MITSUBISHI

Positioning Module Type QD70D

User's Manual

(Hardware)

QD70D4
QD70D8

Thank you for buying the Mitsubishi general-purpose programmable logic controller MELSEC-Q Series

Prior to use, please read both this manual and detailed manual thoroughly and familiarize yourself with the product.

MELSEC-Q
Mitsubishi Programmable Logic Controller

MODEL	QD70D-U-HW
MODEL CODE	13JP87
IB(NA)-0800333-A(0604)MEE	

● SAFETY PRECAUTIONS ●

(Read these precautions before using.)

When using Mitsubishi equipment, thoroughly read this manual and the associated manuals introduced in this manual. Also pay careful attention to safety and handle the module properly.
These precautions apply only to Mitsubishi equipment. Refer to CPU module User's Manual for a description of the PC system safety precautions.
These ● SAFETY PRECAUTIONS ● classify the safety precautions into two categories: "DANGER" and "CAUTION".

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

[INSTALLATION PRECAUTION]

⚠CAUTION

- Use the PLC in an environment that meets the general specifications contained in CPU module User's Manual to use.
  Using this PLC in an environment outside the range of the general specifications may cause electric shock, fire, malfunction, and damage to or deterioration of the product.
- When installing the module, securely insert the module fixing tabs into the mounting holes of the base module while pressing the installation lever located at the bottom of the module downward.
  Improper installation may result in malfunction, breakdown or the module coming loose and dropping.
  Securely fix the module with screws if it is subject to vibration or shock during use.
  Tighten the screws within the range of specified torque.
  If the screws are loose, it may cause the module to fallout or malfunction.
  If the screws are tightened too much, it may cause damage to the screw and/or the module, resulting in fallout or malfunction.
- Completely turn off the externally supplied power used in the system when mounting or removing the module.
  Not doing so may cause damage to the module.
- Do not directly touch the conductive area or electronic components of the module.
  Doing so may cause malfunction or failure in the module.

[WIRING PRECAUTION]

⚠DANGER

- Completely turn off the externally supplied power used in the system when installing or placing wiring.
  Not doing so may cause electric shock or damage to the product.

⚠CAUTION

- Check the layout of the terminals and then properly route the wires to the module.
- Solder connectors for external device properly.
  Insufficient soldering may cause malfunction.
- Be careful not to let foreign matter such as sawdust or wire chips get inside the module.
  These may cause fires, failure or malfunction.
- The top surface of the module is covered with protective film to prevent foreign objects such as cable offcuts from entering the module when wiring.
  Do not remove this film until the wiring is complete.
  Before operating the system, be sure to remove the film to provide adequate ventilation.
- Securely connect the connectors for the drive module to the connectors on the module and firmly tighten the two screws.
- Be sure to fix cables leading from the module by placing them in a 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 cause a module malfunction and cable damage.
- When removing the cable or power supply cable from the module, do not pull the cable.
  When removing the cable with a connector, hold the connector on the side that is connected to the module.
  Pulling the cable that is still connected to the module may cause malfunction or damage to the module or cable.
- The cable used for connecting the QD70D external input/output signal and the drive module should not be routed near or bundled with the main circuit cable, power cable and/or other such load-carrying cables other than those for the PLC. These cables should be separated by at least 100 mm (3.94 in.). They can cause electrical interference, surges and inductance that can lead to mis-operation.

Revisions

* The manual number is noted at the lower right of the top cover.

Print Date	*Manual Number	Revision
Apr., 2006	IB(NA)-0800333-A	First printing

CONTENTS

About Manuals

The following manuals are related to this product.
Referring to this list, please request the necessary manuals.

Detailed Manual

Manual name	Manual No. (Model code)
Positioning Module Type QD70D User's Manual	SH-080551ENG (13JR80)

Conformation to the EMC and Low Voltage Directives

For details on making Mitsubishi PLC conform to the EMC and Low Voltage Directives when installing it in your product, please refer to Chapter 3, "EMC Directive and Low Voltage Instruction" of the using PLC CPU module User's Manual(Hardware).

The CE logo is printed on the rating plate on the main body of the PLC that conforms to the EMC and Low Voltage Directives.

To make this product conform to the EMC and Low Voltage Directives, please refer to Chapter 5 "Wiring".

1. Overview

This manual explains how to handle the Positioning Module, model numbers QD70D4 and QD70D8 (hereinafter collectively referred to as the QD70D). After unpacking the QD70D, please verify that the corresponding product as listed below is enclosed in the package.

Model name	Description	Quantity
QD70D4	QD70D4 Positioning Module (4-axis differential output type)	1
QD70D8	QD70D8 Positioning Module (8-axis differential output type)	1

The user should arrange for a connector for external wiring since it is not provided in the package.

* Connector type
  - A6CON1 (Soldering type, straight out)
  - A6CON2 (Crimping type, straight out)
  - A6CON4 (Soldering type, usable for straight out and diagonal out)

* A6CON2 crimping tool
  - Model name: FCN-363T-T005/H
  - Contact: FUJITSU COMPONENT LIMITED

2. Specifications

2.1 Performance Specifications

Item	Specification	
	QD70D4	QD70D8
Number of axes	4 axes	8 axes
Pulse output system	differential output	
Maximum output pulse count (pulse/s)	4 Mpulse/s	
Maximum connection distance between drive units	10m (32.8ft)	
Applicable wire size	0.3 mm^2 (when A6CON1 or A6CON4 is used), AWG#24 (when A6CON2 is used)	
Applicable connector	A6CON1, A6CON2, A6CON4 (sold separately)	
Number of I/O occupied points	48points (I/O assignment: 16 for empty + 32 for intelligent)	
Internal current consumption (5VDC)	1.16A	2.16A
Weight	0.17kg/0.37lb.	0.23kg/0.51lb.
Outline dimensions	98(H)×55.2(W)×90(D)[H] (3.86(H) ×2.17(W)×3.54(D)[in.])	

