 💌	AA 00 00 20 00 01 00 04 25	0		
		9	Cntinus Slow	Hex 🔹	AA 00 00 20 00 01 00 05 26	0		
		9	Cntinus Fast	Hex 🔹	AA 00 00 20 00 01 00 06 27	0		
		9	Set Offset	Hex 💌	AA 00 00 12 00 01 00 64 77	0		
			Set Address	Hex 💌	AA 00 00 10 00 01 00 51 62	0		
Ready					Send 64 Recv 183 🥥 COM7	19200,8,1,N	DTR RTS	

If you chose to create new project, you have to add your commands by clicking ICO ADD to add commands, after that, Click ICO OPEN to turn serial port on.

•					Geshe	e Beacon	- COM7 19	200,8,1,N DTR	RTS					23
	Home	Tools										G	. 👕 📼	0
Open	Port: BaudRate: DataBits:	COM7 - 19200 - 8 - Com	StopBits: Parity: Handshake: munication	1 • None • None •	RTS: 🗹 DTR: 🔽	HEX	Clear Topmost /iew	Excite Stop	Add	Sav	dd Direct Excitation Alt+A	es		
Data	gister Gasha	Reacon soft	ware and ever	ite communic	ation test b	v Buildin	Direc	t Excitation Exp	Data Fo	rma	Data	Latency(ms)	Active	
1	gister desile	Deacon son	vare and exect	ite communica	ation test b	y bullant	H Au	ito Baudrate	Hex	-	55	0	V	
							9 Ro	l. Status	Hex	+	AA 80 00 00 80	0		
							9 Ro	I. HW	Hex	-	AA 80 00 0A 8A	0		
							🦸 Ro	LSW	Hex	•	AA 80 00 0C 8C	0		
							9 Ro	I. SN	Hex	*	AA 80 00 0E 8E	0		
							🥖 Ro	l. Voltage	Hex	+	AA 80 00 06 86	0		
							🏓 La	ser On	Hex	-	AA 00 01 BE 00 01 00 01 C1	0		
							🏓 La	ser Off	Hex	-	AA 00 01 BE 00 01 00 00 C0	0		
							🃁 🕴 1s	hot Auto	Hex	*	AA 00 00 20 00 01 00 00 21	0		
							🌹 1s	hot Slow	Hex	÷	AA 00 00 20 00 01 00 01 22	0		
							🌹 1s	hot Fast	Hex	*	AA 00 00 20 00 01 00 02 23	0		
							👂 Cr	itinus Exit	Hex	•	58	0		
							🍠 Cr	itinus Auto	Hex	*	AA 00 00 20 00 01 00 04 25	0		
							🧳 Cr	tinus Slow	Hex	4	AA 00 00 20 00 01 00 05 26	0		
							🦸 Cr	itinus Fast	Hex	-	AA 00 00 20 00 01 00 06 27	0		
							🏓 Se	t Offset	Hex	*	AA 00 00 12 00 01 00 64 77	0		
							🍠 Se	t Address	Hex	*	AA 00 00 10 00 01 00 51 62	0		
Ready										S	end 64 Recv 183 😡 COM7	19200,8,1,N	DTR RTS	

First release the PWREN by de-assert RTS box, and wait 100 milliseconds for module boot, then do the auto baud rate stage by assert the 1<sup>st</sup> command Active box, click ICO EXCITE to transmit command 0x55 to laser rangefinder module, Module reply its address right after the auto baud rate success. Now

•					(	Geshe Be	eacon - CON	17 19200,8,1,N					
	Home	Tools										4	s 🍟 📮 🥥
Close	Port: BaudRate: DataBits:	COM7 1 19200 1 8 Comr	StopBits: Parity: Handshake: munication	1 None None	RTS:	HEX		Excite Stop	Add	Sav	e Paste Edit Cut Properti	ies	
Data	1						- Direc	t Excite (F6)	lorer				
Re	gister Geshe I	Beacon softw	vare and exect	ite communio	ation test b	y Buildir	n Na	me	Data Fo	orma	Data	Latency(ms)	Active
1 [201	18-04-16 17:	31:07.064 T	]55				🦻 🖉 A	uto Baudrate	Hex	-	55	0	7
3	10 04 10 17.	51.07.002 N	100				9 R	d. Status	Hex	•	AA 80 00 00 80	0	
							🕴 R	d. HW	Hex		AA 80 00 0A 8A	0	
							9 R	d.SW	Hex	•	AA 80 00 0C 8C	0	
							🦻 R	d. SN	Hex	•	AA 80 00 0E 8E	0	
							🦻 R	d. Voltage	Hex	-	AA 80 00 06 86	0	
							🍠 La	aser On	Hex		AA 00 01 BE 00 01 00 01 C1	0	
							🍠 La	aser Off	Hex	-	AA 00 01 BE 00 01 00 00 C0	0	
							9 1	shot Auto	Hex	*	AA 00 00 20 00 01 00 00 21	0	
							9 1	shot Slow	Hex	•	AA 00 00 20 00 01 00 01 22	0	
							9 1	shot Fast	Hex		AA 00 00 20 00 01 00 02 23	0	
							9 C	ntinus Exit	Hex	-	58	0	
							9 C	ntinus Auto	Hex	*	AA 00 00 20 00 01 00 04 25	0	
							🥑 C	ntinus Slow	Hex	•	AA 00 00 20 00 01 00 05 26	0	
							👂 c	ntinus Fast	Hex		AA 00 00 20 00 01 00 06 27	0	
							🍠 Si	et Offset	Hex	-	AA 00 00 12 00 01 00 64 77	0	
							🦻 🦻 Si	et Address	Hex	*	AA 00 00 10 00 01 00 51 62	0	
Direct	excitation						1.1				Send 1 Recv 1	◎ COM7 19	200,8,1,N

