

# **MELSEC A/Q Series**

Programmable Logic Controllers

User's Manual

## **AJ71QC24N-U-H/W-E**

# ● SAFETY PRECAUTIONS ●

(Read these precautions before using.)

When using Mitsubishi equipment, thoroughly read this manual and the associated manuals introduced in the manual. Also pay careful attention to safety and handle the module properly.

These precautions apply only to Mitsubishi equipment. Refer to the CPU module user's manual for a description of the PLC system safety precautions.

These ● SAFETY PRECAUTIONS ● classify the safety precautions into two categories: "DANGER" and "CAUTION"



Procedures which may lead to a dangerous condition and cause death or serious injury if not carried out properly.



Procedures which may lead to a dangerous condition and cause superficial to medium injury, or physical damage only, if not carried out properly.

Depending on circumstances, procedures indicated by  CAUTION may also be linked to serious results.

In any case, it is important to follow the directions for usage.

Store this manual in a safe place so that you can take it out and read it whenever necessary. Always forward it to the end user.

## [DESIGN PRECAUTIONS]

### DANGER

- When the notification function is used, a situation may arise in which the pager receiver, cellular phone or PHS cannot be paged due to the radio wave transmission conditions associated with the system installation environment, or an error on the receiver side. For the security of the PLC system, provide a separate paging circuit using a lamp indicator or buzzer sound.

## [DESIGN PRECAUTIONS]

### DANGER

- When performing the control of the PLC in operation (especially changing data, program and operation status (status control)) by connecting a personal computer, etc. to the special function module, configure an interlock circuit in a sequence program so the safety of the overall system is always maintained.

Especially, when this control is performed to a remote PLC from an external device, troubles that have occurred on the PLC side may not be able to immediately be handled if there is a data communication error. Define a troubleshooting agreement between external devices and the PLC CPU for data communication error occurrences, as well as construct an interlock circuit in the sequence program.

### CAUTION

- Do not bunch the control wires or communication cables with the main circuit or power wires, or install them close to each other. They should be installed 100 mm (3.9 inch) or more from each other. Not doing so could result in noise that would cause malfunction.

## [INSTALLATION PRECAUTIONS]

### CAUTION

- Use the PLC in an environment that meets the general specifications contained in this manual.  
Using this PLC in an environment outside the range of the general specifications could result in electric shock, fire, malfunction, and damage to or deterioration of the product.
- Switch all phases of the external power supply off when installing or placing wiring. Not doing so could result in electric shock or damage to the product.
- Insert the tabs at the bottom of the module into the mounting holes in the base module.  
If the module is not properly installed it may result in malfunction, failure or fallout.
- Tighten the screw within the range of specified torque.  
If the screw are loose, it may result in fallout, short circuit or malfunction.  
Tightening the screws too far may cause damage to the screw and /or the module, resulting in fallout, short circuit or malfunction.
- Do not directly touch the module's conductive parts or electronic components. Doing so could cause malfunction or failure in the module.
- Perform correct pressure-displacement, crimp-contact or soldering for wire connections using the tools specified by the manufactures.  
Attach connectors to the module securely.

## [WIRING PRECAUTIONS]

### CAUTION

- Be sure to fix communication cables leading from the module by placing them in the duct or clamping them. Cables not placed in the duct or without clamping may hang or shift, allowing them to be accidentally pulled, which may result in a module malfunction and cable damage.
- Before connecting the cables, check the type of interface to be connected.  
Connection, or erroneous wiring to the wrong interface may damage the module and external device.

## [WIRING PRECAUTIONS]

### CAUTION

- When connecting an external device to AJ71QC24N-R4 RS-422 interface of this module, do not connect a device that must receive power from AJ71Q24N-R4.  
The module or external device may be damaged.
- Tighten the terminal screw within the range of specified torque.  
If the screws are loose it may result in short circuit or malfunction.  
Tightening the screws too far may cause damage to the screw and/or the module, resulting in fallout, short circuit or malfunction.
- When detaching the communication cable from the module, do not pull the cable portion. For cables with connectors, hold the connector at the junction to the module, then detach it. For cable without connectors, first loosen the screw at the junction, then detach the cable.  
Pulling the cable portion while it is connected to the module may cause a malfunction or damage to the module and cable.
- Be sure there are no foreign substances such as sawdust or wiring debris inside the module.  
Such debris could cause fire, damage or malfunction.

## [STARTING AND MAINTENANCE PRECAUTION]

### DANGER

- Do not touch the terminals while the power is on.  
Doing so may cause malfunction.
- Switch all phases of the external power supply off before cleaning or retightening screws. If you do not switch off the external power supply, it will cause failure or malfunction of the module.  
If the screws are loose, it may result in fallout, short circuits, or wiring debris inside the module. Such debris could cause fires, damage, or erroneous operation.

### CAUTION

- Do not disassemble or modify the modules.  
Doing so could cause failure, malfunction, injury or fire.
- Switch all phases of the external power supply off before mounting or removing the module. If you do not switch off the external power supply, it will cause failure or malfunction of the module.

