SONY®

FeliCa

Reader/Writer Module

RC-S620 /U

Product Specifications

Version 1.03

No.M551-E01-03

Introduction

This document describes the major features and specifications of Sony's FeliCa Reader/Writer module, RC-S620/U.
For the purpose of this document, the terms below denote the products or equipment described to the right.

Card	: An IC card conforming to Sony's FeliCa contactless IC card technology.
Reader/Writer	: A device used to read and write cards based on Sony's FeliCa contactless IC card technology.
Controller	: An external computer or an equivalent device that is directly connected to a Reader/Writer via a specific cable.

User applications use FeliCa libraries to access the RC-S620/U. API specifications for these libraries vary depending on the products used, as well as the intended usage of the system, making it necessary to refer to the appropriate document for each.

Model Name	Description	Usage	Reference Document
RC-S620/U	USB for controller interfacing	For Windows PC	"SDK for FeliCa User's Manual"

* "SDK for FeliCa Lite" is also needed to use the RC-S620/U in combination with a Windows PC.

Safety Information and Caution

For customers in USA and Canada

WARNING

You are cautioned that any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules and RSS-Gen of IC 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.

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 Class B digital apparatus complies with Canadian ICES-003
Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

For customers in Europe

Sony hereby declares that this equipment is in compliance with the essential requirements and other relevant provisions of European Directive 1999/5/EC.
To obtain a copy of the declaration of conformity (DoC) with the R&TTE Directive, please access the following URL address.
http://www.compliance.sony.de/

For use in following areas: residential, commercial and light industrial.

This product has been tested and found compliant with the limits set out in the EMC Directive for using connection cables not longer than 3 meters (9.8 feet).

Emissions from this inductive device could cause interference to nearby receivers of other radio services.
The manufacturer of this product is Sony Corporation,
1-7-1 Konan, Minato-ku, Tokyo, Japan
The Authorized Representative for EMC and product safety is Sony Deutschland GmbH,
Hedelfinger Strasse 61, 70327 Stuttgart, Germany
For any service or guarantee matters please refer to the addresses given in separate service or guarantee documents.

Contents

1. Key Functions and Features

The RC-S620/U (hereinafter called the module) writes and reads data to and from FeliCa-enabled contactless IC cards. It can also write and read data based on the ISO/IEC 14443 communication standards. Immune to wear caused by dirt and friction, contactless operation leads to enhanced maintainability. Key functions and features of the module are detailed below.

• Based on an inductive read/write system type-certified by the Radio Law of Japan.

• Environmentally friendly, with the adoption of lead-free soldering.

• Compatible with devices such as mobile phones incorporating a Mobile FeliCa IC chip.
* Not all of the processing sequences can be handled.

• Compactly designed with an integral antenna.

• Requires the use of specified magnetic and metal sheets.

• Interface versatility made possible by the use of USB for host controller connection.

• Successful passage of rigorous validation tests by Microsoft's WHQL (Windows Hardware Quality Labs).

2. Hardware Specifications

This chapter focuses on major hardware specifications.

2.1 Major Specifications

The following describes the module's major specifications.

2.1.1 FeliCa Communication

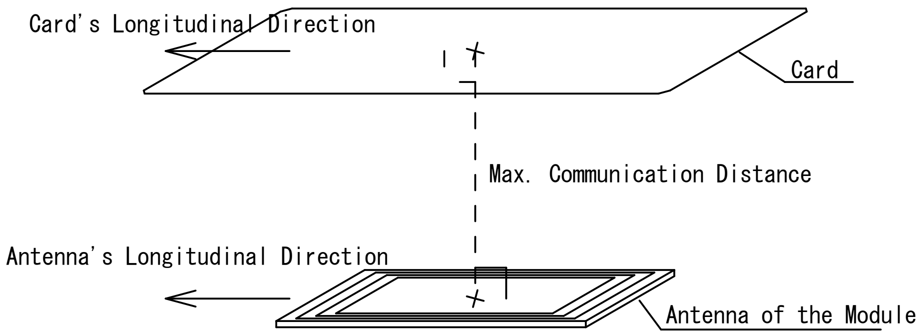
Max. communication distance	:	Approx. 20 mm (No dead zones of more than 1 mm wide within the max. communication distance) * Measurement conditions In a free space (temperature: 25°C, humidity: 50% RH) that is potentially unaffected by nearby radio waves and magnetic sources, a single RC-S880 card (operating at its center frequency) is polled by a standard module. The card is placed so that its center aligns with the center of the module's antenna along a vertical axis perpendicular to the antenna surface, with its longitudinal edges maintained in parallel to those of the antenna. (See Fig. 2-1.) * The communication distance varies depending on the usage environment.
Carrier frequency	:	13.56 MHz
Data transfer rate	:	212 kbps,424 kbps (available only when the card or the device to be used is also compatible with 424 kbps.)
Modulation system	:	Transmission – ASK Reception – ASK
Bit coding	:	Transmission – Manchester coding Reception – Manchester coding
Communication system	:	Half-duplex communication, CRC-ITU-T
Compatible cards		
FeliCa cards	:	RC-S860 Series (RC-S860, RC-S862, RC-S864) RC-S880 Series RC-S850 Series (RC-S850, RC-S853, RC-S854, RC-S855) * Usable number of cards: One at a time.
Compatible devices	:	Mobile phones incorporating a Mobile FeliCa IC chip (Products based on the 2009/1/15 FeliCa Validation Program.)

