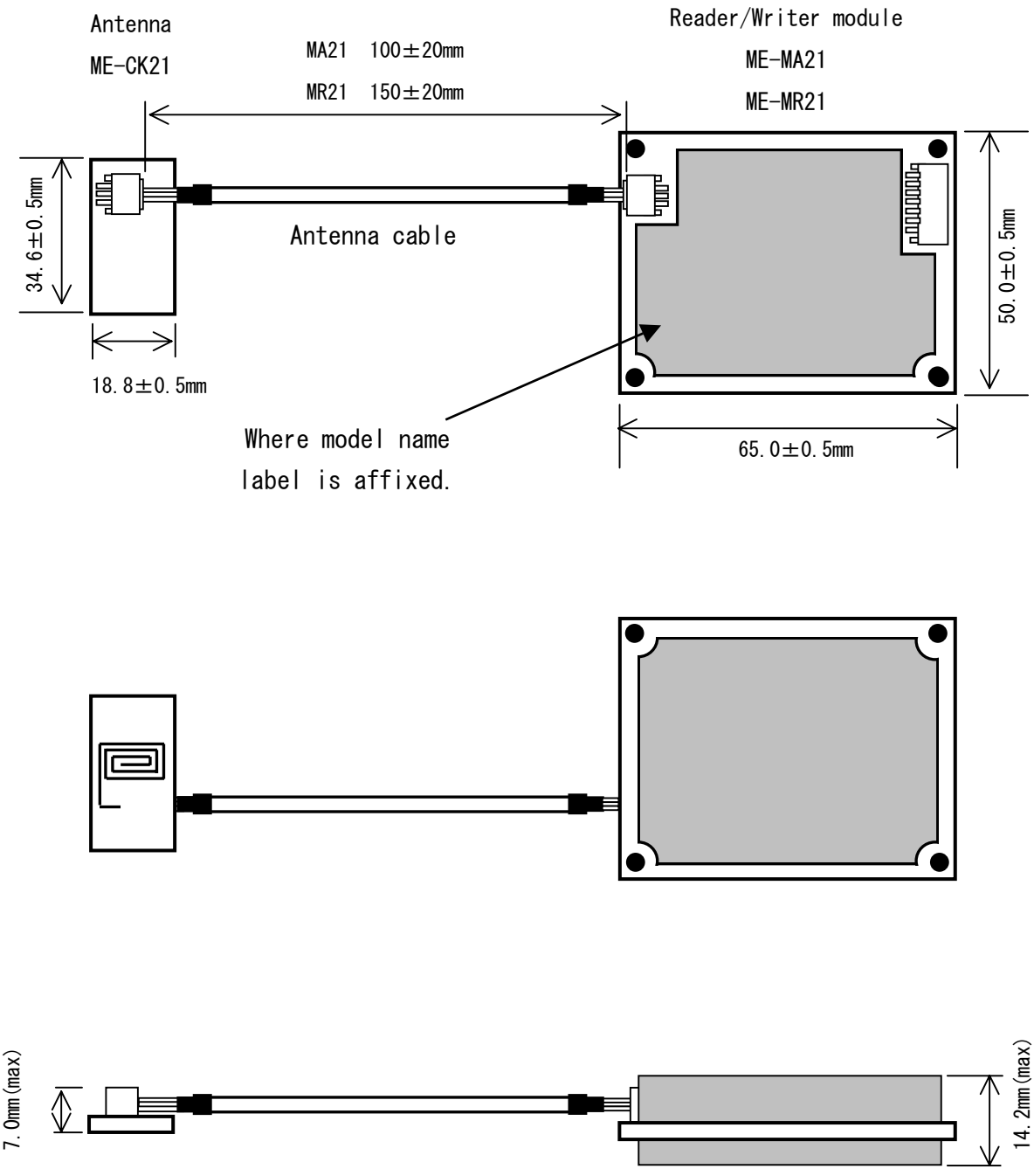
Manual

Reader/Writer Module

ME-MA21 (UART I/F)
ME-MR21 (RS232C I/F)

1 External Appearance



2 Application

These specifications are applicable to the reader/writer modules for RFID: ME-MA21 and ME-MR21 that are delivered by Maxell Seiki, Ltd. (referred to as Maxell hereafter), to SEGA Corporation (referred to as SEGA hereafter) by way of Kaga Devices Co., Ltd.

