MELSEC System Q

Programmable Logic Controllers

User's Manual

MELSECNET/H
Interface Board
Q80BD-J71LP21GE

MITSUBISHI ELECTRIC INDUSTRIAL AUTOMATION

● 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.

Precautionary notes in this manual cover only the installation of this product.

For safety precautions on the PLC system, refer to the CPU 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 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.

[INSTALLATION PRECAUTIONS]

△CAUTION

- Use the MELSECNET/H board in an environment as described in the general specifications listed in this operating manual.
  If the board is used in an environment outside the ranges described in the general specifications, it may result in an electric shock, fire, malfunctioning, damage to or deterioration of the product.
- Always turn off all external power before installing or removing the MELSECNET/H board. If all power is not turned off, this will result in failure of the MELSECNET/H board or malfunctioning.
- Securely mount the MELSECNET/H board to the PCI bus slot of the mounting device. If the MELSECNET/H board is not mounted correctly, this may lead to malfunctioning, failure or cause the board to fall.
- When mounting the MELSECNET/H board, take care not to become injured by the components that are installed or surrounding materials.
- Always make sure to touch the grounded metal to discharge the electricity charged in the body, etc., before touching the MELSECNET/H board. Failure to do so may cause a failure or malfunctions of the MELSECNET/H board.

[WIRING PRECAUTIONS]

◇ DANGER
● Always turn off all external power before performing work such as installing the MELSECNET/H board and wiring. If all power is not turned off, there is a risk of electric shock or damage to the product. ● When turning on the power and operating the module after having installed the MELSECNET/H board and doing the wiring, always attach the cover for the device module in which the MELSECNET/H board is installed. There is a risk of electric shock if the module cover is not attached.

⚠ CAUTION
● Solder the coaxial cable's connector properly. Improper soldering may cause the module to malfunction. ● Take care that foreign objects such as chips or wiring debris do not get on the MELSECNET/H board. This can result in fire, breakdowns or malfunctioning. ● Insert the communication cable securely into the MELSECNET/H board connector. After it has been inserted, check to make sure that it is not being lifted up. A faulty connection can lead to faulty input or output. ● For the communication cable, specialized skills and tools are required to connect the plug and cable. The connector plug itself is a custom part. When purchasing, consult with the nearest Mitsubishi Electric System Services, Inc. If the connection is incomplete, this can result in a short, fire or malfunctioning.

Revisions

Print Date	*Manual Number	Revision
Mar., 2001	IB(NA)-0800188-A	First edition
Jun., 2001	IB(NA)-0800188-B	Correction Section 7.1, Section 8.1
Feb., 2002	IB(NA)-0800188-C	Correction Chapter 3, Chapter 5
Dec., 2002	IB(NA)-0800188-D	Correction SAFETY PRECAUTIONS, Section 7.1, Section 7.2, Section 8.1, Chapter 9

CONTENTS

About the Manuals

The following manuals are also related to this product.
In necessary, order them by quoting the details in the tables below.

| Related Manuals |

Manual name	Manual No. (Model code)
MELSECNET/H Interface Board User's Manual (For SW0DNC-MNETH-B) The system configuration, software package installation, uninstallation and each utility's operation method, accessible range, devices and troubleshooting are explained. (Option)	SH-080128 (13JT25)
Q corresponding MELSECNET/H Network System Reference Manual (PLC to PLC network) The MELSECNET/H network system's system configuration, performance specifications, functions, handling, wiring and troubleshooting are explained. (Option)	SH-080049 (13JF92)
Q/QnA/Q4AR corresponding MELSECNET/10 Network System Reference Manual The MELSECNET/10 network system's system configuration, performance specifications, functions, handling, wiring and troubleshooting are explained. (Option)	IB-66690 (13JF78)
A70BDE-J71QLP23/A70BDE-J71QLP23GE/ A70BDE-J71QLR13/A70BDE-J71QLR23 MELSECNET/10 Interface Board User's Manual (For SW3DNF-MNET10) The MELSECNET/10 board's system configuration, performance specifications, functions, handling, wiring and troubleshooting are explained. (Option)	IB-0800035 (13JL93)

Remarks : MELSECNET/H Interface Board User's Manual (For SW0DNC-MNETH-B) is enclosed with the CD-ROM as a set with the software package.
A printed version of the manual is available as an option. Indicate the manual No. (Model code) when placing an order for a printed version of the manual.

1. Outline

This manual explains the methods of handling the Q80BD-J71LP21GE MELSECNET/H interface board (hereinafter referred to as the MELSECNET/H board).
The MELSECNET/H board can be used as a control station or normal station in the MELSECNET/H network system (PLC to PLC network).
The MELSECNET/H board cannot be used in the remote I/O network.
Unpack the product and confirm that the following products are enclosed.

Part name	Quantity
	Q80BD-J71LP21GE
Type Q80BD-J71LP21GE MELSECNET/H Interface Board	1
SW0DNC-MNETH-B MELSECNET/H software package (CD-ROM)	1
MELSECNET/H Interface Board User's Manual (Hardware)	1
Software License Agreement	1

2. EMC Directive

For the products sold in European countries, the conformance to the EMC Directive, which is one of the European Directives, has been a legal obligation since 1996.
Manufacturers who recognize their products must conform to the EMC Directive are required to declare that their products conform to these Directives and put a "CE mark" on their products.