<Note>
Please consult us in advance when using a card or a device other than the ones listed above. Such a card or device may differ in communication distance, making it necessary to verify its performance.

• Ad-hoc Communication

Data transfer rate	:	Initiator mode 212 kbps,424 kbps (available only when the card or the device to be used is also compatible with 424 kbps.) Target mode 212 kbps
Compatible devices	:	Mobile phones with a built-in Mobile FeliCa IC chip (on which the Mobile FeliCa OS Version 2.0 is running)

* Feasibility of data exchange and other functions necessary for application execution depends on the FeliCa Ad-hoc Link Protocol (FALP) on the device used to control the module and mobile phones, as well as the method of implementing the FALP-compatible application. For more information, please refer to the documents that accompany Sony's software development kit and individual applications.



*The relative positions of the card and the antenna are determined first by paralleling their longitudinal directions and second, by aligning their centers along an axis that intersects at right angles with the antenna.

Fig. 2-1: Module to Card Max. Communication Distance

2.1.2 ISO/IEC 14443 Communication

Carrier frequency	:	13.56 MHz
Data transfer rate	:	106 kbps
Modulation system		
Type A	:	Transmission – ASK Reception – ASK
Type B	:	Transmission – ASK Reception – BPSK
Bit coding		
Type A	:	Transmission – Modified mirror Reception – Manchester coding with subcarrier
Type B	:	Transmission – NRZ Reception – NRZ with subcarrier
Communication system	:	Half-duplex communication
Compatible cards	:	Mifare Standard, Mifare UltraLight, Mifare DESFire, Innovision Jewel, Calypso CDLight * Compliant with ISO/IEC 14443 Type A, Mifare and ISO/IEC 14443 Type B standards.

2.2 Interface

Interfacing between the module and the controller utilizes the connector described below.

2.2.1 Connector

Model number: 08 6223 006 101 868+ (Au Plated) made by Kyocera Elco Corporation

Low-profile, 0.5 mm pitch FFC/FPC connector (SMT/right angle/NON-ZIF/6 poles)

* Refer to “Section 2-7: External Dimensions” for the contact point direction.

* Consult the manufacturer for detailed specifications.

2.2.2 Pin Assignment

Table 2-1: Pin Assignment

Pin No.	Designation	Function	Remarks
1	VDD	Power supply connector	DC3.3V input
2	D – (USB)	USB D – signal	USB2.0 (Full Speed)
3	D + (USB)	USB D + signal	USB2.0 (Full Speed)
4	GND	Ground connector	For grounding
5	Reserve	Non	Requires OPEN processing by the controller
6	PRS(GND)	Module identification signal	Fixed at “L” (with GND grounded)

2.3 USB Communication Specifications

A suspend signal from the controller is received through the USB interface to offer the capability for reduced power consumption.
See the tables below for USB communication specifications.

Table 2-2: Communication Specifications

USB transfer speed	USB 2.0 compliant, Full Speed
No. of endpoints	2
Endpoint 0	Control transfer using individual 8-byte buffers for IN and OUT directions
Endpoint 4	Bulk transfer using individual 64-byte buffers for IN and OUT directions
Command transfer	Data of any given packet length is bulk-transferred to Endpoint 4 (OUT direction).
Response transfer	Data of any given packet length is bulk-transferred from Endpoint 4 (IN direction).

Table 2-3: Device Descriptor

bLength	12h
bDescriptorType	01h
bcdUSB	0200h
bDeviceClass	00h
bDeviceSubClass	00h
bDeviceProtocol	00h
bMaxPacketSize0	08h
idVendor	054ch
idProduct	02e1h
bcdDevice	0130h
iManufacturer	01h
iProduct	00h
iSerialNumber	00h
bNumConfigurations	01h

Table 2-4: Configuration Descriptor

bLength	09h
bDescriptorType	02h
wTotalLength	0020h
bNumInterfaces	01h
bConfigurationValue	01h
iConfiguration	00h
bmAttributes	80h
MaxPower	32h

Table 2-5: Interface Descriptor

bLength	09h
bDescriptorType	04h
bInterfaceNumber	00h
bAlternateSetting	00h
bNumEndpoints	02h
bInterfaceClass	ffh
bInterfaceSubClass	ffh
bInterfaceProtocol	ffh
iInterface	00h

Table 2-6: Endpoint Descriptor (OUT)

bLength	07h
bDescriptorType	05h
bEndpointAddress	04h
bmAttributes	02h
wMaxPacketSize	0040h
bInterval	00h

Table 2-7: Endpoint Descriptor (IN)

bLength	07h
bDescriptorType	05h
bEndpointAddress	84h
bmAttributes	02h
wMaxPacketSize	0040h
bInterval	00h

2.4 Electrical Specifications

2.4.1 Absolute Maximum Rating

Observe the following ranges of operation in order to avoid irreparable damage to the module.

