# MITSUBISHI

# PROFIBUS-DP
# Master Module

## User's Manual
### (Hardware)

# QJ71PB92V

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

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

MELSEC-Q
Mitsubishi Programmable Logic Controller

| MODEL | QJ71PB92V-U-HW |
|---|---|
| MODEL CODE | 13JP82 |
| IB(NA)-0800324-A(0508)MEE | |

# ●SAFETY PRECAUTIONS●

(Be sure to read these instructions before use.)

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 CPU module user's manual.

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 minor or moderate injury or property 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]**

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### ⬦ **DANGER**

● When a communication error occurs on PROFIBUS-DP, the status of the faulty station is as shown below.
Create an interlock circuit in the sequence program using the communication status information to ensure the system operates safely (Input X1, buffer memory 5A20H to 5B19H (23072 to 23321)).
An erroneous output or malfunction may cause accidents.

   (1) The QJ71PB92V holds the input data before the communication failure.

   (2) When the QJ71PB92V has gone down, the output status of each DP-Slave is dependent on the QJ71PB92V parameter setting on GX Configurator-DP.

   (3) When a DP-Slave has gone down, the output status of the other DP-Slaves is dependent on the QJ71PB92V parameter setting on GX Configurator-DP.

● Do not output the "use prohibited" signal as the output signal to an intelligent function module from the PLC CPU.
Writing data into the "system area" or outputting a signal for "use prohibited" may cause system malfunction in the PLC.

● When a stop error has occurred on a CPU module, the communication status varies depending on the error time output mode setting of GX Developer as shown below.

   (1) When "Error time output mode" is set to "Hold"

      (a) Communications with DP-Slaves are continued.

      (b) Input data received from DP-Slaves are updated into the buffer memory of the QJ71PB92V.

      (c) For the output data sent from the QJ71PB92V to DP-Slaves, the values at the time of the CPU module stop error are held.

   (2) When "Error time output mode" is set to "Clear"

      (a) Communications with DP-Slaves are interrupted, and output data are not sent.

      (b) Input data received from DP-Slaves are held in the buffer memory of the QJ71PB92V.

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## [DESIGN PRECAUTIONS]

### ⚠ CAUTION

● Do not install PROFIBUS cables together with the main circuit or power lines or bring them close to each other.
  Keep a distance of 100mm (3.9inch) or more between them.
  Failure to do so may cause malfunctions due to noise.

## [INSTALLATION PRECAUTIONS]

### ⚠ CAUTION

● Use the PLC under the environment specified in the user's manual of the CPU module to be used.
  Otherwise, it may cause electric shocks, fires, malfunctions, product deterioration or damage.

● While pressing the installation lever located at the bottom of the module, insert the module fixing projection into the fixing hole in the base unit to mount the module.
  Incorrect mounting may cause malfunctions, a failure or a drop of the module.
  In an environment of frequent vibrations, secure the module with the screw.

● Tighten the screw within the specified torque range.
  If the screw is too loose, it may cause a drop of the module, a short circuit or malfunctions.
  Overtightening may damage the screw and/or the module, resulting in a drop of the module, a short circuit or malfunctions.

● Be sure to shut off all phases of the external power supply used by the system before mounting or removing the module.
  Failure to do so may damage the module.

● Do not directly touch the conductive part or electronic components of the module.
  Doing so may cause malfunctions or a failure of the module.

## [WIRING PRECAUTIONS]

### ◇ DANGER

● Be sure to shut off all phases of the external power supply used by the system before wiring PROFIBUS cables.
Failure to do so may result in failure or malfunctions of the module.

### ⚠ CAUTION

● Carefully prevent foreign matter such as dust or wire chips from entering the module.
Failure to do so may cause a fire, failure or malfunctions.

● Be sure to place the PROFIBUS cables in a duct or clamp them.
If not, dangling cables may be shifted or inadvertently pulled, resulting in damages to the module or cables or malfunctions due to poor cable contact.

● When disconnecting the PROFIBUS cable, do not pull it by holding the cable part.
Be sure to hold its connector which is plugged into the module.
Pulling the cable with it connected to the module may damage the module and/or cable, or cause malfunctions due to poor contact of the cable.

● A protective film is attached onto the module top to prevent foreign matter such as wire chips from entering the module when wiring.
Do not remove the film during wiring.
Remove it for heat dissipation before system operation.

**Revisions**

| Print Date | *Manual Number | Revision |
|---|---|---|
| Aug., 2005 | IB(NA)-0800324-A | First edition |
| | | |

# CONTENTS

## **Manuals**

The following manual is related with this product.
Please order it as necessary.

