

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

KR20 WIRELESS UNIT



FEATURES

- **High-speed data communications (134kbps wireless)**

Approximately 15 to 20 times faster compared to low power wireless communication devices (comparison by our company) achieved and use for purposes requiring high speed response possible.

Examples: All measuring devices (control panel, security alarm, temperature monitor, electricity monitor, production quantity monitor, etc.), 0.1 seconds or less for sending and receiving data with several dozens of bytes (approximately 1.5 seconds for the previous product)

- **Reducing the wiring and installation work**

Wiring is unnecessary when the layouts for machines and equipment frequently change and in installation in locations where wiring is difficult

Installation of the main unit on the board and DIN rail attachment possible

- **Common units for master and slave**
- **Easy-to-operate main unit and setting tool software**

- **Wireless repeater function**

The communication distance of wireless devices (between the master and a remote) is approximately 250 m outdoors in an open location (approximately 50 m indoors). Since the repeater function is also incorporated in this unit, the communication distance can be extended by adding products for use as repeaters between the master and remote. (Up to 8 units can be installed between the master and remote.)

- **Up to 99 wireless remote units can be connected for one master wireless device**

Co-existence of RS485 and I/O type is also possible. However, only when using 1:N communication and MEWTOCOL (communication protocol for our company's PLC).

Compliance with RoHS Directive

PRODUCT TYPES

■ Main unit

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

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

■ Options

| Product name | Descriptions | Model number |
|-----------------------------|---|--------------|
| Standard antenna | 2 pieces | AKR2802 |
| Antenna with cable | 2 pieces, 2 m length | AKR2803 |
| Antenna extension cable | Special order, 2 pieces, 2 m length | AKR2804 |
| Power supply cable for FPΣ* | 1 piece, 1 m length | AFP805 |
| Power supply unit for FP0 | Input: 100 to 240V AC, Output: 24V DC, 0.7A | AFP0634 |

Notes: 1. Two antennas and two antenna extension cables are required per main unit.
2. A magnet and double-sided tape are supplied with antennas with cable for fitting
3. When an antenna extension cable is used, the communication distance becomes short.
*Included with product

■ Setting software

| Product name | Descriptions | Remarks |
|-------------------------|-------------------------------------|--|
| Control Configurator KR | Setting tool for KR20 wireless unit | You can download from our website (free of charge)* Use the tool Ver. 1.20 or later for KR20. |

■ Manual

| Product name | Descriptions | Remarks |
|----------------------------------|--|---|
| KR20 WIRELESS UNIT User's manual | Detailed explanation of KR20 WIRELESS UNIT usage (pdf) | You can download from our website (free of charge)* |

* Customer registration is required to download data.

KR20 WIRELESS UNIT (AKR2)

SPECIFICATIONS

■ 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) (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/s ² 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 | |

■ 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 ON → OFF Max. 80ms*3 |

Note: 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.

■ 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) |

■ 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 |

KR20 WIRELESS UNIT (AKR2)

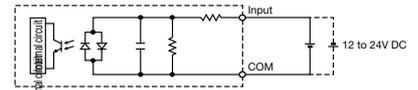
Input specifications (only AKR2015 and AKR2045)

| 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) | |

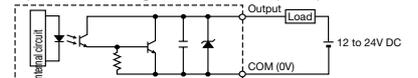
Output specifications (only AKR2015 and AKR2045)

| 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 |
| | Current | Max. 60mA |
| Surge absorber | Zener diode | |
| Operation indicator | LED display (green) | |

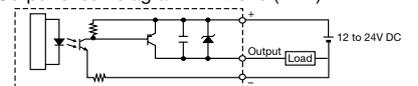
Input circuit diagram



Output circuit diagram AKR2015 (NPN)



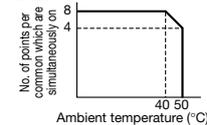
Output circuit diagram AKR2045 (PNP)



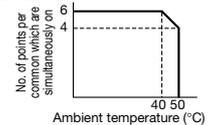
Restriction of input number and output number of simultaneously ON

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

AKR2015



AKR2045



Functions specifications

| Item | Specifications | |
|------------------|--|--|
| | RS485 type | I/O type |
| Setting function | <ul style="list-style-type: none"> Operating mode change (SET, RUN, TEST) Communication channel change (CH switch) Unit No. change (UNIT No. switch) | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> Distinguish master or slave (MASTER) On communication, Power on (COM.) On setting, Complete setting (SET) | <ul style="list-style-type: none"> 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) |

Notes: *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.