3 Product outline

3.1 Outline of ME-MA21 (UART I/F)

The ME-MA21 is used in a reader/writer module for RFID that performs data communication with a host system using UART I/F (CMOS level I/F), by connecting the device to equipment prepared by SEGA. Applicable RFID chips are ME-Y2000 series products (1Kbyte/2Kbyte/4Kbyte), which perform data processing by radio communication with RFID chip incorporated in a card.
The following provides circuit block diagram of the ME-MA21 module:

3.2 Outline of ME-MR21 (RS232C I/F)

The ME-MR21 is used in a reader/writer module for RFID that performs data communication with a host system using RS232C I/F (RS232C level I/F), by connecting the device to equipment prepared by SEGA. Applicable RFID chips are ME-Y2000 series products (1Kbyte/2Kbyte/4Kbyte), which perform data processing by radio communication with RFID chip incorporated in a card.
The following provides circuit block diagram of the ME-MR21 module:

4 Specifications

4.1 Environmental performances

No	Item	Specifications
1	Operating temperature range	0 ~ 50°C
2	Operating humidity range	20 ~ 80%RH (No condensation)
3	Storage temperature range	-10 ~ 60°C
4	Storage humidity range	20 ~ 80%RH (No condensation)

4.2 Physical specifications

・Reader/Writer module

No	Item	Specifications
1	Outer dimensions	50.0mm (D) x 65.0mm (W) x 14.2mm (H: max.)
2	Material of board	Glass epoxy FR-4
3	Weight	Approximately 32g

・Antenna module

No	Item	Specifications
1	Outer dimensions	18.8mm (D) x 34.6mm (W) x 7.0mm (H: max.)
2	Material of board	Glass epoxy FR-4
3	Weight	Approximately 2g

4.3 Electrical performance

▪MA21

Item	Specifications
Power supply voltage	4.75～5.25 V
Current consumption	1） Max. 700mA Operating condition: Primary condition is turning-on carrier. 2） Max. 110mA Idle 1 and Idle 2 conditions: Primary condition is turning-off carrier.
Carrier frequency	13.56MHz±15ppm or lower
Data rate	212kbps
Communication quality*	-Communicating distance: 0.7 to 2.2mm -Allowable transverse displacement (width direction): ±1.0mm/vertcal displacement (length direction): ±2.0mm (from antenna board to antenna side of RFID chip on board) -Communication of only one card 1） When communicating, adjust an amplifier gain at an optimum level on the host system. 2） Do not install any parts of metal or magnetic material around the antenna.
Carrier on/off ratio	Ratio of on status: 50% or lower

▪MR21

Item	Specifications
Power supply voltage	4.75～5.25 V
Current consumption	1） Max. 900mA Operating condition: Primary condition is turning-on carrier. 2） Max. 110mA Idle 1 and Idle 2 conditions: Primary condition is turning-off carrier
Carrier frequency	13.56MHz±15ppm or lower
Data rate	212kbps
Communication quality*	-Communicating distance: 1.0 to 2.2mm (communicating using one card) 1.0 to 1.6mm (communicating using two cards) (from antenna board to antenna side of RFID chip on board) -Allowable transverse displacement (width direction): ±1.0mm/vertcal displacement (length direction): ±2.0mm 1） When communicating, adjust an amplifier gain at an optimum level on the host system. 2） Do not install any parts of metal or magnetic material around the antenna.
Carrier on/off ratio	Ratio of on status: 50% or lower

* Values in the table above are provided for reference purpose only. The values fluctuate according to actual system environments. Perform evaluation on an actual system environment, and adjust communication distance, gain settings, and transverse displacement for secure communication.

The “communication distance” above refers to a distance between an antenna-coil surface of RFID chip and a R/W antenna coil. A distance between an RFID chip package surface and a R/W antenna coil is shorter than the values above as much as a thickness of package.

4.4 Interface specifications

4.4.1 CN101 connector pin alignment (host)

Pin	Pin name	Function	Direction	Remarks
1	GND	GND（0V）	—	Ground
2	TXD	Data output	Output	Sending data signal (output)
3	RXD	Data input	Input	Receiving data signal (input) (Connected to Vcc on board)
4	/DETECT	Presence/absence of chip	Input	RFID chip presence/absence signal Present: /DETECT=0 Absent: /DETECT=1 /DETECT=1 is applicable when “not used.” (Pull-up with 1kΩ on board)
5	/ANTPWR	Antenna power	Input	Antenna power supply control signal ON: /ANTPWR=0 OFF: /ANTPWR=1 Fixed to /ANTPWR=0 when “not used.” (Pull-up with 1kΩ on board)
6	/RESET	Reset signal	Input	System reset signal Reset: /RESET=0 Other than Reset: /RESET= open /RESET is opened for “not used.”
7	VCC	+5V power supply	—	

4.4.2 CN102 connector pin alignment (antenna)

Pin	Pin name	Function	Direction	Remarks
1	VANT	Antenna power supply	Output	Core wire
2	GND	GND	-	Shielded wire side
	SIGNAL	Analog signal	Input	Core wire

4.4.3 RXD/TXD communication specifications

Item	Specifications
Communication rate (real rate *1)	19,200 bps（18,750 bps）*2 38,400 bps（37,500 bps）
Communication mode	RS232C half duplex
Synchronous mode	Asynchronous
Flow control	None
Number of start bits	1bit
Number of data bits	8bit
Number of stop bits	1bit
Number of parity bits	bit/even

*1: The controller installed on this module uses a 6MHz oscillator. Because a communication rate is generated by frequency division of the oscillator, actual rates of this module are values in parentheses.

