MITSUBISHI

AJ71QC24-R4

Serial Communications Module

User's Manual
(Hardware)

Thank you for choosing the Mitsubishi MELSEC-QnA Series of General Purpose Programmable Controllers To ensure correct use of this equipment, please read this manual carefully before operating it

IB(NA)-66611-A (9603) MEE

Related Manuals

The following manuals are available for this equipment Refer to the table given below to choose suitable manuals

Manual Name	Manual No (Type Code)
Guide Book for the AJ71QC24 Serial Communications Module	IB-66622
User's Manual for the AJ71QC24(-R2/R4) Serial Communications Module	IB-66612

● Safety Precautions ●

Before using this equipment, please read this and related manuals thoroughly Also pay special attention to safe and correct use of the equipment

The safety precautions given in this section relate to this equipment only For precautions regarding the programmable controller system, refer to the User's Manual for the CPU Module

The following two safety precaution categories are used in this manual

⚠ **DANGER:**	Describes precautions that should be observed to prevent the danger of serious injury or death to the user in case of incorrect use of the equipment
⚠ **CAUTION:**	Describes precautions that should be observed to prevent the danger of medium or light injury to the user or physical damage to the equipment in case of incorrect use of the equipment

However, note that incorrect use denoted by " ⚠ **CAUTION**" may result in serious accident in some cases Make sure that all the precautions given in this section are strictly observed

Keep the manual in a safe place so that it can be referred to whenever necessary Also make sure that this manual is forwarded to the final user

[Precautions regarding system design]

⚠ CAUTION

- Never place the control cables and communication cables near the main circuit and power cables Never bind them with the main circuit and power cables
  Make sure that they are placed at least 100 mm away from the main circuit and power cables Failure to observe this may result in malfunction of the equipment due to noise

[Precautions regarding installation]

⚠ CAUTION

- Make sure that the equipment is used in the operating environment specified in this manual, otherwise electric shock, fire, malfunction, damage or deterioration of the equipment may result
- When installing the equipment, make sure that the fixing projections provided at the base of the equipment are inserted into the holes on the base unit properly If they are not properly inserted, a malfunction, breakdown or fall of the equipment may result

[Precautions regarding wiring]

⚠ CAUTION

- Before connecting the cables, check the type of interface to be connected If the cables are connected to an incorrect interface, damage to the equipment or external device may result
- When connecting an external device to the RS-422 interface of the equipment, make sure that the external device is one which does not need power from the equipment Failure to observe this may result in breakdown of the equipment or the external device
- Make sure that each terminal screw is tightened with the specified torque If the terminal screws are loose, short-circuit or malfunction may result
- Take care not to allow any foreign matter, such as cutting refuse or wire bits, to enter the equipment If they enter, fire, breakdown or malfunction may result

[Precautions regarding set-up and maintenance]

⚠ DANGER

- Never touch the terminals while the power is supplied, otherwise malfunction may result
- Before cleaning the equipment or re-tightening terminal screws, make sure that the power is turned OFF If cleaning or re-tightening is carried out while the power is ON, breakdown or malfunction of the equipment may result

⚠ CAUTION

- Never attempt to disassemble or modify the equipment, otherwise breakdown, malfunction, injury or fire may result
- Before installing or removing the equipment, make sure that the power is turned OFF
  If the equipment is installed or removed while the power is ON, breakdown or malfunction of the equipment may result

[Precautions regarding disposal]

⚠ CAUTION

- When disposing of the equipment, treat it as industrial waste

1. General Description

This manual describes specifications and names of each part of the AJ71QC24-R4 serial communications module, which is used in conjunction with the MELSEC-QnA series programmable controller CPU

When unpacking the equipment, check that the unit and parts listed in the table below are present

Product Name	Qty
AJ71QC24-R4 serial communications module	1
Terminator (330Ω), 1/4W (orange/orange/brown/□)	2
Terminator (110Ω), 1/2W (brown/brown/brown/□)	2

2. System Configuration

2 1 Applicable System (Applicable CPU module and allowable number of modules)

The following table shows programmable controller CPU module and network module (for remote station) which can be used with the equipment The allowable number of modules to be installed is also given

