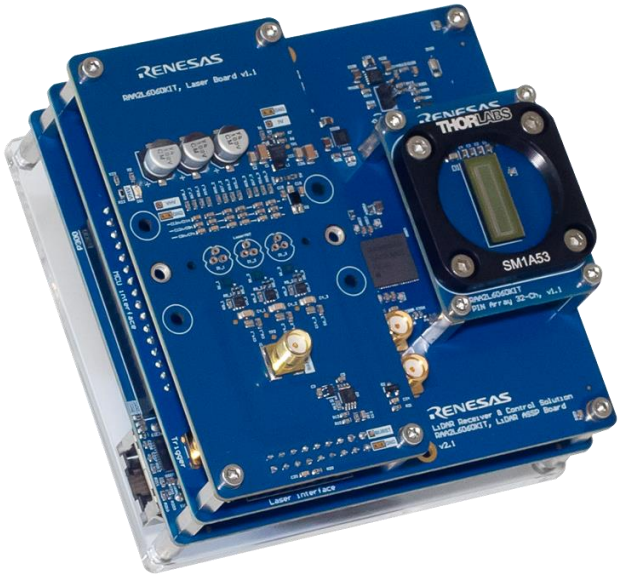
RAA2L6060KIT

LiDAR Receiver and Control Solution Starter Kit

Description

The RAA2L6060KIT LiDAR Receiver & Control Solution Starter Kit provides a comprehensive system for initial lab evaluation and application testing of three-dimensional object detection using the “Time-Of-Flight” (ToF) principle. This principle measures the time required for emitted light pulses to reflect from objects and return to the sensor, enabling precise distance calculations.



At the core of the Starter Kit is the Renesas RAA2L6060 multi-channel LiDAR frontend IC. This IC triggers the light emitters, typically implemented with laser diodes. The reflected light pulses are captured by a photo-array, and the resulting data are pre-processed and transmitted via Quad-SPI to the post-processing SoC or microcontroller.

For post-processing, the Starter Kit utilizes a Renesas R-Car V3M SoC, which provides adequate performance for most post-processing, object detection, and classification requirements. The Starter Kit includes an Ethernet port for data output. Optionally, a cost-optimized post-processing MCU from the Renesas RZ/G series is under development.

The RAA2L6060KIT includes a Graphical User Interface (GUI) enabling users to execute lab and system tests and to develop application specific firmware and software.

This RAA2L6060KIT User Manual describes the features and operation using the embedded SoC Linux FW/SW revision V0.4.2 and Graphical User Interface GUI revision V0.4.6 for Windows. Other operating systems or newer revisions may appear slightly different, but the key features and functionality are same.

Contents

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1. Introduction

1.1 Starter Kit Content

The RAA2L6060KIT Starter Kit contains all the essential hardware, firmware, and software required for initial lab evaluation and application tests. Starter Kit includes the following:

- Evaluation Board Stack (four PCBs):
  - RAA2L6060 LiDAR waveform recorder IC board with supporting components
  - R-Car V3M SoC board with supporting components and interfaces
  - 32 channel PIN photo-array board
  - 3 channel light emitter board
- Ethernet cable and USB-to-Ethernet adapter for data transmission to a PC
- USB-C cable for power supply
- 5V USB-C power supply, current rating ≥2.0A
- Transportation box
- Disclaimer document
- Graphical User Interface (GUI) for Windows or Linux PC (for the download link, contact Renesas representative)

1.2 Minimum System Requirements

The following list outlines the minimum key components and requirements for setting up and using the RAA2L6060KIT Starter Kit:

- Computer with Windows 10/11 (64 bit) or Linux operating system.
- Memory 8 GB RAM
- 500 MB of free HDD space
- One free USB 2.0 port for the USB-to-Ethernet adapter. Alternatively, a free Ethernet port on the computer can be directly used as well.

2. Hardware Description

Optional hardware accessories beyond those listed in section 1.1 can further enhance the functionality of specific applications.