## [OPERATION PRECAUTIONS]

### DANGER

- Do not write data into the "system-area" of the buffer memory of special function modules. Also, do not output the "prohibited to use" signal as the output signal to a special function module from the PLC CPU. Writing data into the "system area" or outputting a signal for "prohibited to use" may cause system malfunction in the PLC.

### CAUTION

- Before performing the control of the PLC in operation (especially changing data, program and operation status (status control)) by connecting a personal computer, etc. to the special function module, read user's manual carefully and confirm if the overall safety is maintained.  
Failure to perform correct operations to change data, program or the status may result in system malfunction, machine damage or an accident.
- When using the module while values, such as buffer memory set values, are registered in the EEPROM, do not turn off the power supply for the module loading station nor reset the PLC CPU.  
If the power supply for the module loading station is turned off or the PLC CPU is reset while any values are registered, the data contents in the EEPROM become inconsistent and as a result the value must be set again in the buffer memory, etc. and registered to the EEPROM. Also, this may cause failure and malfunction of the module.

## [DISPOSAL PRECAUTIONS]

### CAUTION

- When disposing the product, treat it as industrial waste.

## About This Manual

The following product manuals are available. Please use this table as a reference to request the appropriate manual as necessary.

### Related Manual

Manual Names	Manual No. (Model Code)
Serial Communication Module Guide Book	IB-66622 (13JF11)
Serial Communications Module User's Manual	IB-66612 (-C or later) (13J825)
Serial Communications Module User's Manual Additional Explanation for AJ71QC24N (-R2, R4) type Serial Communications Module (For the manual earlier than IB-66612-B)	SH-3630 (-B or later) (13JL13)
Computer Link Module Guide Book	SH3510 (13JE78)
Computer Link Module (Com. link func./ Prnt. func.) User's Manual	SH-3511 (13JE77)

When using this module, be sure to read Serial Communication Module User's Manual

### Correspondence to EMC DIRECTIVE

To make the PLCs compliant with the EMC directive, refer to Chapter 2 "EMC AND LOW-VOLTAGE DIRECTIVE" in the PLC user's manual (Hardware).

- When the PLC CPU user's manual (Hardware) does not include Chapter 2 "EMC AND LOW-VOLTAGE DIRECTIVE", refer to QnA Senes CPU Compatible High-Speed Access Basic Base Unit -- Additional Explanation for Product Conforming to EMC Standards (IB-68837) (optional).

# 1. Overview

This manual is to perform installation and wiring to the external device for the following serial communication modules.

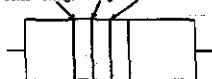
After unpacking the module, check that the following products are included:

Model	Product Name	Qty.
AJ71QC24N	AJ71QC24N serial communications module	1
	RS-422 communication terminal resistor 330Ω 1/4W (orange/orange/brown/□)	2
	RS-485 communication terminal resistor 110Ω 1/2W (brown/brown/brown/□)	2
AJ71QC24N-R2	AJ71QC24N-R2 serial communication module	1
AJ71QC24N-R4	AJ71QC24N-R4 serial communication module	1
	RS-422 communication terminal resistor 330Ω 1/4W (orange/orange/brown/□)	2
	RS-485 communication terminal resistor 110Ω 1/2W (brown/brown/brown/□)	2

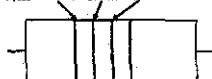
\* Unless there is a need to identify each device, all of the modules are referred to as "QC24N"

\* Differentiate the terminal resistor as follows:

330Ω Orange Orange Brown



110Ω Brown Brown Brown



## Point

Using the QC24N RS-232C interface (1 channel only), the communication via public line, etc., is possible using the modem function which communicate with the external device. And the date manufacture of the QC24N is as follows.

	AJ71QC24N	AJ71QC24N-R2	AJ71QC24N-R4
Modem function	(Products 9804 or later)*		(Unusable)

Manufacture date  Function version

\* The products with 9804  or later printed on the package display and the date column on rated plate of the module are the products with the modem function added.

(The function versions are written on only the products B version or later)



## 2. Transmission Specifications

The transmission specifications of the QC24N is given below.  
Refer to CPU module User's Manual to be used for QC24N general specification.

### 2.1 When the modem function is not used

The table below lists the transmission specification when the QC24N modem function is not used

