

User Manual

PCR91502-M Powercast RAIN RFID Reader Module



PRODUCT DESCRIPTION

The Powercast PCR91502-M is a RAIN UHF RFID Reader module. The module is intended to be integrated into other electronic product designs in order to enable RAIN RFID functionality. The reader module's air interface protocol adheres to EPCglobal® UHF Class 1 Gen 2 / ISO 18000-63 RFID. It is designed to interface to other embedded electronics systems via USB or UART communication lines and is powered from externally applied 5V DC power. The RFID module communicates with and powers RFID tag devices. A Gen2 compliant tag device communicates back to the reader via RF backscattering. The reader operates in the 902-928MHz ISM frequency band. Operational power as well as communication is provided to the reader using header J5. The module can support up to 4 antennas via U.FL/UMCC connectors at ports J1 through J4. The PCR91502-M module has on board LEDs to display status of the reader and tag devices.

ORDERING OPTIONS

Part Number	PCR91502-M
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PRODUCT CONTENTS

The following items are included:

Qty	Description
1	PCR91502-M RAIN RFID Reader Module



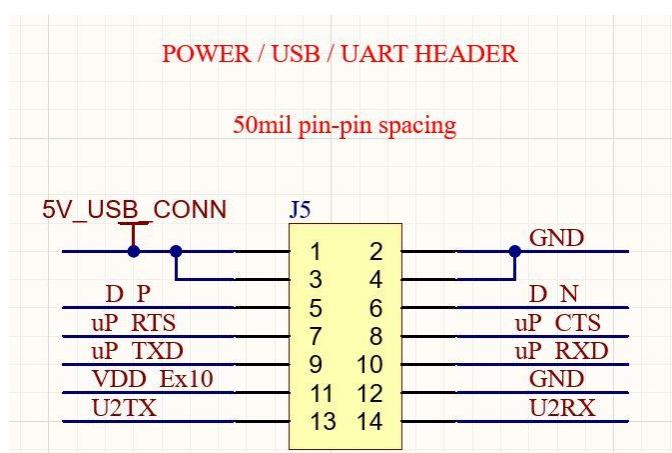
APPLICATIONS

- Communicate with and power Gen2 compliant RFID tags
 - Active tags
 - Battery-Assisted-Passive tags
 - Passive tags
- Inventory tags in a given location
- Issue access (read, write, etc.) commands to tags

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SET-UP AND OPERATION

1. Mount the module in the desired location with appropriate connection to a heat sink.
2. Make the appropriate connections to header J5 for 5V power and USB or UART communication.
3. Determine whether using USB based serial communication or direct UART communication.
 - a. USB – have jumper in place on header J6
 - b. Direct UART – remove jumper from header J6
4. Utilize the binary protocol to control the module.



J5 Pin Number	Signal	Description
1	5V_USB_CONN	Attach 5V DC power
2	GND	Ground
3	5V_USB_CONN	Attach 5V DC power
4	GND	Ground
5	D_P	USB communication Data Positive
6	D_N	USB Communication Data Negative
7	uP_RTS	UART 1 Request to Send line. Connect to host RTS line.
8	uP_CTS	UART 1 Clear to Send line. Connect to host CTS line.
9	uP_TXD	UART 1 TX line. Connect to host RX line.
10	uP_RXD	UART 1 RX line. Connect to host TX line.
11	VDD_Ex10	Internally used 3.3V power rail. Do Not Connect.
12	GND	Ground
13	U2TX	UART 2 TX line. Used for debugging only
14	U2RX	UART 2 TX line. Used for debugging only.

User Manual

PCR91502-M Powercast RAIN RFID Reader Module



The status LED D3 indicates the following operating conditions:

D3 LED Status	Description
Off	Device is not Powered
Solid Red	Firmware Mismatch
Blinking Red	Over Temperature Condition
Green	Reader Idle
Blue	Reader Non-Idle Normal Operation – Tag Read / Inventory
Yellow	Reader Non-Idle Test Mode – CW, PRBS, Etc.

CONTROLLING THE READER

1. Connect the RFID Reader module to a PC or other communication device using the appropriate power and communication connections on header J5.
2. Connect an antenna to an RF output port (J1-J4).
3. Use the following baud rate settings:
 - a. Speed: 115200
 - b. Data: 8 bit
 - c. Parity: None
 - d. Stop bits: 1 bit
 - e. Flow control: none
4. Utilize the reader modules binary protocol API document to communicate and control the reader module.

SPECIFICATIONS

Item	Description
Frequency	Frequency Hopping: 902.75MHz to 927.25MHz; 914.25 MHz Center Frequency
RF Communication	EPCglobal® UHF Class 1 Gen 2 / ISO 18000-63 RFID
Power output	0 to +30dBm
Interface	USB Port Serial Communication or Direct Serial UART
Operating Temperature	-40°C to +85°C
Environment	Indoor or outdoor use with appropriate enclosure
Mounting	Mount to heat sink with non-conductive thermal insulator
Power	5VDC/2A through USB-C Port
Dimensions	2.7" × 1.7" × 0.5"

Note: The PCR91502-M is EPC Gen 2 Compliant

SUPPORT

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User Manual

PCR91502-M Powercast RAIN RFID Reader Module



Technical support for Powercast products can be initiated through the following methods:

Website contact form: <http://www.powercastco.com/contact/>

Telephone: +1 412-455-5800

COMPLIANCE STATEMENTS

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, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by Powercast could void the user's authority to operate the equipment. Use and maintain device only as specified in this manual.