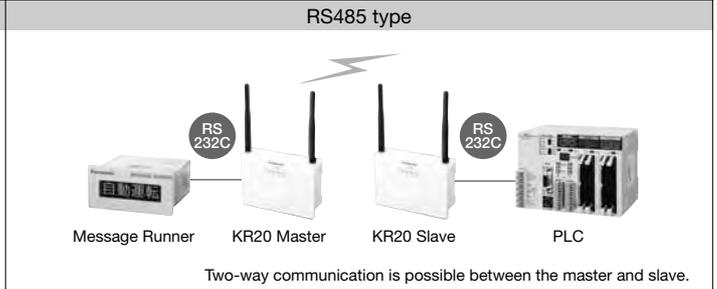
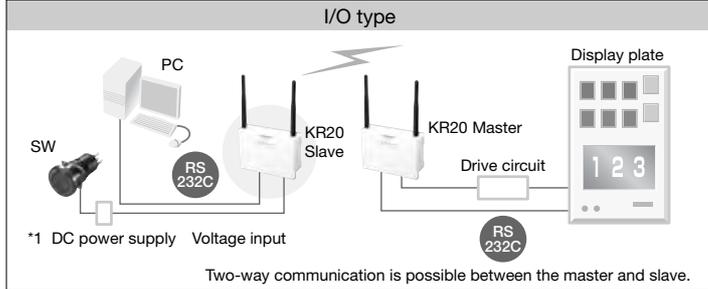
*5. In case simultaneously ON of input and output, input number and output number are restricted according to the ambient temperature.

KR20 WIRELESS UNIT (AKR2)

SYSTEM CONFIGURATIONS

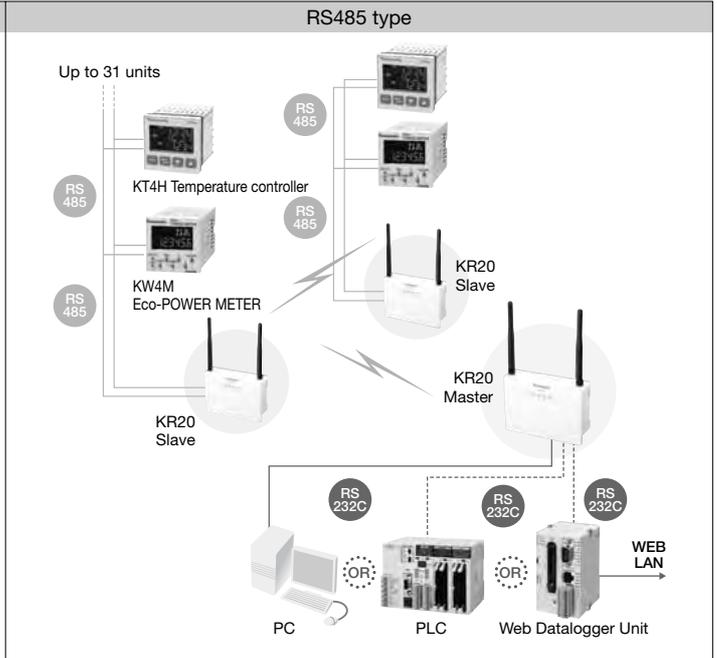
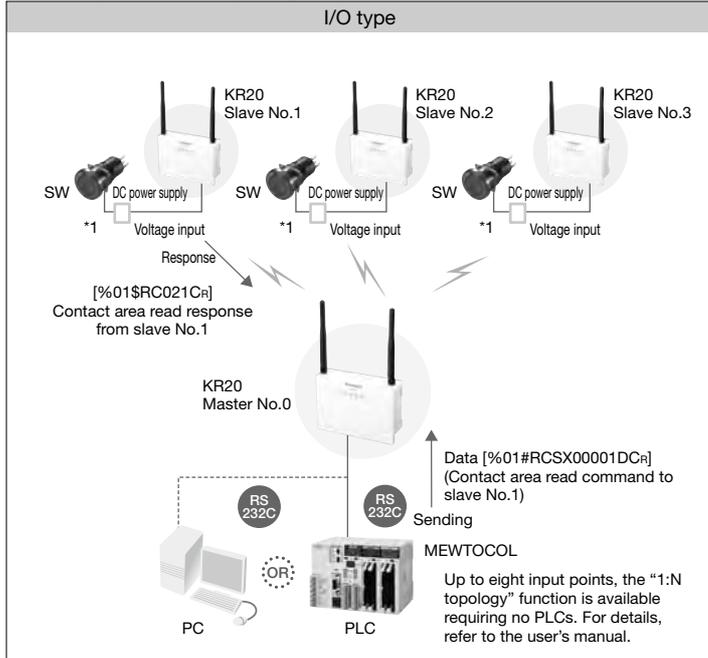
● Example of 1:1 topology

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



*1 For switch inputting, a separate DC power supply is necessary for inputting.

