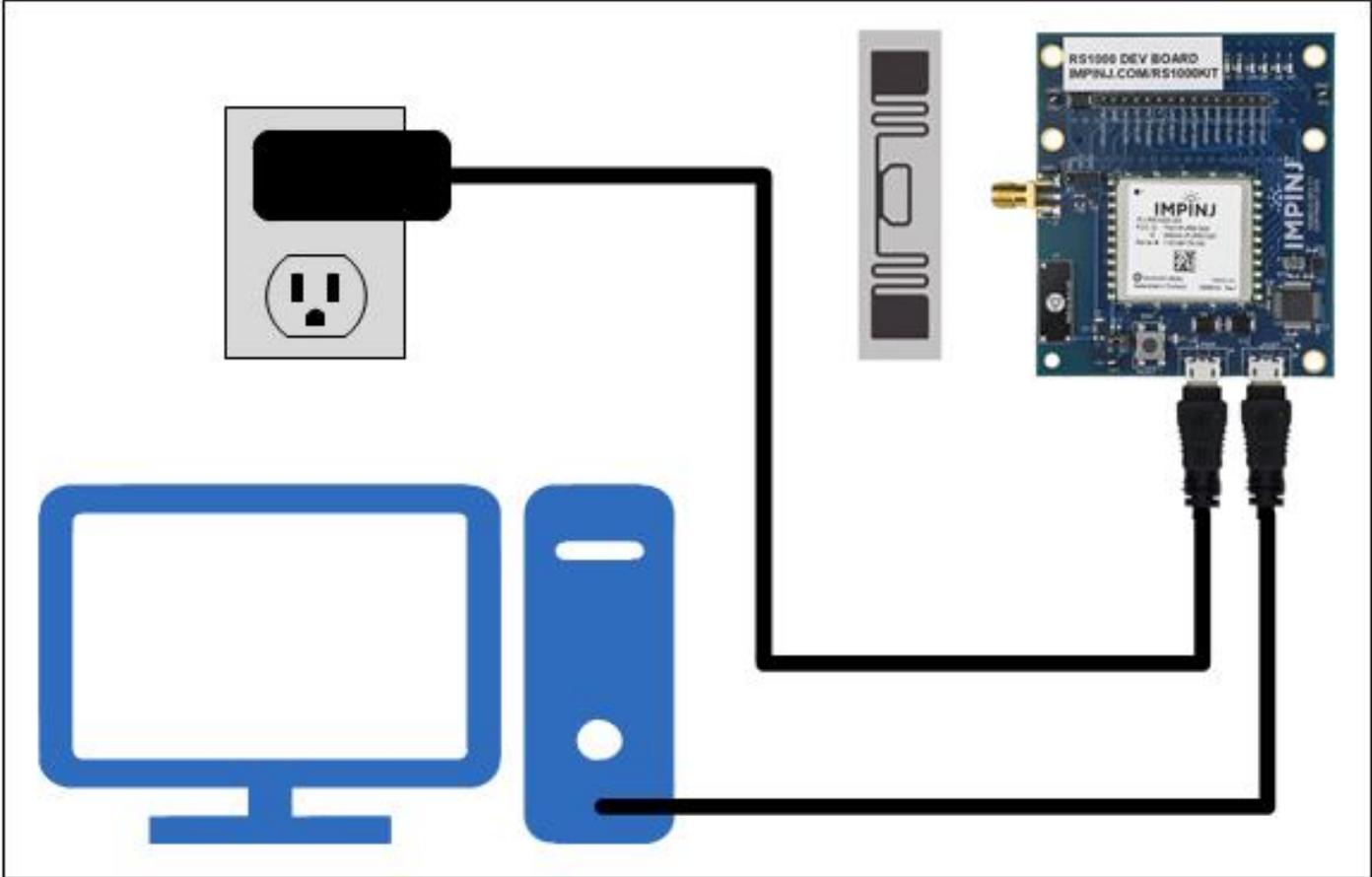