Applicable Module		Allowable Number	Remarks
CPU module	Q2A (S1) Q3A Q4A	Not limited	The allowable number of modules is determined according to the number of available input/output signals of the CPU module and remote station
Network module	AJ72QLP25 AJ72QBR15		

3. Specifications

3 1 Communications

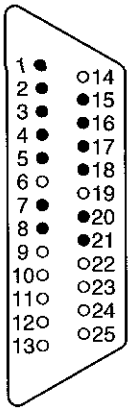
The communications specifications of the equipment is given below

Item			Specifications	
			CH1	CH2
Interface:			RS-422	RS-422/485
Communications method.			Full-duplex	
Synchronization.			Start-stop system	
Baud rate.			300 to 19200 BPS (CH1 and CH2 in total)	
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	
Control method.	DTR/DSR.		Yes	
	DC code:		Yes (DC1/DC3, DC2/DC4) / No	
Writing to EEPROM.			100,000 times for the same area (Max.)	
Network connection:	Independent mode	Dedicated protocol	1 1	1 : 1, 1 : n, m n
		Modeless protocol		
		Bidirectional protocol		1 . 1
	Interlock mode	Dedicated protocol	1 . n, m . n	
		Modeless protocol	1 . n	
		Bidirectional protocol	Data transfer disabled	
Allowable communications distance.			15 m or less	1200 m or less
Power consumption.			5 VDC, 0.38A	
Number of I/O points.			32 points	
Weight.			0.385 kg	

3.2 RS-422 Interface (CH1)

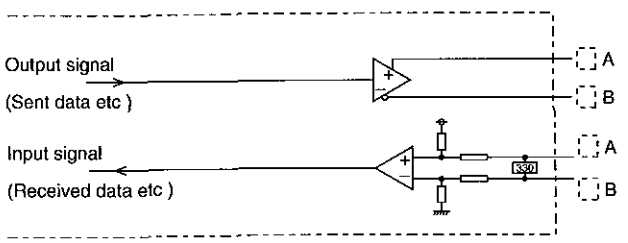
3.2 1 Connector Pin Assignment

(1) Pin assignment of the RS-422 interface connector used for connection with an external device is described below



Pin No	Signal Name	Signal Code	Signal Direction (AJ71QC24-R4 ◄► External Device)
1	Signal ground	SG	◄►
2	Received data (+)	RDA	◄
3	Sent data (+)	SDA	►
4	Terminal ready (+)	DSRA	◄
5	Data unit ready (+)	DTRA	►
7	Signal ground	SG	◄►
8	Signal ground	SG	◄►
15	Received data (-)	RDB	◄
16	Sent data (-)	SDB	►
17	Terminal ready (-)	DSRB	◄
18	Data unit ready (-)	DTRB	◄
20	Signal ground	SG	◄►
21	Signal ground	SG	◄►

(2) Function block diagram for the RS-422 interface is given below



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

25-pin D-sub (female) screw type
17LE-10250-27-D9AC (Daiichi Denshi Kogyo)

3.2.2 RS-422 Cable

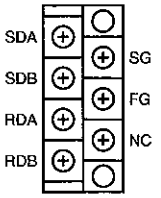
The RS-422 cable must be a shielded cable of 1200 m or shorter and conform to UL2467 (AWG#24)

(Recommended cable)
7/0 2 20C SRVD-SV (2464)

3 3 RS-422/485 Interface (CH2)

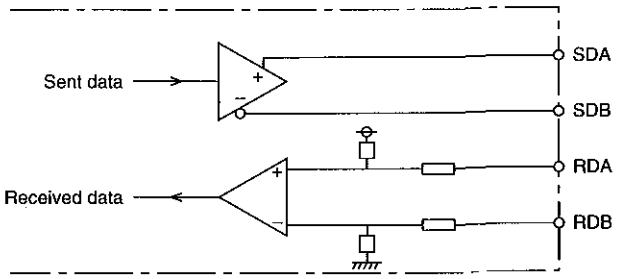
3 3 1 Connector Pin Assignment

(1) Pin assignment of the RS-422/485 interface connector used for connection with an external device or with another AJ71QC24-R4 is described below



Signal Direction	Description (AJ71QC24-R4 ↔ External Device)	Signal Code
SDA	→	Sent data
SDB	→	Sent data
RDA	←	Received data
RDB	←	Received data
SG	↔	Signal ground
FG	↔	Frame ground
NC	—	Not used

