

Instructions for Use

B40420 & B40421 RFID Modules

CE 0678

FCC ID: 2AEGN-B40420

IC: 20032-B40420

Model: B40420

CE 0678

FCC ID: 2AEGN-B40421

IC: 20032-B40421

Model: B40421



B40420B40421

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Manufactured by
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B40420 & B40421 RFID Modules

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Original Instructions

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CHAPTER 1

Important User Information

Prologue

These Instructions For Use must be read prior to the installation and initial start-up of the RFID modules! It provides operating and maintenance instructions, commands, tag references, and other detailed product information like certification and conformity.

Lire ce guide d'utilisation avant de procéder à l'installation et première mise en service du module RFID. Il fournit des instructions d'utilisation et de maintenance, des commandes, références de balises RFID et d'autres informations détaillées sur le produit tels que certification et conformité.

Important User Information

IMPORTANT: Changes or modifications to this product not authorized by Beckman Coulter Biomedical GmbH or improper use could void the Certification and negate your authority to operate this product.

IMPORTANT: Les changements ou modifications à ce produit qui ne sont pas autorisés par Beckman Coulter Biomedical GmbH, ainsi que la mauvaise utilisation peuvent rendre invalide la certification et annuler votre autorisation d'opérer ce produit.

Declaration of Conformity

USA Information

The following is communications regulation information on the RFID modules Model B40420 and B40421.

FCC ID: 2AEGN-B40420

FCC ID: 2AEGN-B40421

This device complies with 47 CFR Part 15 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.

Canada Information

This device complies with Industry Canada RSS-210. 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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio RSS-210. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

IC: 20032 - B40420

IC: 20032 - B40421

CE Information

These devices fully comply with R&TTE Directive 1999/5/EC.

CE 0678

Comprehensive Integration Instructions

For proper integration of modules in the final products it is required that following detailed and comprehensive instructions are followed by the integrators so that any subsequent associated party (grantee, host manufacture, original equipment manufacturer (OEM), integrator, or end-user) can clearly understand the conditions and limitations for authorized uses of the modular transmitter:

- Do not exceed the DC power supply voltage of 5.5V.
- The power supply has to be a SELV (**S**afety **E**xtra **L**ow **V**oltage) type compliant to EN 60950-1.
- The DC power supply should have an output current limited to 500mA DC to avoid fire hazard in case of a short circuit into the module or cable.
- Do not use the modules into an explosive ambient.
- Do not use any liquids or solvents to clean the modules.
- Follow the ESD instructions from this Manual.
- Do not place any electrical conductive or ferromagnetic parts into a distance of 30mm from the PCB surface (measured perpendicular to it in both top and bottom direction) or 10mm coplanar with the PCB from any edge of the board, in order to avoid distorting the antenna characteristic.
- Use only the protocol and commands described in this document to control the modules.

Labeling of Host Equipment

If the FCC / IC / CE identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label should contain the following, as applicable by model:

US: Contains Transmitter Module FCC ID: 2AEGN-B40420, FCC ID: 2AEGN-B40421

Canada: Contains Transmitter Module IC: 20032-B40420, IC: 20032-B40421

Europe: **CE 0678**

ESD Instructions

This equipment is sensitive to electrostatic discharge that can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

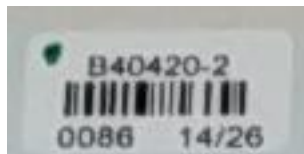
- Touch a grounded object to discharge potential static before handling the product.
- Wear an approved grounding wrist strap or ESD clothes / shoes at a static-safe workstation if available.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- Store the equipment in appropriate static-safe packaging when not in use.

Product Identification

Model: B40420 multi antenna RFID Reader

Model: B40421 single antenna RFID Reader

Figure 1.1 Example Label



Product Information

This manual applies to B40420 and B40421 13.56 MHz RFID reader boards.

Intended Use

The modules should be used to read RFID Tags, under specific communication protocol, power supply, and environmental conditions in industrial environment, as a part of other equipment, machine or device. The modules are delivered without housing. Present manual should be read and followed by technicians, engineers and manufacturing personnel handling, building, installing, servicing or using the product. Violation of intended use may lead to loss of compliance certification.