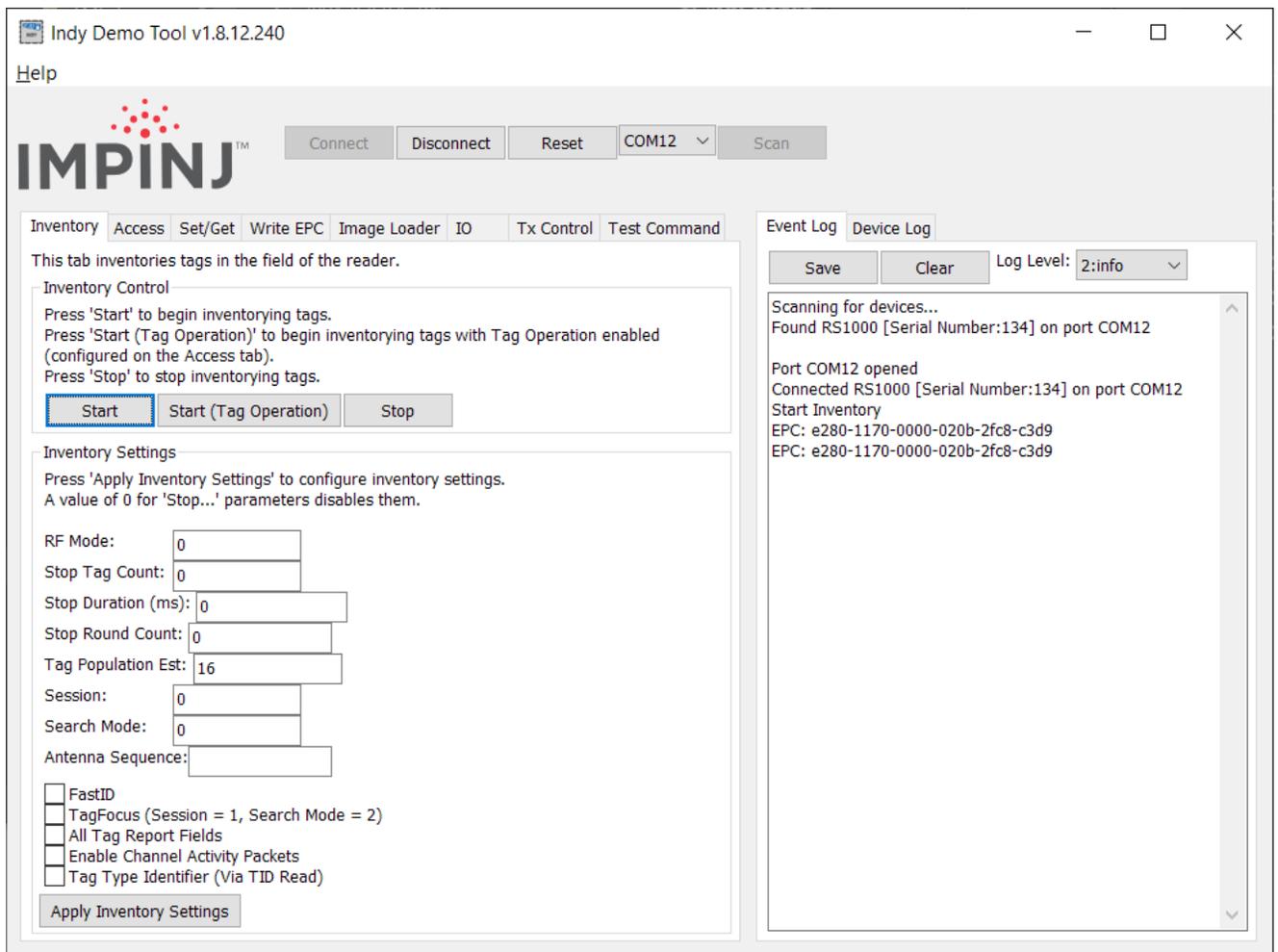


