

Voxtel Laser Rangefinder Quick Start Guide

1. ADHERE TO ALL SAFETY & HANDLING GUIDANCE

This guide requires knowledge of and strict adherence to all procedures, cautions, warnings, and handling notes in the Voxtel *LRF User Manual*. This quick-reference guide for setting up and performing initial testing and communications with all Voxtel LRF products supplements—but does not replace—the *LRF User Manual*. For additional discussion on handling, personal, and product safety, refer to the “Safety” section in the *LRF User Manual*.

⚠ Warning: For all units equipped with a laser, failure to follow laser protocols and precautions when handling the product may result in personal injury and/or damage to the product.

⚠ Caution: Failure to follow electrostatic discharge (ESD) protocols and precautions when handling the product may result in damage to the product. A single ESD event can cause catastrophic or latent device failure.

For all units equipped with a laser:

In addition to the requirements in this guide: adhere to:

- “DPSS Lasers and Laser Driver Boards” section, *LRF User Manual*
- Safe use of laser protocols—Use ANSI Z136.1-2014
- ESD prevention protocols—Use ANSI-ESD-S20.20-2014

For units not equipped with a laser:

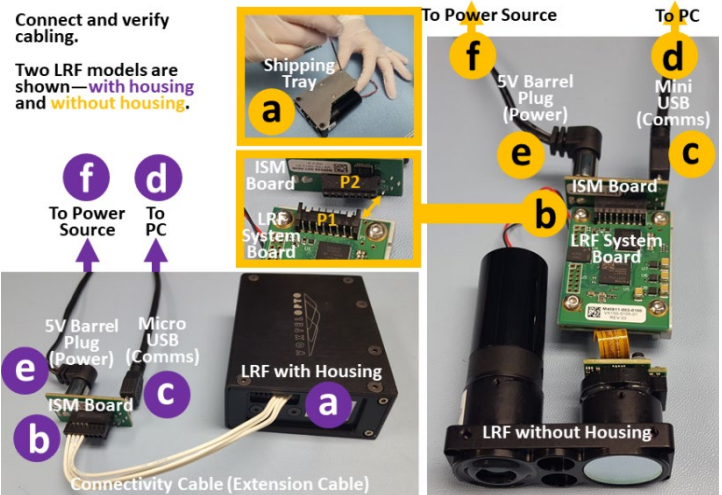
In addition to the requirements in this guide, adhere to:

- ESD prevention protocols—Use ANSI-ESD-S20.20-2014

2. CONNECT LRF SYSTEM COMPONENTS

Set up the LRF for initial testing and communication:

- | LRF with Housing | LRF without Housing |
|--|--|
| a. Plug the white connectivity cable into the back of the LRF. | a. Remove the LRF from the metal shipping tray. Use an M3 driver to remove the (6) M2 screws. |
| b. Connect the other end of the white connectivity cable to the interface support module (ISM) board. The cable connects easily; it can only connect in one orientation. | b. Connect the connector on the ISM board (P2) to the receptacle on the LRF system board (P1). The plug connects easily; it can only connect in one orientation. |
| c. (All LRFs) Connect the micro-USB to the ISM board. | c. (All LRFs) Connect the micro-USB to the ISM board. |
| d. (All LRFs) Connect the other end of the USB cable to the PC. | d. (All LRFs) Connect the other end of the USB cable to the PC. |
| be. (All LRFs) Connect the 5V power supply barrel plug to the ISM board. | be. (All LRFs) Connect the 5V power supply barrel plug to the ISM board. |
| f. (All LRFs) Connect the power supply to the power source. | f. (All LRFs) Connect the power supply to the power source. |



⚠ Caution: If not using the Voxtel-provided power supply, ensure no more than 5V is supplied to the LRF. More than 5V will cause an overvoltage of the system board, which may damage the laser driver board and the laser.

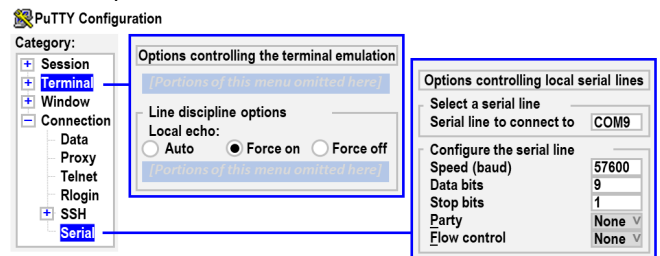
- g. (All LRFs) Verify cabling as shown.

3. SET UP COMMUNICATION WITH THE LRF THROUGH THE PC

Use a UART serial protocol program to establish communication with the LRF. PuTTY (recommended) is used for all examples.

- Set the UART serial protocol to **Force on**. In PuTTY, enter the **PuTTY Configuration** menu, select the **Terminal** option, and enable the **Force on** radial button. (If not enabled, user input will not be displayed—only LRF responses will be displayed.)
- Set the communication port. In PuTTY, enter the **PuTTY Configuration** menu, expand the **Connection** menu, select the **Serial** option, and enter the following:
 - In the **Serial line to connect to** field, enter the port to which the LRF is connected (input varies by setup and may not match example).
 - Set **Configure the serial line** fields to values shown [Speed (baud): 57600; Data bits: 9; Stop bits: 1; Parity: None; Flow control: None]. Values must match values shown.

For help setting up the program, refer to the “Communication” section of the *LRF User Manual*.

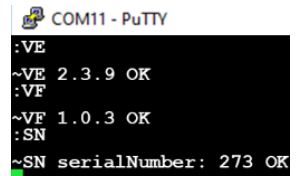


4. CONFIRM OUT-OF-THE-BOX COMMUNICATION

Confirm communications between the LRF and the PC using the following commands, in the sequence shown:

- :VE This queries the LRF firmware.
- :VF This queries the FPGA firmware.
- :SN This queries the serial number.

