

# Impinj R705 Portal Gateway Reader Installation and Operations Guide

## Version 0.2

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## 1 Requirements, Certifications, and Warnings

### 1.1 Products Covered by this Guide

This guide pertains to Impinj R705 Portal Gateways with the following part numbers:

<u>Gateway</u>	<u>Communication Code</u>	<u>Part Number</u>
R705	FCC and Global	IPJ-R705-FGX
R705	ETSI 865-868MHz	IPJ-R705-EU1
R705	ETSI 916-919MHz	IPJ-R705-EU2
R705	Japan	IPJ-R705-JP

<u>Part Number</u>	<u>Frequency Range</u>	<u>*Max TX Power</u>
IPJ-R705-FGX	902 - 928 MHz	4W EIRP (36 dBm)
IPJ-R705-EU1	865 – 868 MHz	2W ERP (33 dBm)
IPJ-R705-EU2	916 – 919 MHz	4W ERP (36 dBm)
IPJ-R705-JP	916 - 920 MHz	4W EIRP (36 dBm)

\* Note: Will vary based-off of country-specific limits

### 1.2 Federal Communications Commission (FCC) Compliance

This equipment was tested and complies with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy. If not installed and used in accordance with the instructions, the equipment may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation and cause harmful interference to radio or television reception. To determine if this equipment causes harmful interference to radio or television reception, turn the equipment off and on. You are encouraged to try to correct the interference by one or more of the following:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Consult the dealer or a qualified radio/TV technician for assistance.

#### 1.2.1 Per FCC 15.19(a)(3) and (a)(4)

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference.
- (2) This device must accept any interference received, including interference that may cause undesired operation.



**Caution:** Changes to this product or modifications not expressly approved by the party responsible for compliance could void your authority to operate per FCC Part 15.



**Attention:** Les modifications apportées à ce produit ou modifications pas expressément approuvés par la partie responsable de la conformité peuvent annuler votre droit à utiliser par FCC Part 15.

### 1.2.2 Minimum Separation Distance

This device has been evaluated for compliance with FCC and IC RF exposure limits in a mobile configuration. At least 34 cm of separation distance between the device and the user's body must be maintained at all times. This device must not be used with any other antenna or transmitter that has not been approved to operate in conjunction with this device.

### 1.3 Canada

Industry Canada (IC) Compliance Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

The term "IC" before the radio certification number only signifies that Industry of Canada technical specifications were met.

Industrie Canada (IC) Conformité Son fonctionnement est soumis aux deux conditions suivantes:

1. Cet appareil ne doit pas provoquer d'interférences.
  2. Cet appareil doit accepter toute interférence, y compris celles pouvant causer un mauvais fonctionnement de l'appareil.
- L'expression "IC" avant le numéro de certification radio signifie seulement que l'industrie des spécifications techniques Canada ont été respectées.

### 1.4 CE Marking and European Economic Area (EEA)

RFID devices designed for use throughout the EEA must have a maximum radiated transmit power of 2W ERP in the frequency range of 865.6-867.6 MHz and 4W ERP for 916.1-918.9MHz. For other EEA restrictions on RFID device use, refer to the Impinj Declaration of Conformity (DoC) located at [support.impinj.com](http://support.impinj.com).

### 1.5 Environmental Requirement

- Operating temperature: -20° C to +50° C (-4° F to +122° F)
- Humidity: 5% - 95% (non-condensing)

- Sealing: IP50

## 1.6 Simplified EU Declaration of Conformity

Hereby, Impinj, Inc., declares that the radio equipment type IPJ-R705-EU1, IPJ-R705-EU2 is in compliance with Directive 2014/53/EU, EMC Directive 2014/30/EU, and RoHS 2015/863/EU.

The full text of the EU declaration of conformity is available at the following internet address:

<https://support.impinj.com/hc/en-us/articles/360005324979-EU-Declaration-of-Conformity>



The EU countries indicated below have not approved RFID use in the 916.1 to 918.9 MHz frequency band:

AT	BE	BG	CZ	DE	EL	ES	FI	HR	IS	IT	LT
MT	NL	PL	RO	SE	SK	TR					

La operación de este equipo está sujeta a las siguientes dos condiciones: (1) es posible que este equipo o dispositivo no cause interferencia perjudicial y (2) este equipo o dispositivo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada.

## 1.7 Hardware Requirements

- TCP/IP network equipment is required to connect the gateway to a PC (Windows, Mac, or Linux), or other network terminal. The network connection must provide power (PoE or PoE+).
- Connecting to the gateway console port requires a USB cable with a micro-USB connector.