Item		Specifications			
		AJ71QC24N	AJ71QC24N-R2	AJ71QC24N-R4	
Interface	CH1	RS-232C	RS-232C	RS-422	
	CH2	RS-422/485	RS-232C	RS-422/485	
Communications method		Full-duplex/Half-duplex (Only RS-232C interface is selectable.)			
Synchronous system		Start-stop synchronous system			
Transmission speed (unit: bps)		38400, 19200, 9600, 4800, 2400, 1200, 600, 300, 115200, 57600, 28800, 14400, (selectable when the total of CH1 and CH2 is within 115200 bps.)			
Data format	Start bit	1			
	Data bit	7/8			
	Parity bit	1 (yes) / 0 (no)			
	Stop bit	1/2			
Error detection	Parity check	Yes (odd / even) / No			
	Sum check code	Yes / No			
Transmission control	DTR/DSR	Yes (Only RS-232C interface is selectable.) / No			
	DC code	Yes (DC1 / DC3, DC2 / DC4) / No			
Writing to EEPROM		100,000 times for the same area (Max.)			
L i n e  c o n n e c t i o n	Independent mode	Dedicated protocol	RS-232C..... 1: 1 RS-422 ..... 1: 1		
		Non-procedure protocol	RS-422/485.... 1: 1, 1: n, m: n Only 1: 1 can be used for the bi-directional protocol. m:n can only be used for a dedicated protocol.		
		Bidirectional protocol			
	Interlock mode	Dedicated protocol	1:n, m:n		AJ71QC24N-R2 is disabled to communicate.
		Non-procedure protocol	1:n		
		Bidirectional protocol	Data communication disabled		
Transmission distance		RS-232C ..... 15m (49.2ft.) or less RS-422 ..... 1200m (3946.0ft.) or less (Within 30m (98.4ft.) when GPP is connected.) RS-422/485.. 1200m (3946.0ft.) or less			

Item	Specifications		
	AJ71QC24N	AJ71QC24N-R2	AJ71QC24N-R4
Power consumption (5 VDC)	0.4A	0.3A	0.6A
Number of I/O points	32 points (*1)		
Weight: kg (lb)	0.385 (0.85)	0.37 (0.82)	0.385 (0.85)

\*1 Set special 32 points when allocating I/O by GPP function. Set "AJ71QC24" as a model name registration when using dedicated command.

## 2.2 When the modem function is used

The table below lists the transmission specification between QC24N and modem/terminal adapter on the QC24N side (abbreviated as TA from here on) when the QC24N modem function is used.

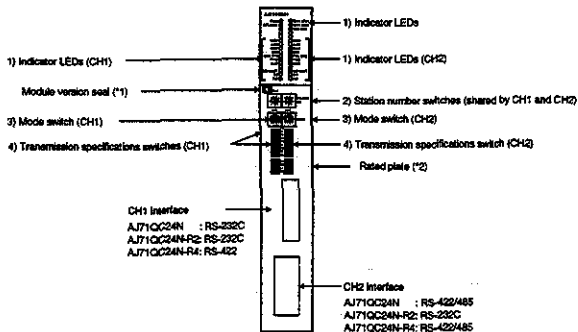
The transmission specification items not shown in the table shall be the same as those listed in Section 2.1

Item	Specifications		
	AJ71QC24N	AJ71QC24N-R2	AJ71QC24N-R4
Applicability of modem function	Usable		Unusable
Interface that can be used modem function	RS-232C	RS-232C (*1)	—
Interlock mode between CH1 and CH2 for QC24N	Unusable		
Communications system	Full-duplex		
Synchronous system	Start-stop synchronous system		
Transmission speed (unit: bps)	38400, 19200, 9600, 4800, 2400, 1200, 115200, 57600, 28800, 14400, (Selectable when the total of CH1 and CH2 must be within 115200 BPS)		
Transmission control	RS/CS control Yes/No (Selection)		
Applicability of data communication	Dedicated protocol	Communication enabled	
	Non-procedure protocol	Communication enabled	
	Bidirectional protocol	Communication enabled	
	Communication with link dedicated instruction	Communication disabled	
Line connection (QC24N: Modem)	1:1		

\*1 Communication by the modem function is possible using either of the two RS-232C interfaces. However, communication with the peripheral devices for GPPQ is possible only on the CH1 side.

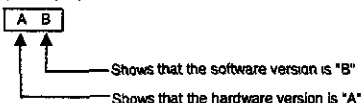
### 3. Name of Each Part and Setting

Name of each part and setting switches in the QC24N are described.



- \*1 Seal showing the module hardware version and software version.

(Example)

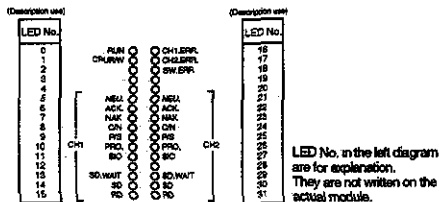


- \*2 The DATE column in the rated plate shows the manufacture date and function versions of the module.

(Example)

9804  ← Function version. (written only on the products B version or later)  
 ↑  
 Manufacture date. (in case of April 1998 in western calendar)

- (1) LED display  
 QC24N LED display shows the data communication status,  
 operation status and error occurrence status for QC24N