Relevant Manual

| Manual name | Manual Number. (Model code) |
|---|---|
| PROFIBUS-DP Master Module User's Manual | SH-080572ENG (13JR84) |

### **COMPLIANCE WITH THE EMC AND LOW VOLTAGE DIRECTIVES**

When incorporating the Mitsubishi PLC into other machinery or equipment and keeping compliance with the EMC and low voltage directives, refer to Chapter 3 "EMC Directive and Low Voltage Instruction" of the User's Manual (Hardware) supplied with your CPU module or base unit.

The CE logo is printed on the rating plate of the PLC, indicating compliance with the directives.

Note that no additional measures are necessary for this product to make compliance with the directives.

# MEMO

# 1. Overview

This manual is provided for handling the QJ71PB92V PROFIBUS-DP master module (hereinafter referred to as "QJ71PB92V").
First, open the package of the QJ71PB92V and check that the following is included.

Table 1.1 Packing List

| Model | Product name | Quantity |
|-------|-------------|----------|
| QJ71PB92V | QJ71PB92V PROFIBUS-DP master module | 1 |

# 2. Specification

The performance specifications of the QJ71PB92V are given below.
For the general specifications of the QJ71PB92V, refer to the QCPU User's Manual (Hardware Design, Maintenance and Inspection).

Table 2.1 Performance Specifications

| Item | | Specifications |
|------|---|---------------|
| PROFIBUS-DP station type | | DP-Master (Class 1) |
| Trasmission specifications | Electrical standard/ characteristics | EIA-RS485 compliant |
| | Medium | Shielded twisted pair cable (Refer to Section 5.1.) |
| | Network topology | Bus topology (Tree topology when repeaters are used) |
| | Data link method | • Between DP-Master: Token passing method<br>• Between DP-Master and DP-Slave: Polling method |
| | Encoding method | NRZ |
| | Transmission speed *1 | 9.6 kbps to 12Mbps (Refer to (1) in this chapter.) |
| | Transmission distance | Differs depending on the transmission speed (Refer to (1) in this chapter.) |
| | Max. No. of repeaters | 3 repeaters |
| | Max. No. of stations | 32 per segment (including repeater(s)) |
| | Max. No. of DP-Slaves | 125 per QJ71PB92V |

*1 The transmission speed is controlled within $\pm 0.2\%$. (Compliant with IEC 61158-2)

Table 2.1 Performance Specifications (Continued)

| Item | | | Specifications |
|---|---|---|---|
| Trasmission specifications | I/O data size | Input data | Max. 8192 bytes (Max. 244 bytes per DP-Slave) |
| | | Output data | Max. 8192 bytes (Max. 244 bytes per DP-Slave) |
| Number of writes to flash ROM | | | Max. 100000 times |
| No. of occupied I/O points | | | 32 (I/O assignment: 32 special points) |
| Internal current consumption (5V DC) | | | 0.57A |
| External dimensions | | | 98(3.86 in.)(H)×27.4(1.08 in.)(W)×90(3.54 in.)(D) [mm] |
| Weight | | | 0.13kg(0.29lb) |

(1) Transmission distance

Table 2.2 Transmission Distance

| Transmission speed | Transmission distance | Max. Transmission Distance when Repeater is Used *1 |
|---|---|---|
| 9.6kbps | 1200m(3937ft.)/segment | 4800m(15748ft.)/network |
| 19.2kbps | | |
| 93.75kbps | | |
| 187.5kbps | 1000m(3281ft.)/segment | 4000m(13123ft.)/network |
| 500kbps | 400m(1312ft.)/segment | 1600m(5249ft.)/network |
| 1.5Mbps | 200m(656ft.)/segment | 800m(2625ft.)/network |
| 3Mbps | 100m(328ft.)/segment | 400m(1312ft.)/network |
| 6Mbps | | |
| 12Mbps | | |

*1 The max. transmission distance in the table above is based on the case where 3 repeaters are used.

The calculation formula for the transmission distance extended using a repeater(s) is:

Max. transmission distance [m/network] = (No. of repeaters +1)×Transmission distance [m/segment]

# 3. Implementation and Installation

This section provides the handling precautions, from unpacking to installation of the QJ71PB92V.
For details on implementation and installation of the QJ71PB92V, refer to the "QCPU User's Manual (Hardware Design, Maintenance and Inspection)."

## 3.1 Handling precautions

The following are precautions for handling the QJ71PB92V as a unit.

(1) Do not drop the module case or subject it to heavy impact since it is made of resin.

(2) Do not remove the printed-circuit board of each from its case.
This may cause a failure in the module.

(3) Be careful not to let foreign objects such as wire burrs enter the module during wiring.
In the even any foreign object enters, remove it immediately.

(4) A protective film is attached onto the module top to prevent foreign matter such as wire chips entering the module during wiring.
Do not remove the film during wiring.
Remove it for heat dissipation before system operation.

(5) Before handling modules, touch a grounded metal object to discharge the static electricity from the human body.
Not doing so may cause failure or malfunctions of the module.