2.2 Electrical Specifications

(1) Input specifications

Signal name	Rated input voltage /current	Working voltage range	ON voltage /current	OFF voltage /current	Input resistance	Response time
Zero signal (PG0)	5VDC /13mA	4.75 to 5.5VDC	3.5VDC or more/5.5mA or more	1.0VDC or less/0.5mA or less	Approx. 390Ω	0.1ms or less
Near-point dog signal (DOG) Speed-position switching signal (CHG)/Retry switch signal (RTRY)	24VDC/5mA	19.2 to 26.4VDC	17.5VDC or more/3mA or more	7VDC or less /0.9mA or less	Approx. 6.8kΩ	1ms or less

(2) Output specifications

Signal name	Rated load voltage	Working load voltage range	Max. load current/rush current	Max. voltage drop at ON	Leakage current at OFF	Response time
Pulse output (PULSE F(+,-) /PULSE R(+,-))	Differential driver equivalent to Am26C31 (Compliant with RS-422 standard)					
Deviation counter clear (CLEAR)	5 to 24VDC	4.75 to 30VDC	0.1A/1 point/ 0.4A 10ms or less	1VDC(TYP) 2.5VDC(MAX)	0.1mA or less	2ms or less (resistance load)

For the general specifications of the QD70D, see User's Manual for the CPU module used.

3. Handling

⚠DANGER

- Provide a safety circuit outside the programmable logic controller so that the entire system will operate safely even when an external power supply error or PLC fault occurs.
  Failure to observe this could lead to accidents for incorrect outputs or malfunctioning.
  (1) Configure an emergency stop circuit and interlock circuit such as a positioning upper limit/lower limit to prevent mechanical damage outside the PLC.
  (2) The OPR operation is controlled by the OPR direction and OPR speed data. Deceleration starts when the near-point dog turns ON. Thus, if the OPR direction is incorrectly set, deceleration will not start and the machine will continue to travel. Configure an interlock circuit to prevent mechanical damage outside the PLC.
  (3) When the module detects an error, deceleration stop will take place. Make sure that the OPR data and positioning data are within the parameter setting values.

⚠CAUTION

- Use the PLC in an environment that meets the general specifications contained in CPU module User's Manual to use.
  Using this PLC in an environment outside the range of the general specifications may cause electric shock, fire, malfunction, and damage to or deterioration of the product.
- When installing the module, securely insert the module fixing tabs into the mounting holes of the base module while pressing the installation lever located at the bottom of the module downward.
  Improper installation may result in malfunction, breakdown or dropping out of the module.
  Securely fix the module with screws if it is subject to vibration or shock during use.
  Tighten the screws within the range of specified torque.
  If the screws are loose, it may cause fallout or malfunction.
  If the screws are tightened too much, it may cause damage to the screw and/or the module, resulting in fallout or malfunction.
- Switch all phases of the external power supply off when mounting or removing the module.
  Not doing so may cause damage to the module.
- Do not directly touch the conductive area or electronic components of the module.
  Doing so may cause malfunction or failure in the module.

3.1 Handling Precautions

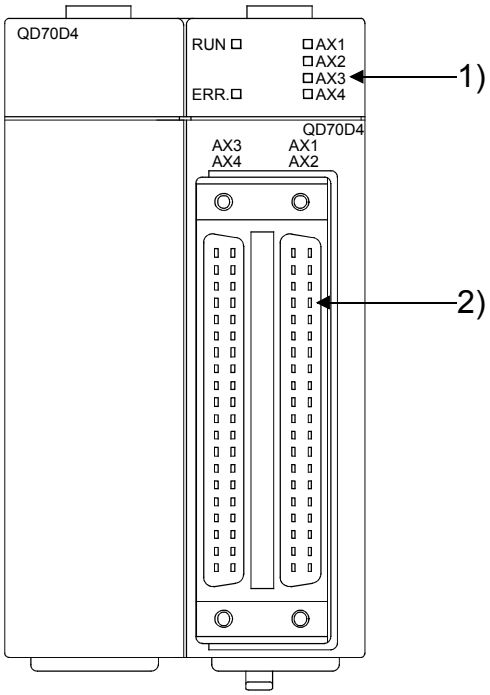
(1) Since the module case is made of resin, do not drop it or subject it to strong impact.

(2) The module can easily be secured to the base unit using the hooks located at the top of the module. However, if the module is to be placed in an area that is subject to strong vibration or impact, we recommend that it is secured with module fixing screws. In this case, tighten the module mounting screws within the following torque range.
Module fixing screws (M3): Tightening torque range is from 0.36 to 0.48 N•m.

