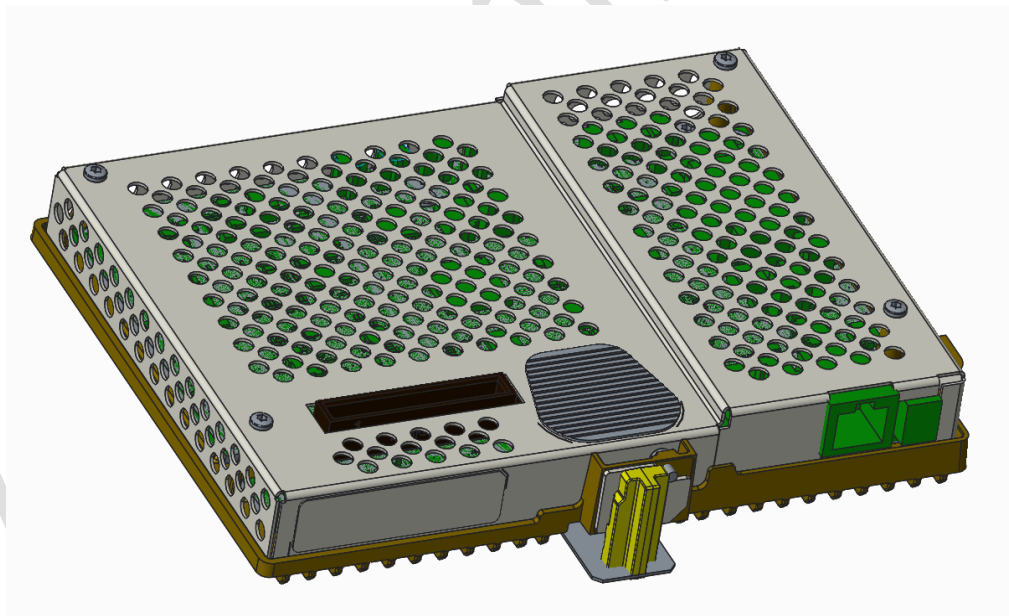


21-199765-01 Integration Guide

Document # MN000026A03



1 Introduction

1.1 Background

The 21-199765-01 Module is intended as an RFID reader which is integrated into a larger product to provide embedded RFID reader capability. It is intended to use the antenna system of the larger product and can get power and communication from an external source.

1.2 Purpose

The purpose of this document is to provide a guideline for product designers when integrating the 21-999765-01 RFID Module.

1.3 Part Number

Part Number	SKU
21-199765-01	US/Canada RFID Module

1.4 Key Features

- The 21-199765-01 RFID module will provide real time tag reading/processing for EPC Class 1 Gen2 compliant tags.
- The communication interface is 10/100 baseT Ethernet
- The Power interface is either Power over Ethernet iaw 802.3af/at or 24V DC Power Adapter
- Up to 1W TX power over each of the 8 Coaxial contacts(only one at a time)
- Heat sink and vented Metal enclosure for RF shielding and thermal control with convection cooling (no additional heat sink required).
- Custom housing for slide on bracket mounting.

2 Architecture

2.1 System Architecture

The Architecture of the 21-199765-01 is based on the Zebra Next Generation Engine RFID reader. The reader contains a Transmitter section, Receiver section, Synthesizer section, a Digital Modem, and a Host Interface section.

The Transmitter section contains a digital-to-analog converter (DAC), I-Q modulator, filtering, RF power amplifier and the antenna multiplexer circuit. Communication with RFID tags is

accomplished using a half-duplex signal consisting of a modulated reader signal followed by a Continuous Wave (CW) signal. The modulated signal sends data to the tag. The tag decodes this signal and then Backscatters (uplinks) its data during the CW portion of the cycle. The Transmitter (downlink) modulation used for communication with RFID tags is Double Sideband Amplitude Shift Keying (DSB-ASK) or Phase Reversal Amplitude Shift Keying (PR-ASK), depending on tag type and reader operating mode. Data rates range from 40 to 160 kbps.

The Receiver section contains I-Q demodulator, filtering and an analog-to-digital (ADC) converter. The Receiver architecture is direct conversion, and therefore it operates using the same Local Oscillator (LO) frequency and RF channel used by the Transmitter. During the Backscatter (uplink) portion of the tag communication cycle the Receiver down-converts the modulation data from the tag to baseband, where it is amplified and low pass filtered before being converted to a digital signal by the ADC converter. The receiver accommodates tag Backscatter data rates range from 32 to 640 kbps, depending on tag type and reader operating mode.

The Synthesizer section contains a voltage-controlled oscillator (VCO) and phase-locked loop. The Synthesizer generates a Local Oscillator (LO) signal that is shared with the Transmitter and Receiver sections. The VCO operating frequency is constrained under software control to the 902 to 928 MHz UHF ISM band when configured for the FCC region.