Table 2-8: Absolute Maximum Rating

Item	Rating	Unit
Power supply voltage	+3.9	V
Input voltage	+3.9	V

2.4.2 Electrical Characteristics

Table 2-9: Electrical Characteristics

(Conditions) Temperature: 25°C, Humidity: 50% RH

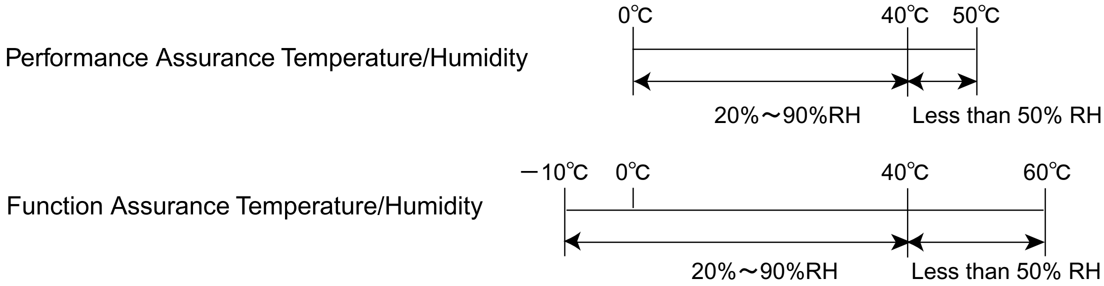
Item	Min	Max	Unit	Remarks
Power supply voltage (VDD)[*1]	3.15	3.45	V	DC 3.3V input
Current consumption (IVDD) [*2]	—	100	mA	RF ON: Approx. 70 mA RF OFF: Approx. 20 mA
H-level output voltage	2.8	VDD	V	Lower than the power supply voltage (VDD)
L-level output voltage	0	0.3	V	
H-level input voltage	2.0	3.6	V	VDD = 3.3 V
L-level input voltage	0	0.8	V	

*1 To power the module, use the USB-controlled Vbus power voltage after stepping it down by using a regulator or something similar.

*2 The module's max. current consumption is the same as the value set to MaxPower of the USB descriptor

2.5 Others

• Operating environment (no condensation or frost)

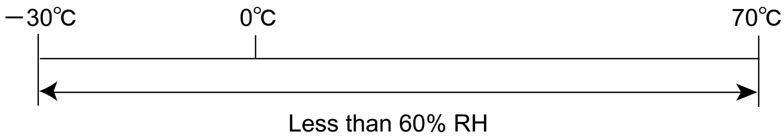


* Performance Assurance Temperature/Humidity :
Guarantees more than 80% of the max. communication distance (25℃, 50%RH) defined in "Section 2.1.1: FeliCa Communication".

Function Assurance Temperature/Humidity:
Guarantees normal operation of the RF communication processor, although the communication performance described above cannot be assured in temperature extremes.

* The board temperature inevitably rises if the Reader/Writer is continually transmitting card access commands (such as when polling a card). Make sure to design the enclosure so that the internal temperature and humidity can be held within the specified ranges.

• Storage environment (no condensation or frost)



• Mass : Approx. 17 g

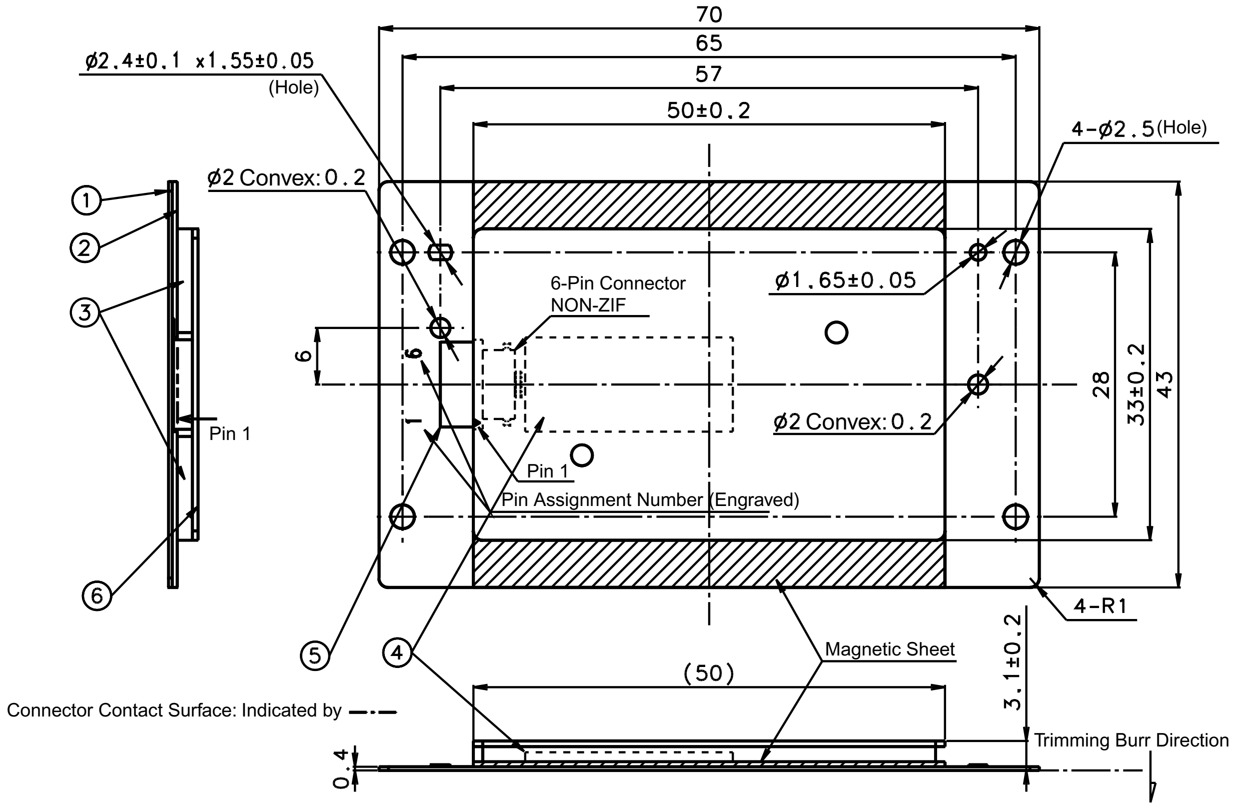
2.6 Reliability Specifications

• Shock : IEC60068-2-27 Part2 Test Ea

• Vibration : IEC60068-2-6 Part2 Test EC

2.7 External Dimensions

External dimensions of the module are illustrated below.