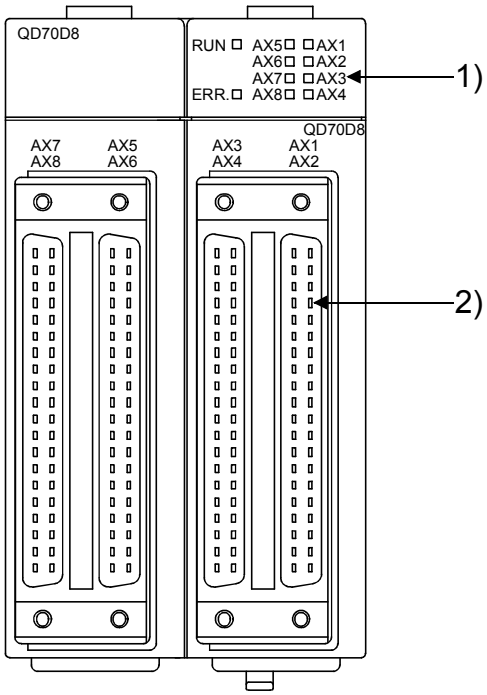
4. Part Identification Nomenclature

(1) Part identification nomenclature

(a) QD70D4

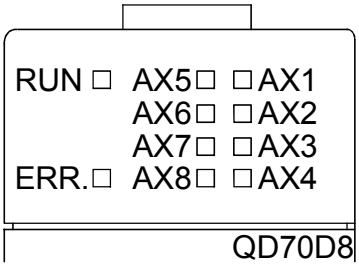


(b) QD70D8



Number	Name	Number	Name
1)	LED Display	2)	External device connector

(2) LED display contents

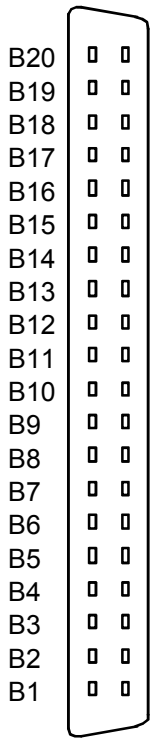


Details of indication	Operation Status	Description
RUN □ AX5□ □AX1 AX6□ □AX2 AX7□ □AX3 ERR.□ AX8□ □AX4	Extinguishment of RUN LED (The status of ERR. and AX1 to AX8 are unfixed.)	The hardware is faulty or the module error occurs.
RUN ■ AX5□ □AX1 AX6□ □AX2 AX7□ □AX3 ERR.□ AX8□ □AX4	Lighting of RUN LED, Extinguishment of ERR. LED	The module is normal.
RUN ■ AX5□ □AX1 AX6□ □AX2 AX7□ □AX3 ERR.■ AX8□ □AX4	Lighting of ERR. LED	System error
RUN ■ AX5□ □AX1 AX6□ □AX2 AX7□ □AX3 ERR.□ AX8□ □AX4	Extinguishment of AX1 to AX8 LEDs	During axis stop, during axis standby
RUN ■ AX5□ ■AX1 AX6□ □AX2 AX7□ □AX3 ERR.□ AX8□ □AX4	Lighting of AX1 LED (Same even if the other axis is lit)	During axis operation
RUN ■ AX5□ ◆AX1 AX6□ □AX2 AX7□ □AX3 ERR.◆ AX8□ □AX4	Flashing of ERR. LED Flasihing of AX1 LED (Same even if the other axis is flashes)	Axis error

The symbols in the Display column indicate the following statuses:
□: Turns OFF, ■: Illuminates, ◆: Flashes

(3) External device connector signal layout

Pin layout



Front view of the module

AX1		AX2		AX3		AX4	
Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
A20	PULSE R1 COM	B20	PULSE R2 COM	A20	PULSE R3 COM	B20	PULSE R4 COM
A19	PULSE F1 COM	B19	PULSE F2 COM	A19	PULSE F3 COM	B19	PULSE F4 COM
A18	PULSE R1-	B18	PULSE R2-	A18	PULSE R3-	B18	PULSE R4-
A17	PULSE R1+	B17	PULSE R2+	A17	PULSE R3+	B17	PULSE R4+
A16	PULSE F1-	B16	PULSE F2-	A16	PULSE F3-	B16	PULSE F4-
A15	PULSE F1+	B15	PULSE F2+	A15	PULSE F3+	B15	PULSE F4+
A14	CREAR1 COM	B14	CREAR2 COM	A14	CREAR3 COM	B14	CREAR4 COM
A13	CLEAR1	B13	CLEAR2	A13	CLEAR3	B13	CLEAR4
A12	NC	B12	NC	A12	NC	B12	NC
A11	NC	B11	NC	A11	NC	B11	NC
A10	PG01 COM	B10	PG02 COM	A10	PG03 COM	B10	PG04 COM
A9	PG01	B9	PG02	A9	PG03	B9	PG04
A8	NC	B8	NC	A8	NC	B8	NC
A7	COM1 to 4	B7	COM1 to 4	A7	COM1 to 4	B7	COM1 to 4
A6	COM1 to 4	B6	COM1 to 4	A6	COM1 to 4	B6	COM1 to 4
A5	CHG1/RTRY1	B5	CHG2/RTRY2	A5	CHG3/RTRY3	B5	CHG4/RTRY4
A4	NC	B4	NC	A4	NC	B4	NC
A3	DOG1	B3	DOG2	A3	DOG3	B3	DOG4
A2	CHG1/RTRY1	B2	CHG2/RTRY2	A2	CHG3/RTRY3	B2	CHG4/RTRY4
A1	NC	B1	NC	A1	NC	B1	NC

