Panasonic
ideas for life

KR20
WIRELESS UNIT

High-speed, wireless communication with easy installation and simple wiring!!

Antenna with cable

*Antenna sold separately.

Antenna extension cable

High-speed data transfer
(2.4 GHz, SS wireless)

250 m range

Antenna with cable available

RS485 type and I/O type

KR20 WIRELESS UNIT
ARCT1B301E '08.5

New

Optimum for high-speed data communications.

134 kbps wireless communication speed optimum for high-speed data communications.

Optimum for reducing the wiring and installation work.

Reduces the cable installation costs when the layout for machines and equipments are changed or in places where the wiring is difficult.

Common units for master and slave

The master and slave can be identified with the unit number settings on the unit. When purchasing, you don't have to worry about the master and slave identifications.

RS485 types are available.

The RS485 types do not need RS232C-RS485 converters, which were conventionally required for communication with the RS485 communication equipments and allow direct connections.

Easy-to-operate main unit and setting tool software

For 1:1 topology (one each master and slave), communication is possible through settings on the main unit. For 1:N topology (one master and more than one slave), the setting tool software (Control Configurator KR) is available, which facilitates the settings. This software incorporates various test functions helpful for unit installation. This software is downloadable from our website.

Wireless repeater function

The communicable distance between the master and a slave is approximately 250 m[*1] outdoors[*2] or approximately 50 m indoors. The communication distance can be extended using the repeater function incorporated in this unit. (Up to eight repeaters can be installed between the master and slave.)

[*1] Linear distance in an open location
[*2] The main unit, standard antenna and antenna with cable are designed for indoor use. If they are used outdoors, then take waterproof measures such as using plastic cases, etc.

Up to 254 terminal equipments can be connected.

The RS485 types allow up to 99 slave units to be connected for one master and in RS485 mode, up to 31 terminal equipments can be connected for one slave. Up to 254 terminal equipments can be connected in an entire network. The I/O types allow up to 99 slave units or terminal equipments to be connected for one master.

Concurrent I/O and serial (RS232C) communications are possible.

The I/O types allow concurrent I/O and serial (RS232C) communications.

All models can be configured for 1:N topology.

When MEWTOCOL is used for 1:N topology, all RS485 and I/O types can be mixed.

Compliant with wireless standards of Japan, China, Europe

System Configurations

● Example of 1:1 topology

Data can be exchanged between the master and slave over a distance of 250 m.

I/O type — Two-way communication is possible between the master and slave.

RS485 type — Two-way communication is possible between the master and slave.
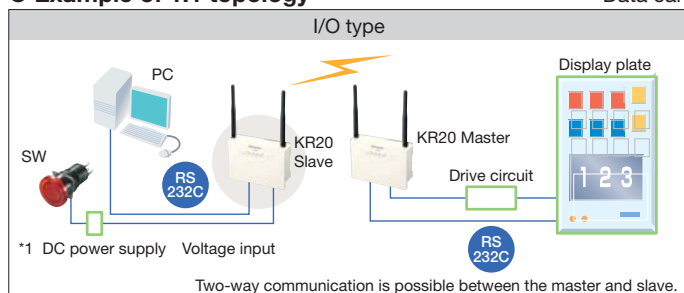
*1 For switch inputting, a separate DC power supply is necessary for inputting.