NO.	PARTS	MATERIAL	Q'TY
1	Magnetic sheet	Soft magnetic sheet	1
2	Metal sheet	SPTE	1
3	Spacer	Polyurethane foam	2
4	Cooling sheet	Silicon sheet	1
5	Insulating tape	Polyester tape	1
6	Board		1

L≦ 4	±0.1
4<L≦ 16	±0.2
16<L≦ 63	±0.3
63<L≦250	±0.4
250<L	±0.6

(Unit: mm)

Fig. 2-2: External Dimensions

2.8 Label Specifications

The module bears a serial label in the position shown below.

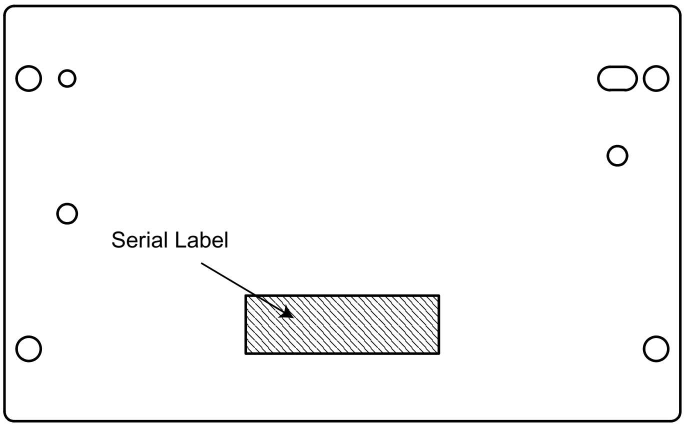


Fig. 2-3: Position of Labels (Metal Sheet)

2.9 RF Performance and the Use of Magnetic and Metal Sheets

- RF (communication) performance is closely related to the effectiveness of the magnetic and metal sheets used below and around the antenna of the module.

- RF performance varies considerably, depending not only on the magnetic permeability (μ', μ"), dimensions and thickness of the magnetic sheet but also on the dimensions and material of the metal sheet used. There is also a possibility that it is affected by metal in the installation environment.

- The module is designed to be used with the specified magnetic and metal sheets attached in advance to control the magnetic field generated by the antenna, as well as to minimize the possible effects from the installation environment. This contributes a great deal to the reduction of the time required for weighing the effects of the installation environment and evaluating the module's RF performance.

3. Software Specifications

3.1 Communication Packet

The host packet format defines three types of frames – normal, extended and ACK.
Transactions between the host controller and the module are based on packet communication using host packets. The module processes the received host command packet and returns a host response packet. Needless to say, the module cannot autonomously transmit host response packets.

3.1.1 Normal Frame

Between the host controller and the module, the normal frame allows transmission and reception of host command/host response packets whose LEN value is smaller than 255 bytes. This frame also provides a subordinate error frame used by the module to notify the host controller of syntax error detection.

Table 3-1: Normal Frame

Designation	Size (Bytes)	Remarks
Preamble	1	00h fixed
Start Of Packet	2	00h ffh fixed
LEN	1	Specify the data length (max. 255 bytes)
LCS	1	Specify the checksum of LEN data (a value that sets 00h to the lower 1 byte of the sum of LEN and LCS bytes).
Packet data	Max. 255 bytes	
DCS	1	Specify the checksum of data in a packet (a value that sets 00h to the lower 1 byte of the sum of data and DCS bytes).
Postamble	1	00h fixed

3.1.2 Extended Frame

The extended frame is used to send and receive host command/host response packets whose LEN value is greater than 256 bytes and smaller than 265 bytes.

Table 3-2: Extended Frame

Designation	Size (Bytes)	Remarks
Preamble	1	00h fixed
Start Of Packet	2	00h ffh fixed
2-byte frame identification code	2	ffh ffh fixed
LEN	2	Specify the data length (max. 265 bytes) in the big endian format. All data greater than 266 bytes is interpreted as 265 bytes.
LCS	1	Specify the checksum of LEN data (a value that sets 00h to the lower 1 byte of the sum of 2-byte LEN and 1-byte LCS).
Packet data	Max. 265 bytes	
DCS	1	Specify the checksum of data in a packet (a value that sets 00h to the lower 1 byte of the sum of data and DCS bytes).
Postamble	1	00h fixed

Which type of frame is to be used for the host response packet is automatically determined – the normal frame if the LEN value is below 255 bytes and the extended frame if it is over 256 bytes.

3.1.3 ACK Frame

The ACK frame is intended for use in the following situations.

• Module to Host Controller Transmission
- Informing the host controller that no data link level error is detected in the received host command packet.

* This is the one and only instance the module transmits the ACK frame.