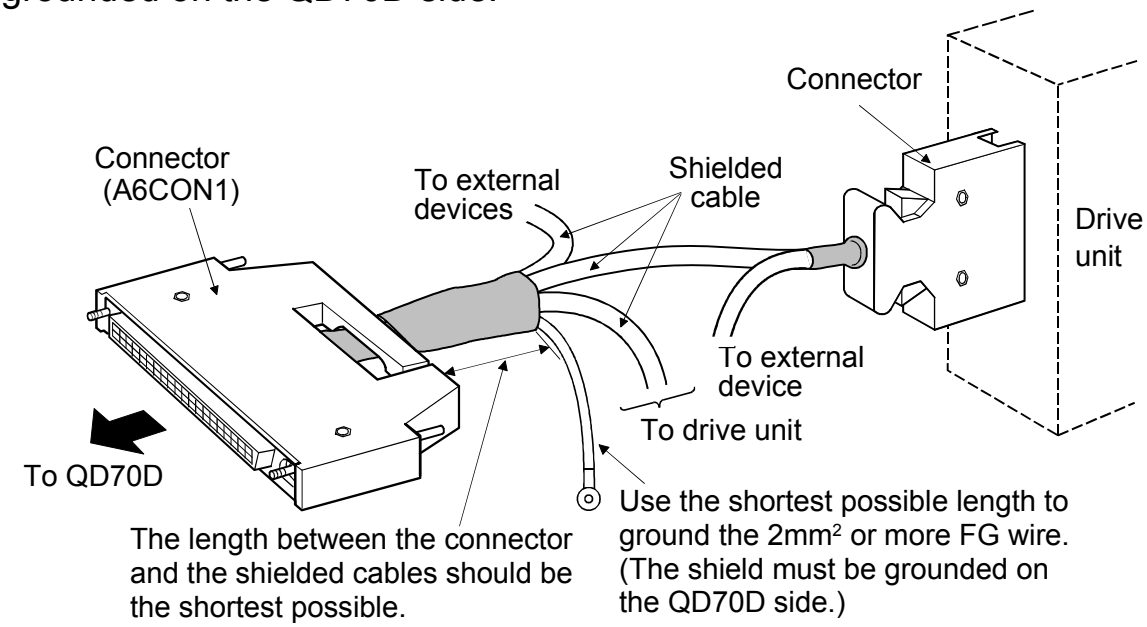
AX5		AX6		AX7		AX8	
Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name	Pin No.	Signal name
A20	PULSE R5 COM	B20	PULSE R6 COM	A20	PULSE R7 COM	B20	PULSE R8 COM
A19	PULSE F5 COM	B19	PULSE F6 COM	A19	PULSE F7 COM	B19	PULSE F8 COM
A18	PULSE R5-	B18	PULSE R6-	A18	PULSE R7-	B18	PULSE R8-
A17	PULSE R5+	B17	PULSE R6+	A17	PULSE R7+	B17	PULSE R8+
A16	PULSE F5-	B16	PULSE F6-	A16	PULSE F7-	B16	PULSE F8-
A15	PULSE F5+	B15	PULSE F6+	A15	PULSE F7+	B15	PULSE F8+
A14	CREAR5 COM	B14	CREAR6 COM	A14	CREAR7 COM	B14	CREAR8 COM
A13	CLEAR5	B13	CLEAR6	A13	CLEAR7	B13	CLEAR8
A12	NC	B12	NC	A12	NC	B12	NC
A11	NC	B11	NC	A11	NC	B11	NC
A10	PG05 COM	B10	PG06 COM	A10	PG07 COM	B10	PG08 COM
A9	PG05	B9	PG06	A9	PG07	B9	PG08
A8	NC	B8	NC	A8	NC	B8	NC
A7	COM5 to 8	B7	COM5 to 8	A7	COM5 to 8	B7	COM5 to 8
A6	COM5 to 8	B6	COM5 to 8	A6	COM5 to 8	B6	COM5 to 8
A5	CHG5/RTRY5	B5	CHG6/RTRY6	A5	CHG7/RTRY7	B5	CHG8/RTRY8
A4	NC	B4	NC	A4	NC	B4	NC
A3	DOG5	B3	DOG6	A3	DOG7	B3	DOG8
A2	CHG5/RTRY5	B2	CHG6/RTRY6	A2	CHG7/RTRY7	B2	CHG8/RTRY8
A1	NC	B1	NC	A1	NC	B1	NC

5. Wiring

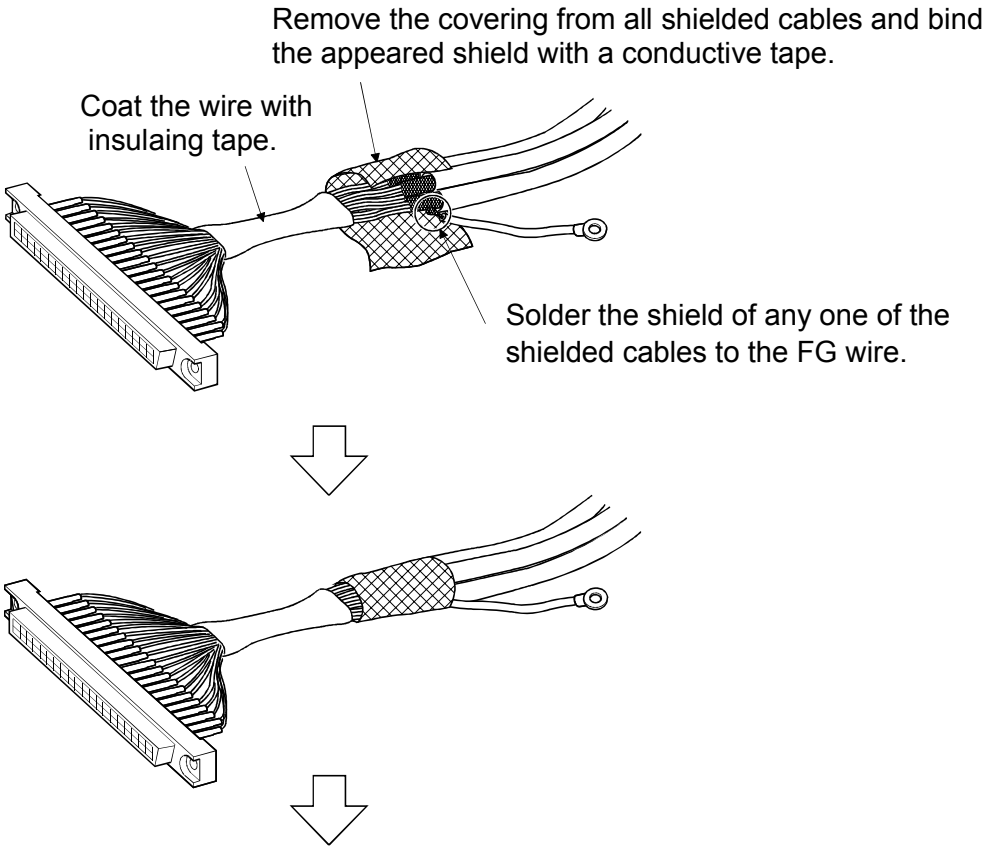
⚠DANGER
● Completely turn off the externally supplied power used in the system when installing or placing wiring. Not doing so may cause electric shock or damage to the product.