● Example of 1:N topology
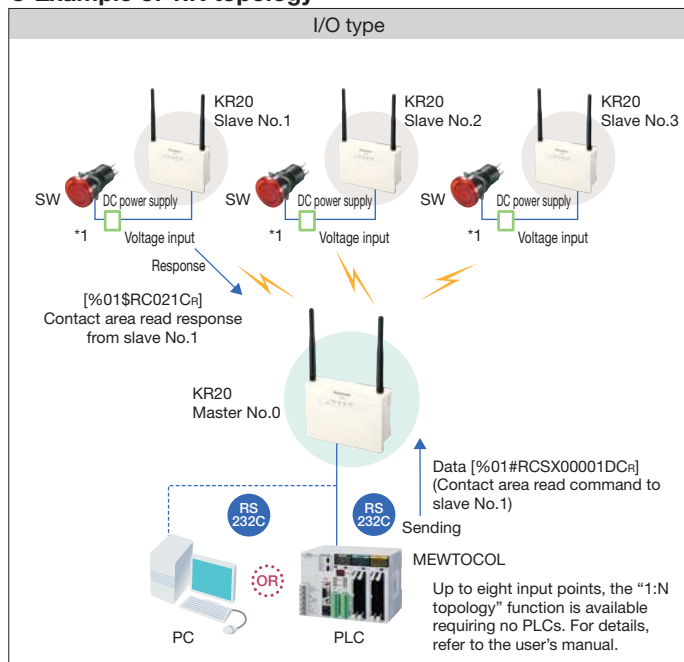
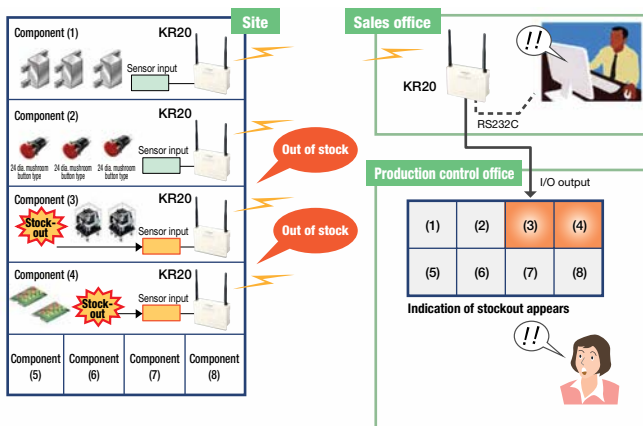*1 For switch inputting, a separate DC power supply is necessary for inputting.   *2 Contact us for equipments that can be connected to the master and slave.
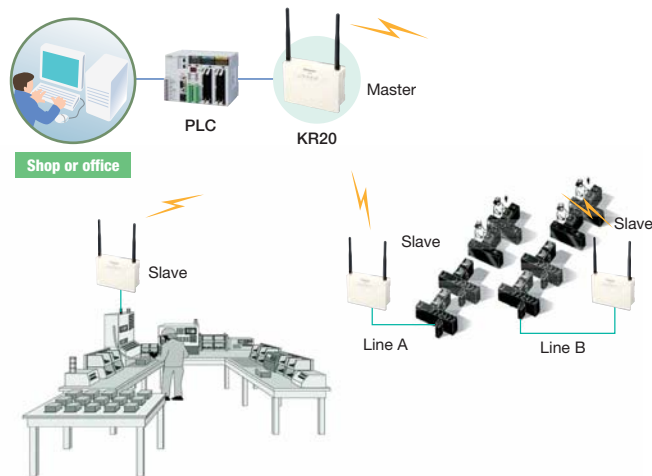
PRODUCT TYPES

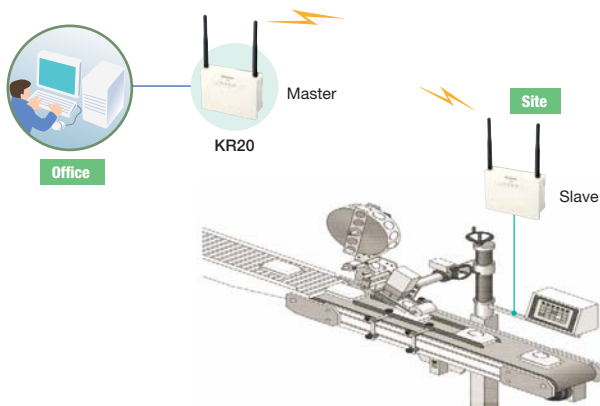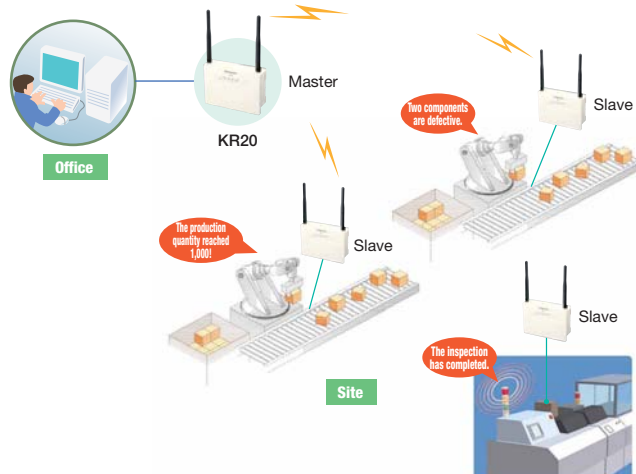| RS485 type	I/O type	Standard antenna	Antenna with cable	Antenna extension cable	Power supply cable for FPΣ
AKR2002 (RS232C, RS485)	AKR2015 (I/O=8/8 (NPN), RS232C) AKR2045 (I/O=6/6 (PNP), RS232C)	AKR2802	AKR2803	AKR2804	AFPG805

2

Plant

To monitor the component stock in the shelf

Component (1) — KR20 — **Site**
Sensor input

Component (2) — KR20
24 dia. mushroom button type
Sensor input

Component (3) — KR20
Stock-out
Sensor input

Component (4) — KR20
Stock-out
Sensor input

Component (5) | Component (6) | Component (7) | Component (8)

Out of stock
Out of stock

Sales office
KR20
RS232C

Production control office
I/O output

| (1) | (2) | (3) | (4) |
| (5) | (6) | (7) | (8) |

Indication of stockout appears

To transmit the component pickup work instructions by wireless.