Impinj RS1000 Development Kit Quick Start Guide

To read your first tag using the development kit and a PC running Windows, follow these steps:

1. **Download [Indy Demo Tool](#)** to your Windows PC.
2. **Configure the RS1000 development kit hardware** as shown in the figure below
 1. **Restore the default jumper configuration** if you have reconfigured the jumpers, as described in the “Kit Default Configuration” section of the [RS1000 Hardware User’s Guide](#).
 1. Jumper J1 should be in the rightmost position to select the surface mount antenna A1
 2. Jumper J5 should be populated to power the module
 2. **Connect the micro-USB power supply to USB port J6: "PWR"**
 1. The green “Health” LED D2 in the upper right corner of the kit PCB should start blinking.
 3. **Connect the PC host to USB port J4: “HOST”** using the micro-USB cable
 4. **Place a RAIN RFID tag** near the surface mount antenna A1 (in the lower left corner of the PCB).
3. **Start performing tag reads** as shown in the figure below.
 1. **Open the Indy Demo Tool software** by double-clicking on the “Indy Demo Tool.exe” file you downloaded above.
 2. **Press the “Scan” button** to detect the COM port corresponding to the development board.
 1. Note: if the software does not detect the board, check the troubleshooting steps below
 3. **Press the “Connect” button** to connect to the development board.
 4. **Press the "Start" button** under the "Inventory" tab to start reading tags
 1. At this point, the “Event Log” on the right hand side of the GUI will show the stream of read tags’ EPCs
 5. **Move the tag** relative to the read field of the antenna, and observe the change in the reads displayed in the Event Log.





Next Steps with the Impinj RS1000 Development Kit

After you've successfully read some tags with the Impinj RS1000 development kit, you can learn more about the RS1000 module by checking out the resources below.

Download the Impinj RS1000 module documentation

To learn more about the Impinj RS1000 module, check out the [RS1000 Device Datasheet](#) and [RS1000 Hardware User's Guide](#). The Datasheet describes the mechanical and electrical characteristics of the module. The Hardware User's Guide goes into deeper descriptions of the behavior of the module and regulatory details, and also details the construction and behavior of the Impinj RS1000 development board.

Download the Impinj RS1000 SDK

Impinj RS1000 host control is implemented using the Impinj Radio Interface (IRI) SDK, also known as the "ITK" (IRI Toolkit). You can download the SDK from the support portal [here](#), and the latest version of the documentation is on our platform portal at <https://platform.impinj.com/indy/itk/>

Use the Impinj RS1000 development kit with a Raspberry Pi host

The Impinj RS1000 Development Kit is designed to operate with a Raspberry Pi host, going as far as to implement a "HAT"-like form factor, which can stack on top of a Raspberry Pi single board computer, using the built-in HAT header to connect power, host communication, and other IO signals. Using this interface to communicate between the devices requires some configuration changes on the Raspberry Pi.

To learn more about how to use the RS1000 development board and other Impinj Indy module hardware with a Raspberry Pi, check out the following support article: <https://support.impinj.com/hc/en-us/articles/205200678>

Use the Impinj RS1000 development kit with an external antenna

The Impinj RS1000 development board has a built-in Fractus surface mount antenna, but it also has an SMA connector that can be connected to an external antenna. The RF port of the module is switched between the surface mount antenna and the SMA connector using an RF switch, U1. This switch can be controlled 2 ways. With the jumper J1 in the rightmost position, labeled "GPIO", the switch is controlled by GPIO1 of the RS1000. By default the signal will be low, selecting the surface mount antenna, but a host can instruct the module to set GPIO1 high, which will select the SMA antenna. J1 can also be moved to the leftmost position, labeled "SMA", whereby the signal will be pulled high, selecting the SMA antenna.

If you want to use the SMA antenna, the easiest way to do it is simply to move jumper J1 to the leftmost position.

To learn more about controlling the GPIO of the Impinj RS1000 module, check out this example in the SDK: <https://platform.impinj.com/indy/itk/latest/ApiGuide/ConfigurationExamples.html#gpio-configuration>

Use the Impinj RS1000 development kit with an arbitrary host device

The Impinj RS1000 development board is designed as a platform that can enable almost any host device, whether it's a fully fledged desktop or laptop PC, a single board computer like a Raspberry Pi or Beaglebone, or even a microcontroller like an MSP430 or STM32F device.