The Digital Modem includes the DSP, dual-function ADC-DAC converter, and general purpose input/output communication interfaces. The Digital Modem has direct control over transceiver functions, including operating frequency, TX power control, and generation and decoding of baseband digital modulation data sent and received by the reader for RFID tag read and write operations.

The Host interface section includes a microprocessor, its associated memory, and all of the circuitry needed to implement the Ethernet interface. The host processor serves as the interface between the radio and the outside world.

2.2 Block Diagram

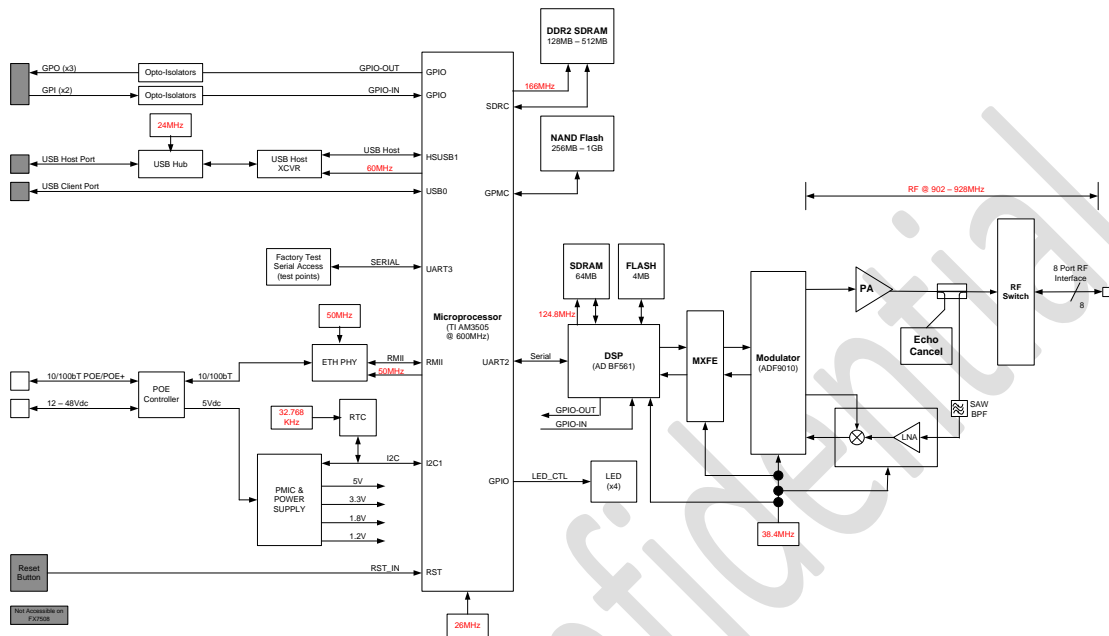


Figure 1 21-199765-01 Block Diagram

3 Hardware Interfaces

3.1 Ethernet Interface

The communication interface on the 21-199765-01 Module is a standard shielded RJ-45 connector that represents the 10/100BaseT interface. This connector also enables powering the module with POE in accordance with 802.3af/at.

3.2 DC Power Interface

The DC Jack is adjacent to the RJ-45 connector and provides an auxiliary method of powering the module using a Zebra approved DC Power Adapter (Zebra P/N PWRS-14000-260R)

3.3 RF Antenna Interface

The RF Interface on the 21-199765-01 Module is a custom 8-port MMCX connector (Molex P/N 73358-1170). This connector is used to interface to the RFID antenna system. The characteristic impedance of the RF antenna interface connector is 50 ohms nominal.

4 Specifications

4.1 Physical and Environmental Specifications

Parameter	Specification	Notes
Size	7.52 x 5.52 x 1.4"	
Weight	1.6 lbs	
Base Material	Die Cast Aluminum	
Mounting	Custom Bracket	
Operating Temperature	-20C to +55C	
Storage Temperature	-40C to 70C	
Humidity	5 to 95% non-condensing	
Shock/Vibration	Mil-Std-810G	
ESD	+8kV Contact/+15kV Air	

4.2 Electrical Specifications

Parameter	Specification	Notes
Frequency Range	902-928 MHz	US/Canada
Transmit Power	+10 to +31.5dBm	Limited to +30dBm Conducted at antenna interface. For professional installation only.
Power Consumption	13W(.af), 18W(.at/POE+)	
Voltage Range	37V to 57V (POE) 12V to 48V (DC)	Use Zebra recommended 24V power adapter
Antenna Ports	50 ohm monostatic	8 ports(Molex P/N 73358-1170)
Communications	10/100 BaseT Ethernet(RJ-45)	POE support