Important User Information

Product Information

Unintended Use

These modules are not designed and manufactured for use as standalone, or in any mobile, consumer, automotive or outdoor application. Any product change, modification, firmware update should only be carried out after prior approval of Beckman Coulter Biomedical GmbH.

Product Photos

Figure 1.2 B40420 Top View

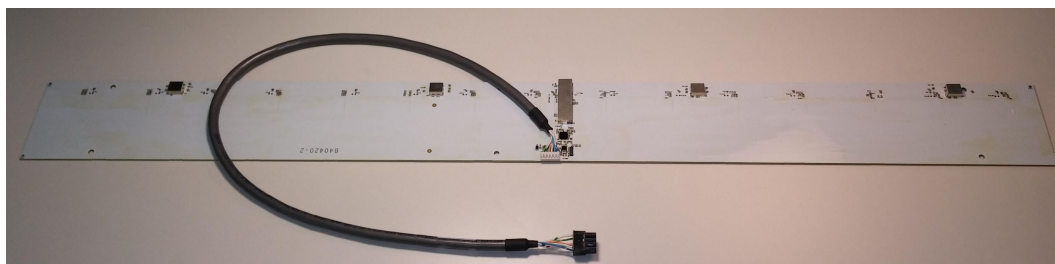


Figure 1.3 B40420 Bottom View

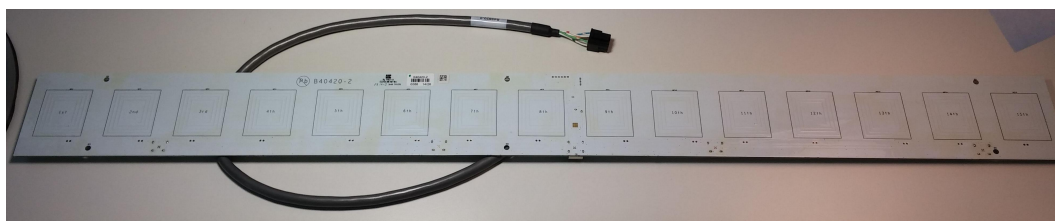


Figure 1.4 B40421 Top View



Figure 1.5 B40421 Bottom View



Physical Dimensions

Figure 1.6 B40420 PCB size: 662.5 x 63 mm, Cable length: 750 ±mm

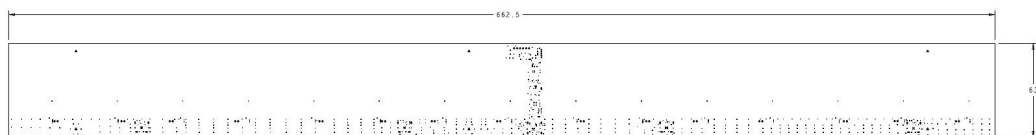
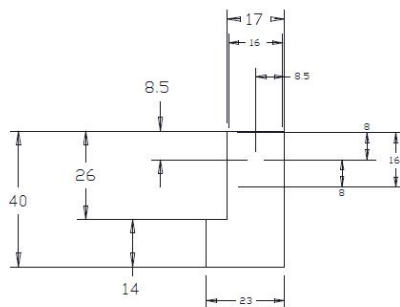


Figure 1.7 B40421 PCB size: 23 x 40 mm, Cable length: 750 ±mm

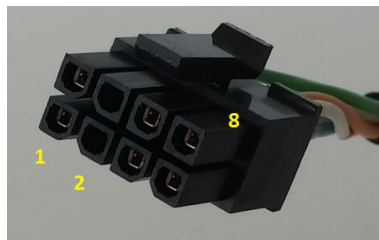
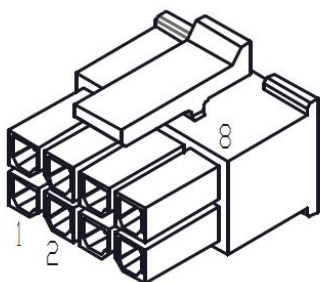