The Starter Kit is available with application specific optical components (emitter, diffusor, lense), depending on version:

- Version A: PIN photo-array, 32 × 3 pixels, 42° × 20° field-of-view
- Version B: SiPM photo-array (under development)

2.1 RAA2L6060KIT Top View

The core component of the LiDAR system is the RAA2L6060 LiDAR Receiver & Control ASSP, located in the center of the LiDAR ASSP board. It performs the following functions:

- Triggers the emitters
- Acquires pulse responses
- Controls system sequencing
- Supervises LiDAR system functionality

Left side: the emitter board is mounted on top of the RAA2L6060 board. It contains multiple driver stages for infrared emitters along with common power supply and safety circuits. Infrared emitters and a diffusor may be optionally installed.

Note: removing the diffusor is prohibed and may result in violating of Laser Safety Class 1 operation.

Right side: the photo-array board is mounted on top of the RAA2L6060 board. A photo-array is mounted on the PCB, and a lense may be optionally installed.

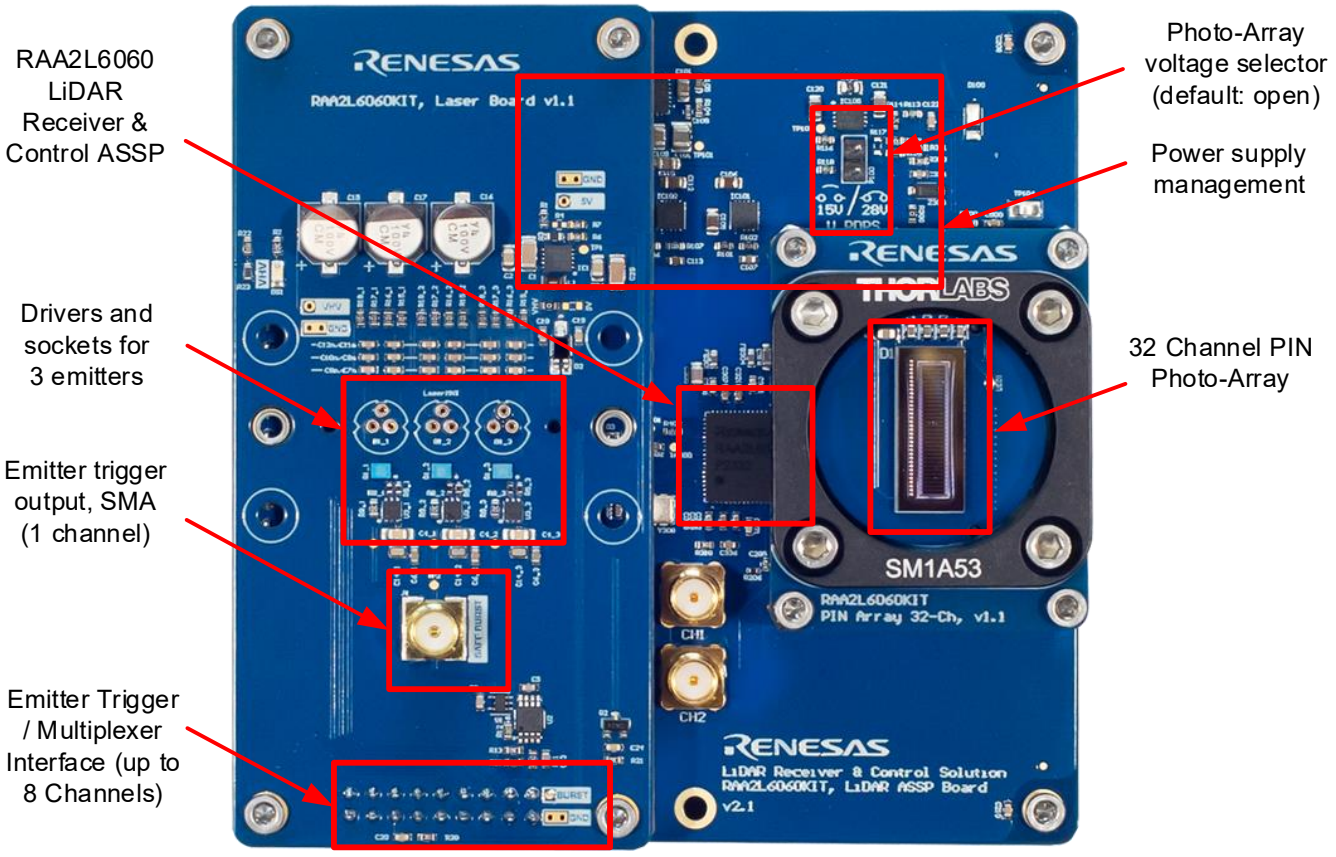

Figure 1. RAA2L6060 LiDAR IC Board with Attached Emitter and Photo-Array Boards

2.2 RAA2L6060KIT Bottom View

The SoC board is mounted on the bottom of the Starter Kit for post-processing data acquired by the RAA2L6060. It contains a V3M SoC, which performs the following functions:

- Filters and processes raw data
- Creates a point cloud
- Transmits data through the Ethernet interface to an attached PC for visualization or to other systems for object recognition and classification