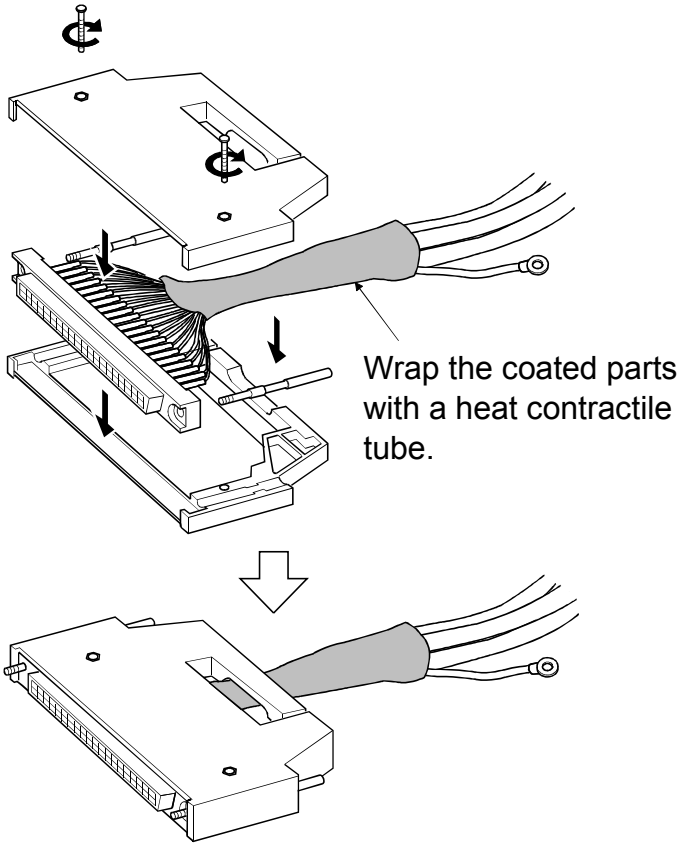
5.1 Wiring Precautions

(1) If cables to connect to QD70D absolutely must be positioned near (within 100 mm) the power line, use a general shielded cable. The shield must be grounded on the QD70D side.



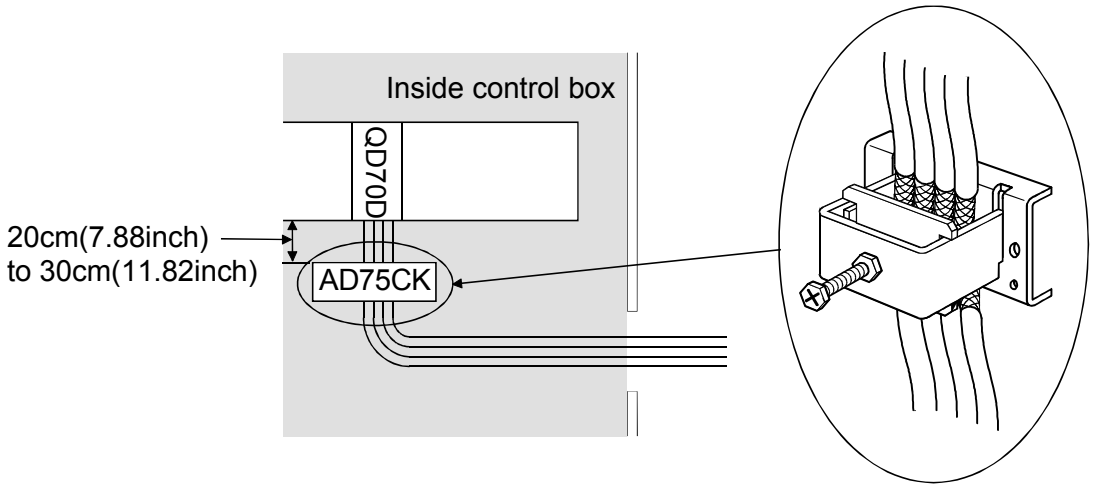
[Processing example of shielded cables]





(2) The shielded cable for connecting QD70D can be secured in place.
If the shielded cable is not secured, unevenness or movement of the shielded cable or careless pulling on it could result in damage to the QD70D or drive unit or shielded cable or defective cable connections could cause mis-operation of the unit.