## 1.8 Supported Operating Environments

This section describes the environments in which you can access the RShell console that is used for configuring, monitoring, and maintaining the gateway. The tools that you use when you access the RShell console depend on the Operating System that is running on your computer.

<u>Interface</u>	<u>Protocol</u>	<u>Microsoft Windows</u>	<u>Linux</u>
Ethernet	SSH Port 22	SSH or Putty	SSH
USB Host	SSH Port 22	SSH or Putty	SSH

Putty: <https://www.putty.org/>

## 1.9 Supported Communication Protocol

For client control of the gateway, the gateway supports the EPCglobal Low Level Reader Protocol (LLRP) v1.0.1. LLRP is an EPCglobal standard interface that allows communication with the gateway, which in turn reads EPCglobal Gen 2 RFID tags.

## 1.10 Power Requirements

The RF transmit power is limited by the type of power supplied (PoE, or PoE+).

<u>Power Source</u>	<u>TX (Max)</u>
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802.3at PoE+	30.0 dBm
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802.3af PoE	30.0 dBm
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Operating above +30 dBm requires professional installation to comply with radio regulatory laws in many countries.

## 1.11 Before You Begin



**Warning:** Please read this document in its entirety before operating the Impinj R705 Gateway, as serious personal injury or equipment damage may result from improper use.



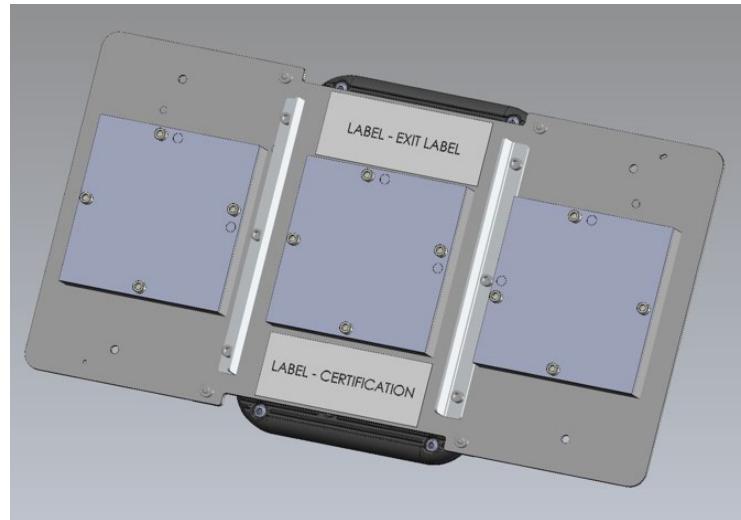
**Avertissement:** S'il vous plaît lire ce document dans son intégralité avant d'utiliser le Impinj R705 Gateway, comme des blessures graves ou des dommages matériels peuvent résulter d'une mauvaise utilisation.

## 2 Introduction

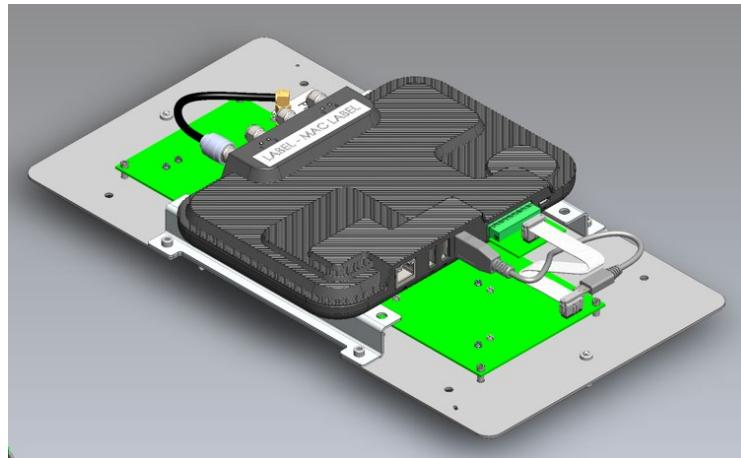
The Impinj R705 portal gateway is sold to product companies, which embed the device within their product providing overall enclosure and device control. The device does not include an enclosure and is not intended for sell to the general public.

### 2.1 Product Tour

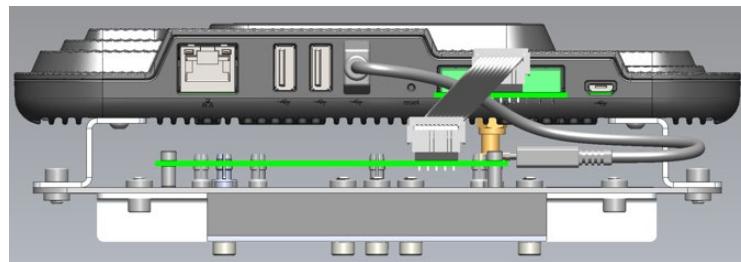
The gateway radiates RF energy from the antenna element side, as shown below.