Electrical Interface

Connector Type

Designation	Manufacturer	Manufacturer's part no.
RECEPTACLE, 8-POLE, MICRO-FIT 3.0	MOLEX	43025-0800
CRIMPCONTACT, FEMALE, AWG 24-20,MICRO-FIT 3.0	MOLEX	43030-0001

Connector Pin Allocation



Pin #	Wire color	Signal
1	WH/G	GND
2		
3	OG	RX A
4	WH/BU	TX Y
5	GN	+5VDC
6		
7	WH/OG	RX B
8	BU	TX Z

Technical Specifications

Model no. B40420

Item	Specification
Power supply	+5V $\pm$ 10%
Current consumption	Standby: 32mA Read: approx. 100mA
Communication interface	4 wire ANSI/TIA/EIA-485
Storage temperature	-40°C $\div$ 85°C
Operating temperature	0°C $\div$ 50°C
Operating frequency	13.56 MHz
TX power	Max. 200mW
Number of antennas	15, multiplexed
Type of antenna	PCB integrated
Reading range	0 $\div$ 30mm

Item	Specification
Supported tags	ISO 15693 RFID tags

Model no. B40421

Item	Specification
Power supply	+5V $\pm$ 10%
Current consumption	Standby: 32mA Read: approx. 100mA
Communication interface	4 wire ANSI/TIA/EIA-485
Storage temperature	-40°C $\div$ 85°C
Operating temperature	0°C $\div$ 50°C
Operating frequency	13.56 MHz
TX power	Max. 200mW
Number of antennas	1
Type of antenna	PCB integrated
Reading range	0 $\div$ 10mm
Supported tags	ISO 15693 RFID tags

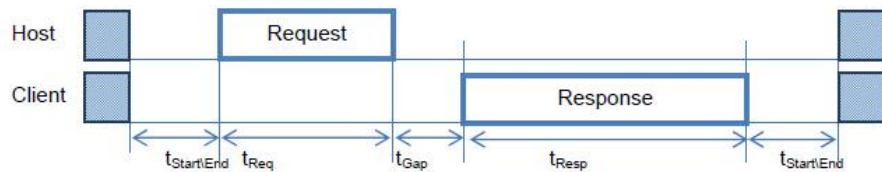
Supported TAGs

- For B40420
Beckman order # B46145 TAG, RFID, 22mmx3mm - RCK
- For B40421
Beckman order # B41938 TAG, RFID, 10mm x 2mm - TRAN

Communication Protocol

The RFID Boards communicate using a 4 wire ANSI/TIA/EIA-485 serial communication interface. The general structure of the communication is that the host sends a request to the RFID Board in a defined format. The RFID board then responds to the request in a defined time frame with a defined format. No spontaneous messages are sent by the RFID boards. The communication protocol is compatible to the ISO/IEC 13239 Standard.

Timing Diagram



Description	Symbol
Time period before start of the request telegram or after end of a response transmission, where no signal on the communication line is allowed. This is defined to ensure that no collision of transmitting happens.	tStart\End
Time period for the request telegram to be send. Depends on the baud rate and data length.	tReq
Time period between request and response	tGap
Time period of the response length. Depends on the baud rate and data length.	tResp

Port Settings

The default setting for the serial interface is: 57.6 kbps, 8N1. These values are fixed by firmware and cannot be changed by user. The default bus address for the RFID board is '0x01'.

Commands

Request Format

General request format

Start Flag	Address	Command	Parameter Size	Parameter	CRC	End Flag
------------	---------	---------	----------------	-----------	-----	----------

The definition for the fields is in the following table.

Field name	Size	Description
Start Flag	1 Byte	Fixed value of '0x7F'.
Address	1 Byte	Address of the Client that has to respond to this request. 0x01 - 0xFE : Client Address Range 0xFF: Broadcast for all connected Clients

Field name	Size	Description
Command	1 Byte	Command to execute from the Client. See Command Description
Parameter Size	2 Bytes	Amount of bytes used in the parameter section
Parameter	n Byte(s)	Parameter bytes depending on the Command
CRC	2 Bytes	Checksum value CRC-16 (a.k.a. CRC-CCITT) as per definition in ISO/IEC 13239. See [3.1.1.7] for a detailed description
End Flag	1 Byte	Fixed value of '0xF7'.