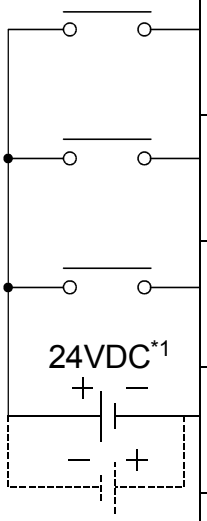
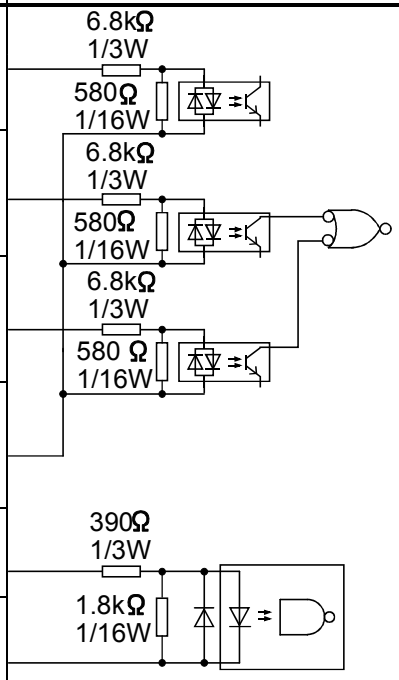
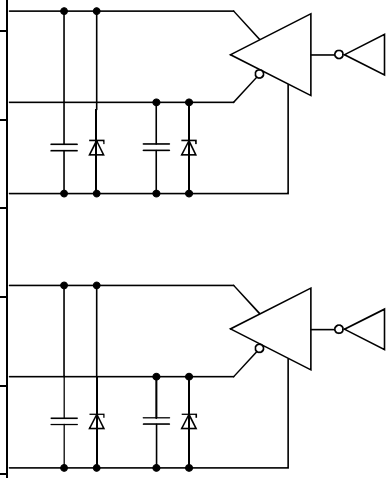
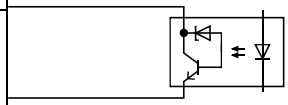
(3) To make this product conform to the EMC directive and low voltage instruction, be sure to use of a AD75CK type cable clamp (manufactured by Mitsubishi Electric) for grounding to the control box.



Using the AD75CK, you can tie four cables of about 7mm outside diameter together for grounding.

5.2 External Interface

Shows summary image of the internal circuit of the interface for connection to external devices of the QD70D.

Input/ output class	External wiring	Pin No.	Internal circuit	Signal name	
Input		A3		Near-point dog signal	DOG
		A5		Speed-position switching signal/ Retry switch signal*3	CHG/RTRY
		A2			
		A6 A7		Common*2	COM
		A9		Zero signal	PG0
		A10		Zero signal common	PG0 COM
Output		A15		Pulse output F +	PULSE F+
		A16		Pulse output F -	PULSE F-
		A19		Pulse output F common	PULSE F COM
		A17		Pulse output R +	PULSE R+
		A18		Pulse output R -	PULSE R-
		A20		Pulse output R common	PULSE R COM
		A13		Deviation counter clear	CLEAR
		A14		Deviation counter clear common	CLEAR COM

*1: Connection to the 24V DC input common (COM) is available from either the positive or negative side.

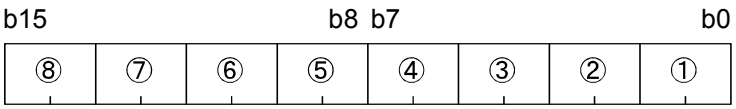
*2: The input common (COM) has internal connections for axes 1 to 4 and 5 to 8.

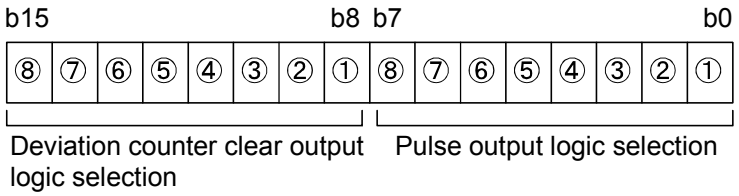
*3: To the Speed-position switching signal/Retry switch signal (CHG/RTRY), both switches which are user-defined as CHG and RTRY for the system can be connected.

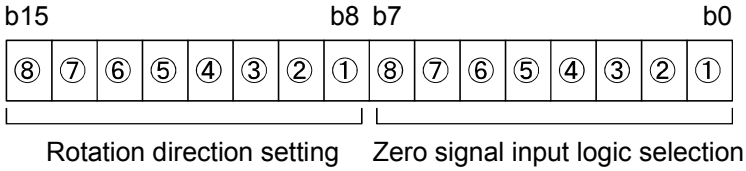
6. Setting from GX Developer

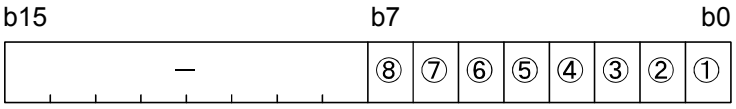
Settings for QD70D pulse output mode, external input/output signal logic, and rotation direction can be made by the GX Developer intelligent function module switch setting.
Use the GX Developer's I/O assignment setting to make the intelligent function module switch setting.

- The intelligent function module switch has switches 1 to 5, and is set at 16 bit data.
- If the intelligent function module switch setting is not operated, the default setting for switches 1 to 5 is 0.

<table>
<tr><th>Switch No.</th><th>Setting items</th><th>Setting details/bit assignment</th></tr>
<tr><td>Switch 1</td><td>Pulse output mode</td><td> 

①to⑧indicate axis No.
00:CW/CCW mode 10:A phase/B phase (muitiple of 1)
01:PULSE/SIGN mode 11:A phase/B phase (muitiple of 4)</td></tr>
<tr><td rowspan="2">Switch 2</td><td>Pulse output logic selection</td><td rowspan="2"> 