Shop or office
PLC
KR20 — Master

Slave
Slave
Slave
Slave

Line A — Line B

To transfer the data such as 2D code, etc.

Office
KR20 — Master

Site
Slave

Counts the production number or inspection data at a high speed

Office
KR20 — Master

Slave
Two components are defective.

The production quantity reached 1,000!
Slave

Site

Slave
The inspection has completed.

Building **Shop**

To transmit the measured power or temperature of the machines or food storage systems or their errors by wireless.

KR20 Master (RS485 type)

Lights
Air conditioner

KR20 Slave (RS485 type)

KW4M Eco-POWER METER

KR20 Slave (Error input) (I/O type)

Supermarket

Showcases

Office
KR20 Master (I/O type)*

KR20 Slave (RS485 type)

KT4H Temperature controller
KW4M Eco-POWER METER
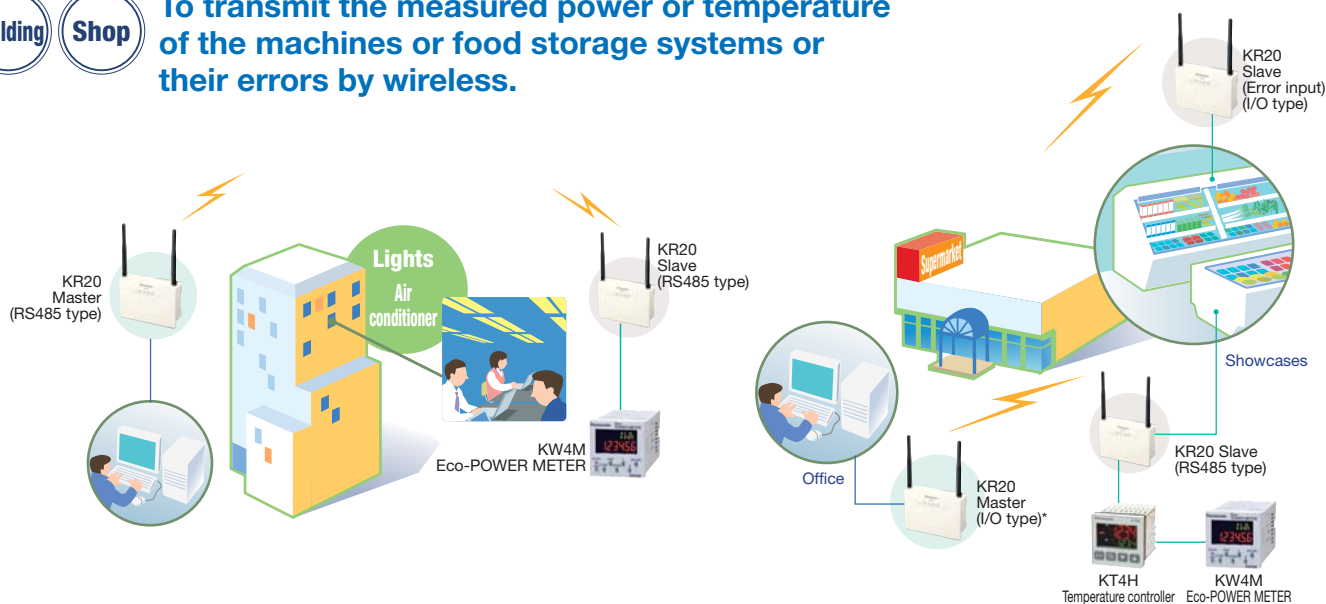
* The RS485 and I/O types can be mixed only when MEWTOCOL is used for 1: N topology.

3

03/2009

■ Product Types

1. Main unit

Model number	Product name	Remarks
AKR2002	KR20 WIRELESS UNIT RS485 type	RS232C, RS485
AKR2015	KR20 WIRELESS UNIT I/O type (NPN)	I/O: 8/8 (NPN), RS232C
AKR2045	KR20 WIRELESS UNIT I/O type (PNP)	I/O: 6/6 (PNP), RS232C

• A power supply cable (1 m) for the main unit is supplied with this product.
• Antenna is not attached. Select from optional supplies.

2. Setting software

Model number	Product name	Remarks
—	Control Configurator KR	Setting tool for KR wireless unit Downloadable from the website: http://www.mew.co.jp/ac/e/. Use the tool Ver. 1.20 or later for KR20.