(2) Function block diagram for the RS-422/485 interface is given below



3 3.2 RS-422/485 Interface Cable

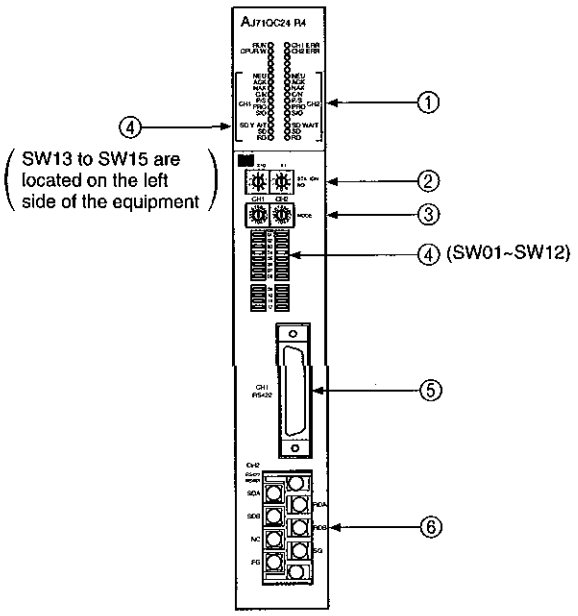
The RS-422/485 interface cable must be of 1200 m or shorter and conform to the RS-422/485 standard

(Recommended cable)
SPEV(SB)-MPC-0 2x3P
SPEV(SB)-0 2x3P

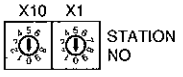
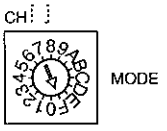
It is also possible to use another cable which conforms to the specifications given in the table below When you use a cable other than the recommended one, make sure that the cable conforms to the specifications given below

Item	Specification
Cable type	Shielded cable
Number of pair wires	3P
Conductor resistance (at 20°C)	88 0 Ω/km or less
Insulation resistance	10,000 MΩkm or higher
Withstand voltage	500 VDC (for 1 minute)
Electrostatic capacity (1 kHz)	60 nF/km or less (average)
Characteristic impedance (100 kHz)	110 ±10Ω

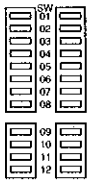
Description for each part of the equipment is given below



No.	Name	Description	
①	LED RUN CH1 ERR CPUR/W CH2 ERR NEU NEU ACK ACK NAK NAK C/N C/N CH1 P/S P/S CH2 PRO PRO SIO SIO SD WAIT SD WAIT SD SD RD RD	RUN	Operation state ON Normal OFF. Abnormal
		CPUR/W	Communications state with PC ON Communications is in progress OFF Communications is in halt
		NEU:	Neutral state (CH1/2) ON Transmission sequence is initialized OFF Reception of ENQ is complete
		ACK	ACK transmission state (CH1/2) ON When ACK is transmitted OFF. When NAK is transmitted
		NAK	NAK transmission state (CH1/2) ON NAK is transmitted OFF. ACK is transmitted
		C/N	Communications state between CH1/2 and programmable controller CPU ON Abnormal OFF. Normal
		P/S	Parity/sum check error (CH1/2) ON Error OFF Normal
		PRO	Protocol error (CH1/2) ON Error OFF. Normal
		SIO	SIO error (CH1/2) ON Received data is disposed of due to overrun, framing error or OS receive area full OFF Normal
		SD WAIT	Wait state ON Awaiting data transmission OFF Transmission is started.
		SD	Transmission state (CH1/2) Blink Data transmission is in progress.
		RD	Reception state (CH1/2) Blink. Data reception is in progress
		CH1/2 ERR	Error (CH1/2) ON Switch setting error, mode switch error, transmission error, reception error, on-demand error OFF Normal

②	Station No setting switch 	Used to set the station No <Setting range> 0 to 31 x10 Used to set the tens digit of the station No x1 Used to set the units digit of the station No.
③	Mode setting switch 	Used to set mode

Mode	Description		
0	When CH1 and CH2 are operated in inter lock mode Set to 0 (for CH1) Set to one of 0 to 6 (for CH2) When CH1 and CH" are operated inde-pendently Setting disabled		
1	Dedicated protocol	ASCII mode	Format 1
2			Format 2
3			Format 3
4			Format 4
5		Binary mode	Format 5
6	Modeless protocol		
7	Bidirectional protocol		
8 to D	Setting disabled		
E	ROM/RAM/switch test		
F	Wrap test		