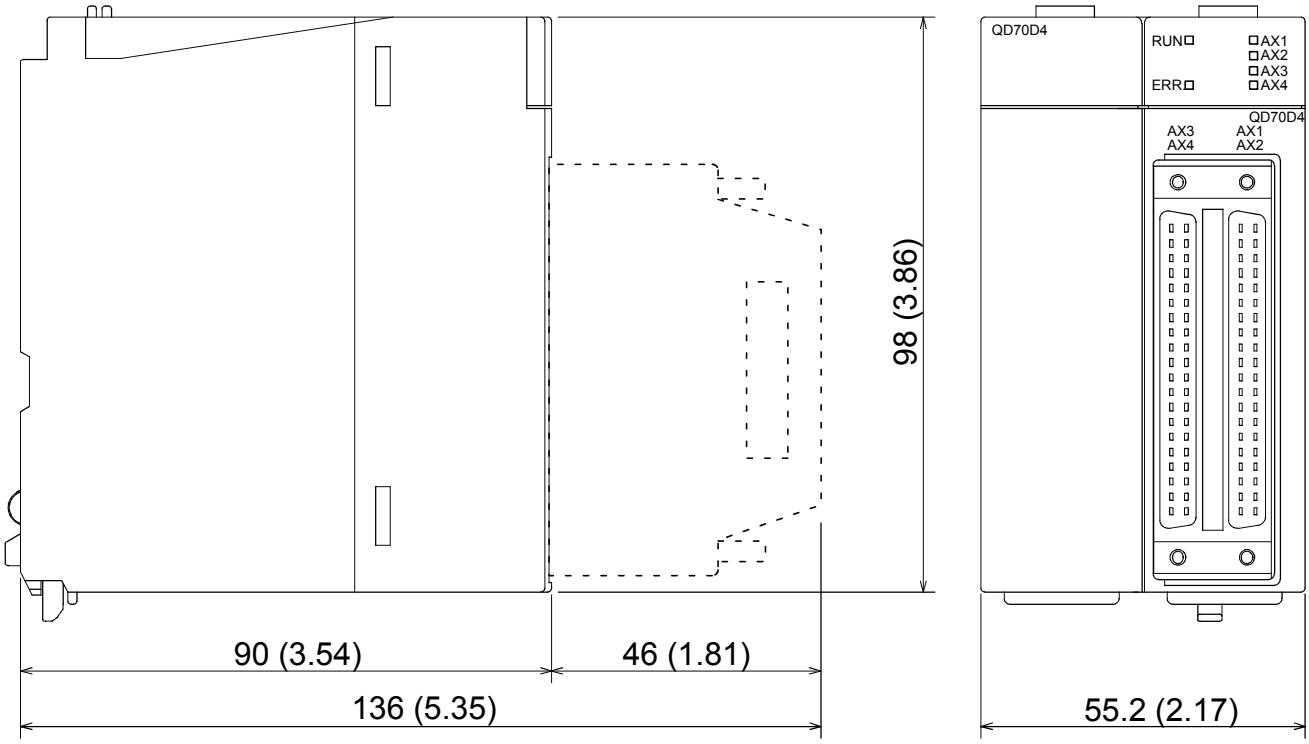
①to⑧indicate axis No.
0:Negative logic
1:Positive logic</td></tr>
<tr><td>Deviation counter clear output logic selection</td></tr>
<tr><td rowspan="2">Switch 3</td><td>Zero signal input logic selection</td><td rowspan="2"> 

①to⑧indicate axis No.
<Rotation direction setting>
0:Current value increment with foward run pulse output
1:Current value increment with reverse run pulse output
<Zero signal input logic selection>
0:Negative logic
1:Positive logic</td></tr>
<tr><td>Rotation direction setting</td></tr>
<tr><td>Switch 4</td><td>Near-point dog signal input logic selection</td><td> 

①to⑧indicate axis No.
0:Negative logic
1:Positive logic</td></tr>
<tr><td>Switch 5</td><td colspan="2">Vacant</td></tr>
</table>