2.1 Requirements for conformance to EMC Directive

The EMC Directive specifies that products placed on the market must "be so constructed that they do not cause excessive electromagnetic interference (emissions) and are not unduly affected by electromagnetic interference (immunity) ". The applicable products are requested to meet these requirements. The sections 2.1.1 through 2.1.5 summarize the precautions on conformance to the EMC Directive of the machinery constructed using the MELSECNET/H Board.

The details of these precautions has been prepared based on the control requirements and the applicable standards . However, we will not assure that the overall machinery manufactured according to these details conforms to the above-mentioned directives. The method of conformance to the EMC directive and the judgment on whether or not the machinery conforms to the EMC Directive must be determined finally by the manufacturer of the machinery.

2.1.1 Standards applicable to the EMC Directive

The standards applicable to the EMC Directive are listed below.

All test items are carried out with the product mounted in a CE mark compliant personal computer.

Specification	Test item	Test details	Standard value
EN50081-2 : 1995	EN55011 Radiated noise	Electromagnetic emissions from the product are measured.	30M-230MHz QP : 30dB μ V/m (30 m in measurement range) *1 230M-1000MHz QP : 37 dB μ V/m (30 m in measurement range)
	EN55011 Conducted noise	Electromagnetic emissions from the product to the power line is measured.	150k-500kHz QP: 79 dB, Mean: 66 dB *1 500k-30MHz QP: 73 dB, Mean: 60 dB
EN61131-2 : 1996	EN61000-4-2 Electrostatic immunity	Immunity test in which static electricity is applied to the cabinet of the equipment.	15kV Aerial discharge
	EN61000-4-4 Fast transient burst noise	Immunity test in which burst noise is applied to the power line and signal lines.	Power line: 2kV Digital I/O (24V or higher): 1kV (Digital I/O (24V or less)) > 250V (Analog I/O, signal lines) > 250V
	EN61000-4-3 Radiated field AM modulation	Immunity test in which field is irradiated to the product.	10V/m, 26-1000MHz, 80%AM modulation@1kHz
	EN61000-4-12 Damped oscillatory wave immunity	Immunity test in which a damped oscillatory wave is superimposed on the power line.	Power line: 1kV Digital I/O (24V or higher): 1kV

*1: QP : Quasi-peak value, Mean : Average value

2.1.2 Installing into the control panel

Installing this module into the control panel is effective not only for ensuring safety, but also for shielding noise generated from the personal computer by the control panel.

   (1) Control cabinet

      (a) Use a conductive control cabinet.

      (b) When attaching the control cabinet's top plate or base plate, mask painting and weld so that good surface contact can be made between the cabinet and plate.

      (c) To ensure good electrical contact with the control cabinet, mask the paint on the installation bolts of the inner plate in the control cabinet so that contact between surfaces can be ensured over the widest possible area.

      (d) Earth the control cabinet with a thick wire so that a low impedance connection to ground can be ensured even at high frequencies.

      (e) Holes made in the control cabinet must be 10 cm (3.94 in.) diameter or less. If the holes are 10 cm (3.94 in.) or larger, radio frequency noise may be emitted.

          In addition, because radio waves leak through a clearance between the control panel door and the main unit, reduce the clearance as much as practicable.

          The leakage of radio waves can be suppressed by the direct application of an EMI gasket on the paint surface.

          Our tests have been carried out on a panel having the damping characteristics of 37 dB max. and 30 dB mean (measured by 3 m method with 30 to 300 MHz).

Maker name	Series type
KITAGAWA INDUSTRIES CO., LTD.	US series
ZIPPERTUBING (JAPAN) LTD.	71TS series
SEIWA ELECTRIC MFG CO., LTD.	E02S□□□A

          All tests carried out by Mitsubishi are carried out with a panel having maximum 37dB, average 30dB (30 to 300MHz, 3m dimension measurement) damping characteristics.

(2) Leading the power and earth wires

Lead the personal computer's earth and power wires as indicated below.

(a) Provide an earth point for the control panel near the personal computer's power supply, and earth the personal computer's FG terminal (FG: frame ground) with an earth wire (electric wire for earthing) as thick and short as possible (wire length should be approx. 30cm or shorter).

The FG terminal acts to relieve noise generated in the personal computer to the earth, so the earth wire impedance must be as low as possible.

As the earth wire acts to relieve the noise, the wire itself has a large noise element. Thus, the short wire acts to prevent the earth wire from functioning as an antenna.

(b) The earth wire led from the earthing point must be twisted with the power supply wires. By twisting with the earthing wire, noise flowing from the power supply wires can be relieved to the earthing. However, if a filter is installed on the power supply wires, the wires and the earthing wire may not need to be twisted.

2.1.3 Cables

The cables led from the control panel have a higher harmonic noise element.
Thus, the cables act as antennas outside the control panel and radiate noise.
Always use shielded cables for those cables led out of the control panel.
The shielded cable is also effective for increasing the noise withstand level.