④	Communications parameter setting switch 	Used to set the following communications parameters

Switch No		Description	State	
CH1	CH2		OFF	ON
SW01 *1		Operation mode	Indepen-dent	Continu-ance
SW02		Data bit	7 bits	8 bits
SW03		Parity bit	No	Yes
SW04		Parity (even/odd)	Odd	Even
SW05		Stop bit	1 bit	2 bits
SW06		Sum check	No	Yes
SW07		Writing during operation	Disabled	Enabled
SW08		Setting change	Disabled	Enabled
SW09 to SW12		Baud rate	Refer to *2	
SW13 to SW15		————	(Set all the switches to OFF)	

*1 Switch for CH1 must be set to OFF Switch for CH2 can be set to either ON or OFF

*2 Baud rate

Baud rate (BPS)	300	600	1200	2400	4800	9600	19200
SW09	OFF	ON	OFF	ON	OFF	ON	OFF
SW10	OFF	OFF	ON	ON	OFF	OFF	ON
SW11	OFF	OFF	OFF	OFF	ON	ON	ON
SW12	OFF	OFF	OFF	OFF	OFF	OFF	OFF

No.	Name	Description
⑤	RS-422 interface	Used to connect the equipment to external device.
⑥	RS-422/485 interface	Used to connect the equipment to external device.

5. Handling Precautions

The equipment must be secured using screws Allowable tightening torque range for the screws is given below

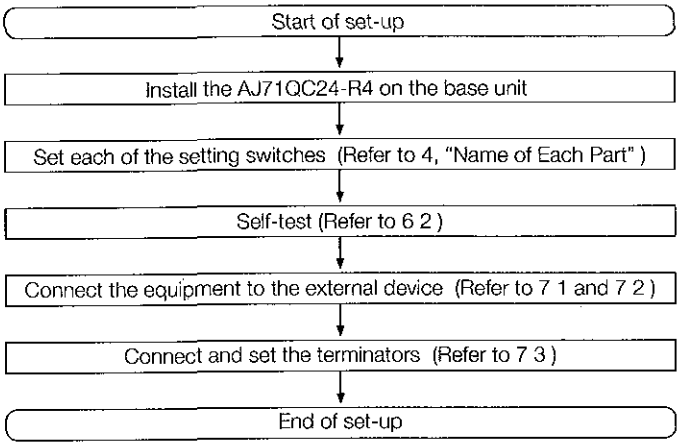
Screw	Tightening Torque
RS-422/485 terminal block screws (M3.5)	58 to 88 N cm (6 to 9 kg cm)
Unit fixing screws (M4)	78 to 117 N cm (8 to 12 kg cm)
RS-422/485 terminal block screws (M3)	49 to 78 N cm (5 to 8 kg cm)

6. Starting up the Equipment

6 1 Set-up Procedure

This section describes how to start up the equipment

For a detail description, refer to the User's Manual for the AJ71QC24(-R2/R4) Serial Communications Module



6 2 Self-Test

The following functions are provided to check whether the equipment can operate correctly, without being connected to an external device

Make sure that the test is carried out with the programmable controller CPU in stop state Also make sure that the power is turned OFF before connecting the cables and setting the switches

6.2.1 ROM/RAM/Switch Test

Setting the mode setting switch

- Set the mode setting switch for CH2 to "E"
  The mode setting switch for CH1 must be set to the No (0 to 7) corresponding to the mode in which data is to be transferred between the equipment and external device after completion of the test
- Set the communications parameter switches according to the communications specifications for the external device

Starting the ROM/RAM switch test

- Turn ON the power to the programmable controller CPU or reset the CPU to start the test

Checking the LED indicators

Check Item		LED Name	Normal	Abnormal
(Test end)		SD WAIT *1	ON	
ROM check		CH1 ERR	OFF	ON
RAM check		CH2.ERR	OFF	ON
Switch check	Station No.	Located just below CH2 ERR	OFF	ON
	Mode	C/N *2	OFF	ON
	Communications parameter	P/S *2	OFF	ON
Interlock setting check	Mode	CH1-PRO	OFF	ON
	Communications parameter	CH1-SIO	OFF	ON