4.3 Hardware/OS and Firmware Management

Parameter		
Memory	Flash 512MB;DRAM 256 MB	
OS	Linux	
Firmware Upgrade	Web-based and remote firmware upgrade capability	
Management Protocol	RM 1.0.1(with XML over HTTP/HTTPS and SNMP binding)	
Network Services	DHCP, HTTPS, FTPS, SFPT, SCP, SSH, HTTP, FTP, SNMP and NTP	
Network Stack	IPv4, IPv6	
Security	Transport Layer Security Ver. 1.2, FIPS 140-2 Level 1	

Air Protocol	EPCglobal UHF Class 1 Gen2, ISO 18000-6C	
Receiver Sensitivity	-82 dBm	
IP Addressing	Static and Dynamic	
Host Interface Protocol	LLRP v1.0.1	
API Support	Host Applications – .NET, C and Java EMDK; Embedded Applications – C & Java SDK	

5 Integration Guidelines

5.1 Mounting

The 21-199765-01 is to be mounted using a bracket that latches on to the latch on the back of the 21-199765-01 Module. There is no requirement for screws or heat sinking once the bracket is installed onto the final product. The module will slide on and latch into the bracket. Details of the bracket are available upon request.

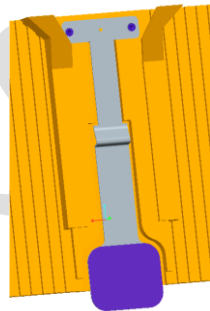


Figure 2 Rear Latch on 21-199765-01



Figure 3 Bracket used to mount 21-199765-01

5.2 Electrical Connection

The electrical connections on the 21-199765-01 are the Ethernet connection, the optional DC power connection, and the 8-Port Antenna connection.

5.2.1 Ethernet Connection

Using a standard Cat5e/Cat6 UTP cable connect the 21-199765-01 module to an Ethernet switch or PC. If the end application is using POE, a POE injector or Midspan should be connected between the 21-199765-01 Ethernet connector and the Ethernet switch/PC.

5.2.2 Optional DC Power Connector

If POE is not the power source for the 21-199765-01 module, a DC Barrel Jack type power supply(Zebra P/N PWRS-14000-260R) may be used to provide power to the module and the Ethernet connection can now be made directly to the Ethernet switch or PC.

5.2.3 Antenna Connections

An RF Cable Harness similar to the one shown below is used to connect the 21-199765-01 to the System Antenna(s). The Antenna Harness part number is Molex SD-73358-116. This harness can be used to connect up to 8 50 ohm Antennas. The Antenna interface connection for this cable harness should be MMCX Female.



Figure 4 Antenna Harness for 21-199765-01

6 Antenna Requirements

6.1 Antenna Specifications for use with the 21-199765-01 Module

Parameter	Specification
Frequency Range	902MHz to 928MHz
Polarization	Linear or Circular
Beamwidth	72 deg typical(Antenna dependant)
VSWR	<1.5:1
Gain	6dBi linear(typ) or 9dBic(Circular)-See Note 1
Connectors	RG316/MMCX-MPRF

Note 1: The antenna used for 21-199765-01 should be professionally installed and must adhere to the FCC Part15 limits.

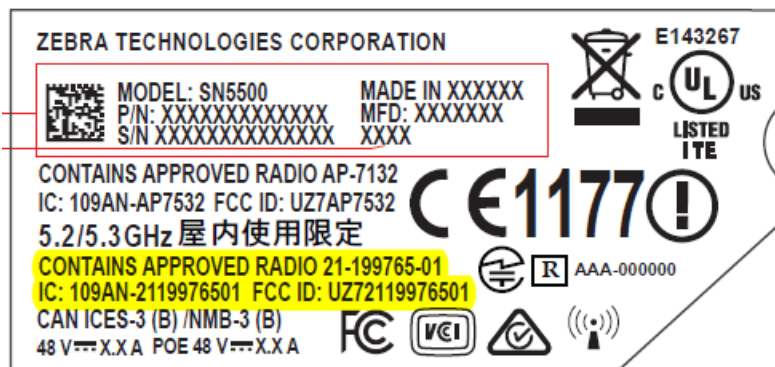
7 Regulatory Requirements

Add a Labeling Section and a Documentation Section

7.1 Host Labeling:

The FCC and Industry Canada require that the FCC ID and the Canadian Listing ID be visible on the end unit. If the label on the module is not visible when the radio module is installed, the contents of the label must be placed on a permanently attached label on the outside of the device.

See example of required labeling for a Host device that contains the radio module,



7.2 Module Documentation:

The following statements must be included in the Host Documentation

To comply with FCC RF exposure requirements, antennas that are mounted externally at remote locations or operating near users at stand-alone desktop or similar configurations must operate with a minimum separation distance of 34 cm from all persons.

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.

This device complies with Industry Canada's license-exempt RSSs. Operation is subject to the following two conditions:

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

Cet appareil est conforme exempts de licence le flux RSS de Industrie Canada. Son fonctionnement est soumis aux deux conditions suivantes:

(1) Ce dispositif ne peut causer des interférences; et (2) Cet appareil doit accepter toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement de l'appareil.