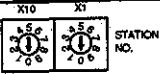
LED No.	CH 1	CH 2	LED Name	Meaning of LED Display	LED ON (ON/BLINK)	LED OFF (OFF)	Initial Status of LED	Related Protocol		
								Defi-cated	Non-Proc-ess	Blind-ness
0			RUN	Normal Operation	Normal	Abnormal	ON			○
1			CPU R/W	Communicating with PLC	Blinks during PLC communications (when not communicating is OFF)		OFF			
2 to 4	19 to 20		—	(Not used during data communications.)	—	—	OFF			—
5		21	NEU	CH1 neutral status	Transmission sequence initial status (Waiting to receive command messages)	Command message receive completed	"1	○		—
6		22	ACK	CH1 [Normal End] transmission	After [Normal end] transmitted	After [Abnormal end] transmitted	OFF			
7		23	NAK	CH1 [Abnormal End] transmission	After [Abnormal end] transmitted	After [Normal end] transmitted	OFF			
8		24	C/N	CH1 and PLC CPU communications result	See "2	Normal	OFF			
9		25	P/S	CH1 parity/sum check error	Parity/sum check error	Normal	OFF			○
10		26	PRO	CH1 protocol error	Communications protocol error	Normal	OFF	○		—
11		27	SIO	CH1 SIO error	Overrun, framing error When receive data purged because OS area is full.	Normal	OFF			○
12		28	—	(Unavailable)	—	—	OFF			—
13		29	SD.WAIT	Send wait status	When data send wait state generated	After start of transmission	OFF			○
14		30	SD	CH1 send status	Blinks during data transmission	Not sent	OFF			
15		31	RD	CH1 receive status	Blinks during data reception	Not received	OFF			
16		—	CH1 ERR	CH1 error occurrence	Switch setting error, mode switching error, send error, receive error, on-demand error	Normal	OFF			
—		17	CH2 ERR	CH2 error occurrence	Switch setting error	Normal	OFF			
18		—	SW.ERR	Switch setting error	Switch setting error	Normal	OFF			

- \*1 The NEU. LED (LED No. 5, 21) come on when the objective interface is set to a dedicated protocol. When the objective interface is set to a protocol other than a dedicated protocol, these LEDs go off.
- \*2 The C/N LED (LED No. 8, 24) come on in the following cases:
- When incorrect communication requests was received from the external device.
    - \* When an external device issued a data write request to the PLC CPU when transmission specifications switch "SW07" is set to off (write during RUN disable).
  - When access between the QC24N and PLC CPU generated an error.

<b>Point</b>
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
- |  |
|--|
| <p>(1) When there is an error in the QC24N switch setting, the "SW ERR." LED turns on, and the "CH1 ERR."/"CH2 ERR." LED on the corresponding interface side of the error turns on. When the "SW ERR." LED is on, review the switch settings on the interface side where the setting error occurred.</p> <p>(2) When the "SW ERR." LED is on, the data communication cannot be performed between the QC24N and external device. (Both interfaces of the QC24N are disabled.)</p> |
|--|

- (2) Station number switch setting  
Set station numbers for the external device to specify the PLC to access during dedicated protocols data communications.

Station Switch Details	Description
	<ol style="list-style-type: none"> <li>Station number is set from 0 to 31. (Do not set a station number over 32.)</li> <li>X10 sets the station number 10 digit.</li> <li>X1 sets the station number 1 digit.</li> <li>Make sure that the station number setting does not overlap with another QC24N, etc., on the same network.</li> <li>Not necessary to set the station numbers in connect order. Station numbers can also be skipped.</li> </ol>

(The factory setting is [00].)

- (3) Mode switch setting  
Set the data communications function of each interface.

Mode Switch Details	Mode Switch No.	Setting Contents	
	0	When CH1 and CH2 operation is linked: 0 is set to CH1 and 1 to 6 are set to CH2. When CH1 and CH2 operate independently: Setting impossible.	
	1	Dedicated protocol	ASCII mode
	2		Format 1
	3		Format 2
	4		Format 3
	5		Format 4
	6	Binary mode	Format 5
	6	Non procedure protocol	
	7	Bidirectional protocol	
	8 to D	Setting impossible	
E	ROM/RAM/switch test		
F	Individual station loopback test		

(Factory setting: "1")

#### Point

Always set "1" to "7" for the mode setting switch on the interface side that is not connected to the external device.

- (4) Transmission specifications switch setting  
Set the transmission specification for the communication with the corresponding device.

Switch Details	Switch		Setting Item	Switch State		Notes
	CH1	CH2		OFF	ON	
	SW01		Operation setting	Independent operation	Linked operation	Always set CH1 to OFF ON/OFF can be set on CH2.
	SW02		Data bits setting	7 bits	8 bits	Parity bit not included.
	SW03		Parity bit enable/disable setting	Disable	Enable	When set to Enable, the setting of SW04 is effective.
	SW04		Even parity/odd parity setting	Odd	Even	When Parity Bit Enable is selected.
	SW05		Stop bit setting	1 bit	2 bits	—
	SW06		Sum check enable/disable setting	Disable	Enable	Dedicated protocol, bidirectional protocol
	SW07		Write during RUN enable/disable setting	Disable	Enable	Dedicated protocol
	SW08		Setting change enable/disable	Disable (prohibit)	Enable (allow)	Sets mode switching and EEPROM write allow/prohibit.
	SW09 to SW12		Transmission rate setting	(*1)		Can be set as long as the total of CH1 and CH2 is within 115200 BPS.

(Factory settings are all OFF.)

- \*1 The data transmission speeds allowed to set are as follows:

		Transmission rate (unit: BPS)											
		300	600	1200	2400	4800	9600	19200	38400	14400	28800	57600	115200
Switch	SW09	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON
	SW10	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON
	SW11	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF
	SW12	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON

\* Settings other than above are not accepted.