(1) Treating the shielded cable's shield

   (a) Treat the shield near the outlet from the control panel.
       If the earth point is not near the outlet, the cables after the earth point will cause electromagnetic induction, and will generate a higher harmonic noise.

    (b) Peel part of the shielded cable's sheath, and earth a wide section of the exposed shielded section against the control panel.
       Clamp fittings can be used as shown below. Note that the painting on the inner side of the control panel, against which the clamp fitting is contacted, must be masked.
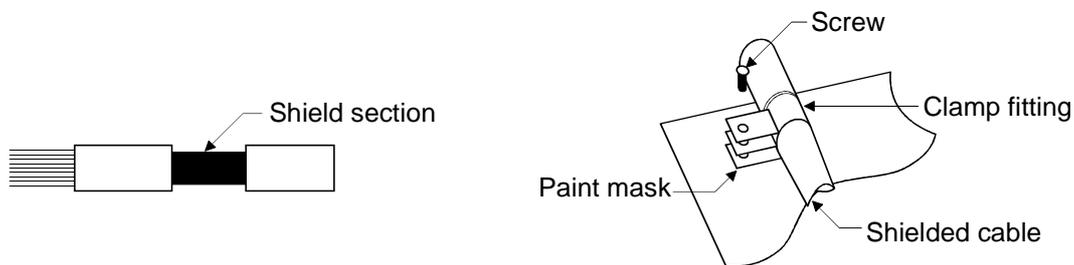
Note) The method of earthing by soldering a wire onto the shield section of the shielded cable as shown below is not recommended. The high frequency impedance will increase and the shield will be ineffective.
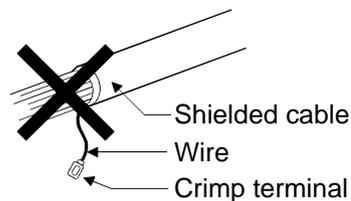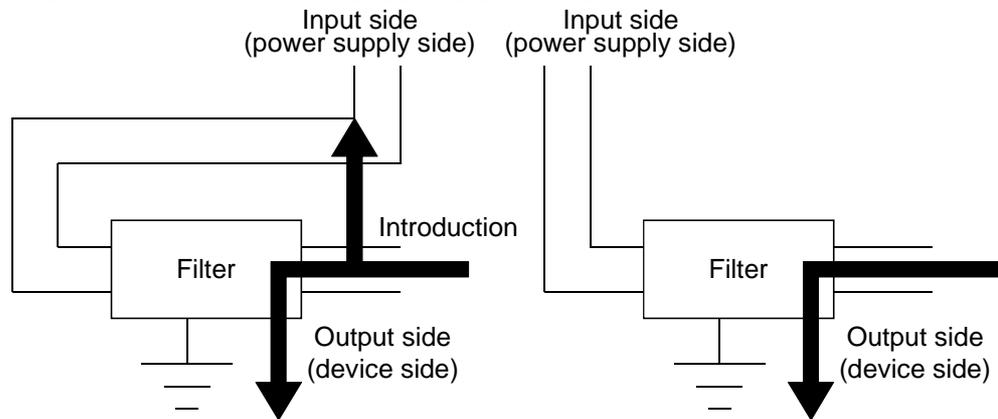
2.1.4 Noise filter (power supply line filter)

A noise filter is a component which has an effect on conducted noise. It is not required to fit the noise filter to the power supply line, but fitting it can further suppress noise.

(The noise filter has the effect of reducing conducted noise of 10 M Hz or less.)

The precautions required when installing a noise filter are described below.

64 Do not bundle the wires on the input side and output side of the noise filter. When bundled, the output side noise will be induced into the input side wires from which the noise was filtered.

Input side (power supply side)   Input side (power supply side)

Filter   Introduction   Filter

Output side (device side)   Output side (device side)

(a) The noise will be included when the input and output wires are bundled.

(b) Separate and lay the input and output wires.

(2) Earth the noise filter earthing terminal to the control cabinet with the shortest wire possible (approx. 10 cm (3.94 in.)).

Remarks

Reference noise filters are shown below.

Noise filter type	Maker name	Rated current	Rated voltage
FN343-3/01	SCHAFFNER	3A	250V
FN660-6-06		6A	
ZHC2203-11	TDK	3A	

3. Performance Specifications

The performance specifications of the MELSECNET/H board are given below.