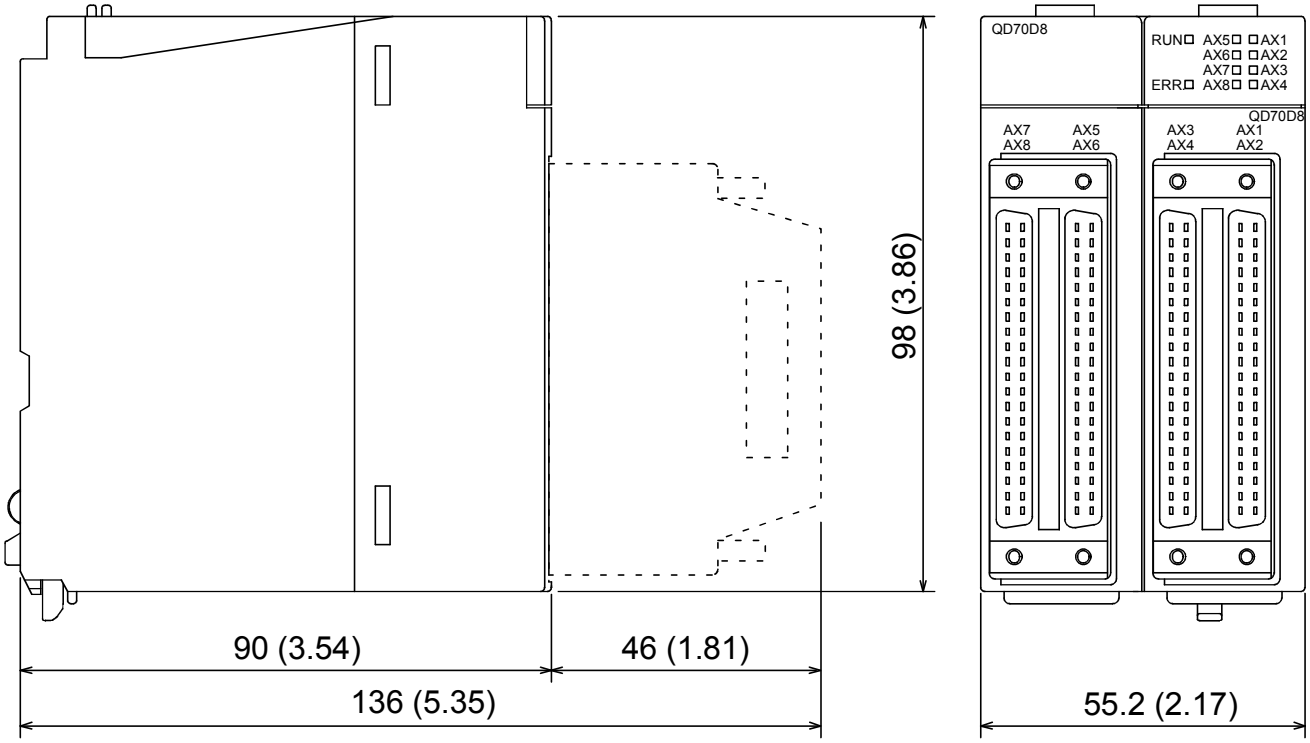
7. External Dimensions

(1) QD70D4



Unit:mm (in.)

(2) QD70D8



Unit:mm (in.)

Warranty

Mitsubishi will not be held liable for damage caused by factors found not to be the cause of Mitsubishi; machine damage or lost profits caused by faults in the Mitsubishi products; damage, secondary damage, accident compensation caused by special factors unpredictable by Mitsubishi; damages to products other than Mitsubishi products; and to other duties.

⚠For safe use

- This product has been manufactured as a general-purpose part for general industries, and has not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the product for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult with Mitsubishi.
- This product has been manufactured under strict quality control. However, when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.

Country/Region	Sales office/Tel
U.S.A	Mitsubishi Electric Automation Inc. 500 Corporate Woods Parkway Vernon Hills, IL 60061, U.S.A. Tel : +1-847-478-2100
Brazil	MELCO-TEC Rep. Com.e Assessoria Tecnica Ltda. Rua Correia Dias, 184, Edificio Paraiso Trade Center-8 andar Paraiso, Sao Paulo, SP Brazil Tel : +55-11-5908-8331
Germany	Mitsubishi Electric Europe B.V. German Branch Gothaer Strasse 8 D-40880 Ratingen, GERMANY Tel : +49-2102-486-0
U.K	Mitsubishi Electric Europe B.V. UK Branch Travellers Lane, Hatfield, Hertfordshire., AL10 8XB, U.K. Tel : +44-1707-276100
Italy	Mitsubishi Electric Europe B.V. Italian Branch Centro Dir. Colleoni, Pal. Perseo-Ingr.2 Via Paracelso 12, I-20041 Agrate Brianza., Milano, Italy Tel : +39-039-60531
Spain	Mitsubishi Electric Europe B.V. Spanish Branch Carretera de Rubi 76-80, E-08190 Sant Cugat del Valles, Barcelona, Spain Tel : +34-93-565-3131
France	Mitsubishi Electric Europe B.V. French Branch 25, Boulevard des Bouvets, F-92741 Nanterre Cedex, France TEL: +33-1-5568-5568
South Africa	Circuit Breaker Industries Ltd. Private Bag 2016, ZA-1600 Isando, South Africa Tel : +27-11-928-2000

Country/Region	Sales office/Tel
Hong Kong	Mitsubishi Electric Automation (Hong Kong) Ltd. 10th Floor, Manulife Tower, 169 Electric Road, North Point, Hong Kong Tel : +852-2887-8870
China	Mitsubishi Electric Automation (Shanghai) Ltd. 4/F Zhi Fu Plazz, No.80 Xin Chang Road, Shanghai 200003, China Tel : +86-21-6120-0808
Taiwan	Setsuyo Enterprise Co., Ltd. 6F No.105 Wu-Kung 3rd.Rd, Wu-Ku Hsiang, Taipei Hsine, Taiwan Tel : +886-2-2299-2499
Korea	Mitsubishi Electric Automation Korea Co., Ltd. 1480-6, Gayang-dong, Gangseo-ku Seoul 157-200, Korea Tel : +82-2-3660-9552
Singapore	Mitsubishi Electric Asia Pte, Ltd. 307 Alexandra Road #05-01/02, Mitsubishi Electric Building, Singapore 159943 Tel : +65-6470-2460
Thailand	Mitsubishi Electric Automation (Thailand) Co., Ltd. Bang-Chan Industrial Estate No.111 Moo 4, Serithai Rd, T.Kannayao, A.Kannayao, Bangkok 10230 Thailand Tel : +66-2-517-1326
Indonesia	P.T. Autoteknindo Sumber Makmur Muara Karang Selatan, Block A/Utara No.1 Kav. No.11 Kawasan Industri Pergudangan Jakarta - Utara 14440, P.O.Box 5045 Jakarta, 11050 Indonesia Tel : +62-21-6630833
India	Messung Systems Pvt, Ltd. Electronic Sadan NO:III Unit No15, M.I.D.C Bhosari, Pune-411026, India Tel : +91-20-2712-3130
Australia	Mitsubishi Electric Australia Pty. Ltd. 348 Victoria Road, Rydalmere, N.S.W 2116, Australia Tel : +61-2-9684-7777

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE : TOKYO BUILDING, 2-7-3 MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN
NAGOYA WORKS : 1-14, YADA-MINAMI 5-CHOME, HIGASHI-KU, NAGOYA, JAPAN

When exported from Japan, this manual does not require application to the Ministry of Economy, Trade and Industry for service transaction permission.

Specifications subject to change without notice.
Printed in Japan on recycled paper.