3. Options

Model number	Product name	Remarks
AKR2802	Standard antenna	2 pieces
AKR2803	Antenna with cable	2 pieces, 2 m length
AKR2804	Antenna extension cable	Special order, 2 pieces, 2 m length
AFPG805	Power supply cable for FPΣ	1 piece, 1 m length

• Two antennas and two antenna extension cables are required per main unit.
• A magnet and double-sided tape are supplied with antennas with cable for fitting.
• When an antenna extension cable is used, the communication distance becomes short.

∗The user's manual is downloadable from the website: http://www.mew.co.jp/ac/e/. Customer registration is required to download the manual.

■ Specifications

1. General specifications

Item	Specifications	
	RS485 type	I/O type
Rated voltage	12 to 24V DC	
Operating voltage range	10.8 to 26.4V DC	
Current consumption	150mA or less (During sending)	200mA or less (During sending)
Inrush current	23A (when 24V DC)	
Ambient temperature	−10 to +50°C	
Storage temperature	−20 to +70°C	
Ambient humidity	30 to 85%RH (at 25°C non-condensing)	
Storage humidity	30 to 85%RH (at 25°C non-condensing)	
Breakdown voltage (initial)	500V AC for 1 min. (Between power terminal and FG/DSUB connector)	500V AC for 1 min. (Between power terminal and FG/DSUB connector, Between power terminal and input/output terminal, Between input terminal and output terminal)
Insulation resistance (initial)	100MΩ or more (at 500V DC mega) (Between power terminal and FG/DSUB connector)	100MΩ or more (at 500V DC) (Between power terminal and FG/DSUB connector, Between power terminal and input/output terminal, Between input terminal and output terminal)
Vibration resistance	10 to 55Hz 1cycle/min. Double amplitude of 0.75mm, 10min. on 3 axes	
Shock resistance	98m/s² or more, 4 times on 3 axes	
Noise immunity	1000V [p-p] with pulse width 50ns, 1 μs (based on in-house measurements) (Power terminal)	
Overcurrent protection of power supply	Fuse (Rated current: 3.15A)	
Weight	Approx. 160g	

2. Wireless specifications

Item	Specifications		
	RS485 type	I/O type	
Wave type	Direct sequence spread spectrum (DS-SS)		
Transmission distance	Approx. 250 m outdoors* (straight, obstacle-free distance), Approx. 50 m indoors		
Wave output	6mW/MHz or less		
Frequency	2403.328MHz to 2480.128MHz		
Number of channels	76ch (Select with communication channel switch)*1		
Number of channels in same transmission area	15 channels recommended (when select fixed channel)*2		
Transmission speed	134kbps		
Communication style	1: N topology (N: 99 units max.)		
Repeater function	8 repeaters (Between master and slave)		
Response time	—	OFF → ON	Max. 80ms*3
		ON → OFF	

*The main unit, standard antenna and antenna with cable are designed for indoor use.
 If they are used outdoors, then take water-proof measures such as using plastic cases, etc.

3. Serial communication specifications (RS232C) *4

Item	Specifications
Interface	Conforming to RS232C
Transmission distance	15m
Transmission speed	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bit/s (Selectable with MODE switch)
Communication method	Half-duplex
Synchronous system	Synchronous communication method
Transmission format	Stop bit: 1 bit, Parity: Not available/Available (odd/even), Data length: 7bit/8bit
Data buffer	2048 bytes (Max. data byte size for send and receive one time)

4. Serial communication specifications (RS485) (only AKR2002) *4

| Item	Specifications
Interface	Conforming to RS485
Transmission distance	1200m
Transmission speed	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 bit/s (Selectable with MODE switch)
Communication method	Half-duplex
Synchronous system	Synchronous communication method
Transmission format	Stop bit: 1 bit, Parity: Not available/Available (odd/even), Data length: 7bit/8bit
Data buffer	2048 bytes (Max. data byte size for send and receive one time)
Ending resistance	Approx. 120Ω (built-in) (Terminal "E" and terminal "–" are shorted when ending.)
Number of connected units	Max. 31

5. Input specifications (only AKR2015 and AKR2045)

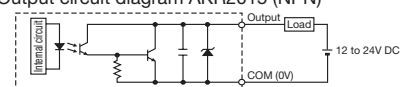| Item	Specifications	
	AKR2015 (Output NPN type)	AKR2045 (Output PNP type)
Insulation method	Optical coupler	
Rated input voltage	12 to 24 V DC (voltage input)	
Operating voltage range	10.8 to 26.4 V DC	
Rated input current	Approx. 3mA/when 12 V, Approx. 6mA/when 24 V	
Points per common*5	8 points/common (Either positive or negative of input power supply can be connected.)	6 points/common (Either positive or negative of input power supply can be connected.)
Input impedance	Approx. 4kΩ	
Operation indicator	LED display (green)	