• Host Controller to Module Transmission
- Interrupting host command execution.
- Determining the results on command execution (prerequisite with the Reset command). For more information, refer to the "RC-S956 Series Command Reference Manual".

* In the cases other than those above, the module ignores the ACK frame received from the host controller.

Table 3-3: ACK Frame

Designation	Size (Bytes)	Remarks
Preamble	1	00h fixed
Start Of Packet	2	00h ffh fixed
LEN	1	00h fixed
LCS	1	ffh fixed
Postamble	1	00h fixed

3.2 Communication Protocol

The communication protocol consists of a data link level and an application level.

3.2.1 Data Link Level

The module uses this level to make sure that the host packet is transmitted or received in accordance with the communication protocol, i.e., without any error. For this purpose, the module verifies the following information contained in each host packet.

• Host Packet Format
  - Preamble
  - Start Of Packet
  - LEN, LCS
  - DCS
  - Postamble

If no error is detected in the received host packet, the module returns an ACK packet to the host controller.

A) Fig. 3-1 shows a typical communication sequence on the data link level.

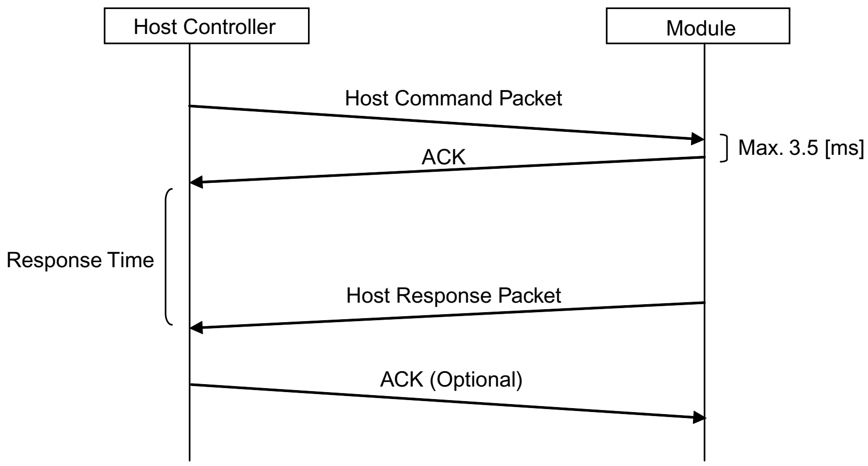


Fig. 3-1: Communication Protocol between Host Controller and Module

If the host command packet is verified, the module prepares an ACK frame within 3.5 ms. Stated the other way round, the module requires a maximum of 3.5 ms in order to be ready to transmit an ACK packet after receiving an IN packet. Acknowledging packet reception, the module proceeds to host command processing, returns a host response packet, and waits for the reception of the next host command packet. Accordingly, it is not necessary for the host controller to be concerned with the time interval between the reception of a host response packet and the transmission of the next host command packet. Upon detection of a host response packet from the module, the controller optionally transmits an ACK frame to the module.

B) If a data link level error is detected, the module remains non-responsive to the host controller. Seeing that no ACK frame is returned, the host controller retransmits a host command packet to recover communication.

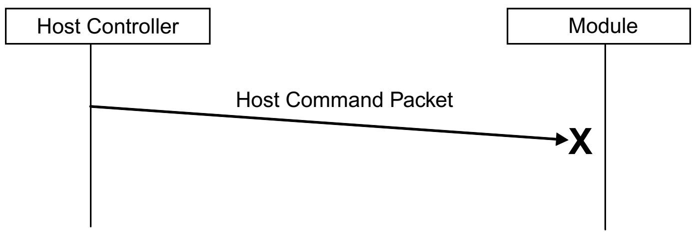


Fig. 3-2: Data Link Level Error in Host Command Packet

Major errors encountered during data link level communication are listed below.

1. Start of Packet Error
   The second byte of the host command packet is not 00h, or the third byte is not ffh.

2. LCS Error
   The lower 1 byte of the sum of LEN and LCS is not 00h.

3. DCS Error
   The lower 1 byte of the sum obtained by adding up all data bytes and DCS is not 00h.

4. Postamble Error
   The postamble byte is not included.

3.2.2 Application Level

This is the level where the module executes the host command specified in the host command packet.

A) When command processing is complete, the module returns a host response packet to the controller.

B) The host controller transmits an ACK frame when it is necessary to interrupt command execution by the module. The next host command cannot be sent until more than 1 ms elapses from the interruption of host command execution (or the completion of ACK frame transmission).

- In addition to when an ACK frame is received, the module discontinues host command processing if one of the following factors is detected. Thereafter, it reacts by performing necessary processing, depending on the detected factor.
  - Reception of a standard USB request (Necessary processing: Responding to the request)
  - USB RESET
  - USB IDLE of more than 3 ms duration (Necessary processing: Suspending USB communication)
  - Reception of a packet bulk-transferred (OUT direction) from Endpoint 4

C) If a syntax error is detected in the received packet, the module notifies the controller by returning an error frame.

Table 3-4: Error Frame

Designation	Size (Bytes)	Remarks
Preamble	1	00h fixed
Start Of Packet	2	00h ffh fixed
LEN	1	01h fixed
LCS	1	ffh fixed
Packet data	1	7fh fixed
DCS	1	81h fixed
Postamble	1	00h fixed

3.3 Mode Transition

3.3.1 Concept of Operating Mode

The module operates in four modes – Mode 0, Mode 1, Mode 5 and Mode 6. Available commands vary according to the mode, while the mode changes as the result of host command execution or RF command reception. For more details, refer to the “RC-S956 Series Command Reference Manual”.