● Example of 1:N topology

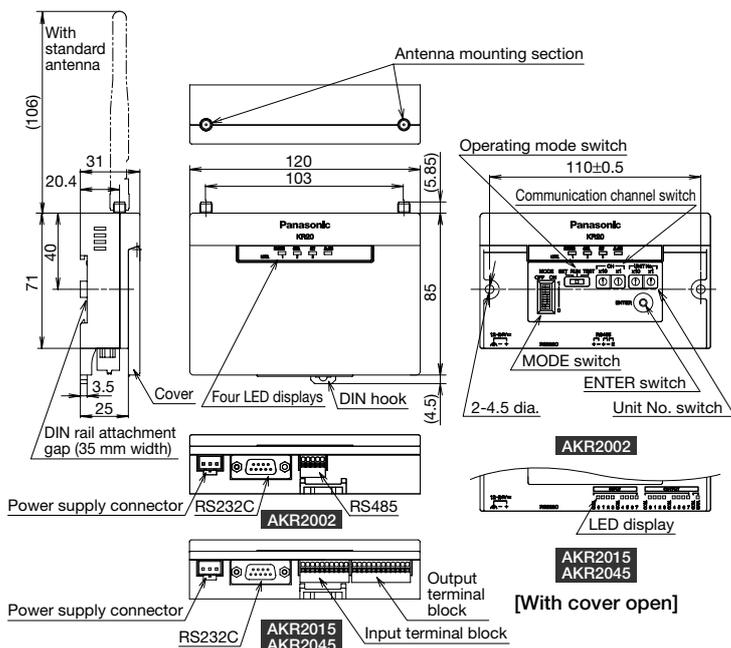


*1 For switch inputting, a separate DC power supply is necessary for inputting.

*2 Contact us for equipments that can be connected to the master and slave.

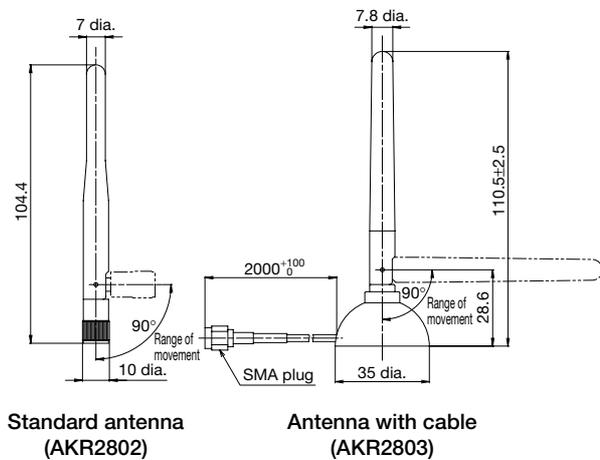
PARTS NAMES AND DIMENSIONS (mm)

■ Main unit **CAD Data**



■ Antenna **CAD Data**

General tolerance: ± 1.0



Standard antenna (AKR2802)

Antenna with cable (AKR2803)

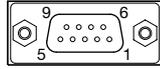
Accessories:
A magnet and a double-faced tape

TERMINAL ARRANGEMENT

RS232C Connector

- Interface specifications
- DSUB 9-pin terminal layouts

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



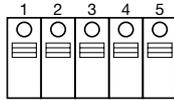
1, 4 and 6 are connected internally.

- 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 terminal 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 to 20, cross-section area: 0.14 to 0.5mm²) 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 terminal layouts

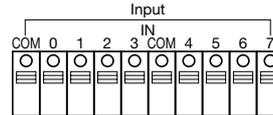
| Pin No. | Signal name | Line color |
|---------|-------------|------------|
| 1 | 12-24V DC | Brown |
| 2 | GND | Blue |
| 3 | FG | Green |



I/O terminal block (only AKR2015 and AKR2045)

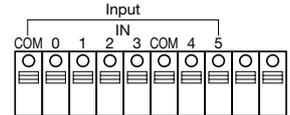
Terminal block 10, 12-pin terminal layouts

Input terminal block (AKR2015)



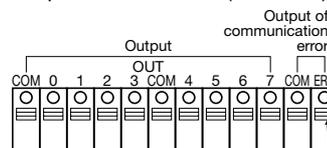
*The both COM of input are connected internally.