it's ready to receive further commands from master.

### More commands and reply transfer between the laser rangefinder module and the master.

•				Geshe	Beacon -	COM7 192	200,8,1,N DTF	R RTS				- 0	23 [
	Home	Tools									6	1	
Close	Port: C BaudRate: 1 DataBits: 8	COM7 F StopBi 19200 F Parity: B F Hands Communicati	ts: 1 r None r hake: None r on	RTS: 🔽 DTR: 🔽	HEX HEX Vie	Clear Topmost	Excite Stop	Add	Sav	e Paste Delete Edit Cut Propertie	es		
Data					*	📋 Direct	Excitation Ex	plorer					
Res           1         [201           2         [201           3         [201           4         [201           5         [201           6         [201           7         [201           8         [201           9         [201           10         [202           11         [201           13         [201           14         [201           15         [202           16         [202           20         [203           21         [201           22         [202           23         [201           24         [202           23         [201           24         [202           24         [202           24         [203           25         [203           26         [203           26         [203           26         [203           26         [203           26         [203           26         [203           26         [203      27         [203	gister Geshe E 8-04-16 16: 8-04-16 16: 8-0	Beacon software and 36:14: 065 155 36:21: 066 155 36:21: 067 155 36:21: 713 R]00 36:39: 048 T]AA 80 36:39: 048 T]AA 80 36:49: 048 T]AA 80 36:49: 048 T]AA 80 36:49: 048 T]AA 80 36:44: 908 R]AA 80 36:44: 908 R]AA 80 36:51: 952 T]AA 80 36:55: 952 T]AA 80 36:55: 952 T]AA 80 37:01: 124 T]AA 00 37:01: 124 T]AA 00 37:10: 125 T]AA 00 37:10: 125 T]AA 00 37:11: 548 R]AA 00 37:31: 1548 R]AA 00 37:35: 361 T]AA 00 37:35: 361 T]AA 00 37:35: 361 T]AA 00 37:35: 361 R]AA 00 37:35: 758 R]AA 00 37:35: 361 R]AA 00 37:35: 758 R]AA 00 37:35: 361 R]AA 00	execute communic           260         60         80           20         60         60         61         60           20         64         60         61         60         62           20         64         60         61         33         91           20         62         62         60         61         33         91           20         62         62         61         84         62         60         61         33         91           20         62         62         61         64         62         66         66         61         33         14         62         66         66         61         33         14         62         66         66         61         33         14         62         66         66         61         31         15         66         66         61         61         61         66         66         61         61         61         66         66         61         61         66         62         60         61         66         62         60         61         60         62         60         62         60	a station test by           0         81           1         0F           2         13           0         09         16           2         13           0         09         16           4         CE           1         C1           1         C1           2         00           0	Buildin 44 42 59 57 52 55 14 51 53 57 14 52 19 7A 14 30	Nam           \$         Au           \$         Au           \$         Rd           \$         Case           \$         Lase           \$         Isl           \$         Can           \$         Can           \$         Can           \$         Can           \$         Can	he to Baudrate . Status . HW .SW . SN . Voltage ser On ser Off not Auto not Fast tinus Exit tinus Exit tinus Slow tinus Slow tinus Fast to Off ot	Data Fo Hex Hex Hex Hex Hex Hex Hex Hex Hex Hex		Data 55 AA 80 00 00 80 AA 80 00 00 80 AA 80 00 0 8A AA 80 00 0 C 8C AA 80 00 0 C 8C AA 80 00 0 E 8E AA 80 00 1 BE 00 11 00 01 C1 AA 00 01 BE 00 11 00 01 C1 AA 00 00 20 00 11 00 01 22 AA 00 00 20 00 11 00 01 22 S8 AA 00 00 20 00 01 00 04 25 AA 00 00 20 00 01 00 04 25 AA 00 00 20 00 01 00 05 26 AA 00 00 20 00 01 00 05 26 AA 00 00 20 00 01 00 05 27	Latency(ms) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		
29 [201 30 Direct	8-04-16 16:3	37:40.167 T]58				9 Set	t Offset t Address	Hex Hex	* *	AA 00 00 12 00 01 00 64 77 AA 00 00 10 00 01 00 51 62 end 64 Recv 183	0 0 19200,8,1,N	DTR RT	s.