3.3.2 Overview of Individual Modes

[a] Mode 0

[Initial Mode]

Used to perform the following functions.

• Self diagnosis
• Transfer speed setting for host communication
• RF waveform test
• Various settings for RF communication
• Starting up as an initiator or a target

In Mode 0, the module exists neither as an initiator nor a target. Switching between the initiator and target states cannot be performed without traversing this mode.

[b] Mode 1

[Target Initial State]

Enables the module to operate as a target to wait for RF command packets.

In other words, this is the mode where the TgInitTarget command is executed. Mode 5 is entered as soon as the command execution is normally completed. Reception of a new host command packet terminates and disables the ongoing TgInitTarget command processing and causes transition to Mode 0 for processing of the newly received host command packet.

[c] Mode 5

[Target State]

The module operates and communicates as a target.

[d] Mode 6

[Initiator Operation]

The module operates and communicates as an initiator.

3.4 Command List

Table 3-5 provides a list of available commands. The module returns a syntax error message if a value other than the one specified in the sub-command code column is used. Functional details of individual commands are provided in the "RC-S956 Series Command Reference Manual".

Table 3-5: Command List

Command	Sub-Command Code	Sub-Response Code	Function Overview
Diagnose	00h	01h	Used to perform self-diagnosis of the module.
GetFirmwareVersion	02h	03h	Used to obtain the module's firmware version information.
GetGeneralStatus	04h	05h	Used to obtain information about the module's internal state.
ReadRegister	06h	07h	Used to access data in the RAM.
WriteRegister	08h	09h	Used to write data in the RAM.
ReadGPIO	0ch	0dh	Used to obtain the value of the input port.
RFU	0eh	0fh	
RFU	10h	11h	
SetParameters	12h	13h	Used to change the internal parameters the module retains in the RAM.
RFU	14h	15h	
PowerDown	16h	17h	Used to set the module in the power-down state.
RFConfiguration	32h	33h	Used to change the RF setting information the module retains in the RAM.
RFRegulationTest	58h	59h	Used to test the module's RF waveform.
Reset	18h	19h	Used to cause transition to Mode 0.
ControlLED	1ch	1dh	Used to turn on and off the LED.
RFU	56h	57h	
RFU	46h	47h	
InListPassiveTarget	4ah	4bh	Used to capture a target to obtain its target ID.
RFU	50h	51h	
RFU	4eh	4fh	
RFU	40h	41h	
InCommunicateThru	42h	43h	Used to transmit and receive RF packets to and from the target when the module is started in the initiator mode.
RFU	44h	45h	
RFU	52h	53h	
RFU	54h	55h	
TgInitTarget	8ch	8dh	Used to start up the module in the target mode.
RFU	92h	93h	
RFU	86h	87h	
RFU	8eh	8fh	
RFU	94h	95h	
TgGetInitiatorCommand	88h	89h	Used to obtain an RF packet when the module is started in the target mode.
TgResponseToInitiator	90h	91h	Used to transmit an RF packet when the module is started in the target mode.
TgGetTargetStatus	8ah	8bh	Used to obtain information about the currently set transfer speed when the module is started in the target mode.
CommunicateThruEX	a0h	a1h	Used to transmit and receive RF packets in Ad-hoc communication. This command can be used regardless of whether the module is started in the initiator mode or the target mode.

* RFU = Command to be implemented in the future

4. Packing Specifications

4.1 Packing Details

The following shows how modules are packed in a master carton.

- Number of packed modules : 100
- Master carton external dimensions : 415 mm x 108 mm x 430 mm (W x H x D)