Item		Specifications Q80BD-J71LP21GE
Maximum number of link points per network	LX/LY	8192 points
	LB	16384 points (During MELSECNET/10 mode[*1]: 8192 points)
	LW	16384 points (During MELSECNET/10 mode: 8192 points)
Maximum number of links per station		$((LY+LB)/8+(2\times LW)) \leqq 2000$ bytes
Communication speed		10Mbps
Number of stations connected per network		64 stations (one control stations, 63 normal stations)
Connection cable		Optical fiber cable
Overall cable distance		30km (98430 ft.)
Distance between stations		62.5 GI optical cable : 2km (6562 ft.)
Maximum number of networks		239
Maximum number of groups		32 (During MELSECNET/10 mode: 9)
Transmission path type		Double loop
Communication method		Token ring method
Synchronization method		Frame synchronization method
Coding method		NRZI coding (Non Return to Zero Inverted)
Transmission format		HDLC compliant (frame format)
Error control method		CRC ($X^{16} + X^{12} + X^5 + 1$) and retry with overtime
RAS function		Automatic return function, loop back function, control station shift function, etc.
Transient transmission		N:N communication
Special cyclic transmission		Low-speed cyclic transmission
Number of mountable boards		Maximum 4 boards [*2]
Mounting slot		PCI bus slot (half-size)
Occupied slot		1 slot
5VDC internal current consumption		0.45A
Weight		0.11kg

*1: The mode is set with the MELSECNET/H utility.
   Refer to the "MELSECNET/H Interface Board User's Manual (For SW0DNC-MNETH-B)" for details.
*2: The number of mountable boards is the total of the MELSECNET/H boards (Q80BD-J71LP21-25/Q80BD-J71LP21G/Q80BD-J71LP21GE/Q80BD-J71BR11) and MELSECNET /10 boards (A70BDE-J71QLP23(GE)/A70BDE-J71QBR13/A70BDE-J71QLR23).

� 4. Handling

This section explains precautions when handling the MELSECNET/H board and the installation environment.

4.1 Precautions when handling
The following are precautions to be noted when handling the MELSECNET/H board.

◇DANGER	● While energizing, do not touch the connector. Doing so may result in electric shock or cause malfunctioning.

⚠CAUTION	● Fasten the MELSECNET/H board securely using the installation screws and tighten the installation screws securely within the specified torque range. If the screws are loose, this may cause malfunctioning. If the screws are tightened too much, this could cause damage to the screws or unit, leading to malfunctioning. ● Do not directly touch the conductive section of the MELSECNET/H board. Doing so could result in malfunctioning or breakdown of the MELSECNET/H board. ● Handle the MELSECNET/H board in a location where there is no static electricity. Static electricity could result in failure or malfunctioning. ● The MELSECNET/H board is packed in a bag for preventing static electricity. Always place the MELSECNET/H board in this bag when storing or transporting. Otherwise, failure or malfunctioning may result. ● Take care that foreign objects such as chips or wiring debris do not get into the PC. This could result in fire, breakdowns or malfunctioning. ● Do not dismantle or rebuild the MELSECNET/H board. This will result in failure, malfunctioning, injury or fire. ● Always turn off all external power before installing or removing the MELSECNET/H board. If power is not turned off, there is a risk of electric shock or damage to the product. ● When disposing of the product, handle it as an industrial waste. ● Do not drop the MELSECNET/H board or subject it to strong impact. This will result in failure or malfunctioning of the board.

4.2 Installation environment
See the instruction manual accompanying the PC unit regarding installation of the PC unit in which the MELSECNET/H board is mounted.
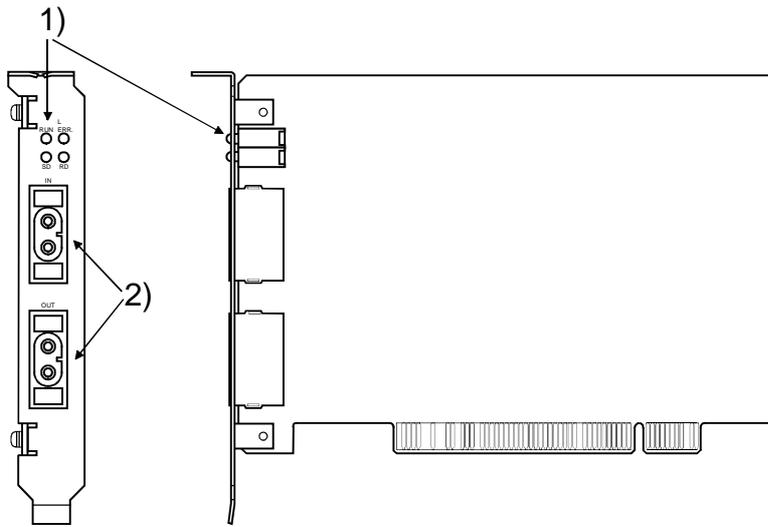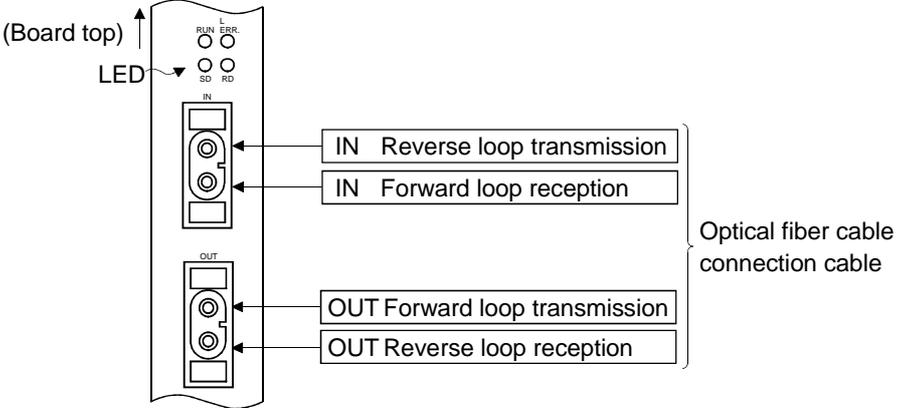
⚠CAUTION	● Always ground the PC unit using grounding type D (Class 3 grounding). Otherwise, there is the risk of malfunctioning.