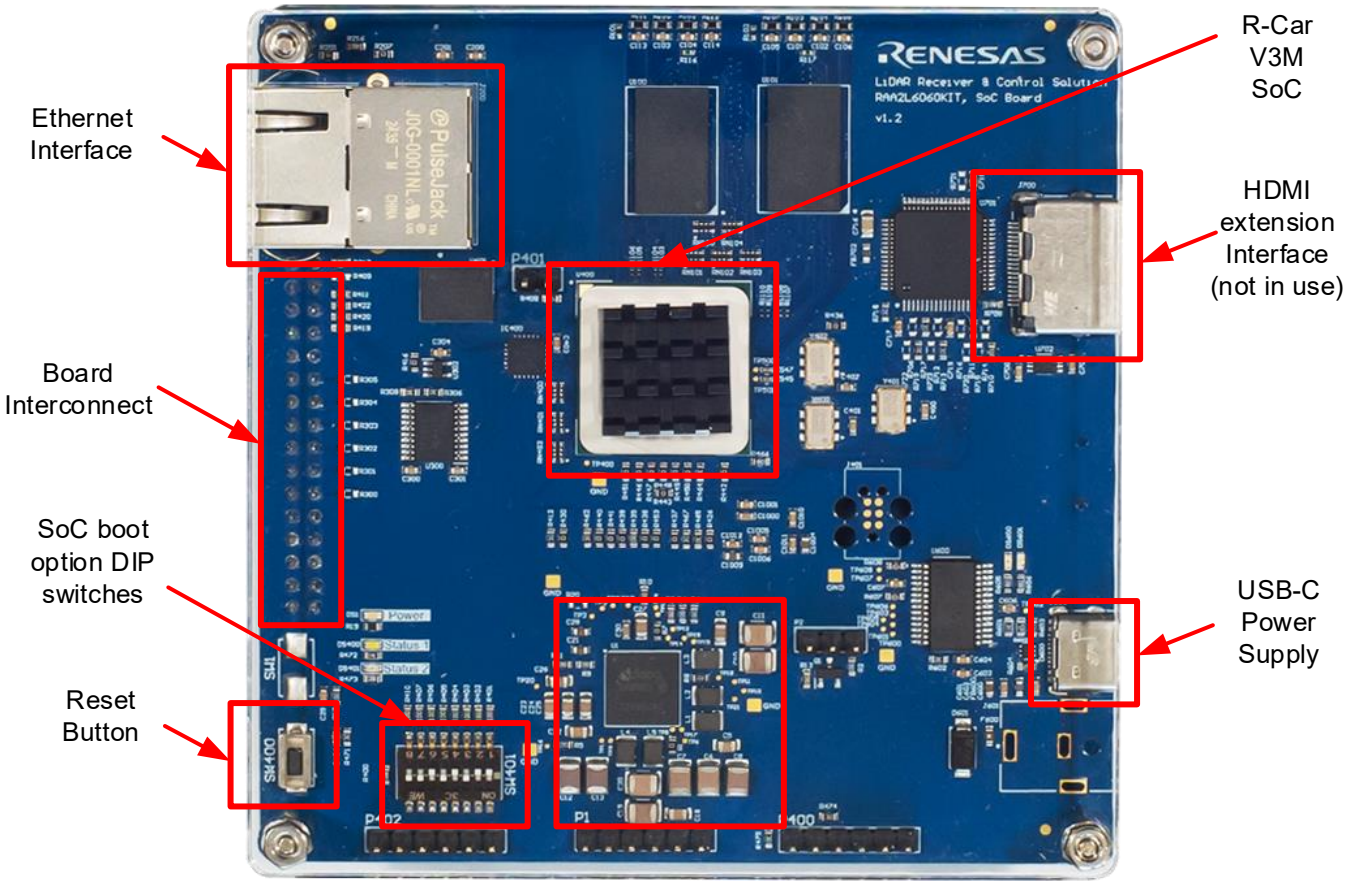

Figure 2. R-Car V3M SoC Board

2.3 Basic Operation

This section describes the initial setup and basic operation of the RAA2L6060KIT Starter Kit. Before proceeding, ensure that all Starter Kit components are available and that the PC meets the minimum system requirements specified in section 1.2. The setup process involves extracting the GUI software, establishing a network connection, configuring IP settings, and powering up the hardware.

Safety Notice: This kit contains Class 1 laser components and generates voltages up to 30 V during operation. Review all safety warnings before powering up the Starter Kit.

Follow these steps to operate the Starter Kit:

1. Extract GUI files.
   Extract all files from the RAA2L6060-GUI-Vxx-OS.zip file, where “Vxx-OS” represents the software revision number (for example, V0.4.6) and the operating system (Windows or Linux).
2. Connect Ethernet.
   Connect the Ethernet cable to an available Ethernet port or use the included USB-to-Ethernet adapter.

3. Configure IP address (Windows only).
   In Windows settings, change the IP address of the Ethernet port to 192.168.0.99 (static IP address). This step is required because Windows computers do not automatically assign an IP address.
   If the Starter Kit is connected to a Linux operation system or to a router, skip this step. The DHCP server assigns an IP address automatically.
4. Power up the Starter Kit.
   Connect the USB-C cable to power up the Starter Kit and press the SoC board reset button. The RAA2L6060KIT is ready for operation when the white LED (marked with “Status 1”) on the SoC board illuminates.

   Caution: This step activates the invisible laser light exposure and on-board generated voltages up to 30V. Ensure appropriate safety precautions to prevent personal injury, property damage and/or burn hazard.
5. Start the GUI.
   Execute the “RAA2L6060 Demo.exe” to launch the GUI.

3. Graphical User Interface (GUI)

The Graphical User Interface (GUI) for the RAA2L6060 Starter Kit provides an intuitive platform for configuring and monitoring the system.

Connection options:

- Use a free Ethernet port on the PC
- Use the included USB-to-Ethernet adapter connected to a free USB port
- Connect the Starter Kit to a router and access it through the local network.

