

Report No.14018425 001

Appendix 9:

User Manual

FCCID: Q72CS231C1GEN2

(Total: 9 pages, include this page)



CNE CS231-2 RFID Module User's Manual

Version 1.0

Warning: 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.

CNE: The Value-added RF Module Manufacturer

The CNE CS231-2 RFID module is an embedded RFID module for application inside all kinds of systems, such as handheld devices, security entrance devices, smart furniture, etc.

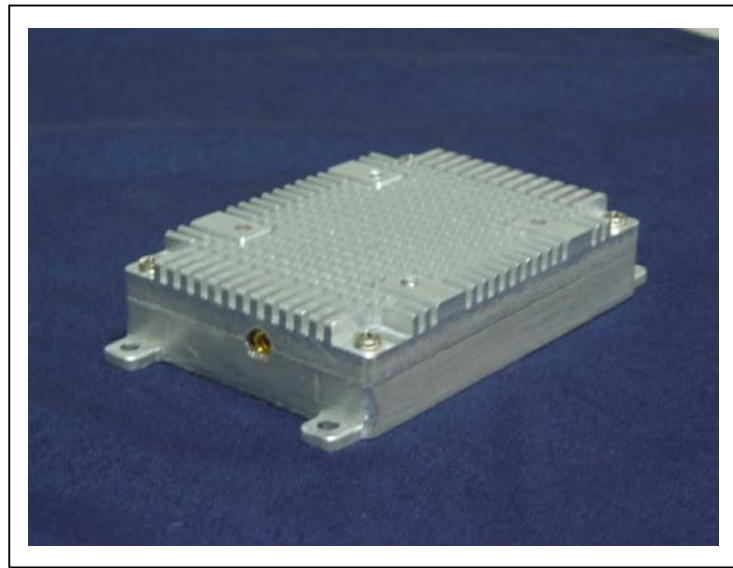


Figure 1 CS231-2 RFID Module

Setup Instructions:

1. Connect the RFID module to antenna via the RF terminal.
2. Connect the RFID module to 3.3 to 4.2 volt DC supply.
3. Connect the RFID module via USB or UART port to the host processor board.
4. The Host processor should have the driver program and application program to control the module.
5. Warning: To comply with RF Exposure requirement, in the application and design-in of CS231-2 RFID module, the module is to be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the antenna's radiating structures and the body of the user or nearby persons.
6. Warning: 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.

Software:

1. Use the Standard RFID Library and API calls via USB or UART. Developer needs to compile the library again for the specific host processor platform.
2. Use the Simplified UART command set, either ASCII based version or Binary based version. Developer does not have to recompile library, just send out appropriate UART based commands and receive data back via UART terminals.
3. Please refer to CS231-2 Programmer's Manual for the above 2 groups of APIs and library.

Environmental Concerns:

The environmental condition of the module must be evaluated to see if the heat dissipation is enough to allow the RFID module to operate according to the product specification requirements. If the product specification requirements mandate the duty cycle of operation is such that the RFID module generates a lot of heat, then effective heat dissipation means must be provided. The heat sink now on the module contains mounting holes for fan. The developer can indeed consider the use of fan.

Federal Communication Commissions Compliance

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 when the equipment is operated in a commercial environment. 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 or more of the following measures:

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

FCC NOTICE: To comply with FCC part 15 rules in the United States, it is the responsibility of the operator and module embedding manufacturer to ensure that only certified systems are deployed in the United States. The use of the system in any other combination (such as co-located antennas transmitting the same information) is expressly forbidden.

Note:

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Radio Frequency Radiation Exposure Evaluation

Three different categories of transmitters are defined by the FCC in OET Bulletin 65. These categories are fixed installation, mobile, and portable and are defined as follows:

- **Fixed Installations:** fixed location means that the device, including its antenna, is physically secured at a permanent location and is not able to be easily moved to another location. Additionally, distance to humans from the antenna is maintained to at least 2 meters.

- **Mobile Devices:** a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to be generally used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structures and the body of the user or nearby persons. Transmitters designed to be used by consumers or workers that can be easily re-located, such as a wireless modem operating in a laptop computer, are considered mobile devices if they meet the 20 centimeter separation requirement. The FCC rules for evaluating mobile devices for RF compliance are found in 47 CFR §2.1091.
- **Portable Devices:** a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user. Portable device requirements are found in Section 2.1093 of the FCC's Rules (47 CFR§2.1093).

The CS231-2 RFID module with 4.5dBi antenna is considered a fixed installation as it is used for the purpose of reading tags.

The FCC also categorizes the use of the device as based upon the user's awareness and ability to exercise control over his or her exposure. The two categories defined are Occupational/ Controlled Exposure and General Population/Uncontrolled Exposure. These two categories are defined as follows:

- **Occupational/Controlled Exposure:** In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means. Awareness of the potential for RF exposure in a workplace or similar environment can be provided through specific training as part of a RF safety program. If appropriate, warning signs and labels can also be used to establish such awareness by providing prominent information on the risk of potential exposure and instructions on methods to minimize such exposure risks.

- **General Population/Uncontrolled Exposure:** The general population / uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category, and the general population/uncontrolled exposure limits apply to these devices.

Radio Frequency Radiation Exposure Evaluation:

The highest RF output power of the EUT was measured at 27.0dBm at 902.75MHz and 927.25MHz. According to §1.1310 of the FCC rules, the power density limit for General Population/Uncontrolled Exposure at 902.75MHz (worst case) is $f_{(\text{MHz})}/1500 = 0.6018\text{mW}/\text{cm}^2$. The maximum permissible exposure (MPE) is calculated to show the required separation distance that must be maintained during installation to maintain compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

where:

S = Power Density

P = Power input to the antenna

(Output power from the EUT antenna port_(dBm))

G = Gain of Transmit Antenna (linear gain)

R = Distance from Transmitting Antenna

For the EUT, the calculation is as follows:

$$P = 27.0\text{dBm} = 500\text{mW} \text{ (Output power from the EUT antenna port)}$$

$$G = \text{Antenna Gain} = 4.5\text{dBi} = \text{anti-log}(4.5/10) = 2.818$$

At 20cm separation,

$$S = \frac{500 \times 2.818}{4\pi(20)^2} = 0.2803\text{mW}/\text{cm}^2$$

Based on the above calculation for 20cm separation, the power density does not exceed FCC limit of $0.6018\text{mW}/\text{cm}^2$.