MITSUBISHI

Multichannel High-Speed Counter Module

User's Manual
(Hardware)

QD63P6

Thank you for purchasing the Mitsubishi programmable controller MELSEC-Q series.

Prior to use, please read this and relevant manuals thoroughly to fully understand the product.

● SAFETY PRECAUTIONS ●

(Always read these instructions before using this equipment.)

Before using this product, please read this manual and the relevant manuals
introduced in this manual carefully and pay full attention to safety to handle the
product correctly.

The instructions given in this manual are concerned with this product. For the
safety instructions of the programmable controller system, please read the User's
Manual for the CPU module.

In this manual, the safety instructions are ranked as "DANGER" and "CAUTION".

| ⬦ **DANGER** | Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury. |
| ⚠ **CAUTION** | Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical damage. |

Note that the ⚠ CAUTION level may lead to a serious consequence according
to the circumstances.

Always follow the instructions of both levels because they are important to
personal safety.

Please save this manual to make it accessible when required and always forward
it to the end user.

[Design Precautions]

⚠CAUTION

● Do not bunch the control wires or pulse input lines with the main circuit or
power wires, or install them close to each other.They should be installed 150
mm (5.91 inch) or more from each other.Not doing so could result in noise
that would cause erroneous operation.

[Installation Precautions]

⚠ CAUTION

● Use the programmable controller in the environment conditions given in the general specifications of the User's Manual for the CPU module.
Using this programmable controller in an environment outside the range of the general specifications could result in electric shock, fire, erroneous operation, and damage to or deterioration of the product.

● While pressing the installation lever located at the bottom of module, insert the module fixing tab into the fixing hole in the base unit until it stops. Then, securely mount the module with the fixing hole as a supporting point.
Incorrect loading of the module can cause a malfunction, failure or drop.
When using the programmable controller in the environment of much vibration, tighten the module with a screw.

● Tighten the screw in the specified torque range.
Undertightening can cause a drop, short circuit or malfunction.
Overtightening can cause a drop, short circuit or malfunction due to damage to the screw or module.

● Completely turn off the externally supplied power used in the system before mounting or removing the module.
Not completely turning off all power could result in electric shock or damage to the product.

● Do not directly touch the module's conductive parts or electronic components.
Touching the conductive parts could cause an operation failure or give damage to the module.

[Wiring Precautions]

⚠CAUTION

● When wiring/connecting the connector, properly press, crimp or solder the connector using the tools specified by the manufactures and attach the connector to the module securely.

● Be sure there are no foreign substances such as sawdust or wiring debris inside the module.
  Such debris could cause fires, damage, or erroneous operation.

● The module has an ingress prevention label on its top to prevent foreign matter, such as wire offcuts, from entering the module during wiring.
  Do not peel this label during wiring.
  Before starting system operation, be sure to peel this label because of heat dissipation.

● Be sure to place the cables connected to the module in a duct or clamp them.
  If not, dangling cables may swing or inadvertently be pulled, resulting in damage to the module and/or cables, or malfunctions due to poor cable connection.

● When disconnecting the cable, do not pull it by holding the cable part.
  Disconnect the cable with connector with holding the connector plugged into the module. Pulling the cable part with the cable still connected to the module may cause a malfunction or damage to the module and/or cable.

● Always ground the shielded cable on the encoder side (relay box). Failure to do may cause a malfunction.

● When wiring in the programmable controller, be sure that it is done correctly by checking the product's rated voltage and the terminal layout.
  Connecting a voltage different from the rated voltage or incorrect wiring may result in a fire or failure.

Revisions

* The manual number is given on the bottom right of the cover.

Print date	*Manual number	Revision
Mar., 2007	IB(NA)-0800387-A	First edition
Aug., 2008	IB(NA)-0800387-B	Correction SAFETY PRECAUTIONS, ABOUT MANUAL, Compliance with the EMC and Low Voltage Directives, Chapter 1, Chapter 4, Chapter 5, Chapter 6, Section 3.1

CONTENTS

ABOUT MANUAL

The following manual is also related to this product.
In necessary, order it by quoting the details in the tables below.

Related manual

Manual name	Manual No. (Model code)
Multichannel High-Speed Counter Module Type QD63P6 User's Manual	SH-080692ENG (13JZ03)

Compliance with the EMC and Low Voltage Directives

(1) For programmable controller system
To configure a system meeting the requirements of the EMC and Low Voltage Directives when incorporating the Mitsubishi programmable controller (EMC and Low Voltage Directives compliant) into other machinery or equipment, refer to Chapter 9 "EMC AND LOW VOLTAGE DIRECTIVES" of the QCPU User's Manual (Hardware Design, Maintenance and Inspection).
The CE mark, indicating compliance with the EMC and Low Voltage Directives, is printed on the rating plate of the programmable controller.