The commands and the expected responses are shown. Firmware versions may vary.



5. PERFORM INITIAL TEST—LOW-GAIN MODE

Test for basic system functionality as follows:

- Set up the physical layout of the testing environment.
 - Position the LRF to target an object within 10 meters.
 - Ensure no highly reflective object is within 10 meters of the LRF; such an object may damage the receiver.
- Set the LRF to low-gain mode: Command “:GN 0”. The command and response are shown right.
- Ensure consistent calibration and false-alarm rate (FAR) are set for the LRF—and confirm correct functionality of the LRF and flex cable within—as follows:
 - Query the low-voltage detection threshold (vThLo): Command “:CL”
 - Verify the response is between 983 and 1148; this correlates to a vThLo range of 0.48V–0.56V; “1025”, shown, correlates to a vThLo = 0.5V.
 - Measure the FAR: Command “:FL”.
 - Confirm the FAR is 100 – 500 Hz (factory default FAR).
 - Repeat steps (i) – (iv) several times.
 - Verify the responses are consistent.

```
COM11 - PuTTY
:GN 0
~GN 0 OK
```

```
COM11 - PuTTY
:CL
~CL vThLo set curr: 1025, prev: 1026 OK
:FL
~FL 340 Hz OK
:CL
~CL vThLo set curr: 1025, prev: 1025 OK
:FL
~FL 380 Hz OK
```



- (Optional, if an IR card is available) Confirm the laser is firing:
 - Place an IR card in front of the laser.
 - Issue a series of range requests (command “:RR” several times).
 - Verify the laser pulse is visible on the IR card.

- Ensure the laser delay is in the range of 1.0 – 2.2-ms at room temperature:
 - Request the range (:RR).
 - Request the laser delay (:RD).
 - Read the laser delay value.Laser delays vary by laser type; typical is < ~2 ms. In the example shown, the delay is 1.1 ns (“1139” in the response syntax).
- Verify consistent/proper LRF functioning:
 - Issue several more range commands (:RR).
 - Monitor the response from the LRF.In this configuration—because the LRF will not resolve returns < 10 meters—the LRF response is “~RR no hits [1001] Errors”, as shown.
- If there is a false hit—a non-zero value (typically < 2 km) received when zero is expected—check the pulse width of the laser:
 - Request the pulse-width: Command “:PW”.In response to this request, the pulse width of the outgoing (T0) pulse is listed first, followed by any return pulse widths; e.g., “~PW 344404, 6072 OK” indicates the T0 pulse width is 344 ns and the return is 6 ns.
 - Verify that the pulse width of the T0 pulse is hundreds of ns, and verify that any false return value is much smaller than the T0 value. A typical false return is about 10 ns (or less).

```
COM11 - PuTTY
:RR
~RR no hits [1001] ERROR
:RD
~RD 1139 OK
:RR
~RR no hits [1001] ERROR
:RD
~RD 1139 OK
```

```
COM11 - PuTTY
:RR
~RR no hits [1001] ERROR
:RR
~RR no hits [1001] ERROR
:RR
~RR no hits [1001] ERROR
```

```
COM11 - PuTTY
:RR
~RR no hits [1001] ERROR
:RR
~RR no hits [1001] ERROR
:RR
~RR 76180 OK
:PW
~PW 344404, 6072 OK
```

If the LRF does not pass testing, contact Voxel:
Engineering support, support@voxtel-inc.com

6. PERFORM INITIAL TEST—HIGH-GAIN MODE

Test for functionality at a distance as provided below. This process repeats several of the low-gain command sequences in a higher-gain mode for a target at a greater distance.

- Set up the physical layout of the testing environment: Position the LRF to target an object at a 50 – 200-meter range.
- Set the LRF to high-gain mode: Command “:GN 1”.
- Ensure consistent calibration and FAR:
 - Query vThLo: Command “:CL”.
 - Verify the response is between 983 and 1148.
 - Measure the FAR: Command “:FL”.
 - Verify the FAR is 100 – 500 Hz.
 - Repeat steps (i) – (iv) several times.
 - Verify the responses are consistent.
- Ensure the laser delay is 1.0 – 2.2 ms at room temperature:
 - Issue a range request: Command “:RR”.
 - Issue a laser delay request: Command “:RD”.
 - Read the laser delay value.
- Verify consistent/proper LRF functioning:
 - Issue several more range requests: Command “:RR”.
 - Monitor the response.
 - Verify that the LRF responds with non-zero values that are consistent with the target distance.
- If there are multiple returns/false hits, or if lighting conditions change, reset the calibration and FAR. To reset the calibration and FAR, repeat step (c).

- Verify that the pulse width of the T0 laser pulse is greater than the pulse width of the return(s):
 - Issue a range request: Command “:RR”.
 - Check the pulse width of the returns: Command “:PW”.

```
COM11 - PuTTY
:RR
~RR 1052 OK
:RR
~RR 1053 OK
:RR
~RR 1051, 68426 OK
:PW
~PW 87362, 97472, 11702 OK
```

The T0 pulse is reported first, followed by the return pulse(s). A typical output for high-gain testing to a 105-meter target is shown. Also included is an example of the return pulse widths showing an 87.4-ns T0 pulse, a 97.5-ns return, and a typical 11.7-ns pulse-width false return.

If the LRF passes initial testing in high-gain mode:

The LRF is functioning as intended. Additional testing can be conducted. For additional questions regarding communication with the system board or troubleshooting, refer to the *LRF Software ICD* and/or the *LRF User Manual*.

If the LRF does not pass testing, contact Voxel:
Engineering support, support@voxtel-inc.com