*2: A communication rate upon turning on the power (system resetting) is 19,200bps.

5 Receiving property parameters

This setting is very important for stable reading and writing processings. Optimum receiving property parameter values vary depending on communication characteristics of individual RFID chips and positional relationship between the R/W antenna and the RFID chip. When communicating with another RFID chip or after re-positioning the components (including removing and inserting a card), be sure to optimize the receiving property parameters to agree with the receiving property of the RFID chip.

Parameters to be optimized are slice level and gain. Switching of gain only also can optimize the characteristics to some degree. To optimize the system more fitting to the using environments, optimize the parameters in combination with a slice level.

Specify a comparator slice level using higher-order bits b7 to b4 (4 bits) of the receiving property parameter. Also, specify an amplifier gain using lower-order bits b 3 to b0 (4 bits) of the parameter. The following provides receiving property parameter setting registers and parameter values.

bit	Reset values	Function
7 ~ 4	0	Slice level selecting bit D: Low E: High
3 ~ 0	0	Receiving gain selecting bit 0: 14dB 1: 16dB 2: 18dB 3: 20dB 4: 22dB 5: 24dB 6: 26dB 7: 28dB 8: 30dB 9: 32dB A: 34dB B: 36dB C: 38dB D: 40dB E: 42dB F: 44dB

− Example of adjusting receiving property parameters

Find a gain setting that causes the least communication errors in product development and evaluation stage, and set the value as default. In addition, provide software processing that automatically fine-tunes the gain values upward and downward.

In consideration of operating conditions (power supply voltages and ambient temperatures), variation of communicating distance, and variation of communicating performances of RFID chip, tuning the gain in 1-LSB steps upward and downward is recommended.

For details, refer to the application notes.

Example: Setting values in lower 8 bits of receiving property parameter setting register:

Default “EA”→EB→E9→EC→E8→ED→E7→EE→E6→EF→E5 (→Return to default)

(Repeat several retries at each gain level.)

6 Notices before use

・R The R/W module may not comply with the Electro Magnetic Interference (EMI) Standards by itself.

Provide appropriate EMI measures on a system according to customer's application and use.

・For safety purposes, provide protective measures on the host against overcurrent of a power supply due to short circuit in components of this product.

・Do not place a metal object between the R/W module and the RFID chip. Place the antenna away from conductive objects such as a metal frame. ME-CK21 antenna must be placed 30mm or more away from such objects. Placing a conductive object near the antenna may deteriorate communication property.

7 Notes in handling

・When handling the module, remove static electricity from human body. Do not drop, bump, bend, or give a shock to the module.

8 Notes in operating

・Be sure to use Maxell's ME-Y2000 series RFID chip (ME-Y2001/ME-Y2002/ME-Y2004). Using other chips may cause malfunction or destruction of circuits.

・A slow-start power supply circuit is installed on the R/W module for protection against rush currents. After changing /ANTPWR=1 into /ANTPWR=0 (shutdown), wait for at least 2 seconds before starting communication with a RFID chip.

・Perform sufficient evaluations on user environments and communicating distances and perform correct adjustment on receiving gain property parameters in accordance with user's environments.

・Be sure to adjust receiving gain property parameters by host control. Upon retrying after communication error, re-adjust gain.

・After terminating required communication, issue a carrier OFF command (CARRIER_OFF command). Continuing operation under carrier ON status causes heating of RFID chip and deformation of the package.

・Specify an interval of switching carrier-OFF into carrier-ON to be twice or more of a previous carrier-sending period. For safety purpose, a carrier is terminated in approximately 40 seconds after starting transmission of a carrier (Protection status) .

・To release the Protection status, issue a RESET command or turn off the power and then turn it on again.

・When inserting and removing connectors on the R/W module, turn off the power. Inserting and removing connectors with power on may cause damage to circuits.

●FCC WARNING

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

Notice:

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 or more 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.

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.

We, the manufacturer (Maxell Seiki, Ltd.) hereby declare that this equipment (RFID Reader/Writer Module), model ME-MA21-A-SNT/ME-MR21-A-SG is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

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