(2) For the product
To conform this product to the EMC and Low Voltage Directives, refer to Chapter 5 "EXTERNAL WIRING".

1. OVERVIEW

This manual describes the specifications and part for the type QD63P6
multichannel high-speed counter module (hereinafter abbreviated as
QD63P6) that is used together with the MELSEC-Q series CPU module.

2. PERFORMANCE SPECIFICATIONS

The following table shows the performance specifications of the QD63P6.

Table 2.1 Performance specifications

<table>
<tr><td colspan="2" rowspan="2">Item</td><td colspan="3">Model</td></tr>
<tr><td colspan="3">QD63P6</td></tr>
<tr><td colspan="2">Counting speed switch setting[*1]</td><td>200 k
(100 k to 200 kPPS)</td><td>100 k
(10 k to 100 kPPS)</td><td>10 k
(10 kPPS or less)</td></tr>
<tr><td colspan="2">Number of occupied I/O points</td><td colspan="3">32 points (I/O assignment: Intelligent 32 points)</td></tr>
<tr><td colspan="2">Number of channels</td><td colspan="3">6 channels</td></tr>
<tr><td rowspan="2">Count input signal</td><td>Phase(ϕA, ϕB)</td><td colspan="3">1-phase input, 2-phase input</td></tr>
<tr><td>Signal level</td><td colspan="3">5 VDC 6.4 to 11.5 mA</td></tr>
<tr><td rowspan="5">Counter</td><td>Counting speed (max.)[*2]</td><td>200 kPPS</td><td>100 kPPS</td><td>10 kPPS</td></tr>
<tr><td>Counting range</td><td colspan="3">32-bit signed binary (-2147483648 to 2147483647)</td></tr>
<tr><td>Model</td><td colspan="3">UP/DOWN preset counter + Ring counter function</td></tr>
<tr><td>Minimum count pulse width (Duty ratio 50 %)</td><td>5
2.5 2.5
(Unit: μs)</td><td>10
5 5
(Unit: μs)</td><td>100
50 50
(Unit: μs)</td></tr>
<tr><td></td><td>(Minimum phase difference for 2-phase input: 1.25 μs)</td><td>(Minimum phase difference for 2-phase input: 2.5 μs)</td><td>(Minimum phase difference for 2-phase input: 25 μs)</td></tr>
<tr><td rowspan="3">Coincidence output</td><td>Comparison range</td><td colspan="3">32-bit signed binary</td></tr>
<tr><td>Comparison result</td><td colspan="3">Setting value < Count value, Setting value = Count value, Setting value > Count value</td></tr>
<tr><td>Interrupt</td><td colspan="3">With coincidence detection interrupt function</td></tr>
<tr><td colspan="2">Applicable connector[*3]</td><td colspan="3">A6CON1 (soldering type, straight out)
A6CON2 (crimp type, straight out)
A6CON4 (soldering type, usable for both straight out and diagonal out)</td></tr>
<tr><td colspan="2">5 VDC internal current consumption</td><td colspan="3">0.59 A</td></tr>
<tr><td colspan="2">Weight</td><td colspan="3">0.15 kg</td></tr>
</table>

*1 Make the counting speed switch setting with intelligent function module switch.

*2 Counting speed is affected by pulse rise and fall time.
Countable speeds are shown in Table 2.2. Note if a pulse with long rise and/or fall time is counted, a miscount may occur.

*3 The A6CON3 connector (crimp type, straight out) cannot be used for the QD63P6.

Table 2.2 Relation between rise/fall time and counting speed

Counting speed switch setting	200 k	100 k	10 k
Rise/fall time	Both 1 and 2-phase input		
t = 1.25 μs or less	200 kPPS	100 kPPS	10 kPPS
t = 2.5 μs or less	100 kPPS	100 kPPS	10 kPPS
t = 25 μs or less	-	10 kPPS	10 kPPS
t = 500 μs	-	-	500 PPS
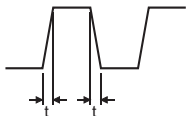
Remarks

For general specifications of the QD63P6, refer to the User's Manual for the CPU module.

3. IMPLEMENTATION AND INSTALLATION

3.1 Handling Precautions

The following explains the precautions for handling the module.

(1) Do not drop the module case and/or connector or apply a strong impact to it.