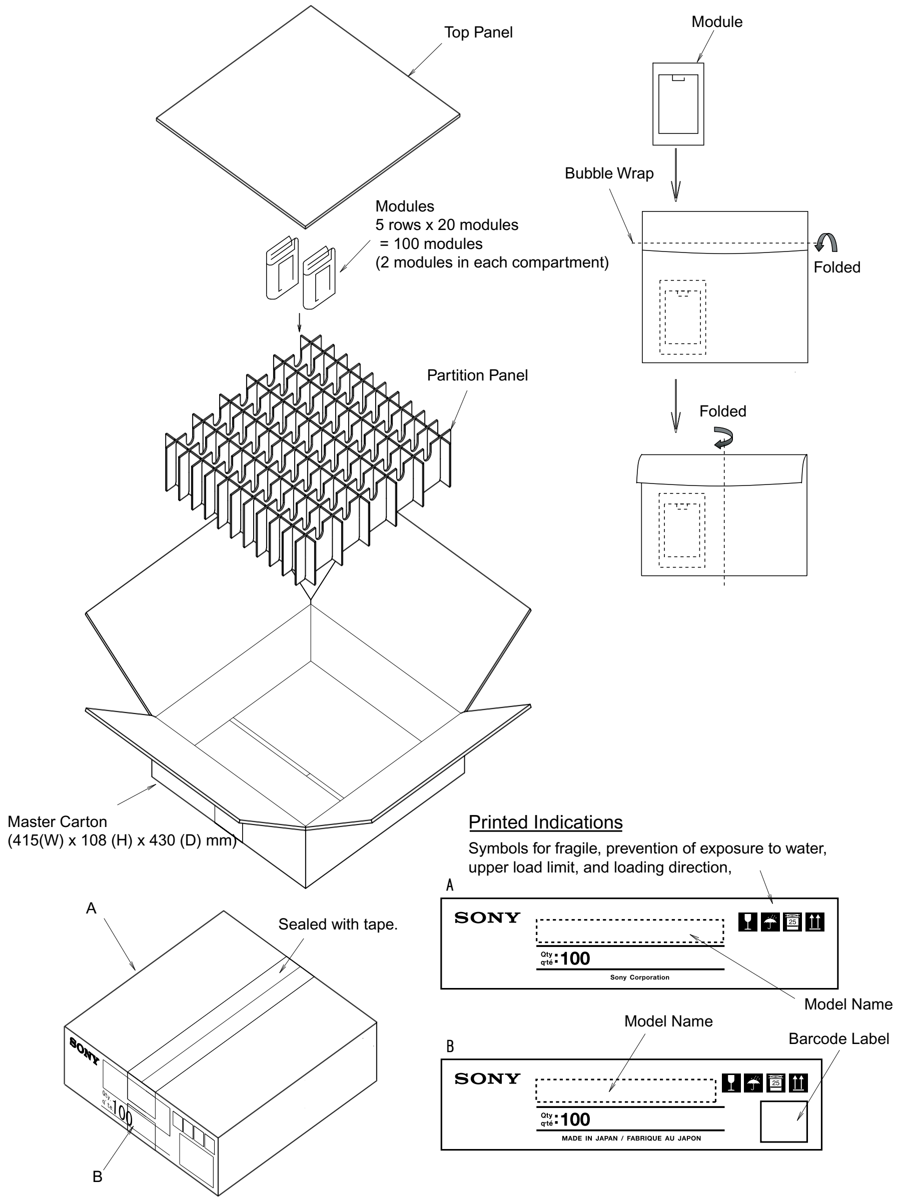


Fig. 4-1: Packing Details

5. Precautions

5.1 Handling Precautions

The module must be handled with special care, keeping the following precautions in mind.

- This module is an inductive-type read/write communication device that is type-certified in compliance with the Radio Law of Japan. The operating frequency is 13.56 MHz. Disassembly or modification of the module, removal of the type number or similar acts are subject to penalties according to applicable laws.
- Be sure to use a stable power supply so that the module can be protected from the effect of noise and excessive voltage peaks, such as lightning, transmitted through the power supply connector.
- Do not cause any chemical or physical damage to the module.
- Do not subject the module surface to contaminated air or materials.
- Ground all jigs, machines, workbenches and workers' bodies to prevent static electricity from affecting the module.
- For safety's sake, be sure to wear gloves when handling the module, although its surfaces are carefully finished.
- Protect the module from interference from other wireless machines.
- Do not install the module in an environment where a strong electromagnetic field may exert deleterious effects on communication performance. Take special note of the installation location so that interference between the module and other equipment can be adequately controlled.
- Communication performance may be affected by the harmonics of the 13.56 MHz carrier frequency generated on the signal line.
- Check in advance the compatibility between the module and your system. The module cannot handle part of the processing sequences* provided by mobile phones and other portable devices incorporating mobile FeliCa IC chips.
- The interface cable (FFC/FPC) is not supplied, making it necessary to prepare the one appropriate for your system. When selecting the cable, make sure of the contact point direction because the module uses a single-sided interface connector.
- Measures for static noise and power line noise must be designed and incorporated on your own.

* Among the processing sequences unique to mobile FeliCa compatible portable devices, the module cannot handle the sequence which allows wireless communication from the Reader/Writer after the mobile FeliCa IC chip was activated by the portable device via a wired interface. For more information, refer to the "Mobile FeliCa Technical Information" (Japanese only) that explains Reader/Writer operation in mobile applications.

5.2 Notes on External Appearance

Since the module is designed for embedded applications, please realize that flaws on the order described below may occur.

- Scratch or stain on the product surface, which has no effect on performance.
- Change in the board color.

Appendix Installation Requirements

The following describes the points to remember when installing the modules.

1. Do not use any metal or carbon compound as the material for the palm rest. The palm rest surface must be at least 1.5 mm apart from the board surface.
2. Do not place any metal in the forbidden zone (dot-meshed area in Fig. A-1) secured around the module. Particularly, communication performance undoubtedly deteriorates if a plate-like metal is put near the module.
3. In order not to induce eddy current, make a cut in the metal plate surrounding the above forbidden zone.
4. If no performance improvement is achieved through the steps described above, add magnetic sheets, as shown in Fig. A-2, to the metal surface that faces the card.