6. Output specifications (only AKR2015 and AKR2045)

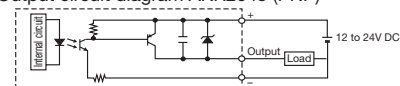| Item	Specifications	
	AKR2015 (Output NPN type)	AKR2045 (Output PNP type)
Insulation method	Optical coupler	
Output type	Open collector (NPN)	Open collector (PNP)
Rated load voltage	12 to 24 V DC	
Allowable load voltage range	10.8 to 26.4 V DC	
Max. load current	0.3A	
Max. inrush current	1.5A	
Points per common*5	9 points/common (Signal output, Communication error output)	7 point/common (Signal output, Communication error output)
Off state leakage current	1 μA or less	
On state voltage drop	1.5 V DC or less	
External power supply (+, – terminal) — Voltage	—	10.8 to 26.4V DC
External power supply (+, – terminal) — Current	—	Max. 60mA
Surge absorber	Zener diode	
Operation indicator	LED display	

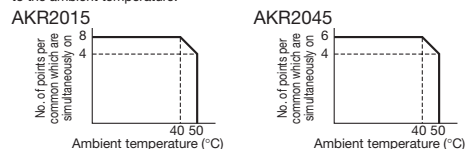Input circuit diagram
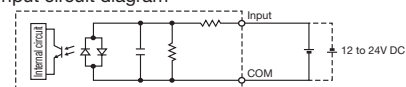
Output circuit diagram AKR2015 (NPN)

Output circuit diagram AKR2045 (PNP)

Restriction of input number and output number of simultaneously ON

Input number and output number should be in the range of the blow according to the ambient temperature.

7. Functions specifications

Item	Specifications	
	RS485 type	I/O type
Setting function	• Operating mode change (SET, RUN, TEST) • Communication channel change (CH switch) • Unit No. change (UNIT No. switch)	• Serial communication setup (MODE switch) • Slave registration • Initializing (Factory setting)
	—	• Data holding (When communication error)
Test function	Communication test: 3-stage LED display (With setting tool, it can do various communication tests such as changing data amount, including repeaters and so on. And it can measure an approximate communication time.) Field intensity monitor: 3-stage LED display (With setting tool, it can display and record a field intensity of each channel by numeric value.)	
LED display	• Distinguish master or slave (MASTER) • On communication, Power on (COM.) • On setting, Complete setting (SET)	• Error, Alarm, Caution (ALARM) • Level indication (1, 2, 3: when using test function)
	—	I/O operating display (16 or 12 points + 1 point of communication error)

*1 Adding to the fixed channel, 76ch (00 to 4B), 89 group channel can be selected.
     Group channel is the function that it selects connectable channel from several fixed channels automatically. When using repeater function, use with the fixed channel.
     When using group channel, settable channel numbers are decreased in the same communication area and the communication time becomes longer.
*2 It is different according to the mounting conditions, when several channels are used in the same communication area, communication error might occur due to interference radio wave.
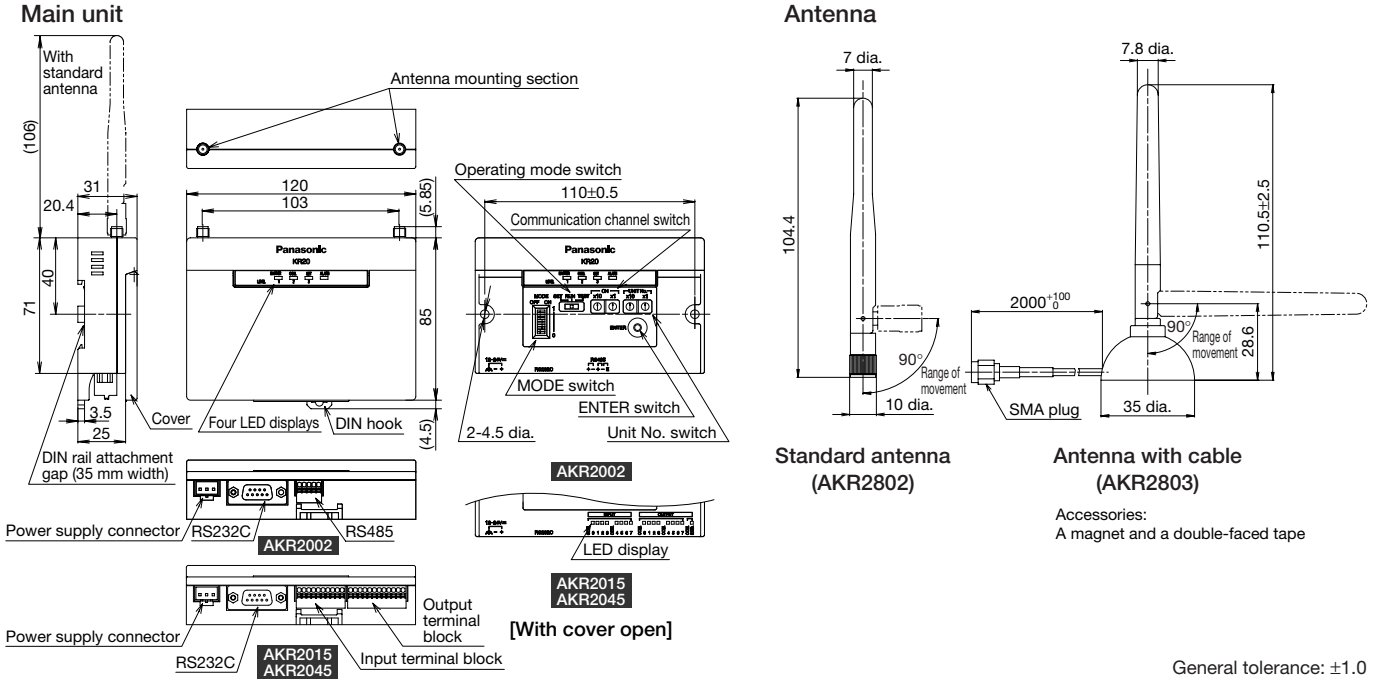*3 There are no error without serial communication at 1:1 topology.
     Response time: Time from input signal to input terminal to output from output terminal in connected equipment
     When input signal is shorter than response time, there is a possibility not to transfer to output side.
*4 RS232C and RS485 are not used in the same time.
*5 In case simultaneously ON of input and output, input number and output number are restricted according to the ambient temperature.