(2) Do not remove the printed-circuit board of the module from the case.
Doing so will cause failure.

(3) Be sure there are no foreign substances such as sawdust or wiring debris inside the module.
Such debris could cause fires, damage, or erroneous operation.

(4) The module has an ingress prevention label on its top to prevent foreign matter, such as wire offcuts, from entering the module during wiring.
Do not peel this label during wiring.
Before starting system operation, be sure to peel this label because of heat dissipation.

(5) Tighten the fixing screws within the following torque ranges.
Undertightening can cause a drop, short circuit or malfunction.
Overtightening can cause a drop, short circuit or malfunction due to damage to the screw or module.

Table 3.1 Tightening torque range of module fixing screw

Screw	Tightening torque range
Module fixing screw (M3)[*1]	0.36 to 0.48 N·m
Connector screw (M2.6 screw)	0.20 to 0.29 N·m

* 1 The module can be easily mounted to a base unit, using the hook on the upper part of the module.However, it is recommended to secure it with the module fixing screws when used in an environment where constant vibrations may occur.

(6) When mounting the module to the base unit, insert the module fixing projection into the fixing hole in the base unit, and mount the module with using the hole as a supporting point.
Incorrect module mounting may cause a malfunction, failure, or drop of the module.

3.2 Installation Environment

Refer to the User's Manual for the CPU module.

4. PART NAMES
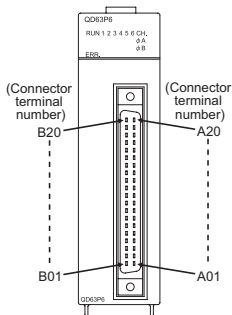
The following explains the part names of the QD63P6.

Figure 4.1 Appearance of the QD63P6

Table 4.1 Part names

LED name	Description
RUN	Indicates operation status of the QD63P6. ON: Normal operation OFF: Watchdog timer error
ERR.	Indicates error status of the QD63P6. ON: Error at 1 or later CH OFF: All channels in normal operation
ϕA_CH1 to CH6	Indicates input status of A-phase pulse terminal. ON: Pulse ON OFF: Pulse OFF
ϕB_CH1 to CH6	Indicates input status of B-phase pulse terminal. ON: Pulse ON OFF: Pulse OFF

Table 4.2 Terminal layout of each channel

Signal name	Terminal number		Signal name
Reserved	B20	A20	Reserved
CH1 Phase A pulse input -	B19	A19	CH1 Phase A pulse input +
CH1 Phase B pulse input -	B18	A18	CH1 Phase B pulse input +
Reserved	B17	A17	Reserved
CH2 Phase A pulse input -	B16	A16	CH2 Phase A pulse input +
CH2 Phase B pulse input -	B15	A15	CH2 Phase B pulse input +
Reserved	B14	A14	Reserved
CH3 Phase A pulse input -	B13	A13	CH3 Phase A pulse input +
CH3 Phase B pulse input -	B12	A12	CH3 Phase B pulse input +
Reserved	B11	A11	Reserved
CH4 Phase A pulse input -	B10	A10	CH4 Phase A pulse input +
CH4 Phase B pulse input -	B09	A09	CH4 Phase B pulse input +
Reserved	B08	A08	Reserved
CH5 Phase A pulse input -	B07	A07	CH5 Phase A pulse input +
CH5 Phase B pulse input -	B06	A06	CH5 Phase B pulse input +
Reserved	B05	A05	Reserved
CH6 Phase A pulse input -	B04	A04	CH6 Phase A pulse input +
CH6 Phase B pulse input -	B03	A03	CH6 Phase B pulse input +
Reserved	B02	A02	Reserved
Reserved	B01	A01	Reserved

5. EXTERNAL WIRING

5.1 Wiring Precautions

(1) Inputting a signal of different voltage may result in a malfunction or mechanical failure.

(2) For 1-phase input, always perform pulse input wiring on the phase A side.

(3) When pulse status noise is input, the QD63P6 may miscount.

(4) Take the following measures against noise for high-speed pulse input.

    (a) Always use a shielded twisted pair cable and provide grounding.

    (b) Wire the shielded twisted pair cables so as not to be in parallel with wires causing much noise such as power lines or I/O wires while keeping a distance of at least 150 mm (5.91 inch) between such wires. Also install the shielded twisted pair cables as short as possible.

(5) When wiring the QD63P6 and an encoder, separate the power supplycable and signal line.