(6) Tighten the module fixing screws and connector screws using torque within the following ranges.

Table 3.1 Screw Tightening Torque

| Screw Location | Tightening Torque Range |
|---|---|
| Module fixing screw (M3 screw) | 0.36 to 0.48N•m |
| PROFIBUS cable connector screw (#4-40 UNC screws) | 0.20 to 0.28N•m |

3

### 3.2 Installation environment

Refer to the QCPU User's Manual (Hardware Design, Maintenance and Inspection).

# 4. Part Names and Settings

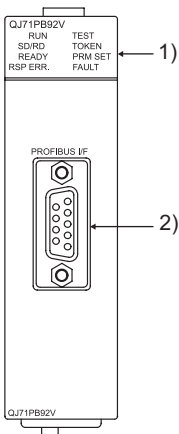This section explains the names and settings of each part of the QJ71PB92V.



Figure 4.1 QJ71PB92V Appearance

Table 4.1 Names of Part

| No. | Name | Description |
|-----|------|-------------|
| 1) | Indicator LEDs | These LEDs indicate the operation status of the QJ71PB92V. For details, refer to (1) in this chapter. |
| 2) | PROFIBUS interface connector | This connector connects the PROFIBUS cable to the QJ71PB92V.*1 |

*1 Use a D-Sub 9-pin male connector.
   The PROFIBUS cable is to be fabricated by users. (For details on cable wiring, refer to Section 5.1.)
   The applicable screw size is #4-40 UNC.

(1) Indicator LEDs



Figure 4.2 Indicator LEDs

Table 4.2 Indicator LEDs

| LED | Status | Description |
|---|---|---|
| RUN | ON | Normally operating |
| | OFF | Hardware error (watchdog timer error) or power failure |
| SD/RD | ON | Exchanging I/O data*1 or during acyclic communications *2 |
| | Flashing | |
| | OFF | Not communicating with DP-Slave |
| READY | ON | Ready to communicate or communication being performed |
| | OFF | Not ready to communicate or no communication |
| RSP ERR. | ON | A communication error has occurred. |
| | OFF | No communication error |
| TEST | ON | Executing self-diagnostics or flash ROM initialization |
| | Flashing | Executing self-diagnostics |
| | OFF | Not executing self-diagnostics or flash ROM initialization |
| TOKEN | ON | Token being passed*3 |
| | Flashing | |
| | OFF | No token passing*3 |
| PRM SET | ON | Operating in Parameter setting mode (mode 1) |
| | Flashing | Operating in operation mode other than Parameter setting mode (mode 1) |
| | OFF | |
| FAULT | ON | An error has occurred. |
| | OFF | Normally operating |

*1 The LED flashes at intervals based on the value set in "Data control time" in Master Parameters.

*2 The LED flashes at the time of request or response in acyclic communication.

*3 The LED status during token passing varies depending on the number of DP-Masters within the same network and the transmission speed setting, as shown the Table 4.3.

Table 4.3 TOKEN LED Status

| No. of DP-Masters within the same network | Transmission speed | |
|---|---|---|
| | 19.2kbps or less | 93.75kbps or more |
| 1 | ON | |
| More than 1 | Flashing | ON or OFF |

# 5. Wiring

## 5.1 PROFIBUS cable wiring

The following describes the pin assignments of the PROFIBUS interface connector on the QJ71PB92V, the PROFIBUS cable wiring specifications, bus terminator and other information.

(1) Pin assignments of the PROFIBUS interface connector
The following shows the pin assignments of the PROFIBUS interface connector (D-sub 9-pin female connector).
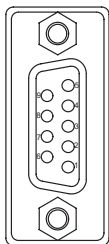


Figure 5.1 PROFIBUS Interface Connector

Table 5.1 Pin Assignments of the PROFIBUS Interface Connector

| Pin No. | Code | Name | Description | Cable color |
|---------|------|------|-------------|-------------|
| 1 | — | SHIELD *1 | Shield, protective ground | — |
| 2 | — | — | Open | — |
| 3 | B/B' | RxD/TxD-P | Receive/send data-P | Red |
| 4 | — | — | Open | — |
| 5 | C/C' | DGND *2 | Data Ground | — |
| 6 | — | VP *2 | Voltage + | — |
| 7 | — | — | Open | — |
| 8 | A/A' | RxD/TxD-N | Receive/send data-N | Green |
| 9 | — | — | Open | — |

*1 Optional signal
*2 Signal used to connect the bus terminator

(2) PROFIBUS cable
   The following shows the PROFIBUS cable and wiring specifications.

   (a) PROFIBUS cable
      Use a PROFIBUS cable that meets the following specifications
      (Type A (IEC 61158-2) compliant).