This equipment has been tested and found to comply 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 residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

WARNING: Operation of the PCR91502-M module requires professional installation to correctly set the TX power for the RF cable and antenna selected.

This transmitter module is authorized to be used in other devices only by OEM integrators under the following conditions:

1. *The antenna(s) must be installed such that a minimum separation distance of 23cm is maintained between the radiator (antenna) & user's/nearby person's body at all times to meet FCC MPE requirement.*
2. *The transmitter module must not be co-located with any other antenna or transmitter.*

As long as the two conditions above are met, further transmitter testing will not be required.

However, the OEM integrator is still responsible for testing the end-product for any additional

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User Manual

PCR91502-M Powercast RAIN RFID Reader Module



compliance requirements with this module installed. (i.e., digital device emissions, PC peripheral requirements, etc.)

IMPORTANT NOTE: *In the event that these conditions cannot be met (for certain configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID number cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.*

The OEM integrator must be made aware not to provide information to the end user regarding how to install or remove this RF module in the user manual of the end product.

The user manual for the end product must include the following information in a prominent location:

USER MANUAL REQUIREMENT

The user manual for the end product must include the following information in a prominent location:

“To comply with FCC’s and IC’s RF radiation exposure requirements, the antenna(s) used for this transmitter must be installed such that a minimum separation distance of 23cm is maintained between the radiator (antenna) & user’s/nearby person’s body at all times and must not be co-located or operating in conjunction with any other antenna or transmitter.”

AND

“The transmitting portion of this device carries with it the following two warnings: “This device complies with Part 15. ...”

AND

“Any changes or modifications to the transmitting module not expressly approved by Powercast could void the user’s authority to operate this equipment”

END PRODUCT LABELING

The end product must be labeled with the following identification information in a visible area:

“Contains Transmitter Module FCC ID: YESPCR91502-M” or “Contains FCC ID: YESPCR91502-M”

User Manual

PCR91502-M Powercast RAIN RFID Reader Module



AUTHORIZED ANTENNAS

There are no trace antennas on the PCR91502-M module. This device has been designed to operate with the antennas listed below.

Professional Installation permits the use of the following antennas:

Antenna Type	Manufacturer	Part Number	Max Gain
Circular Polarized Patch	Laird	PAR90209H	6 dBi
Linear Patch	Powercast	PAP-ANT-H1-915	6 dBi
Linear Dipole	Pasternack	PE51OM1013	3 dBi

Approved Cables and Adaptors List:

Type	Manufacturer	Part Number	Loss at 900MHz
LMR-100	Pasternack	LMR-100	22.8 dB/100ft
RF Adaptor – SMA Plug, Male Pin to RP-TNC Jack, Male Pin	Amphenol RF	242124RP	0.1 dB
RF Adaptor – U.FL (UMCC, IPEX) Female to SMA Female	Adam Tech	CA-DKCA1-152L0-AJI0	1 dB

NOTE: Professional installation is required for operation of the PCR91502-M. Only similar antennas with the same or lower gain, and cables with/without additional adapters or connectors with total loss same as or higher than the total loss in the table above can be used to connect to the PCR91502-M without violating FCC regulations. It is the responsibility of the professional installers to comply with this requirement.

FCC MODULAR CERTIFICATION CONSIDERATIONS

Powercast has obtained FCC modular certification for the PCR91502-M module and meets all parts of FCC Part 15.212 and FCC Part 15.247. This means that the module can be installed in different end-use products by another equipment manufacturer with limited or no additional testing or equipment authorization for the transmitter function provided by that specific module. Specifically:

- No additional transmitter-compliance testing is required if the module is operated with one of the antennas listed in the FCC filing.
- No additional transmitter-compliance testing is required if the module is operated with the same type of antenna as listed in the FCC filing, as long as it has equal or lower gain than the antenna listed. Equivalent antennas must be of the same general type (e.g. dipole, circularly polarized

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User Manual

PCR91502-M Powercast RAIN RFID Reader Module



patch, etc.), and must have similar in-band and out-of-band characteristics (consult specification sheet for cutoff frequencies).

If the antenna is of a different type or has higher gain than those listed in the modules' FCC filing, a class II permissive change must be requested from the FCC.

A host using a module component that has a modular grant can:

1. Be marketed and sold with the module built inside that does not have to be end-user accessible/replaceable, or
2. Be end-user plug-and-play replaceable.

In addition, a host product is required to comply with all applicable FCC equipment authorizations, regulations, requirements and equipment functions not associated with the RFID module portion. For example, compliance must be demonstrated to regulations for other transmitter components within the host product, to requirements for unintentional radiators (Part 15B), and to additional authorization requirements for the non-transmitter functions on the transmitter module (for example, incidental transmissions while in receive mode or radiation due to digital logic functions).

To ensure compliance with all non-transmitter functions, the host manufacturer is responsible for ensuring compliance with the module(s) installed and fully operational. For example, if a host was previously authorized as an unintentional radiator under the Declaration of Conformity procedure without a transmitter certified module and a module is added, the host manufacturer is responsible for ensuring that after the module is installed and operational the host continues to be compliant with Part 15B unintentional radiator requirements. Since this may depend on the details of how the module is integrated with the host, we will provide guidance to the host manufacturer for compliance with Part 15B requirements.

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