TFmini Plus is a milestone of Benewake in the process of promoting the cost-effective LiDAR. Apart from low-cost, small-size and low-power-consumption, TFmini Plus also improves the frame rate, introduces IP65 enclosures and optimizes various compensation algorithms. These new characters greatly expand the application fields and scenarios of TFmini Plus.

### Technical Specifications and Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range</td>
<td>0.1m~12m&lt;sup&gt;①&lt;/sup&gt;</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±5cm@(0.1-6m)</td>
</tr>
<tr>
<td></td>
<td>±1%@ (6m-12m)</td>
</tr>
<tr>
<td>Distance resolution</td>
<td>5mm</td>
</tr>
<tr>
<td>Frame rate</td>
<td>1-1000Hz(adjustable)&lt;sup&gt;②&lt;/sup&gt;</td>
</tr>
<tr>
<td>Ambient light immunity</td>
<td>70klux</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-20°C～60°C</td>
</tr>
<tr>
<td>Enclosure rating</td>
<td>IP65</td>
</tr>
<tr>
<td>Light source</td>
<td>LED</td>
</tr>
<tr>
<td>Central wavelength</td>
<td>850nm</td>
</tr>
<tr>
<td>FOV</td>
<td>3.6°</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>5V±0.5V</td>
</tr>
<tr>
<td>Average current</td>
<td>≤110mA</td>
</tr>
<tr>
<td>Power consumption</td>
<td>550mW</td>
</tr>
<tr>
<td>Peak current</td>
<td>500mA</td>
</tr>
<tr>
<td>Communication level</td>
<td>LVTTL (3.3V)</td>
</tr>
<tr>
<td>Material of enclosure</td>
<td>ABS+PC</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-20°C～75°C</td>
</tr>
<tr>
<td>Weight</td>
<td>11g</td>
</tr>
<tr>
<td>Wire length</td>
<td>30cm</td>
</tr>
</tbody>
</table>

<sup>①</sup> Range based on a standard whiteboard with reflectivity 90% in indoor condition;  
<sup>②</sup> Only frame rates meet the formula – 1000/n (n is Positive integer) can be set;

### Product Appearance and Structure

Dimensions of TFmini Plus module (Unit:mm)

www.benewake.com
Wiring Guide

<table>
<thead>
<tr>
<th>Number</th>
<th>Color</th>
<th>PIN-1</th>
<th>PIN-2</th>
<th>PIN-3</th>
<th>PIN-4</th>
<th>PIN</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>Red</td>
<td>+5V</td>
<td>RXD</td>
<td>TXD</td>
<td>GND</td>
<td></td>
<td>Power</td>
</tr>
<tr>
<td>②</td>
<td>White</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Receive</td>
</tr>
<tr>
<td>③</td>
<td>Blue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Transmit</td>
</tr>
<tr>
<td>④</td>
<td>Black</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Ground</td>
</tr>
</tbody>
</table>

Communication Protocol

<table>
<thead>
<tr>
<th>Communication port</th>
<th>UART</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default Baud rate</td>
<td>115200(adjustable)</td>
</tr>
<tr>
<td>Data bits</td>
<td>8</td>
</tr>
<tr>
<td>Stop bit</td>
<td>1</td>
</tr>
<tr>
<td>Parity</td>
<td>None</td>
</tr>
</tbody>
</table>

Data Format

The data frame contains 9 bytes, 2 bytes of frame head, 2 bytes of distance value (Dist_L and Dist_H), 2 bytes of signal strength (Strength_L and Strength_H), 2 bytes of temperature (Temp_L and Temp_H) and 1 byte of checksum. All the data and commands are transmitted in hexadecimal format.

<table>
<thead>
<tr>
<th>Byte0-1</th>
<th>Byte2</th>
<th>Byte3</th>
<th>Byte4</th>
<th>Byte5</th>
<th>Byte6</th>
<th>Byte7</th>
<th>Byte8</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x59 59</td>
<td>Dist_L</td>
<td>Dist_H</td>
<td>Strength_L</td>
<td>Strength_H</td>
<td>Temp_L</td>
<td>Temp_H</td>
<td>Checksum</td>
</tr>
</tbody>
</table>

Data code explanation

- Byte0: 0x59, frame header, same for each frame
- Byte1: 0x59, frame header, same for each frame
- Byte2: Dist_L distance value lower by 8 bits
- Byte3: Dist_L distance value higher by 8 bits
- Byte4: Strength_L low 8 bits
- Byte5: Strength_L high 8 bits
- Byte6: Temp_L low 8 bits (suit for version later than V1.3.0)
- Byte7: Temp_H high 8 bits (suit for version later than V1.3.0)
- Byte8: Checksum is the low 8 bits of the cumulative sum of the numbers of the first 8 bytes.

Temperature(°C) = Temp / 8 - 256
**Command Protocols**

TFmini Plus has released the commands of setting frame rate, baud rate and measurement unit.

**Frame Definition**

<table>
<thead>
<tr>
<th>Byte</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3-Len-2</th>
<th>Len-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Head</td>
<td>Len</td>
<td>ID</td>
<td>Payload</td>
<td>Checksum</td>
</tr>
</tbody>
</table>

Head: frame head of command frame (0x5A)

Len: length of the frame, head and checksum included

ID: identifier code of command

Payload: data segment. Little endian format

Checksum: sum of all bytes from Head to payload. Lower 8 bits.

**Commands**

<table>
<thead>
<tr>
<th>Commands</th>
<th>Downlink frame</th>
<th>Uplink frame</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obtain firmware version</td>
<td>5A 04 01 5F</td>
<td>5A 07 01 01 02 03 SU</td>
<td>Represent V3.2.1</td>
</tr>
<tr>
<td>System reset</td>
<td>5A 04 02 60</td>
<td>5A 05 02 00 SU</td>
<td>00-Succeeded 01-Failed</td>
</tr>
<tr>
<td>Set update rate</td>
<td>5A 06 03 00 00 SU</td>
<td>5A 06 03 00 00 SU</td>
<td>Set update rate (1~1000Hz)³</td>
</tr>
<tr>
<td>Set measurement unit</td>
<td>5A 05 05 01 SU</td>
<td>5A 05 05 01 SU</td>
<td>01-cm 06-mm</td>
</tr>
<tr>
<td>Set baud rate</td>
<td>5A 08 06 00 00 00 00 SU</td>
<td>5A 08 06 00 00 00 00 SU</td>
<td>Set baud rate²</td>
</tr>
<tr>
<td>Enable/Disable output</td>
<td>5A 05 07 00 SU</td>
<td>5A 05 07 00 SU</td>
<td>0-Disable 1-Enable</td>
</tr>
<tr>
<td>Restore factory settings</td>
<td>5A 04 10 6E</td>
<td>5A 05 10 00 SU</td>
<td>00-Succeeded 01-Failed</td>
</tr>
<tr>
<td>Save settings³</td>
<td>5A 04 11 6F</td>
<td>5A 05 11 00 SU</td>
<td>00-Succeeded 01-Failed</td>
</tr>
</tbody>
</table>

Bytes with yellow undertone represents checksum. Bytes with blue undertone represents data segment.

¹ The default update rate is 100Hz. The customized update rate should be calculated by the formula: 1000/n (n is Positive integer). Increasing frame rate will decrease the data stability.

² Only standard baud rates are supported. When setting a high update rate, a high baud rate is recommended to ensure data security.

³ Please always send the command of save settings when try to modify parameters of TFmini Plus, otherwise the settings will not take effect.