5. Names of Each Part

The names of each MELSECNET/H board part are explained in this section.

Number	Name	Details
1)	Display LED L RUN ERR. ○　○ ○　○ SD　RD	This indicates the MELSECNET/H board operation status. The LED lighting status include the normal mode and error mode. (1) Normal mode 　If a communication error, etc., occurs in the normal mode, judge the error by reading the status of the LED on the MELSECNET/H Utility's "Board Information" screen. 　Refer to the "MELSECNET/H Interface Board User's Manual (For SW0DNC-MNETH-B)" for details on the "Board Information" LED statuses.

LED name	Status	Details
RUN	OFF	A WDT error has occurred, or the board is being reset.
RUN	ON	The board is operating normally.
L ERR.	OFF	A communication error has not occurred.
L ERR.	ON	A communication error has occurred.
SD	OFF	Data has not been received.
SD	ON	Data is being transmitted.
RD	OFF	Data has not been received.
RD	ON	Data is being transmitted.

Number	Name	Details
1)	Display LED L RUN ERR. ○ ○ ○ ○ SD RD	(2) Error mode When the RUN LED is flickering, the LED display will change to the error mode. If an error occurs in the error mode, check the details of the error with the Error Viewer or Event Viewer. Refer to the "MELSECNET/H Interface Board User's Manual (For SW0DNC-MNETH-B)" for details. LED status table below
2)	Optical fiber cable connection connector	This connector is used to connect the optical fiber cable. (1) The cable terminal has the following type of configuration. (2) Refer to the "MELSECNET/H Interface Board User's Manual (For SW0DNC-MNETH-B)" for details on wiring the optical fiber cable.

The LED status table (within row 1):

LED name	Status	Details
RUN	Flicker	The error mode has been entered.
	ON OFF	No error
L ERR.	OFF	OS starting error has occurred.
	ON	OS starting error has not occurred.
SD	OFF	Driver compatibility error has occurred.
	ON	Driver compatibility error has not occurred.
RD	OFF	PCI bus error has occurred.
	ON	PCI bus error has not occurred.

6. Wiring

The precautions for connecting the optical fiber cable with MELSECNET/H board in an optical loop system are given below.

> Remarks
>
>   Refer to the "MELSECNET/H Interface Board User's Manual (For SW0DNC-MNETH-B)" for details on the wiring method.

(1) When connecting an optical fiber cable, the following restrictions on the bending radius must be observed. Please confirm bending radius of the cable with the cable used.

(2) Please maintain the optical fiber cable permissible bending radius with a checking tool.
   Enquiries for the checking tool for optical fiber cable bending radius maintenance are handled by Mitsubishi Electric System Service Corporation. Please contact Mitsubishi Electric System Service Corporation for detail.

(3) When laying the opticalfiber cable, do not touch the fiber core of the cable connector or module connector, or let dirt or dust collect on it.
   If oil from the hands, dirt or dust should adhere to the core, the transmission loss will increase, causing a malfunction in the data link.

(4) When attaching or detaching the opticalfiber cable to/from the module, hold the cable connector securely with the hands.