5

■ Part Name and Dimensions (Unit: mm)

Main unit

Antenna

Standard antenna (AKR2802)

Antenna with cable (AKR2803)

Accessories:
A magnet and a double-faced tape

General tolerance: ±1.0

■ Termainal Layouts

RS232C Connector

• Interface specifications
DSUB 9-pin termainal layouts

Pin No.	Signal name	Input/Output
1	–	–
2	RD	Output
3	SD	Input
4	–	–
5	SG	Signal GND
6	–	–
7	(RS)	(Unused)
8	(CS)	(Unused)
9	–	No connection

1, 4 and 6 are connected internally.
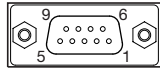
• Flow control is not supported now.
• Without flow control, use DSUB 9-pin female-female straight cable to connect to the computer. If using male-female straight cable, use attached gender changer in main unit. (when using setting tool etc.)

RS485 terminal block (only AKR2002)

Terminal block 5-pin termainal layouts

Pin No.	Signal name	Input/Output
1	+	RS485 (+)
2	–	RS485 (–)
3	+	RS485 (+)
4	–	RS485 (–)
5	E	
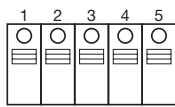
• 1 and 3, 2 and 4 are connected internally.
• Shielded twisted-pair cable (connectable range: AWG26-20, cross-section area: 0.14-0.5mm^2) is recommended. (stripped wire length is 9mm)
• When using shielded cable, the grounding connection should have a resistance of less than 100Ω, and grounded one end.
• Connect between each unit by extending wiring in the transmission line. Cannot use branch connection.
• At terminal unit, "E" terminal (No.5) should be shorted with "–" terminal (No.4). (Terminator connection)

Power supply connector

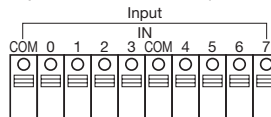Power supply connector 3-pin termainal layouts

Pin No.	Signal name	Line color
1	12-24V DC	Brown
2	GND	Blue
3	FG	Green

I/O terminal block (only AKR2015 and AKR2045)

Terminal block 10, 12-pin termainal layouts
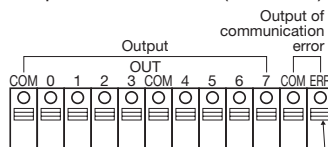
Input terminal block (AKR2015)

Input
IN
COM 0 1 2 3 COM 4 5 6 7

*The both COM of input are connected internally.

Input terminal block (AKR2045)

Input
IN
COM 0 1 2 3 COM 4 5
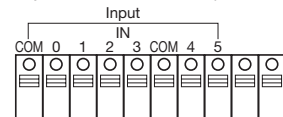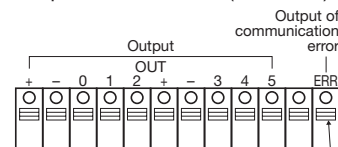
*The both COM of input are connected internally.

Output terminal block (AKR2015)

Output   Output of communication error
OUT
COM 0 1 2 3 COM 4 5 6 7 COM ERR

*The both COM of output and COM of communication error are connected internally.