## 4. Mounting and Installation

This section describes the handling precautions and installation environment common to all the modules when handling the QC24N from unpacking to installation.

See the User's Manual of the PLC CPU module used for a detailed description of mounting and installation of the module.

### 4.1 Handling precautions

This section describes the module handling precautions.

- (1) The module case is made of plastic. Be sure not to drop it or subject it to strong vibration.
- (2) Tighten the module mounting screws within the following tightening torque range.

Screw	Tightening Torque Range
RS-422/485 terminal block terminal screws (M3.5 screws)	59 to 88N · cm (6 to 9kgf · cm) (5.2 to 7.8 lb · inch)
Module mounting screws (M4 screws)	78 to 118N · cm (8 to 12kgf · cm) (6.9 to 10.4 lb · inch)
RS-422/485 terminal block mounting screws (M3 screws)	39 to 59N · cm (4 to 6kgf · cm) (3.5 to 5.2 lb · inch)
RS-232C and RS-422 connector mounting screws (M2.6 screws)	19 to 24N · cm (1.9 to 2.4 kgf · cm) (1.7 to 2.0 lb · inch)

### 4.2 Installation environment

Do not install the QnA Series PLC in the following environments.

- (1) Where the ambient temperature exceeds the 0 to 55°C range.
- (2) Where the ambient humidity exceeds the 10 to 90% RH range.
- (3) Where condensation is produced by sudden temperature changes.
- (4) Where corrosive or combustible gas is present.
- (5) Where dust, iron powder and other conductive powder, oil mist, salt, or organic solvents are prevalent.
- (6) In direct sunlight.
- (7) Where a strong electric or magnetic field is generated.
- (8) Where vibration and shock may be transmitted directly to the module.



## 5. External Wiring

### 5.1 RS-232C connection

Pin No.	Signal Code	Signal Name	Signal Direction
			QC24N (*) ↔ External Device
1	FG (*)	Frame ground	↔
2	SD (TXD)	Send data	→
3	RD (RXD)	Received data	←
4	RS (RTS)	Request to send	→
5	CS (CTS)	Send possible	←
6	DSR (DR)	Data set ready	←
7	SG	Signal ground	↔
8	CD	Carrier detection	←
20	DTR (ER)	Data terminal ready	→

\*1 AJ71QC24N: CH1 side, AJ71QC24N-R2: CH1 side · CH2 side

\*2 FG of the QC24N is connected to the nut used to fasten the connector, thus it is the FG of the module itself.

The following type of the RS-232C connector is used. The counter connector must match this connector.

25-pin D-sub (female) screw type

17L-10250-27-D9AC (DDK ELECTRONICS LTD)

(1) An example of connecting to an external device which is capable of turning ON/OFF the CD signal (pin 8)

QC24N side		Cable connection and signal direction (Full-duplex/Half-duplex)	External device	
Signal name	Pin No.		Signal name	Pin No.
FG	1	↔	FG	
SD (TXD)	2	→	SD (TXD)	
RD (RXD)	3	←	RD (RXD)	
RS (RTS)	4	→	RS (RTS)	
CS (CTS)	5	←	CS (CTS)	
DSR (DR)	6	←	DSR (DR)	
SG	7	↔	SG	
CD	8	←	CD	
DTR (ER)	20	→	DTR (ER)	

(2) An example of connecting to an external device which is not capable of turning ON/OFF the CD signal (pin 8)

(a) An example of external wiring for DC code control or DTR/DSR control

QC24N side		Cable connection and signal direction (Full-duplex)	External device
Signal name	Pin No.		Signal name
FG	1	↔	FG
SD (TXD)	2	→	SD (TXD)
RD (RXD)	3	←	RD (RXD)
RS (RTS)	4	↔	RS (RTS)
CS (CTS)	5	↔	CS (CTS)
DSR (DR)	6	↔	DSR (DR)
SG	7	↔	SG
CD	8	↔	CD
DTR (ER)	20	↔	DTR (ER)

(b) An example of external wiring for DC code control

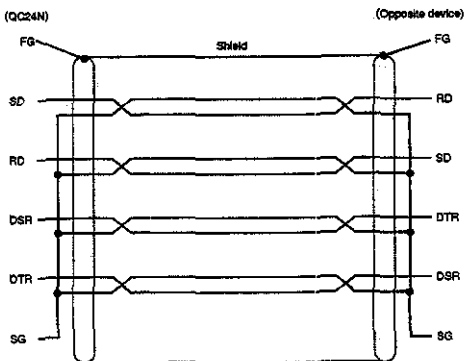
QC24N side		Cable connection and signal direction (Full-duplex)	External device
Signal name	Pin No.		Signal name
FG	1	↔	FG
SD (TXD)	2	→	SD (TXD)
RD (RXD)	3	←	RD (RXD)
RS (RTS)	4	↔	RS (RTS)
CS (CTS)	5	↔	CS (CTS)
DSR (DR)	6	↔	DSR (DR)
SG	7	↔	SG
CD	8	↔	CD
DTR (ER)	20	↔	DTR (ER)

(3) Precaution when performing connections

1) Handle the FG signal and the shield of the connection cable in the following manner.