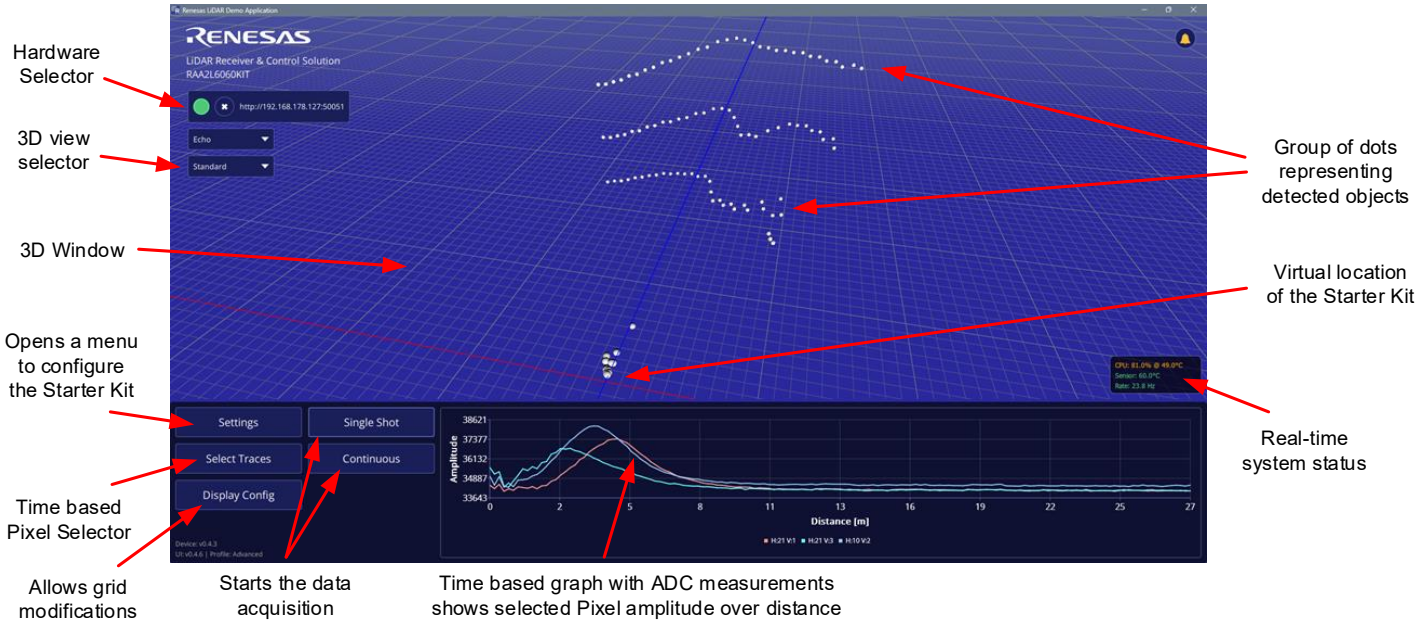

Figure 3. GUI Main Page

Follow these steps to operate the GUI:

1. Connect to hardware by clicking the magnifier glass icon
   A dropdown menu displays available hardware. If no devices appear:
   - Verify IP address settings
   - Restart the setup to re-establish an Ethernet connection
   - Add the IP address manually (typically 192.168.0.2 or 192.168.0.100).

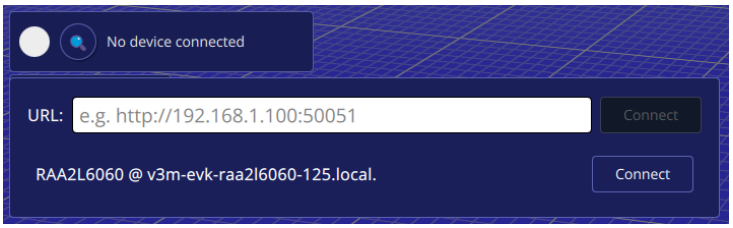

Figure 4. Hardware Select

2. Configure settings by clicking the “Settings” button to access configuration settings.
   Predefined settings for typical application cases are provided with the GUI:
   - Use “Import” feature to load settings from a .json file (an example file can be found in the GUI main folder).
   - Use the “Export” feature to save customized settings.