The USB-UART and Raspberry Pi "HAT" connectors have already been explained above, but there is a third way to connect a host device to the Impinj RS1000 via the development board. The 14 pin breakout header J3 can be used to connect arbitrary signals to the dev board and RS1000 directly. These pins allow connection of a UART host device, GPIO signals, and even an arbitrary power supply. They also allow monitoring and debugging of the signals on the board and at the pins of the module.

To connect host communication with an arbitrary 3.3 volt UART host, connect the U1-TX pin of J3 to the UART Rx pin of the host, and connect the U1-RX pin of J3 to the UART Tx pin of the host. The host should be configured for 115,200 baud, and 8-N-1 bit configuration, and should implement the IRI host library that is part of the SDK.

Impinj RS1000 Development Kit Further Documentation

The Impinj RS1000 Development Kit PCB behavior and functionality is described in the [RS1000 Hardware User's Guide](#).

The Impinj RS1000 Development Kit PCB design(EDA project) and manufacturing files(Gerbers, drill drawings, and bill of materials) are available for download [here](#).

Impinj RS1000 Development Kit Troubleshooting

If your Impinj RS1000 Development Kit is not behaving as expected, check the following sections for help.

My kit doesn't read any tags

After connecting to a board using the Indy Demo Tool GUI, when you press the "Start" button, the board should start reading tags and reporting them in the GUI's log. If this doesn't happen, there are a few potential culprits.

Antenna is not connected properly

The default state of the Impinj RS1000 development board has jumper J1 in the rightmost position, which will connect the onboard surface mount antenna to the module. However, if you've moved this jumper, or reconfigured GPIO1, the module may be connected to the SMA antenna port. If you aren't trying to use the onboard antenna, move the jumper back to the rightmost position, and reset the module, ensuring that the GPIO1 LED, D4, is not lit.

Power supply brownout causes UART communication to be lost or module to reset

RAIN RFID requires a not-insignificant amount of power, and some USB power supply configurations are not sufficient. For example, if you don't provide power via the "PWR" USB connector J6, your PC host might not be able to supply enough current over the "HOST" USB connector J4 to keep the board running properly. If the power supply drops below 4.25 volts, the USB-UART IC U4 can reset, which will interrupt COM port communication. If the power supply drops below 3.2 volts, the RS1000 module U3 will reset, interrupting inventory activity completely.

To prevent brownouts, ensure you have a USB or other DC supply capable of supplying 4.25 volts at 1.5 amps.

RFID system sensitivity budget is too tight

RAIN RFID communication relies on the tags being sensitive enough to understand commands from the reader, and the reader being sensitive enough to understand the responses from the tags. In systems where the reader's transmit power is low, or the antenna is not performing well, or the tags are not very sensitive, or the distances between reader and tags are great, system performance can suffer. Sensitivity budgets are very complicated, and have lots of variables involved, but they have a large impact on system performance.

To determine if sensitivity budget is limiting tag reads, try moving tags closer to your antenna or increasing the reader's transmit power.

My kit is not detected when I press "Scan"

The Indy Demo Tool software automatically searches all of the COM ports of the Windows PC it is run on, checking to see if any of them have Impinj Indy modules attached. If you have the Impinj RS1000 development board attached to your PC via USB, but it is not detected when you scan for it, there are a few potential causes.

Impinj RS1000 module is not powered

If the Impinj RS1000 module is not powered, it will not be able to connect to a host via UART. To determine if the module is powered, look at the "Health" LED D2, at the top of the board. If it is not on or flashing green, the module itself is not powered. Moreover, if the power LED D1 near the USB connectors is not solid green, the entire dev board is not powered.

To restore power to the Impinj RS1000 module, make sure the series current jumper J5 is populated, and 5V power is being supplied, either through USB, breakout header J3, or the 40 pin Raspberry Pi HAT connector J7.