Orange color button

Output terminal block (AKR2045)

Output   Output of communication error
OUT
+ – 0 1 2 + – 3 4 5 ERR

*The both + are connected internally. The both – are connected internally.

Orange color button

• Shielded cable (connectable range: AWG26-20,cross-section area: 0.14-0.5mm^2) is recommended. Select the diameter that there is margin in the current capacity. (stripped wire length is 9mm)
• When using shielded cable, the grounding connection should have a resistance of less than 100Ω, and grounded one end.
• Connect the wire with pushing the orange color button.

■ KR20 WIRELESS UNIT Utilities
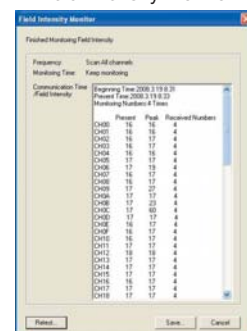
● Settings tool

Routing function
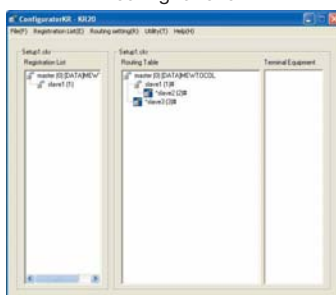
Communication test function

Field intensity monitor

■ Caution for use

1) When mounting, (wiring, adjustment etc.), be careful not to add static electricity to connector, switch and antenna.
2) Do not squeeze the switches or push buttons with an excessive force. Otherwise, they may be damaged.

■ Mounting

1) Do not place the units in the vicinity of radios or TVs. Otherwise, the reception may be impaired.
2) If nearby broadcasting or wireless stations emit radio waves with a high field intensity, then this wireless system may not be used.
3) This system uses frequencies on 2.4 GHz band for data communication. If there are other devices using the same frequency band in its vicinity, then the communication may be impaired due to interference.
4) In order to make the wireless performance better, pay attention to the below items.
   - Mount the unit as high as possible.
   - Connect 2 of the antenna and the mounting direction is vertical for the ground.
   - Antenna should be keep away from metal board. If antennas are mounted inside the control board, the wireless performance will decrease.
   - Keep away from the place or line that noise might occur.
   - Mount in the place where electric wave condition is good refer to field intensity monitor.
   - When using several channels in the same communication area, check if there is no influence each other.
5) When mounting the unit to DIN rail, hook the upper part and push DIN hook. When removing it, pull out with minus driver until locking DIN hook. And fastening plate (ATA4806) is recommended to prevent from moving.

## ■ Restrictions

● Wired communication restrictions

Separation of data sent on wire

The wireless unit detects the end of data sent on wire not by control codes such as "CR", etc., but by the idle time. Initially, if there is an idle time equivalent to 10 characters, then it will be deemed the end of data and the wireless unit will start communicating. Therefore, if consecutive data includes an idle time equivalent to 10 characters or more, then the data will be separated. However, if the idle time between two successive items of data is equivalent to 10 characters or less, then they will be deemed to be partial data and will not be sent correctly.
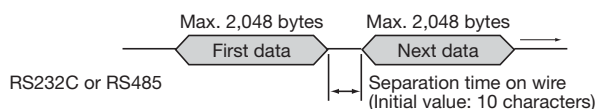
Direction of communication between the master and slave
(1:1 topology with repeaters or 1:N topology)

Command and response is assumed in the communication procedure. Set the master to a command sender and the slave to a response sender. Otherwise, the communication is impossible. If both units are set to command senders, then communication will not be possible.
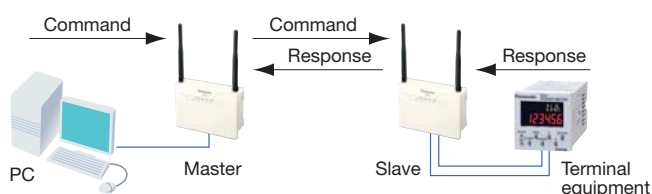

Command and response sequence

If commands are sent in succession, then define a sequence, in which a command is sent after the response to the previous command is returned. If a time-out is defined, then the time required for wireless communication must be taken into consideration. The time required for wireless communication may be extended depending on the communication environment. If the interval between two commands is fixed, then a command and a response may collide with each other.