(6) To conform the wiring to the EMC and Low Voltage Directives, ground the shielded twisted pair cables to a control panel with the AD75CK cable clamp (manufactured by Mitsubishi Electric Corporation).
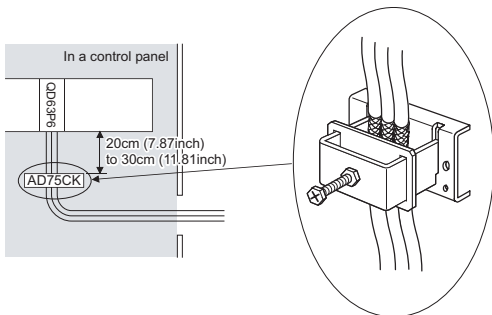
Figure 5.1 AD75CK cable clamp

5.2 External Wiring

Example of wiring the module and an encoder

(1) Example of wiring with an encoder of open collector output type (5 VDC)
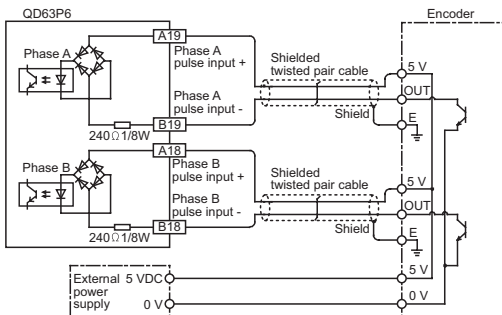

Figure 5.2 Example of wiring with an encoder (5 VDC)

POINT

When wiring the QD63P6 and an encoder, separate the power supply cable and signal line.
The following diagram shows an example of wiring with Phase A (Wire Phase B as well).
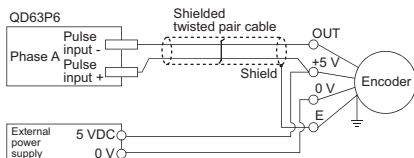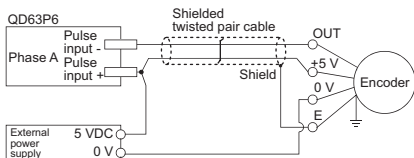
[Wiring example]

Figure 5.3 Wiring example

[Incorrect wiring example]

Since the current through the shielded twisted pair cable flows in the same direction, canceling effect does not work, which results in susceptibility to electromagnetic induction.

Figure 5.4 Incorrect wiring example

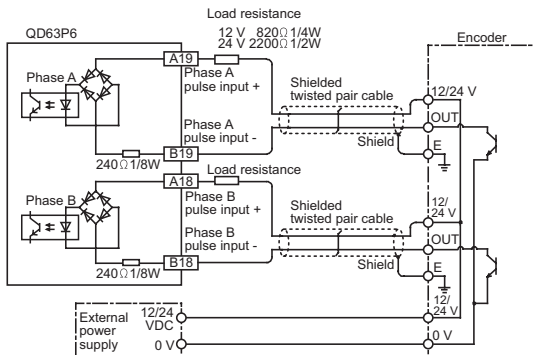(2) Example of wiring with an encoder of open collector output type
(12/24 VDC)

Figure 5.5 Example of wiring with an encoder (12/24 VDC)

According to external power supply voltage, connect load resistance between each pulse input terminal of the QD63P6 and shielded twisted pair cable.

The following table shows conditions on load resistance.

Table 5.1 Conditions on load resistance

External voltage [V]	Load resistance [Ω]	Capacity [W]	Tolerance [%]
12	820	1/4	±5
24	2200	1/2	±5

When wiring the QD63P6 and an encoder, separate the power supply cable and signal line.

The following diagram shows an example of wiring with Phase A (Wire Phase B as well).
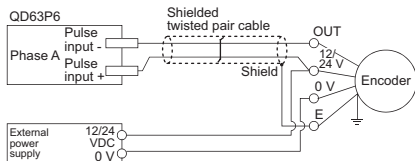
[Wiring example]

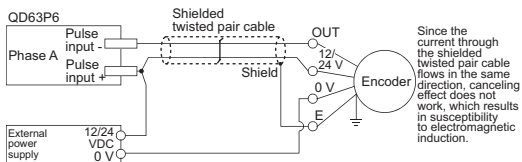Figure 5.6 Wiring example

[Incorrect wiring example]

Since the current through the shielded twisted pair cable flows in the same direction, canceling effect does not work, which results in susceptibility to electromagnetic induction.