	Connection method	Remark
FG signal	Connect to the FG signal on the QC24N side.	<ul style="list-style-type: none"> <li>Do not short circuit the FG signal and the SG signal of the connection cable.</li> <li>When the FG signal and the SG signal are internally connected on the external device side, do not connect the FG signal of the QC24N to the external device.</li> </ul>
Shield	Connect to the FG signal on the QC24N side. (Do not connect to an external device.)	

- 2) When a normal data communication cannot be performed because of external noise even though the wiring has been made as above, perform the wiring as follows:
- Connect between the FG of both stations with the shield of the connection cable.  
On the external device side, however, follow the instruction manual of the external device.
  - Connect each signal other than SG and FG of the connection cable by pairing up with SG.



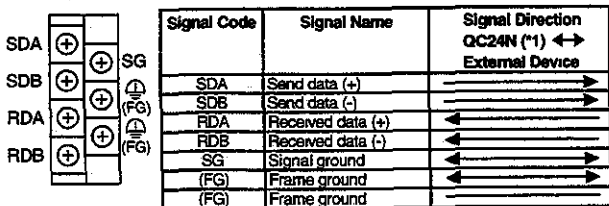
- \* FG of the QC24N is connected to the nut used to fasten the connector, thus it is the FG of the module itself.
- 3) Do not connect a RS-422 device to the RS-232C interface.  
If a RS-422 device is connected, the RS-422 interface hardware on the connected device will be damaged, and communication will be disabled.

**Point**

When connecting QC24N and the modem/TA, use the RS-232C cable supplied with the modem/TA for a cable specified for the modem/TA during the modem function for QC24N is used.

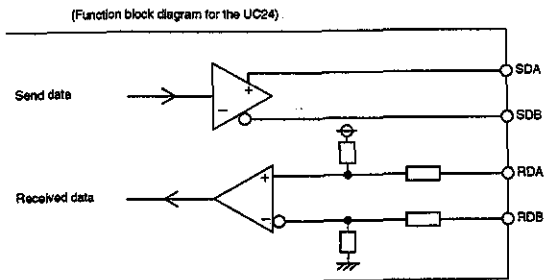
## 5.2 RS-422/485 connection

The standard method for connecting the RS-422/485 line is shown below.



\*1 AJ71QC24N: CH2 side, AJ71QC24N-R4: CH2 side

(Function block diagram for the QC24N side)



### Point

If the QC24N serves as the first or the last station on the RS-422/485 line, connect a terminal resistor as shown below to the RS-422/485 interface according to the communication specification.


When a terminal resistor is not connected, an error may result during data communication.

- For RS-422 communication..... 330 Ω, 1/4W
- For RS-485 communication..... 110 Ω, 1/2W

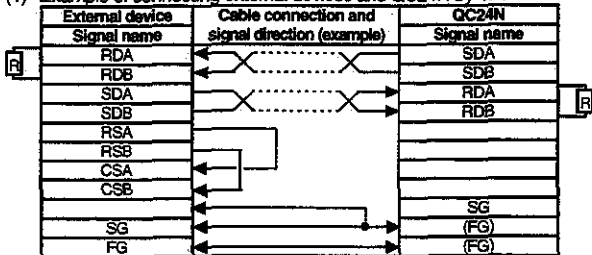
(To be continued to the next page)

**Point**

- (1) When an external device and the QC24N are connected in 1: 1, connect a terminal resistor between RDA and RDB.
- (2) When an external device and the QC24N are connected in 1: n, connect a terminal resistor between SDA and SDB as well as between RDA and RDB.
- (3) When an external device and the QC24N are connected m: n, connect a terminal resistor between RDA and RDB.

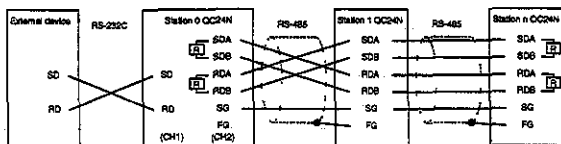
The  in the following wiring diagram represents a terminal resistor.

(1) Example of connecting external devices and QC24N by 1: 1

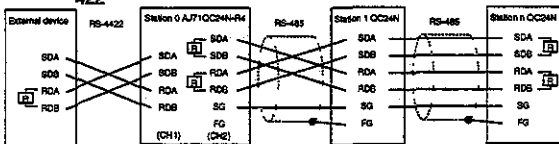


(2) Example of connecting external devices and QC24N by 1: n

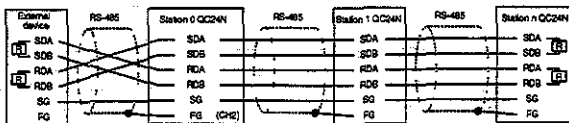
- 1) Connecting the external device and QC24N modules via RS-232C



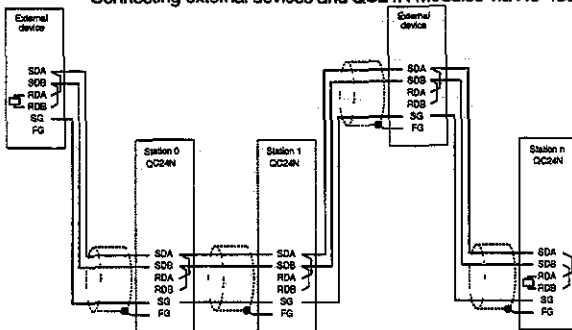
2) Connecting the external devices and QC24N modules via RS-422