(5) Connect the cable connector and module connector securely until you hear a "click" sound.
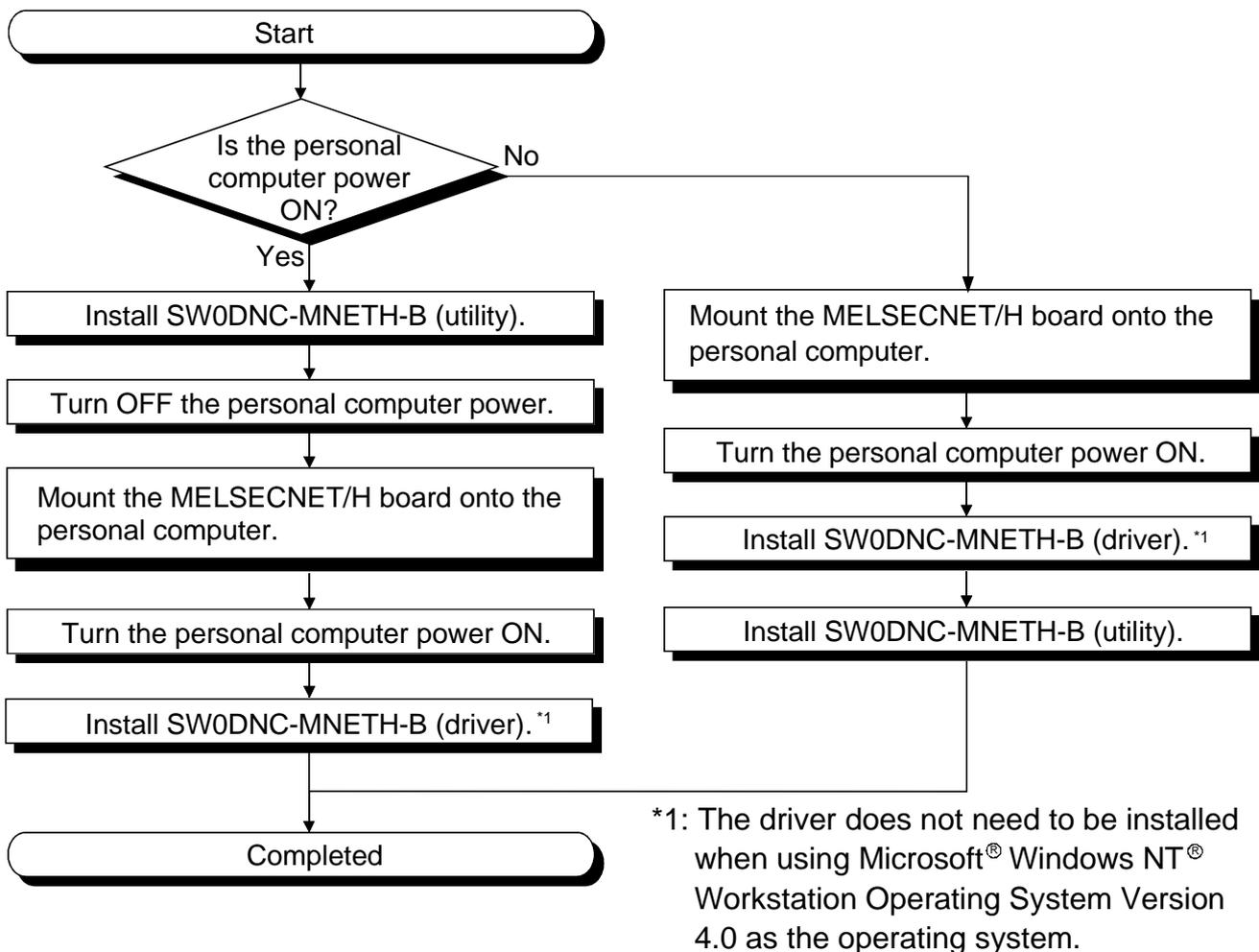
7. Installing Software Packages

The methods of installing the software package and the registered icons are explained in this section.
Refer to the "MELSECNET/H Interface Board User's Manual (For SW0DNC-MNETH-B)" for details on uninstalling the software and on installing by copying onto an FD.

7.1 Installation procedures

Refer to the "MELSECNET/H Interface Board User's Manual (For SW0DNC-MNETH-B)" for detailed installation procedures.

Point

(1) A multi-processor compatible personal computer cannot be used as the drivers are not compatible.
  Refer to the "MELSECNET/H Interface Board User's Manual (For SW0DNC-MNETH-B)" for details on the working environment.
(2) Log on as the user who has the Administrator attributes, when any of the following OSs is used.
  Microsoft® Windows NT® Workstation Operating System Version 4.0
  Microsoft® Windows® 2000 Professional Operating System
  Microsoft® Windows® XP Professional Operating System
(3) Make sure to close other applications running on Windows® (including resident software such as antivirus software) before installation.
(4) Remove all applications that are included in the Start up menu, then restart PC before installing.
(5) When the installation fails to complete successfully, and if software packages can be uninstalled, execute uninstall.
(6) If you want to reinstall the software package, turn off the personal computer after uninstalling the software package, them turn the personal computer back on and reinstall the software package.

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                    │        Start         │
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                     ╱  Is the personal  ╲         No
                     ╲  computer power    ╱──────────────────┐
                      ╲      ON?         ╱                    │
                       ╲───────────────╱                     │
                              │ Yes                          │
                              ▼                              ▼
        ┌──────────────────────────────┐   ┌──────────────────────────────┐
        │ Install SW0DNC-MNETH-B        │   │ Mount the MELSECNET/H board    │
        │ (utility).                    │   │ onto the personal computer.    │
        └──────────────────────────────┘   └──────────────────────────────┘
                              │                              │
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        │ Turn OFF the personal         │   │ Turn the personal computer     │
        │ computer power.               │   │ power ON.                      │
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                              │                              │
                              ▼                              ▼
        ┌──────────────────────────────┐   ┌──────────────────────────────┐
        │ Mount the MELSECNET/H board   │   │ Install SW0DNC-MNETH-B         │
        │ onto the personal computer.   │   │ (driver). *1                   │
        └──────────────────────────────┘   └──────────────────────────────┘
                              │                              │
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        │ Turn the personal computer    │   │ Install SW0DNC-MNETH-B         │
        │ power ON.                     │   │ (utility).                     │
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        │ Install SW0DNC-MNETH-B        │                    │
        │ (driver). *1                  │                    │
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*1: The driver does not need to be installed when using Microsoft® Windows NT® Workstation Operating System Version 4.0 as the operating system.

7.2 Icons to be registered

Installing the software packages will register the icons shown below.
The icons shown below are registered in [Start] - [Program] - [MELSEC].