Figure 5.7 Incorrect wiring example

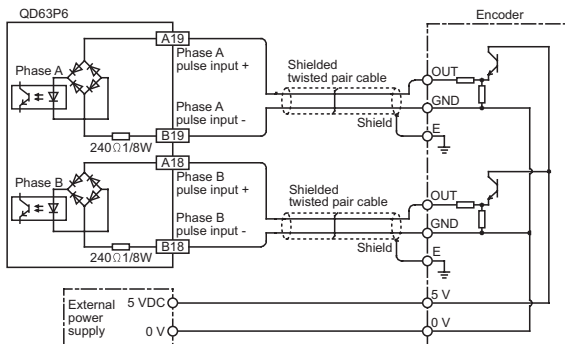(3) Example of wiring with an encoder of voltage output type (5 VDC)

Figure 5.8 Example of wiring with an encoder (5 VDC)

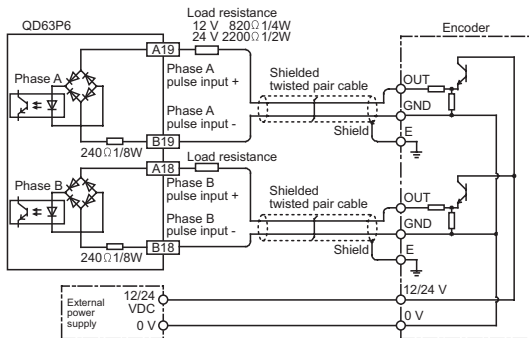(4) Example of wiring with an encoder of voltage output type (12/24 VDC)

Figure 5.9 Example of wiring with an encoder (12/24 VDC)

According to external power supply voltage, connect load resistance between each pulse input terminal of the QD63P6 and shielded twisted pair cable.

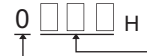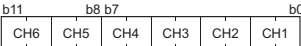The following table shows conditions on load resistance.
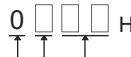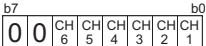
Table 5.1 Conditions on load resistance

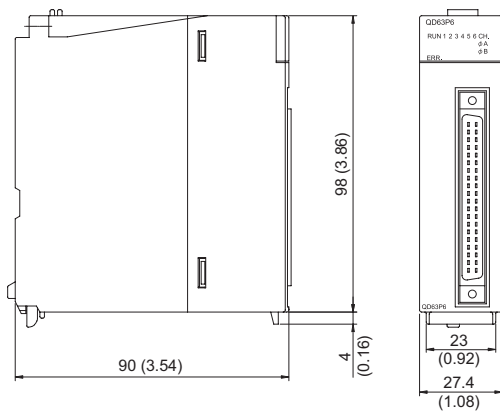| External voltage [V]	Load resistance [Ω]	Capacity [W]	Tolerance [%]
12	820	1/4	±5
24	2200	1/2	±5

5.3 Intelligent Function Module Switch Settings

The switch setting is made on the [I/O assignment] screen of GX Developer.

Table 5.3 Intelligent function module switch

	Setting item	Setting value	Default
Switch 1	Pulse input mode □□□□ H CH4 CH3 CH2 CH1	Pulse input mode 0H : 1 multiple of 1 phase 1H : 2 multiples of 1 phase 2H : CW/CCW 3H : 1 multiple of 2 phases 4H : 2 multiples of 2 phases 5H : 4 multiples of 2 phases	0000H
Switch 2	Pulse input mode 0 0 □□ H Reserved: CH6 CH5 Fixed to 0		0000H
Switch 3	Counting speed setting 0 □□□ H ↑ ↑ Reserved: Fixed to 0	Counting speed setting Set the following bit pattern with hexadecimal. b11 b8 b7 b0 | CH6 | CH5 | CH4 | CH3 | CH2 | CH1 | 00 : 10 kpps 01 : 100 kpps 10 : 200 kpps Example) CH1 and 2 : 200 kpps, CH3 : 100 kpps, CH4 to 6 : 10 kpps 00 00 00 01 10 10 → 001AH	0000H
Switch 4	Counter format Present value selection setting 0 □□□ H ↑ ↑ ↑ Reserved: Fixed to 0	Counter format Set the following bit pattern with hexadecimal. b7 b0 | 0 | 0 | CH6 | CH5 | CH4 | CH3 | CH2 | CH1 | 0 : Linear counter 1 : Ring counter Example) Linear counter: CH1, CH2, and CH5 Ring counter : CH3, CH4, and CH6 00101100 → 2CH Present value selection setting 0 : Present value A 1 : Present value B	0000H
Switch 5	Reserved: Fixed to 0		

11

6. EXTERNAL DIMENSIONS

Unit: mm (inch)

Figure 6.1 External dimensions

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, 11550 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 : +91-20-2712-9130
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.