Input terminal block (AKR2045)



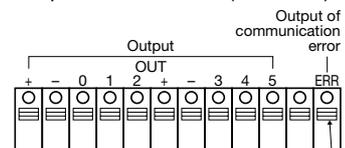
*The both COM of input are connected internally.

Output terminal block (AKR2015)



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

Output terminal block (AKR2045)



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

- Shielded cable (connectable range: AWG26 to 20, cross-section area: 0.14 to 0.5mm²) 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.

MOUNTING

- Do not place the units in the vicinity of radios or TVs. Otherwise, the reception may be impaired.
- If nearby broadcasting or wireless stations emit radio waves with a high field intensity, then this wireless system may not be used.
- 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.
- 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.
- 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.

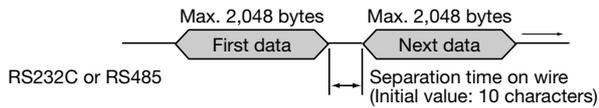
KR20 WIRELESS UNIT (AKR2)

RESTRICTIONS

• Wired communication restrictions

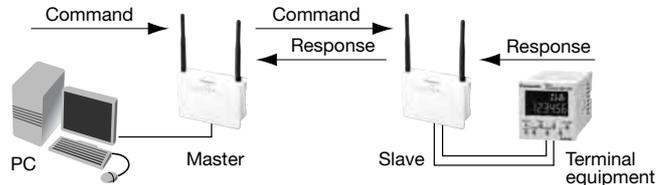
Separation of data sent on wire

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.

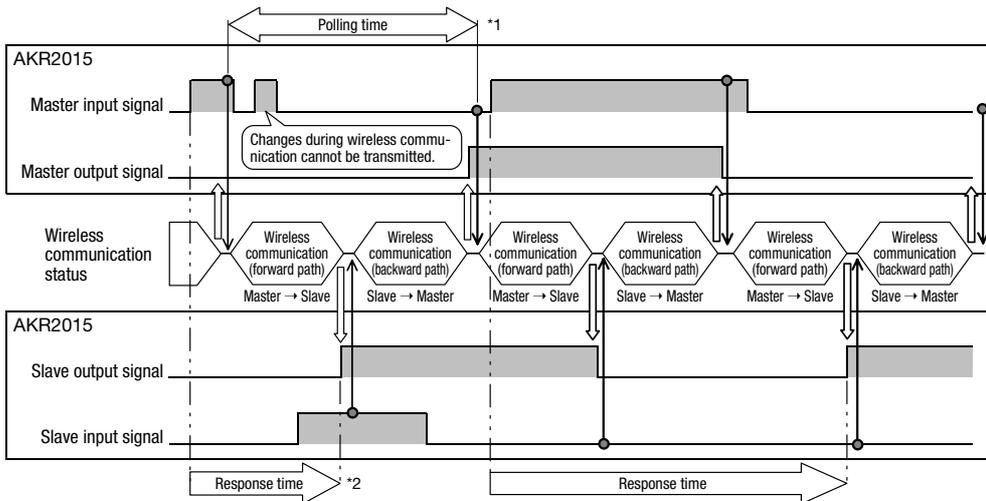


Command and response sequence

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) | Yes | Yes | <ul style="list-style-type: none"> 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 | Yes | - | | |
| MODBUS RTU | Yes | - | | |
| GT Series Original | Yes | - | | Screens cannot be transferred. |
| Message Runner Original | Yes | - | | Screens cannot be transferred. |

*1 Operations using the PLC software are not supported.

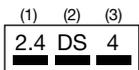
*2 Use with 1:1 topology or 1:1 topology with repeaters for other protocols.

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) 2.4: 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.

CAUTION CONCERNING RADIO LAW

Do not dismantle or remodel the product.

COUNTRIES WHERE THE USE OF KR20 HAS BEEN AUTHORIZED

The use of KR20 has been authorized in the following countries.

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

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

* Products with the    indication label affixed to their rear side

COMPLIANCE FOR EN STANDARD

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)