Remarks

When Microsoft® Windows® XP Professional Operating System is used, the icons are registered to [Start] - [All Programs] - [MELSEC].

Icon	Utility name	Details
	MELSECNET/H Utility	The MNETH Utility starts when this icon is clicked.
	Error Viewer *1	The Error Viewer opens when this icon is clicked.
	Device Monitor Utility	The Device Monitor Utility starts when this icon is clicked.
	MELSEC Communication Function HELP	The Communication function HELP opens when this icon is clicked.

*1: This utility is compatible only with the Microsoft® Windows® 95 Operating System and Microsoft® Windows® 98 Operating System.

8. Using the Manual (PDF Data)

The MELSECNET/H Interface Board User's Manual (For SW0DNC-MNETH-B) is enclosed in the same CD-ROM as the SW0DNC-MNETH-B MELSECNET/H software package.
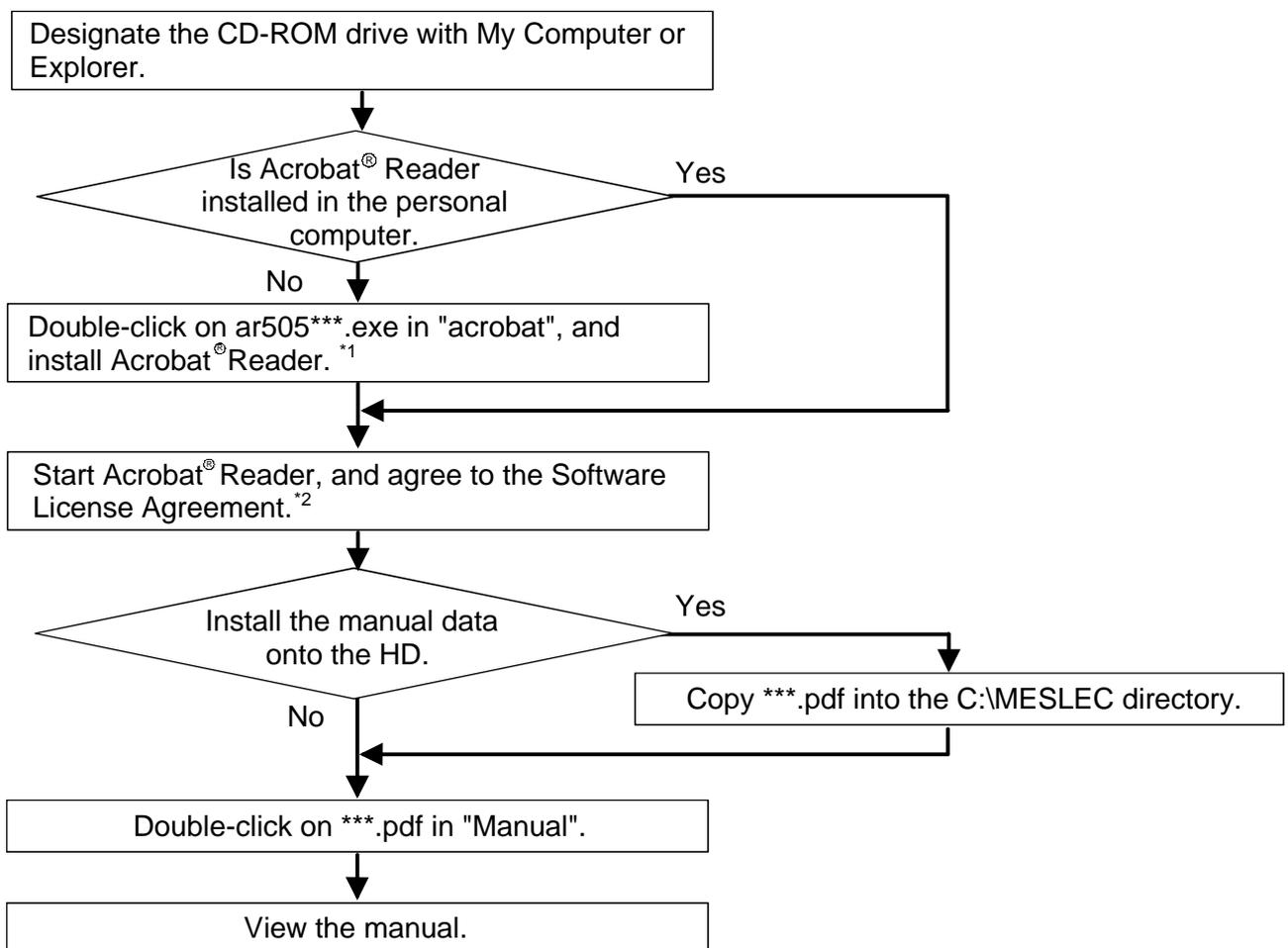The operating manuals may either be used by reading them directly from the CD-ROM or by installing them on the HD. (They can be used at the user's option.)
The manuals are in the form of PDF data which can be viewed using Acrobat Reader of Adobe Systems, Inc.

8.1 Procedures for viewing manual

The following explains the procedure up to manual reading and details of the Manual folder.