3) Connecting the external device and QC24N modules via RS-485



(3) Example of connecting external devices and QC24N by m n  
\* Connecting external devices and QC24N modules via RS-485



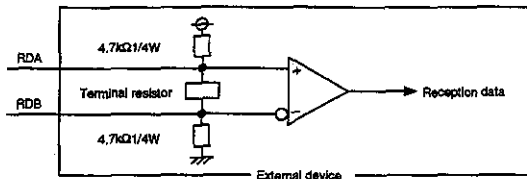
**Point**

See Section 5.1 for a connection example between external devices and QC24N modules in m-to-n relationship via RS-232C.

(4) Countermeasure for data reception errors in the external device with the RS-422 or RS-422/485 connection

During data communication with external devices via QC24N RS-422/485 interface, if there is a possibility that the external RS-422 or device receives an error data, install pull-up and pull-down resistors to the external device side (about  $4.7\text{k}\Omega$ ,  $1/4\text{ W}$  as a reference of resistor value).

Installation of pull-up and pull-down resistors will prevent data reception errors.



**Point**

Installation of pull-up and pull-down resistors will prevent data reception errors.

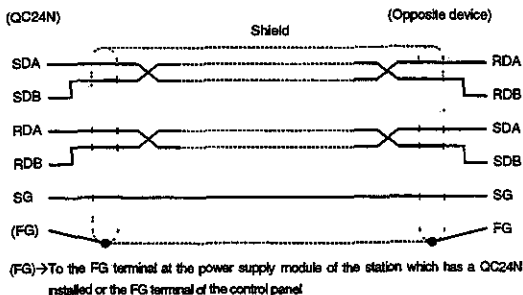
**Remarks**

The following explains the case in which pull-up and pull-down resistors are not installed to the external device:

- 1) When none of the stations are transmitting, the transmission line is in a state of high impedance, causing the transmission line to become unstable due to noise and a possibility that the data will be received incorrectly at the external device. When this happens, a parity error or framing error is likely to occur. Therefore, skip the data when the error has occurred.
- 2) The first data during data reception is fixed in the following cases.  
Skip the data received prior to the first data as determined.
  - When data communicating via the dedicated protocol, the user selects the first data according to the mode and format used.
  - When data communicating via the non-procedure protocol using user registered frames, the user selects the first data according to the user registered frames to register in QC24N.

(5) Precautionary items when wiring

- 1) When connecting the SG and FG signals of the QC24N to an external device, follow the specification of the external device.
- 2) Connect the connector cable shield to either one of the FG terminals on the connected device.
- 3) If data communication cannot be performed normally due to external noise even if the wiring is done as described above, perform wiring as follows:
  - Connect the FGs of both stations using the connector cable shield. As for the connection on the external device, follow the instruction manual for the external device.
  - Connect the (FG) of the QC24N side to the FG terminal at the power supply module of the station which has a QC24N installed, or to the FG terminal of the control panel on which the QC24N PLC is installed.
  - Connect nA and nB in each signal of the connector cable as a pair.



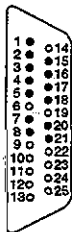
**Point**

- (1) In the explanation of the terminal resistor setting/connection in this section, when an RS-232C - RS-422 converter or other equipment is used for the device which serves as either of the line terminating stations, setting/connection for a terminal resistor is required on the converter.
- (2) The devices connected to the QC24N RS-422/RS485 interface must use all RS-422 or all RS-485, including 1-to-n and m-to-n connections.



### 3.3 RS-422 connection

The standard method for Connecting the RS-422line is shown below



Pin No.	Signal Code	Signal Name	Signal Direction QC24N (*1) ↔ External Device
1	FG	Frame ground	↔
2	RDA	Received data (+)	←
3	SDA	Send data (+)	→
4	DSRA	Terminal ready acknowledgment (+)	←
5	DTRA	Data device ready (+)	→
7	SG	Signal ground (*2)	↔
8	SG	Signal ground (*2)	↔
15	RDB	Received data (-)	←
16	SDB	Send data (-)	→
17	DSRB	Terminal ready acknowledgment (-)	←
18	DTRB	Data device ready (-)	→
20	SG	Signal ground (*2)	↔
21	SG	Signal ground (*3)	↔

\*1 AJ71QC24N-R4: CH1 side

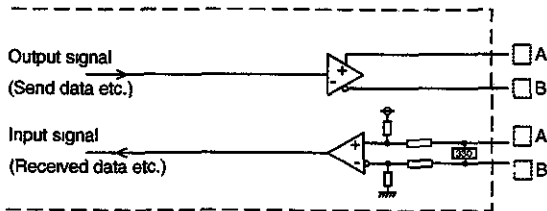
\*2 Each SG is connected inside the module.

\*3 Be sure to connect with SG of the opposite device.