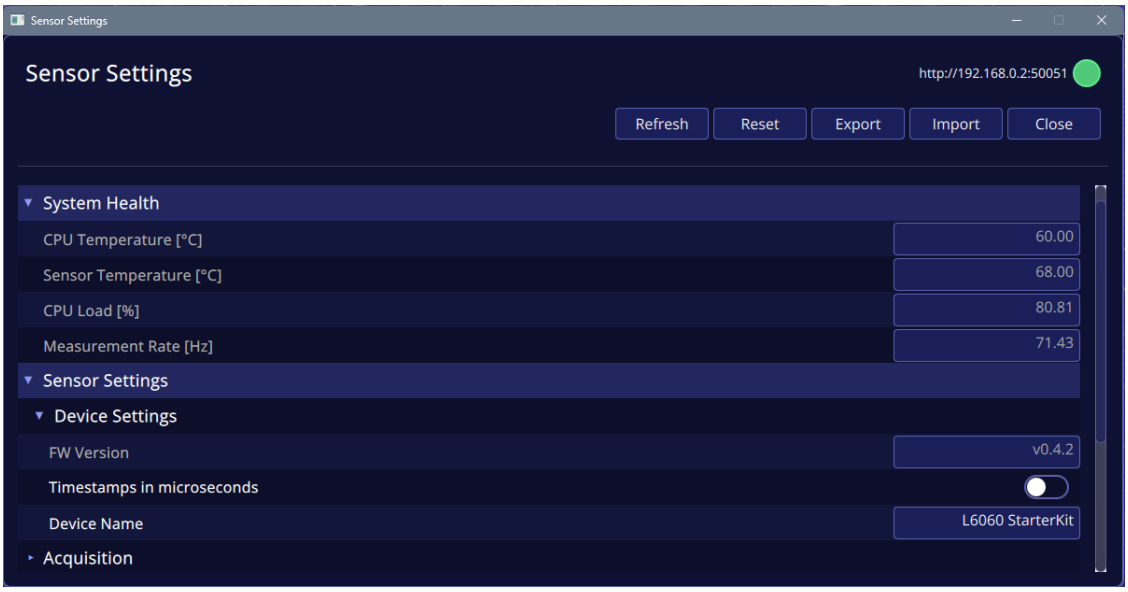

Figure 5. Settings Menu

3. Select 3D view by using the “3D view selector” which provides three predefined viewing angles: Standard, Front, and Top.

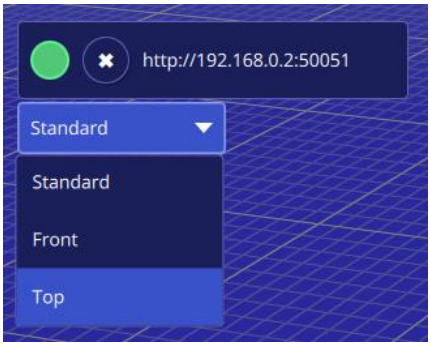

Figure 6. 3D View Selector

4. View measurement details by selecting a measurement point in the 3D window to display details about the selected pixel.

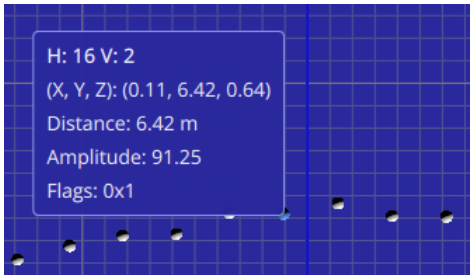

Figure 7. 3D Measurement Point Details

4. Collaterals and Support

The following collaterals and system development support are available on the product page:

- RAA2L6060 Datasheet
- RAA2L6060 Programming Manual
- RAA2L6060KIT schematic

GUI and further documents are available on request.

5. Ordering Information

Orderable Part Number	Description
RAA2L6060KIT	RAA2L6060 LiDAR Receiver & Control Solution Starter Kit

6. Revision History

Revision	Date	Description
1.0	Jan 27, 2025	Initial release.