The reader is located the side of the ground plane opposite the antenna elements.



The reader features multiple interfaces. Ethernet network interface, USB ports and GPIO block are located on the end of the reader. The Ethernet network jack is the only interface that the customer is required to access.



The antenna ports are located opposite the interface.



## 2.2 Connect the gateway to the network

The network connection serves a dual purpose, as it supplies both data connectivity and power. To power the gateway with the Ethernet connection, there are two options:

- If your network switch directly provides PoE or PoE+, simply connect to the switch with an Ethernet cable.
- If your network switch does not have PoE or PoE+ capability, use a PoE injector adapter. The PoE injector adapter connects to the end of the un-powered Ethernet cable from your switch or PC, and then another Ethernet cable runs from the power-injector to the gateway.

**IMPORTANT:** Automatic selection of PoE+ depends on LLDP support at the power source. If your switch or injector adapter does not support LLDP but does provide PoE+ power levels, you must manually configure the expected power levels using the RShell command:

```
> config system power source PoE+
```

After manually setting the power source to PoE+, you must reboot the gateway so that the change can take effect. Please refer to the Impinj RShell Reference Manual for more details. The selected power source will persist across reboots but will need to be configured again after a full system reset.

The boot sequence begins in either case when power is supplied to the gateway. This sequence typically completes within 30 seconds. After the boot sequence finishes, the gateway accepts commands, not before. The Power and Status LEDs on the gateway alert you to the status.

Note that the network address of the gateway will depend upon your network configuration and preferences:

- If your network supports DHCP, you can connect the gateway directly to your Ethernet network. The DHCP server will assign an address to the gateway.
- If your network does not support DHCP, the gateway defaults to the following fixed IP address: 169.254.1.1. If this address is already in use, the gateway will select a random fixed IP address in the 169.254.xxx.xxx link local address range. You can also connect to the gateway by connecting via the micro-USB port and use the gateway's RShell command-line interface to configure a static IP address for the gateway. After that is completed, you can connect the gateway to your Ethernet network.

The gateway supports both IPv4 and IPv6 protocols. In a dual network environment (where both an IPv4 and IPv6 address are assigned to the gateway), the gateway will preferentially choose the IPv6 address

for the LLRP connection. However, if the IPv6 address is not available when the gateway is booting, but the IPv4 address is available, then Octane will choose an IPv4 address. You can confirm which IP address the gateway is using for the LLRP connection via either the Web UI or the RShell console (using the “show network summary” command).

Details about how to complete each connection option are described below. Before proceeding, make note of the gateway’s factory default network settings.

### **2.2.1 Default Network Settings**

Settings	Description
Hostname	impinj-xx-xx-xx, where xx-xx-xx is the last three bytes of the gateway’s MAC address (which is printed on the label attached to the gateway case).
DHCP	Enabled. The gateway also reports its hostname to the DHCP server.  Note: When the gateway is plugged into a network that does not have a DHCP server OR when the PC is connected directly to the gateway via Ethernet cable, the gateway defaults to a fixed IP address (169.254.1.1). If this address is not available, the gateway then randomly selects a fixed IP address in the 169.254.xxx.xxx link local address range.

### **2.2.2 To connect the gateway to the Ethernet network**

- Using a standard Ethernet cable, connect the RJ-45 connector on the reader to a LAN drop or network switch.

Note: If you need to connect a PC directly to the Ethernet port, you can use a standard Ethernet cable. A crossover cable is not necessary.

### **2.3 Configure the Region Setting**

The gateways require that the specific region of operation be set by a professional installer. Note: that readers cannot be altered and only operate per the regulatory laws of the country of operation.



**Warning:** The RF settings must match the country/region of operation to comply with local laws and regulations. You, the user, are responsible to ensure operation with the correct RF settings and are solely responsible for any fines and other damages due to incorrect or non-compliant country/region settings on your Gateway.



**Avertissement:** Les paramètres RF doivent correspondre au pays / région d'exploitation se conformer aux lois et règlements locaux. Vous, l'utilisateur, sont chargés d'assurer le fonctionnement avec les paramètres RF correctes et sont seuls responsables de toutes les amendes et autres dommages imputables à des manipulations ou les paramètres de pays /région non-conformes sur votre lecteur.