● Input signal time

During 1:1 topology or 1:1 topology with repeaters for the I/O type , the input or output signals are not always monitored. They are monitored only immediately before wireless transmission and when their information is transmitted. In this case, if the input signal duration is shorter than the polling time*1, then it may not be transmitted to the output terminal. Therefore, in order to ensure that the input signal is transmitted, it must be held for the polling time or more.
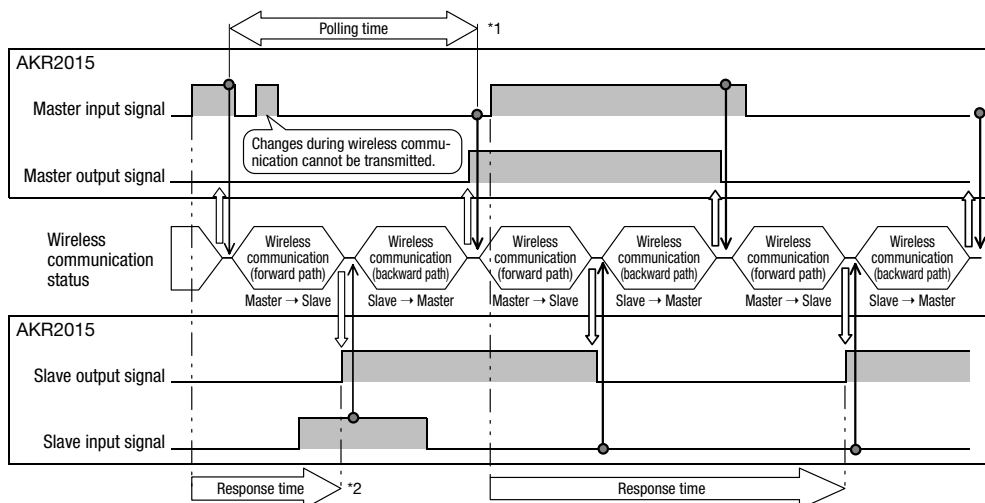
*1 The polling time refers to a cycle for the master to continuously transmit (polling) data to a slave.
*2 The response time refers to the time required for the signal inputted to the input terminal to be outputted from the output terminal of the partner unit.

● Protocol for 1:N topology

Communication protocol	RS485 type	I/O type	Restrictions	Remark
MEWTOCOL (MEW)	○	○	• The volume of data to be simultaneously transmitted must not exceed 2,048 bytes. • The time-out must be able to be extended.	*1
MODBUS ASCII	○	–		
MODBUS RTU	○	–		
GT Series Original	○	–		Screens cannot be transferred.
Message Runner Original	○	–		Screens cannot be transferred.

*1 Operations using the PLC software are not supported.
*2 Use with 1:1 topology or 1:1 topology with repeaters for other protocols.

KR20 WIRELESS UNIT (AKR2)

■ To prevent from interference with the other wireless station (Japan only)

In the frequency band using this unit, in-plant radio station (license is necessary.) using at industrial such as microwave oven, science, medical machinery and a production line in factory to identify mobile object, specified low power radio station (license is not necessary.) and amateur radio station (license is necessary.) are managed

1) Before using this unit, please confirm that in-plant radio station to identify mobile object, specified low power radio station and amateur radio station are not managed.

2) When some cases of harmful electric wave interference occurred from this unit to an in-plant radio station to identify mobile object, change the using frequency immediately or stop discharging the electric wave. After that please contact us to consult measures to avoid interference (for example, setting of partition).

3) When any other troubles such as harmful electric wave interference occurred from this unit to a specified low power radio station or an amateur radio station or an amateur radio station, please contact us.

■ Actual indication

```
 (1)  (2)  (3)
┌──────────────┐
│ 2.4  DS   4  │ (4)
│ ▄▄   ▄▄   ▄▄ │
└──────────────┘
```

(1) 2.4: 2.4GHz band electric wave is used.
(2) DS: Modulation method is direct sequence type.
(3) 4: Intended interference distance is 40m.
(4) Bar: All bands are used and possible to avoid the band of machine to identify mobile object.

*Please put the attached label "Caution for using wireless unit" near the setting place.

■ Countries where the use of KR20 has been authorized

Products with the CE① indication label affixed to their rear side
As of May 2008, the use of KR20 has been authorized in the following countries.

Japan, China, 25 European countries (Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France*, Germany, Greece, Hungary, Iceland, Ireland, Italy, Lithuania, Malta, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, UK, Netherlands)

* In France, this product must not be used outdoors. Please use it indoors only.

■ Compliance for EN standard

Obtained the European wireless certification (EN300 328)
In order to comply with EN standard, use this product in following condition.
• When installing this product to wall, install it on a DIN rail.
• Use power supply cord that is less than 3m.
• For communication cable (RS232C or RS485), use shielded cable, and connect one end of shield wire to ground. And use ferrite core (correspond to TDK: ZCAT2035-0930) in the communication cable (RS232C or RS485) of wireless unit side. (Turn numbers: 2T)

Please contact ....

Panasonic®

ARCT1B301E 200805-3YT   Specifications are subject to change without notice.   Printed in Japan.