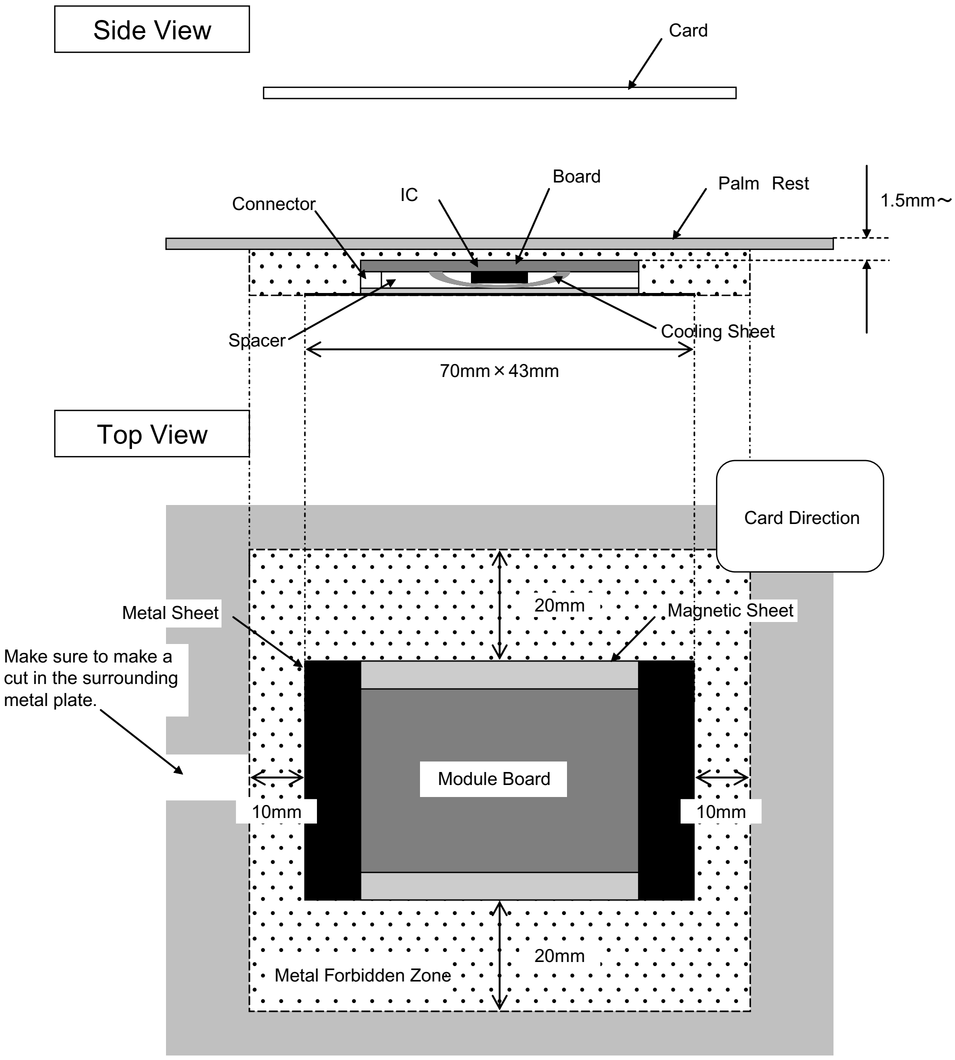
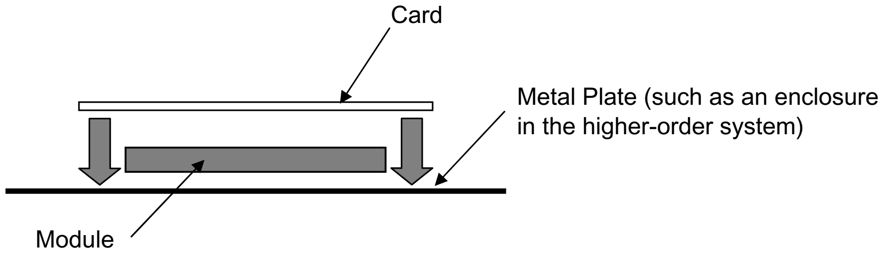
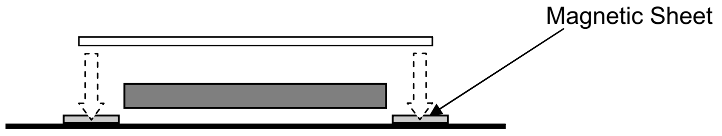


Fig. A-1: Installation Requirements



* Deviation from the resonance point caused by bringing the card closer
to the metal plate may result in a change in the card's original characteristics.



* The effect of the metal plate is reduced by adding magnetic
sheets to the positions illustrated above.

Fig. A-2: Reduction of the Impact of Metal

Glossary

(In alphabetical Order)

ACK

Abbreviation for ACKnowledgement, which means an affirmative message transmitted when, for example, data transfer is successfully completed.

ASK

ASK stands for Amplitude Shift Keying. The amplitude of the carrier frequency is modulated according to the logic of the data to be transmitted.
The degree of modulation (normally indicated in percent) is expressed by (a - b)/(a + b), where a and b respectively represent the maximum and minimum amplitudes of the modulated signal waveform.

DCS

Abbreviation for packet Data CheckSum representing the checksum for packet data.

Initiator

A device that initiates RF communication transactions by issuing the first RF command packet. Equivalent to the conventional FeliCa Reader/Writer.

LCS

Abbreviation for packet Length CheckSum representing the checksum for all data bytes specified by the LEN byte.

LEN

Abbreviation for packet LENgth, indicating the number of data bytes contained in the packet.

Manchester Encoding

A method of coding bit data. The bit duration time is divided at the transition point in the center and translated into two logical values.

Target

A device that returns an RF response packet to the RF command received from the initiator in RF communications. Equivalent to the conventional card. During Ad-hoc transactions (possible with the use of devices operating on the Mobile FeliCa OS Version 2.0), there is a case where the target sends a command to the initiator.

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Reader/Writer Module

RC-S620/U Product Specifications

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