Dev board USB-UART communication is not connected

For the USB-UART IC to communicate with the host PC, there must be a USB data connection between the two. This is achieved by using a standard micro-USB data cable to connect the "HOST" USB connector J4 with your PC.

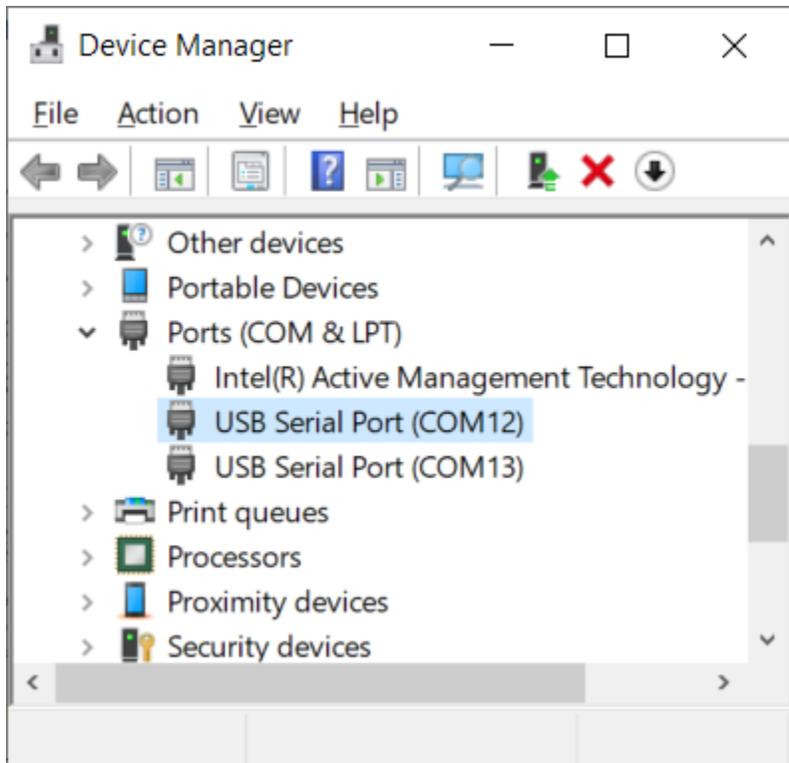
Make sure the PC host is connected via J4, and not J6, the "PWR"(power) USB connector.

Dev board USB-UART IC drivers are not installed

For the Indy Demo Tool to communicate with the module, it must be able to use the USB-UART as a COM port. This is only possible if the USB-UART IC's drivers are installed.

An easy way to tell if the drivers are installed is to open up the Windows Device Manager. Simply search for "Device Manager" in the start menu or settings, or open it using the WIN-X menu. If the drivers are properly installed, two adjacent COM ports labeled "USB Serial Port" will appear under "Ports (COM & LPT)", as shown in the screen capture below.

For more information on fixing USB-UART problems, see the " RS1000 Development Board USB-UART Details" section in the Impinj RS1000 [Hardware User's Guide](#).



My kit stops communicating when I start inventory

As with the tag read rate troubleshooting listed above, brownout resets can interrupt communication with the Impinj RS1000 module.

Power supply brownout causes UART communication to be lost or module to reset

RAIN RFID requires a not-insignificant amount of power, and some USB power supply configurations are not sufficient. For example, if you don't provide power via the "PWR" USB connector J6, your PC host might not be able to supply enough current over the "HOST" USB connector J4 to keep the board running properly. If the power supply drops below 4.25 volts, the USB-UART IC U4 can reset, which will interrupt COM port communication. If the power supply drops below 3.2 volts, the RS1000 module U3 will reset, interrupting inventory activity completely.

To prevent brownouts, ensure you have a USB or other DC supply capable of supplying 4.25 volts at 1.5 amps.

The Indy Demo Tool GUI reported an "error code"

The Impinj RS1000 reader module has a number of error codes it can report to communicate conditions to the host device. To determine what these error codes mean,

check out the appropriate section of the ITK
documentation: <https://platform.impinj.com/indy/itk/ApiGuide/ErrorCodes.html>

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