The following type of the RS-422 connector is used. The counter connector must match this connector.

25-pin D-sub (female) screw type  
17L-10250-27-D9AC (DDK ELECTRONICS LTD)

(Function block diagram for the QC24N side)



<b>Point</b>
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- (1) For the AJ71QC24N-R4 RS-422 interface, do not connect an external device which requires power supply from the AJ71QC24N-R4.

Doing so may cause module or external device malfunctions.

- (2) The terminal resistor connection or setting is required on the external device side.

Perform the terminal resistor connection or setting according to the manual for the external device.

There is no need to connect the terminal resistor on the QC24N side because it contains the terminal resistor.

The **R** in the following wiring diagram represents a terminal resistor.

- (1) An example of external wiring for DC code control or DTR/DSR control

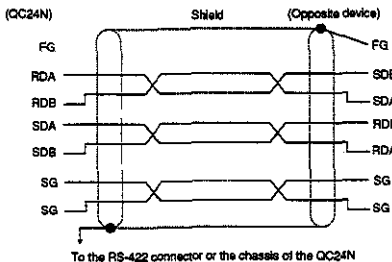
QC24N side		Cabal connection and signal direction (example)	External device	
Signal name	Pin No.		Signal name	Terminator position
FG	1	←→	FG	
RDA	2	←→	SDB	
RDB	15	←→	SDA	
SDA	3	←→	RDB	R
SDB	16	←→	RDA	
DSRA	4	←→	DTRB	
DSRB	17	←→	DTRA	
DTRA	5	←→	DSRB	R
DTRB	18	←→	DSRA	
SG	7	←→	SG	
SG	8	←→	SG	
SG	20	←→	SG	
SG	21	←→	SG	

(2) An example of external wiring for DC code control

GC24N side		Cable connection and signal direction (example)	External device	
Signal name	Pin No.		Signal name	Terminator position
FG	1		FG	
RDA	2		SDB	
RDB	15		SDA	
SDA	3		RDB	R
SDB	16		RDA	R
DSRA	4		DTPB	
DSRB	17		DTRA	
DTRA	5		DSRB	R
DTRB	18		DSRA	R
SG	7		SG	
SG	8		SG	
SG	20		SG	
SG	21		SG	

(3) Connection precautions

- 1) See Section 5.2 (4) for the countermeasures for erroneous receive data on the external device side.
- 2) Connect the QC24N DTR□ terminal and DSR□ terminal as shown in this section.
- 3) Connect the shield of the connection cable to either side of the connected device. When connecting to the QC24N side, connect to the FG signal.
- 4) When a normal data communication cannot be performed because of external noise even though the wiring has been made as above, perform the wiring as follows:
  - Connect the shield of the connection cable to both stations.
    - QC24N side: Connect the shield to the connector or to the chassis.  
(Example) Connect to the (FG) terminal of the RS-422/485 interface.
    - External device side: Connect according to the instruction manual of the external device  
(Example) Connect to the FG terminal, etc.
  - Connect nA and nB of each signal in the connection cable as a pair.

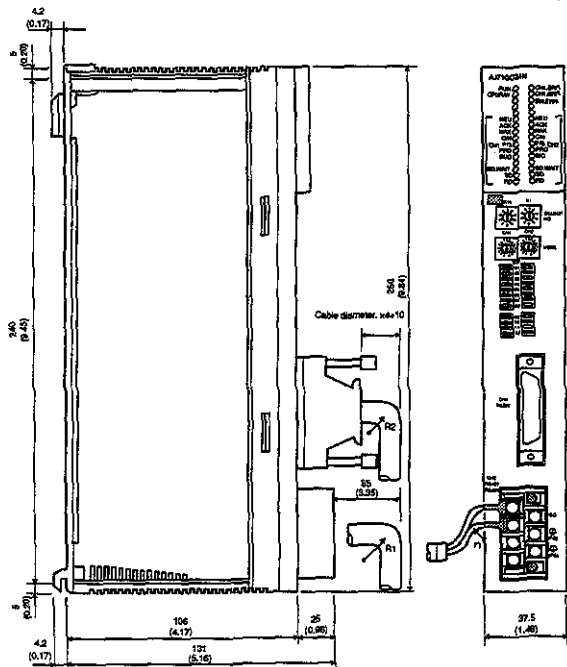


- 5) Make the connections according to the QC24N RS-422 interface and connected device signal polarity specifications. (Connection of the □A and □B signals to the QC24N may be the opposite of those described in this section.)
- 6) Do not input RS-232C signals to the RS-422 interface. If RS-232C signals are input, the hardware of the RS-422 interface may be damaged and communications may be lost.

## 6. External Dimensions

(AJ71QC24N (-R2, R4))

Unit: mm (inch)



R1 (bend radius near terminal board) : Cable diameter  $\times$  4  
 R2 (bend radius near connector) : Cable diameter  $\times$  4  
 r1 (bend radius near crimp terminal) : Can be connected within the range over which bending is not excessive

\* Except for the interface section, the AJ71QC24N (-R2, R4) external dimensions of all three models are the same.

The illustration above shows the external dimensions of the AJ71QC24N.

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