Response Format

General response format

Start Flag	Address	Command	Data Size	Data	CRC	End Flag
------------	---------	---------	-----------	------	-----	----------

The definition for the fields is in the following table.

Field name	Size	Description
Start Flag	1 Byte	Fixed value of '0x80'.
Address	1 Byte	Address of the Client that responds to the host's request. 0x00 - 0xFE : Client Address Range
Command	1 Byte	Command that has been executed and that the client is responding to
Data Size	2 Bytes	Amount of bytes used in the Return section
Data	n Byte(s)	Data bytes depending on the Command. Contains the Return Code.
CRC	2 Bytes	Checksum value CRC-16 (a.k.a. CRC-CCITT) as per definition in ISO/IEC 13239.
End Flag	1 Byte	Fixed value of '0xF8'.

The RFID boards Serial Communication Interface supports the following (request and response) commands:

- Initialization
 - **Purpose:** Initialize the hardware and firmware of the client.
 - **Command Code:** 0x01
 - **Format:** Return Code / Board ID / Firmware Version Major / Firmware Version Minor
 - **Input:** NA
 - **Output:** RFID Board ID, Firmware Version
- Set Communication Parameters
 - **Purpose:** Sets the communication parameters for the serial communication port.

- **Command Code:** 0x08
- **Input:** Bit rate, Data Bits, Parity bits, Stop bits. The Default values for the communication parameters are 57.6 kbps, 1 start bit, 8 bits data, 1 stop bit and no parity bit (8N1).
- **Output:** NA
- Start Firmware Update
 - **Purpose:** Sets the RFID reader board to the firmware update mode.
 - **Command Code:** 0x0A
 - **Input:** NA
 - **Output:** NA
- Firmware Data
 - **Purpose:** Send the firmware data from the host to the RFID reader board.
 - **Command Code:** 0x0B
 - **Input:** Firmware HEX file
 - **Output:** NA
- Set Address
 - **Purpose:** Sets the RS-485 Bus Address for the RFID reader board.
 - **Command Code:** 0x0F
 - **Input:** RS-485 Bus Address
 - **Output:** NA
- Reset Address
 - **Purpose:** Reset the RS-485 Bus Address of the RFID reader board to the Default value.
 - **Command Code:** 0xFF
 - **Input:** NA
 - **Output:** NA
- Get antenna connection state
 - **Purpose:** Identify the connected antennas and to know how many are connected to the RFID Board.
 - **Command Code:** 0x10
 - **Input:** NA
 - **Output:** Amount of connected antennas and Antenna indices
- Get inventory
 - **Purpose:** Read out the inventory from all RFID tag's that are in the range of the connected antennas.
 - **Command Code:** 0x11
 - **Input:** NA
 - **Output:** Amount of connected antennas, Antenna indices, DSFID, UID
- Get memory
 - **Purpose:** Read out the RFID Memory Data of all known RFID tag's or only one defined RFID tag.
 - **Command Code:** 0x1F
 - **Input:** RFID Tag
 - **Output:** Number of RFID Tags, Index of the antenna, Amount of data bytes for each RFID tags and Memory data

Firmware Update

The firmware is preprogrammed during manufacturing. The boards have both the option to firmware update in field (in installed and powered state) during serial communication interface, according to following procedure.

- Send / respond the following commands
 - Initiation, Get Inventory for ensuring the RFID Reader Board is working fine
 - Set the new baud rate (For example: 115000-8-Even-1) : 0x01
- Communication settings are changed and updated in the Application code execution
- Then send / respond the following commands
 - Initiation, Get Inventory for ensuring the RFID Reader Board is working fine with new baud rate
 - Start firmware upgrade and Firmware Data - to upgrade the new firmware command and write the new .hex file data to the flash (hex file available from Beckman Coulter)
- Firmware upgrade command is issued firmware will jump to boot
- Boot loader will receive new firmware data with changed communication settings
- But after successful programming of new application hex file, the RFID board will communicate with default communication settings (57600-8-None-1).
- RFID board needs power cycle after successful firmware upgrade process.

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