Table 5.2 PROFIBUS Cable Specifications

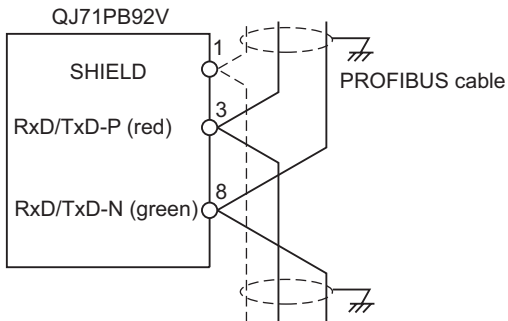| Item | Transmission line |
|---|---|
| Applicable cable | Shielded twisted pair cable |
| Impedance | 135 to 165$\Omega$(f = 3 to 20MHz) |
| Capacity | Less than 30pF/m |
| Conductor resistance | Less than 110$\Omega$/km |
| Cross-sectional area | 0.34mm$^2$ or more (22AWG) |

   (b) Wiring specifications



Figure 5.2 PROFIBUS cable Wiring Specifications

(3) Connector
   Use a D-sub 9-pin male connector for the PROFIBUS cable.
   The applicable screw size is #4-40 UNC.

(4) Wiring specifications for bus terminator

When the QJ71PB92V is a terminal station, use a connector with built-in bus terminator that meets the following wiring specifications.
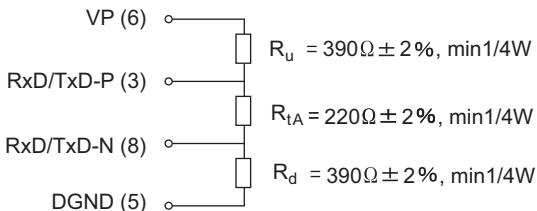


$$R_u = 390\,\Omega \pm 2\,\%,\ \text{min}1/4W$$

$$R_{tA} = 220\,\Omega \pm 2\,\%,\ \text{min}1/4W$$

$$R_d = 390\,\Omega \pm 2\,\%,\ \text{min}1/4W$$

Figure 5.3 Wiring Specifications for Bus Terminator

(5) PROFIBUS equipment

The PROFIBUS cables, connectors and other PROFIBUS equipment must be purchased or obtained at user's discretion.
For details on PROFIBUS equipment, access the following website.
・PROFIBUS International：http://www.profibus.com/

## 5.2 Wiring precautions

As one of the requirements to give full play to QJ71PB92V's functions and make up the system with high reliability, it is necessary to have an external wiring unsusceptible to an influence of noise.
The following gives the precautions for external wiring of the QJ71PB92V.

(1) Do not install the QJ71PB92V communication cable together with the main circuit, power lines and/or load carrying wires for other then the PLC, or bring them close.
Doing so may cause the QJ71PB92V to be affected by noise and surge induction.

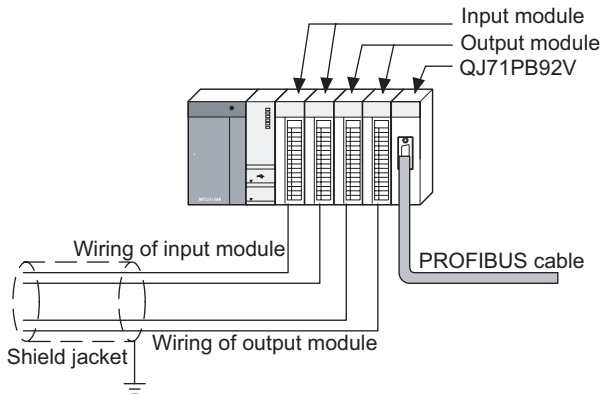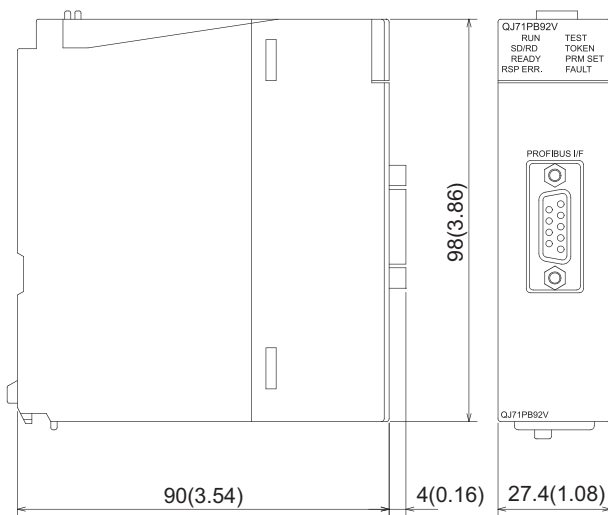(2) Keep the PROFIBUS cable away from I/O module cables as much as possible.



Figure 5.4 PLC Wiring

(3) For use of the QJ71PB92V, ground the FG and LG terminals of the PLC's power supply module.

# 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.

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