*1 LED for both CH1 and CH2

*2 LED for the interface where the setting error is occurring

6.2.2 Wrap Test

Connecting the cables

- Connect the RS-422 interface as shown below

AJ71QC-24-R4 Side		Cable Connection
Signal Name	Pin No	
SG	1	
RDA	2	
SDA	3	
DSRA	4	
DTRA	5	
SG	7	
SG	8	
RDB	15	
SDB	16	
DSRB	17	
DTRB	18	
SG	20	
SG	21	

- Connect the RS-422/485 interface as shown below

AJ71QC-24-R4 Side	Cable Connection
Signal Name	
SDA	
SDB	
RDA	
RDB	
SG	
FG	

Setting the mode setting switch

- Set the mode setting switch for both CH1 and CH2 to "F"

Starting wrap test

- Turn ON the power to the programmable controller CPU or reset the CPU to start the test

Checking the LED indicators

Check Item	Normal		Abnormal	
Communications with programmable controller CPU	CH1-C/N	OFF	CH1-C/N	ON
	CPU R/W	ON (dark)		
	CH 1NEU, ACK, NAK	Blinks in turn.		
RS-422 (CH1) communications	CH1.ERR	OFF	CH1 ERR	ON
	CH1-SD	Blink		
	CH1-RD			
RS-422/485 (CH2) communications	CH2.ERR	OFF	CH2 ERR	ON
	CH2-SD	Blink		
	CH2-RD			

Ending the wrap test

- Turn OFF the power

After the test is complete, change the mode setting switch to enable data transfer with the external device
(Make sure that the mode setting switch for the interface via which data transfer is not to be carried out is set to one of 1 to 7)

7 1 Connecting the RS-422 Interface (CH1)

(1) An example for DC code control or DTR/DSR control

AJ71QC-24-R4 Side		Connection and Signal	External Device	
Signal Name	Pin No	Direction (Example)	Signal Name	Terminator position
SG	1		SG	
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 for DC code control

AJ71QC-24-R4 Side		Connection and Signal	External Device	
Signal Name	Pin No	Direction (Example)	Signal Name	Terminator position
SG	1		SG	
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	

7.2 Connecting the RS-422 /485 Interface (CH2)

Typical connecting method for the RS-422/485 interface is described below

AJ71QC-24-R4 Side	Connection and Signal	External Device
Signal Name	Direction (Example)	Signal Name
SDA		RDA
SDB		RDB
RDA		SDA
RDB		SDB
		RSA
		RSB
		CSA
		CSB
NC		
SG		SG
FG		FG

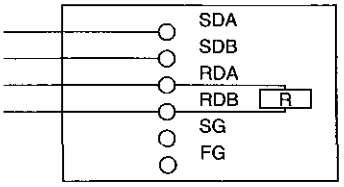
7.3 Connecting the Terminators (Required for CH2 only)

If the equipment is used as the first or last station in the network, install a terminator as follows If no terminator is installed, problems may result during data transfer

The terminators to be connected vary according to the type of interface, as shown below

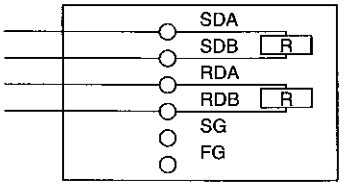
- RS-422 330Ω
- RS-485 110Ω

(1) One to one connection (one external device to one AJ71QC24-R4)



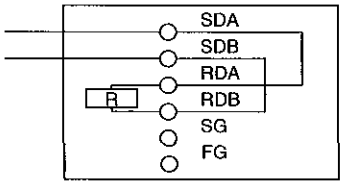
Install a terminator between RDA and RDB

(2) 1 to n connection (one external device to n pieces of AJ71QC24-R4)



Install a terminator between SDA and SDB as well as between RDA and RDB

(3) m to n connection (m pieces of external device to n pieces of AJ71QC24-R4)



Install a terminator between RDA and RDB

7 4 Installing the RS-422/485 Interface Terminal Block

The RS-422/485 interface (CH2) accommodates a two-piece type terminal block, to enable replacement of the unit without having to remove the signal lines

The method of mounting the terminal block is illustrated below