(1) Procedure up to manual reading

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┌─────────────────────────────────────────────┐
│ Designate the CD-ROM drive with My Computer  │
│ or Explorer.                                 │
└─────────────────────────────────────────────┘
                    │
                    ▼
          ◇ Is Acrobat® Reader ◇ ───── Yes ──────┐
          ◇ installed in the personal ◇           │
          ◇ computer. ◇                           │
                    │ No                          │
                    ▼                             │
┌─────────────────────────────────────────────┐  │
│ Double-click on ar505***.exe in "acrobat",  │  │
│ and install Acrobat® Reader. *1             │  │
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                    │◄────────────────────────────┘
                    ▼
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│ Start Acrobat® Reader, and agree to the     │
│ Software License Agreement. *2              │
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                    ▼
          ◇ Install the manual data ◇ ──── Yes ───┐
          ◇ onto the HD. ◇                        │
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                    │ No     ┌─────────────────────────────────────────┐
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│ Double-click on ***.pdf in "Manual".        │
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                    │
                    ▼
┌─────────────────────────────────────────────┐
│ View the manual.                            │
└─────────────────────────────────────────────┘
```

*1: 8MB of open space is required in the hard disk.

*2: The PDF data in the "Manual" folder can be viewed by "Agreeing" to the Software License Agreement.

(2) Details of the Manual folder

For details on the contents of the Manual folder, refer to readme.txt in the CD-ROM.
The storage location of readme.txt is as follows:

```
Manual
  ├── Japanese
  │       ├── readme.txt (The following explains the files in the Japanese folder.)
  │       ┊
  └── English
          ├── readme.txt (The following explains the files in the English folder.)
          ┊
```
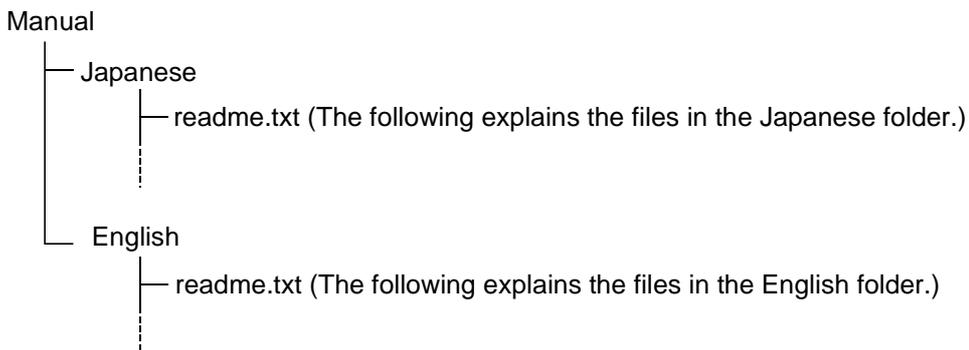
8.2 Operating the manual

The following screen is used to browse any operating manual.

Bookmark section   Manual display section
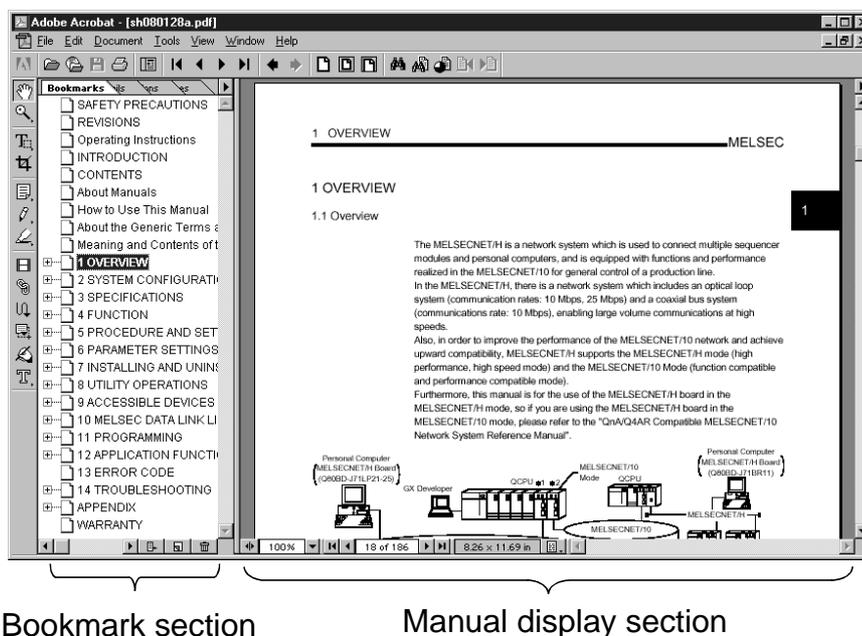
Clicking any contents item in the "bookmark section" with the mouse changes the screen in the "manual display section".

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9. External Dimensions

(1) Q80BD-J71LP21GE

147(5.73)

153(5.97)

141(5.50)

121(4.72)

90(3.51)

99(3.86)

RUN ERR.

L

SD RD

IN

OUT

19
(0.74)

Unit: mm (in.)

MITSUBISHI ELECTRIC