### 2.3.1 To set the region for a gateway by using a web interface

1. Connect to the gateway by using a web browser using the following format:

`http://<gateway name or IP address>.`

Examples:

- `http://impinj-10-00-DD`
- `http://10.0.10.44.`

2. Log in to the gateway using the administrator credentials. The default credentials are as follows:

user name: root

password: impinj

Note: 'impinj' is the default password. It is recommended you create your own after logging on for the first time.

3. Select one of the available regions from the dropdown list.

Note: If you do not see your country or region listed, contact Impinj to find out about current regulatory approval status.

4. On the Change Regulatory Region dialog, click Reboot. When you change the operating region, the change does not take effect until the next reboot. If you attempt RFID operations on the gateway after you change the region but before you reboot the gateway, you will get unexpected behavior.

### 2.3.2 To set the region using RShell commands

Alternately, you can use the following RShell commands to set or change an operating region:

- `show system region`

- shows the configured region and a list of selectable regions.
- config system region X
  - set the region to region number X. Note: region numbers are listed, in various tables, in the LLRP Guide.

### 3 Upgrading the firmware

#### 3.1 There are three methods for upgrading the firmware

- Using RShell, the command line interface.
- Copying the firmware to a USB memory drive and plugging it into the Impinj R705 gateway's host port.
- Using the Impinj Reader Management web page.

#### 3.2 Upgrading the Firmware using RShell

Use this procedure to use RShell to upgrade the firmware.

1. Obtain the firmware upgrade file from the Impinj support web site, <http://support.impinj.com>. The upgrade file extension is .upgx
2. Place the upgrade file on a server (http or sftp) that can be accessed by the Impinj R705 gateway you are upgrading.
3. Using the Putty application, connect the Gateway by using SSH or serial and that log in.
4. From the RShell command prompt, issue the following command:  

```
> config image upgrade <URI>
```

where <URI> is the server location and name of the upgrade file.
5. After starting the upgrade, view the upgrade status at any time by issuing the following command:  

```
> **show image summary**
```
6. This command provides a display of the current upgrade status, the last operation, the status of the last operation, and information about the primary and secondary images. Reissue the show image summary command if you want to track the upgrade status.
7. Reboot the Gateway by issuing the following command:  

```
> reboot
```

The Gateway reboot process displays messages in the RShell console as it goes through each stage of the process. The reboot completes, then the gateway login prompt displays on the console. The Gateway status light displays solid green. The behavior details of the xArray reboot LEDs are provided in xArray product Tour.

### **3.3 Upgrading the Firmware with a USB Drive**

Obtain the firmware upgrade file from the Impinj support web site, <http://support.impinj.com>. This upgrade process has two steps, preparing the USB drive for upgrade, and then using the USB drive to upgrade the firmware.

#### **3.3.1 To Prepare the USB Drive for Upgrade**

- Insert a USB drive into your computer.
- Create an `impinj` directory in the root of the USB drive along with the subdirectories `revolution`, `upgrade`, and `images`. The names of the directory are case sensitive and must all be lower case.
- Copy the desired firmware upgrade “.upg file” into the `\impinj\revolution\upgrade\images\` directory.
- Note: If multiple “.upgx files” exist in the `images` directory, the gateway will use the most recently modified file.
- Remove the USB drive from your computer.

#### **3.3.2 To Upgrade By Using the USB Drive**

- Confirm that the Gateway is ready for upgrade, with both the Power and Status LEDs illuminated.
- Insert the USB drive into the “USB Host” port. Within 5-10 seconds, the gateway will begin upgrading the device and the Power LED will blink amber. If the Power LED remains solid green, the Gateway likely cannot locate the `images` directory and `.upgx` file on the USB drive.
- The upgrade process completes in 20-60 seconds and then the Power LED will change to solid green.
- Remove the USB drive from the USB Host port and reboot the gateway.

Note: during the upgrade process, the Gateway will attempt to append information to a `status.log` file in the `impinj\revolution\upgrade` directory. The `status.log` file is intended to provide an audit trail for the upgrade of one or more products. If the firmware upgrade process fails, the Power LED will blink red. If this happens, remove the USB drive, reboot the Impinj R705 gateway, and check the `status.log` file for the reason of the failure.

### 3.3.3 Upgrading the firmware through the Impinj Management Web UI

You can also upgrade the firmware by accessing the Impinj Reader Management web page and running the upgrade from the management web page.

- Connect to the Gateway using a web browser `http://<gateway name or IP address>`
- Log in to the gateway using the default user name and password:
  - user name: root
  - password: impinj
- Click Choose File, and then select the firmware upgrade .upgx file.
- Click Upgrade
- After the upgrade is complete, click Reboot.

## 4 Document Revision History

<u>Date</u>	<u>Revision</u>	<u>Comments</u>
June 29, 2020	1.0	Original Release

## 5 Notices

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